ntt.net

NTT Communications

IDA IPV6 EXECUTIVE BRIEFING SESSION

"Customers needs for IPv6"

17th November 2011

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Innovative IP Architecture Center
NTT Communications Corporation

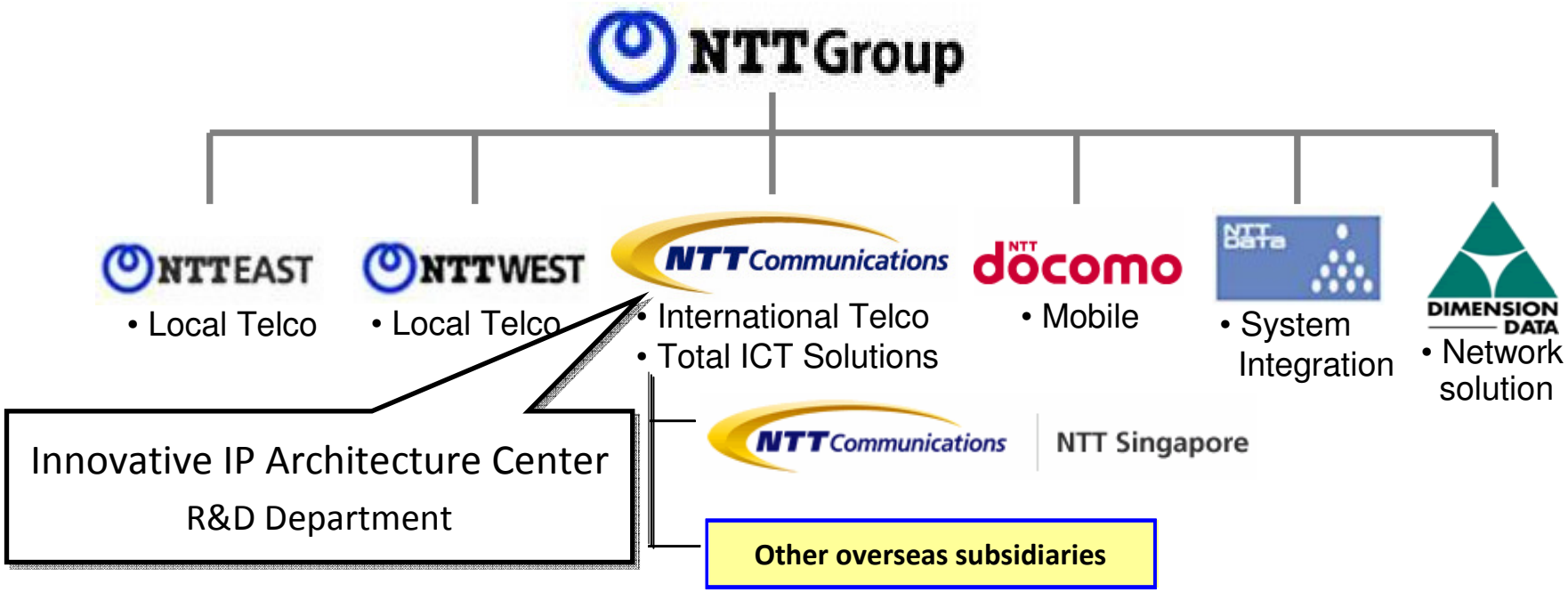
Today's Agenda

1. Our Company and Business Profile
2. Our IPv6 development, deployment, and commitment
3. Requirements and Motivation of moving onto IPv6
4. Case study
5. Moving towards IPv6

Today's Agenda

1. Our Company and Business Profile

NTT Group

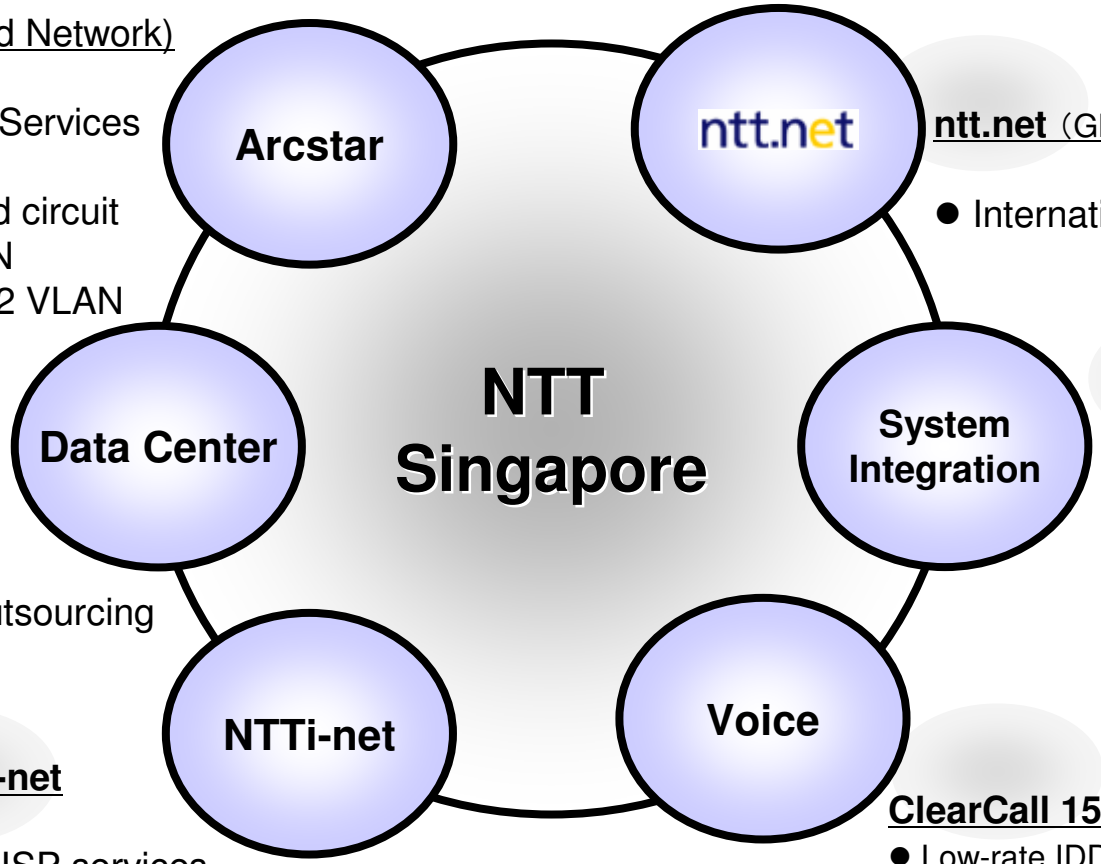


Headquarter:	Tokyo, Japan
Establishment:	founded 1952 and privatized in 1985 established NTT Communications Corporations on 1 July 1999
Business:	Telecommunications (fixed line, mobile, IP Solutions, systems integration, data centers)
Revenue:	US$120.315 Billion (as reported by Fortune Global 500, July 2011) Ranked 31st in Fortune Global 500 (July 2011)
Recent Initiative:	IPv6, new DCs, Low Latency solution, new regional cable
R&D:	>US$1 Billion

NTT Singapore

Arcstar (Global closed Network)

International Network Services for business
- International Leased circuit
- International IP-VPN
- International Layer-2 VLAN



ntt.net (Global IP Network)
- International IP backbone

Data Center
- Colocation
- System operation outsourcing
- Hosting

System Integration

for network equipments, servers, PC, etc.
- consulting
- Designing and Implementation
- Operation/Maintenance

NTT i-net

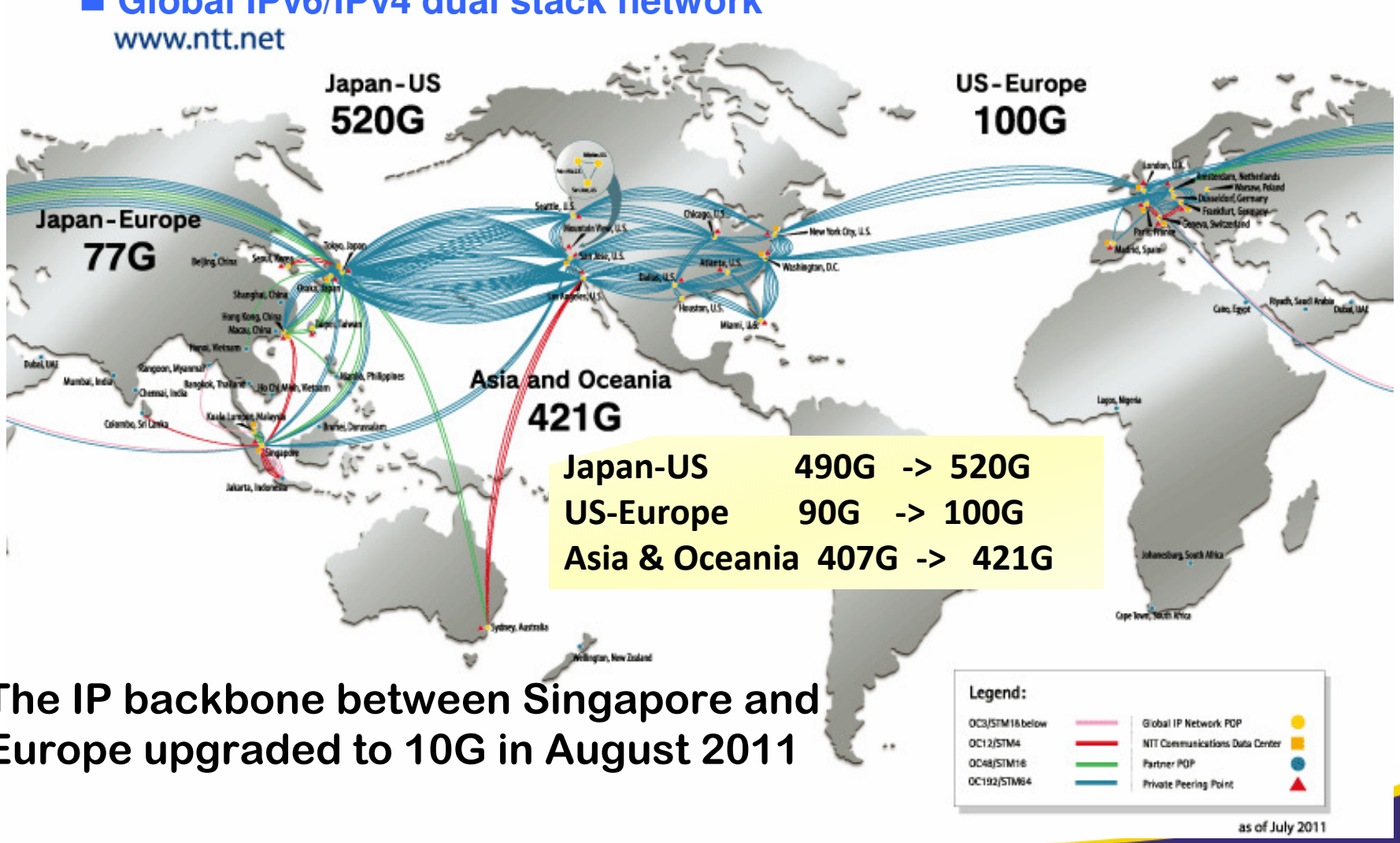
Local ISP services
- Internet connectivity (NGNBN/Leased circuit/ADSL)

ClearCall 1517
- Low-rate IDD calls from office/home phones and mobiles

NTT Com Global IP Backbone

- The only Asia-based Global Tier 1 IP Backbone
- Fully redundant network backed by industry leading SLA's
- Global IPv6/IPv4 dual stack network

www.ntt.net



The IP backbone between Singapore and Europe upgraded to 10G in August 2011

NTT Com Global MPLS Network

Global MPLS Network Service PoPs

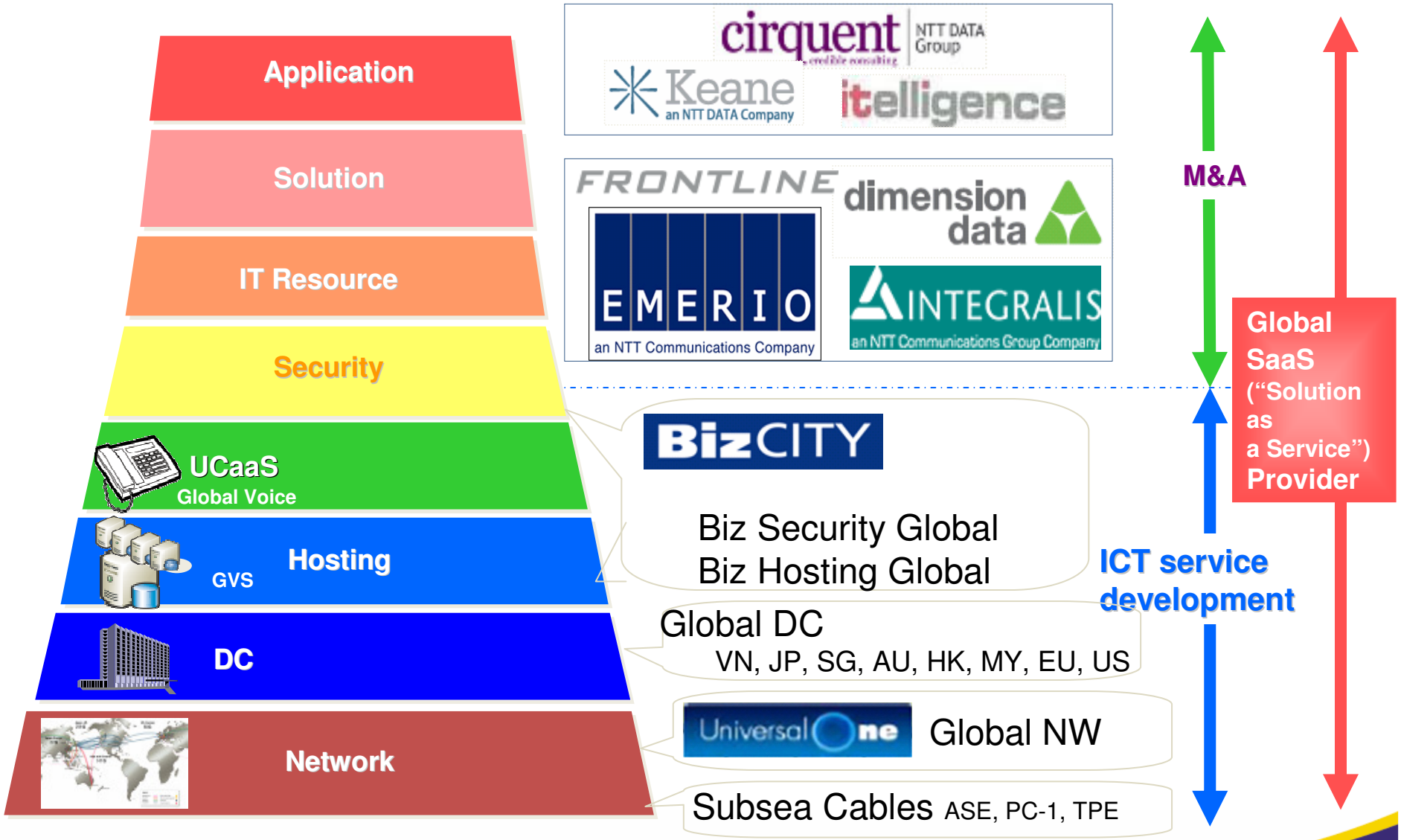
NTT Communications Data Centres worldwide

NTT-COM has expanded its data center services over 31 Cities in 20 countries/regions outside of Japan

***Total server space : Approx. 37,000sqm**

(As of Aug 2011)

NTT Com – Solution as a Service provider

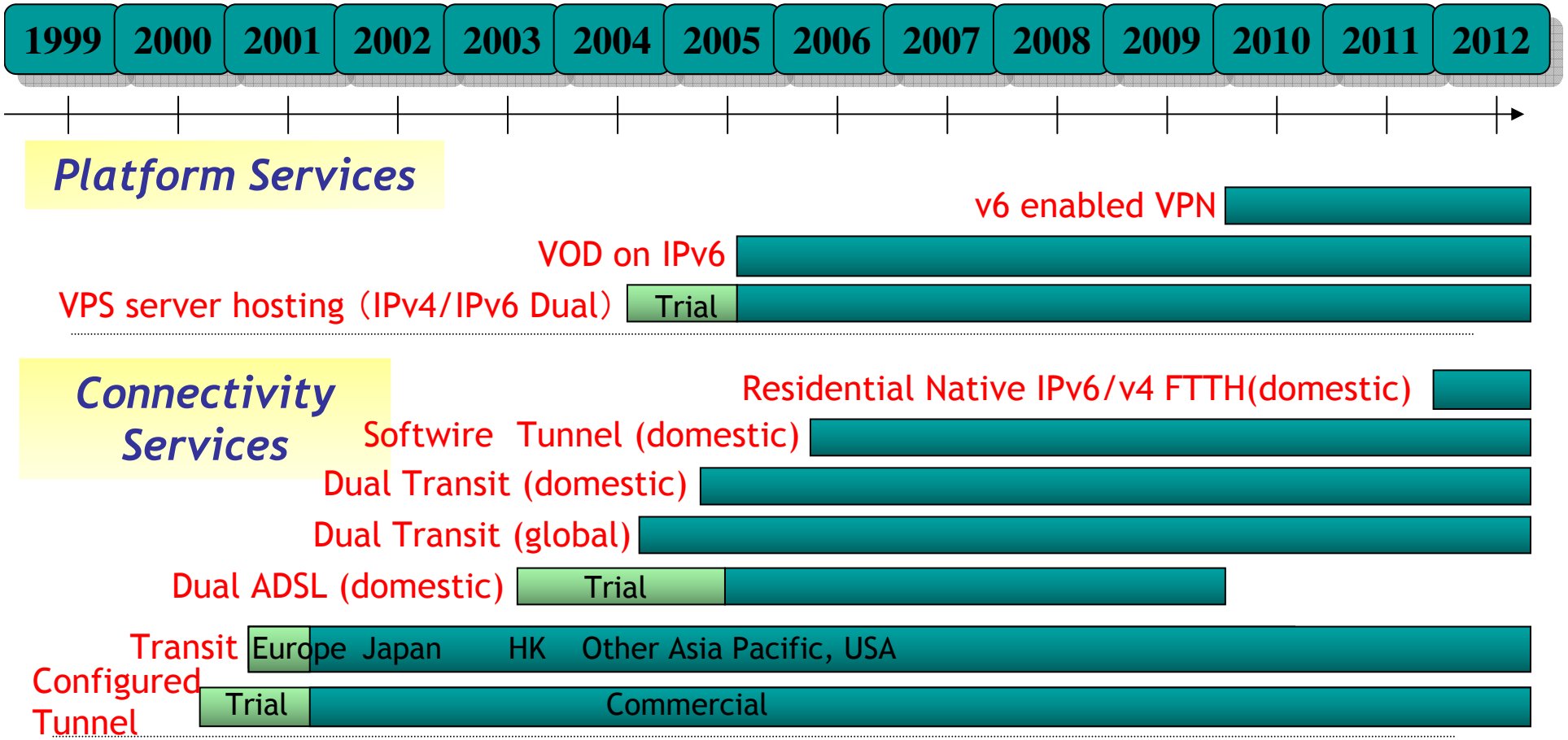


Today's Agenda

2. Our IPv6 development, deployment, and commitment

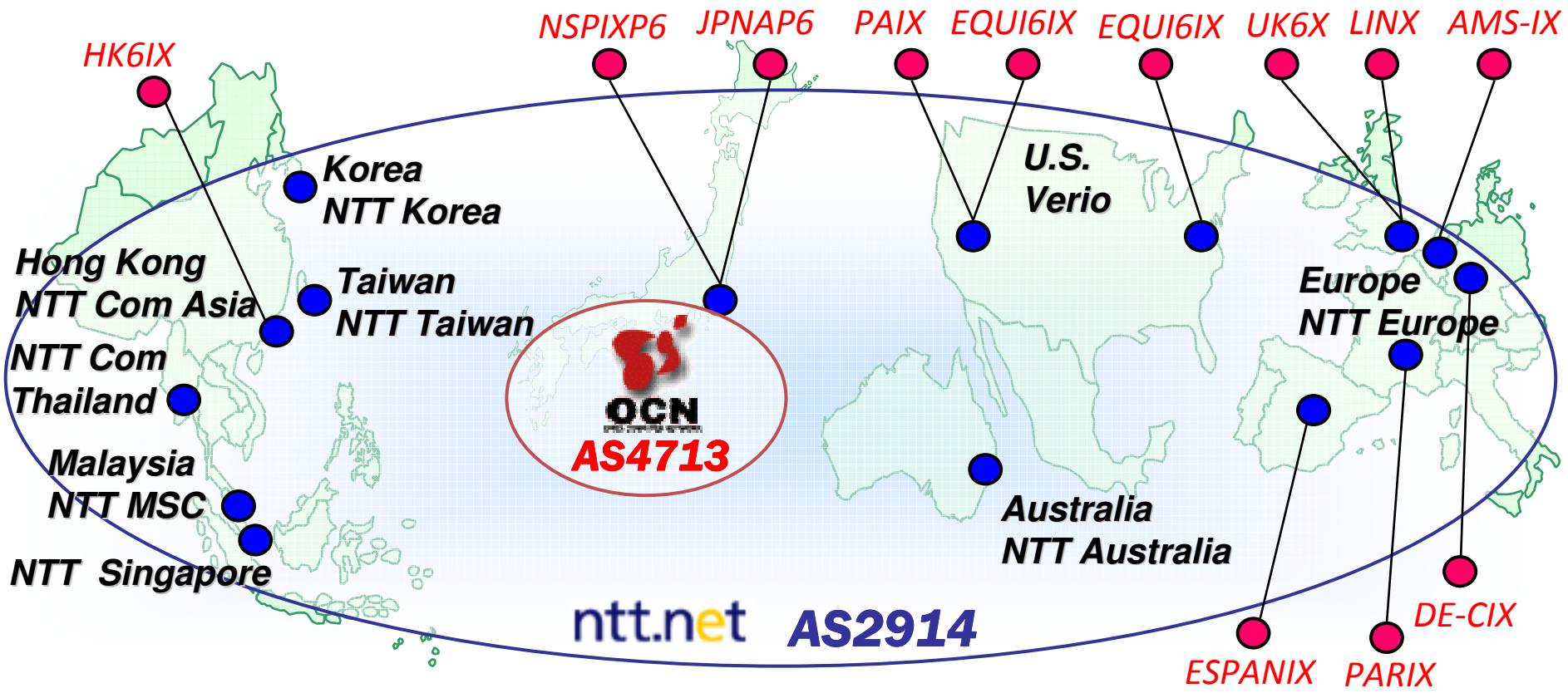
NTT's IPv6 developments, contributions, and strength

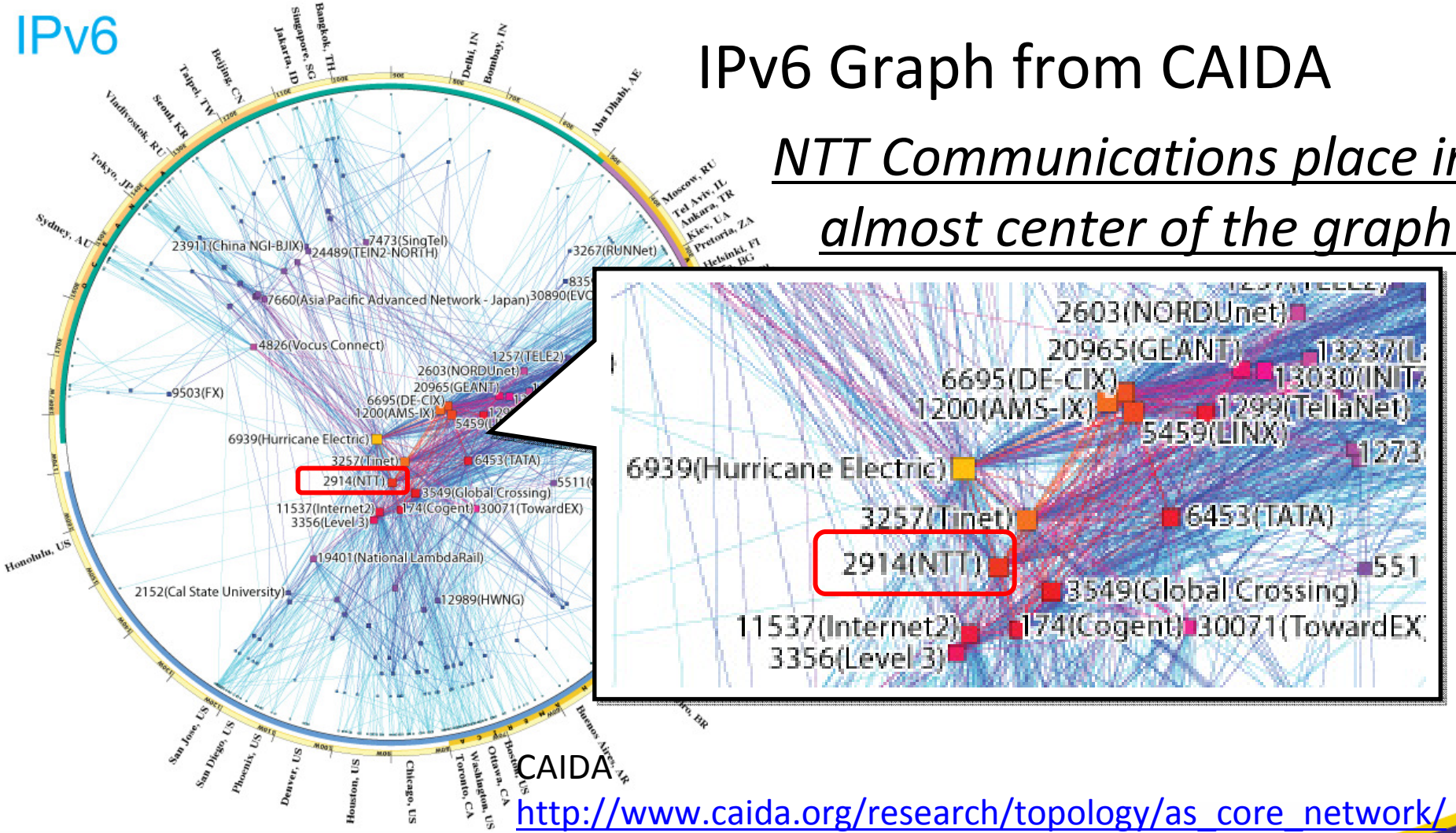
NTTCom has been the very first global leader of IPv6 development worldwide and no other provider has longer history in IPv6 than NTTCom.



The first IPv6/v4 dual stack global IP backbone

NTTCom is the first telcom carrier/ISP in the world to deploy IPv6-enabled (IPv4/v6 dual stack) IP backbone worldwide.





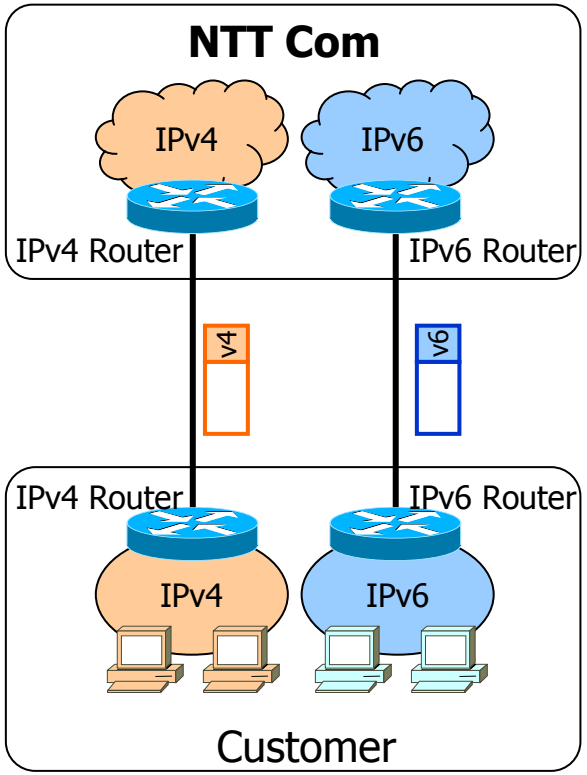
IPv6 Graph from CAIDA

NTT Communications place in almost center of the graph!

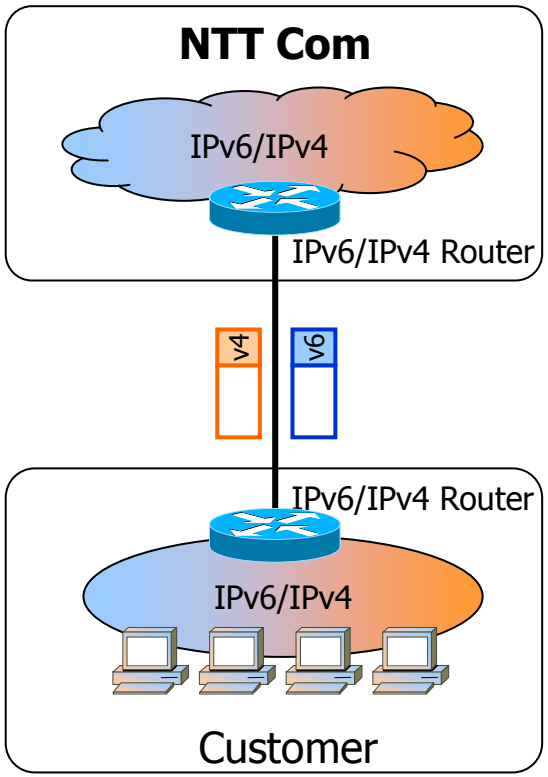
CAIDA
http://www.caida.org/research/topology/as_core_network/

Our IPv6 connectivity services available worldwide

Some of leading Telcos/ISPs and enterprise customers are already using our IPv6 connectivity service in Singapore.



IPv6 Native Service



IPv6/IPv4 Dual Service

NTT Singapore new Serangoon Data Centre

* Image of Singapore Serangoon Data Centre

- **Opening in mid January 2012**

- **<u>Fully IPv6-enabled Data Centre</u>**
  - **All networks, systems, servers are IPv6-ready**
  - **IPv6 deployment showcase**

- **Awarded** BCA Green Mark Platinum award, a Singapore Building & Construction Authority (BCA) program that assures the environmental friendliness of buildings.

BCA GREEN MARK

We are the 1st commercial building in Singapore to achieve BCA Green Mark Platinum Award

Building Specifications

- Purpose built data center
- 5-storey building
- Server room area: more than 5000sqm
- Fully redundant UPS systems, generators, cooling systems, etc

NTT Communications named “Best International Wholesale Carrier” at Telecom Asia Awards 2011

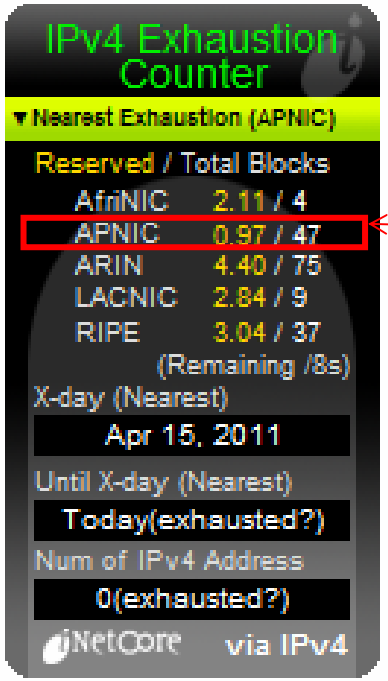
NTT Com was singled out for its Global IP Network Service, Asia's only global **Tier 1** Internet backbone and boasting **the largest network capacity in the region**. The network features a completely redundant structure and operates under a **single Autonomous System** guaranteeing seamless connection with optimal peering and routing. NTT Com also was cited for services incorporating **IPv6** and **advanced security technologies**.

Today's Agenda

3. Requirements and Motivation of moving onto IPv6

Why is IPv6 needed now?

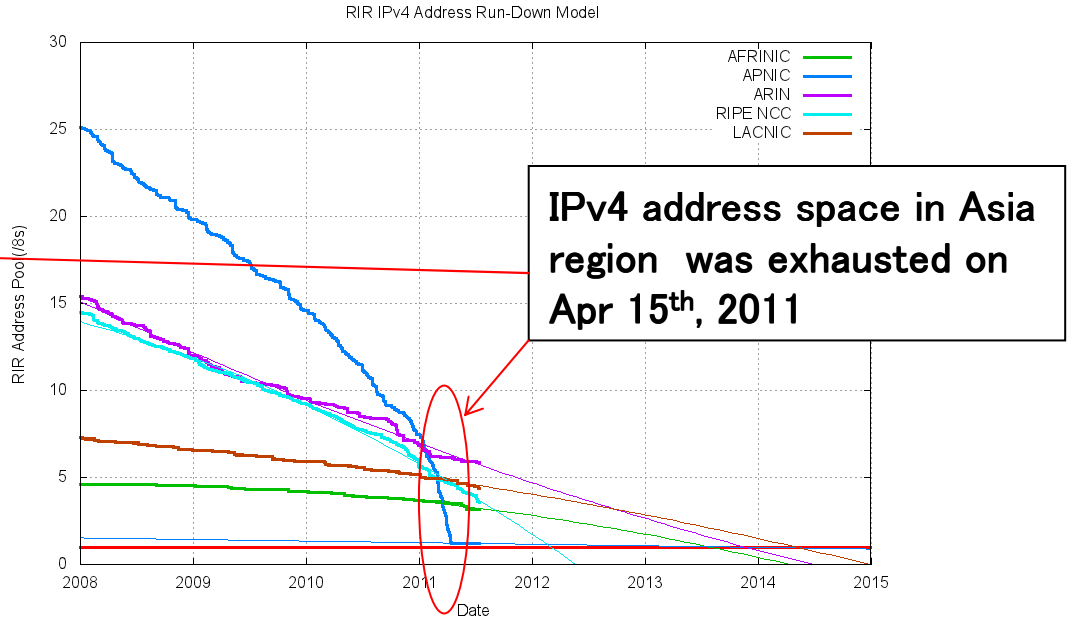
IPv4 address is exhausting. IANA and APNIC pool has been exhausted. So we cannot get new IPv4 address space in Asian region. To keep our business, we need IPv6 address now.



IPv4 Exhaustion Counter (IANA)

Windows, MacOS, iPhone

http://inetcore.com/project/ipv4ec/index_en.html



IPv4 address space in Asia region was exhausted on Apr 15th, 2011

Projection of consumption of Remaining RIR Address Pools
http://www.potaroo.net/tools/ipv4/index.html

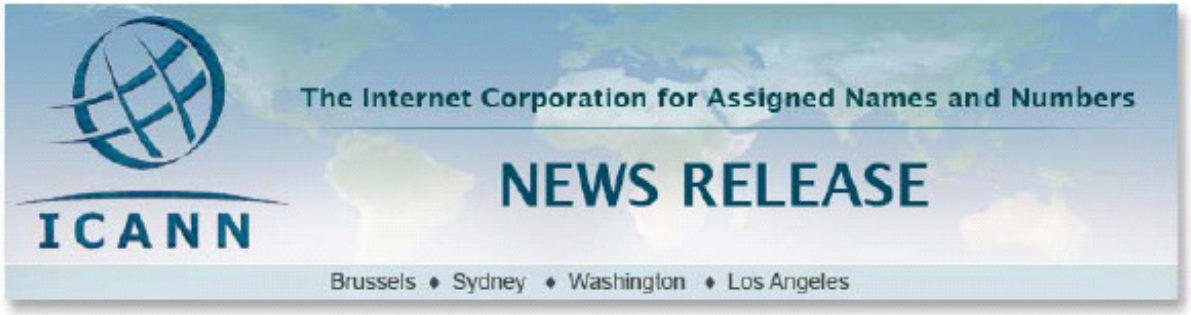
IANA Unallocated Address Pool Exhaustion: 03-Feb-2011
Projected RIR Address Pool Exhaustion Dates:

APNIC:	19-Apr-2011
RIPENCC:	28-Feb-2012
AFRINIC:	01-Aug-2013
ARIN:	21-Nov-2013
LACNIC:	05-May-2014

Why is IPv6 needed now?

ICANN　News Release

※ICANN：Organization of Internet Resource.
IANA is run by ICANN.



FOR IMMEDIATE RELEASE
February 3, 2011

Available Pool of Unallocated IPv4 Internet Addresses Now Completely Emptied

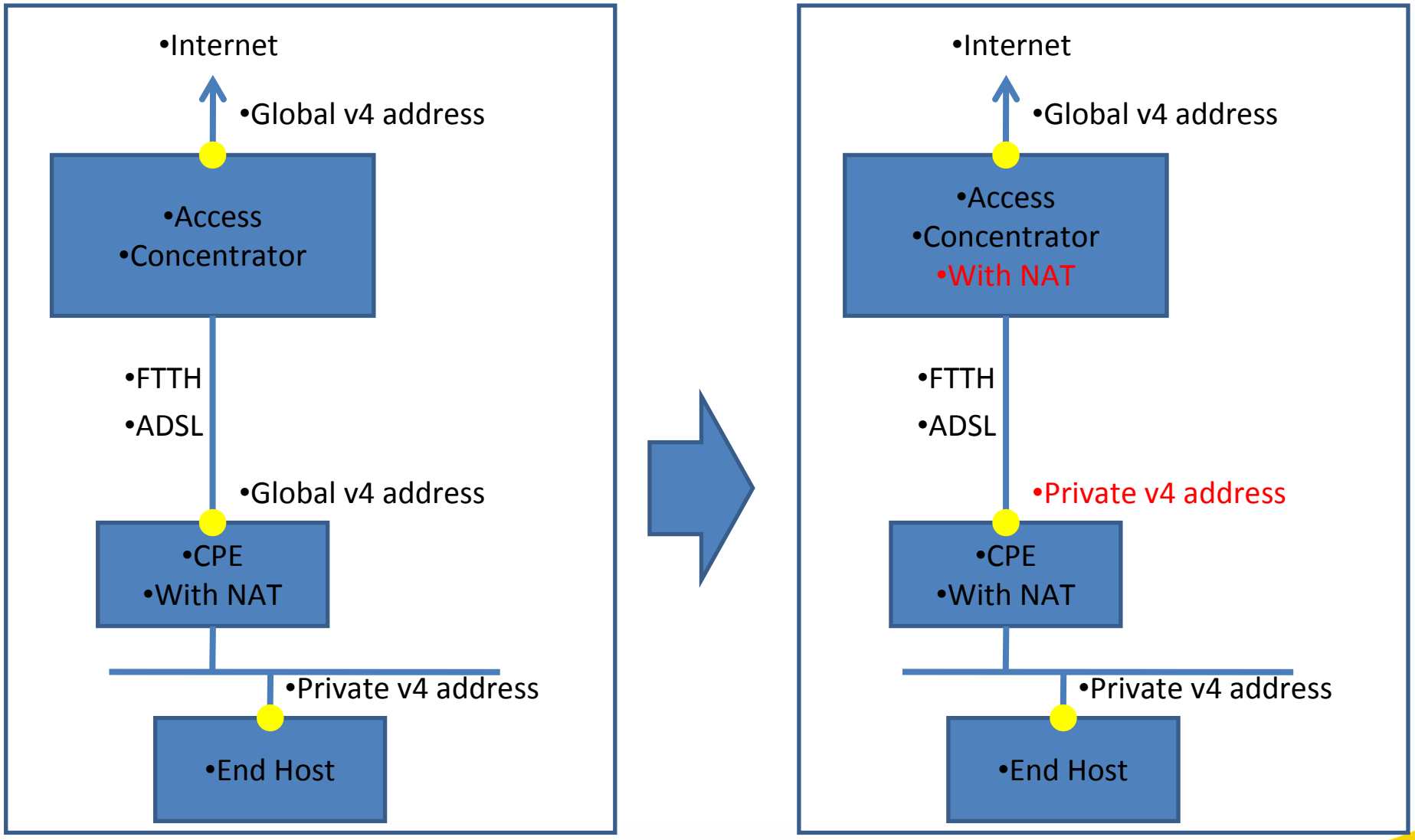
The Future Rests with IPv6

A critical point in the history of the Internet was reached today with the allocation of the last remaining IPv4 (Internet Protocol version 4) Internet addresses from a central pool. It means the future expansion of the Internet is now dependant on the successful global deployment of the next generation of Internet protocol, called IPv6.

The announcement was made by four international non-profit groups, which collaboratively work to coordinate the world's Internet addressing system and its technical standards.

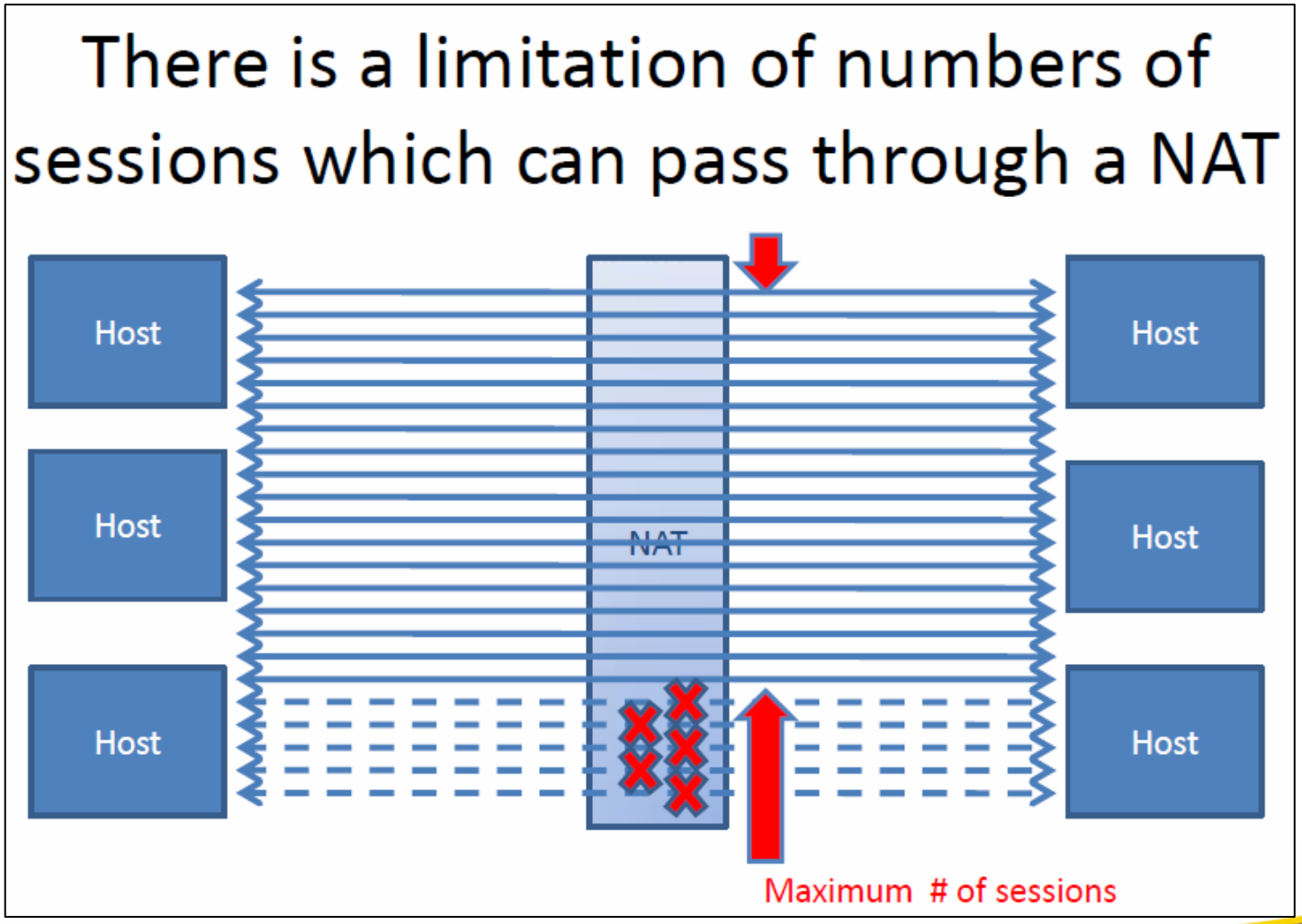
At a news conference in Miami, Florida, the Internet Corporation for Assigned Names and Numbers (ICANN) joined the Number Resources Organization (NRO), the Internet Architecture Board (IAB) and the Internet Society in announcing that the pool of first generation Internet addresses has now been completely emptied.

CGN: Carrier Grade NAT (NAT444)

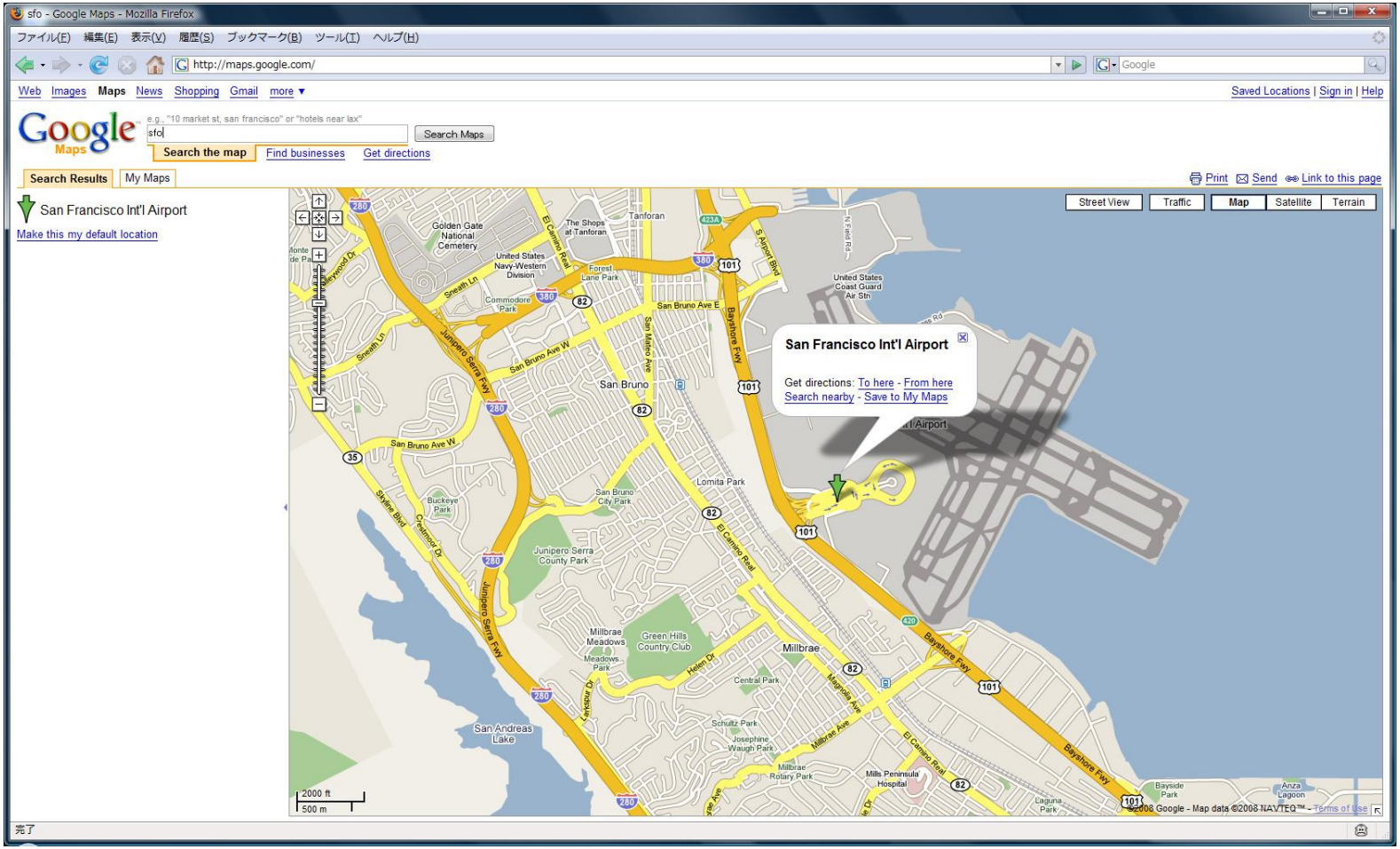


NAT issue: Limited number of connections

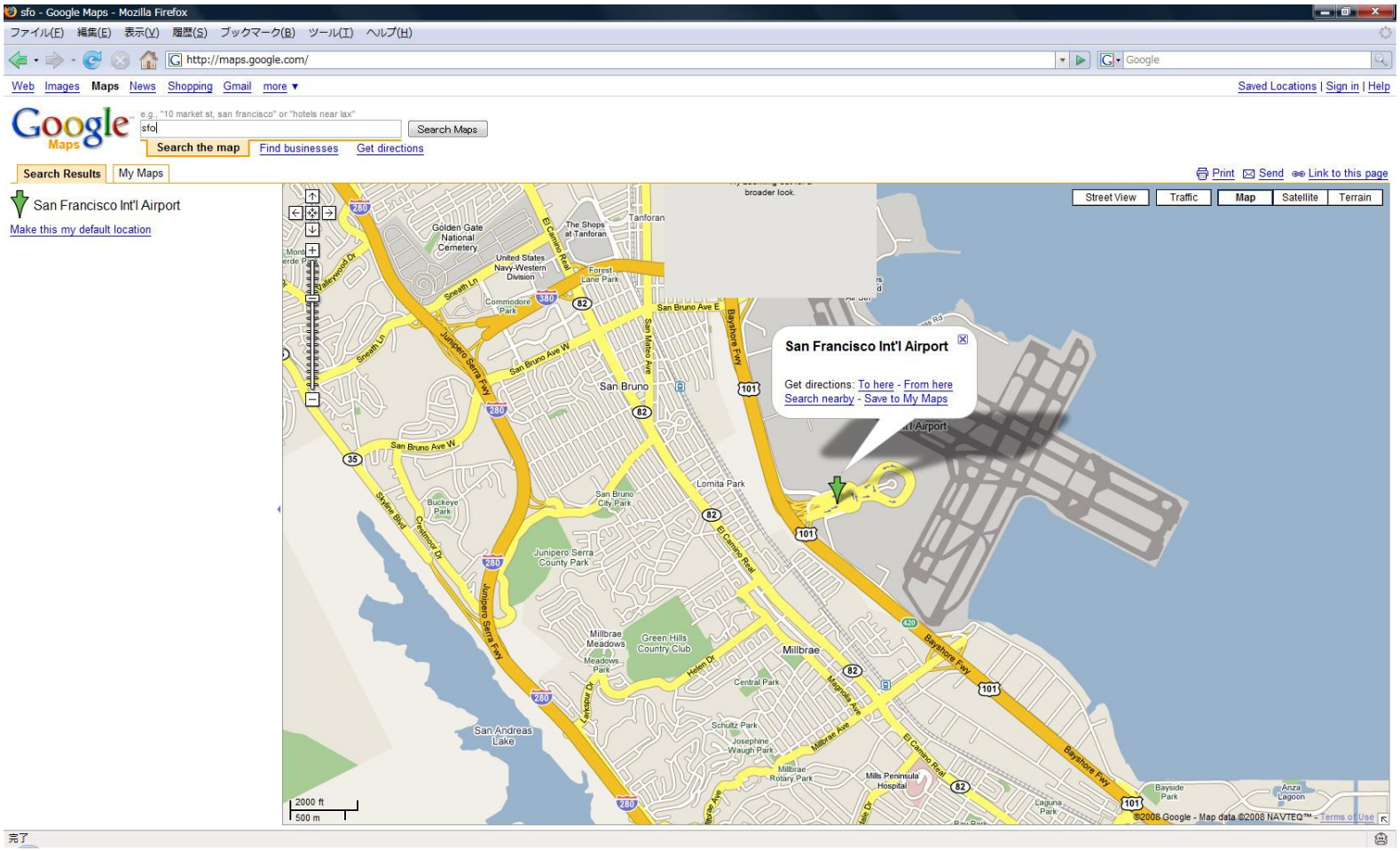
Port number is only 2byte (65,536) size.
So one global IP address can share 65,536 sessions.



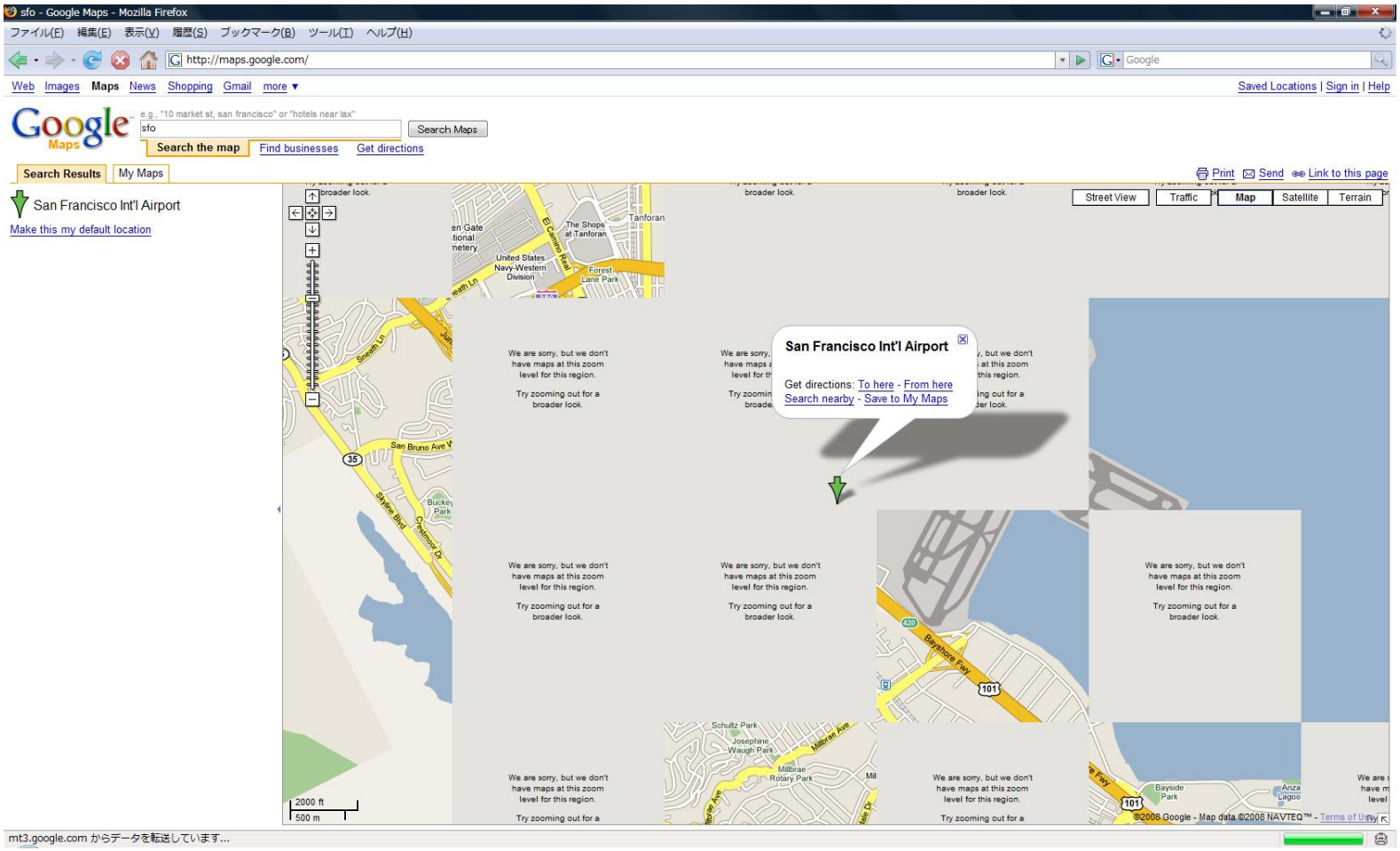
NAT issue: Max 30 Connections



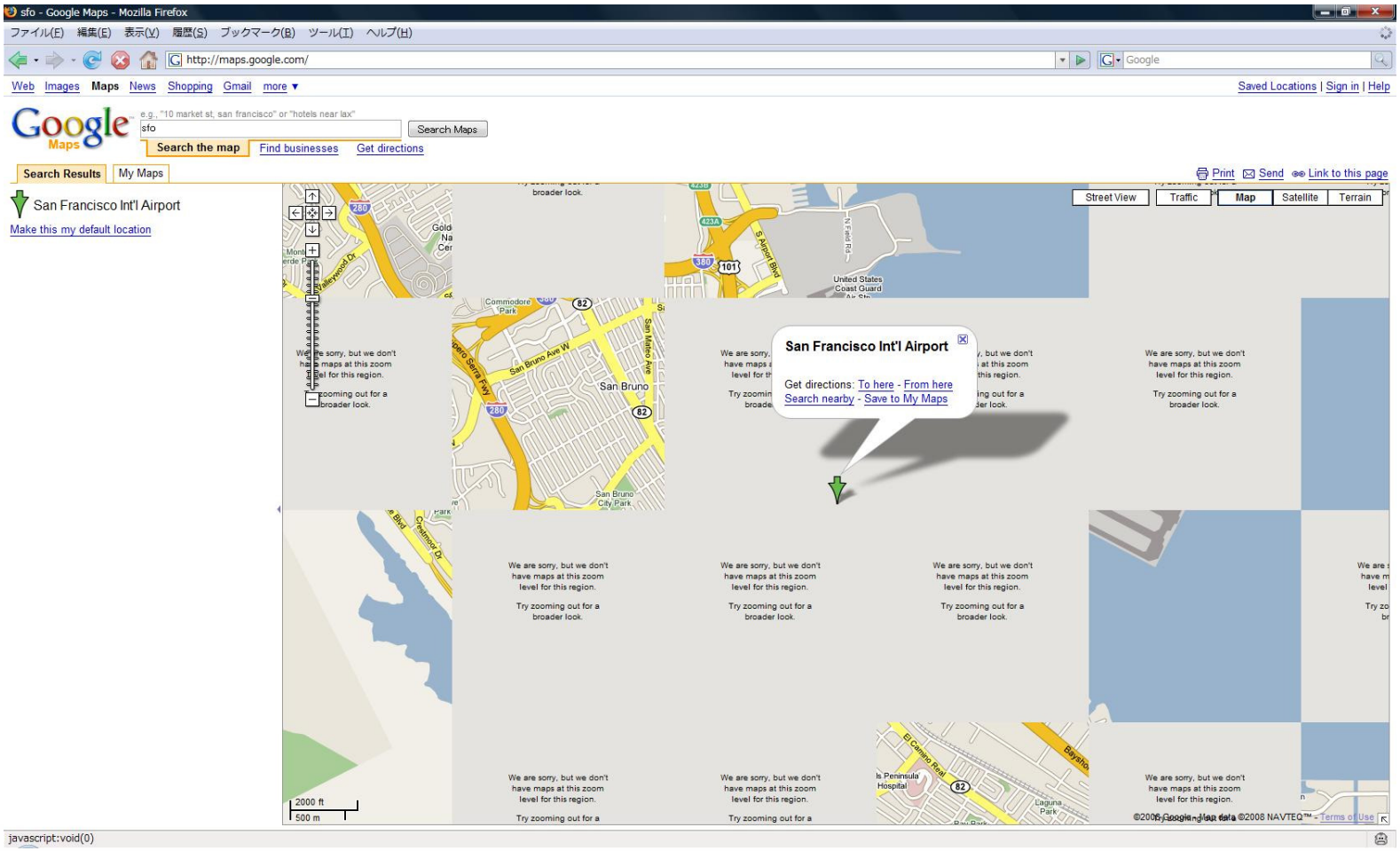
NAT issue: Max 20 Connections



NAT issue: Max 15 Connections



NAT issue: Max 10 Connections



NAT issue: Max 5 Connections

Recent applications need more sessions

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

Advantages of IPv6

- Huge IP address space
  -> No more headache for IP address assignment and control
- Efficient routing mechanism
- Automatic address-assigning mechanism
- IPsec is supported by default

Major latest IT devices are IPv6-enabled

Windows Vista/7
Microsoft

MacOS X
Apple

iPhone/iPad(iOS)

Anti Virus Software
Trendmicro

IP Video Conference System
NTT East / NTT West

Android Smart Phone

IPv6 Camera
Panasonic

IPv6 STB TV
(Hikari TV etc.)

Android Tablet

IPv6 communications among these devices are coming soon!!

Today's Agenda

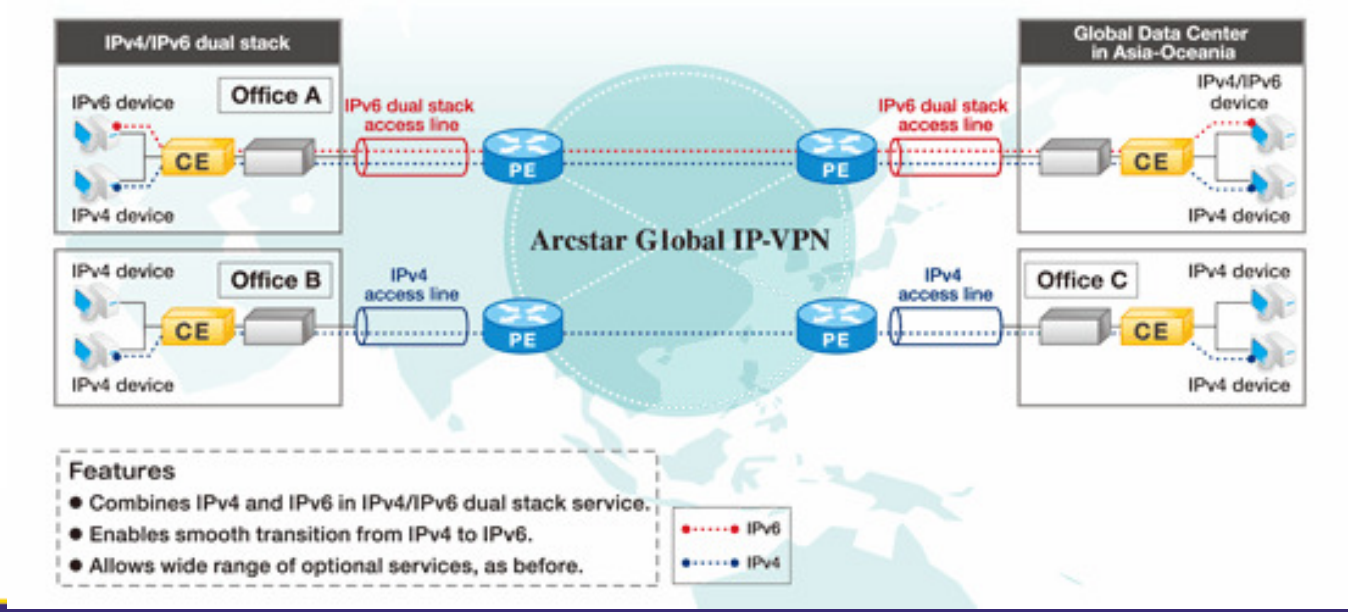
4. Case study in IPv6 deployment

Our consulting case example on IPv6

Customer	Case
Global electronics maker	Global ICT infrastructure Case 1
Business media company	ASP service (using translator)
University	Portal site (dual-stacked)
ISP (OCN) customer	CPE (customer premise equipment)
TV broadcasting company	Authentication system
Construction company	Energy monitoring service
Global mobile carrier	Technical support

[Case 1] Issues and solutions

- Issues
  - Expansion efforts take too long due to the complicated structure of the network, and total cost of ownership (TCO) continues to rise
  - Technical limitations of IPv4 impede internal communications
- Solutions
  - Using NTT Com's IPv6 dual-stack service for dual-stacked WAN connection
  - Reworking network architecture and routing protocols to reduce the burden of introducing the IPv6 dual-stack service
  - Close coordination with vendors helped to accelerate the introduction of compatible devices



[Case 1] Why NTT Com. ?

- The Company started looking at IPv6 in 2006 and then launched a full-scale effort in 2008. One of the first steps was to choose a telecommunications company that could:
  - Respond to all technical specifications
  - Reduce network TCO
  - Introduce IPv6 on schedule
  - Provide support for all corporate sites in Asia-Oceania.

- In the end, the Company determined that NTT Com was the only company in Asia-Pacific that could fully meet all requirements in terms of technology, cost, schedule and coverage

Our consulting case example on IPv6

Customer	Case
Global electronics maker	Global ICT infrastructure
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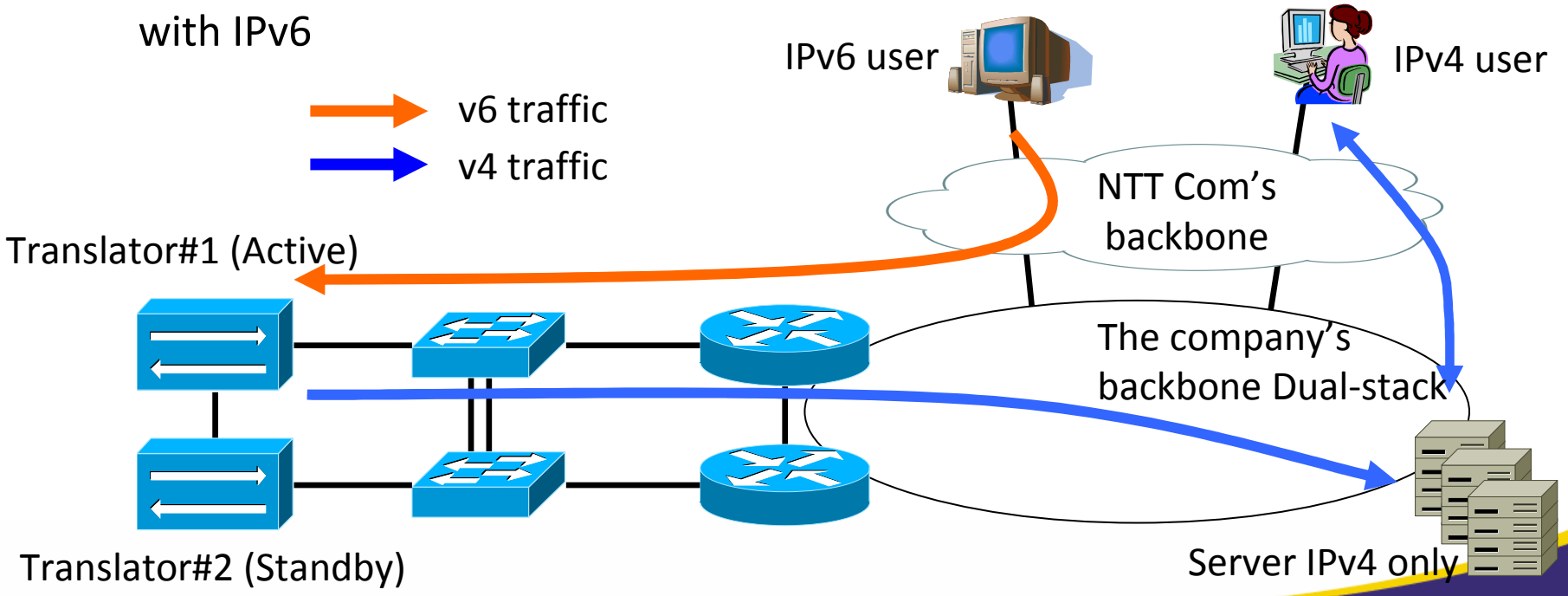
Construction company	Energy monitoring service
Global mobile carrier	Technical support

Case 2

[Case 2] Issues and solutions

- Issues
  - The company want to upgrade its web services to dual-stack
  - But the company has many servers and web applications and the cost of reworking all of them can be very high
- Solutions
  - Using translator to translate users' IPv6 requests to IPv4 for IPv4 only services
  - The cost can be drastically reduced while users can access all of the services with IPv6



Our consulting case example on IPv6

Customer	Case
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Global mobile carrier	Technical support

Case 3

[Case 2] Developing dual-stacked CPE

- NTT Com's OCN (Open Computer Network)
  - The largest ISP in Japan
  - Over 800 million customers (including 210 thousand business user lines)
  - Access line: NGN(FTTH), ADSL, Dial-up
- Developing dual-stacked CPE
  - NGN started to support IPv6 over PPPoE in June, 2011
  - To offer the advantage of IPv6 to the OCN customers, we developed dual-stacked CPE and started to provide it

- Features
  - 5 x gigabit Ethernet ports (WAN x1, LAN x4)
  - WiFi (IEEE802.11b/g/n)
  - Both IPv4 and IPv6 over PPPoE are supported for dual-stack Internet connection

Motivating factors towards IPv6

<u>for Enterprises</u>

- to have more scalable network for their business expansion worldwide

<u>for B2B, B2C businesses</u>

- to be ready for possible access/request from users via IPv6 into B2B/B2C platform

Today's Agenda

5. Moving towards IPv6

What each player needs to do towards IPv6

NTT Communications

Network Service Providers/ISPs

- Need to get their network ready for IPv6
- Need to provide IPv6 addresses to customers

Manufactures/Vendors of network equipment, servers, etc.

- Need to get their machines ready for IPv6

Content providers/Web site holders

- Need to get their servers, DNSs, and applications ready for IPv6

and also

End users/Clients

- Need to get their PC's OS, mobile phones, and home appliances ready for IPv6

Everybody/Everything needs to be ready for IPv6

IPv6 readiness for Network equipments

- Layer2~3 equipments are IPv6-enabled, but Layer4~7 equipments are starting to support IPv6 gradually.

Router/Switch
Cisco, Juniper, Alaxala…

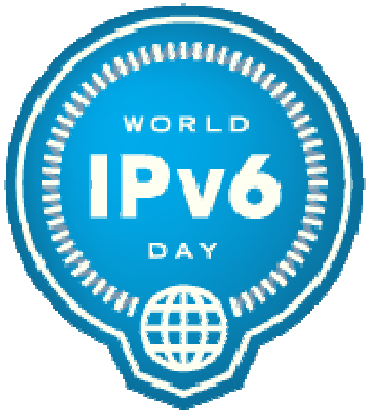
Firewall
Checkpoint, Cisco, Juniper…

Load Balancer
F5、A10Networks …

Proxy
Bluecourt…

World IPv6 Day – 8th June, 2011

IPv6 trial use worldwide participated by major online providers

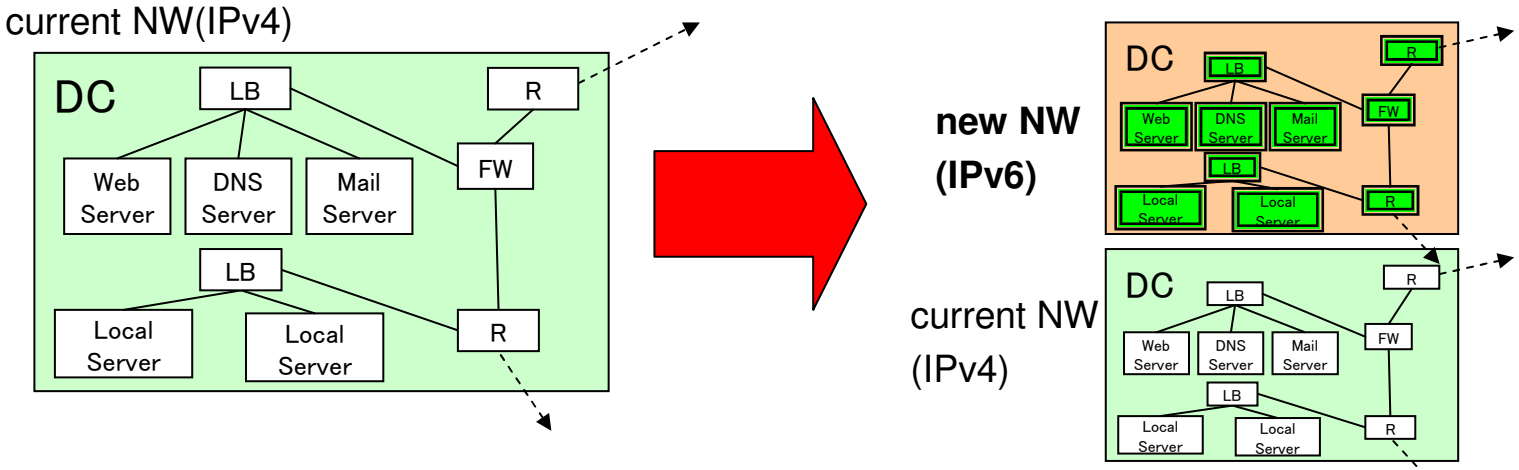


Major Participants:

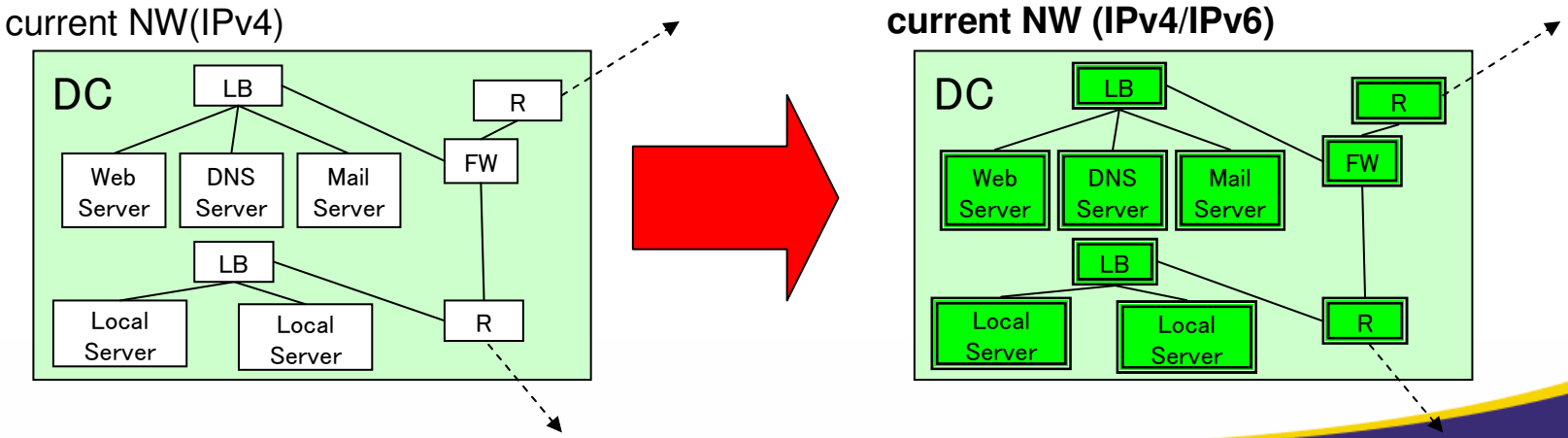
www.google.com
www.facebook.com
www.youtube.com
www.yahoo.com
www.yahoo.co.jp (#12)
www.bing.com (#21)
www.microsoft.com (#25)
www.bbc.co.uk (#38)
www.cnn.com (#48)
www.aol.com (#55)

2 possible approaches for Enterprise/ASP/DC

- (Approach-1) Building up another IPv6 network
  Less impact on business operation, but higher cost



- (Approach-2) Turning current network and equipments into IPv6
  Less cost, but more impact on business operation

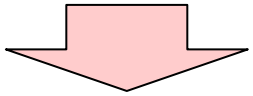


Key points in transition

- Balance of cost and risk
  - Combination of the 2 ways shown on the previous page
  - Taking (Approach-2) in v6-matured areas, where cost matter has more priority

    ex. WAN, router, L2-SW
  - Taking (Approach-1) in v6-unmatured areas and application areas

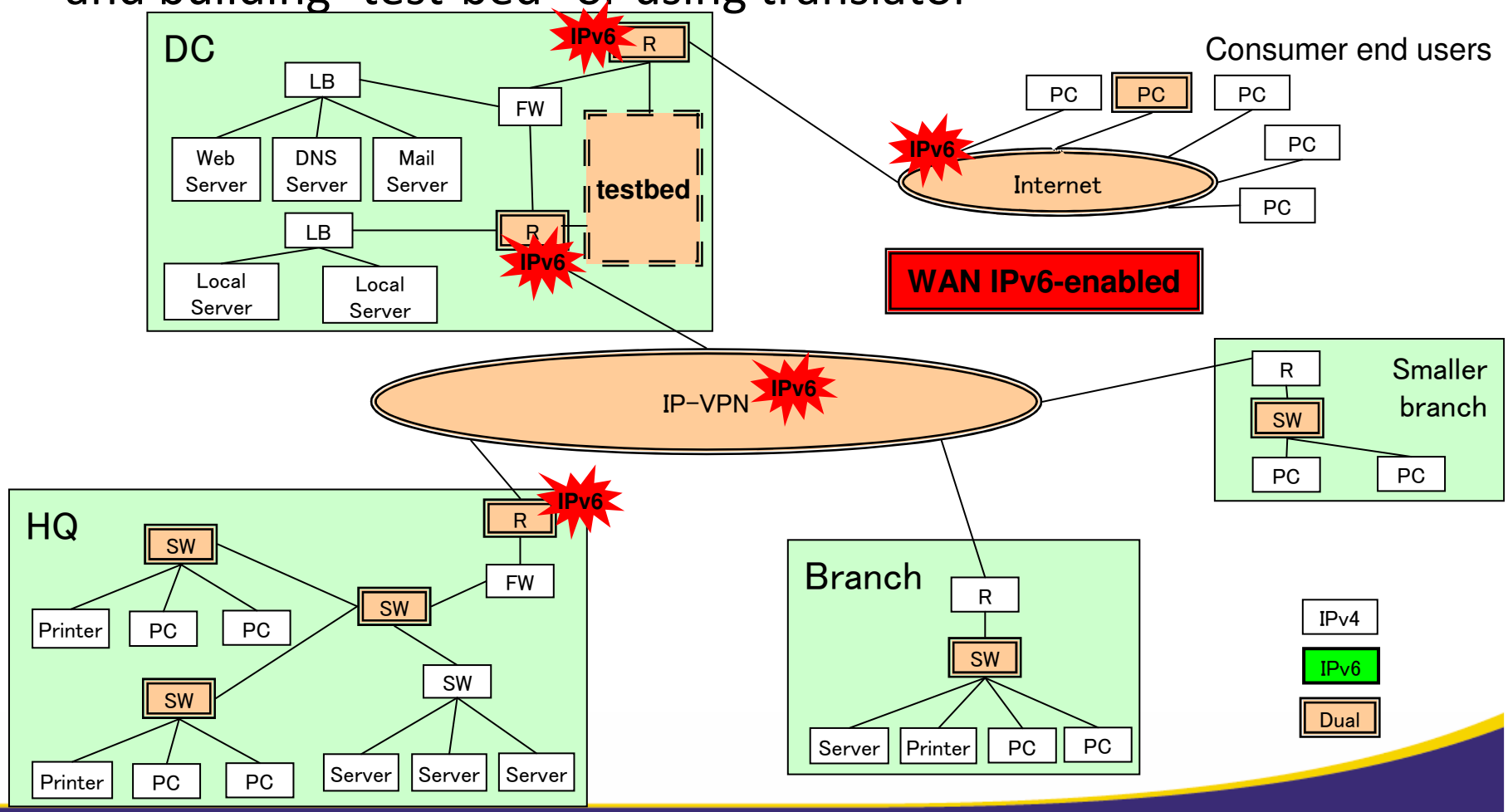
    ex. Security, Web application



- What's the first step of transition
  - **Starting from WAN and WAN routers -> proven/matured areas**
  - Building IPv6 test-bed, where we can test equipments and own-developed application
  - Using translator to quickly enable IPv6 in v6-unmatured areas

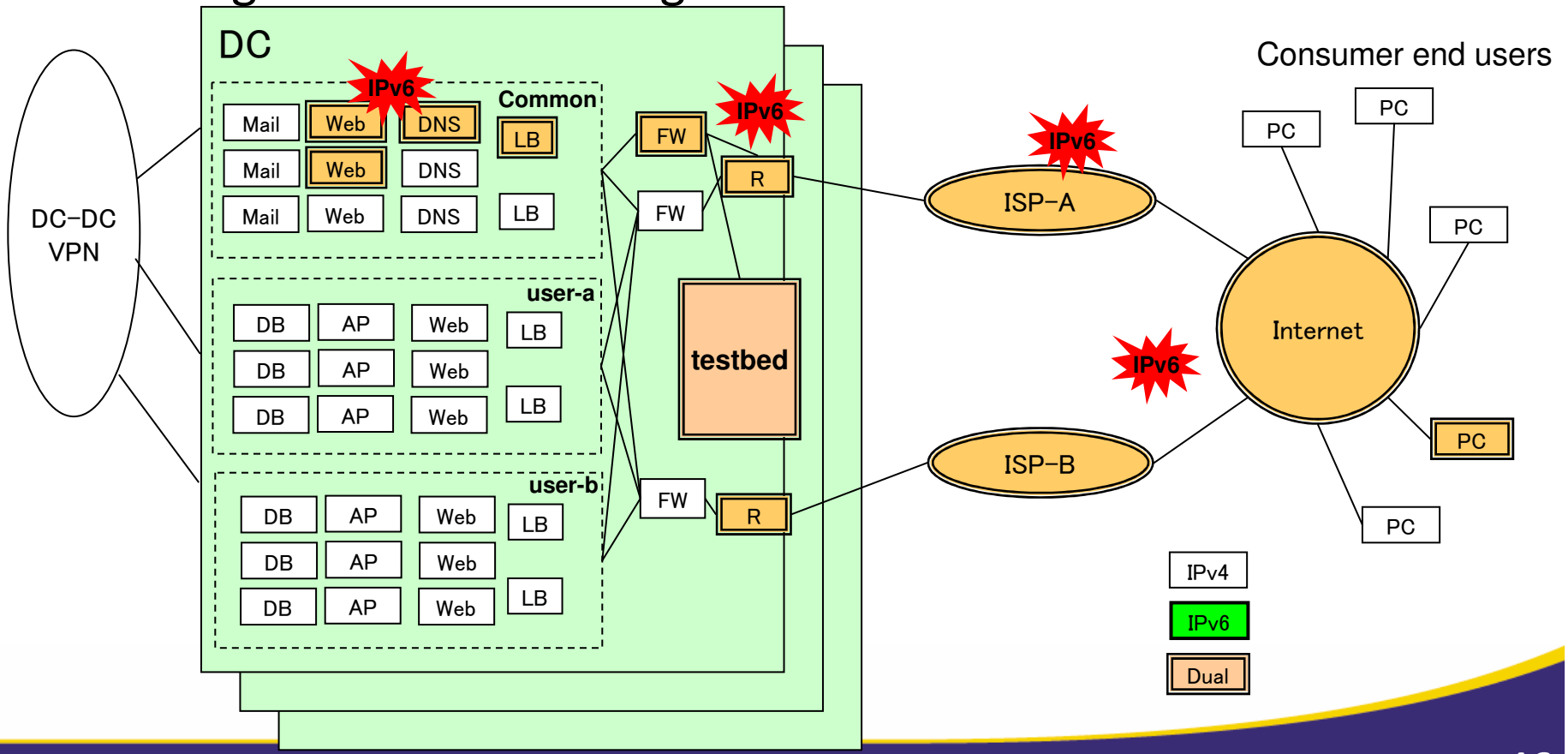
First step for Enterprise

- Network services : -> IPv4/IPv6 dual stack service
- Location-wise : starting at DC, then moving to other sites
- Equipment : turning WAN equipments into IPv6-enabled first, and building “test-bed” or using translator

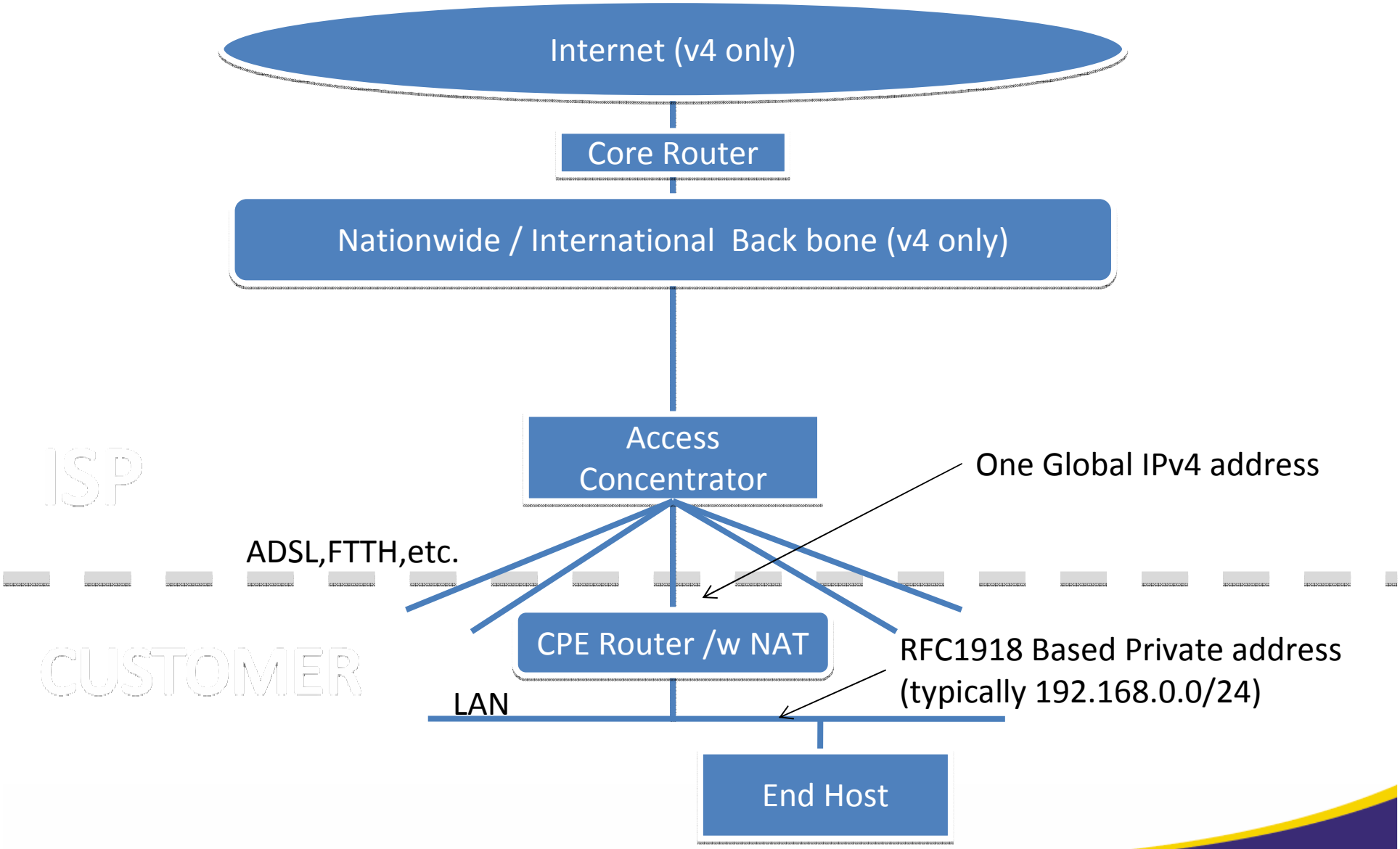


First step for ASP/DC

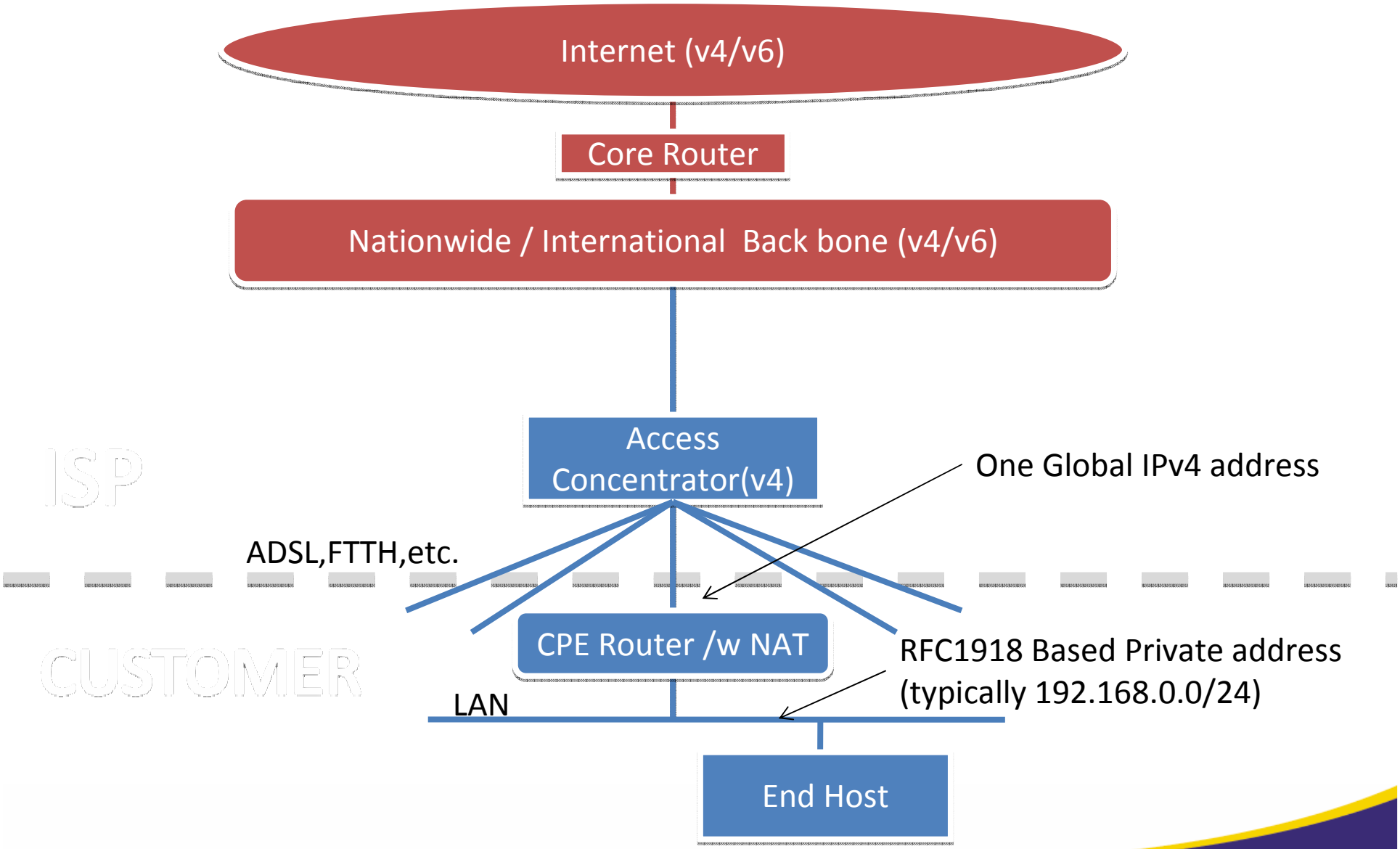
- Turning Internet access and Gateway router into dual stack
- Then, DNS server, and FW/Load Balancer
- And then, web sever for external users
- Followed by not-internet-related areas
- Building “test-bed” or using translator for v6-unmatured areas



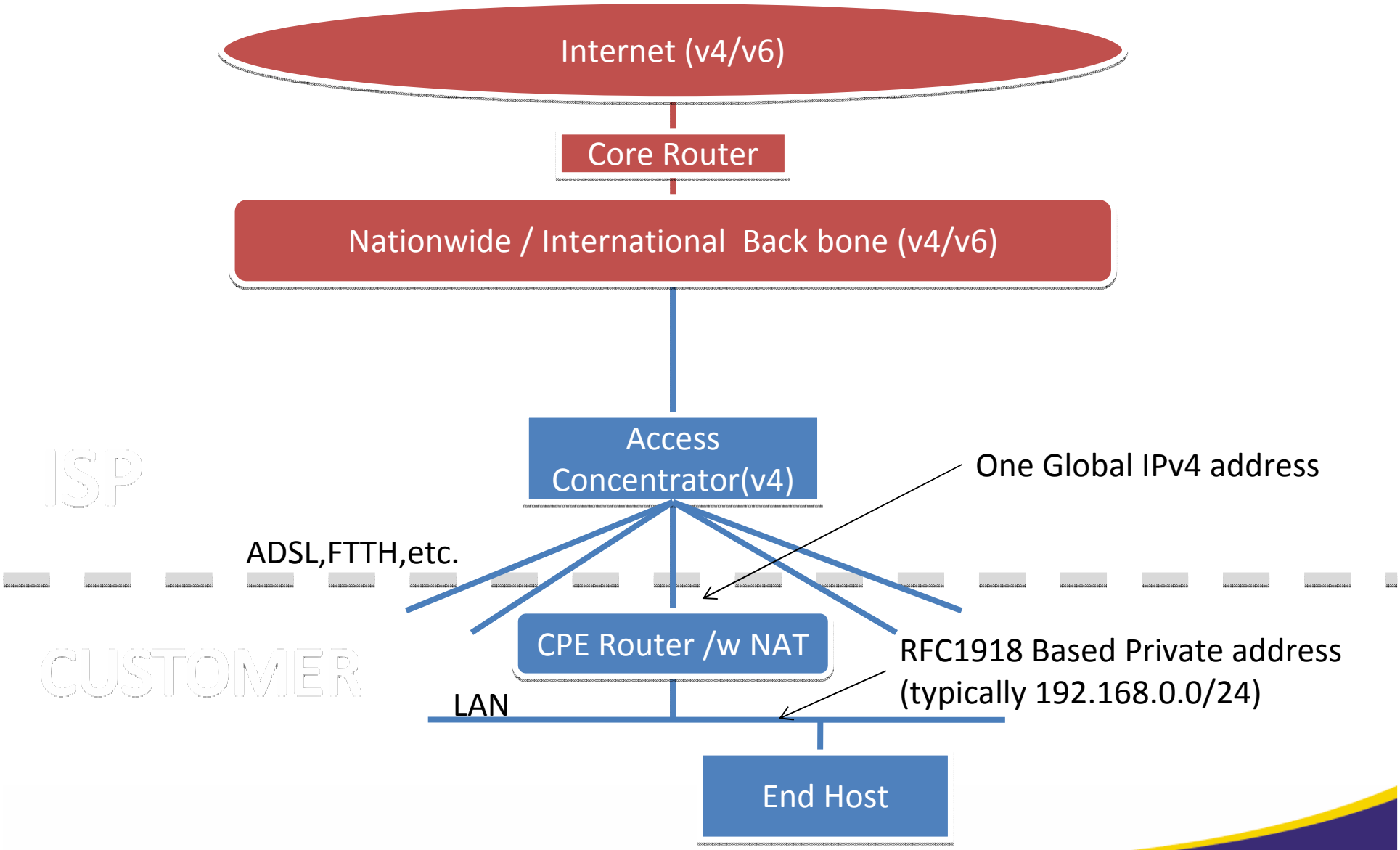
Possible transition scenario for ISP



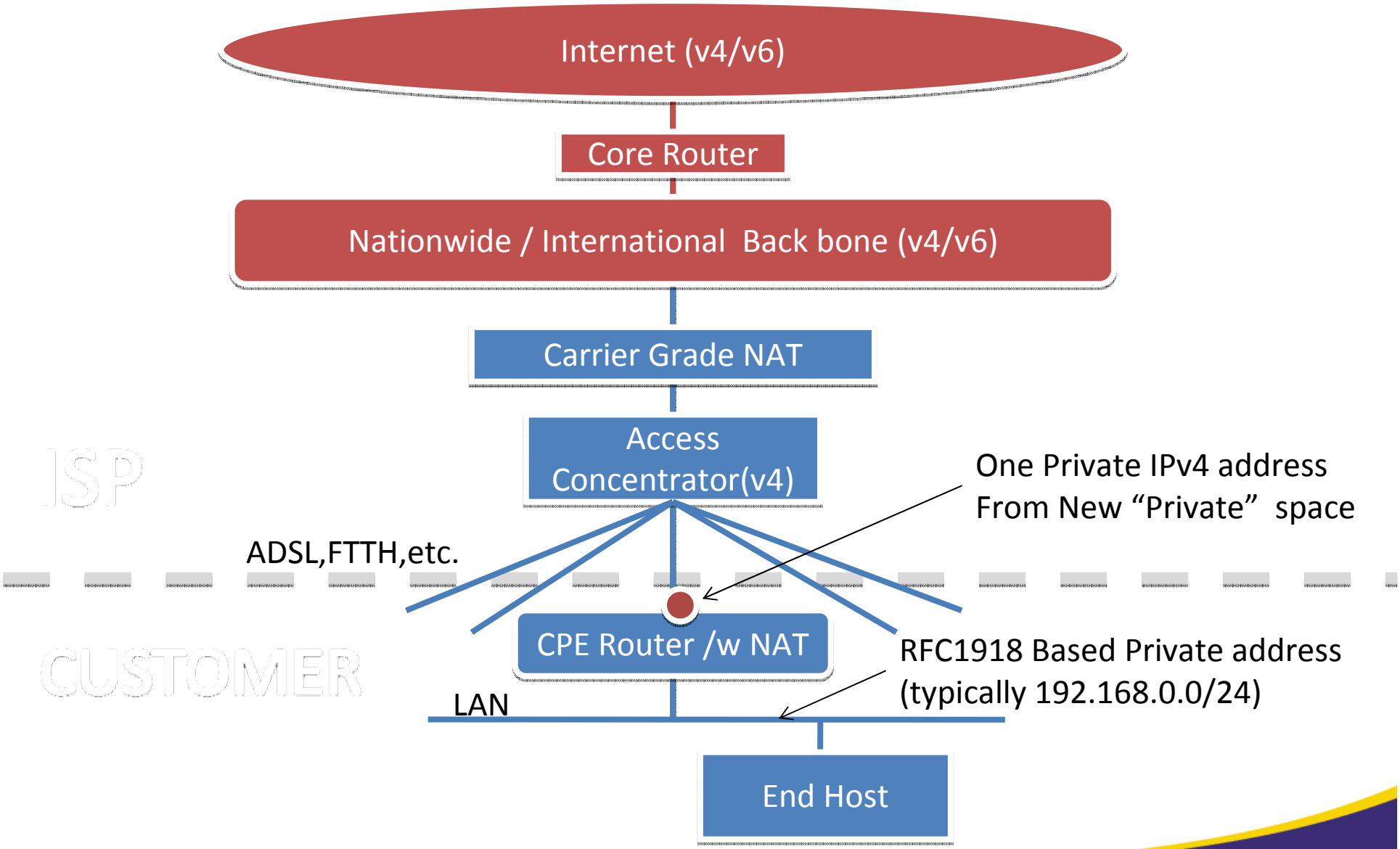
Dual Stack backbone



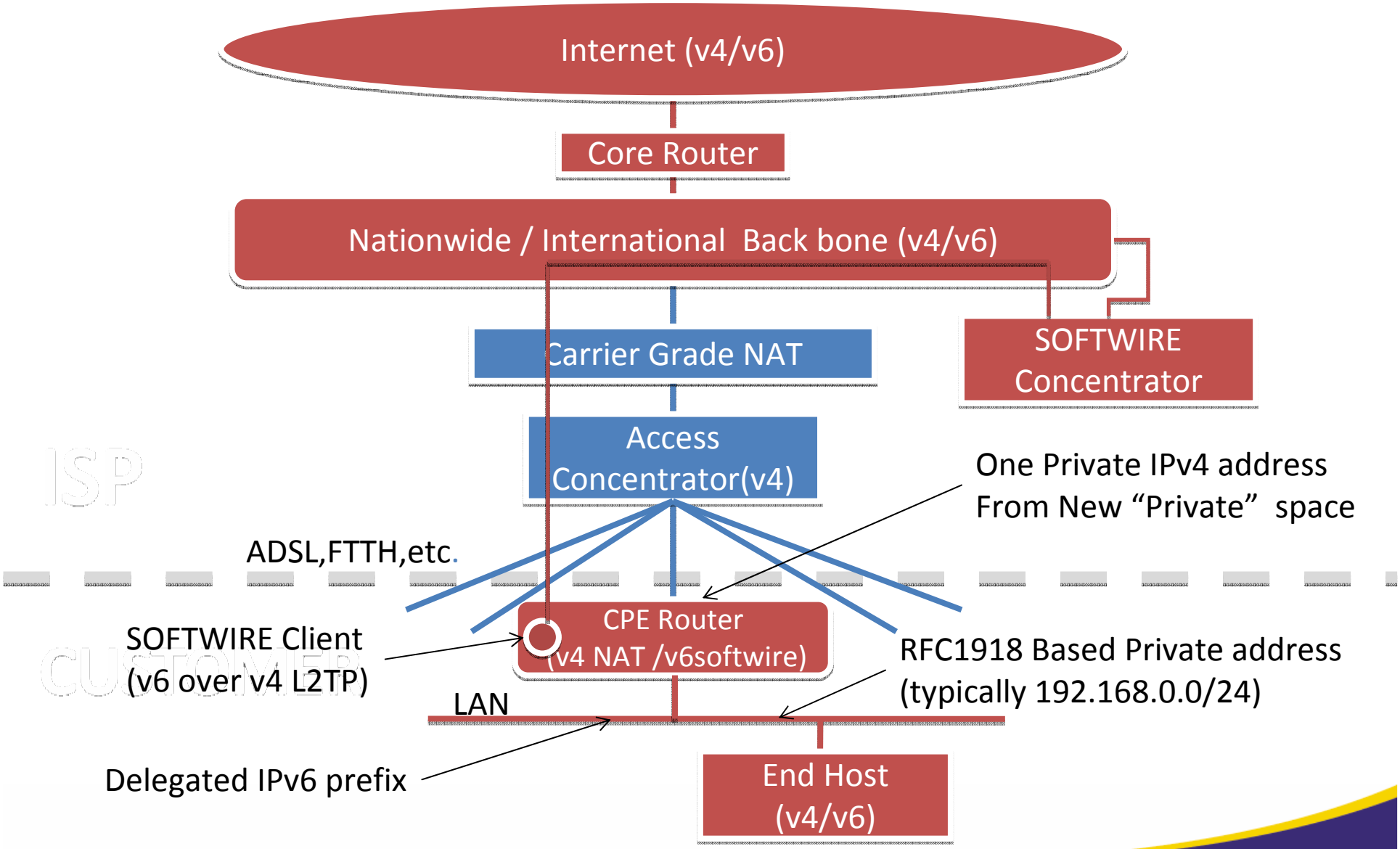
Dual Stack backbone



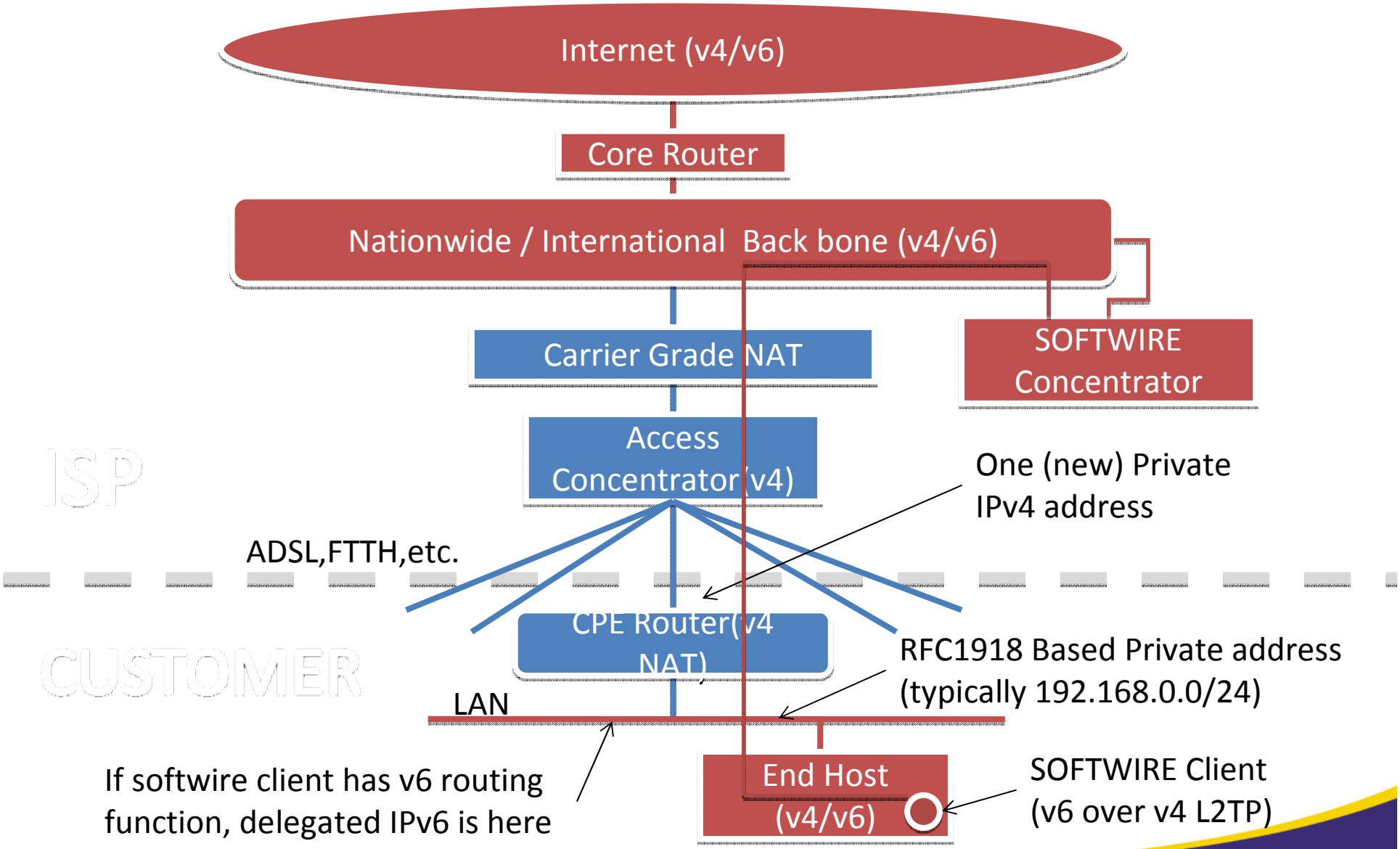
Introducing Carrier Grade NAT(CGN)



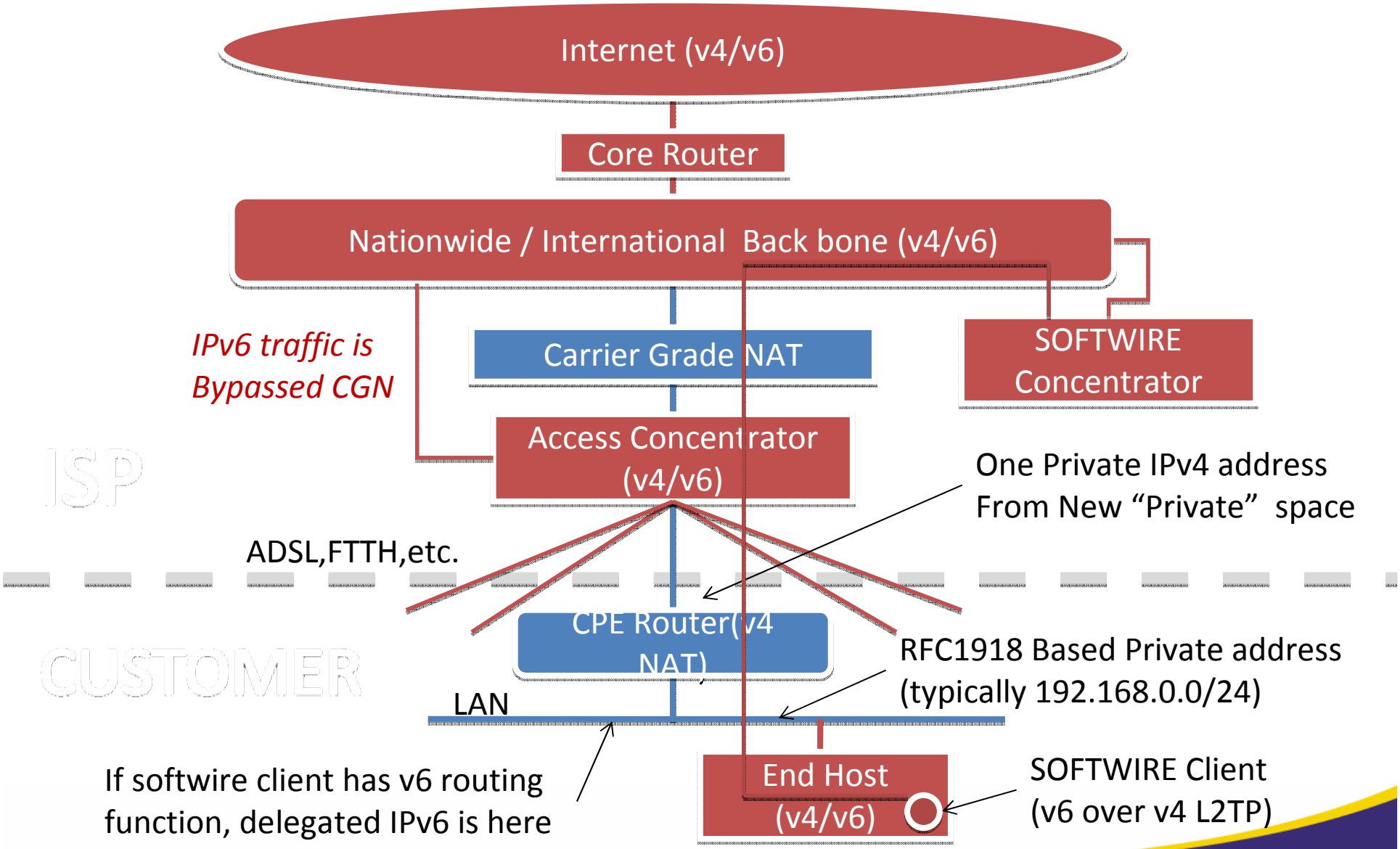
Softwire termination on CPE router



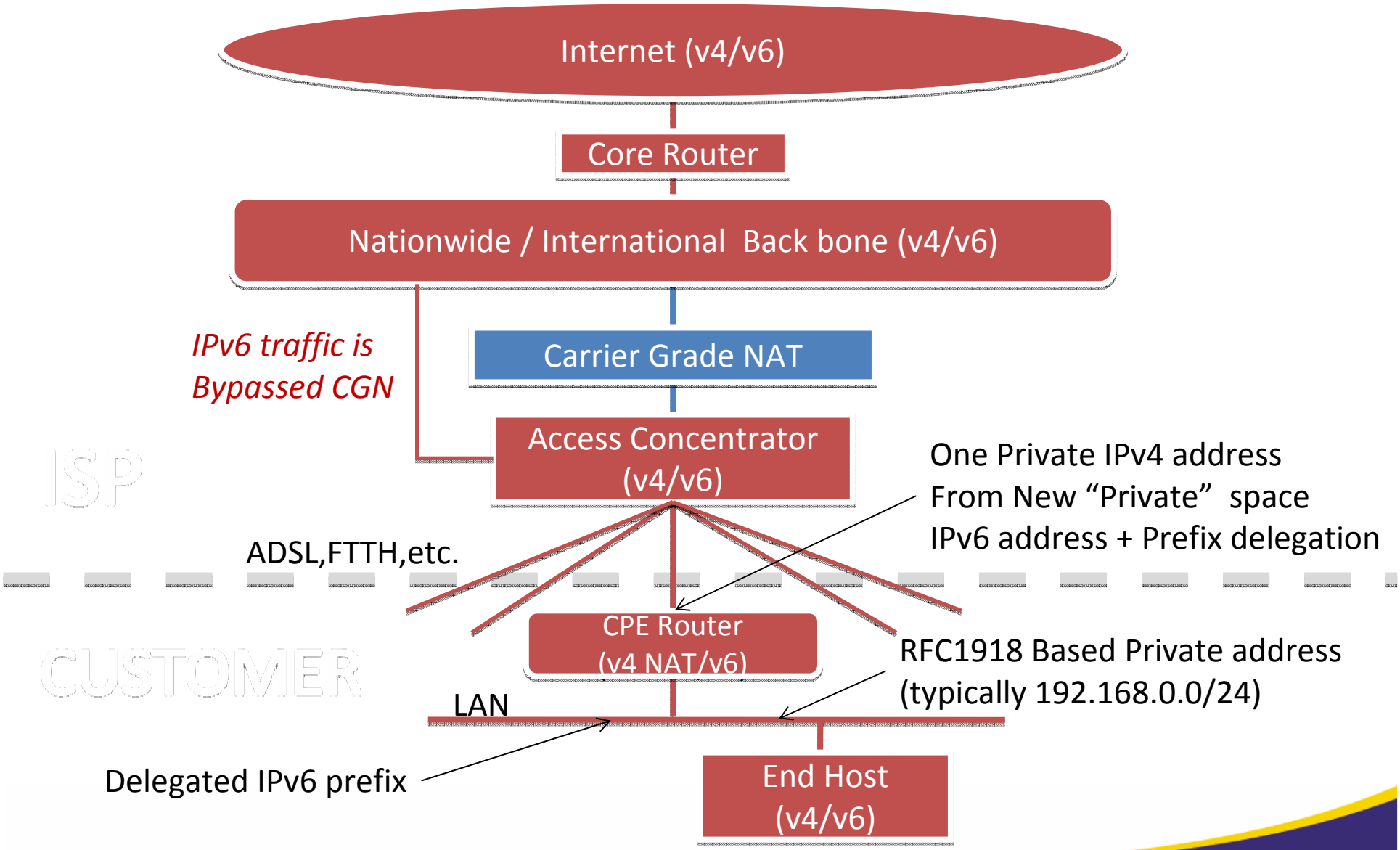
Introducing Softwire (v6 over v4 L2TP)



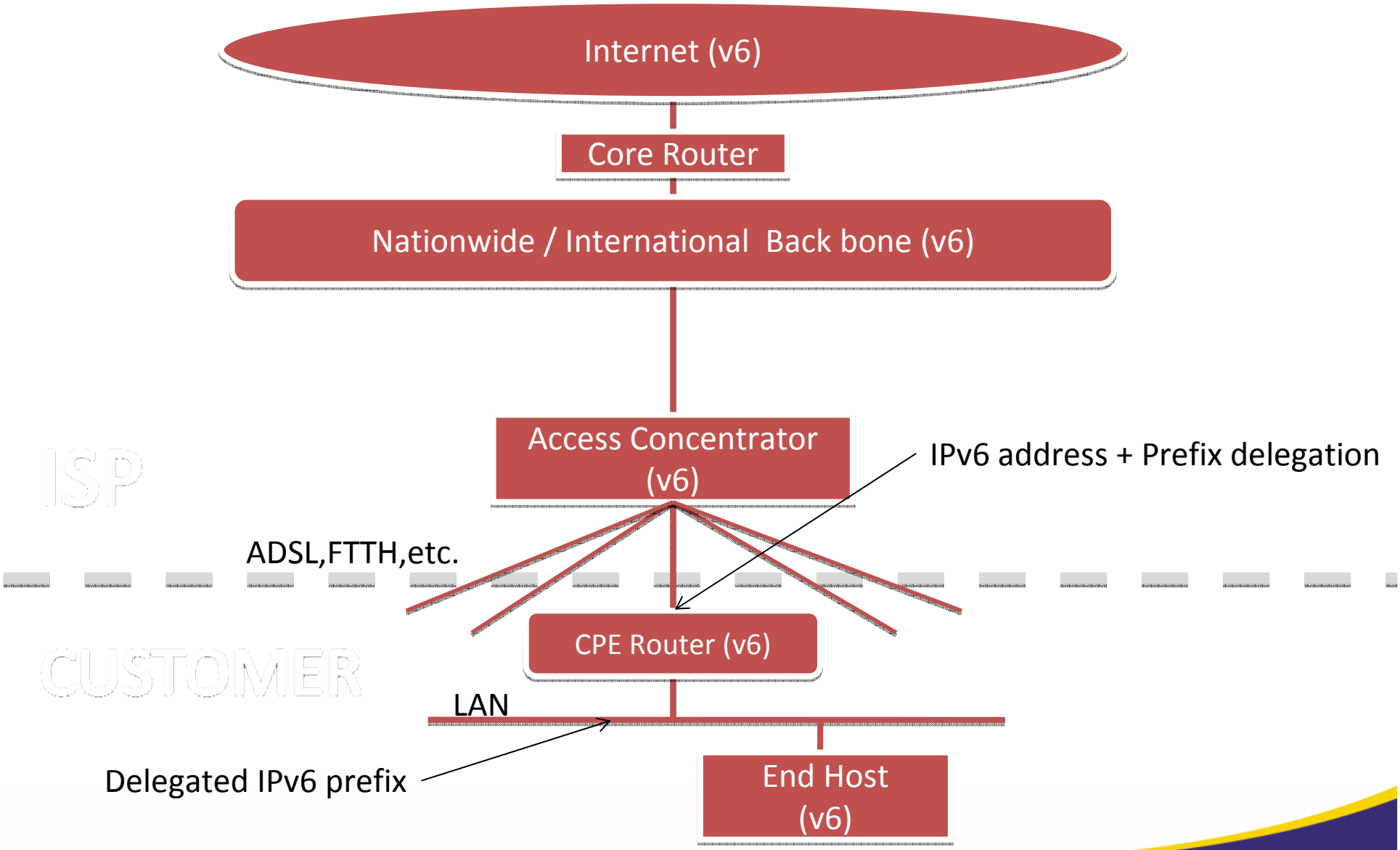
Native IPv6 service but CPE router is not ready



Replace CPE router to IPv6 compatible



Final: Pure v6 world



Summary: First step towards IPv6

NTT Communications

<u>for Enterprises, SMEs</u>

- converting WAN network and WAN routers into v4/v6 dual stack

<u>for ASPs, Data Centres, and B2B/B2C businesses</u>

- converting WAN network and WAN routers into v4/v6 dual stack
- introducing NAT4->6 or translator

What NTT can offer to our customers regarding IPv6?

1. Network/ISP services

- NTT Com global IP backbone can provide IPv6 connectivity now.
  -> Some of our ISP, enterprise customers are already using IPv6.
- NTT Singapore local ISP (i-net) will be IPv6-ready soon.

2. Network/System Integration

- Needs for IPv6-enabled equipments and kind of IPv4/v6 translator
- Collaboration with NTT group companies and partners

3. Consultancy

- Possible needs for kind of consultancy for IPv6 migration based on NTT's development and experience

Thank you for your attention