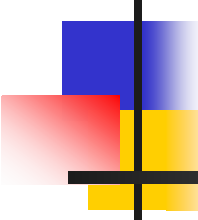


Innovative Business Cases & The Internet of Things

or

How to put Linear Types, Control
Theory and Bigraphs into one neat
storyline



Jon Crowcroft,

<http://www.cl.cam.ac.uk/~jac22>



Old school capitalism & socialism

- See *Future Perfect: The Case For Progress In A Networked Age* , by Steven Johnson

<http://www.amazon.com/dp/1594488207>

- There's a good case made for new ways of doing business
 - Not a *Legrand Star* or a *Hayek Hub*, but
 - A **Baran Web**....



Taking sides...

- Alec Broers wants Big Companies
 - Like Intel, IBM, etc
 - ex IBM, VC Cambridge, now chair of house of lords ctee on S&T
- Andy Hopper likes what we do
 - Head of dept CL
 - 10 startups, 2 IPOd....
- Who do you believe?



Cambridge has been doing new business cases for some time

- ARM
 - Mostly fabless chip designer
 - More chips than intel out there...
- RealVNC
 - Open source desktop virtualisation
 - Millions of users...
- Ubisense
 - Actually, fairly traditional h/w -> IPO
 - Used by BMW on production line.



More radical

- Xen
 - Open Source - the Cloud (Amazon EC2)
 - Engaged with ALL of industry (not just 1 preferred initial customer)
 - Intel AND AMD
 - Microsoft and Sun/Oracle and HP ...
 - Acquired by Citrix for 500M USD.
 - Pretty much standard value in expertise
 - 50 kernel hackers with PhDs:)
 - Big 2nd customer was Tesco... ..



More radical still

- Raspberry Pi
 - Charity
 - 500,000 units shipped in 6 months.
 - Doubled application rate to University CS
- BOB
 - Building Open Buildings
 - Internet of things - to be seen
- Digital Life Foundation
 - Signpostdisintermediation
 - Open Source, decentralised, appstore



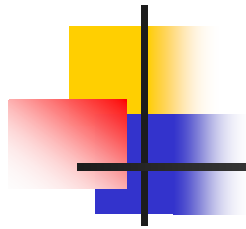
BOB, e.g. of Internet of Things

- Thing 1 - we need an app store to network legacy (and new) appliances
 - Commodity Appliance Thing
- Thing 2 - we need a new app store for people to contribute apps to federate (and isolate) Systems of Things
 - Home Appliance Thing
- See Dr Seuss for more details:
http://www.youtube.com/watch?v=fj_xwgLW_4I



Internet of Things

- Need a grass roots (cottage industry)
 - Therefore need to give people tools
 - Equivalent of knitting needles+wool
 - Or sewing machines and thread (better)
 - Or even looms
- Hence need 3D Sculpters & Printers
 - But also need to give them **upload** capability
 - Moral equivalent of knitting pattern contributions made to magazines & books
 - But 3D CATs uploaded to websites
 - 3D HATs are easy (c.f. Fresnel project:)
- Hence need 3D scanners too



Render Unnecessary

<http://fffff.at/free-universal-construction-kit/>





Intellectual Property is Theft

- See aforesaid book for why
- Patents are not capitalism,
 - they are monopolistic
 - Long patterns incentivize companies to hide background longer term knowledge
 - 10 year pharma pattern is longer than the survival rate of someone's creativity
 - So blocks the sideways flow of innovation
 - Especially in methodologies



Alternatives

- Xensource worked without IP protection because....
- A big incumbent cannot catch up with 5, or even 50 smart people working on an exciting new idea
 - Throwing 500 people (at MSR) doesn't work
 - Old news (c.f. Mythical Man Month)
- So novel S/W doesn't need any protection than raw speed of development



Some possible exceptions

- Modest, but useful, genuine h/w innovations -
 - e.g. Dyson bagless vacuum cleaner
 - Patent lifetime perhaps could be shorter
 - Invention to market cycle*2 == 5 years?
- Peer Patent Review
 - Deals with scale out of
 - Finding prior art
 - Detecting obviousness << patent >> sufficiency



Employee Owned Business models

- Good karma
 - Works outside of business too
 - Incentive alignment without toxicity
- What if society is the employer?
 - So government is the employee
 - So how to use EOB in government?



Why would we trust a decentralized IoT Appstore

- Where anyone can upload a T2 thing
- Because we will build a toolchain which
 - Verifies T2 behaviours are within bounds
 - Can do because have engineering theory
 - Embed in programming language for T2 cyberphysical objects
 - Eg linear type s/w+linear control h/w
 - Bound+dynamic behaviour checks
- Business case is licensing certification:-)



Conclusions, Discussion

- Today Ocaml Labs
 - <http://www.cl.cam.ac.uk/projects/ocamlabs/>
- Tomorrow,
 - <http://hubofallthings.wordpress.com/>
 - World Peace and an er
- Live long and prosper

