

User-Centric Networking & the Personal Information Hub

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Networks & Operating Systems
SRG, Computer Laboratory

User-Centric Networking & the Databox

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User-Centric Infrastructure

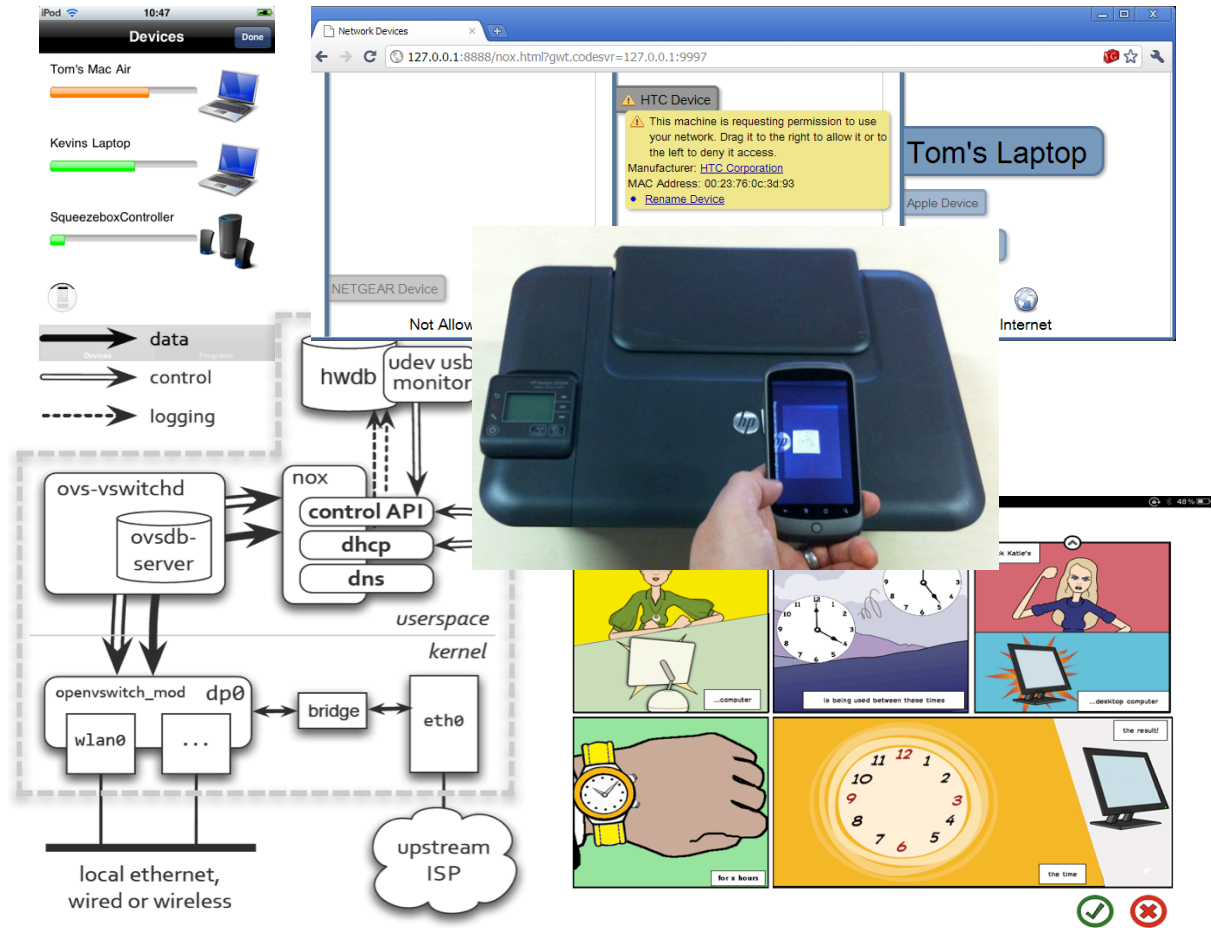


Stable, hidden, shared vs
Dynamic, exposed, intimate



Homework

- Little point putting lipstick on a pig
- System design
- Information basis
- Granularity
- Vocabulary
- Points of control



[Mortier et al, UIST'12; Crabtree et al, PUC'14]

Getting Out of the House

Our digital footprints pose major societal challenges...

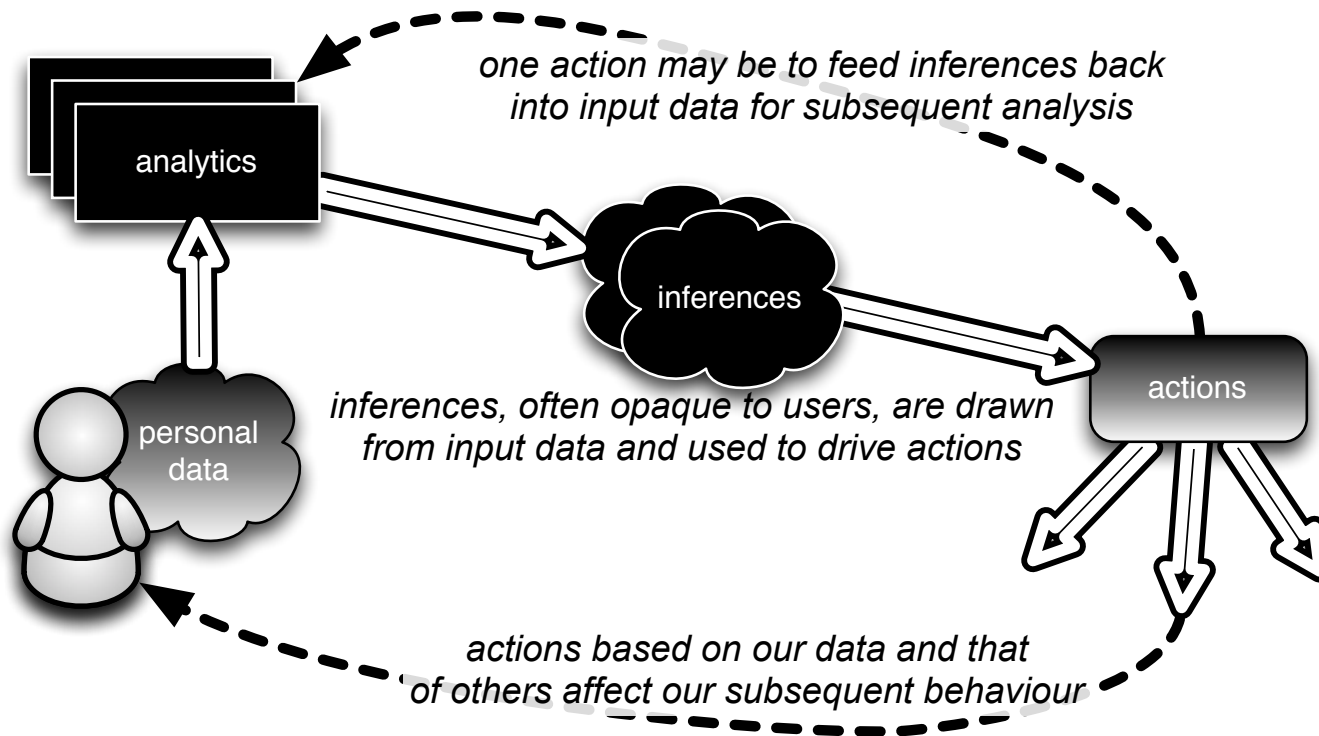
<https://flic.kr/p/ppMdY1>



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...as the same time as an opportunity for **economic growth**

Human-Data Interaction



We believe current systems lack

Legibility, Agency, Negotiability

[Mortier et al, SSRN'14; Crabtree & Mortier, ECSCW'15]

Living in a Big Data IoT World

- Intimate information about us is collected and used
- It augments already large, rich data silos
- Never forgetting or forgiving

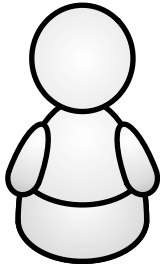


Key Challenge:

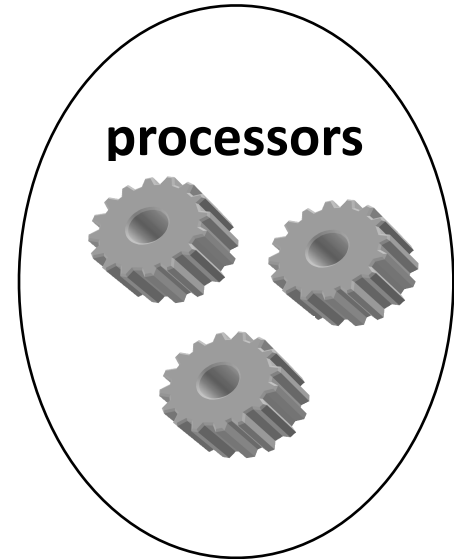
How do we enable individuals to control collection and exploitation of both **their data** and **data about them**?

Dataware: The Actors

subject

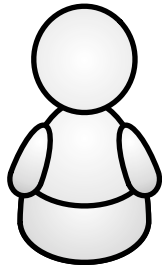


processors



Dataware: Implementing HDI

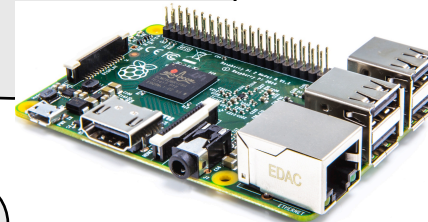
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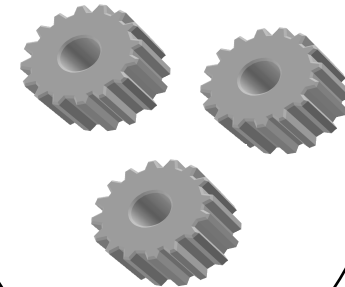
databox



sources

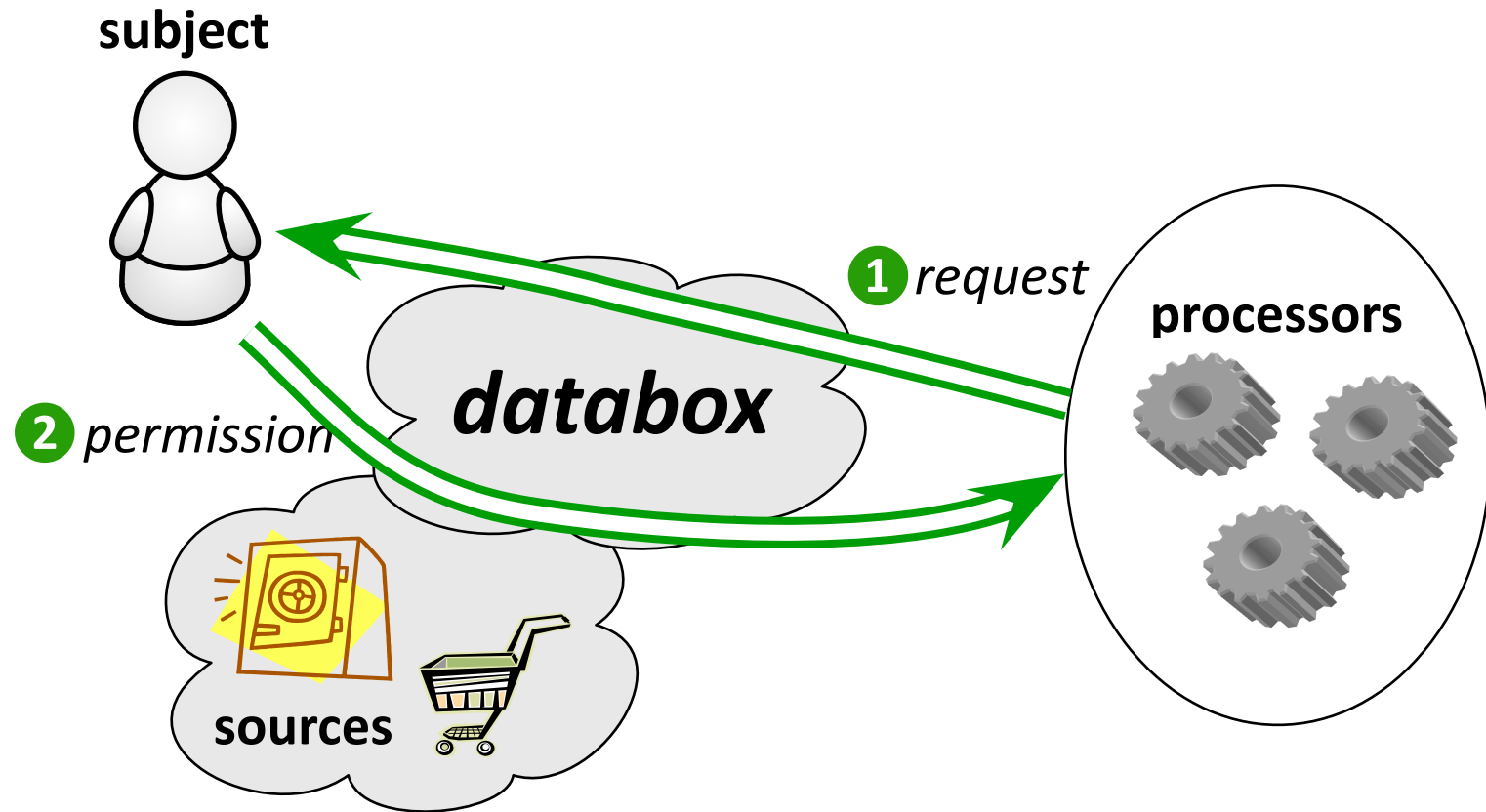


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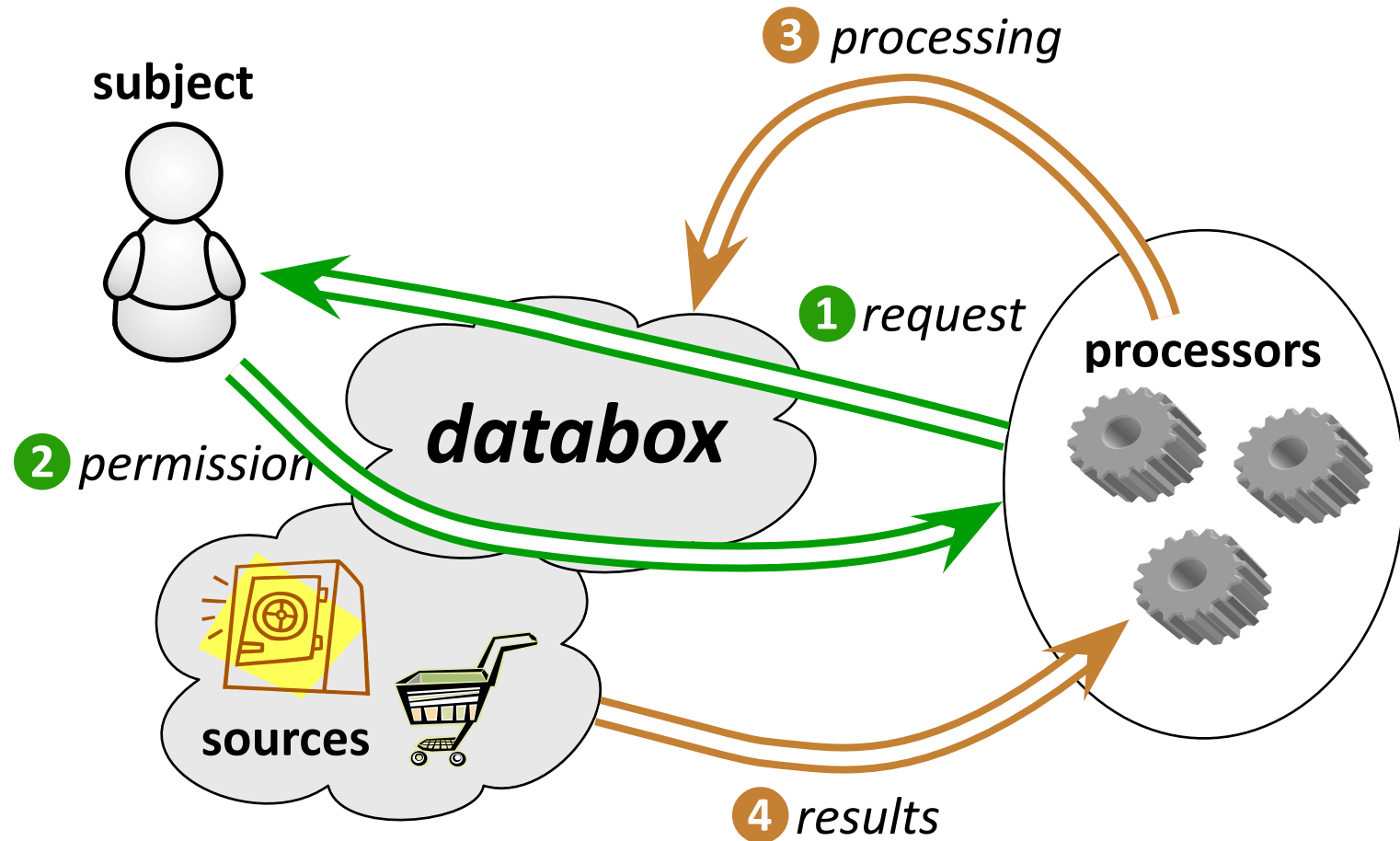


[Chaudhry et al, AARHUS'15; Haddadi et al, arXiv'14]

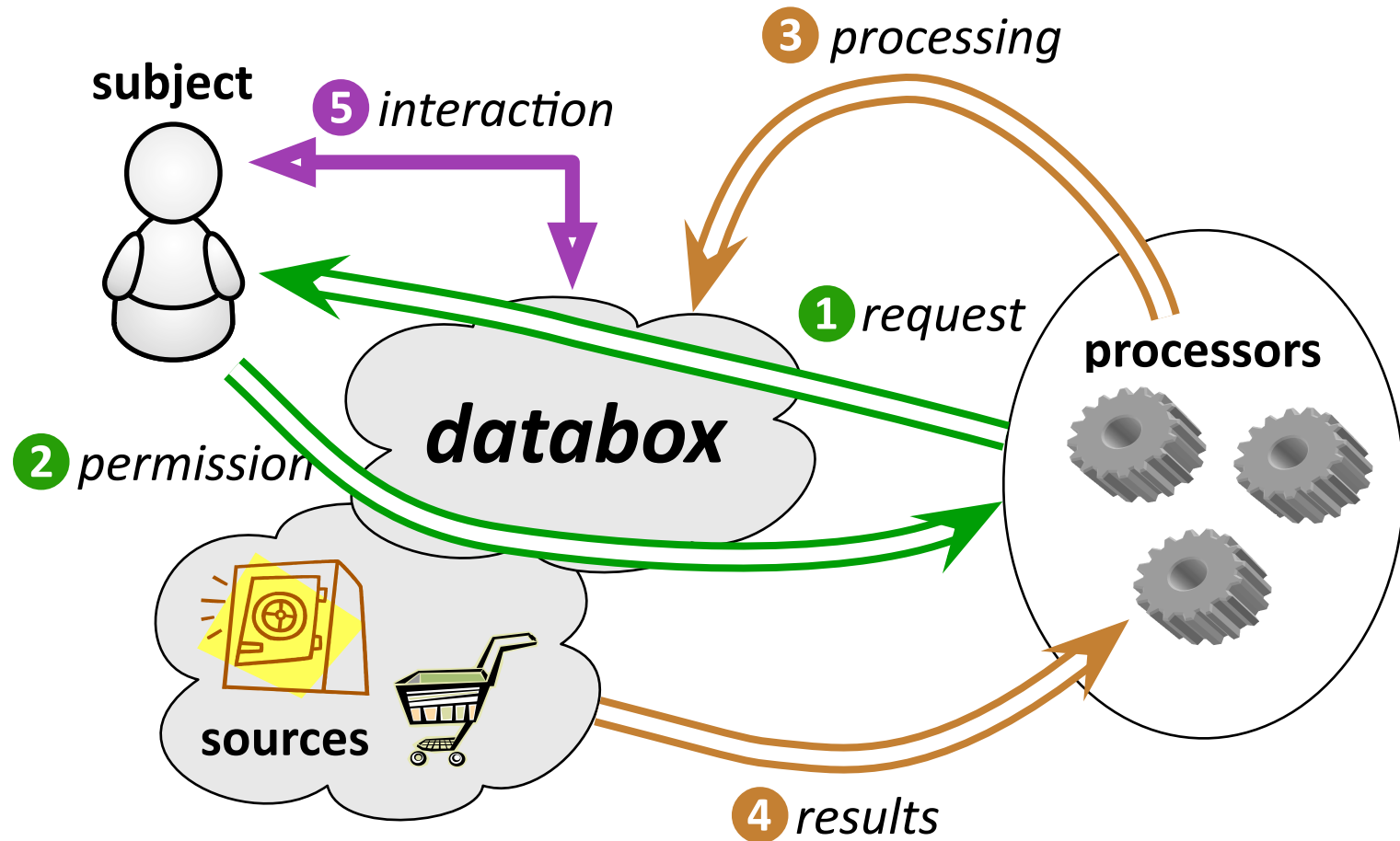
Dataware: Legibility



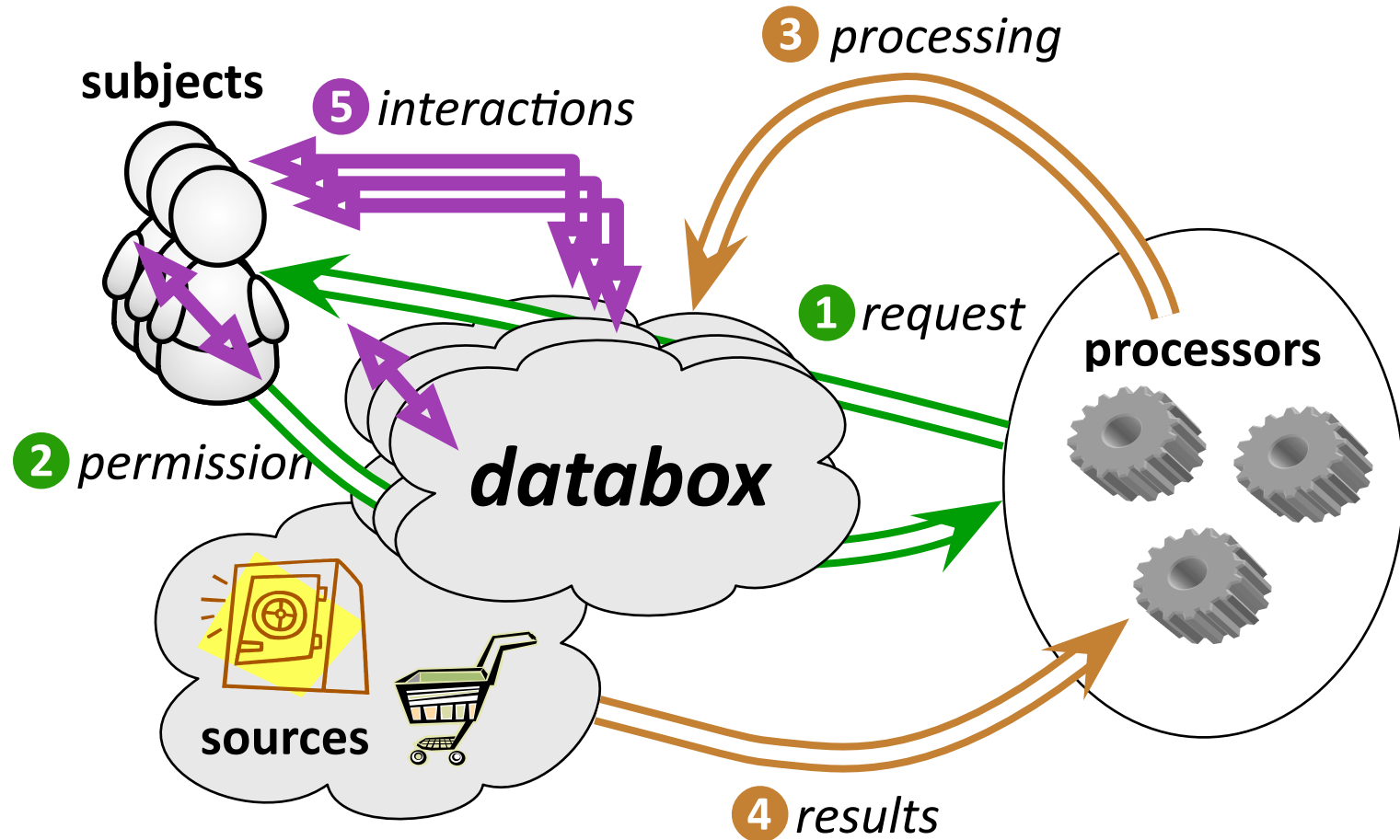
Dataware: Agency



Dataware: Negotiability



Dataware: Constructing Interaction



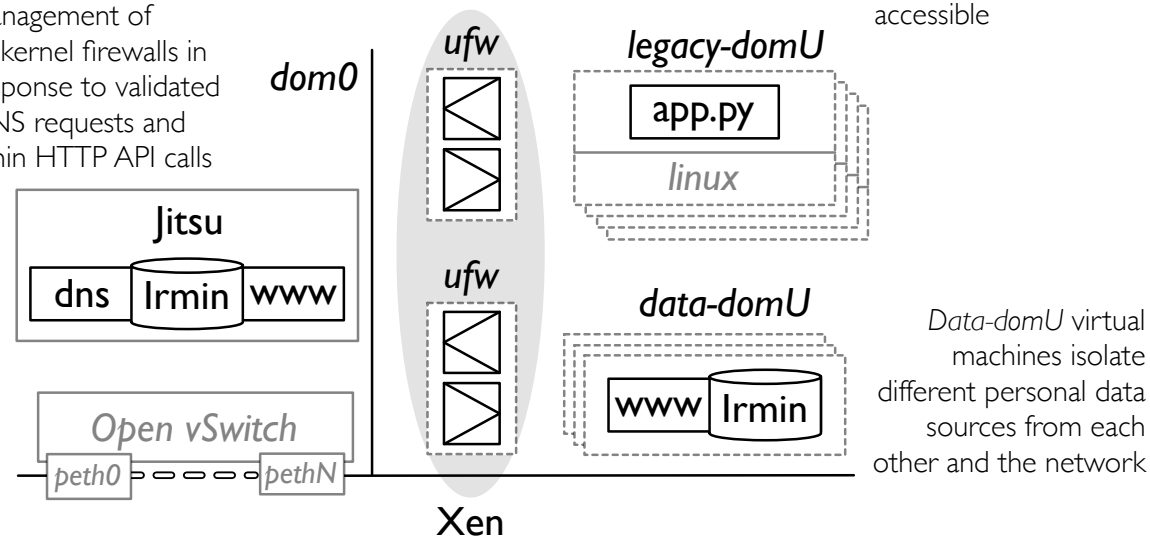
Databox Unikernels

- Privacy Preserving Resource Discovery
- Support for legacy non-unikernel code
- Isolation of cloud originated data
- Network isolation of all data stores and legacy VMs

Jitsu toolstack automates access to legacy and data VMs via lifecycle management of unikernel firewalls in response to validated DNS requests and Irmin HTTP API calls

Unikernel firewalls, dynamically created by *Jitsu* in response to validated requests

Legacy-domU virtual machines ensure vulnerable legacy code is not network accessible



ARM / x86

Xen/ARM enables the full Xen stack, including Mini-OS, to run on low-power ARM boards providing the ideal hardware platform

Physical Interaction and the Databox

- Physical devices often easier to reason about
 - Visible; Located; Proximity; Portability
- Physical access control is the norm
 - “The bag of keys” is well understood
- For example,
 - “when the grey tag is attached to my iPhone at home, the photos I take are shared with no-one; but when the grey tag is attached to my iPhone away from home, photos I take can be shared with family members”
 - “when the red tag is plugged into my Databox, none of my data may be accessed without direct permission from me”
 - “access to our smart meter data is allowed only when I have the green tag plugged into my Databox, and my wife has the green tag plugged into hers, or when one of our tags is plugged in and we’re both in the house”



Beer^WQuestions!

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[McAuley, Mortier & Goulding, COMSNETS'11](#)

[Mortier et al, SSRN'14](#)

[Chaudhry et al, AARHUS'15](#)

[Crabtree & Mortier, ECSCW'15](#)

