

IPv6 Transition Revisit

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The KAME project was a joint effort of six companies in Japan to provide a free stack of IPv6, IPsec, and Mobile IPv6 for BSD variants.

Our products are available in:

FreeBSD 4.0 and beyond OpenBSD 2.7 and beyond

NetBSD 1.5 and beyond

REDIOS 12 and boyond

BSD/OS 4.2 and beyond

The project officially concluded in March 2006 (see press release from the WIDE project). Almost all of our implemented code has been merged to FreeBSD and NetBSD. The snap releases (FTP or cvsweb), anoncvs access, git, and Archives of the snap-users mailing-list are still available. The historical archive of the KAME CVS repository is available at our FTP server.





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Global IPv6 Development and Efforts

- On Feb, 3, 2011 IANA announced the exhaustion of its IPv4 pool
 ✓ Followed by APNIC at 19-Apr-2011, and RIPE NCC in 14-Sep-2012
- IPv6 Day (June 6, 2011) and IPv6 Launch (June 6, 2012) accelerated IPv6 development worldwide
- Montevideo Statement called for transition to IPv6 as top priority
- IPv6 highway ahead of us
 - ✓ Major ISP& Carrier: Verizon Wireless(40.03%), Free (34.28%), AT&T(9.26%), KDDI(9.31%)
 - ✓ 12.7% of the Alexa Top 1000 websites support IPv6
 - More than 3% Google users are using IPv6 to access Google's services
 - ✓ 10 out of 13 root servers support IPv6 dual-stack, 90.5% (400)
 TLDs with IPv6 support in the root zone



Challenge still exists

- Lack of global consensus on the importance of IPv6 deployment asap
 - ✓ISP prefer IPv4+ NAT/CGN
 - ✓ ICPs are stuck in "egg and chicken" circle
- Too complex IPv6 transition
 - ✓ Dual-stack deployment still consume IPv4 address
 - Too many transition technologies adds to network complexity
- The Global IPv6 development is unequal, and cannot follow up the pace of market demand

IPv6 and Transition Process



- Nearly 20 years technical discussion and experiment
- Dozens of IPv6 Transition Technology
 - Tunnel, Translation, Dual-stack, IPv4 workarounds(CGN)
- Complicated transition scenarios
 - Multi-player in the Internet: Users, access ISP, backbone ISP, ICP
 - Pure IPv4, Pure IPv6, IPv4 /6 Dual stack, private IPv4+IPv6



IPv6 Transition tools

- Dozens of IPv6 Transition tools
 - NAT64, IVI, MAP, DS-Lite, 4rd, 6rd, Lw4o6, 464xlat, PNAT. etc.
 - IPv6 Transition Technology Tutorial by Alastair Johnson



14 proposals for IETF standardization in just one tunnel scenario

http://www.ietf.org/mail-archive/web/ietf/current/msg84102.html By 01e Troan

An Successful Example



- Only IPv4 traffic is Charged in Universities
 - 20Gbit per Mouth free for each student
 - IPv6 free access for each student
 - Full of IPv6 application
 - Online TV, Live Broadcasting,
 - BBS & Forum
 - BT/PT download (uTorrent)
 - youtube, facebook & twitter
- IPv6 export network bandwidth (2Gbit/s) is filled up in between campuses in Beijing





One observation

show its differences and benefits IPv6 transition is much more of an industry promotion problem than a technical problem.

show its differences and benefits

The Initial problem: Address Shortage





- To implement IPv6 purely
 - Migrated the whole ecosystem of InternetTo extend life of IPv4
- Share the IPv4 address with multiple users
 - NAT, CGN, NAT444, ...
- IPv6 transition (a compromise)
 - Migrate the internet from IPv4 to IPv6 smoothly







IPv4 Workarounds still proceed

• NAT-friendly Technology development

- Client/Server mode communication
- STUN/TURN (RFC5389/RFC5766)
- PCP (RFC6887 Port control protocol)
- Virtualization and Server Sharing (For Web/DNS)
- <u>Happy eyeballs implementation (RFC6555)</u>
- SPDY(or HTTP/2.0) with CGN

• Web/http dominant ecosystem(with 53/80/443)

- High layer of Security
- End-Middle-End communication



Google Map with SPDY



Source:http://www.ietf.org/proceedings/87/slides/slides-87-behave-6.pdf

Max 15 port





Source :http://www.janog.gr.jp/meeting/janog32/doc/janog32-http2.0-nishizuka-01.pdf





Another observation

The development of IPv4 and IPv6 are in a race, which affects the speed of

IPv6 adoption Worldwide.

IPV6 adoption Worldwide.

When can we pull the plug of IPv4?





The environment will affect everyone!





Ro we need more sophisticated anti-haze Mask?



Internet with Bright Future





IPv6-Only Effort IETF

- Survey of IPv4 Addresses in Currently Deployed IETF Documents (RFC3790-RFC3796)
- IPv6 Support Required for All IP-Capable Nodes (RFC6586)
- Experiences from an IPv6-Only Network (RFC6586)
- Gap Analysis for Operating IPv6-only MPLS Networks(draftgeorge-mpls-ipv6-only-gap-04)
- Interoperability Impacts of IPv6 Interworking with Existing IPv4 SIP Implementations (draft-klatsky-dispatch-ipv6impact-ipv4-02)
- IPv6 Support Within IETF work(draft-george-ipv6-support-02)



Sunset4 WG Discussion

IETF New Work

- All IETF work must work with IPv6-only
- Functional parity
 - But only for features people use
 - Unused IPv4 options not required in IPv6
 - Except nonsense, e.g. NAT traversal techniques
- New features should be in IPv6
- "IETF effort SHOULD NOT be spent retrofitting features into the legacy protocol"



IPv6-only Root in ITI Discussion

- Contribution from Paul Vixie:
 - "We propose that IANA produce several additional forms of the DNS root zone, to allow universal anycast and operational research. "Operational research" in this context includes wide scale public testing of IPv6-only root name service and wide scale public testing of "new gTLD" collision effects."
 - "A second variation on the current root zone would provide universal anycast as above, but would denote name servers that had only IPv6 connectivity (indicated by the presence of AAAA records) and no IPv4 connectivity (as indicated by the absence of A records). This variation would facilitate operational research into IPv6-only networking."

About BII (Beijing Internet Institute)



an <u>independent</u>, <u>private</u> company, headquartered in China since 1999, providing research, certification, training and networking <u>supporting a secure</u>, <u>stable and interoperable Internet</u> with a <u>focus</u> <u>on IPv6</u> deployment, Internet challenges and information





Thank you



IPv6 need our concerted effort!