



# US Government & FNAL IPv6 Update

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# US Government IPv6 Mandate & Status Update

# Refresh - US Government IPv6 Mandate




- FY23
- All new federal systems to be IPv6 enabled at deployment.
  - 20% of all networked federal systems IPv6-only

- FY24
- 50% of all networked federal systems IPv6-only

- FY25
- 80% of all networked federal systems IPv6-only
  - Identify, plan, schedule retirement/replacement of remaining networked systems that cannot be converted to IPv6-only

- US National Labs (T1s) are included; but university-run T2s are not subject to the mandate

# Full Speed Ahead to IPv6, right?

- Not so fast, my friend...
- The US Government has issued OMB IPv6 mandates before:
  - 2005: Federal agency networks provide IPv6 support by 2010 
  - 2010:
    - [a] IPv6 support for DNS, email, & web services within federal end sites by 2012 
    - [b] Internal (user) client applications use IPv6 by 2014 
- General trend with OMB IPv6 mandates has been the harder the objective, the less that actually gets done

# DOE's IPv6 Policy & Implementation Plan

DOE IPv6 Policy	DOE IPv6 Implementation Plan (Guidance on how sites should implement DOE IPv6 Policy)
Follow the OMB(*) Mandate	Follows OMB(*) Mandate and has current guidance: <ul style="list-style-type: none"><li>• Scientific Instrument Systems<ul style="list-style-type: none"><li>• Enable IPv6 per OMB Timeline (dual-stack)</li><li>• Transition to IPv6-only as external collaboration allows</li></ul></li><li>• Scientific Control Systems (SCS)<ul style="list-style-type: none"><li>• Transition to IPv6-only during natural lifecycle refresh</li></ul></li></ul>

- DOE Policy & Implementation Plans still waiting for OMB(\*) approval

(\*) Office of Management & Budget – US Govt IPv6 policy enforcement arm

# DOE status 10/2022

- Based on FISMA reporting, DOE is:
  - Lead of *reported* federal systems with ~1.2% of assets running single stack IPv6
    - Next closest department is < .01% IPv6-only
  - 11.6% of reported systems dual-stacked
  - Other departments are considerably further along with dual-stack
  - OMB asked for feedback on evaluation DOE implementation plan
    - DOE has provided feedback and suggestions for further evaluation

# FNAL IPv6 Status Update

# FNAL IPv6 Status & Efforts

- IPv6-only focus is on business & administrative systems:
  - Scientific computing focus is on dual stack for now; IPv6-only will come as scientific collaboration allows
- US-CMS T1 is fully dual stack:
  - Including batch system, user analysis (LPC) cluster, & worker nodes
- Non-CMS scientific computing systems/clusters are mostly dual-stack:
  - Data servers are fully dual stack



# FNAL WAN Traffic – IPv6 vs IPv4

	Outbound Traffic (*)	Outbound % IPv6	Inbound Traffic (*)	Inbound % IPv6
<b>Science Networks (**) Traffic</b>	56 Gb/s	44%	29 Gb/s	77%
<b>General Routed IP Traffic</b>	29 Gb/s	33%	10 Gb/s	18%
total	85 Gb/s	40%	39 Gb/s	61%

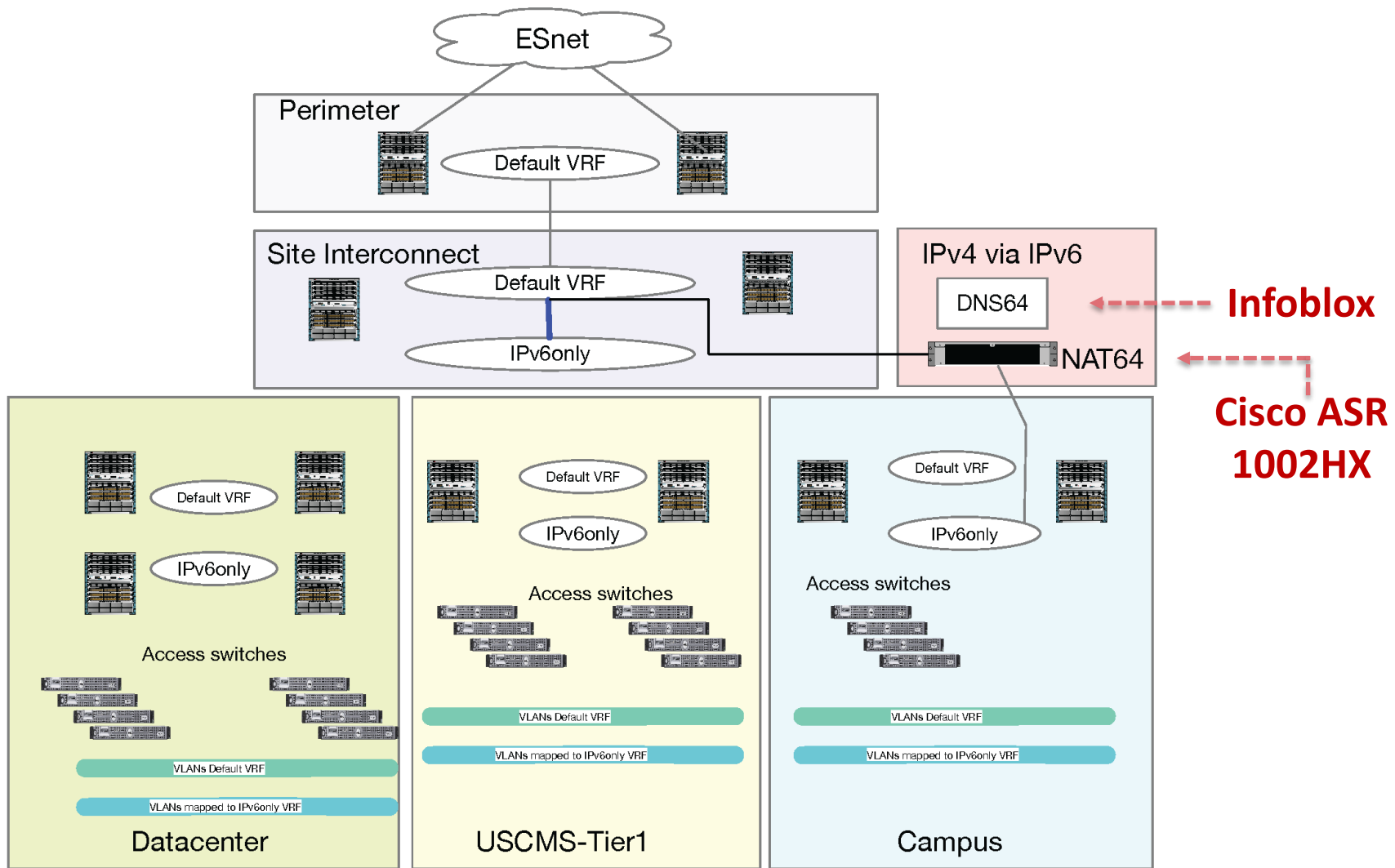
(\*) 24/7 average

(\*\*) LHCONE / LHCOPN / pt-to-pt circuits / etc

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# FNAL IPv6-Only Strategy...

- Deploy separate VRF for IPv6-only:
  - Default (dual-stack) and IPv6-only VRFs use same physical links but separate virtual uplinks for inter-switch connectivity
  - At Site-Interconnect, Default (dual-stack) VRF and IPv6-only VRF are connected together
  - DNS64 (Infoblox) and NAT64 (ASR-1002-HQ) provide IPv4/IPv6 translation services
- Systems moved to IPv6-only by vLAN change on switch port:
  - Initially for testing & evaluation (ie., see what breaks...)
  - Eventually, permanent migration...



# Questions

