Two-Sided Marketing to Incent Internetworking Networks of Things

Jon Crowcroft,
http://www.cl.cam.ac.uk/~jac22
http://nymote.org
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
  - Signpost ... ... disintermediation
  - 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:
The D.E. in a HAT
An Alternative presentation

By Dr Parry, with apologies to Dr Seuss and image copyright holders
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 IoT 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://fffff.at/free-universal-construction-kit/
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?
Today HAT, REMS, Ocaml Labs

- http://hubofallthings.wordpress.com/
- http://www.cl.cam.ac.uk/~pes20/rem/
- http://www.cl.cam.ac.uk/projects/ocaml labs/
- 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-coercable places

1. Sustainable energy sources (solar/wind) contain natural randomness, which can be observed/recorded but ain’t 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?