

IPv6: Journey to the next generation IP Protocol

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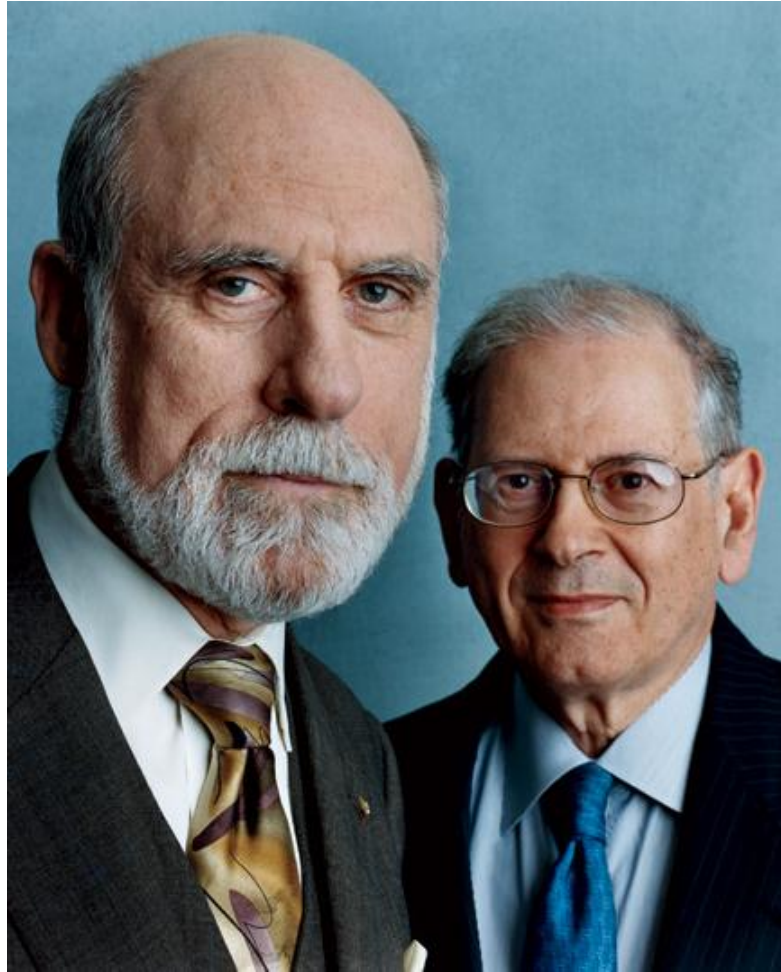
Senior Manager, Systems Engineering UAE

19 March 2012

Vint Cerf

Chief Internet Evangelist

Google



Bob Kahn

Chairman, CEO and
President

Corporation for National
Research Initiatives

Widely known as the founding "fathers of the Internet"

source: http://en.wikipedia.org/wiki/Vint_Cerf

Agenda

How did we get here?

Where are we?

How do we move from here?

So where are we?





Internet Assigned Numbers Authority



Registry Area Covered

AfrINIC	Africa Region
APNIC	Asia/Pacific Region
ARIN	North America Region
LACNIC	Latin America and some Caribbean Islands
RIPE NCC	Europe, the Middle East, and Central Asia

source: <http://www.iana.org/numbers>

IPv4 & IPv6 Statistics

RIR v4 IPs Left

AfriNIC 59,199,744
APNIC 18,998,272
ARIN 120,206,848
LACNIC 54,659,533
RIPE 40,597,129

v6 ASNs

12% (5,243/40,616)

v6 Ready TLDs

84% (266/313)

v6 Glues

8,305

v6 Domains

3,246,615

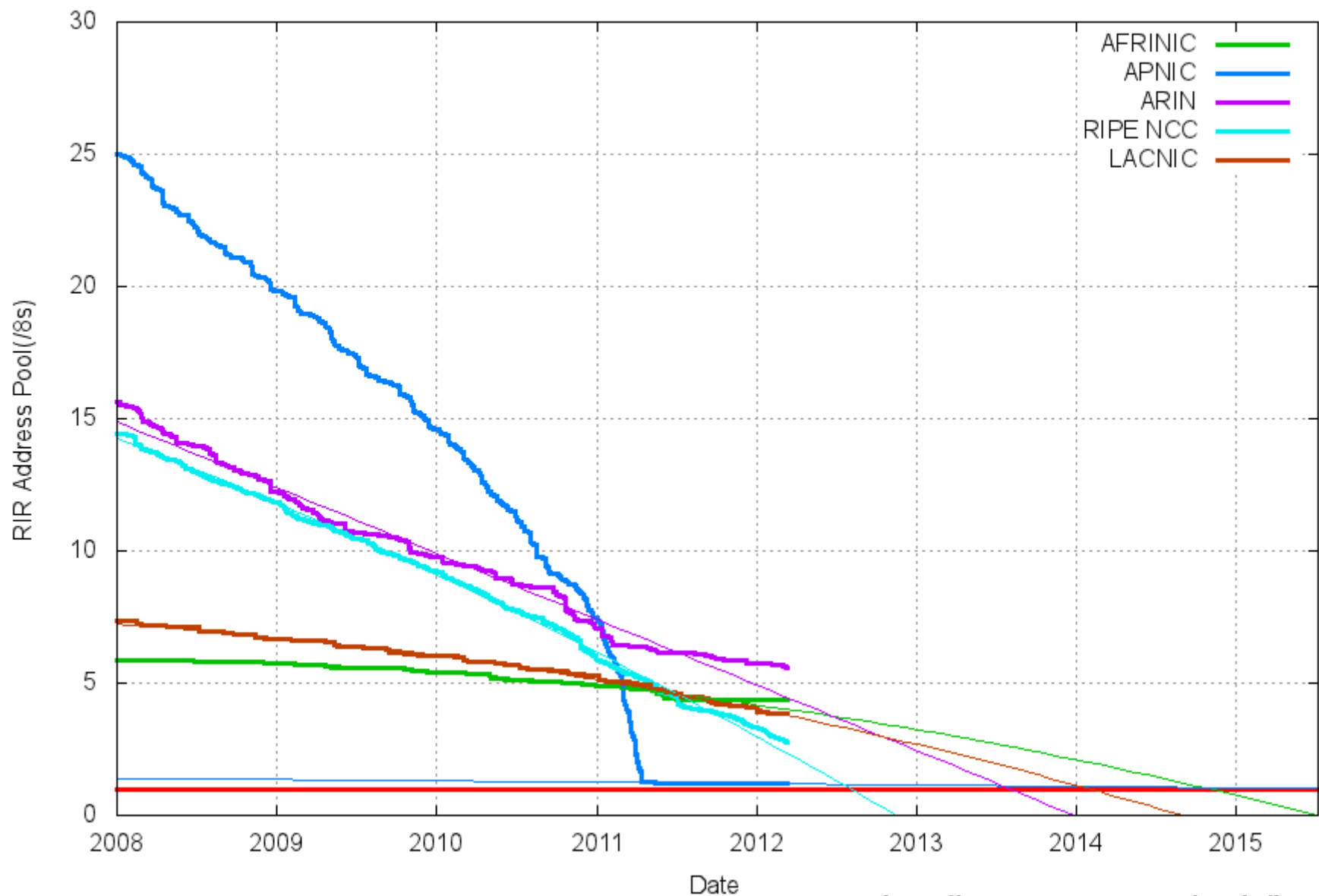
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days remaining

IANA exhausted

HURRICANE ELECTRIC
INTERNET SERVICES

RIR IPv4 Address Run-Down Model



source: <http://www.potaroo.net/tools/ipv4/>

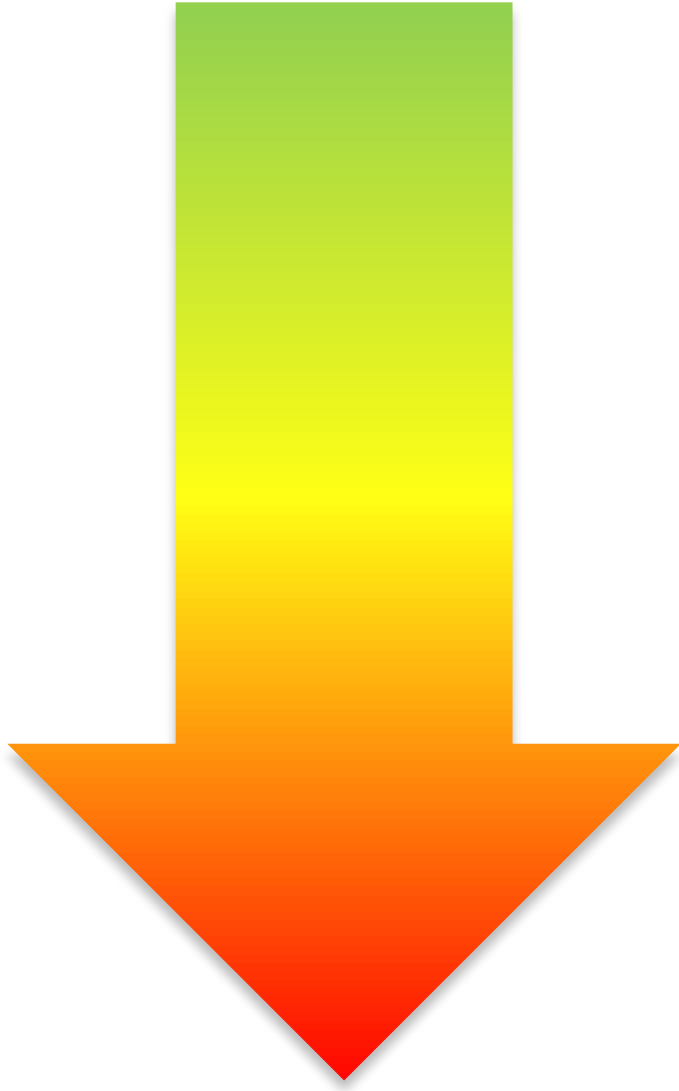
IANA Unallocated Address Pool Exhaustion

03-Feb-11

Projected RIR Address Pool Exhaustion Dates

RIR	Projected Exhaustion Date	Remaining Addresses in RIR Pool (/8s)
APNIC	19-Apr-11	1.1939
RIPENCC	01-Aug-12	2.7386
ARIN	31-Jul-13	5.6013
LACNIC	30-Jan-14	3.8648
AFRINIC	31-Oct-14	4.3439

source: <http://www.potaroo.net/tools/ipv4/>



IANA exhausted its IPv4 free pool (3 February 2011)

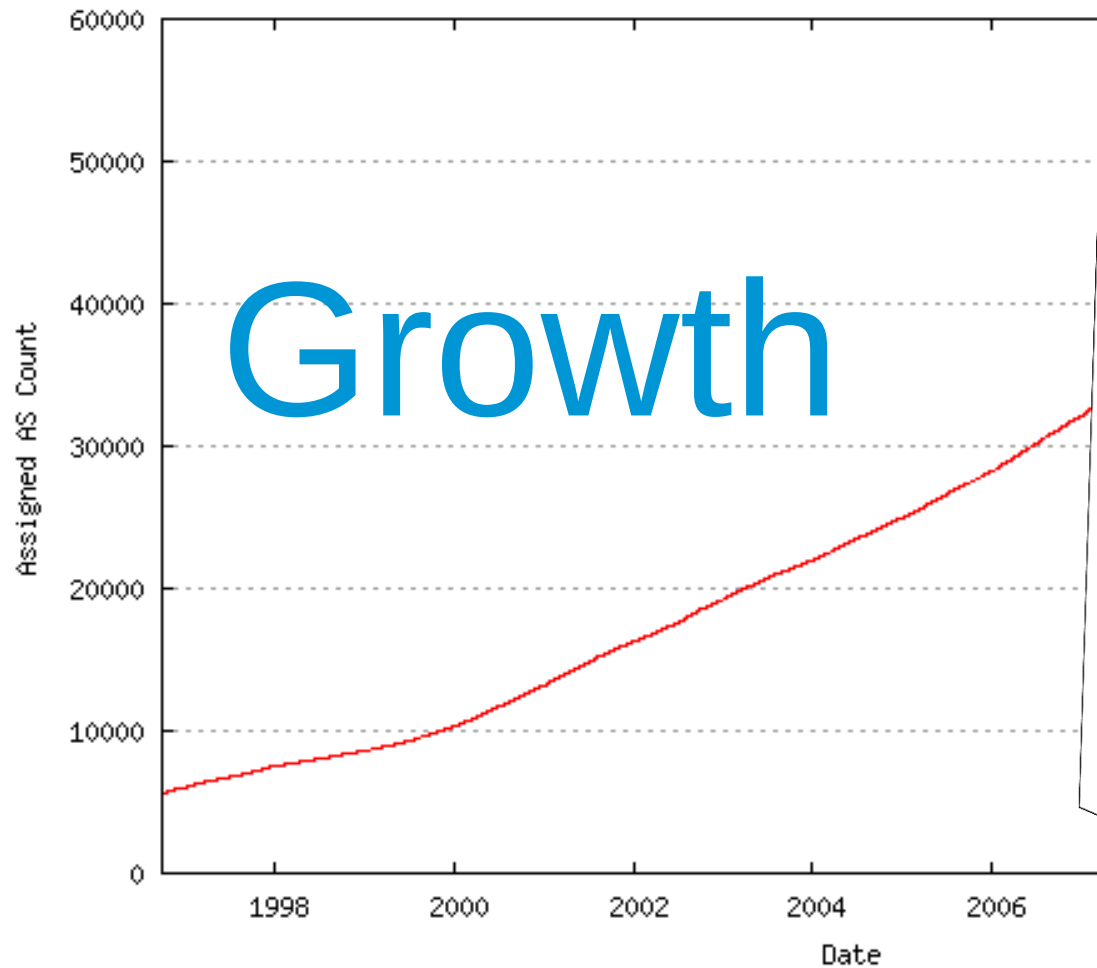
RIRs exhaust their unallocated pools

Expanding networks (ISPs, businesses, etc) exhaust their pools of unused addresses

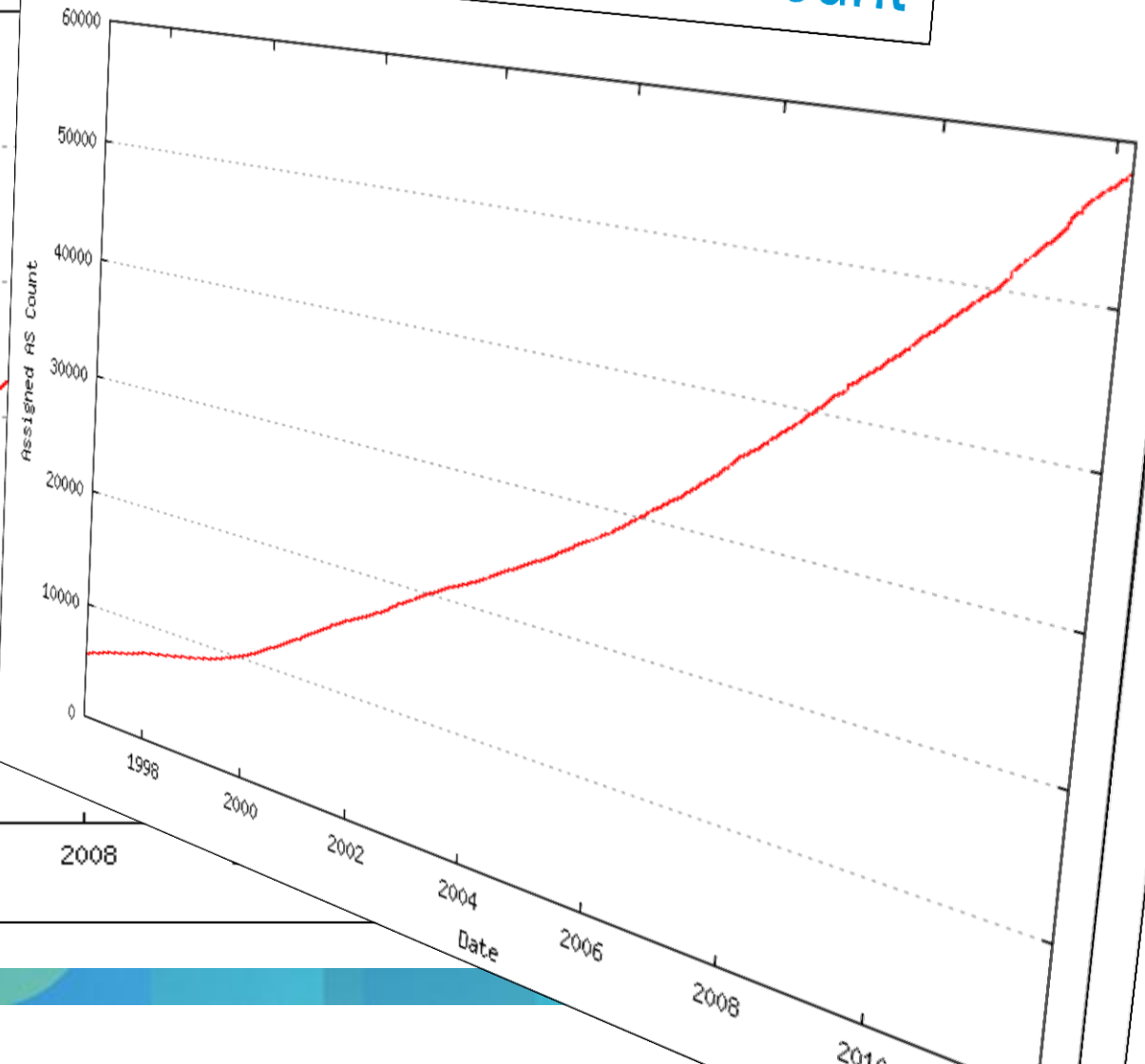
Will the internet
STOP?

Autonomous Systems

Growth



Autonomous Systems Count

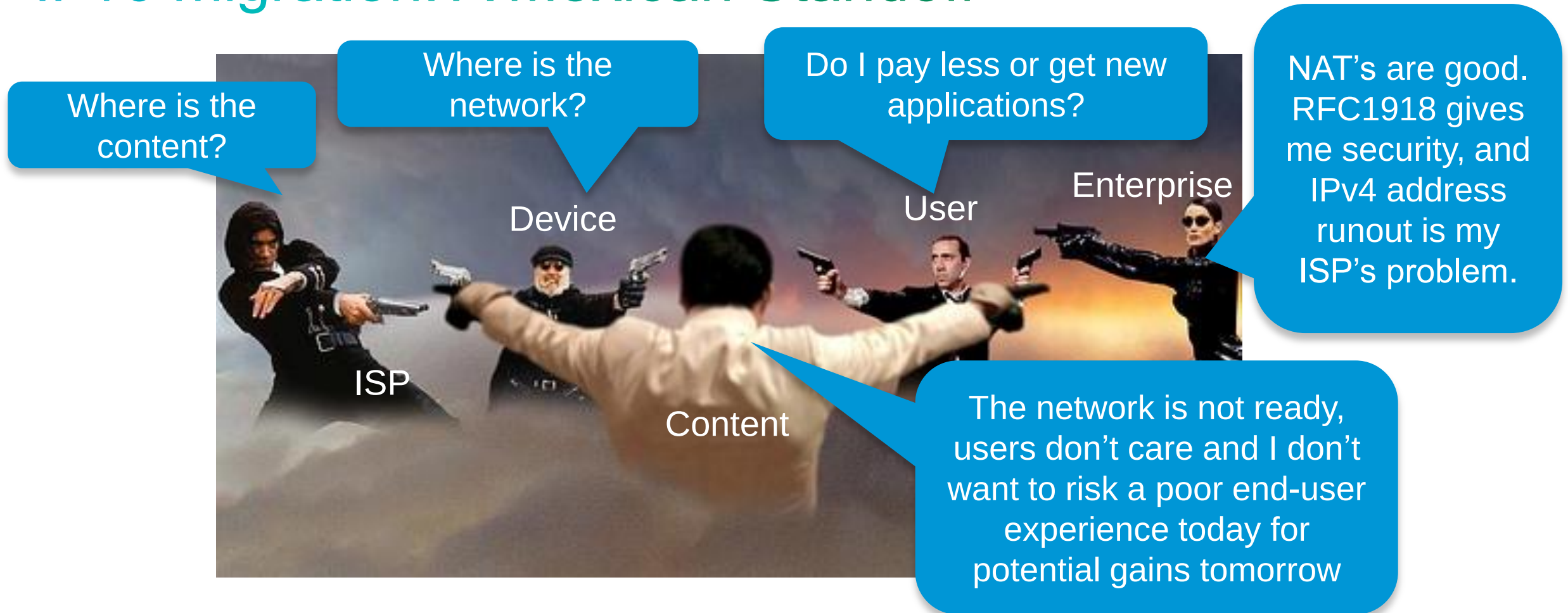


IPv6 is the only
long term solution

How do we move from here?



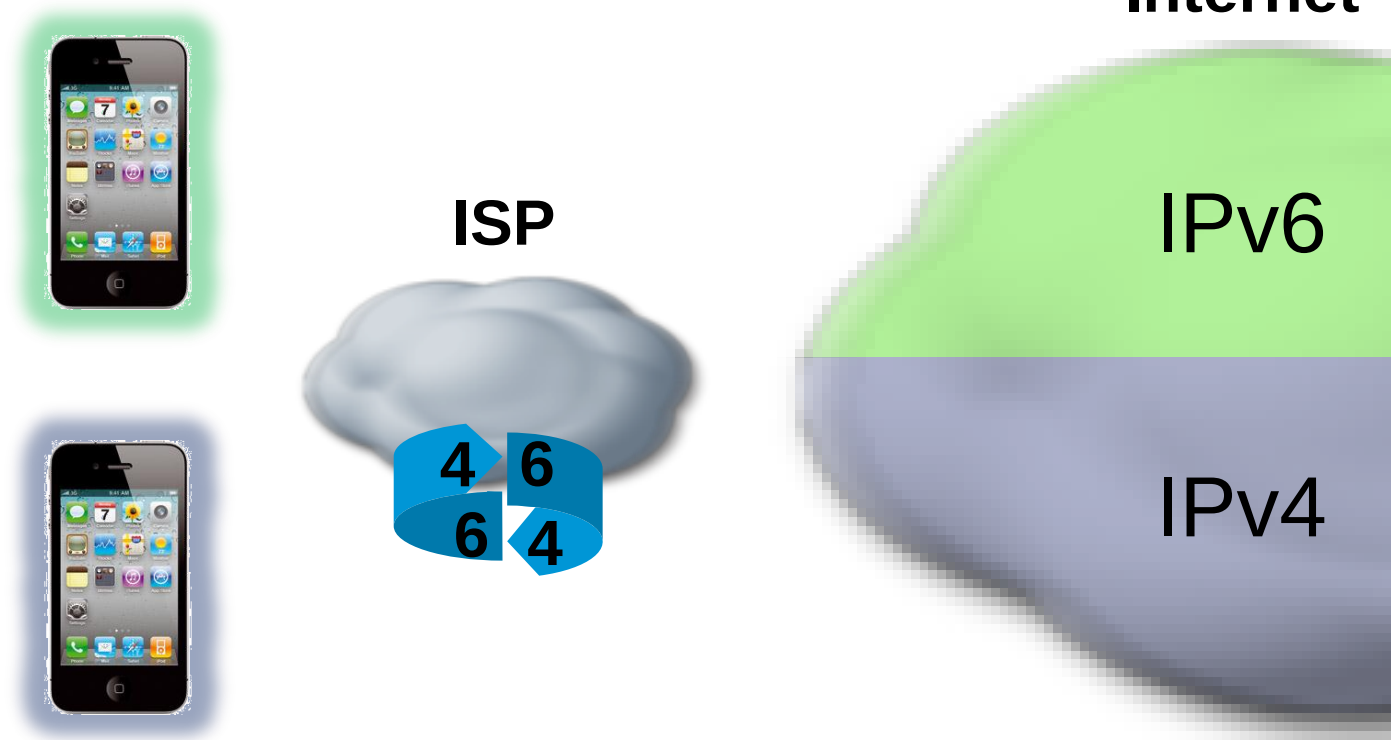
IPv6 migration: A Mexican Standoff



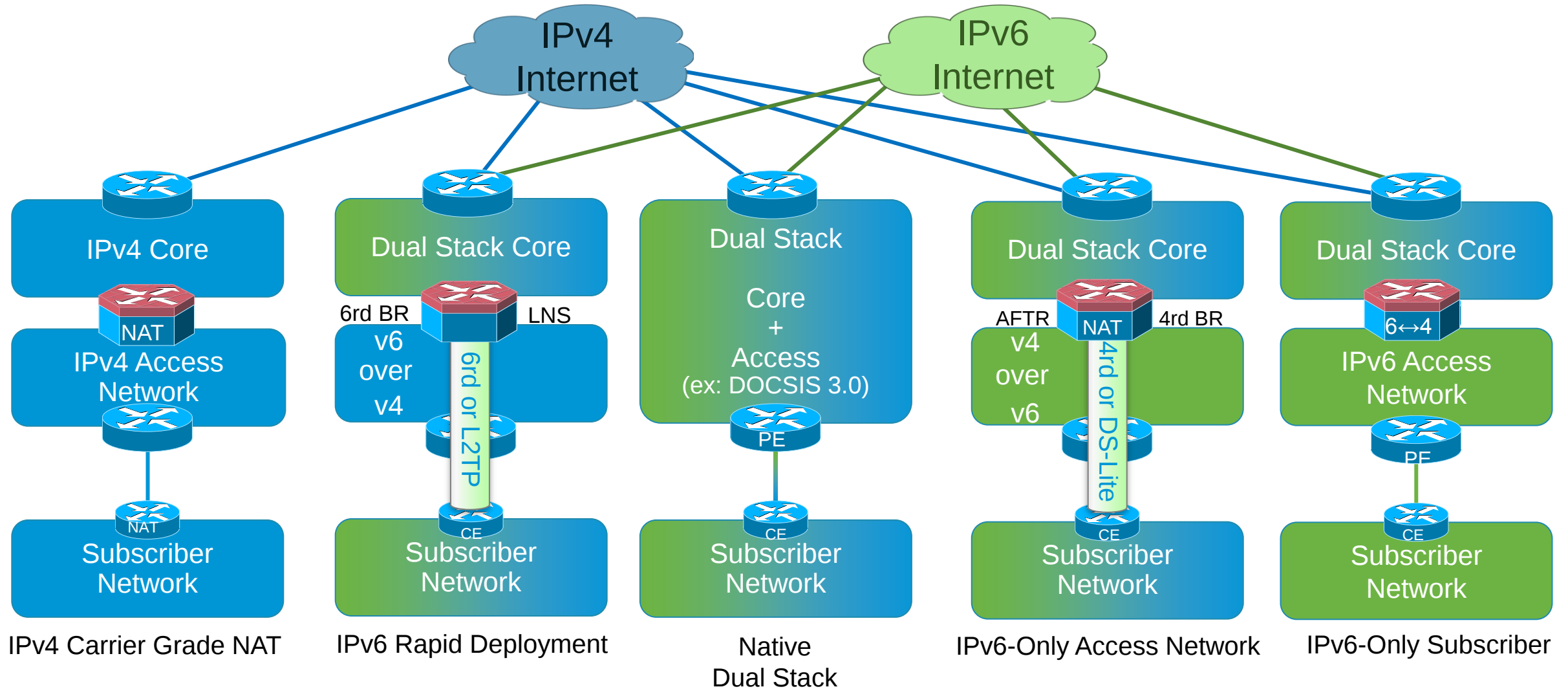
"A deadlock, stalemate, impasse; a roughly equal (frequently unsatisfactory) outcome to a conflict in which there is no clear winner or loser,"

Internet Service Providers

- Preserve IPv4 address allocation
 - Use Private Addresses (10.0.0.0/8 - RFC1918) to address customers
 - Use Carrier Grade NAT / Large Scale NAT
- Provide IPv6 addresses
 - Native IPv6 → Provide bridging function to reach IPv4
 - Dual Stack



SP IP Network Transition options

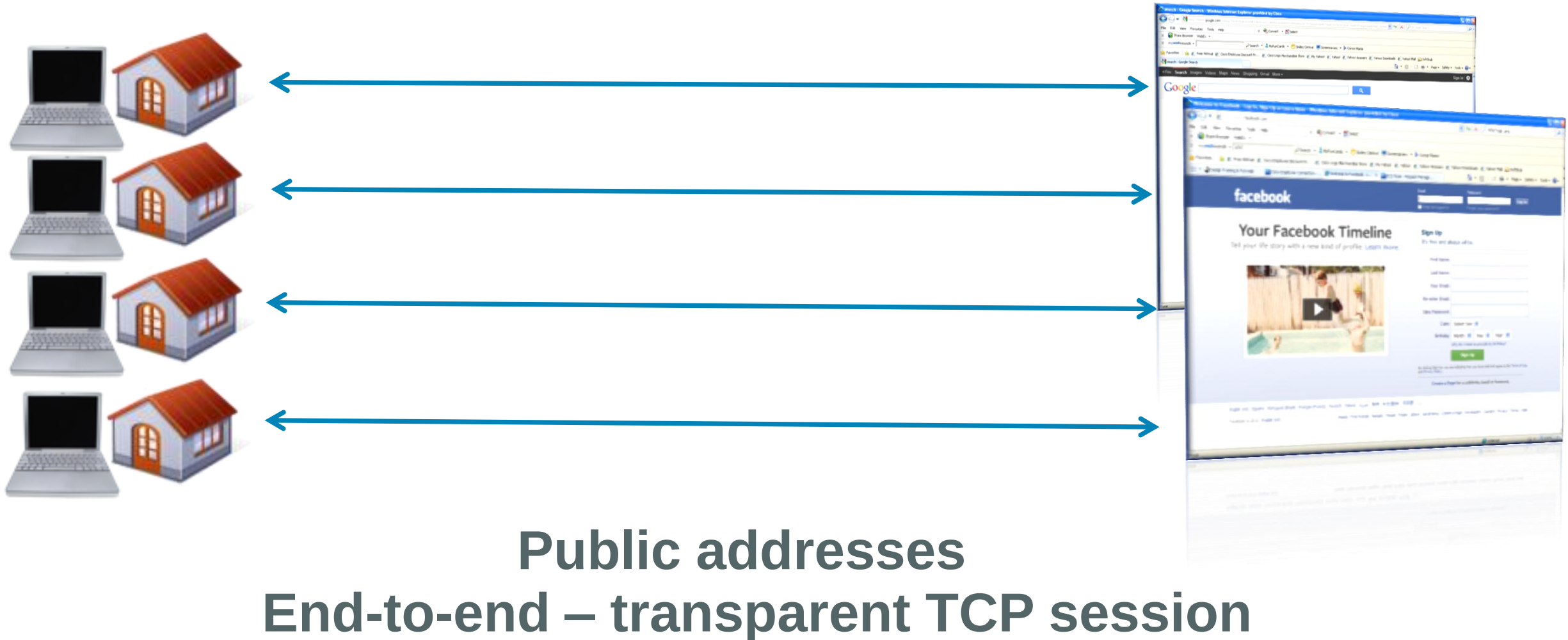


Preserve

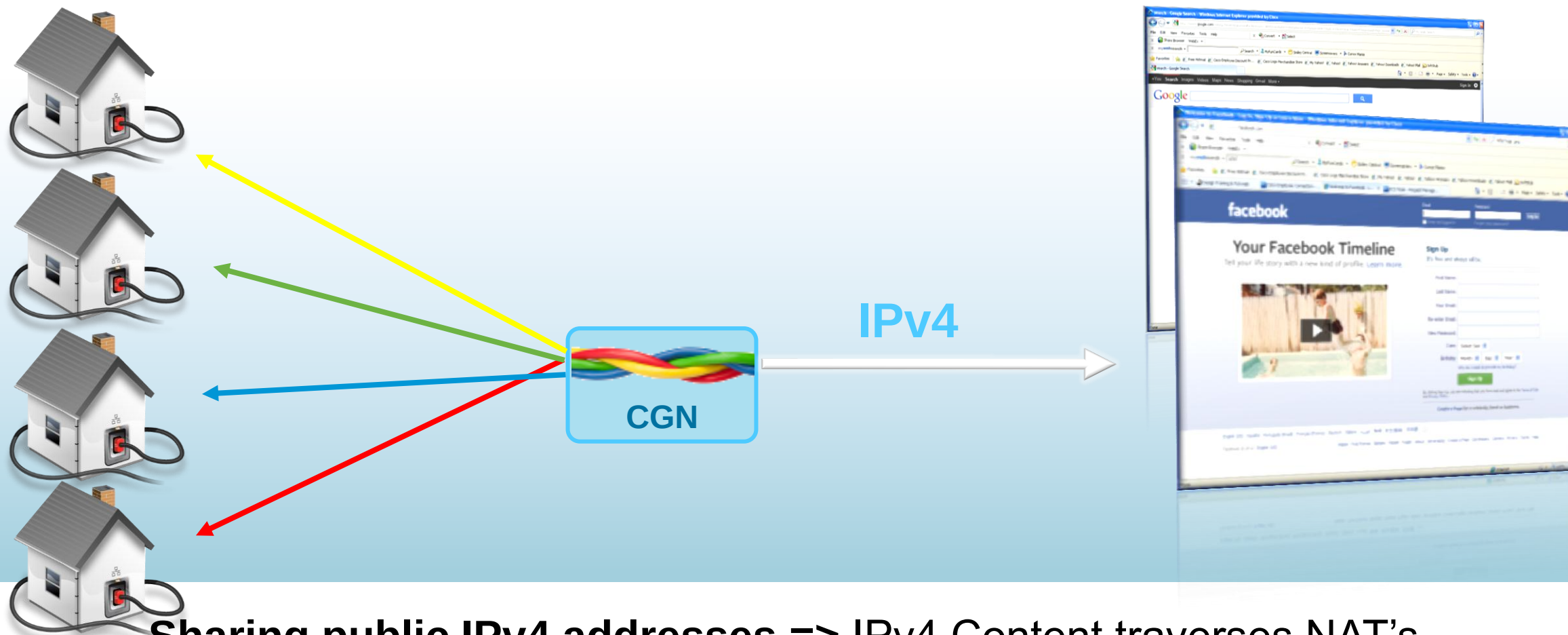
Prepare

Prosper

Internet evolution: IPv4 end to end model



Internet evolution: sharing IP address



Sharing public IPv4 addresses => IPv4 Content traverses NAT's.

Challenges: Transparency to application, Location, Security

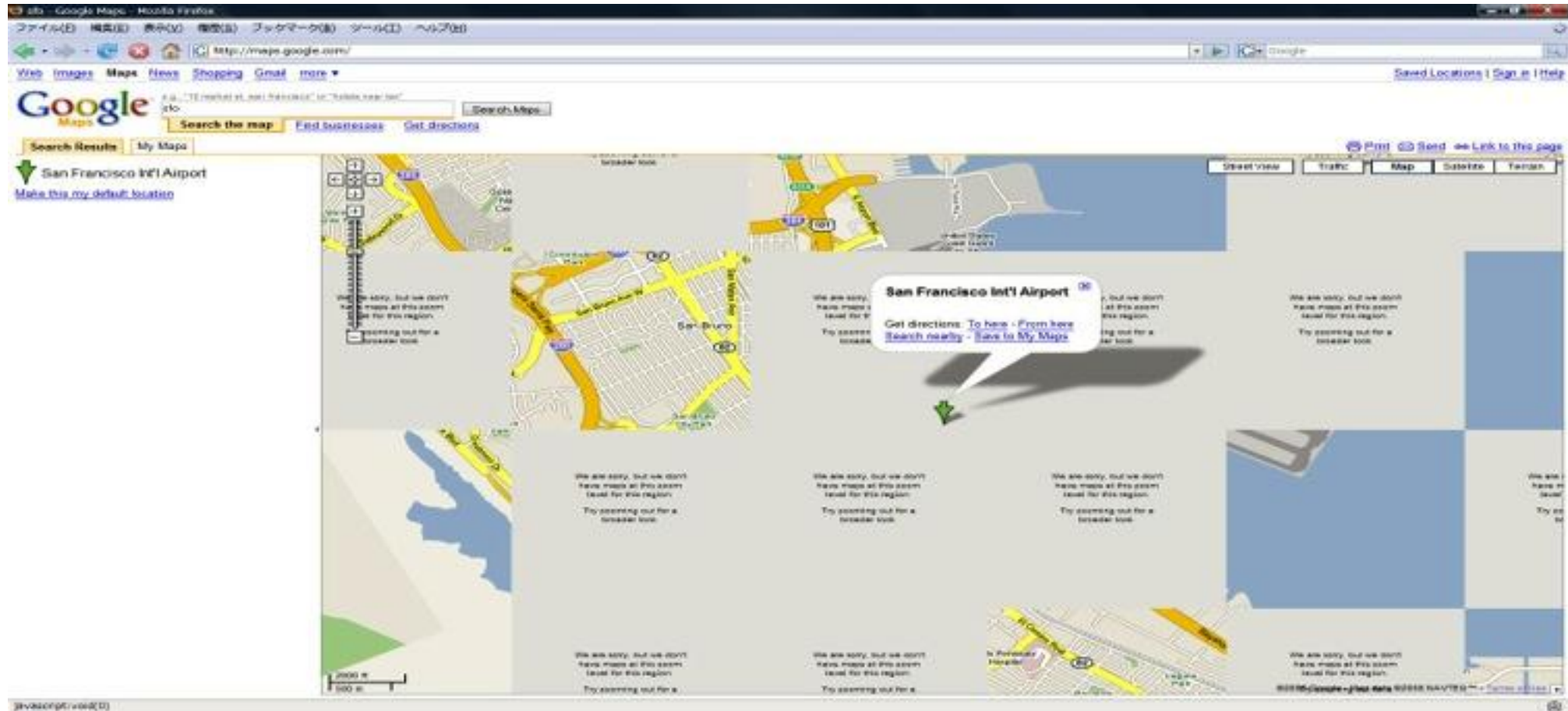
CGN creates State (and logging) for every sessions

Myth: I Can Run My Business on IPv4 NAT gone Bad !

How many concurrent sessions will your business require?

30 NAT Sessions

times millions of users

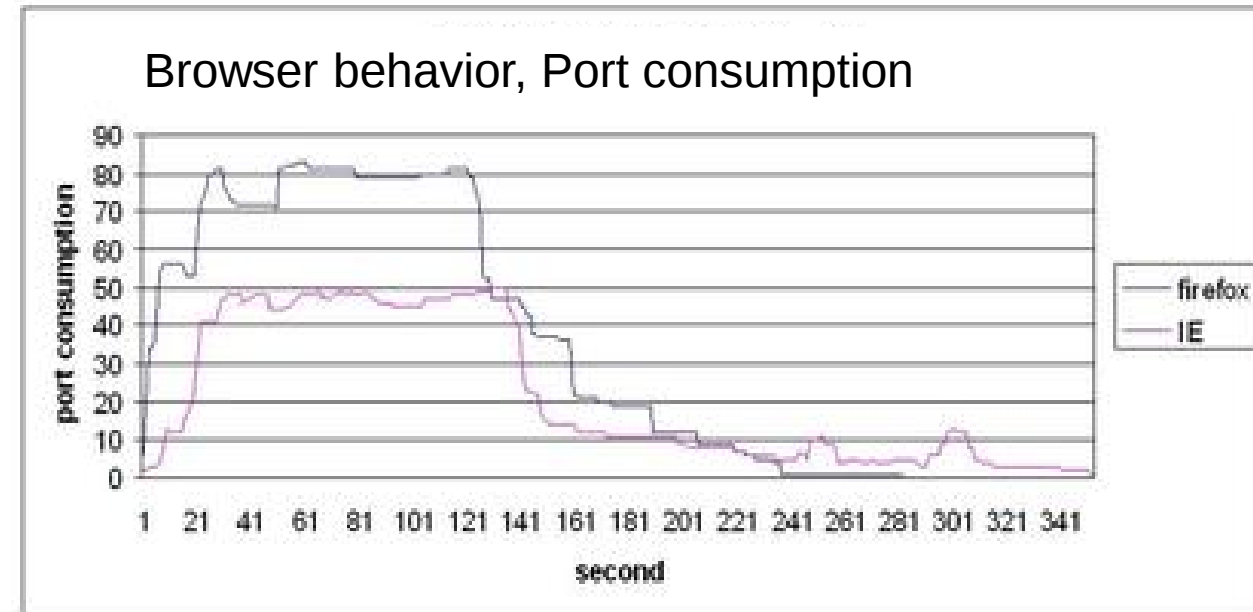


Web 2.0 (ex: AJAX) Application Behavior Under Constrained NAT Resources

How many ports does your business require ?

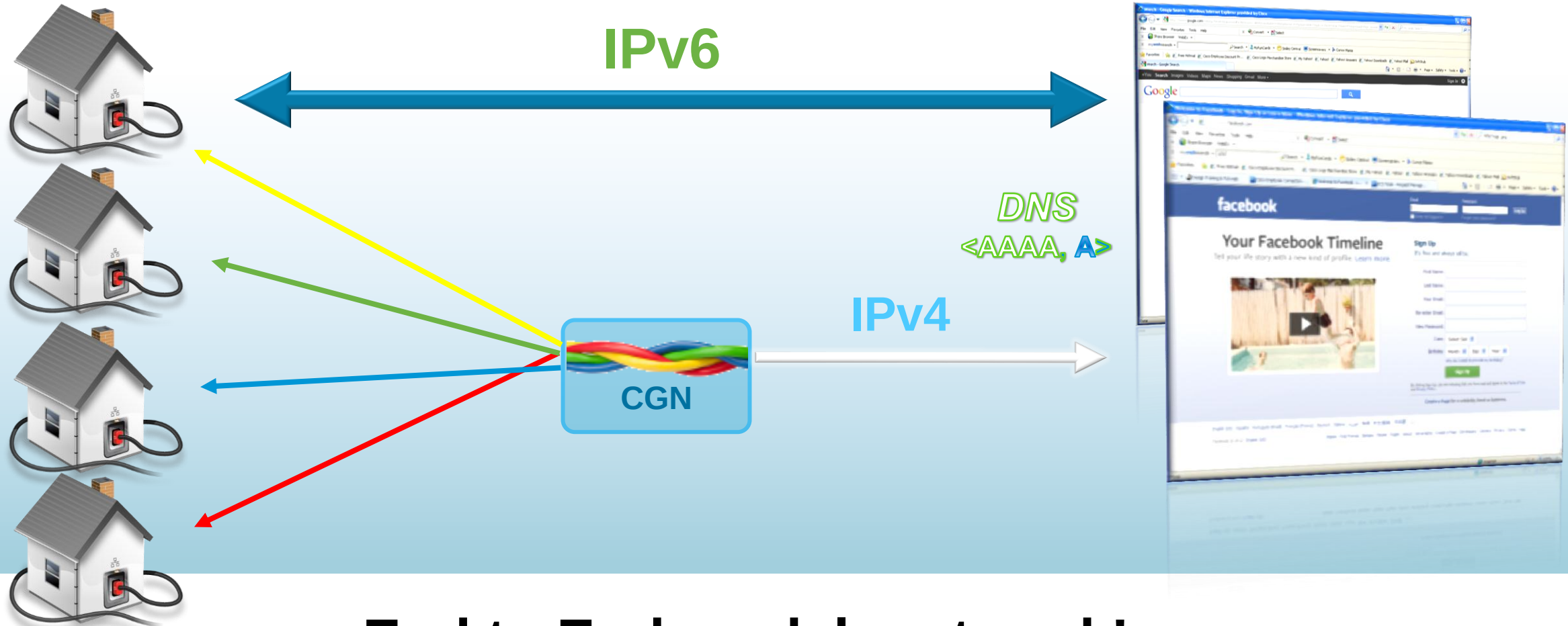
Some examples of major Web site

Application	# of TCP sessions
No operation	5~10
Yahoo top page	10~20
Google image search	30~60
ニコニコ動画	50~80
OCN photo friend	170~200+
iTunes	230~270
iGoogle	80~100
楽天(Rakuten)	50~60
Amazon	90
HMV	100
YouTube	90



End-User experience-performance drives Port up (AJAX)

IPv6 – “Full Spectrum” Internet



End to End model restored !

IPv6 Content bypasses NAT Resources, DNS is the switch

Content Providers - Impact of NAT at Carrier Scale

1. Double-NAT

e.g. at CPE and Carrier

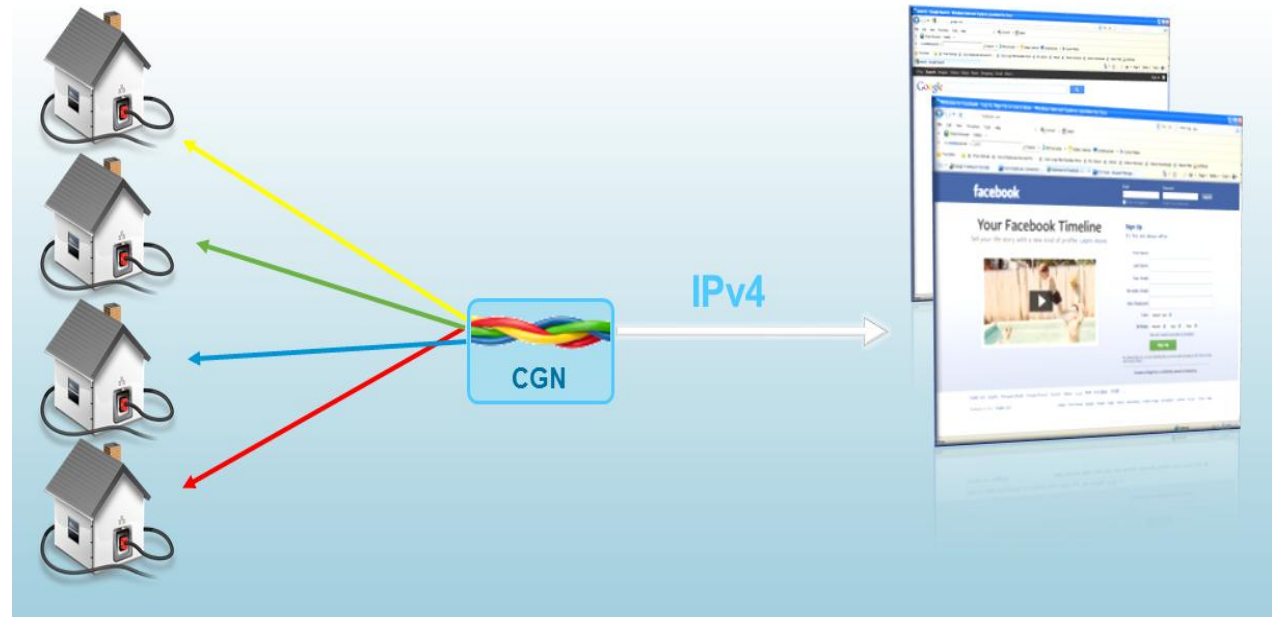
2. Hides location of users

3. Security Concerns

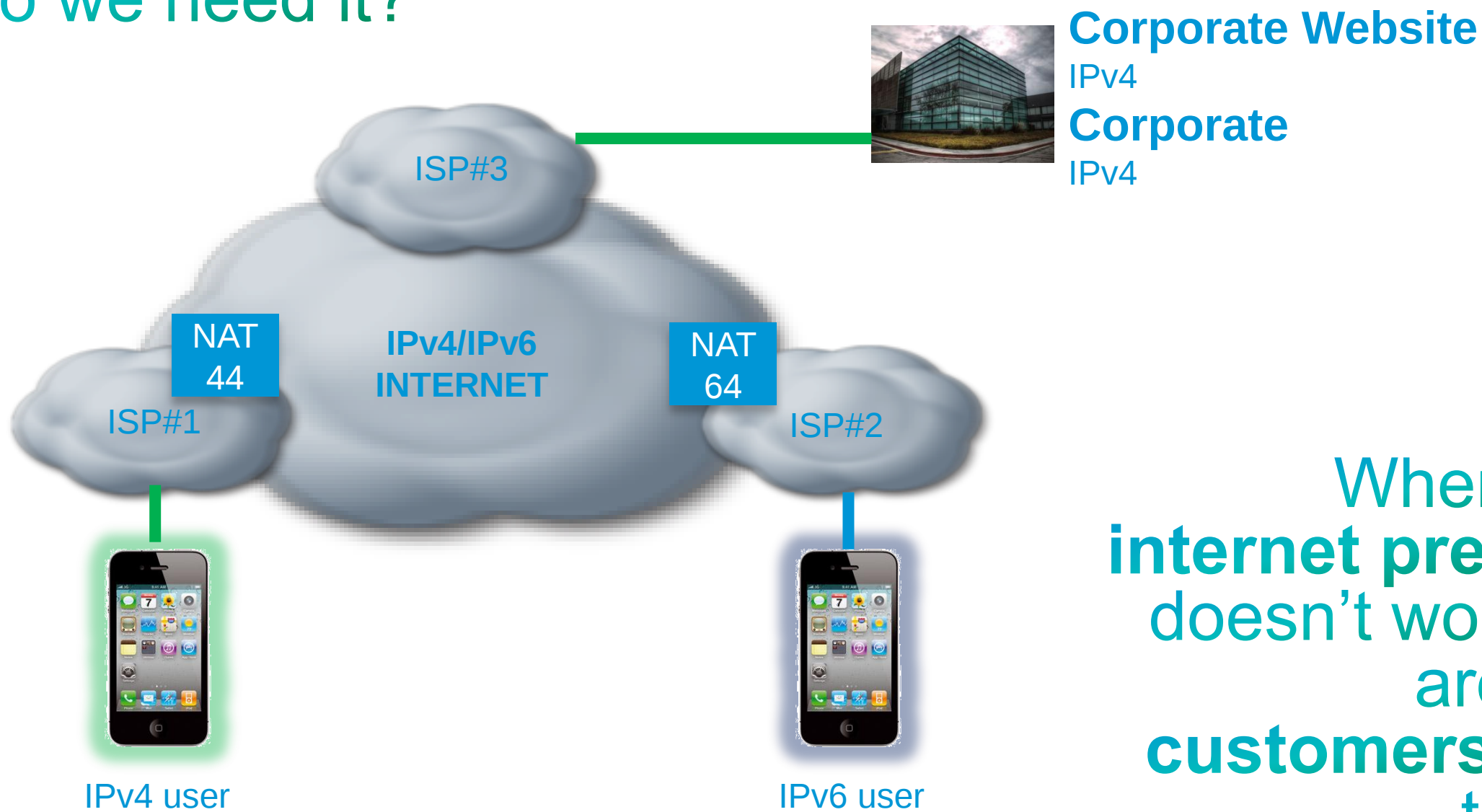
blocking an IP might black out entire countries or mobile operator

4. Impacts User Experience

e.g. limited number of translations per user

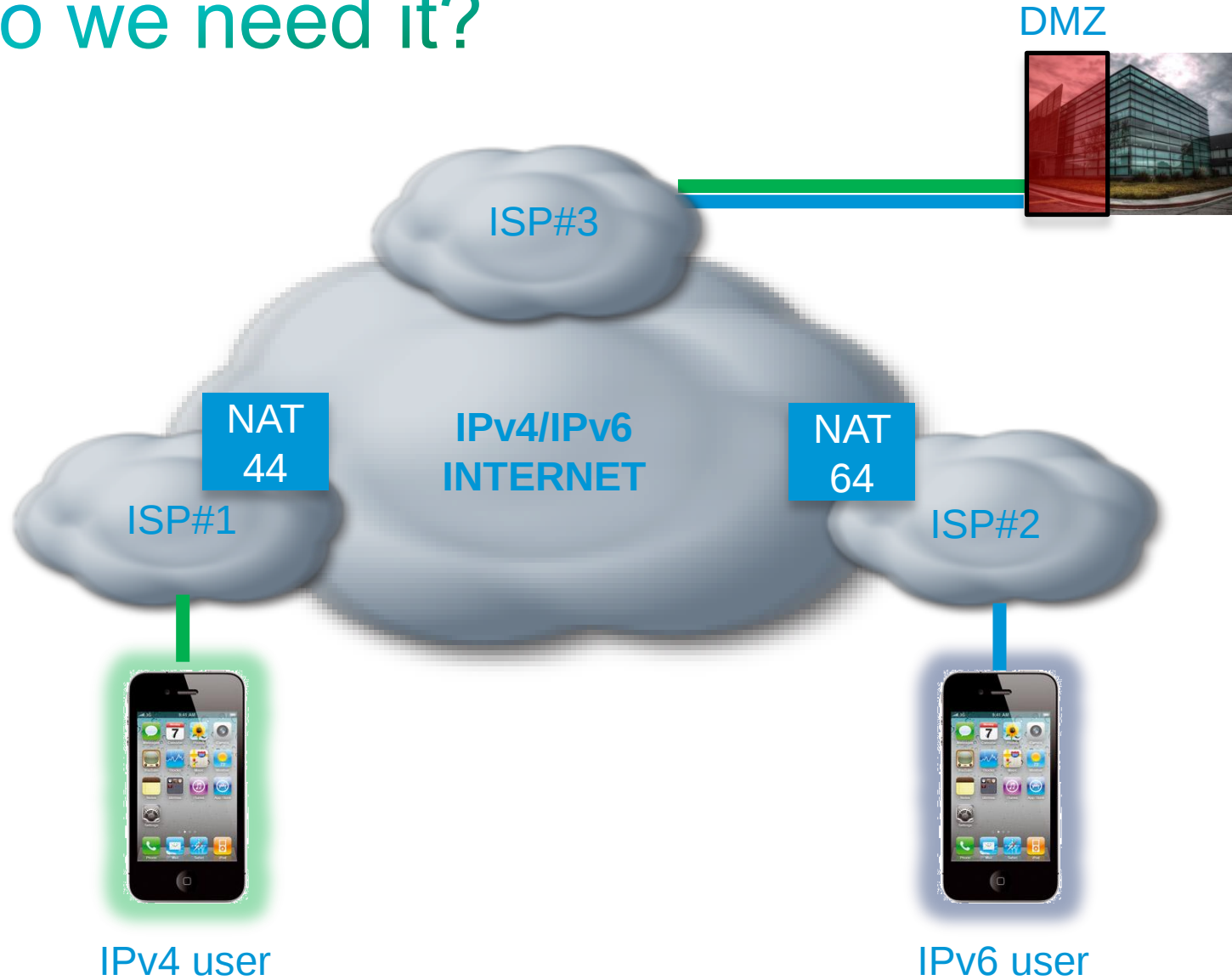


What about in the Enterprise do we need it?



When **your**
internet presence
doesn't work who
are **your**
customers going
to call?

What about in the Enterprise do we need it?



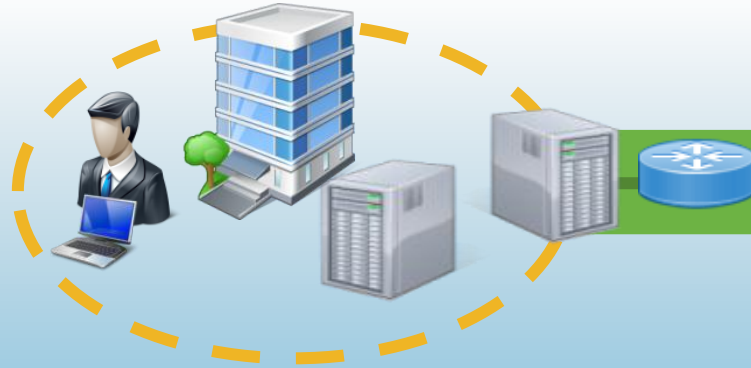
Corporate Website
IPv4/IPv6
Corporate
IPv4

for **how long** are
you willing to **wait**?

IPv6 is not a
matter of **IF** it's a
matter of **when**

Enterprise Deployment Options

Outside - In



IPv4 Enterprise



IPv6 Internet

Inside - Out

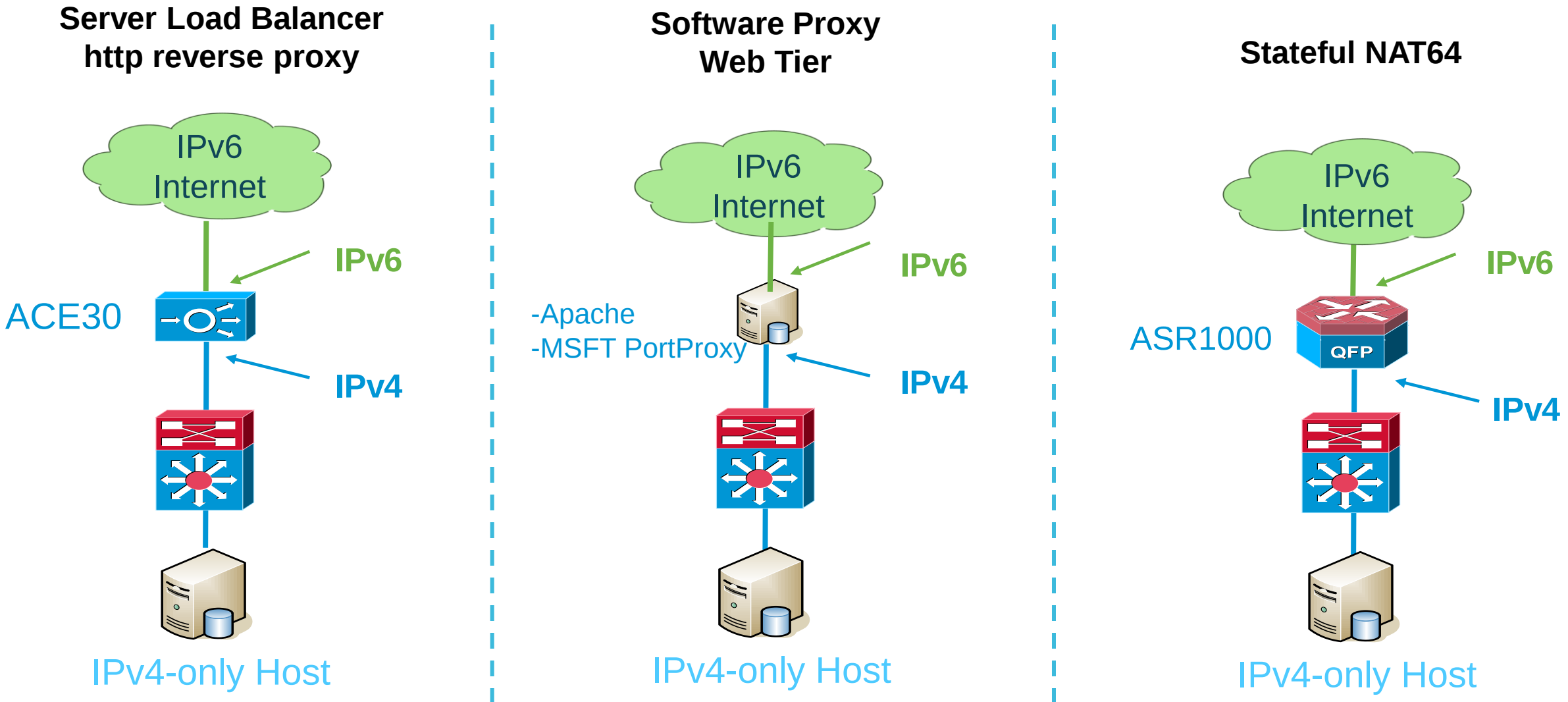


Dual-Stack Enterprise



IPv4 Internet

Enterprise Internet Edge transition options



World IPv6 Day

Overview

- **What was it?**

A single day (24 hrs) where major content providers advertised a AAAA DNS record for their production service (e.g. www.cisco.com, www.facebook.com); coordinated by the Internet Society

- **When was it?**

June 8, 2011

- **Who participated?**

[Google](http://www.google.com), [Facebook](http://www.facebook.com), [Yahoo!](http://www.yahoo.com), [Akamai](http://www.akamai.com), [Cisco](http://www.cisco.com), [Limelight Networks](http://www.limelightnetworks.com) were among 434 participants that offered content from their main websites over IPv6 for a 24-hour "test drive" (<http://www.worldipv6day.org/participants/index.html>)

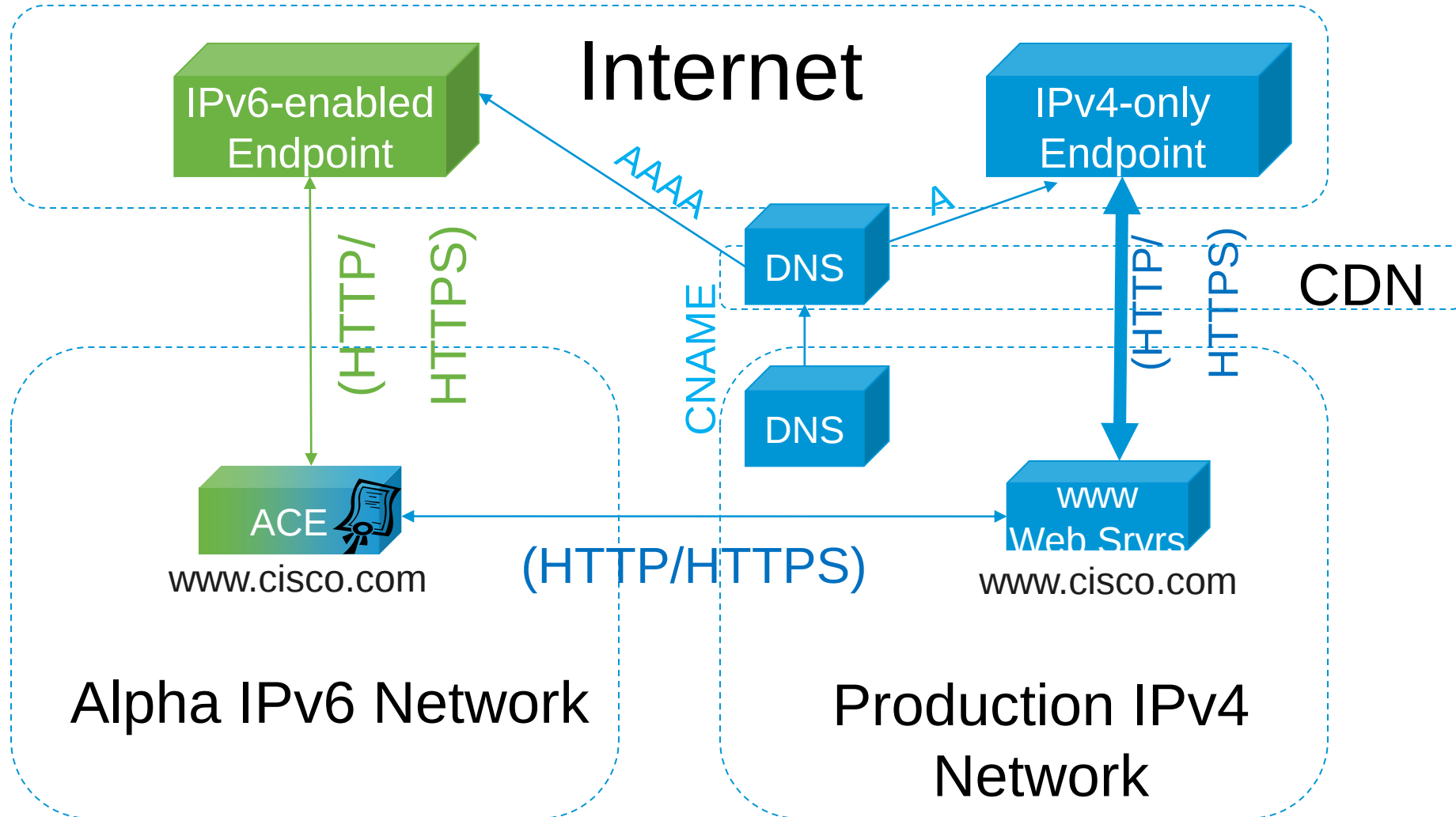
- **Why do this?**

Demonstrates commercial viability of IPv6

Helps identify areas of improvement in IPv6 functionality

World IPv6 Day

Solution Concept for www.cisco.com



World IPv6 Day

Vital Statistics for the 24Hrs

- From concept (March) to delivery (June) in **3 Months**
- Cross functional collaboration across **18 Teams** in Cisco to make this a successful event (excludes external collaboration)
- 1.2% of total traffic hitting www.cisco.com was IPv6
- 1.5% of Unique IPs hitting www.cisco.com were IPv6
- No support cases created

World IPv6 Launch, June 6th 2012

<http://www.worldipv6launch.org/>

THIS TIME IT IS FOR REAL



Major Internet service providers (ISPs), home networking equipment manufacturers, and web companies around the world are [coming together to permanently enable IPv6 for their products and services](#) by 6 June 2012.

**AKAMAI
COMCAST
FREE TELECOM
KDDI
TIME WARNER CABLE**

**AT&T
D-LINK
GOOGLE
LIMELIGHT
XS4ALL**

**CISCO
FACEBOOK
INTERNODE
MICROSOFT BING
YAHOO!**

**DO YOUR PART
JOIN THE LAUNCH!**

We welcome web companies, ISPs, and home router vendors to [join the cause](#) and [spread the word](#) and [follow along](#).

Call to Action

- Education and awareness
- Define a strategy based on your business drivers
 - outside-in vs inside-out
- Assessment (infra and apps)
- Mandate IPv6 in all products procurement based on your roadmap
- Get an IPv6 prefix
 - Engage RIR
 - PI is better
- Monitor IPv6 adoption in your region
 - Core infra and peering
 - DNS AAAA request
- Engage your SP to get IPv6 access
 - Parity with IPV4 SLA
- Start a project to design a dual-stack internet presence
 - Routing, Security/Monitoring, SLB, Proxies, DNS, CDN
 - IPv6 Enable your Networking and Security practice

Cisco IPv6 Services Portfolio



IPv6 Discovery Service

Guidance in the early stages of considering a transition to IPv6



IPv6 Assessment Service

Determine how your network needs to change to support your IPv6 strategy



IPv6 Planning and Design Service

Designs, transition strategy, and support to enable a smooth migration



IPv6 Implementation Service

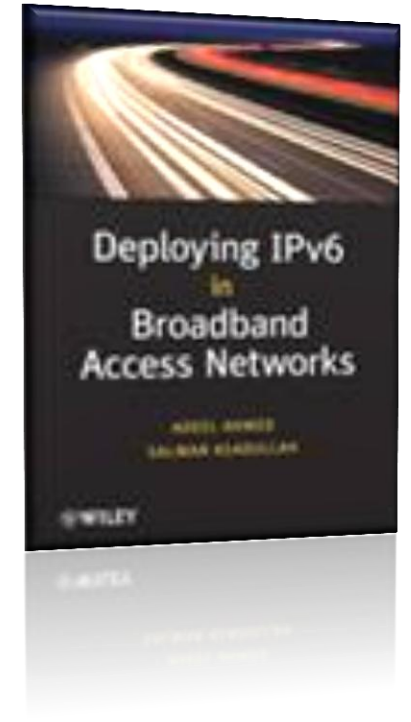
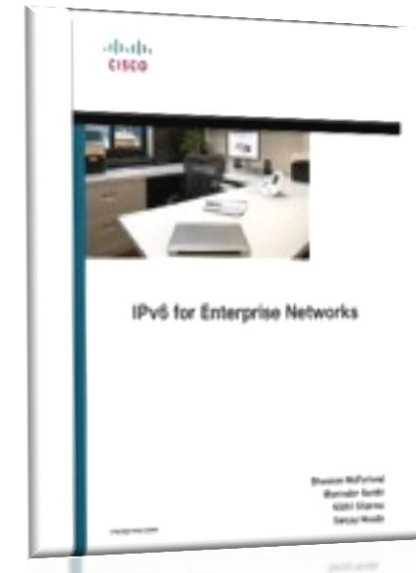
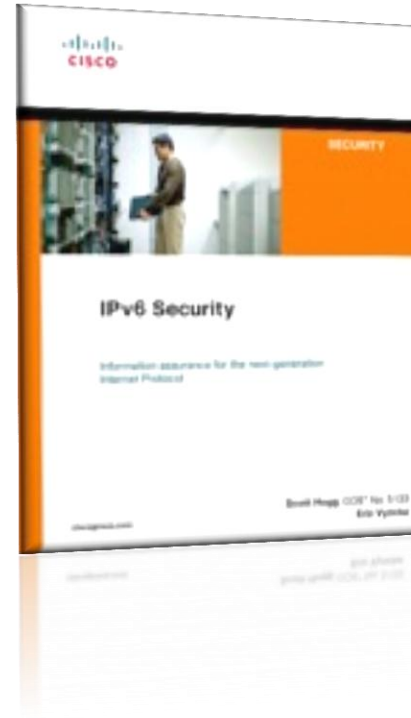
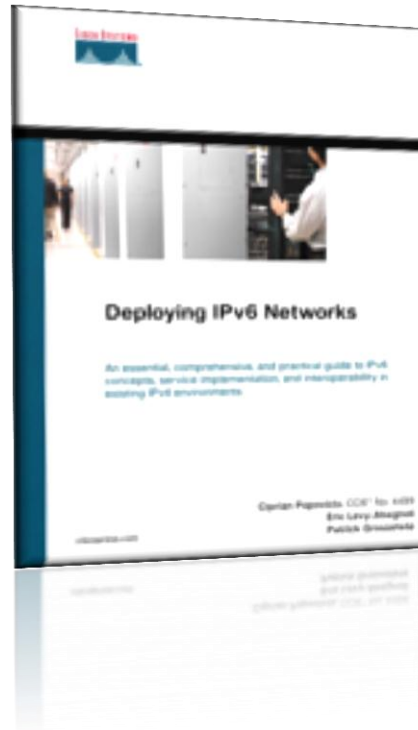
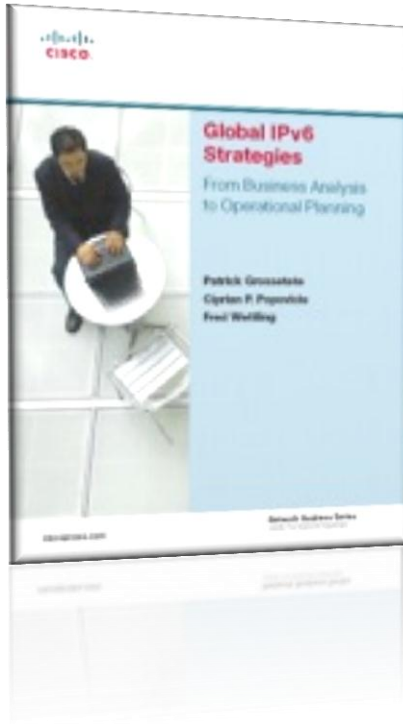
Validation testing and implementation consulting services



Network Optimization Service

Absorb, manage, and scale IPv6 in your environment

Recommended Reading



www.cisco.com/go/ipv6

Join Cisco IPv6 Support Communities!

- **Free** for anyone with Cisco.com registration
- Get **timely** answers to your technical questions
- Find **relevant** technical documentation
- Engage with over 200,000 **top technical experts**
- **Seamless** transition from discussion to TAC Service Request (*Cisco customers and partners only*)
- Visit the Cisco Support Community booth in the World of Solutions for more information

supportforums.cisco.com
supportforums.cisco.mobi



The Cisco Support Community is your one-stop community destination from Cisco for sharing current, real-world technical support knowledge with peers and experts.

Thank you.

