Enterprise IPv6 Deployment
Experiences from the field

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What motivated us to deploy IPv6?

Google Culture == Innovation

“IPv6 will enable innovation and allow the Internet’s continued growth”

Early adopters of technology
Eat your own “Dogfood”

Launch early, Iterate often
Think Big, Start Small
About the Enterprise Network

Distributed Enterprise Network

26000+ Employees

69 Offices in 36 Countries

Multi-vendor network
Design Fundamentals

- Dual stack when you can, Tunnel when you must
- Design Consistency with IPv4
- Design should work across all WAN clouds.
- Maximize impact by prioritizing deployment in Engineering offices

Key Design Decisions
“Rome wasn’t built in a day”

Key Building Blocks

- Addressing Plan
- Transit
- Hardware/Software
- Routing
- SLAAC/DHCPv6
Addressing Plan (1 of 2)

PI Address Space from RIRs

- AMER
  - ARIN
  - LACNIC
- EMEA
  - RIPE
  - AFRINIC
- APAC
  - APNIC
Addressing Plan (2 of 2)

Campus - /48

Building A - /56
  Vlan 100 - /64
  Vlan 200 - /64

Building B - /56
  Vlan 100 - /64
  Vlan 200 - /64
Routing Policy

Protocols

- HSRPv2
- OSPFv3
- BGP

Policy

- Longest prefix length accepted/announced is /48
- Import/Export policies for v6 peers consistent with v4
Transit

New Providers

- IPv6 is Mandatory
- Oh, and NO tunnels please!
- IPv6 in Hardware

Existing Providers

- When can you support IPv6?
- How good is your peering?
- Perhaps we need to go get a new provider…
Hardware

- Does your existing Routing and Switching hardware support IPv6?
- Is the existing gear interoperable with other vendor equipment
- Does your Wifi gear support IPv6?
- Does your WAN Accelerator or other Overlay networks support IPv6

Software

- Test, Test, Test
- Test your design
- Test performance
SLAAC vs. DHCPv6

SLAAC

- Ease of deployment
- Time to delivery is faster
- Readdressing made simple
- Widely implemented

DHCPv6

- Allows granular control of IPv6 address allocation
- Poor client support
Deployment Phases (1 of 3)

1. Beginnings of a Dual Stack Cloud
2. Disconnected Networks
3. v6 in the lab
Deployment Phases (2 of 3)

Dual Stack Hosts w/GRE

Partial Dual Stack Networks w/GRE
Deployment Phases (3 of 3)

Dual Stack Office w/GRE

True Dual Stack Office
Challenges

Network Equipment
- Vendors don’t run IPv6 on their corporate networks
- IPv6 still processed in software on many platforms
- Not all vendors support IPv6 yet

ISP Support
- General lack of ISPs that provide IPv6 on a typical enterprise connection
- Those who do, have very spotty peering
- Many ISPs still rely on Tunnels
Challenges

Client Support
- No out-of-the-box DHCPv6 support on Macs

Organizational
- Personnel training is becoming increasingly important
- Resource allocation is IPv4 centric
The Bottom Line

It’s not Rocket Science

• IPv6 is easy and simple to deploy
• It just takes some time

Don’t forget to ‘Think Big, Start Small’

• All you need is a vision and a few enthusiastic people

Remember – ‘Rome wasn’t built in a day’

• Take small steps – Start with a lab and build the rest in stages
• Design to the same quality standards as IPv4

Build a “Production” IPv6 Network

• Monitored
• Supported

Launch Early, Iterate Often

• The earlier you deploy, the faster we as an internet community can iterate to make IPv6 a widespread reality
Thank You!

Q&A