National Aeronautics and Space Administration

IT Talk

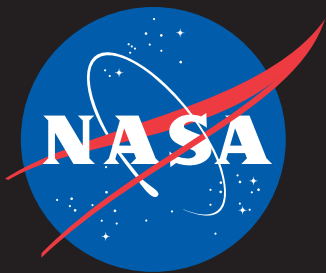April - June 2018   Volume 8 • Issue 2

WALL CLIMBER

PUFFER

OPEN SOURCE ROVER

Diverse Robotic SWARM

IT Talk

## In this Issue

Message from the NASA CIO

Working at NASA certainly has a "cool factor," which is one of the reasons so many people are attracted to it. In this issue, we'll learn about the Jet Propulsion Laboratory's (JPL) latest "gee whiz" cool things. It's a living-on-the-edge prototype known as the Diverse Robotic Swarm. JPL's Information Technology team and its robotics community have created a distributed brain and body that focus on solving a single NASA mission. The effort combines the six major technology waves we are pursuing in this IT decade.

We'll also explore how NASA's IT Strategic Plan is helping to shape our current and future NASA IT community. The Agency's Information Technology Strategic Plan (Fiscal Years 2018–2021) is a terrific roadmap for managing NASA's IT as a strategic resource. The plan helps to better connect and align the Office of the Chief Information Officer's (OCIO) daily practices with the Agency's mission and strategic goals.

And finally, we'll get an up-close and personal look at Office 365, which is coming to NASA end users in 2018! Employees will enjoy the benefit of increased mailbox size, better data security, and larger Skype meeting capabilities. The Office 365 suite will include Microsoft Word, Excel, PowerPoint, Outlook, Publisher, Access, Exchange, One Note, One Drive, and Skype for Business. Office 365 will transform the end-user experience and provide better and more innovative tools.

Sit back and enjoy this fun-filled and informative issue.

~Renee
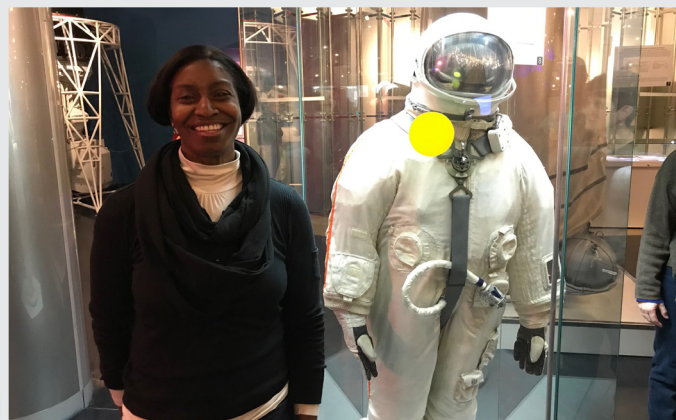
Johnson Space Center's (JSC) CIO Annette Moore and NASA CIO Renee Wynn visit network operations at the Moscow Mission Control Center in Russia, March 10-27, 2018.

Office 365 Coming Soon to NASA!

By Emily Townsend, EUSO Communications Lead, Marshall Space Flight Center

NASA will soon be migrating to Microsoft Office 365, offering a breadth of capability to our users.

Office 365 is a cloud-based e-mail, calendaring, and collaboration service, hosted by Microsoft. Office 365 lets you access your e-mail, calendar, address book, and tasks through a Web browser on any NASA computer with a Personal Identity Verification (PIV) badge. All NASA employees will receive access to Office 365.

Office 365 will eventually serve as the Agency's single cloud-based solution, replacing multiple collaboration tools we now have in place, including Exchange e-mail and calendaring, Skype, and Microsoft Office 2013.

NASA will initially implement e-mail and calendaring, OneDrive, OneNote, and Skype for Business. Implementation of Microsoft Office applications will follow in a later phase.

OneDrive for Business is the Microsoft cloud storage service that comes with Office 365. With OneDrive, you can securely store all your files in one place, share them with others, and get to them from any NASA device with a PIV reader. Every NASA user will have unlimited storage online, and with OneDrive, you will be able to sync and share your OneNote workbooks.

For e-mail, NASA users will migrate to Exchange Online in the Cloud, where they will receive secure access to their e-mail, calendar, and contacts. Exchange Online helps protect mailboxes with advanced capabilities, such as anti-malware and anti-spam filtering.

Skype for Business will provide similar functionality that users experience now with the ability to host team meetings and use Instant Messaging (IM).

"We are excited to be implementing Office 365 across NASA. This technology is industry-leading for our workforce, while supporting NASA's plans to enhance our Agency's security posture," said Sittra Battle, Program Manager for the End User Services Program Office (EUSO).

The Agency is working toward an Office 365 pilot sometime in the summer, followed by general deployment in the fall. Look for more information on *https://inside.nasa.gov/euso* or through your Center communication channels.

NEW Cloud Computing Seminar Series: How to Cloud for Earth Scientists

By Karen Petraska, Program Executive for Computing Services, Headquarters

Wish you could analyze the whole dataset, and not just selected pieces? Tired of waiting for your four-year-old server to crunch through the last job? Cloud computing may be able to help.

NASA projects are increasingly embracing the use of cloud computing, leveraging the nearly boundless computing capacity and extremely efficient cloud services. To promote further cloud adoption, the Goddard Space Flight Center (GSFC) Earth Sciences Division and Earth Science Data and Information System Project have teamed to launch a seminar series called "How to Cloud for Earth Scientists" aimed at increasing awareness of how cloud computing can be applied to the work of the science community to facilitate scientific data processing and analysis.

In the first of a series of monthly seminars, Dr. Chris Lynnes, Earth Observing System Data and Information System (EOSDIS) System Architect, surveys a wide variety of cloud computing services that can be leveraged for Earth observation data analysis. There have been four seminars to date, and both YouTube video and slides can be found for all of them at this link: *https://earthdata.nasa.gov/user-resources/webinars-and-tutorials/how-to-cloud-for-earth-scientists*.

Subsequent seminars will continue to drill down into how to use cloud computing, with an emphasis on the practical, including a look at strategies and methods for parallel computing in the cloud, cloud data storage, and exploring some NASA-specific resources for working in and with the cloud.

If you are interested in receiving information about scheduled "How to Cloud for Earth Scientists" seminars, please contact Chris Lynnes at *christopher.s.lynnes@nasa.gov*. You do not have to be a scientist to take advantage of this unique opportunity to learn more about how NASA does science.

If you are interested in using cloud computing to assist in your work, please contact your Center's Chief Information Officer (CIO) office and speak with their Cloud Computing Point of Contact: *https://intranet.share.nasa.gov/agency/cloudservices/Pages/About-Us.aspx*. The Cloud POC can connect you with appropriate resources.

MELTDOWN
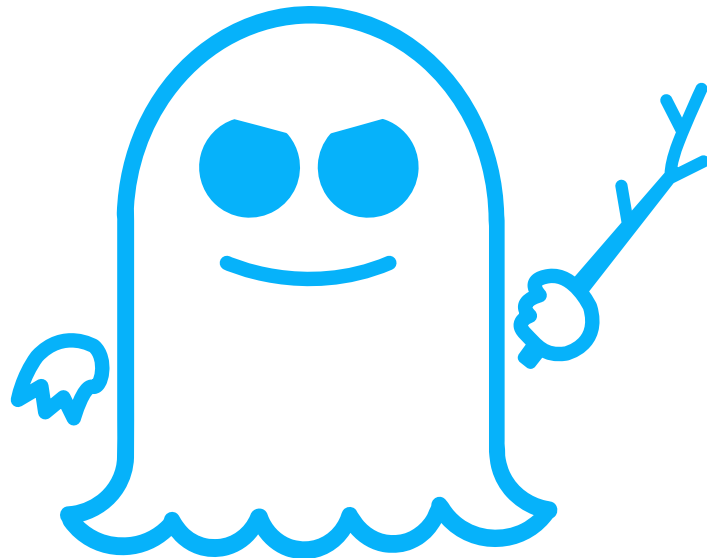
SPECTRE

Security Tips: Meltdown and Spectre

By Meredith Isaacs, Communications Specialist, Headquarters

Early in 2018, the world learned of two mysterious information security vulnerabilities: Meltdown and Spectre. Behind the dramatic names, cybersecurity practitioners and many end users wondered how exposed their devices and information were. Once the dust settled, we were introduced to two new vulnerabilities that exploit processor operations for the chips found in most of our computers and smartphones.

Typically, cybersecurity threats surround flaws in software rather than chip hardware. Both Meltdown and Spectre open doors to kernels of memory that can include passwords, documents, photos, etc. Meltdown affects computers and cloud servers and does not value any type of operating system or software over another. Spectre, using alternative methods to Meltdown, accesses kernels of memory; impacts computers, cloud servers, and mobile devices; and is difficult to employ.

Most vendors and manufacturers (including Apple, Microsoft, Android, Google, Amazon, etc.) have released software patches to mitigate the impact of Meltdown and Spectre. Not sure if you have the latest software for your personal devices? Check with your vendor for the current update number.

While these vulnerabilities do not leak information on their own, malicious actors, applications, or code can exploit these weaknesses if efforts are not taken to plug the holes.

NASA's cybersecurity teams work every day to protect you and keep Agency information and networks free from unauthorized access. You can support NASA's efforts by staying on the cybersecurity TRACKS.

Remember, cybersecurity begins and ends with you!

THINK Before you click, verify e-mail senders, links, and attachments.

REPORT Contact NASA's Security Operations Center, available 24/7, to report any suspicious cyber activity or incidents.

ACCEPT Install software and application updates on Agency devices promptly.

CONNECT To automatically receive Agency Consolidated End-user Services (ACES) weekly updates, leave your computer connected to NASA's network and left at the operating system login screen during the patching window.

KNOW Don't take the bait! Look for the signs of phishing: misspellings, requests for sensitive personal information, and hidden URLs.

SECURE Protect sensitive information, like Sensitive but Unclassified (SBU) and Personally Identifiable Information (PII), when viewing, transmitting, or storing data.

What Can IT Do with Extreme Prototyping? A Lot.

By Tom Soderstrom, IT Chief Technology and Innovation Officer, and Michael "Mik" Cox, IT Data Scientist, Jet Propulsion Laboratory, California Institute of Technology

In May 2017, we came up with a completely crazy idea that seemed extremely difficult to implement. We would execute a complex demo on technology that did not exist yet. We would involve new and inexperienced people and require IT to work with several Jet Propulsion Laboratory (JPL) organizations plus Amazon Web Services (AWS). We would incorporate several different types of rovers communicating and coordinating with each other. Most importantly, we would demonstrate this new concept on a large, public stage six months later.

Here are the basics of the idea that we ended up calling "A Diverse Robotic Swarm":

1. We would bring in two students to build a new rover from scratch using inexpensive, commercially available hardware and software, so that we could later release the rover as open source. This would help generate interest in NASA, robotics, and science and lead to hands-on training for the next generation of explorers.

2. We would make the parts list so cheap that schools or hobbyists could afford it. The previous rover took five engineers more than a year to build and came with a parts list that totaled over $30K. Our two student interns would have 10 weeks to build it with a parts list worth less than $3K.

3. We would prototype and implement new technology with AWS that was under deep nondisclosure agreement and that would (for the first time) extend the edge of the cloud to microprocessors. This would allow our robots to use off-the-shelf software for communication and coordination, which would be a big win for JPL and NASA.

4. We would create a platform for the public to continually improve the open-source rover with new engineering and science experiments.

5. We would build a Mars-like environment on stage and have several types of rovers, with dif-

ferent capabilities, collaborate to find life…all live in front of a global audience.

What could possibly go wrong?

As it turned out, many things went wrong throughout the life cycle. However, because of the extremely tight timeframe necessary to implement it, we quickly pivoted and found a solution for each item. Here are a few examples:

- The rover (currently called the Open Source Rover, or OSR) consisted of many small and inexpensive parts, which was a challenge for our logistics system. However, the JPL acquisition personnel were able to help, and we ordered (and refined and reordered) the parts just in time to build our many OSR prototypes and improve them.

- There was no available "maker space" for IT to create a rover. However, because IT partnered with several organizations, we were able to find and borrow shared lab space for machining and assembling the OSR.

- Our scope was larger than our timeframe. We wanted to implement several advanced features, including completely automated artificial intelligence and augmented reality on all rovers. Because of the extremely aggressive deadline, we were able to down-scope to ensure we could deliver the basics.

- Off-the-shelf, inexpensive parts break a lot. We mitigated this by having many spare parts and learned how to replace them quickly.

- Although the two students (Eric Junkins and Olivia Lofaro) were very bright and motivated, they had no experience with the JPL system. They were also led by an early-career hire (Mik Cox) with no JPL robotics experi-

ence. We mitigated this by asking the engineers who had built the previous rover to serve as a review board, where they gave comments in live, hands-on demos every two weeks. This greatly improved the design throughout the ten-week period and allowed us to rapidly pivot away from ideas that might lead us astray.

In the end, it worked! The distributed brain/ distributed body Diverse Robotic Swarm introduced the new Open Source Rover as well as the smaller JPL DROP (Wall Climber) and Puffer robots running on microcontrollers and using new AWS technology to collaborate on a "Martian" stage in front of thousands of people to execute a single NASA mission: Find life. And it did. This was voted the top demonstration at the event's Maker Faire. You can see the eight-minute demo from the AWS re:Invent conference at *https://youtu.be/gAi18SbtWwU?t=53m8s*.

Some of the benefits and lessons learned from this extremely rapid prototyping include the following:

- IT personnel established new relationships with key NASA missions, such as robotics. These relationships have already created new opportunities for the robotics and IT organizations.

- JPL was able to influence the development of the AWS software that extended the cloud to microcontrollers. This will help robotics going forward as we can now use standard software packages to facilitate communication between many different types of robots, as well as communication to the cloud for extended computing as needed.
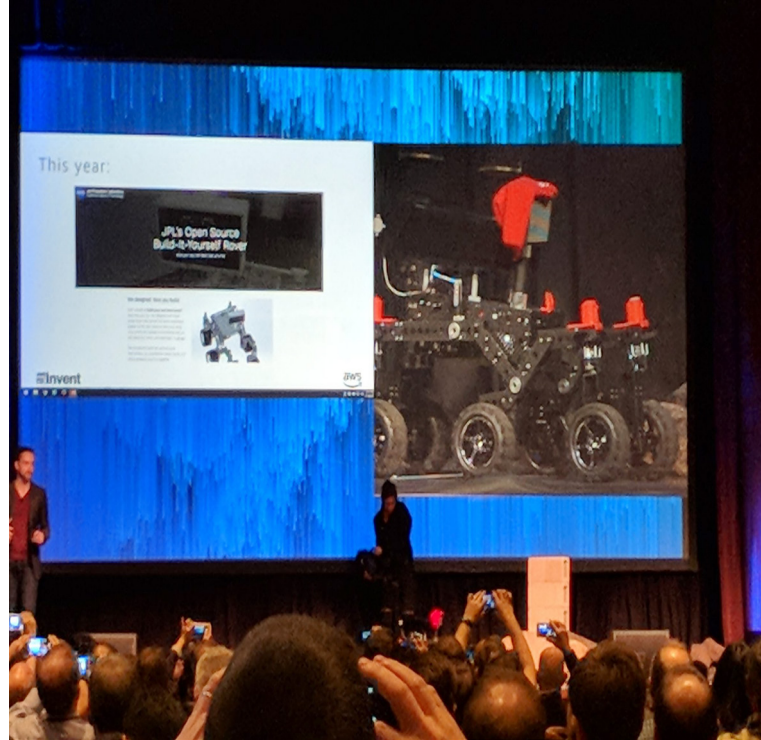
- JPL was able to recruit new personnel to the NASA mission. Eric Junkins joined JPL IT full-time upon graduation, and Olivia Lofaro (who is still in school) has been offered a second internship.

- We can get the public and schools engaged and excited about IT, engineering, and science through the open-source platform. We are now working with several schools to beta-test the build instructions and build the first of the Open Source Rovers. The program will be released to the general public in April 2018.

In the end, this type of high-risk, low-cost, fast-paced, start-up style of development—while not appropriate for everything—can help us experiment with and infuse new technologies faster. It was challenging, but also engaging and fun. It is generating excitement with the public, as evidenced by the positive engagement at the re:Invent conference as well as the Consumer Electronics Show in January 2018. We look forward to seeing how the public will engage and help us innovate with the Open Source Rover and beyond.

Spring 2018 Datanauts

Lori Parker, IT Specialist (Policy and Planning), Headquarters

NASA has selected the fifth class of Datanauts—50 individuals eager to engage with NASA's open data, collaborate with peers, and learn new skills. The NASA Datanauts Initiative was born out of NASA's focus on women in data, welcoming anyone interested in technology, data science, Earth, and space. The Datanaut community now includes designers, developers, data scientists, students, storytellers, career transitioners, managers, and entrepreneurs.

The program encourages collaboration between members, merging ideas and skills. The first four cohorts (2015–17) built an ecosystem of problem-solvers, beta-testing data science and data analytics concepts in a collaborative setting. Each new cohort builds upon the previous one—the fifth class will grow data science skills while aiding the Agency in bringing modern concepts and ideas to leadership.

Datanauts is a year-round opportunity to learn and practice data science skills with prior participants, aiding NASA in engaging unique communities with our open data and data science, specifically reaching out to women and girls. Datanauts will follow community activities via *https://open.nasa.gov*, including challenge tracks, learning tracks with supporting tutorials, and project workspaces. The class will leverage their existing skills, learn new ones, and communicate with NASA experts. We will continue weekly "data water cooler chats" with NASA data experts, former Datanauts, and external data innovation champions.

*Spring 2018 Datanauts Kickoff on February 7, 2018 at NASA Headquarters.*

Building Blocks

Through a continual feedback loop, each Datanauts class builds on the lessons and experiences of the ones prior. This class is characterized by

- opportunities for self-driven exploration/experimentation;

- regular Datanauts project presentations;

- a problem-solving mode enhanced by diversity of thought, technical expertise, experience, and culture;

- a welcoming environment encouraging risk-taking and a knowledge sharing culture; and

- insight into technology trends that may innovate NASA's IT environment.

The spring 2018 class kicked off at NASA Headquarters on February 7. Featured speakers included NASA's Chief Information Officer, Renee Wynn; the Director of Astrophysics, Dr. Paul Hertz; and astronaut Alvin Drew. The NASA team demonstrated *https://open. nasa.gov*, and all participants engaged in PCB Board Design. Welcome to all new Datanauts and welcome back to alumni who are working to collaborate, mentor, and hone data science skills.
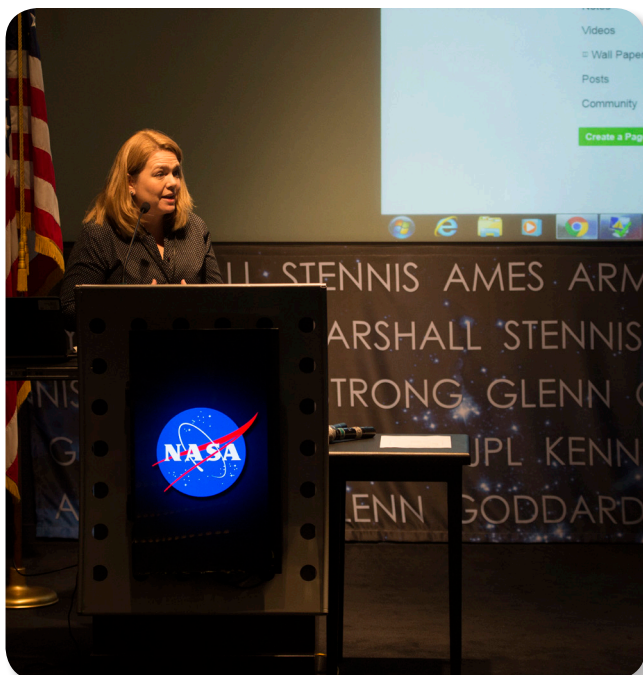
BSA Corner

By Meredith Isaacs, Communications Specialist, Headquarters

Throughout the winter, IT staff across the Agency continued the implementation of the seven Mission Support Council–approved, Information Technology Business Services Assessment (IT BSA) decision areas: Roles and Responsibilities, Governance, Computing Services, Communications, Workstations, Collaboration, and IT Security. After the 2015 deep dive into IT and its services, the Business Services Steering Committee (BSSC) recommended changes in these areas to improve collaboration, limit redundancies, and uncover efficiencies.

Setting the pace, the Collaboration and IT Security decision areas officially completed their implementation activities by the end of 2017. Congratulations to these teams and thank you to all who supported these efforts from across the Agency. We are excited by the advances made, as well as the future impacts of the work. For example, the Collaborations Tool Portal has been established (*https://inside.nasa.gov/ecs/approved-collaboration-tools*), and interested users can find tools available to them. Coming in 2018, the Core Suite of Collaboration Tools (designed to meet nearly all of your teamwork needs) will be populated with Office 365 and Cisco capabilities. Larger inboxes, bigger Skype meetings, and easy document sharing are on the horizon!

Cybersecurity and protecting NASA's networks and data are top priorities for the Agency. Establishing a risk management framework and deploying the Department of Homeland Security's (DHS) Continuous Diagnostics and Mitigation (CDM) tools have given cybersecurity personnel greater insight into our networks, devices attached, and associated risks.

Compliments to the Computing Services and Communications teams for being next across the finish line! These decision areas were officially fully implemented in February 2018. The Computing Services Program put together a detailed data center architecture, established oversight of all data center and cloud service investments, and continued monthly Cloud Community of Interest forums for interested users across the Agency.

The Communications Program continued enterprise consolidation of a number of communications services under the Network Transformation Initiative (NTI), unifying investments through shared funding and sources. When consolidating contracts, IT services pool their resources and requirements to negotiate together for comprehensive contracts, resulting in savings that are reinvested back into those same services!

Runner Report

The baton has been passed to our final three decision areas. To be completed in the near future are organizational changes for the Office of the Chief Information Officer (we'll be welcoming the Applications Division); strategic sourcing guidelines; and the use of enterprise contracts for 80 percent of our laptops, desktops, and workstations. Good luck on the sprint to the finish!
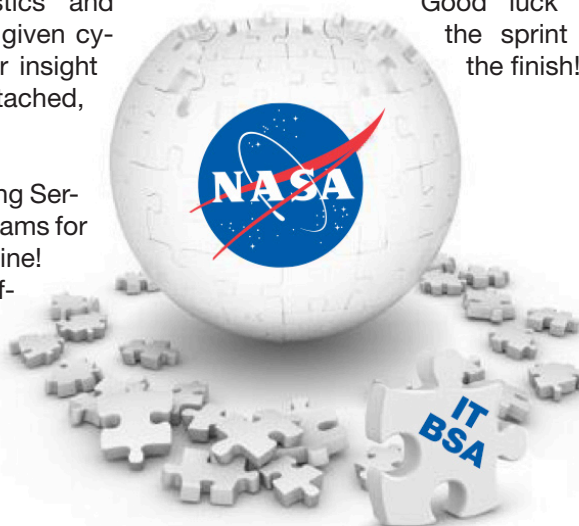
Paperwork Reduction Act

What is the Paperwork Reduction Act (PRA)? The PRA, passed in 1980 and again in 1995, requires Office of Management and Budget (OMB) approval for Federal data collection, with few exceptions. NASA is obligated to limit the public burden: "the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency" (NASA Interim Directive [NID] 1417.102, p. 7). To collect information from the public on behalf of NASA, PRA clearance is required.

Does this affect my project? Data collection from ten or more members of the public triggers PRA requirements. The PRA considers the public "an individual, partnership, association, corporation, business trust, or legal representative, an organized group of individuals, a State, territorial, tribal, or local government or branch thereof, or a political subdivision, and federal contractors" (NID 1417.102, p. 1).

To find out whether your project falls under the umbrella of the PRA, contact the Agency PRA Clearance Officer for guidance through the OMB approval process, which includes a public comment period, dispositioned feedback, and final OMB review. Approved information collection must carry the PRA statement and OMB control number. The process takes about six months to complete.

Not all collections need PRA approval. Some projects, e.g., customer surveys, focus groups, and usability testing, can use NASA's Generic Clearance. Others, like social media, message boards, contests, and design challenges, may not require any clearance. Of note, Institutional Review Board (IRB) approval does not substitute for PRA clearance; projects may require one, both, or neither.

What if I don't use PRA? While it may seem challenging to make sure your research complies with the PRA, not reporting may impact your project. To

Introducing NASA's IT Strategic Plan

By Meredith Isaacs, Communications Specialist, and Jon Walsh, IT Strategic Planner, Headquarters

What does IT do? Information technology (IT) is more than the computers on our desks, Internet connections, and e-mail inboxes. Innovation, data, and technology drive much of our work at NASA, enabling mission outcomes like International Space Station operations, human exploration in near-Earth orbit, new discoveries in our universe, air transportation system improvements, and innovations in science and technology.

Strategically managed IT contributes to NASA's missions in a number of ways, including

- sharing NASA's data and results through open, appropriate access;

- increasing mission quality and effectiveness through data and technology;

- accelerating mission results through increased productivity;

- increasing mission safety and integrity through adaptive and resilient cybersecurity;

- increasing mission cost-effectiveness by driving efficiency and reinvesting the difference; and

- driving new discoveries and mission concepts as a strategic partner on new capabilities like data science.

To support NASA's Vision and Mission and to realize our IT vision of managing IT as a strategic resource to securely unleash the power of data, NASA created the Information Technology Strategic Plan, effective for fiscal years 2018–2021. The Agency's goals for IT are as follows:

Goal 1—Excellence: Partner with customers to consistently deliver excellence and enable mission success.

Goal 2—Data: Capitalize on data management, access, and innovation.

Goal 3—Cybersecurity: Safeguard NASA's data and IT assets.

Goal 4—Value: Maximize business value by optimizing IT.

Goal 5—People: Care for our people today and prepare them for tomorrow.

This plan was created in conjunction with NASA's Office of the Chief Information Officer (OCIO)

and leaders and representatives from the Agency's Mission Directorates, mission support organizations, and Center communities. The strategic goals, objectives, and measures will help achieve NASA's Vision to discover and expand knowledge for the benefit of humanity. The Agency will evaluate this plan annually, and update the plan as needed, in alignment with the NASA Strategic Plan, Presidential administration direction and priorities, and Federal laws and policies.

When published, you will find the NASA Information Technology Strategic Plan here: *https://www.nasa.gov/ocio*

Send us your questions! *Agency-ITSP@mail.nasa.gov*

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avoid work stoppage while obtaining a late clearance, contact the Agency PRA Clearance Officer before you need to collect information. The Officer reports PRA violations and NASA's steps to resolve noncompliance.

What do I need to do? When collecting information from ten or more members of the public (remember, this group is larger than you think!), make sure you contact the Agency PRA Clearance

Officer. They determine PRA eligibility, suggest modifications to fit NASA's Generic Clearance, and walk you through the OMB approval process.

Contact the Acting Agency PRA Clearance Officer at 202-358-1351.

To read more, visit *https://inside.nasa.gov/ocio/information/info_pra/index.html*.

NASA Interim Directive (NID) 1417.102 NASA Paperwork Reduction Act (PRA) Compliance Program: *https://nodis3.gsfc.nasa.gov/OPD_docs/NID_1417_102_.pdf*.

Awards

FCW magazine included three NASA employees among their 2018 Federal 100 winners, honoring work in Federal Government information technology. Congratulations to Headquarters' Mamta Patel Nagaraja (science engagement for NASA Science Communications) and Michael Powers (an IT Security Manager in NASA's Office of the Chief Information Officer), as well as NASA Shared Services Center's James "Jim" Walker (Former Shared Services Portfolio Manager)! They will be profiled in FCW's March/April issue online and were honored at FCW's Federal 100 gala in late March.

Colleagues Luis Bares, Michael Powers, Emma Antunes, and Jeff Seaton from the NASA Office of the Chief Information Officer celebrate the 29th Annual Fed100 awards in Washington, DC. For a list of winners visit https://fcw.com/fed100

Honors

At the end of 2017, *FedTech* magazine named NASA's *Space Data Daily* to their list of 30 2017 Must-Read Federal IT Blogs.

Part of the Agency's Open Data Initiative, the blog is a gateway to NASA data for citizen scientists, developers, citizen activists, govvies, and the curious!

Check it out at:
https://open.nasa.gov/blog/

Space Agency CIO Forum
6 March 2018 - Washington, D.C.

NASA CIO