NAT444+v6 Softwire

Shin Miyakawa , Ph.D. NTT Communications Corporation miyakawa@nttv6.jp

NAT444 + Softwire

- This is not IDEAL solution, we know
- There are several (maybe serious) problems
- However so, this is the only choice if we can not assume CPE router which can be upgraded or replaced in front of PC in the home.

 If DS-Lite, A+P ... can terminate at the customer edge device including PC, of course, we like that.

Even IPv4 address allocation "completion" comes;

- We need to modify IPv4 access scheme in the ISP environment for our customers
 - To save their old equipments
 - Windows 2000, Windows 98 does not have IPv6 support
 - To make DNS works
 - Windows XP SP2 or SP3 have IPv6 but to resolve DNS name, it uses IPv4 transport only
- If we can not enforce customers to replace or upgrade their CPE router, step-by-step conversion and "incentive" are needed.
 - If we can enforce to replace their CPE router, different scheme like "dual-stack-lite" is better.

Most conservative access model changes - introducing "Carrier-Grade NAT" -



There is a limitation of numbers of sessions which can pass through a NAT



Maximum # of sessions

Max 30 Connections



Max 20 Connections



Max 15 Connections



Max 10 Connections



Max 5 Connections



So, We DO NEED IPv6

- Anyway, we do need IPv6 to let rich applications and contents like AJAX based, RSS, P2P ... to survive
 - Such ASPs and applications MUST be converted IPv6 compatible within few years
 - other wise they may lose huge market (for example Asia Pacific region where IPv4 address space is not sufficient)
- But at the same time, we have to extend the life of IPv4 for more 10 years or so at "SO-SO" level to keep old implementations work so far
- Which means, We have to do IPv6/v4 dual stack for a while (let say..until around 2020) and let IPv4 retire step-by-step but still as fast as possible from cost point of view.

Examples of # of concurrent sessions

Webpage	# of sessions
No operation	5 ~ 10
Yahoo top page	10~20
Google image search	30~60
Nico Nico Douga	50~80
OCN photo friend	170~200+
iTunes	230~270
iGoogle	80~100
Rakuten	50~60
Amazon	90
HMV	100
YouTube	90

Large Scale NAT (Carrier-Grade NAT)

- Scalability
 - >10K users (or contracts)
 - 100s of sessions per user (or contract)
- Maximum Transparency is desired
 - Like SOHO Router, there should be no barrier for application
 - So call "Full-CONE" + "Hairpinning" is ideal
 - Different from NAT for Enterprise
 - draft-nishitani-cgn-00.txt
 - IETF BEHAVE WG
- High Availability

Some additional issues

- NAT-PT (v6 <-> v4 translator) does not work well some time for example , against google cache that has the numeric IP address notation in URL like
 - <u>http://[2001:4860:b002::84]/search?q=cache:FgE</u>
 <u>REgfx830J:ja.wikipedia.org/wiki/IPv6+IP%EF%BD%</u>
 <u>96%EF%BC%96&cd=1&hl=ja&ct=clnk&gl=jp</u>
- Also any application which has numeric IP address in the payload

Softwire

- Simply talking, carry IPvX over IPvY
- Today, I am concentrating to IPv6 over L2TP over IPv4
- IETF Softwire WG

- NTT Communications' OCNIPv6 is the commercial service of Softwire
- Can terminate on PC running XP, Vista, Windows7, FreeBSD, Linux

Transition Scenario

- One possible transition scenario from v4 only to dual stack to v4/v6 will be showed
- I think this is the most conservative and stepby-step

Simple concept

- Customer can be converted one by one
- Customer do not need to purchase any hardware until some stage of conversion
 - Especially he/she uses XP, Vista, Leopard, Linux or BSD

- IPv6 will be main stream eventually
- IPv4 will be for backward compatibility

About "SOFTWIRE"

• IETF SOFTWIRE WG

- SOFTWIRE HUB-and-SPOKE model is essentially "IPv6 over L2TP over IPv4"
- Sometime, we have to configure CPE router so that it passes L2TP session but generally speaking, because L2TP is on UDP scheme, it can traverse NAT easily

Implementations

• NAT444

No need to be changed on the PC to use

- v6 Sotwire
 - Windows XP SP2 NTT-C has developed the client
 - Windows Vista compatible with v6 over L2TP over v4
 - upcoming Windows 7 same above as Vista
 - FreeBSD there is "ports" software
 - Linux, Mac : NTT-C has blog to show the technique

At the beginning: Global v4 only service



Dual Stack backbone (it's easy)



Introducing LSN



Introducing Softwire (v6 over v4 L2TP)



Softwire termination on CPE router looks tricky but in-expensive



At this stage

• We can use 6rd maybe

Native IPv6 service but CPE router is not ready



Replace CPE router to IPv6 compatible



At this stage

• We can use DS-lite to omit v4 faster

Pure v6 world

