National Aeronautics and Space Administration

Federal & NASA IPv6 Updates

Office of the Chief Information Officer

2017 North American IPv6 Summit
LinkedIn Headquarters
Sunnyvale, CA

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www.nasa.gov

NASA CIO
Office of the Chief Information Officer

September 28, 2010 OMB Memo

USG IPv6 Implementation Goals

1. **FY2012 Goal:** Enable IPv6 in public services (e.g. DNS, Email, Web, IP services)

   Rationale: Ensure citizen services are available via IPv6

2. **FY2014 Goal:** Enable IPv6 Internal Internet capable client systems

   Rationale: Ensure USG can access IPv6 enabled public services

3. **Acquisitions:** Ensure Internet capable purchases are IPv6 compliant

   Rationale: Leverage technology refreshes to obtain IPv6 enabled infrastructure

Fedv6 FY2012 Goal
Testing Tools

Publicly Available Website Testing Tools

- http://ipv6-test.com/validate.php
- http://IP6.nl
- http://ready.chair6.net/
- https://www.mythic-beasts.com/ipv6/health-check

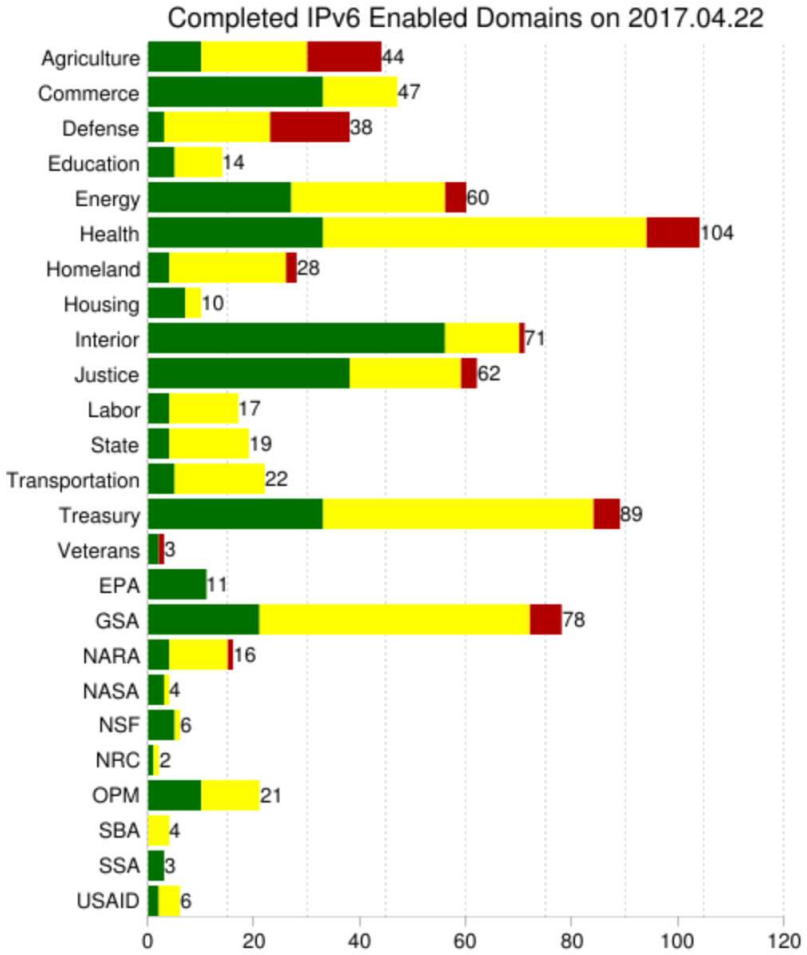
NIST Deployment Monitor

- Publicly measures IPv6 status of public websites for USG, Industry and Universities
- https://usgv6-deploymon.antd.nist.gov/govmon.html

Fedv6 FY2012 Goal Status

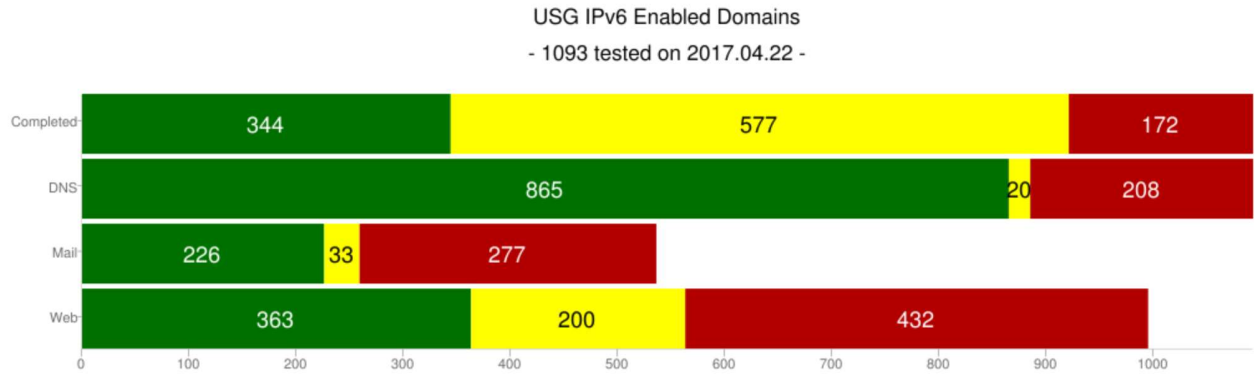
FY2012 Goal Accomplishments

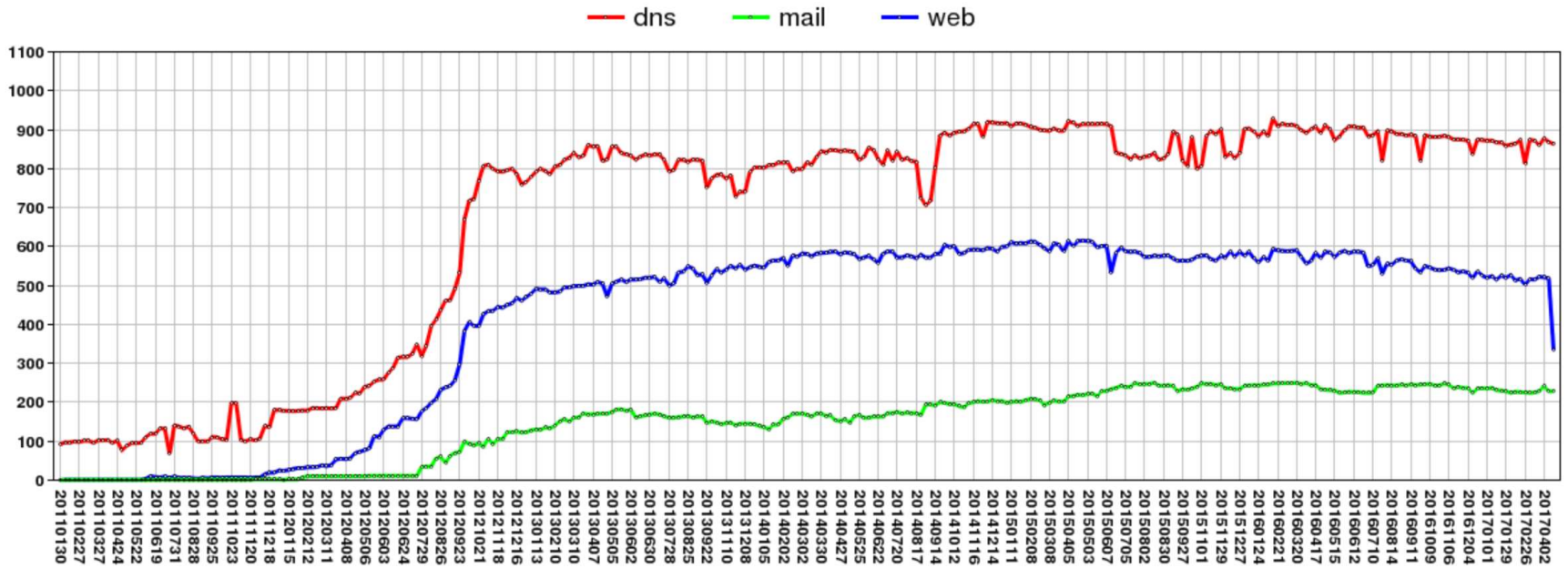
- Progress is slow but noticeable
- All agencies have made some level of progress, resulting in a lot less red on the NIST Deployment Monitor
- Majority of the DNS is IPv6 enabled
- Multiple agencies at 100% on the NIST Deployment Monitor: EPA, SSA, NASA*



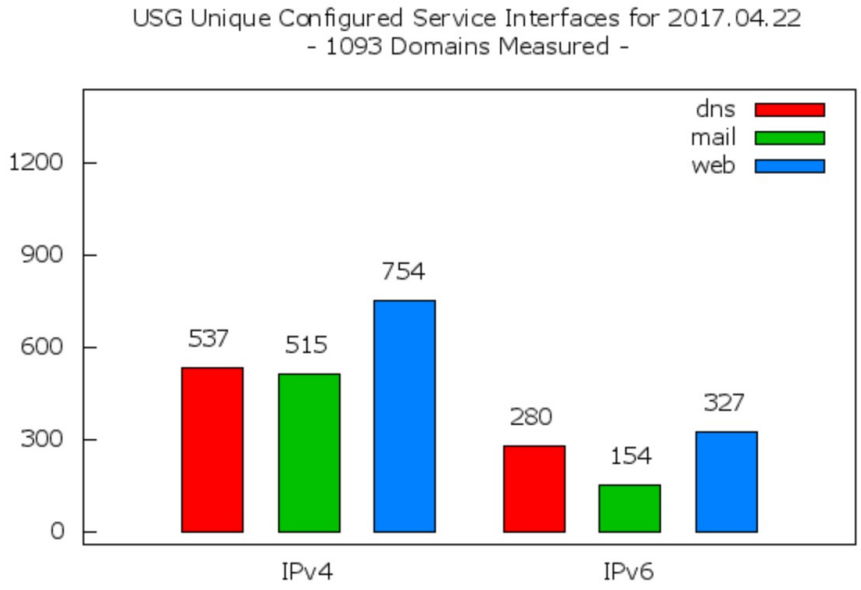
** Slide 13: NASA's NIST Deployment Monitor status*

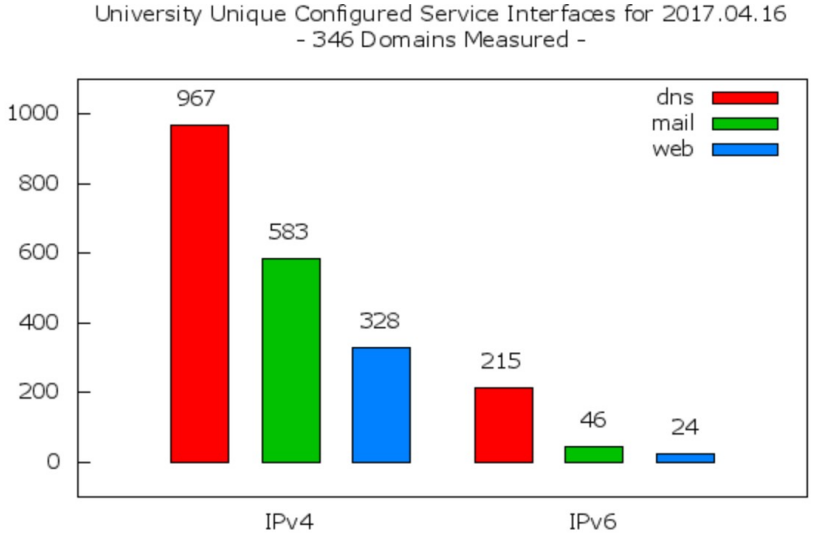
Fedv6 FY2012 Goal
USGv6 Operational Domains

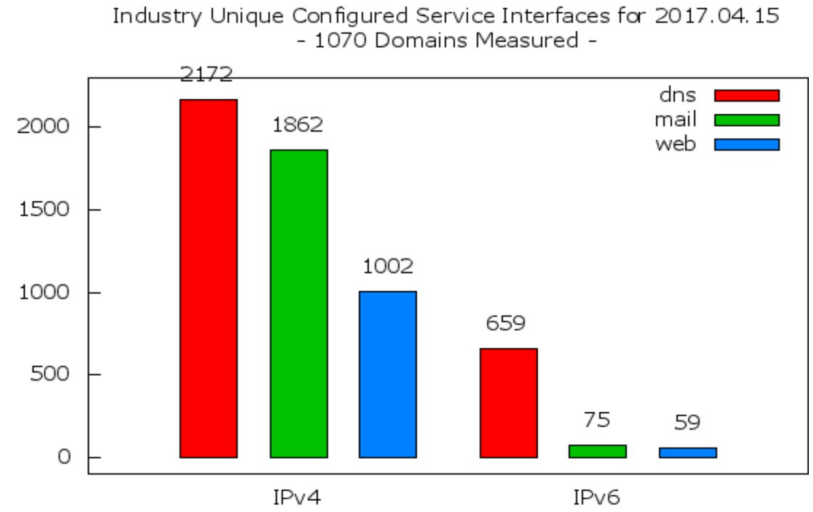




Fedv6 FY2012 Goal
Unique Configured Service Interfaces







World IPv6 Day & Launch

- June 6, 2011: World IPv6 Day – challenged to IPv6 enable public websites for 24-hours
- June 6, 2012: World IPv6 Launch - challenged to IPv6 enable public websites permanently
  - » “This Time it is for Real”
- There are still are extremely large number public websites that are not IPv6 enabled
  - » IT Technology Days
  - » NANOG
  - » Supercomputing
- Perhaps another World IPv6 event is needed to get more public websites enabled

Public Website Status

5 Stars

- LinkedIn
- Rocky Mountain Taskforce
- ARIN
- Akamai
- CloudFlare
- Erion LTD

4.5 Stars

- Cisco

4 Stars

- Infoblox
- NASA
- Comcast

3 Stars

- Microsoft

1 Star

- T-Mobile

Results are based on http://IP6.nl

NASA FY2012 Goal
Communication & Organization

- **IPv6 Working Group (WG)** – Developed from formal charter to assist communicating status, providing guidance, and discussing issues
- **Developed Sub Teams as needed:**
  - » Web & Applications
  - » Routing
  - » Security
  - » Procurement
- **Internal IPv6 Website** – Developed for providing agency-wide guidance and information
- **IPv6 WG Sharepoint Site:** Document repository for presentations, guidance, action items, etc.
- **Distribution Lists:** Each WG and subteam has a distribution list
- **IPv6 Tracker (Sharepoint & Excel):** Established to manage and track FY2012 goal status
- Quarterly presentations to the CIO Leadership Team

NASA FY2012 Goal
Planning

- Project Plan
- Centers checklist based on Project Plan
  - » Develop teams with roles and responsibilities
  - » IPv6 Training Opportunities
  - » Equipment Audit
    - IPv6 Capable, Partial IPv6 support, Legacy
    - Classification by impact to FY2012, FY2014
    - Plan to resolve issue
  - » Request Public IPv6 Address space
- IPv6 address planning for the Intranet continued

NASA FY2012 Goal
Scope & IPv6 Tracker

Services that are intended for use by the general public

- Utilized a NASA database to websites and applications to identify our public websites
- Developed the IPv6 Tracker
  - » Sharepoint & Spreadsheet are mirrors of each other
  - » Centers can access the sharepoint to see their status
  - » Spreadsheet enables easier by center status reporting
- Newly created websites had to be added to the list for IPv6 implementation
- Exploring adding a IPv6 validation check, but the databases are in transition right now

NASA FY2012 Goal
Public Websites Status

Target Completion Date: August 30, 2017

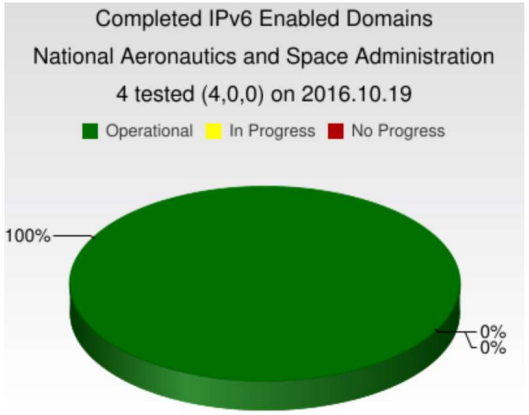
ARC	AFRC	GRC	GSFC	HQ	JSC	KSC	LARC	MSFC	NSSC	SSC	WSTP	OTHER	Agency Totals	
115	2	63	490	65	47	31	111	56	11	4	43	3	1038	Total # Identified Sites
115	2	63	344	65	47	31	111	56	11	4	43	3	892	Total # Dual Stack
0	0	0	146	0	0	0	0	0	0	0	0	0	146	Total # IPv4 Only

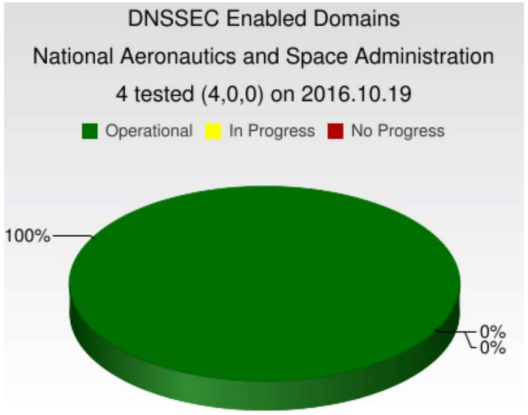
100%	100%	100%	70%	100%	100%	100%	100%	100%	100%	100%	100%	100%	86%	Total % Completed
Complete	Complete	Complete	8/30/17	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	8/30/17	

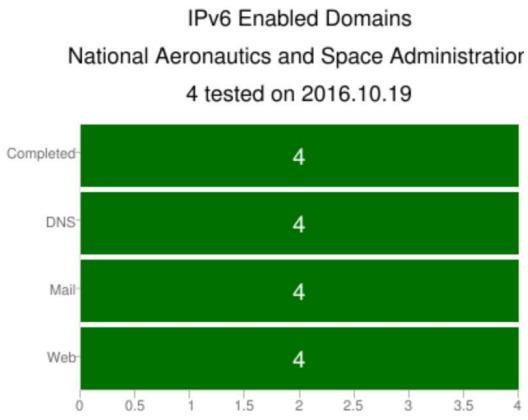
- Large number of NASA public websites
- As a result, one of larger numbers IPv6 enabled websites
- All centers 100% complete but one
- Center with the largest number of public websites is making steady progress towards completion

NASA FY2012 Goal
NIST Deployment Monitor Status

- Internet2 routing issue has NASA temporarily reporting as no longer being at 100%
- NIST is reaching out to resolve the issue
- In the interim www.nasa.gov is showing as yellow but the site is still passing IPv6 traffic







Fedv6 FY2014 Goal Status

- Tracked via the OMB quarterly Integrated Data Call (IDC)
  - » Agencies must report their implementation percentage quarterly
  - » No longer capture the target dates or challenges
- Agencies are having more difficulty with this goal
  - » At least one agency has completed this goal with a few others making significant progress
  - » Hopefully the rest of the agencies are continuing to make progress towards the completion of this goal
    - Upgrading their infrastructure
    - Shifting to a new building
    - Establishing native connectivity

Fedv6 FY2014 Goal
Testing Tools

- Test IPv6 status on your desktop system
  - » http://test-ipv6.com
    - Goal is to obtain IPv6 readiness score of 10/10
  - » http://ipv6-test.com
    - Goal is to obtain IPv6 readiness score of 20/20
- NIST tool to test IPv6 status for various services
  - » http://usgv6-2014.antd.nist.gov/
- IPv6 Now
  - » http://www.ipv6now.com.au/tools.php
    - Provides command line IPv6 tests along with capabilities from other IPv6 test websites

NASA FY2014 Goal
Planning

- IPv6 Intranet Address Plans approved for a some centers
- Centers provided LAN IPv6 implementation actions
- Center IPv6 Guidance
  - » **IPv6 Intranet Standards Document**
    - Provides a detailed set of Agency-wide local area network standards for configuring, implementing & supporting NASA IPv6 Intranet Services address space
  - » **Design Document**
    - Step-by-step instructions with a “fictitious” center
  - » **Proof of Concept & Sandbox**
    - Develop & configure fictitious center in VIRL

NASA FY2014 Goal
Dependencies: Interrelated Efforts

- NASA is undergoing various communications transformation initiatives
  - » Corporate Network Target Architecture (CNTA) LAN compliance
  - » Dynamic DHCP
  - » Perimeter Protections – VPN service, Web Content Filters, & Perimeter Firewalls
  - » Corporate Routing Symmetry
  - » Network Access Control
- DHS Continuous Diagnostic Mitigation
- Security Governance changes

NASA FY2014 Goal
Next Steps

- Reporting via the Monthly Program Integration Review
- Still in the very early stages of implementation
- Centers with approved intranet address plans will work on LAN actions
- Centers will work through various dependencies and advocate for approved IPv6 intranet address plans
- Preparing for pilot activities to start in June that will transition into early adopters
- Target is August 31, 2017 for centers with approved IPv6 intranet address plans (CNTA LAN Compliance)
- Date for full completion is still TBD since some centers will require funding to become CNTA LAN compliant

Fedv6 Acquisitions Compliance
NIST Guidance

- In July 2008, NIST created the USGv6 Profile
  - » A Profile for IPv6 the US Government - Version 1.0
  - » Special Publication 500-267
  - » https://www.nist.gov/sites/default/files/documents/itl/antd/usgv6-v1.pdf
- The roughly 75 page document provides a framework for specifying IPv6 requirements to assist in the acquisition of IPv6 technologies
  - » Host Profile
  - » Router Profile
  - » Network Protection Device Profile

Fedv6 Acquisitions Compliance
FAR Language – Primary Clause

- In December 2009, IPv6 language was added the Federal Acquisitions Regulation (FAR)

- **11.002(g) - Policy**

  Unless the agency Chief Information Officer waives the requirement, when acquiring information technology using Internet Protocol, the requirements documents must include reference to the appropriate technical capabilities defined in the USGv6 Profile (NIST Special Publication 500-267) and the corresponding declarations of conformance defined in the USGv6 Test Program. The applicability of IPv6 to agency networks, infrastructure, and applications specific to individual acquisitions will be in accordance with the agency's Enterprise Architecture (see OMB Memorandum M-05-22 dated August 2, 2005).

Fedv6 Acquisitions Compliance
FAR Language – Additional Clauses

- **7.105 (b)(5)(iii) - Contents of written acquisition plans**

  For information technology acquisitions using Internet Protocol, discuss whether the requirements documents include the Internet Protocol compliance requirements specified in 11.002(g) or a waiver of these requirements has been granted by the agency's Chief Information Officer.

- **12.202 (e) - Market research and description of agency need**

  When acquiring information technology using Internet Protocol, agencies must include the appropriate Internet Protocol compliance requirements in accordance with 11.002(g).

- **39.101 (e) - Policy**

  When acquiring information technology using Internet Protocol, agencies must include the appropriate Internet Protocol compliance requirements in accordance with 11.002(g).

Fedv6 Acquisition Actions
Agency Guidance

- **OCIO and Acquisitions Point of Contacts** – The successful establishment of Acquisitions IPv6 Compliance Policy requires collaboration from both the Chief Information Office as well as the Chief Acquisitions Office. Once the contacts from both organizations are provided they are made available via the IPv6 Acquisitions Resources Page to facilitate interagency collaboration.
- **Contract Clause/Specification Language** – Establish Acquisitions IPv6 Compliance language to be added to contracts so that the FAR and USGv6 Profile is followed when purchases are made via contract
- **IPv6 Compliance Policy Documents** – Formally describes the actions that are required by requestors, approvers and vendors to ensure acquisitions IPv6 compliance
- **Major IT Contracts** – All new IT contracts must contain IPv6 compliance language. All existing contracts that have more than three years left their term, must be updated to include IPv6 compliance language.

Fedv6 Acquisition Actions
Agency Guidance

- **IPv6 Compliance Memos** – Announces agency acquisitions IPv6 compliance policies to ensure purchases are aware of and comply with the FAR and USGv6 Profile
- **Baseline IPv6 Requirements** – Facilitates requestors specifying appropriate IPv6 requirements in statements of work, during market analysis, and directly to vendors
- **IPv6 Compliance Forms, Tools & Processes** – Methods the Chief Information Office and Chief Acquisitions Office use to ensure new networked IT purchases are IPv6 compliant
- **CIO Waivers** – A formal Chief Information Waiver process is a FAR requirement that enables a CIO to approve a networked IT purchase. Ideally, these waivers are used to obtain vendor commitments to implement IPv6 within their products and/or obtain a Suppliers Declaration of Conformity (SDOC).

Fedv6 Acquisition Actions
Agency Tracking & Vendor Impact

Agency Tracking

- IPv6 Acquisitions Compliance Stoplight Chart developed
- Developed an IPv6 Acquisitions Resource Page that contained all of the artifacts that had been successfully submitted

Vendor Impact

- More vendors are being educated on the USGv6 Profile and are providing Suppliers Declaration of Conformity (SDOC)s
- Updating SDOCs to show DHCPv6 is working in their products
- Known bugs are being fixed in vendor products

NASA IPv6 Acquisitions Compliance Status

- New IPv6 Compliance Acquisitions Actions completed in early 2016 in partnership with NASA acquisitions staff
- Developed a formal procurement notice that establishes IPv6 language for contracts
- Developed agency IPv6 baseline requirements to assist purchasers with specifying a minimum set of IPv6 requirements to vendors
- Two forms:
  - » Formal CIO waiver
  - » IPv6 check on form that is used for purchase requests
- Major IT Contracts – Network Services, Web Services, & High End Computing

NASA IPv6 Acquisitions Compliance
IPv6 Compliance Users Guide

A working document, updated as necessary…

- Baseline IPv6 Requirements & Guidance for specifying additional requirements
- FAQ
- IPv6 Applicability Matrix
  - » Helps a requestor determine whether an item is in scope
  - » Guidance on whether the item should be treated as a host, router, or network protection device
- Template for communicating requirements to vendors
- Sample IPv6 contract clauses

NASA IPv6 Acquisitions Compliance
Next Steps

- Continue to add IPv6 language to IT contracts: desktop services, SEWP V (NASA's major IT government wide acquisition contract)
- Update IPv6 Compliance Users Guide as necessary
- CIO Waiver Updates
  - » Create workflow to track the approval status
  - » Create a database for the waivers
- Expand the communications on the NASA IPv6 Compliance policies so that they go out agency-wide
- More outreach on the IPv6 compliance policies

Fedv6
Communications Tools

- Monthly Fedv6 Technical Sub Team Meetings
  - » Largely focused on Security Vendors presenting
- Fedv6 F2F Meetings Twice a year put on by the Fedv6 Outreach Sub Team
  - » Next one: GSA HQ – 6/13-14
- Fedv6 OMB Max Page
  - » Repository of various presentations
  - » Guidance documents
- Fedv6 Taskforce
  - » Works with OMB and FCIO leadership to provide guidance to the agencies
- Various distribution lists

Fedv6
Next Steps

- New OMB IPv6 Memo in development
  - » Move beyond existing goals to achieve IPv6 Everywhere
  - » Develop strategy for achieving the ultimate goal of IPv6-only
- Acquisitions
  - » NIST is updating USGv6 Profile to version 2
    - Tweaks to the core standards, adding ability to test applications/services, updating firewalls to latest CVEs, and adding a sample IoT configuration
  - » Augmenting the existing FAR language
    - Vendor specific requirements

Fedv6
Next Steps

- Shift towards automating the reporting on the IPv6 implementation goals
  - » **FY2012 Goal:** NIST Deployment Monitor
    - Also, exploring tracking the status of the more comprehensive list of agency public websites
  - » **FY2014 Goal:** Adding IPv6 status to the Continuous Diagnostic & Mitigation (CDM) Agency Dashboard
    - Utilizing a CDM tool that is common amongst most agencies to track implementation status

Contact Information

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