Tie Downs, TE and TCAM tuning. IPv6 from an ISPs perspective.



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IPv6 and ISPs

What's so special about ISPs?
Transport and Transit
Effectively a pipe
Good candidates for early adopters

Why ISPs are early adopters?

 Security is less of an issue (directly) Already have a security policy Enough pull to get vendors to help Generally have budgets (every 5 years) Community support Competitive in nature.. Customer moves if.....

Sense of the room

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ISPs vs. Non-ISPs?

Non-ISPs

- It's your lucky day!
 - (Not really but we'll get to that later)
- Part of the reason you are here is because you know you need to get educated about IPv6.
 - There is operational experience in this room
 - There will be best practices developed
 - * ISPs will make a lot of the mistakes for you.

Why this talk is about ISPs?

1) No one else was speaking about them when I picked my topic.. :)

ISPs are the guinea pigs

* Guess who gets to make most of the mistakes? There are few documented best practices * ISPs are writing them for everyone Resources are extremely limited (SME -> books) Vendor management starts here Benefits outside of survivability * No significant cost to dual stacking the network

ISP motivation

- Survivability (loss of revenue)
- * RIR max IPv4 resource allocations at 3 mon Impact on Tie downs and guestimates Eventually v4 will be very expensive * IANA out of IPv4 * Global exchange market about to open Alternatives suck! (NAT444/CGN/etc)

ISP Motivation cont.

Customers do not care how they reach other numbered objects on the Global Internet, they just want it to work and will blame you for its failure _PERIOD_

IPv4, IPv6, X.25, ATM, LTE, String and Paper cup.. They don't care as long as it works and at the speed they know as the norm or better. Moving forward.

We've decided to stay in business..



Network is the transport for all other services as an ISP so network must go first.

Implementation

TAKE YOUR IPv4 HAT OFF NOW
Write an IPv6 10 year implementation plan
Write an IPv6 10 year numbering plan
Write an IPv4 3 mo - 10 year survivability plan
This can be done second, but must be done

ISP Implementation Approach

Departments are isolated (to some extent)
Simple hierarchal approach to IPv6
Network
Lab / Sometimes ops
Edges (we'll worry about that later)

Why Network?

✤ Super easy!

- * Start at an edge (Peering, Transit, anything v6)
- Work your way in to the core and around the network testing each step
- address some pieces of security (maybe)
- Pat yourself on the back, you're done!

A little deeper

Dual stacking is fairly easy on the network * Walking / 32s & / 30s and adding / 128s and / 126s is not that hard * OSPFv2 + OSPFv3 ✤ BGP unicast IPv4 + BGP unicast IPv6 Never touching a host means less work

Challenges

Ok.. So it's not quite that easy, but it's a good start.

Challenges across depts.

- Marketing and PR (website, campaigns)
- * Sales
- Planning and design
- Sales Engineers
- Provisioning / Implementation
- * Operations

Customer awareness / Account Management

Operations Challenges

Monitoring is now double (or more)
Debugging which path
Managing resources TCAMS, memory, processor, IGP and EGP sessions
Training staff (Sales -> Provisioning -> Ops)

Tools no longer cover needs

Marketing

Yes people Google for \$City + ISP + IPv6 (lead gen)

Compliance / we're telling them to look for it.

 All website material for IPv4 needs to be updated to include IPv6 (communities, DNS, BGP, resource requests, blah blah)



What's IPv6?

We currently charge per IPv4 address. How do we charge for IPv6? 18 Quintillion dollars?

Promotion vs. Profit

Did you say we can make money off of IPv4?!



* Your sales people do not want to learn anything new unless is means more money in their pocket.

- Figure out a cost model (if you charge for v4)
- Think of outreach as an upsell opportunity.
 Customer contact is a good thing.
- This also makes the customer stickier

Operational Policy

Do we allow customers to announce IPv6 to us? * What size is the minimum/maximum Follow RIR-> LIR policy or not? How do we deal with multihoming? What do we recommend to our customers * How do we update IRR, filters, SWIP?

Provisioning

- Serious considerations here, possibly the most challenging department.
 - Eval existing systems and accommodate
 - ✤ SFA/CRM
 - IPAM/DNS/Asset management
 - Implementation tools/Config Templates
 - E-mail templates to customers

Provisioning cont.

Simple Assignments / Detailed Assignments * Logging Post log processing +d\.+d\.+d\.+d ✤ NAT444 (dealing with 100.64/10) Dealing with duplicates * Addressing runout in general

Compliance

- SAS70/SSAE16/AT101/SOX/Govt.
- Repeatable process has changed and therefore docs will need to be updated
- What steps do you need to go through to change your process
- Access controls (ACLs)/log processing/ accounting
- How do translation technologies impact compliance? (port+address+timestamp)



* What's that funky ::number in the header?
* RBLs
* Reporting
* AUP update/rewrite
* Again with tools

Security

- How do we protect our infrastructure?
- i/e gress filtering
- To route or not route internal infrastructure
- Protecting internal systems
- Statefull firewalls v. NAT (New \$'s)
- Automated prefix list distribution (IRRpt)
 Anti-Spoof

Downstream Customers

Communication - How do we inform our customers?

- What's our default allocation size?
- Routed vs. Bridged
 - Why is this different than IPv4 (assumes NAT)
- Dealing with lack of DDNS (-> CPE)

Colo customers

What happens if I just assign an /64 to each interface by default as my policy?

IPv6 one direction -> out

IPv4 in (No AAAA's)

Borrow from Peter to pay Paul

TCAMs are finite
Bucket for IPv4 unicast
Bucket for IPv6 unicast
Bucket for IPv4 multicast
Bucket for IPv6 multicast

TCAMs cont

- Roughly 1M IPv4 unicast
 Roughly 8K IPv4 unicast
 Reload required!
 500K v4 60K v6 (BTW: IPv4 multicast is growing too)
- Balance is tough and we can only guess

TCAMs cont.

What happens when there is no more Peter?Time to start trimming?

- Split tables into multi-routers and punt in circles?
- ✤ \$'s for routes?
- New un-budgeted hardware?

Tie down policy

No longer running to 80% utilization How do I write an IPv6 plan good for 10 years? Do I follow nibbles or conserve? * What size? /44s? /40s? /36s? /32s? /28s? How do I deal with subsequent allocations? Single announcement policy?

Sizing up a region

Think BIG, REALLY BIG! Round up and multiply.. Round that number to next nibble

Network sum up

Once the network dual stack is done, TCAMs are tuned, TE planned, 10 year plan in place, the network is done. The IPv6 box is checked!

But what about the rest of the services?

That's your problem..

The network would be perfect if it weren't for the pesky users.

This is not untypical...

 Cable, DSL, Video, Voice, Wireless, Residential Services

Far slower adoption in ISP services using the network

Ethernet like connectivity

Less common but..

These are the easiest customers to dual stack and hardest to communicate with

Tuesday, April 10, 12

Cable and DSL

Majority have started to look at or have completed DSLAM and CMTS upgrades (or have plans to) but still have issues with vendor support for CPE.

 SLAAC supported DHCPD some, PD not supported on any that I am aware as of this writing.

Customer gear still unknown..

Fears

- Old systems will be used forever (think pulse)
 Transition technologies will be used forever
 Plans will be incorrect
 No real development on the other side of the demarc
 DNS never gets fixed
- Security becomes a nightmare

What happens if I do nothing?

How are my customers affected by CGN?
Who takes the support call?
Do my customers go to my competitor?
Do devices start to exist with IPv6 only?

What's missing?

Everything beyond the pipe/CPE/demarc still in development / no real standards

- No idea what will happen to the IPv4 unicast table
- No idea what will happen when global transfer opens / speed up runout?
- * Awareness could be triggered suddenly

Sum up

 ISPs networks are well dual-stacked and challenges are possible to overcome but fluid.

Services over the network are moving along but slowly.

 A good deal of mysteries still exist BCOPs still in progress

This, like all presentations about IPv6 will be out of date by the time we get to the questions slide..



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