



NASA IPv6 Deployment Status

DREN IPv6 Summit

Office of the Chief Information Officer

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

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Overall IPv6 Status



- NASA IPv6 effort is underway, but still in the early stages of implementation
- Cooperated in the 2008 IPv6 demonstration of capabilities but not much was done afterwards for various reasons
 - » Person leading IPv6 effort left the agency
 - » Some were in denial that IPv6 was a priority
 - “We have plenty of IPv4 address space”
 - » Unfunded mandate in some sense was not extended until September 2010
- With what might be considered good timing, NASA IT leadership is supportive of the implementation of IPv6
 - » September 2010 - OMB Memo
 - » February 2011 - Depletion of IPv4 address space
 - » June 8, 2011 - World IPv6 Day



- After being appointed as the NASA IPv6 manager for NASA presentations were given to two NASA IT boards:
 - » Network Architecture Board (NAB) which consists of at least one networking lead from each NASA center and some IT groups
 - » Information Technology Management Board (ITMB) – consist of the center and mission directorate CIOs
- With the support of the ITMB and NAB the NASA IPv6 Taskforce was established
 - » The taskforce has five technical sub teams
 - » Routing, DNS, Security, Test & Verification, and Web & Applications



- Conference Calls
 - » NASA IPv6 Taskforce meets bi-weekly
 - » NASA Technical Sub Teams meet weekly, bi-weekly or as needed
- Distribution lists for NASA taskforce and sub teams
- NASA IPv6 taskforce sharepoint site
- Internal IPv6 website is in development for the entire agency to capture notices, policies, updates, etc.
- Fedv6 Meetings
 - » Fedv6 Working Group meets monthly
 - » Fedv6 Sub Teams meet as needed



- IPv6 is an unfunded mandate, and therefore there is no specified budget for this activity
- Therefore, the current NASA approach is that each IT project will have to absorb their IPv6 implementation cost within their program and/or project. As Ron says, “Everyone must do their part!”
- One of the OMB milestones requires the exhibit 300 investment submissions incorporate language about how they will implement IPv6
- IPv6 implementation is a coordination activity
- Real urgency to insure IPv6 is incorporated into all technology refresh activities



IPv6 Procurement Compliance



- FAR language from November 2009 requires agencies to comply with IPv6 compliant IT purchases
 - » Utilizing the USGv6 profile is non-trivial
 - » There is a learning curve for making Standards Declaration of Conformance (SDOC) being part of the standard IT purchase process
- Approach underway is to establish a NASA Interim Technology Requirement (NITR) that will come from the agency CIO to the entire agency via the center CIOs
 - » Gets the word out to the entire agency
 - » Policy will eventually replaced by a more formal Communications Policy Document



- Development of a NASA sub team to focus on this area has been a goal for some time now
 - » Most policy people believe the FAR language should be sufficient
 - » Procurement folks are already overloaded so while supportive they are adverse to taking on new work responsibilities
- Very interested in the efforts that will come out of the Fedv6 IT Management Sub Team
- Some agencies seem to have made progress in this area (e.g. Commerce, DoE), need to follow-up to see what they have specifically implemented and how

IPv6 Address Allocation



- Currently only two networks in NASA have IPv6 running
 - » NASA Research & Engineering Network (NREN)
 - » The LAN for the NASA Advanced Supercomputing (NASLAN)
- NASA is in the process of completing an IPv6 Guidelines document which will capture
 - » Allocation of IPv6 address space by region
 - » Process for obtaining IPv6 address space
 - » Each center, program, project, etc. will be expected to submit address plans to the NASA IP Address Management (IPAM) project to obtain IPv6 address space

IPv6 Security



- During World IPv6 Day events, discovered that our IDS vendor had not properly implemented IPv6
 - » Vendor is still working on getting fixes implemented
 - » Getting requirements to security vendors
 - » Major concern for going forward with IPv6 implementations
- Notice to the system security plan owners & security community of IPv6 effort
- In process of developing a guidelines document with best practices from the agency network WAN infrastructure group

Next Steps



- Continue to get the word out to the rest of the agency
 - » NITR, internal IPv6 website, Notice to the Security Community, Security Guidelines document
- Center Readiness Assessment
 - » Notification of the IPv6 effort
 - » Data call to establish the readiness of center network infrastructure to turn of IPv6
- Organizing the list of public/external facing servers and services that need to be implemented with IPv6
 - » Consolidation of the list
 - » Grouping by center would enable progress tracking via CIO registry tool

Next Steps



- Utilizing Ames Project Management Office support
 - » Requirements Review
 - » Development of an IPv6 Implementation Plan
 - Updated ACT-IAC Roadmap that is due to be completed in September
 - Requirements Review
 - Transition Plan
- Developing NASA IPv6 Checklist
 - » Infrastructure
 - » Website & Applications
- Developing IPv6 Testplans and testing best practices



Contact Information



- NASA IPv6 Taskforce Sharepoint Site:
 - » <https://share.nasa.gov/teams/arc/ipv6-taskforce/default.aspx>
- NASA IPv6 Distribution Lists:
 - » ipv6-taskforce@lists.nasa.gov
 - » ipv6-routing-subteam@lists.nasa.gov
 - » ipv6-dns@lists.nasa.gov
 - » ipv6-security@lists.nasa.gov
 - » ipv6-tv@lists.nasa.gov
 - » ipv6-web-apps@lists.nasa.gov
- Federal IPv6 Taskforce Distribution Lists
 - » v6task-force@nist.gov
 - » fedv6-deploy@nist.gov
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Backup Slides

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The Good – Things worked!



- Operating systems (Linux/Unix, Mac OS X, Windows), web servers (e.g. Apache) clients (Firefox, Safari, IE)
- Most dual stack IPv4/IPv6 host client and server applications including ssh, scp, Kerberized telnet and rcp (although Kerberos itself was only using IPv4), and http/https client and server
- IPAM and DNS (both forward AAAA and reverse PTR records)
- Global IPv6 routing exchange and packet forwarding verified to a number of sites
- ping6 and traceroute6 IPv6 network diagnostic tools performed analogously to their ping and traceroute IPv4 tools
- 10-GigE IPv6 network performance between GSFC and ARC using our automated nuttperf/nuttcp network performance measurement capability was demonstrated to be very comparable to the equivalent IPv4 network performance tests

The Bad – Things to watch out for...



- Some sites did not make IPv6 DNS available via IPv6 (making pure IPv6 problematic)
No single transition day for IPv4 to IPv6
Was 2010 impact to IPv6 users that it caused a few unnecessary issues for IPv6
- In some cases, IPv6-only routers can't run IPv6-only.
Some apps & tools still require IPv4 only
- Need creative approaches for troubleshooting IPv6 connectivity
- Likely ISPs are in the process of upgrading IPv6 by 2012 too
- Network monitoring needs to support IPv6
- Firewalls will probably need to replicate IPv4 rulesets with equivalent IPv6 rules
Dual-stack requires security for both IPv4 & IPv6
required effort to support simultaneous IPv4 & IPv6 access restrictions

The Ugly – Warning: Lots of work ahead...



- Policy development is behind the technology development, and some policies will have to be updated.
Need to update both policies & equipment
- Security is behind the other aspects of IPv6. Many IDS systems handle IPv6 poorly. If security is not addressed early, security will be behind at least one year.
Need communicate IPv6 security reqs. to vendors early
Security will have to play catch-up in order to meet mandated deadlines.
- If no IPv6 route exists to some service such as a web server, the system automatically drops back to an IPv4 connection, but if an IPv6 route exists (e.g., via ID-64 interface), the ID-64 interface will drop back to IPv4 after a timeout before switching to IPv4.
Growing pains in this transition are inevitable
- Postponing the implementing IPv6 is no longer an option. It is critical to “begin” now.
Now is the time!