
# NSF Information Resource Management Plan

*September 2008*
*Version 3.0*

## Document Change Record

| Version Number | Date | Description |
|---|---|---|
| 0.50 | February 21, 2005 | Initial Release |
| 1.0 | May 31, 2005 | Initial Release to OMB |
| 2.0 | July 31, 2005 | Updated all Programs; Changed name from NSF IT Implementation Plan to NSF EA Transition strategy; combined with NSF IT Implementation Plan; added performance measures for funded Programs from NSF METIS EA Repository |
| 2.0 | February 28, 2006 | FY2006 Release to OMB<br>Added mapping between Transition projects and IT investment portfolio; added Infrastructure Program Section<br>Inserted “EA Program Plan” Language into EA section; updated “workstreams" with “Programs”<br>Inserted Section 4.5: Stakeholders; inserted sections x.4: Stakeholders in each Program Section; Moved parts of Section 3 to the TGF<br>Added performance measures as milestones to individual Programs<br>Inserted segment architectures into sequencing plan<br>Inserted Quarterly EA Milestones (Section 5) |
| 2.1 | August 13, 2006 | Added section for NSF Dissemination of Public Information |
| 3.0 | September 2008 | Updated Enterprise Architecture and dissemination of public information sections |

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# 1 Document Scope and Purpose

NSF's FY 2008 Information Resource Management (IRM) Plan defines the Agency's strategic information technology (IT) vision and strategy, consistent with the Agency's mission, goals, and objectives. The IRM plan is both a vision for the future use of information technology in NSF and a description of how current and near term IRM activities help accomplish the Agency's mission. The plan provides a framework for creating and maintaining the NSF enterprise architecture transition strategy and establishes the course for achieving the goals that are essential to fulfilling the mission of the Agency. NSF's Enterprise Architecture (EA) program is integrated with capital planning and investment control (CPIC) and system development lifecycle (SDLC) processes at NSF to better manage IT investments. This document covers guidelines for NSF to create an EA transition strategy and, in effect, implement the NSF Target Enterprise Architecture as described in NSF Target Enterprise Architecture document.

The purpose of this document is to:

- Describe how NSF disseminates public information
- Describe the business drivers and goals of the NSF EA
- Provide an overview of NSF's methodology for developing and implementing the EA
- Describe the projects determined to be necessary to move NSF from its baseline to the target EA and the sequence of those projects

For the purpose of this document we define the Transition Strategy as a series of steps undertaken by NSF, in conjunction with the CPIC process, to translate services (business and technical) identified in the EA into an actionable plan for stakeholders.

# 2 NSF Dissemination of Public Information

## *2.1 Background*

NSF disseminates information on the Internet through a variety of communication channels. The NSF website (http://www.nsf.gov/) provides both general and program-specific information. NSF is committed to efficient, effective and consistent use of its website to communicate information about the activities, programs, research results, and NSF policies. NSF has an information dissemination process for reviewing and approving information posted on the NSF website.

### 2.1.1 NSF Mission

Created in 1950, the National Science Foundation (NSF) is an independent U.S. government agency responsible for advancing science and engineering (S&E) in the United States across a broad and expanding frontier. NSF plays a critical role in supporting fundamental research, education, and infrastructure at colleges, universities, and other institutions throughout the country.

Unlike most other federal research agencies, NSF does not operate its own laboratories or research facilities (with the exception of operations in the polar regions). Instead, NSF's role is that of a catalyst, fostering research that will advance Discovery, expanding Learning by cultivating a world-class, broadly inclusive science and engineering workforce, and building a national Research Infrastructure. NSF directly supports scientists, engineers, and educators through their home institutions, usually colleges and universities, throughout the United States.

The NSF mission is set out in the preamble to the National Science Foundation Act of 1950 (Public Law 810507):

> To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes.

Ninety percent of funding is allocated through a merit-based competitive process. On average, NSF receives 45,000 research proposals and makes over 11,000 awards to 1,700 colleges, universities, and other public institutions throughout the country annually.

In addition to authorizing support of basic scientific research, the National Science Foundation Act of 1950 (Public Law 810507) makes NSF responsible for an information base on science and engineering appropriate for development of national and international policy, including facilities for S&E research, and for addressing issues of equal opportunity in science and engineering.

## *2.2 Web Content and the NSF Mission*

The NSF website (http://www.nsf.gov/) is the agency's primary interface for disseminating information to scientists, engineers, university administrators, educators, business, vendors, the media, policy makers, and the interested general public. From an organizational perspective, NSF is composed of science and engineering Directorates and administrative offices that collaboratively provide content and manage the NSF website. Content for the website is provided by the organizations that have traditionally provided the content via printed publications.

All NSF web content is developed for the purpose of promoting and supporting NSF's mission. The NSF website is accessible to all, including those with disabilities and those without reasonable access to advanced technologies. NSF also integrates industry best practices for web technologies such as XML, HTML, JavaScript, RSS, and CSS.

NSF's web policies ensure the public web site and NSF Update, NSF's email alert service, provide accurate, unbiased information about NSF programs and activities to the widest possible audience. The public-facing NSF web site includes NSF's policies on copyright and the reuse of graphics and text, the use of NSF logos, and links to external web sites. NSF's Intranet includes a portal for web developers, which has a wealth of internal resources such as usage statistics, scripts, templates, graphics and the *NSF Web Development Policy and Standards Manual*, which contains specific policy, procedures and best practices with regard to web authoring and content. The "Webdev" portal also is the entry point to our Web Manager application, which is used by all NSF webmasters to review, approve, and publish HTML, PDF, and other "static" files to the public web server. Web Manager maintains a log of all publish actions, as well as required certifications that each content item adheres to NSF policies for privacy, accessibility, and security.

The core content of the NSF website is managed by an internal content-management system, ePublish. ePublish provides NSF staff with the tools to publish information in five discrete categories of content: Funding opportunities and program information, News, Events, Discoveries (NSF research results), and Organizational information. The system provides basic online review and approval mechanisms, as well as an administrative console that lets each organization manage and customize the content on its home page. The News module is used both by the Office of Legislative and Public Affairs (OLPA) for preparing and disseminating official NSF news releases, and by each NSF Directorate and Division for publishing news and announcements specific to its audience.

The largest component of ePublish is the Program Information Management System (PIMS), an innovative content-management system that was one of the first of its kind in the Federal Government to provide a standard, template-driven approach to describing research and education programs and specific funding opportunities. A reengineered PIMS, with a much more flexible and user-friendly interface and more advanced tools for building XML-based workflows,

was introduced in 2006. This version also enhances the system's ability to store XML snapshots of data, which are used to let reviewers easily compare different instances of a given funding opportunity or program description.

ePublish and PIMS are products of the collaborative web development model NSF fostered several years ago by establishing the Web Implementation Group (WIG) to ensure optimum oversight and management of the website. The WIG, chaired by the chief of the Information Dissemination Branch of the Division of Administrative Services, addresses the technical and design considerations for the website, implements and manages overall standards for consistent appearance and presentation quality, achieves economies of scale by identifying requirements and centralizing resources, and coordinates the organizational and navigational features of the site.

### 2.2.1 NSF Web Content for User Audiences

The home page for the NSF Web site allows users to select content organized for their needs: as applicants for funding, as educators or students, as the press, or as the interested public. The "NSF Update" functionality provides e-mail alerts to subscribers when new information is posted in the categories they select and also includes a range of RSS feeds for specific content types.

The NSF website provides information that it targeted to four primary user groups: the research and education community that competes for NSF research awards; the public, including K-12 educators; public information/media professionals; and those who use NSF statistical information on science and engineering.

#### 2.2.1.1 The Research & Education Community

Our primary audience is the research and education community. Potential applicants for NSF support use the Web site for information on sources of funding, procedures for application, and how to manage an award. Most of the information on these pages is prepared, reviewed, approved, and published automatically to the Web from ePublish and PIMS to present the most current information possible.

#### 2.2.1.2 The Public

The NSF mission includes improving public understanding of public policy issues involving science and technology, through support for programs of informal science and engineering. This is accomplished primarily through media projects, museum exhibitions, and curriculum support. The NSF Website presents a changing array of stories and images about Discoveries related to NSF supported projects, along with links to science stories in the media, and on-line curriculum resources for teachers and students.

#### 2.2.1.3 Public Information Professionals

While some Web content is designed for the public to search and use directly, some content is designed to make information on recent discoveries highly accessible to public information professionals, to encourage its use in media beyond the NSF Website. This includes images and films packaged for professional use as well as contact information for the public information office at NSF.

#### 2.2.1.4 Science and Engineering Statistics

The NSF Act calls on the agency to collect and present data on U.S. science and engineering. For over a decade NSF's library of detailed statistical data has been available on line, with resources ranging from detailed statistical tables to current topical updates. Thousands of pages and numerous databases of data measuring science and engineering activity are available to researchers and analysts from the NSF Web site.

#### 2.2.1.5 Other Users

Many pages on the Web site are maintained for the convenience of other users: information for visitors, those looking for job or contracting opportunities, and those who need information on the agency itself, related to such topics as budget, organization, performance assessment or policy. In addition, there are Web pages maintained independently by the National Science Board and the NSF Office of Inspector General, both of whom post regular and special public reports.

### 2.2.2 Web Currency and Ease of Search and Navigation

#### 2.2.2.1 Maintaining Current Content

NSF focuses on two features to maximize the usability of the Web site for users: maintaining up-to-date information and making the content conveniently searchable.

Content and navigation for NSF's external web site (http://www.nsf.gov) is developed to meet the specific needs of the four primary user groups described above. Before release the newly designed pages are tested for usability, and user statistics and voluntary user surveys are continually monitored to identify gaps and needed improvements.

To maintain currency, major Web content areas are updated automatically. These include program information, information on existing awards and funding, staff contact information, and lists of news, discoveries, events and publications. When any office in NSF takes formal action to update information on programs or staff, the same data automatically updates the external Web site. Updated internal records of award status and funding actions are available to the Web site daily. And when a news item, discovery, event or publication is prepared, the approval system also makes that record available to the Web site.

To ensure that information for potential awardees is up-to-date, NSF requires that all program information is reviewed and updated annually. In addition the process of approving new program information includes an automated check to ensure that potential applicants have a minimum of 90 days prior to the proposal deadline or target date. As a result, the information on the external NSF Website is both accurate and highly usable for potential award applicants.

#### 2.2.2.2 Ease of Search and Navigation

Ease of searching the NSF Web site is a primary focus. Along with searches of the entire Web site, nsf.gov offers searches specific to research fields and databases for awards, funding, calendar/events, staff, news, discoveries and publications. Databases linked to the web site can be searched by recentness, topic, or by A to Z index. NSF uses formal information models such as XML schemas, document type definitions (DTDs), and Really Simple Syndication (RSS) to categorize, disseminate and share information stored in systems.

### 2.2.3 Web Content Priorities and Schedules

The table of Web content uses the following definitions for priorities:

- Priority 1: Required by Law, regulation, Presidential Directive or other official directive or to ensure national security.
- Priority 2: Mission-critical and essential for program operations, but not required by law, regulation, or Presidential Directive.
- Priority 3: Frequently requested information or services that would improve business processes and/or customer service to the public.
- Priority 4: Other information.

Information on schedules refers to due dates for mandated reports, periodicity of updates (if applicable), or (in the case of statistical data) the most current existing data.

As required by the E-Government Act of 2002, Section 207 (f)(2), NSF's current inventory of website content, priorities and schedules can be found on NSF's Website at http://www.nsf.gov/policies/egov_inventory.jsp.

## *2.3 NSF Information Available on the Internet*

NSF has three main offices that determine what content is made available on the NSF website: the Office of Legislative and Public Affairs (OLPA); the Budget, Finance and Award Management (BFA) Policy Office; and the Division of Science Resources Statistics (SRS). OLPA oversees and manages the public components of the NSF website, BFA provides review and clearance for NSF policy and program information and SRS provides statistics on scientific and engineering resources to fulfill NSF's legislative mandate. A detailed description for each of these offices follows.

### 2.3.1 Office of Legislative and Public Affairs (OLPA)

The Office of Legislative and Public Affairs (OLPA) uses the NSF website to communicate information about the activities, programs, research results, and NSF policies. OLPA employs a wide variety of communication tools and techniques to engage the general public and selected audiences, including Congress, the news media, state and local governments, other Federal agencies, and research and education communities. OLPA's five sections (Congressional Affairs, Media and Public Information, Communications Resources, Issues Development and Special Projects), collaborate with NSF's research directorates and offices to produce web content for these audiences. "Public" content includes:

- Discoveries – brief stories highlighting research results, focusing on some of the important discoveries and innovations that began with NSF-supported research.
- Special reports – mini-web sites that provide in depth looks at the latest advances and hot topics in science, engineering and education research.
- Research overviews – these pages identify the "big questions" in each field of science, engineering and education research supported by NSF and show how NSF-funded researchers are addressing them.
- Multimedia Gallery - photos, illustrations, animations, sound bites, radio and video programs, and pod casts to help the public learn about and explore fascinating advances in science and engineering.
- News and story ideas – news releases, media advisories, and fact sheets providing coverage of the latest advances at the frontiers of science, mathematics, and engineering, as well as agency activities and messages to the general public and other external audiences; also news releases published by grantee institutions and other partners.
- Legislative information including major NSF-related legislation in Congress, a calendar of hearings, hearing testimony and summaries, NSF budget information, and program information by state.
- Speeches, statements, and presentations by the NSF Director and Deputy Director in communicating the mission and work of the Foundation to a variety of audiences such as state governments, business and industry, and foundations and organizations.
- Now Showing – covering the wide variety of educational and informational projects, including films, museum exhibits and television and radio programs, supported by NSF to promote public understanding of science, mathematics, engineering and technology.
- Classroom resources - a diverse collection of lessons and web resources for classroom teachers, their students, and students' families, arranged by research area

OLPA has created a web management plan to develop and maintain these components. Priorities are set and revised on a weekly basis.

## 2.3.2 Office of Budget, Finance & Award Management (BFA)

### 2.3.2.1 Policy Office

The Office of Budget, Finance & Award Management's (BFA) Policy Office, located in the Division of Institution and Award Support, is responsible for the development, coordination, issuance, and communication of NSF pre- and post-award policies for NSF's assistance programs, and provides official clearance approval for all NSF proposal-generating documents. The Policy Office develops and issues grant, cooperative and other agreement policies, procedures and practices that are responsive to both Federal law and regulations and yet are sufficiently flexible to meet the needs of the diverse national and international programs of the NSF.

Policies, procedures and implementing guidance may be developed in response to administrative initiatives published by the Office of Management and Budget, Office of Federal Procurement Policy, General Services Administration and other Federal agencies involved in the oversight of grant activities. These initiatives, as well as proposed and newly enacted legislation, regulations and policies relating to grant activities are evaluated for possible implications and impact on the NSF grant activities, and the NSF grantee communities.

The Policy Office has responsibility for various manuals and publications that provide Foundation-wide proposal processing and award administration guidance. The primary document for dissemination of information on NSF's grants process is the NSF Proposal & Award Policies & Procedures Guide (PAPP). The PAPP can be found online at http://www.nsf.gov/pubs/policydocs/pappguide/nsf08_1/index.jsp.

- Part I of the PAPP is comprised of NSF's proposal preparation and submission guidelines, including the NSF Grant Proposal Guide (GPG). The NSF Grant Proposal Guide provides guidance for the preparation and submission of proposals to NSF, and is online at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.

- Part II of the PAPP is comprised of documents used to guide, manage, and monitor the award and administration of grants and cooperative agreements made by the Foundation, contained within the Award and Administration Guide (AAG). The Award and Administration Guide sets forth NSF policies regarding the award and administration of grants and cooperative agreements, and is available online at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

- Grant and Agreement Conditions - The NSF website contains links to the terms and conditions which govern various types of awards. The terms and conditions are available online at http://www.nsf.gov/awards/managing/general_conditions.jsp.

All of these documents, as well as Frequently Asked Questions and information regarding the NSF proposal and award process, are available on the Policy Office Home Page at: http://www.nsf.gov/bfa/dias/policy/.

### 2.3.2.2 Budget Division

The Budget Division maintains the Budget Internet Information System within NSF's public web site. The site contains information about obligations and funding rates by fiscal year, state, and institution, in addition to budget levels organized by account, dating back to the inception of the Foundation. The site is used internally by NSF staff and by external stakeholders, including colleges and universities, congressional staff, and other government agencies.

## 2.3.3 Division of Science Resources Statistics (SRS)

The Division of Science Resources Statistics (SRS) fulfills the legislative mandate of the National Science Foundation Act to "provide a central clearinghouse for the collection, interpretation, and

analysis of data on scientific and engineering resources, and to provide a source of information for policy formulation by other agencies of the Federal Government. . ."

To carry out this mandate, SRS designs, supports, and directs periodic surveys as well as a variety of other data collection and research projects. SRS surveys yield the materials for SRS staff to compile, analyze, and disseminate quantitative information about domestic and international resources devoted to science, engineering, and technology.

Upon completion of the data processing for the major surveys, SRS staff prepares abridged "InfoBriefs" that summarize and highlight new data findings prior to the lengthier publishing of the more detailed statistical reports and analyses. Each year, SRS produces about 30 publications, which can be roughly divided into the following categories:

- Detailed Statistical Tables: reports containing an extensive collection of tabulated data from each of SRS's surveys
- InfoBriefs: highlighting results from recent surveys and analyses
- Periodic "overview" reports such as:
  - Science and Engineering Indicators
  - Women, Minorities, and Persons With Disabilities in Science and Engineering
  - National Patterns of R&D Resources
- Special reports, such as US Doctorates in the 20th Century, Interstate Migration Patterns of Recent Recipients of Bachelor's and Master's Degrees in Science and Engineering, and Gender Differences in the Careers of Academic Scientists and Engineers

In partnership with other Federal agencies such as the National Institutes of Health, the National Center for Education Statistics, the Bureau of the Census, the Bureau of Labor and Statistics, the U.S. Citizenship and Immigration Services (formerly Immigration and Naturalization Service), and the Department of Commerce's Patent and Trademark Office and International Trade Administration, SRS provides reports and data in a variety of formats and media. All reports are available online (html and PDF) and some are also available in print. In addition, SRS data are available on CD-ROM, and online through downloadable micro-data files. All Federal agencies that perform research and development (R&D) participate in providing the data for the SRS Federal Funds reports. SRS also works closely with universities, industrial firms, professional associations, and international organizations to provide comprehensive and up-to-date reports and information for NSF stakeholders.

## *2.4 Agency Disclosure of Information and the Freedom of Information Act (FOIA)*

The Foundation makes available an enormous amount of information beyond that required to be disseminated by the Freedom of Information Act. The public can access most information about NSF without having to make a request for information under the FOIA, Section (a)(3) access provisions.

NSF is a small agency with one central FOIA office and maintains a single-track system. The Foundation receives approximately 250 to 300 FOIA requests annually. The Foundation receives most FOIA requests electronically, and upon request, is able to disclose releasable records electronically.

An estimated 90% of NSF's FOIA requests are for copies of funded grant proposals. These proposals routinely contain personal information exempt from disclosure under FOIA exemption 6 protecting personal privacy. In addition, they may contain confidential, proprietary business information potentially protected by FOIA exemption 4. Executive Order 12,600 requires the agency to contact the submitter and provide an opportunity to comment before any disclosure.

Management plans for improvement of information disclosure and FOIA operations are detailed in NSF's FOIA Management Plan, available online at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=foiamp06.

## *2.5 Performance and Results of NSF's Information Dissemination Program*

NSF has increased electronic outreach to the general public through its public-oriented website. An entirely redesigned website was introduced in January 2005, to better serve both the research and education community and the public. The planning, creation and maintenance of this website reflects a variety of inputs from several audiences.

The Web Implementation Group (WIG) ensures optimum oversight and management of the NSF website. The WIG, chaired by the chief of the Information Dissemination Branch of the Division of Administrative Services, addresses technical and design considerations for the website, implements and manages overall standards for consistent appearance and presentation quality, achieves economies of scale by identifying requirements and centralizing resources, coordinates the organizational and navigational features of the site, and tracks customer usage and satisfaction.

NSF also seeks input from the research and education community, special audiences such as congressional staff, the news media, K-12 teachers and the general public. Methods for obtaining input have included a survey on the website, a broader survey (reaching beyond current visitors to the NSF Web site) to ascertain public preferences, and focus groups and usability testing to measure how well the site meets audience needs and expectations. According to past surveys, audiences wanted improved navigation, more science news, more research results, more images, and more multimedia content. NSF has developed a content management system for the Web site. The system (ePublish) improves both the reliability of information and the consistency of how it is presented across the entire site.

NSF's Public Affairs office oversees and manages the public components of the NSF website. Examples of "public" content include news, discoveries, special reports, research overviews, legislative information, speeches, lectures, webcasts, and the multimedia gallery. The Office of Legislative and Public Affairs (OLPA) created a web management plan to plan and maintain those components. Priorities are set and revised on a weekly basis. As a follow up to the site redesign, NSF is conducting periodic surveys to measure public satisfaction with the redesigned site. A second broad survey of public Web preferences and another round of usability studies was conducted during the first half of 2007, and NSF is continuing to make improvements to the site based on that data. NSF also collects and analyzes Web server log statistics on a continuing basis.

# 3 NSF'S Enterprise Architecture Transition Strategy

The NSF EA is a business-driven blueprint that describes NSF's current, future vision, and transitional states in terms of strategy and performance, business, applications and services, technology, data, and security at the end of a two-to-five year planning horizon, and provides a plan for transitioning to the desired future state. NSF utilizes the EA as the foundation for IT modernization, driving both investment in and implementation of systems and technologies that will transform NSF's business. By defining the current baseline and desired future state from several distinct perspectives (e.g. business, data, technology, etc.), the EA provides stakeholders with a "line of sight" into the complex relationships that exist among these different perspectives. Additionally, the EA provides stakeholders with traceability from NSF's organizational goals through people, lines of business, services and technological components. It is this traceability that will allow NSF to ensure its programs are directly supported by IT investments.

The NSF Enterprise Architecture Program is influenced by key architectural business and design drivers. Business drivers include: legislation; executive initiatives and mandates; limited organizational resources; and customer and stakeholder community needs and requirements. Design drivers encompass technological changes that can significantly impact the way NSF delivers its mission and/or supporting operations.

The EA Program seeks to effectively and efficiently respond to the architectural drivers. The goals of the EA are to:

- **Improve Program Performance** by ensuring business functions support strategic goals and priorities, data are optimized in support of the business, and applications and technology solutions are driven by business needs
- **Simplify IT Investment Decisions** by providing a line of sight from strategy to business function to technology, which enables decision-makers to select investments that support NSF's core mission, and to identify duplicative or misaligned initiatives
- **Reduce IT Diversity and Complexity** within NSF by promoting standards and the sharing and reuse of common technologies
- **Improve Interoperability** through the establishment of enterprise-wide standards that promote platform and vendor independence, enabling greater interoperability across disparate applications, both internal and external
- **Improve Utilization of IT Resources** by eliminating duplicative investments, promoting sharing of common services and standards.

## *3.1 Overview*

### 3.1.1 Purpose and Benefits

The EA Transition Strategy describes the approach and Information Technology (IT) programs and projects that NSF will employ to achieve its Target Enterprise Architecture (EA). It outlines the necessary steps for achieving the future state for NSF's business, performance, applications/services, data, and technology. The Transition Strategy provides stakeholders with the information to link IT investments with Agency segments (identified within the EA), performance measures, milestones, and dependencies; thereby providing NSF with the necessary tools to assess both investments and implementation of systems and technologies in support of its target EA. The specific benefits of this document include:

- Use of a priority-driven approach to plan and execute the activities needed to transition to the Target EA
- Improved strategic decision-making and communications relative to achieving the desired transition
- Increased sharing, reuse, and collaboration of processes, services, and technology through greater emphasis on enterprise-wide, rather than program-specific, planning and investment
- Increased program participation in, and ownership of, enterprise-wide or cross-program initiatives through segment architectures
- Improved portfolio evaluation through linkage of planned investments to major transition activities

### 3.1.2 Scope

The EA Transition Strategy contains programs and IT projects that provide detail on specific milestones, schedules, and activities associated with the major EA implementation efforts. The EA Transition Strategy links investments to the target architecture, which are shown through the Sequencing Plan (see section 3.2) and also provides a fiscal year view of funded activities that

help achieve the Target vision. The Sequencing Plan presents to stakeholders the general order by which the Foundation intends to undertake these transitional activities.

The scope of the transition strategy is programs and projects which fall under the domain of NSF's currently developed segments: Grants Management, IT Security & Privacy, and Network Management; and current, funded projects that fall outside the scope of these segments but help achieve the Target state. Current projects in the operations and maintenance (O&M) phase or individual project plans are not included in this document.

The following list represents the set of programs that are included in the Transition Strategy:

- Grants Management
- Cross-Agency Initiatives
- Identity Management
- Digital Asset Services
- Legacy Migrations
- IT Management
- IT Infrastructure
- IT Security and Privacy
- Next Generation Data Architecture (NGDA)
- Administrative Management

### 3.1.3 NSF EA Framework

The EA Transition Strategy, like the Target EA, leverages the seven architectural layers presented in
Table 3-1. Layers 1 – 6 are discussed in detail in the *NSF Target Architecture*, as well as in NSF's segment architectures (see Section 3.1.5 NSF Segment Architecture). Layer 7, the transition architecture comprises the NSF EA Transition Strategy in its entirety. Each program consists of multiple projects, which have been aligned to the below layers of NSF's EA Framework. Aligning projects to NSF's architectural layers allows EA stakeholders to see the relationship between the projects selected to transition NSF to its future state, and the specific architectural layers of the Foundation to which these projects are aligned. For a mapping of projects to architectural layers, see Table 3-2: Project to Architectural Layer.

**Table 3-1: NSF EA Framework (by layer)**

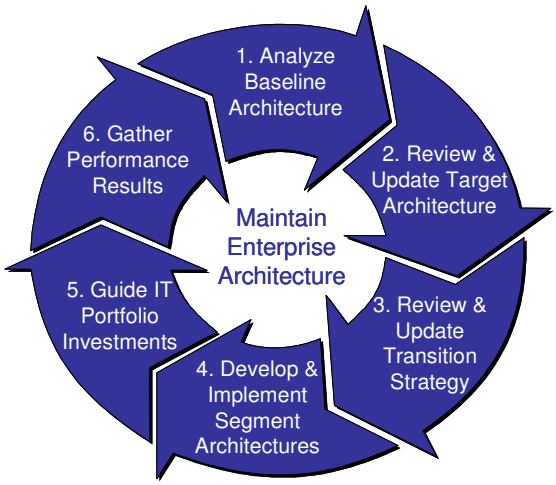
| Layer | Purpose |
|---|---|
| **Business Strategy Architecture** | Sets the foundation upon which the EA is framed. Because NSF's business strategy drives the EA, this layer encompasses NSF's drivers, mission, vision, goals and objectives, as defined in the *NSF Strategic Plan*. |
| **Performance Architecture** | Defines established metrics to determine the performance of IT investments and their contribution to program performance. Includes and extends portions of the FEA Performance Reference Model (PRM) that relate to NSF. |
| **Business Operations Architecture** | Describes NSF's lines of business (LOBs) or segments, business functions, and sub-functions as NSF-specific extensions of FEA Business Reference Model (BRM). It also defines NSF's business organizations, business processes, and governance information. |
| **Data Architecture** | Defines the conceptual and logical data information that support program and business line operations. Aligns to the FEA Data Reference Model (DRM). |
| **Application/ Service Architecture** | Defines the set of service domains, types, and components that provide the information processing capabilities needed to support NSF's business (i.e. the ability to capture, store, access, and manipulate business data and information). NSF specific FEA Service Component Reference Model (SRM) information is represented here. |

| Layer | Purpose |
|---|---|
| **Technology Architecture** | Defines the technology standards, services, and products that support the secure delivery, exchange, and construction of NSF's business and application services. Also encompasses infrastructure information. This layer aligns to the FEA Technical Reference Model (TRM). |
| **Transition Architecture** | Describes the Foundation's Programs, Projects, and Investments that help the organization move from its baseline to target environment. |

### 3.1.4 Methodology

NSF has crafted a collaborative approach to developing and implementing the architecture, as discussed in the *NSF Enterprise Architecture Management Guide*. The major activities that comprise NSF's EA Development and Implementation Approach are depicted in Figure 1.

**Figure 1: NSF EA Development and Implementation Approach**




The EA Transition Strategy has been developed in accordance with "Process 3: Review & Update Transition Strategy" of Figure 1. The following steps highlight the approach taken to review and update the EA Transition Strategy:

**Step 1:** The Enterprise Architecture Working Group (EAWG) reviews, updates and categorizes NSF's EA segments (see section 3.1.5). Profiles for each segment are created to summarize critical information, including: segment scope, segment owner, reference model mappings, related Government-Wide initiatives (e.g. E-Gov, LOB, SmartBUY, Enterprise Licensing), related IT investments, related systems, and common services associated with the activity.

**Step 2**: The EAWG conducts a gap/redundancy analysis of the Baseline and Target Architectures using business priorities and project dependencies based on CIOAG guidance. The scope of this analysis includes cross-agency initiatives (as found in the Federal Transition Framework[1]) and their updated tasks, activities and milestones. This analysis helps to narrow the list of candidate segments to those that are likely to fill gaps or present opportunities.

**Step 3**: The EAWG prioritizes the candidate segments based on mission impact, financial impact, likelihood of early success, and timeliness. NSF has developed a segment prioritization tool to help capture and rank segments.

[1] *Details regarding the Federal Transition Framework can be found at: http://www.whitehouse.gov/omb/egov/a-2-EAFTF.html.*

**Step 4**: The EAWG sequences the segments based on the analysis of relationships among transition activities, dependencies and "clusters" of activities. Combining this information with the prioritization and opportunities analysis will result in the overall sequencing of transition activities. The preferred development schedule considers all ongoing and new projects at NSF, the resources deployed for these projects, and timeframe required for implementing these projects. After reviewing the Target EA and EA Transition Strategy, the EAWG presents the validated information to the CIOAG for approval.

**Step 5**: The overall Transition Strategy is created using outputs from the previous four steps. Included are consideration of strategic transition issues, plans and schedule, risks and mitigation factors, and next steps.

**Step 6**: The CIOAG provides final approval of the Transition Strategy and the EAWG publishes the next version of the EA Transition Strategy before NSF's initiative screening process for the next funding year. By publishing the EA Transition Strategy before the start of the screening process, NSF can ensure that its EA Transition Strategy articulates the initiatives / investments to be considered in the CPIC select cycle.

Through these steps, the EAWG will be able to demonstrate that IT investments support NSF's mission and are consistent with NSF's EA. For all changes to EA Transition Strategy data, the EAWG will update the related content in the NSF Enterprise Architecture Repository (NEAR).

Table 3-2: Project to Architectural Layer lists projects within the scope of the EA Sequencing Plan and aligns them to their appropriate program and architectural layer.

**Table 3-2: Project to Architectural Layer**

| Program | Project | Architectural Layer |
|---|---|---|
| Grants Management | EJacket | Data, Application/Service, Technology |
| | Reviewer Management | All |
| | Project Reports System | Application/Service, Technology |
| | Graduate Research Fellowship Program | Application/Service, Technology |
| | Guest Travel | Application/Service, Technology |
| Cross-Agency Initiatives | Grants.gov | Technology |
| | Research.gov (GMLoB) | All |
| | E-Authentication | Application/Service, Technology |
| | E-Travel | Data, Application/Service, Technology |
| | Geospatial line of business | Data, Application/Service, Technology |
| | E-Training | Data, Application/Service, Technology |
| | E-Rulemaking | Data, Application/Service, Technology |
| | Business Gateway | Data, Application/Service, Technology |
| | Recruitment One-Stop | Data, Application/Service, Technology |
| | Enhanced human resource integration (EHRI) | All |
| | Integrated acquisition environment | Data, Application/Service, Technology |
| | Human resources management line of business | All |

| Program | Project | Architectural Layer |
|---|---|---|
| | Financial management line of business | All |
| | Budget formulation and execution line of business | All |
| | IT infrastructure line of business | All |
| | E-Payroll | Data, Application/Service, Technology |
| | IPv6 | Application/Service, Technology |
| | HSPD-12 | Data, Application/Service, Technology |
| | Information System Security LoB | Data, Application/Service, Technology |
| Identity Management | Identity and access management | Data, Application/Service, Technology |
| | Identity Manager | Data, Application/Service, Technology |
| Digital Asset Services | Content Management | All |
| | Collaborative Work Environment | All |
| | Document/Records Management | All |
| | Portal | Service |
| Legacy Migrations | NGIS Migration | Technology |
| IT Management | Enterprise Architecture Program Management | Business |
| | Integrated Portfolio Management | Business |
| IT Infrastructure | Enterprise Management System | Service |
| | Network and Security | Technology |
| | Email and Storage | Technology |
| | Directory (Network) Services Project | Technology |
| | Independent Projects | Technology |
| Next Generation Data Architecture | Database management | Data |
| | Data access framework | Data |
| | Major data services | Data |
| | Minor data services | Data |
| | Enterprise data model | Data |
| | Data management plan | Data |
| | Data quality | Data |
| | Operations | Data |
| Administrative Management | Procurement System | Service/Technology |
| | Financial Management Solution Modernization | All |

### 3.1.5 NSF Segment Architecture

Segment architectures are a detailed architecture for a portion of an overall EA, where measurable results (e.g., performance improvement) can be quickly achieved through

implementation. Segment architectures typically address all architectural layers at more granular levels than the overarching EA and make the overall Target EA more clearly-defined and readily achievable. Segment architectures, like the overarching EA, contain a baseline, target, and transition plan. Showing alignment between the enterprise-level sequencing programs and the segments to which they align allows stakeholders to easily see which high-level transition projects are helping to achieve the Foundation's target state for a particular line of business (e.g., grants management). For a mapping of projects to segments, see Table 3-4: Project to Segment.

This document leverages segment architectures through the sequencing of segment projects, and the linking of current and requested investments to these activities.
NSF, like OMB, classifies segments into one of the following three categories:

- **Core Mission Segments** – These segments define the mission or purpose of the Agency. Core Mission segments align to the FEA BRM (services for citizens).
    - NSF has identified and developed the Grants Management core mission segment. See the *NSF Grants Management Segment Architecture* document.

- **Business Service Segments** – These segments define the common or shared business services supporting core mission segments. Business Service segments also align to the FEA BRM (mode of delivery, support delivery of services, management of government resources). NSF has identified Administrative Business Solutions, IT Management, IT Security and Privacy, and Customer Relations as business service segments.
    - NSF has developed and defined the NSF IT Security & Privacy business service segment. See the *NSF IT Security & Privacy Segment Architecture* document.

- **Enterprise Service Segments** – These segments define the common or shared IT services supporting Core Mission and Business Service segments. Enterprise Service segments align to the FEA SRM. NSF has identified Digital Asset Services, Business Analytical Services, Process Automation Services, Network Infrastructure and Data Center Operations as enterprise service segments
    - NSF has developed and defined the Network Infrastructure business service segment. See the *NSF Network Segment Architecture* document.

Table 3-3 below, lists the segments NSF has identified within each segment type. Definitions for each segment are also provided in the table to distinguish scope of the various segments.

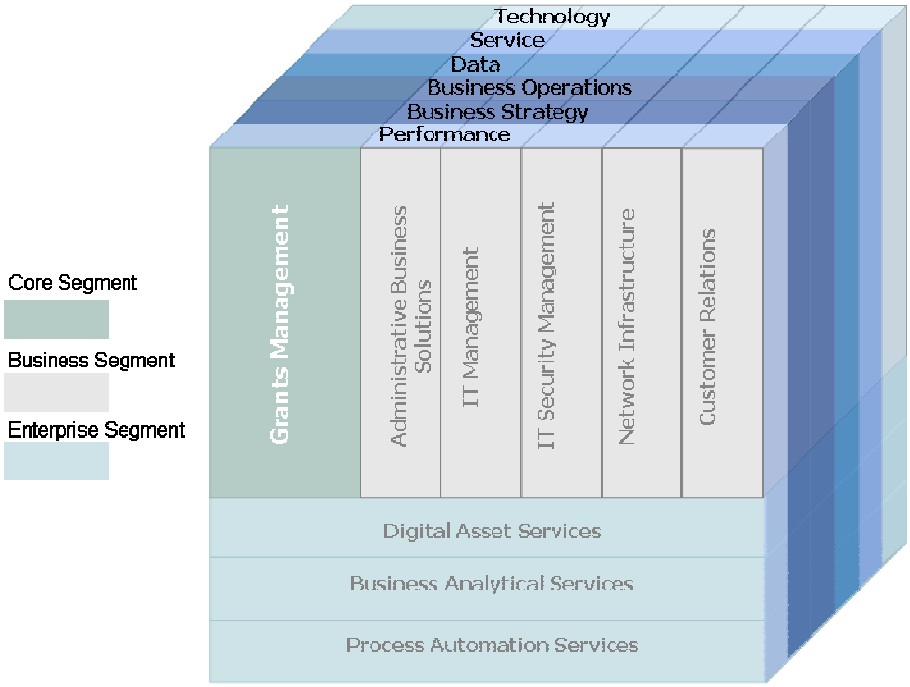
**Table 3-3: NSF Individual Segment Descriptions**

| Segment Type | Segment Name | Type | Description |
|---|---|---|---|
| **Core Mission Segment Area** | Grants Management | Core Mission Area | The purpose of the Grants Management Segment is to provide a wide range of grants solutions and services that support the NSF core mission of promoting the progress of science. Specifically, the Grants Management Segment comprises services and initiatives spanning the entire grant lifecycle, including those used (1) by NSF staff to create program announcements and solicitations as well as make program data available for use to NSF's user communities; (2) by researchers, scientists, educators, technology experts and administrators to conduct business with NSF; (3) by NSF staff to process proposals/applications for grants, including receipt, review, and recommendation for award; and, (4) by NSF staff to manage awards, including composing an award letter, reviewing and approving award actions, analyzing needs for continuing grant increments, sending electronic notification to the grantee, and post-award activities. |
| **Business Service Segments** | Administrative Business Solutions | Business Service | The purpose of the Administrative Business Solutions Segment is to provide the needed solutions and services for back-office support activities that enable NSF to operate effectively. Specifically, the Administrative Business Solutions Segment comprises services and initiatives for financial management (including those related to grants), human resources, procurement, logistics, visitor access, and other administrative functions. |
| | IT Management | Business Service | The purpose of the NSF IT Management Segment is to enable NSF to implement government-wide legislative mandates and guidance, and to strategically plan, manage, and assess the Foundation's investment in information technology. Specifically, the IT Management Segment Architecture comprises services and initiatives in the areas of policy and plans, capital planning and investment control, project management, enterprise architecture, product assurance, and "Continuous Improvement". |
| | IT Security and Privacy | Business Service | The purpose of the NSF IT Security and Privacy Segment Architecture is to maintain the continuity of NSF operations by preventing the occurrence or minimizing the impact of security-related events. The IT Security and Privacy Segment comprises services vulnerability assessment; monitoring and controls of personal, proprietary, and other sensitive data; information assurance; incident management; and, training and awareness. |
| | Customer Relations | Business Service | The purpose of the Customer Relations Segment is to ensure all NSF customers, internal and external, have timely and accurate support to meet their customer service needs. Specifically, the Customer Relations Segment comprises services and initiatives in the areas of (1) Desktop Services, which provides hardware and software technical support and troubleshooting as well as IT-related advice, guidance, and problem-resolution; and (2) Panel and Committee of Visitors Services, which provides support to approximately 7,000 panelists and visitors annually with conference-room setup and maintenance responsibilities; and (3) IT Support Services, which provides support for email and network, remote access, and digital security. |
| **Enterprise Service Segments** | Digital Asset Services | Enterprise Service | The Digital Asset Services Segment encompasses NSF's capabilities to support the generation, management, and distribution of intellectual capital and electronic media across the business and extended enterprise. Specifically, the Digital Asset Services Segment is responsible for services and initiatives in the areas of (1) Content Management; (2) Document Management; (3) Knowledge Management; and, (4) Records Management. |

| Segment Type | Segment Name | Type | Description |
|---|---|---|---|
| | Business Analytical Services | Enterprise Service | The Business Analytical Services Segment defines the set of capabilities supporting the extraction, aggregation, and presentation of information to facilitate decision analysis and business evaluation. Specifically, the Business Analytical Services encompass NSF's initiatives and applications that provide (1) Analysis and Statistics; (2) Visualization; (3) Knowledge Discovery; (4) Business Intelligence; and (5) Reporting. |
| | Network Infrastructure | Enterprise Service | The purpose of the Network Infrastructure Segment is to support NSF business services by ensuring the reliability and availability of NSF network services. The Network Infrastructure Segment provides support and services in the areas of email, personal desktop assistants and remote access, as well as maintaining all NSF's networks. |
| | Data Center Operations | Enterprise Service | The purpose of the Data Center Operations Segment is to support NSF core mission and business services through physically secured and environmentally controlled facilities to house and manage NSF's computing hardware. The Data Center Operations Segment provides support and services for NSF's secured central computer facility, including system/data backup, data storage, data recovery, day-to-day operations, and system monitoring. |
| | Process Automation Services | Enterprise Service | The Process Automation Services Segment defines the set of capabilities supporting the automation of process and management activities to assist in effectively managing the business. The Process Automation Services Segment represents those services and capabilities serving to automate and facilitate the processes associated with tracking, monitoring, and maintaining liaison throughout the business cycle of an organization. |

Figure 2 depicts how segments, regardless of segment type, relate to NSF's EA Framework. To simplify the graphic, only a sample set of the Business Service Segments are shown.

**Figure 2: Architectural Layers of NSF Segments**



As noted above, the list of included programs does not provide enough detail for sequencing activities. Table 3-4 below lists projects within the scope of the EA Sequencing Plan and maps them to their appropriate program and segment.

**Table 3-4: Project to Segment**

| Program | Project | Segment |
|---|---|---|
| Grants Management | eJacket | Grants Management |
| | Reviewer Management | Grants Management |
| | Project Reports System | Grants Management |
| | GRFP | Grants Management |
| | Guest Travel | Grants Management |
| Cross-Agency Initiatives | Grants.gov | Grants Management |
| | Research.gov (GMLoB) | Grants Management<br>Digital Asset Services |
| | E-Authentication | Identity Management |
| | E-Travel | Administrative Business Solutions |
| | Geospatial line of business | Administrative Business Solutions |
| | E-Training | Administrative Business Solutions |
| | E-Rulemaking | Administrative Business Solutions |
| | Business Gateway | Administrative Business Solutions |
| | Recruitment One-Stop | Administrative Business Solutions |
| | Enhanced human resource integration (EHRI) | Administrative Business Solutions |
| | Integrated acquisition environment | Administrative Business Solutions |
| | Human resources management line of business | Administrative Business Solutions |
| | Financial management line of business | Administrative Business Solutions |
| | Budget formulation and execution line of business | Administrative Business Solutions |
| | IT infrastructure line of business | IT Management, Network Infrastructure, Data Center Operations |
| | E-Payroll | Administrative Business Solutions |
| | Ipv6 | Application/Service, Technology |
| | HSPD-12 | Administrative Business Solutions |

| Program | Project | Segment |
|---|---|---|
| | Information System Security LoB | IT Security and Privacy |
| Identity Management | Identity and access management | TBD |
| | Identity Manager | TBD |
| Digital Asset Services | Content Management | Digital Asset Services |
| | Collaborative Work Environment | Digital Asset Services |
| | Document/Records Management | Digital Asset Services |
| | Portal | Digital Asset Services |
| Legacy Migrations | NGIS Migration | TBD |
| IT Management | Enterprise Architecture Program Management | IT Management |
| | Integrated Portfolio Management | IT Management |
| IT Infrastructure | Enterprise Management System | Data Center Operations |
| | Network and Security | Network Infrastructure |
| | Email and Storage | Network Infrastructure |
| | Directory (Network) Services Project | Network Infrastructure |
| | Independent Projects | Network Infrastructure |
| Next Generation Data Architecture | Database management | TBD |
| | Data access framework | TBD |
| | Major data services | TBD |
| | Minor data services | TBD |
| | Enterprise data model | TBD |
| | Data management plan | TBD |
| | Data quality | TBD |
| | Operations | TBD |
| Administrative Management | Procurement System | Administrative Business Solutions |
| | Financial Management Solution Modernization | Administrative Business Solutions |

This mapping shows how the EA is being leveraged to fund programs and projects which align to and help progress towards the Target EA. Table 3-5, below lists NSF's budget request investments and unique project identifier.

Not all IT investments from the Exhibit 53 are mapped to projects since some (e.g., FastLane) are in a steady, or operations and maintenance (O&M), state. Future and/or recently completed projects may not map to current investments. Also, the timing for when projects start within a business case depends on NSF management priorities and available funding.

**Table 3-5: Project to Investment (Budget Request)**

| Program | Project | Budget Request Investment | Investment UPI |
|---|---|---|---|
| Grants Management | EJacket | PRAMIS | 422-00-04-00-01-0008-00 |
| | Reviewer Management | PRAMIS | 422-00-04-00-01-0008-00 |
| | Project Reports System | PRAMIS | 422-00-04-00-01-0008-00 |
| | GRFP | PRAMIS | 422-00-04-00-01-0008-00 |
| | Guest Travel | PRAMIS | 422-00-04-00-01-0008-00 |
| Cross-Agency Initiatives | Grants.gov | GMLoB | 422-00-01-04-04-0160-24 |
| | Research.gov (GMLoB) | GMLoB | 422-00-01-04-01-1326-24 |
| | E-Authentication | eAuthentication | 422-00-01-04-04-0250-24 |
| | E-Travel | See Note 2 | NA |
| | Geospatial line of business | LOB: Geospatial | 422-00-01-04-04-3100-24 |
| | E-Training | See Note 2 | NA |
| | E-Rulemaking | eRuleMaking | 422-00-01-04-04-0060-24 |
| | Business Gateway | Business Gateway | 422-00-01-04-04-0100-24 |
| | Recruitment One-Stop | HRLoB Transition/Migration Support; LOB: Human Resource Management | 422-00-01-02-02-0026-00; 422-00-01-02-04-1200-24 |
| | Enhanced human resource integration (EHRI) | HRLoB Transition/Migration Support; LOB: Human Resource Management | 422-00-01-02-02-0026-00; 422-00-01-02-04-1200-24 |
| | Integrated acquisition environment | Integrated Acquisition | 422-00-01-04-04-0230-24 |
| | Human resources management line of business | HRLoB Transition/Migration Support; LOB: Human Resource Management | 422-00-01-02-02-0026-00; 422-00-01-02-04-1200-24 |
| | Financial management line of business | LOB: Financial Management | 422-00-01-04-04-1100-24 |
| | Budget formulation and execution line of business | LOB: Budget Formulation | 422-00-01-04-04-3200-24 |
| | IT infrastructure line of business | LOB: Infrastructure | 422-00-01-04-04-3300-24 |
| | E-Payroll | See Note 1 | N/A |
| | IPv6 | IT Infrastructure, Office Automation, and Telecommunications | 422-00-02-00-01-0032-00 |
| | HSPD-12 | See Note 2 | N/A |
| | Information System Security LoB | IT Security and Privacy Initiatives | 422-00-02-00-02-0016-00 |
| Identity Management | Identity and access management | PRAMIS | 422-00-04-00-01-0008-00 |
| | Identity Manager | PRAMIS | 422-00-04-00-01-0008-00 |
| Digital Asset Services | Content Management | GMLoB | 422-00-01-04-01-1326-24 |
| | Collaborative Work Environment | PRAMIS | 422-00-04-00-01-0008-00 |

| Program | Project | Budget Request Investment | Investment UPI |
|---|---|---|---|
| | Document/Records Management | PRAMIS | 422-00-04-00-01-0008-00 |
| | Portal | GMLoB | 422-00-01-04-01-1326-24 |
| Legacy Migrations | NGIS Migration | PRAMIS | 422-00-04-00-01-0008-00 |
| IT Management | Enterprise Architecture Program Management | EA Planning | 422-00-03-00-02-0033-00 |
| | Integrated Portfolio Management | OCIO Requirements | 422-00-03-00-02-0034-00 |
| IT Infrastructure | Enterprise Management System | IT Infrastructure, Office Automation, and Telecommunications | 422-00-02-00-01-0032-00 |
| | Network and Security | IT Infrastructure, Office Automation, and Telecommunications | 422-00-02-00-01-0032-00 |
| | Email and Storage | IT Infrastructure, Office Automation, and Telecommunications | 422-00-02-00-01-0032-00 |
| | Directory (Network) Services Project | IT Infrastructure, Office Automation, and Telecommunications | 422-00-02-00-01-0032-00 |
| | Independent Projects | IT Infrastructure, Office Automation, and Telecommunications | 422-00-02-00-01-0032-00 |
| Next Generation Data Architecture | Database management | PRAMIS | 422-00-04-00-01-0008-00 |
| | Data access framework | PRAMIS | 422-00-04-00-01-0008-00 |
| | Major data services | PRAMIS | 422-00-04-00-01-0008-00 |
| | Minor data services | PRAMIS | 422-00-04-00-01-0008-00 |
| | Enterprise data model | PRAMIS | 422-00-04-00-01-0008-00 |
| | Data management plan | PRAMIS | 422-00-04-00-01-0008-00 |
| | Data quality | PRAMIS | 422-00-04-00-01-0008-00 |
| | Operations | IT Infrastructure, Office Automation, and Telecommunications | 422-00-02-00-01-0032-00 |
| Administrative Management | Procurement System | PRAMIS | 422-00-01-03-02-0003-00 |
| | Financial Management Solution Modernization | Potential FY10 Investment | Potential FY10 Investment |

Note 1 – Project represents an activity that has completed development; maintenance is performed under a separate UPI.
Note 2 – Project is not an IT investment or represents a future activity that has not been aligned with the Exhibit 53.

## *3.2 Sequencing Plan*

NSF is undertaking a comprehensive plan to modernize its IT in support of business transformation. This plan is referred to as NSF's Sequencing Plan, which is a key element of the overall EA Transition Strategy. The goal of the Sequencing Plan is to operationalize NSF's EA and technology vision by describing the path to the Target EA, as conveyed through a series of identified programs and projects below, and which provide an integrated view of technology activities. The projects described below represent a subset of all possible IT projects and are a

result of the analysis carried out during the baseline and target phases of the EA development process.

As mentioned in the scope section of this document, the following programs have been identified as part of the Transition Strategy:

- Grants Management
- Cross-Agency Initiatives
- Identity Management
- Digital Asset Services
- Legacy Migrations
- IT Management
- Infrastructure
- Next Generation Data Architecture (NGDA)
- Administrative Management

The above list represents a high-level view of the scope of the transitional programs required to progress towards the Target EA. It is important to note that projects, which make up programs, are the tactical activities that contain actionable milestones. Milestones are listed for technology activities, within each IT project, progress against these milestones is shown. The EAWG works with an IT project POC to obtain milestone progress reports, whose information is updated in the EA Sequencing Plan (section 3.2).

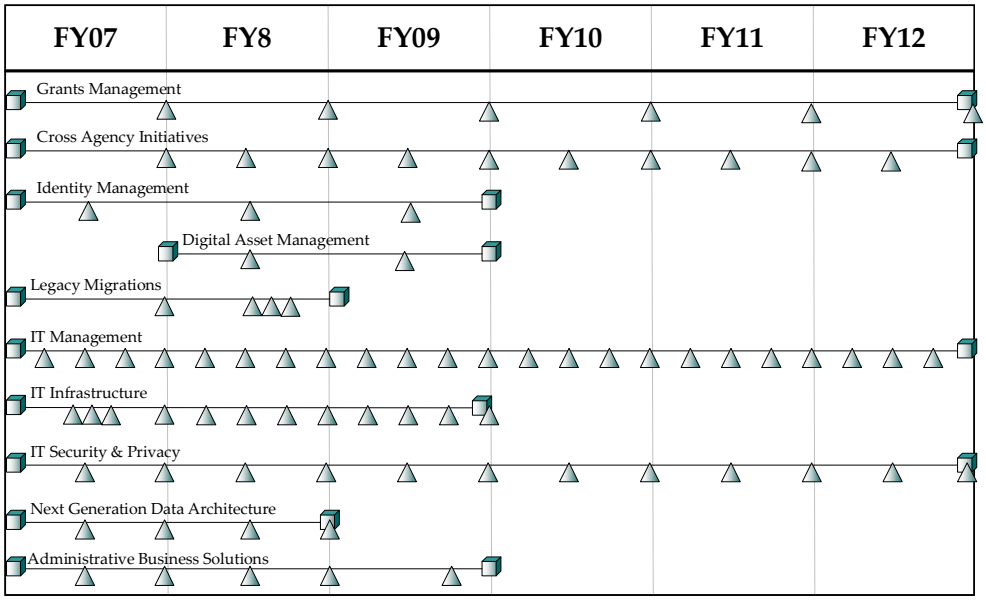
Also, because programs are often too broad to map to segments, a program, through its projects, may relate to multiple segments. Likewise, a program can span multiple architectural layers and investments. This signifies that there is not always direct alignment of programs to investments or segments. Because of this, it was determined that organizing the Sequencing Plan by investment or segment would be duplicative in that programmatic information would be repeated throughout the document. Therefore, the Sequencing Plan has been organized by program and project (project to segment, project to architectural layer and project to investment views are also provided[2]).

[2] *Though not each NSF program maps to only one segment, there are several which do map one-to-one (e.g. Digital Asset Services, IT Management). As NSF's segments are developed, it is conceivable that future versions of the EA Transition Strategy will be structured by segment.*

### 3.2.1 Sequencing Plan Timeline

Figure 3: NSF Sequencing Plan Timeline represents the programs identified to transition NSF from its current state to the future state, sequenced across a timeline. It is important to note that within some programs, milestone achievement is dependent upon other projects and their milestones.

**Figure 3: NSF Sequencing Plan Timeline**




The NSF Sequencing Plan demonstrates levels of performance improvement achieved over multiple fiscal years. Milestones from NSF's IT investments are identified in the table below grouped by performance measurement area.

**Table 3-6: EA Sequencing Plan Performance Improvements**

| Measurement Area | FY07 | FY08 | FY09 | FY10 |
|---|---|---|---|---|
| Mission and Business Results | - 75,000 journal citations linked to awards and made available to the public | - 100,000 journal citations made available to public | - New types of information (e.g., journal abstracts) made available to public | |
| | - 87% grantee institutions have EFT certified | - 85% of funds transferred electronically | - 90% of funds transferred electronically | |
| | - Complete high-level requirements for enterprise eRecords management system | - Design strategy for electronic records processing | - Declare electronic record as the official record for grant awards | |
| | | - 3 Research.gov services offered | - 4 Research.gov services offered | - 5 Research.gov services offered |
| Customer Results | | - 60% Research.gov grantee satisfaction | - 65% Research.gov grantee satisfaction | - 70% Research.gov grantee satisfaction |

| Measurement Area | FY07 | FY08 | FY09 | FY10 |
|---|---|---|---|---|
| | | - 2 Research.gov partners using offerings | - 3 Research.gov partners using offerings | - 4 Research.gov partners using offerings |
| | | - 95% Help Desk Customer Satisfaction | - 96% Help Desk Customer Satisfaction | |
| | - Posted 100% of discretionary grant application packages on Grants.gov | - Post 100% of competitive grant application packages on Grants.gov | | |
| | | - Transition to Adobe forms from PureEdge forms | | |
| | - 90% of FastLane help functions in RoboHelp | - Grants.gov help added to RoboHelp | - GRFP help added to RoboHelp | |
| Technology | - 100% GRFP applications submitted electronically | - 100% of fellowship applications submitted electronically | | |
| | - Validate Service Provider IPv6 transitions | - Demonstrate IPv6 capability | | |
| | - Retire 3 legacy applications by consolidating functionality into target architecture | - Deploy target architecture database system for reviewer management | - 2 reviewer management services integrated with grants and financial capabilities | |
| | - Implement E-Auth for Research.gov Pilot | - Implement E-Auth for Research.gov Production Portal | | - Implement E-Auth for Webcaspar |
| | - 92.5% of fellowship applications received electronically | - 100% of fellowship applications received electronically | - 100% of fellowship applications received electronically | - 100% of fellowship applications received electronically |
| | | - 99% Research.gov portal uptime | - 99.5% Research.gov portal uptime | - 99.9% Research.gov portal uptime |
| Processes and Activities | - 90% of review panels using electronic means | - 95% of review panels using electronic means | - 95% of review panels using electronic means | - 95% of review panels using electronic means |
| | | - 2,000 registered Research.gov users | - 5,000 registered Research.gov users | - 8,000 registered Research.gov users |

| Measurement Area | FY07 | FY08 | FY09 | FY10 |
|---|---|---|---|---|
| | - Document requirements for strategic information management of grants data | - Pilot an enterprise data repository | - Establish enterprise repository of NSF reviewers<br>- Establish electronic capability to identify, recruit and assign NSF reviewers | |
| | | - Use ISS LoB for Security Training | | - Use ISS LoB for FISMA Reporting |
| | | - 95% of SF-85 investigations in e-QIP (E-Clearance) | - 95% of SF-85-P (Public Trust) investigations in e-QIP | |
| | | - Submission of Networx Provider Selection to GSA | | - Submission of Networx transition orders and final disconnects<br>- Expiration for parallel operations and transition reimbursements |
| | - Begin compliance with FIPS 201, part 2 (HSPD-12) | - Verify/Complete background investigations for current employees | - Verify/Complete background investigations for employees employed over 15 years | |
| | | - Identify HR systems to potentially migrate to Shared Services Provider (SSC) | - Select HR SSC | |

The NSF Sequencing Plan also identifies project interdependencies as identified in the table below.

**Table 3-7: EA Sequencing Plan Key Program/Project Dependencies**

| Project | Dependent Milestone(s) | Project | Milestone(s) Needed to Complete |
|---|---|---|---|
| DD Concur | Moving DD concur for award functionality to eJacket from the Awards System | eJacket | Select and integrate workflow |
| | | Identity Management | Implement Authorization Service |
| Report Service | Consolidate reporting services and remove redundant reporting services from legacy applications | Research.gov | Establish Oracle data warehouse |
| Content Management - NSF Portal | All | Identity Management | All |
| Reviewer Management | All | Research.gov | Establish Oracle databases capable of supporting transitional and business intelligence activities |

### 3.2.2 Sequencing Plan Assumptions

- Time is the controlling factor and, therefore, a crucial assumption is being made that financial and human resources will be available to accomplish the task in the time allotted. If this assumption is not applicable in full or in part, project/task duration will vary. Regardless, project/ task durations contained herein are estimates and will likely vary even if appropriate levels of financial and human resources are available
- Time estimates are based on fiscal years
- Time estimates are based on project plans, input from subject matter experts, and experience with similar projects
- Project timelines for potential future funding requests are derived from a theoretical "kickoff", which would occur in the beginning of the fiscal year the project is started. For the purpose of the Sequencing Plan Timeline, these projects are assumed to start in FY09.

## *3.3 Transition Strategy Programs*

This section provides a more detailed description of each Transition Strategy program. This includes a:

- Program description/introduction
- Mapping of the projects to their architectural layer and segment
- Descriptions of the individual projects (and/or references to individual segment architectures)

### 3.3.1 Grants Management

NSF's primary mission is that of advancing science, research, engineering and education through grant-making and managing. To that end, the Target Enterprise Architecture has at its core an integrated end-to-end grants management system. NSF's current grants management system comprises a series of loosely integrated silo-applications that lacks the cohesive application, data, and middle-ware infrastructure necessary to effectively: optimize system and staff resources, integrate with inter-government initiatives (e.g., Grants Management Line of Business) and guarantee continued performance under increased system load, security requirements and demands for functionality and flexibility. Please see the Grants Management Segment Architecture for a complete description of baseline and target architectures, gap/redundancy analysis, and transition strategy.

The Grants Management Systems program currently consists several project that focus primarily on the application, service, and technology layers in the grants management segment. This section of the document provides a brief description of ongoing and planned projects with key milestones as appropriate. ***For a complete description of the grants management-related projects, milestones, and architectural elements, please see the NSF Grants Management Segment Architecture.***

**Table 3-8: Next Generation Grants Management Program Scope Table**

| Project | Layer | Segment |
|---|---|---|
| e-Jacket | Application/Service | Grants Management |
| Reviewer Management | Business, Application/Service, Technology | Grants Management |
| Project Reports System | Application/Service | Grants Management |
| GRFP | Application/Service | Grants Management |

| Project | Layer | Segment |
|---|---|---|
| Guest | Application Service | Grants Management |

#### 3.3.1.1 eJacket

EJacket is an end-to-end Web-based grants management system which allows NSF staff to view and process proposals electronically from receipt in our external facing grants applications systems (FastLane or Grants.gov), through to concurrence from a Senior NSF representative. The goal of eJacket is to provide access to electronic documents and a set of functions and capabilities, supporting the activities of NSF Division Directors, Program Officers, Administrative Officers and Support Staff. It currently provides the back-office proposal processing functionality that provides Program Officers and Division Directors with the capability to manage and recommend submitted proposals.

Recently implemented enhancements include:

- Budget Module
  - Establishing User Permissions Related to Budget Information
  - Creating and Maintaining Funding Lines/Budget Line Items including Automated Budget Line Population/Prorating and Comparison of Proposal/Award Budget/FastLane Budget Versions
  - Importing of FastLane Budgets (original and revised)
  - Supporting Documentation

- eCorrespondence Batch Processing
  - Create capability for batch requests for eLetter generation with divisional preferences and incorporated into the communication channel for proposal processing and award management.

- Integration of Internal FastLane Applications and Abstracts
  - Add functionality for Abstracts, Site Visit Reports, PO Comments, Context Statements, and General Communication (a.k.a. Other Comments) into eJacket to streamline tasks
  - Allows retirement of current legacy applications

- Reviews and Panel Summaries
  - Add capability for Program staff to retrieve and review summary reviews and/or panel summaries for inappropriate text that may need to be redacted or struck out before being released to a Principal Investigator.

Future enhancements could include:

- Recommend /DD Concur for Award
  - Implementation of capability to Recommend/DD Concur for Award into eJacket allowing for full proposal processing in one application.
  - Elimination of physical signatures and allows awards to be processed electronically by the Division of Grants and Agreements
  - Puts NSF closer to making electronic records the official award record (non-awards are already electronic)
  - Allows retirement of some remaining Proposal and Reviewer System (PARS) services

- Automated workflow
  - Implementation of a COTS, GOTS or custom enterprise solution to Grants case management that features an automated and configurable workflow

- Automated/Expanded proposal compliance checking that allows for self-audit before proposal submission
- Allow individual staff, Programs or Directorates to specify/customize workflow, appearance, security and accessibility option

#### 3.3.1.2 NSF-wide reviewer management system

This is a multi-year, multi-phased project to improve the business processes and systems supporting reviewer management that includes that NSF effectively utilizes reviewers, increases reviewer acceptance rates, and diversifies the reviewer pool. These business processes will eventually support:

- An externally-managed reviewers database system that integrates application, awardee and reviewer database; externally manages service charted with collecting information on the expertise of reviewers and expanding the pool of reviewers
- Online reviewer applications
- Online reviewer training
- Functionality and services provided by and through the NSF Library including internet and subscription data sources

Additionally, new capability in the NSF grants management applications includes continuing the implementation of a Reviewer Management System to allow the Foundation to effectively manage and identify thousands of scientific experts required to support the merit review process. Currently, there is very limited technology to support the identification, selection, assignment, and tracking of individuals who serve as reviewers, and establishing a set of more modern tools and capabilities has become a priority in support of NSF's Strategic Plan. Because separate databases exist for Principal Investigator and Reviewer data, combining the data would allow researchers to:

- Easily update their information
- Greatly improve the quality of the contact and demographic data that is provided to NSF
- Allow NSF to implement cutting-edge tools to assist NSF by suggesting which researchers would be best to review which proposals, and which panels are best for each proposal received.

For FY08 NSF will initiate the development of capabilities to support searchable databases of NSF proposal reviewers that includes information on types of institutions, location of institutions, and other relevant demographic indicators.

#### 3.3.1.3 Project Reporting System

As mandated by the Government Performance and Results Act (GPRA) of 1993, NSF must demonstrate its performance to Congress by providing information obtained in Awarded Proposal project reports. NSF has recognized the need to enhance its internal and external grant applications to improve tracking of Annual Project Reports (APR)s , Final Project Reports (FPR)s and Interim Project Reports (IPR)s in the Project Reports System. Enhancements focus primarily on both internal and external NSF applications with one goal in mind: establishing a submission / tracking system for Project Reports and improving compliance by the user community. The internal and external grant applications include FastLane, eJacket, Awards, and the Proposal and Reviewer System (PARS). There are no further enhancements planned for the Project Reporting System as it has transitioned into maintenance within its component systems.

#### 3.3.1.4 Graduate Research Fellowship Program

The Graduate Research Fellowship Program (GRFP) supports the annual online submission of fellowship applications through FastLane's GRFP system. Applicants receiving awards become fellows, and are tracked throughout their tenure to document their ongoing research efforts. At the university level, university officials monitor fellow's progress and report annual expenses. The GRF Program Office oversees the activities of all users through an administrative module. GRFP has plans to enhance the award process for institutions by automatically gathering information for institution budget requests, and allowing institutions to submit these requests as proposals to NSF. GRFP is also working on an effort to consolidate divergent data sets of applicant and fellowship information from 1952 – present.

#### 3.3.1.5 Guest Travel

The Guest Travel and Reimbursement System is a web application developed to automate NSF's paper-based process of establishing and managing meetings, and reimbursing meeting attendees for their travel related expenses. The Guest team provides continued support to correct defects and implement enhancements that are approved and prioritized by the Guest System Requirements Review Board for Maintenance Releases. Maintenance support also focuses on NGIS/Sun development and responding to production requests. Receipt Management was a large scale enhancement made in FY07 to the Guest System. In addition to continuing maintenance support, the following major enhancements have been identified by NSF: Making Guest the central repository for flat-rate travel documents, Managing Meeting Notices with DIS support, and to allow FastLane Travel and Reimbursement participants certify that they do not wish to be paid for flat-rate travel.

### 3.3.2 Cross-Agency Initiatives

This program includes cross-agency initiatives in which NSF participates or, in the case of Research.gov, leads. Though all initiatives relate to the service/technology layer, almost all NSF segments benefit from at least one of these initiatives.

**Table 3-9: Cross-Agency Initiatives Program Scope Table**

| Project | Layer | Segment |
|---|---|---|
| Grants.gov | Service/Technology | Grants Management |
| Reasearch.gov (GMLoB) | Service/Technology | Grants Management |
| E-Authentication | Service/Technology | IT Management |
| E-Travel | Service/Technology | Administrative Business Solutions |
| Geospatial Line of Business | Service/Technology | Administrative Business Solutions |
| E-Training | Service/Technology | Administrative Business Solutions |
| E-Rulemaking | Service/Technology | Administrative Business Solutions |
| Business Gateway | Service/Technology | Administrative Business Solutions |
| Recruitment One-Stop | Service/Technology | Digital Asset Service |
| Enhanced Human Resource Integration (EHRI) | Service/Technology | Grants Management |
| Integrated Acquisition Environment (IAE) | Service/Technology | Administrative Business Solutions |
| Human Resources Management Line of Business (HRLOB) | Service/Technology | Administrative Business Solutions |

| Project | Layer | Segment |
|---|---|---|
| Financial Management Line of Business (FMLOB) | Service/Technology | Administrative Business Solutions |
| Budget Formulation and Execution Line of Business | Service/Technology | Administrative Business Solutions |
| IT Infrastructure Line of Business | Service/Technology | IT Management, Network Infrastructure, Data Center Operations |
| E-Payroll | Service/Technology | Administrative Business Solutions |
| Ipv6 | Service/Technology | Network Infrastructure |
| HSPD-12 | Service/Technology | Administrative Business Solutions |
| Information System Security LoB | Service/Technology | IT Security and Privacy |

Below are descriptions of each of the Cross-Agency Initiatives. With the exception of the IPv6 and HSPD-12 text, the descriptions are from the *NSF FY 2008 Budget Request to Congress* (accessible at: http://www.nsf.gov/about/budget/fy2008/).

#### 3.3.2.1 Grants.gov

The Grants.gov Initiative benefits NSF and its grant programs by providing a single location to publish grant (funding) opportunities and application packages, and by providing a single site for the grants community to apply for grants using common forms, processes and systems. NSF will post all of its discretionary grants programs in Grants.gov Find and all of its funding opportunities in Grants.gov Apply beginning in FY07. Additionally, Grants.gov will transition from PureEdge to Adobe forms in FY08. Adobe forms provide more robust support and are compatible with Vista and Mac.

#### 3.3.2.2 Research.gov

This initiative benefits NSF by improving the delivery of services to grant recipients, improving decision-making, and decreasing costs associated with building and maintaining Grants Management IT systems. GM LoB identifies Federal Service Centers, which work with customer agencies to define requirements, streamline processes, improve reporting, and host a grants management system. The grants management system can be used by multiple grant-making agencies to make awards as well as other services and capabilities to be determined in collaboration participating agencies. This system consists of personalization and customization features which:

- Provide Principal Investigators (PIs) PIs with personalized web pages at the time of proposal submission that contains information specific to that PI (e.g., proposals submitted, status, total awards, outstanding obligations, reminders, news, etc.)
- Provide Sponsored Research Offices (SROs) with web pages that communicate administrative and financial information and guidance for program support
- Provide the ability to certify Applicant SROs prior to award decision

By sharing services, NSF's costs to build and maintain grants management systems decrease. NSF has been chosen as a consortia lead for grants made by the research community.

#### 3.3.2.3 E-Authentication

The initiative benefits NSF by providing E-Authentication expertise, guidance, and documentation, including project planning and reporting templates, to enable NSF to achieve production implementation of E-Authentication for aspects of its FastLane application. The E-Authentication Federation allows NSF to use identity credentials issued and managed by

organizations within and outside the Federal Government, thereby relieving NSF of much of the cost of providing its own identity management solutions.

#### 3.3.2.4 E-Travel

This web-based service benefits NSF by helping to minimize technology costs and guarantee refreshed functionality for travel management services. The end-to-end service will enable NSF to capture real time visibility into the buying choices of travelers and assist in optimizing travel budgets.

#### 3.3.2.5 Geospatial Line of Business

NSF participates in activities related to the development of Geospatial Line of Business (GEO LoB) to ensure the effective and efficient provision of geospatial data to the research community. NSF is able to realize cost savings by not having to process individual requests for data in an ad hoc fashion. The public frequently requests maps and other geospatial data from NSF, particularly during emergency response situations. The Geospatial portal provides an integrated environment to coordinate (and focus) these requests, making the agency's response more efficient. It has the potential to reduce the cost of supporting such data requests.
NSF has had significant impact on the nation's research in the area of Geographic Information Systems. The National Center for Geographic Information and Analysis (NCGIA) centers at the University of California- Santa Barbara, the State University of New York at Buffalo, and the University of Maine-Orono have developed and demonstrated powerful practical applications of geospatial data and technology. The NSF Geographic and Regional Science Program sponsors research on the geographic distributions and interactions of human, physical, and biotic systems on the Earth's surface utilizing GIS at the State, county and city level. These research programs benefit from GOS as a resource for locating data and other geospatial resources for use in their studies.

#### 3.3.2.6 E-Training

This initiative supports the development of NSF's workforce and advancing the accomplishment of its mission through simplified and one-stop access to e-Training products and services. Use of NSF's learning management system, AcademyLearn, will enhance the agency's ability to attract, retain, manage, and continuously educate its workforce.

#### 3.3.2.7 E-Rulemaking

The Federal Docket Management System (FDMS) under the leadership of this initiative provides the research community a web-based, central location to track proposed regulations by NSF and to provide comment when applicable.

#### 3.3.2.8 Business Gateway

The Business Gateway Initiative helps NSF in its goals of promoting science, advancing the national health, and securing the national defense by helping small businesses partner with NSF. NSF has a program called "NSF SBIR/STTR" whose purpose is to increase "the incentive and opportunity for small firms to undertake cutting-edge, high risk, high quality scientific, engineering, or science/engineering education research that would have a high potential economic payoff if the research is successful."
Additionally, the Business.gov website provides easy access to all of the NSF forms/instructions relevant to businesses. The site also provides compliance assistance for companies seeking to meet all of the regulatory requirements of NSF and other Federal agencies.

#### 3.3.2.9 Recruitment One-Stop

NSF benefits through state-of-the-art online recruitment services to Federal job seekers including online job posting, intuitive job searching, resume warehousing, online application submission,

automated eligibility and status feedback, applicant data mining and integration with sophisticated automated assessment tools.

#### 3.3.2.10 Enhanced Human Resource Integration (EHRI)

This initiative is developing policies and tools to streamline and automate the electronic exchange of standardized human resource data (such as the electronic office personnel file) needed for creation of an official employee record. The EHRI tool set and central data repository will provide comprehensive knowledge management workforce analysis, forecasting, and reporting for the strategic management of human capital.

#### 3.3.2.11 E-Clearance

The e-Clearance initiative leverages information technology to improve the effectiveness and efficiency of the personnel security investigations process.

#### 3.3.2.12 Integrated Acquisition Environment

Through adoption of the tools and services provided by IAE, NSF improves its ability to make informed and efficient purchasing decisions and allows it to replace manual processes. If NSF were not allowed to use the IAE systems, they would need to build and maintain separate systems to record vendor and contract information, and to post procurement opportunities. Agency purchasing officials would not have access to databases of important information from other agencies on vendor performance and could not use systems to replace paper-based and labor intensive work efforts.

#### 3.3.2.13 Human Resources Management Line of Business

NSF benefits through its use of best-in-class HR services and systems provided by one of the approved service providers. Through its adoption of an approved service provider, the agency can achieve the benefits of “best-in-class” HR solutions without the costs of developing and maintaining their own HR systems. Employees across the agency benefit from improved HR services.

#### 3.3.2.14 Financial Management Line of Business

The initiative benefits NSF by providing the reference tools and templates needed to assist them in planning and managing their migration to a selected center of excellence. The FM LoB has established an Advisory Board to govern the activities and decision making process for the initiative. NSF’s involvement with this board affords them the opportunity to review critical issues that have an impact on their FM systems, voice their unique needs and concerns, and collaboratively offer recommendations and influence decisions on how best to implement the common solution. In the short term, NSF will be provided key tools such as an RFP framework and SLA guides to help them develop agency agreements with their selected service providers. In the long term, NSF will have the opportunity to play an active role in standardizing core FM business process and data elements. NSF’s involvement in this crucial task ensures their needs and requirements are addressed in the target FM LoB enterprise architecture supporting the FM LoB common solution. This work allows NSF to influence the future direction of financial management across the government from both an information technology and business process perspective.

#### 3.3.2.15 Budget Formulation and Execution Line of Business

This initiative enhances NSF budgeting capabilities by strengthening the Federal budgeting profession through a community of practice, establishing a clearinghouse for sharing best practices, improving tools for government-wide budget exercises and collaboration, and establishing standards for data, data exchange, and modularity that facilitate flexible solutions, sharing, and re-usability. The BF&E LoB has established a Task Force that governs LoB activities

and makes decisions. NSF's involvement with the Task Force ensures that solutions developed by the BF&E LoB meet NSF's needs.

#### 3.3.2.16 IT Infrastructure Line of Business

The initiative benefits NSF by providing government-wide target service levels and infrastructure cost measurements to objectively evaluate NSF IT Infrastructure investments against standard government and industry averages. This will allow for objective evaluation of NSF IT Infrastructure performance in the areas of Desktop/Seat Mgt, Data Centers, and Voice/Data Networks and provide guidance to develop action plans for improvement through use of standard best practices, and where appropriate, use of consolidation, shared service providers, and aggregated purchase agreements. The goal is to reduce the total cost of commodity IT infrastructure while not degrading performance and service to NSF users.

#### 3.3.2.17 E-Payroll

NSF has migrated its payroll function to the Department of Interior (DOI) service center. We have seen good integration between payroll, human resource and finance functions as well as a high level of customer service from DOI.

#### 3.3.2.18 IPv6

NSF has undertaken activities to continue transition towards enabling IPv6 on the NSF core network. IPv6 activities are within the scope of the Network Infrastructure segment. Please refer to this segment for more detailed information on implementation considerations, risks, challenges, and options to achieve the target state vision.

#### 3.3.2.19 HSPD-12[3]

On August 27, 2004, the President signed HSPD-12 "Policy for a Common Identification Standard for Federal Employees and Contractors" (the Directive). The Directive requires the development and agency implementation of a mandatory, government-wide standard for secure and reliable forms of identification for Federal employees and contractors. As required by the Directive, the Department of Commerce issued Federal Information Processing Standard 201 (the Standard).

Department and Agency heads must conduct a background investigation, adjudicate the results, and issue identity credentials to their employees and contractors who require long-term access to federally controlled facilities and/or information systems.

Part I of the Standard establishes minimum requirements for a Federal personal identification system that meets the control and security objectives of the Directive, including the personal identity proofing, registration, and issuance process for employees and contractors.

Part II of the Standard details specifications to support technical interoperability among departments and agencies, including card elements, system interfaces, and security controls required to securely store and retrieve data from the card.

#### 3.3.2.20 Information System Security LoB

The Information Systems Security Line of Business (ISS LoB) enables agencies' mission objectives through a comprehensive and consistently implemented set of risk-based, cost-effective controls and measures that adequately protects information contained in Federal

[3] *Text extracted from parts of OMB Memorandum M-05-24, "Implementation of Homeland Security Presidential Directive (HSPD) 12 – Policy for a Common Identification Standard for Federal Employees and Contractors", dated August 5, 2005 and available at: http://www.whitehouse.gov/omb/memoranda/fy2005/m05-24.pdf.*

Government information systems. The ISS LoB initial focus is on two services: FISMA training and FISMA reporting.

For FISMA training, the ISS LoB is developing common suites of ISS training products and training services for the Federal Government. NSF must migrate to Security Awareness Training Shared Service Provider by September 30, 2008.

For FISMA reporting, the ISS LoB is providing agencies with shared products and services to comply with FISMA reporting requirements through the use of pre-existing standardized tools. NSF must migrate to a FISMA reporting solution September 2010.

### 3.3.3 Identity Management

A key concern regarding security as well as ease of access to system resources is the management of user identities of both internal and external users and authentication and authorization to NSF resources. NSF currently has multiple systems that contain user information about the 2000 internal NSF users and the 250,000+ users of external systems. Problems endemic in such a distributed system include the lack of authoritative source of information, duplicate entries, diminishing data integrity, limited ability to control access to data, the inability to provide services based on personalized user preferences, increased administration and development costs.

NSF will continue to establish a common, "corporate directory service" that will store and manage user profiles, access privileges, desktop configurations, and application and network resource information. The tangible use of a directory service is to provide a coherent and integrated management of users and resources. It will provide NSF with a logical view of its staff and selected resources and it will provide a basis for interactions with external customers such as Sponsored Research Organizations or contracting organizations. Associated with the directory are methods of authentication and authorization. This service will help ensure appropriate access policies are followed across NSF applications, facilities, and services and enable NSF to adopt Government-wide e-Authentication services and provide better service to the scientific community. Implementation of an NSF-wide corporate directory structure is a pre-requisite to implementing the services of the Government-wide e-Authentication and other Government-wide initiatives[4].

The NSF Target Architecture features an authoritative source of user information based on an open set of Identity Management standards and the SUN JES suite of products that will enable centrally managed and administered user identification. NSF Identity Management will be the enabling mechanism for:

- Controlling access to data and NSF resources
- Managing the identity of internal and external users (including personalization)
- Role-based authorization (i.e., access to system resources and data based on your role within or pertaining to the organization)
- Personalization/Customization based on role
- Single-sign on (only one login action necessary to access all applicable system resources)
- A single source for user information and authentication into NSF systems
- Instantly adding, deleting or modifying user information in multiple systems
- Securing the NSF computing environment
- Basis for the NSF Portal and streamlined end-user experience

NSF is currently in the process of implementing an enterprise Authorization and Provisioning based on Sun's JES platform. In addition to providing the above services, the NSF Identity

[4] *Source: NSF "Infrastructure" Exhibit 300*

Management (and associated services) will provide the cornerstone for many other current and future technology projects (e.g., Research,gov, NSF Portal, Content Management, etc.)

The Identity Management program currently consists of two projects: Identity and Access Management and Identity Manager

**Table 3-10: Identity Management Program Scope Table**

| Project | Layer | Segment |
|---|---|---|
| Identity and Access Management | Service/Technology | TBD |
| Identity Manager | Service/Technology | TBD |

#### 3.3.3.1 Identity and Access Management

This project intends to transition NSF towards a common, more robust authorization structure for web-based applications. The new authorization architecture will increase security and manage access to resources from a consolidated, standards-based repository for these web applications. This project will establish an enterprise-wide authorization scheme, using roles based on the various business functions at NSF. This re-usable service will be used by web-based and other COTS/GOTS applications at NSF. This project will assess existing Authorization data repositories and then port over the appropriate data to the Directory Server. Upon completion of this project, Directory Server will serve as the new credentials data repository, containing a consolidated Authentication and Authorization structure.

This project follows the successful implementation of the Authentication service, a common service developed to authenticate users at NSF. The Authorization service will ultimately transition all custom-built applications to using the Sun JES Identity and Access Management suite for authenticating and authorizing users using common, enterprise roles.

#### 3.3.3.2 Identity Manager

This project is charted to complete the implementation of the Sun JES Identity Manager system. This will support the full life-cycle management of identities and synchronization of data among different data stores as well as provide an LDAP accessible gateway for applications and middleware services requiring a consistent normalized view of Authentication credentials and specified staff, contractors and staff outside NSF.

This project is focused on refining and implementing a more efficient password consolidation and synchronization system. It will complete the Password Synchronization process, using the Sun Identity Manager, between Active Directory and Sun JES Access Manager and seed the Identity Manager with user attributes and passwords.

### 3.3.4 Digital Asset Services

Digital Asset Services encompass NSF's capabilities to support the generation, management, and distribution of intellectual capital and electronic media across the business and extended enterprise. Specifically, the Digital Asset Services program is responsible for services and initiatives in the areas of (1) Content Management; (2) Collaborative Work Environment; (3) Document/Records Management; and, (4) Portal.

**Table 3-11: Digital Asset Services Program Scope Table**

| Project | Layer | Segment |
|---|---|---|
| Content Management | Service | Digital Asset Service |
| Collaborative Work Environment | Service | Digital Asset Service |

| Project | Layer | Segment |
|---|---|---|
| Document/Records Management | Service | Digital Asset Service |
| Portal | Service | Digital Asset Service |

#### 3.3.4.1 Content Management

The Content Management project provides the necessary infrastructure for staff to effectively manage content throughout the digital information lifecycle, including systems and processes for content creation, automated and configurable workflow, approval, edit, publishing and archiving. The project will enable the foundation to improve the quality and accuracy of content published to NSF-sponsored websites by accessing to real-time/up-to-date information, as well as enhancing staff efficiency and productivity by reducing duplication of information.

The purpose of implementing a Content Management System (CMS) is to facilitate the workflow process and allow one central repository for all content. The CMS can create electronic paper trails and speed up web content publishing by using a flexible workflow process for uploading, creating, editing, and publishing of content. The CMS offers editing capabilities for those who are not technical or do not have general knowledge of HTML. It also contains software with rendition capabilities that allows automatic conversion of content to a web ready format.

This system will also allow NSF to personalize the user-experience for all NSF-sponsored websites and deliver targeted content to end users based on roles and preferences (user-defined interface).

#### 3.3.4.2 Collaborative Work Environment

The Collaborative Work Environment project encompasses all procedures and tools used internally to create and share documents, schedules, and other critical project information. Collaboration tools, such as SharePoint, enable users to aggregate, organize and search information quickly to meet business needs and complete processes at the project level and resolve many organizational issues.
Additionally, the use of collaboration tools can help reduce duplication of effort and resources. A sustainable collaborative work environment can also save time for users by utilizing tools that are innately compatible with other desktop resources.

#### 3.3.4.3 Document/Records Management

This project is responsible for the efficient and systematic control of the creation, receipt, maintenance, use, and disposition of documents and records, including the processes for capturing and maintaining evidence of and information about business activities and transactions in the form of records.
Documents management includes the process of managing documents from it's creation to the end of its life. A document management system includes the following activities:

- Creation,
- Editing/Approval
- Retrieval
- Sharing/Collaboration
- Tracking
- Revision
- Protection
- Distribution

Records management is the process of managing records in accordance to defined policies or procedures regulating their life-cycle.
It includes the following activities:

- Creating, approving and enforcing records policies, including a classification system and a records retention policy
- Developing a records storage plan, which includes the short and long-term housing of physical records and digital information
- Identifying existing and newly created records, classifying them, and then storing them according to standard operating procedures
- Coordinate the access and circulation of records within and even outside of an organization
- Executing a retention policy to archive and destroy records according to operational needs, operating procedures, statutes, and regulations.
- Therefore, a records management system aids in the capture, classification, and ongoing management of records throughout their lifecycle.

#### 3.3.4.4 NSF Portal

The NSF Portal will provide single point of access and integrated web-based access to NSF applications, analytical knowledge, transactional data, and business-related information. For many applications capable of being fully integrated, the NSF Portal could provide the additional benefit of a standard framework for user-interface design. The NSF Portal, in conjunction with the NSF Directory and Identity Management Services, will provide a method for securing access to applications and for the end-user to personalize views, applications (to whatever extent possible), and other user-interface elements. Additionally, information sources are spread across additional web sites and sources. A NSF Portal will help consolidate and streamline NSF's information, provide greater security and allow for personalization of the end-user experience.

### 3.3.5 Legacy Migrations

The suite of projects as part of the Legacy Migrations will ensue that NSF systems and applications are migrated to take advantage of its upgraded infrastructural capabilities like Sun JES stack. This will ensure that not only will the new infrastructure is put in place but the applications are modified to take advantage of the new features available in the target environment.

The Legacy Migrations program currently consists of one project: NGIS Migration.

**Table 3-12: Legacy Migrations Program Scope Table**

| Project | Layer | Segment |
|---|---|---|
| NGIS Migration | Technology | Grants Management |

#### 3.3.5.1 Next Generation Infrastructure Services Migration

The NGIS Migration Task was conceived to manage the transition of all FastLane applications (Proposal Awards and Status, Panelist Functions, Research Admin, Financial Functions, GRFP, NSBO, Post Doc, Guest Travels, Grants.gov, and Inside FastLane) from the existing JRun infrastructure to the SUN NGIS environment. This effort consist of creating five separate environments, Development, Integration, Acceptance, Demo, and Production, to manage, streamline and document the processes involved with migrating applications through the NGIS environments to production thus allowing NSF to retiring the JRun infrastructure.

### 3.3.6 IT Management

The purpose of the NSF IT Management program is to enable NSF to implement government-wide legislative mandates and guidance, and to strategically plan, manage, and assess the Foundation's investment in information technology. Specifically, the IT Management program comprises services and initiatives in the areas of policy and plans, capital planning and

investment control, project management, enterprise architecture, product assurance, and "Continuous Improvement".

NSF recognizes that successful IT Management Services requires a holistic approach designed to integrate:

- EA development,
- Capital planning concepts and implementation, and
- Linking IT Policy and Strategic Planning with the detailed implementation of systems and services

NSF has integrated EA into the IT capital planning and investment control processes. Through the establishment and support of key governing bodies, NSF has created a well defined IT governance process that is being used to increase the efficiency of IT budgeting and planning.

NSF continues to fund its EA Program Management and Integrated Portfolio Management projects to ensure continued maturity, integration, and success within its IT Management program, as measured both internally and externally (e.g. by OMB and GAO).

The IT Management program currently consists of two projects: EA Program Management and Integrated Portfolio Management

**Table 3-13: IT Management Program Scope Table**

| Project | Layer | Segment |
|---|---|---|
| Enterprise Architecture Program Management | Business | IT Management |
| Integrated Portfolio Management | Business | IT Management |

### 3.3.6.1 Enterprise Architecture Program Management

This section includes the planning, research, development and communication of NSF's Enterprise Architecture, in other words, the Program Plan for the Enterprise Architecture effort. The meta-information included here describes the steps necessary to develop EA baseline and target information, the EA Management Guide, the Enterprise Architecture Transition Strategy and the IT Sequencing Plan.

> *NB: It is important to note that there is distinction between this project plan and the NSF Sequencing Plan, which is represented by this document as a whole: NSF Sequencing Plan represents the subset of technology projects necessary to attain the NSF Target EA; this EA Program Plan represents the steps necessary to achieve the tasks associated with the management and execution of the EA project*

### 3.3.6.2 Integrated Portfolio Management

Funding for the Integrated Portfolio Management project supports execution of CIO responsibilities, including Capital Planning and Investment Control (CPIC), project management, and earned value management (EVM). Through this project's funding, NSF plans to continue to better define and integrate these processes.

NSF has integrated a framework for system development through its Continuous Improvement Program (CIP) modeled after the CMM/CMMI® methodology. Select teams reviewed existing program's assets and phase definitions and provided suggestions for improvements to ensure that the objectives of system development at DIS were being implemented effectively. NSF has published standard procedures and templates for every phase of its SDLC, and has been successful in achieving a functional process that has moved from a conceptual model to an operational routine practice.

### 3.3.7 IT Infrastructure

The purpose of the IT Infrastructure program at NSF is to address the future needs of NSF's IT infrastructure, consisting of but not limited to physical network, operating systems, desktops, servers, and applications, etc. The program consists of addressing NSF's primary business and technical requirements for their Target network architecture and ensures that design of each network component meets industry best practices and Federal guidelines. The program also ensures that NSF's local area and wide area networks (LANs and WANs) are fully capable of supporting mission critical business processes, enterprise applications, admin applications, and end-user workstations. The architecture is based on industry standards for LAN/WAN, security, and network support system technologies and is designed to be flexible and modular for supporting future business and technical requirements. This program also includes increasing NSF's future enterprise management capabilities (currently, the NSF computing environment has a number of tools that provide varying levels of enterprise management for several computing components but without an integrated view into the entire computing environment) by providing an integration plan and management processes for providing a complete picture and history of the NSF computing environment using existing tools.

The IT Infrastructure program currently consists of four projects: Enterprise Management Systems, Network and Security, Email and Storage, Directory (Network) Services Project, and Independent Project

**Table 3-14: Infrastructure Program Scope Table**

| Project | Layer | Segment |
|---|---|---|
| Enterprise Management Systems | Service | Data Center Operations |
| Network and Security | Technology | Network Infrastructure |
| Email and Storage | Technology | Network Infrastructure |
| Directory (Network) Services Project | Technology | Network Infrastructure |
| Independent Project | Technology | Network Infrastructure |

#### 3.3.7.1 Enterprise Management Systems

The NSF target architecture is characterized by tools and strategies to completely "know" about and monitor all computing components ranging from the physical network, servers and OS's to desktops, application and virus definitions; tools that provide these services are known as Enterprise Management Systems (EMS). Currently, the NSF computing environment has a number of tools that provide varying levels of enterprise management for several computing components but without an integrated view into the entire computing environment. NSF's Target Enterprise Architecture will provide an integration plan and management processes for providing a complete picture and history of the NSF computing environment using existing tools. The resulting technology structure will mean better performance, less downtime, better security and better asset control than available in the current configuration.

#### 3.3.7.2 Network and Network Security

This project is primarily focused on aligning NSF's LAN/WAN, Perimeter Network, Remote Access, IDS, and Internet access designs with the Target Network Architecture. It is recommended that LAN access/core layer upgrade, LAN server farm deployment, and the Perimeter Network deployment initiatives should be conducted simultaneously. The same resources could be utilized for executing all three initiatives and synergy can be achieved for planning, design, test, and implementation activities. Upon successful deployment of the NSF's Perimeter Network, the WAN Transition and the Internet access upgrade initiatives should be executed. Both the IDS and the Remote Access upgrade initiatives should begin during the last phase (monitor/validation) of the Perimeter Network and Server Farm deployment initiative.

*NSF has developed the NSF Network Segment Architecture that is directly supported by the IT Infrastructure Programs. Please see that document for detailed information about the NSF Network Segment is contained in a separate document:* ***The NSF Network Architecture Segment v 3.0, February 2008.***

#### 3.3.7.3 Email and Storage

This project is focused on aligning NSF's E-Mail, Storage Area Network, and File Services environment with the Target Network Architecture. Since, the SAN will be integrated with the server farm to provide storage services this project should start after the LAN Server Farm has been successfully deployed. Additionally, the e-mail servers will utilize the SAN for storage and therefore executing both e-mail and SAN upgrade projects concurrently will result in planning and deployment efficiencies.

*NSF has developed the NSF Network Segment Architecture that is directly supported by the IT Infrastructure Programs. Please see that document for detailed information about the NSF Network Segment is contained in a separate document:* ***The NSF Network Architecture Segment v 3.0, February 2008.***

#### 3.3.7.4 Directory (Network) Services Project

This project is focused on aligning NSF's Active Directory (AD), DNS, DHCP, and Print Services environments with the Target Network Architecture. It is recommended that this project should be executed after the perimeter network and the server farm have been successfully deployed. Since the Target Architecture recommends that NSF should standardize its DNS environment on Windows platform, the Directory Services upgrade project should be also executed simultaneously. In order to achieve additional planning and deployment efficiencies, NSF should consider executing the DHCP project concurrently, as well.

*NSF has developed the NSF Network Segment Architecture that is directly supported by the IT Infrastructure Programs. Please see that document for detailed information about the NSF Network Segment is contained in a separate document:* ***The NSF Network Architecture Segment v 3.0, February 2008.***

#### 3.3.7.5 Independent Projects

This project includes such activities as Network Management Systems (NMS) upgrade that can be executed independently of other Target Architecture projects. The NMS upgrade should be executed independent of all other Target Network Architecture projects.

### 3.3.8 IT Security and Privacy

NSF's agency-wide IT Security and Privacy Program encompasses all aspects of IT security and privacy and include business processes for generating, monitoring, and implementing: policies, procedures and plans; security assessments, audits and testing NSF systems and applications' management, operational and technical security controls; security awareness training; Certification and Accreditation; intrusion detection, computer incident response; vulnerability assessment and management; and independent reviews.

The projects associated with the IT Security and Privacy Segment span a number of the security and privacy business processes mentioned above as well as multiple architectural layers. This section provides an overview of the individual projects and a high-level set of future milestones. For a complete description of the IT Security and Privacy Segment including projects, please see the ***NSF IT Security and Privacy Segment Architecture v1.0, dated February 2008***.

The IT Security Program currently consists of the following projects.

| ID | Project | Layer |
|---|---|---|
| IT-SEC-2008-01 | Security Program Maturity Assessment | Business |
| IT-SEC-2008-02 | Enhanced Technical Tools and Controls | Service/Technology |
| IT-SEC-2008-03 | Employee/Contractor Out Processing | Business |
| IT-SEC-2008-04 | ISS LoB Transition | Service/Technology |
| IT-SEC-2008-07 | Security Event Management Service | Service/Technology |
| IT-PRI-2008-01 | SSN Be Gone | Business |
| IT-PRI-2008-02 | Mobile Device Encryption | Service/Technology |
| IT-PRI-2008-03 | Log Data Extracts | Service/Technology |

#### 3.3.8.1 Security Program Maturity Assessment

Balancing risk and controls with business improvements and protecting an open and collaborative environment of research and discovery is a continuous challenge as NSF transforms its IT operations. This project assesses and identifies opportunities to improve compliance, effectiveness, and efficiency of NSF's IT Security and Privacy Program, which are critical to protecting NSF's financial and research information assets.

#### 3.3.8.2 Enhanced Technical Tools and Controls

As part of the NSF IT Security and Privacy Segment Architecture gap analysis, numerous small tasks to enhance security technical tools and controls were identified. This project is the implementation of numerous tasks including:

- All applications and computers time-out after a period of inactivity
- All systems lockout users after unsuccessful logon attempts
- Develop rules of behavior specific to FAS users which clearly delineate responsibilities and expected behavior of all individuals

#### 3.3.8.3 Employee/Contractor Out Processing

NSF has an established set of procedures for outgoing or transferring employees, and has instituted procedures for separating contractors. Specifically, NSF has an online Contractor/Guest Exit form that is used for the deactivation of NSF email and IT system accounts and for the return of government property. Contractors separating from NSF are reminded that all government equipment issued or assigned in their name must be returned to their contract project manager or division Administrative Officer upon separation.

#### 3.3.8.4 ISS LoB Transition

The Information Systems Security Line of Business (ISS LoB) enables agencies' mission objectives through a comprehensive and consistently implemented set of risk-based, cost-effective controls and measures that adequately protects information contained in Federal Government information systems. The ISS LoB initial focus is on two services: FISMA training and FISMA reporting.
For FISMA training, the ISS LoB is developing common suites of ISS training products and training services for the Federal Government. NSF must migrate to Security Awareness Training Shared Service Provider by September 30, 2008.

For FISMA reporting, the ISS LoB is providing agencies with shared products and services to comply with FISMA reporting requirements through the use of pre-existing standardized tools. NSF must migrate to a FISMA reporting solution September 2010.

#### 3.3.8.5 Security Event Management Service

Security Event Management provides automated correlation and analysis of security data from multiple server security logs and intrusion detection systems to provide real time analysis and response to emerging security threats. It augments the ability of the NSF Security Team to collect, assess, analyze, and act on security threats to the NSF.
Currently NSF security and operations staff must manually examine thousands of security events in multiple server logs and intrusion detection systems. This manual process is reactive in nature due to the volume of information that must be collected and analyzed. A security event management system would change the process to a proactive one that would enable the security and operations staffs to identify attacks at their inception, limiting the potential damage to NSF assets and minimizing lost productivity and cost of repair/recovery.

#### 3.3.8.6 SSN Be Gone

The goal of the SSN Be Gone project is to minimize NSF's risk of exposing SSNs by eliminating the use of SSNs in processes, systems, and files where no business need exists, and by increasing protections where SSNs must be used for business purposes. This project enables NSF to comply with Federal mandates, including:

- Office of Management and Budget Memoranda
    - "Protection of Sensitive Agency Information" (M-06-16)
    - "Safeguarding Against and Responding to the Breach of Personally Identifiable Information" (M-07-16)
- Office of Personnel Management Memorandum
    - "Guidance on Protecting Federal Employee Social Security Numbers and Combating Identity Theft" (June 18, 2007)

SSN Be Gone has three phases. Phase I is complete and included:
- FastLane Registration: Remove collection of SSN
- FastLane Proposal Cover Sheet: Remove ability to select co-PI using SSN
- Introduce the term "NSF ID"
- FastLane Login: Enable NSF ID (along with continued use of SSN)
- Begin migration to exclusive use of NSF ID
- FAS: Protect SSN data in FAADS Report and YearEnd Pending Transactions Report

#### 3.3.8.7 Mobile Device Encryption

In accordance with OMB Memo M-06-16, NSF is required to encrypt all data on mobile computers/devices which carry agency data. Milestones to meet this mandate include completing encryption for Laptops and Blackberries.

#### 3.3.8.8 Log Data Extracts

In accordance with OMB Memo M-06-16, NSF is required to log all computer-readable data extracts from databases holding sensitive information and verify each extract including sensitive data has been erased within 90 days or its use is still required.

### 3.3.9 Next Generation Data Architecture

The Next Generation Data Architecture (NGDA) project provides infrastructure and process plans for NSF to define data use and data business rules at the enterprise level for data related to its

financial, grants management, and supporting business processes. The scope of NGDA includes defining the data architecture across major systems, enterprise data model, physical data structure, and managing the business rules, policies, standards and guidelines for data management, access and use. The Data Architecture task will result in a consolidated view (logical and physical) of NSF's information.

As depicted below, the NGDA program currently consists of eight projects Each project's outputs would add to/update the data architectural layer but not for the same segment architecture. For example, the Database Management project will help complete the IT Management segment's data architecture layer while the Major and Minor Data Services projects will fill in parts of the data layer for the Digital Asset Services segment.

**Table 3-15: Next Generation Data Architecture Program Scope Table**

| Project | Layer | Segment |
|---|---|---|
| Database Management | Data | IT Management |
| Data Access Framework | Data | IT Management |
| Major Data Services | Data | IT Management |
| Minor Data Services | Data | IT Management |
| Enterprise Data Model | Data | IT Management |
| Data Management Plan | Data | IT Management |
| Data Quality | Data | IT Management |
| Operations | Data | IT Management |

#### 3.3.9.1 Database Management

This project will encompass the work necessary for NSF to incorporate data integrity and key relational database principles to all NSF databases as well as to move NSF's database environment from Sybase to an alternative relational database management system.

#### 3.3.9.2 Data Access Framework

This project involves the separation of business logic currently stored in the data tier (Stored Procedures) from the Data layer and adoption of a standardized data access framework across NSF applications. This will localize all the data related code in one place and minimize application changes on account of database related changes.

#### 3.3.9.3 Major Data Services

The purpose of this project is to enable more accurate business decisions through the manipulation, storage, management and transmission of information across the enterprise. An example of a major data service would be a data warehouse service.

#### 3.3.9.4 Minor Data Services

The purpose of this project is for minor data services to enable more accurate business decisions through the manipulation, storage, management and transmission of information across the enterprise. The minor data services support the major data services (e.g., The Extract, Transform and Load (ETL) service that supports the data warehouse major data service).

#### 3.3.9.5 Enterprise Data Model

The purpose of this project is to document the enterprise data architecture across major systems so as to enable a consolidated logical view of the grants related data being used by applications at NSF.

#### 3.3.9.6 Data Management Plan

The purpose of this project is to support the development and execution of architecture, policies, practices and procedures that manage NSF data lifecycle needs.

#### 3.3.9.7 Data Quality

The purpose of the data quality project is to ensure that NSF data is accurate, timely, meaningful and complete in response to the business needs.

#### 3.3.9.8 Operations

The purpose of the operations project is to improve the operational environment that supports the current data architecture.

### 3.3.10 Administrative Management

This program involves the critical administrative systems that are needed by NSF for executing its core mission applications and processes.

The Administrative Management program currently consists of two projects: Procurement System and Financial Management Solution Modernization.

**Table 3-16: Administrative Management Program Scope Table**

| Project | Layer | Segment |
|---|---|---|
| Procurement System | Service/Technology | Administrative Business Solutions |
| Financial Management Solution Modernization | All | Administrative Business Solutions |

#### 3.3.10.1 Procurement System

The goal of the eProcurement project is to significantly improve NSF's procurement processes by delivering a highly-integrated, fully-functional procurement system. It involves implementation and integration of COTS solutions for requisitions/acquisition management from Distributed Solutions Inc(DSI). NSF has acquired from DSI AAMS (Automated Acquisition Management System) - a system to manage the contract activities and ProReq - a system to manage the requisitioning activities. These will be integrated with FAS, CCR/Institution and the EIS systems at NSF.

#### 3.3.10.2 Financial Management Solution Modernization

The Financial Management (FM) Solution Modernization project is a multi-phase, multi-year project whose purpose is to secure a financial management solution for the National Science Foundation that will ensure accurate and reliable financial information is available to the grantee community; provide continued financial management excellence to the Foundation; maximize NSF's ability to adapt to continually evolving and more stringent financial performance and reporting requirements mandated by the President through OMB; and maintain compliance with existing regulation.

## *3.4 EA Program Results Analysis*

This section summarizes the 5 major measurement areas described above plus other areas that NSF and the NSF EA team have found to be useful in measuring NSF's EA value.

> In summary, the NSF EA Program demonstrates compelling results. From an NSF program perspective, our PART scores are rated effective and we have exceeded our target GPRA goal. These program results have been achieved with minimal IT funding – less than 1% of NSF's discretionary budget is spent on IT. The IT investments we maintain are managed effectively as seen by our M-06-22 reports, which show minimal variance. Even with this small investment in IT, NSF leads, participates and/or contributes to the success of many E-Gov initiatives, as described below.

### 3.4.1 Long-term Objectives

NSF's long-term objectives are quantified in accordance with the OMB Program Assessment Rating Tool (PART) and reported in the NSF Program Assessment Report. NSF's 2007 PART rating average is 93 with all programs being rated as "Effective". NSF's EA is used to communicate strategic IT direction, set IT spend priorities, and measure the effectiveness of investments that directly support NSF's highly-rated PART programs.

| Measurement Area | Type | Indicator | Baseline | Target (3-5yrs) | FY08 Actual |
|---|---|---|---|---|---|
| Programs | Objective | Average agency program PART score | 93 | 90 | 92 |

### 3.4.2 Government Performance and Results Act (GPRA)

As with PART, the NSF EA directly supports the effective performance of NSF's programs by guiding and measuring the selection, development, implementation, and maintenance of IT investments. NSF's primary GPRA measurements is that for 70% of proposals submitted, NSF be able to inform applications as to whether or not proposals have been declined or recommended for funding within six months of deadlines or target receipt date.

| Measurement Area | Type | Indicator | Baseline | Target (3-5yrs) | FY08 Actual |
|---|---|---|---|---|---|
| Programs | Objective | Inform Applications of funding decision within 6 months of submission | 78% | 70% | 75% |

### 3.4.3 IT as a percentage of overall budget

NSF's EA directly contributes to cost savings and cost avoidance by reducing redundancy in IT investments as well as providing the direction for reuse. One measure of cost effectiveness is IT cost as a percentage of the overall NSF IT budget. Based on the FY09 budget request, which contains FY07 actuals, the NSF IT FY07 budget comprises less than 1% of the Agency's overall budget.

- NSF's Budget Authority in FY 2007: $5.923B
- NSF's FY07 IT Budget (per the Exhibit 53): $48.502M
- % IT of Budget Authority: 0.82%

| Measurement Area | Type | Indicator | Baseline | Target (3-5yrs) | FY08 Actual |
|---|---|---|---|---|---|
| IT Investment Portfolio | Objective | Agency's IT spending as percent of FY06 discretionary budget is less than 3.5% | <1% | <3.5% | 0.82% |

### 3.4.4 OMB M-06-22 Financial Reports

NSF reports major IT investments in accordance with OMB memorandum M-06-22's Information Technology Investment Cost Measurement Framework. Per that framework, NSF captures baseline and actual costs, and variance statistics on personnel Costs, materials and supply costs, and other costs (facilities, utilities, training, etc. where applicable). To date, the NSF EA is used directly in the planning and measurement of all grants, security, and infrastructure investments. Future versions of the EA will include all OMB M-06-22 projects. The investments included in M-06-22 reports are:

- Fastlane
- Research.gov
- Security
- Infrastructure
- Financial Accounting System (FAS)
- Integrated Time and Attendance System (ITAS)
- Training System
- Electronic Official Personnel Folder (eOPF)
- eRecruit

| Measurement Area | Type | Indicator – Standard costing factor | Baseline | Target (3-5yrs) | FY08 Actual |
|---|---|---|---|---|---|
| IT Investment Portfolio | Objective | Total Baseline 26,068,740<br>Total Actual 25,688,083<br>Total Variance 380,657 | NA | <5% | 1.46% Variance |

### 3.4.5 e-Government Initiatives

NSF's EA provides a clear line of site between leadership and participation in e-Gov initiatives and the benefits realized by NSF. NSF; EA Transition Strategy and Sequencing Plans fully guides the implementation and performance milestones of all NSF e-Gov initiatives as does NSF's Target Enterprise Architecture. Below is a qualitative and quantitative summary of e-Gov benefits realized by NSF.

- Grants.gov

The Grants.gov Initiative provides grant applicants with a single source to search and apply for funding opportunities from all Federal grant-making agencies using common forms, processes, and systems. With NSF's full implementation of Grants.gov, the research community can now

find and apply for NSF funding opportunities on Grants.gov as well as through NSF's FastLane web site. In FY 2007, NSF published all of its funding opportunities on Grants.gov and published associated application packages for nearly all of those opportunities. In FY 2007 NSF received over 1,600 electronic applications through Grants.gov, more than double the amount from FY 2006.

NSF has not identified or reported savings resulting from its use of Grants.gov. However, NSF recognizes the benefits that Grants.gov provides to the research community through use of standardized terminology, application forms and electronic submission processes. NSF has leveraged Grants.gov in the development of five agency specific forms (of which only 2 are required) and has used them 100% of the time; NSF uses government-wide forms 100% of the time for its application packages. In FY 2007, NSF published 140 or 100% of its funding opportunities on Grants.gov and published associated application packages for 136 of those opportunities. The remaining 4 were in areas not currently supported through Grants.gov. NSF received 1,606 electronic applications through Grants.gov, more than double the amount from FY 2006.

- Grants Management Line of Business (GM LoB)

NSF manages a portfolio of awards totaling approximately $5 billion. For NSF, the key benefit of participating in the GM LoB will be having a centralized location from which program managers can download all grant applications, make awards, and track those awards through closeout. As a consortium lead, NSF envisions developing a single web portal, Research.gov, containing government-wide resources and tools for research institutions to conduct grants business with Federal research agencies.

Automated business processes available through consortium service providers will decrease agency reliance on manual and paper-based processing. Consortium lead agencies will spread operations and maintenance (O&M) costs, and development, modernization, and enhancement (DME) costs across agencies, decreasing the burden that any one agency must bear.

GM LoB will lead to a reduction in the number of systems of records for grants data across the government as well as the development of common reporting standards. This will improve the government's ability to provide agency- and government-wide reports on grant activities and results. The use of a consortium will help NSF comply with the Federal Financial Assistance Management Improvement Act of 1999 and the Federal Funding Accountability and Transparency Act of 2006.

Service to constituents will be improved through the standardization and streamlining of government-wide grants business processes. GM LoB will minimize complex and varying agency-specific requirements, like annual and final reporting. Constituents will save time and money with fewer unique agency systems and processes to learn; the new Federal grant systems will be easier to learn so reliance on call center technical support will be reduced.

- E-Authentication

This initiative provides E-Authentication expertise, guidance, and documentation, including project planning and reporting templates, to enable NSF to implement E-Authentication for agency applications. The E-Authentication Federation allows NSF to use identity credentials issued and managed by organizations within and outside the Federal Government, thereby relieving NSF of the responsibility for providing its own identity management solutions.

- Geospatial One Stop/Line of Business

Although NSF is not currently a provider of a geospatial data, it does consider proposals for support of fundamental research that utilizes or enhances the value of geospatial information. NSF recognizes the importance of the LoB in establishing a more collaborative and performance-oriented culture within the Federal geospatial arena that should optimize investments in data and technology and yield many long-term benefits to the nation.

- E-Rulemaking

NSF's support of fundamental science and engineering research requires the Foundation to maintain constant contact with the research community. The Federal Docket Management System (FDMS) provides the research community (as well as members of the public) with a web-based, central location to track regulations proposed by NSF and to provide comment when applicable.

- Business Gateway

By creating a single portal for business information, such as regulatory compliance information, Business Gateway directly benefits NSF's "customers" (e.g., research firms, universities, etc.), many of whom are subject to complex regulatory requirements across multiple agencies. NSF's constituents could potentially receive significant benefits from Business Gateway including time and cost savings, assistance in compliance with the Small Business Paperwork Relief Act (SBPRA), and reduction in burden hours. Through increased outreach, more constituents will be able to realize these benefits.

NSF will also benefit in specific ways from participation in the Business Gateway initiative. The web search technology on Business.gov will provide NSF with user statistics about information most sought by customers, which will enable the agency to improve the management of web content related to business compliance. By making forms available on Forms.gov, NSF saves agency time in forms management, and is expected to produce significant savings in paper and postage.

- Integrated Acquisition Environment (IAE)

The tools and services provided by IAE allow NSF to make informed and efficient purchasing decisions and replace manual processes. Without the IAE systems, NSF would need to build and maintain separate systems to record vendor and contract information, and to post procurement opportunities. Agency purchasing officials would not have access to other agencies' information on vendor performance, and would have to rely on paper-based and labor-intensive work efforts.

- Human Resources Management Line of Business (HR LoB)

The HR LoB services and initiatives provide NSF with best-in-class HR services and systems. Through NSF's adoption of an approved service provider, the agency can achieve the benefits of advanced HR solutions without the costs of developing and maintaining its own HR systems. NSF's involvement in the HR LoB allows NSF to help shape the government-wide solution and benefit from the best practices and lessons learned as developed by the HR LoB task force and other agencies.

- Financial Management Line of Business

The FM LoB uses a Shared Service Provider (SSP) to promote standard business processes and common system configurations. Reliance on SSPs helps keep capital investment and risk to a minimum. NSF's involvement with FM LoB will enable it to benefit from future system

modernization efforts. In the short-term, key tools such as a Request for Proposal (RFP) framework and Service Level Agreement (SLA) guides will be provided to NSF. Further cost savings will be recognized through the reduction of redundant costs and through the use of Financial System Integration Office certified financial management system software to minimize the cost of application upgrades.

- Budget Formulation and Execution Line of Business

The BFE LoB plans to make at least one government off-the-shelf (GOTS) budget formulation system available for purchase or use via a fee-for-service arrangement. NSF will be able to utilize the planned BFE LoB guidance for budget system procurement. The guide will include a listing of agencies and their current budgeting systems, information on various budgeting systems that are currently available in the market place (both GOTS and COTS – commercial off-the-shelf), and a decision matrix that agencies can use in assessing budgeting systems. Additionally, agencies will have the ability to share lessons learned for budget formulation, execution, planning, performance measurement, and financial management information and activities across the government. The BFE LoB will provide all agencies with more information about collaborative tools and technologies to facilitate communications in the Federal budget environment.

- IT Infrastructure Line of Business

The IT Infrastructure LOB will provide NSF with best practice data and industry-wide performance metrics related to investments in IT infrastructure. It will allow NSF to validate and/or improve existing system performance.

## *3.5 EA Value Measurement Summary*

This section descries the outcomes of the EA value measurement process contained in the EA Management Guide. The NSF EA measurement process follows the steps prescribed in the FEA Practice Guidance Section 5: Measuring EA Program Value and comprise:

- Defining Value Measurement Areas
- Identifying Measurement Sources
- Executing Value Measurement Plan

Through this process, the NSF EA Team has developed a series of value indicators that are currently the most accurate information on describing the effectiveness of NSF EA program. As the EA continues to mature, NSF will refine the measurement indicators by regularly updating the kinds of questions that the EA is designed to answer. Doing so will naturally result in changes to the EA artifacts, reports to stakeholders, the meta-model, and, ultimately, the indicators collected to judge its effectiveness.

### 3.5.1 Continuous Improvements

The NSF EA Team is continually engaging stakeholders within NSF and across the NSF community to improve the value of NSF's EA and refine EA information and reporting. In FY07, the NSF EA team conducted a complete EA stakeholder analysis that has resulted in a complete new set of standard EA reports linked directly to stakeholder needs, an easy-to-use interface to the Metis NSF EA Repository, and, a modified NSF EA meta-model. The results of this analysis were:

- A fundamental redesign of the NSF EA Meta-model that has allowed for information to be captured, stored and reported more effectively and accurately (Please see the NSF Target Enterprise Architecture)

- A series of new reports specifically created and customized to satisfy different perspectives of stakeholders across the foundation (Please see the NSF EA Management Guide)
- An updated series of questions and goals for the NSF EA (Please see the NSF Target Architecture: Business Architecture)

For complete description of the stakeholder analysis and related processes, please see *NSF Meta Model Implementation Phases 1 & 2 for the stakeholder analysis*; and the *NSF EA Target Architecture* for the updated NSF EA Meta-model information.

### 3.5.2 Common Value Indicators

In accordance with the guidance established in the FEA Practice Guidance, Chapter 5, Measuring EA Program Value, NSF has established a series of Common Value Indicators that are based on the NSF EA stakeholder analysis conducted in June of FY07. These indicators, along with those described in the above sections (PART, GPRA, % IT budget) comprise the total measurement indicators used by NSF. The following table contains those measurements that best described the value obtained by NSF from the NSF EA Program.

| Measurement Area | Type | Indicator | FY07 Baseline | Target (3-5yrs) | FY08 Actual |
|---|---|---|---|---|---|
| Agency Enterprise Architecture | Objective | Total OMB EA Assessment Score (including completion) | Completion: 4.6<br>Use: 4.5<br>Results: 5.0 | Completion: 5.0<br>Use: 5.0<br>Results: 5.0 | |
| | Objective | Number of training sessions held | 1/Quarter | 1/Quarter | 1/Quarter |
| | | | | | |
| IT Investment Portfolio | Objective | % of IT investments compliant with agency transition strategy | 100% | 100% | |
| | | | | | |
| Operating Environment | Objective | Number of cross-agency service level agreements (provide and subscribe) | 1 | 5 | |
| | Objective | Number of common/shared service components. | 1 | 5 | |
| | Objective | % of IT systems compliant with agency technical standards profile | 100% | 100% | |
| | | | | | |
| Segment Architecture | Objective | Number of segments completed | 2 | 7 | 2 |
| | Objective | % of enterprise segments with an assigned Integrated Product Team (IPT) (in accordance with guidance) | 100% | 100% | |
| | Objective | % of approved segments reconciled with agency EA | 100% | 100% | |
| | Objective | % of segment-level architectures integrated with cross-agency initiatives | 100% | 100% | |
| | | | | | |

| Measurement Area | Type | Indicator | FY07 Baseline | Target (3-5yrs) | FY08 Actual |
|---|---|---|---|---|---|
| IT Investment Business Case | Objective | % of investments to segments by type, e.g. core mission areas, business services, enterprise services | 100% | 100% | |
| | | | | | |
| Solution Architecture | Objective | % of approved software architectures conformant with agency EA standards within data, technical and service component models | 100% | 100% | |
| | | | | | |
| Projects | Objective | % of projects fulfilling opportunities to reuse shared services | 100% | 100% | |

# 4 Conclusion and Next Steps

This EA Transition Strategy represents an organization-wide action plan for transforming NSF's IT environment, in support of the business. The programs and projects within the EA Transition Strategy provide the foundation for NSF's progression toward their Target EA (for an in-depth look at NSF's Target Architecture, refer to *NSF 2007 Target EA*). It is part of an overall modernization process that represents a fundamental change in the way the Foundation plans for, invests in, and implements business and IT modernization activities.

Successful execution of this Strategy will require executive-level buy-in and sponsorship, frequent and effective communication, cultural change, and hands-on participation at the staff level. NSF has identified a series of additional next steps that will help ensure a successful transition to their Target environment:

- **Continue to identify, develop, and maintain Foundation segments**: The transition process from baseline to target state environments represents a moving target, requiring regular updates to reflect current Foundation priorities at. As such, the CIOAG should continue to identify, develop, and maintain segment architectures to ensure that future transition strategy program accurately reflect business and architectural drivers, as well as NSF's business needs.
- **Continue to integrate potential future funding requests into the NSF CPIC process**: The programs and projects within the transition strategy have a series of dependencies that necessitate the use of this document as an input into the IT CPIC funding process, to ensure effective allocation of funds to critical projects.