

IPv6 @ IBM – an enterprise journey

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Market trend for IPv6

Mobile carriers have it...

Broadband carriers do it...

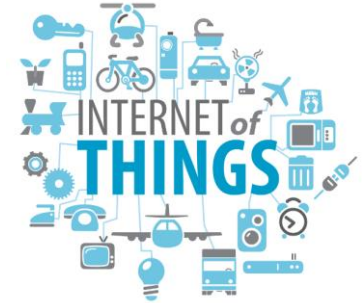
Content providers give it...

Operating systems use it...

Cloud wants it...

IoT needs it...

...and your **ENTERPRISE** still thinks it doesn't require it?



Getting started

Why?

- You install new products every day, with a lifetime of years! - Have them support IPv6!
- Influence your costs for IPv6 through timing



How?

- Convince your CIO! Name technical champion & executive sponsor
- You can start small, and grow over time
- Focus on certification for new services
- Change buying guidelines
- Be an evangelist in your company

The goal: Get yourself 'more prepared' for IPv6

It all starts with an IPv6 address plan



Technology baseline

Transition architecture = now

- Native **dual-stack** transport = IPv4 & IPv6 in parallel
- IPv6 capable IP services, DNS & DHCPv6
- [Tunnel IPv6 across IPv4 only networks]
- Dual-stack Internet egress
- Network device management can still use IPv4
- End-points will choose best way to connect (RFC 6555, happy eyeballs)



Target architecture = future

- **IPv6-only, a single stack network!**
- Run IPv4 as a service (IPv4aaS) on top of it, where still needed
- Full management via IPv6 for all tools
- No more tunneling of IPv6

Spreading it around the globe

- Start with senior architects
 - make architectural decisions
 - develop solutions
- Test and certify in your lab
- Publish new configs / templates
- Start with a few pilot sites
- Ask delivery teams in the regions to apply
- Review for consistency, build a baseline (i.e. # of hours per device).

- After some initial sites in a country, move to applying IPv6 in ‘BAU’

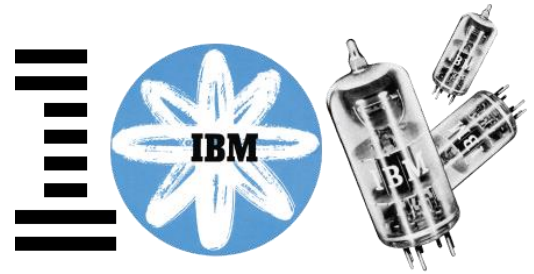


Achievements inside IBM

- Solutions ready:
 - Dual-stack WAN transport
 - Small site VPN solution
 - LAN & Wireless LAN for end-users
 - Data center
 - IP services farms (DHCP, DNS & IPAM)
 - Internet gateway
 - Asset inventory for IPv6 roll-out tracking

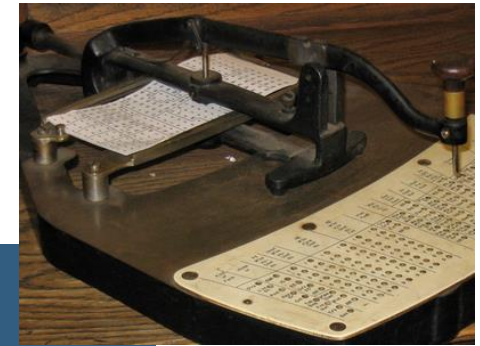
- Production deployment:
 - >100 IBM sites globally, covering >100k IBMers

- Majority of production IPv6 traffic is destined for the Internet



Tracking sites around the globe

Region	ASPAC								Grand Total
Count of Asset	Column Labels								Grand Total
Row Labels									Grand Total
⊕ Australia	14		2	6	2	2		2	28
⊕ China	14	14	4	10	32	18		14	106
⊕ India	48	6	2	16	44	12	2	18	148
⊕ Japan		7	8	6	14	6	4	4	49
⊕ Korea, Republic of				2	2		2	2	8
⊕ Malaysia				2	4			4	10
⊕ New Zealand		2							2
⊕ Philippines	4			4				4	12
⊕ Singapore	2		2	4	2				10
⊕ Sri Lanka	2								2
⊕ Taiwan	5	1							6
⊕ Viet Nam	4								4
Grand Total	93	30	18	50	100	38	8	48	385



Make sure sites cover:

- WAN transport
- LAN routing
- DHCP scopes

Manufacturer	Part Number	IP V4 Address	IP V6 Address	IP Version Configured	Region	Country
CISCO SYSTEMS	C6832-10G-BUN	9.97.	2620:1F7:	IPv4 + IPv6	ASPAC	Singapore
CISCO SYSTEMS	C6832-10G-BUN	9.97.	2620:1F7:	IPv4 + IPv6	ASPAC	Singapore
JUNIPER NETWORKS	QFX5100-48S-AFO	9.97.	2620:1f7:	IPv4 + IPv6	ASPAC	India
JUNIPER NETWORKS	QFX5100-48S-AFO	9.97.	2620:1f7:	IPv4 + IPv6	ASPAC	India
CISCO SYSTEMS	WS-C4506E-S7L+96V+	9.97.		IPv4 + IPv6	ASPAC	Singapore



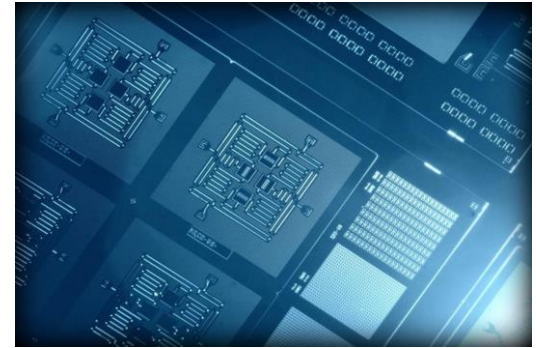
Technical difficulties on the way

Numerous bugs... you need to: Test, Test, Test!

A few 'nice ones':

- Configuring DHCP forwarding on a distribution layer device, but not having configured a DHCPv6 destination (server address) yet, led to a crashing forwarding daemon for both IPv4 & IPv6
Not really a graceful error-handling...
- When the 'any' keyword is used in an IPv6 ACL the firewall does not process that line or any subsequent lines until the access-group is removed and then reapplied. This affects only IPv6. IPv4 works correctly.
- WANx device corrupting BGP IPv6 peering hash (no bypass as in IPv4)

Lessons learned: Vendors treat your bug reports very different!



IPv6 challenges

- Getting other technology towers to listen to IPv6
Be an evangelist!
- Monitoring both IP stacks for availability
- IPv6-only is still difficult for enterprise use
 - IETF draft-lmhp-v6ops-transition-comparison
- Multi-homing with central egress plus local breakout (hybrid WAN)
 - i.e. see IETF work on PvD and SADR
 - IETF draft-ietf-rtgwg-enterprise-pa-multihoming




Upcoming activities

- Remote access
- Embedding IPv6 into SDN-xx projects

- Pilot IPv6-only
- New opportunities?
- More tooling IPv6 aware
- Log parsing, machine learning & analytics to monitor dual-stack operation

- Capture lifecycle opportunities, more IPv6 roll-out in 'BAU' mode



A long, straight path lined with trees and greenery, leading towards a bright horizon. The path is paved and flanked by lush green grass and rows of tall, thin trees. The scene is bright and sunny, with a clear sky and a bright light source at the end of the path.

For
a large
enterprise,
enabling IPv6
is a journey
of several years!

Start yours now!



THANK YOU



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