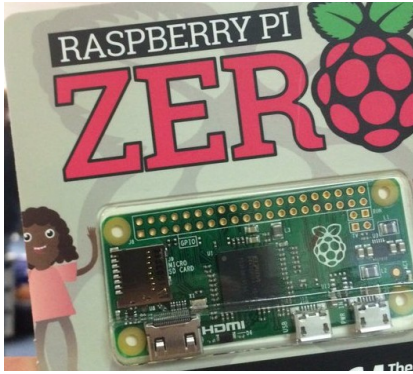# IPv6 Only

Pete Stevens
Mythic Beasts Ltd

Why?

This computer costs $5

- 93.93.128.1

This IP address costs
~~$10~~ ~~$20~~ $24

No public IPv4

- Start from the assumption that we can't have a public IPv4 address on a service.

- Is there any sellable service we can deliver?

- Thanks to an accidental prototype in 2012 we had a potential service.

Raspberry Pi DDOS

- Just after launch the main Raspberry Pi website was subject to a DDOS.

- We put a collection of small servers infront to sink unwanted traffic.

- We used IPv6 to communicate from front end to back end.

- To protect the back end, we turned off IPv4. You can't DDOS what you can't route to.

- (this is no longer a working strategy with 30%+ IPv6)

Bare minimum service

- Virtual machine or server with only IPv6.

- Proxy inbound traffic through a dual stack load balancer.

- HTTP works fine.

- HTTPS can only be proxied if the web browser supports SNI.

- Only common browser is IE6 on WinXP, that went end of life without security updates in 2014

- If we display an SSL fail to Windows XP, we don't care, it's not secure anyway.

Receiving data

- We may have to call out to other services that aren't IPv6 enabled, e.g. twitter, github

- NAT64+DNS64

- We run central NAT64/DNS64 service for servers on our LAN

- This works for straightforward web applications!

- Minimum Viable Product achieved!

Other protocols from v4 only end points

- POP3S, IMAPS. Work fine.

- POP3, IMAP. Can't proxy.

- SSH. Can't proxy.

- In general SSL protocols can easily be proxied. Non SSL protocols should be turned off.

- Port forward for SSH if needed, or tell the administrators to use an ISP with IPv6 support.

Managed services

- Most of our business is managed virtual machines.
  - Easier to roll IPv6 only, the customer needn't understand or necessarily know.
  - Every part of our management stack has to work on an IPv6 only host.

Monitoring and graphing

- Fix UI to allow IPv6 literals

- 127.0.0.1 vs [::1]

- Prefer v6 over v4 for any server that has an allocated v6 address.

- Dual stack servers can report in over v4 or v6, make sure you can match up the report to the customer.

Backups

- Worked out of the box on all our v6 servers.

- By sending the backup through the NAT64 proxy.

- On balance, a native IPv6 address on the backup servers is a much better idea.

Security

- Exactly the same as v4 or dual stack, getting and deploying updates for all our supported linux flavours works fine.

- IPv6 only is less work, only one firewall not two to configure.

- We've already paid our technical debt for v4 → v6 transition.

- Expert penetration testers can send very confused audits if the only IPv4 you have bound is 127.0.0.1

Security #2

- With RFC1918, deploying an update on the inside of a customer firewall involves tunnelling through to get to the back end server.

- The mapping is easy if they don't all use 10.0.0.1 in their private network.

- (hint, they do)

- With IPv6, you just allow our jump box to ssh to the backend directly. Routing and firewalling are now different.

New managed services

- Any new managed services we roll out will support v6.

- They might support v4, but the don't have to.

- If an existing v4 only customer wants to use a new management service, they can enable v6.

IPv6 only customers

- The obvious technical ones

  - London Internet Exchange

  - Raspberry PI

  - UKNOF

- And the less obvious

  - Parallax Photographic (film cameras)

  - ECMWF (weather)

  - Ellexus (IO profiling software)

Pi Rack

mythic beasts
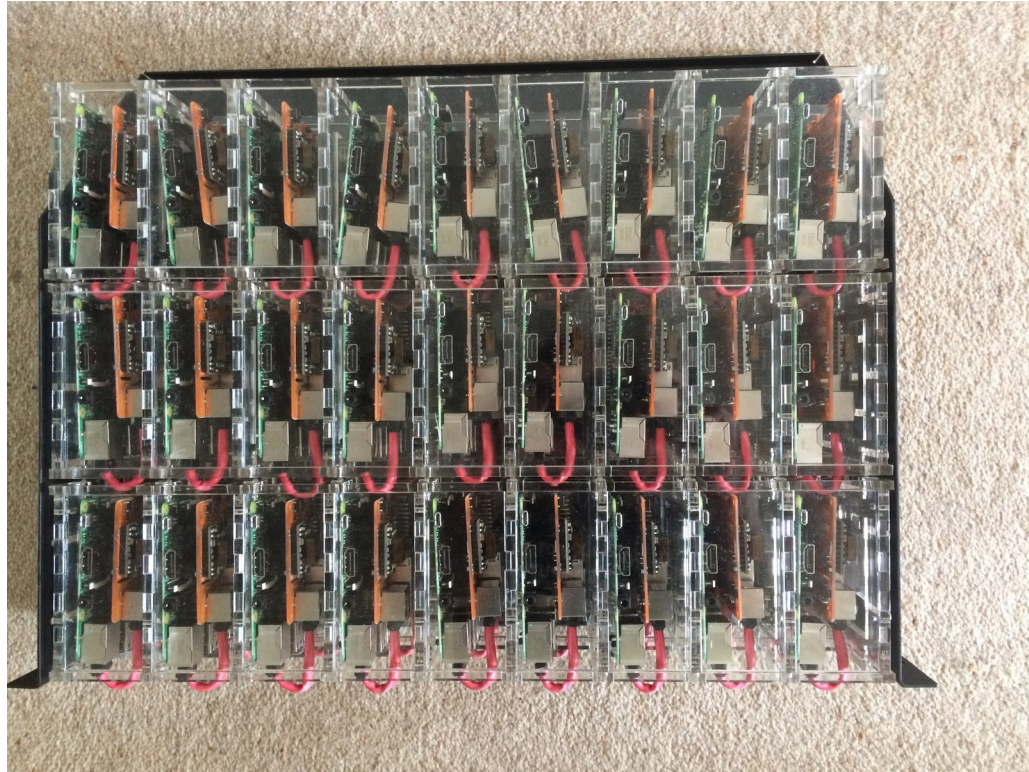
Pi3 Hosting

- 4U of rackspace including the switch

- 108 Pi3s – 108GB RAM, 432 cores

- All netboot and PoE

- Just one wire to each Pi

- 2-3W each

Pi3 Network

- /30 of RFC1918 space for network filesystem.

- v4 address + v6 address on a tagged vlan.

- **Nice idea but it doesn't work.**

- Bug in the rom – a tagged vlan crashes it.

- Computers that don't boot are very hard to sell.

- Add a /30 for each Pi3 - $96 of IP space to turn on a $35 computer. A /64 is effectively free.

Pi3 Networking

- The v4 costs are too high for a proper setup.

- /31 or proxy arp make it possible, but horrid.

- Educational – so do it right, hacks come later.

- V6 only. We don't support direct V4.

- Ssh.petespi.hostedpi.com:XXXX → ssh (4&6).

- Www.petespi.hostedpi.com → SSL & HTTP (4&6).

- Petespi.hostedpi.com → v6 only.

Toy computer users

- Our Pi platform is experimental with no SLA

- Hosted the backed for the Cambridge Beer Festival including all the customer ratings.

- PiWheels – a build service for Python packages on ARM all natively built on Raspberry Pi

- Many Pi user groups run their websites + meeting pages

- Biggest problem is people firewalling IPv4 – the only thing available over IPv4 is the filesystem.

The little computer that could

piwheels.org
@piwheels

Now passed 20,000,000 downloads from piwheels.org
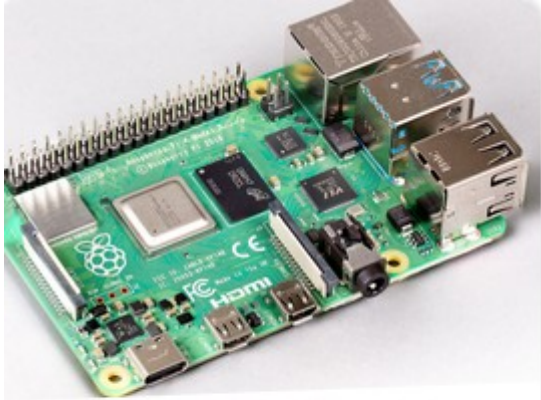
10:17 am · 18 May 2020 · piwheels stats

3 Retweets **7** Likes

mythic beasts

The little computer that could

- 20,000,000 binary downloads from a single Raspberry Pi 3, 4 slow cores, 1GB RAM, 100Mbps ethernet.

- Currently averaging over 40,000 downloads per day.

The slightly less little computer that will

8GB Raspberry Pi 4 on sale now at $75

- For the launch of the Pi4 we hosted the main page on a cluster of 14x 4GB Pi4.

- Tens of millions of visitors in a day.

- No IPv4 addresses were needed for the Pi4 cluster.

Get started v6 only

- Deploy a server / VM with no IPv4 address.

- Enable your webserver.

- Use a CDN with v6 origin support.

- Set your nameservers to 2a00:1098:2c::1 / 2a00:1098:2b::1 2a01:4f9:c010:3f02::1 for public NAT64/DNS64 (nat64.net).

- Congratulations, project complete.

Toy computer users

- Our Pi platform is experimental with no SLA

- Hosted the backed for the Cambridge Beer Festival including all the customer ratings.

- PiWheels – a build service for Python packages on ARM all natively built on Raspberry Pi

- Many Pi user groups run their websites + meeting pages

- Biggest problem is people firewalling IPv4 – the only thing available over IPv4 is the filesystem.