

National Aeronautics and Space Administration



NASA IPv6 Implementation Status



Office of the Chief Information Officer

***NASA IT Vision:** The NASA IT Organization is the **very best** in government*

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Agency IPv6 Transition Manager





OMB IPv6 Mandate Goals



1. Designate an IPv6 Transition Manager by 10/30/2010
2. Ensure agency procurements of networked IT comply with the FAR requirements for use of the USGv6 Profile and Test Program for the completeness and quality of their IPv6 capabilities
3. (**Goal # 1**) Upgrade public/external facing servers and services (e.g. web, email, DNS, IP services, etc.) to operationally use native IPv6 by the end of FY 2012
4. (**Goal # 2**) Upgrade internal client applications that communicate with public internet servers and supporting enterprise networks to operationally use native IPv6 by the end of FY 2014



NASA's IPv6 Implementation Status



- Despite a significant amount of planning, we are still in the early stages of implementation but quickly making great progress
- In April 2012, using Akamai, we were able to implement our top level domain with IPv6 along with about 70 other sites.
 - » Enabled us to participate in World IPv6 Launch in June
 - » This represented less than 5% of the approximately 1600 public sites that we will be implementing as part of the FY2012 mandate
- By the end of March 2013, we expect to have at least 75% of these sites implemented dual-stack with IPv6



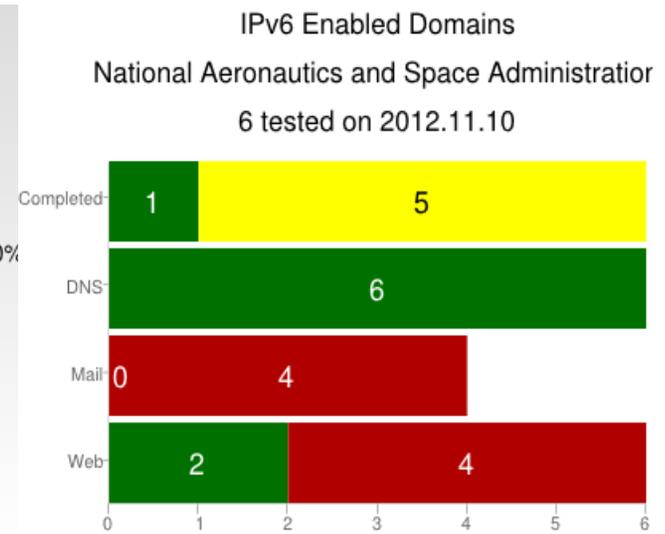
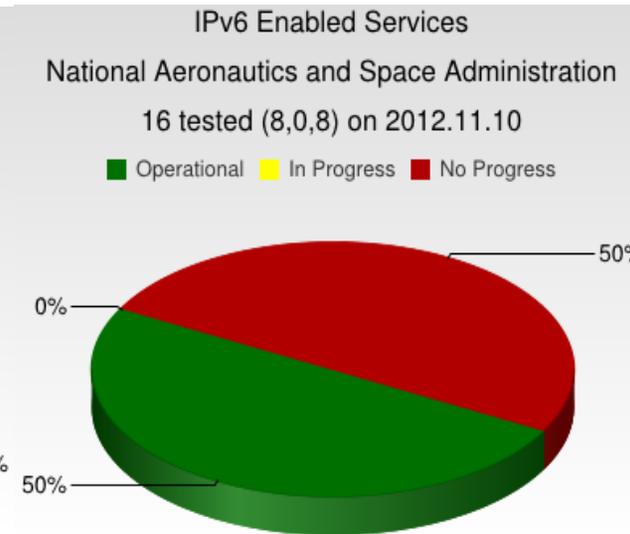
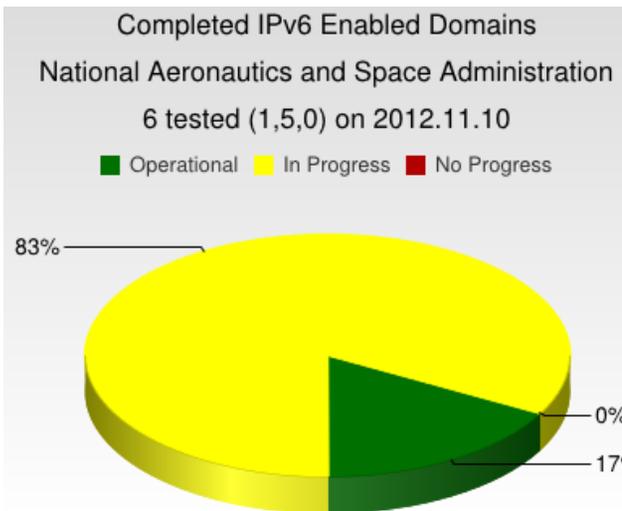
NASA's IPv6 Implementation Status²



- NIST IPv6 Deployment Monitor

<http://usgv6-deploymon.antd.nist.gov/cgi-bin/generate-gov>

Domain	Organization	DNS	Mail	Web	DNSSEC
gov.globe.	National Aeronautics and Space Administration	[4] 2/0/2 [O]	[1] 0/0/0 [O]	[1] 0/0/0 [I]	S/V/C
gov.km.	National Aeronautics and Space Administration	[3] 3/0/3 [O]	[0] 0/0/0 [-]	[2] 2/2/2 [O]	S/V/C
gov.nasa.	National Aeronautics and Space Administration	[3] 3/0/3 [I]	[6] 0/0/0 [I]	[2] 2/2/2 [O]	S/V/C
gov.nswp.	National Aeronautics and Space Administration	[3] 3/0/3 [O]	[0] 0/0/0 [-]	[1] 0/0/0 [I]	S/V/C
gov.scijinks.	National Aeronautics and Space Administration	[3] 3/0/3 [O]	[3] 0/0/0 [O]	[1] 0/0/0 [O]	S/V/C
gov.usgeo.	National Aeronautics and Space Administration	[3] 3/0/3 [O]	[1] 0/0/0 [I]	[1] 0/0/0 [I]	S/V/C





NASA's IPv6 Implementation Status³



- NASA hosts the monthly Fedv6 Working Group Meetings at NASA HQ
- Chartered IPv6 Working Group with various technical sub teams: Routing, Test & Verification, DNS, Web & Applications, and Security
 - » Distribution list, team sharepoint site, internal website
 - » Bi-weekly meetings
 - » Excellent support from OCIO, working groups & IT projects
- Regularly briefings to the CIOs – usually 1 to 3 months
 - » Often include stoplight charts on center implementation status



IPv6 Directions & Policies



- NASA will be using dual-stack. Active efforts are underway to disable tunneling by default on the firewalls and also exploring disabling this capability in pc desktops
- Standards documentations require IPv6 to be enabled in our host systems
- NASA has a /32 assigned.
 - » NASA plans to utilize octets to help identify traffic (e.g. wired vs. wireless)
 - » Reassess to see if a /32 is sufficient (e.g. Owen DeLong's, Hurricane Electric's formula)
- Reviewing IPv4 polices to see what IPv6 updates need to be made



IPv6 Implementation Challenges: Security Operations Center Vendors



Challenge: Multiple Security Operations Center (SOC) vendors were not capable of fully implementing IPv6

- Implementation was delayed until the SOC was capable of monitoring IPv6
- Utilizing a workaround, SOC was able to start monitoring IPv6 a few days before the FY2012 deadline

Lessons Learned:

- Audit IT equipment – Legacy (No IPv6 Support), Partial, Full
- Expect vendor issues (security, data center, etc.) and develop a formal process for dealing with them
- Utilize USGv6 Profile/IPv6 Ready to ensure IPv6 compliance for IT purchases



IPv6 Implementation Challenges: Lack of IPv6 Training



Challenge: NASA networking and security IT staff needed IPv6 training but there were limited training funds.

- Conducted Agency IPv6 Training sessions and webinars
- Shared information about IPv6 conferences, webinars, Fedv6 Working Group/Sub Team presentations

Lessons Learned:

- Training is very important, but it is also critical to have IPv6 labs or environments to test and verify concepts
- Expect training to be an ongoing activity
- Utilize “best value” instead of “lowest bidder” and check certifications, trainer history, etc.



IPv6 Implementation Challenges: Lengthy Address Plan Development



Challenge: Too much time was spent developing the NASA IPv6 Address Plan and it will still require updates

- After spending almost two years trying to develop an IPv6 address plan, we decided to focus on public IPv6 plans
- Further address plan details will need to be finalized in support of the FY2014 mandate

Lessons Learned:

- Follow recommendations of those with operational experience (e.g. Federal v6-taskforce, etc.)
- Accept that the address plan will not be correct the first time
- Allow the iterative process to begin by quickly testing or implementing proposed address schemas



IPv6 Implementation Challenges: No IPv6 Funding



Challenge: As an unfunded mandate, projects are expected to integrate IPv6 into their planning and purchases within their existing budgets

- NASA must leverage technology refreshes as way to replace or upgrade legacy equipment, software and tools
- NASA must ensure that IT purchases are IT compliant

Lessons Learned

- Add IPv6 compliance language to contracts as early as possible
- Add IPv6 checks to Project reviews
- Publicize/widely distribute IT compliance requirement

Actions Required to Complete FY2012 Milestone

- Fully implement the public IT infrastructure in IPv6
 - » Peer with the WAN backbone
 - » Configure IPv6 on firewalls and enable IPv6 enclaves
- Web POCs/System Administrators will need to:
 - » Request IPv6 addresses for public services & services
 - » Request ports be opened (e.g. port 80 and 443) on F/W
 - » IPv6 Status Check: <http://www.mrp.net/cgi-bin/ipv6-status.cgi>

Implement and provide proof of completion

Domain Name	nren.nasa.gov	
HTTP	SUCCESS	This service is reachable via IPv6
SMTP	SUCCESS	This service is reachable via IPv6
DNS	0/0 3/3	All DNS servers reachable via IPv6

- Enable easy tracking of the 1600 sites that are to be implemented with IPv6 as part of FY2012 mandate



Completing FY2012 & Planning for FY2014



- Agencies need to remain engaged and continue to make progress with their IPv6 implementations
- Facilitating the agencies to continue to make progress:
 - » More agency presentations that share successful implementations, challenges resolved, hurdles that still need to be addressed, etc.
 - » Collaborating to deal with vendor issues on a Federal level, as opposed to an agency level. Much in the same way OMB & GSA have been helping to resolve issues with the Networx providers
 - » Simplifying/expanding where possible the USGv6 profile.

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A banner for the gogoNET LIVE! 3 conference. It features a hand making a peace sign, a large blue circle with the number '6', and a red and white striped background with a sunburst effect. The text reads "gogoNET LIVE! 3" in a stylized font, with "LIVE!" in a blue speech bubble. Below it, it says "Conference for professionals to go v6" and "November 12-14, 2012, Silicon Valley, USA".

Backup Slides

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FY2012 Mandate Status based on NIST IPv6 Deployment Monitor



Agencies Leading the way: Defined by having multiple domains completely implemented with IPv6

- **Social Security Administration – 100%**

- Office of Personnel Management – 89%
- Dept. of Education - 85%
- Department of Justice – 65%
- EPA – 65%
- Dept. of Transportation – 57%
- Department of State – 50%

- Dept. of Interior – 35%
- General Services Administration – 32%
- Dept. of Energy – 28%
- Dept. of Commerce – 18%
- Department of Health & Human Services – 13%
- Dept. of Defense – 7%
- Dept. of Treasury – 6%