What have we done?

Geoff Huston

25 Years Ago…

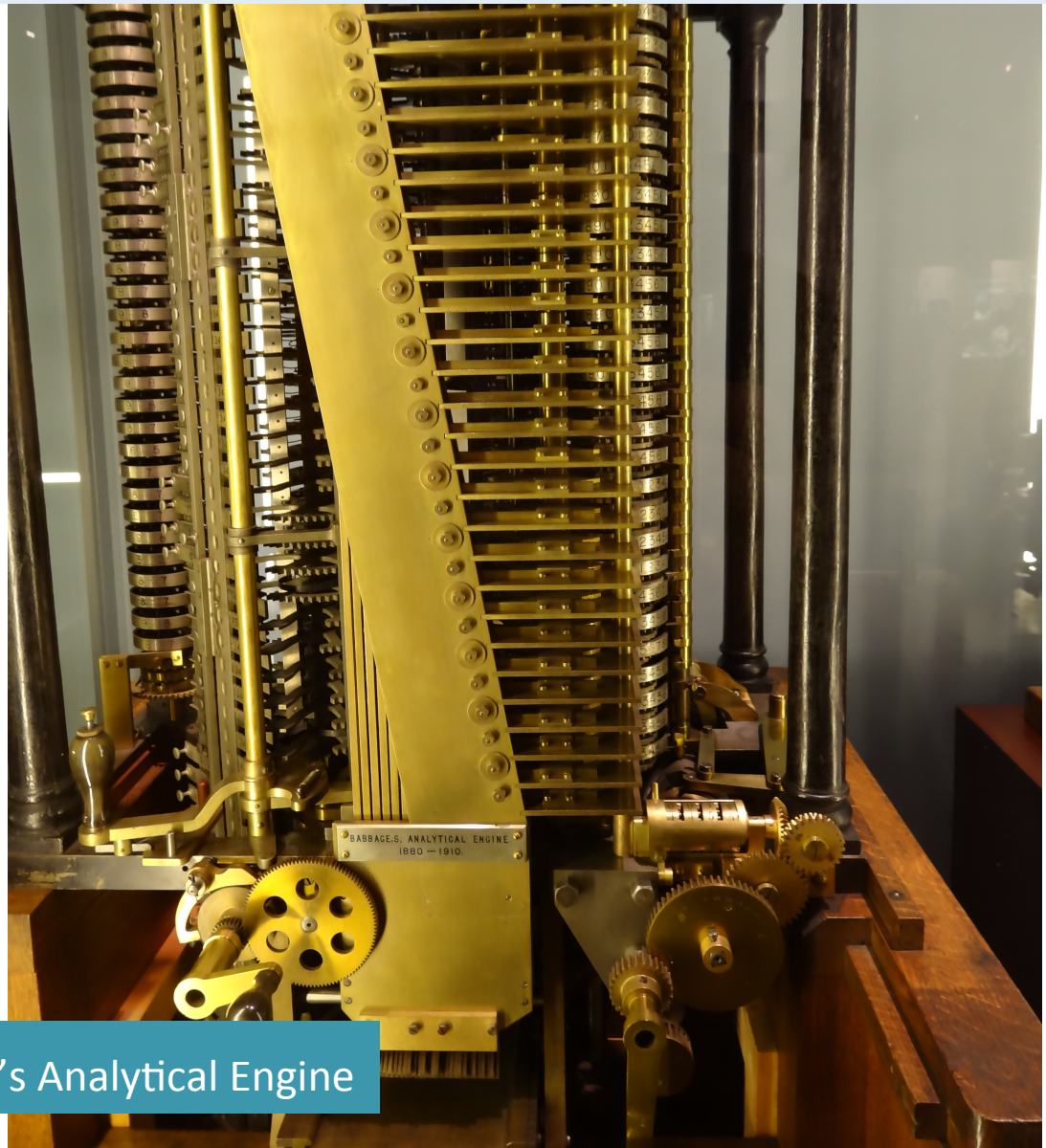
In 1990, Peter Elford and I turned on the Australian Academic and Research Network for every University and CSIRO site in Australia

The Internet had arrived for the national higher education and research sector

So what were the issues then and how much have things changed…?

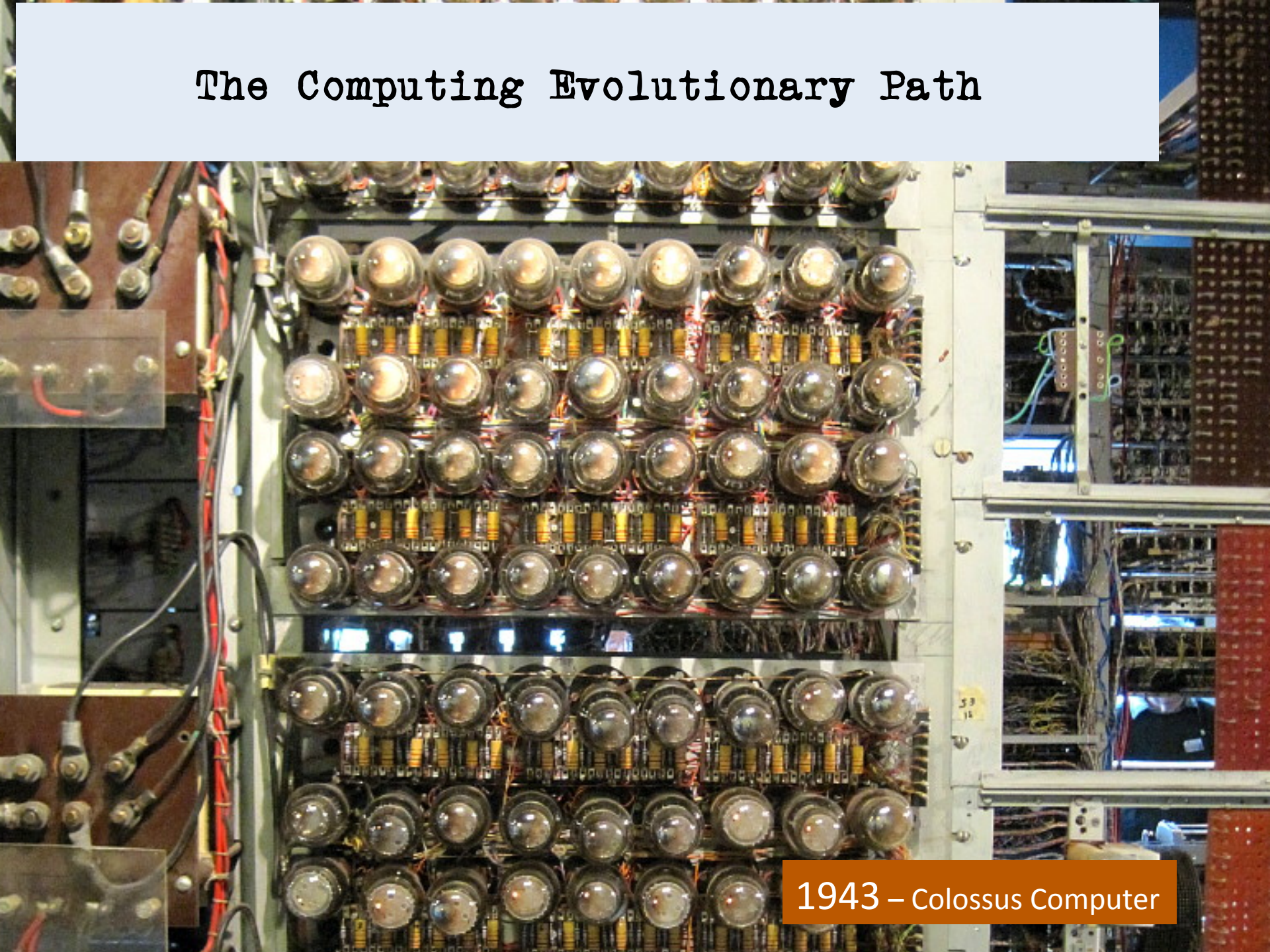

The past is a foreign land -
they do things differently
there!

The Computing Evolutionary Path



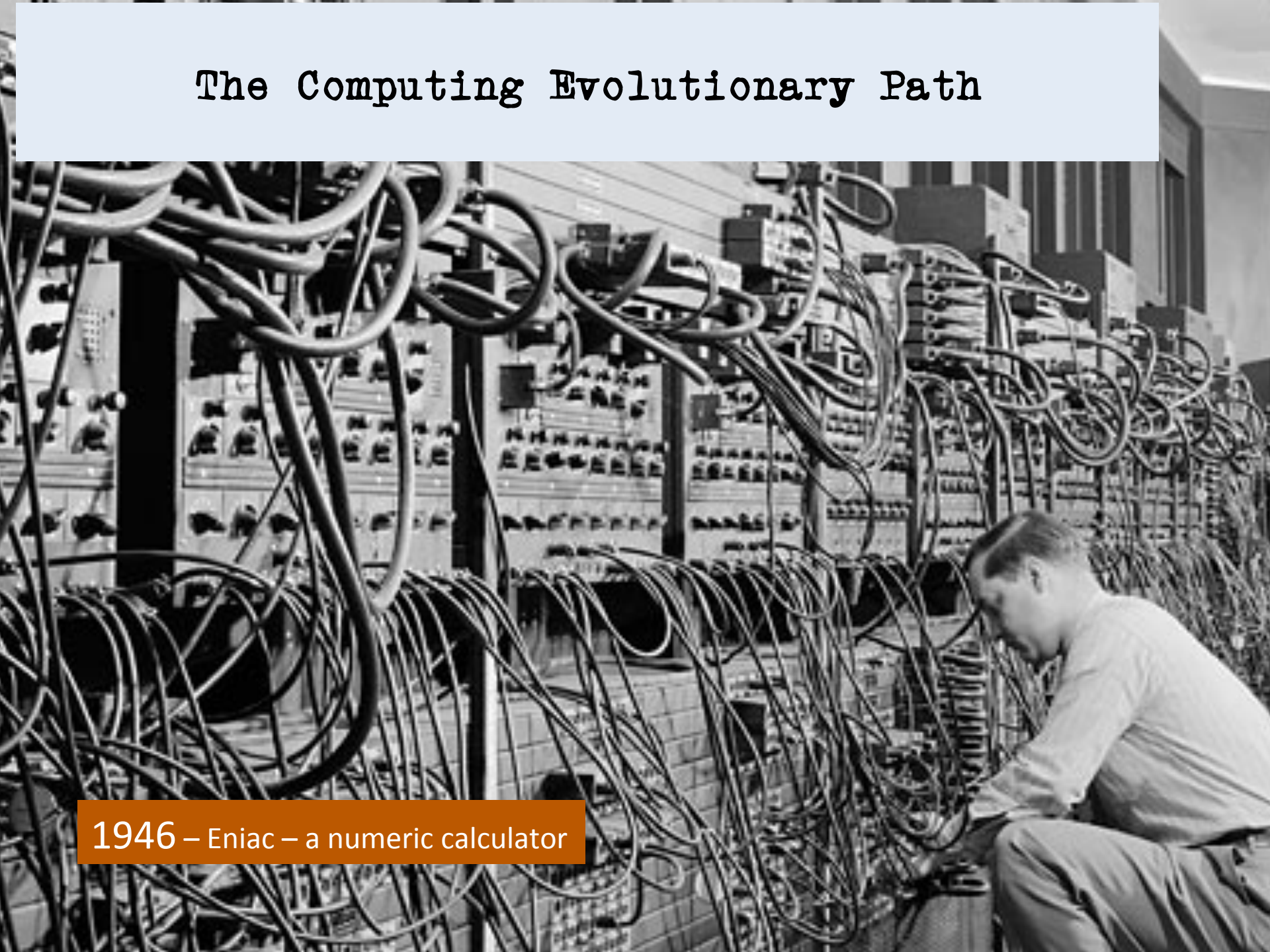
1837 – Babbage's Analytical Engine

The Computing Evolutionary Path



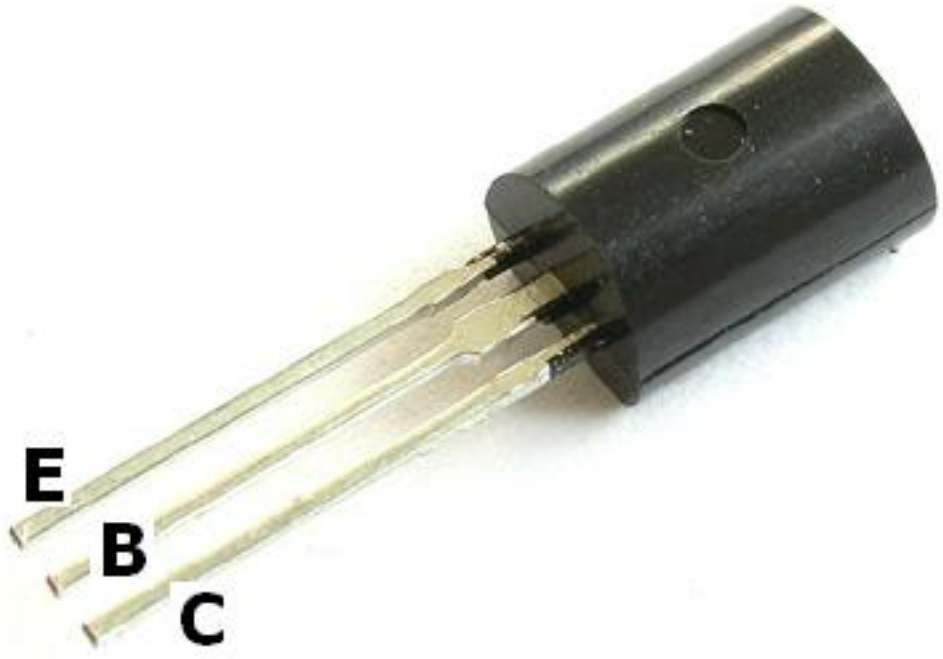
1943 – Colossus Computer

The Computing Evolutionary Path



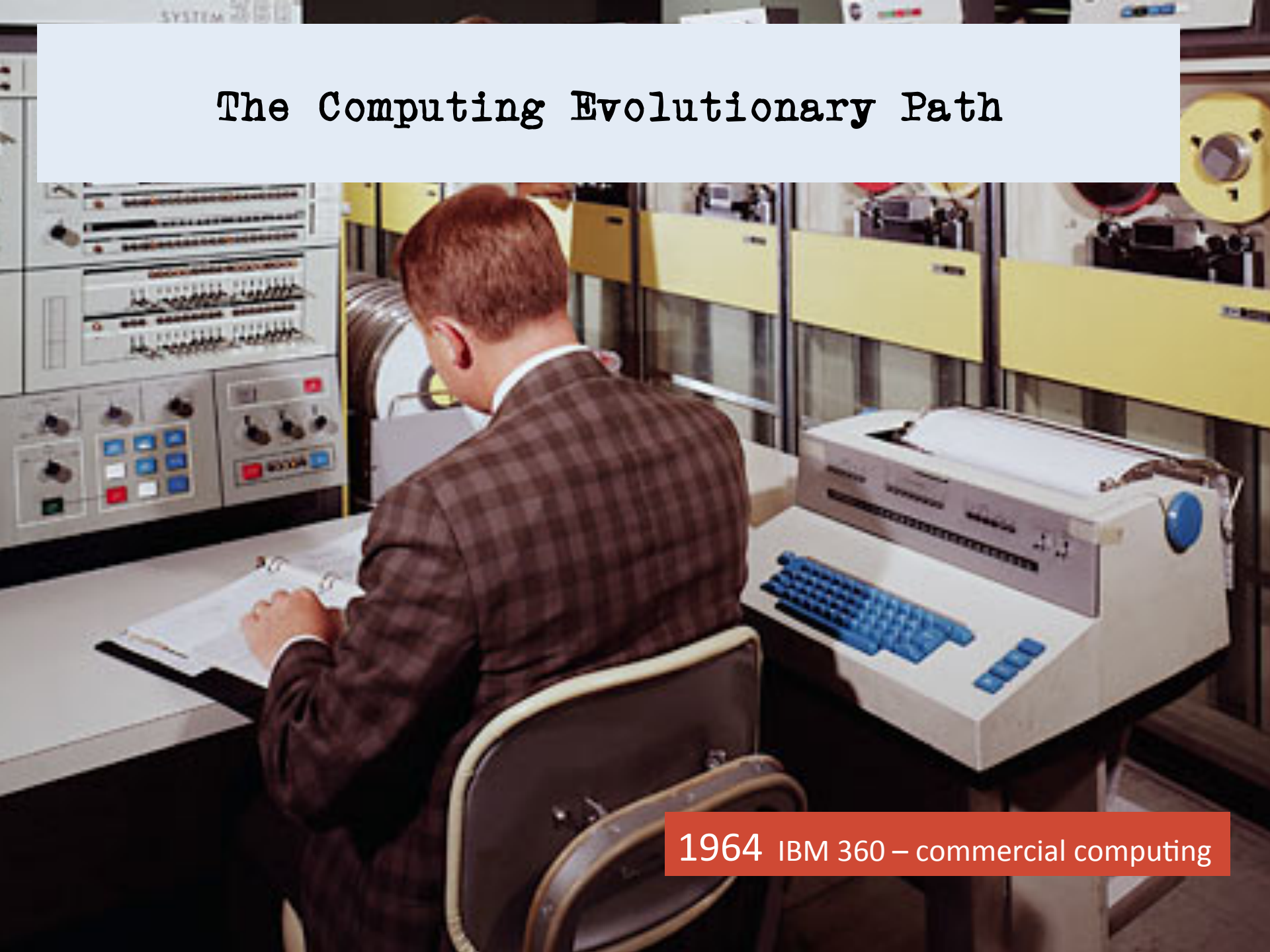
1946 – Eniac – a numeric calculator

The Computing Evolutionary Path



1947– The Transistor

The Computing Evolutionary Path



1964 IBM 360 – commercial computing

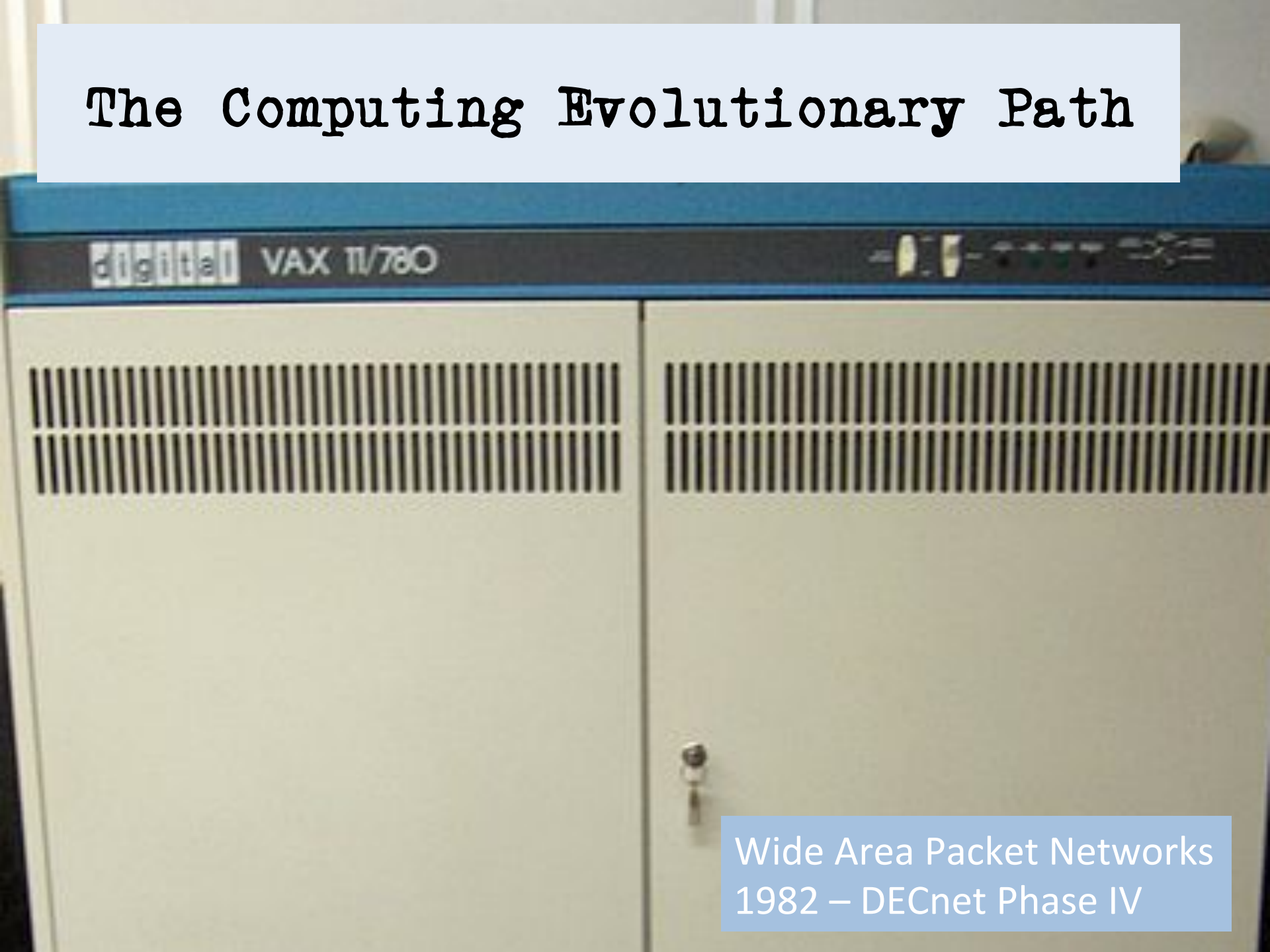
The Computing Evolutionary Path

The Computing Evolutionary Path

The Computing Evolutionary Path

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

The Computing Evolutionary Path

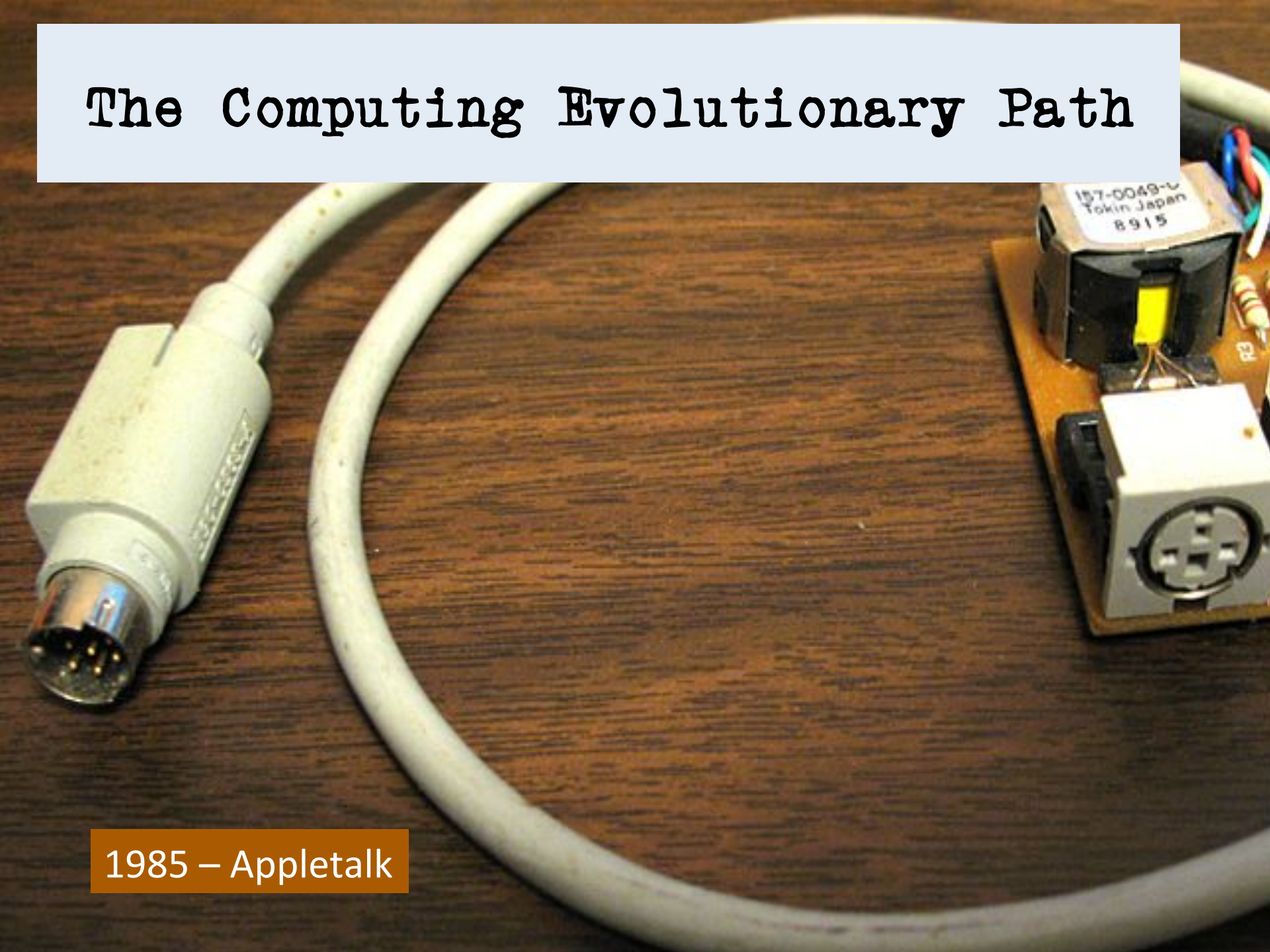


Wide Area Packet Networks
1982 – DECnet Phase IV

The Computing Evolutionary Path

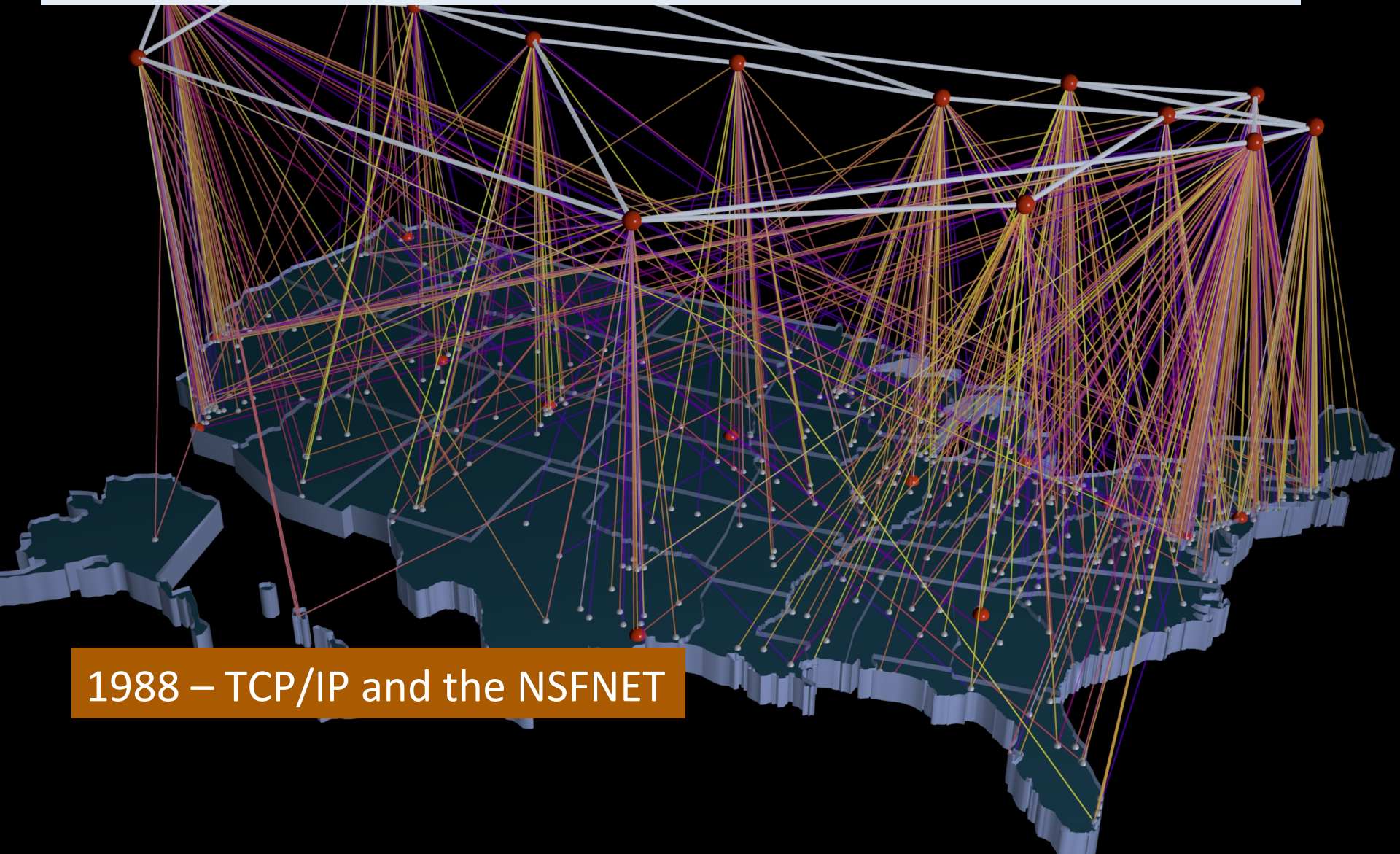
1984 – Mac - visual computing

The Computing Evolutionary Path



1985 – Appletalk

The Computing Evolutionary Path



1988 – TCP/IP and the NSFNET

Which brings us to 1990

(Or thereabouts)

What were we talking about then?

Background

- The mainframe to PC transition
- Shift away from terminal access networks
- The Local Area Network of peering hosts

The Field of Fire

- ISO/IEC OSI
- Internet IETF

OSI - the Dream

- An "open" architecture
- specified from physical to application interface
- universal signon by the industry
- The specification of a single ubiquitous technology interoperation platform for the industry as a whole

From Dreams to Nightmares

- telcos never understood the real extent of the domain
  - telcos are not no longer at the cutting edge of technology development
  - telcos are predominately billing enterprises!

- The process of standards definition was flawed when applied to technology development

And of course

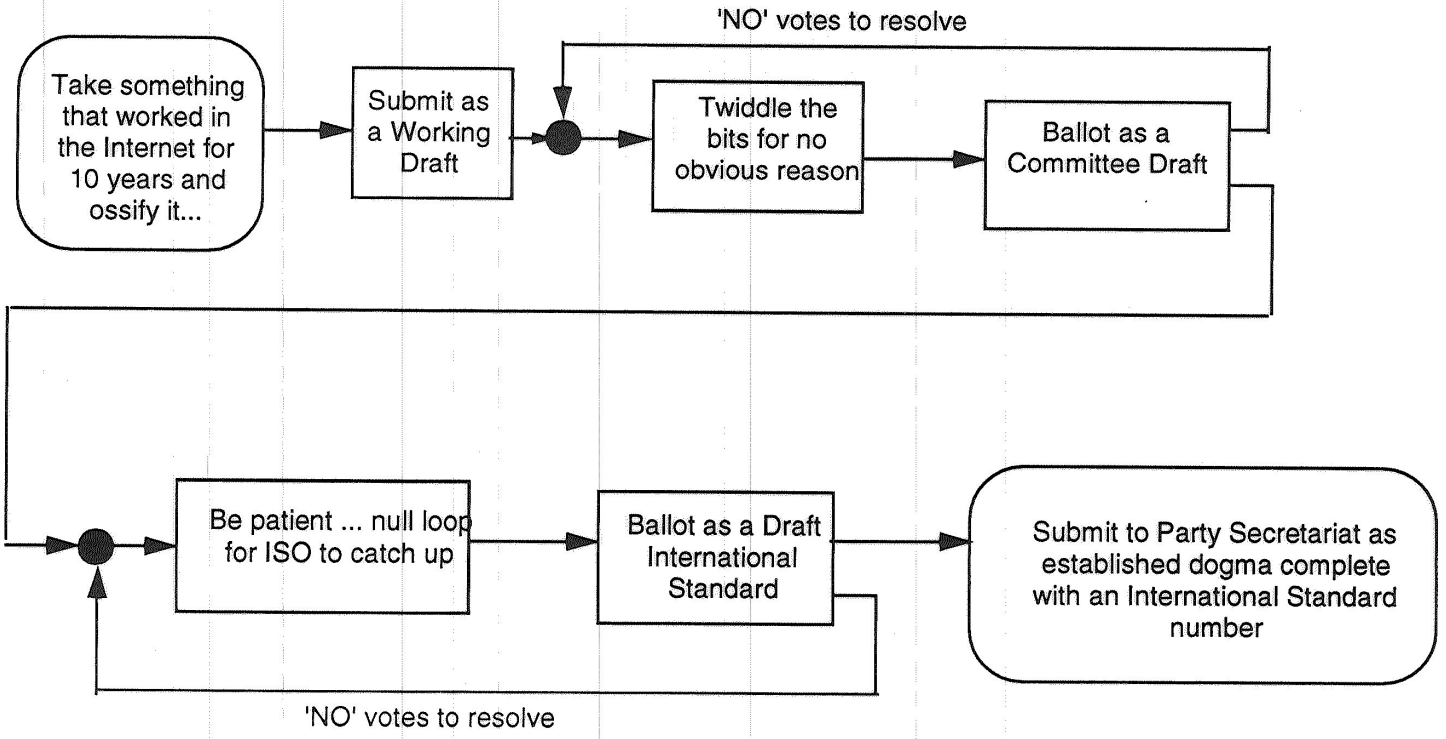
- X.400 & X.500
  - working together defining the address from hell

The Network Management Debacle

- One should never attribute to malice that which can be adequately explained by incompetence

The OSI Standards Process

(after Piscatello and Chapin)

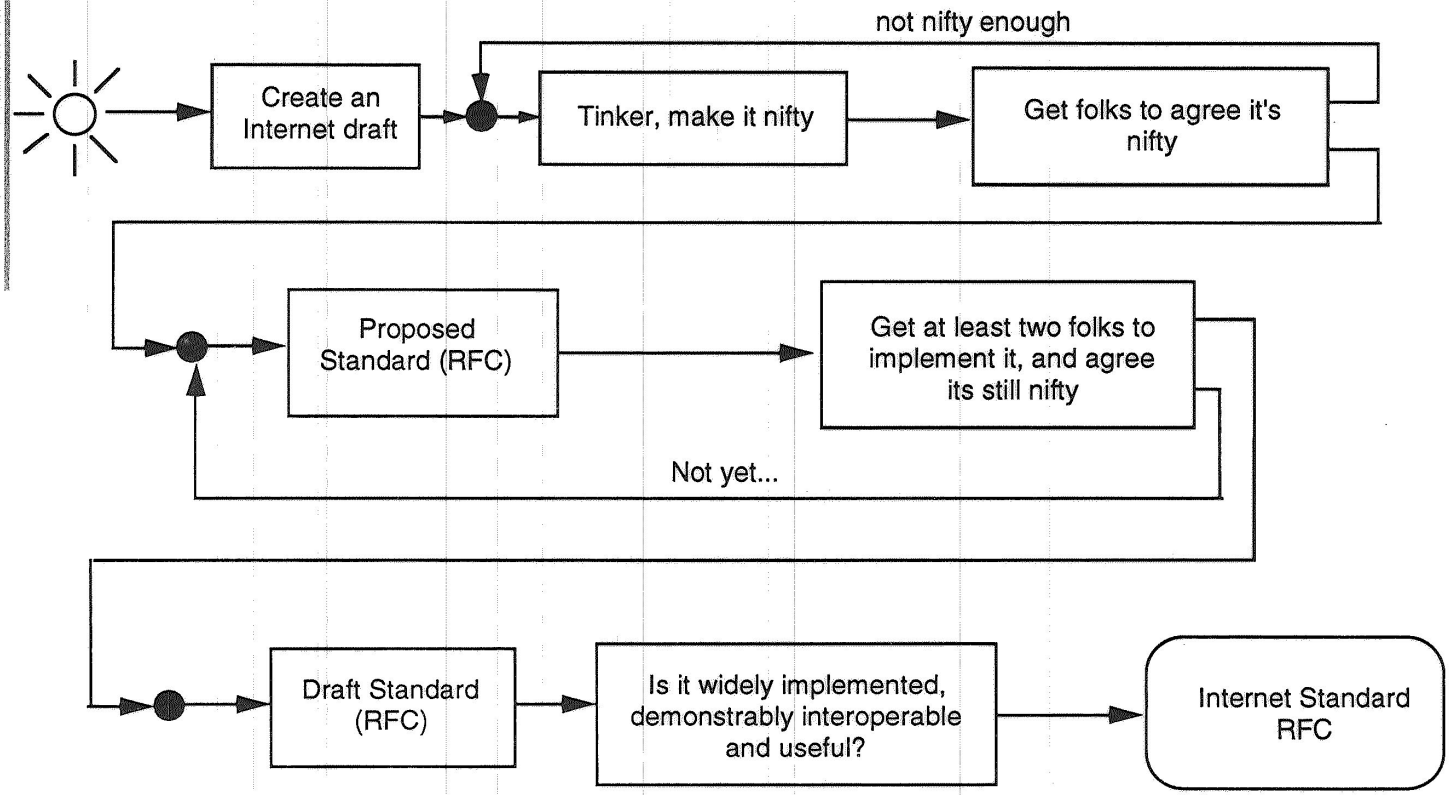


The Impotence of Good Ideas

- **The OSI Standards Process...**
  - **Any Good Standards Process must be equally unfair to all participants**

The Internet Standards Process

(after Piscatello and Chapin)



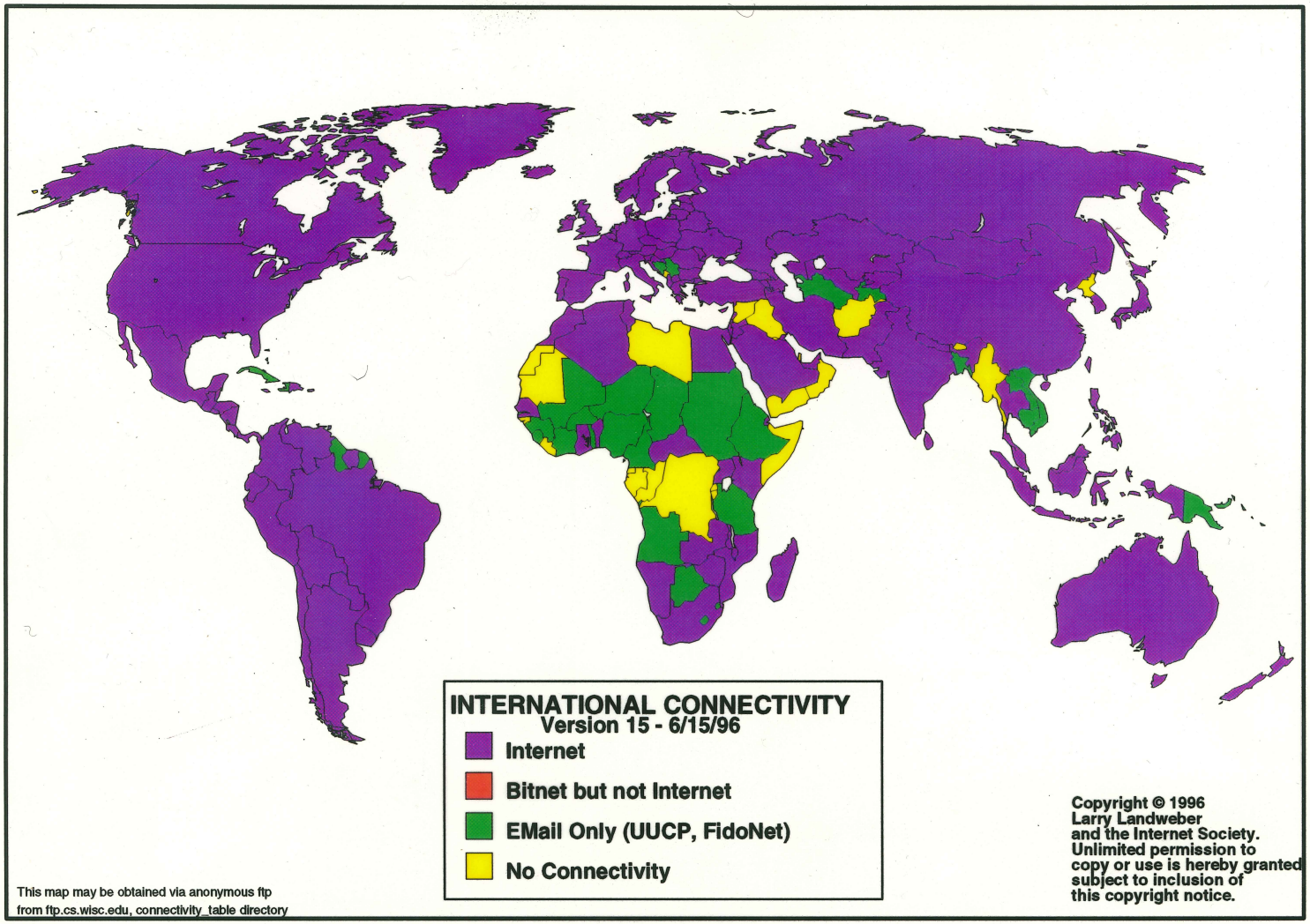
The Role of Standards

- Document sane and rational current operational practice
- Freely available
- Useful to developers, vendors and consumers
- not whimsical attempts at eternal truths

Networking ..

- sane technology choices
- underlying industry approach to rational competition
- the political process is a massive diversion of effort

We had high hopes for the Internet



But we were a lot younger then

Photo Credit: Aimee Ray https://www.flickr.com/photos/merwing/516164481

And we were the underdog

Photo Credit: https://www.flickr.com/photos/barrielynn/1817195121

Things are different now

Things are different now

We won

Things are different now

We won:

- We won the protocol wars with OSI
- We won the voice wars with telephony
- We won the content wars with television

Computers and the Internet are now everywhere…

Recording **everything**

2005

2013

Always with us

And it sure looks like…

And it sure looks like…

WE are now the problem!

Street Art: Banksy

How did we get to this unexpected point?

How did we get to this point?

What happened over the past 25 years to get us here?

- The commercialisation of the electronic messaging Internet
  - The expansion from the academic and research stable to a public venture based largely on entrepreneurial activity
  - The proliferation of Dial-up ISPs

How did we get to this point?

What happened over the past 25 years to get us here?

- The internal re-building of the telco industry
  - Active effort to engage with the Internet and integrate it into the telco service portfolio
    - The Internet was not originally seen as a threat to voice – but it was seen as a threat to their services
  - Active effort of the ISPs at the time to keep em out!
  - Regulatory confusion

How did we get to this point?

What happened over the past 25 years to get us here?

- The Web and the DSL world
  - Listing access capacity by the first orders of magnitude (Kilobits to Megabits)
  - First wave of ISP rationalisation
  - Web content revolution
  - The rise of search
  - The emergence of VOIP as a threat to the telco core

Then what?

- Broadband Capacity meets Broadband content – the rise of the streamers
  - Noone truly expected that the Internet would take on broadcast television at the pace and volume that it has played out
  - All of the capacity planning models for infrastructure engineering need to change
  - New business relationships between CDNs and IAPs had to be forged

Then what?

- Further ISP culling as volume economics places ever greater control over the access industry
  - Profitability is no longer based on aggressive market expansion, but on cost management
  - Volume wins in such a market, so the ISP industry aggregates up to a small (3 – 4) number of large providers in each national market
- The assumptions of ubiquity and the "cloud"

Closer to home - some thoughts on the Australian NBN Experiment

- Early efforts to underwrite large scale cable infrastructure blocked by political resistance to Telstra and Foxtel union – Telstra walks away from initial HFC program
- Telstra and its capital investment program heads into mobile services to seek higher returns from capital investment, leaving wired consumers on the DSL infrastructure
- As part of a Keynesian style response to the GFC Canberra tries to replace the country's aging copper distribution infrastructure through public capital injection, and weaken Telstra's stranglehold over access to urban distribution infrastructure – the NBN
- Political interference, poor execution, changing commercial models, shifting consumer desires all add to the subsequent confusion
  - No current clear idea of timetable, cost, deployment schedules, technology model, service outcome …

So what are the issues?

The wired internet is being handed back to the telcos and telco wannabes

And that's disappointing in every possible way:

- Conservative business model
- Conservative technology model
- Massive political clout
- And the brain stem of an unreconstructed monopolist

So what are the issues?

The security folk are acting like this is a phone network – when it's the opposite!

So you can expect more inspired idiocy following Data Retention regulation

TICSA anyone?

TICSA

Telecommunications (Interception Capability and Security) Act 2013

The Legislation

The Telecommunications (Interception Capability and Security) Act 2013 (the TICSA) establishes obligations for New Zealand's telecommunications network operators in two key areas – interception capability and network security.

The Government Communications Security Bureau (GCSB) is responsible for administering the network security provisions of the TICSA.

Part 3 of the TICSA, which relates to network security, establishes a framework under which network operators are required to engage with the GCSB (through the NCSC) about changes and developments with their networks where these intersect with national security.

The legislation sets out a path to identify and address, prevent, mitigate, or remove network security risks which may arise. To assist in applying TICSA, the Director of the GCSB has issued Guidance for Network Operators, and has granted a number of exemptions from the duty to notify which are in place as of 11 May 2014, when the network security part of TICSA came into effect.

A copy of TICSA is available here.

So what are the issues?

The “new” Internet is now all mobile:

- 1.5 BILLION devices shipped in 2014
- 50% of all visible devices on the Internet
- 75% of all access service ARPU is mobiles

So mobile access networks are the focus of “new” competition in the “new Internet”– right?

But the "new" mobile provider is just the same as the "old" telco

But the "new" mobile provider is just the same as the "old" telco

Exclusive Use Spectrum has blessed a tiny number of operators

- and everyone else is shunted through “wholesale channels”

The data margins and caps are truly awesome revenue generators

The "old" telco

THE YEAR AT A GLANCE

Financial highlights

30.5 CENTS TOTAL DIVIDEND PER SHARE + $1b SHARE BUY-BACK = $4.7b DISTRIBUTION TO SHAREHOLDERS

$4.3b NET PROFIT AFTER TAX[2]

$26.6b TOTAL INCOME[3]

$1b INVESTED IN WIRELESS NETWORK

Driving value from the core

4G SERVICE NOW REACHING 94% of the Australian population

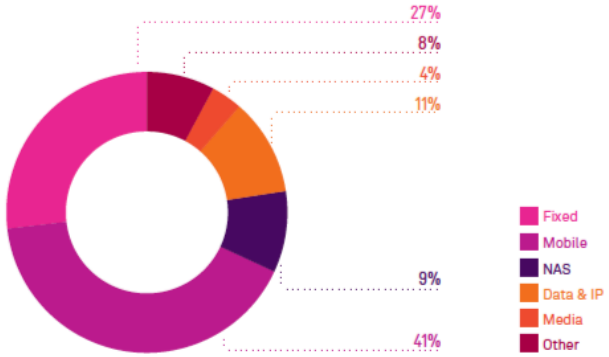
4GX™ INTO 1,200 suburbs and towns

2.2m CUSTOMERS ON A BUNDLED PLAN

16.7m DOMESTIC RETAIL MOBILE CUSTOMERS

Product performance

Product sales revenue breakdown



Key product revenue

	FY15 $m	FY14 $m	Change %
Fixed	6,944	7,076	(1.9)
Mobile	10,651	9,668	10.2
Data and IP	2,883	2,968	(2.9)
NAS	2,418	1,963	23.2

Product profitability EBITDA margins[(i)]

	FY15 %	FY14 %	2H15 %	1H15 %
Mobile	40	40	40	40
Fixed voice[(ii)]	55	59	54	56
Fixed data[(ii)]	41	41	39	42
Data and IP	64	65	65	64

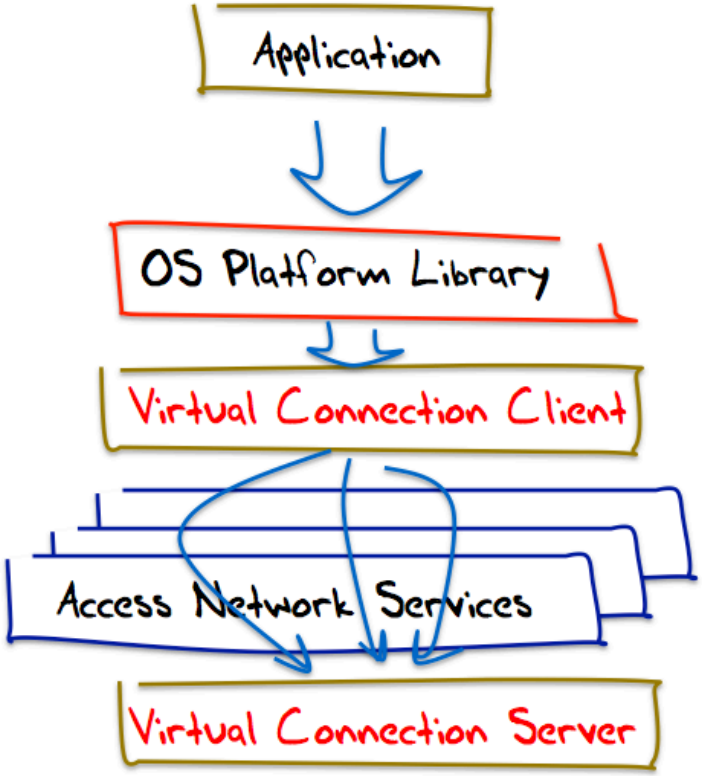
(i) The data in this table includes minor adjustments to historic numbers to reflect changes in product hierarchy.
(ii) Margins include NBN voice and data products.

The "new" competitors

The "new" competitors

A new way to say hello

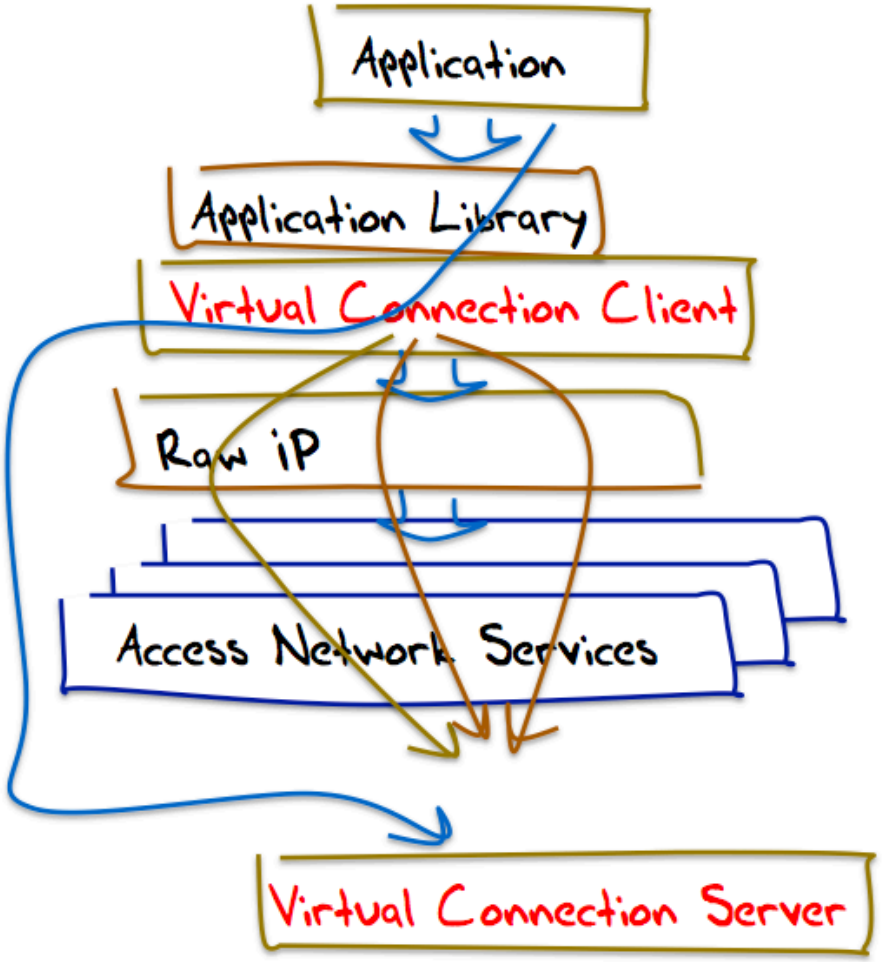
Project Fi is a program to deliver a fast, easy wireless experience in close partnership with leading carriers, hardware makers, and our users.



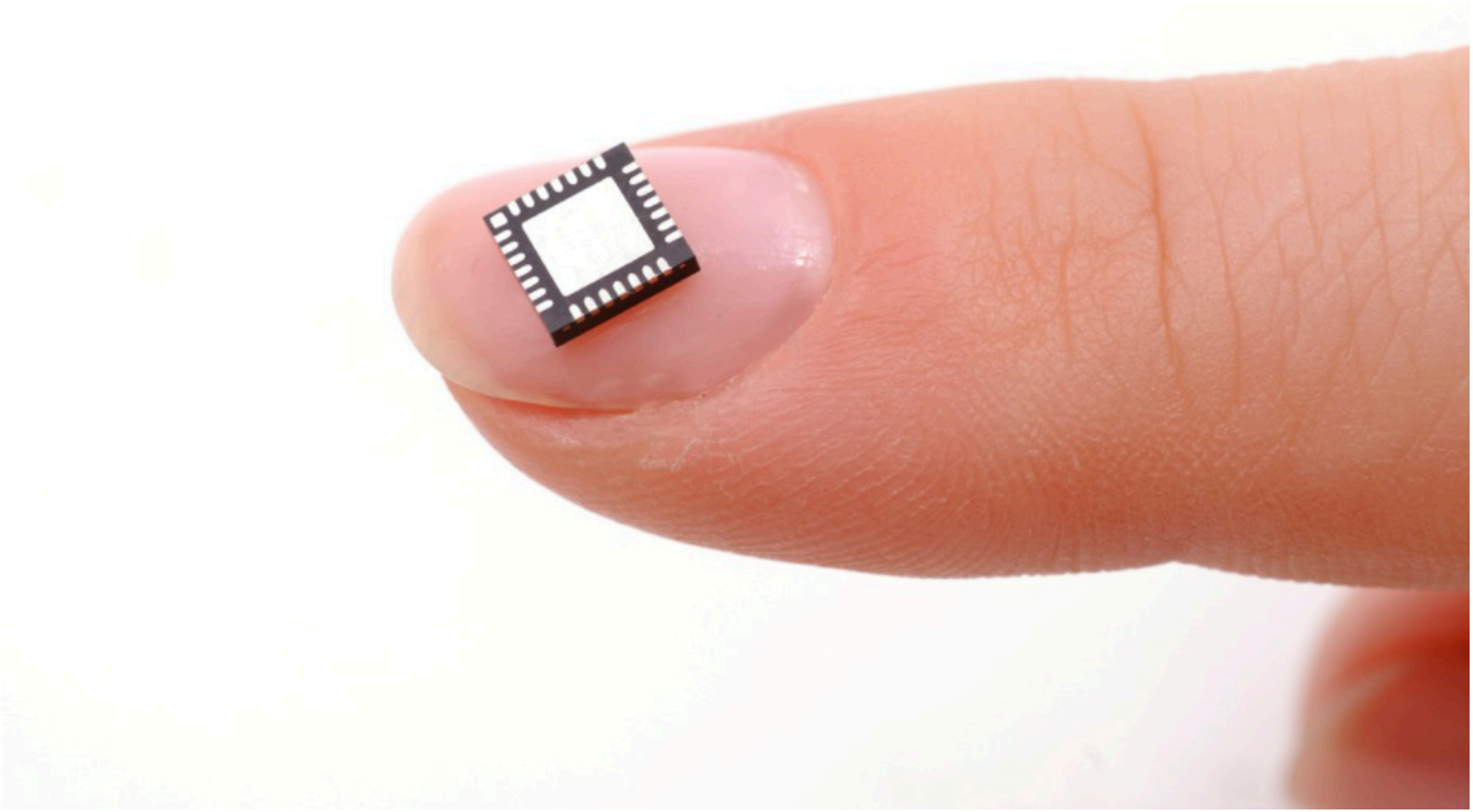
The new "new" competitors

The VPN Application Approach:

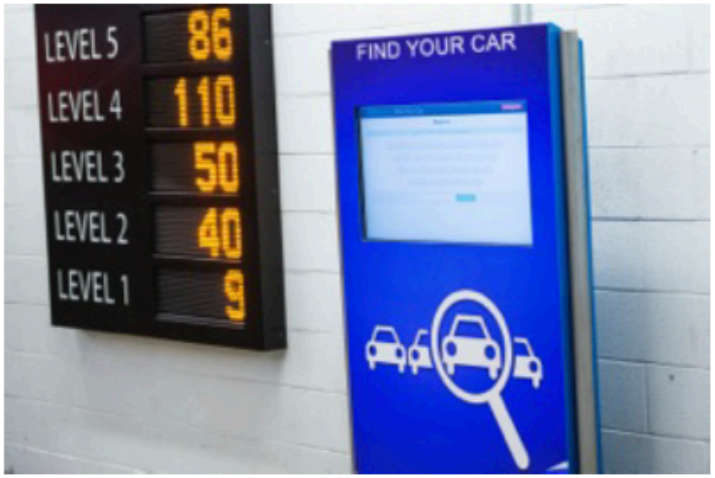
Hide the application traffic from both the local platform as well as the local network

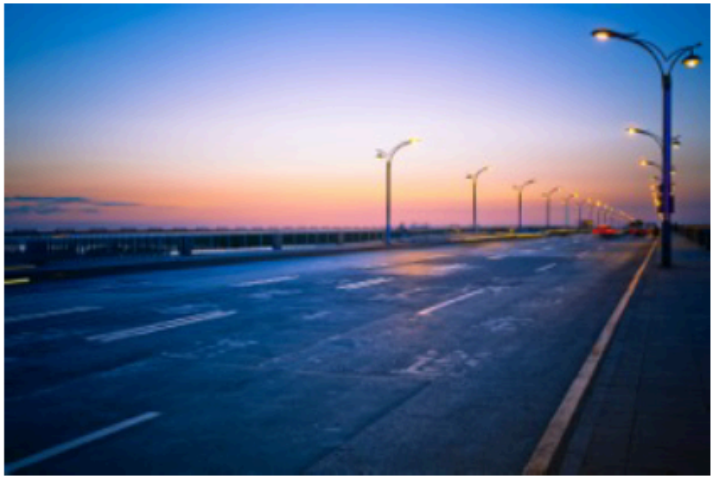


So what are the issues?

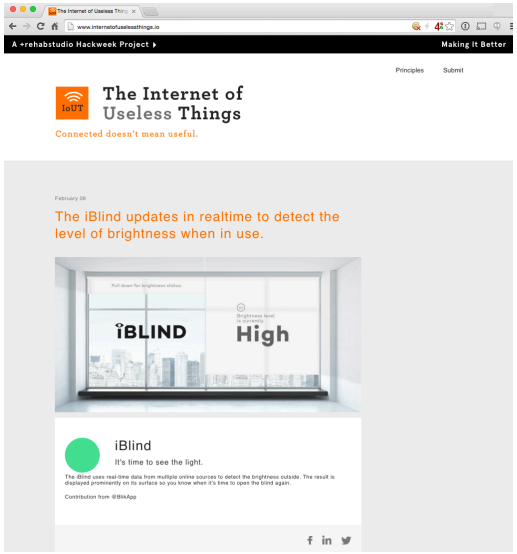


Silicon Ubiquity





Silicon Stupidity



The Internet of Stupid Things

April 2015

Geoff Huston

In those circles where Internet prognostications abound and policy makers flock to hear grand visions of the future, we often hear about the boundless future represented by "The Internet of Things". This phrase encompasses some decades of the computing industry's transition from computers as esoteric pieces of engineering affordable only by nations, to mainframes, desktops, laptops, handhelds, and now wrist computers. Where next? In the vision of the Internet of Things we are going to expand the Internet beyond people and press on with connecting up our world using billions of these chattering devices in every aspect of our world.

It's not a new vision by any means. Already my car probably has 100 microprocessors doing everything from regulating the engine to remembering the seat position. But this grand vision connects all these processors up in one massive Internet. Gartner have projected that the world of chattering silicon will get to 25 billion devices by 2020. Cisco has upped the ante with their prediction of 50 billion such connected things by 2020, and Morgan Stanley has trumped them both by going further with a prediction of 75 billion devices connected to the Internet in that time. Other reports have placed this number as high as 100 billion. The extent of the current levels of unbounded technical euphoria in this space project economic values of this activity in units of trillions of dollars by 2020.

Internet Of Things: Limitless Dumb Possibilities

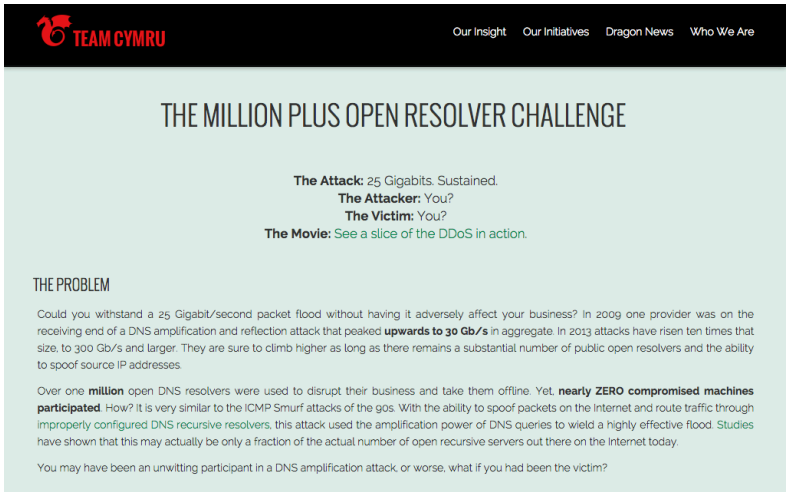
Many of the "improvements" to ordinary household objects promised by SmartThings, a software company just acquired by Samsung, are already available elsewhere or seem like overkill.

Geek's Guide To NYC Travel: Interop Preview

(Click image for larger view and slideshow.)

In the 2004 reboot of *Battlestar Galactica*, the starship for which the series is named escapes destruction because its computers were not networked.

This profoundly pessimistic view of network security qualifies as realism outside the realm of science fiction. Computers and networks are full of vulnerabilities. Beyond mission-critical, heavily-overseen projects with limited scope, the security industry doesn't even contemplate bulletproof code. Instead, it measures software defects per thousand or million source code lines. There will be bugs; the only question is how many.



So where does it head?

In 1990, when Pete and I were connecting up campuses in Australia, our world had:

- mobile phones the size of briefcases
- "portable" computers that weren't even luggable!
- cameras that loaded film
- "real" computers that were multi-million dollar investments with cluster of work bees to tend them
- "technology" as a skilled occupation undertaken by a small cadre of educated professional engineers
- And it may have had Microsoft and Apple, but it had no Google!

Much of that world has vanished!

"Technology" is now a consumer-driven commodity

So where does it head?

What has replaced it is both oddly familiar and strangely alien at the same time

Which is about the best one say say about the next 25 years!

Thanks!