

---

# An Infrastructure Challenge in the Digital Economy

Derek McAuley



# RCUK Digital Economy

---

- Digital Economy is defined by the Research Councils as:  
*The novel design or use of information and communication technologies to help transform the lives of individuals, society or business.*
- The Digital Economy programme is:
  - Cross-Research Council (EPSRC, ESRC, AHRC)
  - Funded 2008-2011 for:
    - £80m research – including 3 x £12m hubs
    - £36m training – 8 x DTCs
  - Aimed at realising the transformational impact of ICT for all aspects of Business, Society and Government.



# What is Horizon?

---

- A Digital Economy Research Centre at the University of Nottingham comprising:
  - A Digital Economy Hub
    - £20m from RCUK and university
    - Spokes at Cambridge, Reading, Exeter, Brunel
  - A Doctoral Training Centre
    - £15m from RCUK and university
    - 20 PhD students per year for 5 years
  - Was 40 now 90 partner companies
  - 3 TEDDI projects
  - ... + future Digital Economy projects

# Our Digital Footprint

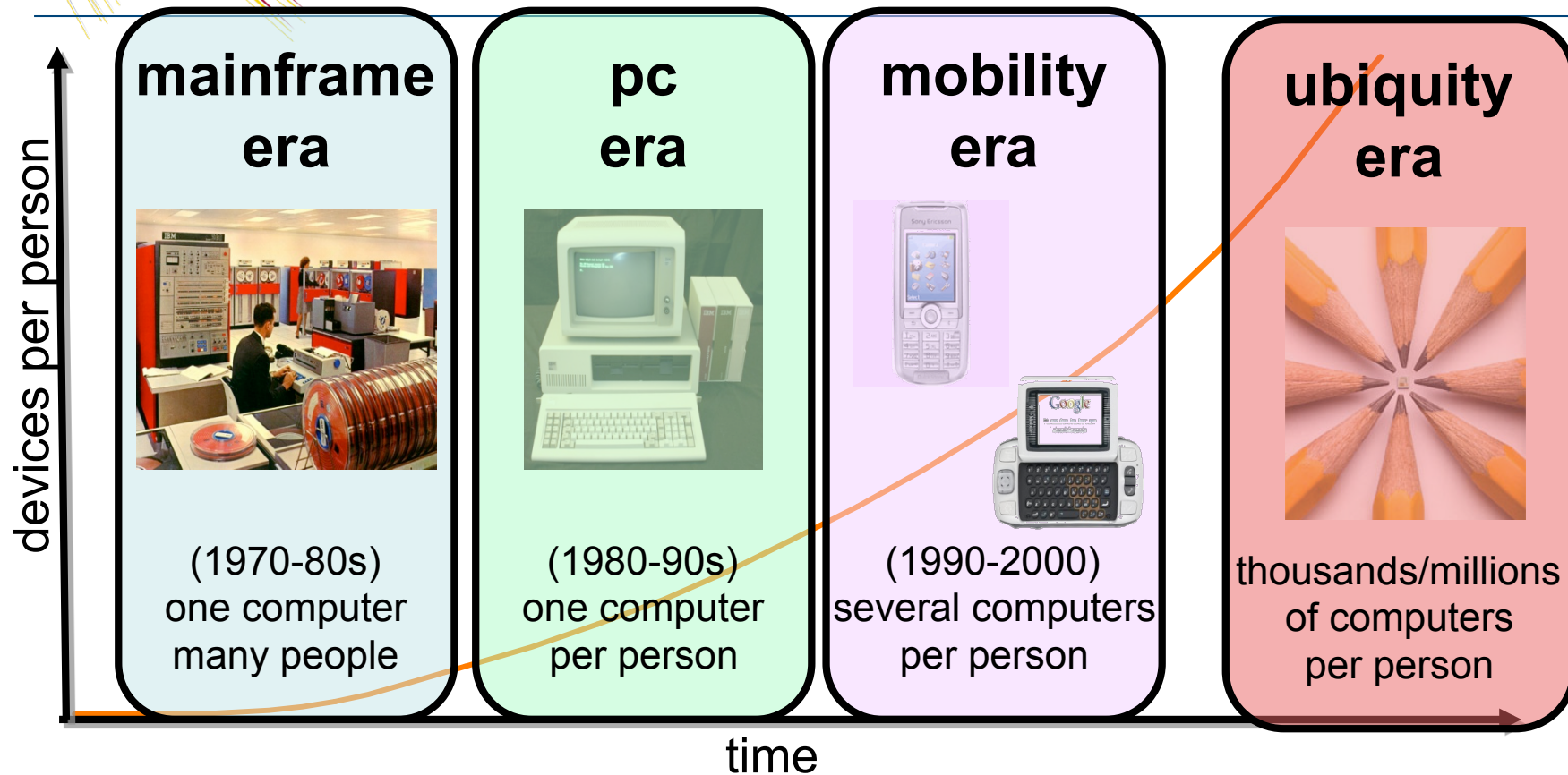
“Every time we register for a new web service, or upload our photos and videos, we are enlarging our own digital footprints”

- This growing digital footprint is a significant part of the digital economy
- It also poses major societal and ethical challenges



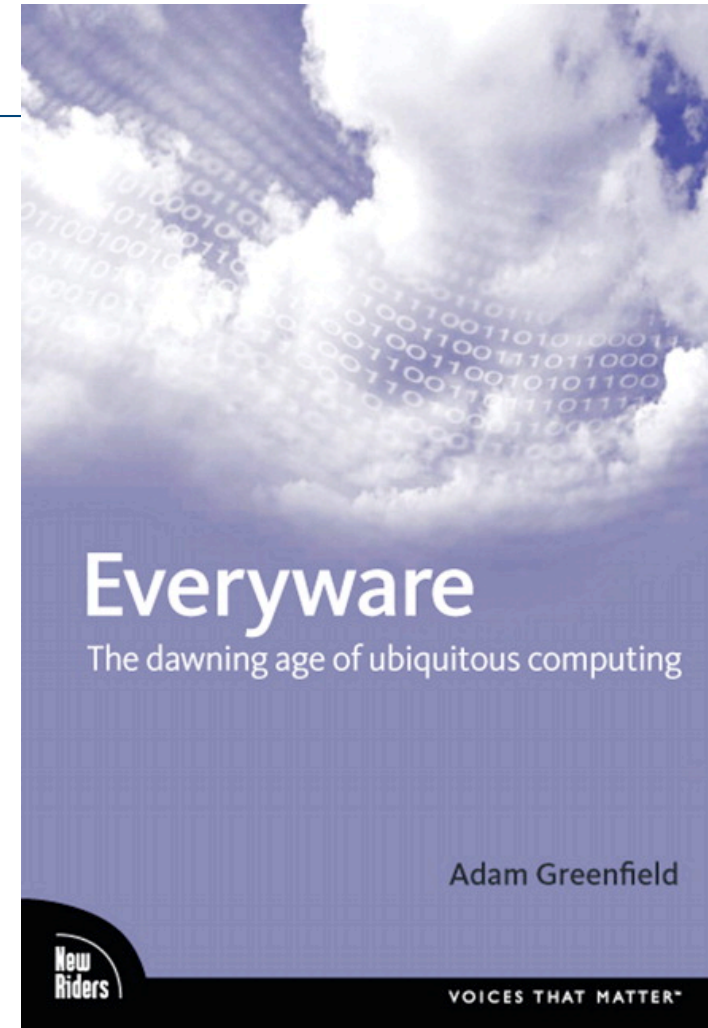
The screenshot shows a web browser displaying a BBC News article. The article title is "The spread of our 'digital footprint'" by Spencer Kelly, a presenter for BBC Click. The article discusses how digital footprints grow as users upload information online. A quote from the article reads: "Every time we register for a new web service, or upload our photos and videos, we are enlarging our own digital footprints". The article also mentions a Panamanian website from 2006 and a student's profile search. The page includes navigation links, a sidebar with program information, and a list of popular stories.

# The Era of Ubiquity

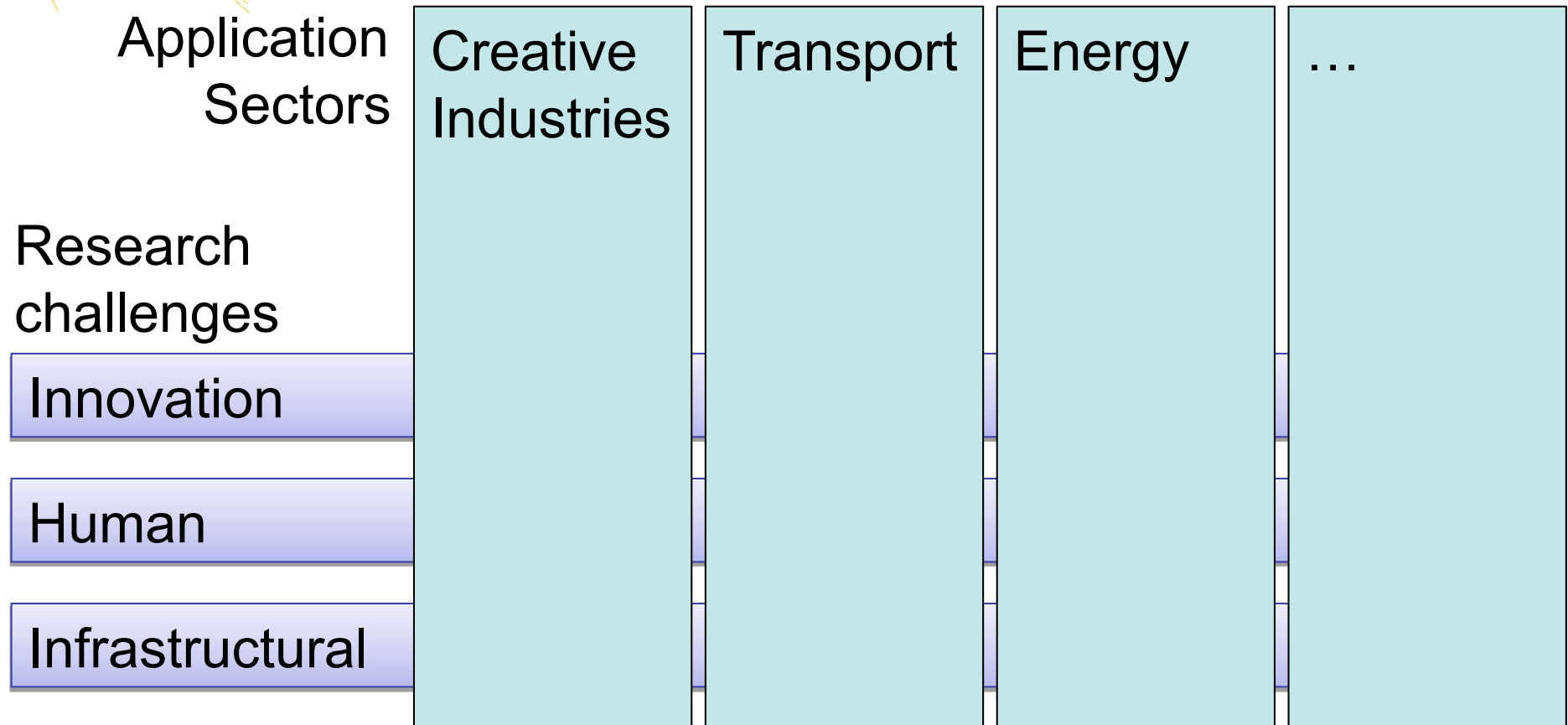


# Contextual Footprint

- As we enter an era of ubiquity data increasingly comes from:
  - Buildings, furniture, artefacts, vehicles, clothing, biosensors
- Combined with:
  - Location, context, interactions..
  - ..both virtual and physical
- Our **contextual footprint** blends physical and digital interaction



# Sectors and challenges





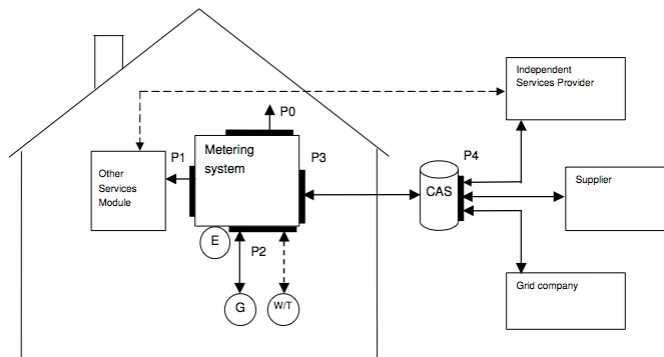
# Experience projects from sectors

---

- Creative Industries:
  - A Day in the Park (started)
  - Pervasive Monuments (started)
  - Archiving pervasive experiences (started)
  - Urban gaming (started)
- Transport
  - The Connected Journey (started)
  - Smart travel needs smart networks (planning)
- Energy
  - Multiscale Modelling (funded)
  - Enabling Consumer Awareness of Carbon Footprint Through Mobile Service Innovation (funded)

# e.g. energy consumption

- Mandatory smart meters considered invasion of privacy
- Why?
  - Poor security
  - Central services
- But it was supposed to empower the citizen...



[ABOUT](#) [MISSION](#) [WHO WE ARE](#) [SIGN UP](#) [DONATE](#) [CONTACT](#)

« We should allow cameras to cover court proceedings | [Main](#) | 'Web Cop' to patrol internet for anti-police comments »

01/14/2010

## Privacy concerns scotch Smart Meters plan in Holland

Back at the beginning of December, I wrote a piece and spoke on the radio regarding Ed Miliband's announcement that the government would soon be rolling-out Smart Meters across the UK - and the danger that this posed to the sovereignty of our energy supply and the uncertainties surrounding the information that utility companies would now have immediate access to.



## RESEARCH

Research and publications from Big Brother Watch

## CAMPAIGNS

The latest campaigns from Big Brother Watch

## MEDIA ARCHIVE

February 2010

January 2010

## GUERRILLA STICKER CAMPAIGN



## TWITTER UPDATES

# A bad Latitude

If we have to  
turn it off  
we won't  
turn it on...

xkcd



LOCATIONS		
TIME	MEGAN	ROBERT
11:00 AM	HOME	
12:30 PM	EASTVIEW ADULT TOY STORE	HOME
1:30 PM	HOME	
2:00 PM	LAKE HOUSE TOY STORE	SCHOOL
2:30 PM	HOME	
3:00 PM	FRY'S	
3:30 PM	ED'S TOOL ETC	SUBWAY
4:00 PM	HOME	
4:10 PM	HOSPITAL BURN WARD	

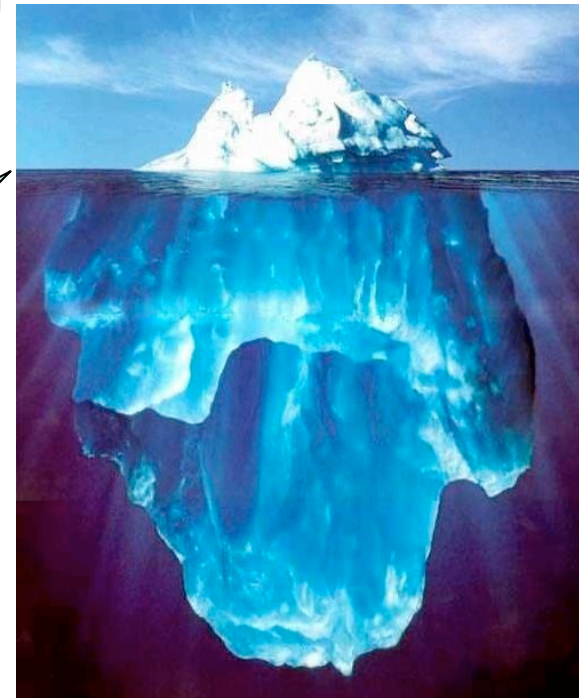


# Social networking

- Already most “ICT” systems are used for communications not computation
- We humans exist simultaneously in many different social contexts with different behavioural and temporal characteristics
- Our tools for managing the real complexity of this do not yet exist...



You are here



# Location in Context

From: NottIS (Derek McAuley)

Invite: J.Bond@mi6.gov.uk O.BinLaden@alqueda.org

Subject: Drinks reception


Location: Room A, Universal Imports, London

Start: Fri, 25 Dec 2009 09:00  All-day event

End: Fri, 25 Dec 2009 10:00

Show all day

25 December 2009	
9 <sup>00</sup>	10 <sup>00</sup> 11 <sup>00</sup> 12 <sup>00</sup> 13 <sup>00</sup>
All Attendees	
Derek McAuley	
J.Bond@mi6.gov.uk	
O.BinLaden@alqueda.org	

**25 December 2009** 

08:53 live location

All attendees	Location	Attending
D McAuley	Room A	Present
J Bond	Universal Imports	On his way
O BinLaden	Afghanistan	Not coming

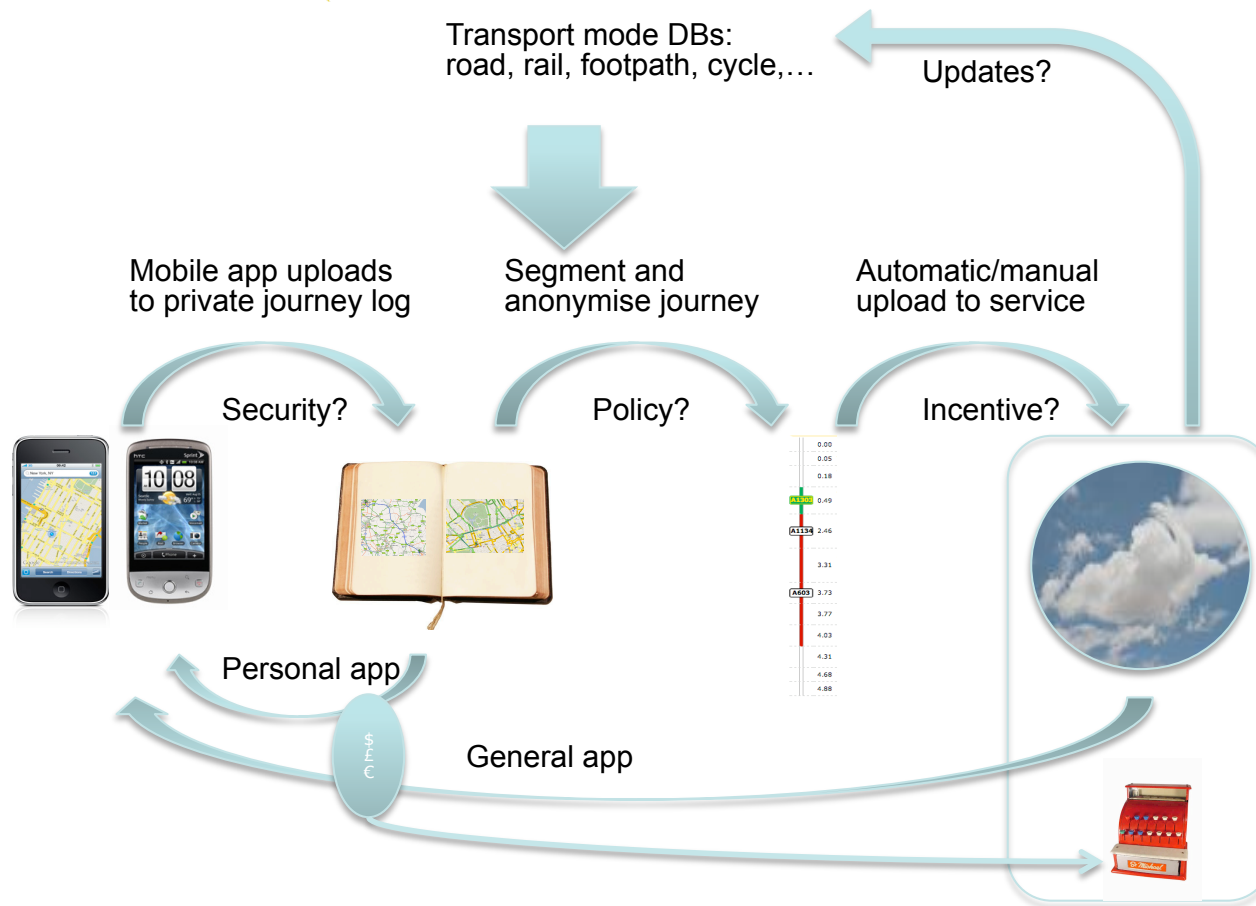


# Personal Travel

---

- Transform the journey of the future into well informed choice:
  - Allow choice in planning
    - Cost, time, £££s, CO<sub>2</sub>, travel with friends
  - Adapt to circumstances
    - Schedule changes, load, congestion, weather warnings(!), events
  - Make it end-to-end
    - Multi-modal: walk, cycle, car, taxi, bus, train, plane
    - Support multi-modal transactions
- How?

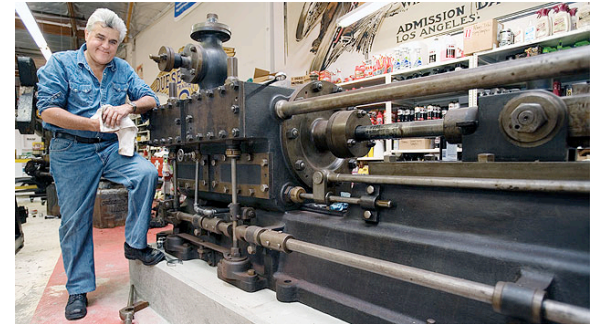
# Crowdsourcing Movement



- Process personal movement data to provide generic useful services...
- Transform personal to public service information via aggregation and anonymization

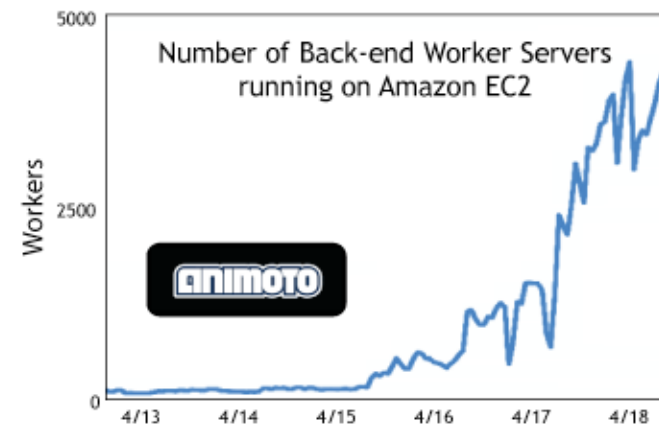
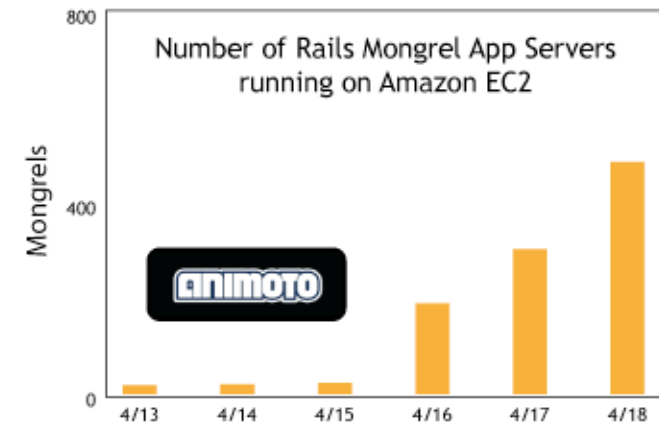
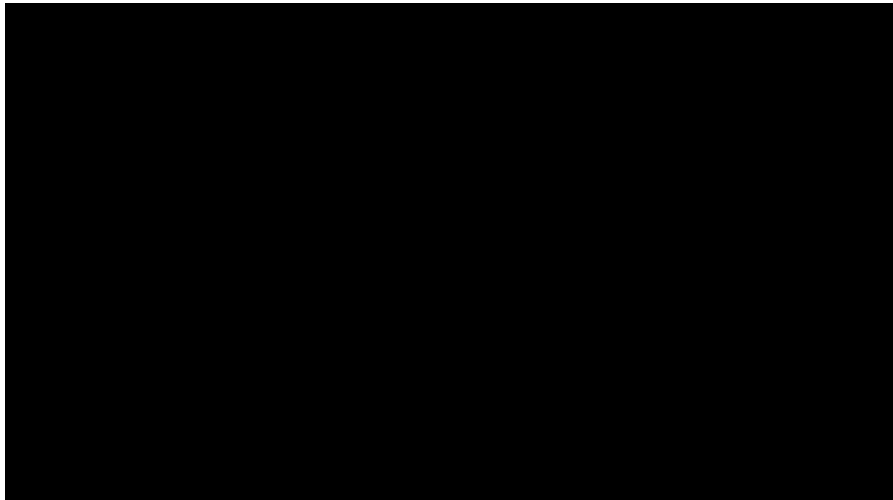
# Cloud Computing

- The dream:
  - Migrate capital to operational expense
  - Provide just-in-time provisioning
  - Customer choice of provider
- The current reality:
  - Amazon EC2 or Google Apps or MSFT Azure or ...
  - Where's your data and who can see it
  - Novel failure models
  - Some problems don't fit...



# Animoto...

- At last a cloud service company with a business model
- £/\$ for pop videos...
- Went viral as a facebook app





# openstreetmap

---

```
host47:~ drm$ nslookup www.openstreetmap.org
Server:          10.203.129.68
Address:         10.203.129.68#53
```

```
Non-authoritative answer:
Name:   www.openstreetmap.org
Address: 128.40.168.98
```

```
host47:~ drm$ nslookup 128.40.168.98
Server:          10.203.129.68
Address:         10.203.129.68#53
```

```
Non-authoritative answer:
98.168.40.128.in-addr.arpa      name = bart-98.bartlett.ucl.ac.uk.
```

# Semantic web

- Transform from
  - presentation of information to humans (HTML)
  - information available for further processing (RDF)
- Whose data is it anyway?
- Privacy (what is that black blob)

**oyster**<sup>®</sup>online

Welcome Back, Derek  
Oyster help | Shopping basket | Sign out

My card My account

Card No: [REDACTED]

Card overview | Add/renew/top-up ticket | Manage Auto top-up | Journey history  
Change security question | Transfer products

### Journey history

This statement shows pay as you go journeys using the above card, taken from 08/12/2009 to 21/01/2010 .

Please note, it normally takes 48 hours for journeys to be added to your statement.

For legal reasons we are only able to display up to eight weeks of data.

Date	Time	Location	Action	Fare	Price cap	Balance
21/01/10	16:24	Waterloo (Bkloo, Nthn, W&C Lines)	Entry	- £6.00		£33.40
19/01/10	17:58	London Bridge [London Underground]	Exit	- £4.20		£39.40
22/12/09	14:44	Piccadilly Circus	Exit	£2.40		£41.20
	14:28	Swiss Cottage	Entry	- £4.00		£38.80
08/12/09	14:36	Kings Cross (Met, Circle, H&C)	Exit	£4.00		£42.80

[1]

Printer friendly version

# Whose data is it anyway?

## It's ours

Why we, not government, must own our data

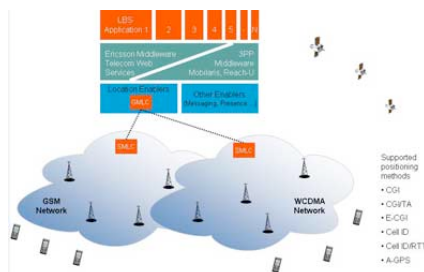
LIAM MAXWELL

"It's ours"

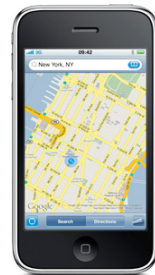
- Liam Maxwell, Centre for Policy Studies

Google health  
beta

"Google stores your information securely and privately, but you always control how it's used." - Google



v.



"Can Spam" and "EU Data Retention Directive" – it is ours!



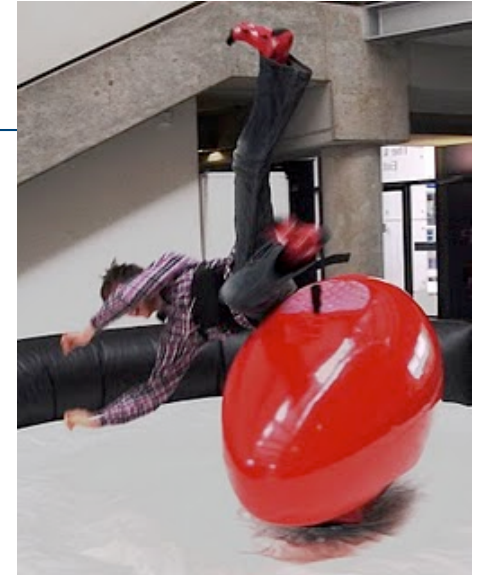
# Personal containers

---

- My “stuff” logically under my control
  - The DPA get’s real!
- Distributed vs. Centralized
  - Logically a single entity
  - On hosts under my control or on my cloud
  - Or managed by a third-party in the cloud
  - Or federated among many third-parties
- User vs. Third party owned
  - Just because you can doesn’t mean you’re allowed
  - Ability to collect does not imply right to process
- What does it look like?

# What's in it?

- Everything? Well, a wide variety of data types
  - Messaging: Facebook, Twitter, Email, ...
  - Media: Phone calls, SMSs, Photos, ...
  - Activity: Credit/bank transactions, loyalty card data, ePortfolio, location ...
  - Biometrics: heart rate, EEG, breathing rate, ...
- Audit trails, intervention
  - Who accessed what, when, why?
  - I need to be able to correct the inevitable mistakes





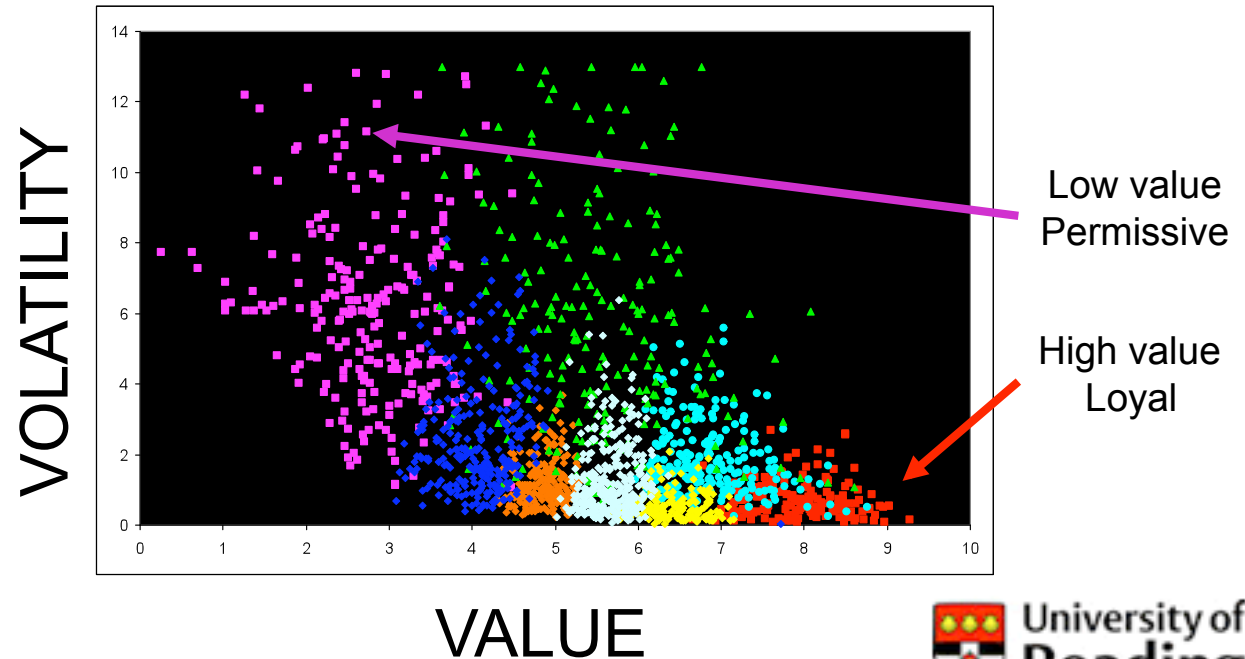
# What can it do?

---

- Return control over data to the creator, i.e., me
  - Host execution of queries
  - You can't have my data
  - But I might let you compute across it
- Correlation across rich detail
  - No longer restricted to what you can sneak
  - I have everything about me
  - It's all about the incentives you give me

# Models from the data

- Making a behaviour based dynamic model for customers
  - Deployment over vast data sets
  - Presentation of outputs
  - Projections
  - Real-time





# Finally...

---

- Digital Economy enables new business models that can allow an activity to scale rapidly
  - Learn lessons here for ac.uk and gov.uk services...
  - Should we simply outsource the computes and storage?
- Personal containers are a key concept in getting control of our data to permit new uses
  - Requires massive deployment of active containers
  - <http://perscon.net/>



[www.horizon.ac.uk](http://www.horizon.ac.uk)

---



Questions?

[Derek.McAuley@nottingham.ac.uk](mailto:Derek.McAuley@nottingham.ac.uk)