

IPv6 is Ready

Are you?

**The Internet Protocol is central to the Internet.
It exists in any device, service or system that
needs to connect to the Internet.**

**Since the birth of the Internet
we have used
IP version 4.**

the story of

IPv4



3.7 billion

addresses available

"IANA Global Pool"

1983

The Birth of the Internet

THE FIRST WAVE OF ADDRESS ALLOCATION

DEC

DOD HP

GEC DNIC

MIT IBM

FORD XEROX

INTEROP SITA

APPLE ELI LILLY CSS

PRUDENTIAL SECURITIES

CAP DEBIS CCS JTC

DUPONT AT&T BOEING

ARPANET USAISC JAPAN INET UK GOV

STANFORD UNIVERSITY MERIT PSINET

HALLIBURTON UK DEFENCE USPS

BOLT BERANEK AND NEWMAN MERCK

BELL-NORTHERN RESEARCH NORISK IANA

AMATEUR RADIO DIGITAL COMMUNICATIONS

Academic and experimental

Generous allocations made to early adopters

Worldwide uptake

IANA

35%
IPv4 SPACE
ALLOCATED

1992

65%
IPv4 SPACE
AVAILABLE

Expanding the Internet

THE RIR SYSTEM ESTABLISHED
FOR SUSTAINABLE ADDRESS ALLOCATION

1992  **RIPE
NCC**

1993  **APNIC**

1997 ~~ARIN~~

1999  **lacnic**

2005  **AFRINIC**
The Internet Numbers Registry for Africa

THE REGIONAL
INTERNET REGISTRIES

The RIR system allocates addresses according to policies developed in open, transparent, bottom-up, multistakeholder processes

Sustained global uptake



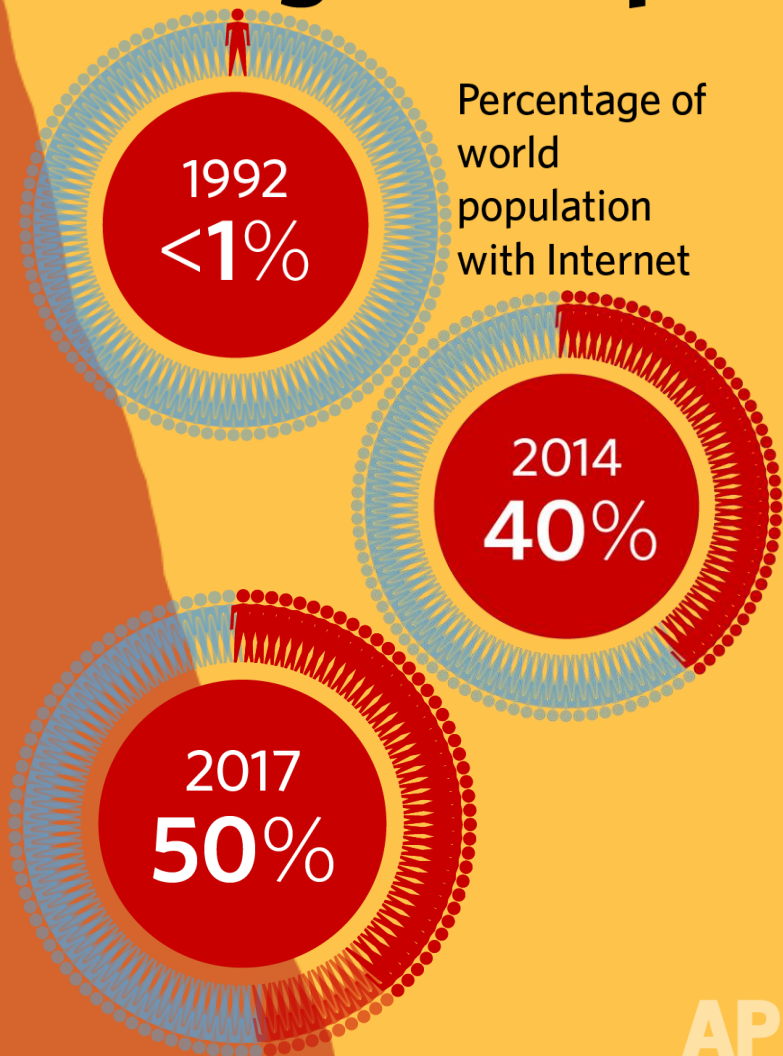
The first billion users was reached in **2005**



The second billion users was reached in **2010**

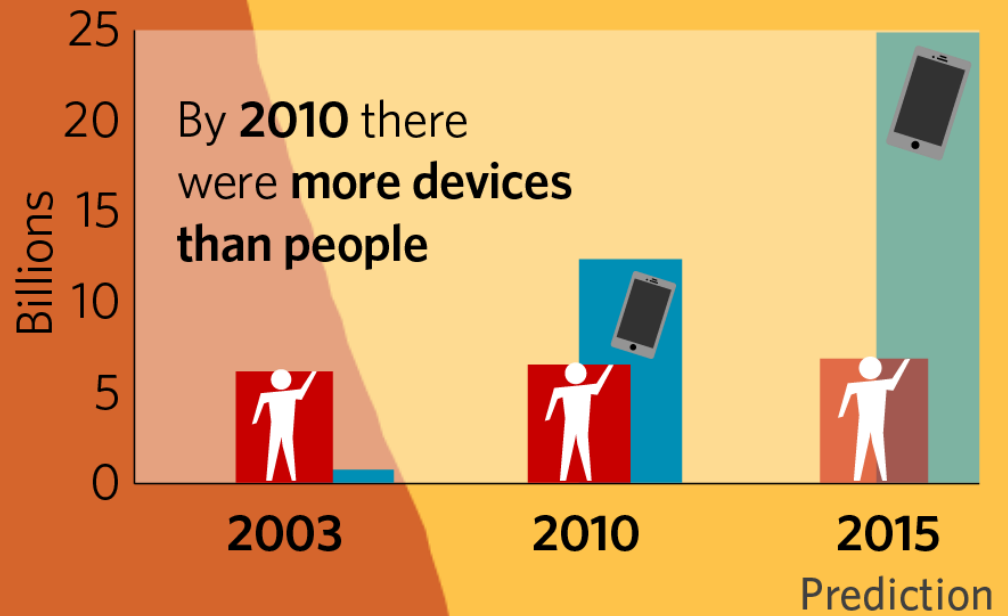
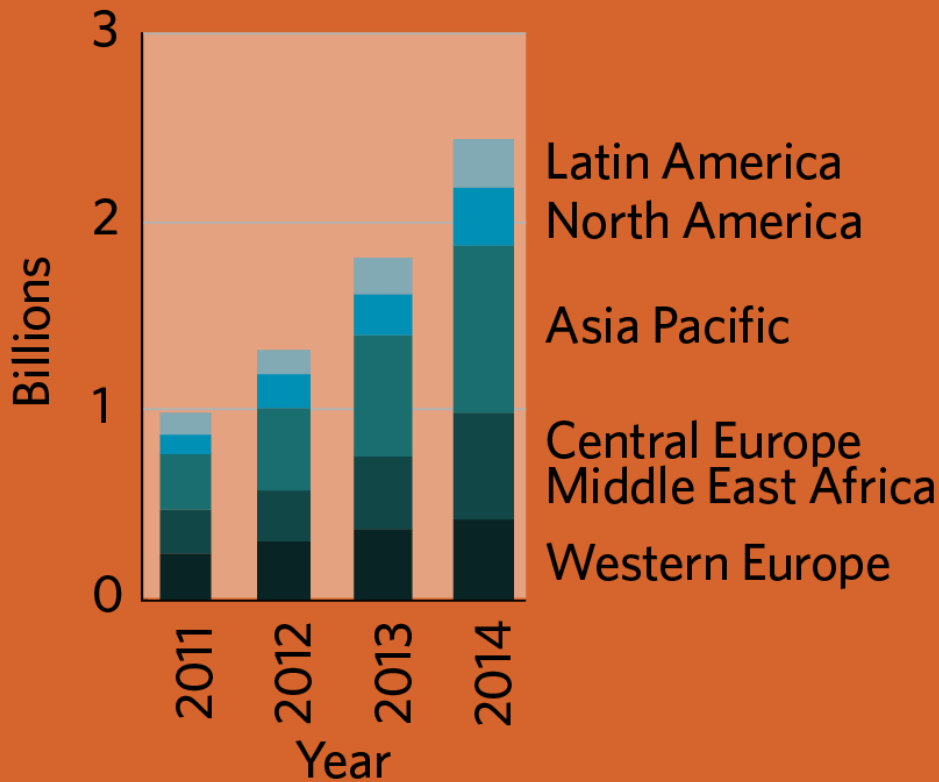


The third billion has been reached in **2015**



Mobile Broadband Subscriptions

LTE WCDMA/HSPA



Devices connect to the Internet

But, 25 Billion devices online?
with 3.7 Billion IPv4 addresses?

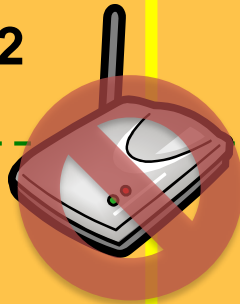
... How exactly?

Address Sharing and NAT

Internet

Phone
Network

202.12.29.32



02 6262 9898

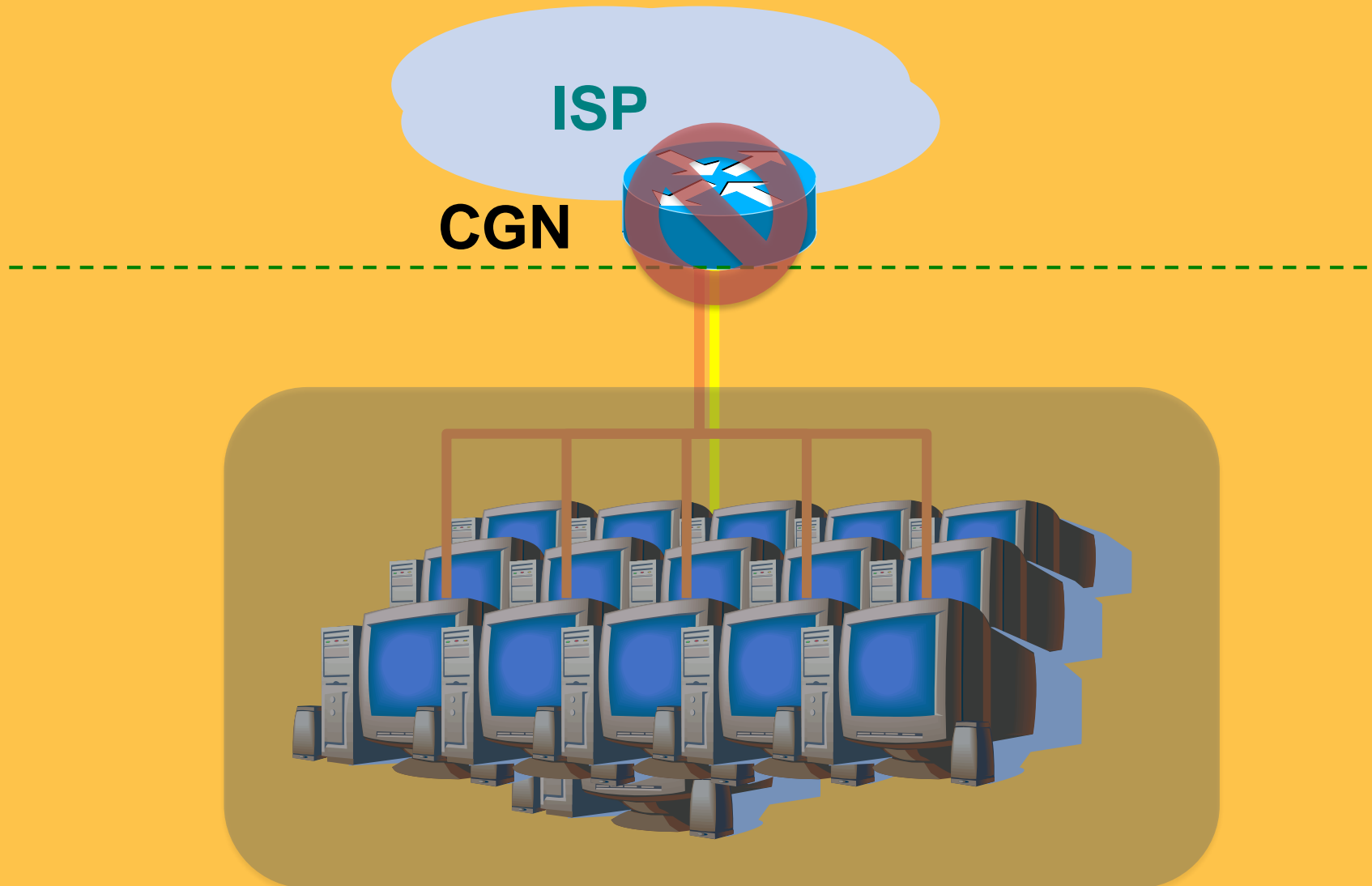


10.0.0.202 ...



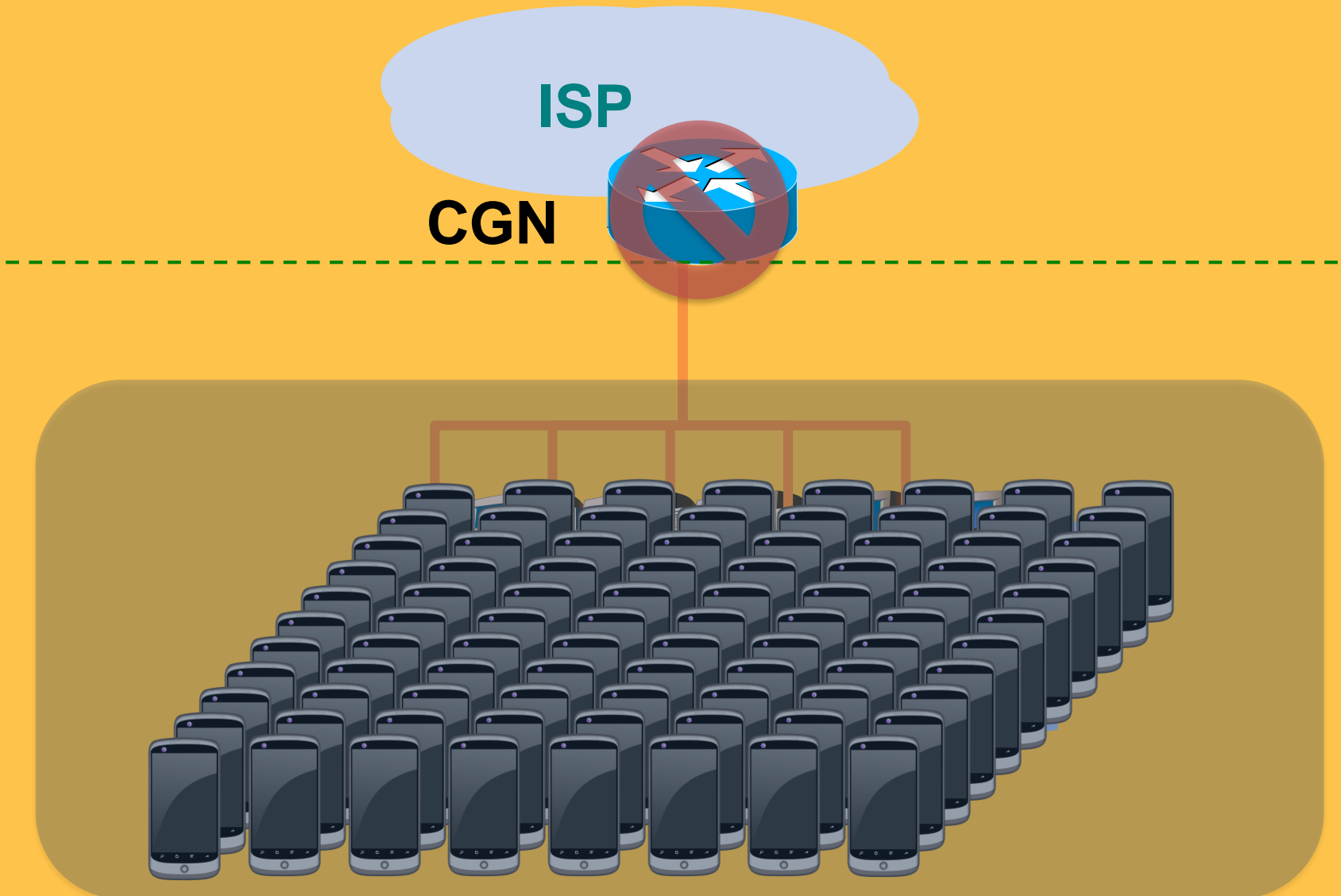
Extn 202

Carrier Grade NAT (CGN)



Challenges	Workarounds
P2P SIP (cannot initiate/ receive calls) uTorrent (seeding does not work)	Use Proxies for Peer to Peer applications Port Control Protocol
P2P Gaming	Software Upgrade from Manufacturer Port Control Protocol
Degraded experience for services such as Netflix, video streaming	Deploy tested home-routers from an approved list
Slower Download rates (some clients)	No known workarounds (Try larger MTU)
Negative impact to targeted advertising/geo-location	Distributed CGN, Regional IP and Port assignments
Logging requirements for lawful intercept <i>1TB per 1K subs per month!</i>	Deterministic NAT, Data compression, Bulk port assignment
Overlapping Addressing / NAT Zones	Large enough shared transition space
Impacts to traffic engineering	Distributed CGN, VRF (MPLS/VPN)

Carrier Grade NAT (CGN)



03 Feb 2011
IANA
Limits to
Unallocated
Address Pool
Growth?
Exhaustion

12%
IPv4 SPACE
AVAILABLE

88%
IPv4 SPACE
ALLOCATED

2011

IPv4 Exhaustion

FURTHER RATIONING OF ALLOCATIONS

2015

ARIN approaches IPv4 exhaustion

THE INTERNET CONTINUES TO EXPAND

IPv4 addresses are still available, but in limited supply



We only have **76 million** IPv4 addresses left

2%
IPv4 SPACE AVAILABLE

APNIC

The Internet of 2016

25+
billion
devices

**BILLIONS OF
INTERNET
ADDRESSES
ARE NEEDED
NOW!**

3+
billion
users

Internet
economy
in G20
worth \$4.2
trillion

When

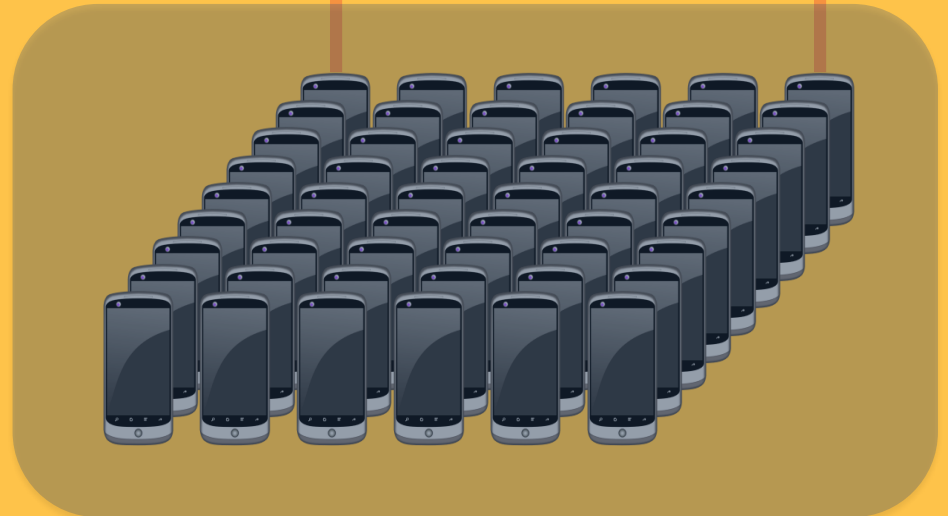
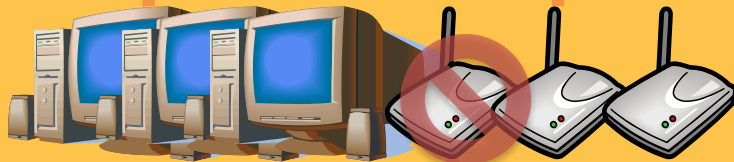
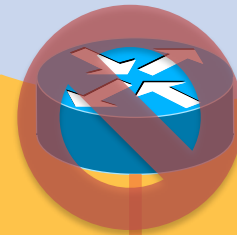


We only have **76 million**
IPv4 addresses left

It only gets worse...

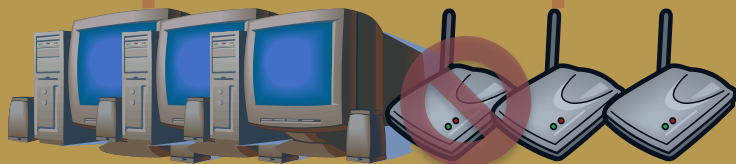
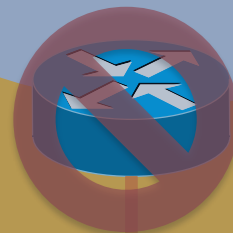
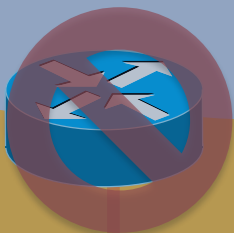
NAT and CGN

Internet



Double NAT

Internet



“Things”

the call for

IPv6

IPv6 provides

**340,282,366,920,
938,463,463,374,607,
431,768,211,456**

addresses

Global IPv6 usage

7% AND GROWING

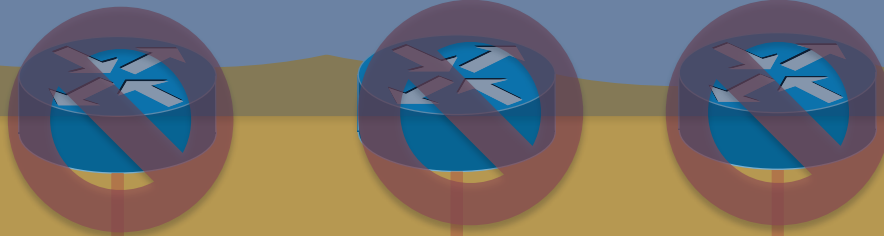
After 10 years, you can still be an Early Adopter!



So here's the opportunity...

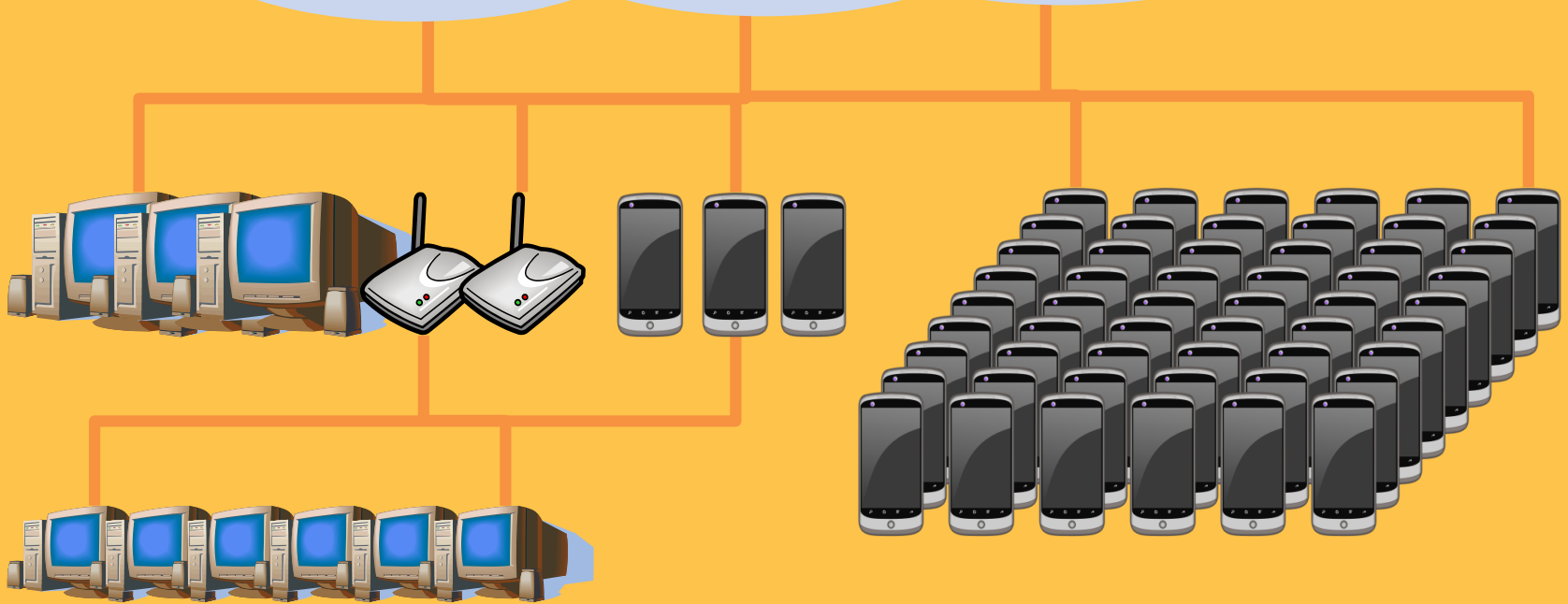
From this...

IPv4 Internet



To this...

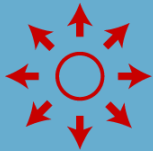
IPv6 Internet





Mobile Operators

Start executing your IPv6 transition plan now



Content Providers

Ensure you can provide consistent user experience on IPv6



Businesses

Mandate IPv6 support from your IT suppliers



Governments

Work with industry and consider incentives



Internet Users

Choose an ISP that is IPv6 ready

**Watch out for:
Carrier wifi, "Wifi First"
Internet of Things
Internet of Everything...**

**2010s
mobile
broadband
explosion**

**1990s
mobile
voice
explosion**

**CRITICAL MASS
FOR IPV6
DEPLOYMENT IS IN
THE HANDS
OF MOBILE
OPERATORS**



Thank you!

Paul Wilson

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