

The importance and future of the cloud

Prof J Craig Mudge FTSE

Collaborative Cloud Computing Lab (C3L)
School of Computer Science
University of Adelaide

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Outline

1. Essence of cloud computing
2. Security and privacy
3. Easy to use parallel computers
4. Future

Data analytics in the cloud

Scientific discovery – new paradigm

Essence of cloud computing

Service provider owns and manages the infra

Offered as a utility

Business model: pay as you go

Massive scale

Accessed over the Internet

Easy to use + flexible

Cloud service provider owns and operate the infrastructure



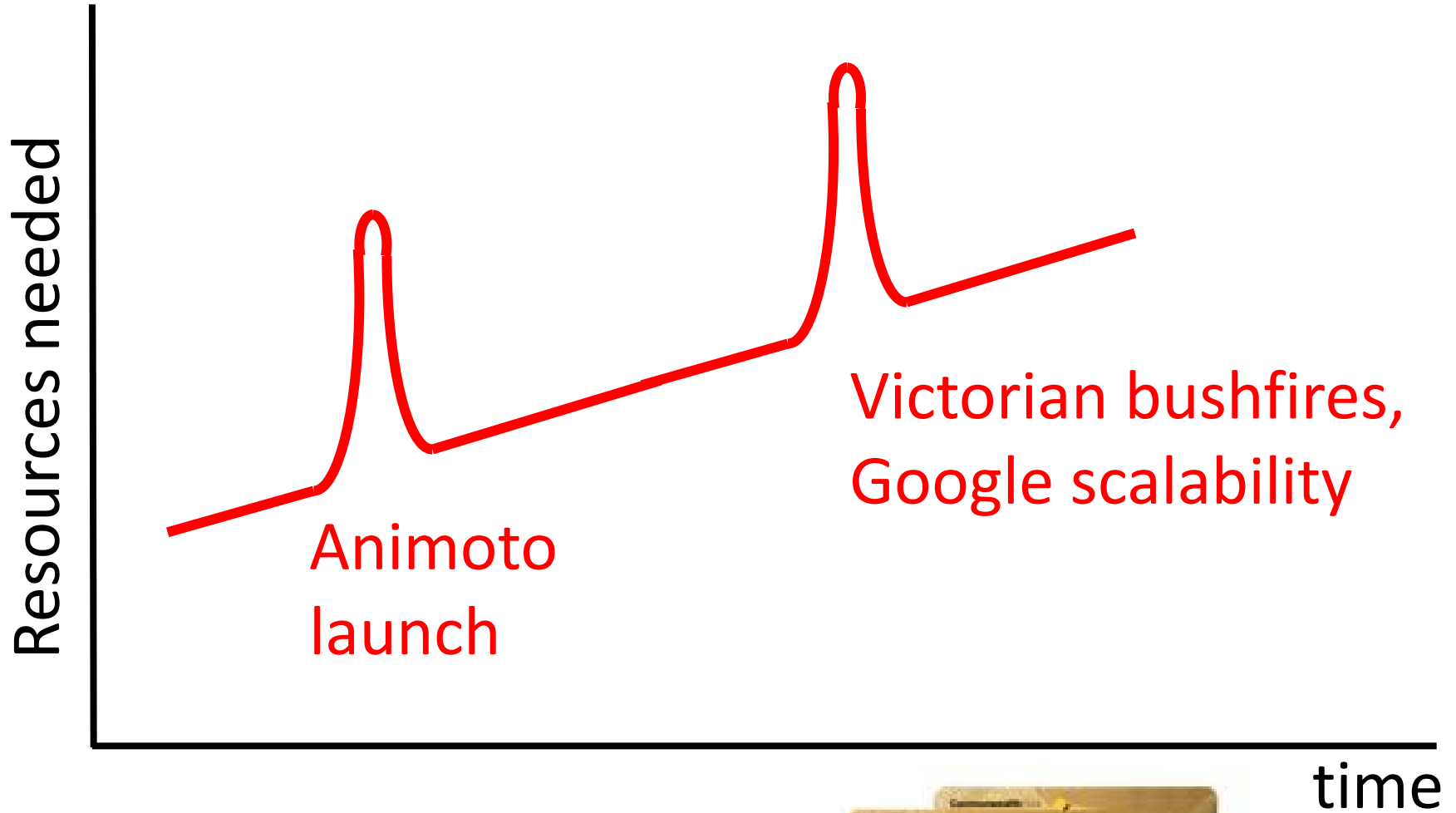
Google, Dalles Oregon



Microsoft Azure, Chicago

From www.cloudinnovation.com.au

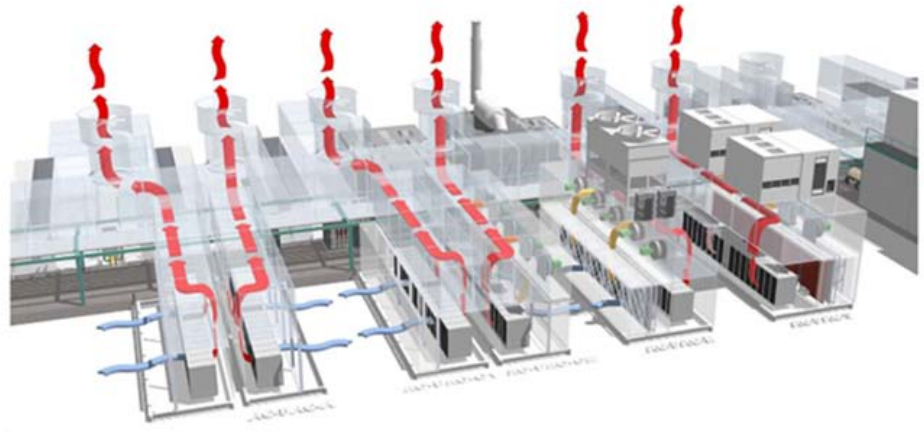
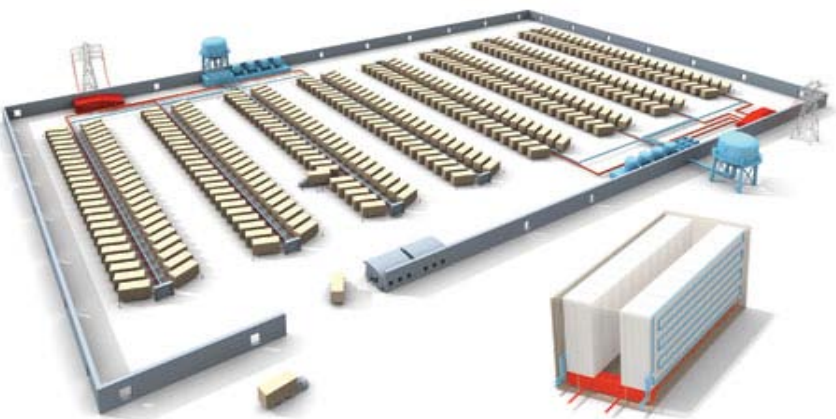
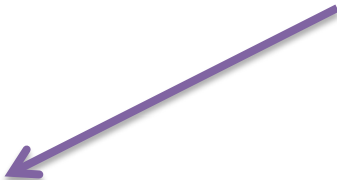
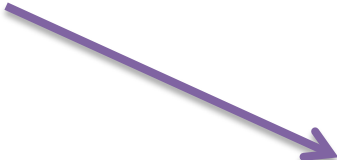
Offered as a utility



Matching business mode
pay-per-use



Massive scale

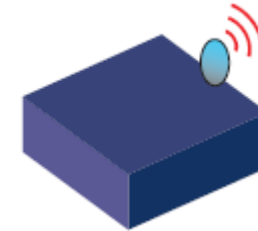


Air flow

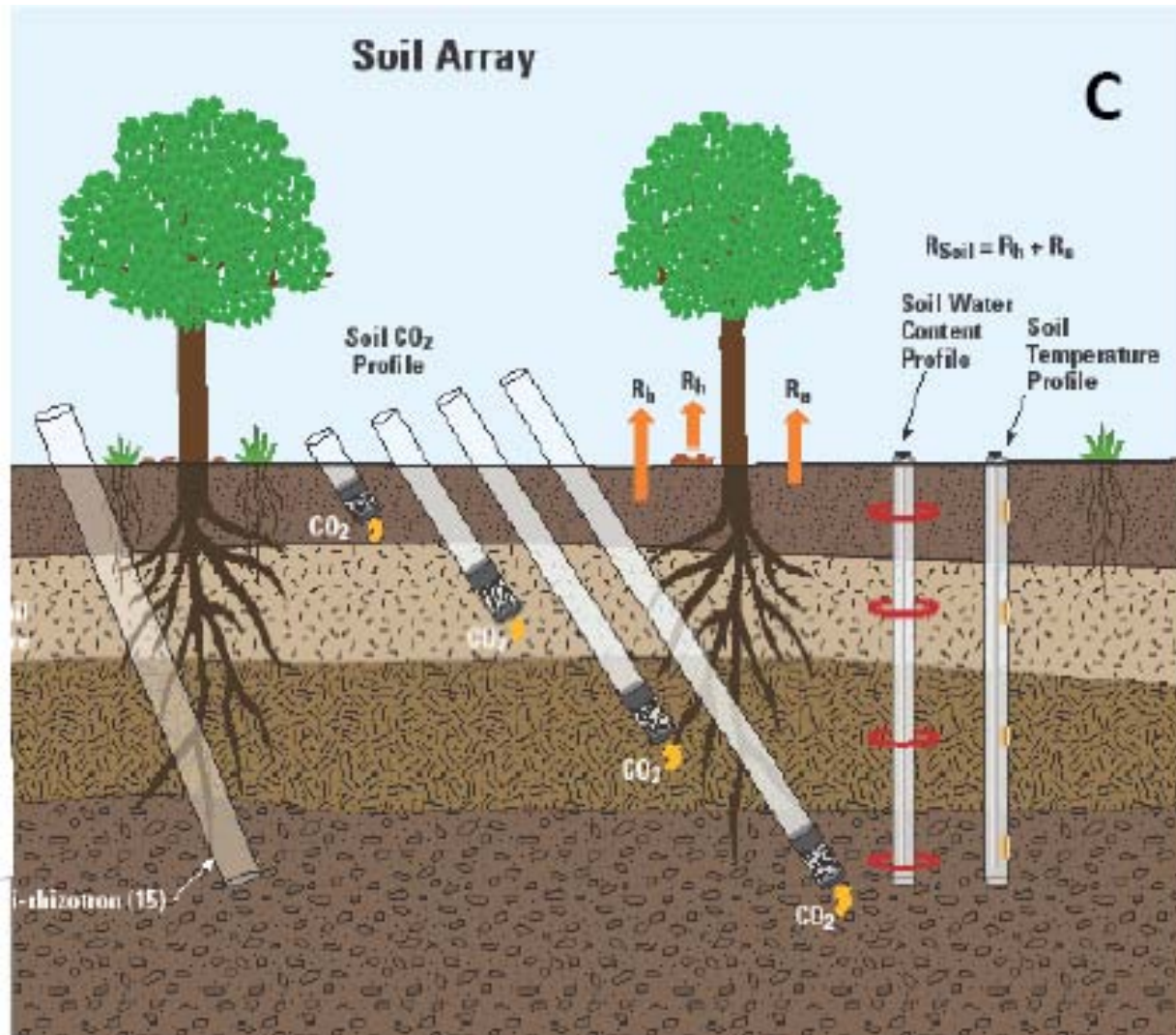
Accessed over the Internet



Accessed over the Internet



Sending wirelessly
Soil, tree canopy
temperature, CO₂,
Moisture, etc.



Essence of cloud computing

Service provider owns and manages the infrastructure

No worries from Software upgrade; Technology refresh

Offered as a utility

Capacity planning

Business model: pay as you go

CAPEX replaced by OPEX

Massive scale

Low cost 4-7x cheaper

Accessed over the Internet

Universality of access

Easy to use + flexible

Productivity

True cloud computing

Amazon Web Services

Google

Microsoft Azure

Cloud washing

You also hear “cloud” attached to virtualisation, offsite hosting of your equipment, and private clouds

- None of these capture the benefits unless
 - Built at scale
 - The provider owns and operates a pooled set of resources
 - Offered as a utility

SECURITY AND PRIVACY

Australian Academy of Technological Sciences and Engineering



Driving technological solutions for a better Australia

www.atse.org.au

Security

For certain applications, security is an obstacle, but not an insurmountable obstacle.

Solutions include

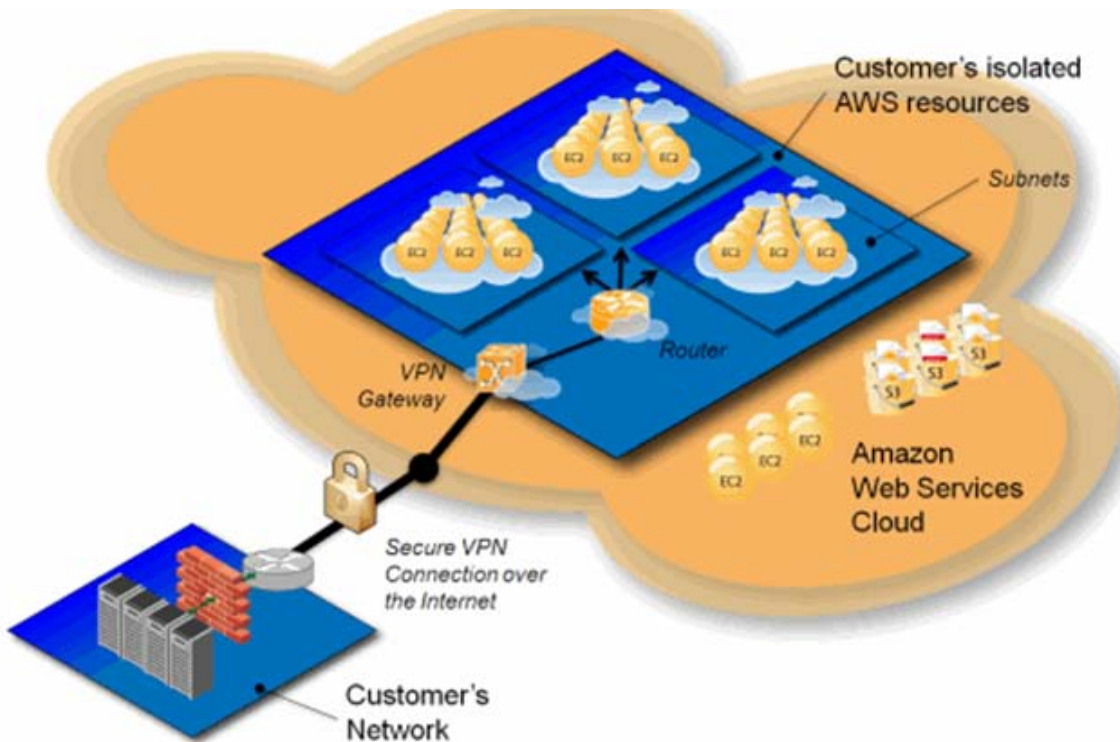
encryption, and authentication, and access control

Communications can use secure networking and encrypted data.

However, privacy is complicated by

- different laws by country of location
- and different practices by state.

Isolated section of data centre



Security:

Ask for a provider's security and privacy policy and procedures

Ensure compliance with standards

- Medical records
- Credit card

Recommendation 1

The Commonwealth Government should take a whole-of-government approach to new security and privacy issues arising from the use of cloud computing, by establishing a new taskforce to review the adequacy of current legislation and identify what steps need to be taken to ensure a supportive regulatory environment.

Access to parallel computing

1. Essential for data analytics
2. Supercomputer centres are often hard to use, very expensive, and a capital cost
3. Cloud provides on-demand supercomputing
4. Parallelism is across hundreds and thousands of processors connected by 10GE and 40GE

Hence the cloud programming model MapReduce, and Dryad/LINQ, is well matched to loosely coupled multis



5. See speed up obtained by our Lab in processing geophysics data (reduced runs from weeks to days)
6. Can also access parallelism through multi-core on each processor chip

Comments on adoption in Australia

1. SMEs
2. large business
3. government
4. eScience

5. Startups

"Lowering the entrepreneurial barrier to Zero"

John Taylor, CSIRO

"Compete on ideas, not on amount of resources".

Craig Mudge

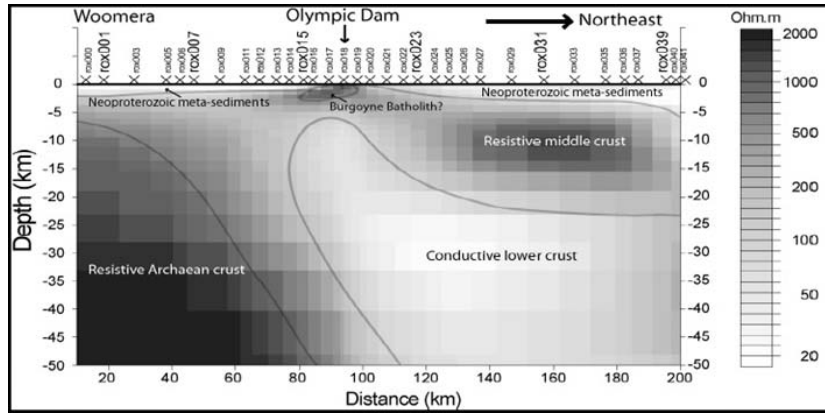
FUTURE

1. High Performance Computing (HPC) in the cloud
2. Data warehouses for data analytics
3. Machine learning in agriculture

The future is now

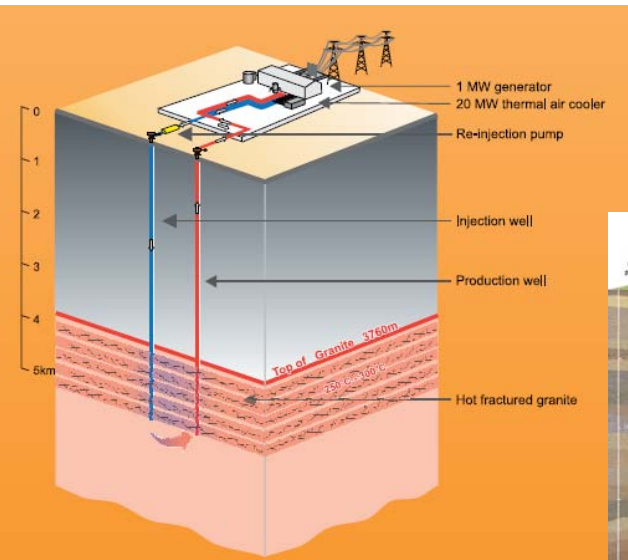
High Performance Computing (HPC) in the cloud

Magnetotelluric (MT) imaging

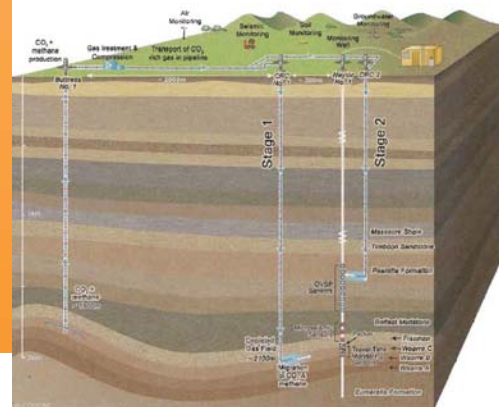


1. Using the magnetic and electric fields of the earth, MT imaging determines the resistivity structure of a sub-surface area of interest.
2. It goes deeper (hundred or so Km) than seismic (<2 Km) but does not have the same resolution
3. Applications

1. mineral exploration,
2. water management in mining,
3. geothermal exploration,
4. carbon storage,
5. aquifer research and management
6. earthquake and volcano studies.



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CO2 in depleted gas field

(Heinson and Mudge, 2010)

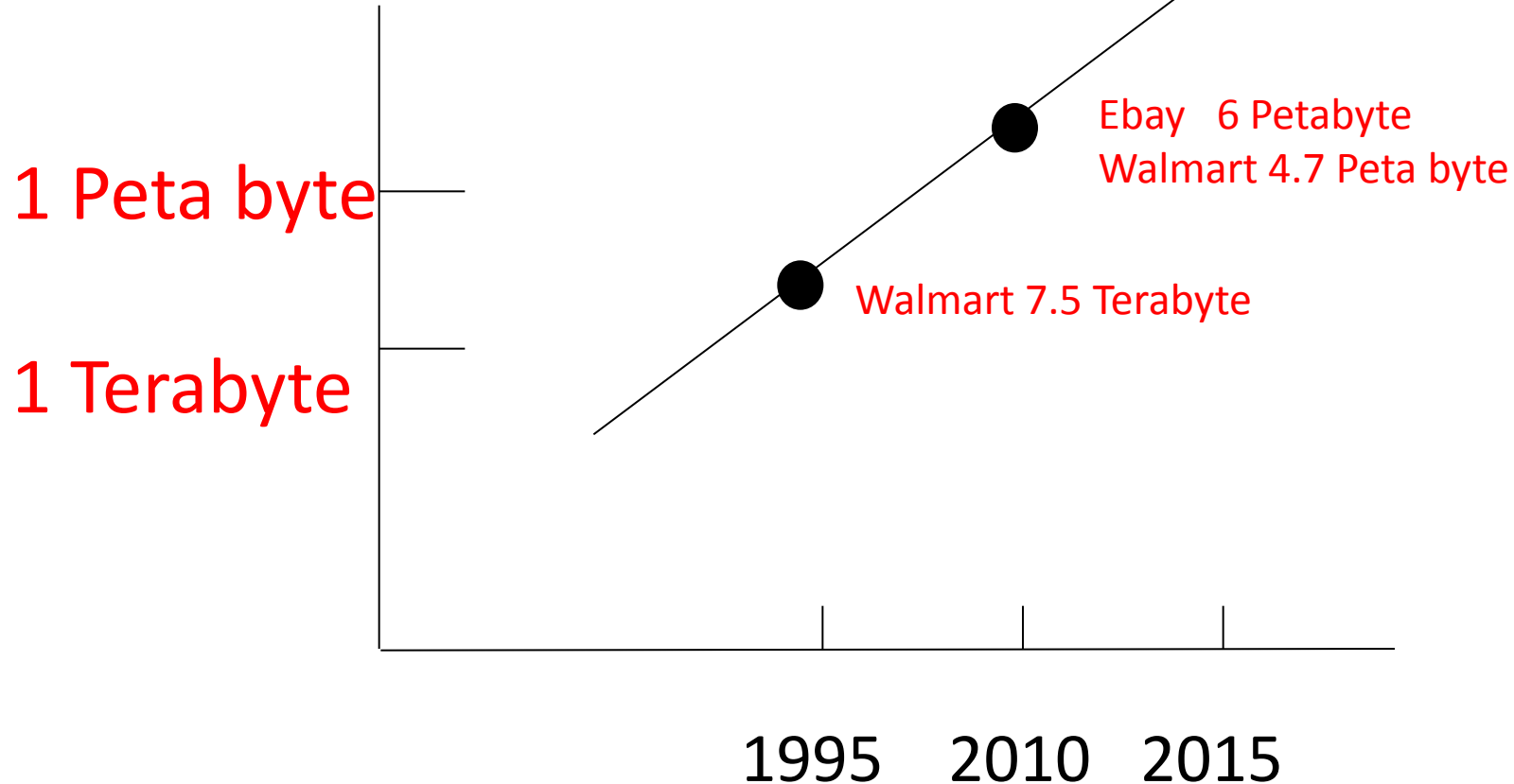
craig.mudge@adelaide.edu.au
27 sep 2010

Data logging by University of Adelaide Geophysics, on a geothermal site – Paralana, SA, Australia

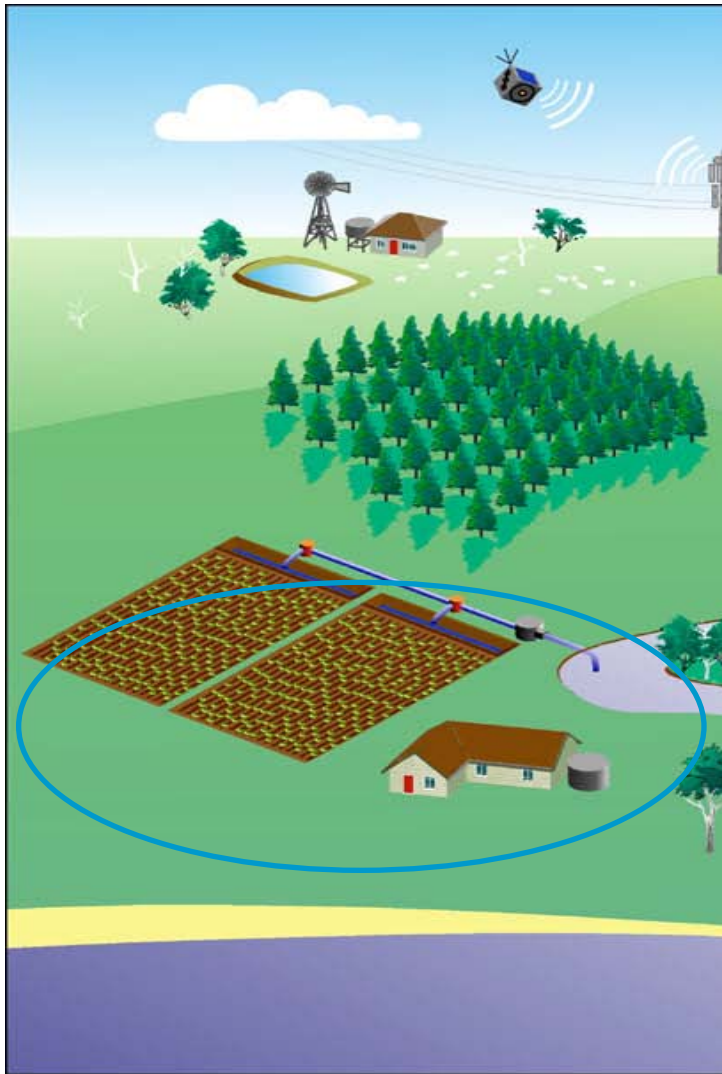


Data warehouses for data analytics

- Trend analysis leading to pricing
- Supply chain management
- Recommendations for books, movies



Spatio-Temporal Systems



Agronomists view (field level – maybe at the entire farm level):

$$\text{Yield} = \text{Harvest Index} * \Delta\text{Biomass}$$

$\Delta\text{Biomass} = \text{Function} (\text{meteorology, site, crop \& management parameters})$



FUTURE

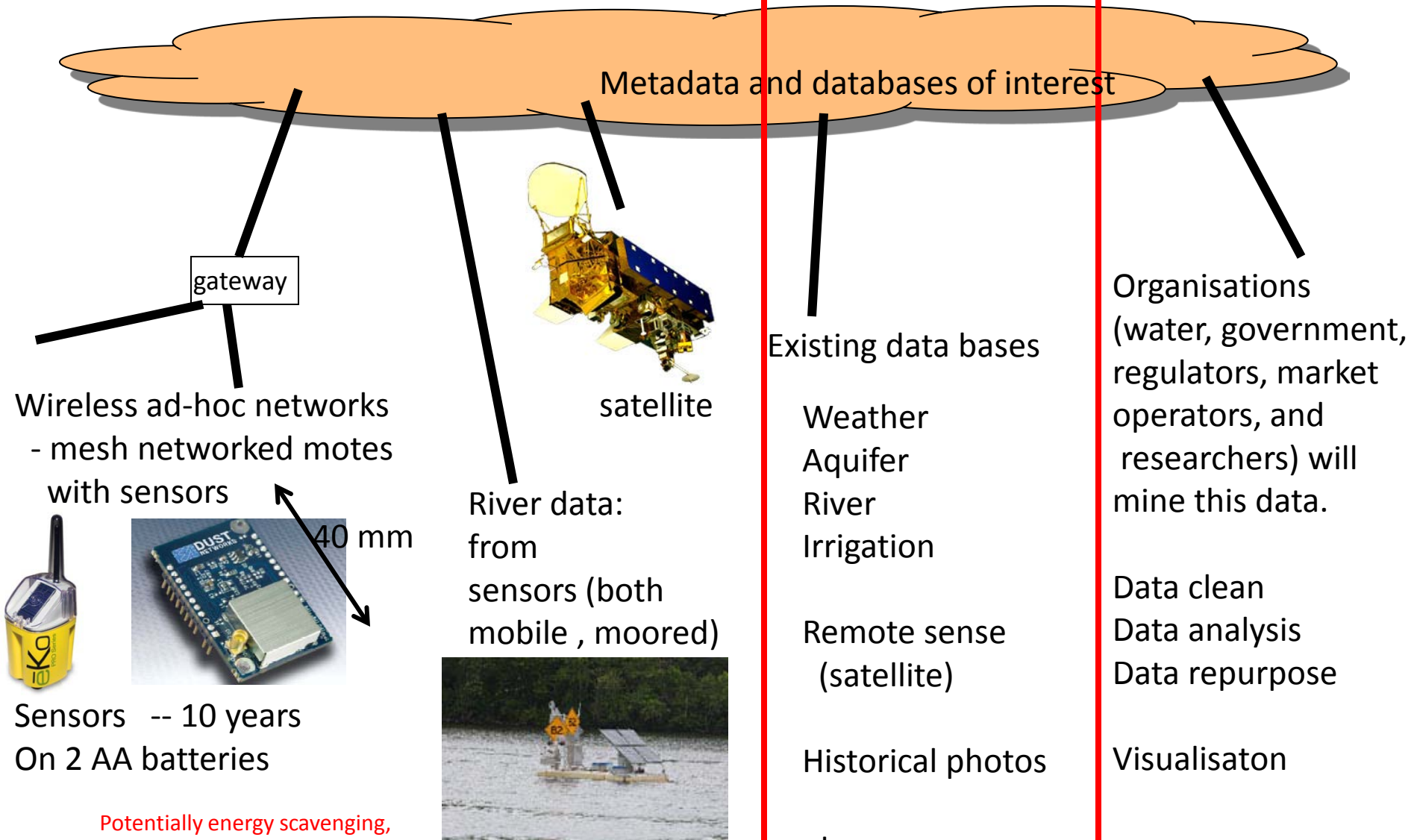
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The future is now

Water: Data collection, management, and analysis in the cloud

Data collection, aggregation

- high volumes of complex heterogeneous data



Thanks
and
questions

Craig Mudge

0417 679 266

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