



# **U.S. Department of Veterans Affairs**

## **IP Address Planning & Design**

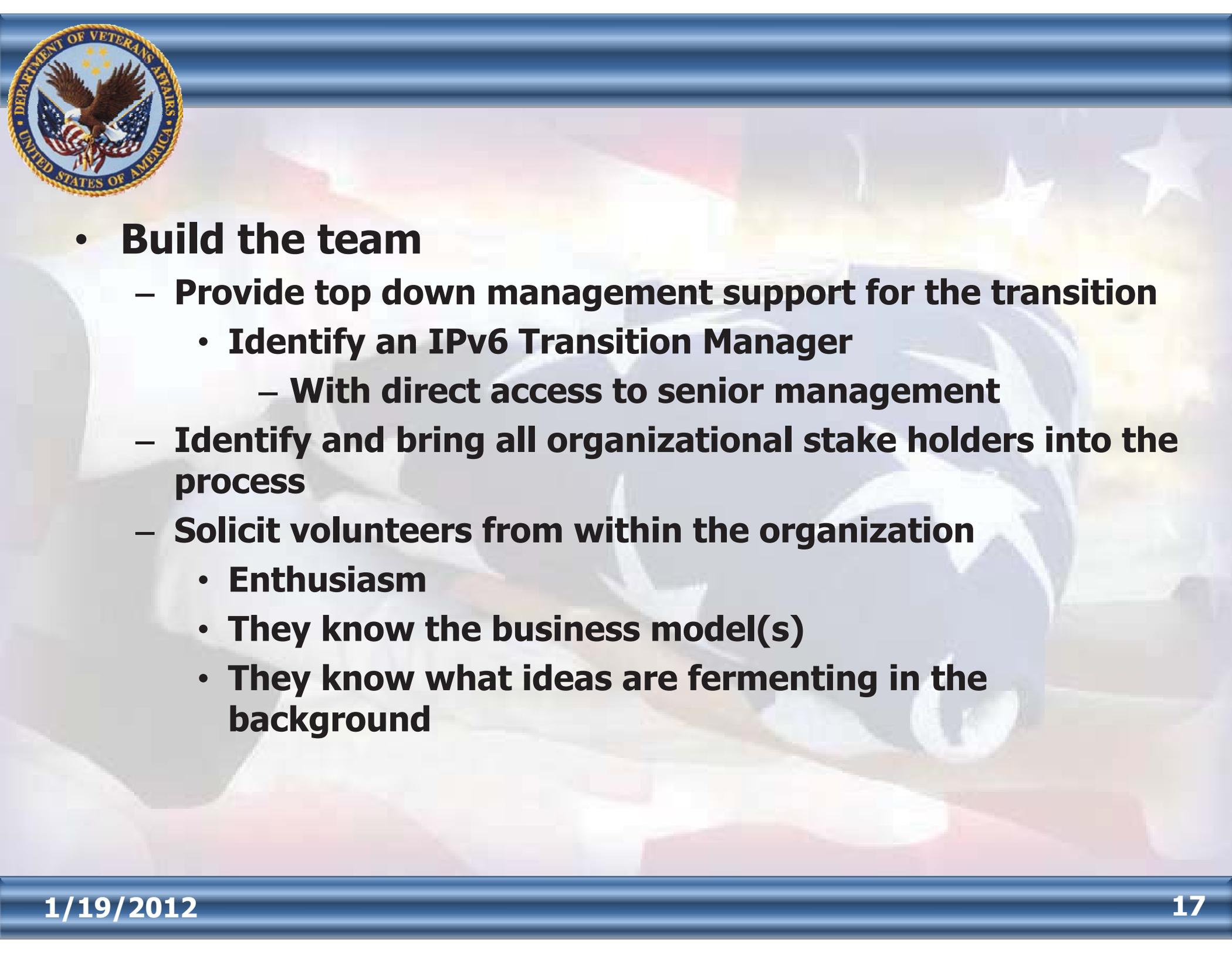
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# Address Design



- **Build the team**
  - **Provide top down management support for the transition**
    - **Identify an IPv6 Transition Manager**
      - **With direct access to senior management**
  - **Identify and bring all organizational stake holders into the process**
  - **Solicit volunteers from within the organization**
    - **Enthusiasm**
    - **They know the business model(s)**
    - **They know what ideas are fermenting in the background**



- **Solicit volunteers from within the organization**
  - **Include volunteers with from a wide variety of backgrounds**
    - **Network design/management**
    - **Network Security**
    - **Project Management**
    - **Contracting**
    - **Education/Training**
- **Select/hire a contractor team for support**
  - **Prevent burn-out of your volunteers**
  - **Handle the administrivia**
  - **Provide a sounding board for internal implementation plans**
  - **Bring a “second opinion” to the table**



- **Finally, create a portal for central storage of information and publishing schedules**



# Lessons Learned



- **Plan on 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**



- **IPv6 logic is not IPv4 logic**
  - **There is a different link layer protocol in IPv6**
  - **For example, IPv6 does not try to conserve addresses**
  - **Hiding (subnet ranges) is not something to plan for**
  - **What about chatty hosts with 18 million trillion hosts per subnet? (the number of hosts in one /64 subnet)**
    - **IPv6 handles broadcasts differently from IPv4 so broadcast storms don't happen in IPv6**
  - **How many IP's will you have in a subnet?**

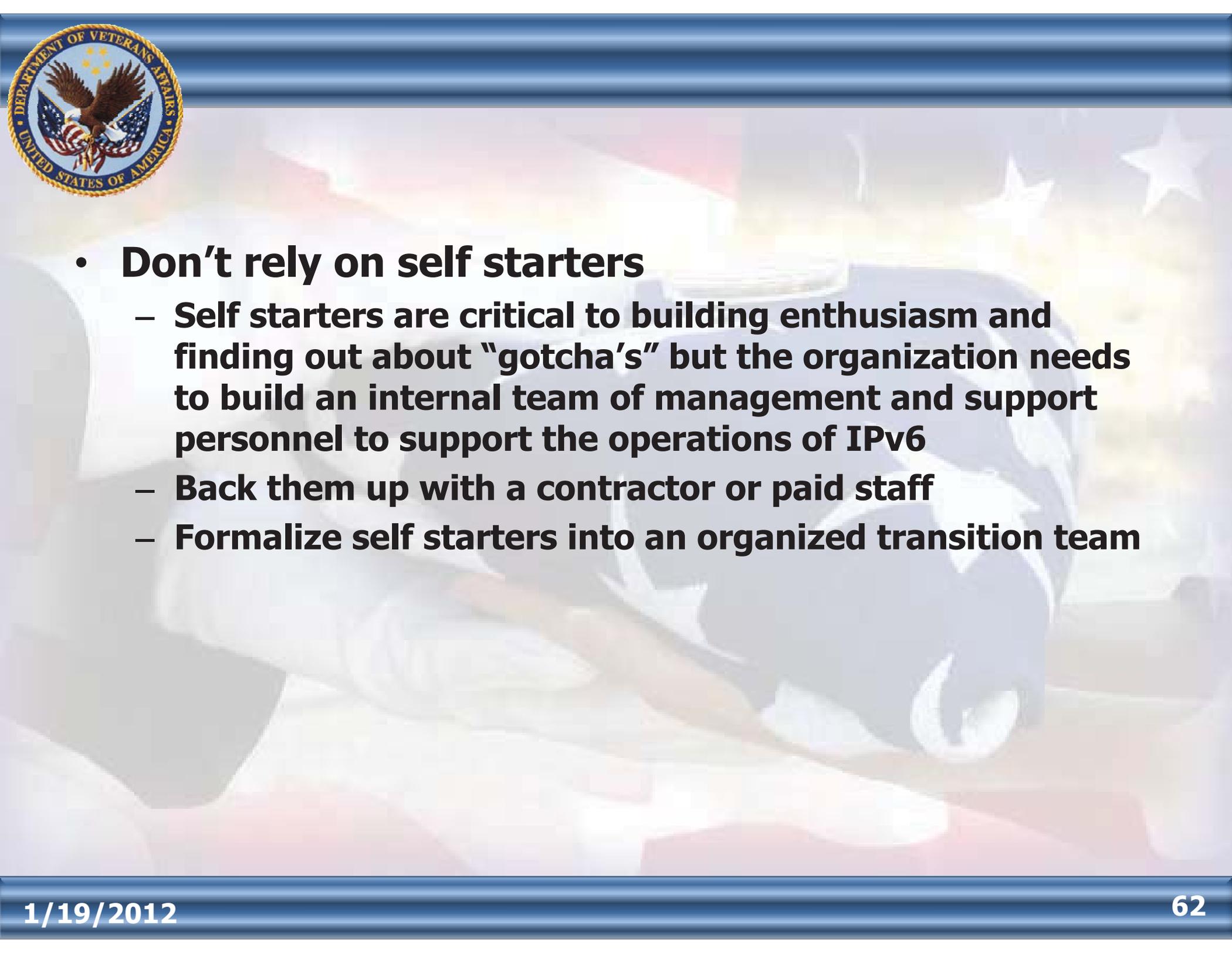


- **Stay Standards Based**

- **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*).**



- **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**



- **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**
  - **Back them up with a contractor or paid staff**
  - **Formalize self starters into an organized transition team**



- **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**
- **Set up a lab for testing**
  - **This will help you understand your own network’s characteristics and identify potential issues before they hit the production network**
  - **Set up both an internal and an external testing lab**
    - **Internal for connections between internal devices**
    - **External for connections with business partners**
    - **Separation helps with security**



# Lessons Learned

- **Learn from other network transitions including:**
  - **DREN, Internet2, UNHIOL, Moonv6, 6Bone**
  - **Contractor expertise in Large v4 and smaller v6 Networks including:**
    - **US wide renumbering of large content network**
    - **Multiple smaller operational and test v6 and Dual stacked networks**
    - **An in-depth understanding of routed v4 networks with different EGRP and IGRP routing protocols**



## Lessons Learned ...

- **Ensure that your Network Access Control (NAC) system is IPv6 aware (both hardwired and wireless)**
  - **End user devices that show up on your network should be redirected to secured VLANs with NAC and appropriate address leases during the verification process**
  - **Every device should get a provisioned address from the system before they are attached or they are not released by the NAC to communicate (if you want a stable network)**