

Putting **IPv6** to work



North American IPv6 Summit
Plaza Tower One Conference Facilities
Greenwood Village, CO
April 22-23, 2015

Rocky Mountain IPv6 Task Force



IPv6 and Microsoft

Challenges in implementing IPv6

Dawn Bedard
Microsoft



Agenda

In the Beginning

What we have learned

Microsoft Clients



In the Beginning

World IPv6 Day June 8, 2011

Corporate wide interest and excitement leading up to IPv6 world launch day!!

A leader in IPv6 support

Since Vista, Microsoft solutions have IPv6 support turned on by default/natively

World IPv6 Launch June 6, 2012.....YAY!



What did we learn?

Need an infrastructure that can support IPv6

Need to be able to manage our IPv6 address space

It's going to take awhile to get fully enabled

Working together – Cloud & Enterprise – we can accomplish a lot



Since that day.....

Our initial IPv6 addressing plan had issues

Learned lessons around paper vs implementation

No master plan for implementation.
Our infrastructure had gaps- what had it implemented where?

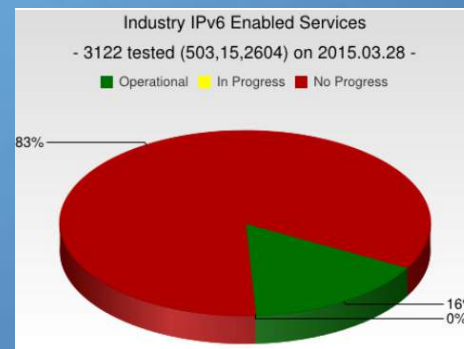
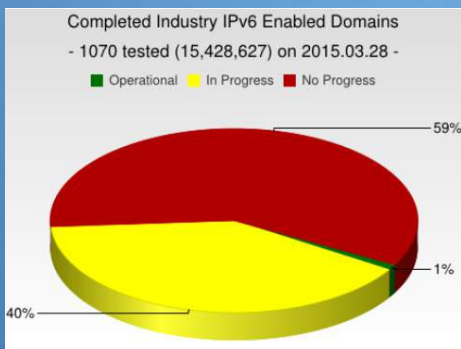
Did IPv6 Day really make a difference in customer needs?

Teams need to collaborate
Enterprise had one strategy,
Cloud had its own strategy



Business vs Technology

- Biggest challenge by far!
 - Both Enterprise and Cloud have the same challenge
- How do you balance the demands of the customer vs where technology wants to go
 - Customer demand for IPv6 has been low
 - Risks vs value



IPv6 IS Important

- Support from upper management is necessary
- Developed a whole new addressing plan
 - Work with each business to identify their business requirements and security requirements
 - Keep in mind the basics
 - Route aggregation
 - ACLs – where are they defined?
 - Who talks to who?
 - Standardization in implementations and definitions
 - /127 for point-to-point
 - /64 for a “subnet”
 - /40 for a region



What surprised us

- Memory available on common chipsets in the switches impacted our IPv6 address plans
- For example, one set of tests :

Test#	%IPv4 (/24-/29)	%IPv6 (all /64s)	IPv4/IPv6 % split
1	200k	0	100/0
2	160k	15k	80/20
3	120k	31k	60/40
4	80k	46k	40/60
5	40k	62k	20/80
6	0	77k	0/100
7	210k+ (all /32s) [1]	0	100/0

This is why testing and experience with IPv6 is important!



Coordinating

- Begin tracking implementation across the corporation
 - Each business and their planning schedule
- Do not forget
 - security cameras
 - IP Phones
 - TV's and Displays
 - lab environments
 - Re-evaluate projects already in progress
- Get on the roadmap for the applications
- Keep beating the drum



Teaming with Enterprise

- The Enterprise team has a goal of one building that is ipv6-only
 - Desktops have been dual stacked for years
 - Pilot v6-only using NAT64 (with DNS64)
 - Already have DNS64 with Direct Access
 - DHCPv6 already on corporate network in test for Stateful DHCPv6
 - ISATAP deprecated in favor of dual-stack
- Desktop testing
 - 2 laptops, same OS, same hardware
 - Switching from v6-only wired to dual-stacked wireless
 - 1 gets a new address immediately, 1 waits 300 seconds (timeout on RA) (no “release6/renew6”, used powershell “restart netadapter”)
 - Only difference is the version of the NIC software
 - Why?
- Operations and Troubleshooting
 - Issues when one troubleshooting step is to turn off IPv6



SLAAC

IPv6 Address: SLAAC Temporary IPv6: Microsoft Link-Local: self-assigned

```
Wireless LAN adapter Wireless Network Connection:
Connection-specific DNS Suffix . : hsd1.co.comcast.net.
Description . . . . . : Intel(R) WiFi Link 1000 BGN
Physical Address. . . . . : 8C-A9-82-A0-P9-44
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
IPv6 Address. . . . . : 2601:1c100:1ad:98b8:bfb9:3be1:e9fe(Pref
ered)
Temporary IPv6 Address. . . . . : 2601:1c100:1ad:65ff:acad:2c30:a50b(Pref
ered)
Link-local IPv6 Address . . . . . : fe80::98b8:bfb9:3be1:e9fe%14(Preferred)
IPv4 Address. . . . . : 192.168.1.17(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : Friday, March 28, 2014 7:33:13 AM
Lease Expires . . . . . : Saturday, March 29, 2014 7:33:16 AM
Default Gateway . . . . . : fe80::eadc:fcff:fe76:3b91%14
DHCP Server . . . . . : 192.168.1.1
DHCPv6 IAID . . . . . : 361539970
DHCPv6 Client DUID. . . . . : 00-01-00-01-14-F4-E4-EC-10-1F-74-12-7B-3C
DNS Servers . . . . . : 2001:558:feed::2
2001:558:feed::1
75.75.75.75
75.75.76.76
NetBIOS over Tcpip. . . . . : Enabled
```

- With SLAAC, the router advertises a network prefix as part of the Router Advertisement (RA)
- Client will self-assign an IP based on the network prefix
 - Hint: router lifetime must be > 0
- Will the client use SLAAC
 - A: Routers advertisement (RA) contains Prefix Information and the client can use it to create an address
 - O: Other configuration (SLAAC will get the DHCP options from the DHCP server even though it generates its own address)



Why Temporary Addresses



- A randomly generated IPv6 address that changes over time
- Generated for public address prefixes that use stateless address configuration
- If an interface identifier is always based on EUI-64, then the host could be tracked (regardless of the prefix)



...after a valid lifetime, a new interface identifier and temporary address is generated

Managed DHCPv6/Stateful DHCPv6

- If do not suppress RA AND broadcasting the network prefix AND are configured for Managed DHCP, then the client can have 4 IP addresses:
 - Link local
 - Managed DHCP address
 - SLAAC address
 - Temporary Preferred address



**ipv6 nd
managed-config-
flag**

Note: These are the preferred addresses. Deprecated addresses may also exist such as expired temporary addresses.

**ipv6 nd prefix
2001:DB8:CAFE:2
100::/64 300 300
no-autoconfig**



*Keep that in mind when determining
policy*



Microsoft Clients in a dual-stack environment

- Looking at a longer term solution for a dual-stack environment than Happy Eyeballs (RFC 6555) as more environments move beyond to native IPv6
- Tests IPv6 when connecting to a network that advertises IPv6 routability and will only use IPv6 if IPv6 is *functioning*
 - IPv6 version of Network Connectivity Status Indicator (NCSI)
 - Windows 8 does a test to for network connectivity to ipv6.msftncsi.com
 - If this works then IPv6 is operational
 - If it fails then IPv4 is preferred (IPv6 is demoted)
- Uses approach mentioned in RFC 6724
 - Default Address Selection for
Internet Protocol Version 6 (IPv6)
- Caches information for 30 days



Scope, Preferred over Deprecated, Native over Transitional, Temporary over Public

Choice of v6 over v4 is application dependent



Tools are available to help port applications

- Check4.exe
 - Part of the Microsoft Windows Software Development Kit
 - A utility that steps through your code base with you, identifies potential problems or highlights code that could benefit from IPv6-capable functions or structures, and makes recommendations.





QUESTIONS?

Dawn.Bedard@Microsoft.com



© 2015 Microsoft Corporation. All rights reserved. Microsoft, Windows, Windows Vista and other product names are or may be registered trademarks and/or trademarks in the U.S. and/or other countries. The information herein is for informational purposes only and represents the current view of Microsoft Corporation as of the date of this presentation. Because Microsoft must respond to changing market conditions, it should not be interpreted to be a commitment on the part of Microsoft, and Microsoft cannot guarantee the accuracy of any information provided after the date of this presentation. MICROSOFT MAKES NO WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, AS TO THE INFORMATION IN THIS PRESENTATION.