Transición a IPv6
(En Inglés)

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IMDEA Networks / UC3M
Madrid, 11 may 2009
IPv4

- Total: 3706.65 million addresses
- Free in IANA pool: 30 /8s (503 M)
- Free in RIR pools: 371 M
- Total free: 874 M /32s
- Used last year: 197 M
- $874 / 197 = 4.4$ years
IPv6

- Global unicast: 42 million million million million
  million million million
- (Let's say 536 million /32s)
- 138635 /32s in use
- 81015 given out last year
- 536870912 / 81015 = 6626
May 2009: 191 /8s, 86.4%

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Legend

★ Not usable
★ Given out to end-user
★ "Various registries"
★ RIPE NCC (Europe and more)
★ ARIN (North America)
★ APNIC (Asia, Australia and Pacific)
★ LACNIC (Latin America + Caribbean)
★ AfriNIC (Africa)
So we need IPv6!

• Still a few years of IPv4 addresses left, but just a few
• IPv6 has been around since late 1990s
• (Yes, that's more than 10 years!)
• So how far along is IPv6?
IPv6 capability

• OSes: Vista, Mac OS X and many Linuxes and BSDs have it enabled by default (XP...)
• (just need IPv6 router on the local net)
• Routers: Cisco, Juniper, many others: available at full speed in newest boxes
• slower than IPv4 or not available in older ones
IPv6 capability (2)

• Software: 50/50, a lot of IPv6-capable software, also a lot of IPv4-only software
• Home routers... a problem!
• Firewalls, load balancers: getting there, but still a lot of IPv4-only stuff
• or not all IPv4 features in IPv6
Actual deployment

- Arbor Networks test with many ISPs: 0.0026% IPv6 traffic
- Lars Eggert, top 500 websites: 0.4% (US) to 1.4% (DE) have AAAA records
- Google, search users: 0.25% have working IPv6, 0.09% broken IPv6
- 4.5% of ASes advertise an IPv6 prefix
- AMS-IX: ± 1 Gbps = 0.2% IPv6 traffic
Where is the IPv6???

• Reasons why IPv6 is deployed so slowly:
  • being the first = find all the bugs!
  • waiting means: more expertise available, (probably) lower cost
  • customers aren't asking for IPv6
  • can't charge extra for IPv6
Where is IPv4 going?

• Nowhere.
• still no good IPv6 DSL/cable modems, home routers
• still IPv4-only OSes (Windows before XP, iPhone, non-computer devices)
• still IPv4-only software
The future

• First and foremost:
  • IPv4 needs to keep working!
  • even if we have to break it to keep it!!
  • and is going to cost money!!!

• Then, maybe:
  • IPv6 to do what IPv4 can't do
Sharing the pain

• In a few years: not enough addresses to give one to each user

• So: share one address with multiple users

• with network address translation (NAT)
Problems with NAT

• Doesn't support incoming connections
  • fix with: UPnP (port forwarding), ICE
• If you have to share an address with your neighbors, who gets ports 80 and 5060?
• All NATs break some stuff, some NATs break a lot of stuff
• so more NATs: less chance of your peer-to-peer protocol working
What if we want IPv6?

• (Probably not everyone wants it...)

• ((Probably some people connected to non-IPv6 service providers want it))

• (((If you try hard you can always tunnel))))
Messy transition
Messy transition

IPv4

IPv6
ISPs vs content

• ISPs:
  • need new addresses every year
  • can leave existing customers on IPv4 and give new customers IPv6

• Content providers:
  • need very few addresses
  • either have an AAAA record or not
ISPs vs content (2)

• Likely result once v4 addresses are scarce:
  • more and more (home) users on IPv6
  • most content still on IPv4
• This is a good thing!
  • (well, everyone on IPv6 would be better)
Email Model

Clients

Servers
WWW Model

Clients

Servers
Client/Server Apps

• Email
  • clients talk to one server
  • servers communicate between them

• World Wide Web
  • clients talk to all servers
  • servers don't communicate with servers
Peer to Peer Apps

- P2P type BitTorrent (file distribution):
  - no server-to-server and only subset clients needs to be reachable
- P2P type VoIP (one-to-one/one-to-few):
  - potentially all servers with all servers, all clients with all clients
Translating IPv4 - IPv6

• From IPv6 clients to IPv4 servers:
  • relatively easy!
• From IPv4 clients to IPv6 servers:
  • very hard
• With translation, everything looks like email model
Translation Model

Clients

Servers
NAT-PT

• Network Address Translation - Protocol Translation
• Translate IPv6 to IPv4 and then NAT
  • translator has /96 prefix
• A records translated to AAAA records
• /96 + 32 IPv4 = 128 bits (so each IPv4 address maps to an IPv6 address in the translator)
IETF

• NAT-PT "deprecated" in the IETF
• Now work on "NAT64", improved NAT-PT
  • support for ICE, DNSSEC, IPsec
• What can the IETF do to help you?
• What can you do to help the IETF?
Questions?

Thanks for listening!

www.runningipv6.net

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