



National Institute of Standards and Technology (NIST)

NIST, founded in 1901, is a non-regulatory federal agency within the [Department of Commerce](#). NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.

Open Data

NIST Public Access Plan

In response to the Memorandum from the Executive Office of the President for the Heads of Executive Departments and Agencies: Increasing Access to the Results of Federally Funded Scientific Research, dated February 22, 2013, NIST developed a NIST Public Access Plan, which was approved by OSTP and OMB in December 2014. The plan described NIST efforts to make freely available to the public, in publicly accessible repositories, all peer-reviewed scholarly publications and associated data arising from unclassified research and programs funded wholly or in part by NIST. Within the constraints of its mission and funding, NIST will also promote the deposit of scientific data arising from unclassified research and programs, funded wholly or in part by NIST, free of charge unless an exception exists, in publicly accessible databases. The plan and public comments are available as NISTIR 8084 [<http://dx.doi.org/10.6028/NIST.IR.8084>]. NIST's Public Access Policy, which was derived from the plan, became effective on June 26, 2015 and is available at <http://www.nist.gov/open>.

Improved Access to Publications and Archival Materials

NIST has partnered with the National Institutes of Health (NIH) to use the existing PubMed Central (PMC) repository system to provide public access to full-text peer-reviewed scholarly publications and associated data for NIST, leveraging the well-established search, archival, and dissemination features of PMC. NIST plans to acquire a web-based manuscript submission and peer-review workflow solution that enables geographically dispersed stakeholders, including both NIST employees and non-NIST collaborators, to electronically submit, edit, and search bibliographic information and view progress-tracking information during internal review.

NIST is also working with the Internet Archive, under an arrangement with the Library of Congress, to digitize the hundreds of technical reports it has published over more than 100 years, with the goal that the entire legacy collection of NBS/NIST technical series publications will be available to the public through the Government Printing Office's Federal Digital System. Some of these technical publications were targeted to very specific audiences, but many are about topics of interest to a broader audience.

NIST staff members are also enhancing the NIST Digital Archives by adding information about and images of artifacts in the NIST Museum collections and photographs portraying NBS/NIST history. NIST staff members are tracking the number of web hits on and the number of citations of those reports and papers to make a measurement-based determination of the effectiveness of this strategy to increase the impact of NIST research.

Improved Access to Research Data

NIST's plan for providing public access to scientific research data consists of three components: data management plans (DMPs), an Enterprise Data Inventory (EDI), and a data repository providing a public access infrastructure. Generation of data management plans has begun, providing documentation of plans for storage, archival, and accessibility for NIST's multiple types of data. The EDI is a catalog of the datasets with a user-friendly front end to enable NIST scientists to easily enter metadata about their datasets and an export capability to facilitate feeding that metadata into data.gov. The NIST Data Repository will make it easier for NIST staff to make their research data publicly accessible.

To enhance its ability to store, exchange, and disseminate its research data to external stakeholders and the public as well as to share it between NIST technical staff and their immediate collaborators, NIST is making foundational improvements to its data management infrastructure. There are four prongs to this initiative:

- Analyze data management practices across NIST organizational units, document procedures, and build out flexible and extensible tools to support data management plans and the Enterprise Data Inventory;
- Create a robust data management framework for data of all working levels by extending cloud-based storage and network connectivity, and deploying easy-to-use interfaces for the management of NIST data;
- Pilot development of a NIST public access data portal with improved interfaces, with particular focus on supporting Standard Reference Data;
- Accelerate the identification, assessment, authorization, and deployment process for widely used software tools that support data exchange and research collaboration.

Privacy

NIST follows departmental guidance from the Office of Privacy and Open Government.

Whistleblower Protection

NIST follows departmental guidance from the Office of Inspector General.

Websites

Several years ago, as part of an effort to expand dissemination of its research results, NIST implemented a content management system (CMS), which included access to an improved database of research papers authored or co-authored by NIST researchers. Content is “tagged” by topic, enabling the public to subscribe to receive new information posted on the website on specific topics of interest such as nanotechnology or energy-related research. Currently, there are more than 140,000 subscribers who receive information on approximately 160 different topics. The NIST website also includes several blogs that allow members of the public to comment or ask questions about posted articles and the CMS includes icons to easily share content from the NIST site with social media websites (more than 4,200 “shares” in the last 6 months of FY2015).

NIST is migrating its central web pages from a proprietary CMS to Drupal, an open source CMS. The new website will allow greater flexibility in the functionality of NIST internal and external web pages. It will also be hosted in the cloud, which will improve NIST’s ability to meet current and future needs.

Social Media

NIST has created sites on YouTube (more than 5,400 subscribers, more than 1 million video views), Facebook (more than 43,000 “likes”), Twitter (more than 27,000 “followers”), LinkedIn (almost 19,000 followers) and Flickr (more than 1,400 images with nearly 880,000 views). To ensure that as many people as possible benefit from NIST’s work, news of major research results posted on the NIST website is routinely announced through these additional social media sites.

Transparency

NIST strives to be consistently open and transparent in its interactions with the public and news media.

The Institute implements the Department of Commerce Public Communications Policy, which includes explicit approval for research staff to talk with the news media and the public directly – without prior permission from the Public Affairs Office – about the results of their taxpayer funded research.

NIST Public Affairs Office regularly offers communications training to its research staff, including describing this portion of the policy, to ensure that they are committed to broadly disseminating NIST results to a wide variety of audiences. Plain language training is available online and through regularly scheduled in-person courses on campus.

The Union of Concerned Scientists, a non-profit dedicated to encouraging transparency in scientific communication, surveyed NIST technical staff and found that NIST scientists “are aware of free speech protections in the official policy and report a comparatively high degree of openness.”

NIST provides a dedicated phone and email public inquiries referral service during all business hours to ensure that any member of the public may request assistance in locating specialized technical reports or experts or in resolving customer services concerns they may have. The Public Inquiries email is available in the footer of most NIST web pages to facilitate easy access to this service.

NIST’s [policy on scientific integrity](#) is also easily accessed on its homepage.

Public Notice

NIST follows departmental guidance from the Office of Public Affairs.

Records Management

NIST manages its records in accordance with NARA and Department of Commerce regulations, ensuring that records are economically and effectively created to meet business needs, kept long enough to protect rights and assure accountability, and preserved and available for future generations. Records are retained in accordance with NARA-approved records schedules. NIST is updating its records management directives and data management infrastructure to be clear and concise, conveying records management requirements and responsibilities to all NIST staff.

Freedom of Information Act (FOIA) Requests

NIST responds to Freedom of Information Act requests in accordance with Department of Commerce regulations and Department of Justice guidance. NIST emphasizes the importance of transparency of its operations and regularly performs discretionary releases of documents and information that could qualify for exemption from release, but for which there is no foreseeable harm. The NIST FOIA Office works collaboratively with NIST Operating Units to obtain information in response to requests in a timely manner and to encourage proactive disclosure of information.

Proactive Disclosure

In November 2013, NIST initiated a review of its cryptographic standards development process in response to concerns about the integrity of NIST cryptographic standards and guidelines. As a

critical component of this review, the NIST Director charged the NIST Visiting Committee on Advanced Technology (VCAT) to form a Committee of Visitors (CoV) to serve as technical experts to assess NIST cryptographic standards and guidelines development process and if necessary provide findings on how it could be improved. NIST made publicly available all materials provided to the panel by posting the content on the VCAT website. NIST also held open discussions with multiple stakeholders for awareness and input.

Congressional Requests

NIST follows departmental guidance from the Office of Legislative and Intergovernmental Affairs.

Declassification

NIST follows departmental guidance from the Office of the Secretary.

Participation

NIST has a rich history of participation in numerous standards development efforts, dating back to the beginning of the 20th century when the National Bureau of Standards (which became NIST in 1988) was founded. Currently, over 450 NIST staff members participate in over 120 standards development organizations on both a national and international scale.

To increase citizen involvement in the development of standards to address new technological challenges, NIST has reached out into the community to convene workshops at key locations around the country, organize diverse stakeholders, and establish consensus-developing organizations. This strategy has broadened participation and organized communities to take action in a prioritized, timely manner. It has been used successfully for developing standards frameworks for the smart grid sector and critical infrastructure cybersecurity. The strategy is currently being used to develop a community-centric resilience framework and to bring a uniform structure to the previously ad hoc development of forensic standards and guidelines.

Smart Grid Interoperability Panel

In 2009, NIST initiated the Smart Grid Interoperability Panel (SGIP) as a vehicle for NIST to solicit input and cooperation from private and public sector stakeholders in developing the smart grid interoperability standards framework. With NIST encouragement, the SGIP was transitioned to a non-profit private-public partnership organization in 2013, supported by industry stakeholder funding and funding provided through a cooperative agreement with NIST. The SGIP does not develop standards directly, but rather it provides an open process for stakeholders, including NIST, to coordinate and accelerate standards development and harmonization and to advance the interoperability of smart grid devices and systems.

Green Button Initiative

NIST provides leadership to the standards development work in the White House-inspired and industry-led Green Button Initiative, which enables consumers to obtain and share their own energy usage information in a standardized electronic format. Working closely with the SGIP, industry and other federal agencies, NIST has led the development of the technology foundation for Green Button, including standards, testing, developer tools and technical support for implementers, including many utilities. NIST has also encouraged the formation of the new Green Button Alliance, a non-profit organization dedicated to advancing Green Button and supporting Green Button testing and certification. Based on significant nationwide voluntary adoption by utilities, and with support by NIST, over 100 million U.S. consumers (and over 8 million Canadian consumers) now have Green Button data access to help them better understand and manage their energy usage.

Materials Genome Initiative

The Materials Genome Initiative (MGI), launched by President Obama in 2011, is a multi-agency initiative designed to create a new era of policy, resources, and infrastructure that support U.S. institutions in the discovery, manufacture, and deployment of advanced materials twice as fast, at a fraction of the cost. The discovery and optimization of new materials for innovative products is a time-consuming and laborious process, and computational design of materials has begun to emerge as a powerful new tool for materials discovery and optimization. However, major efforts in both theory and experiment are needed to provide the data that underlies successful modeling. Given NIST expertise in the integration, curation, and provisioning of critically evaluated data and models, NIST has assumed a leadership role within the MGI, establishing essential data exchange protocols and the means to ensure the quality of materials data and models. These efforts will yield the new methods, metrologies, and capabilities necessary for accelerated materials development. NIST is working with stakeholders in industry, academia, and government to develop the standards, tools, and techniques enabling acquisition, representation, and discovery of materials data; interoperability of computer simulations of materials phenomena across multiple length and time scales; and the quality assessment of materials data, models, and simulations.

Framework for Improving Critical Infrastructure Cybersecurity

Starting in 2013, NIST has worked with stakeholders to develop a voluntary framework – based on existing standards, guidelines, and practices – for reducing cyber risks to critical infrastructure. The first version of the Framework for Improving Critical Infrastructure Cybersecurity was released on February 12, 2014. Since then, NIST has collected user feedback and experience through a Request for Information and a public workshop. NIST also facilitated working sessions on specific technical areas that will be used to enhance the Framework in the future.

National Strategy for Trusted Identities in Cyberspace

Since 2011, NIST has led implementation of the National Strategy for Trusted Identities in Cyberspace (NSTIC). This global initiative aims to improve the privacy, security, and convenience of online transactions through a collaborative effort between the private sector, the public sector, advocacy groups, and other non-profit organizations. NSTIC implementation has three primary stakeholder engagement approaches: 1) Modeled after the SGIP, NIST initiated the private sector led Identity Ecosystem Steering Group, a multi-stakeholder vehicle for the development of the Identity Ecosystem Framework (IDEF) – the policy, standards, and accreditation processes for Identity Ecosystem participants. The first version of the IDEF was released in 2015. 2) Over the past four years, NIST has facilitated adoption of NSTIC-aligned identity solutions by funding 16 private sector pilots and two pilots with states through cooperative agreements. As of December 31, 2015, the Pilots Program has convened more than 150 organizations to work together in advancing NSTIC-aligned solutions. The pilots have impacted over 3.8 million individuals, with advances occurring across 11 sectors – including the development of 10 multi-factor authentication solutions. 3) NIST advances standards and guidance by working with stakeholders to advance the measurability of identity and authentication solutions to further risk-based decision-making and support the evolution of an efficient marketplace for identity solutions.

Privacy Risk Management Framework

NIST also has initiated development of a privacy risk management framework to support improved privacy engineering in the design of information systems. NIST is developing a NIST Interagency Report on privacy engineering objectives and a model to enable identification of privacy risk and improved responses. NIST held two public workshops, with attendance from industry, government and academia, in FY2014 to inform the development of this report, and presented the draft concepts through a live webcast with an interactive question and answer period. Comments received were posted publicly.

Organization for Scientific Area Committees

In 2014, NIST collaborated with the Department of Justice and the forensic science community to create the Organization for Scientific Area Committees (OSAC), established to coordinate development of standards and guidelines for forensic science. OSAC has named 402 new members to 23 subcommittees on forensic disciplines such as firearms and toolmarks and facial identification, and is bringing a uniform structure to what was previously an ad hoc system, with the goal of improving the quality and consistency of forensic science in the United States.

Community Resilience Planning Guide

NIST is leading the development of a community-centric Community Resilience Planning Guide for Buildings and Infrastructure Systems, or Guide, which will establish the overall performance goals; assess existing standards, codes, and practices; and identify gaps that must

be addressed in order to bolster community resilience. In 2014 and 2015, NIST convened a series of Community Resilience Workshops around the country to engage a broad network of stakeholders with multidisciplinary expertise to help develop the Guide, with a focus on the role that buildings and infrastructure lifelines play in ensuring community resilience. NIST convened 5 workshops across the country to engage stakeholders in the development of the Guide. Following a public comment period kicked off in April 2015, the first version of the Guide was released on October 29, 2015, and may be updated periodically as new best practices and research results become available and as communities gain experience using the guide and recommend improvements.

Big Data Public Working Group

Big Data is another important area in which NIST is leading public participation in standards development. Although there is broad agreement about the remarkable potential of "Big Data" to spark innovation, fuel commerce, and drive progress, the rate at which data volumes, speeds, and complexity are growing is outpacing scientific and technological advances in data analytics, management, transport, and more. NIST is leading the NIST Big Data Public Working Group (NBD-PWG) to develop consensus definitions, taxonomies, reference architectures, and technology roadmaps to accelerate the deployment of robust Big Data solutions. The NBD-PWG, open to the public with active membership from industry, academia, and government, has five subgroups that have developed Phase 1 of a Big Data Interoperability Framework that will define and describe high-level reference architectural components. The seven volumes representing Stage 1 of the NIST Big Data Interoperability Framework V1.0 are available at http://bigdatawg.nist.gov/V1_output_docs.php. In stage 2, we will explore preliminary interfaces between these components with the goals to aggregate low-level interactions into high-level general interfaces and produce a set of white papers to demonstrate how the reference architecture can be used; in stage 3, we will validate the reference architecture by building Big Data general applications through the general interfaces.

Standards Education

Standards provide industries and innovators with a common language that facilitates trade, simplifies transactions and enables people to work together toward greater common goals that cut across disciplines and borders. NIST supports the development of standards by identifying areas where they are needed, convening stakeholders and providing technical and scientific guidance and expertise to help stakeholder groups reach a consensus. In 2015, NIST awarded seven grants totaling more than \$490,000 to universities in five states to advance standards education. Under the Standards Services Curricula Development Cooperative Agreement Program, recipients will work with NIST to integrate instruction related to standards and standardization into undergraduate and graduate curriculum at U.S. colleges and universities. Grants in 2015 were awarded to Carnegie Mellon (Pittsburgh, PA), Jackson State (Jackson, MS), Michigan State (East Lansing, MI), University of Hartford (West Hartford, CT), University of Houston (Houston, TX), and the University of Pennsylvania (Philadelphia, PA).

Collaboration

To help accomplish its mission, NIST seeks out high-quality partnerships, collaborations, and other interactions with U.S. companies, universities, and agencies at the federal, state, and local levels. Each year, NIST hosts about 2,700 associates and facility users who collaborate with its scientists. NIST works with over 1,300 manufacturing specialists around the country to help small and mid-size manufacturers improve and grow. NIST has several designated user facilities available for both proprietary and non-proprietary research. Access to these facilities is generally provided on a first-come, first-served cost-reimbursable basis. In addition, NIST jointly operates research organizations explicitly established to promote the kind of cross-disciplinary collaborations that accelerate research results. NIST hosts as many as 100 conferences, workshops, symposia, and other meetings annually. Most are co-sponsored with other federal agencies, academic institutions, professional societies, or industry groups.

National Cybersecurity Center of Excellence

NIST also recently established the National Cybersecurity Center of Excellence (NCCoE). The NCCoE brings together experts from industry, government, and academia to develop and effectively transfer practical cybersecurity standards, technologies, and best practices to the nation's business sectors. By accelerating dissemination and use of standards, best practices, and integrated tools and technologies for protecting information technology assets and processes, the NCCoE fosters trust in U.S. business sectors and improvements to the overall security of the economy. The NCCoE supports implementation of existing cybersecurity guidelines and frameworks, serves as a technical resource for both public and private sectors, and contributes to the development of cybersecurity practices and practitioners.

Today, the NCCoE has programs working with the health care, energy, financial services, transportation and retail sectors. In addition, the center is addressing challenges that cut across sectors, including mobile device security, software asset management, cloud security, identity management, and secure email.

Centers of Excellence

NIST is also in the process of creating Centers of Excellence to provide an interdisciplinary environment where researchers from NIST, academia, and industry will collaborate on emerging areas of basic and applied research and innovations in measurement science. The first of these centers, the Center for Hierarchical Materials Design (CHiMaD), was established in 2013 to accelerate materials discovery and development; provide opportunities to transition new breakthroughs in advanced materials to industry; convene multidisciplinary and multi-sector communities for in-depth discussions; and provide training opportunities for scientists and engineers in materials metrology.

Two Centers of Excellence were established in 2015 after selection through a merit-based competition. The Center for Risk-Based Community Resilience Planning will focus on tools

to support community disaster resilience. The center will work on developing integrated, systems-based computational models to assess community infrastructure resilience and guide community-level resilience investment decisions. The center will provide a scientific basis for developing resilience metrics and decision-making tools and for evaluating cascading effects that arise in interconnected physical and social infrastructures.

The third center, the Center for Statistics and Applications in Forensic Evidence, was announced in May of 2015. This center supports NIST's efforts to advance the utility of probabilistic methods to enhance forensic analysis. Working with NIST researchers and partners from four universities led by Iowa State University, the Forensic Science Center of Excellence will evaluate and solidify the statistical foundation for fingerprint, firearm, toolmark, and other pattern evidence analyses, and for multimedia evidence analyses. The center will also develop and implement an education and training program to ensure that judges, lawyers, and forensic science investigators can effectively decipher the results of statistical analysis on pattern and digital evidence.

Advanced Manufacturing National Program Office

NIST provides leadership and coordination across all federal agencies with program in advanced manufacturing by leading the interagency Advanced Manufacturing National Program Office (AMNPO), hosted by NIST. In particular the AMNPO is charged with enabling industry-led, private-public partnerships focused on manufacturing innovation to enhance technology transfer in U.S. manufacturing industries. With participation from all federal agencies involved in U.S. manufacturing, the AMNPO is establishing the National Network for Manufacturing Innovation (NNMI), a network of linked Institutes for manufacturing innovation with common goals but unique concentrations, which will create a manufacturing research infrastructure for U.S. industry and academia to solve industry-relevant problems, as well as provide work force training needed in manufacturing. To date, these Institutes have been stood up by the mission agencies DoE and DoD, but it is proposed that DOC, USDA, and other agencies soon fund institutes. In FY 2016 NIST intends to hold an open-topic competition to fund up to two institutes that will join the others in the network. NIST will manage a competitive proposal and review process to select and fund Institutes funded by DOC that bring together industry, academia, and government partners to collaborate and co-invest in manufacturing innovation.

NIST is responsible for convening all Institutes within the NNMI for sharing of best practices and providing support infrastructure.

Technology Transfer

NIST works to disseminate its research results as broadly as possible. In October 2014, NIST and NOAA co-sponsored a Technology and Entrepreneurship Showcase to bring together innovative technologies, licensable inventions, research and engineering facilities, small

business support resources at the Federal and state levels, and sources of funding—all under one roof, and all available for networking. Excluding presenters, over 60 individuals attended. NIST plans to continue this series in 2015, working in conjunction with the Commonwealth of Virginia. NIST also plans to host two “listening sessions” in Maryland to hear from the local communities about how federal labs can contribute to economic development. Technology Transfer partnership activities across Commerce are described in an annual report available at <http://www.nist.gov/tpo/publications/doc-annual-reports-techtransfer.cfm>.

Lab to Market

NIST plays a prominent role in fulfilling requirements of the Lab to Market Cross Agency Priority (CAP) Goal, one of 15 goals established as part of the President’s Management Agenda and stemming from the Presidential Memorandum on Technology Transfer of 2011. As part of this effort, in FY2015 NIST initiated a pilot NIST entrepreneurship program, partnering with the Minority Business Development Agency (MBDA) to integrate minority business development into the Lab to Market process, working with other agencies to develop policies and tools to bring investors and capital to the technology commercialization process, holding workshops with universities on extramural commercialization, and conducting economic studies to evaluate impact in identified priority areas. Also as part of the Lab to Market Team, NIST has placed all of its technology data and facility use data on data.gov in a machine-readable format for other parties to use.

Challenges

Global City Teams Challenge

The NIST is partnering with other federal agencies and the private sector to sponsor a year-long [Global City Teams Challenge](#) to help communities around the world work together to address issues ranging from air quality to traffic management to emergency services coordination. GCTC identifies standards and measurements to guide technology innovators in creating solutions that can work anywhere and lay the groundwork for a future of smarter cities. NIST is inviting communities and innovators to create teams that will foster the spread of “smart cities” that take advantage of networked technologies to better manage resources and improve quality of life. Voluntary participants will work collaboratively to build, deploy, and test transformative Internet of Things/Cyber-Physical Systems applications within communities across the U.S. This new challenge will leverage the success of the previous GCTC round, which took place from September 2014 through June 2015 and brought together more than 200 companies, universities and other organizations with more than 40 cities worldwide to form teams that developed and applied smart city technologies. That challenge demonstrated that these technologies have the potential to create jobs and business opportunities and provide socioeconomic benefits. For GCTC 2016, a mid-course Tech Jam will be held March 2016 in Washington, leading to the capstone event in June in Austin, Texas where city teams will

demonstrate smart solutions that provide measurable benefits to residents such as reducing traffic congestion, lowering energy costs, enabling ageing in place, and more.

Transactive Energy Challenge

Transactive Energy (TE) refers to techniques for managing the generation, consumption, or flow of electric power within the electric power system through the use of economic or market-based constructs while considering grid reliability constraints. As the electric grid transforms to integrate more wind and solar energy and to give customers more choice and control in their use of energy, the concept of transactive energy is expected to play a key role. Members of NIST's Smart Grid Team have been working closely with the Department of Energy to understand TE's potential and to support utilities, technology developers, and policy makers. The TE Challenge brings researchers and companies with simulation tools together with utilities, product developers, and other grid stakeholders to create and demonstrate modeling and simulation platforms while applying transactive energy approaches to real grid problems.

Head Health Challenge III

NIST joined with the National Football League (NFL), GE, and Under Armour to launch Head Health Challenge III, an open innovation competition to support the discovery, design, and development of advanced materials that better absorb or dissipate impact energy. NIST will work to refine measurement approaches, convene the research and industry communities to assess the state of performance testing for impact energy absorbing/dispersing materials and identify gaps in these measurements. The ultimate goal will be to develop standard testing methods for these materials systems over the next several years. These new materials have the potential to improve the performance of protective gear and equipment for athletes, members of the military, and others. Head Health Challenge III was part of the \$60 million Head Health Initiative, a multiyear collaboration between GE and the NFL launched in March 2013. Entries were judged by leading experts in the field of materials science who selected five winners to receive a \$250,000 award each to advance their work in developing technologies that can help prevent mild traumatic brain injury. One grand prize winner will be selected from the five and will receive an additional \$500,000 to further develop their innovation. The five winners were announced in December 2015; the grand prize winner will be announced in January 2017.

Nutrient Sensor Challenge

Nutrients like nitrogen and phosphorus are essential for plant growth but high nutrient concentrations in our waterways can be harmful to ecosystems and to human health. Federal and State agencies, researchers, utilities, and watershed managers across the United States measure these concentrations to gain a better understanding of nutrient

levels and how nutrients move through the environment—empowering both scientific research and more-informed watershed management decisions. Better sensors can also help Federal and State agencies, communities, and the private sector better track progress of their nutrient control programs and the significant investments they have made to reduce nutrient pollution. The EPA, NOAA, USGS, and NIST in conjunction with the Alliance for Coastal Technologies ran the Nutrient Sensor Challenge for development of sensors that are affordable, accurate, and reliable. Applications were due in December 2015, after which verification testing will begin. Winners will be announced in December 2016.

NIST Open Government Initiatives

The table below shows a list of initiatives for *NIST*.

Table 1 - NIST Initiatives

Operating Unit	Project	Status	Estimated Completion
NIST	Improving NIST's Data Management Infrastructure	Ongoing/Continuous	
	Establishing New Centers of Excellence	Completed (May 2015)	
	Engaging Citizens to Develop a Disaster Resilience Framework	Completed (October 2015)	
	NIST Reference Data Challenge	Completed (November 2015)	
	Improving Access to Publications by NIST Authors	Live/Operational	
	Global Cities Team Challenge 2	In Progress	June 2016
	Modernization of Standard Reference Data	In Progress	July 2016
	Materials Data Curation System	In Progress	September 2016
	Head Health Challenge III - Advanced Materials for Impact Mitigation	In Progress	January 2017

- ***Project – Improving NIST’s Data Management Infrastructure***

Some of NIST’s data outputs are highly vetted data products intended explicitly for broad dissemination. However, a large fraction of the valuable data that NIST produces is in support of scientific, engineering, and other technical work, allowing scientists to demonstrate results

and draw conclusions that are then published in scholarly journals. The teams producing such research data can vary in size from dozens of researchers to individual staff scientists. In some cases the data are shared only within small, internal teams of NIST employees, while in other cases the data must be shared with collaborators in other government agencies, national labs, academia, industry, or foreign institutions. The volumes of data also cover a large range, from the scale of terabytes in a single dataset to a few megabytes for one team's annual output.

In order to enhance NIST's ability to store, exchange, and disseminate NIST research data with external stakeholders and the public as well as between NIST technical staff and their immediate collaborators, NIST is making fundamental and foundational improvements to its data management infrastructure. There are four areas in this initiative: 1) Analyze data management practices across NIST organizational units, document procedures, and build out flexible and extensible tools to support Data Management Plans and the Enterprise Data Inventory; 2) Create a robust data management framework for data of all working levels by extending cloud-based storage and network connectivity, and deploying easy-to-use interfaces for the management of NIST data; 3) Pilot development of a NIST public access data portal with improved interfaces, with particular focus on supporting Standard Reference Data; 4) Accelerate the identification, assessment, authorization, and deployment process for widely used software tools that support data exchange and research collaboration.

- ***Project – Establishing New Centers of Excellence***

NIST is creating Centers of Excellence to provide an interdisciplinary environment where researchers from NIST, academia, and industry can collaborate on emerging areas of basic and applied research and innovations in measurement science. Two Centers of Excellence were established in 2015 after selection through a merit-based competition. The Center for Risk-Based Community Resilience Planning will focus on tools to support community disaster resilience. The center will work on developing integrated, systems-based computational models to assess community infrastructure resilience and guide community-level resilience investment decisions. The center will provide a scientific basis for developing resilience metrics and decision-making tools and for evaluating cascading effects that arise in interconnected physical and social infrastructures. The Center for Statistics and Applications in Forensic Evidence will support NIST's efforts to strengthen forensic science through the development and delivery of improved measurement and analysis technologies and the development of best practices and standardized methodologies to improve evidence interpretation and reporting. The Center will evaluate and solidify the statistical foundation for fingerprint, firearm, toolmark, and other pattern evidence analyses and for multimedia evidence analyses. The center will also develop and implement an education and training program to allow investigators, lawyers, and judges to understand the results of statistical analyses on pattern and digital evidence. These new Centers of Excellence join the National Cybersecurity Center of Excellence and the Center for Hierarchical Materials and Design.

- ***Project – Engaging Citizens to Develop a Disaster Resilience Framework***

Natural and man-made disasters cause an estimated \$57B in average annual costs, with large single events resulting in losses of \$100B or more. Recent events, such as the World Trade Center disaster, Hurricane Katrina, and Superstorm Sandy, have highlighted a need for current practice to consider the functionality and interdependencies of buildings and infrastructure systems and the role they play in restoring the fabric of the community following a hazard event.

To address this problem, NIST is leading the development of a community-centric Disaster Resilience Framework, which will assess existing standards, codes, and practices, and identify gaps that must be addressed in order to bolster community resilience. In 2014 and 2015, NIST convened a series of five Disaster Resilience Workshops around the country to engage a broad network of stakeholders with multidisciplinary expertise to help develop the Disaster Resilience Framework, with a focus on the role that buildings and infrastructure lifelines play in ensuring community resilience. The first version of the Community Resilience Planning Guide for Buildings and Infrastructure Systems was released in October 2015.

- ***Project – NIST Reference Data Challenge***

NIST launched its first app challenge in 2015, intending to spur the development of new ways to use standard reference data (SRD) on mobile devices. SRD are scientific and technical databases that cover a broad range of chemical substances and properties and are used in many scientific disciplines. Six machine-readable SRD products were available to developers, and the challenge garnered 25 entries. Judges rated submissions based on four criteria: the potential impact of the app to help students and other technical experts use NIST SRD; creativity and innovation; implementation criteria such as user engagement and how well it worked; and whether or not the app used at least one NIST dataset. Prizes totaling \$45,000 were awarded to three developers in November 2015; two honorable mentions were also awarded.

- ***Project – Improving Access to Publications by NIST Authors***

NIST has partnered with the National Institutes of Health (NIH) to utilize the existing PubMed Central (PMC) repository system to provide public access to full-text peer-reviewed scholarly publications and associated data for NIST, leveraging the well-established search, archival, and dissemination features of PMC. NIST staff began depositing papers in 2015. NIST has plans to acquire a web-based manuscript submission and peer-review workflow solution that enables geographically dispersed stakeholders, including both NIST employees and non-NIST collaborators, to electronically submit, edit, and search bibliographical information and view progress tracking information during internal review of manuscripts.

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be available to the public through the Government Publishing Office's Federal Digital System. Some of these technical publications were targeted to very specific audiences, but many are about topics of interest to a broader audience.

- ***Project – Global Cities Team Challenge***

The 2016 Global City Teams Challenge (GCTC 2016) brings together communities with shared smart city goals and teams them with innovators from industry and academia to apply Internet of Things and Big Data concepts in making cities measurably more sustainable, resilient, livable, and workable. GCTC identifies standards and measurements to guide technology innovators in creating solutions that can work anywhere and lay the groundwork for a future of smarter cities. For GCTC 2016, a mid-course Tech Jam will be held March 2016 in Washington, leading to the capstone event in June in Austin, Texas where city teams will demonstrate smart solutions that reduce traffic congestion, lower energy costs, enable ageing in place, and more. GCTC 2016 will include training opportunities for cities interested in using Commerce data, including the Census Bureau's CitySDK.

- ***Project – Modernization of Standard Reference Data***

For more than 50 years, NIST has been making standard reference databases available for a broad range of chemical and physical properties for use in many scientific disciplines including biology, chemistry, engineering, forensics, materials science, and physics. Customer expectations for a 'useable' data product have changed as technology has evolved. Most of the 100 databases are currently available as searchable tables. We are modernizing the look and feel of these databases and incorporating APIs to make the databases easier to use and to allow access to the data through code rather than requiring users to perform multiple manual searches.

- ***Project – Materials Data Curation System***

The Materials Genome Initiative (MGI), launched by President Obama in 2011, aims to dramatically increase the speed businesses can discover, develop, and deploy new materials, by capitalizing on breakthroughs in materials modeling, theory, and data mining. The MGI approach is expected to decrease cost and time-to-market by 50%. The NIST Materials Data Curation System (MDCS), an infrastructural platform developed to support the MGI, provides a means for capturing and transforming this materials data into a structured format that is XML-based and amenable to transformation to other formats so that the data can be shared across academia, the government, and industry. The MDCS will be beta-tested in September 2016.

- ***Project – Head Health Challenge III – Advanced Materials for Impact Mitigation***

NIST joined with the National Football League (NFL), GE, and Under Armour to launch Head Health Challenge III, an open innovation competition to support the discovery, design, and development of advanced materials that better absorb or dissipate impact energy. These new materials have the potential to improve the performance of protective gear and equipment for

athletes, members of the military, and others. The challenge was part of the \$60 million Head Health Initiative, a multiyear collaboration between GE and the NFL launched in March 2013. Entries were judged by leading experts in the field of materials science who selected five winners to receive a \$250,000 award each to advance their work in developing technologies that can help prevent mild traumatic brain injury. One grand prize winner will be selected from the five and will receive an additional \$500,000 to further develop their innovation. The five winners were announced in December 2015; the grand prize winner will be announced in January 2017.