

National Aeronautics and Space Administration



Information Resources Management (IRM) Strategic Plan

Office of the Chief Information Officer

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CIO's Introductory Message


Information technology capabilities have enabled many of NASA's past achievements and are paramount to future missions, such as NASA's Space Launch System and James Webb Space Telescope. Our strategy for managing information resources commensurate with the evolving needs of the Agency is therefore a fundamental enabler of NASA's current and future success.

Several years ago, NASA embarked on the transformation of information technology (IT) management to better enable NASA's mission by integrating people, processes, technology, and information. Improved efficiencies from our efforts enabled NASA's overall IT spending to decrease by thirty six percent, to \$1.4B, from 2005 to 2013, while NASA's mission portfolio evolved. Today's environment is characterized by massive data sets from higher resolution instruments challenging traditional data management methods, model-based engineering and design practices, and accelerating technology advancements coupled with increasing security threats to our systems and data, an increasingly team-oriented and mobile workforce, numerous federally-driven IT reform initiatives, and ongoing budget pressures.

To address the challenges of this environment, our vision for IT is to enable NASA's mission while moving with purposeful intent toward improving our IT capabilities and security. Our efforts are aligned with NASA's broader institutional strategy of investment and realistic consolidation which focuses on supporting current and future mission needs in a responsive, integrated, and cost-effective manner. Through management discipline and balanced decision-making, we will drive financial sustainability for NASA's IT operations while making innovative investments to deliver increased value to the NASA mission.

This 2014 NASA IRM Strategic Plan communicates three strategic goals for information resources management supported by fourteen objectives to be accomplished over the next three to five years. Our first goal focuses on delivering transformative IT capabilities to enable mission success, while addressing the needs of our mobile and collaborative workforce, yet driving the effectiveness and efficiency of enterprise-wide services and tools. The protection of NASA's information assets is the central focus of our second goal. Proactive and adaptable cybersecurity capabilities will inform risk-based decisions while our toolset becomes increasingly integrated, predictive and responsive, supporting an empowered workforce that is cognizant of the continually-changing risk landscape. Our third goal is to mature our information technology management practices. Underlying strategies include responsive, effective, and transparent IT governance, sustainable enterprise architecture, and a balanced approach to innovation that leverages the efficiencies and new capabilities inherent in the changing nature of enterprise IT services.

Through this plan, we have clarified our information resources management strategy and provided the direction necessary for the collective IT team across NASA to evolve IT into an agile, efficient and cohesive enterprise capability that enables NASA's mission success.


Larry Sweet
Chief Information Officer


Robert M. Lightfoot
Associate Administrator



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Plan Background

As part of the section 3506(b)(2) of title 44 of the United States Code and the Clinger-Cohen Act of 1996, the Office of the Chief Information Officer is directed to develop and maintain a strategic information resources management (IRM) plan. The purpose of NASA's IRM Strategic Plan is to guide the direction, focus, mission alignment, principles, investments, and accountability of the NASA Information Technology organization and to maximize the value of IT to NASA's programs, partners, stakeholders and the American public.

Annually, the NASA OCIO reviews progress towards its NASA IRM Strategic Plan and adjusts and publishes an updated IRM Strategic Plan as appropriate. The resulting strategic goals and objectives are intended to ensure close alignment with the NASA Strategic Plan, internal stakeholder needs, Federal strategy and regulations, and to establish Agency IT investment priorities and guide the allocation of IT resources through the enterprise roadmap.

The release of this 2014 IRM Strategic Plan was timed to follow the publication of the 2014 NASA Strategic Plan which relays three strategic goals for the Agency.

Goal 1. Expand the frontiers of knowledge, capability, and opportunity in space.

Goal 2. Advance understanding of Earth and develop technologies to improve the quality of life on our home planet.

Goal 3. Serve the American public and accomplish our Mission by effectively managing our people, technical capabilities, and infrastructure.

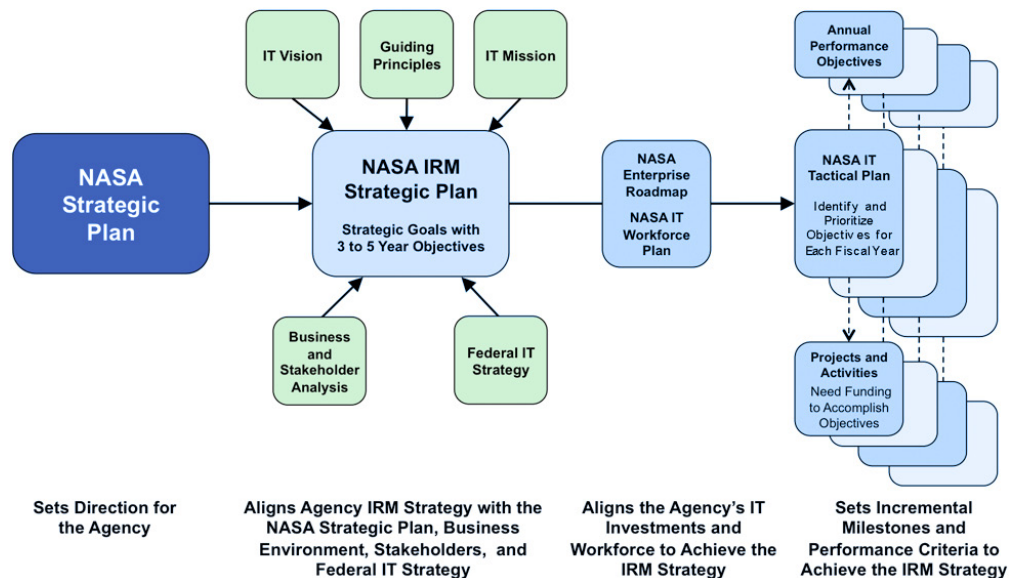
In support of Goal 3 above, NASA's Objective 3.3 communicates the Agency's IT strategy to provide secure, effective, and affordable information technologies and services that enable NASA's Mission. This IRM Strategic Plan provides the direction and supporting information regarding how NASA's IT community will support and enable achievement of NASA's strategy. This plan also aligns with NASA's institutional infrastructure strategic implementation planning process, which assembles a long-range composite direction for institutional services to increase efficiency and effectiveness within the broader institutional portfolio that includes strategic infrastructure and human capital.

Guiding Principles

These principles articulate core elements for our IT community' culture and framework for decision-making, or the norms for how we work together as an organization.

- **Mission-Enabling.** NASA's information technology and processes must be mission-enabling, customer focused, mobile, and interoperable, supporting near-term and longer-term customer needs and serving as a key enabler for achieving NASA's missions and programs.
- **Purposeful.** IT capabilities continue to rapidly evolve globally. NASA must make smart, value-added innovation and investment in enterprise IT in order to shape our future by optimizing the return on limited resources and serve as a force multiplier for mission accomplishment.
- **Responsive.** The design and operations of NASA's IT must ensure scalability and accountability in order to responsively accommodate mission needs, IT requirements, and business conditions as they unfold.
- **Secure.** Information security is critical to mission integrity and the protection of our national assets. NASA IT will proactively and efficiently manage information security and privacy to reduce risk to mission success and to enable innovation.
- **Integrated.** NASA IT must operate as an integrated team of teams aligned by shared goals to effectively support NASA's missions and partners. IT customers and partners will be included appropriately throughout NASA's IT life cycle across IT planning, execution and evaluation.
- **Cost-Effective.** Maximizing value from limited resources is achieved through balanced near- and long-term portfolio decision-making guided by NASA's goals. NASA IT strives to provide efficient services today while evolving an effective enterprise architecture discipline that affordably sustains NASA's IT needs for tomorrow.

IRM Strategic Plan in Perspective



IRM Strategic Plan Overview

NASA IT Vision

We enable the mission and move with purposeful intent towards improving IT services at NASA.

NASA IT Mission

Provide secure, effective and affordable information technologies and services that enable NASA's mission.

NASA IT Principles

Mission-Enabling. Purposeful. Responsive. Secure. Integrated. Cost-Effective.

Strategic Goal 1: Capabilities

Transform NASA's IT infrastructure and application capabilities and services to meet evolving stakeholder needs and support mission success.

Strategic Goal 2: Cybersecurity

Enhance and strengthen IT security and cybersecurity to ensure the integrity, availability, and confidentiality of NASA's critical data and IT assets.

Strategic Goal 3: Sustainability

Enable innovative, sustainable, and transparent mission support through effective IT planning, enterprise architecture, and governance.

Performance Outcomes

Information technologies and processes support the shift from legacy work patterns to a seamless mobile and collaborative work environment. IT services operate within published service level agreements.

Performance Outcomes

Risk-based security is embedded in IT-related processes, weaknesses are proactively identified, and security practices dynamically adjust to the changing cyber environment.

Performance Outcomes

IT resources are transparently aligned and prioritized via stakeholder engagement to optimize IT enablement of NASA's mission and vision. Funding and operational efficiencies are identified and executed to enable opportunities to reinvest.

3-5 Year Objectives

- 1.1 Ensure a positive end-to-end computing experience for our stakeholders.
- 1.2 Establish a seamless enterprise approach to empower our mobile workforce, partners, and the public (anytime, anywhere, securely).
- 1.3 Provide enterprise applications and services that support the Agency's business and information needs, with new initiatives and enhancements focused on improving business and management practices.
- 1.4 Enhance mission value by providing efficient and effective access to enterprise information and collaborative functionality.

3-5 Year Objectives

- 2.1 Provide risk-based information security management.
- 2.2 Enable advanced, proactive, and adaptable threat-based cybersecurity capabilities.
- 2.3 Ensure that the NASA workforce is consistently aware of the dynamic nature of information security risks.
- 2.4 Expand NASA's information protection program.
- 2.5 Provide an integrated and near real-time incident management capability.

3-5 Year Objectives

- 3.1 Achieve and leverage efficiencies in providing enterprise IT services.
- 3.2 Evolve NASA's enterprise IT governance and management practices to drive decision-making effectiveness and accountability for results.
- 3.3 Develop discipline in NASA's enterprise architecture process to effectively enable execution of our IRM strategy.
- 3.4 Provide focused innovation to identify, test, and adopt new information technology and processes that will make NASA's missions more capable and affordable.
- 3.5 Align NASA's IT workforce with desired skills levels through effective recruiting, partnering, contracting, and training.

Major Activities:

Mobile Workforce ♦ Seamless Collaboration ♦ On-Demand Services ♦ Cloud Computing ♦ Information & Data Security
Evolving IT Governance ♦ Enterprise Architecture ♦ Focused Innovation ♦ Enterprise Licensing

IRM Strategic Goals & Objectives

Strategic Goal 1 – Transform NASA’s IT infrastructure and application capabilities and services to meet evolving stakeholder needs and support mission success.

Effective information technologies and processes are critical cross-cutting dependencies that enable NASA’s mission and mission support success, including services such as business applications, IT infrastructure and information security. In our increasingly budget-constrained Federal environment, investment in innovative business processes and information technologies is necessary to strengthen the Agency’s buying power through increased productivity. To provide focus for our investments, we will leverage our ongoing improvements in IT governance and enterprise architecture and align with NASA’s institutional infrastructure strategy for investment and realistic consolidation to meet mission needs in the most cost-effective manner. Our strategy will improve mission performance through our portfolio of enterprise IT capabilities by delivering integrated services driven by customer priorities and scaled appropriately for cost-effectiveness. Investment will be required to modernize our infrastructure and mature our business-enabling capabilities spanning workforce mobility, seamless collaboration and communications, enterprise applications, and information sharing. We will use the most appropriate operating model for each IT service to satisfy NASA mission needs with balanced enterprise efficiency and risk reduction. Cloud computing and on-demand services will be critical to enabling our efficient infrastructure modernization while enhancing our business capabilities. As part of our continuous improvement process, we integrate customer feedback and service performance data to assess and act on service improvements to better align our services with user needs and expectations.

Performance Outcomes: Information technologies and processes support the shift from legacy work patterns to a seamless mobile and collaborative work environment. IT services operate within published service level agreements.

Objective 1.1 – Ensure a positive end-to-end computing experience for our stakeholders.

To enhance the computing experience across the NASA enterprise, we must include our customers in the planning and delivery processes, improve the integration of Agency IT services, and minimize the customer and technical impacts related IT service delivery. Standardization across computing services will continue where appropriate to improve consistency, accompanied with the flexibility needed to meet diverse requirements when necessary to support our missions. Additionally, we will implement “self-help” capabilities to empower our customers to perform administrative business functions and resolve issues, reducing reliance on IT support staff availability. IT services will be evaluated and refreshed to meet evolving customer requirements that enable the Agency’s mission and services will be seamlessly integrated into NASA’s IT architecture and operations. The successful migration of public and enterprise services to Internet

Protocol version 6 (IPv6) will help prepare us to support the diverse portfolio of applications that the Agency and participants in NASA’s mission will require in the future.

Objective 1.2 – Establish a seamless enterprise approach to empower our mobile workforce, partners, and the public (anytime, anywhere, securely).

NASA’s workforce must be able to take advantage of new mobile technologies in the marketplace in a manner that is functional and secure. An end-to-end NASA network will help enable common capabilities and applications to be deployed consistently across the Agency while reducing costs associated with Center-centric solutions. We will improve enterprise-wide network management and provide capacity and reliability to support NASA’s increasing mission-related data transfer requirements. Our communications infrastructure will use a combination of commercial and private entities to enable the effective and efficient delivery of data, voice, and video services across the Agency and our partners. These virtual collaboration capabilities will help empower our workforce to become increasingly mobile and less reliant on physical infrastructure while delivering savings on facility costs. Further enabling our mobile capability is the strategy of appropriately securing our data, with network security and related security paradigms becoming a secondary instead of primary security layer.

Objective 1.3 – Provide enterprise applications and services that support the Agency’s business and information needs, with new initiatives and enhancements focused on improving business and management practices.

In order to satisfy the evolving demands of NASA’s workforce, we must continue partnering with our customers in the delivery of automated enterprise applications and services that enhance NASA’s business capabilities, efficiency, and mission effectiveness. Enterprise business and administrative systems include the Enterprise Resource Planning suite, financial management, supply management, project management, and human capital management. In alignment with our strategy to enable our workforce to work from anywhere, we must also deliver the mobile applications most needed by our mobile customers. We will work collaboratively with our customers to prioritize and allocate limited IT application funding and resources to ensure delivery of enterprise applications and services that affordably improve the Agency’s mission-enabling capabilities.

Objective 1.4 – Enhance mission value by providing efficient and effective access to enterprise information and collaborative functionality.

The National Aeronautics and Space Act of 1958 established NASA and provided the mandate for the Agency to “provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof.”

NASA's mission statement released in February 2011 carries this enduring theme, stating that "...what we do and learn will benefit all humankind." We must enable participants in NASA's mission to easily create, collect, share, discover, exchange information, and guarantee the source, quality, authenticity, and integrity of information throughout its lifecycle. To accomplish this objective, NASA must implement enterprise knowledge sharing and collaboration capabilities that enable seamless teamwork across our Centers and partners. We must also implement interfaces to publicly available data based on open standards coupled with instructions and data interpretation capabilities to make NASA's data accessible to our wide variety of customers. These aims must be balanced with affordability and the increasing need for privacy protection and integrated records management practices. In response to increasing interdependence and teamwork across the workplace, collaborative technologies have improved and expanded rapidly over the last decade. NASA must enable virtual collaboration that is as easy as face-to-face collaboration, supported by seamless interfaces to across our workforce and partners. An enabling technology to support this objective is the use of cloud computing. NASA is well positioned to utilize cloud services that allow our vast scientific missions to efficiently store, retrieve, and mine data, and achieve economies of scale that drive down host computing costs while simultaneously increasing opportunities for rapid, open collaboration.

Strategic Goal 2 – Enhance and strengthen IT security and cybersecurity to ensure the integrity, availability, and confidentiality of NASA's critical data and IT assets.

Cybersecurity is a critical driving force to protect the intellectual property, power of invention, and natural ingenuity that is at the heart of NASA. Therefore, we must provide timely, reliable, and cost effective enterprise security to protect NASA's information and information systems, in alignment with the Federal cybersecurity priorities. IT threats are evolving globally and NASA's capabilities to protect information assets need to evolve accordingly. To this end, we will anticipate and defend against these changing threats in order to enable the continued success of NASA's missions. We have a great sense of urgency as we transform our cybersecurity capabilities and integrate cybersecurity as a vital part of NASA's cultural identity. Achieving full awareness of our Agency-wide IT security posture will complement our approaches to improve the capability to combat sophisticated cyber attacks. We will also ensure that NASA integrates the appropriate level of security needed to safely unlock the value of innovation, such as increasing end user mobility and burgeoning cloud computing capabilities. Finally, these cybersecurity challenges will demand balanced collaboration, resources, and communication to proactively defend against the ever-changing threat environment.

Performance Outcomes: Risk-based security is embedded in IT-related processes, weaknesses are proactively identified, and security practices dynamically adjust to the changing cyber environment

Objective 2.1 – Provide risk-based information security management.

NASA will utilize risk-based information security management that enables the adoption of emerging information technologies and enhances NASA's mission while ensuring that protective measures are commensurate with business needs and the ever-changing threat landscape. NASA will articulate, implement, and communicate a cohesive, consistent enterprise approach to IT security and align the approach with business and mission requirements to improve cyber-security awareness and risk-based decision making.

Objective 2.2 – Enable advanced, proactive, and adaptable threat-based cybersecurity capabilities.

We will enable advanced, proactive, and adaptable threat-based cyber security capabilities that operate in an integrated, situationally aware, and effective manner across the Agency. To support this shift, we will develop policies and procedures, and deploy tools and technologies moving the Agency from reactive threat management to predictive threat management in order to maintain pace with the ever-changing threats that target networks, systems, and personnel.

Objective 2.3 – Ensure that the NASA workforce is consistently aware of the dynamic nature of information security risks.

We must ensure that the NASA workforce is consistently aware of the dynamic nature of information security risks and can identify and execute their role in protecting NASA's information resources. To accomplish this objective, we will refine the Agency's information security awareness and training efforts to ensure employees are cognizant of the risks posed by the routine use of connected technologies to perform job functions. We will also define and deploy the education, training, and certification resources necessary to improve the effectiveness of the Agency's cybersecurity workforce.

Objective 2.4 – Expand NASA's information protection program.

In order to ensure the appropriate identification and protection of NASA's critical information resources regardless of medium, location, and ownership, we must expand NASA's information protection program. Improvements in the security of NASA's data will be based on sensitivity (e.g., publicly available information, Controlled Unclassified Information, Personally Identifiable Information, classified information) and risk tolerance through updates to Agency policy, the deployment of new technologies, and additional training for personnel.

Objective 2.5 – Provide an integrated and near real-time incident management capability

We will provide an advanced incident management capability that ensures consistency, timeliness, and an appropriate level of transparency to Agency stakeholders. A key enabler

of this objective is the evolution of continuous monitoring of NASA systems and networks through improvements in planning, analyzing, authorizing, implementing, and monitoring risk across all NASA tiers. Through enhanced collaboration and partnerships across the Agency and external stakeholders, we will be better positioned to ensure that information security requirements enable and support NASA's operations based on risk tolerance as defined by mission and business organizations. We will also ensure that Agency cybersecurity requirements are part of the baseline requirements when changes are made to enterprise services, as new technologies are deployed, and throughout the IT System Development Lifecycle (SDLC) and procurement processes.

Strategic Goal 3 – Enable innovative, sustainable, and transparent mission support through effective IT planning, enterprise architecture, and governance.

As a united IT community, we must ensure the financial sustainability of NASA's IT operations by being more responsive and adaptable while making innovative investments to deliver increased value to our customers. Core approaches to providing a responsive, economical enterprise IT platform for NASA include strategic sourcing, buying “services-on-demand” when appropriate instead of owning infrastructure, and consolidation of duplicative services. To improve the effective and efficient use of IT, we need to understand the allocation of the Agency's pool of IT resources in order to enable decisions that direct these resources towards achieving agreed-upon architectures and solutions that achieve our mission support commitments. Supporting NASA's mission demands a high level of performance from our diverse IT workforce, whose knowledge, skills, and dedication form the backbone of our achievements. We empower and rely on our workforce for the timely and effective planning and execution of the strategies defined within this IRM Strategic Plan. Collectively, through more effective governance, management discipline, and execution accountability, we will reduce NASA's IT operations and maintenance costs, improve NASA's information security posture, and better enable mission success.

Performance Outcomes: IT resources are transparently aligned and prioritized via stakeholder engagement to optimize IT enablement of NASA's mission and vision. Funding and operational efficiencies are identified and executed to enable opportunities to reinvest in the advancement of NASA's programs and IT capabilities

Objective 3.1 – Achieve and leverage efficiencies in providing enterprise IT services.

NASA has achieved significant IT efficiencies over the last decade and remains committed to reducing the cost of commodity IT services while maintaining service quality. We will leverage the Agency's scale to pool resources to reduce prices, duplication, and administrative costs when acquiring IT products and services. Our intent is to purchase IT services rather than build infrastructure when appropriate, focusing on efficient, productive service delivery to our customers instead

of service asset maintenance. Aligning with this strategy, NASA will expand the use cloud-computing and shared services approaches for IT service delivery to improve cost-effectiveness, service consistency, and quality. NASA will continue centralizing and standardizing enterprise IT services when appropriate and identify opportunities to capitalize on existing Center capabilities by sharing those services across the Agency. For example, consolidation of Agency and Center-specific data centers will simplify NASA's IT architecture by reducing duplication within the Agency's IT footprint. While some savings derived from these efficiencies will support mission programs and projects, our intent is to reinvest a portion of these Agency savings to fund critical IT innovations in order to drive further efficiencies and cost savings. Candidate investments to drive efficiencies include standardization of mobile and collaboration capabilities, continued consolidation of IT security tools and computing services, and shifting web services to a cloud platform.

Objective 3.2 – Evolve NASA's enterprise IT governance and management practices to drive decision-making effectiveness and accountability for results.

By collaborating as a community with shared goals, we will enable timely and effective strategic, tactical, and operational decision-making with transparent, concise decisions that are communicated effectively across our stakeholders. We must refine our decision domains and responsibilities to drive decisions to the lowest practical level and once a decision is made, we must hold those responsible for execution accountable for both implementing the decision and reporting results. Transparency underlies effective IT governance, enabling a better understanding of IT spending, customer needs and perspectives, and trade-offs across the Agency. Understanding the broader IT portfolio will allow the Agency to ensure that resources are allocated to the Agency's top IT priorities, opportunities are identified and acted on to capitalize on existing Center capabilities by sharing those services across the Agency, duplication is reduced, and economies of scale are realized, while enhancing the ability to safeguard NASA's information assets.

Objective 3.3 – Develop discipline in NASA's enterprise architecture process to effectively enable execution of our IRM strategy.

Enterprise architecture provides the context and roadmap for the Agency to translate strategies and desired outcomes into actionable plans so an organization can effectively achieve its mission and vision. NASA must define and commit to a long-term target enterprise-wide IT architecture that captures the optimal operations configuration to enable NASA to achieve its mission and vision effectively through IT. The implementation of the architecture process described in NASA Procedural Requirement (NPR) 2830 will facilitate alignment and integration of OCIO's IT roadmap with related NASA road-mapping efforts. Related efforts include NASA's institutional infrastructure roadmap and the Office of the Chief Technologist's (OCT) Technology Roadmap. The architecture process will also ensure other drivers such as industry trends, mission needs, and OMB mandates are addressed in OCIO's IT roadmap.

Objective 3.4 – Provide focused innovation to identify, test, and adopt new information technology and processes that will make NASA’s missions more capable and affordable.

A focused IT innovation portfolio enables NASA to more effectively plan for and achieve the optimal desired enterprise business capabilities and long-term cost savings. Innovation efforts will be driven by the common objective to resolve near- and long-term gaps in the enterprise IT roadmap and must effectively enable the systematic adoption of new information technologies and processes that securely enable the Agency’s mission while controlling costs. The implementation and use of a technology infusion process will facilitate the identification of industry and technology trends and enable NASA to effectively assess candidate information technologies and processes from diverse perspectives including customer requirements, usability, business efficiency, information security, and service integration while ensuring alignment with the target IT architecture. NASA will continue collaborating with other Agencies and industry partners in the sharing of methodologies and opportunities to transition enhanced capabilities and more cost-effective solutions into our operational environment. Furthermore, the performance of new capabilities will be monitored and measured against the relevant business expectations to determine what, if any, further investment is warranted. Supporting

achievement of this objective, NASA will provide continued effort towards the E-Government initiative to transparently enhance citizen participation and reduce government costs through process and technology standardization and innovation.

Objective 3.5 – Align NASA’s IT workforce with desired skills levels through effective recruiting, partnering, contracting, and training.

To deliver on the direction set forth in this IRM strategy, we must invest in our human capital as a strategic asset and driver to effect the organizational changes required to successfully achieve our strategic goals and objectives. By evaluating the gaps between our current workforce skillsets and our future workforce needs, we will be prepared to leverage the Agency’s recruiting, partnering, training and development resources to align our employees with NASA’s mission priorities, changing capabilities and new ways of doing business. Change management for our diverse IT organization must encourage transparency, collaboration, and timely communications to improve the effectiveness of our coordination on behalf of our customers. We must also ensure that we attract and support future workforce generations that will influence, sustain, and drive NASA’s future information technology environment.

Alignment with NASA and Federal Strategies

NASA's IT strategic goals are aligned directly or indirectly to achieving the Agency's long-term goals in the 2014 NASA Strategic Plan and the Office of Management and Budget's (OMB) strategies to enable and achieve Federal IT reform. Direct alignment is established when there is a clear linkage between

the execution of an IT goal and achieving a NASA mission goal or Federal IT goal. Cross-cutting alignment is established when execution of the IT goal supports the broader environment in which a NASA mission goal or Federal IT goal will be achieved.

Alignment with the 2014 NASA Strategic Plan

The [2014 NASA Strategic Plan](#) outlines the Agency's long-term goals and objectives and describes how the Agency will accomplish these goals over the next decade or more. These goals cover more than flagship missions and cutting-edge technology development by driving NASA's commitment to working smarter, doing business more effectively and efficiently, and being transparent in our operations. Continuous improvement is essential to our future success and NASA's IT community will keep the public's trust through transparency and accountability. We will adhere to NASA's

core values of safety, integrity, teamwork, and excellence while fostering the pioneering, innovative, and partnering spirit that drives us and continues to advance our Nation. We will continue to collaborate within the Federal government and with international partners, educators, industry, the public, and other stakeholders to drive success. NASA will be a leader in research and development and in innovative business and communications practices. The table below depicts how the NASA IRM strategy aligns with supporting the broader strategic goals set forth as an Agency.

| NASA IT Goals | 1. <i>Expand the frontiers of knowledge, capability, and opportunity in space</i> | 2. <i>Advance understanding of Earth and develop technologies to improve the quality of life on our home planet</i> | 3. <i>Serve the American public and accomplish our Mission by effectively managing our people, technical capabilities, and infrastructure</i> |
|---|--|--|--|
| 1. <i>Transform IT Capabilities</i> | Direct | Direct | Direct |
| 2. <i>Strengthen IT Security</i> | Direct | Direct | Direct |
| 3. <i>Effective IT Planning, Architecture, & Governance</i> | Cross-Cutting | Cross-Cutting | Direct |

Alignment with the Federal Strategy for IT Reform

Following the 25 Point Implementation Plan to Reform Federal IT in December 2010, OMB released a series of IT strategies to enable Agencies to create a more efficient and effective government and to deliver more value to the American taxpayer. The Federal IT innovation approach includes the Digital Government Strategy to improve how services are delivered to customers and the Federal Cloud Computing Strategy to improve the efficiency and capability of the infrastructure that supports these services. Advancing Cybersecurity calls for improvements in information security

as relayed through a set of Cross-Agency Priority (CAP) Goals that address strong authentication, continuous monitoring, and network security. Finally, the approach to maximize the value of Federal IT includes PortfolioStat, a process to develop a clearer picture of duplication within the IT portfolio in order to inform plans to eliminate duplication as well as the Shared Services strategy to foster efficiency by pooling buying power for similar IT needs to reduce duplication services.

You may view the Federal CIO's agenda at <https://cio.gov/agenda/>.

| OMB IT Reform | <i>25 Point Plan to Reform Federal IT</i> | <i>Digital Government Strategy</i> | <i>Federal Cloud Computing Strategy</i> | <i>PortfolioStat</i> | <i>Shared Services Strategy</i> | <i>CAP Goals (Cybersecurity & Data Centers)</i> |
|---|---|------------------------------------|---|----------------------|---------------------------------|---|
| <i>Transform IT</i> 1. <i>Capabilities and Services</i> | Direct | Direct | Direct | Direct | Cross-Cutting | Direct |
| 2. <i>Strengthen IT Security</i> | Direct | Direct | Direct | Direct | Cross-Cutting | Direct |
| <i>Effective IT Planning,</i> 3. <i>Architecture, & Governance</i> | Direct | Cross-Cutting | Cross-Cutting | Direct | Direct | Cross-Cutting |

CIO Responsibilities

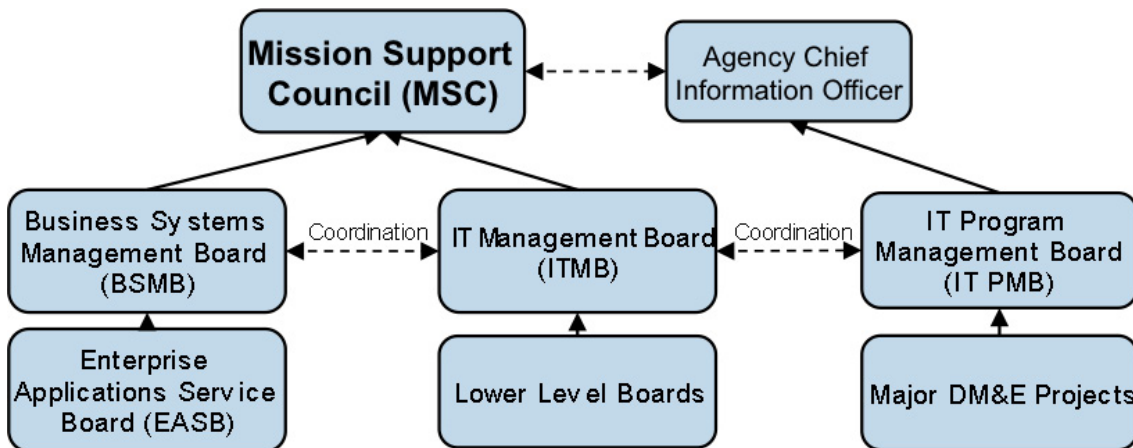
Per NASA Policy Directive (NPD) 1000.3D, the Office of the Chief Information Officer (OCIO) provides leadership, planning, policy direction, and oversight for the management of NASA information and all NASA information technology (IT) in accordance with the responsibilities required by the Clinger-Cohen Act of 1996, the Paperwork Reduction Act of 1995, the E-Government Act of 2002, the Federal Information Security Management Act of 2002, and the Privacy Act of 1974. The Chief Information Officer (CIO) is the principal advisor to the NASA Administrator and other senior officials on matters pertaining to information technology, the NASA Enterprise Architecture, IT security, records management, and privacy.

The OCIO develops and implements plans that include IT goals, objectives, metrics, and actions needed to enable the execution of the strategic goals and outcomes in the NASA Strategic Plan and to reduce institutional risk to NASA's missions. To achieve these outcomes, the OCIO identifies and implements Agency-wide strategies, policies, programs, roadmaps, workforce planning, and processes for the

management of IT investments and services. Additionally, the OCIO leads and implements NASA's IT Security program, ensuring appropriate confidentiality, integrity, and availability of all NASA's information assets throughout the system lifecycle. Effective governance of IT is provided through chartered boards with appropriate stakeholder representation as depicted in NASA's IT Governance Model below.

The Agency CIO manages NASA's IT systems as a joint responsibility with the NASA Centers, Mission Directorates, and all other Headquarters Offices. The Centers, Mission Directorates, and Headquarters Offices have responsibility for the applications, while the CIO has overarching responsibility for ensuring alignment of those applications with the NASA Enterprise Architecture and for all aspects of the IT infrastructure in which those applications reside. The Agency CIO directs, manages, and provides policy guidance and oversight of the Agency's Center CIOs' activities and operations, including formal performance planning and appraisal in conjunction with the Center Director, in accordance with NPD 1003.D.

NASA's Information Technology Governance Model



In 2011, NASA's IT governance model was updated to reduce duplication, improve efficiency across the Agency, provide stakeholders with a greater voice in decision-making, and ensure that investments perform as expected during implementation and operations. NASA's IT Governance Model was approved by the NASA Mission Support Council (MSC), the Agency's senior decision-making body regarding the integrated Agency mission support portfolio, including IT. This IT governance model includes memberships and consultation across senior NASA Administration officials, Mission and Center leadership, and stakeholder organizations. Chaired by the Associate Deputy Administrator for NASA, this executive governing council reviews and approves the Agency IT strategy, significant IT investments and divestments, and material changes to Agency IT policy to ensure alignment with the Agency strategy and priorities. MSC members include the Associate Deputy Administrator (Chair),

Associate Administrator, Associate Administrator of the Mission Support Directorate, the Chief Financial Officer, the Chief Information Officer, and Chief for Safety and Mission Assurance.

- The enterprise applications-oriented Business Systems Management Board (BSMB) provides governance and visibility into the Agency Enterprise Business Systems portfolio, approves the Business Systems strategy and transition plan, and oversees the Business Systems performance and budget.
- The IT Management Board (ITMB) provides governance and visibility into the Agency IT Infrastructure portfolio and makes decisions regarding infrastructure strategy, transition plan, integration, and performance. The ITMB also serves as a senior-level Configuration Control Board (CCB) for Agency infrastructure projects and reviews and approves high-level infrastructure requirements.

- The IT Program Management Board (IT PMB) oversees major IT programs, projects, and initiatives during the formulation and implementation phases of the lifecycle to ensure that strategic alignment, cost, schedule, performance and risk targets are evaluated at key investment decision points.
- Cross-Agency IT stakeholder engagement is performed through the Customer Advisory Council (CAC) while IT security considerations are coordinated and evaluated

by the IT Security Advisory board (ITSAB).

- Functional governance boards also exist for each IT service area, for example, end user services, communications, and computing. Each of these boards ensure that a consistent approach is used for planning, delivery, and operational performance within each service areas. Governance across these functional services areas is integrated through the Enterprise Change Advisory Board (ECAB).

IT Life Cycle and Enterprise Transformation

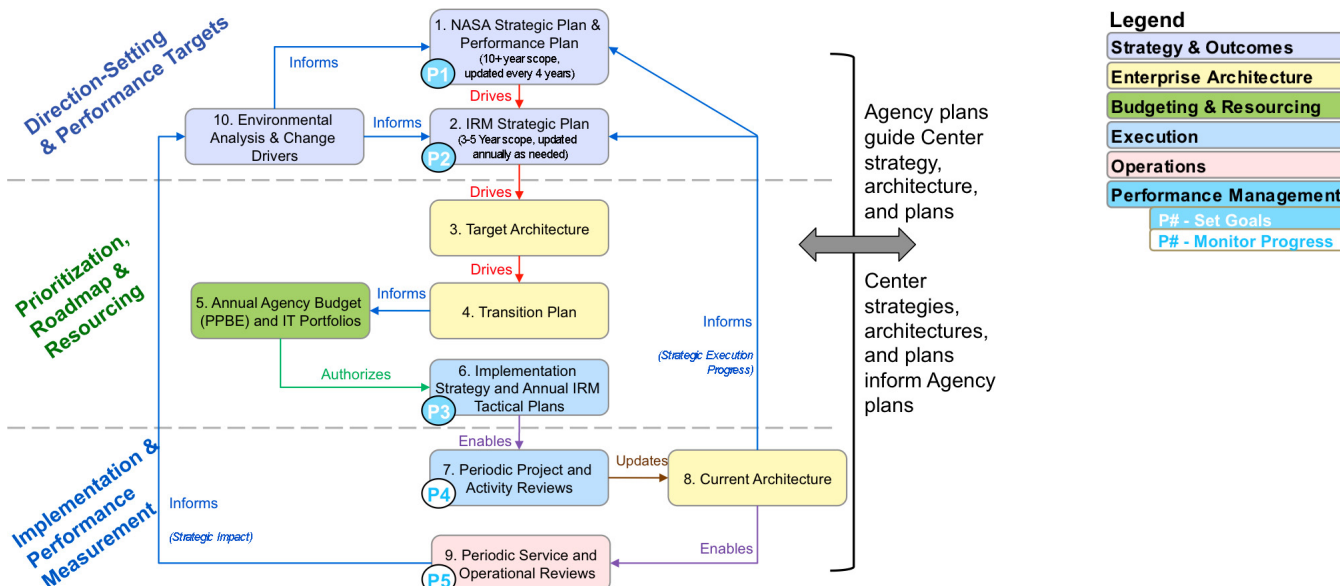
This IT Life Cycle represents our target approach to responsively plan and execute changes to NASA's enterprise IT environment over time to mature NASA's business capabilities, infrastructure, and operations. This life cycle is intended to facilitate long-term resource planning, drive innovation by helping to forecast technology and service changes, and align the program and project management necessary to implement these changes. The stages of the IT life cycle are summarized below to provide context for the role of this strategic plan across the Agency and our Centers.

Informed by NASA's 10-year Strategic Plan and environmental analysis, the IRM Strategic Plan sets the goals, objectives, and outcomes for that define our aspiration for the next 3 to 5 years – our target IT capabilities and operating environment to enable NASA's vision. Our current architecture communicates the reality of our current IT capabilities and operating environment. The difference in the capability and operations of these current and target environments describes the value gap that we must close to support achievement of NASA's vision and strategy. Through alignment of strategic priorities, customer needs, and business constraints, we will develop a multi-year transition plan to translate our strategies into actionable plans to resolve the value gap by leveraging efficiencies, enhancing capabilities and information security, and divesting what is no longer needed.

This transition plan will guide the annual IT budget formulation two years prior to execution, aligning with Federal cycles and our Capital Planning and Investment Control (CPIC) approach to manage IT investments. During the year before execution, we will assess recent performance and develop the annual tactical plan for the upcoming execution year to set performance criteria for major execution initiatives. These performance criteria will be used to monitor execution progress through periodic program and project reviews and inform updates to NASA's current architecture. To ensure operational effectiveness and sustainability, we will perform periodic service reviews to monitor and assess the health of our current architecture and operations. Together, these tactical and operations performance results will inform updates to our strategy and enterprise roadmap as appropriate, beginning the next iteration of our IT life cycle.

During execution, IT acquisitions are evaluated on a case-by-case basis in alignment with our strategic sourcing approach. Major enterprise IT projects are governed by NASA Procedural Requirements (NPR) 7120.7 through the IT Program Management Board. Broader enterprise IT service transitions and transformation are incrementally implemented. Development and implementation methodologies are selected based on project needs. For example, NASA's Enterprise Applications Competency Center (NEACC) typically utilizes the customer-focused Agile methodology when applicable.

Enterprise IT Life Cycle



Workforce Planning

NASA's workforce consists of Federal civil service employees, students, contractors, university researchers, and many others. NASA continues to strive to set the Equal Opportunity Standard for Excellence through recruiting and hiring a highly skilled workforce which is representative at all levels of America's rich diversity and supportive of innovative practices that respond to diverse abilities and needs. As a result of this diversity and other practices, NASA is consistently rated as one of the top places to work in the Federal Government.

NASA uses a systematic approach for planning, monitoring, developing, assessing, and rewarding employee performance that contributes to the achievement of the Agency's vision, mission, and goals in accordance with applicable law and regulations. This approach utilizes a set of personal performance expectations with linkage to strategy execution and promotes

an accountable, performance-oriented culture that leverages two-way communications between supervisors and personnel.

In parallel, the Agency systematically measures and monitors the Agency's knowledge base, both to facilitate development of the workforce competency plan and to help the Agency match the talents and strengths of employees with the positions that can best utilize those skills. For example, the skills required for all leadership roles within the agency are guided by the NASA Leadership Model, which was developed by NASA through extensive research and validation. The NASA Leadership Model consists of a model for each of the five leadership roles including Influence Leader, Team Leader, First Line Supervisor, Manager, and Executive. Each model provides guidance for the necessary competencies, skills, and behaviors expected for each role.

Accessibility

In alignment with our workforce diversity strategy and to ensure that NASA's electronic and information technology is accessible to individuals with disabilities, the Agency developed NASA Procedural Requirements (NPR) 2800.2: Electronic and Information Technology Accessibility. This guidance from the Office of the Chief Information Officer aids our audience with understanding accessibility legislation and assigns responsibility to key stakeholders in order to achieve and maintain compliance. The scope of these requirements includes the procurement of goods and services as well as any

electronic and information technology development by NASA or its contractors for the use of NASA employees, employees of other Federal agencies, and the public. To facilitate ongoing awareness and implementation of these accessibility requirements, NASA maintains the online resource center that includes contact information for Agency and Center accessibility coordinators, an accessibility checklist, tools, and links to the United States Access Board website. Furthermore, accessibility compliance is validated as a standard component of our implementation processes.

Continuity of Operations (COOP) and Disaster Recovery (DR)

NASA regularly exercises continuity of operations plans with OCIO personnel to manage mission critical applications. All mission critical applications are housed from one designated Center with backups stored locally and replicated to another

geographically separated Center. Critical applications are kept in an online replication status in order to expedite restoration from the designated Center to the Disaster Recovery location in the event of a declared disaster.

Strategic Sourcing Approach

The goal of NASA's Strategic Sourcing Program is to establish a process that enables NASA to strategically acquire products and services common across the Agency, Centers or organizations to support the Agency's mission in a more effective and efficient manner. The Office of the CIO plays a key role in the Strategic Sourcing Program and has representation on the Agency Strategic Sourcing Team and relevant commodity working groups. This approach balances the goals of strategic sourcing, value to the government, optimization of resources (e.g., funding, assets, services, and personnel), and anticipated customer experience to align the sourcing effort to identification of the best procurement vehicle to appropriately support NASA's requirements.

One of our greatest opportunities for IT cost optimization is in the area of application portfolio rationalization. To this end, the CIO works closely with the NASA Shared Service Center's (NSSC) Enterprise License Management Team (ELMT) on licensing and contract consolidation initiatives to drive economy of scale pricing and cost savings by leveraging the pooled purchasing power of the Agency. ELMT also works across

NASA Centers to manage licenses and eliminate duplication within the ELMT portfolio. We continue to leverage the Solutions for Enterprise-Wide Procurement (SEWP), a multi-award Government-Wide Acquisition Contract (GWAC) vehicle, for the procurement of hardware, software, and services.

In addition, NASA's strategic sourcing approach aligns with our transition from acting a predominately as a service-provider to being a hybrid of service provider and service broker. In our refreshed approach, we will procure services in addition to managing systems, broker IT commodity services for our NASA customers, and invest in owned infrastructure when commercial services that meet specific requirements do not exist or cannot be acquired effectively. Our approach will allow NASA to procure the information technology services required while only investing in systems that must be managed within the Agency. NASA also participates in other innovative sourcing approaches as represented by NASA's Agency-wide Open Source Initiative, which focuses on centralizing NASA's open source software efforts within a collaborative environment for use by developers inside and outside of our Agency.

IT Investment Valuation Methodology

Each year the Federal government spends billions of dollars on IT investments. Due to the importance of spending oversight, the Office of Management and Budget (OMB) established a public Web site, the IT Dashboard, which provides detailed information on over 700 major Federal IT investments, including assessments of actual performance against cost and schedule targets, referred to as ratings. Annually, the NASA CIO reviews the health of NASA's eleven major investments in its Exhibit 300, which covers the IT Capital Asset Summary and Performance Measurement Report. The CIO's review includes real-time discussions with Program Managers, fielding questions from the CIO leadership team regarding investment health and proposed areas for consolidation and/or cost savings. After reviewing the investment risks and assumptions, the NASA CIO characterizes each investment on the IT Dashboard (<https://www.itdashboard.gov/>) with a green (low risk), yellow (moderate risk), or red (high risk) status and rates the investment on a scale of 1 (poor) – 5 (excellent).

The individual IT investments in NASA's portfolio are categorized either as (1) Development, Modernization, and Enhancement (DME), which refers to new IT investments to meet a mission requirement or to improve Agency productivity, or as (2) Operations and Maintenance, which refers to IT investments to sustain the Agency's IT infrastructure and business services. The comparative valuation of DME investments focuses on the impact of the investment on the Agency, including strategic alignment, benefits, organizational and technical risk, proposed timing, resource allocations that include out-years, investment assumptions, and dependencies. The comparative valuation of O&M investments focuses on the ongoing need and performance of the investment within the Agency, including strategic alignment, efficiency improvements, investment health and performance, funding scenarios, resource allocations that include out-years, and refreshed assumptions and dependencies. Standardized templates are used to clearly identify and capture critical information necessary to value and prioritize DME and O&M investments using the IT investment criteria and weighting below.

| <i>DME Decision Criteria</i> | <i>Weighting (100%)</i> |
|---|-------------------------|
| <i>1. Alignment with Agency IT Strategy</i> | <i>30%</i> |
| <i>2. Expected Benefits</i> | <i>20%</i> |
| <i>3. Investment Risk</i> | <i>15%</i> |
| <i>4. Initiative Soundness</i> | <i>25%</i> |
| <i>5. Political Sensitivity</i> | <i>10%</i> |

| <i>O&M Decision Criteria</i> | <i>Weighting (100%)</i> |
|---|-------------------------|
| <i>1. Alignment with Agency IT Strategy</i> | <i>30%</i> |
| <i>2. Expected Financial Improvements</i> | <i>15%</i> |
| <i>3. Expected Efficiency Improvements</i> | <i>20%</i> |
| <i>4. Investment Health</i> | <i>25%</i> |
| <i>5. Political Sensitivity</i> | <i>10%</i> |

Strategy Execution: IT Investment and Tactical Planning Overview

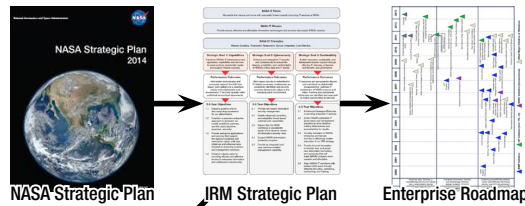
While the IRM Strategic Plan and Enterprise Roadmap identify what the Agency IT workforce will collaboratively focus on achieving over the next three to five years, IT tactical and operational plans are developed annually to define how the strategy and roadmap will be incrementally executed to achieve the longer term IT goals. NASA's Office of the Chief Information Officer (OCIO) annually reviews progress towards the IRM Strategic Plan and Enterprise Roadmap and publishes an updated IRM Strategic Plan and Enterprise Roadmap as appropriate. Following this reconciliation process, customer-oriented governing boards prioritize the elements of the IRM Strategic Plan, after which the annual prioritization of IT investments is performed using a standardized approach for investment criteria and weighting. This approach maximizes the linkage between the

prioritized IT investments and achievement of NASA's mission while optimizing the use of the Agency's limited funding.

The chart below depicts the high level IT tactical planning and investment prioritization process which aligns with the Capital Planning and Investment Control (CPIC) process. Investments are cataloged as fixed, administrative costs that are right-sized annually based on enterprise needs and IT portfolio size or variable costs for the discretionary IT services and innovation portfolios that are adjusted based on strategic considerations, the operating environment, and budget constraints. Once finalized, performance toward the annual IT Tactical Plan is monitored by the CIO on a monthly basis. These processes are updated as needed based on stakeholder feedback, best practices, and lessons learned during each process iteration.

Why

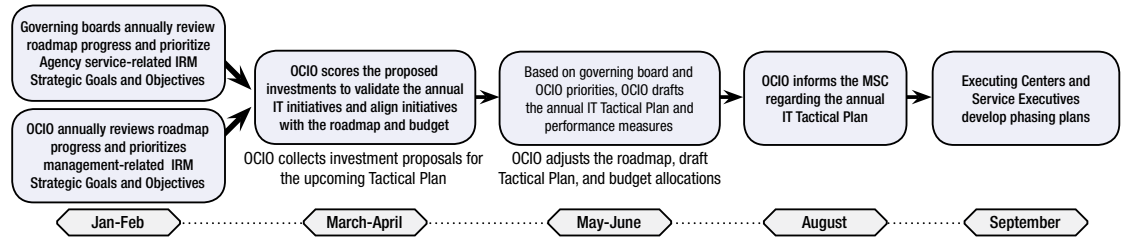
(OCIO's strategy to support NASA's mission)



The IRM Strategic Plan is reviewed annually by the MSC to ensure that IT aligns with current Agency priorities and serves as the foundation for the Enterprise Roadmap and annual IT Tactical Plans.

What & When

(Governing boards set annual Agency IT priorities, and OCIO develops the annual IT tactical plan)

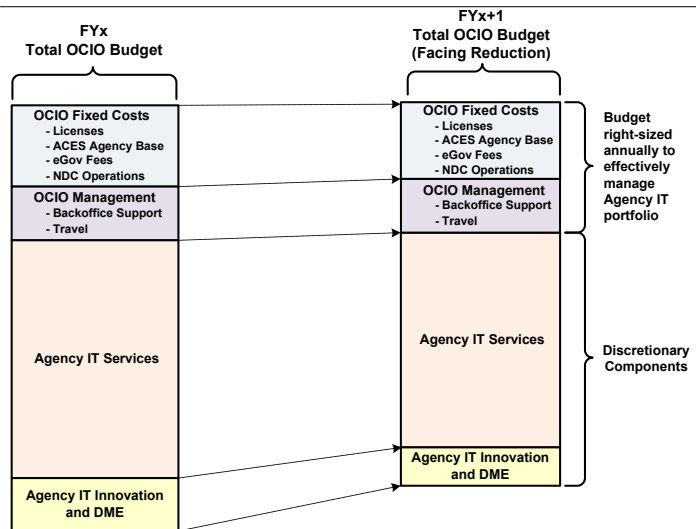


How

(OCIO adjusts the resource mix to accomplish the tactical IT plan)

- OCIO allocates funding for fixed bills (e.g., annual licenses, eGov fees).
- OCIO right-sizes staffing and travel budget to meet annual plans.
- OCIO uses annual governing board priorities for IT to establish resource allocations for the Agency's institutional IT services and innovation.

Note: OCIO may request additional funding if the existing budget cannot support the MSC request (e.g., if DME is a MSC priority but funding is unavailable after O&M allocations).



- EXAMPLE: PROPORTIONS NOT TO SCALE -

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