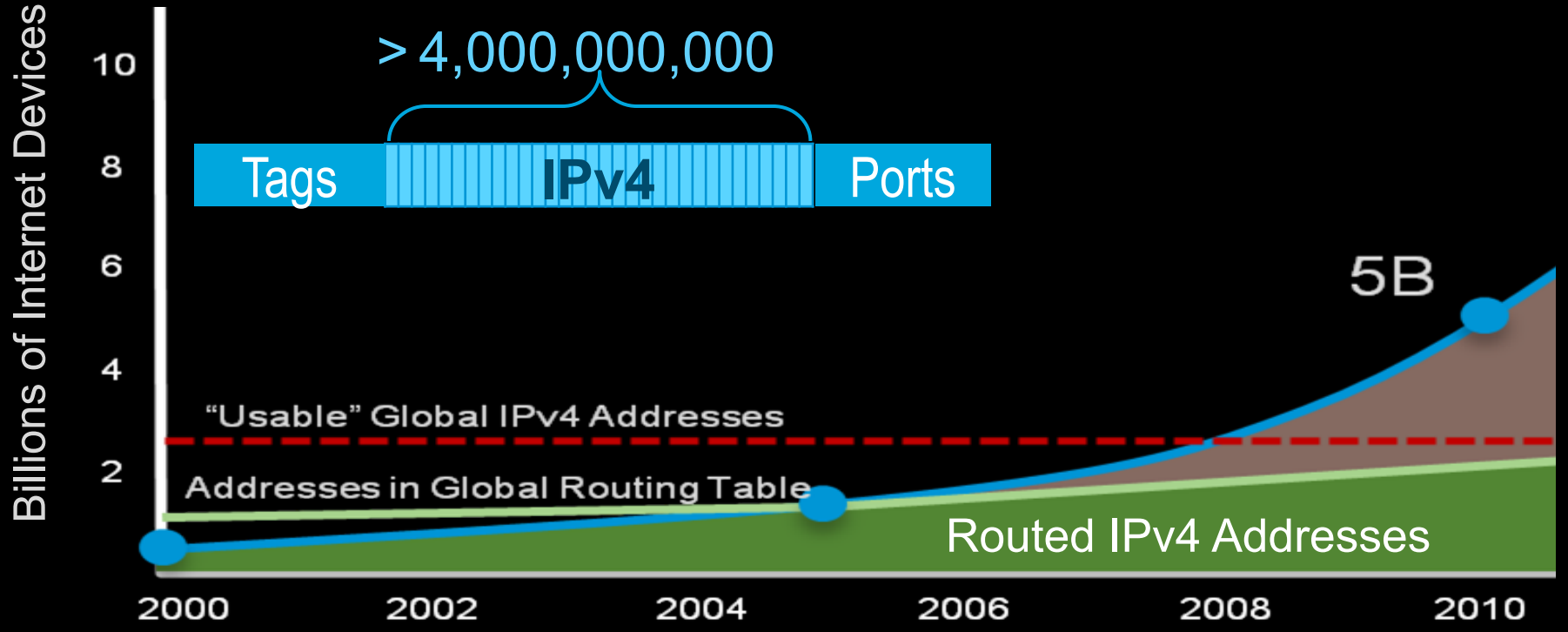
# IPv6 Adoption …acceleration

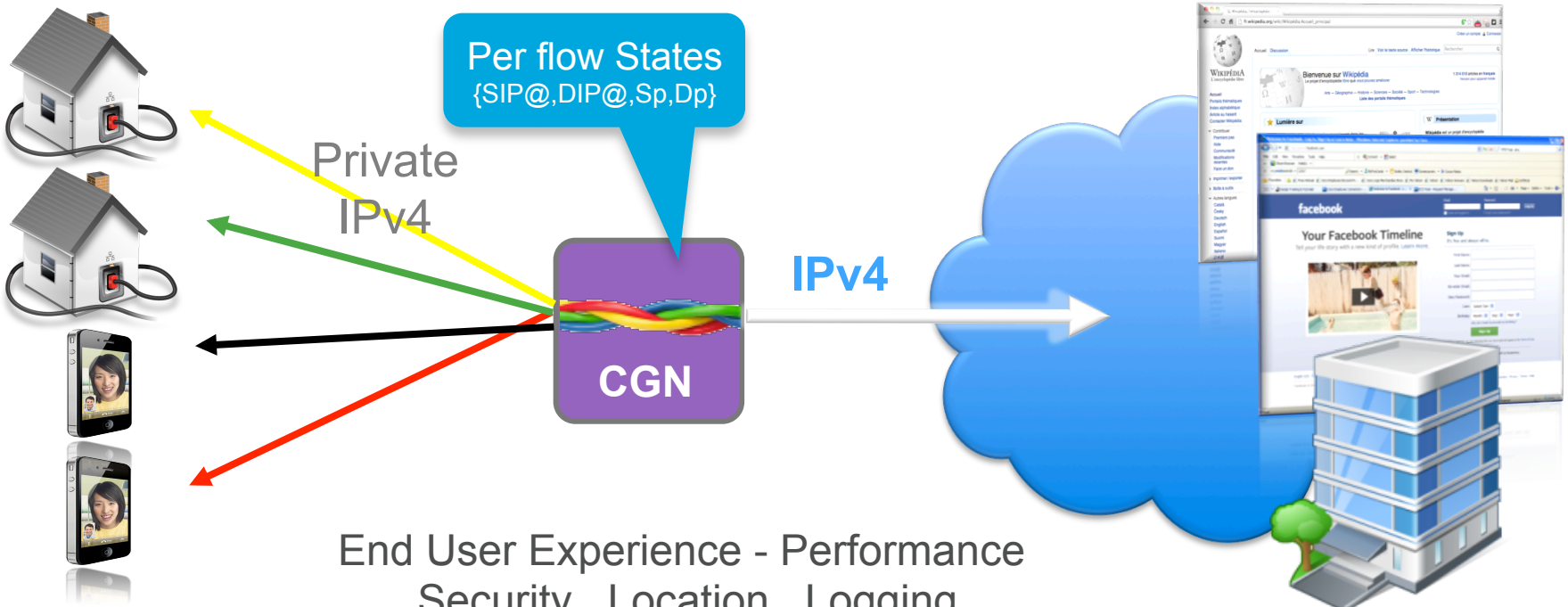
- Alain Fiocco, Sr. Director IPv6 High Impact Project

# Past Internet Growth Challenges With IPv4




Sources: IMS Research, Intel, Ericsson, Cisco

# Carrier Grade NAT: Sharing public IPv4 addresses




End User Experience - Performance
Security , Location , Logging
Troubleshooting



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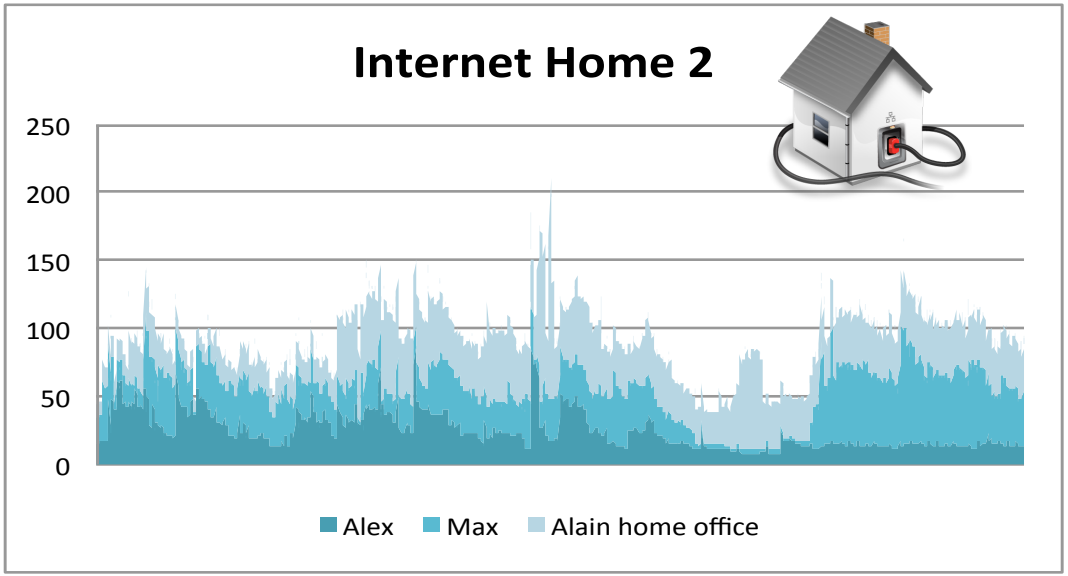
# Real world Session Statistics




## Peer to Peer:

- BitTorent: >700

## Portals/Social

- Facebook: 40 sessions
- Yahoo: 110 sessions
- Bing: 30
- G+: 30
- Wikipedia: 50
- Twitter : 20

## VoD/TV Replay platforms:

- Canalplus : 70 sessions
- Pluzz.fr: 95 sessions
- BBC : 45 sessions
- CNN: 50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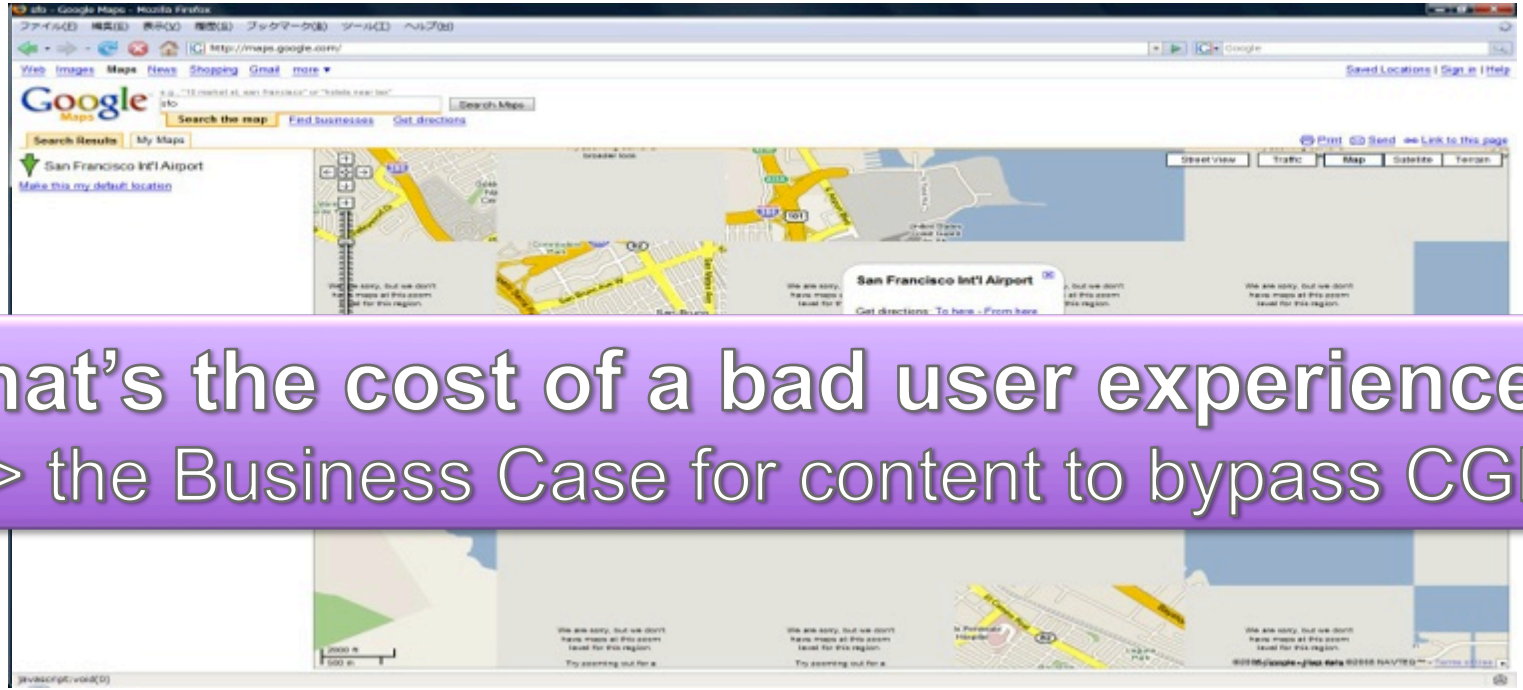
# Impact of CGN-NAT on User Experience

**16 NAT Sessions times millions of users**

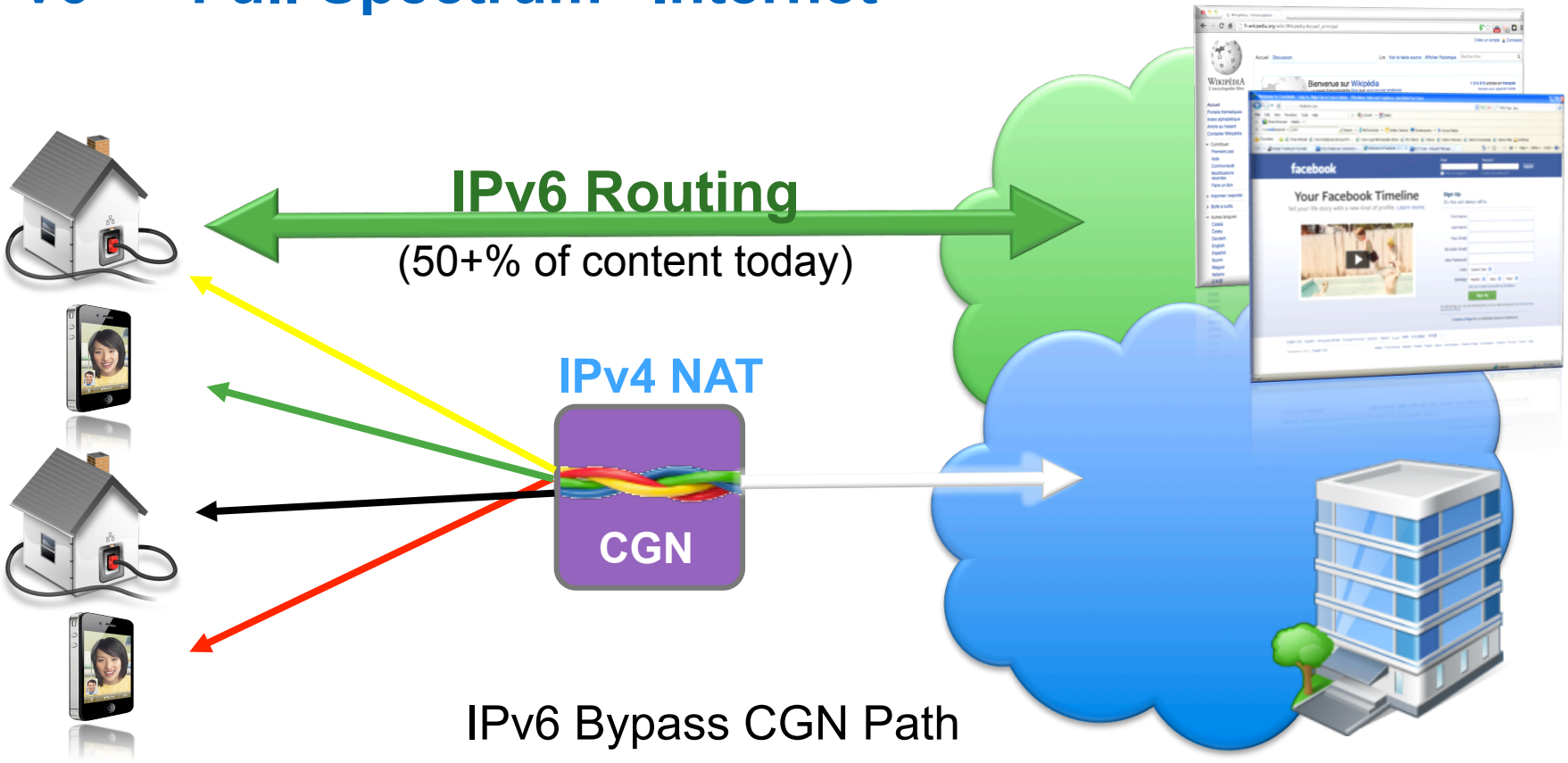



**What's the cost of a bad user experience ?**

=> the Business Case for content to bypass CGN

Web 2.0 (ex: AJAX) Application Behavior Under Constrained NAT Resources

# IPv6 – “Full Spectrum” Internet



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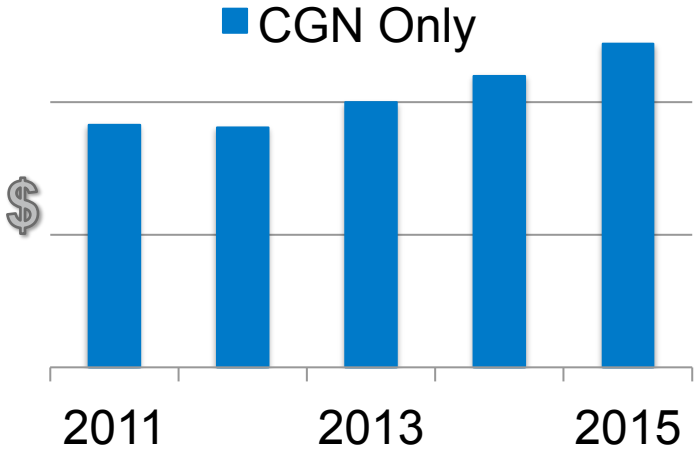
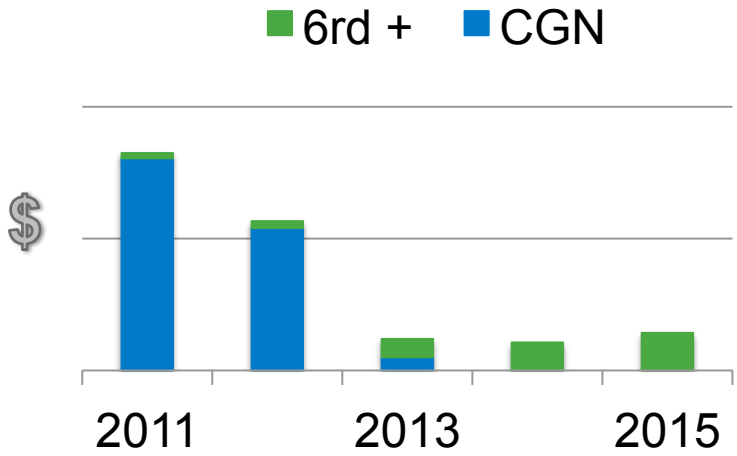
# The IPv6 business case for Wireline or Cable

## CGN Bypass




May, 2012 IDC Study – “The Business Case for Delivering IPv6 Service Now“

http://tinyurl.com/cgn-bypass-business-case



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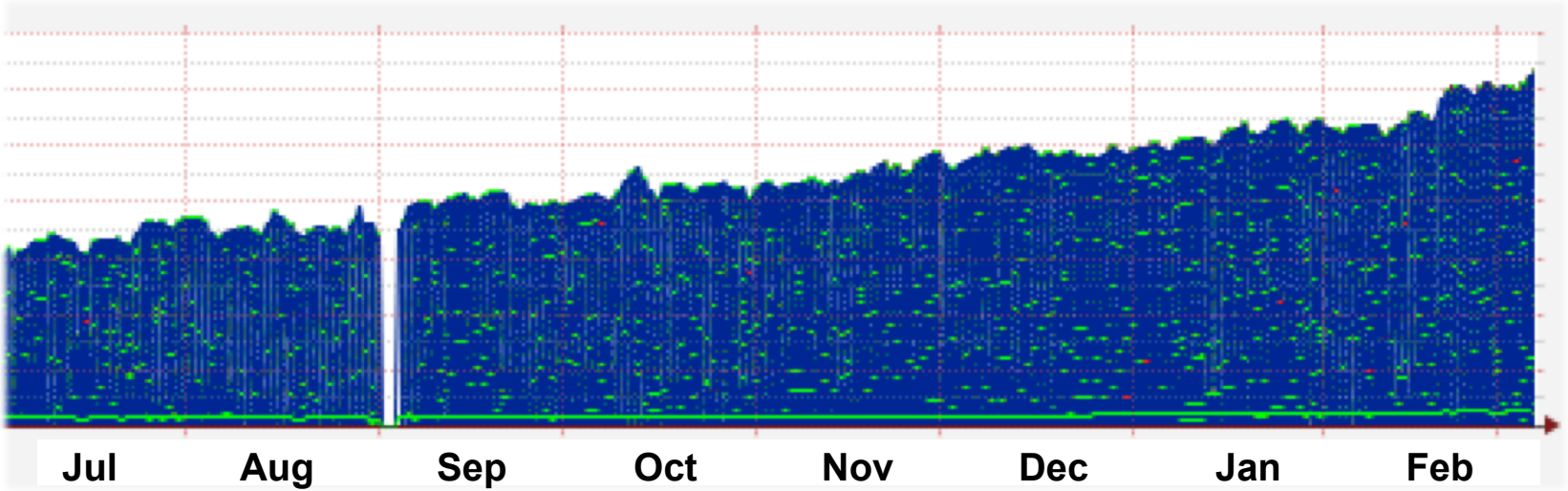
# NAT44 Session State Growth

## …in a Real Mobile Network




2 X over 8 months. Accelerating with Smartphone penetration
=> More sophisticated apps => more tcp sessions + keepalive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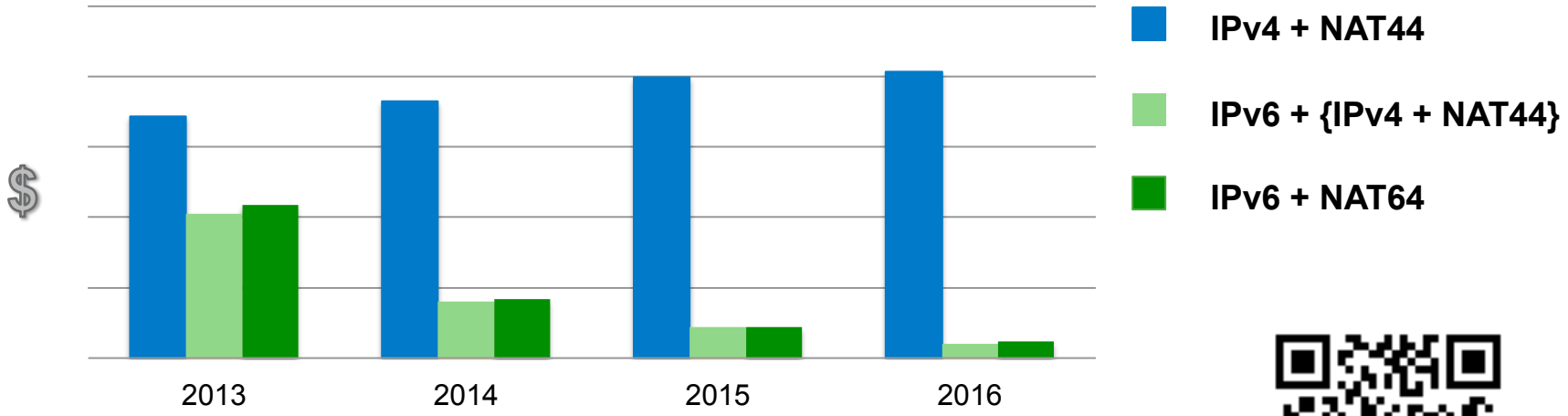
# The IPv6 business case for Wireline or Cable

## Mobile CGN Bypass




March 2013, IDC Study - "The Business Case for IPv6 in Mobile Networks"

http://tinyurl.com/cgn-mobile-bypass-case



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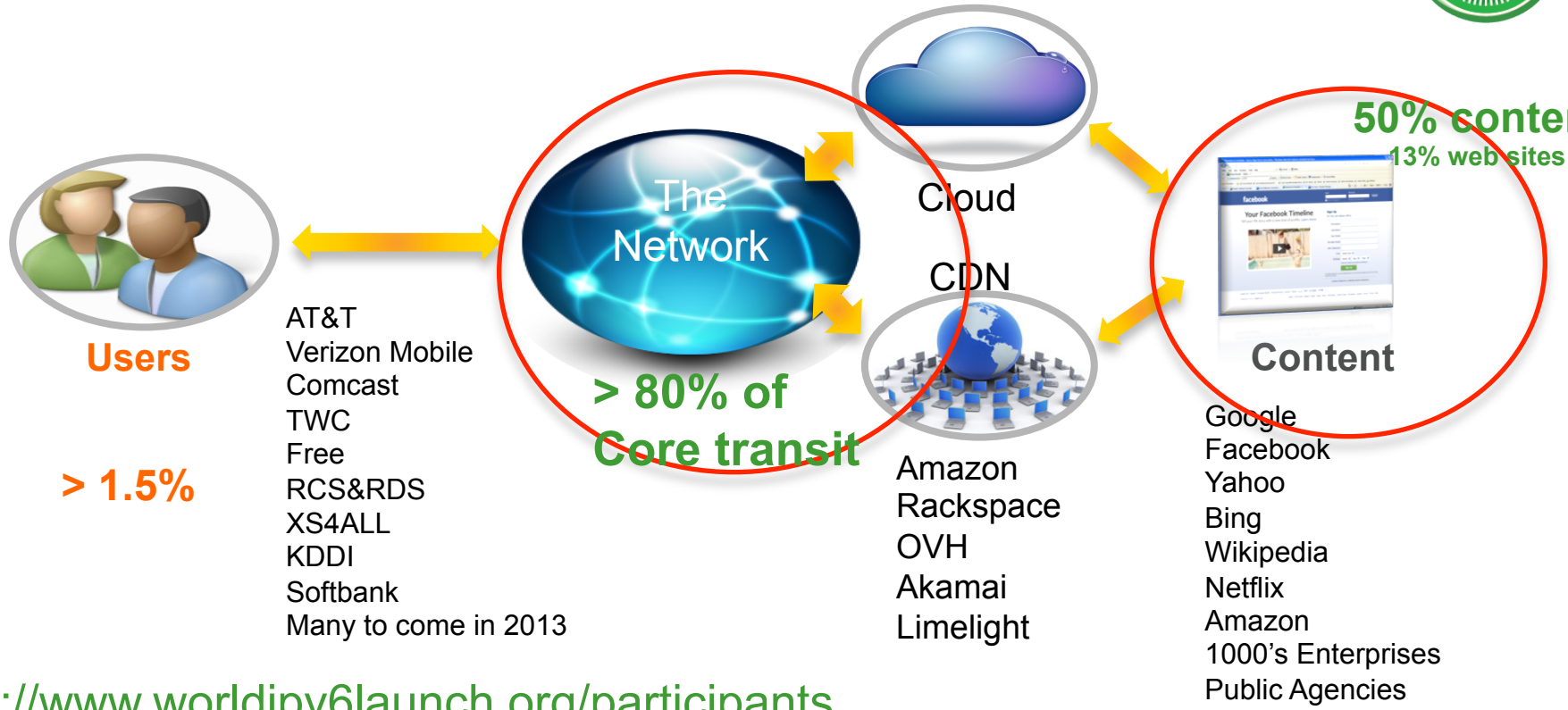
# The world has changed on June 6th 2012




http://www.worldipv6launch.org/participants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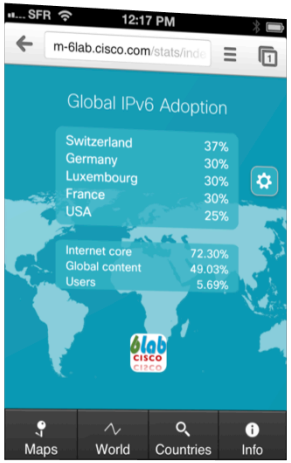
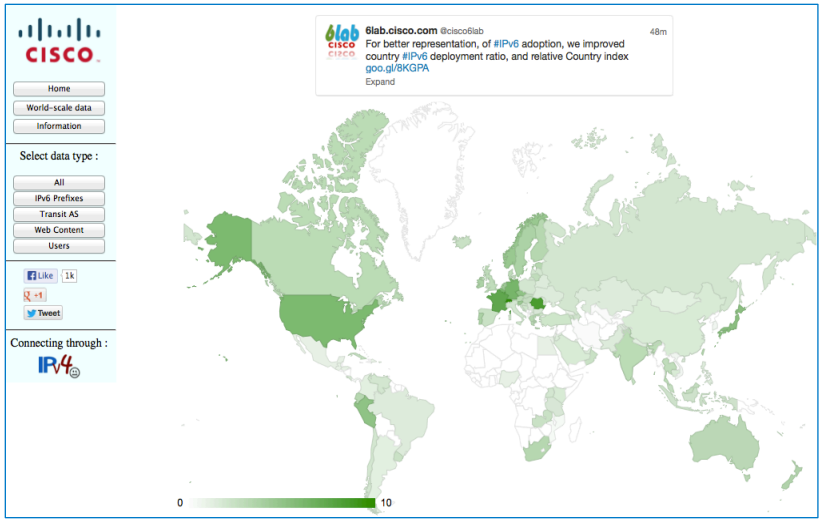
# 6lab.cisco.com/stats @cisco6lab

*"When a tree falls, we can hear it.*
*When the forest grows, not a sound"* Gandhi





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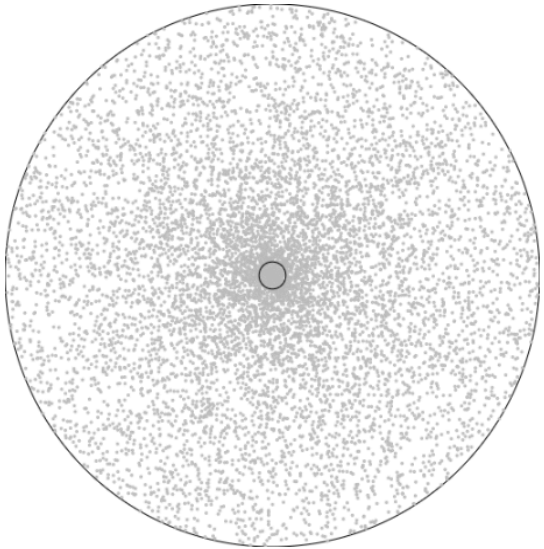
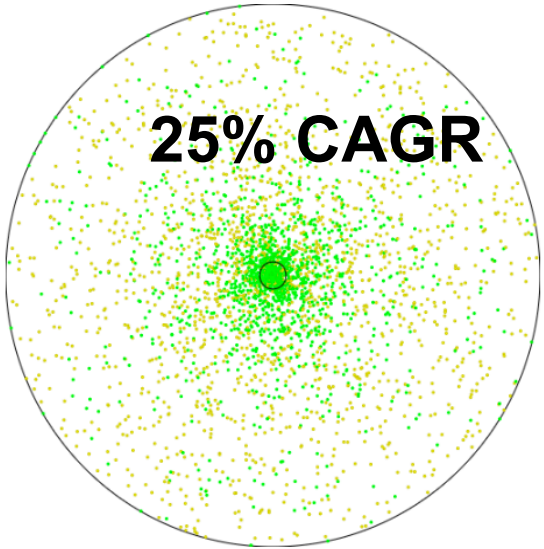
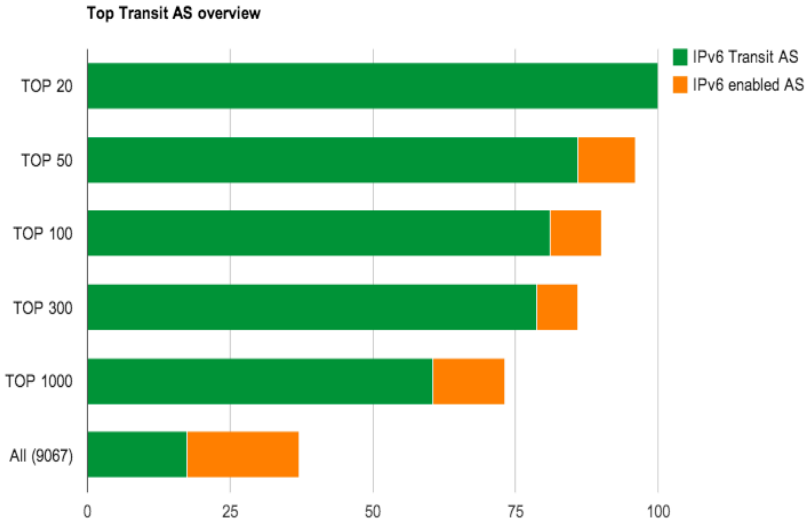
# The Internet Core is ready !






IPv4 transit AS's: 9133

IPv6 transit AS's: 1577*

IPv6 enabled AS's: 3372

→ Concentrated in TOP 300
(77% of AS's are IPv6 transit)



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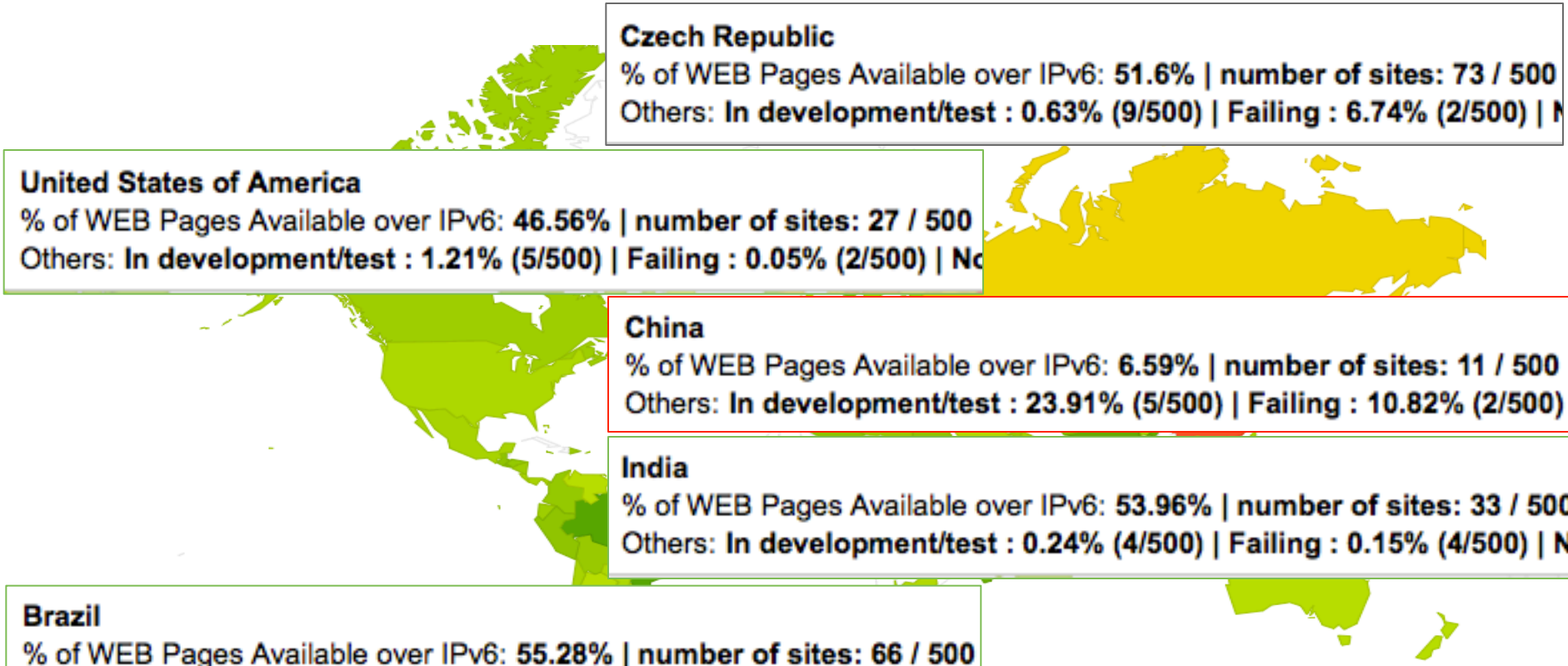
# ~50% Content reachable over IPv6





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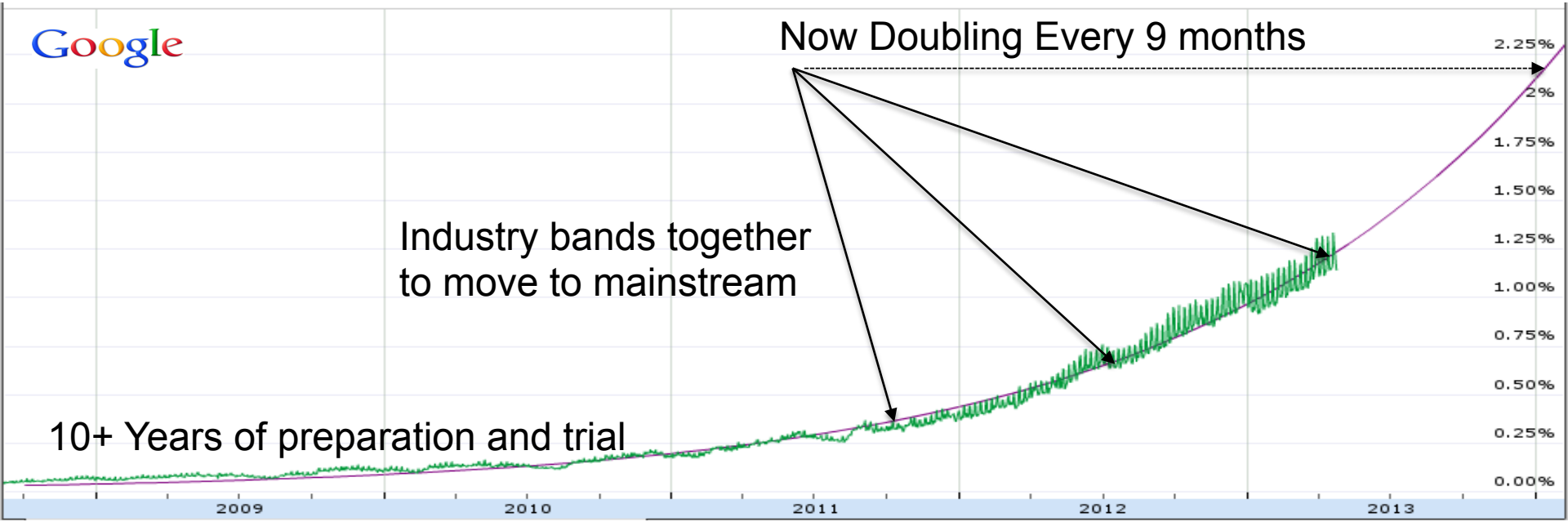
# IPv6 Global Deployment To Users



Cisco's commitment
to IPv6
June, 2010

"World IPv6 Day"
June, 2011

"World IPv6 Launch"
June, 2012

Cisco Live
June, 2013



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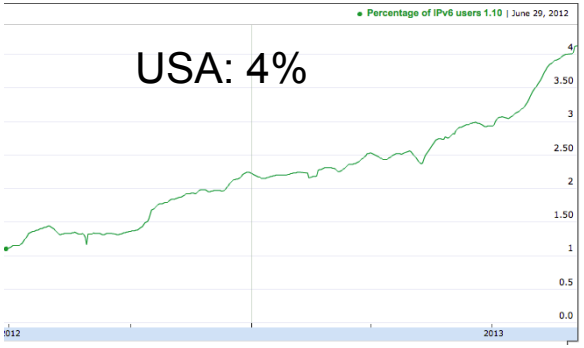
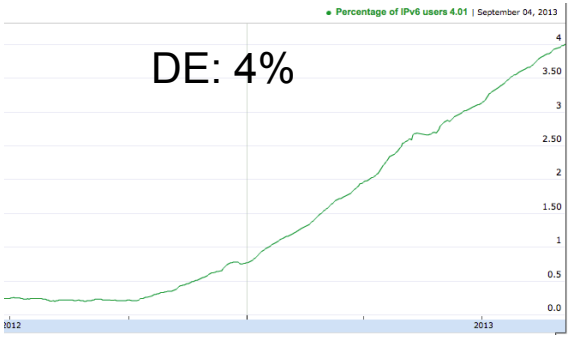
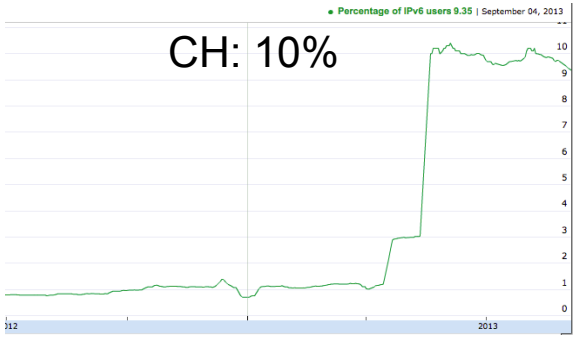
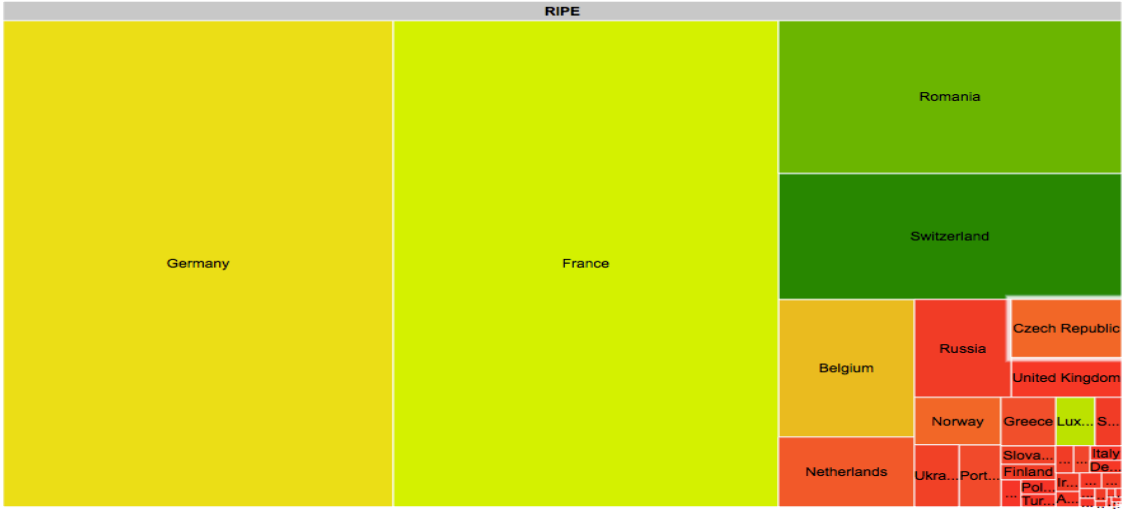
# IPv6 Users

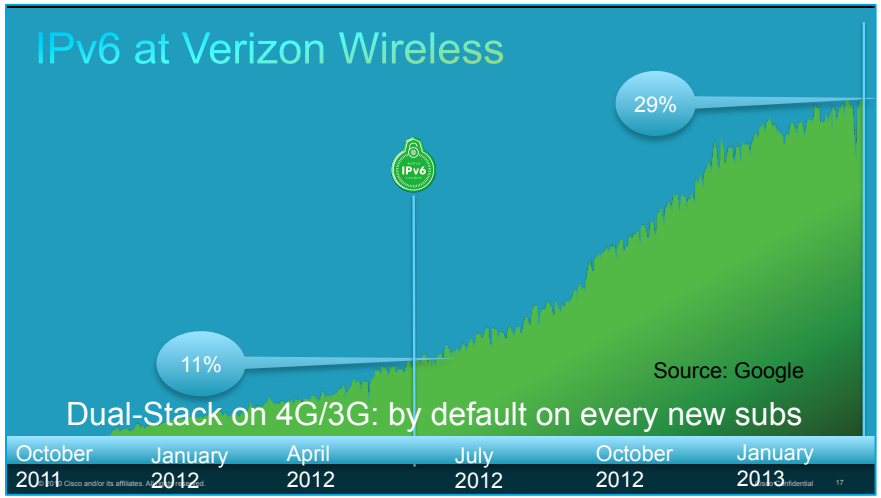

Percentage of IPv6 users 1.10 | June 29, 2012
USA: 4%
4
3.50
3
2.50
2
1.50
1
0.5
0.0
2013

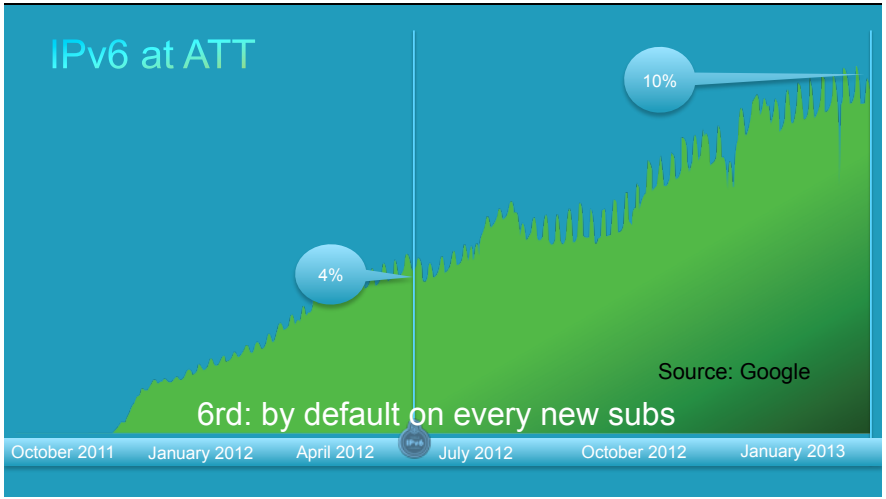

Percentage of IPv6 users 4.01 | September 04, 2013
DE: 4%
4
3.50
3
2.50
2
1.50
1
0.5
0.0
2013


Percentage of IPv6 users 9.35 | September 04, 2013
CH: 10%
10
9
8
7
6
5
4
3
2
1
0
2013


RIPE
Germany
France
Romania
Switzerland
Belgium
Russia
Czech Republic
United Kingdom
Norway
Greece
Lux...
S...
Netherlands
Ukra...
Port...
Slova...
Finland
Pol...
Tur...
Ir...
A...
Italy
De...

# Where are IPv6 users coming from ?




- 10% at KDDI (6rd: by default on every new customer
- 20% at Free, (6rd: done a while back, leveraging CPE transition)
- 23% at VOO (DS over Docsis 3.0: in three waves of enablement)
- 16% at XS4ALL(DS over Docsis 3.0)
- 15% at Swisscom (6rd: enabled the bulk in just couple of days !)
- 6% at DT (DS over PPP, start in Nov 2012)

Source: http://www.worldipv6launch.org/measurements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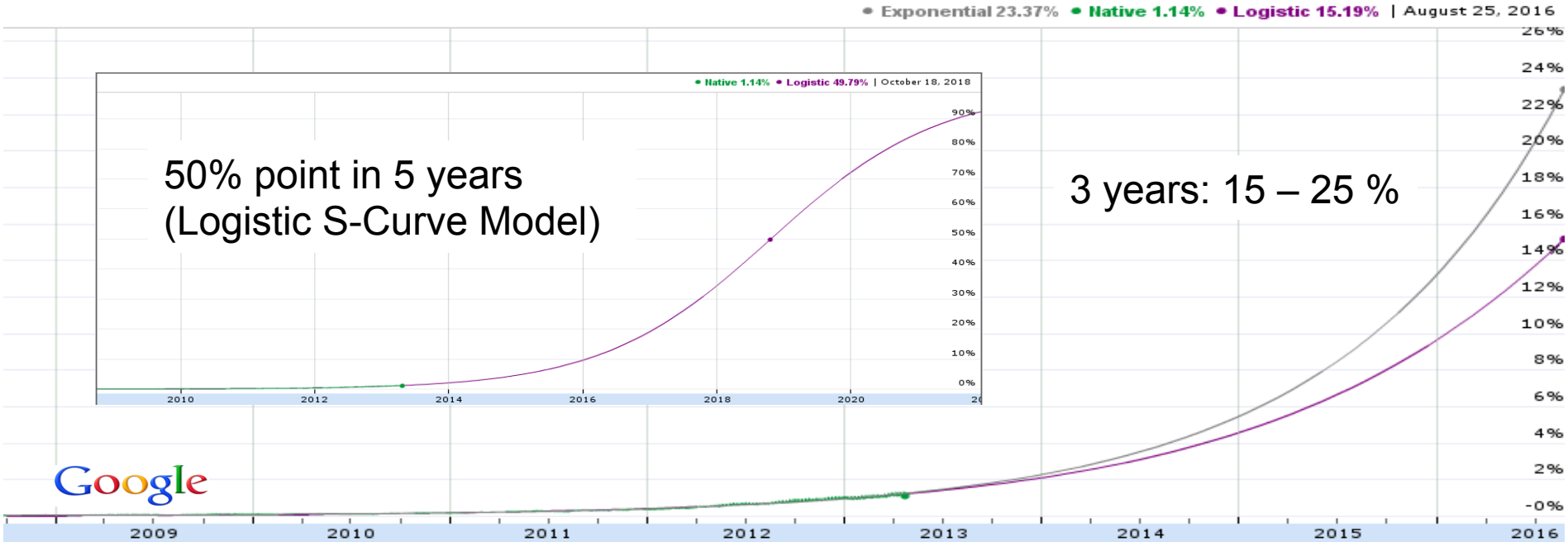
# Forecasting*




* Based on past data. Does not include effect of new IPv6-only Internet of Things Architectures, Smartgrid, IPv4 run-out outside of Asia and the EU, etc.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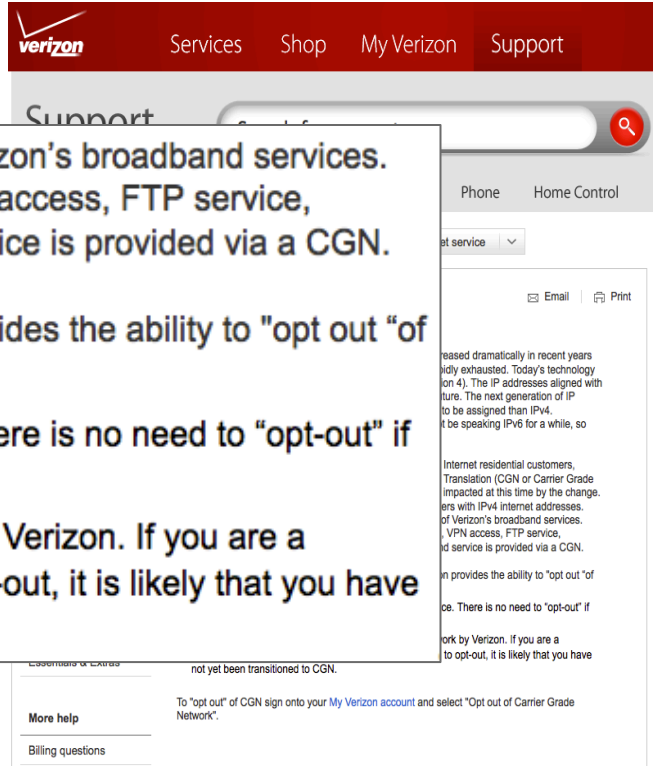
# Accelerate IPv6 to end-users

- Deployment of CGN should be transparent
  - U
  - C
- Inte
  rou
  - P
  - IP
- Country roadmap – IPv6 Capacity building
  - Government lead by example




CGN will not impact the access, reliability, speed, or security of Verizon's broadband services. However, there are some applications such as online gaming, VPN access, FTP service, surveillance cameras, etc., that may not work when broadband service is provided via a CGN.

For our customers utilizing these types of applications, Verizon provides the ability to "opt out "of CGN. **To "opt out" you must:**

- Be a Residential customer with High Speed Internet Service. There is no need to "opt-out" if you are a FiOS or Business customer.
- Have already been transitioned to the Carrier Grade Network by Verizon. If you are a Residential High Speed Internet customer and are unable to opt-out, it is likely that you have not yet been transitioned to CGN.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# China pushing forward…

## Huge impact on B2C in China and B2B for Rest of the world

**Chinese telcos embark on IPv6 adoption**

*Staff writer* | April 17, 2013
telecomasia.net

China is moving a step closer towards large scale of commercial IPv6 adoption, as the three major telecom operators have begun upgrading their networks from IPv4.

Speaking at an industry event in Beijing last week, Chen Jiachun, deputy director at China's Ministry of Industry and Information Technology (MIIT), said China Mobile, China Unicom and China Telecom are upgrading their networks to IPv6 in 20 cities across 14 provinces.

The telcos' moves are in line with the government's network development policies set in the 12th five-year plan. The China government aims to reach a network penetration rate of 45% with more than 25 million IPv6 users, and switch the mobile networks from IPv4 to IPv6 by the end of 2015.

The 3 largest SP in China:

- Will have 3M subs each by Dec 2013
- 45% wireline penetration (25M homes) by End 2015
- All mobile switch to IPv6 by End 2015 !

http://www.telecomasia.net/content/chinese-telcos-embark-ipv6-adoption?src=popular


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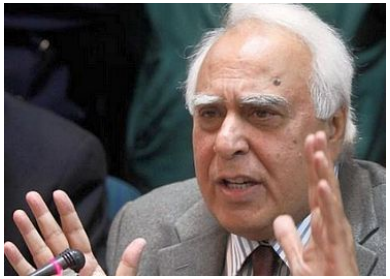
# …So is India

## Huge impact on B2C in India and B2B for Rest of the world



The DoT has released IPv6 deployment roadmap version II on March 26, 2013, with an objective for effective transition from IPv4 to IPv6 in a time-bound manner. The guidelines allow that public interface of all government projects for citizen-centric services should support IPv6 traffic by Jan 15, 2014.

The government also mandates service providers to ensure GSM/CDMA customers acquired after June 30, 2014 shall be capable of carrying IPv6 traffic while the LTE consumers after June 30 shall be IPv6 complaint.

**India IPv6 Deployment Roadmap Version 2: Key Recommendations**

The IPv6 Roadmap Ver. 2 is approved by Government of India and is being released by Honorable Minister of Communication and IT, Sh. Kapil Sibbal on 26.3.2013. The Key recommendations are:

| SERVICE PROVIDERS | CONTENT PROVIDERS | EQUIPMENT MANUFACTURER | GOVERNMENT ORGANIZATIONS |
|---|---|---|---|
| • **Enterprise Customers**- All new enterprise customer connections (both wireless and wire line) after **01-01-2014** shall be capable of carrying IPv6 traffic.<br>• **Retail Customers (Wire line)**- All new retail wire line customer after **30-06-2014** shall be capable of carrying IPv6 traffic.<br>• **Retail Customers (Wireless)**- All new LTE customer after **30-06-2013** shall be capable of carrying IPv6 traffic.<br>• All new GSM/ CDMA after **30-06-2014** shall be capable of carrying IPv6 traffic | • All contents & applications providers should target to adopt IPv6 for new contents & applications by 30-06-2014 and for existing ones latest by 01-01-2015.<br>• The complete financial ecosystem including payment gateways, financial institutions, banks, insurance companies etc. should transit to IPv6 latest by 30-06-2013.<br>• The new registrations on '.in' domain to be compulsorily on dual stack with effect from 01st January 2014. The entire '.in' domain should migrate to IPv6 latest by June 2014 | • All mobile phone handsets/ data card dongles/ tablets and similar devices sold in India after 30-06-2014 shall be capable of carrying IPv6 traffic.<br>• All wire line broadband CPEs sold in India after 01-01-2014 shall be capable of carrying IPv6 traffic. | • Govt organisations should prepare detailed plan for transition to IPv6 by Dec 17. Plan should be prepared latest by Dec 13<br>• Public interface of all Govt projects for delivery of citizen centric services should be dual stack supporting IPv6 traffic by Jan 15.<br>• Govt organisations should procure IPv6 Ready equipments (Dual Stack). It should be either TEC certified or IPv6 Ready Logo certified.<br>• IPv6 should be included in curriculum of technical courses being offered by various institutes / colleges |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# Arriving Now: All-IPv6 Networks and Data Centers

Perspectiva de un proveedor de Servicio Móvil Avanzado (**Cameron B**...

www.youtube.com/watch?v=gl41DCUwfVk

May 8, 2012 - Uploaded by supertelecua

**Cameron Byrne**, técnico de T- Mobile pari conferencista en el ... el desarrollo y los se

IPv6-only Data Center (built by **Tore Anderson**) « ipSpace.net by ...

blog.ioshints.info/2012/.../ipv6-only-data-center-built-by-**tore**.ht...

by Ivan Pepelnjak - in 749 Google+ circles

May 23, 2012 – A while ago I wrote about uselessness of stateless NAT64 and got in nice discussion with **Tore Anderson** who wanted to use stateless NAT64 ...

Ian Farrer on the All **IPv6 TeraStream** Network - YouT...

www.youtube.com/watch?v=QRR5ewjmxxE

Mar 22, 2013 - Uploaded by Cisco

Ian Farrer of Deustche Telekom talks about the challenges of working on one of the first all v6 projects to be ...

More videos for **ipv6 terastream** »

17.10 The Killer App is Automation in the Cloud

The pace of change in IT infrastructure and services has never been greater. New opportunities abound with the shift to cloud computing and the explosion of mobility. Organizations must automate infrastructure and workload provisioning to remain relevant and compete in the new economy, yet much of the opportunity is only available using IPv6. Thoughts on where the biggest opportunities are and some practical advice will be presented.

**Paul Zawacki** | Enterprise Architect | ORACLE

Cisco Demonstrates **Mapping** Address and Port (**MAP**) Technology f...

www.youtube.com/watch?v=He681zqeUJU

Apr 10, 2013 - Uploaded by Cisco

During V6 World Congress 2013 at the EANTC public multi-vendor interoperability event, Andrew Yourtchenko ...



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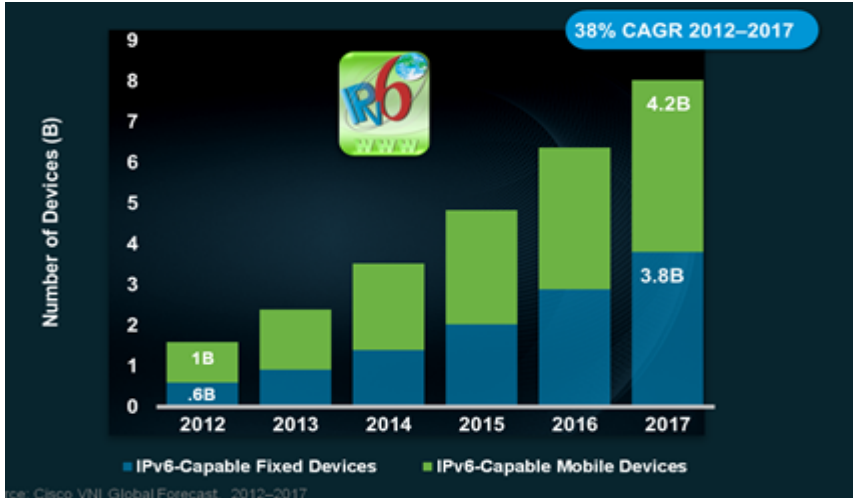
# Visual Networking Index forecast

http://goo.gl/xxLT



Devices Projected to be IPv6 capable in 2017:

- 73% of smartphones, reaching 2.1 billion
- 74% of tablets, reaching 520 million
- 79% of laptops, reaching 717 million
- 24% of M2M connections, reaching 1.4 billion

In 2017, If 50 percent of IPv6-capable devices are actively connected to an IPv6 network, the forecast estimates that globally, IPv6 traffic would amount to

- 28.8 exabytes per month
- 24 percent of total Internet traffic.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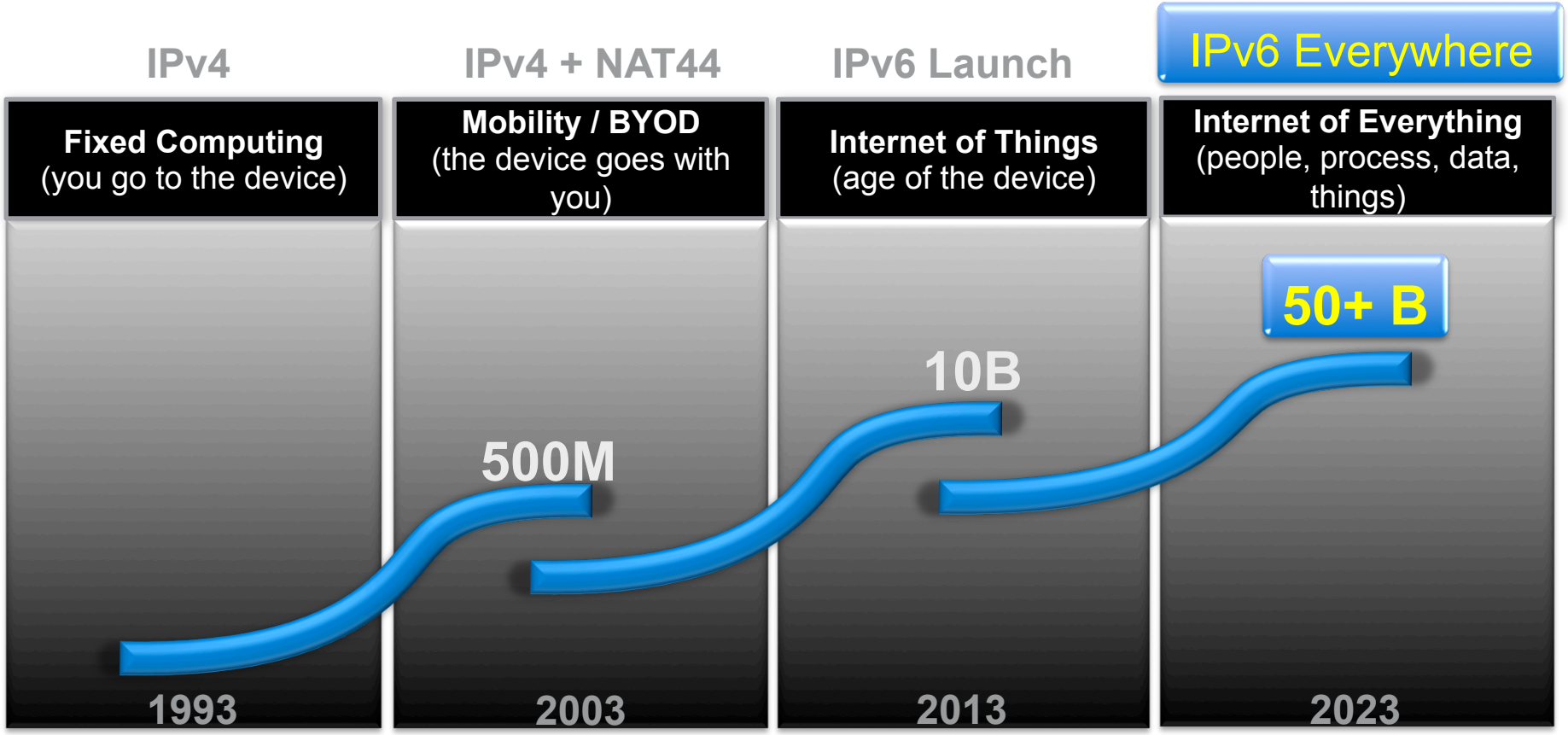
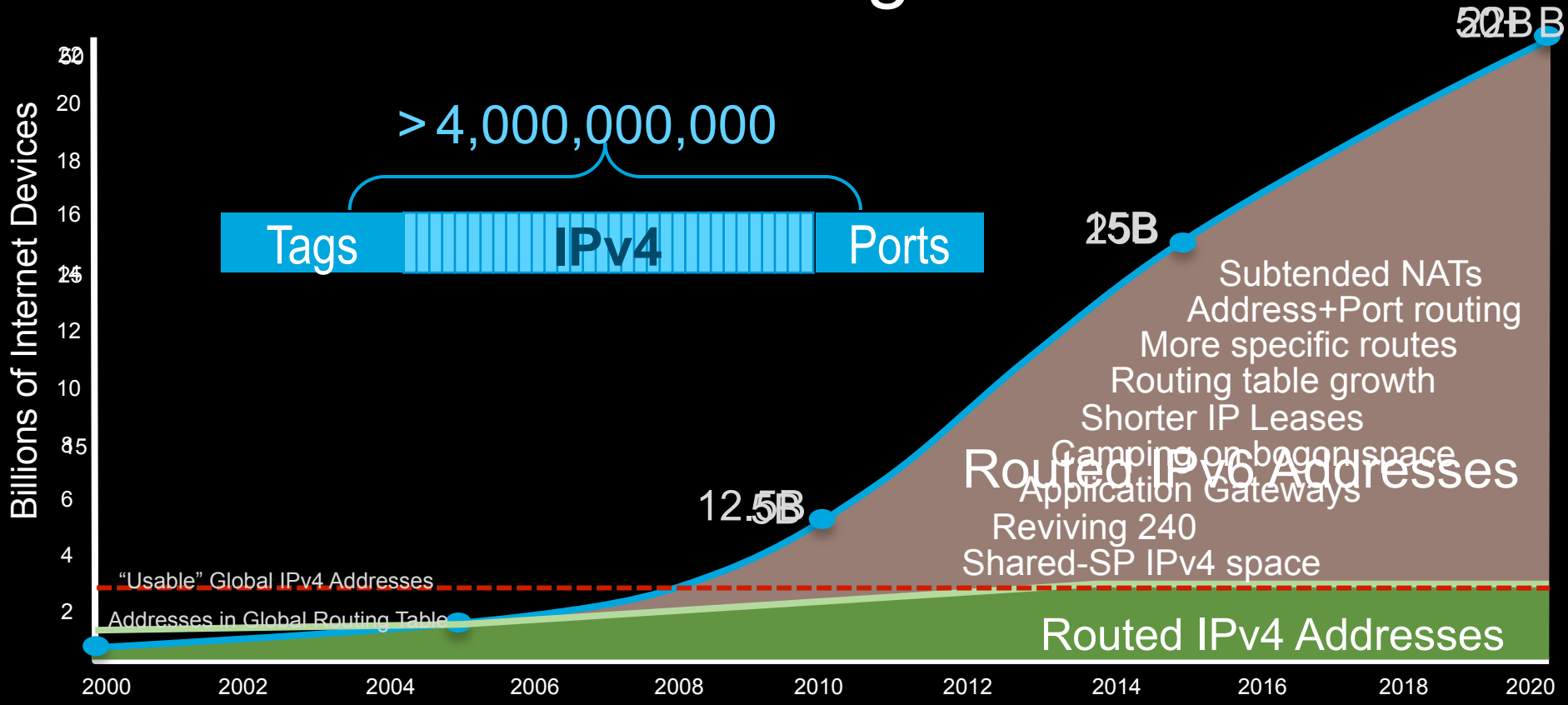



Source: Cisco IBSG, 2013

http://www.cisco.com/web/tomorrow-starts-here/index.html

# IPv6 Increases Challenges with IPv4




Sources: IMS Research, Intel, Ericsson, Cisco

# Key take away

- IPv4 is over - NAT444 is very short term
- CGN Deployment should be limited and users informed

- IPv6 Technology is mature - Products are ready
- The Internet is dual protocol now
- IPv6 users growing fast in (large) pockets
- Encourage IPv6 on Wired and Wireless subscribers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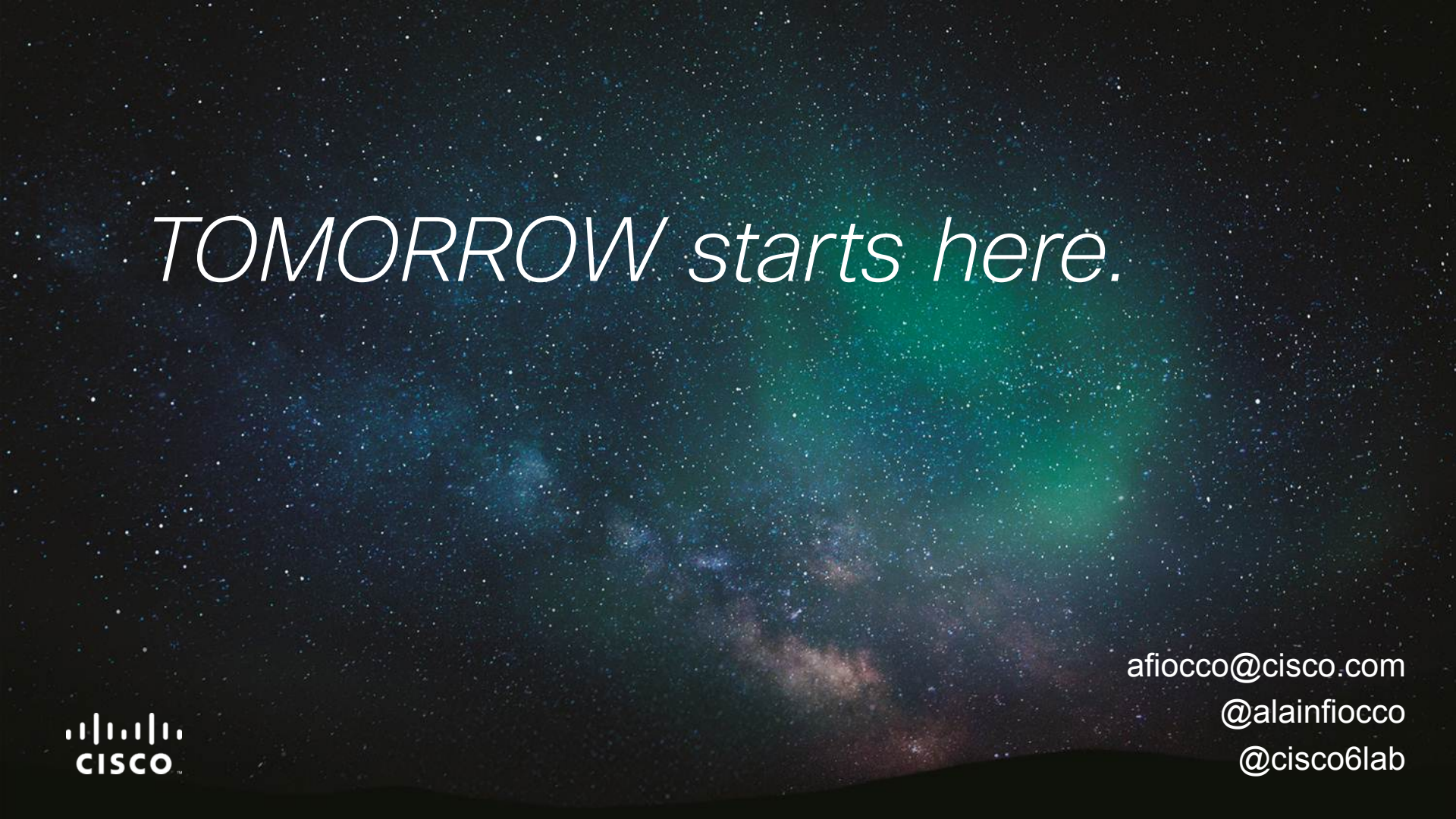


afiocco@cisco.com
@alainfiocco
@cisco6lab

# All of our devices, applications and services…

UC 9.0
CUCM 9.0
CUBE/IOS 15.3

AnyConnect 3.x
(Android, iOS)
Windows, MacOS

ASA 9.1 (incl IPS)
ASA-Cx
AsyncOS 7.6 Email

Webex
Mobile Client

Webex
Meeting EFT

Prime Infra

IOS 15.3
IOS-XE 3.8

WLC 7.3

NXOS 6.2

Prime Infra

CNR/CAR

IOS-XR 4.3
IOS-XE 3.8
StarOS 14.0

**100s of IPv6 features**

**Engineering Process changes – Test and Hardening - USGv6 certified Portfolio**



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