

Understanding Your IPv6 Options:

Business Continuity and Best
Practices From ISC



Agenda

- Introductions & Logistics
- IPv6 problem statement
- ISC's path to IPv6
- Wrap-up & Questions



Webex Logistics

- Attendees are muted
- Questions can be asked through the Chat panel throughout the presentations
- Questions will be responded to at the end of the seminar



Who is ISC?

Internet Systems Consortium, Inc. (ISC) is a non-profit [501\(c\)\(3\)](#) public benefit corporation dedicated to supporting the *infrastructure of the universal connected self-organizing Internet*—and the autonomy of its participants—by developing and maintaining core production quality software, protocols, and operations.

BIND:
Open Source
DNS

Quality DNS
Capabilities for
Everyone

DHCP

Open source
automated IP
address protocol.
Someone has to.

ISC
**Professional
Services**

Support Development
Training Consulting
Audit Design
Call in the experts!

Hosted@

Public Benefit
Hosting for the
Common Good

Public Benefit
Expanding the
internet through
rough
consensus,
running code,
and open
standards

IPv6

It is time. Call
the experts to
help make it
happen.

DNSSEC
Are you ready?

SIE

Changing how
the Security
Communities
Productively
Collaborate



Internet Today

- IPv4 had 4.2 billion addresses
- We've successfully used up all of them
 - This was unimaginable in the 1970s
 - Technological advances have extended IPv4 well beyond its original capacity
 - But we did it!
- IPv6 has 360 undecillion addresses
 - we can't use those up any time soon
 - we have some work to do



Don't panic about IPv6

- The situation is not urgent
 - Nothing that works today will stop working tomorrow
 - We've got a big, complex Internet that will rely on IPv4 for a long time yet to come
- The situation IS important
 - In the long run, there's no more room to expand the IPv4 Internet
 - Don't be left behind!



IPv4 and IPv6: overview

- We have lots more addresses with IPv6
- IPv4 and IPv6 are different protocols on the wire even if they perform the same function
- Hardware, OS, and applications that speak IPv4 need some changes to run IPv6
- We will take a closer look here at what has to be done and how to approach it



IPv6 compatibility means

Simply put an IPv6-compatible or IPv6-compliant network, device, or application is:

***at least as functional and useful
over IPv6 transport
as it is when IPv4
transport is used***



IPv6: A drop-in replacement

- Addresses are bigger
 - They are 4x the bits, so many trillions more actual addresses
 - Your ISP or RIR can now give you a large block, much larger than you can imagine needing
- But they act almost the same
 - You need them for desktops, smartphones, firewalls, servers, printers
 - Familiar protocols already work: web, DNS, email



Drop-in still means change

In good shape

- Recent Microsoft & Apple OS
- Free UNIX OS –
 - BSD & LINUX
- High-end Routers
- Specialty Devices
 - Firewalls

Less good shape

- Legacy OS
- Embedded devices –
 - POS Credit card processor
- Manufacturing & Control equipment
- Soho Gateways
- *Special Consideration for NAT*



Assess, Plan, Implement

- If you haven't started yet, NOW is the time
- Determine:
 - Where is IPv6 going to be easy for you?
 - Where is IPv6 going to be difficult?
 - Devices that don't speak IPv6
 - Monitoring and management
 - Specialty and custom/in-house applications
- Turn on IPv6 somewhere as a test



Transition Technologies

- 6to4, NAT64/DNS64, 6rd, NAT66, NAT444, dual-stack lite, pcp....
- Basic use cases
 - IPv6 transport, IPv4 edges
 - IPv4 transport, IPv6 edges
 - client speaks one transport, server speaks the other
- Some NAT, some tunnels



Transition Technologies: Pros

- Allow for incremental deployment of IPv6
- Accommodates legacy gear that can't easily be upgraded to IPv6
- Accommodates new devices after you've run out of IPv4 addresses
- Most likely useful for core carriers and very large end-user networks



Transition technologies: Cons

- Add complexity to the network
 - provisioning
 - troubleshooting
 - single points of failure
- Breaks things we're used to having
 - geolocation
 - authentication and accounting
 - lawful intercept

Stop Gap Measure not a permanent solution



A Word on Security

- There are few or no new security problems with IPv6
- The gaps we just talked about do have implications for security
 - tools that aren't IPv6 compatible
 - additional configuration of hosts, routers, servers and firewalls
 - SOPs and checklists may be IPv4-specific
- Security needs to be part of planning from the beginning



Case Study - ISC

- BIND 8 was created to support IPv6
- BIND 9 IPv6 compliant since inception in 2000
- DHCP 4, 2007 – IPv6 compliant
- ISC is 99% Dual Stack today
- Leo Bicknell, Sr. Network Architect
 - ISC's journey to a IPv6 network



ISC & IPv6

- Started IPv6 testing over 10 years ago!
- Needed IPv6 deployments internally to support work on BIND
 - BIND version 8 had IPv6 support around 2000!
- Want to be ahead of our customers, so we can better support them



Where do problems occur?

Layer	Description	IPv6 Changes?	Level of Effort
9	Management		
8	Staff		
7	Application		
6	Presentation		
5	Session		
4	Transport		
3	Network		
2	Data Link		
1	Physical		



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2	Data Link	Minimal	Low
1	Physical	No	None



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Layer	Description	IPv6 Changes?	Level of Effort
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2	Data Link	Minimal	Low
1	Physical	No	None



Transition Technologies

- Transition technologies are there to help you move from IPv4 to Ipv6.
 - None are designed to be permanent solutions!
- Virtually all of them have significant drawbacks.
 - They are better than having no connectivity, but are worse than having a proper, dual-stack network.



Transition Drawbacks

Tech	Requires IPv4	One Way	Tunnel	ALG	Breaks End2End	Requires CPE Support
4in6	X		X			X
6in4	X	X	X			X
6over4	X		X			X
6rd	X		X			X
Teredo	X		X			X
NAT64	X	X		X	X	
NAT46	X	X		X	X	
ISATAP	X		X			
NAT44				X	X	
AFTR				X	X	



ISC & Transition Tech

- ISC currently operates no transition technologies
 - We find dual stack to be cheaper and easier.
- Others may not be so lucky
- ISC may be forced to run some technologies (like 6to4 relays or Teredo servers) if those services gain in popularity



IPv6 Enables New Thinking

- IPv6 puts the focus on subnets, not IP addresses
 - “Burning” IP addresses is much more attractive when you have a /64 subnet
- Pushes folks further away from static addressing
 - SLAAC, multiple addresses per interface, privacy addresses



The Largest Challenge

- The Internet is about interconnection, and thus you are dependent on everyone else in the network!
 - ISC spends a lot of time working with our partners, particularly around F-Root sites, getting them to deploy IPv6 so we can connect!
- Being first or last is bad
 - There is no one else to talk to!



How can ISC help?

- Larissa Shapiro, Product Manager



Top 5 takeaways

- True value of the Internet is interconnection – *stay connected*
- Identify problem areas for migration
- IPv6 isn't as hard as many believe *IF* you prepare
- Don't panic – Plan
- ISC can help



ISC Can help

- Things you'd expect
 - Open Source software that is IPv6 compatible
 - BIND, DHCP, AFTR, AFTR-PCP
- Things you might not know
 - Training for IPv6
 - Consulting Services – Audit, Plan or Implement around our software
 - Support you through the process



Offers

- Training seat + Consulting -- \$3,500
 - 1 seat at an upcoming IPv6 training course
 - 8 hours of consulting to determine potential issues and best practice adherence
 - Valid for 90 days
 - Web attendee – 11feb16-101
- Consulting + Support -- \$7,500
 - 8 hours of consulting to determine potential issues and best practice adherence
 - 6 months of basic support for BIND
 - Valid for 90 days
 - Web attendee – 11feb16-201



Upcoming Web Events

- DNS BIND 9.8 Roadmap
 - March 2nd
- Passive DNS for Security Intelligence
 - March 8th
- Carrier IPv6
 - March 23rd
- Security Information Exchange (SIE)
 - March 29th
- DHCP IPv6 Feature
 - April 13th
- Enterprise IPv6
 - May 11th



Sign up via www.isc.org/webinars



Upcoming IPv6 Training

- April 19-21 - Arlington, VA
- June 6-8 - Amsterdam, NL
- August 22-24 - Washington D.C.
- November 21-23 - Cape Town, South Africa
- December 5-7 - Los Angeles, CA

Get more information and register at
www.isc.org/services/training





Questions?

Thanks for attending.

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