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IT Talk

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Connecting Spacecraft to Earth

IT Talk

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In this Issue

Message from the NASA CIO

In 1964, NASA established the NASA Communications Network (NASCOM), a worldwide space operations network that bridged real-time communication for historic space missions such as Apollo 11. In this issue of IT Talk, we journey into the past to explore how NASCOM has evolved and paved the way for the modern operations networks that power NASA's space missions today.

We will also unveil AI Atlas and CodeX, two generative AI tools that harness large language model (LLM) technology to provide quick and accurate answers to questions about NASA's procedural documents. We will show you how these new IT capabilities will help accelerate the agency's progress toward its long-term goals under the NASA 2040 strategic initiative.

In cybersecurity news, we will examine the unique role of ethical hackers collaborating externally with the agency under the Vulnerability Disclosure Policy. Come behind the scenes to see how these "hackers" aid our IT teams by discovering and reporting security vulnerabilities before they are exposed to malicious cybercriminals.

I also had the honor of speaking about NASA's leading-edge IT during the 60th anniversary celebration of the Madrid Deep Space Communications Complex (MDSCC). For the last 60 years, the MDSCC has helped us explore our universe and communicate with our deep space interplanetary spacecraft. We hope you enjoy the exclusive coverage of this 60-year milestone, along with all the other news and information in this edition of IT Talk.

Finally, my leadership team and I send heartfelt congratulations to our retiring OCIO leadership members. We are filled with gratitude for your dedication and uplifting leadership which have contributed to making OCIO a success during the course of your careers. And to the rest of the OCIO team -- thank you for your continued hard work and contributions to NASA's mission. I look forward to another year of our team working together to strive for the stars and beyond.

With gratitude,

Jeff Seaton

NASA Chief Information Officer

Workplace and Collaboration Services (WCS) News and Updates

Check out the latest news from WCS (all links are internal to NASA):

- *Disregard macOS Sequoia Upgrade Notifications*
- *Verify Time Zone When Scheduling a Delivery Appointment*
- *Windows 11 Availability*
- *Non-NEST Software Package Services Expand to Mac, Linux, and More*
- *Test Computers Now Available for 20 Days Instead of 10 Days—Free of Charge!*
- *SpaceBar and TechBar Grand Openings at LaRC & ARC*
- *Teams Enhancements: Shared Tab in Chats, Website Tabs, and Add a Q&A Session to Your Teams Meeting*
- *See What's New with ICAM*

NASA's Vulnerability Disclosure Policy: The Case for Ethical Hacking

By Michelle Kim, Communications Specialist, NASA Headquarters, in collaboration with Leslie Cahoon, IT Cybersecurity Specialist, and Martin Ramos, Cybersecurity Case Manager, Cybersecurity and Privacy Division (CSPD)

Several news outlets, including a *Johns Hopkins cybersecurity blog*, have reported that ethical hackers around the world are uploading their Letters of Recognition (LOR) from NASA's Vulnerability Disclosure Policy (VDP) on their social media accounts. These letters, awarded by the Cybersecurity and Privacy Division (CSPD) and signed by Senior Agency Information Security Officer Mike Witt, thank the hackers for reporting security vulnerabilities found on NASA-managed systems accessible through the Internet.

NASA's VDP is the result of the Cybersecurity and Infrastructure Security Agency (CISA) Binding Operational Directive (BOD - 20-01), *Develop and Publish a Vulnerability Disclosure Policy*. The directive calls for Federal agencies to set clear guidelines for ethical hackers (formally called security researchers) to find security vulnerabilities on the agency's public-facing systems and report them through Bugcrowd, the bug bounty platform that CISA has partnered with to provide the service for the Federal Government. After a report is submitted, CSPD assesses the validity of the vulnerability reports and remediates any exposures before they are found by threat actors. Although NASA conducts thorough internal assessments, the security research provides a fresh look from a unique perspective—through the lens of a hacker.

"The VDP may have started as a binding operational directive, but it also turned out to be something greater," IT Cybersecurity Specialist Leslie Cahoon affirms. "The security researchers want to help NASA protect its infrastructures and our greater mission of going to the moon and Mars. They help us by pointing out vulnerabilities not yet identified."

However, not all vulnerability reporting qualifies for the coveted LOR. NASA's VDP policy lays out stringent requirements for eligibility, including adherence to *Bugcrowd platform's* P1–P4 reporting categories. They identify the threat level using these parameters:

"P1—Critical: Vulnerabilities that cause a privilege escalation from unprivileged to admin or allow for remote code execution, financial theft, etc.

P2—High: Vulnerabilities that affect the security of the software and impact the processes it supports.

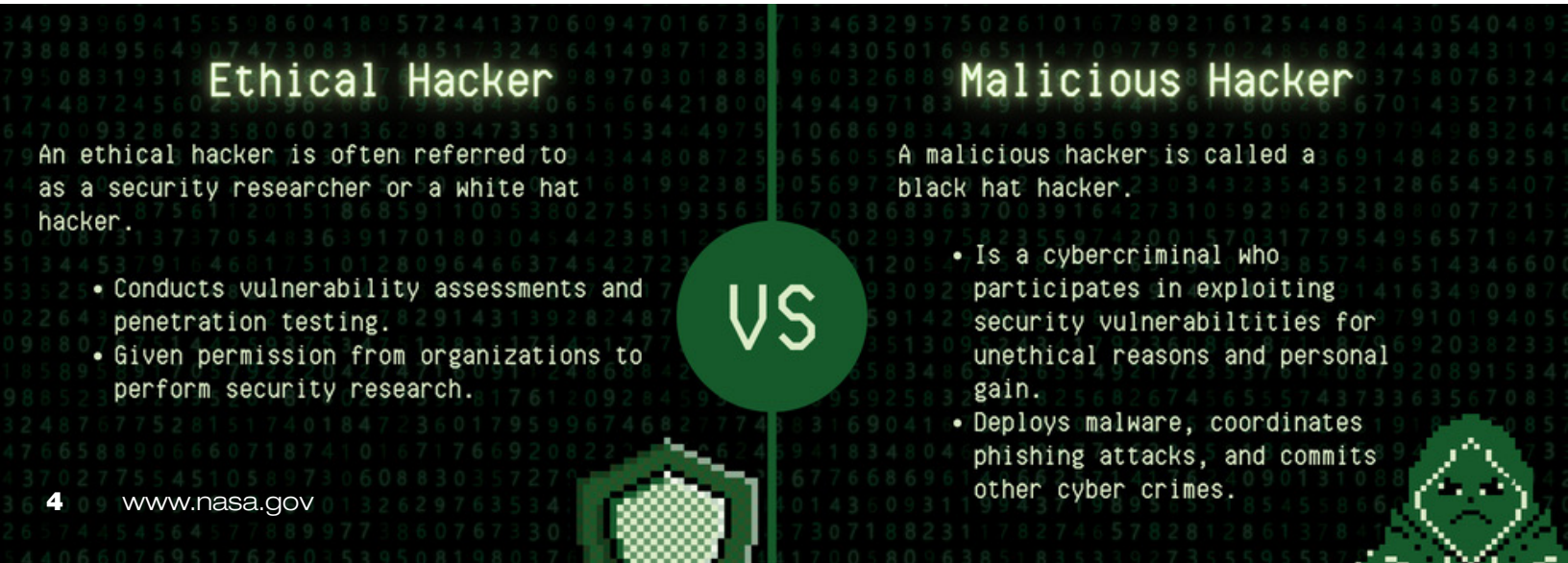
P3—Medium: Vulnerabilities that affect multiple users and require little or no user interaction to trigger.

P4—Low: Vulnerabilities that affect singular users and require interaction or significant prerequisites to trigger."

According to Martin Ramos, Cybersecurity Case Manager, finding NASA employees' credentials online is an example of a "P1—Critical" report. Ramos elaborates, "in those cases, after a report is filed, we rectify the situation by notifying the system owner, and we also work with the site with the credentials to request removal so that they are not accessible to whoever is looking."

To gain a better understanding of the appeal of security research, we reached out to 7h3h4ckv157, a prominent ethical hacker who received over 40,000 likes on a photo of their LOR on their X account. "Ethical hacking is about curiosity, problem-solving, creative mindset, discovering vulnerabilities and ensuring they are addressed before malicious actors exploit them," they emphasize. "It isn't about destruction; it's about uncovering the truth that nothing is ever truly safe." As an accomplished computer science engineer, 7h3h4ckv157 has entered the ethical hacking hall of fame for top companies such as Google, Apple, and X.

In other latest news, these tech giants are upping the stakes for security research with bug bounties as high as a million dollars. This shift indicates that the IT industry is increasingly seeking security research to build a more robust vulnerability management strategy. Cahoon adds, "ethical hacking, although it's strange to see those words together, is a very positive activity for the government and private corporations when done responsibly. I think it will become more mainstream, and the understanding will continue to evolve."



AI in Action: How the Mission Cloud Platform (MCP) Empowers Mission Partners Through Generative AI

By Catherine Tresslar, Mission Cloud Platform, and NASA Official Joe Foster, MCP Program Manager, Goddard Space Flight Center

The NASA 2040 initiative is advancing its blueprint to transform the agency's future, with technology modernization as a key focus to meet strategic goals and future mission needs. Expanding NASA's use of artificial intelligence and machine learning (AI/ML) was identified as a top priority to increase efficiency and keep pace with industry partners. The Mission Cloud Platform (MCP), a consolidated commercial cloud service within NASA, developed two in-house generative AI tools, Atlas and CodeX, to answer agency-specific questions and assist with code development in compliance with NASA standards.

What Are Atlas and CodeX?

Atlas and CodeX are generative AI prototype tools that allow agency-wide natural-language queries via a chatbot interface. They source data from procedural documents identified by the NASA 2040 workstream, including NASA directives, procedural requirements, standards, and Space Act agreements. These tools provide quick, reliable answers to questions on NASA guidance and requirements, empowering users to focus on groundbreaking science or critical mission design work.

How Does Atlas/CodeX Work?

Atlas and CodeX use large language model (LLM) technology to answer technical and scientific questions with high levels of accuracy. Atlas leverages Retrieval-Augmented Generation (RAG) to provide answers from relevant portions of source documents. RAG involves a pre-compute step where an LLM identifies semantic concepts in each source document, a process called "vector embedding." Atlas uses these embeddings to find documents semantically similar to a user query. Finally, those documents are passed to an LLM along with the user's questions and a prompt instructing the LLM to generate a helpful answer. Atlas/CodeX is designed to outperform off-the-shelf RAG solutions through improved document preparation, optimized chunking strategies, fine-tuned prompts, and incorporated subject matter expert feedback in its iteration processes.

Lessons Learned

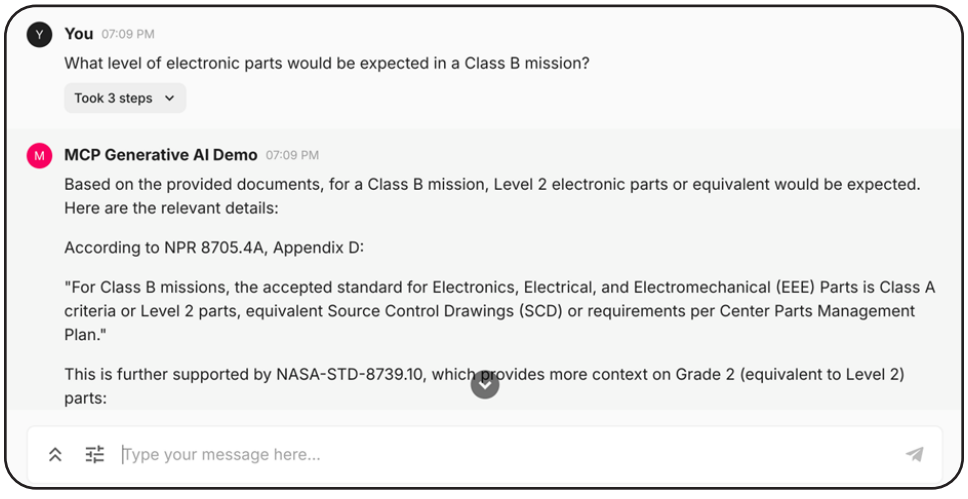
As the MCP team developed these custom tools, they captured invaluable insights that will be instrumental to expanding generative AI across NASA. Key takeaways include the following:

1. **Subject matter expertise is critical.** Building generative AI tools requires a system that can answer diverse questions touching on a variety of domains. Altas/CodeX developers are experts in cloud solutions, so it was essential to verify data and identify "good" answers with NASA mission experts to achieve desired results.
2. **Prepare for answers that may surprise you.** MCP developers received feedback from subject matter experts that answers to some questions were incorrect. Upon reviewing source documents, however, they discovered that guidance around the given subject had changed. Atlas/CodeX can help even the most well-versed users within a subject area source the most up-to-date information.

What's Next?

There is huge potential for Atlas and CodeX to grow and explore NASA's abundant knowledge bases. Immediate areas for expansion include National Institute of Standards and Technology (NIST) Publications, Federal Information Processing Standards (FIPS) Books, acquisition regulations, and travel regulations. The team also plans to develop role-based access controls, document upload features, produce knowledge graphs, and optimize answer completeness and succinctness.

Can Atlas/CodeX streamline your mission needs? Email us at agcy-missioncloud@mail.nasa.gov to learn more!



Screenshot demonstrating the Atlas/CodeX generative AI prototype.

Flight Dynamics Facility team supporting successful launch of Boeing Starliner. NASA

The Evolution and Resilience of the NaTS NASCOM Network

By Angela Culley, NaTS NASCOM Element Lead, Goddard Space Flight Center

The Network and Telecommunications Services (NaTS) Service Line provides NASCOM services to customers under the agency's Office of the Chief Information Officer (OCIO). NASCOM, which stands for NASA Communications, is NASA's worldwide real-time mission-critical network enabling spacecraft operations. It was formally established in 1964, combining the NASA ground communications system into one central program. NASCOM was the central nervous system that connected all the communications circuits (voice, television, commands, and data) of all three major NASA networks—the Satellite Tracking and Data Acquisition Network (STADAN), Mercury Space Flight Network, (MSFN) and Deep Space Network, which fed into NASA's Goddard Space Flight Center (GSFC), where it was managed. With each mission, the networks would call NASCOM to get the appropriate communications for the mission and then return the communication infrastructure when the mission was done.

NASCOM's primary customers now include Space Communications and Navigation (SCaN), Space Relay (SR), the Near Space Network (NSN), and the Deep Space Network (DSN). NASCOM provides terrestrial communication between SCaN Ground Stations, Flight Project Control Centers, Science Operations Centers, satellite manufacturers and test facilities, Federal and international partners, launch complexes, and the Flight Dynamics Facility (FDF). Additionally, in its present form, NASCOM offers data, voice, and video services to customers across the agency. Due to worldwide mission-critical support commitments, NASCOM operates continuously, 24x7x365. When it was first created, NASCOM managed its services from a single location—the NASCOM Operations Management Center (NOMC) at GSFC.

NASCOM has been instrumental in supporting iconic spaceflight achievements, featuring 12 crewed Apollo missions to the Moon from 1969 to 1972.

During the Apollo 11 mission, NASA made history with the first crewed lunar landing, allowing Neil Armstrong and Buzz Aldrin to walk on the Moon, marking humanity's first steps on another celestial body. NASCOM provided the voice path for Armstrong's unforgettable words: "One small step for a man, one giant leap for mankind."

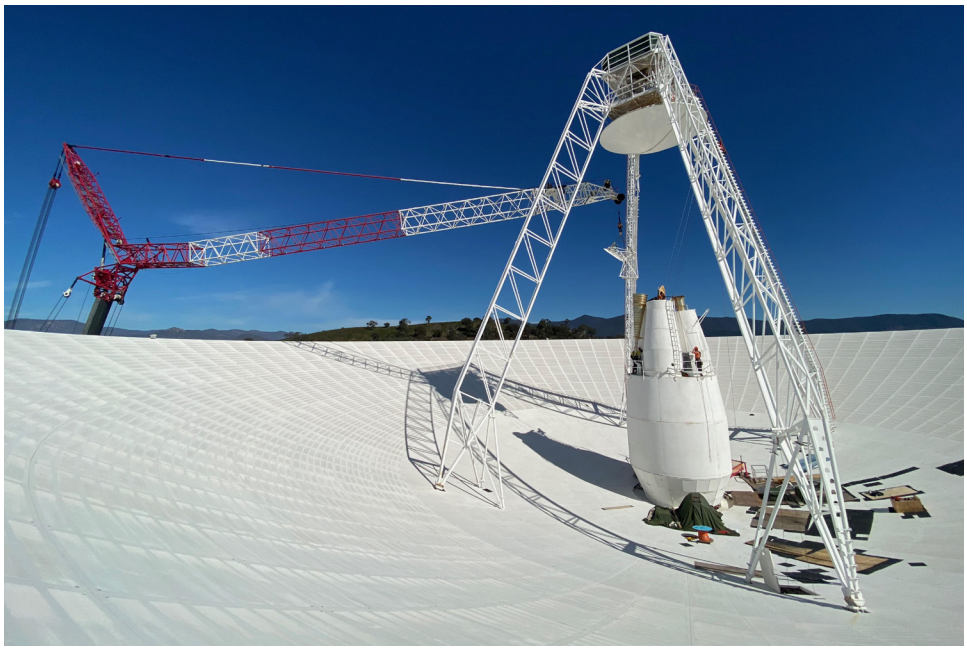
Astronaut Edwin Aldrin poses for photograph beside deployed U.S. flag. NASA

Deep Space Network sites on monitor during the Perseverance Mars rover landing. NASA/Bill Ingalls

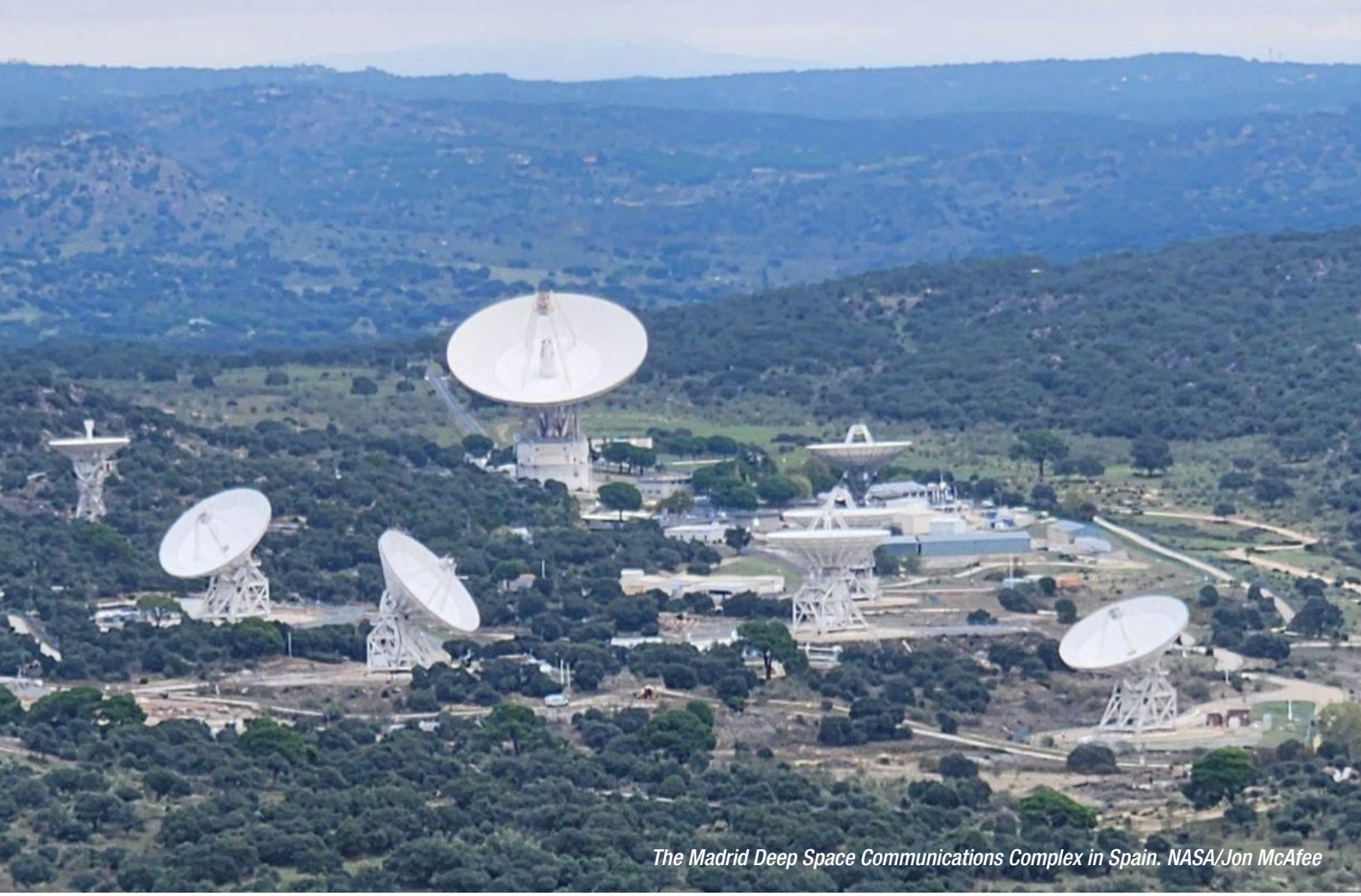
Building on this legacy, NASCOM supported all 135 Space Shuttle missions, which first launched on April 12, 1981, and culminated with the final mission on July 21, 2011. The Shuttles, including Columbia, Challenger, Discovery, Atlantis, and Endeavour, became symbols of human exploration. NASCOM has also facilitated over 40 commercial launches through partnerships with private companies, operating under innovative programs like the Commercial Crew Program and Commercial Resupply Services (CRS). NASCOM played a pivotal role in SpaceX's crewed launches, enabling astronauts to journey to the International Space Station (ISS). The first successful crewed launch under this program, SpaceX's Crew Dragon Demo-2, took place in May 2020, as the program has paved the way for exploration since 2010. NASCOM has proudly supported nearly 10 crewed missions with SpaceX. Moreover, NASCOM has contributed to uncrewed missions designed to resupply the ISS. SpaceX has successfully completed over 20 resupply missions, while Northrop Grumman's Cygnus spacecraft has accomplished 19 missions. Additionally, NASCOM supported 11 significant launches by United Launch Alliance (ULA), including the Perseverance Rover and Ingenuity Helicopter aboard an Atlas V rocket in July 2020, as well as the launch of the James Webb Space Telescope on an Atlas V rocket in December 2021, which represents one of NASA's most remarkable achievements in recent history.

In early 2023, NaTS identified the need for an alternate facility to increase the diversity and redundancy of the NASCOM Network. The NaTS NASCOM Mission Alternate Operations Facility (MAOF) Project began in May 2023 and was completed in early October 2024, implementing a solution that ensures the continuity of mission services. The NaTS NASCOM MAOF project established a geographically diverse facility at the Marshall Space Flight Center (MSFC). Before MAOF was established at MSFC, there was no secondary location available to sustain operations in the event of a human-made or natural disaster. With two locations functioning as a single unit, NASCOM can better address special support requirements, such as mission freezes, critical coverage, and individualized customer support. The additional dedicated workforce reduces risk and enhances implementation and trouble-shooting support for mission services at NASA centers and sites.

In August 2024, the facility at MSFC reached a significant milestone by supporting the Crew-8 launch and the docking of personnel at the ISS. On-console support during the launch activities included a Mission Operations Manager (MOM), a Subject Matter Expert (SME), and an operator. This milestone demonstrated the ability to transition to a distributed operations model for NASCOM mission customers. The facility features 17 NASCOM operations workspaces that facilitate the training and integration of enhanced NASCOM team members located at MSFC. The systems and server infrastructure at MSFC are designed to be redundant to those at GSFC, ensuring a geographically dispersed capability. Furthermore, the MSFC facility is connected to the NASA Mission Backbone (NMB), and NASCOM Network Monitoring and Security services and tools are fully operational at MSFC. The environment has now successfully transitioned into operation and is under the appropriate management of the NASCOM Element. As a result, NASCOM Mission Operations Centers are now established at both NASCOM GSFC and NASCOM MSFC, serving as beacons of resilience and ensuring the continuity of mission services, ready to tackle future challenges with confidence and determination.



Inside a 70-meter antenna at the DSN Deep Space Station in Canberra, Australia. NASA/JPL-Caltech



The Madrid Deep Space Communications Complex in Spain. NASA/Jon McAfee

NASA Celebrates the 60th Anniversary of the Madrid Deep Space Communications Complex

This October, a team from NASA's Office of the Chief Information Officer (OCIO) led by CIO Jeff Seaton, joined other NASA, American, and Spanish officials to celebrate the 60th anniversary of the Madrid Deep Space Communications Complex (MDSCC). The MDSCC's antennas are part of the three-complex Deep Space Network (DSN), along with sites in Canberra, Australia and Goldstone, CA. The DSN provides telecommunications for spacecraft, radar, and radio astronomy and is managed by the Jet Propulsion Laboratory and the Space Communications and Navigation Program (SCaN), and is supported by the OCIO's Network and Telecommunications Services (NaTS).

The OCIO team poses in front of the antenna that received the first signals from the Apollo 11 moon landing. Clockwise from left: NaTS Director Jon McAfee, SCaN Network Integrity Manager Justin Heubner, NASA CIO Jeff Seaton, and OCIO JPL Liaison Lara Petze. NASA/Jeff Seaton

NASA Celebrates the 60th Anniversary of the Madrid Deep Space Communications Complex (Continued)

Flyer advertising NASA CIO Jeff Seaton's lecture at the University of Madrid Facultad de Ciencias Matematicás. NASA/Lara Petze

Jeff Seaton presenting about NASA information technology. NASA/Jon McAfee

Jeff Seaton with students at the Facultad de Ciencias Matematicás. NASA/Jon McAfee

Seaton, Petze, and McAfee in Madrid, ES for the MDSCC 60th Anniversary Celebration. NASA/Jon McAfee

Saying Farewell...

By Nick Stavrakis, Cybersecurity Services Communications Lead, Glenn Research Center

As many know, Rob Binkley, the Deputy Senior Agency Information Security Officer (SAISO) for the Cybersecurity and Privacy Division (CSPD), is retiring after 42 years of extraordinary service to NASA.

There is not enough space on a page (or an entire IT Handbook) to note all the significant milestones Rob achieved during his tenure or all the incredible stories he has been a part of along the way.

Examining Rob's career, one would have to conclude he was born to do cool things. Rob's career began at Dryden (now Armstrong) Flight Research Center as a Co-op student (now Pathways) while studying electrical and computer engineering at Purdue University. After graduation, he was hired as a simulation hardware engineer, at which point his ascent into the ranks of legends began.

Over the next 42 years, Rob shared his knowledge and rose in the ranks in Systems Engineering, Research Facilities, the Project Support Office, in OCIO as the Chief Information Officer (CIO) of Armstrong Flight Research Center and eventually in his twilight tour as the Deputy SAISO of NASA in the OCIO's CSPD, where he has remained until this day. Rob also squeezed in obtaining his master's in electrical engineering from Purdue while he was busy working full time for NASA.

Rob has always had an uncanny ability to solve problems, and later in his career, he taught others how to efficiently manage IT…all with patience and a candid sense of humor. According to Rob, "You've gotta have a little fun." Think a critical system cannot be protected? Rob can figure out a solution. Unsure how to communicate IT complexities to external stakeholders? Rob knows how to effectively manage the conversation. Implementing a new enterprise cybersecurity service? Rob will be handing out homemade Star Wars–themed lightsabers at the Service KDP–Review meeting.

Rob's ability to inspire enterprise IT change management from shock, through the valley of despair, and ultimately to integration and success is unparalleled, and he leaves a significant amount of wisdom for his coworkers to pay it forward.

When asked if he could sum up his career at NASA in one sentence, his response was made in typical Rob fashion: "Easy: It's been a rollercoaster, lots of ups and downs, but [I] really enjoyed the ride of a lifetime."

While in his well-deserved retirement, Rob's NASA OCIO colleagues will remember him saying, "Remember, someday this will be the good ol' days."

A Brief Look at the OCIO Service Management Office

By Penny Hubbard, SMO Communications Lead, Service Management Office

NASA's Office of the Chief Information Officer (OCIO) has many teams working together to bring IT services and support to NASA and its close to 70,000 civil servants and contractors. This article highlights the OCIO Service Management Office (SMO), one of several Agency Level Offices (ALOs) working together with colleagues in other OCIO ALOs, Service Lines (SLs), and Centers.

The mission of the Service Management Office (SMO) is to optimize integrated, transparent, streamlined, and consistent end-to-end IT service delivery mechanisms enhancing customer satisfaction across the agency. SMO achieves this mission by leveraging industry standard frameworks to provide oversight for IT Service Management (ITSM) tools, practices/processes, governance and strategy, communications, service-level management, and service structure and reporting. Some of these processes happen in the background—for example, improving the online IT catalog interface by implementing simpler processes for approving, ordering, and tracking devices, augments, peripherals, and services. Another example is how IT incidents (unscheduled outages and/or degradation of services) will be managed, mitigated, communicated, and reported. View more details about *SMO's Core Functions* (links internal to NASA).

In addition to optimizing IT services and support mechanisms, SMO also manages the IT Service Management Working Group (ITSMWG), the Technical Integration Working Group (TIWG), and the Technical Review Board (TRB). These governing bodies enable projects, when approved, to be defined, reviewed, and moved onto other groups for further analysis and implementation. Once projects are underway, teams report updates, issues, and milestones in these boards and working groups. Visit the *SMO Events Calendar* for details on boards and working groups.

The SMO uses project management frameworks to standardize the implementation of intuitive end-user tools, reduces duplication across the board, and provides continual service improvements as we move into the future. SMO has established an excellent roadmap for today's IT with a focus on continuous improvement well into the future. To discover more about SMO, project contacts, FAQs, events, and ITSM processes, please visit *SMO online*.

Jeff Seaton speaking at the 2024 OCIO Holiday Party at NASA Headquarters

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