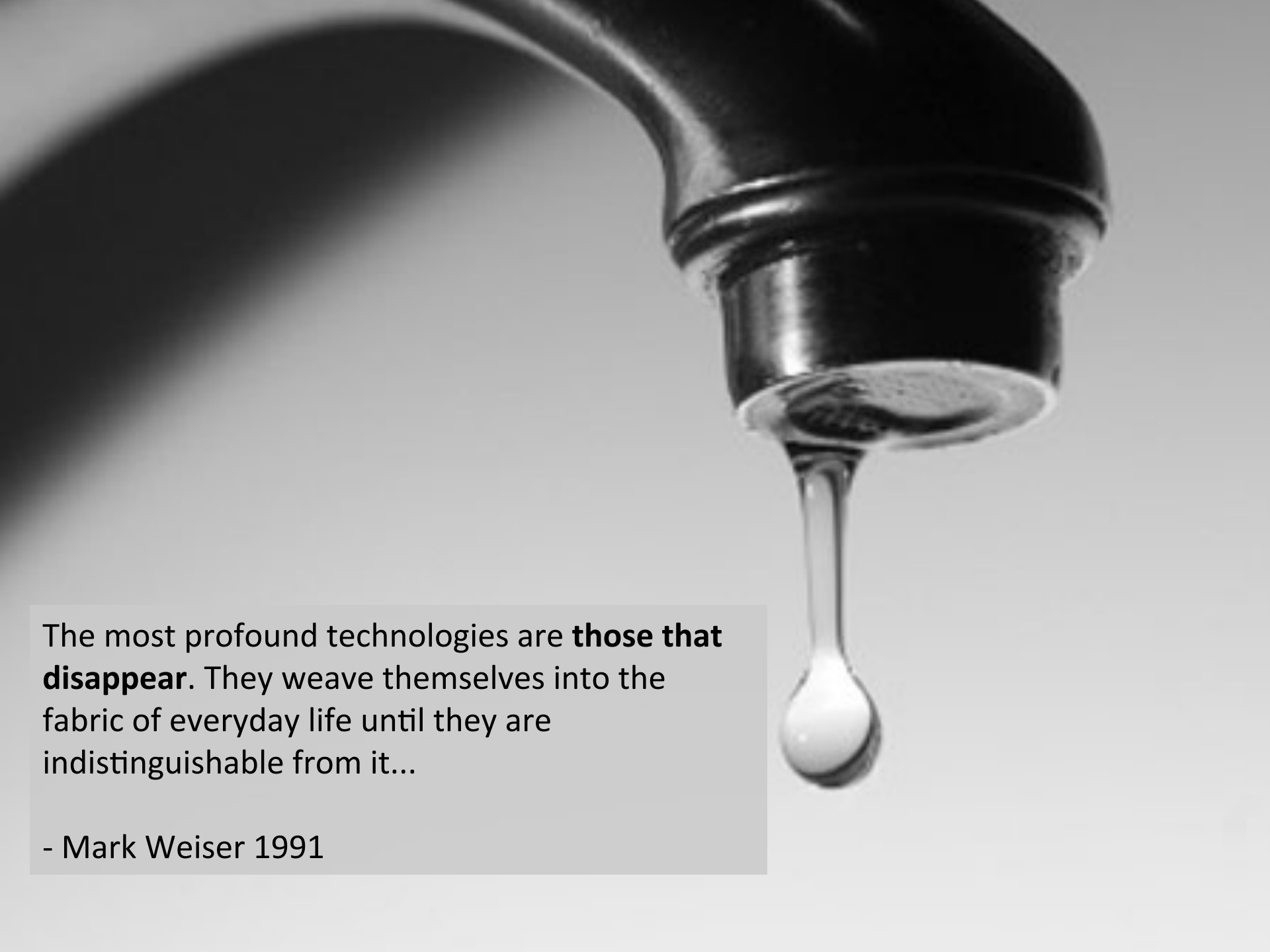
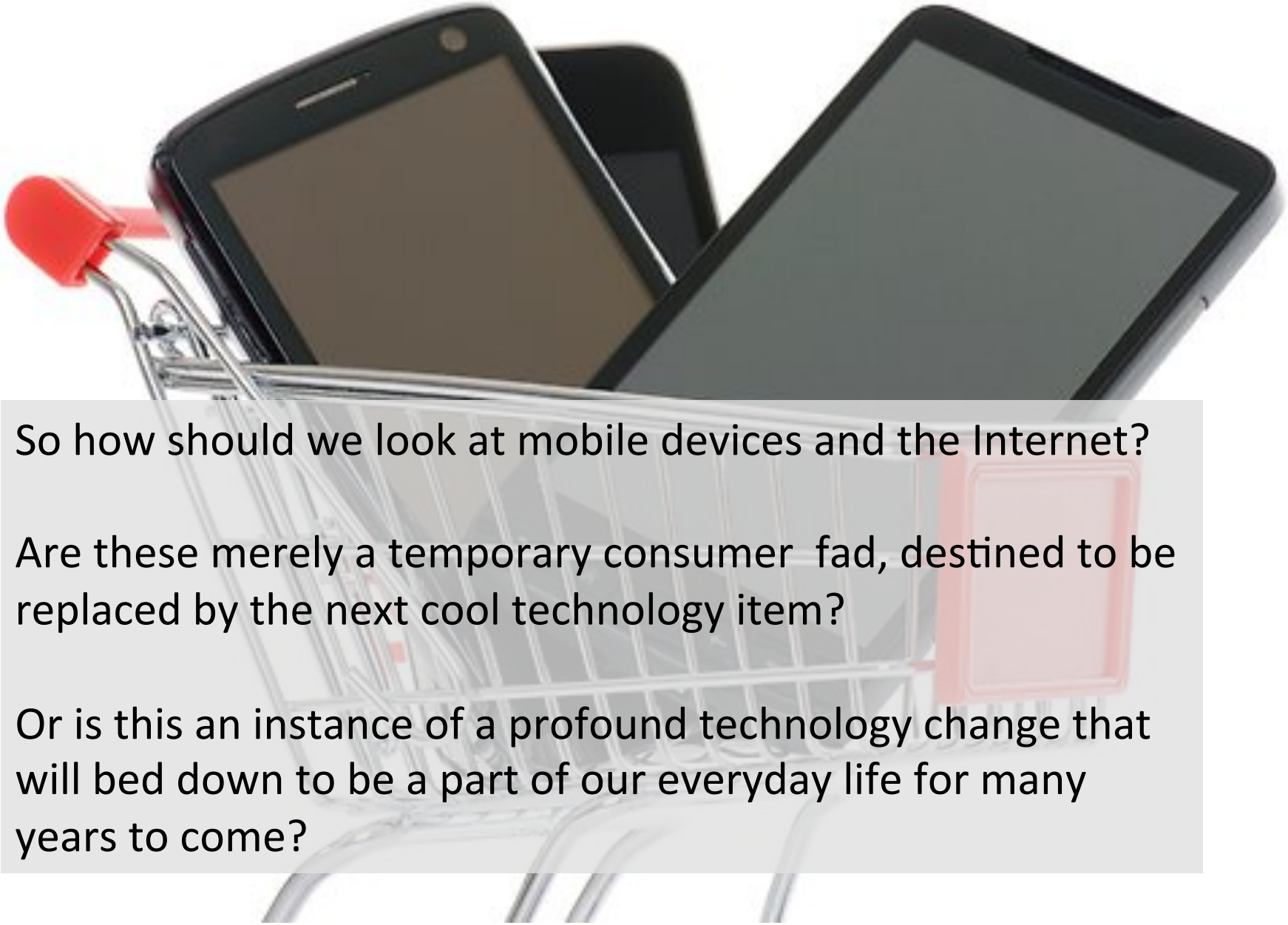
Today's Mobile Internet

Geoff Huston,
APNIC Labs



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



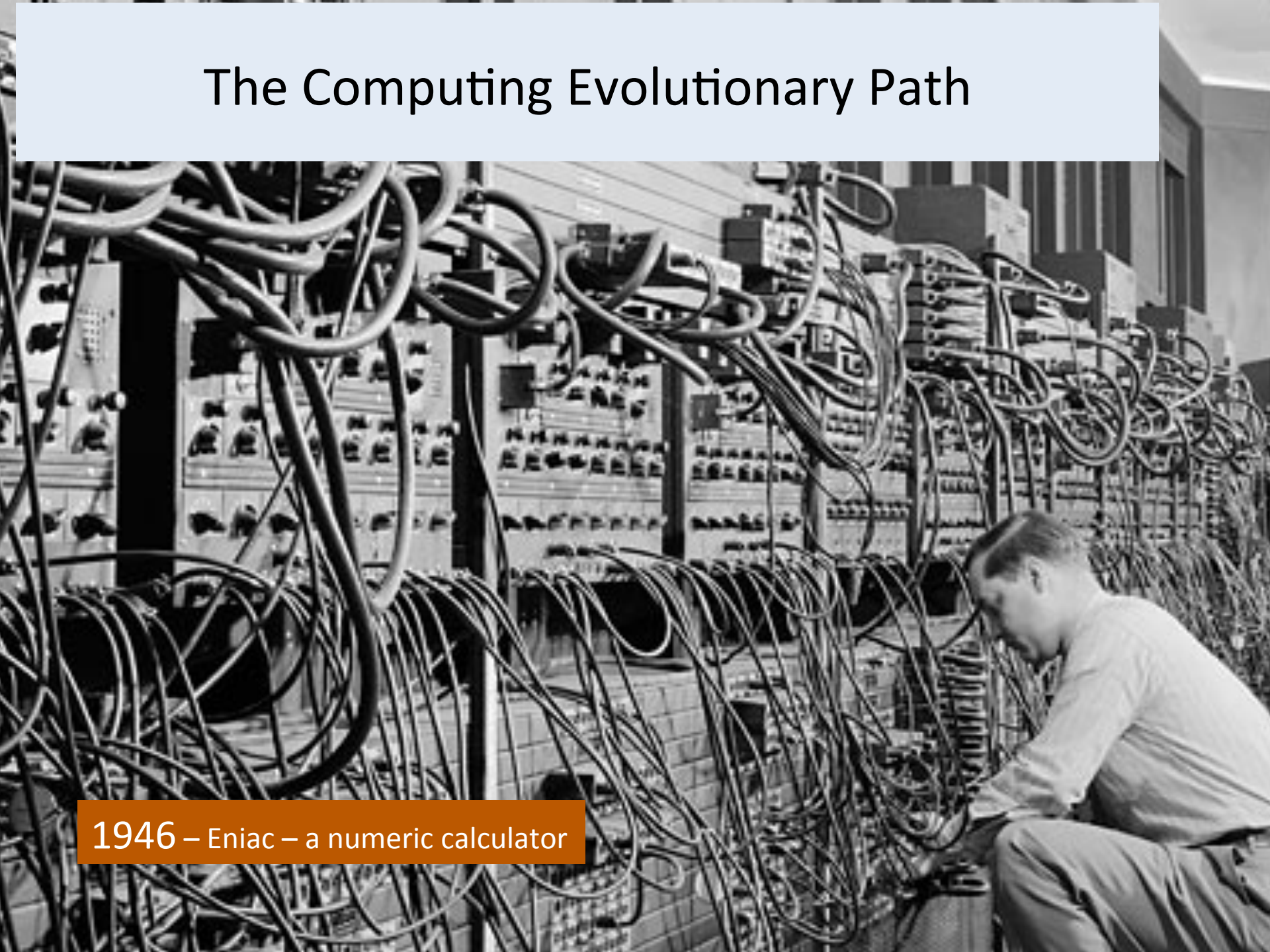
So how should we look at mobile devices and the Internet?

Are these merely a temporary consumer fad, destined to be replaced by the next cool technology item?

Or is this an instance of a profound technology change that will bed down to be a part of our everyday life for many years to come?

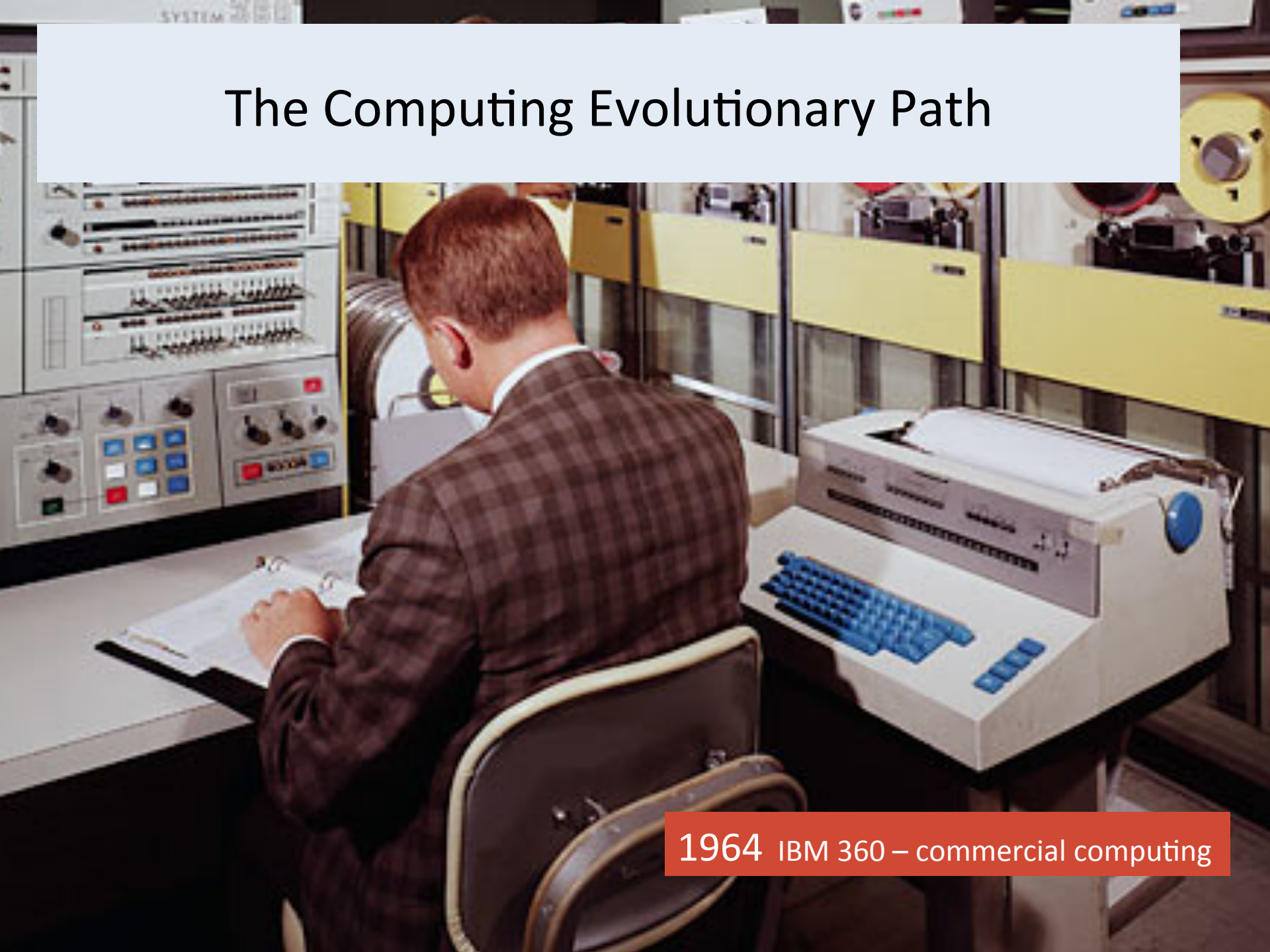
To try and answer this, lets try and put this question into some broader context of the evolution the computer and communications enterprise

The Computing Evolutionary Path



1946 – Eniac – a numeric calculator

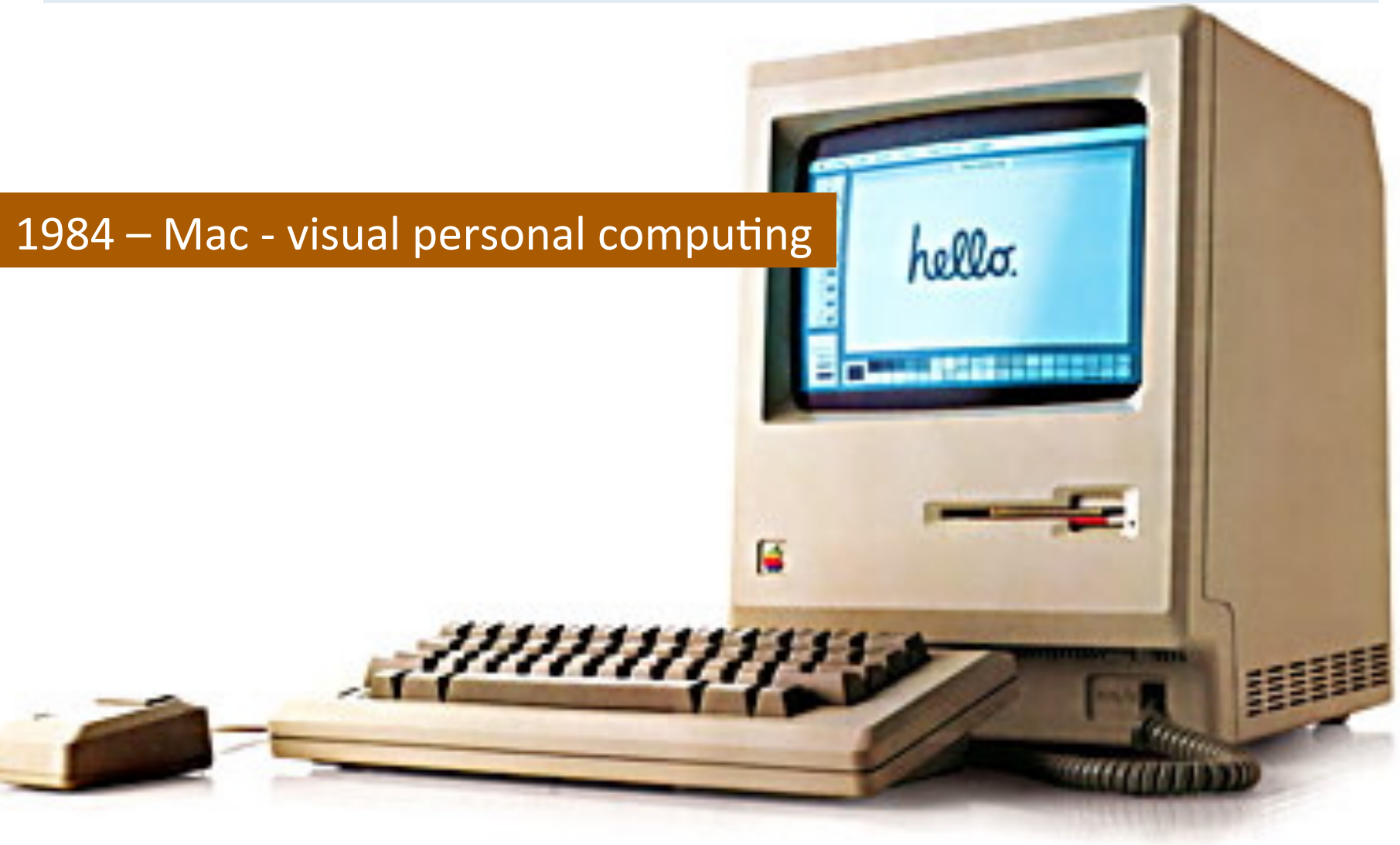
The Computing Evolutionary Path



1964 IBM 360 – commercial computing

The Computing Evolutionary Path

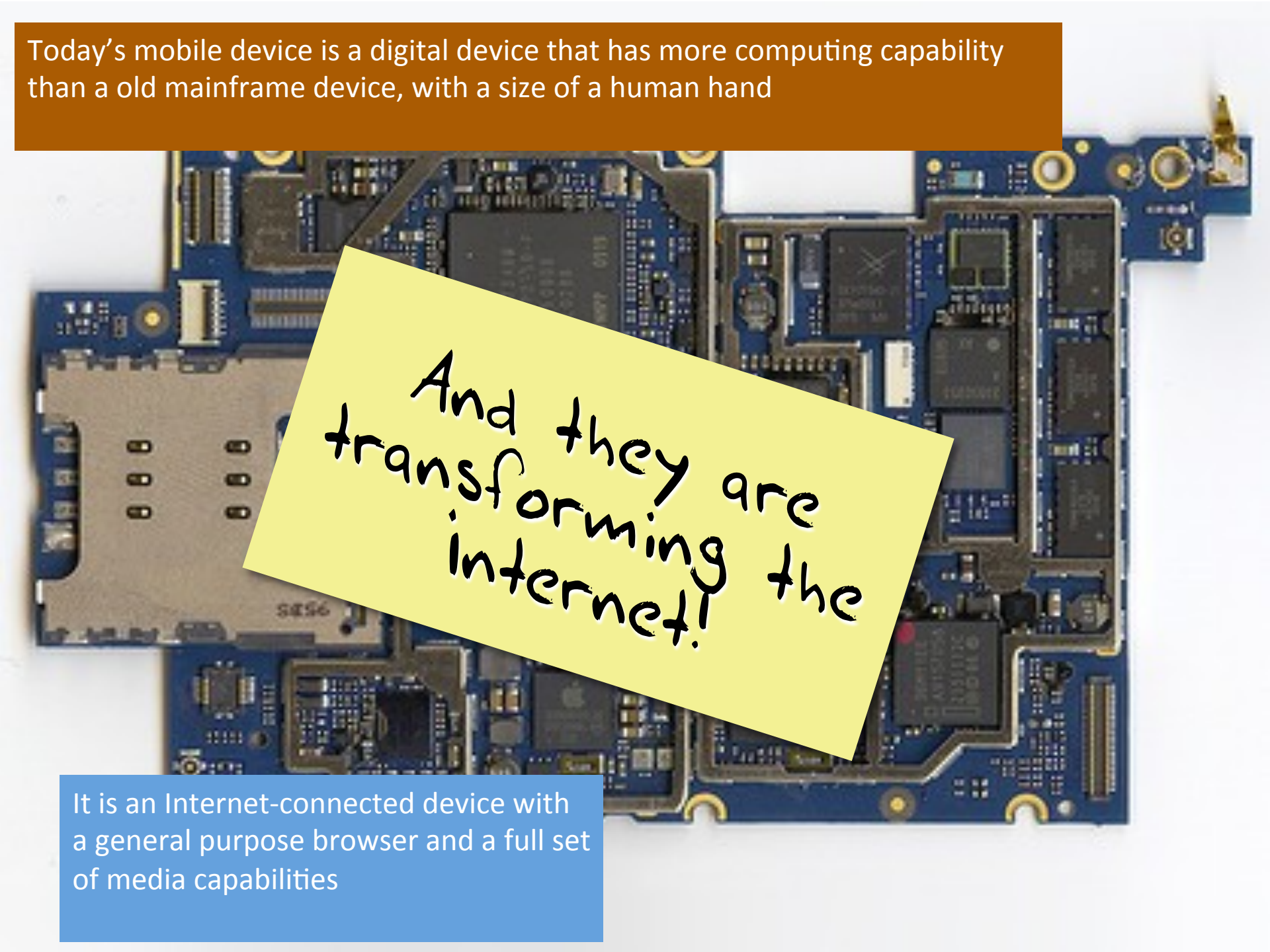
1984 – Mac - visual personal computing



The Computing Evolutionary Path

2007 – Apple's iPhone

Today's mobile device is a digital device that has more computing capability than a old mainframe device, with a size of a human hand



It is an Internet-connected device with a general purpose browser and a full set of media capabilities

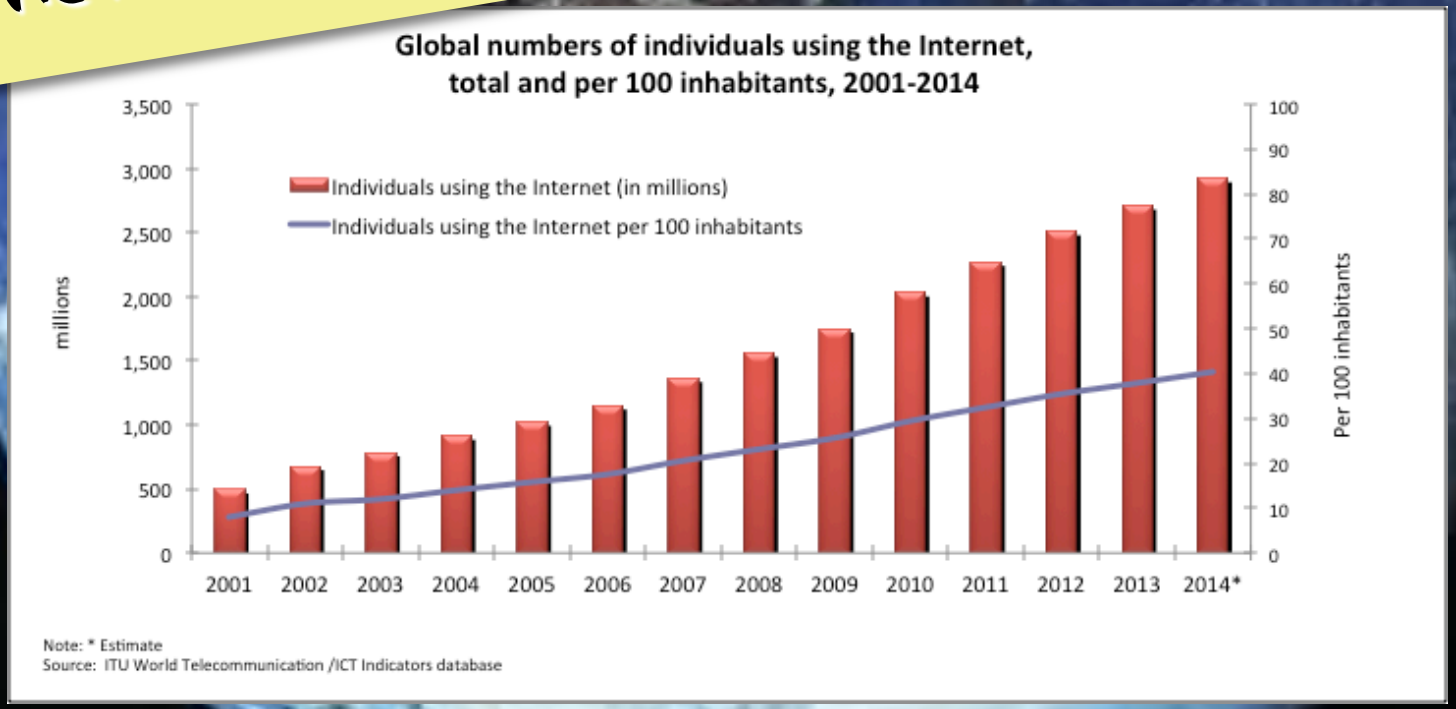

PLACED UPON THE HORIZON (CASTING SHADOWS)
MASSIVE CHANGE
The Future of Global Design
WORLD PREMIERE
October 2, 2004 to January 3, 2005


With desktop devices the Internet was a destination
reliable power
lighting
privacy
large view screens
dedicated worktop
wired bandwidth


The Internet is now anywhere and everywhere
radio connectivity
Thumb operated
hand sized
battery power
Its trivial, commonplace and incidental

Counting Users...

There are 3 billion internet users today

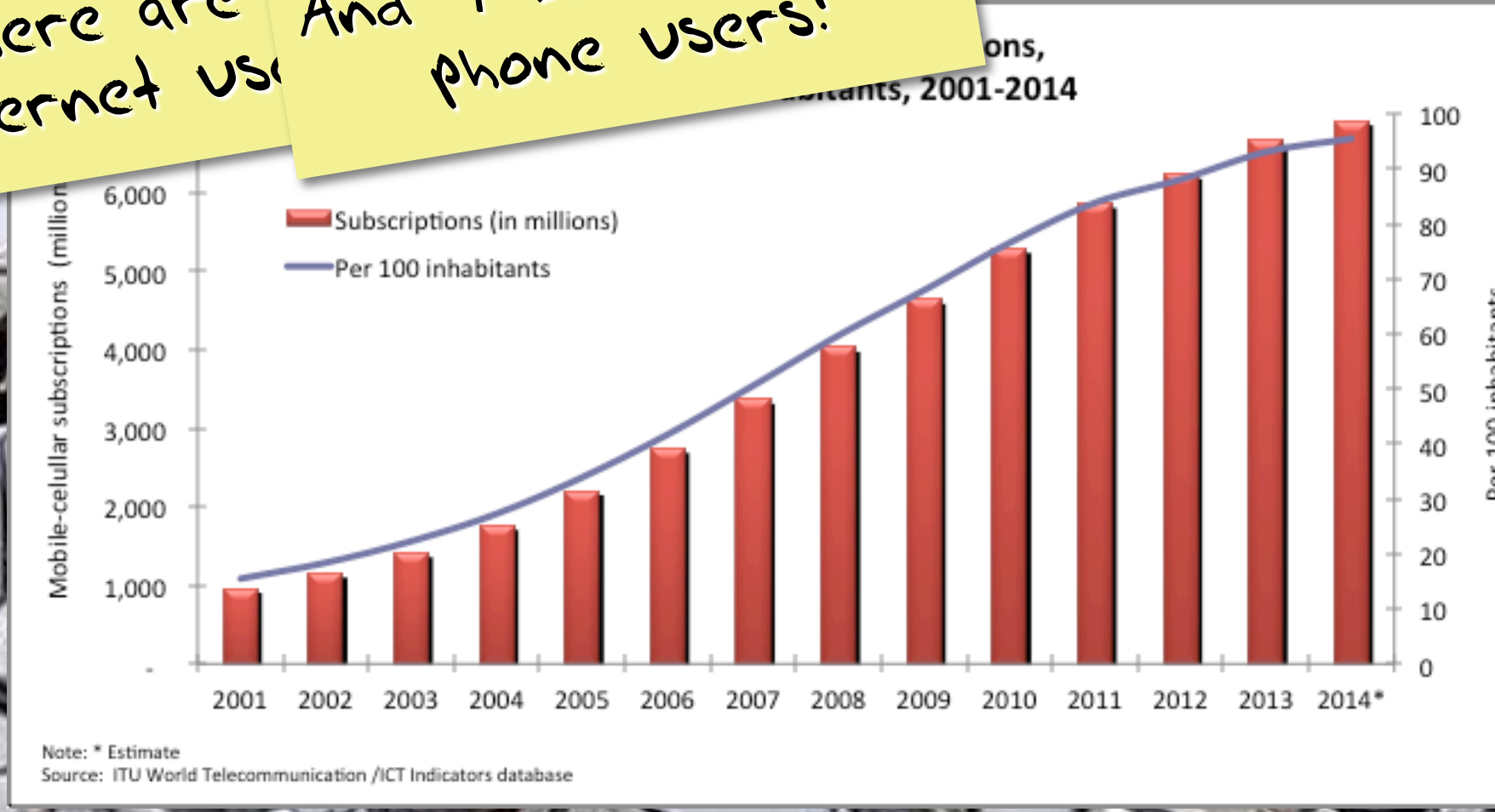


http://www.itu.int/ITU-D/ict/statistics/

Counting Users...

There are
internet use

And 7 billion mobile phone users!

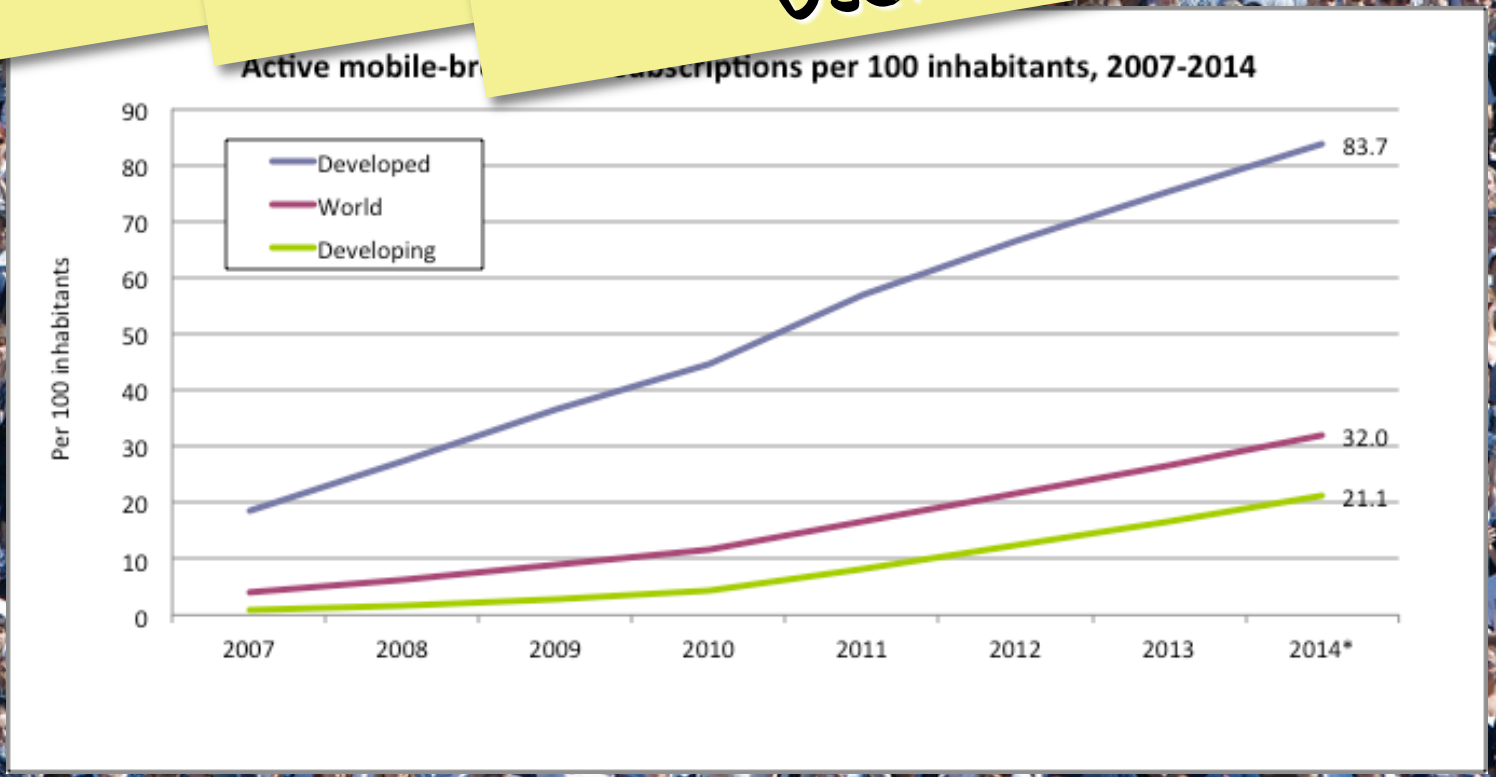


Counting Users...

There are
internet us

And 7

And 2.3 billion
mobile internet
users!



Source: Generation Research

Counting Platforms

Mobiles are now 40÷ of all visible devices

4.3%

http://statcounter.com/

Mobile Production Numbers

2014: 1.5 billion 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

Who's playing

Android

- 84% of all smartphone shipments in 2014
- Multi-vendor adoption
- Android also extending into tablets and large screens

Apple iPhone / iPad

- 12% of all smartphone shipments in 2014
- Revenues for Apple: $182B in 2014

Windows

- 3% market share
- Mostly Lumia models with Nokia

It's all about the Money

International New York Times

BUSINESS DAY

How, and Why, Apple Overtook Microsoft

JAN. 29, 2015

Common Sense

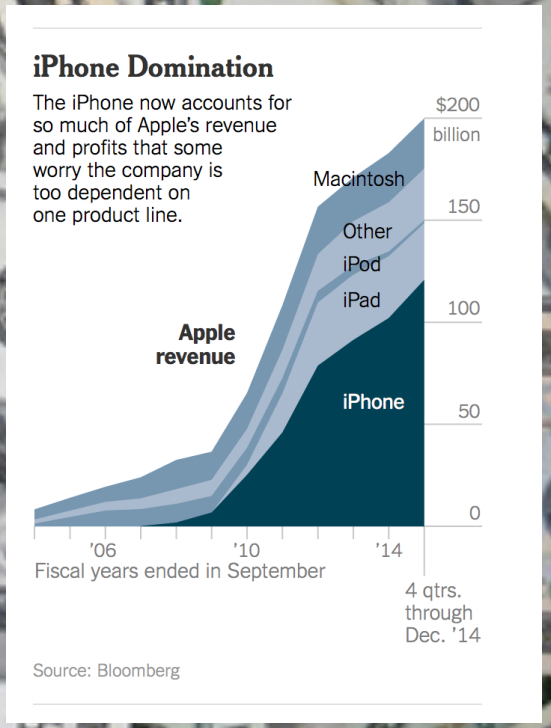
By JAMES B. STEWART

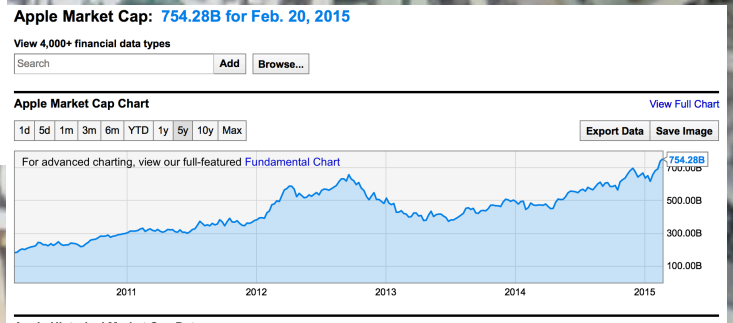
When Microsoft stock was at a record high in 1999, and its market capitalization was nearly $620 billion, the notion that Apple Computer would ever be bigger — let alone twice as big — was laughable. Apple was teetering on bankruptcy. And Microsoft's operating system was so dominant in personal computers, then the center of the technology universe, that the government deemed the company an unlawful monopoly.

This week, both Microsoft and Apple unveiled their latest earnings, and the once unthinkable became reality: Apple's market capitalization hit $683 billion, more than double Microsoft's current value of $338 billion.

At Apple's earnings conference call on Tuesday, its chief executive, Timothy D. Cook, called the quarter "historic" and the earnings "amazing." Noting that Apple sold more than 34,000 iPhones every hour, 24 hours a day, during the quarter, he said the sheer volume of sales was "hard to comprehend."

Apple earned $18 billion in the quarter — more than any company ever in a single quarter — on revenue of $75 billion. Its free cash flow of $30 billion in one quarter was more than double what IBM, another once-dominant tech company, generates in a full year, noted a senior Bernstein analyst, Toni Sacconaghi. The stock jumped more than 5 percent, even as the broader market was down.



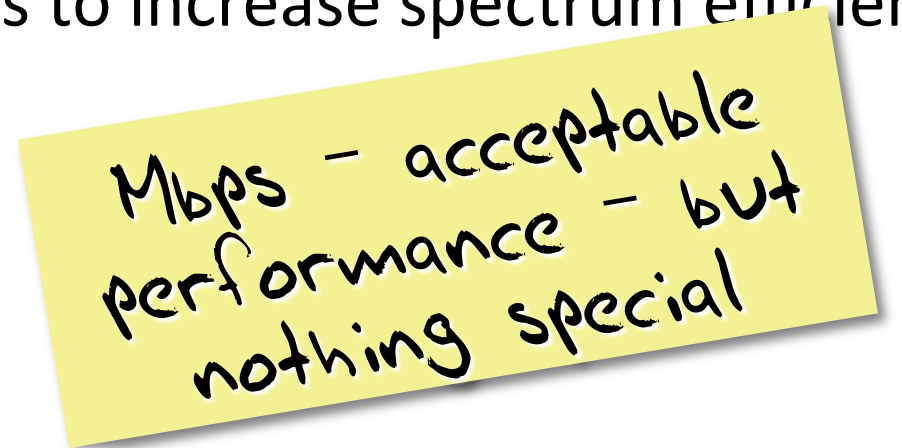


Technology for Mobility

3G: HSPA

High Speed Packet Access – an evolution of W-CDMA

- Peak data rates 20Mbps downlink, 5.8Mbps Uplink
- Shared channels, shorter Transmission Time Intervals, adaptive use of 16QAM and 64QAM access to increase spectrum efficiency



4G: LTE

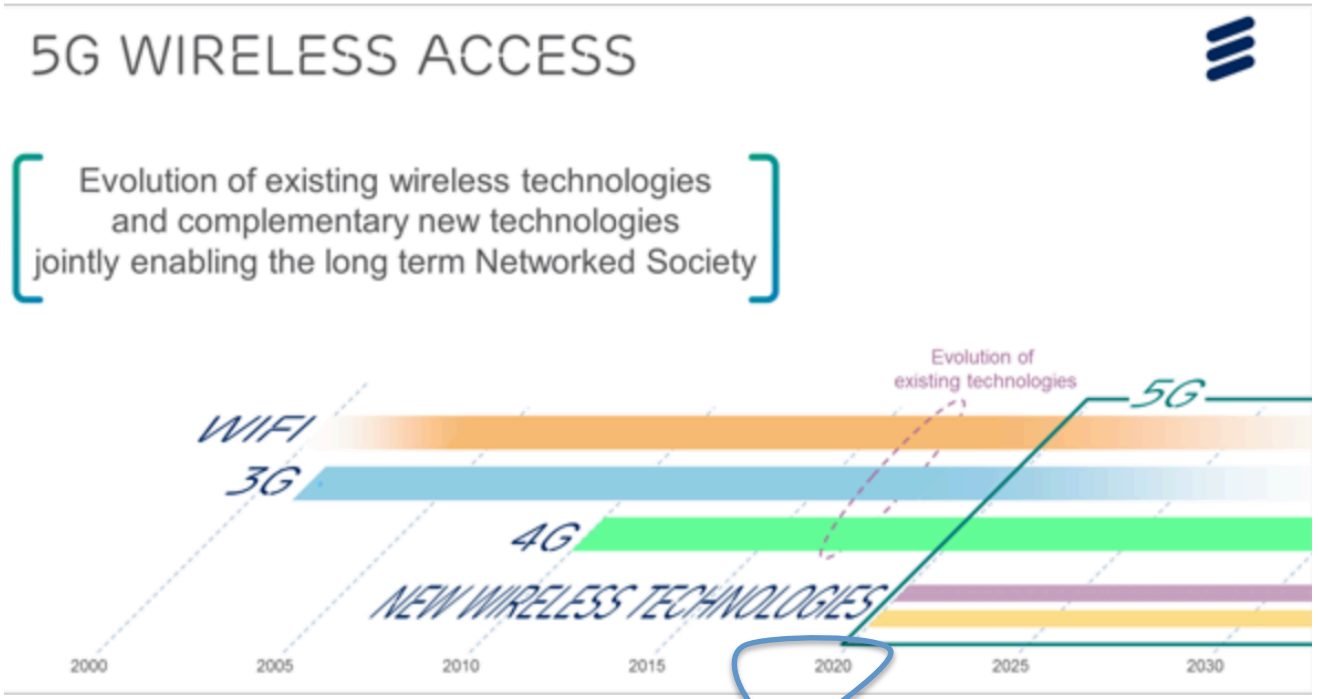
- Theoretical maximum peak speed* 326Mbps
- Practical achievable speeds of 4 – 12 Mbps
- All IP internal architecture

Now it gets interesting!

* Probably assuming the absence of many of the laws of physics as we understand them ☺

5G:5Gps

5Gbps downloads! *

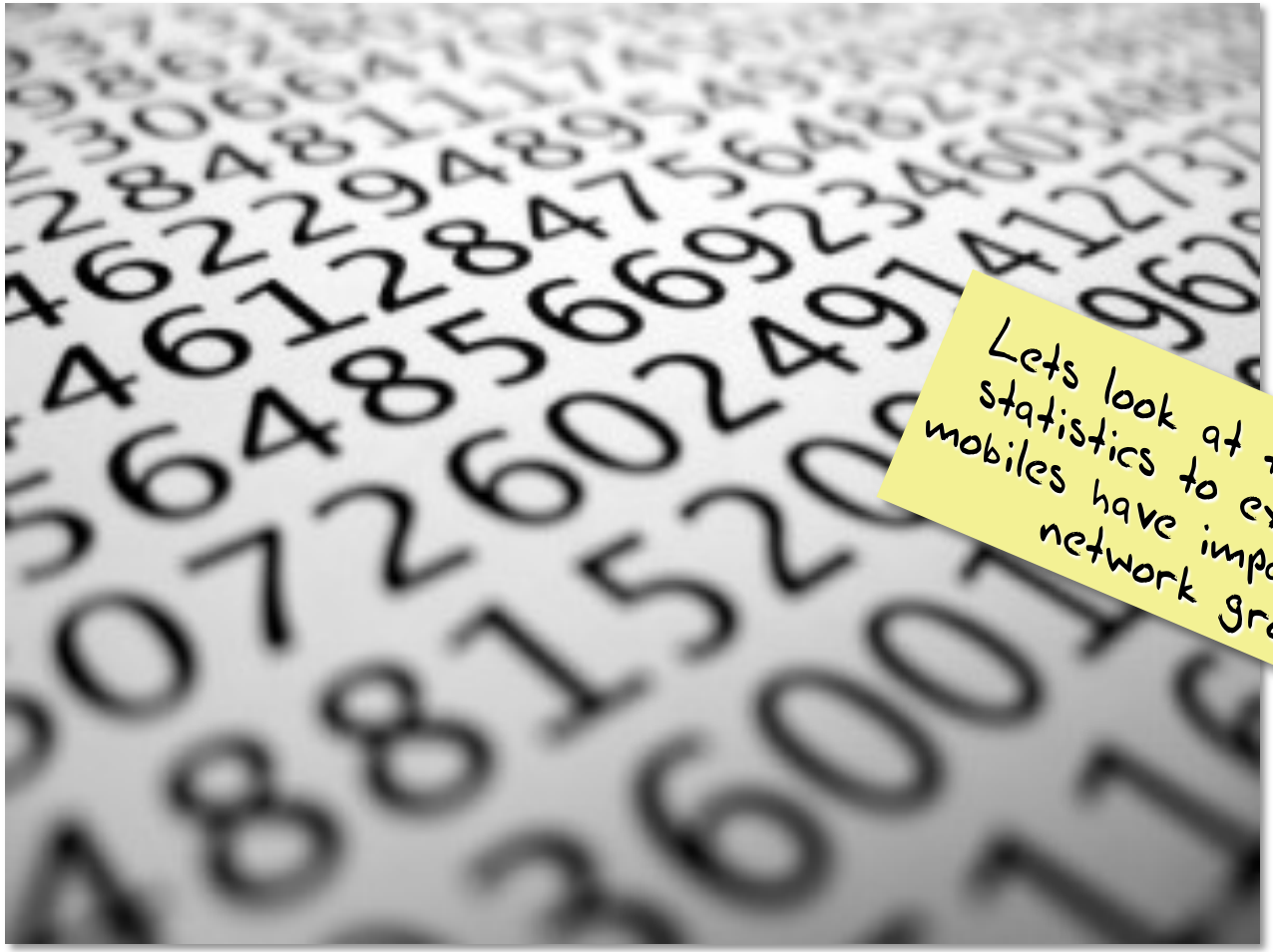


Yes, that's 2020!

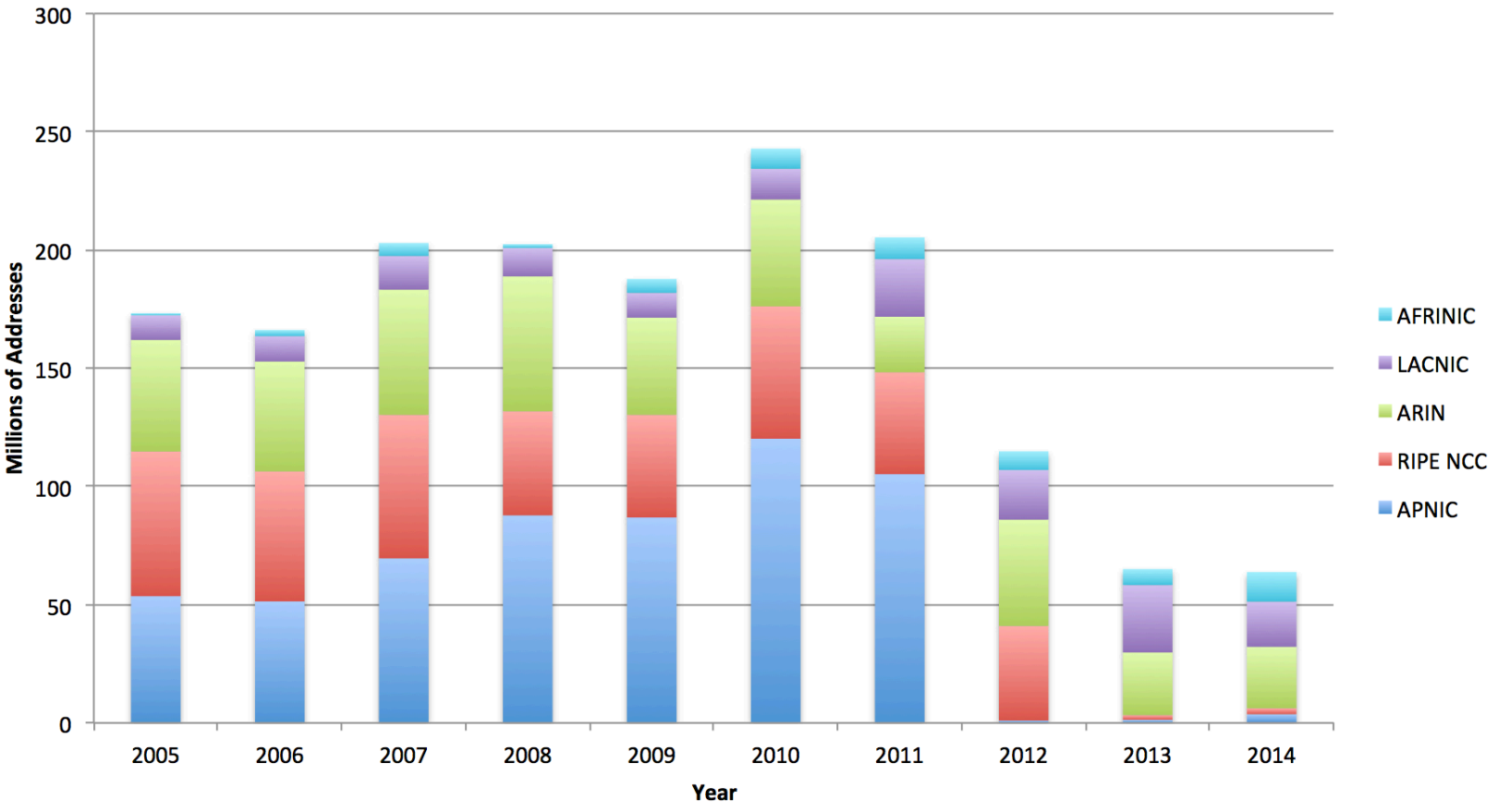
* In the lab at 15Ghz

And at that frequency it means that the signal is going to be absorbed by almost anything solid!

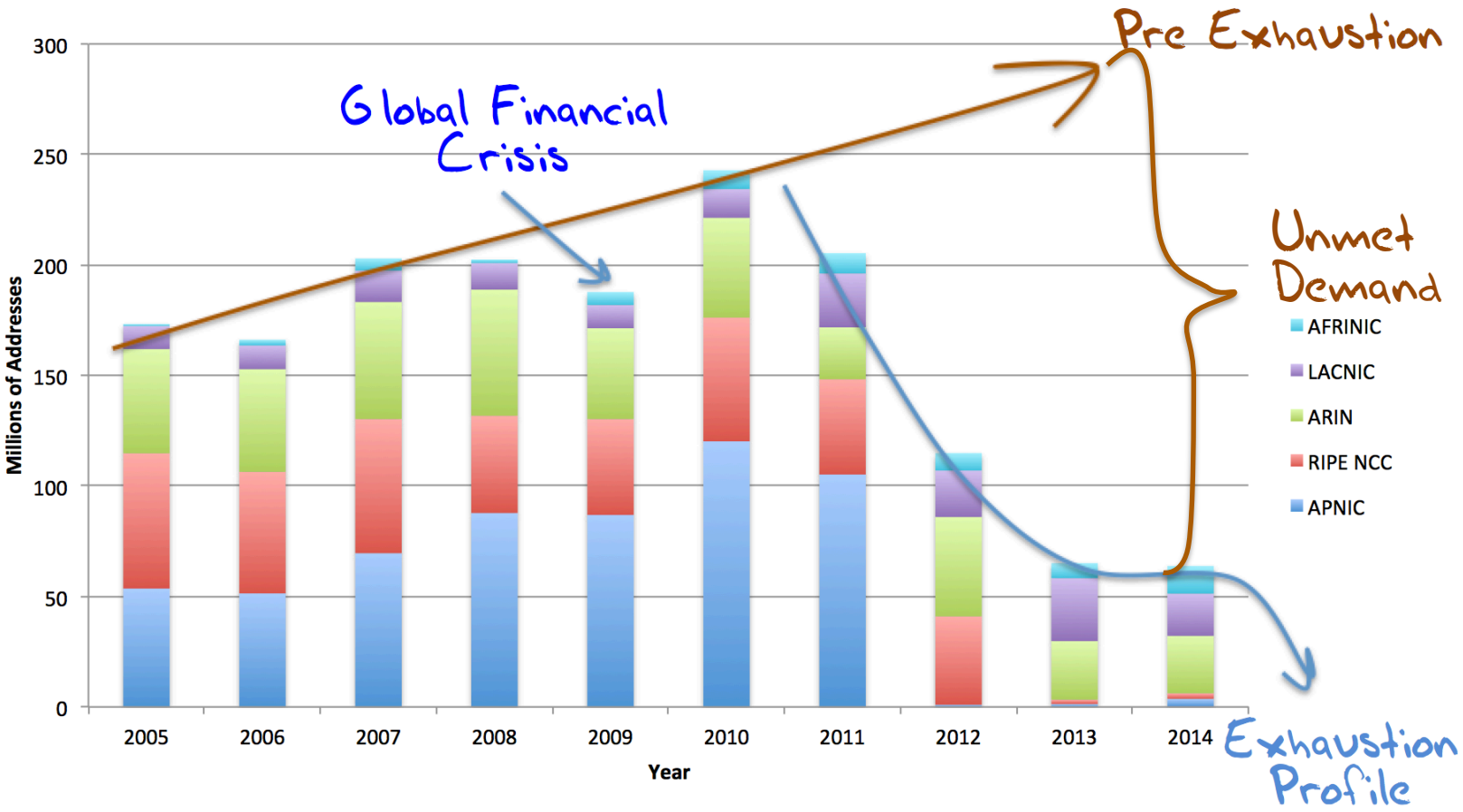
By The Numbers



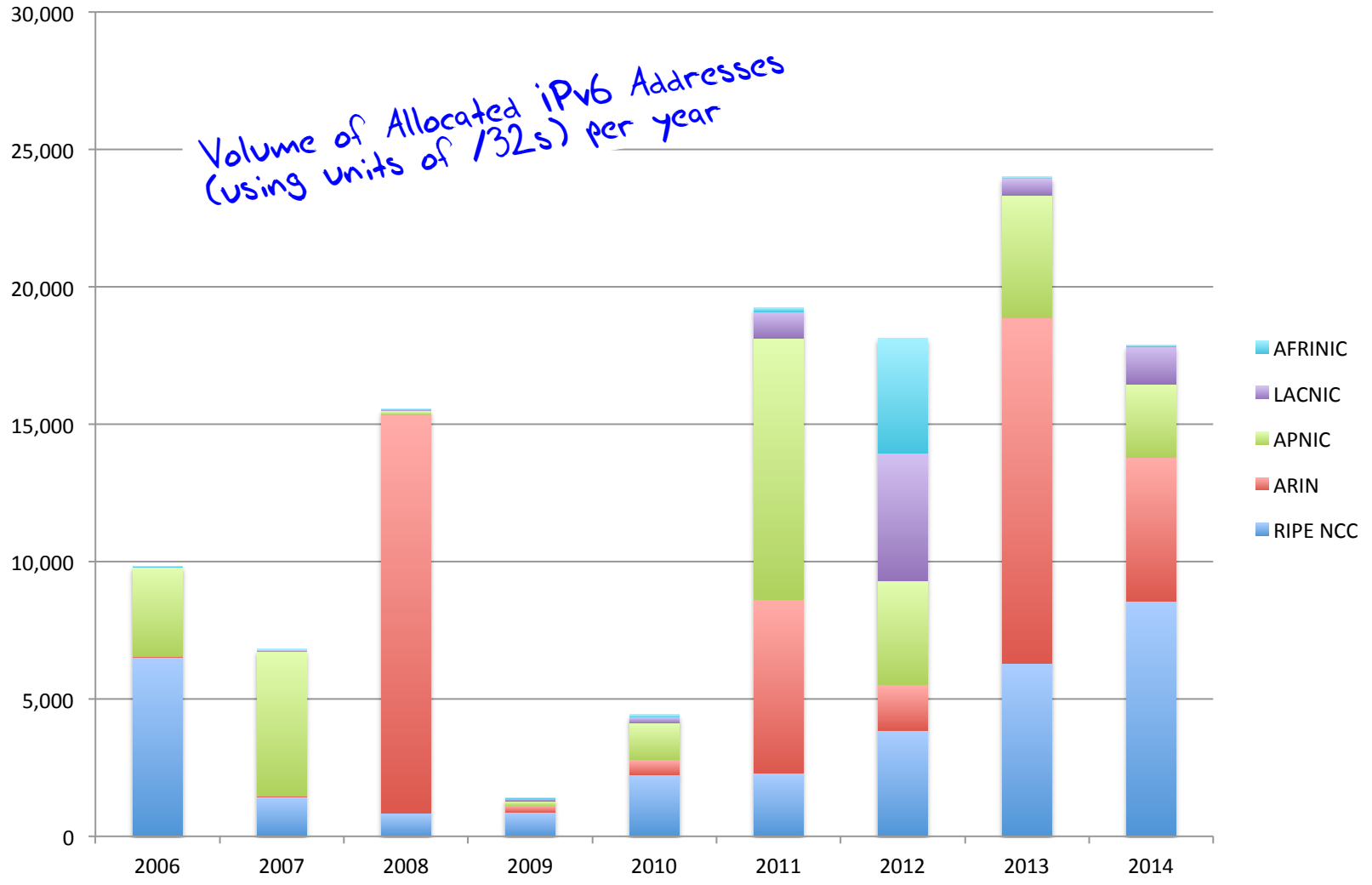
IPv4 Allocations



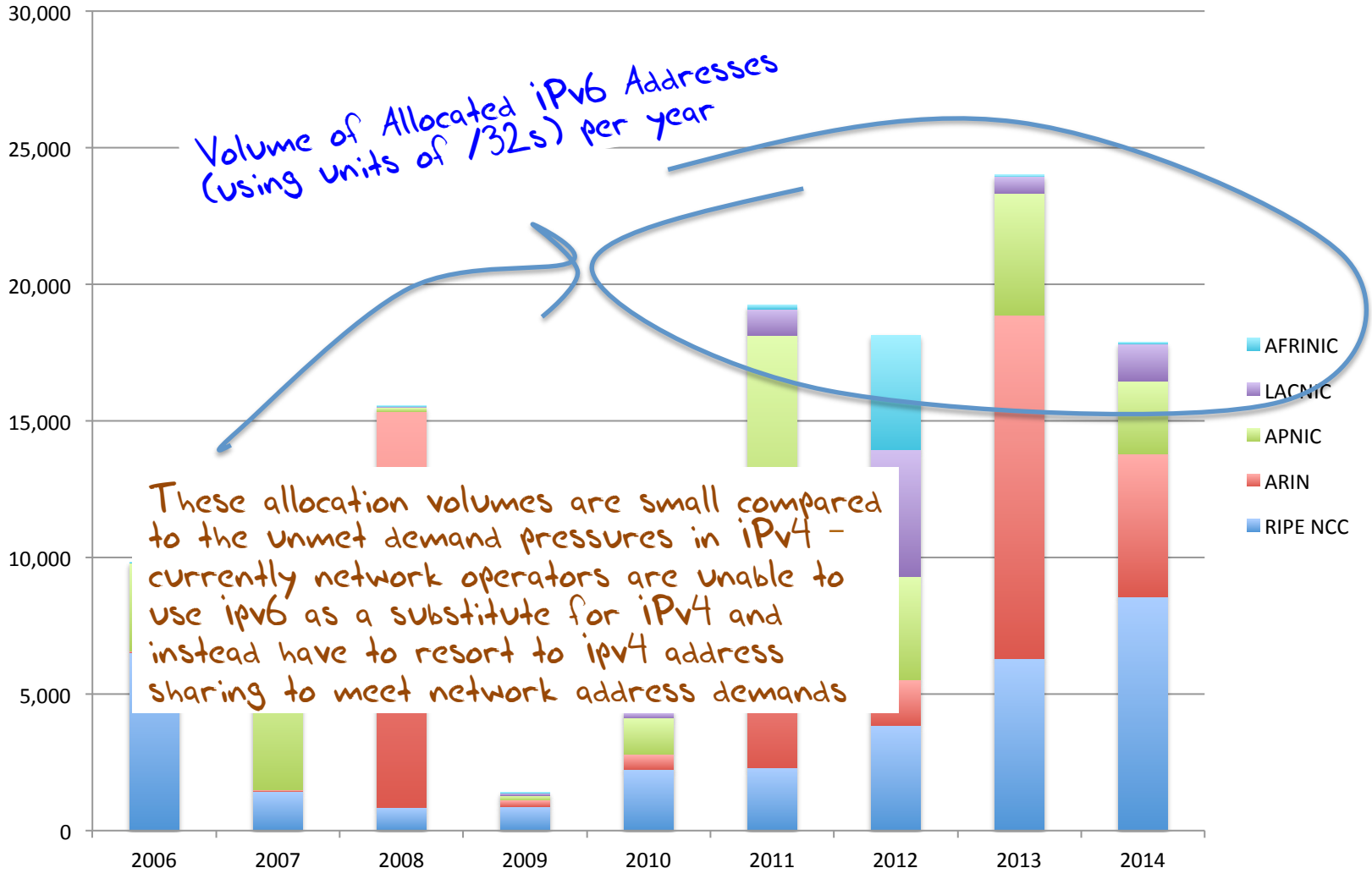
IPv4 Allocations



IPv6 Allocated Addresses



IPv6 Allocated Addresses



Where are we headed?

Where are we headed?

Up until 2013 mobile Internet had been constructed exclusively using IPv4 infrastructure

Today's mobile internet continues to grow by extensive use of NATs in the operator's network

This cannot continue indefinitely

The Mobile Transition

- The mobile industry is very heterogeneous
  - Various spectrum allocations and regulatory constraints
  - Various service objectives
  - Various operator business objectives (incumbent vs challenger)
  - Different objectives from handset suppliers vs network operators

- The approach to IPv6 transition is highly fragmented across the operators
- The result is the deployment of various permutations of transitional IPv4 and IPv6 support in the mobile environment:
  - Native mode dual stack over LTE: e.g. Verizon
  - IPv4 layered over native IPv6, 464 XLAT: e.g. T-Mobile
  - IPv6 tunelled over IPv4

The Mobile Transition

- The mobile industry is very
  - Very

This diversity implies that many operators have unique requirements for network and device capabilities

Which implies the imposition of cost and complexity for the service operators through customization of technologies

Which all adds to the cost of service to consumers

Nobody wins from this fragmented transition scenario!

- ...ntations of transitional
  - ...mobile environment:
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It's not just Transitional Complexities

It’s also Spectrum issues:

- The traditional mobile providers operate with exclusive access to spectrum within defined locales (with associated license costs)
- Alternate access competitors can operate in unlicensed spectrum with WiFi network services
- Handsets are also entering the space with platform services that support connection agility across diverse access networks
- Mobile incumbents are being forced to chase this alternate access market or risk losing market share

Where now for Mobiles?

- Mobile Operators are being pushed into undistinguished utility roles
  - No more voice premiums
  - Erosive pressure on data service margins
- Consumers want more for less
  - Higher download speeds
  - Larger data caps
  - Lower premiums
- Exclusive Use spectrum is too expensive
  - Are they pricing themselves out of the consumer market?
  - WiFi access and application handover approaches are placing pressure on the traditional mobile operator's margins
- The underlying problem here is that the mobile network operator has lost control of the access device
  - And there is no way back!
  - The device vendor and its applications are charting a course that is in direct conflict with the mobile network operator's desires, and managing to monetize this far more efficiently than the mobile network operator

Thank You!

Questions?