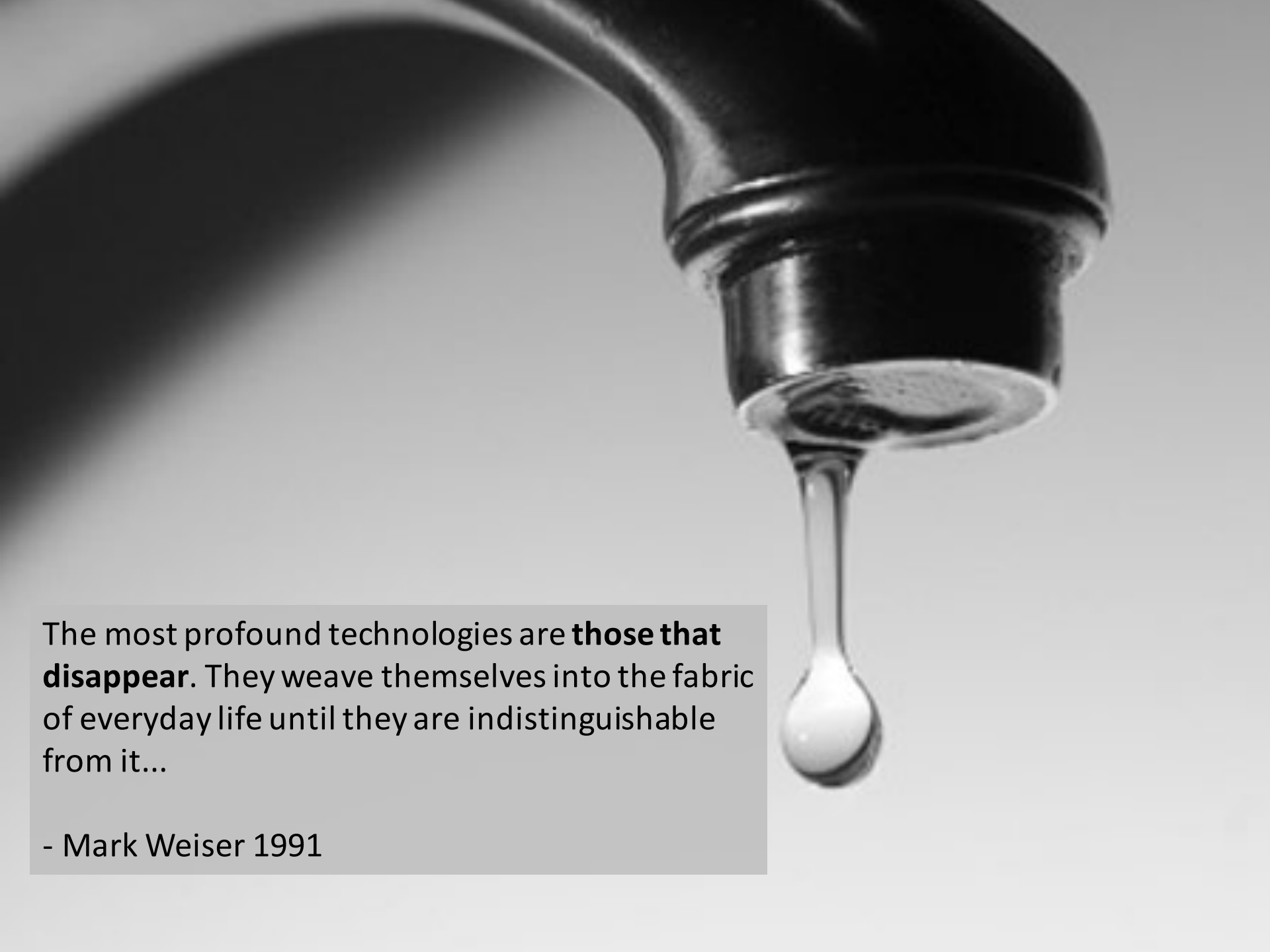
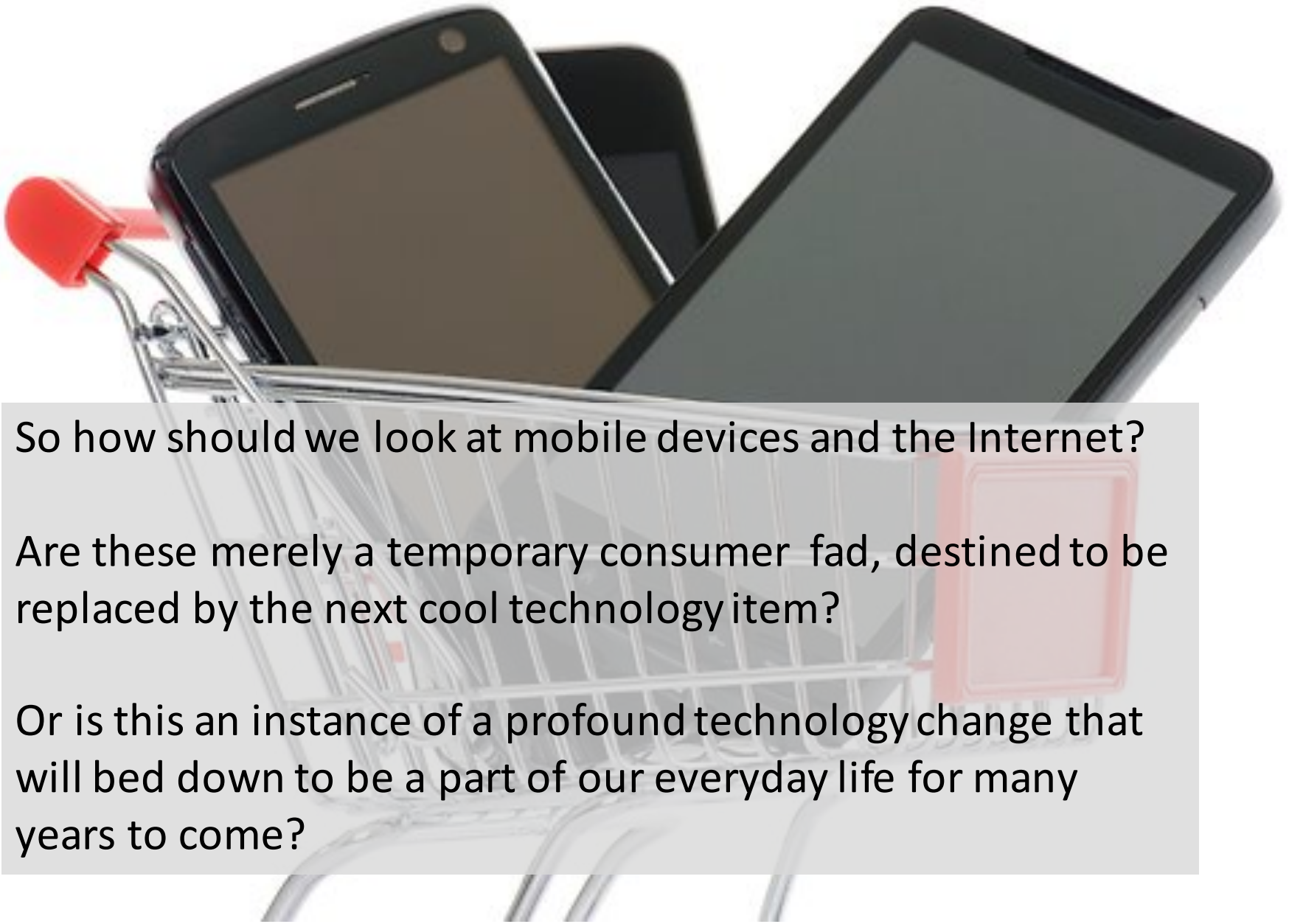
Today's Mobile Internet

Geoff Huston,
APNIC



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



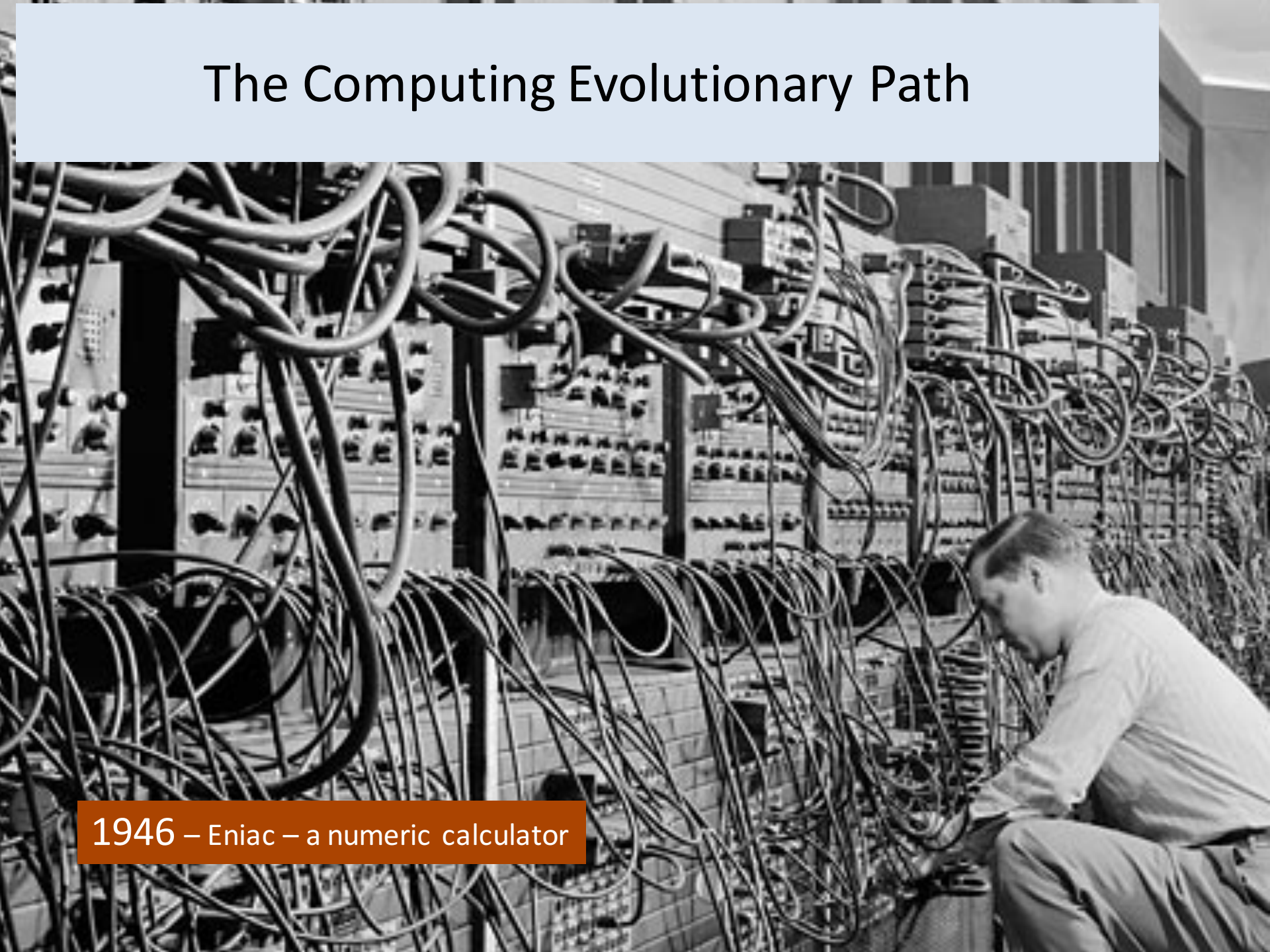
So how should we look at mobile devices and the Internet?

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?

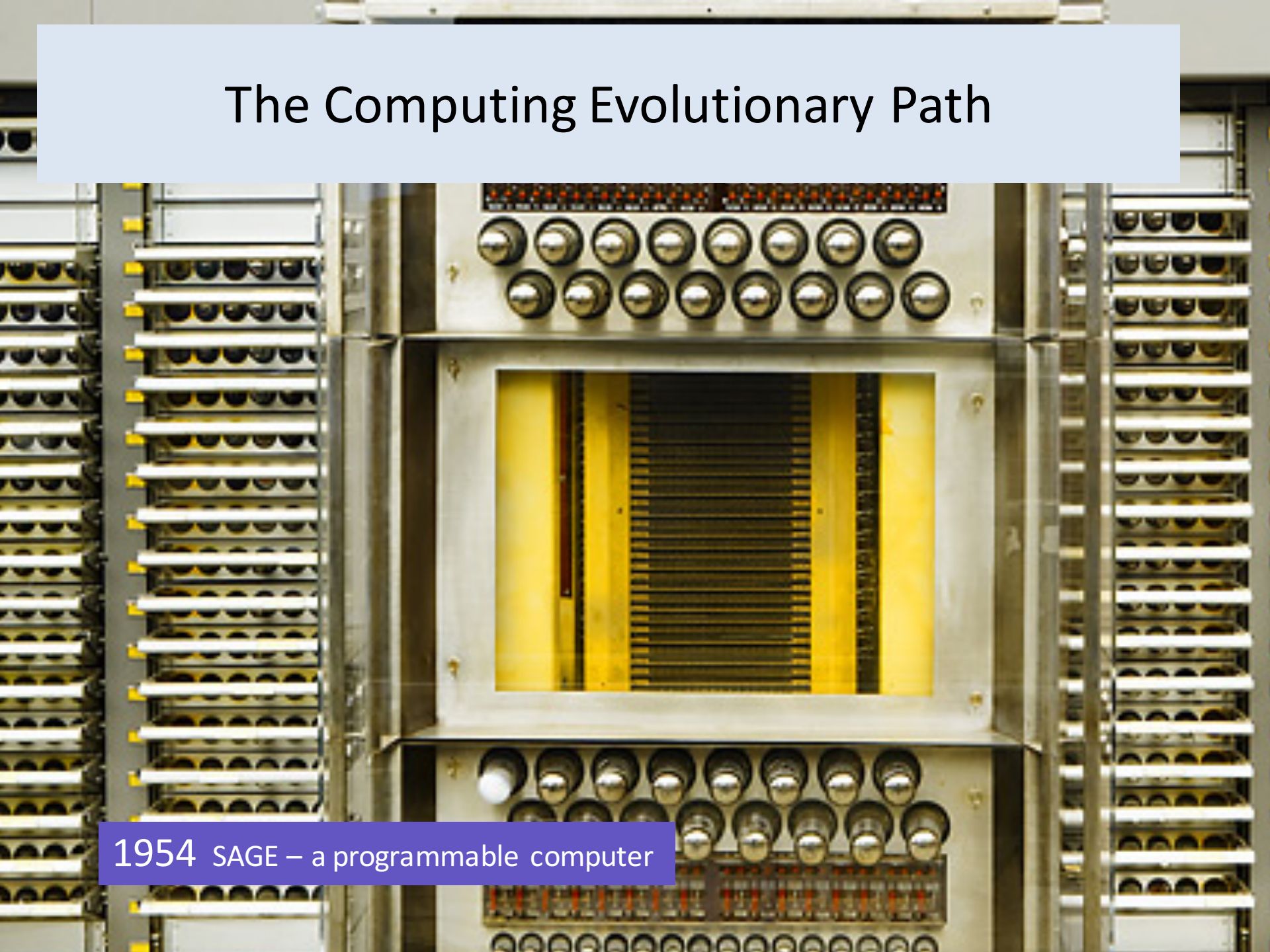
To try and answer this, lets try and put this question into some broader context of the evolution the computer and communications enterprise

The Computing Evolutionary Path



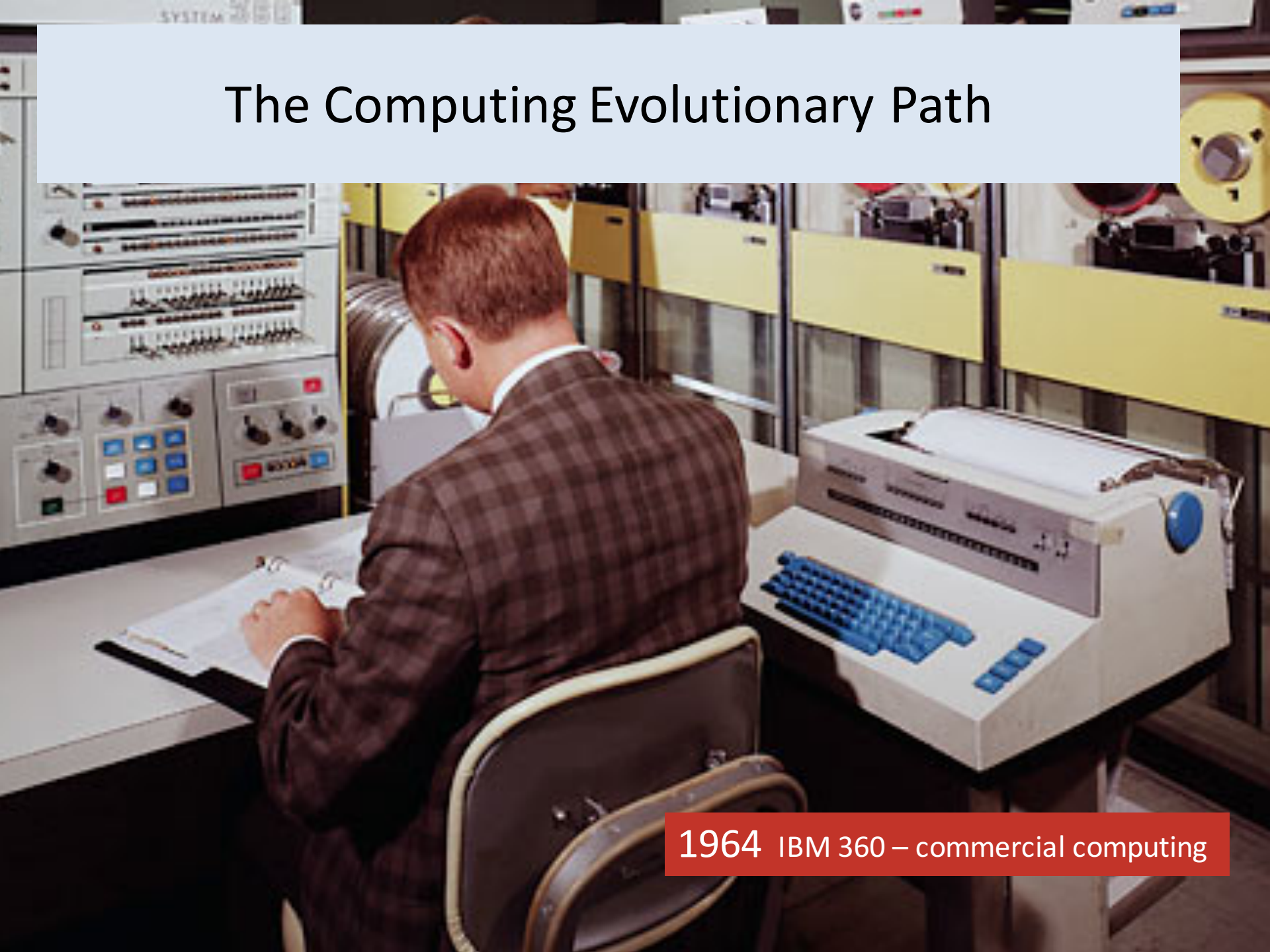
1946 – Eniac – a numeric calculator

The Computing Evolutionary Path



1954 SAGE – a programmable computer

The Computing Evolutionary Path



1964 IBM 360 – commercial computing

The Computing Evolutionary Path

1976 CRAY-1 – “super” computing

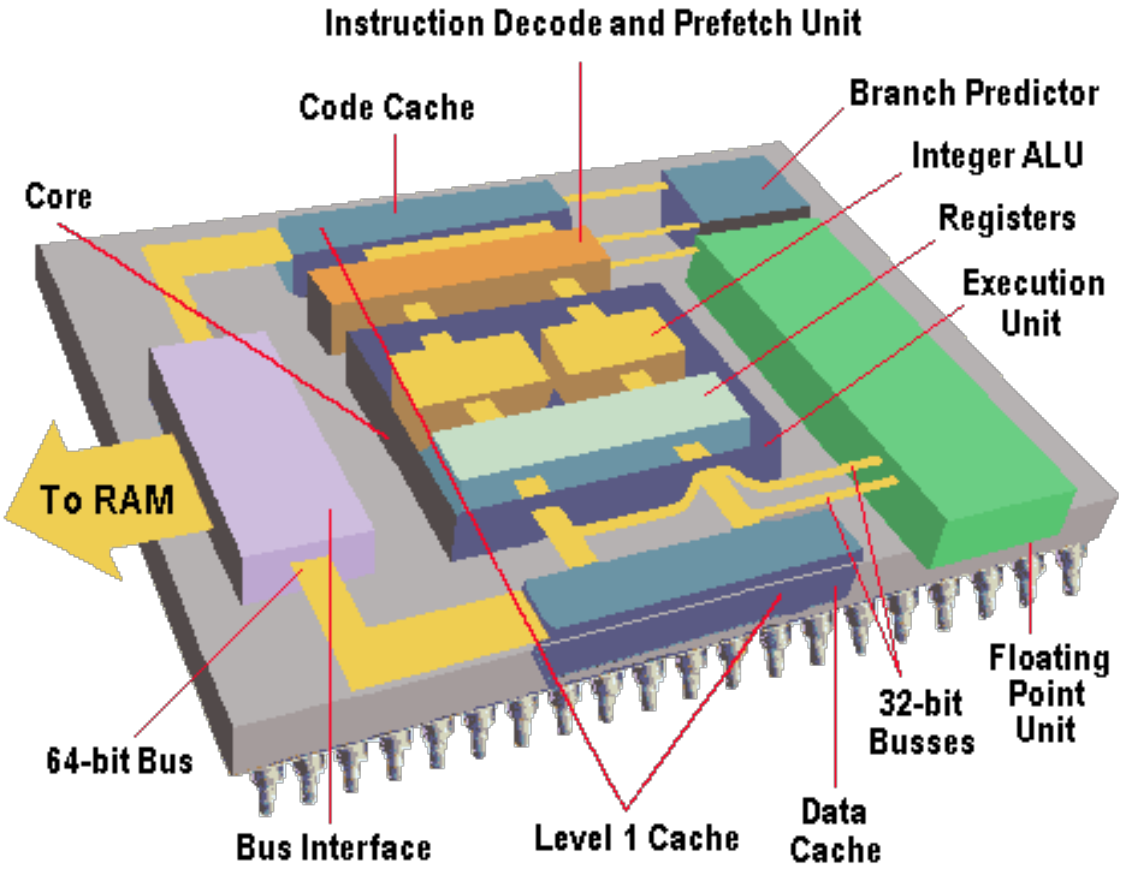
The Computing Evolutionary Path

A fork in the road:
1976 – Apple-1 “personal” computing

The Computing Evolutionary Path

1984 – Mac - visual computing

The Computing Evolutionary Path

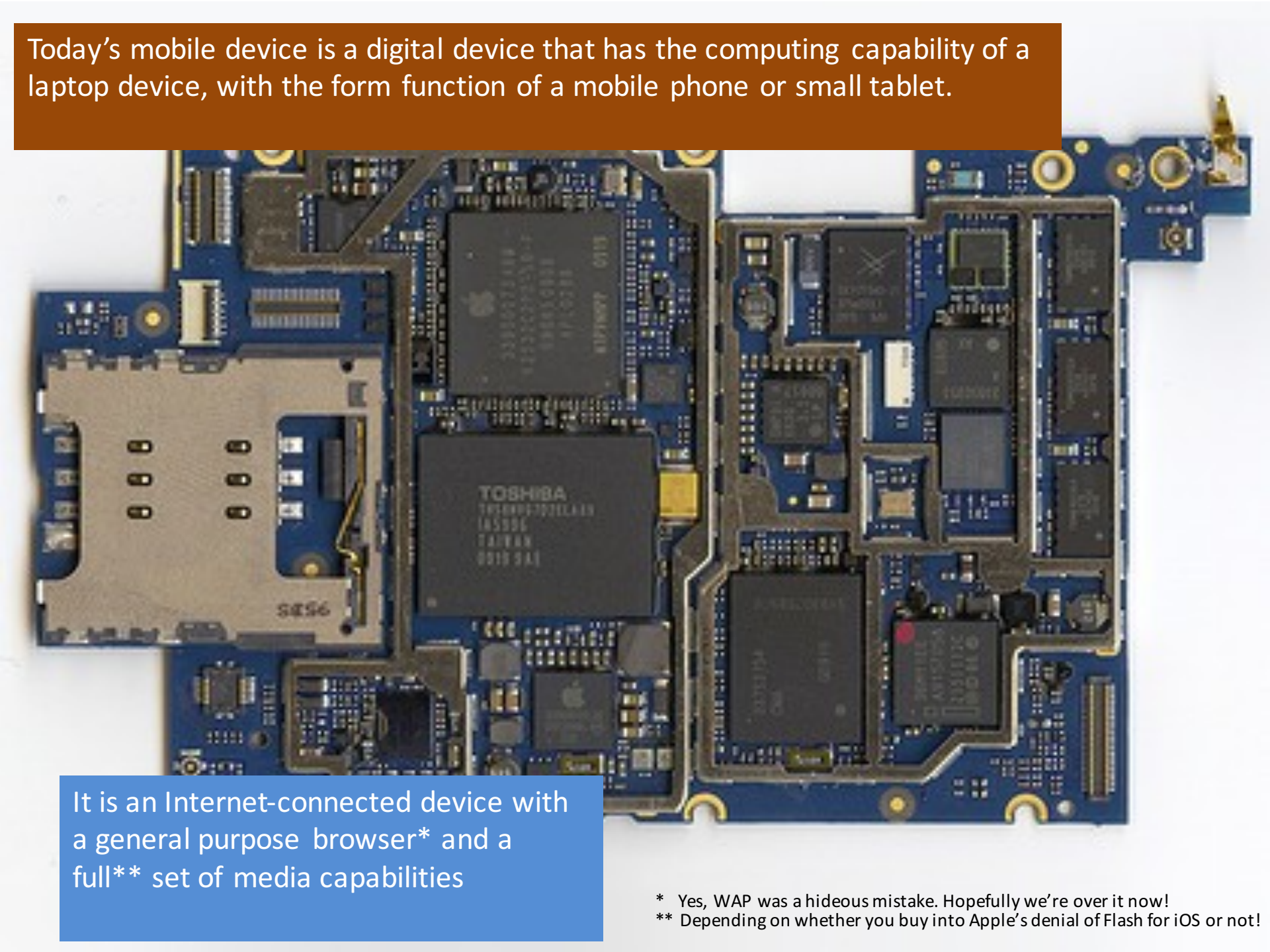


1993 – Intel - Pentium processor

The Computing Evolutionary Path

2007 – Apple's iPhone

Today's mobile device is a digital device that has the computing capability of a laptop device, with the form function of a mobile phone or small tablet.



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

* Yes, WAP was a hideous mistake. Hopefully we're over it now!
** Depending on whether you buy into Apple's denial of Flash for iOS or not!

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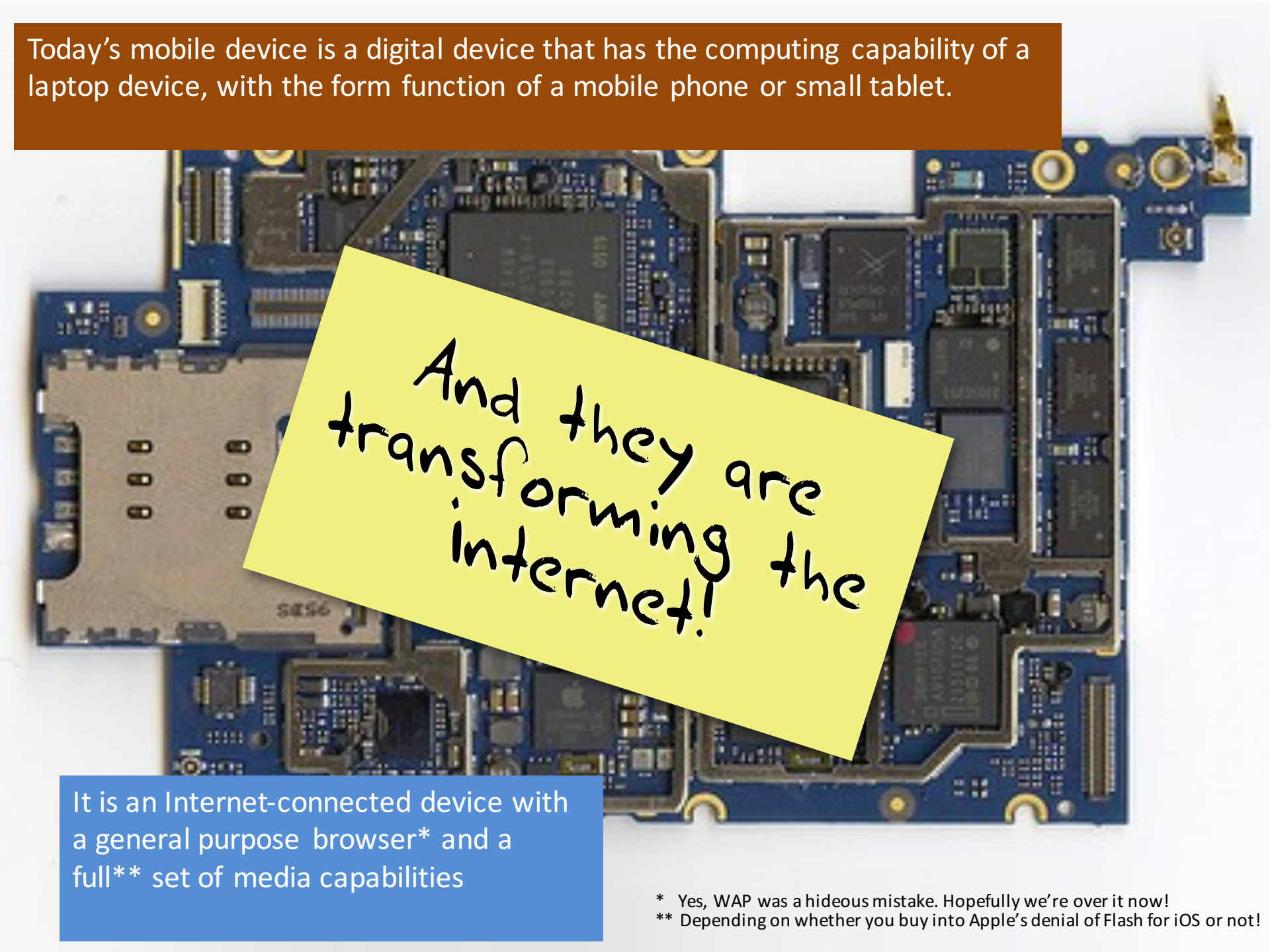

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PLACED UPON THE HORIZON (CASTING SHADOWS)
MASSIVE CHANGE
The Future of Global Design
WORLD PREMIERE
October 2, 2004 to January 3, 2005

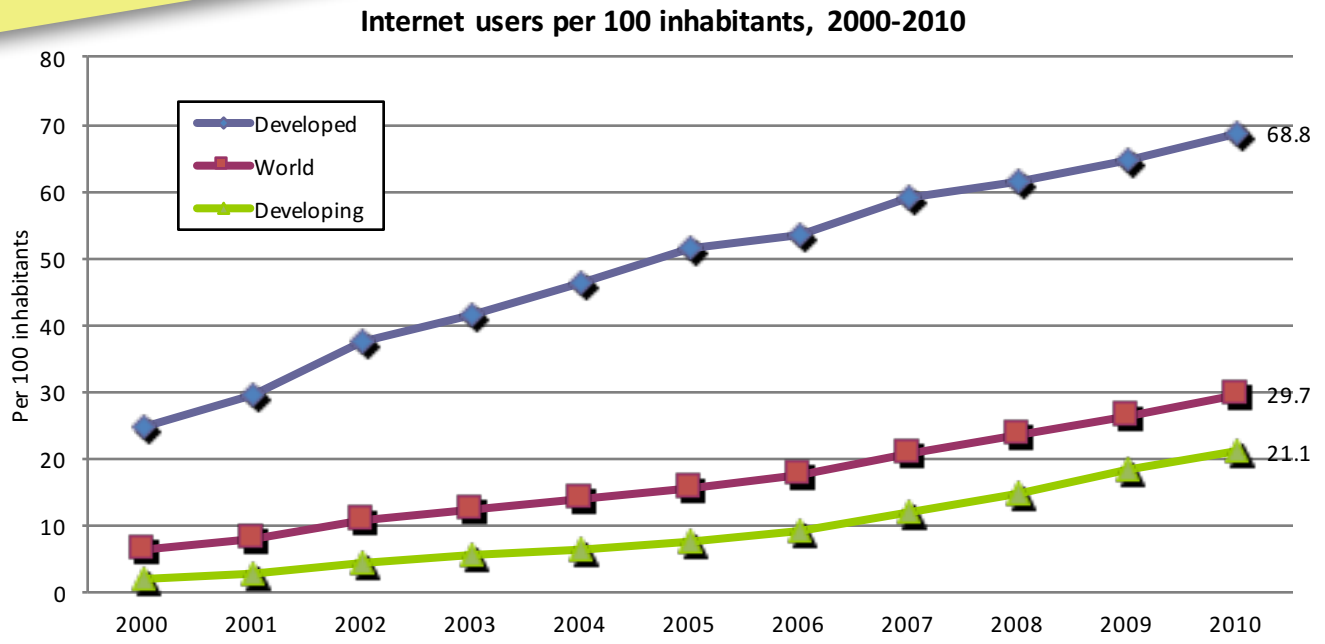

With desktop devices the Internet was a dedicated activity
reliable power
lighting
privacy
large view screens
dedicated worktop
wired bandwidth
dedicated chair

The Internet is now anywhere and everywhere

Its trivial, commonplace and blends into all our activities

Counting Users...

There are 2 billion internet users today

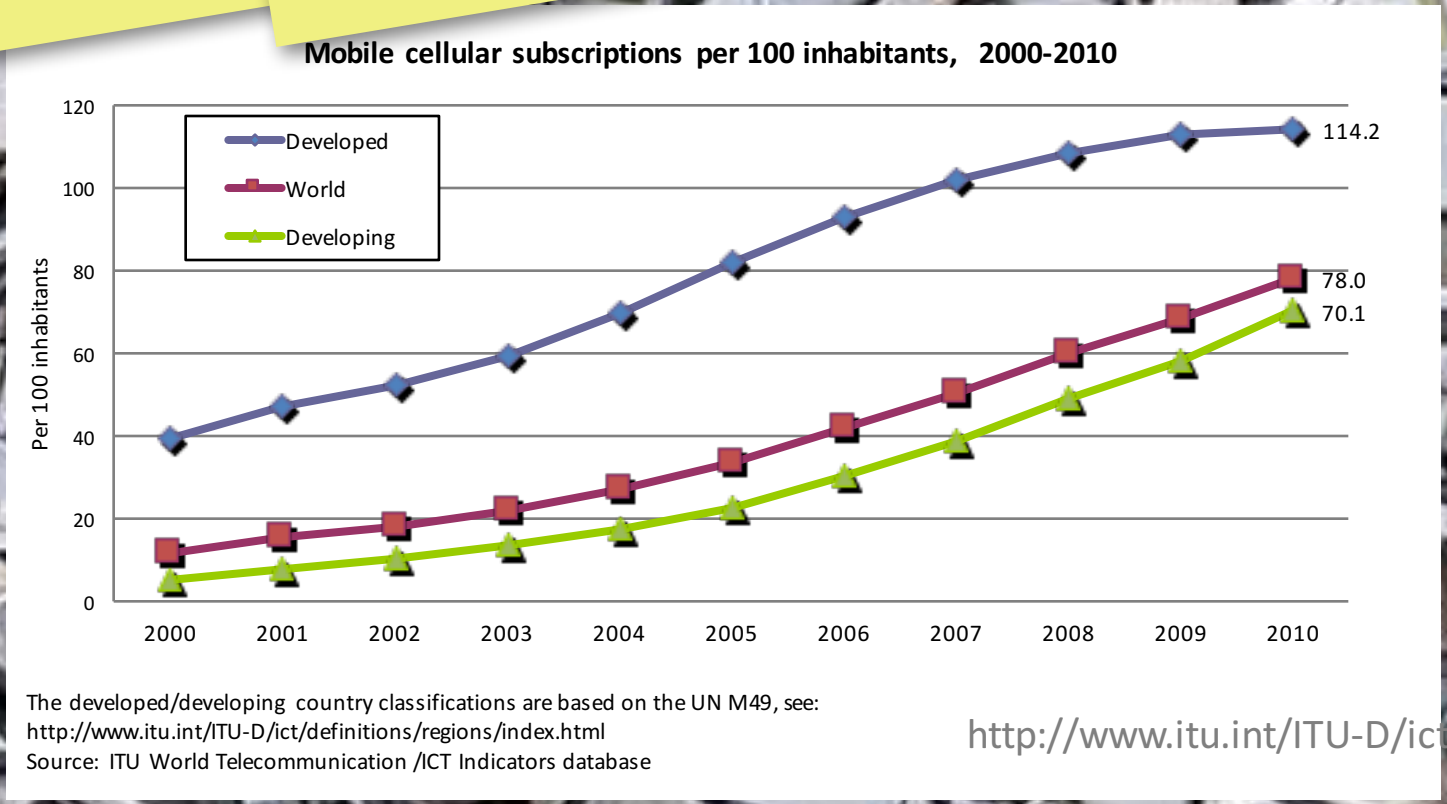


http://www.itu.int/ITU-D/ict/statistics/

Counting Users...

There are internet use

And 5 billion mobile phone users!



The developed/developing country classifications are based on the UN M49, see:
http://www.itu.int/ITU-D/ict/definitions/regions/index.html
Source: ITU World Telecommunication /ICT Indicators database

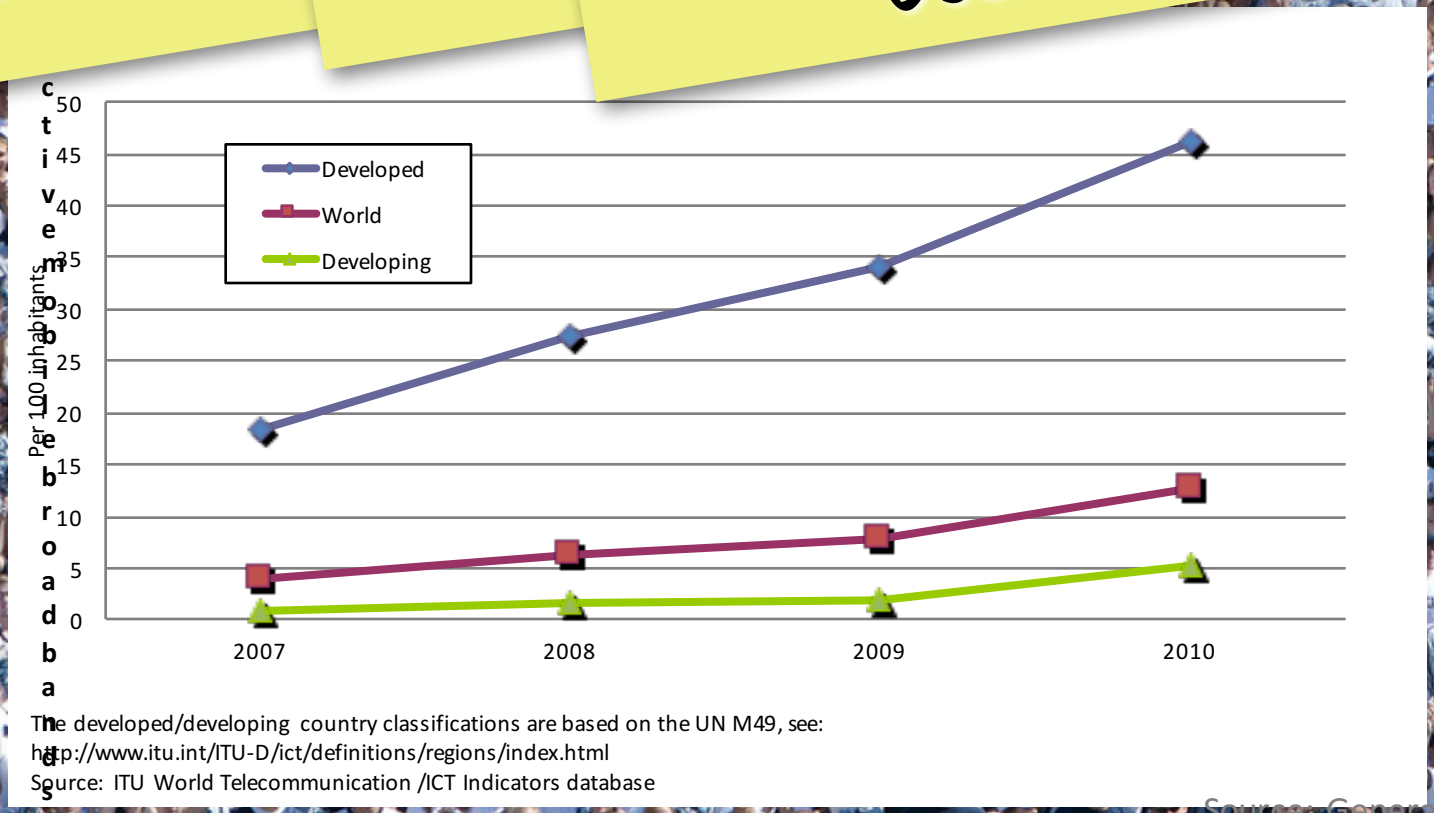
http://www.itu.int/ITU-D/ict/statistics/

Counting Users...

There are [illegible] internet use[illegible]

And 5[illegible]

And 630 million mobile internet users!



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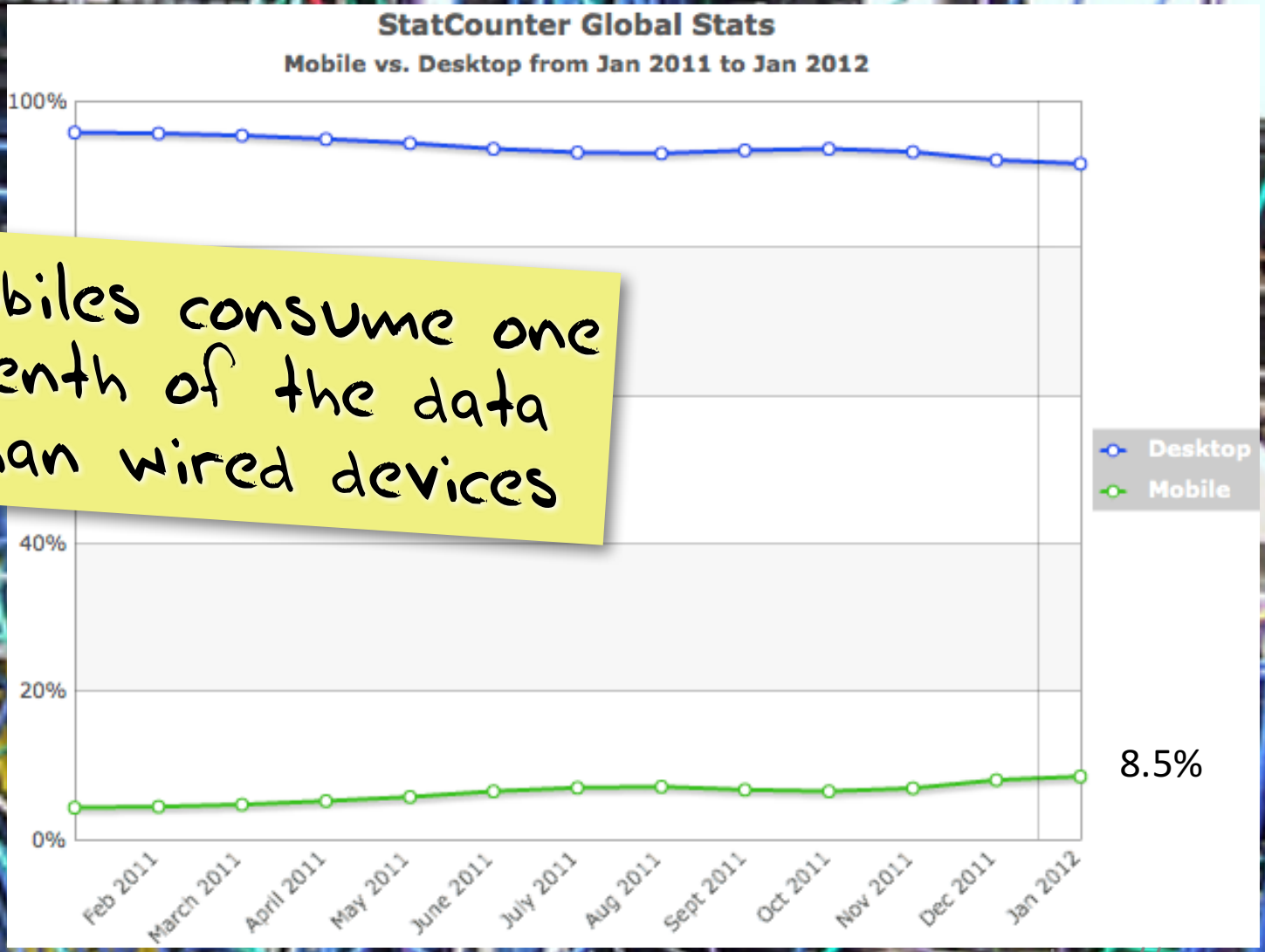
Source: Generator Research

Counting Bytes



Mobiles consume one tenth of the data than wired devices

http://statcounter.com/

Production Numbers

2011: 270 million 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 is playing

Android

- 19% of all smartphone shipments in 2011 – projected to reach 25% in 2015
- Multi-vendor adoption
- Android also extending into tablets and large screens

Apple iPhone / iPad

- 18% of all smartphone shipments in 2011 – projected to remain steady through to 2015
- High revenue margins for Apple: $27B in 2011 to (proj.) $39B in 2015

RIM Blackberry

- highest revenue margin product (44%)
- Likely not to keep pace with market growth in the next 4 years
- 2011 service disruptions have accelerated decline in market share

Nokia

- 35% of all smartphones in 2011 – likely to drop to 30% in 2015
- Open question whether the Windows Phone OS will turn around Nokia's fortunes

Sales Projections by OS

	Units Shipped (M)				
	2011	**2012**	**2013**	**2014**	**2015**
Android	50	68	88	108	125
Apple iOS	47	60	72	83	92
RIM	43	49	55	58	60
Symbian	94	100	97	85	67
Windows	14	32	54	81	110
Other	21	26	30	34	36
	269	**335**	**396**	**449**	**490**

Source: Generator Research

THE WALL STREET JOURNAL.

IPHONE, IPAD SALES SET RECORDS

Apple profit jumps, shares soar

YUKARI IWATANI KANE
IAN SHERR

APPLE swept aside growing competition from smartphones and tablets running on Google's Android operating system to more than double quarterly earnings and post surging revenues on strong iPhone and iPad sales.

Third-quarter profit rose to $US7.31 billion ($6.85bn), from $US3.25bn a year earlier.

Revenue soared 82 per cent to $US28.57bn. Gross margins rose to 41.7 per cent from 39.1 per cent a year ago.

Apple shares jumped 4.8 per cent to $US395.34 in after-hours trading on the Nasdaq market after ending the day at $US376.85.

Apple's results come even as its wide berth in markets that it has dominated — smartphones and tablet computers — has diminished.

The company has seen increasing competition from rivals such as Samsung, Motorola and HTC, prompting several intellectual property disputes. Many rival devices run on Google's Android.

Apple finance chief Peter Oppenheimer described the results achieved on record iPhone and iPad sales, as "staggering".

Apple chief executive Steve Jobs is on medical leave.

Apple issued a conservative financial forecast for its current quarter, which ends in late September, as analysts said they were unconcerned because the company was entering a strong selling season.

Apple plans to release new products — such as a new version

Steve Jobs remains active at Apple despite being on medical leave, say people working at the company

Apple's Numbers

iPhones:

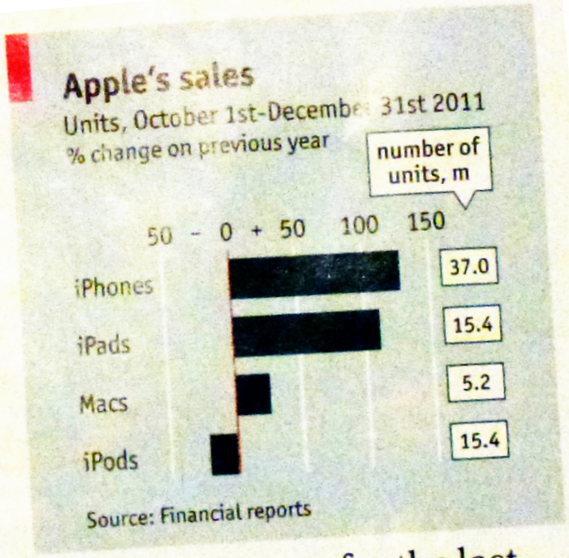
- Q3 2010 : Apple shipped 8.4M iPhones
- Q3 2011 : Apple shipped 20.3M iPhones
  - Added 42 carriers and 15 countries in the quarter!

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

.e's Numbers



Apple's earnings for the last three months of 2011 surpassed all expectations. It racked up a record $46.3 billion in sales for the quarter and more than doubled its net profit, to $13.1 billion. Apple's share price jumped on the news, vaulting it once again over Exxon Mobil to become (briefly) the world's most valuable listed company.

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And Q4 2011 was even bigger!

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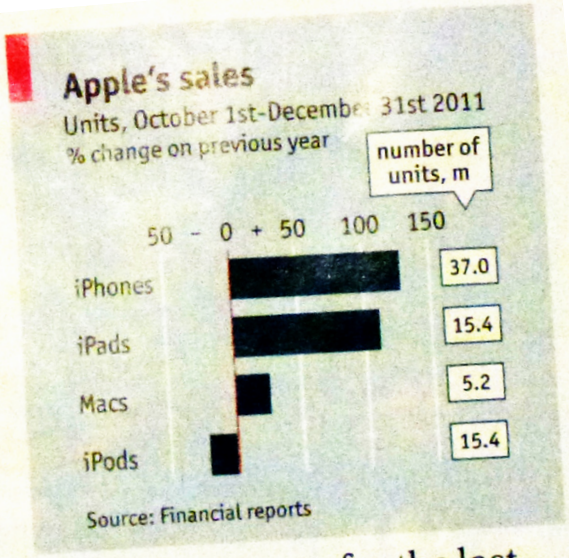

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37M iPhones

shipped 8.4M iPhones

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$13.1B profit!

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Mobiles by Money

Revenue by OS (USD, B)	2011	2012	2013	2014	2015
Android	$ 12	$ 15	$ 18	$ 19	$ 20
Apple iOS	$ 28	$ 32	$ 26	$ 39	$ 40
RIM	$ 14	$ 16	$ 16	$ 16	$ 15
Symbian	$ 16	$ 17	$ 16	$ 13	$ 10
Windows	$ 2	$ 6	$ 9	$ 13	$ 16
Other	$ 3	$ 4	$ 4	$ 4	$ 4
	$ 75	$ 90	$ 89	$ 104	$ 105

Source: Generator Research

Technology for Mobility

2G: GSM

- *Groupe Spécial Mobile* standards, developed by ETSI for second generation digital cellular networks, replacing the earlier analogue system (AMPS)
- Data Services Provided by a *General Packet Radio Service* (GPRS) sub-system
  - Data rates: typically 16 – 32kbps, with latency of ~600ms
  - Higher speeds require more timeslots from the Base Transceiver Station

2G: GSM

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- Data Services Provided by a *General Packet Radio Service* (GPRS) sub-system
  - Data rates: typically 32 – 40kbps, with latency of ~600ms
  - Higher speeds require more timeslots from the Base Transceiver Station

Kbps – suitable for WAP – just!

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

3G: HSPA

High Speed Packet A… evolution of W-CDMA

- Pea… link, 5.8Mbps Up…
- Shared channels, shorter Transmission Time Intervals, adaptive use of 16QAM and 64QAM access to increase spectrum efficiency

Mbps – acceptable performance – but nothing special

3G: HSPA+

- Evolved HSPA
  - Theoretical peak of 84Mbps downlink, 22Mbps uplink
  - Obtained by MIMO (multiple antenna technique) plus 64QAM

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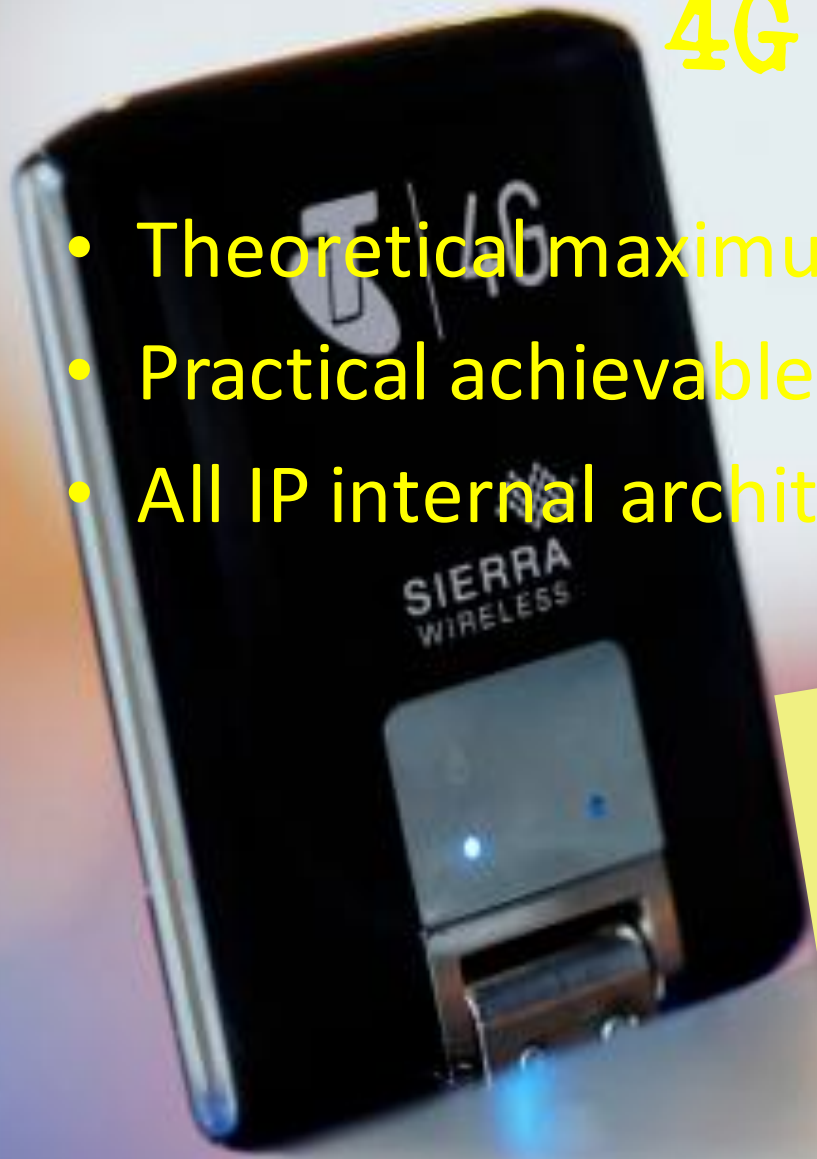
4G: LTE

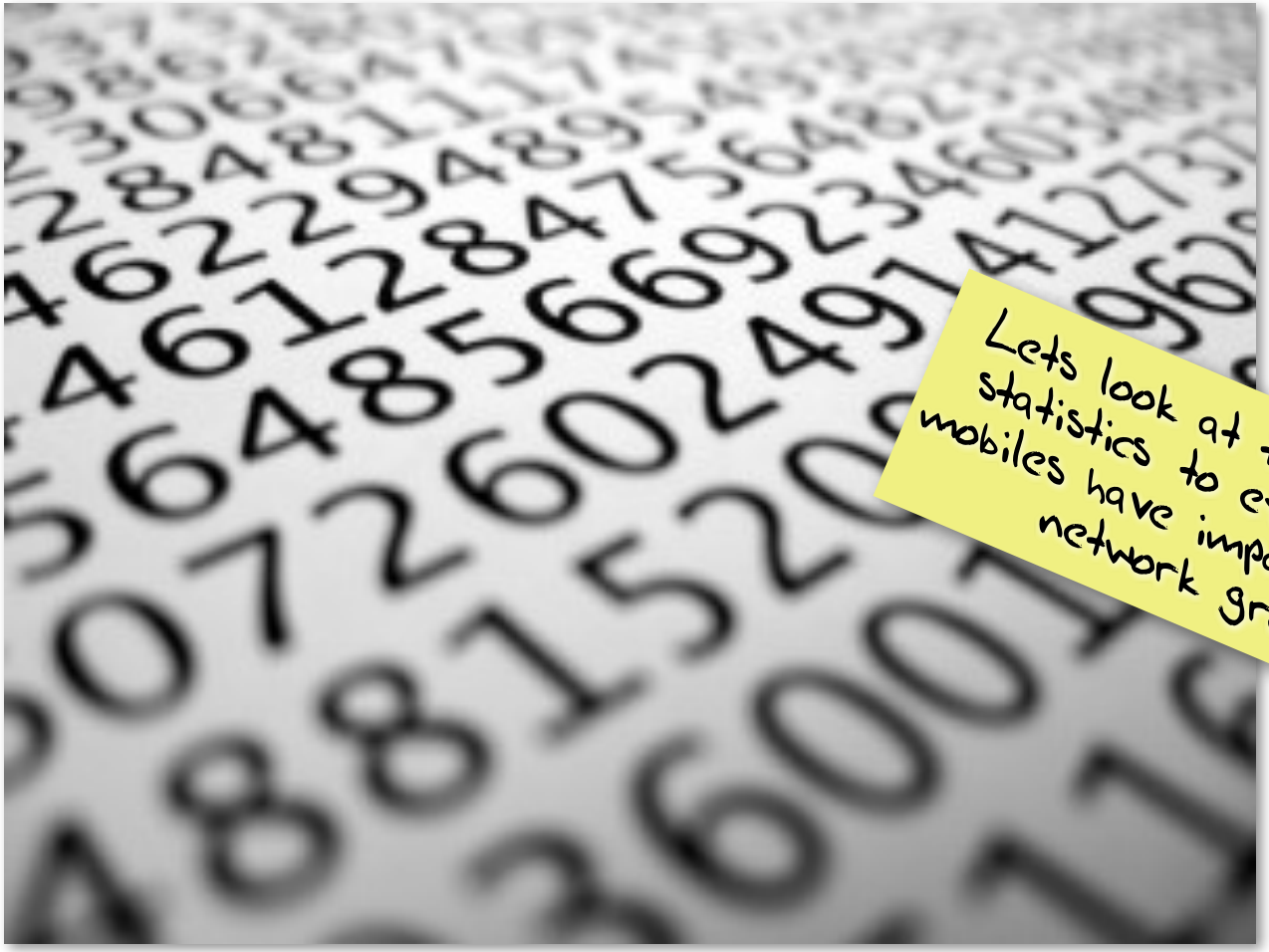
- Theoretical maximum peak speed* 326Mbps
- Practical achievable speeds of 4 – 12 Mbps
- All IP internal architecture



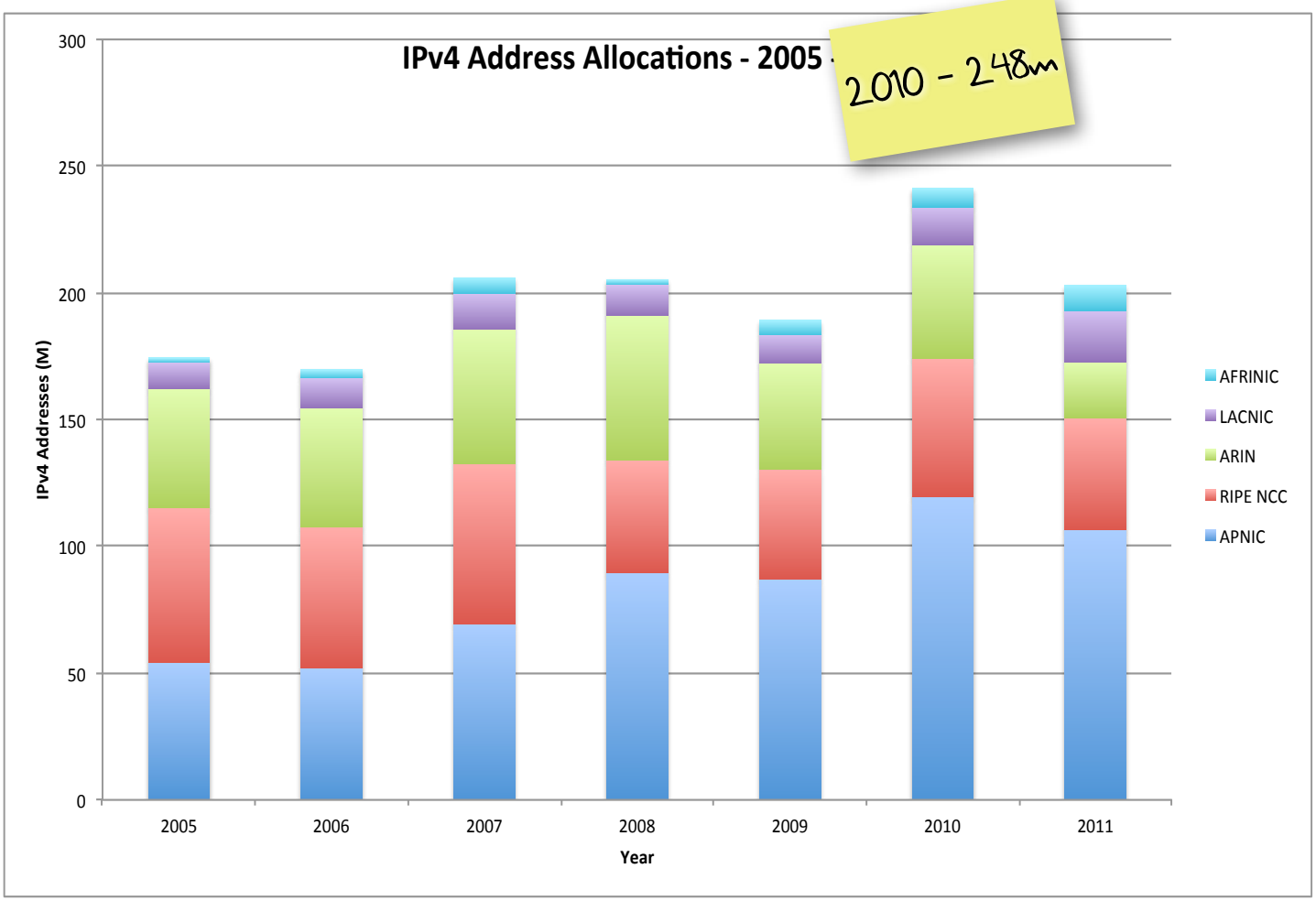
Now it gets interesting!

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

By The Numbers



Internet Growth



Top 10 Countries, 2009-2011

IPv4 Addresses (/32's Millions)

Rank	2009		2010		2011	
1	**China**	**50.67**	**China**	**45.2**	**China**	**53.07**
2	USA	38.55	USA	42.32	USA	21.21
3	**Japan**	**11.04**	**Rep.Korea**	**25.73**	**Japan**	**16.91**
4	**Rep.Korea**	**10.95**	**Japan**	**10.02**	**Rep.Korea**	**7.68**
5	Russia	5.46	**Australia**	**9.63**	**Indonesia**	**7.09**
6	Brazil	4.19	**India**	**9.43**	Brazil	6.29
7	UK	4.19	UK	8.13	**India**	**6.01**
8	Italy	4.16	Germany	6.97	France	5.39
9	France	3.85	Russia	6.46	Russia	5.02
10	Germany	3.6	Brazil	6.29	Germany	4.92

Largest Allocations in 2011

Rank	Economy	Organization	Addresses(M)	
1	Japan	NTT Communications Corporation	8.39	*
2	China	China Mobile Communications Corporation	8.39	*
3	Brazil	Comite Gestor da Internet no Brasil (Brasil NIR)	6.29	
4	Indonesia	PT Telekomunikasi Selular Indonesia	6.29	*
5	Japan	KDDI Corporation	4.19	
6	United States	AT&T Mobility LLC	4.19	*
7	United States	AT&T Internet Services	4.19	
8	France	Bouygues Telecom	4.19	*
9	Germany	Telekom Deutschland Mobile	2.1	*
10	China	CHINANET Zhejiang Province Network	2.1	
11	China	China TieTong Telecommunications Corporation	2.1	
12	Pakistan	Pakistan Telecommuication	2.1	*
13	China	China Unicom Shandong province network	2.1	
14	Morocco	Maroc Telecom	2.1	*
15	India	Bharti Airtel Limited	2.1	*
16	Vietnam	Viettel Corporation	2.1	
17	Mexico	Uninet S.A. de C.V., Mexico	2.1	
18	Egypt	TE Data, Egypt	2.1	
		Total	**67.11**	

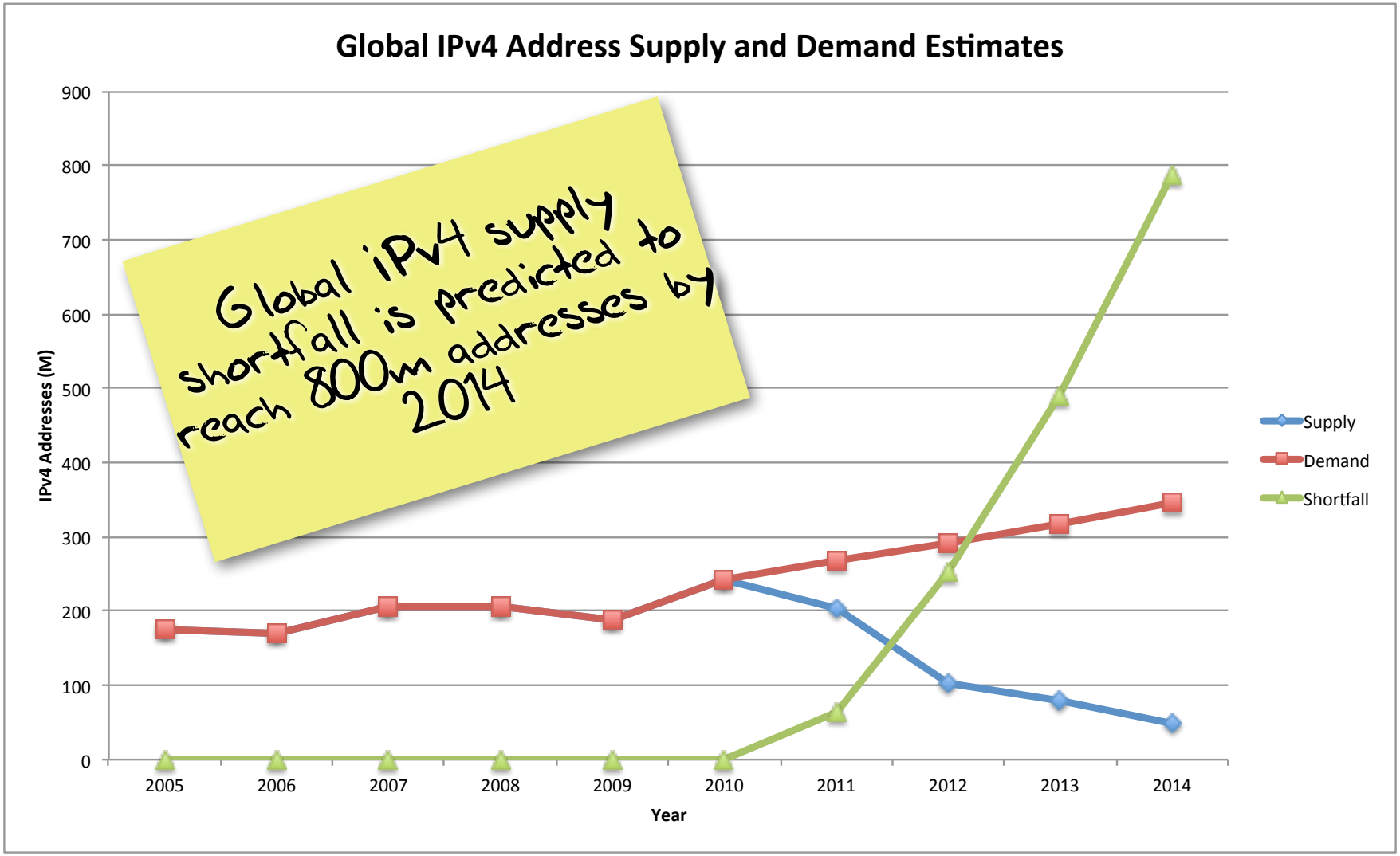
18 Carriers --> 30÷ of the addresses

Where are we headed?

Where are we headed?

- So far the mobile Internet has been constructed exclusively using IPv4 infrastructure
- The Asia Pacific region region has an aggregate demand for 100M addresses p.a. to support network service growth
- The global demand for V4 addresses is now approaching 300M addresses p.a.
- Today's mobile internet continues to grow by consuming accumulated address stockpiles and extensive use of NATs
- But what about tomorrow?

V4 Demand Projection



V6 and Mobile Devices

Android

IPv6 Support in 2.2 (in the radio module for some)

Dual Stack support in some apps

Apple

IPv6 has been added to iOS (wlan, not radio)

Dual Stack support added to browser

Windows Phone

still not yet (coming in Apollo release?)

V6 and Radio Access Providers

Public details are scant:

- In the US:
  - Some pilots by T-Mobile in the US
  - Some early announcements by Verizon about future intent for its LTE network and IPv6
- Elsewhere:
  - Slovenia: Mobitel
  - Norway: NWN (?)
  - ???

What about everyone else?

Thank You!