

IPv6 Only

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2012

- World IPv6 day
- We enabled IPv6 on our public website
- We think someone even used IPv6 to see it
- ... that wasn't us

2012

- Gradually added IPv6 to other services
- MX
- DNS
- Hosting accounts by default
- But mostly IPv4 only

IPv6, why bother?

- We hadn't achieved anything
- Deploying IPv6 wasn't slowing down our IPv4 address consumption.
- Migration plan, everyone deploys dual stack then we can deploy IPv6 only was nuts.
- We were going to run out of IPv4 before everyone deployed dual stack.
- We needed a better migration plan.

Our first IPv6 only service

- We implemented an IPv6 health check to find out if our services worked in an IPv6 single stack environment
- Parts of the checker are single stack and can't talk IPv4.
- We made this publically available.
- <https://www.mythic-beasts.com/ipv6/health-check>

IPv6 checking

google.com scored 10 out of 11



2018-06-04T12:58:39Z



IPv6 addresses for nameservers ?

4 out of 4 nameservers have IPv6 addresses [\[details\]](#)



Nameserver IPv6 connectivity ?

All IPv6 nameservers responded [\[details\]](#)



IPv6 address(es) for web server(s) ?

Got IPv6 record(s) for webserver from IPv6 nameservers [\[details\]](#)



IPv6 address(es) for bare domain name ?

1 AAAA record found for bare domain [\[details\]](#)



Web server IPv6 connectivity ?

1 webserver responded OK [\[details\]](#)

Managing a production IPv6 only service

- We had to enable our entire set of server management tools to work with IPv6 single stack.
- Assumptions such as All Servers Have At Least One IPv4 Address stop being true.
- We had to add IPv6 to our backup server.
- We had to enable IPv6 literals in our monitoring server for ping/ssh/http
- <http://1.2.3.4/> vs [http://\[a:b:c::d\]/](http://[a:b:c::d]/)

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IPv6 only management

- Security rules that rely on source IP needed updating.
- Munin configuration needed a hack for [a::b] syntax
- Perl needs socket6 installing to use IPv6 by default
- Eventually we got there and could offer the same service level to IPv6 only as we had done to IPv4 enabled servers.

IPv6 only

- We started selling servers with no IPv4 address
- We sold <10
- This wasn't helping slow IPv4 depletion
- Global IPv6 usage was reaching 1%, nowhere near enough for IPv6 only to be viable

Finally a production use case!

- Raspberrypi.org faced a DDOS
- I removed the v4 address of the server
- Dropped a collection of dual stack load balancers in front to sink the traffic
- You can't DDOS a server you can't route too
- Admittedly, this is saying IPv6 is good, because it's so rubbish not even the script kiddies will use it!

IPv6 only back end servers

- To be useful, an IPv6 only server must be able to talk to the majority of IPv4 clients.
- NAT64 outbound
- HTTP proxy inbound

Windows XP to the rescue!

- April 2014 Windows XP went end of life
- The last major client that didn't support SNI for SSL.
- So SNI was now production stable and we could proxy HTTPS / IMAPS / POP3S etc. too
- Complaining Windows XP users were told the padlock was missing because their OS was insecure and they should upgrade.

Production ready IPv6 only

- VM has
 - Backups
 - 24/7 monitoring
 - Http/https through our central proxy
 - NAT64 for outbound connectivity
- How to sell it?

Selling IPv6 only (management)

- Don't say
 - Would you like IPv6 only? It's a new internet standard used by 5% of the population and you might find the odd compatibility issue with your application.
- Do say
 - Would you like next generation networking like we used for Raspberry Pi to protect them from DDOS attacks. As there are no legacy costs it's slightly cheaper too.

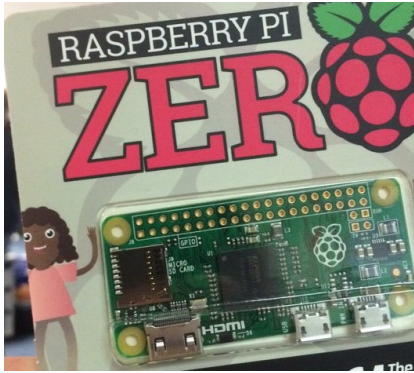
Selling IPv6 only (techies)

- Here is your /64 or /48 of IPv6 space.
- If you want another IPv4 address here is a form to fill in and please send a purchase order for £20/year for the address.
- This gives techies a choice of two
 - Enable IPv6
 - Explain to accounts about unnecessary expenditure

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)

Computers get cheaper

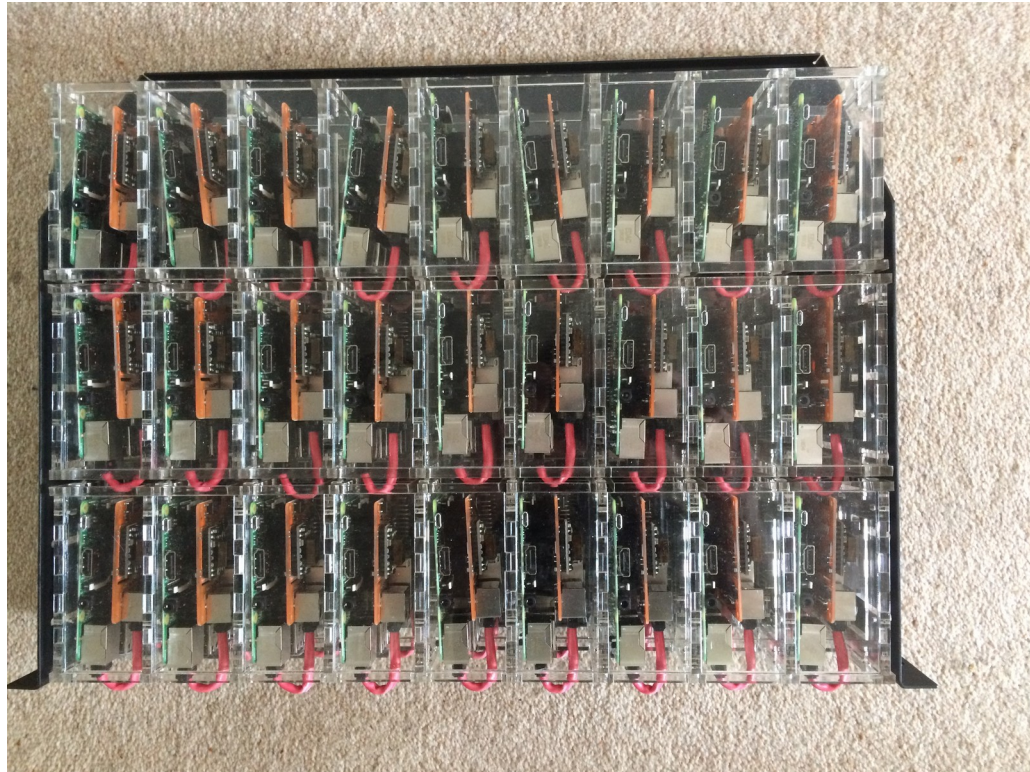


- 93.93.128.1

This computer costs \$5

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

Pi Rack



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.

