From IPv4 only to v4/v6 dual stack
- IPv6: Dose it work for you? -

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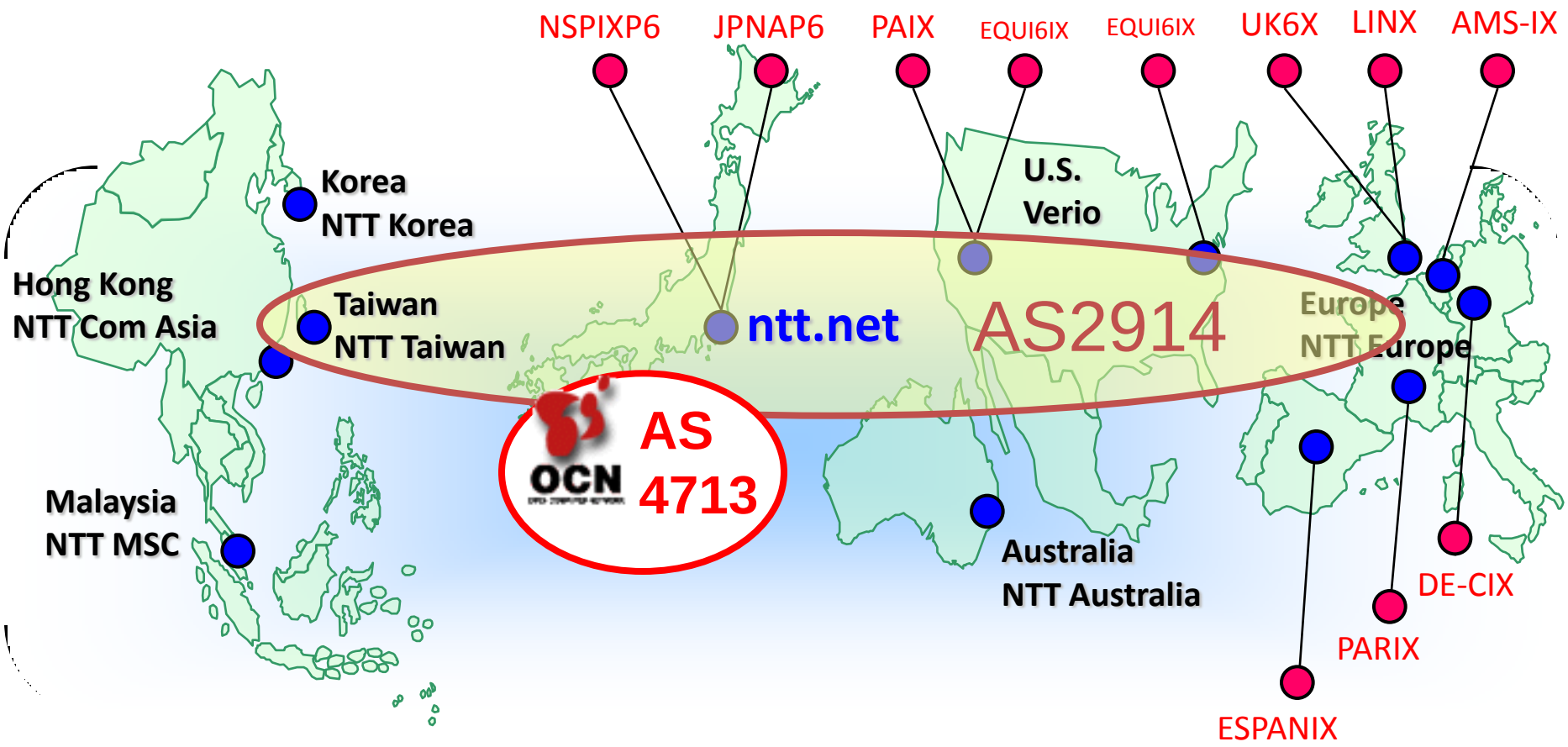
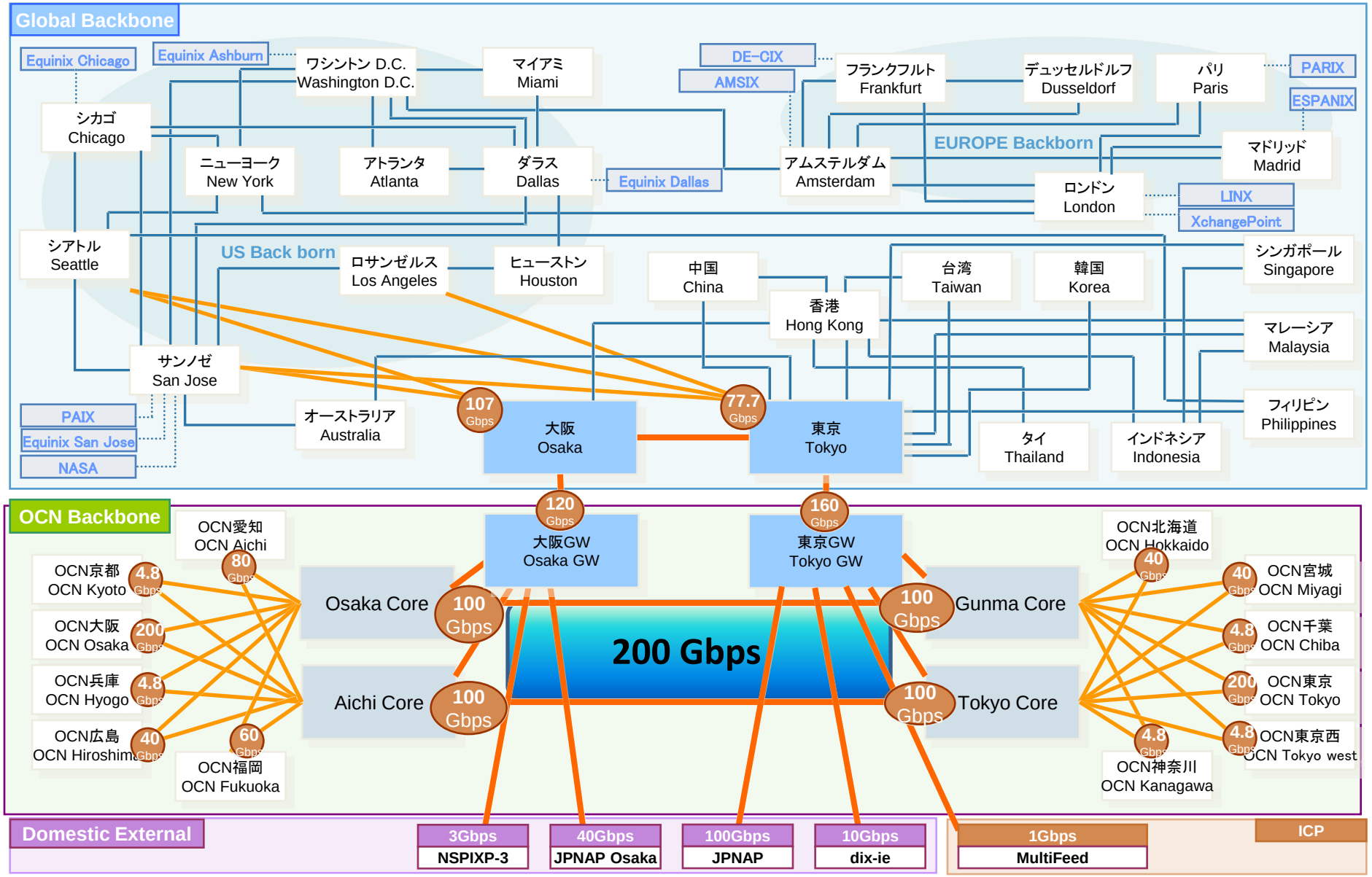
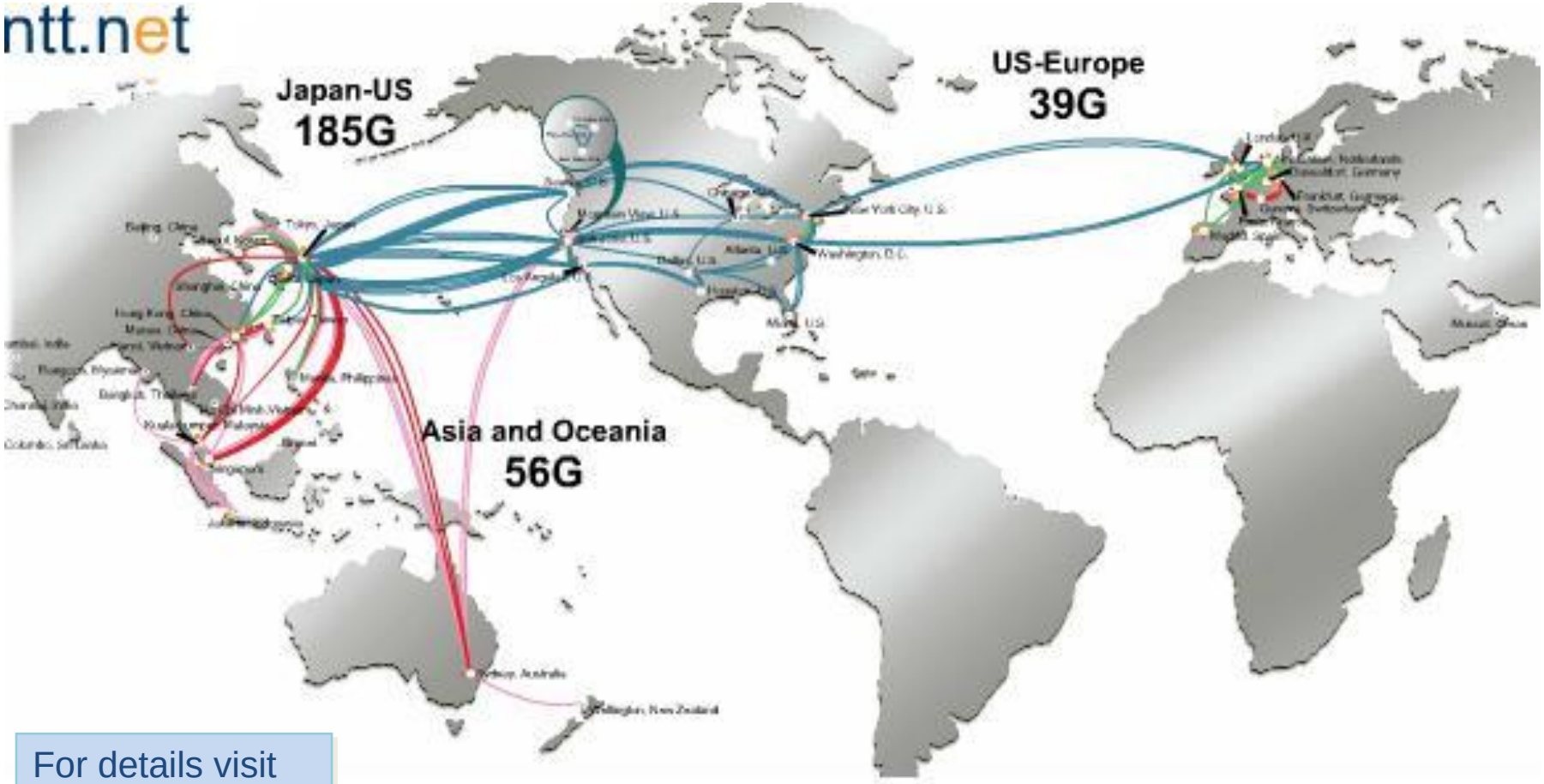
NTT Communications' two ASes



Domestic Backbone



International Backbone



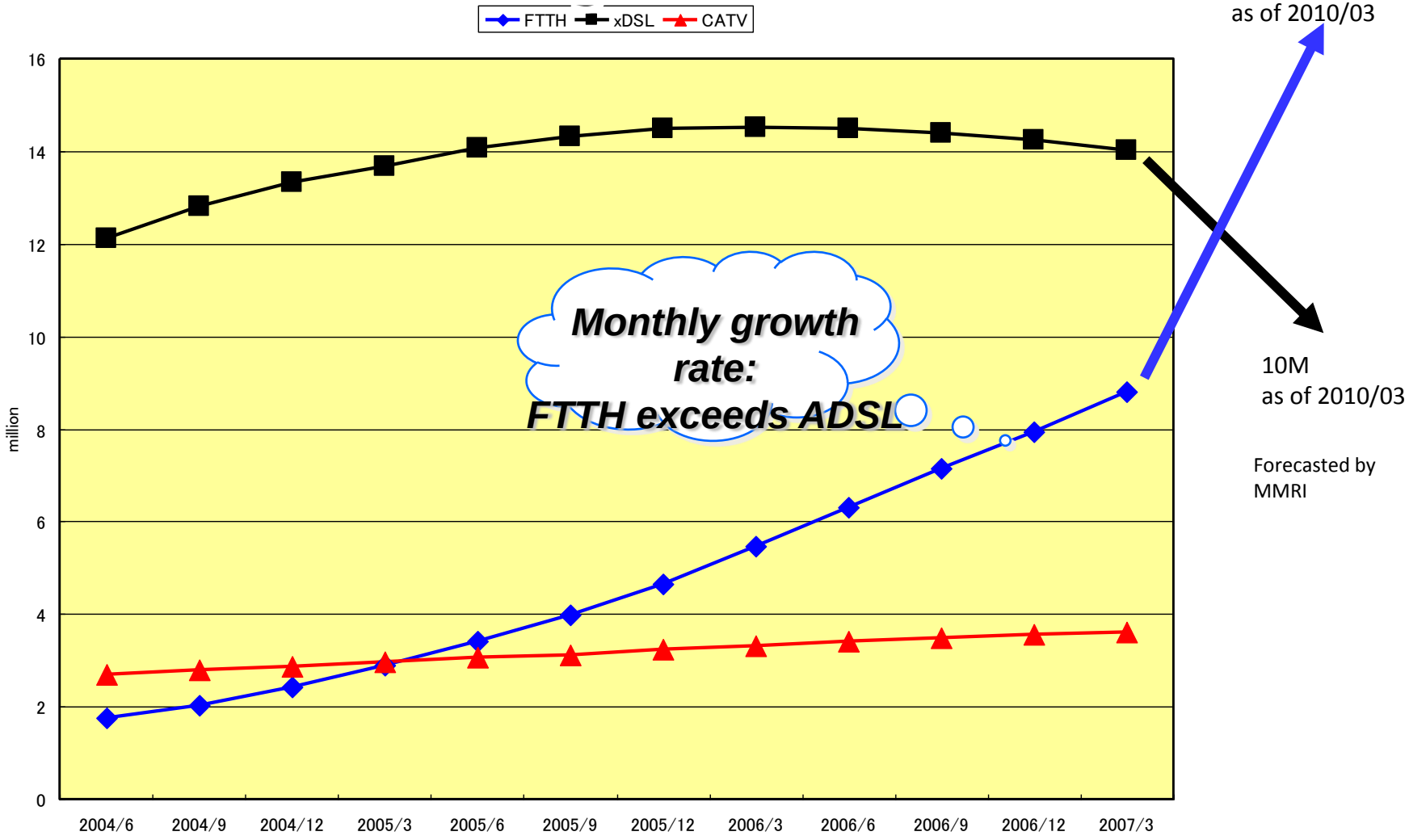
For details visit
http://www.ntt.net

- **The only global Tier-1 provider in Asia**
- **Largest IP backbone in Asian area**

NTT Communications' IPv6 service - almost everything is ready -

- Now
  - Leased line
  - Data center
  - Hosting
  - ADSL (native : RFC4241 + a bit enhancement)
  - FTTH (softwire [L2TP] based)
    - "Native" is on the way… ☺
  - Transit
  - And more..

- Achieved 8.8 millions of FTTH on May 2007
  - cf. Japanese national popularity: about 120 millions



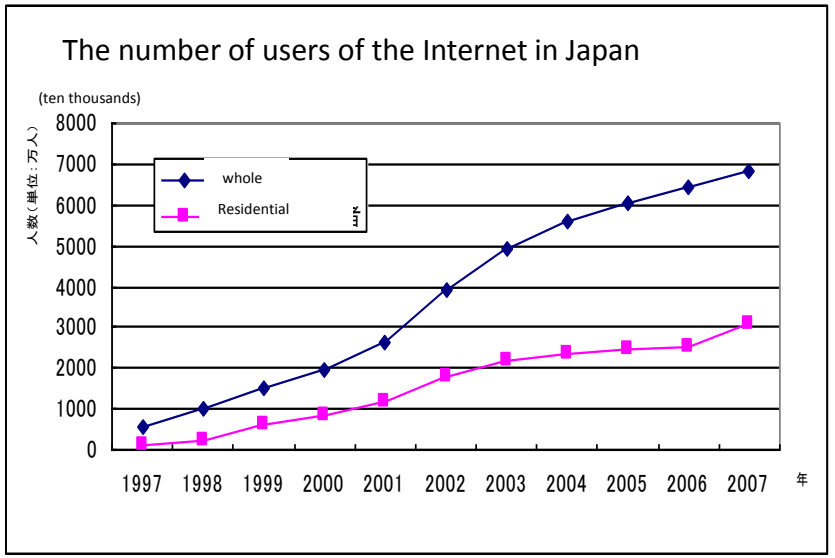
Source: Statistics from Ministry of Internal Affaires and Communications

The number of ISP customers is increasing; however, IPv4 global address will exhaust in a few years.

Especially, the number of broadband internet connectivity service is growing; e.g. annual growth of OCN broadband customers is about 700,000.

IPv6 is ready for network equipment and PCs; however, we don't think that all the servers support IPv6 before IPv4 address exhaustion.

Therefore, we need to provide IPv4 connectivity for customers even after IPv4 exhaustion.



Ref: Internet White Paper 2007

year	The number of Users (Ten thousands)
2004/2	5614
2005/2	6064
2006/2	6459
2007/3	6827

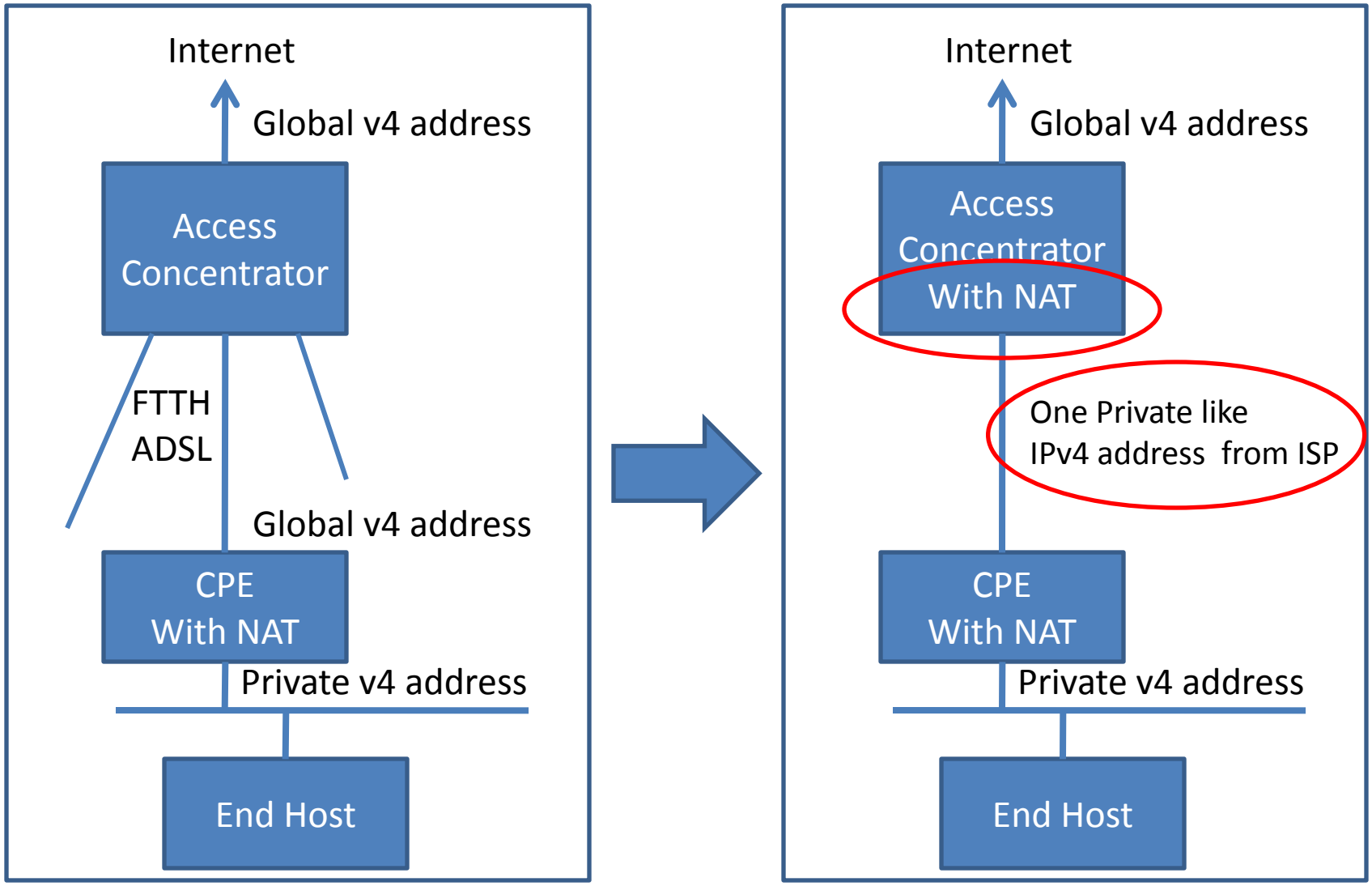
about 4 million growth annually

* Expect for mobile users

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” maybe better.

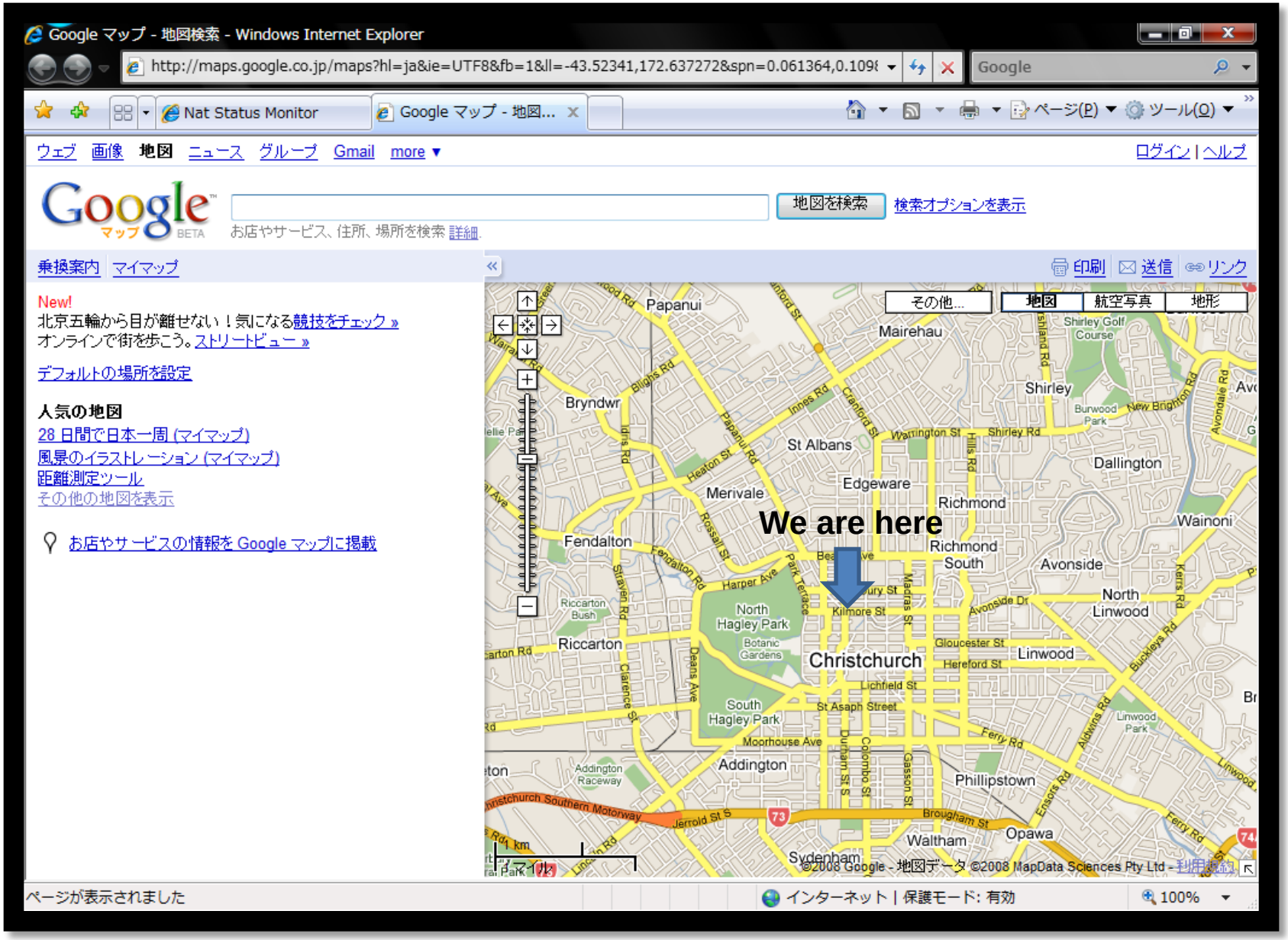
Most conservative access model changes - introducing some NAT function-



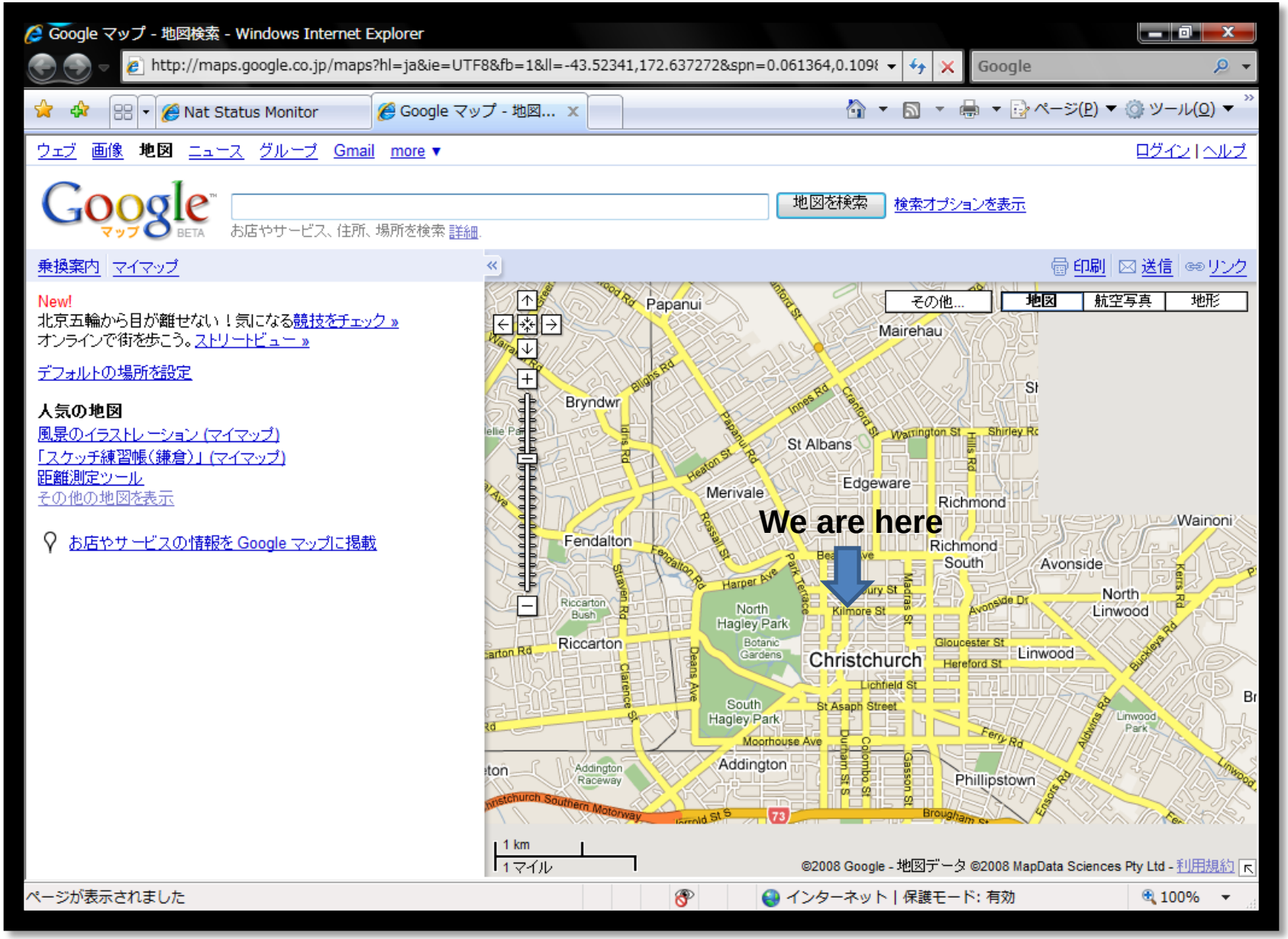
It looks v6 is not needed ?

- Please do not feel safe. CGN (and any NAT scheme) has serious restrictions.
- IPv6 is needed !
- Each customer can have only some “limited” numbers of sessions simultaneously.
  - How many ? Let say… 50 ? 30 ? Because “port number” is just 2bytes which means 64K
  - For example, if 2000 customer shares same Global IPv4 address (please note that this is just for example), only 25 or 30 so sessions can be used by each customer at the worst case.
- Which means that:

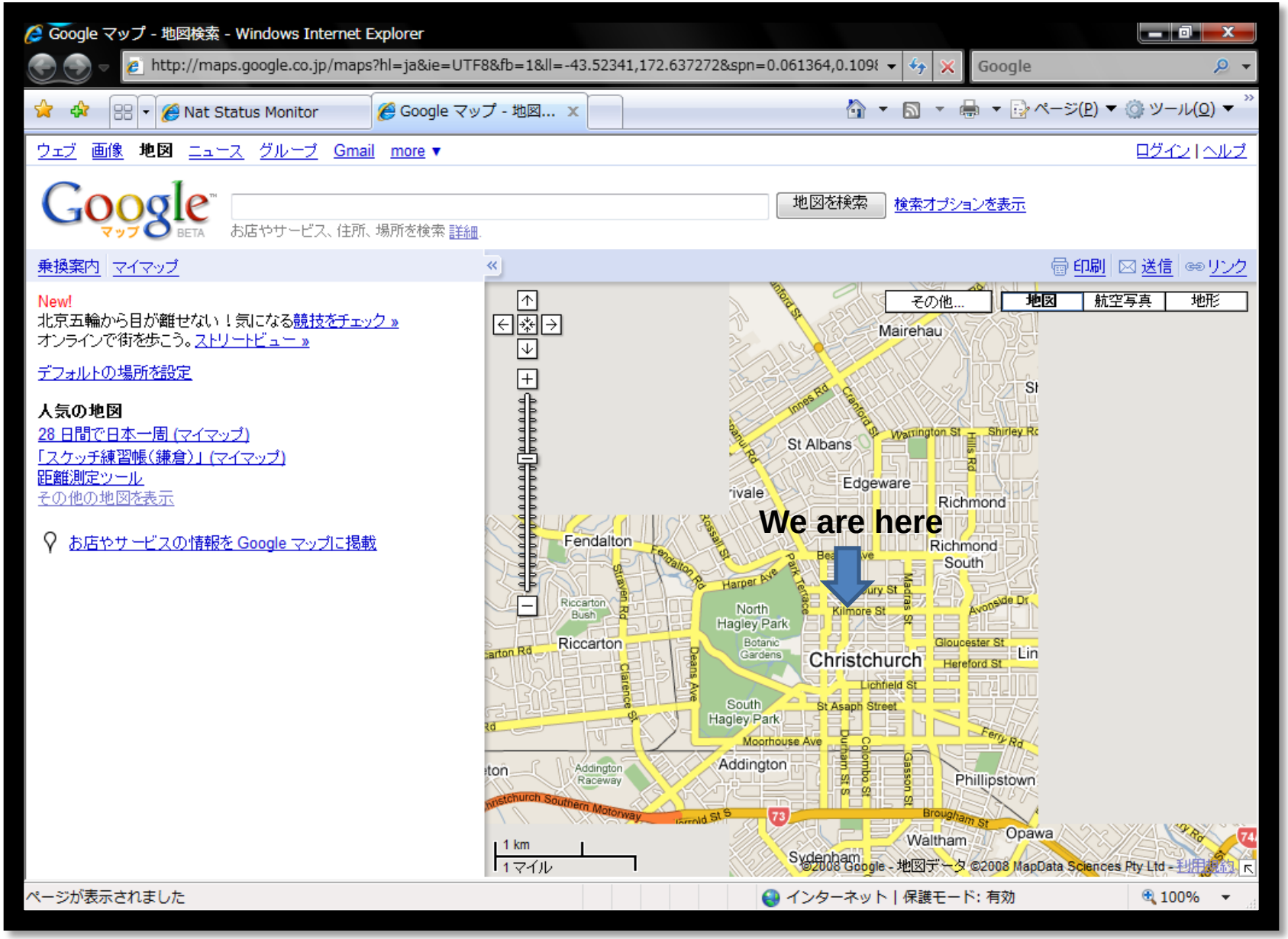
Max 30 Connections



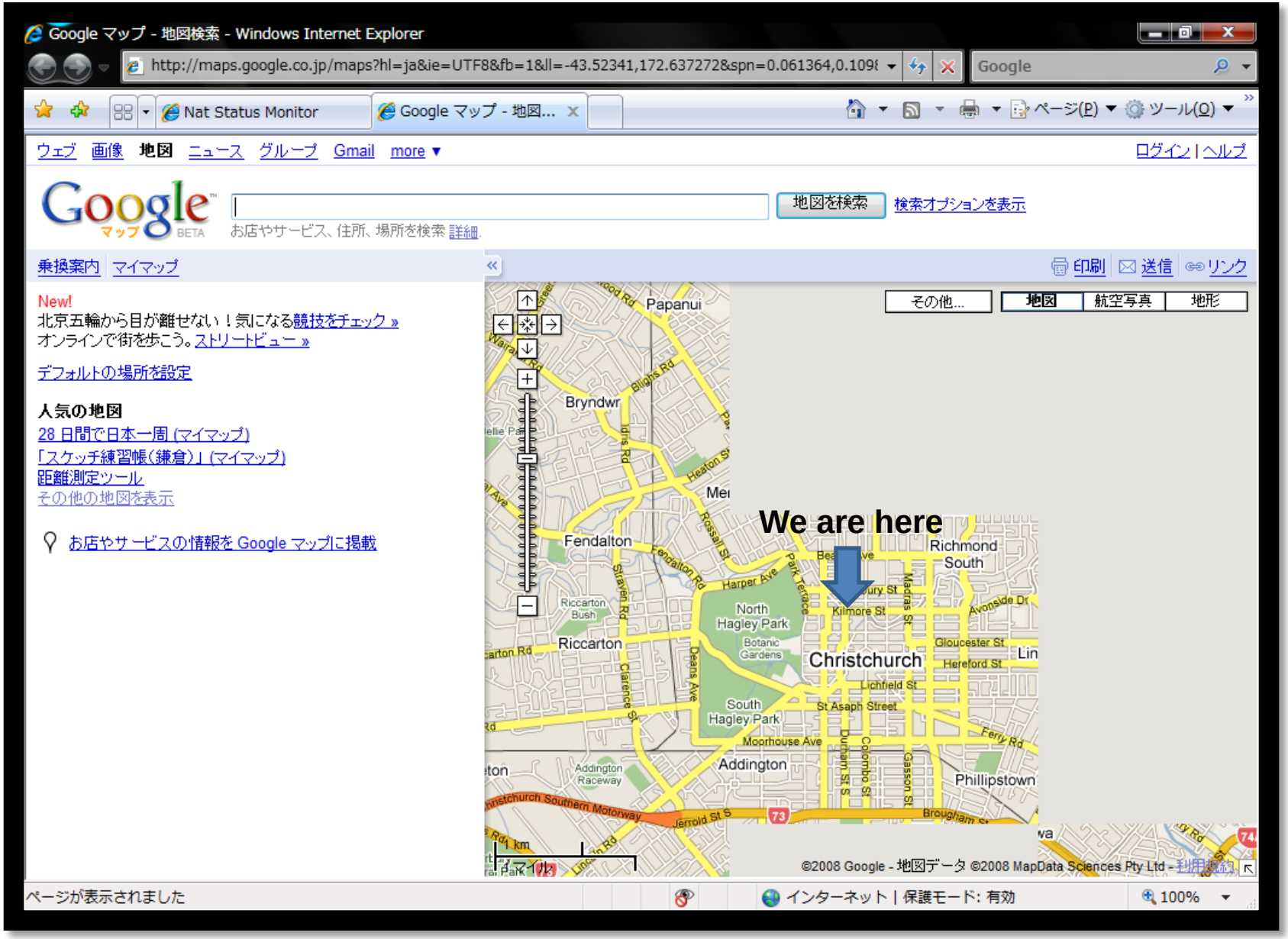
Max 20 Connections



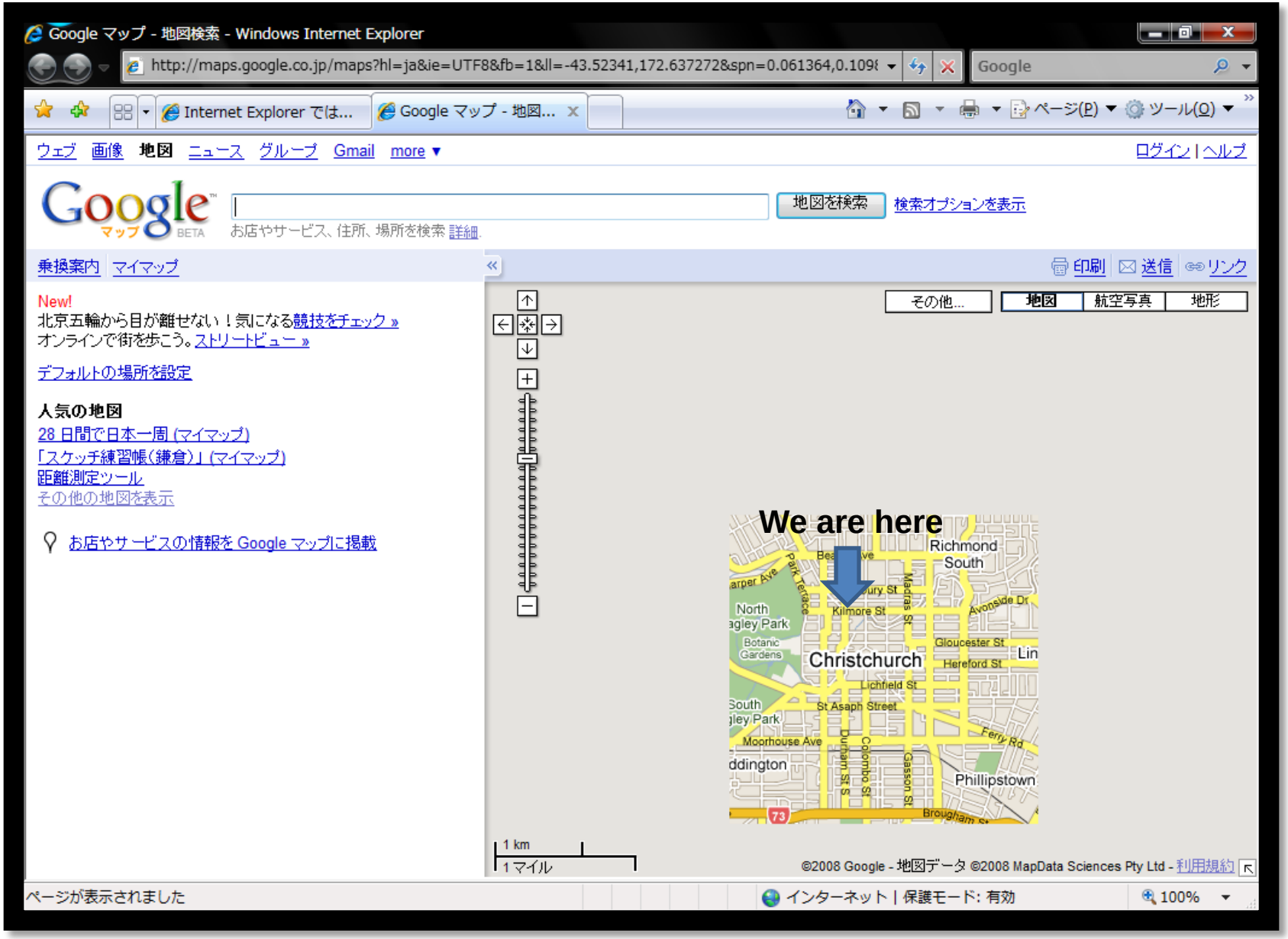
Max 15 Connections



Max 10 Connections



Max 5 Connections



http://maps.google.com/
Google
サーバが見つかりませんでした
maps.google.com という名前のサーバが見つかりませんでした。
www.example.com を間違えて ww.example.com と入力するなど、アドレスを間違って入力していないか確認してください。
他のサイトを表示できない場合、コンピュータのネットワーク接続を確認してください。
ファイアーウォールやプロキシでネットワークが保護されている場合、Firefox による Web アクセスが許可されているか確認してください。
再試行

So, We DO NEED IPv6

Examples of numbers 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

In the real world

- According to our observations, about 500 sessions are average numbers of concurrent sessions per users.
- To be more realistic, only 8 users per 1 single global IPv4 address may be a good ratio to use ISP NAT.
  - This is a worst case but..

Transition Scenario

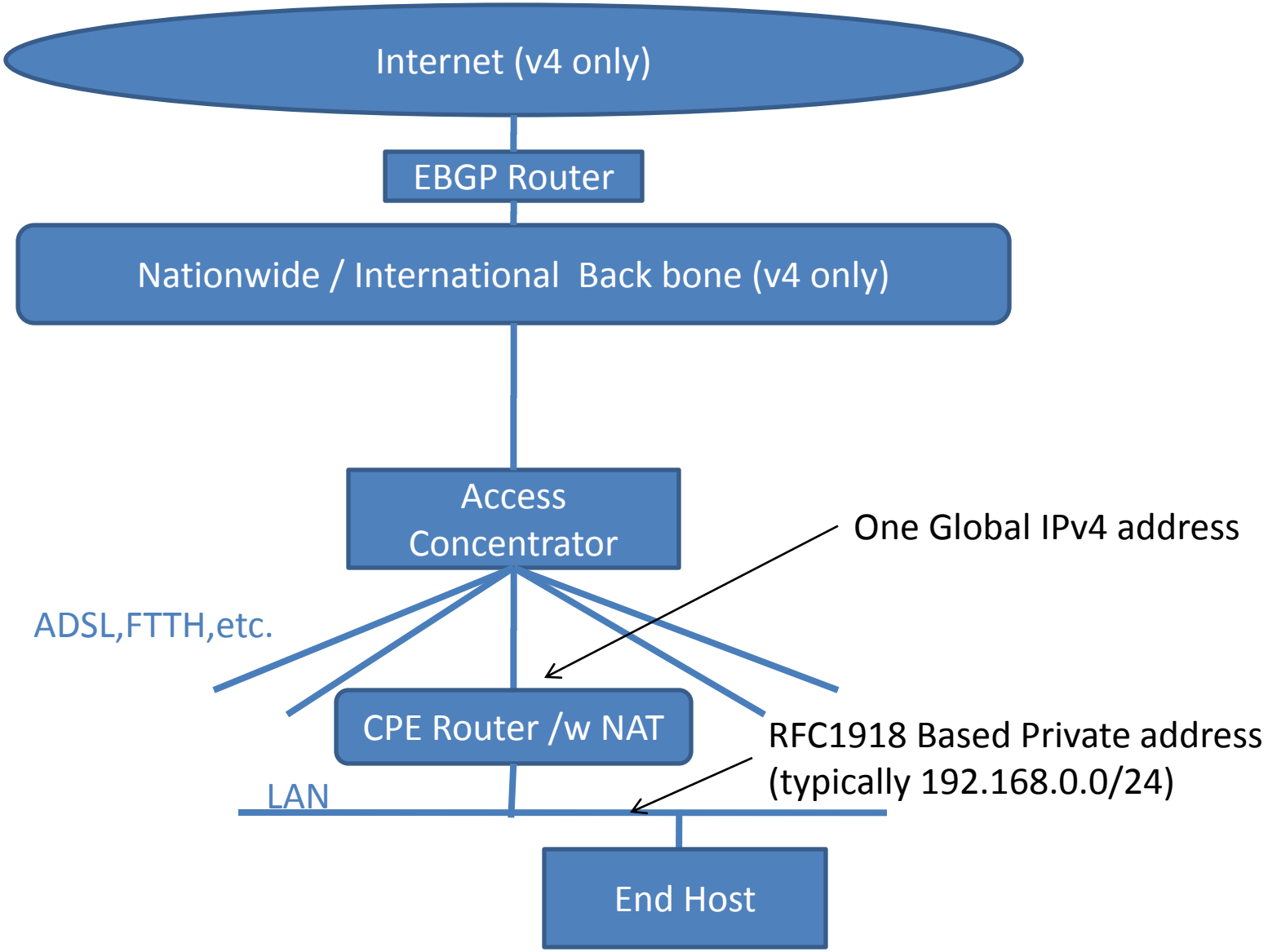
- One possible transition scenario from v4 only to v4/v6 dual stack will be showed
- I think this is the most conservative and step-by-step

Simple concept

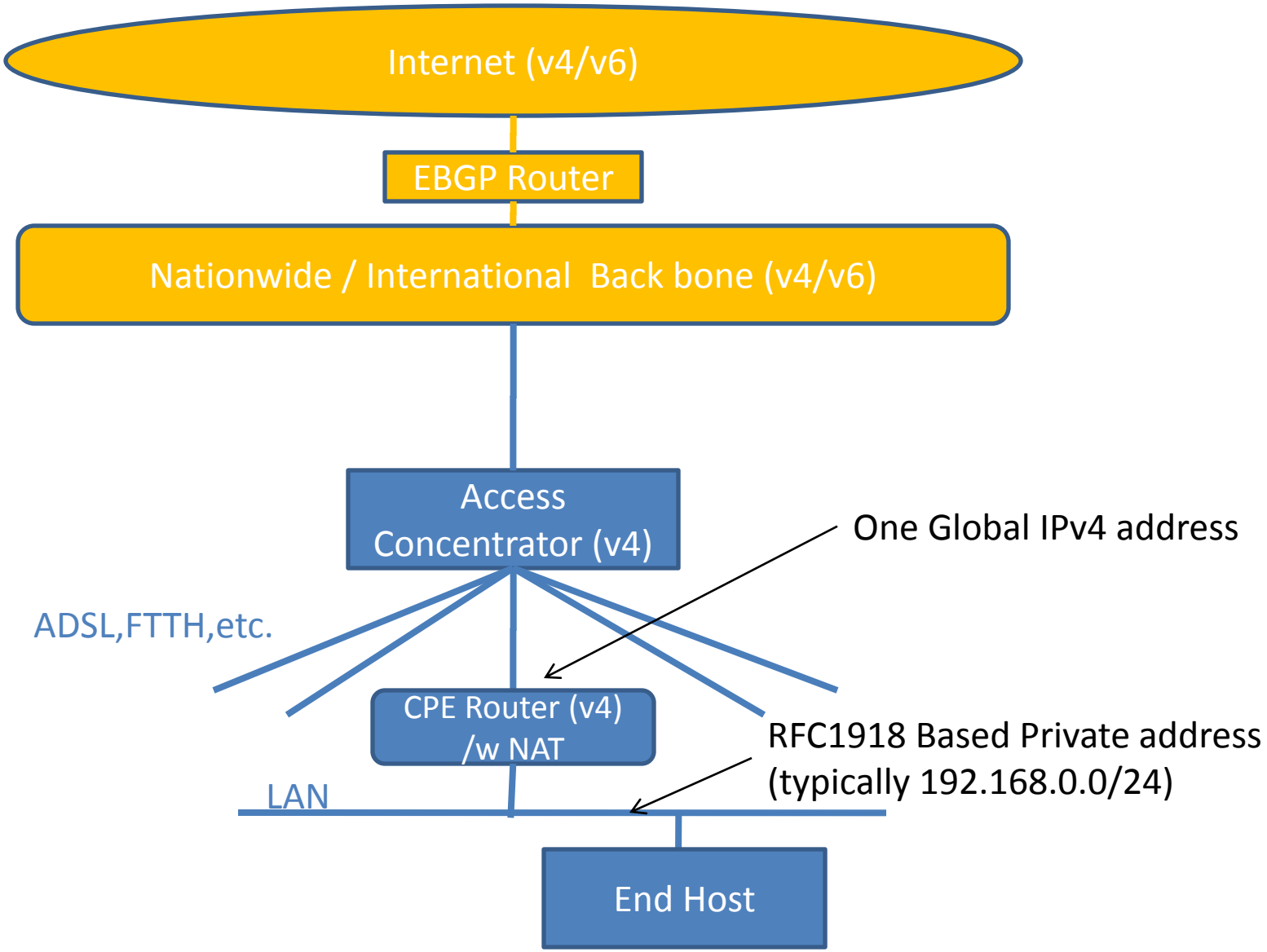
- Customer can be converted one by one
- Customer do not need to purchase any hardware until some stage of conversion
  - Especially he/she uses XP, Vista, Leopard, Linux or BSD

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

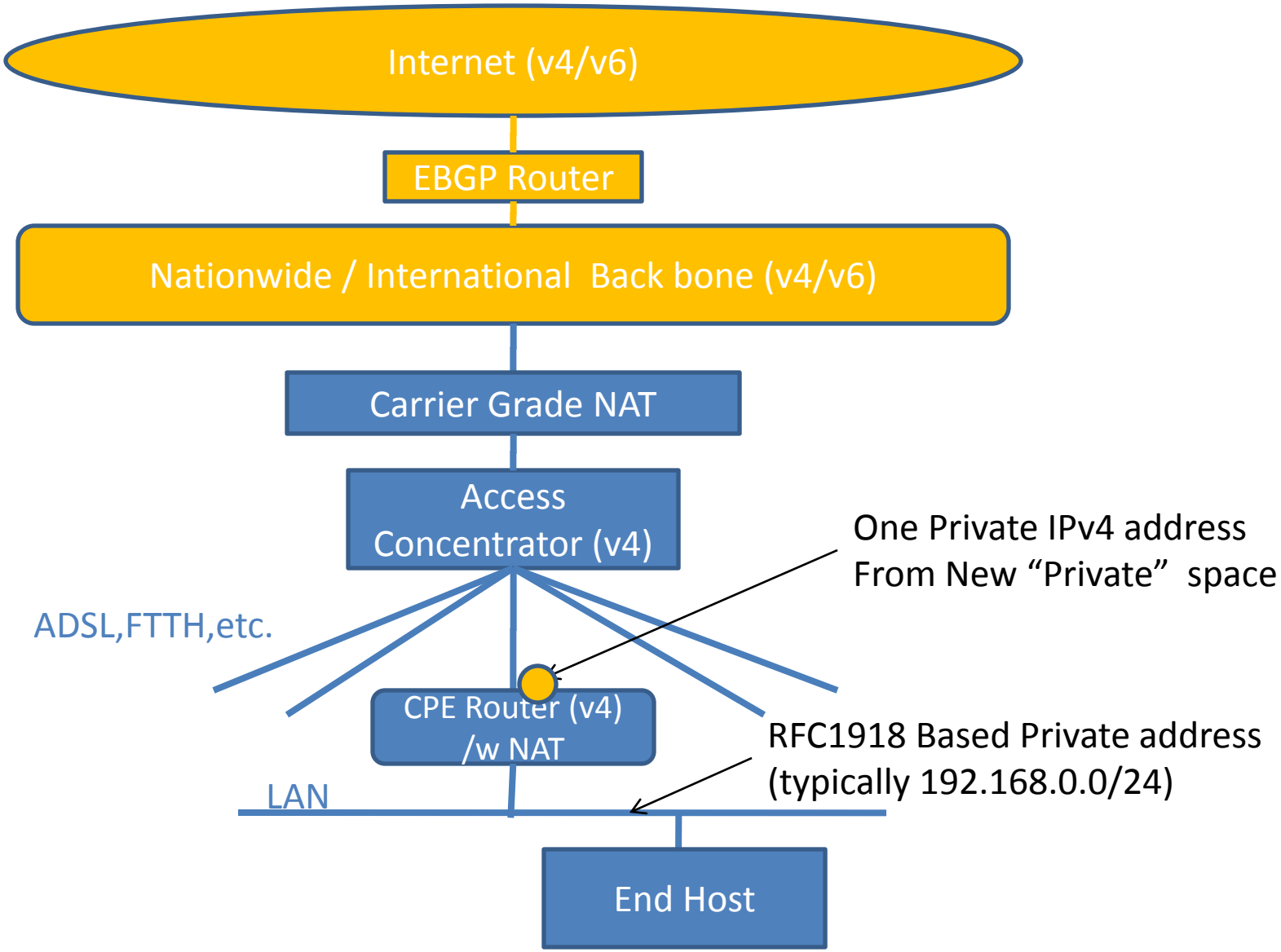
At the beginning: Global v4 only service



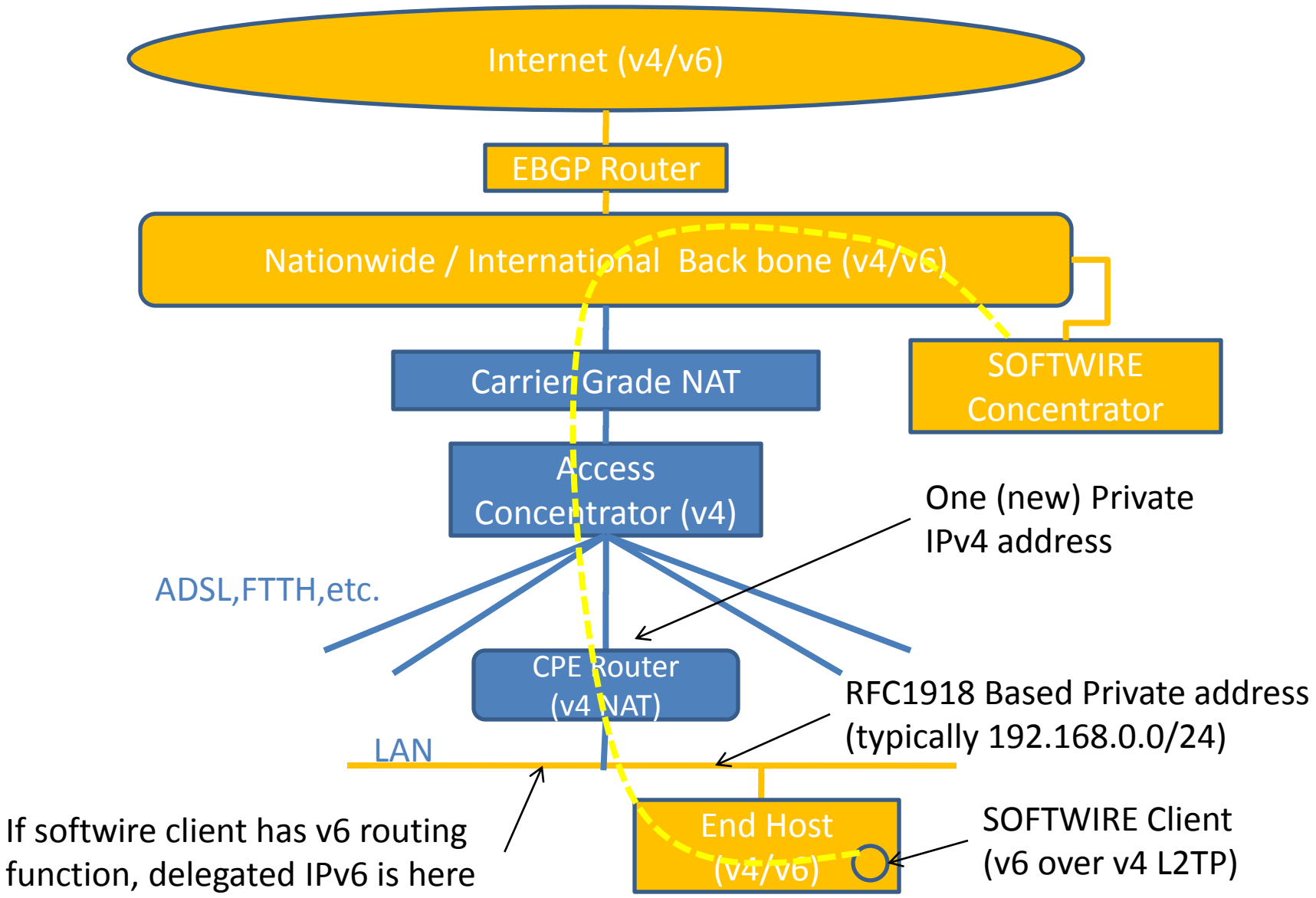
Dual Stack backbone (it's easy)



Introducing NAT

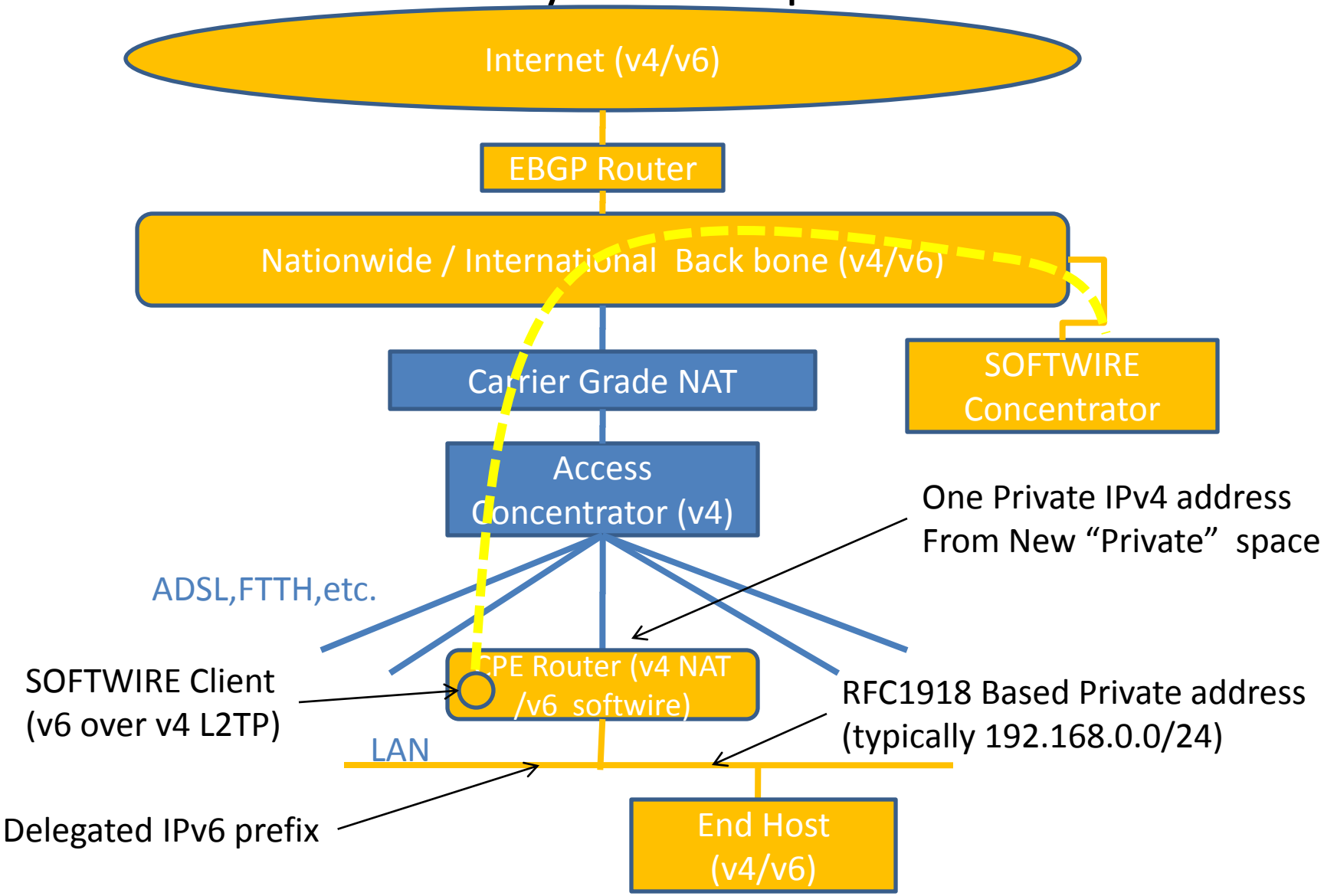


Introducing Softwire (v6 over v4 L2TP)

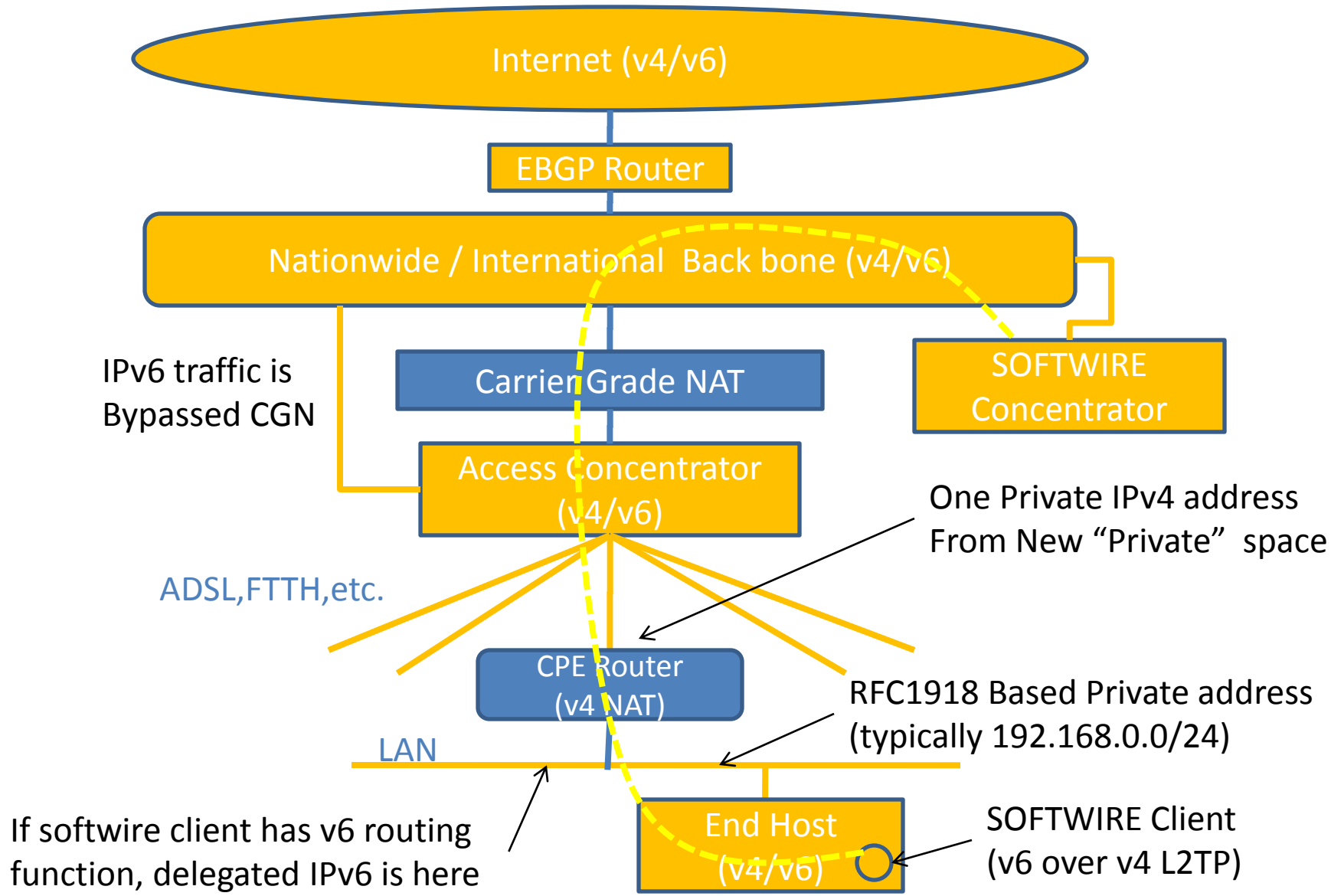


Softwire termination on CPE router

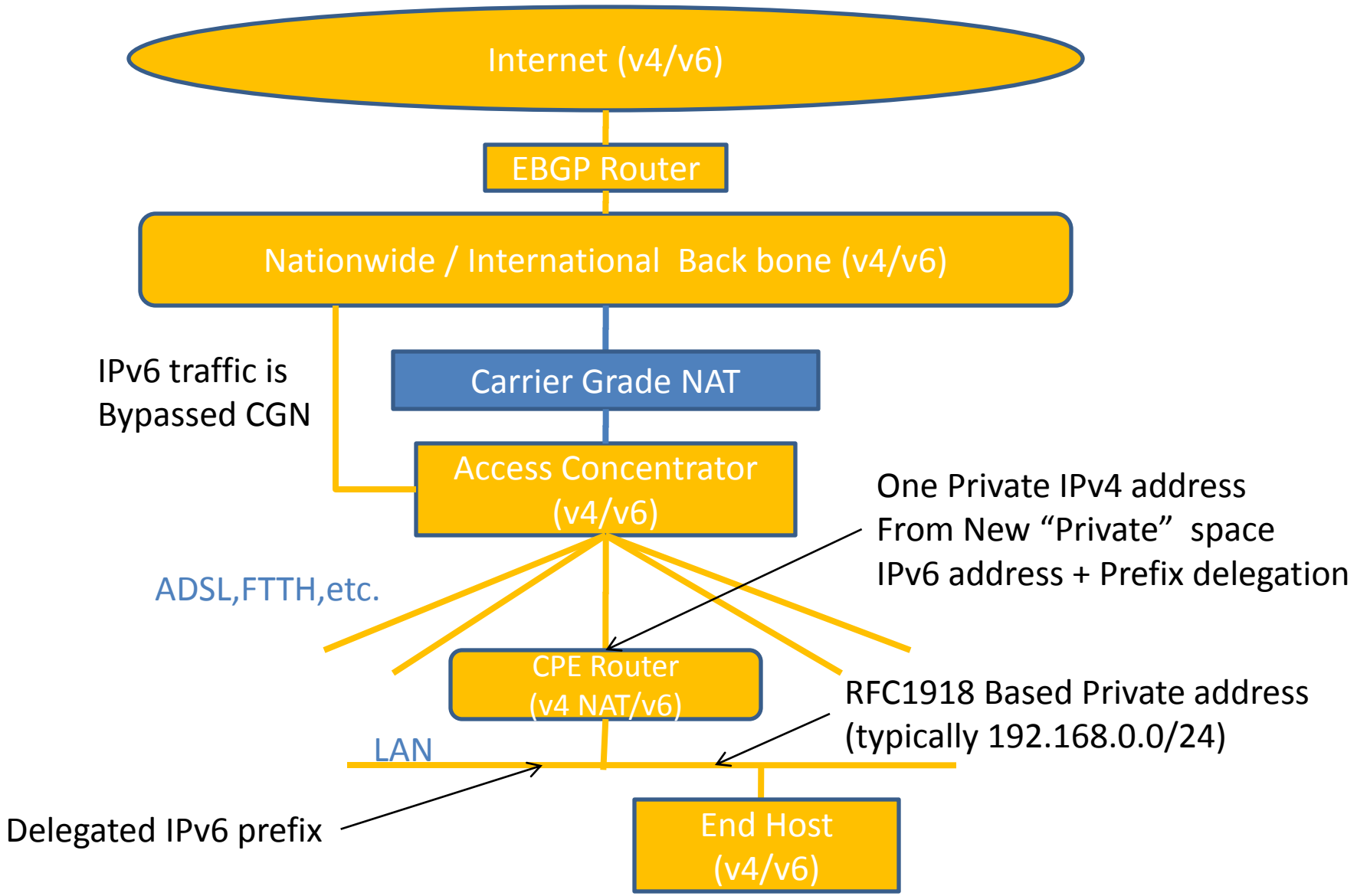
looks tricky but in-expensive



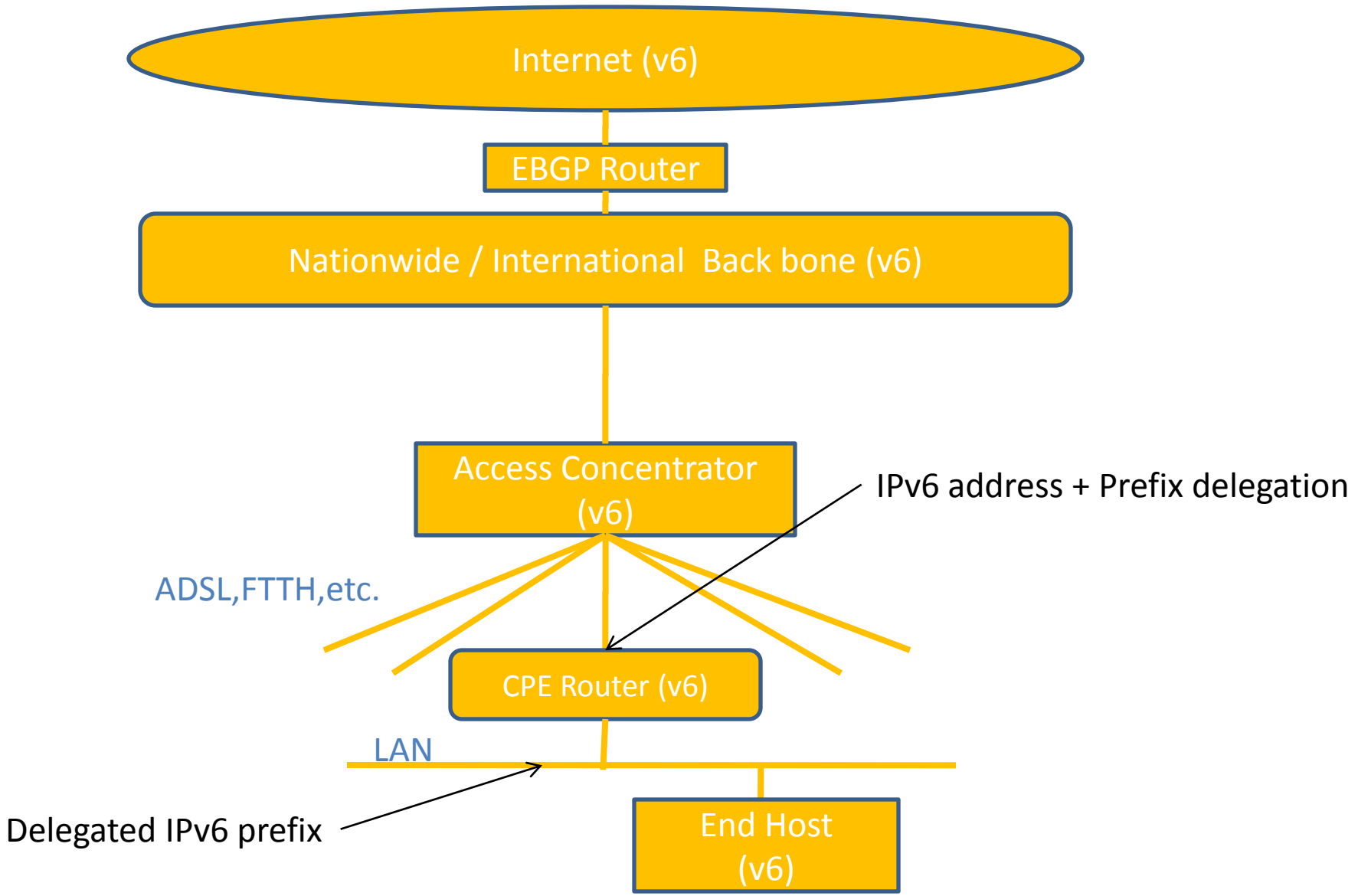
Native IPv6 service but CPE router is not ready



Replace CPE router to IPv6 compatible



Pure v6 world



We will do

- Actually, NTT group already has commercialized IPv6 services for VoIP, IPTV and so on for 5+ millions of customers
- We are now constructing a beta testing ISP facility for complete dual stack with CGN environment in a data center in down town Tokyo
- Our new service in addition to IPv6 with CGN is planned to start by year 2010 autumn
- We are really happy if we could help ISPs especially in Asia Pacific area (but not limited to) that will be facing same problems

Thank you