

# NOAA Cloud Action Plan

Maximizing the Value of NOAA's Cloud Services



National Oceanic and Atmospheric Administration  
U.S. Department of Commerce



## NOAA Science & Technology Focus Areas:

Uncrewed Systems ■ Artificial Intelligence ■ 'Omics ■ Cloud ■ Citizen Science ■ Data

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# NOAA Cloud Action Plan

*Maximizing The Value of NOAA's Cloud Services*

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## NOAA Cloud Action Plan

### *Maximizing The Value of NOAA's Cloud Services*

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## Introduction

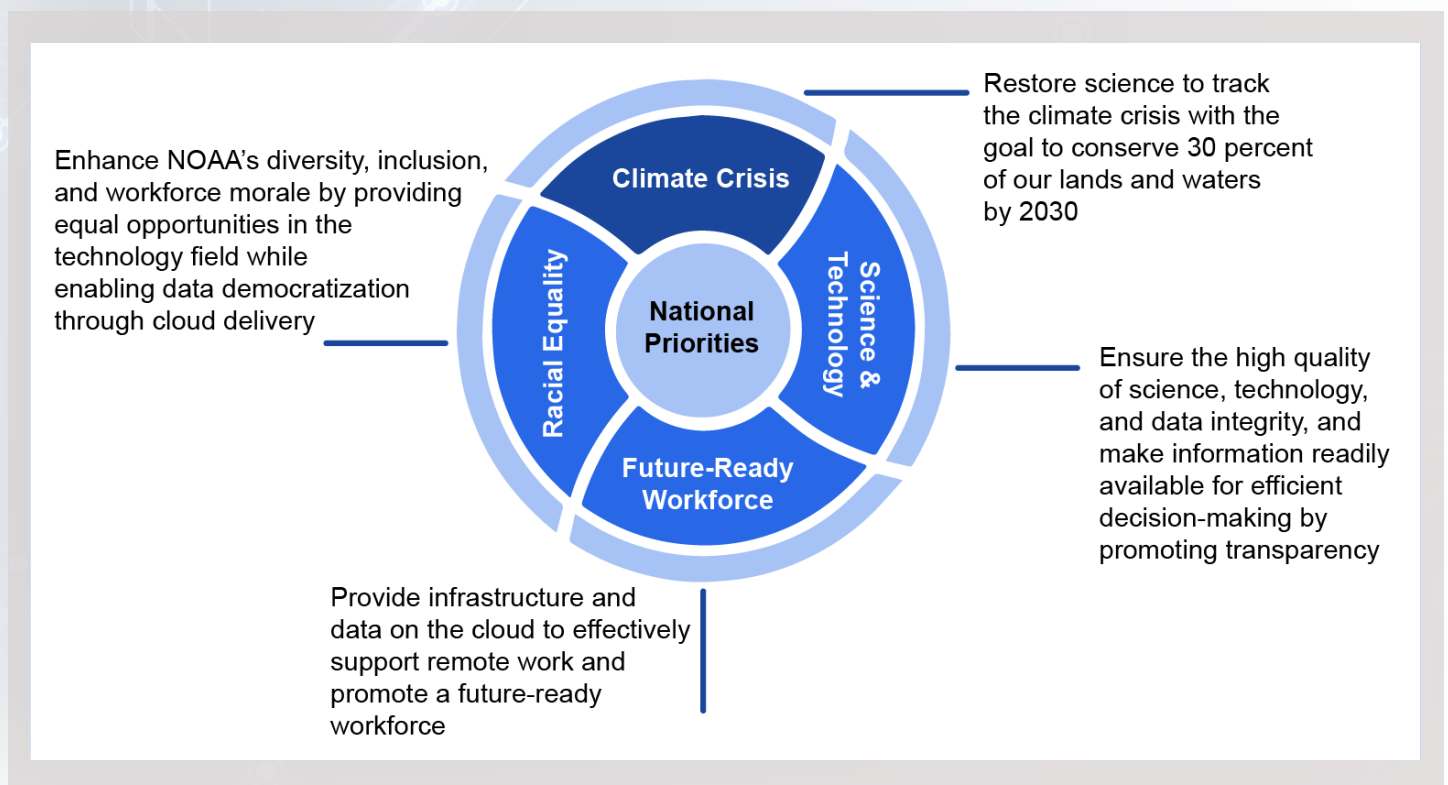
The National Oceanic and Atmospheric Administration (NOAA) has approved the *NOAA Cloud Strategy*<sup>1</sup> for applying emerging science and technologies<sup>2,3</sup> to guide transformational advancements of products and services across the agency’s mission areas. This NOAA Cloud Action Plan complements that document, to be used as a guide for the strategy’s implementation, including NOAA’s promotion, and utilization of cloud services as we work to become a Climate Ready Nation and support the [New Blue Economy](#).

Cloud is a foundational tool that empowers the future of the NOAA S&T Strategies. In alignment with the [Federal Cloud Computing Strategy](#), this plan highlights the updated 2019 “Cloud Smart” guidance by using the cloud to advance mission requirements for long-term modernization, via three key pillars of successful cloud adoption: security, procurement, and workforce. The action plan calls for a NOAA Enterprise Cloud Program to provide governance, workforce management, and high-level services (such as network, IT security, billing, and authentication) to avoid duplication of these services across Line Offices (LO). The elements of the action plan will have financial and human resource allocation implications.

The NOAA Cloud Action Plan will be executed collectively by the NOAA Office of the Chief Information Officer (OCIO) and (LO) Assistant CIOs for oversight and prioritization, the NOAA Enterprise Cloud Program Office for coordination and facilitation in managing and maintaining Cloud Enterprise Services, and the NOAA Cloud Committee (NCC) for technical guidance. The NOAA OCIO will be accountable for implementing this living document and executing regular reports on overall progress. Actions in this plan will be consolidated and tracked through the NOAA Enterprise Cloud Program tool (SmartSheet). The NOAA Cloud Action Plan objectives and actions are subject to change based on the availability of funding and NOAA LOs are encouraged to create more detailed implementation plans based on their mission priorities.

## Utilization of Cloud to Accomplish National Priorities

Following the 2021 Executive Orders (EO) on [Climate Crisis](#), [Racial Equality](#), and [Science & Technology](#) to address gaps in scientific-integrity policies relating to emerging technologies, NOAA has prioritized the use of cloud technology to support the goals captured in the following diagram:





## Current Cloud Actions Underway Aligned with Priorities

**National Environmental Satellite Data and Information Service (NESDIS) Cloud Actions Aligned with Climate:** At NESDIS, the Large-scale Enhancement through Artificial Intelligence (AI) Processing (LEAP) Project explores the application of AI on satellite data for new applications, weather-forecasting skill improvement, research, and innovation. NESDIS has partnered with Google to produce an AI-based system that addresses the large and diverse environmental datasets, which will advance the U.S. government mission for weather prediction and environmental monitoring.

**NOAA Fisheries Reaching the Goal to Conserve Land & Water by 2030:** NOAA Fisheries Ecosystem Research uses the cloud to understand interactions between Antarctic krill and their predators. Cameras collect too much data for scientists to analyze by hand, so cloud models have been developed to automate the analysis of images. Using the cloud, the model ran in 45 seconds rather than the one- and two-hour standard timeframe that is typical for a traditional on-premise platform for High Performance Computing (HPC). When broadly available to scientists, this model will provide more accurate and timely advice for fishery management.

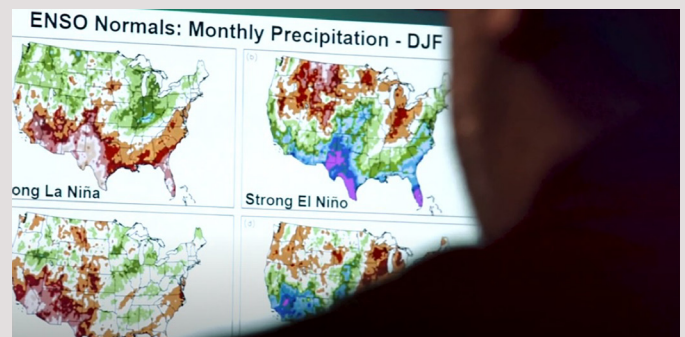
## Actions to Execute the Strategy

The **NOAA Cloud Action Plan** is organized into five overarching goals and subsequent objectives with planned timelines, actions, and responsible groups. The following is a summary of the goals and their high-level activities, to be completed during the next five years, based on resource availability and funding:

- **Goal 1: Enable Innovation through Rapid Adoption of Cloud-Based Services**

**Action Summary:** NOAA will invigorate a culture and atmosphere that encourages and fosters innovation based on cloud technologies. NOAA will provide cloud ‘sandboxes’ as a low-risk, low-barrier-to-entry environment for anyone in NOAA to explore cloud services and develop new and innovative cloud-native solutions. ‘Infrastructure as Code (IaC)’ will be adopted as a best practice to rapidly, repeatedly, and consistently build cloud projects. Scripts and templates will be shared across offices to rapidly provision similar infrastructure.

NOAA physical scientist Anthony Arguez reviews El Niño and La Niña winter precipitation Climate Normals on a computer screen at NOAA National Centers for Environmental Information. For additional information: [AI agreement to enhance environmental monitoring, weather prediction](#)



A juvenile krill feeds on microscopic algae growing under sea ice. [More information here.](#) Photo: Australian Antarctic Division/Simon Payne





- **Goal 2: Support Smart Migration to the Cloud**

Action Summary: NOAA will champion a 'Cloud-Smart' philosophy. Cloud migration decisions will be based on mission requirements and a sound business case to confirm that a cloud-based alternative is viable.

- **Goal 3: Ensure Secure and Broad Access to Cloud Services**

Action Summary: NOAA will develop a common framework for cloud security with the goal of simplifying overall security architecture and reducing the duplication of security compliance on the LOs. For consistent security, NOAA will implement a cloud access security broker (CASB) with automated security monitoring and reporting across all platforms. NOAA will address top-level organizational security controls and provide common templates for lower-level project controls.

- **Goal 4: Provide Effective Governance for Cloud Shared Services**

Action Summary: Based on funding availability, NOAA will create and staff a new NOAA Enterprise Cloud Program Office. The office will provide mission assurance through uniform and streamlined governance, including billing, acquisitions, contracting, security, networking, change control, quality assurance, and authentication, across all its primary cloud platforms. The office will collaborate closely with other cloud-based programs in NOAA in a hybrid model.

- **Goal 5: Empower a Cloud-Ready Workforce**

Action Summary: In support of scientific requirements and research, NOAA will nurture a 'Cloud-Ready' workforce by making high-quality, online training for a wide range of cloud services and technologies available to all of its workforce. NOAA will do this by creating new training materials for NOAA-unique services, in addition to condensing existing training information. NOAA will empower all levels of personnel through adequate resource-sharing and clear processes, and will encourage wider communication and outreach (i.e., webinars, blogs, and mentoring) in order for the workforce to better understand and leverage cloud services within and across LOs. While NOAA will cultivate informal "grassroots" knowledge-sharing opportunities, it will also be critical to encourage employees to set aside time for training in pursuit of cloud-technology tracks for

related certifications. Employees should continue cloud education to maintain/enhance operations. NOAA will utilize flexible hiring authorities to reach a diverse pool of new talent and develop the next wave of cloud technologists through intern and fellowship programs, as indicated in the IT Workforce Strategy.

## Goal 1: Enable Innovation through Rapid Adoption of Cloud-Based Services

The Cloud Action Plan will leverage best practices, build partnerships, and enable innovation in order to support the NOAA mission, while meeting business and science requirements. Innovation will evolve NOAA's world-class Research and Development (R&D) and operational capabilities. Cloud computing services enable innovation at NOAA through: rapid system provisioning and processing, automation of security and administration, ease of access to machine learning (ML) and analytic tools, data integration, use of cloud native capabilities, and developing actionable strategies to reduce the investment risk of experimenting or operating in the cloud.

**NOAA Fisheries Cloud Sandboxes:** NOAA Fisheries has created sandboxes, a low-risk, temporary environment (similar to Qwiklabs) where customers can explore services on the Google Cloud Platform (GCP). The sandbox environment is available to all customers interested in exploring GCP services and working out potential solutions for future cloud efforts. Sandboxes are quickly deployed using 'Infrastructure as Code.' So far, over 60 staff across NOAA have begun exploration with over 30 sandbox projects.

*School of Fish*  
NOAA Fisheries

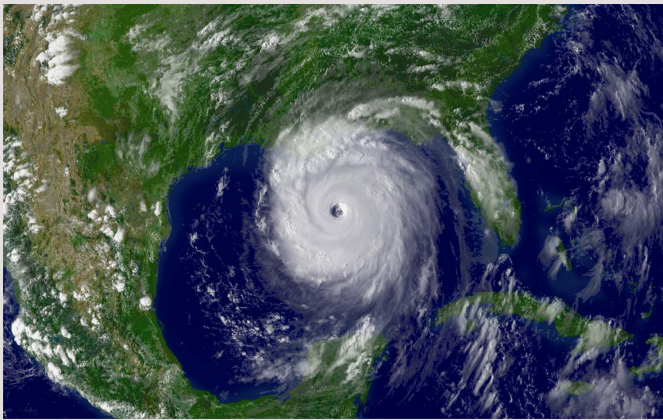






**National Weather Service (NWS) English-to-Spanish Forecast Translation:** The NWS is piloting the use of Google translation services to automatically translate hurricane forecasts from English to Spanish during the 2021 hurricane season at the San Juan forecast office. The translation model was ‘trained’ to a high level of accuracy using English-Spanish forecast pairs from earlier hurricane seasons. The translation service will provide more timely forecasts of critical weather events to Spanish-speaking customers and will allow forecasters more time to develop other forecasting products.

*NOAA satellite image for larger view of Hurricane Katrina taken August 28, 2005, as the storm’s outer bands lashed the Gulf Coast of the United States, a day before making landfall. NOAA*



**Objective 1.1: Establish capability for users with appropriate approvals to rapidly access or provision a secure exploratory cloud environment.**

1.1.1 In Fiscal Year 22 (FY22), establish an exploratory environment with appropriate security controls for cloud service tests and trials. Create a sandbox platform where cloud-native tools and NOAA data are available for NOAA scientists and partners to develop innovative solutions. The environment will have a low barrier to entry by addressing security, billing, authentication, and change control. [NOAA Enterprise Cloud Program, NOAA Cloud Committee, S&T Strategy Leads]

1.1.2 In FY23, implement a system to make R&D more accessible and seamless to scientists/researchers. Create a dashboard capability for NOAA cloud customers to request cloud services and track their progress in the onboarding process with established timelines. [NOAA Enterprise Cloud Program]

**Objective 1.2: Identify opportunities to automate cloud management processes (e.g., provisioning, monitoring consumption, etc.) to accelerate timelines, achieve efficiencies, and promote consistent implementation of policy.**

1.2.1 In FY22, develop an overall model for delivering top-four shared services (network, authentication, IT security and billing). [NOAA Enterprise Cloud Program, NOAA Cloud Committee]

1.2.2 In FY22, develop monitoring dashboards at various levels of granularity for users to identify shared services. [NOAA Enterprise Cloud Program, NOAA Cloud Committee]

**Objective 1.3: Identify and promote novel approaches to encourage innovation using cloud technologies, to include leveraging agile principles and a continuous learning culture.**

1.3.1 In FY23, develop a plan supported by leadership that outlines an ‘intrapreneurship’ program (innovating like an entrepreneur while working within a large organization) specific to the cloud for both internal (NOAA) and external stakeholders. [NOAA Enterprise Cloud Committee]

1.3.2 In FY23, create an environment and culture where cutting-edge and innovative projects (inherently high-risk and high-reward) can be pursued on the cloud. ‘Smart failures’ are perceived as a positive outcome and are tracked by offices and parlayed into lessons learned, and are applied for future growth, across the organization. [NOAA Enterprise Cloud Committee, NOAA Cloud Communications]

1.3.3 By FY22, identify and assess NOAA projects that have already successfully pursued cloud migration. Such projects have the potential to capture significant upside opportunities while limiting downside risk. [NOAA Enterprise Cloud Committee]

## Objective 1.4: Establish best practices for developing cloud-native applications using DevSecOps approaches to accelerate Research to Operations (R2O).

1.4.1 In FY22, develop a forum to share best practices across the NOAA LOs for using development, security, and operations (DevSecOps) practices to produce an enterprise methodology for managing application delivery in the cloud to accelerate R2O and legacy migration. Develop guidance for tools and technologies to help LOs embrace continuous integration and continuous deployment (CI/CD) practices. [NOAA Cloud Committee]

1.4.2 In FY23, develop open approaches, common templates, and architectures for using AI/ML across all cloud platforms, instead of per cloud customization. [NOAA Cloud Committee, AI S&T Lead, NOAA Center for Artificial Intelligence]

## Goal 2: Support Smart Migration to the Cloud

Cloud migration decisions should be based on mission requirements and a sound business case to confirm that a cloud-based alternative is viable. Thorough, but agile, analyses are critical to validate the selection of the most appropriate platform based on the requirements. In accordance with the [Federal Cloud Computing Strategy](#) from [Executive Order 13800](#), it is recommended to develop a deliberate migration of cloud-appropriate resources and services in a cost-effective way and should acknowledge the equitable delivery and development of data to address concerns regarding environmental justice in line with the NOAA Data Equity and Environmental Justice Strategy.

**NOAA's "Science, Service, and Stewardship" Mission with Open Data:** The Registry of Open Data provides public access to the agency's environmental datasets since 2015 through Amazon Web Services (AWS). By providing direct access to NOAA data without needing to download and store copies, researchers and entrepreneurs can deploy compute resources on-demand in the cloud and perform analysis more quickly and efficiently.

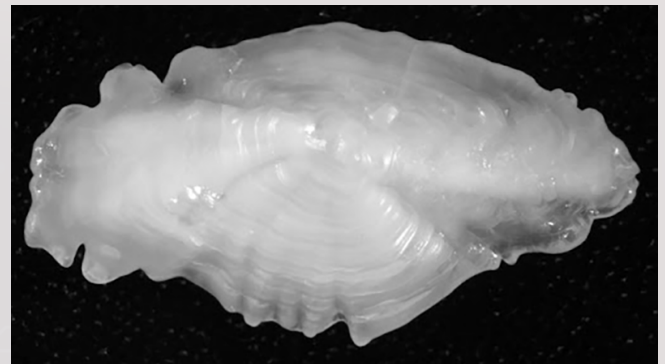
**NOAA Fisheries Rapid Identification of Fish Species:** NOAA Fisheries uses images of fish otoliths (inner ear bones) to identify two rockfish species that are often misidentified for each other. Within a couple hours, more than 700 images were processed using Google Cloud, exponentially increasing the speed of discovery. This now has potential to serve as a model for other fish identification processing.

*Tropical systems Otis, Norma, Jose, Maria, Lee (from left to right) as captured by NOAA's GOES-16 satellite on September 17th, 2017. More information [here](#).*



*Image of fish otoliths (inner ear bones). More information [here](#)*

*Christopher Gburski, Alaska Fisheries Science Center*



## Objective 2.1: Develop a NOAA Cloud Strategy Action Plan that aligns with the Data Strategy Action Plan, promotes collaborative solutions, and supports the other NOAA Science and Technology (S&T) Action Plans.

2.1.1 By FY22, establish a NOAA Enterprise Cloud Program Office, with staff dedicated to delivering enterprise solutions at a reduced acquisition timeline and expense (network, billing/contracts, authentication, and IT security). [NOAA OCIO, NOAA CIO Council]

2.1.2 In FY22, ensure Cloud Action Plan milestones and accountable parties are tracked in the SmartSheet system, including overarching S&T milestones dependent on the cloud plan. [NOAA Enterprise Cloud Program, S&T Leads, Chief Data Officer]





**Objective 2.2: Develop guidance and tools to facilitate cloud transition planning. Guidance includes, but is not limited to, templates for cloud business cases, models to estimate migration and hosting costs, and best practices to prevent cost overruns.**

2.2.1 In FY22, establish a framework between agile processes and Cloud Transition activities (e.g., design phase including cost of rewriting applications to scale in the cloud, data storage, and archival processes). [NOAA Cloud Committee]

2.2.2 In FY23, develop guidance, or revise existing guidance, to the LOs for migrating to the cloud. This guidance should include consultation with and lessons-learned from the Cloud Utility Contract, Big Data Program (BDP) and HPC. [NOAA Enterprise Cloud Program, CDO, EDMC]

2.2.3 In FY22, the NOAA Enterprise Cloud Program will review and consider leveraging a standard framework for cloud migration (see NESDIS [framework](#) as an example). [NOAA Enterprise Cloud Program, NOAA Cloud Committee]

2.2.4 In FY22, utilize the [Federal CIO Application Rationalization Playbook](#) and apply appropriate toolsets to assist portfolio managers in decision-making to move computer applications to the cloud. [NOAA Enterprise Cloud Program, LO ACIOs]

2.2.5 In FY22, create a library of acquisition templates for commonly purchased cloud services to simplify the procurement process and promote Performance Based Contracting (PBC) to ensure appropriate cloud contract language. [NOAALink Program Office, Acquisition & Grants Office-SSAD]

2.2.6 In FY23, ensure budget analysis to produce thoughtful and realistic funding and staffing requirements for the next several years for dedicated enterprise cloud migrations. [NOAA Enterprise Cloud Program]

**Objective 2.3: Ensure enhanced transparency to promote trust and encourage collaboration on enterprise cloud solutions.**

2.3.1 By FY22, launch and maintain a centralized, well-organized, and easily accessible intranet site for cloud-related activities, including training and learning environments. [NOAA Enterprise Cloud Committee]

2.3.2 By FY22, establish multiple avenues for collaboration and communication, including NOAA-wide workshops and regular briefings. [NOAA Enterprise Cloud Program]

**Objective 2.4: Leverage shared infrastructure and partnerships to reduce data dissemination and egress costs.**

2.4.1 In FY22, create a team that will build on past work performed by the LOs, partners, and OCIO demonstrating the efficiency, effectiveness, and overall value of using cloud-native services capabilities for data management. [NOAA Chief Data Officer (CDO), S&T Data Lead, NOAA Cloud Committee, EDMC]

2.4.2 By FY23, create a pilot project that will build on past work performed by the LOs, partners, and OCIO for a cloud development environment that moves both the processing and test data into the same cloud environment. Expected outcomes include reduction in data egress expenses during development, increasing collaboration with CI/CD pipelines, and reducing latency in batch/data processing to be shared across LOs. [NOAA Enterprise Cloud Program, ACIOs]

2.4.3 In FY23, develop an enterprise framework for both data access/distribution and data ingest that can be used as NOAA guidance documentation for those planning to manage data in a cloud environment. [NOAA Data S&T strategy lead, NOAA Chief Data Officer (CDO), EDMC]

**Objective 2.5: Establish Cloud Success Team(s) to assist NOAA programs with developing and executing cloud adoption/migration plans.**

2.5.1 In FY22, build upon lessons learned from both inter- and intra-agency partnerships. Partner with organizations to provide models and examples of cloud success teams for LOs in the evaluation and adoption of cloud services and technologies. [NOAA Cloud Committee, LO ACIOs]

**Objective 2.6: Engage other Federal agencies to identify and leverage best practices for cloud migration and lessons learned applicable to NOAA's use cases for the cloud.**

2.6.1 By FY23, identify and engage in relevant cross-agency communities of practice to share cloud knowledge, to provide NOAA with access to other agency cloud subject-matter experts (SMEs) and to promote collaboration across agencies. [NOAA Enterprise Cloud Program]

### Goal 3: Ensure Secure and Broad Access to Cloud Services

Expanding access to NOAA’s data will unleash its full value, while simultaneously maintaining the security of the information systems and data supporting NOAA’s mission. We must leverage, inherit, and augment (as needed) FedRAMP-provided security controls to ensure the availability, integrity, and confidentiality of data, applications, and cloud services, with full consideration of national security, Personally Identified Information/Business Identified Information, and trust concerns in service to our constituents.

**NOAA Center for Operational Oceanographic Products and Services (CO-OPS) Cloud Migration:** The NOAA CO-OPS Information System Division (ISD) successfully completed its cloud migration initiative by vacating the Silver Spring Main Campus (SSMC) server room and relocating services to the cloud. CO-OPS is not only one of the leading adopters of cloud technologies within National Ocean Service (NOS), but is also the first office to fully migrate out of SSMC. In moving to the cloud, CO-OPS has been able to take advantage of many new capabilities that improve security, service uptime, and provide better support to customers.

*NOAA oceanographers deploy sensors like these in the water to measure tidal currents for a period of time and then return to collect them. The two sensors pictured here were recovered from the Hudson River, just off the coast of Lower Manhattan in New York.*

NOAA NOS, Center for Operational Oceanographic Products and Services



#### Objective 3.1: Identify and onboard NOAA Cloud Service Providers (CSP) into a cloud access security platform.

3.1.1 In FY22, attain visibility of NOAA’s data across NOAA’s cloud platforms using a CASB solution. [NOAA Cloud Committee, OCIO Computer Security Division (CSD)]

#### Objective 3.2: Identify and implement advanced techniques (e.g., AI and ML) to improve detection and prevention of malicious and unauthorized behaviors.

3.2.1 In FY23, develop a plan to initiate AI, ML, and cloud tools to manage the risks of cybersecurity vulnerabilities and threats. [OCIO Cyber Security Division, NOAA Center Artificial Intelligence (NCAI)]

3.2.2 In FY22, develop the ability to analyze cyber and regulatory risk, and mitigate against ‘shadow IT’. Identify Cloud Service Provider (CSP) services within the organization for both development and operations that can be appropriately monitored. [OCIO Cyber Security Division]

#### Objective 3.3: Establish an accredited system boundary for SaaS applications used by NOAA.

3.3.1 In FY22, utilize the NOAA OCIO Federal Information Security Modernization Act (FISMA) system boundary (NOAA0900) for enterprise Software as a Service (SaaS) offerings. [OCIO Cyber Security Division]

#### Objective 3.4: Provide guidance for defining information system boundaries when programs are leveraging cloud services.

3.4.1 In FY22, building on existing LO efforts, develop a set of controlled vocabulary/common lexicon for the NOAA organization-level administrator/policy account tags for consolidated monitoring. [NOAA Cloud Committee]

3.4.2 In FY22, streamline the secure onboarding process for applications to already existing cloud environments. [NOAA Enterprise Cloud Program, NOAA Cloud Committee]

3.4.3 In FY23, develop a set of guidelines for asset inventory and boundary management in the cloud. [NOAA Cloud Committee]



**Objective 3.5: Identify and establish common services for cloud use. Common services include procurement, networking, authentication, configuration management, change management security assessment, and security monitoring.**

3.5.1 In FY23, create a reference website linking to the CSP and NOAA-approved common services (i.e., FedRAMP) including training material on the services. [NOAA Enterprise Cloud Program, NOAA OCIO]

3.5.2 In FY22, establish across the enterprise processes, roles, and responsibilities for implementing network, security, and access solutions in NOAA CSP environments (outlined in the Cloud Conops). [NOAA Enterprise Cloud Program, NOAA Cloud Committee & Computer Security Division]

3.5.3 In FY22, identify NOAA common and hybrid controls, service providers, and adoption criteria for inheritance that pertains to approved CSP environments. [NOAA Cloud Committee, NOAA Computer Security Division]

## Goal 4: Provide Effective Governance for Cloud Shared Services

Cloud governance, with substantial and multi-disciplinary NOAA-wide engagement, provides a strategic framework for cloud adoption and promotes consistency across implementations. Governance occurs at both the strategic level and operational level. Effective governance provides management mechanisms to centralize communications of cloud activities through best practices and ensure that the use of on-demand, cloud-based computing services is conducted within NOAA's annual budgetary constraints. Through this, the utilization of cloud computing platforms can help to leverage efficiencies across the organization and offer an elevated space for the development of new ideas through streamlined processes, as well as increased opportunities for scalability and growth across all projects. While cloud governance will be developed in consultation and partnership with NOAA program offices and consistent with NOAA and LO policies, distinction between operational requirements for on-time delivery and research should always be conducted at the individual/office level when considering cloud adoption. The primary entity to facilitate and coordinate cloud governance is the NOAA Enterprise Cloud Program Office, which is to report to the CIO Council with technical guidance from the NOAA Cloud Committee.

**Objective 4.1: Develop and implement procedures to govern enterprise cloud services. Procedures ensure continuous and measurable customer experience improvements.**

4.1.1 In FY22, the NOAA Cloud Program will partner with LO program offices to evaluate a Scaled Agile Framework (SAFe) intranet site for agile cloud lifecycle projects and governance to organize, expedite, and execute cloud requirements. [NOAA Enterprise Cloud Program, NCC (for LO program office feedback)]

**Objective 4.2: Establish an NCC to support governance and coordinate effective use of cloud services. The Committee will ensure alignment of planned cloud activities with the NOAA Cloud Strategy, as well as the NOAA Data and other S&T strategies.**

4.2.1 By FY22, the NCC will update the Working Group plans to reflect the deliverables in this action plan and map actions that cross S&T strategies. [NOAA Cloud Committee]

**Objective 4.3: Develop and implement cross LO procedures to seamlessly transition cloud-based services from R20.**

4.3.1 In FY22, establish migration procedures and guidelines from sandbox/development environments to managed environments, where appropriate. [NOAA Enterprise Cloud Program, NOAA Cloud Committee (NCC)]

4.3.2 By FY23, develop a repository/library and LO agreements to support enterprise cloud development (i.e., data and code sharing agreements). [NOAA Enterprise Cloud Program, NOAA Cloud Committee]

4.3.3 In FY23, ensure agile development to accommodate sufficient computing power and storage space to support the 'Omics S&T strategy. [NOAA Cloud Committee, 'Omics Strategy Lead]

4.3.4 By FY24, work with cloud architects familiar with a range of bioinformatics practices to build and test architectures and to evaluate the feasibility and cost-effectiveness of moving bioinformatics workflows to the cloud. [NOAA Cloud Committee, 'Omics Strategy Lead]



4.3.5 In FY24, in collaboration with the Data Strategy S&T team, establish a system that integrates research and performance data from sensor-equipped autonomous or remotely piloted vehicles (uncrewed systems) to enable better decision-making. [NOAA Chief Data Officer, NOAA Enterprise Cloud Program, Uncrewed S&T Lead]

## Goal 5: Empower a Cloud-Ready Workforce

To successfully implement cloud technologies across NOAA and meet its mission, it is imperative that the NOAA workforce have the skills, training, and competencies to successfully apply cloud technology. Attaining this goal is reliant on attracting and retaining talented individuals, successfully integrating new hires into the existing workplace culture, and cultivating a workforce that is collaborative, well-trained, and diverse, so that it reflects, understands, and responds to the varied communities and stakeholders we serve.

Moreover, the composition of people with diverse backgrounds, experiences, and areas of expertise fosters creativity and innovation, along with creating an inclusive work environment that drives workforce performance and collaboration. Integrating cloud technologies throughout NOAA's unique mission of science, service, and stewardship demands this diversity and inclusion. The actions under this goal are deliberate steps to advance diversity and inclusion, while promoting cloud proficiency in support of scientific requirements and research.

**NOAA's Ships and Aircrafts Utilize the Azure Cloud Environment:** NOAA uses Azure to provide data aggregation and platform support services. NOAA's platforms send consolidated environmental data to a receiving system residing in Azure. Both ships and aircraft utilize maintenance and logistical systems residing in the Azure environment. One hundred percent of the support systems servicing the NOAA sensor platforms reside in the Azure cloud.

Composite image of NOAA's WP-3D Orion Hurricane Hunter aircraft (top left) and NOAA Ship Ronald H. Brown. NOAA/OMAO





**Objective 5.1: Invest in and develop the full range of NOAA's cloud expertise, including cybersecurity in the cloud and other cloud-centric skillsets. Employ traditional and innovative development approaches and methods.**

5.1.1 In FY22, building on existing LO efforts, provide access to online cloud-related training resources and recommended list of courses per job function to a broad range of staff in pursuit of role-based cloud education, in accordance with the NOAA IT Workforce Strategic Plan.<sup>4</sup> [NOAA Enterprise Cloud Program]

5.1.2 In FY22, support the Information Resource Management plan as it relates to IT recruiting, retaining, and reskilling. [CIO Council IT Workforce Priority Working Group, LO ACIOs]

**Objective 5.2: Establish a cloud Community of Interest (COI) to share cloud knowledge, lessons learned, and best practices NOAA-wide.**

5.2.1 In FY23, build on existing LO efforts to develop a community of practice that includes cloud success teams from each LO that drive the evaluation and adoption of cloud services and technologies and formalize a forum to share best practices. [NOAA Cloud Committee, LO Assistant Chief Information Officers]

5.2.2 In FY23, identify programs that have already made the transition to cloud development and/or operations and capture their lessons learned for use by others.

**Objective 5.3: Expand NOAA's cloud talent pool by creating partnerships with other governmental organizations, academia, non-profit organizations, and the private sector, and by leveraging internship opportunities.**

5.3.1 Beginning in FY24, develop an External Rotational Assignment Program (ERAP) with external partners. [NOAA Enterprise Cloud Program, Workforce Management Office]

5.3.2 In FY24, leverage public-private partnerships to harness emerging technologies and develop innovative Science, technology, engineering, and mathematics (STEM) education and outreach efforts to train the next generation of Blue Economy leaders.

**Objective 5.4: Attract a multi-generational cloud-proficient IT workforce by creating an agile workplace that embraces technology allowing the flexibility to work from anywhere.**

5.4.1 By FY24, utilize diverse hiring panels to promote diversity and inclusion into the workspace as outlined in the NOAA IT Strategic Workforce Plan and NOAA's Information Resource Plan. [CIO Council IT Workforce Priority Working Group, Hiring managers]

**Objective 5.5: Streamline recruitment and hiring to bring on needed cloud talent quickly. Develop a cloud workforce pipeline. Use existing hiring authorities and incentives, and develop new ones. Expedite background checks for new hires.**

5.5.1 Immediately, promote and utilize flexible hiring authorities and develop new talent through the NOAA Pathways and NOAA IT Fellowship programs. [NOAA OCIO, NOAA LOs]

5.5.2 In FY23, work with the NOAA Security Office to identify and implement efficiencies in the background and security check process. [CIO Council IT Workforce Priority Working Group]

5.5.3 In FY23, create standard position descriptions for cloud positions to enable more rapid, consistent hiring. [CIO Council IT Workforce Priority Working Group]

**Objective 5.6: Develop NOAA-wide competency-based standards for cloud knowledge, skills, and abilities.**

5.6.1 In FY23, enable the development of cross-LO teams with a mixture of skilled cloud personnel to foster mentorship. [NOAA Enterprise Cloud Program, LO ACIOs]

5.6.2 In FY23, develop innovative hiring and workforce practices to obtain a broader applicant pool that enables remote work and is not dependent upon the candidate's location. [Office of Human Capital, NOAA Enterprise Cloud Program]

5.6.3 In FY23, encourage employees to earn and maintain industry certifications in cloud-related fields and technologies. [CIO Council IT Workforce Priority Working Group]



## Acronyms

ACIO	Assistant Chief Information Officer
AGO	Acquisition and Grants Office
AI	Artificial Intelligence
ATO	Authority to Operate
BDP	Big Data Program
CASB	Cloud Access Security Broker
CIO	Chief Information Officer
CI/CD	Continuous Integration/Continuous Delivery
CSP	Cloud Service Provider
DevSecOps	Development/Security/Operations
FISMA	Federal Information Security Modernization Act
FedRAMP	Federal Risk and Authorization Management Program
EDMC	Environmental Data Management Committee
ERAP	External Rotational Assignment Program
EO	Executive Order
HPC	High Performance Computing
IaC	Infrastructure as Code
IaaS	Infrastructure as a Service
LO	Line Office
ML	Machine Learning
IT	Information Technology
NCAI	NOAA Center for Artificial Intelligence
NCC	NOAA Cloud Committee
NOAA	National Oceanic and Atmospheric Administration
OCIO	Office of Chief Information Officer
PBC	Performance Based Contracting





R&D	Research and Development
ROI	Return on Investment
SaaS	Software as a Service
SAB	Science Advisory Board
SAFe	Scaled Agile Framework
S&T	Science and Technology
SDD	Service Delivery Division
SDLC	System Development Life Cycle
SLA	Service Level Agreement
SME	Subject Matter Expert
STEM	Science, technology, engineering, and mathematics

## References

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