INFORMATION TECHNOLOGY (IT) **$139,390,000**
+$27,380,000 / 24.4%

NSF's FY 2022 Request level for IT investments total $139.39 million. Funding for NSF's IT investment is provided from the AOAM, R&RA, and EHR accounts. It is the second largest component of the Organizational Excellence portfolio, accounting for 20 percent of the total.

NSF IT Portfolio Investments by Appropriation

NSF IT Portfolio Investments by Appropriation
(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Change over FY 2021 Estimate Percent	Funding Source
Agency Operations & Award	$24.19	$24.28	$31.97	$7.69	31.7%	AOAM
Program Related Technology (PRT)	97.31	87.73	107.42	19.69	22.4%	R&RA/EHR
Total	**$121.50**	**$112.01**	**$139.39**	**$27.38**	**24.4%**	
Total AOAM	24.19	24.28	31.97	7.69	31.7%	
Total R&RA	85.08	76.47	92.18	15.71	20.5%	
Total EHR	12.23	11.26	15.24	3.98	35.3%	

Agency IT investments funded through the AOAM account support the agency's operations to ensure high quality, reliable, and secure administrative applications and associated IT infrastructure support and services to meet the needs of the Foundation. This funding accounts for almost one quarter (23 percent) of NSF's total IT investment at the FY 2022 Request level.

Program Related Technology (PRT) investments support NSF's programmatic activities and associated services and are funded through the R&RA and EHR accounts. PRT investments are mission-related IT and Data Management investments that support the merit review process, including pre-award planning and activities; receipt of proposals; processing proposals; reviewing proposals; award decisions, documentation, and notification; funding awards; post-award oversight; dissemination of award results; and award close-out. PRT investments account for just over three quarters (77 percent) of NSF's FY 2022 Request for IT investments.

For FY 2022, funding for NSF's IT portfolio increases $27.38 million to support current and emerging business practice and organizational changes needed to establish and support the new Translation, Innovation, and Partnership directorate, implement the agency's response to COVID-19 as NSF transitions to a hybrid physical/remote workforce, and acquire, deploy, and secure the systems and technology needed to support the overall increase in NSF's mission. These factors necessitate changes to legacy systems and implementation of new applications, expansion of IT security and infrastructure capabilities, and support for new, innovative uses of tools and commercial off the shelf (COTS) products to provide capabilities. Advances supported by this request include: additional automation and streamlining of work performed by NSF staff; implementing new business rules, workflows, and/or reporting needs as a result of business process and organizational changes as well as any Congressional oversight and transparency/stewardship requirements; updates to public and researcher facing systems and websites to respond to user experience input and increased interest in NSF's work; reducing administrative burden on our external partners; and changes to make additional data available to the public as well as university and corporate partners. NSF's IT investments will also focus on how technology can be used to augment and amplify human performance, a continued effort on implementing and scaling solutions that will further priorities stemming from

continuing the agency's commitment to enterprise excellence. Within the full FY 2022 Request, development and modernization efforts will continue, including:

- Technology transformations geared toward improving the customer experience both internally and for public-facing digital services, with a continued focus on modernization and digitization;
- Expand development and implementation of advanced technologies such as artificial intelligence (AI), robotic process automation (RPA), and data analysis tools to support NSF's mission;
- Employ innovative and advanced technology capabilities in support of agency priorities, enabling the continued transformation of the agency's workforce and providing platforms for development and testing of new technology tools and capabilities;
- Support for the IT infrastructure and systems that serve the agency, preserving secure, reliable operations while enabling risk-based prioritization of cybersecurity improvements;
- Support the continued operation of iTRAK, the Foundation's financial management system, and NSF's Financial Services Support investment, distinct from the iTRAK investment, to ensure continued interoperability between NSF's core financial functions; modernize NSF's financial management functions; and increase transparency and accuracy of reporting between iTRAK and other mission systems;
- Support continued use and refinement of the Technology Business Management (TBM) framework for managing IT as a business.

NSF IT Portfolio Investments by Category

Investments in NSF's IT Portfolio can be grouped across five main categories: Administrative Applications Services and Support; Mission-Related Applications and Services; IT Operations and Infrastructure; IT Security and Privacy; and IT Management. Funding for the activities under these investment categories is split between AOAM and PRT.

NSF IT Portfolio Investments by Category

(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Change over FY 2021 Estimate Percent	Funding Source
Administrative Applications Services & Support	$6.86	$6.91	$7.91	$1.00	14.4%	AOAM
Mission Related Applications & Services	60.42	55.93	68.72	12.79	22.9%	PRT
IT Operations & Infrastructure	43.29	38.68	48.97	10.29	26.6%	AOAM/PRT
Security & Privacy Services	8.18	7.97	11.01	3.04	38.1%	AOAM/PRT
IT Management	2.75	2.52	2.78	0.26	10.5%	AOAM/PRT
Total	**$121.50**	**$112.01**	**$139.39**	**$27.39**	**24.4%**	

Administrative Applications Services and Support ($7.91 million, +$1.0 million above the FY 2021 Estimate: AOAM only)

Investments in this category support administrative applications, such as the NSF website, NSF's human resources management systems, and NSF's financial management system.

- iTRAK is NSF's financial management system. Seventy percent will be funded by PRT through the R&RA and EHR accounts and 30 percent will be funded by the AOAM account. The AOAM portion of the FY 2022 funding supports ongoing operations and maintenance of the system, updates and enhancements to support intragovernmental transactions, as well as initial planning for the next generation of iTRAK.

- Other administrative applications services which provide for operations and maintenance of agency administrative and collaboration tools, such as the NSF website. FY 2022 funding in this area will support operations and maintenance of both NSF's legacy website and beta.nsf.gov as the agency continues to transition site content.
- Continued operations and maintenance of the systems that support the strategic management of NSF human capital, including those that enable the effective recruitment, retention, reskilling, and rewarding of NSF staff in alignment with NSF's Strategic Goal 3: Enhance NSF's performance of its mission, Strategic Objective 1: Human Capital - Attract, retain, and empower a talented and diverse workforce. Funding in FY 2022 will support operations for the agency's core human capital management systems as the agency continues to invest in new capabilities and expand services to accommodate the growing workforce.

Mission-Related Applications and Services ($68.72 million, +$12.79 million above the FY 2021 Estimate: PRT only)

Investments in this category fund the applications and services that support the merit review process, including pre-proposal planning; receipt of proposals; processing proposals; reviewing proposals; award decisions, documentation, and notification; funding awards; post-award oversight; dissemination of award results; and award close-out. These investments can be classified as:

- Mission Support Systems, which include support for a wide range of activities:
  - Operations and maintenance of NSF's mission support systems, which provide a suite of functionality supporting each stage in the NSF proposal and award management process. Work in this area incorporates ongoing needs for new functionality as it is incrementally deployed for production use. In FY 2022, additional costs are expected in this area, as long-term investments in Program Management Efficiencies (PME) and Website Modernization begin to move into production and will require operational support and maintenance.
  - Continuous modernization of systems and services that support the merit review process. FY 2022 efforts will continue to prioritize modernization of public-facing digital services. Specific investments include:
    - PME: This investment prioritizes the continuous modernization of citizen-facing services and data cleanup activities, including retirement of legacy technologies. In FY 2022, this initiative will focus on continued decommissioning of legacy proposal submission functions as new efforts shift to the Intelligent Automation of Grants Management Systems investment area.
    - Web Modernization: Continues efforts to expand the capabilities and information shared through NSF's website, which provides the general public, science and engineering research communities, and education communities with access to high quality information and services. FY 2022 investments will focus on improving integration across funding and award information to help researchers identify programs and potential collaborators to enhance their proposal submissions.
    - Public Access: Supports continued use of the NSF Public Access Repository (NSF-PAR) as a controlled platform for integration with third-party services, leveraging application programming interfaces that support machine-to-machine communication to enhance use and discovery and reduce burden on the research community. FY 2022 efforts will extend access to federally funded reports and metadata, and pilot access to the federated cross-agency repository.
    - Intelligent Automation of Grants Management Systems: A new initiative beginning in FY 2021, this investment provides for enhancements to IT systems/applications that support the grants management lifecycle, including those related to the PME investment. Investments aligned to this initiative in FY 2022 will include efforts related to consolidation of NSF's external portals; modernization of internal applications that support the merit review process, and enhancements related to NSF's identity management capabilities and services. FY 2022

investments will also include technology support for efforts related to NSF operational changes, with particular focus on features and functionality that will support emerging funding and award types as well as new mechanisms for collection, use, and publication of award data.
    - Improve Service Delivery: This is a new investment area for FY 2022 focusing on tools to enhance IT service delivery, potentially including enhancements to agency collaboration tools and services, such as distributed video conferencing capabilities, whiteboarding technologies, and use of smart vending machines to innovate IT support services.
    - Interactive Panel Systems (IPS) Replacement: A modernization effort continuing from FY 2021 to replace the current interactive panel system, which provides reviewers an application for collaborating with fellow panelists to review and rank proposals and recommend the proposals deemed most meritorious.
    - Innovation Management: Continues the adoption and implementation of advanced tools and technologies to support the renewed merit review process. Specifically, FY 2022 funding will further efforts to consolidate, integrate, and streamline services through the expansion of advanced technology such as AI, RPA, and machine learning, reducing administrative burden on the user.
- NSF's Data Management and Delivery investment: NSF's IT governance groups have prioritized agency initiatives to strengthen the agency use of data and evidence. FY 2022 funding includes investments in services and systems to centralize and streamline access to NSF data, including enhancements to the infrastructure that supports data analysis activities; enabling data-driven decision-making by expanding analytical and visualization capabilities; leveraging artificial intelligence and new technologies; and further maturing data management and delivery services. In addition, support is provided for evidence-based data-driven decision making by providing advanced analytics capabilities, such as the NSF By the Numbers Dashboard.
- Operations and maintenance of NSF's core financial system, iTRAK: As noted above 70 percent of this request is funded by PRT with the remaining 30 percent funded by AOAM under Administrative Applications Services and Support.
- Financial services support: Enables continued agency efforts to increase transparency and accuracy of reporting between iTRAK and other mission systems, such as through account code structure modernization and implementation of Unique Entity Identifier (UEI) requirements. FY 2022 efforts will also focus on enhancements to post-award merit review functions.
- Human Resource System Modernization: This is the continuation of a new investment for FY 2021 that will modernize and enhance core agency systems for strategic management of human capital and administrative resource management, including systems for Intergovernmental Personnel Act (IPA) management and performance management, as well as implement the upcoming payroll mandate, NewPay.

<u>IT Operations and Infrastructure ($48.97 million, +$10.29 million above the FY 2021 Estimate: $18.97 million in AOAM, $30.0 million in PRT)</u>

The FY 2022 Request reflects NSF's ongoing enhancements to agency capabilities related to network, infrastructure, data center, customer support, and database administration. The increase reflects NSF's continued investment in technologies and capabilities to support NSF's post-COVID work environment, including an ongoing focus on remote work. It is anticipated that future increases in staff will create an additional need for licenses, technical support services, and tools across the infrastructure investments. Specifically, the investments in this category are classified as:

- Network: Provides access to administrative applications, services, and technologies for virtual collaboration via a single network with wired and Wi-Fi connectivity for NSF staff and visitors. FY 2022 funding supports improvements to the agency's secure remote access capabilities and increased network bandwidth to facilitate NSF's ability to sustain remote operations. This investment also includes costs associated with the agency's continued adoption of Internet Protocol Version 6

(IPv6) technologies, as well as voice services via NSF's modernized voice over internet protocol (VoIP) solution and other telecommunications requirements delivered through the federal Enterprise Infrastructure Services (EIS) contract.

- Data Center and Cloud: Continues the agency use of cloud services and technologies, including the use of cloud-based email and collaboration tools, to enable further reductions in NSF's data center footprint, as the agency continues to expand cloud services adoption. FY 2022 funding will support continued cloud migrations to increase resilience of IT services and applications and improve speed of deployment. NSF anticipates increasing costs in cloud contracts as the agency's presence in the cloud increases. It is also likely that as cloud migrations continue, some applications may have to be refactored or modified to run effectively in the cloud. All services will have to be replicated to maintain NSF's service recovery capability. Support for Data Center Facilities and Power is not included in the AOAM IT or PRT budgets discussed in this narrative but is included in the agency's IT Portfolio summary reporting and mentioned here for transparency. Funding for Data Center Facilities and Power is supported under Space Rental and referenced in the Space Rental narrative.
- End User: Provides help desk services and customer care support for internal users (NSF staff) and external users (the research community including institutions, principal investigators, reviewers, and NSF visitors), as well as support for agency-provided workstations, mobile devices, and peripherals. FY 2022 funding in this area supports continuing improvements to service delivery, including expanded use of tools to diagnose and remediate IT issues and to deploy new technology capabilities to NSF staff and customers who are working remotely. As NSF proceeds to modernize to meet mission objectives, additional expenditures in this area are expected in order to expand conferencing capabilities in executive offices, team rooms, and conference rooms to support a larger and more geographically diverse hybrid workforce.
- Platform: Reflects NSF's use, management, and acquisition of hyper-converged hardware, software, and services. In FY 2022, NSF is working to migrate existing databases to the cloud, or potentially re-platforming onto a new database standard at some point in the future.
- Output: Supports NSF's Print Center services. These costs are not part of the AOAM IT or PRT budget discussed in this narrative but are included in the agency's IT Portfolio summary reporting and mentioned here for transparency. Funding for Print Center services are supported under Building and Administrative Services and discussed further in that section of the Administrative Support narrative.

<u>Security and Privacy Services ($11.01 million, +$3.04 million over the FY 2021 Estimate: $4.51 million in AOAM, $6.50 million in PRT)</u>

Investments in this category support the portion of NSF's IT security program which provides security and compliance oversight for NSF's administrative applications and mission support systems under the direction of the NSF Chief Information Security Officer (CISO). The FY 2022 level prioritizes preservation of secure, reliable operations, including the agency's Security Operations Center (SOC) capability providing 24/7/365 security monitoring, detection, and response capabilities and adds support for information technology operations and maintenance for a new Sensitive Compartmented Information Facility (SCIF) in the Alexandria facility. This funding level also enables NSF to continue current approaches to manage, modernize, and secure agency information, including efforts to modernize NSF's High Value Assets (HVAs) as warranted, and to expand assessment, authorization, and security monitoring activities as the agency continues to invest in new IT capabilities aligned with mission and organizational change. In the wake of recent high-profile, government-wide security issues, NSF anticipates additional investment in staff, tools and professional services to mitigate the increasing risks of a larger, hybrid workforce operating in a more complex and rapidly growing infrastructure environment. In FY 2022, NSF will be continuously assessing growth in systems and users and evaluating new tools and services, including new cloud security tools, as well as expanded security scanning and monitoring and data loss prevention technologies, that can help to continue providing secure, reliable operations and around-the clock security monitoring. The investment includes: offerings from the Department of Homeland Security (DHS) Continuous Diagnostics

and Mitigation (CDM) shared services program, which provides NSF with security monitoring tools that supplement agency capabilities; automated configuration management tools that manage security patches and provide proactive protection from viruses, spyware, and other threats; application security; security control testing and tools; vulnerability management activities, including activities related to assessment, management, and disclosure; remediation and intrusion detection services; and activities related to cybersecurity assessment and authorization, including supply chain risk management.

IT Management ($2.78 million, +$260,000 above the FY 2021 Estimate: $583,000 in AOAM, $2.20 million in PRT)

IT Management includes support for the Chief Information Officer, Chief Data Officer, Senior Agency Official for Privacy, and senior IT leadership in the areas of IT strategy and planning, enterprise architecture, capital planning, vendor management, IT budget/finance, IT strategic communications, and support for policy and reporting efforts related to Federal IT, including compliance with the Federal Information Technology Acquisition Reform Act (FITARA). In FY 2022, investments in this category will enable NSF to continue implementation of the TBM framework, further enhancing the agency's ability to manage IT as a business.

Individual Directorate/Office IT Costs Outside of NSF's Central IT Budget

In an effort to increase transparency and show continuous improvement in NSF's reporting and understanding of its IT expenditures, NSF's Chief Information Officer intends to begin reporting of IT investments at NSF that are made outside of the central IT budget (AOAM IT and PRT) discussed above. Currently, NSF has identified about $6.77 million of non-central IT costs that are being actively tracked and are included in the FY 2022 IT Portfolio summary reporting. These investments are coordinated through the Division of Information Systems (DIS) in OIRM—the organization that manages NSF's central IT budget—and are realized when other NSF divisions apply their funds (either R&RA, EHR or AOAM account funds) onto DIS vendor labor contracts for various IT-related efforts.

NSF Funding for E-Government Initiatives

The tables below show NSF's contributions and service fees for various E-Government initiatives. These costs are not part of the AOAM IT or PRT budget discussed in this narrative but are included in the agency's IT Portfolio summary reporting and mentioned here for transparency. Both the FY 2021 and FY 2022 levels are consistent with the funding amounts provided by the initiatives' respective managing partners.

NSF FY 2021 Request Funding for E-Government Initiatives

	FY 2021			Appropriations Account	
Initiative	Agency Contributions	Agency Svc. Fees	NSF Total	AOAM	R&RA
Grants.gov	$323,000	-	$323,000	-	$323,000
Geospatial LoB	25,000	-	25,000	-	25,000
E-Rulemaking	-	17,253	17,253	17,253	-
USA Jobs	-	10,399	10,399	10,399	-
Integrated Acquisition Environment (IAE)	-	719,644	719,644	21,000	698,644
Human Resources Management LoB	68,478	-	68,478	-	68,478
Financial Management LoB	139,094	-	139,094	-	139,094
Budget Formulation/Execution LoB	120,000	-	120,000	-	120,000
Total	**$675,572**	**$747,296**	**$1,422,868**	**$48,652**	**$1,374,216**

LoB: Line of Business

NSF FY 2022 Request Funding for E-Government Initiatives

	FY 2022			Appropriations Account	
Initiative	Agency Contributions	Agency Svc. Fees	NSF Total	AOAM	R&RA
Grants.gov	$326,000	-	$326,000	-	$326,000
Geospatial LoB	25,000	-	25,000	-	25,000
E-Rulemaking	-	21,627	21,627	21,627	-
USA Jobs	-	10,399	10,399	10,399	-
Integrated Acquisition Environment (IAE)	-	719,644	719,644	21,000	698,644
Human Resources Management LoB	68,478	-	68,478	-	68,478
Hiring Assessment LoB	66,000	-	66,000	-	66,000
Financial Management LoB	139,094	-	139,094	-	139,094
Budget Formulation/Execution LoB	120,000	-	120,000	-	120,000
Total	**$744,572**	**$751,670**	**$1,496,242**	**$53,026**	**$1,443,216**

LoB: Line of Business