



## National Institute of Standards and Technology (NIST)

**N**IST founded in 1901 is a non-regulatory federal agency within the [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. The plan describes 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. A NIST Public Access Policy will articulate the roles and responsibilities of NIST staff for ensuring public access.

### **Improved Access to Publications and Archival Materials**

The NIST is partnering 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.

The 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.

The 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 Data**

The NIST's plan for providing public access to data consists of three components: data management plans (DMPs), an Enterprise Data Inventory (EDI), and a Common Access Platform 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 Common Access Platform will create an infrastructure of registries to make it easier for users to find and use datasets from any source.

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 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.

### **Materials Genome Initiative**

The Materials Genome Initiative (MGI) 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.

### **Privacy**

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

### **Whistleblower Protection**

The 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 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 110,000 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 3,000 “shares” in the first 4 months of FY2015).

### **External Website Migration**

The 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**

The NIST has created sites on YouTube (more than 4,300 subscribers, nearly 1 million video views), Facebook (more than 20,000 “likes”), Twitter (16,000 “followers”), LinkedIn (10,000 followers) and Flickr (more than 17,000 images viewed). 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**

The 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.

The 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 the 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.”

The 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**

The NIST follows departmental guidance from the Office of Public Affairs.

## **Records Management**

The 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. NIST is updating its records management directives to be clear and concise, conveying records management requirements and responsibilities to all NIST staff.

## **Freedom of Information Act (FOIA) Requests**

The 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 the 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.

### **Participation**

The NIST has a rich history of participation in numerous standards development efforts, dating back to the beginning of the 20<sup>th</sup> 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, the 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 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**

The NIST provides leadership to the standards development work in the White House inspired and industry-led Green Button Initiative, which enables consumers to download their own energy usage information from their utilities' websites 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. 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.

### **Framework for Improving Critical Infrastructure Cybersecurity**

Starting in 2013, the 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**

In 2011, the President signed the National Strategy for Trusted Identities in Cyberspace (NSTIC). This important White House 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. The National Program Office (NPO) was established at NIST by the Secretary of Commerce to coordinate the implementation of the NSTIC. Modeled after the SGIP, NIST initiated the Identity Ecosystem Steering Group (IDESG) as a multi-stakeholder vehicle for the development of the Identity Ecosystem Framework – the policy, standards, and accreditation processes for Identity Ecosystem participants. Over the past three years, NIST has funded twelve private sector pilots through cooperative agreements to facilitate the adoption of NSTIC-aligned identity solutions.

### **Privacy Risk Management Framework**

The 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 risk model. 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, the 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.

### **Disaster Resilience Framework**

The NIST is leading the development of a community-centric Disaster Resilience Framework, 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 is convening a series of 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. To date, NIST has convened 3 workshops and has another scheduled for mid-February 2015. The first version of the Disaster Resilience Framework will be released for public comment in the spring of 2015.

### **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 developing a working draft of a Big Data Interoperability Framework that will be available for public comment in February 2015.

### **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**

The NIST has established the National Cybersecurity Center of Excellence (NCCoE) to collaborate with user communities and vendors and integrators of commercially available technologies to build practical cybersecurity reference designs that can be rapidly applied to the real challenges that businesses face each day.

## **Centers of Excellence**

The 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.

The second, the Community Resilience Center of Excellence, was selected through a merit-based competition and announced in February 2015. The new center will collaborate with NIST to achieve its long-term goal of developing tools that individual communities can use to assess their resilience. This includes evaluating the effectiveness of alternative measures intended to improve performance and minimize post-disaster disruption and recovery time. These tools will improve decision-making so that communities can build a “business case” for the measures they take.

A third center, the competitive selection of which is to be announced in FY 2015, 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.

## **Advanced Manufacturing National Program Office**

The 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. NIST is responsible for convening all Institutes with the NNMI for sharing of best practices and providing support infrastructure. NIST also responsible for managing 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.

## **Technology Transfer**

The 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.

## **Lab to Market**

The 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 is initiating 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. 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”/“CyberPhysical Systems” applications within communities across the U.S. This new challenge will leverage the success of the [SmartAmerica Challenge](#), which from December 2013 through June 2014 brought together more than 100 companies, universities and other organizations to form teams that developed and applied networked technologies. That challenge demonstrated that these technologies have the potential to create jobs and business opportunities and provide socioeconomic benefits.

### Head Health Challenge III

The NIST has joined with the NFL, GE and Under Armour to launch Head Health Challenge III, an open innovation competition to advance materials that better absorb or dissipate energy. These new materials could improve the performance of protective equipment for athletes, military personnel and those in dangerous occupations. The challenge, which will award up to \$2million for innovative materials, is part of the \$60 million Head Health Initiative, a multiyear collaboration between GE and the NFL launched in March 2013. It aims to support the discovery, design and deployment of advanced materials that can improve the protection of athletes, members of the military and others from brain injuries by better absorbing and mitigating force. Additionally, 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.

### NIST Open Government Initiatives

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

Table 9 - NIST Initiatives

Operating Unit	Project	Status	Estimated Completion
NIST	Improving Dissemination of Basic Research Results via the NIST and other websites	Live / Operational	--
	Improving access to NIST research results through social media including Wikipedia, Facebook, YouTube, Flickr, and Twitter	Live / Operational	--
	Improving Access to the Digital Data Repository of NIST Collections, including Publications, Artifacts, and Photographs Relating to Measurement Science	Live / Operational	--
	Making Photos and Videos from the 9/11 Investigation available to the public	Completed (August 2011)	--

- ***Project – Improving Dissemination of Basic Research Results via the NIST and other websites***

Several years ago, as part of an effort to broadly disseminate its research results, NIST implemented a 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 60,000 subscribers who receive information on approximately 160 different topics. The website also allows members of the public to comment or ask questions about posted research articles and

to easily share content from the NIST site with their own websites (more than 3,000 “shares” in just 4 months of this fiscal year).

In the last 110 years, NIST published hundreds of technical reports such as NIST Interagency or Internal Reports (NISTIRs) and Technical Notes – which were targeted to very specific audiences. Some of these topics are of interest to a broader audience, so NIST is republishing them electronically as papers in the Journal of Research of NIST. Because the Journal of Research is indexed in major scientific/technical databases, these republished reports will reach a broader audience and are more likely to be used and cited, increasing the impact of NIST research. NIST staff members are tracking the number of web hits on and the number of citations of those papers to make a measurement-based determination of the effectiveness of this strategy.

- ***Project – Improving Dissemination and Access to Basic Research Results via Social Media***  
The NIST has created sites on YouTube (more than 2,000 subscribers), Facebook (more than 4,500 “likes”), Twitter (4,800 “followers”), and Flickr (more than 17,000 images viewed). To ensure that as many people as possible benefit from NIST’s work, news of major research results posted on the new NIST website is routinely announced through these additional social media sites.

The NIST continues to use Wikipedia to improve dissemination of its research results to the public. For selected topics NIST staff members continue to add links to NIST technical reports or papers in the Journal of Research of NIST, to make NIST research information more readily available in a highly used web resource. NIST staff members are adding links to images and descriptions of scientific instruments in the NIST Digital Archives. 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.

- ***Project – Improving Access to the Digital Data Repository of NIST Collections, including Publications, Artifacts, and Photographs Relating to Measurement Science***  
Currently, information regarding NIST publications is electronically available through its Research Library’s online catalog, which includes links to the full text of many publications. Information about some of the objects in NIST’s museum is also available through the NIST Virtual Museum. The online catalog and the NIST Virtual Museum are available to the public.

In fiscal year 2011, NIST implemented the NIST Digital Archives, a digital library repository. The Digital Archives conforms to the latest library and publishing metadata standards to enhance the ability of other scholarly and research repositories to discover and harvest information. It contains the full text of NIST’s technical publications, including the Journal of Research, as well as images of and information about NIST historical scientific objects. The metadata conforms to the Open Archives Initiative Protocol for Metadata Harvesting, which is the accepted standard within scholarly and scientific communities for making the contents of

information collections available to researchers. File formats adhere to Government Printing Office, Library of Congress, and NARA preservation requirements. NIST is collaborating with the Library of Congress and the Internet Archive to digitize NIST's legacy publications through the Open Content Alliance FedScan initiative.

The NIST Digital Archives permits the digital forms of NIST's technical publications and other content to be easily searchable by the public through major Internet search engines, such as Google, Google Books, Google Scholar, WorldCat, and Yahoo. Through the FedScan initiative NIST's legacy publications are scanned, processed through a rigorous quality assurance protocol, and made available to the public in a variety of file formats (e.g., Daisy, EPub, Kindle) through the Internet Archive website. All file formats are also provided back to NIST. These multiple efforts and searchable access points significantly enhance dissemination and use of NIST's research results.

- ***Project – Making Photos and Videos from the 9/11 Investigation available to the public***  
The NIST acquired a large amount of visual material as part of its World Trade Center Investigation. A subset of this material, including photographs and video clips, was organized into a searchable database in which each image and video clip was characterized by a set of attributes including: source/owner, time of shot/video, content (including building, face(s), key events such as plane strike, fireballs, collapse), and other details. These materials can be