

Internet Futures

A personal glimpse into a future
of the internet

A quick look back: 1992



The mainframe era ended around this time

The flagship of Digital's technology of the time, that turned out to be a commercial flop. Anyhow, it's still a true mainframe, remarkable in any aspect: the system takes up a whole room, it consumes electricity as if it was free, and dissipates heat like hell. All this is due the fact that it's built out of ECL components, which are very fast (CMOS wasn't even close to that at that time), but draws significant power (the whole system takes around 20 kW). It was designed to have water-cooling, but it didn't work, so they modified it to air-cooling, the name however remained: "Aquarius". There were different models, with performances varying from 40 to 157 VUPs (125 MFLOPS). The I/O-memory-CPU interconnect is switched (with a frequency of 1 GHz), which was a totally new concept at that time. There were only a few dozen 9000's ever made.

A quick look back: 2002



Computing meets
consumer electronics:
the rise and rise of
the personal computer

Today!

The new iPad



"We are now living in a post-PC world"

Where to from here?



5 Years Out



its turning into a mobile world!

2011: 270 million mobile units shipped

Factors:

- **Production volumes are bringing down component unit cost**
- **Android is bringing down software unit cost**
- **No need for new content - leverage off the the existing web universe of content**
- **Shift away from the desktop and the laptop by the production industry seeking new markets for their production capability**

Apple's Numbers

iPhones:

- Q3 2010 : Apple shipped 8.4M iPhones
- Q3 2011 : Apple shipped 20.3M iPhones
 - Added 42 carriers and 15 countries in the quarter!

iPads:

- Q3 2010 : Apple shipped 3.3M iPads
- Q3 2011 : Apple shipped 9.2M iPads
 - “every iPad we could make has been sold”

Q3 2011 profit: \$US 7.3B

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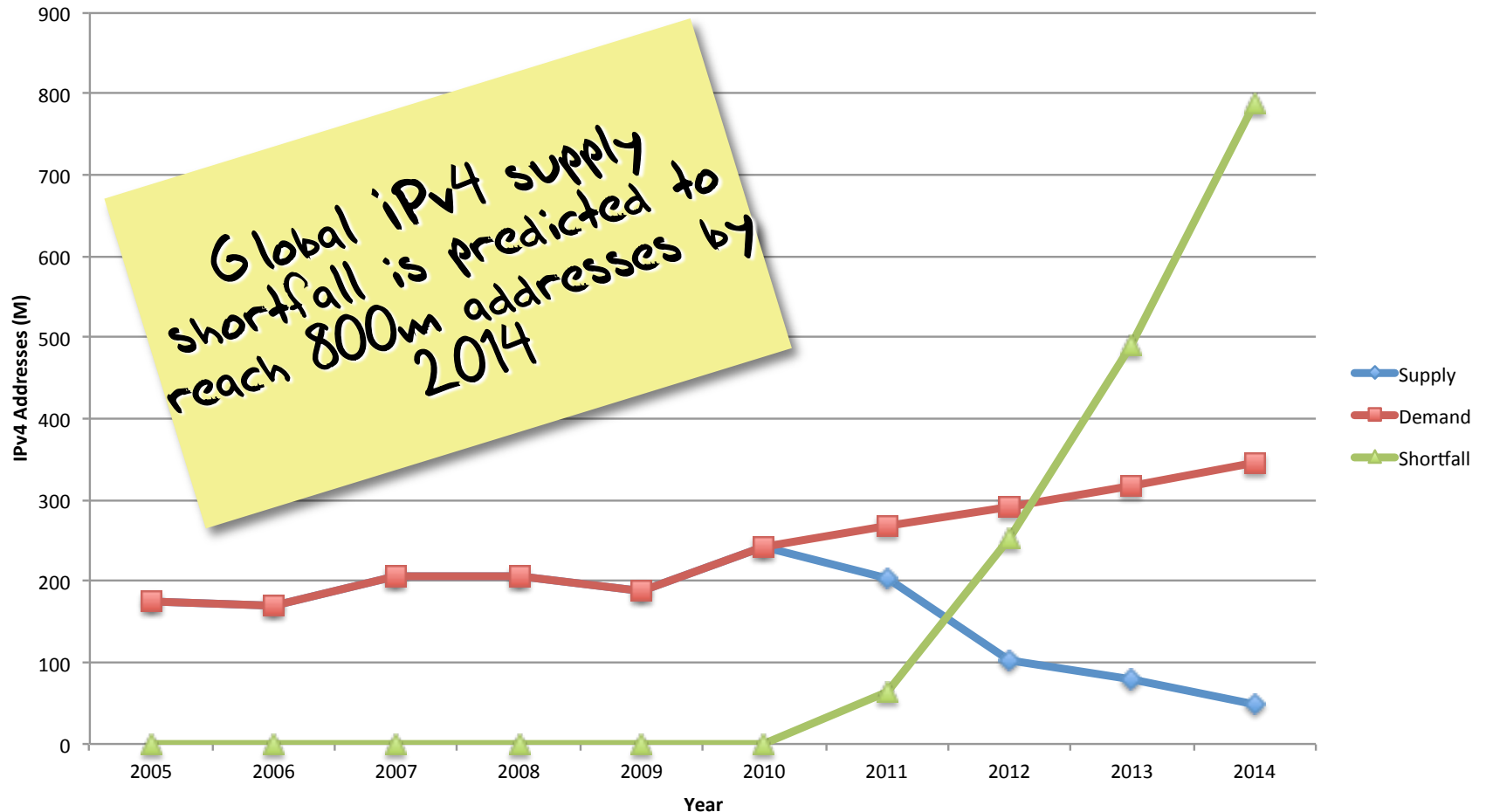
Q3 2011 profit: \$US 7.3B

\$13.1B profit!

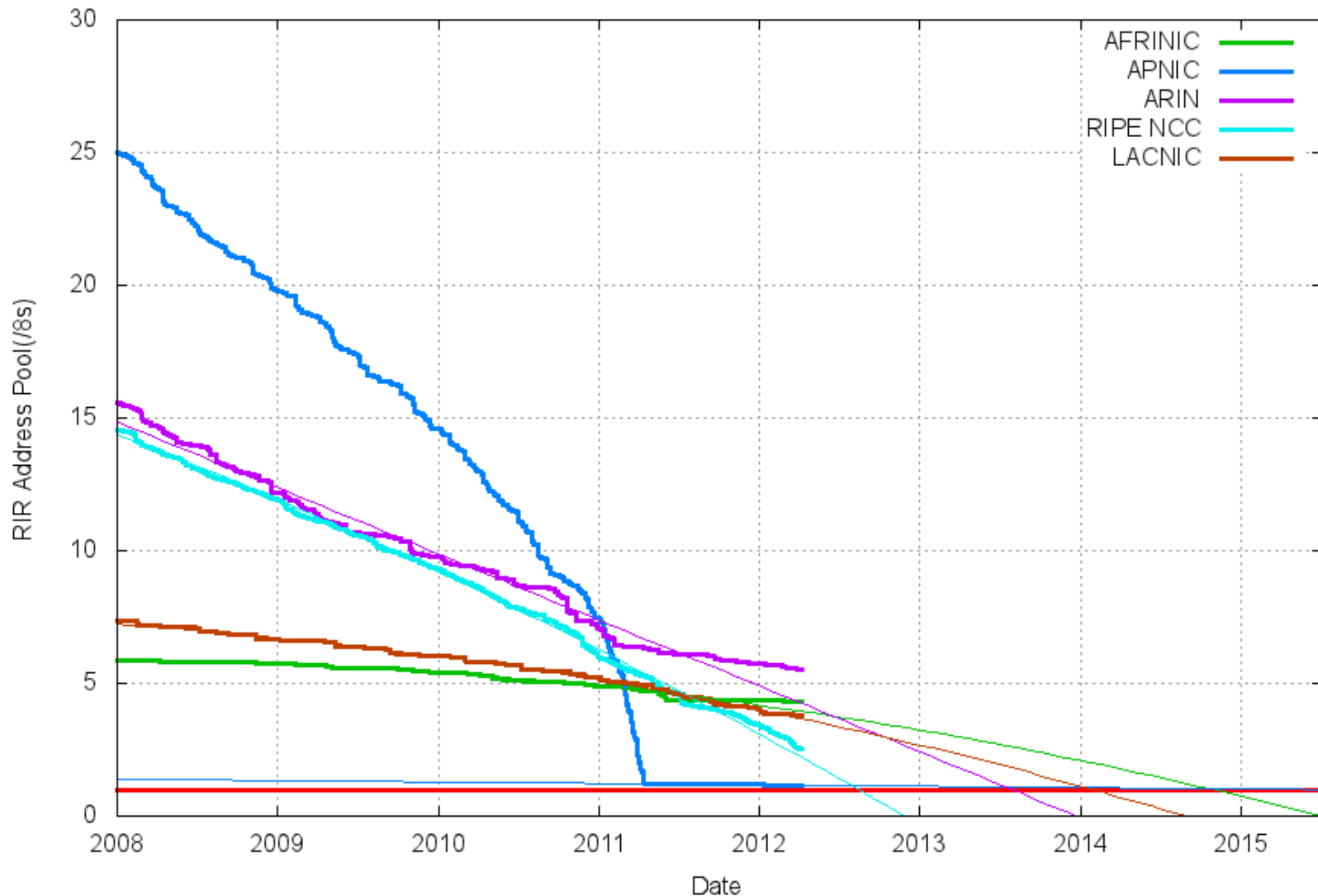
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Coping with Demand

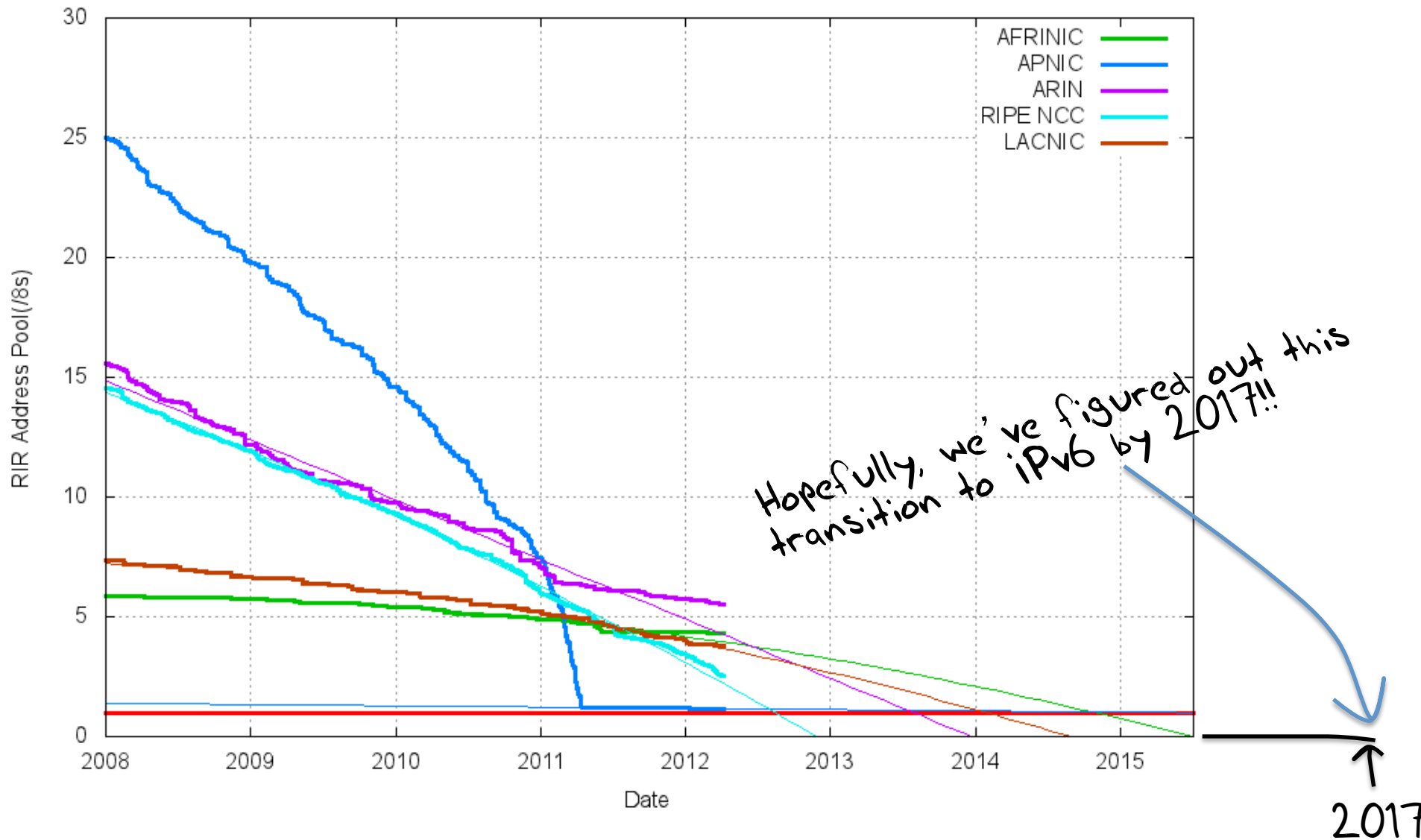
Global IPv4 Address Supply and Demand Estimates



Coping with IPv4 Address Exhaustion



Coping with IPv4 Address Exhaustion



But we're now High Risk!



The emergence of a market in IPv4 addresses is now a certainty.

But the outcomes of this market are by no means assured...

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But the outcomes of this market are by no means assured...

If the price goes too high then this will generate acute instability and potentially fragment the network

If the price is highly volatile this will deter new investors in networked services and entrench the incumbent services and incumbent providers

If the price is too low then there is little incentive for incumbents to move away from IPv4 and commence investments in IPv6, leading to stasis and entrenched incumbents

in the next five years...



we have a choice

in the next five years...



Everything gets
squashed into
HTTP, IPv4 and
CGNs

IPv6

And its not yet clear which path the internet will take!

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path ~~the internet~~ will take!
market forces

Can we look further out?

10 Years Out?



My personal view...by 2022

The Internet will be all IPv6 by 2022!

The market in IPv4 trading is a short term phase
CGNs also have near term limits under intense
scaling pressure

There is no extended afterlife in store for CGNs +
IPv4 if we make this transition to IPv6

(look at what happened to DECnet, SNA, Appletalk, X.25,...)

My personal view...by 2022

Radio spectrum will become even more of a scarce and highly valuable asset

well it is already, but the competition for spectrum in highly populous areas will continue

Fewer wide area services - more cellular / femtocell services backed by fibre backhaul to improve spectrum efficiency

My personal view...by 2022

Cloud / Data Centre services may well be at their peak by 2022

Innovative competitive pressure at this time may well come from highly distributed systems that do not rely on intense concentrations of computation and information storage

20 Years Out?



My personal view...by 2032

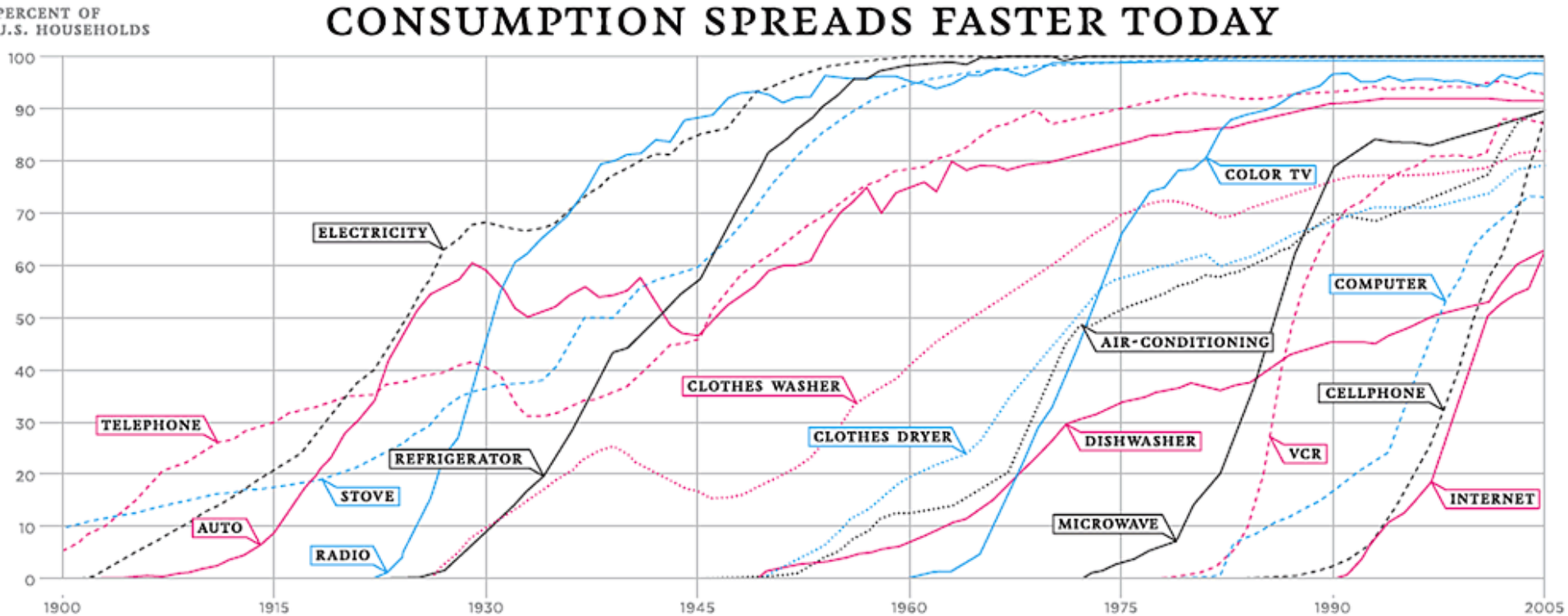
This is extremely tough!

very little from the world of 1992 is still with us today

very little of today's environment will be persistent for the next two decades

Why?

As the pace of technology adoption gets faster
we cycle through successive generations of
technologies at ever faster rates



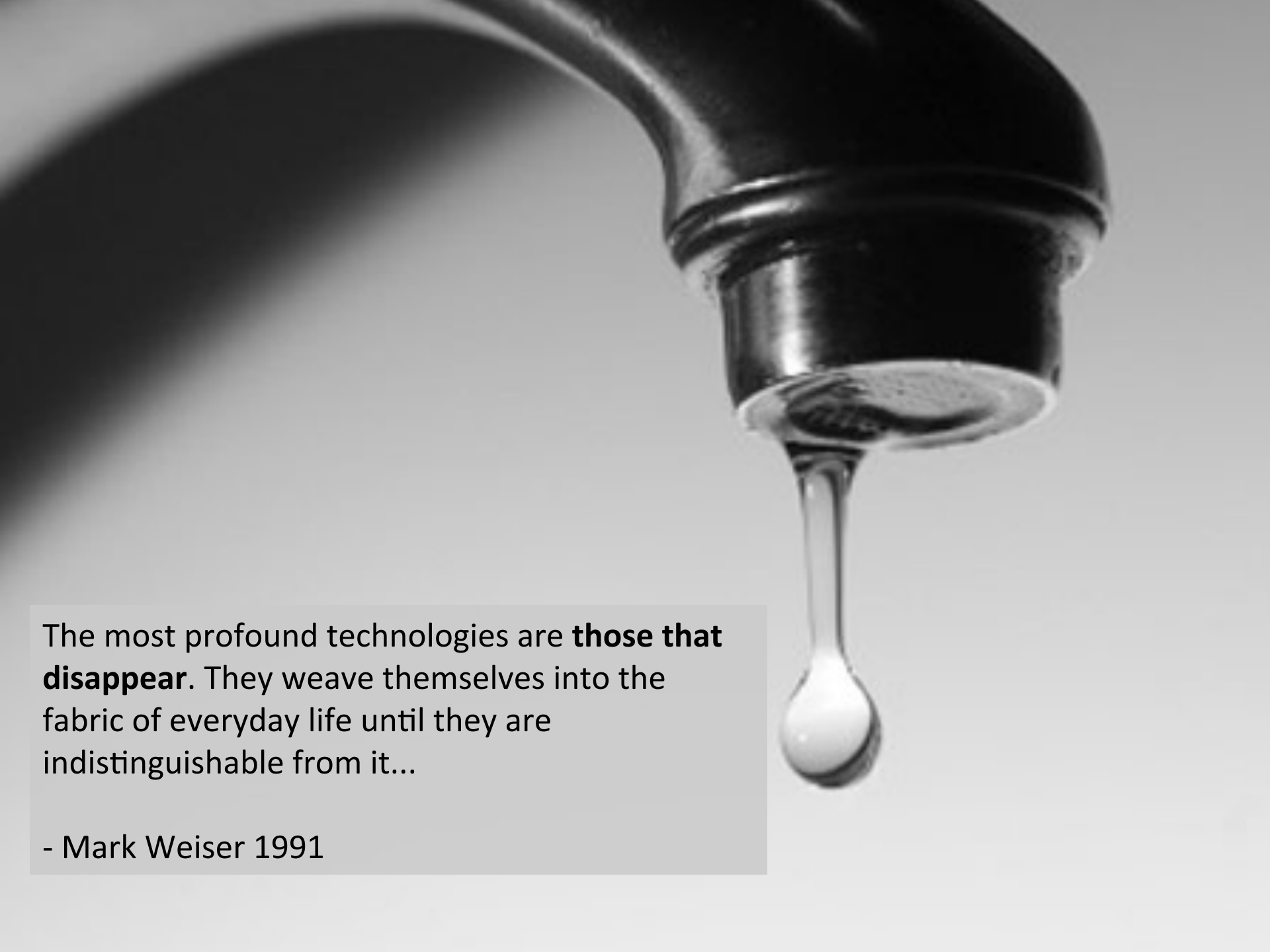
What's shaping our future?

You and i!

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We need to think about a post-PC world where computation, storage and communications are abundant commodities. It's innovative mass-produced consumer devices and services that will shape much of the Internet's future. And the innovative force here is one of constant technology refinement and evolution!

A black and white photograph of a faucet. A single, large drop of water is falling from the spout, suspended in mid-air. The background is a plain, light color.

The most profound technologies are **those that disappear**. They weave themselves into the fabric of everyday life until they are indistinguishable from it...

- Mark Weiser 1991