Timeline

the V6 dual stack crawl

- 2003 to 2006 Dual stack backbone equipment swap
- 2008 V6 Management in house Database creation started
- 2009 exec level Intro to IPv6 ppt created to try and spur support

2010 V6
Still Crawling

- 2010 Summary

- 1.   Dual stack Backbone augments completed out to the Border routers.

- 2.   Frontier Network Analysis and IPv6 deployment conducted

  – a.   Laid out technical options

  – b.   Used weighted measures in the analysis such as time, money, and employee skill level and availability

  – c.   Did not account for competing projects- time killer in 2011

- Change of Focus- Ouch

  - i.   Purchased territories in 14 US states, renumbered IP Addresses and a customer base (non v6)

    - eyeball network of over 9 million customers and connections in 27 states

  - ii.   Product Creation and Delivery schedules (non v6)

V6 Project Statement Scope
2011

a.   Frontier will take immediate action to enable IPv6 address use network wide.

b.   The breadth of this project starts with inventory and discovery and ends when we have fully integrated IPv6 into the entire network.

c.   This project is to integrate IPv6 with IPv4.

d.   Frontier will not shut off IPv4 usage but will actively roll customers into IPv6 when appropriate, requested and needed.

e.   When the life cycle of IPv4 will end is undetermined and goes beyond the scope of this project

2011 – Summary
convincing everyone they should Learn to Walk V6 Style

- -2011 Summary
- 1.   Part time IPv6 planning, integration and testing given a small push
- 2.   DIA and Metro-E product was brought up as a service for IPv6 on the E series routers at several locations.
  - a.   This was possible due to the back bone equipment
- 3.   IPv6 Awareness plan
  - a.   was written for Internal and Public dissemination
  - b.   IPv6 website was developed and launched at http://www.frontier.com/IPv6
- 4.   IPv6 Project Plan created
  - a.   Statement of Scope for clarity
  - b.   3 phases: Inventory, Network Planning (includes testing) and Implementation
  - c.   Inventory ongoing project due to vendor responses
  - d.   Risk Assessment: IPv4 Run Out, Money and Head Count and Deadlines
  - e.   Vulnerabilities: Products, Addressing, Vendors, Training, V6 Experience
  - f.   Definitions
  - g.   Coordination points

2011 – Summary
convincing everyone they should Learn to Walk V6 Style

- 5.   IPv6 Tactical deployment Testing Plan written
- 6.   IPv6 Lab was created in Rochester.
  - a.   Getting lab space and equipment was a big hurdle
  - b.   Getting people to participate in the testing was a big hurdle
- 7.   40 IPv6 peering sessions up on the network as of APR 2011
  - a.   Needs focused time to get peering further
- 8.   Public involvement
  - a.   Decide to be visible or keep your head down
- i.   conference no
- ii.   emails yes
- iii.   don't get side tracked
- iv.   collaborate with other entities

V6 in 2011- details

1. IPv6 Project Plan -tactical deployment strategy, a Long Term deployment strategy and a Stop Gap strategy. All three developed in parallel with timelines detailing the gaps and overlaps.

a. Tactical approach: the items you can chew off without 100% dedication

- i. Backend office system
  - 1. Changes were made and produced in strategic timeline but with the long term goal.
  - 2. Backend office systems are V6 Beta test ready
    - a. Appoint IT focused PM to push this through

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- ii. IPv6 Management
  - 1. Subnet size?
  - 2. What it needs to be for static customers by product type and for Dynamic product services.
  - 3. This will affect the technical specs for the CPE your vendor makes.
  - 4. This will affect a lot of platforms used in any company. Set fields have to be modified to accommodate your subnet plan.

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- iii. Addressing Specifics
  - 1. Geo Addressing by state or by med regions?
  - 2. Breakout by product set then by state or by state then product set?
  - 3. Private space a set field or a selected subnet?

V6 in 2011- details

- v.   Product Focus:
  - 1.   on the heaviest IP Address usage product

- vi.   Location specific:
  - 1.   Not all locations will have the tactical approach implemented due to equipment not present or other equipment and architectural requirements making that location a better candidate for the Long term approach.
  - 2.   Least number of offerings to reduce testing time

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- vii.   Equipment selection: make use of current equipment that can function with just a software upgrade.
  - 1.   upgrades were a success on E320
  - 2.   Don't be afraid to ask vendors for freebies be it equipment, license fees etc.
  - 3.   upgraded from 7.x to 9.x to 12.1.1 JUNOSe without issues
  - 4.   Tested 7206 series routers with success
    - a.   But only good for Low traffic areas on a sizeable network

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V6 Lab

- viii. Testing hiccups
  - 1. Dslam-
    - a. Not so pass through friendly as one had hoped nor as v6 compatible as vendors claimed.
    - b. Suddenly SW upgrades on road maps.
  - 2. CPE-
    - a. Vendors not volunteering spec options like it's been in the IPv4 world
    - b. Dual stack with PPP and DHCP not available
    - c. Also coordinating this carefully with future product roll outs is essential. Tightly controlling contracts for future purchases will only benefit you and if managed correctly give you the upper hand on getting vendors to more proactively assist in the development.
    - d. Push from futures lab failed. Zero attention. Fell to v6 part timers to push the vendors and create specs. Coordination is needed but relying on outside team for results can be a time kill.
  - 3. Wireless added at last minute
    - a. New v4 markets that included the V6 integration test locations.

Stop Gap

- Stop Gap approach –
  - Carrier Grade NAT-
    - Make use of equip that can function with just a software upgrade.
    - Testing results on M320 success
      - » Combining the size of PBA allocation and release messages, and comparing them to the previous logs of the individual TCP and UDP sessions, the results are the following log sizes:
      - » C:\temp>dir *pba*
      - » ...
      - » 01/20/2012 11:21 AM   10,753 non-pba.txt
      - » 01/20/2012 11:20 AM   240 pba.txt
      - » This represents a **97.8%** space savings on the syslog server.

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    - CALEA cannot be configured on the same MS-PIC as CGN* however FTR is now modifying its network and moving the CALEA piece closer to the customer and out of the BRAS position.
    - CGN project is now at the testing phase with the equipment options that will do CALEA.
    - RFC 6319 Issues Associated with Designating Additional Private IPv4 Address Space RFC 6598 IANA-Reserved IPv4 Prefix for Shared Address Space

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Stop Gap

- IP Requests thoroughly vetted
  - Pushing back on hoarders
  - Researching BGP and multi-homing requests and rejecting the fraudulent cases
- Companywide education efforts – Awareness plan
  - Educational presentations on Ipv6 integration, IPv4 run out and how to conserve IPv4 addresses was posted on self-training internal site.
    - » Made use of vendors for consolidated training days.
  - Training for sales and SE's on NAT and PAT practical application.
    - » Internal training site and consolidated training days.
    - » Documents archived in SharePoint site
    - » internal notices to include what, why, and how they can help

Long Term

- Long Term approach
  - Next generation equipment.
    - Dual stack throughout the Access Network.
  - Still in multiple vendor testing phase.

Suggestions

- Make a plan and make it work
  – -Dedicate a group of people to it
  – -Make use of your vendors that have IPv6 knowledge to your advantage.
    - *Vendor A to present v6 to the Sales Regions- they get publicity and we keep our technical experts busy on the task and not on the training.
    - *Vendor B to assist with equipment test plan creation and software upgrade bug fixes.
    - *Vendor C, D and maybe even E to assist in the lab on actual testing days.
- -What if no one knows IPv6? It doesn't matter. If they can read they can do this. They just need dedicated time for it.
- -Use hexadecimal as a tool of influence. One round of how to count hexadecimal will make their heads spins. They might run for the hills at first but they will come back in support of getting as much organizational and database migration possible so they don't have to ever look at that again.