Department of Veterans Affairs
IPv6 Addressing

Lessons Learned

Agenda

- **Development and Implementation Process**
- **Lessons Learned**
- **Questions**

Development and Implementation Process (1 of 4)

- **Implemented an IPv6 addressing team**
  - **Responsible for:**
    - **Defining an addressing structure**
    - **Determining organizational address needs**
    - **Address space request to ARIN**
    - **Defining how addresses were to be managed and assigned**
    - **Selecting an Address management tool (IPAM)**

Development and Implementation Process (2 of 4)

- **Defining an addressing structure**
  - **Started with existing IPv4 addressing structure**
  - **Included future growth and re-organization plans**
    - **National Medical Device Network**
    - **Centralization of Resources**
- **Determining organizational address needs**
  - **Focus on Subnets and hierarchies (address rollup)**
    - **More complicated than an ISP**
      - **Support for networks of networks**

Development and Implementation Process (3 of 4)

- **Address space request to ARIN**
  - **Submitted request through our organization POC**
- **Defining how addresses were to be managed and assigned**
  - **Standards based**
  - **Centralized management structure (IPAM)**

Development and Implementation Process (4 of 4)

- **Selecting an Address management tool (IPAM)**
  - **Addresses are to big and complicated to trust to a spreadsheet**
  - **Reduce risk of logic errors**
    - **Overlapping subnet space**
  - **Support for real world descriptions of IPv6 subnets (objects)**
  - **Built in web based interface to support access controls and error checking**

Lessons Learned (1 of 10)

- **Plan on rolling out multiple address plan iterations**
  - **No matter how much expertise and involvement you bring to the table initially, it won't cover everything**
    - **We are up to version 4 of our plan now**
  - **Incorporate staff in the design process with a lot of corporate history**
    - **They will know about ideas that keep coming around but haven't gotten anywhere due to IPv4 limitations**
      - **For example, a separate "national" medical device network**

Lessons Learned (2 of 10)

- **IPv6 logic is not IPv4 logic**
  - **For example, IPv6 does not try to conserve addresses**
  - **Hiding (subnet ranges) is not something to plan for**
  - **What about broadcast storms with 18 million trillion hosts per subnet? (the number of hosts in one /64 subnet)**

Lessons Learned (3 of 10)

- **Stay Standards Based**
  - **Won't be limited to only vendors that support your non-standard approach**
  - **You're not saving any addresses by using a non-standard implementation**
    - **For example, using a /127 subnet mask instead of a /64 for point to point links – the difference between 2 or 251 (the standard size of a class C subnet, or 5000 (an example of how many hosts one might put in an IPv6 subnet) out of 18 million trillion addresses isn't enough to matter (the number of possible hosts in one /64 subnet) *(remember my comment earlier about IPv6 and IPv4 logic differences).***

Lessons Learned (4 of 10)

- **Stay Standards Based (continued)**
  - Watch out for vendor specific implementations
    - For example, does the Microsoft and RedHat IPv6 implementation interoperate? (tunnels, DNS, etc…)
    - "Trust but verify" everything that your circuit and hardware vendors say
      - "Capable" and "Supports" may not mean "does" or "performs"
  - Makes it easier to interface with neighbor networks

Lessons Learned (5 of 10)

- **Order two address ranges from ARIN**
  - **One for production**
  - **One for piloting and development**
    - **To be turned in as production gets rolled out**
  - **Don't have to be the same size**

Lessons Learned (6 of 10)

- **Ask for more space (a lot more) than you think you will need**
  - **It isn't host address space that will get you, it's the subnet address space**
- **Build to nibble boundaries**
  - **ARIN standard**
  - **Again, not thinking in terms of IPv4 conservation of address space**

Lessons Learned (7 of 10)

- **Monitor your vendor**
  - **Both circuit and equipment**
  - **"Trust but Verify" (where have I seen that before?)**
  - **Be prepared to drop those that do not support your move to IPv6**
    - **This might be a good time to switch vendors if the cost to "upgrade" your current equipment or circuits is higher than it is to "purchase" new equipment or circuits.**
    - **In our case, getting carriers to provide "native" IPv6 connections into the community has been, and continues to be, very difficult**
      - **Point to point connections are available but why do you want to build a point to point network with all of your business partners??**

Lessons Learned (8 of 10)

- **Get ahead of the curve**
  - **Get your IPAM tool in place early**
  - **"Test" and "development" have a tendency to become "permanent" especially if they interface with the Internet**
    - **(this comes back to the earlier comment about ordering two address ranges)**

Lessons Learned (9 of 10)

- **Don’t rely on self starters**
  - **Self starters are critical to building enthusiasm and finding out about “gotcha’s” but the organization needs to build an internal team of management and support personnel to support the operations of IPv6**

Lessons Learned (10 of 10)

- **Document everything**
  - **Who said "what", "when" becomes important when contracting gets involved when a "capable" item becomes a "non-performing" item**
  - **It is also important to document why changes were made to your address plan**
    - **This is not about blame but about the logic**

Questions?

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