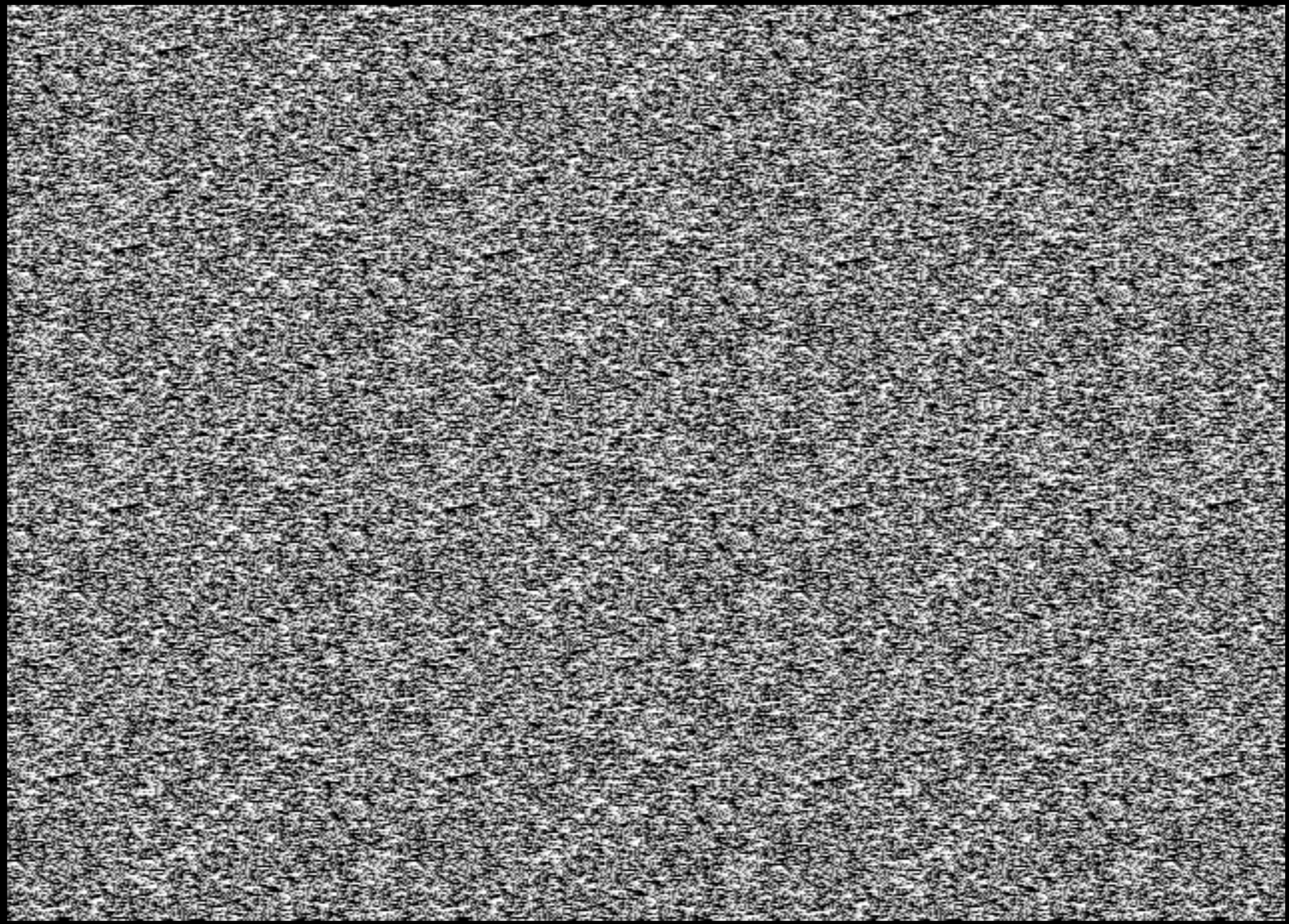
Found Footage

I found this on a USB stick on my flight yesterday. Apparently its a strategy presentation made to a large carrier. Let's see what they are saying to each other over there…

DISCLAIMER

The information presented herein is sarcastic, ironical, cynical, realistic, or all, or none. Technical details occasionally warp reality. Any resemblance to real persons or organizations, living or dead, existing or product of fantasy is purely coincidental. The presenter will not be held responsible for the use of the arguments presented herein. Future visions are as seen in a FluiDome® Chrystal Ball. FluiDome® Chrystal Ball manufacturers do not guarantee fortune telling properties of their balls.



IPv4 Forever

or

why we don't need to be serious about IPv6

Services generate value

- Users don't care about the network, they care about services
  - voice, games, music, movies, and other entertainment
  - self-ordering fridges, automotive intelligence, and other device2device or device2human interaction

Prior to the Internet

- Our sector provided the services, controlled the value chain and managed its revenue
- local monopolies
- highly stable arrangement
- conservative approach to technology innovation

Internet as a virus!

- The Internet caught us by surprise:
  - Customers connected to Internet Service Providers via modems over telephony infrastructure
  - ISPs were reselling basic telephony services as data at a major premium
  - Content Services were offered by third parties without our ability to exert control

Our Response

- We have been playing catch-up, and never quite getting ahead
  - Entered the ISP market
  - Bought up competition
  - Attempted to bundle services and traditional content - triple play services

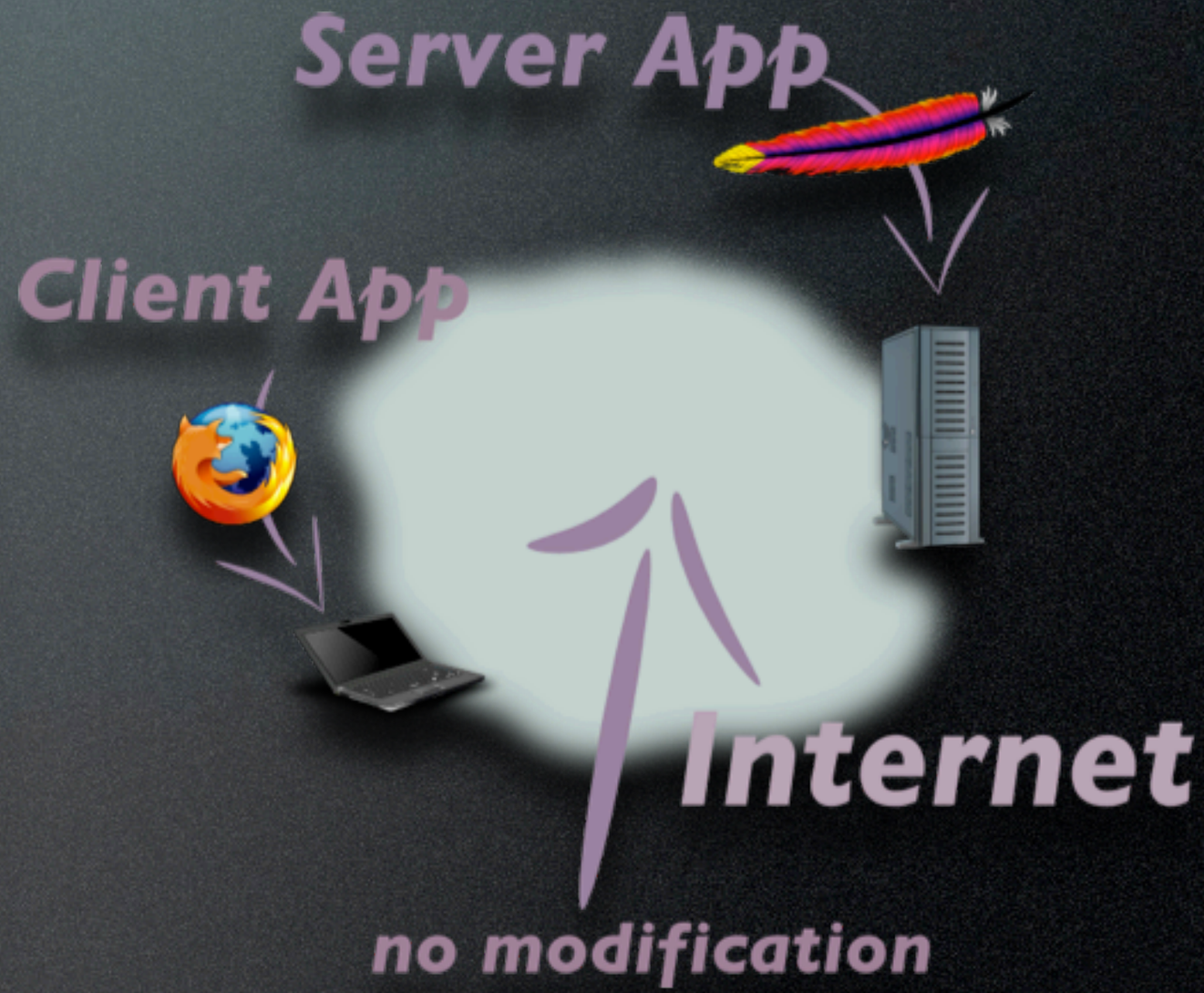
Over-the-Top is Winning

- Content bundling has not worked for our carrier services
- Internet Content is provided via a direct relationship between content provider and the client
- Carriage provision cannot mediate between users and services
- Carriage is now a commodity utility

Why does this work?

The open end-to-end model:

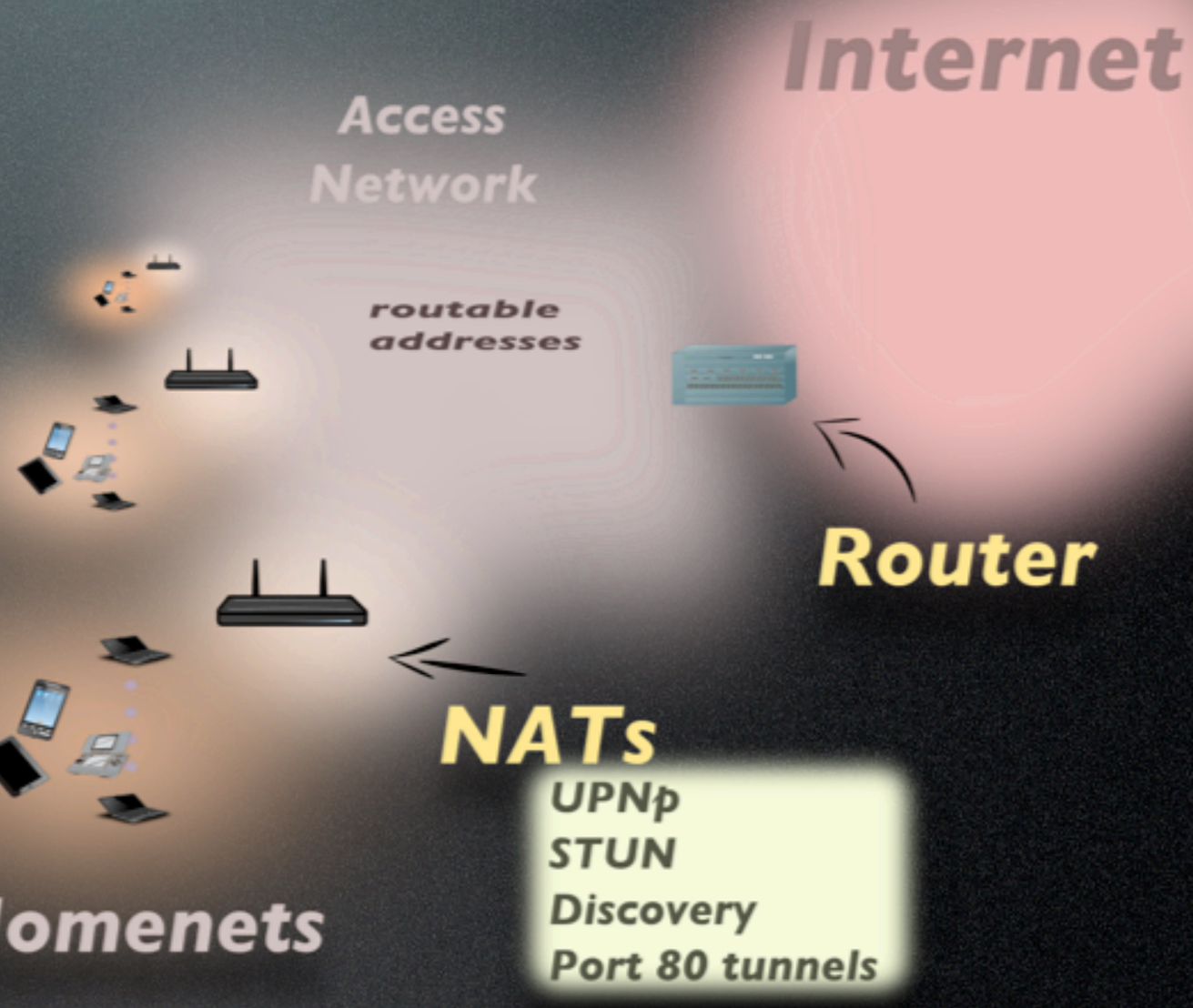
- Network Layer and Application Layer evolved independently
- Connected devices interact directly
- New services do not require changes to the network's infrastructure



How to break end-to-end openness

Add Network Middleware!

- Network elements are aware of the content delivery application
- NAT traversal technology added to applications to compensate



But Over-The-Top is still at the Top!

- Carriage Providers are being squeezed into commodity utility roles
- Carriage product margins are declining for both fixed and mobile products
- And public Broadband deployments are further squeezing carriage providers into simple access resellers
- Content Services are now totally dominant in terms of revenue and agenda setting

But there is a change coming!

We're running of IPv4 addresses!

How will we respond?

We can either:

- invest significant resources in a rushed deployment of IPv6

  and stress our customers, our supply chains, our products, and our capital budgets

- or continue to use IPv4 by adding NATs to our carriage network

Why is IPv4 Shortage Good For Us?

We will need to deploy Carrier Grade NATs (CGNs) within the IPv4 networks

- End users will not be able to connect directly to services when we shift to CGNs

Allows us to introduce an additional control point through which we can gain control over users' access to services

- No competitive disadvantage because all carriers are in the same position

Internet

Access Network

routable address

controlled private addresses

CGN

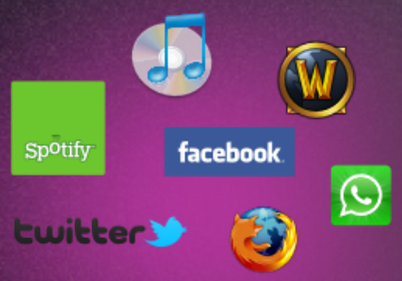
NATs

Homenets

Properties of Carrier NAT Architecture

Turns one limited resource (addresses) into another (ports), but now offers us direct control of the resource bottleneck

- our equipment dynamically assigns port bindings to customer applications
- we can differentiate across our service offerings:
- more ports: better experience: premium price



10 Aps
per device

15 devices
per customer

100 Customers
per ext. address

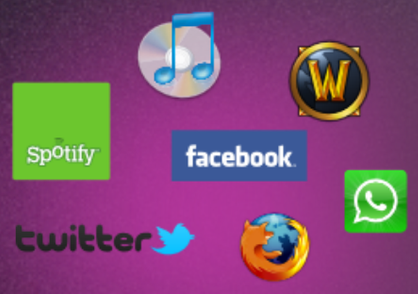
65535 port
per ext. address

CGN

Application
Service
Providers

4 ports for the customer experience
The Internet model expects many more

Constrained Services



10 Aps per device

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CGN

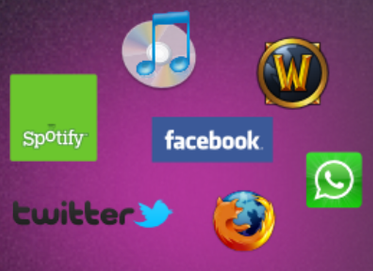
Application Service Providers

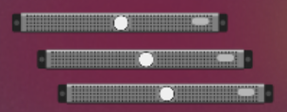
Better per IP knowledge and service

Move application services to the inside

Partner Service Platform

Internet Platform





CGN

unencumbered view

Experience limited because of global resource limits

The Return of the Walled Garden

- We can charge Content Service Providers for direct access to our clients by linking our access network to the Content Delivery Network
- All other services sit behind the CGN and have constrained visibility to our customers
- We can migrate the CGN to an Application Level Gateway and exert more direct control over user services

And possibly more...

- Some services are extremely difficult to operate over multiple NATs.
- Many peer-to-peer applications are unsustainable when the CGN is hostile
- In general, all Internet services will need our cooperation

Risks

Potential Regulatory Pressure

- Reservation of IPv4 for new entrants
- Net Neutrality regulation
- IPv6 ‘as public good’ - carrier license constraint

Hostile Content Providers

- Exert pressure on us to deploy IPv6

IPv4 and new entrants

- IPv4 is a scarce resource: 2012 no IPv4 available from the RIRs
- Market Openness is a regulatory concern
- We will return IPv4 addresses
  - Goodwill with regulators
  - Making ports even more scarce!

Countering Net Neutrality

- The CGN based architecture cannot be neutral any longer
- Port-scarcity cannot be fixed by investments
  - External services move inside our network
  - or only have limited ports: bad user experience

Our IPv6 efforts

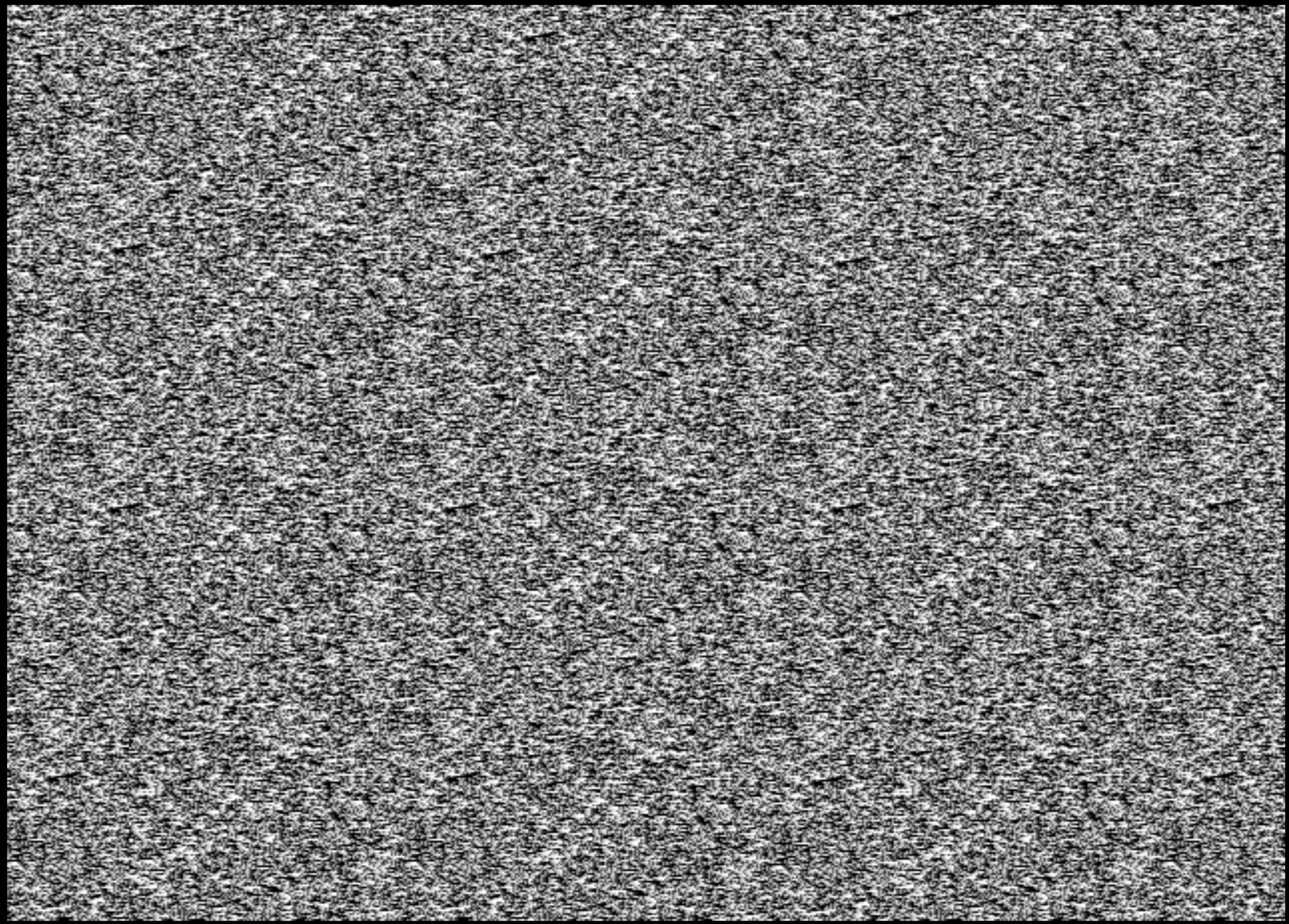
- Offering IPv6 leads to failure:
  - No application and CPE support
  - Worse user experience
    - User systems de-preferences IPv6
    - Customers will allow us to stay conservative and move to CGNs.
- But its still a visible demonstration of good will and demonstration of regulatory compliance

Buy off Established Content

- Selectively invite the larger content providers into the Walled Garden
  - users are familiar with a small set of services and a small set of content providers
  - established providers have an interest to raise the barrier to future competitors
  - Raise the competitive barrier to new services and content of mutual benefit to use and existing content providers

IPv4 Forever

- IPv4 based CGNs to cope with address exhaustion as a positive long term incentive
- CGNs will allow us leverage more control over users' access to services and buy time in IPv4
- We can then re-establish relationships with both users and content and service providers
- We can then migrate CGNs to a full IPv4 application level gateway architecture and completely lock in users and services



The Internet is Complex

It's one service, but the combination of many diverse independent elements

Noone is in charge

There is no script

And when there are disruptive changes then we don't all pull in the same direction

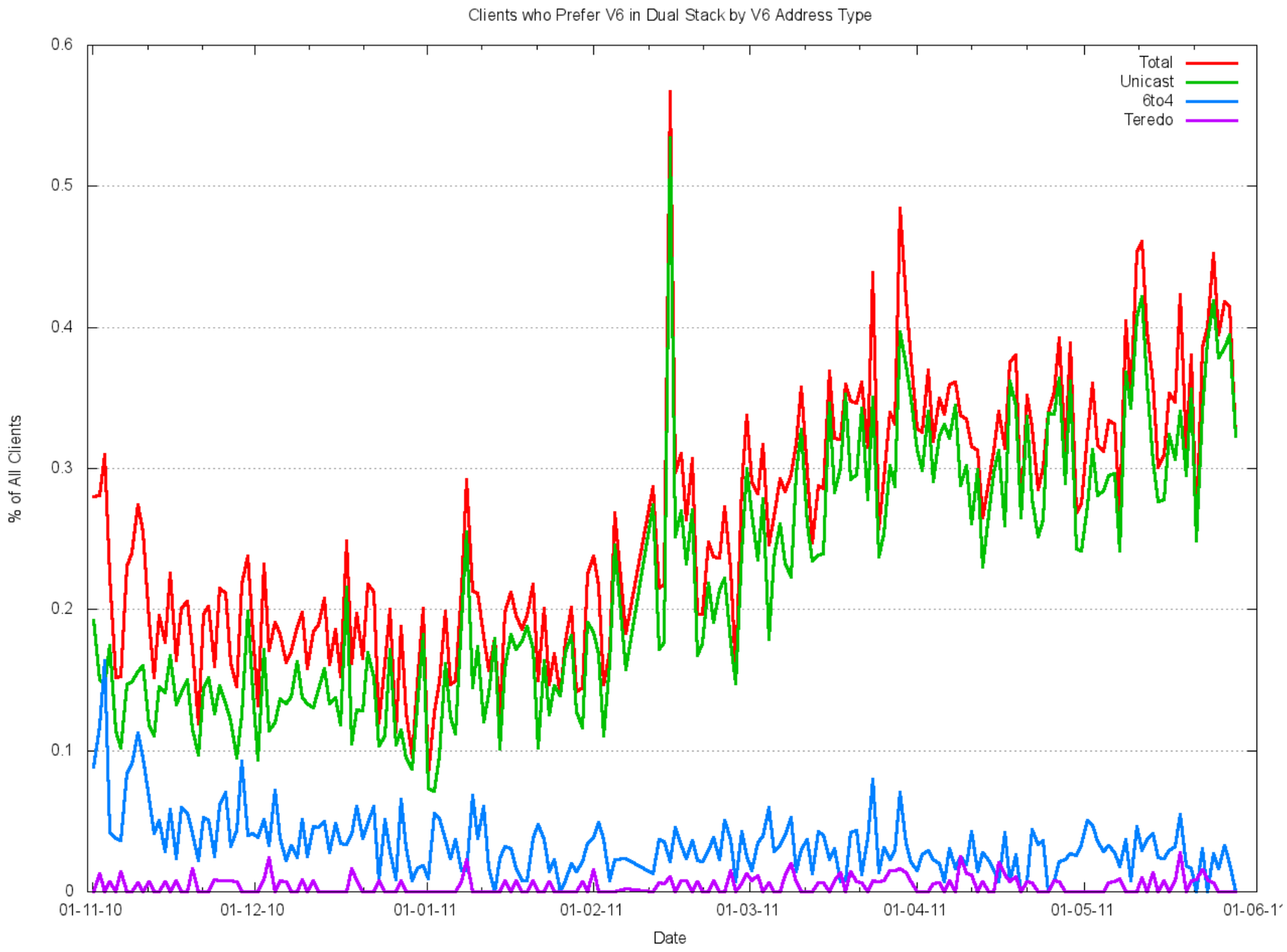
We have a choice

Do nothing and let “the market” define the outcome

Market Dynamics

- Its not clear that the market will naturally migrate the Internet to IPv6
- Its not clear that all the carriers want IPv6
- Its not totally clear that current content and services are totally committed to IPv6

IPv6 Penetration



We have a choice

Its not clear that if we do nothing that IPv6 will simply happen.

It may not.

We have a choice

If we want an open Internet

If we want creativity and innovation to florish in tomorrow's Internet, then

We all need to get behind IPv6 and make it work today!

I hope you feel encouraged and motivated to get moving in migrating your services to dual stack IPv6

We're all counting on you!

My sincere thanks to Olaf Kolkman for the concept and much of the material used in this presentation!

Geoff

Thank You