



# NASA IPv6 Implementation Status

## North American IPv6 Summit

Office of the Chief Information Officer

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

19 April 2013

Presented by: Kevin L. Jones  
Agency IPv6 Transition  
Manager



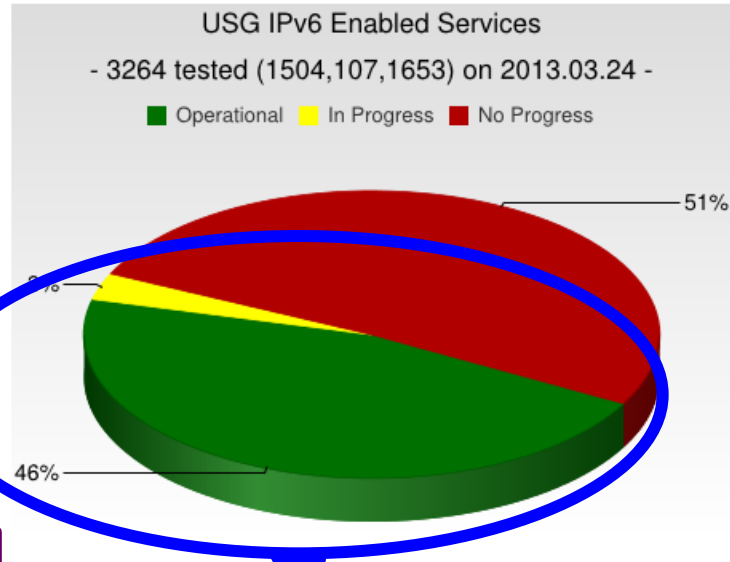
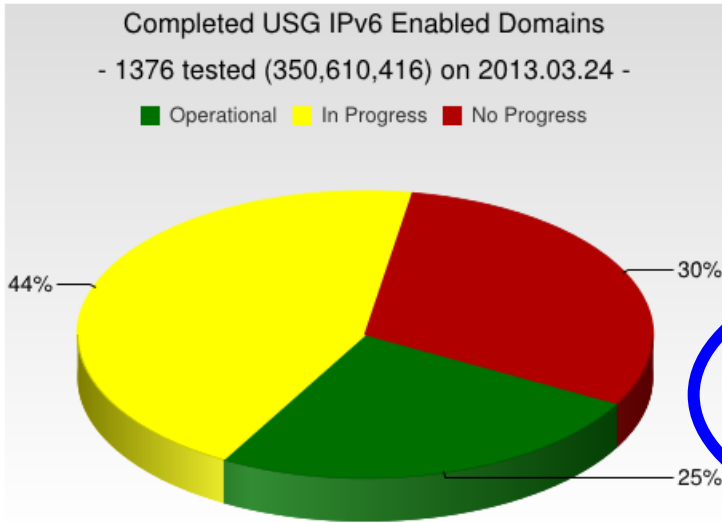
1. Designate an IPv6 Transition Manager by 10/30/2010
2. Ensure agency procurements of networked IT comply with the FAR requirements for use of the USGv6 Profile and Test Program for the completeness and quality of their IPv6 capabilities
3. (**Goal # 1**) Upgrade public/external facing servers and services (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

- NIST IPv6 Deployment Monitor – NASA Status

<http://usgv6-deploymon.antd.nist.gov/cgi-bin/cfo?agency=nasa>

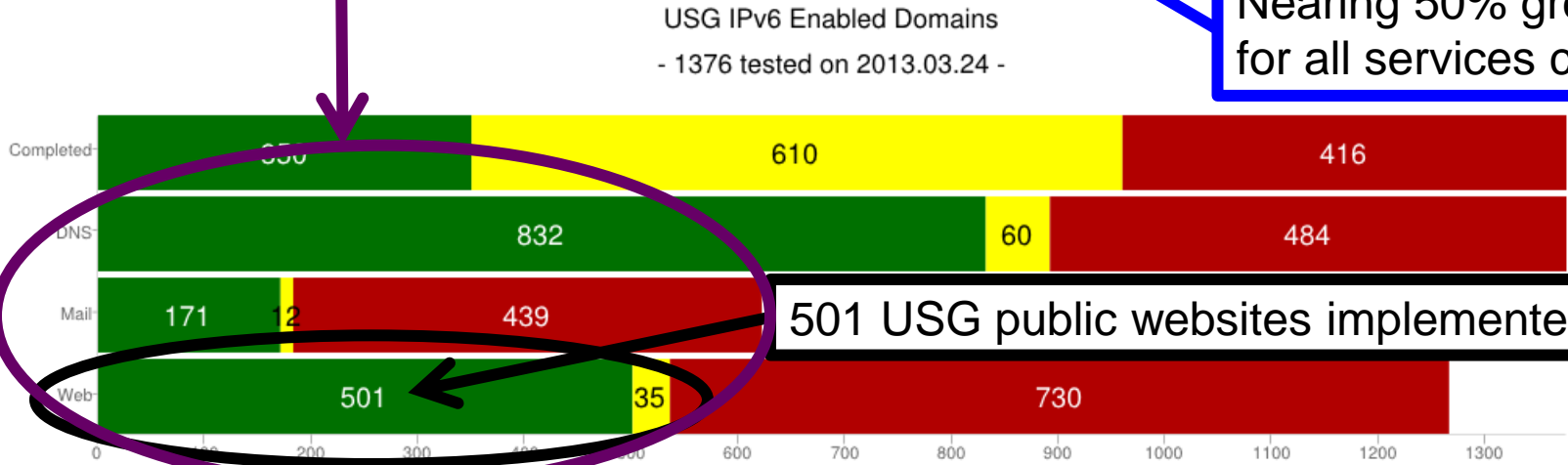
Domain	Organization	DNS	Mail	Web	DNSSEC
<a href="#">gov.globe.</a>	National Aeronautics and Space Administration	[4] 2/0/2 [0]	[1] 0/0/0 [0]	[1] 0/0/0 [I]	S/V/C
<a href="#">gov.km.</a>	National Aeronautics and Space Administration	[3] 3/0/3 [0]	[0] 0/0/0 [-]	[2] 2/2/2 [0]	S/V/C
<a href="#">gov.nasa.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

- Only secondary domains are tracked by NIST Deployment Monitor
- DNS & DNSSEC green for all six domains
- Two fully implemented domains: Km.gov and nasa.gov
- Four partially implemented domains:
  - » gov.nswp (GSFC – April/May 2013)
  - » gov.scijinks (JPL – May/June 2013)
  - » gov.usgeo (Amazon and 1&1 – December 2013)
  - » gov.globe (UCAR – TBD)



Over 1500 total IPv6 operational services

Nearing 50% green for all services checked



501 USG public websites implemented



# USG Progress on FY2012 Mandate<sup>2</sup>



- **Small Business Admin. – 100%**
- **Social Security Admin. – 100%**
- EPA – 95%
- Office of Personnel Mgt. – 89%
- Dept. of Education - 85%
- Department of Justice – 73%
- Dept of Labor – 67%
- DHS – 66%
- DOT – 60%
- Veterans Affairs – 56%
- Dept of HHS – 52%
- GSA – 34%
- **NASA – 33% (66% by June 2013)**
- DOI – 33%
- DoE – 30%
- Dept. of Commerce – 24%
- National Science Foundation - 14%
- DoD – 9%
- Dept. of Treasury – 9%
- Dept. of Agriculture - 2%
- Dept. of HUD - 0%
- Department of State – 0%
- Nuclear Regulatory Comm. - 0%
- USAID - 0%

Compare USGv6 progress to industry and university  
<http://usgv6-deploymon.antd.nist.gov/snap-all.html>

- Deadline for the FY2012 Mandate has passed
  - » Many agencies are still actively trying to complete the FY2012 goal while they plan and implement for FY2014
  - » NASA reported to OMB that we planned to complete the FY2012 mandate by the end of March 2013
- Even though we have also missed our targeted March 2013 goal, we do have a path forward to completion
- Upcoming meetings will shift focus from FY2012 completion to FY2014 planning and implementation

- IPv6 Working Group – Charter, Sub teams, sharepoint, internal website
- Public IPv6 Address Plan
- DNS & External IPv6 peering enabled
- IPv6 language added to exhibit 300 documents and to contracts (e.g. NICS, ACES, WEST)
- Targeted communications notices & briefings
- IPv6 IT asset audit
- Developed a formal process for communicating IPv6 requirements to vendors
- Developed an IPv6 Tracker sharepoint site to track progress towards FY2012 completion



# Center IPv6 Implementation Status



Center --- >	Center 1	Center 2	....	Site 1	Site 2	....	Dept.	Org.			
Milestone:											
Submit Initial IPv6 Address Plan											
Final IPv6 Address Plan Approved											
Scheduled date to peer with WAN backbone											
IPv6 Peering with WAN backbone											
IPv6 configured on Center Firewalls											
IPv6 enabled in public enclaves											
Distribute instructions to Web POCs & Sys admins											
Public servers & services enabled with IPv6											



- Most centers have completed implementing IPv6 in the infrastructure required for FY2012
- Communication with the web community & system administrators is well underway
- 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
  - » Implement and provide proof of completion



<http://ipv6-test.com/validate.php>

IPv6 validation for **prod.nais.nasa.gov/cgi-bin/nais/index.cgi**

Checking for <a href="#">AAAA</a> DNS record	✓	2001:4d0:8302:1004::e050
Checking for IPv6 web server	✓	Apache

**Congratulations, this website is IPv6 ready !**

You can help raise awareness and show your commitment to IPv6 deployment to your users, by adding an IPv6-test validator button to your site :

```

<!-- IPv6-test.com button BEGIN -->
<a href='http://ipv6-test.com/validate.php?url=referer'><img src='http://ipv6-test.com/button-ipv6-big.png' alt='ipv6 ready' title='ipv6 ready' border='0' /></a>
<!-- IPv6-test.com button END -->

```

paste the code above into your website source code to add the chosen button.

## ▪ Vendor Issues

- » IDS Vendor
- » Equipment Replacements: Firewalls, Load balancers
  - Vendors not IPv6 capable
  - End of Life Equipment
- » OS updates from routers to servers

## ▪ IPv6 Training

## ▪ Public Server Issues

- » Shifting their locations to DMZs & Datacenters
- » Separating public uses from internal uses

## ▪ Redesign of Web Architecture

## ▪ Data Center service providers

# Center Target Dates for 100% Completion of FY2012 Mandate

												Agency Totals	
121	2	127	459	95	59	115	101	28	13	12	1132		Total # Identified Sites
5	2	0	0	95	0	2	47	1	0	6	158		Total # Dual Stack
116	0	127	459	0	59	113	54	27	13	6	974		Total # IPv4 Only

4%	100%	0%	0%	100%	0%	2%	47%	4%	0%	50%	14%		Total Percentage Completed
7/12/13	Complete	7/31/13	9/30/14	Complete	12/31/13	4/30/13	9/30/13	5/6/13	9/30/13	4/30/13	9/30/14		

**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

**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.

**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

**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



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