

Two-Sided Marketing to Incent Internetworking Networks of Things



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History of Mobile Cloud

- Smart Phone disintermediates Cellular
 - Cloud/Web disintermediates telco
 - Cloud/Web end run ISPs
- But wait ... we missed something
- Internet was meant to democratize
 - Flatter, P2P, Decentralized
 - Devices (in pocket&home) powerful enough
 - Uplinks nearly fast enough now
- How to reboot?



Old school capitalism & socialism

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

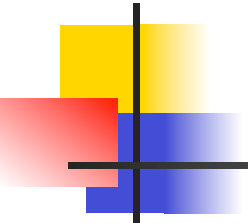
<http://www.amazon.com/dp/1594488207>

- 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?
 - Time for science (experiment w/ biz model)



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... ..



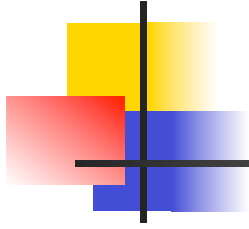
More radical still

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



HAT:Internet of Things

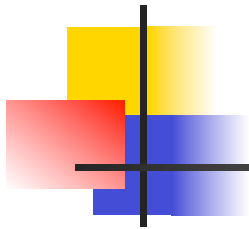
- Thing 1 - we need an app store to network legacy (and new) appliances
 - Commodity Appliance Thing
- Thing 2 - we need a new app store for people to contribute apps to federate (and isolate) Systems of Things
 - Home Appliance Thing
- See Dr Seuss for more details:
http://www.youtube.com/watch?v=fj_xwgLW_4I



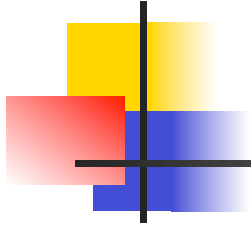
By Dr Parry, with apologies to Dr S... image copyright holders

The D.E. in a HAT

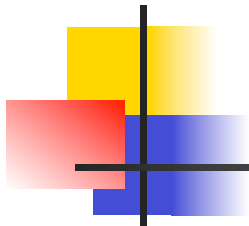
An Alternative presentation



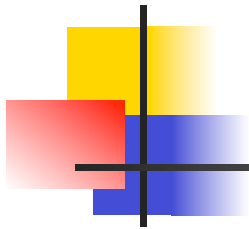
**A home tech platform
What ever is that?
The Hub of All Things
Which we know as the H.A.T.**



**How to will it work?
Well let me tell you,
We collect data using things
Named Thing 1
And Thing 2**

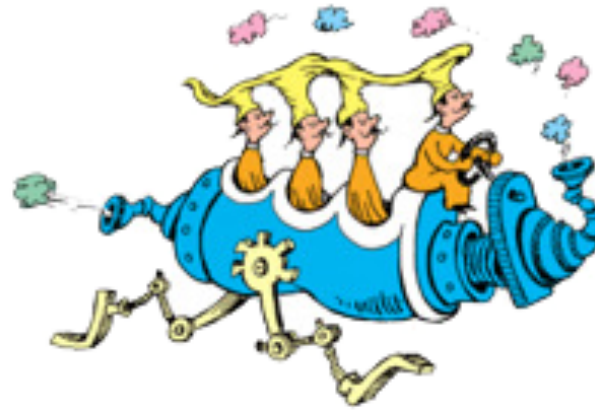
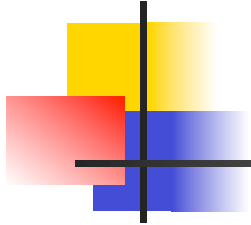


**Thing 1 is a smart thing
IoT ready you know
We just need to name him
And link him
And then let him go**

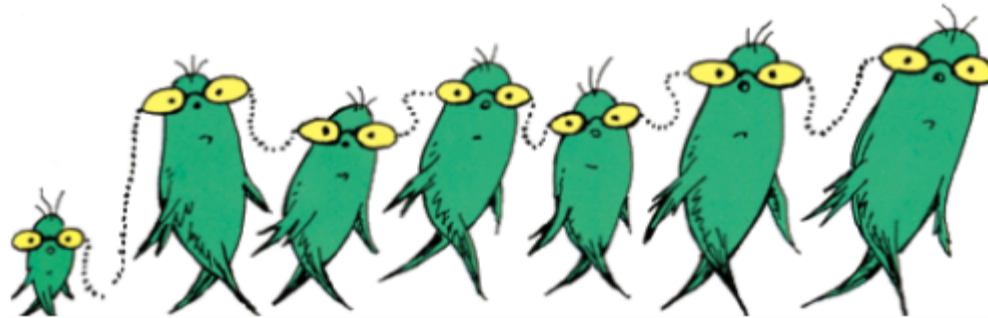
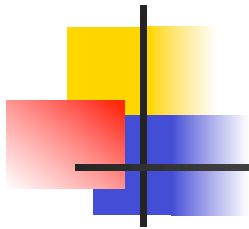


**Thing 2 makes objects smarter
With just a little finance
Milk bottles, cups and kettle
They let enhance**

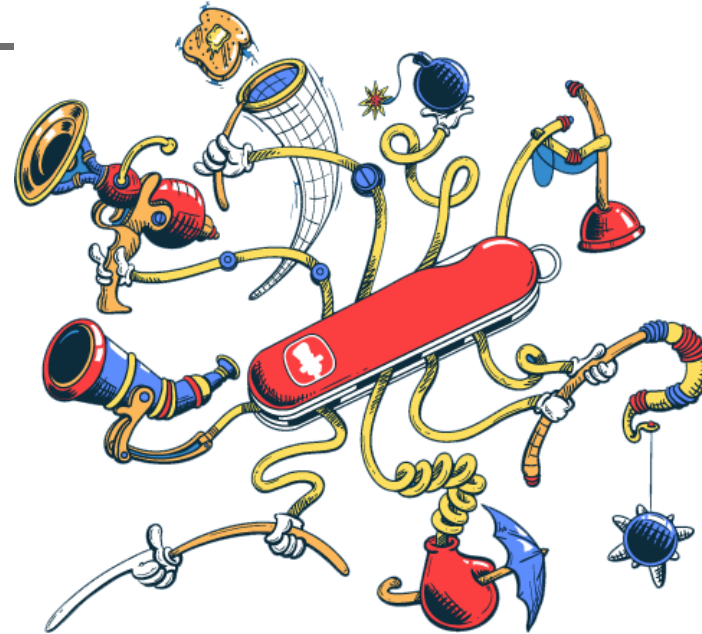
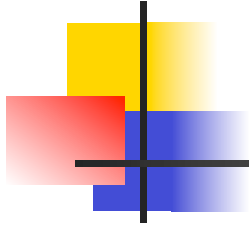




**The things collect data
Which algorithms analyse
Contextual archetypes appear
Right in front of your eyes**



**We learn from the home
And from each other too
We learn all about the things
And what they tend to do**



**SMEs play at the HAT-Fest
With the data compiled
Creating novel offerings
Which are deployed in the wild**

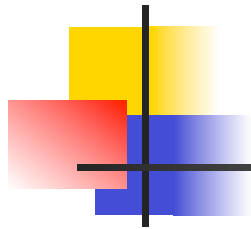


**The Hub of All Things
We commend it to you
We think it is the future
We hope you do too**



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://ffffff.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?



Mezzanine Conclusions, Discussion

- Today HAT, REMS, Ocaml Labs
 - <http://hubofallthings.wordpress.com/>
 - <http://www.cl.cam.ac.uk/~pes20/rems/>
 - <http://www.cl.cam.ac.uk/projects/ocamlabs/>
 - Platform (free), toolchain (free), service (tbd)
- Tomorrow,
 - World Peace and an end to Hunger?
- Live long and prosper





DO\$H - Decentralized Object Storage Help (need better name 😊)

- How to incentive decentralized system?
- Lets think about monetizing ...
- Not just token payment...



Background to P2P and Virtual Currencies

- Peer-to-peer systems avoid infrastructure
 - Eschew centralised ownership/management
 - Examples:
 - Internet (originally), Usenet
 - Mesh wireless nets
 - Mobile Ad Hoc Nets (MANETs)
 - Opportunistic/mule nets are examples



P2P #2

- Mutual exchange of resources
 - Layered on another (infra or p2p) net
 - Structured v. Unstructured, DHT, Key, Value stores, in Cloud (Cassandra etc)
- Storage
 - BitTorrent, Freenet, Eternity
- Computation
 - SETI@Home, ClimatePrediction.com
- Service (e.g. Presence)
 - Skype (originally)



Virtual Currencies

- No currency - direct barter
 - Air Miles
 - Subway tokens
 - Exchanges - credit cards, paypal
- New:: BitCoin, Ripple, Properties
 - Decentralised Mint
 - no Owning/coercion
 - Decentralised Verification
 - mutual benefit in verifying == p2p store/check
 - Non-inflationary (BitCoin)



Mint/Verify BitCoin - crypto

- Basic trick is "proof of work"
 - Mitigates both forgery&double spending
- P2P verification entails keeping history
 - Transaction chain->not strictly anonymous
- Various possible problems like hoarding
 - Plus finite total (eventual) number of BitCoins -> possible loss impact
- "Alien Technology"



P2p incentives and currencies

- We've been trying to get incentive alignment in p2p
 - Bittorrent uses tit-for-tat tokens
 - Did same in our work on mesh wifi
 - With deflationary currency to deal with
 - People leaving with money in their pocket
 - People joining/starters...
- Then along comes bitcoin (and ripple)
 - But....



Objections to BitCoin

1. Proof of work is a waste of energy
2. Not anonymous (at least not as much as some people think)
 - We don't like 1, but we don't mind 2.
 - So.....



DO\$H: an anonymous idea (by me)

- To fix some elements of bitcoin
 - And p2p storage systems
- Specifically,
 - Want to fund the Personal Cloud vision
 - with backup/resilience
 - other goodness properties



Personal cloud

- Everyone keeps their personal data
 - In their pocket
 - In their home hub, or car or bike
- But want backup (or nearby copies)
 - Could crypt and put in cloud
 - Or crypt and put in friends/family
 - Or even (many) arbitrary other users stores
- How to pay for cloud storage/cpu?



Monetizing Personal Data

- Don't "*put all our eggs in one basket*"
- s/facebook/personal cloud/
- Monetize data *case by case* basis
 - Idea also from HAT project
 - Have relationship with many vendors of goods and services - loyalty cards etc
 - They don't have usage data - we do
 - in personal cloud - home power, fridge, fitbit, scales, washing machines etc



Model is they pay us

- Supermarket/pharmacy pay us for data
- In DOSH
- Generate DOSH coins by crypting our data - i.e. useful
- So we get adverts, but they don't leak data
- we also get DOSH, and could give BACK in exchange for no ads (just storage)



DOSH is quite like BitCoin

- But not deflationary - but bounded by people and goods used
 - so can't hyperinflate due to sustainability of world
- Keep BitCoin model of auditable verification chains
 - so can discourage use for Silk Road #3



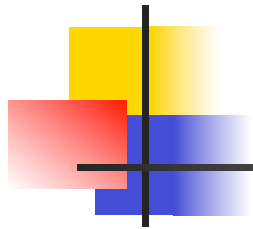
Two more ideas

- Could source randomness for hashes DOSH protocol from non-co-ercable places
 1. Sustainable energy sources (solar/wind) contain natural randomness, which can be observed/recorded but aint easy to fake/force
 2. Could also use 3D printers DRM random source (and so mark real world goods 3D printed with BitCoin verification hash



Have some pieces

- <http://perscon.net/>
 - <http://nymote.org/software/irminsule/>
 - Need to do open source DOSH
 - And find some seed users...
-
- You didn't hear this from me



Who Am I?

