IPv6 Network Evolution Strategy
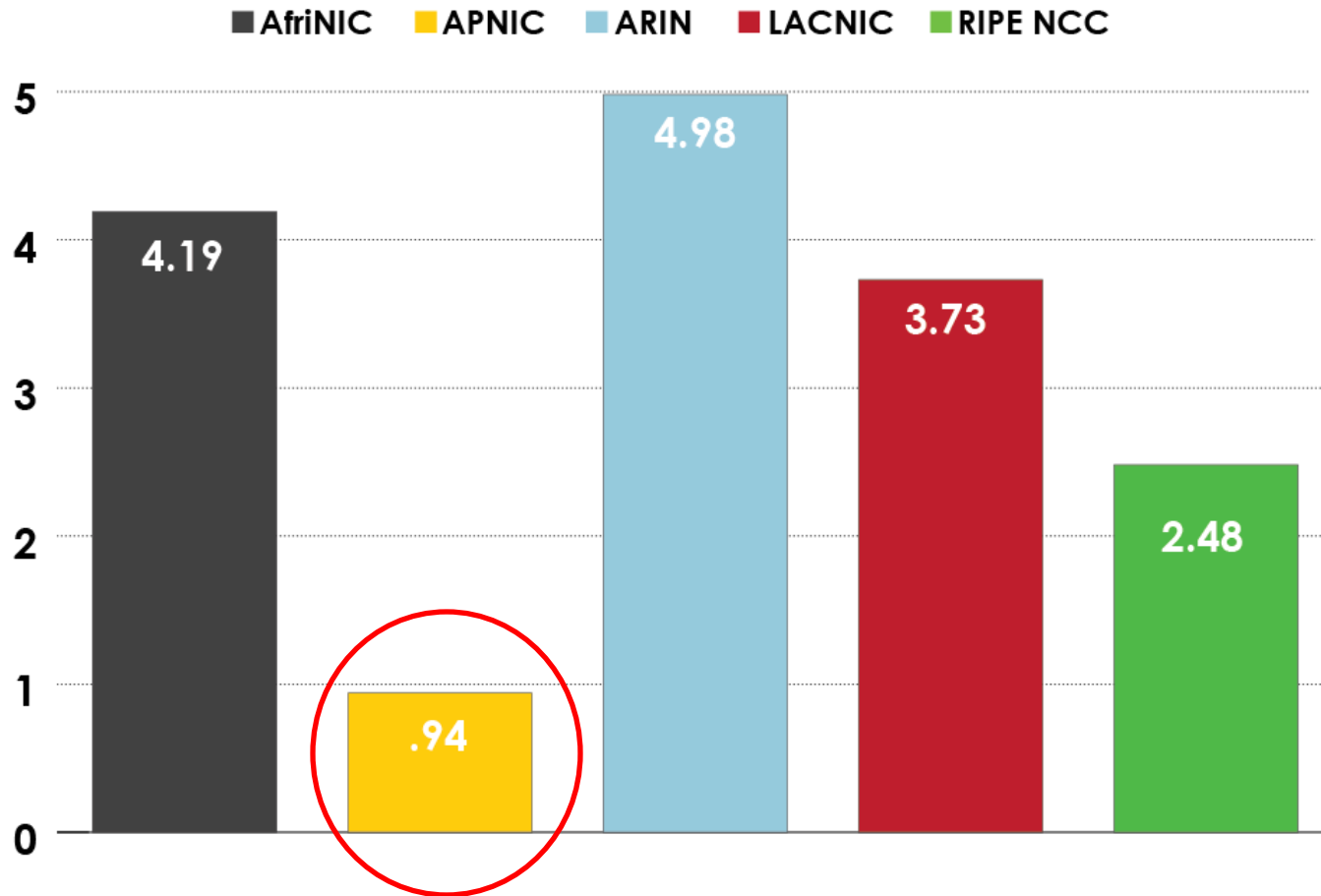
Sam Lim
Carrier IP Solutions Marketing
North America IP Competence Center

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Available IPv4 /8s In Each RIR
As of March 31, 2012 by NRO

Internet Number Resource Report

Reality Check

The Equation Doesn't Add Up For IPv4

Explosive demand for Addresses

- Explosive growth of broadband (>1 address per home)
- Rapid penetration of smart phones
- Internet of THINGs

IPv4 Address Supply

4.3B

"It's enough to do an experiment, the problem is the experiment never ended."

Unbalance

IPv6

Address Demand

>57B

Home Network >2B

Mobile Internet 5B

M2M 50B

Industry Is Ready for IPv6

Terminal
⭐⭐⭐☆☆

- **The main Operating Systems are ready**
- Windows 7, Windows Vista, Windows XP, Mac OS, Linux, Solaris
- Android, iOS, Symbian

Standard
⭐⭐⭐⭐☆

- **The core standards are stable**
- Ongoing work will be continued to address the new issues in some deployment-specific scenarios

Content
⭐⭐⭐⭐⭐

- **World IPv6 Day: 90% participants certified**
- Successful global-scale trial of IPv6: 391 websites enabled IPv6 on their main services for 24 hours on June 8th, 2011.

IPv6 is Ready for Deployment

Beyond Address Exhaustion

IPv6: Abundant public addresses stimulate new applications and opportunities

Windows 7 DirectAccess	**Windows 2008 Cluster**	**Apple Airport**
(transport IPv6 only)	**(**uses IPv6 link-local address)	**(**uses IPv6 Link-local address)

For Enterprise users

■ *DirectAccess allows users to remotely connect to corporate network without a traditional VPN client configuration or application, gives users a seamless remote corporate connection.*

For Residential Users (also SME)

■ *Apple Airport makes it easy to connect to the Internet, print, and stream iTunes music to any room in the house — all wirelessly*

■ *Windows 7 HomeGroup: simplifies the sharing within your home network.*

IPv6 provides more possibilities and opportunities

Global IPv6 Progress

Governments are promoting IPv6 to maintain / gain competitiveness

- The US Government set deadline (2008.06.30) for federal agencies to be up and running with IPv6.
- Comcast, AT&T, Verizon, Sprint etc.

- European Commission plan to realize at least 25% of users connecting to the IPv6 Internet.

- China CNGI: 5 year plan for deployment of IPv6
- Japan: government support IPv6 by e-Japan plan (2001)
- India: all entities migrate to IPv6 by Mar. 2012.

	2011	2012
RFQ/RFP Commercial trial	france telecom, Telefónica, vodafone, PT, SFR, O₂, belgacom, Kabel Deutschland, swisscom, QSC AG Ihre.Premium-Alternative, Bouygues Telecom, TELE2	TELECOM ITALIA, Deutsche Telekom, BT
Commercial deployment	JAZZTEL, free	Telefónica, france telecom, vodafone, PT

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Main considerations for IPv6 Strategy

Motivations

1. IPv4 address shortage
2. Government Mandate
3. Business possibilities and opportunities

Requirements

1. Enable IPv6 connectivity to users
2. Continue sharing IPv4 public addresses among users
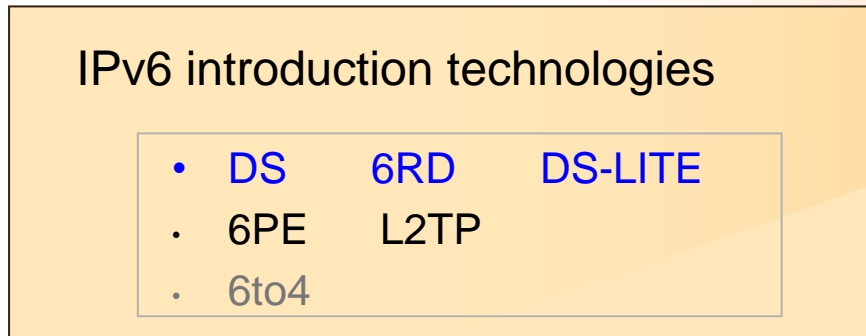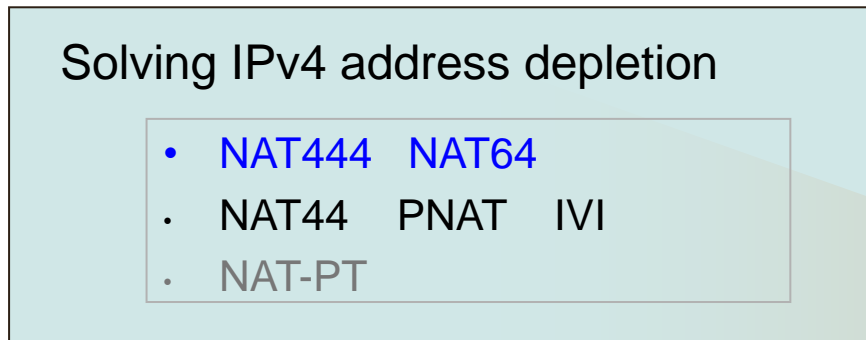3. IPv6 and IPv4 network managment

Opinions

1. IPv6 & IPv4 will coexist for a long time
2. There is no "one size fits all" migration solution
3. Collaborate with an experienced and trusted partner

GOALs

1. Maintain user service experience
2. Optimize network investment
3. Monetization

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IPv6 Migration Technologies

Customer satisfaction constraints

- Existing services need to be moved seamlessly
- New services need to be IPV6 enabled directly
- Maintain user experience

Solving IPv4 address depletion

- NAT444   NAT64
- NAT44   PNAT   IVI
- NAT-PT

IPv6 introduction technologies

- DS   6RD   DS-LITE
- 6PE   L2TP
- 6to4

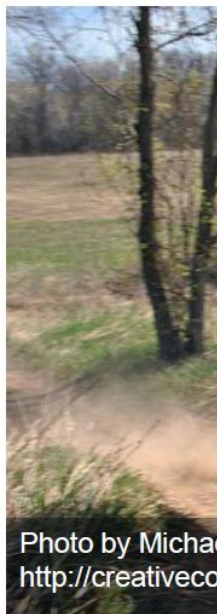IPv6 & IPv4 coexist

Pure IPv6

SP financial constraints

- SP Investment Protection
- Reducing impact on network
- Minimizing TCO

The solution is a combination of multiple technologies
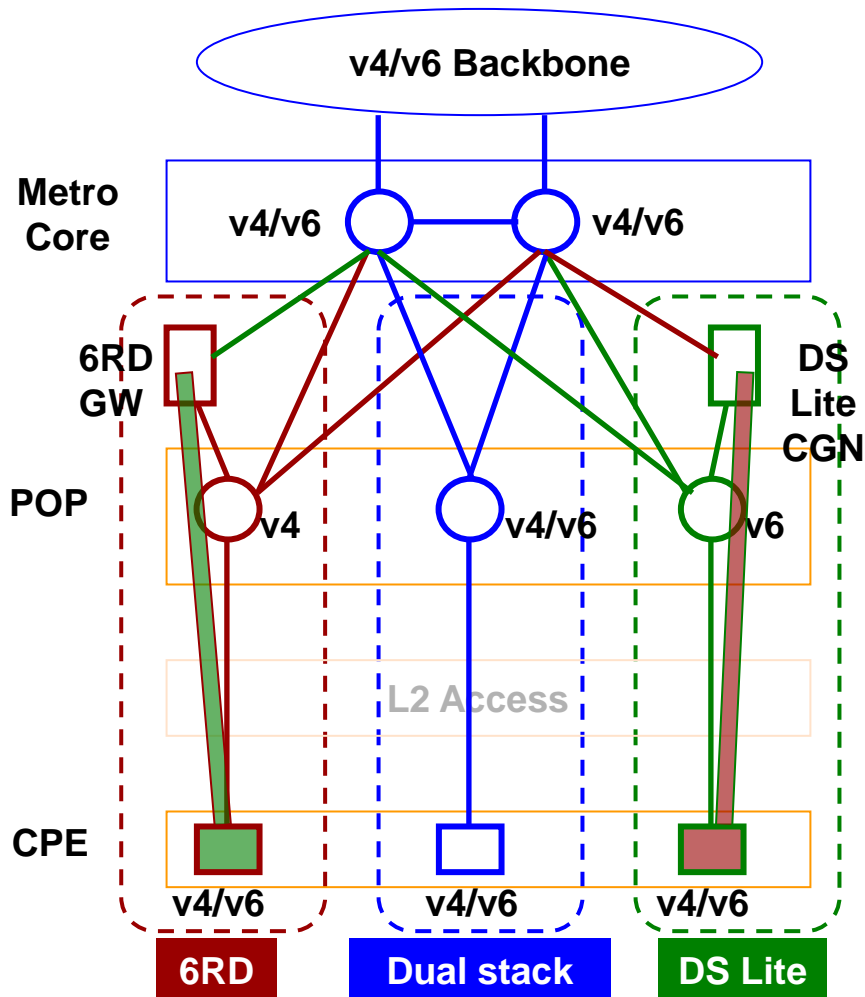
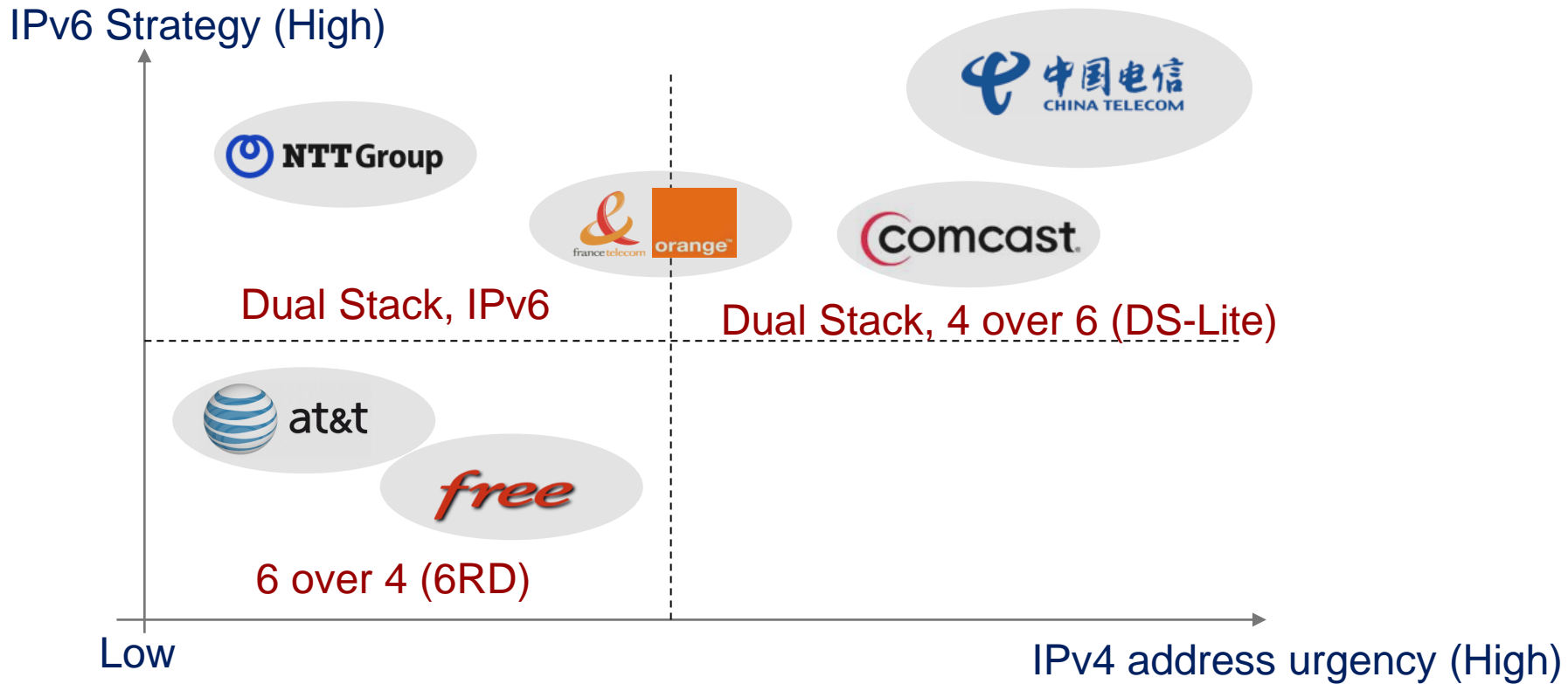HUAWEI

NAT Looks like…

If IPv4 add

Cycles …

Photo by Carol Mitchell via Flickr
http://creativecommons.org/licenses/by-nd/2.0/deed.en

Source: YAHOO! ® *<<Content Delivery Over IPv6: The Yahoo! Experience>>*

Top Three IPv6 Migration Options

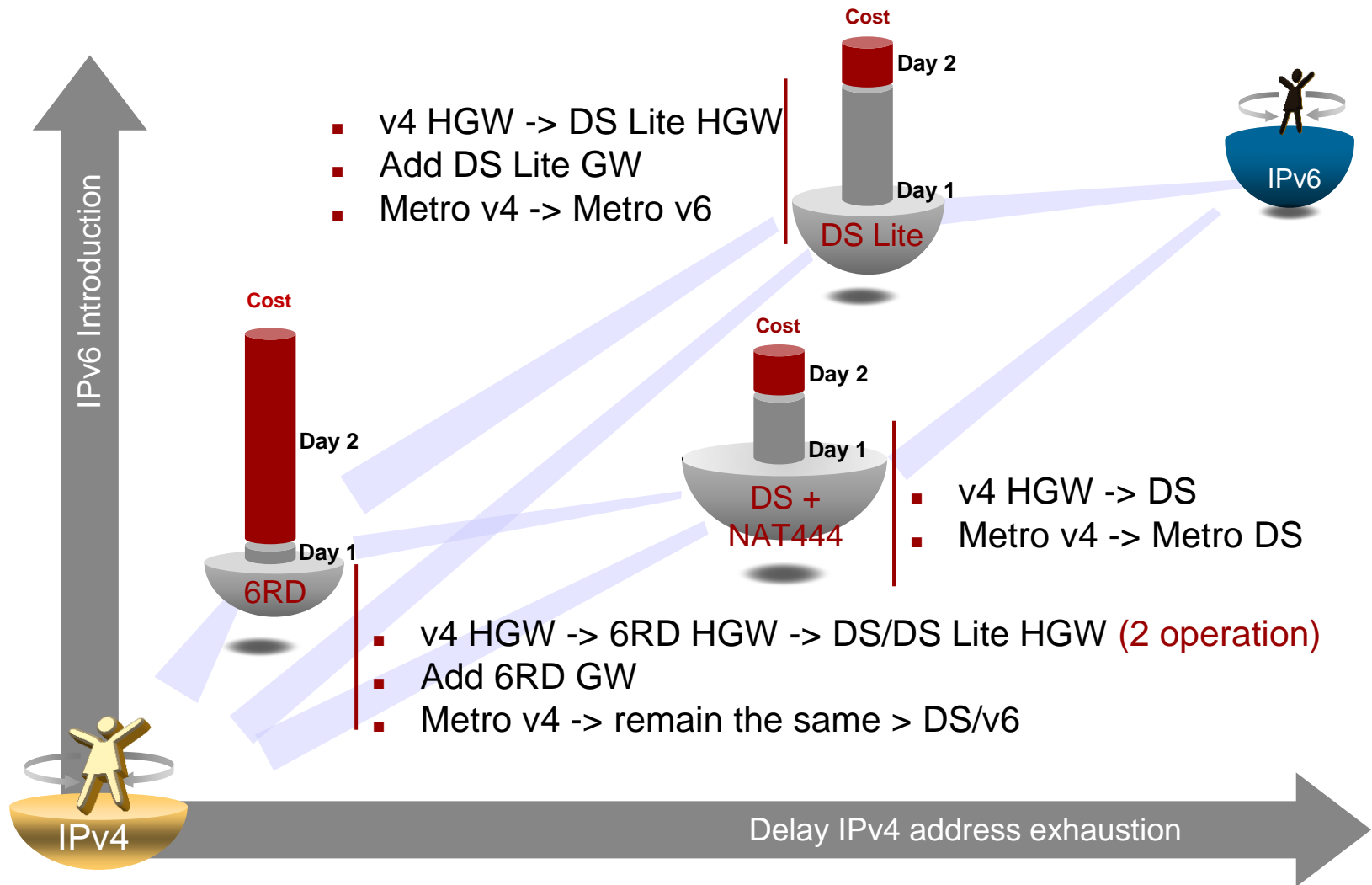| Solution	Description	GW	CPE
Dual Stack + NAT444	E2E Dual stack, NAT444 is used to release v4 addr. pressure	N	Bridge or DS
DS Lite	v4 service in v6 tunnel, NAT444 could also be used	Y	DS + DS Lite GW
6RD	v6 service in v4 tunnel, NAT444 could also be used	Y	DS + 6RD GW

No "One Size Fits All" Solution

Different operation environments dictate different paths to IPv6

Cost and Complexity Comparison

- v4 HGW -> DS Lite HGW
- Add DS Lite GW
- Metro v4 -> Metro v6

Cost — **Day 2** — **Day 1** — DS Lite

IPv6

Cost

IPv6 Introduction

Cost — **Day 2** — **Day 1** — 6RD

Cost — **Day 2** — **Day 1** — DS + NAT444

- v4 HGW -> DS
- Metro v4 -> Metro DS

- v4 HGW -> 6RD HGW -> DS/DS Lite HGW (2 operation)
- Add 6RD GW
- Metro v4 -> remain the same > DS/v6

IPv4

Delay IPv4 address exhaustion

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IPv6 Contribution to Standards

- **Huawei leads IETF v4 to v6 transition, multicast transition, and renumbering work, is the top 3 contributor for each mainstream .**
- **3 RFC （RFC4925, 5121, 5790） + 57 drafts**

Dual Stack	Translation	Tunneling	V4V6tran	Multans
29 Drafts	6 Drafts	RFC5121 and 5 Drafts	RFC4925, RFC5790 and 10 Drafts	5 Drafts

- **Huawei leads the harmonization between IETF and ITU-T standardization on IPv6**
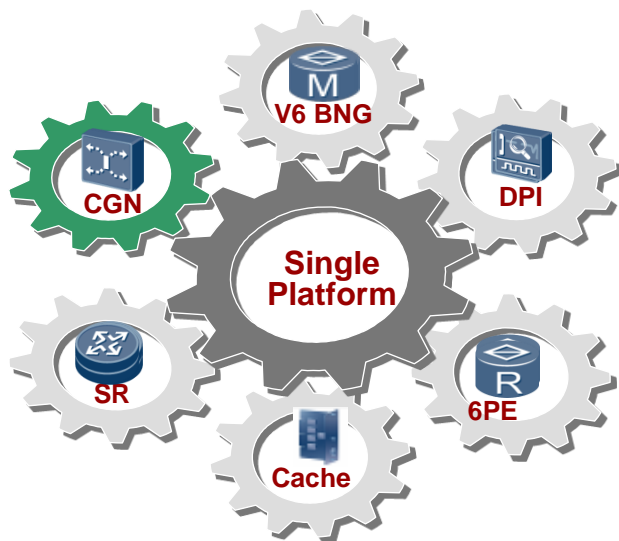
Y.ipv6split	Y.ipv6na	Y.ipv6migration

- **The co-editor of WT-242 "Migration Strategies to IPv4/v6 Dual Stack"**

A. Contributions in all these working groups

B. Several editors positions held by Huawei folks

Industry Leading Multi-Scenario CGN solution

V6 BNG

CGN

DPI

Single Platform

SR

Cache

6PE

CX600 Router Series

Single Platform

CX600-X1   CX600-X2   CX600-X3   CX600-X8   CX600-X16

32 hardware thread / CPU

Up to 40G processing capabilities/boarxd

40 M flows/board, 20M session/board

1M tunnel/board

400K new flows/s

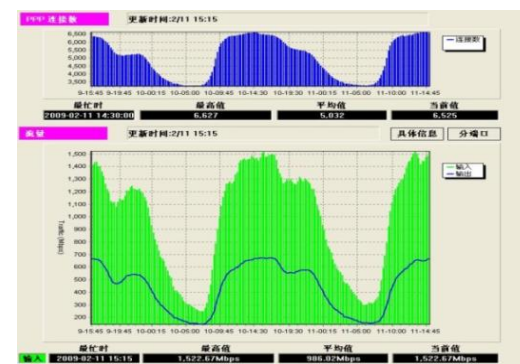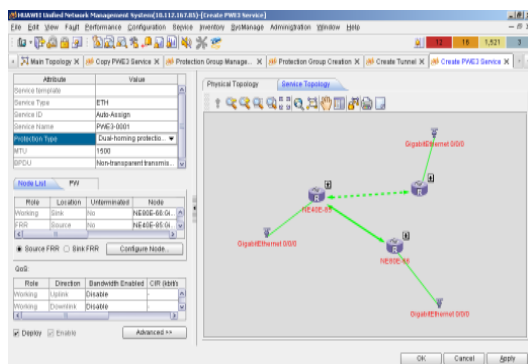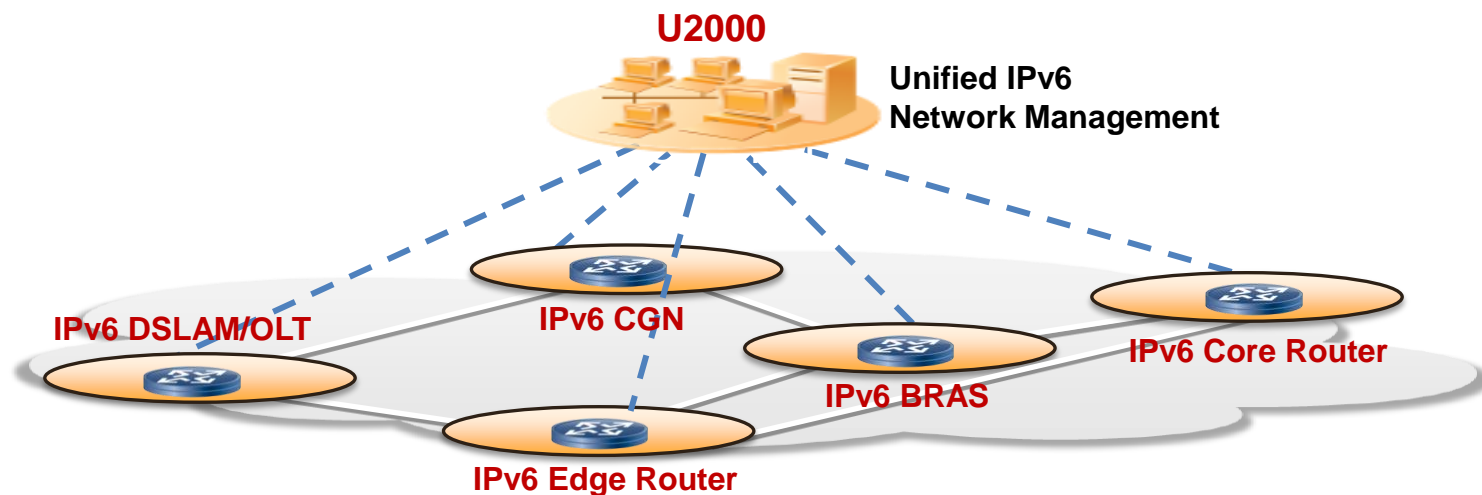100us tunnel processing latency and 50us for NAT44

Pluggable CGN line card

VSUI-40-A

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Visualized IPv4/IPv6 Network O&M

U2000

**Unified IPv6
Network Management**

IPv6 DSLAM/OLT

IPv6 CGN

IPv6 Core Router

IPv6 BRAS

IPv6 Edge Router

Visualized IPv6 VPN Establish

**Visualized DS Network Logical
Topology**

**Real-time IPv6 DS Traffic
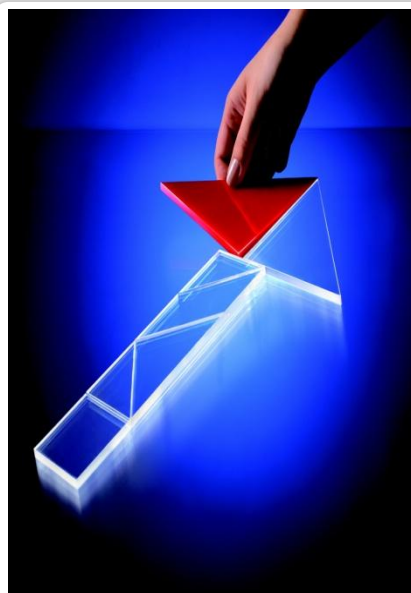Monitoring**

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Summary: Huawei IPv6

Lower cost Network Migration

E2E IPv6 Network O&M

- Any CPE Migration
- Smooth ATM Network Migration to IPv6
- Single platform for Metro and CGN

100% Carrier-grade NAT

- Larger capacity
- Higher Reliability
- Hot Standby 1+1
- NAT Log storage

User-oriented Managed CGN

E2E IPv6 Network O&M

- Tunnel-aware CGN
- User-oriented CGN and Managed CGN

Trusted Partner & Successful Deliveries

Massive Deployments Worldwide

36 of the world's top 50 operators

130+ NGN/wireless bearer networks

700+ Metro Ethernet networks

Partnership with Top Operators in 2010

BT   Deutsche Telekom   vodafone   Telefónica   telenor

&france telecom   TeliaSonera   STC   etisalat   oi

KDDI   SingTel   中国电信 CHINA TELECOM   中国移动通信 CHINA MOBILE   China unicom中国联通

Proven track record of successful delivery

中国电信 CHINA TELECOM

"We choose Huawei as our long-term partner in the IP field for his **leading technologies, reliable performance, and experienced telecom assurance**.

Telefónica

Highly recognized by Telefonica on **both the high project delivery quality and the product performance**, Huawei is regarded as a model for other suppliers.

mobily موبايلي

Mobily has again chosen Huawei because of its **rich experience in core router and its adequate understanding of our needs**."

— *Abdulaziz Al Tamami, COO of Mobily*

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Accelerate IP Ubiquity
——Lead the full-IP era Accelerate the network converge

As a world leader operators of telecommunications solutions, Huawei constant innovation according to customer needs, by the powerful advantages in fixed networks, mobile networks, IP data communications and other core areas, Huawei have established leadership in the full-IP convergence era.
Huawei will continue to conduct product innovation, business innovation, structure innovation and technological innovation, standing on the high ground of new technology, develop future-oriented networks strategy of IPv6, support future business growth, Promote to form industry alliances and develop it together.

Thank You

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