



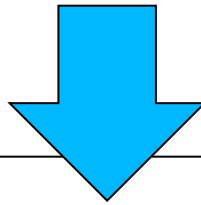
Nimbus: Intelligent Personal Storage

MSN Workshop at Cosener's House

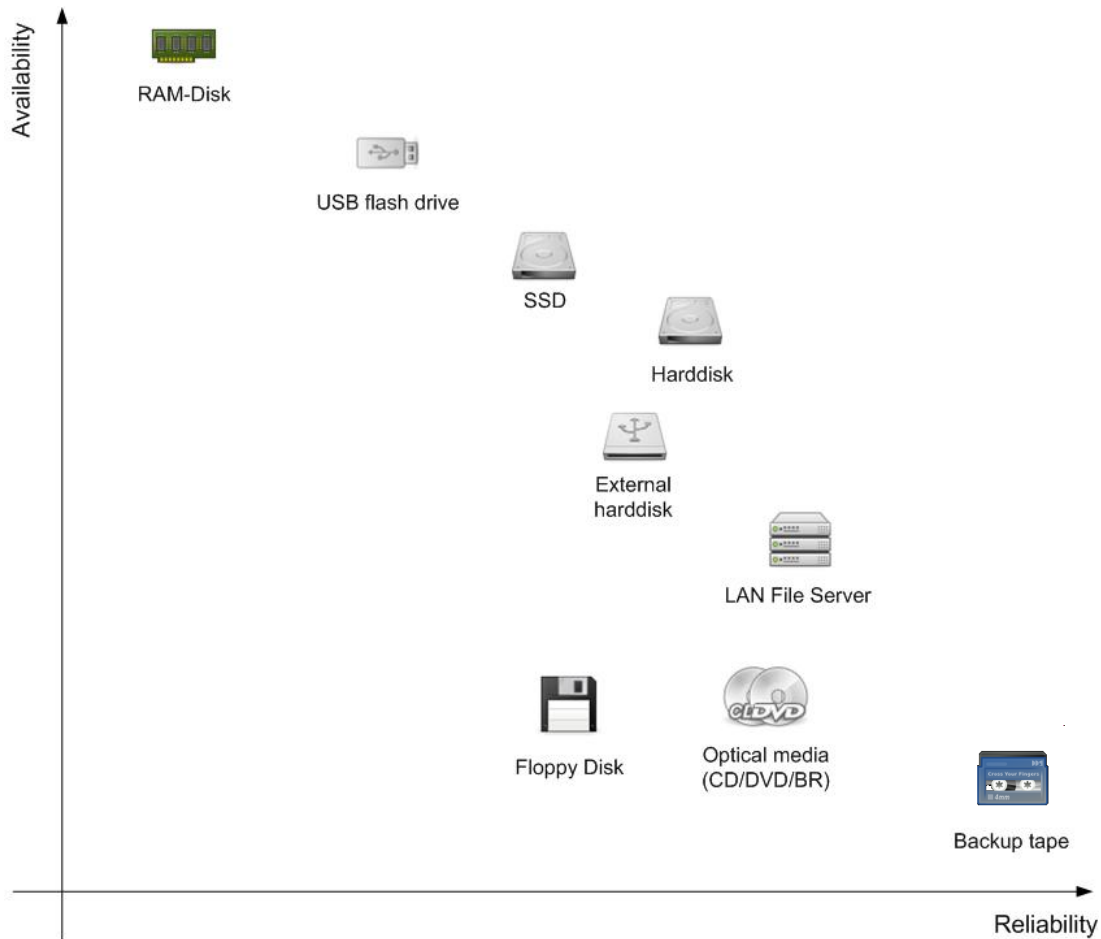
July 8th, 2010

Malte Schwarzkopf, Systems Research Group

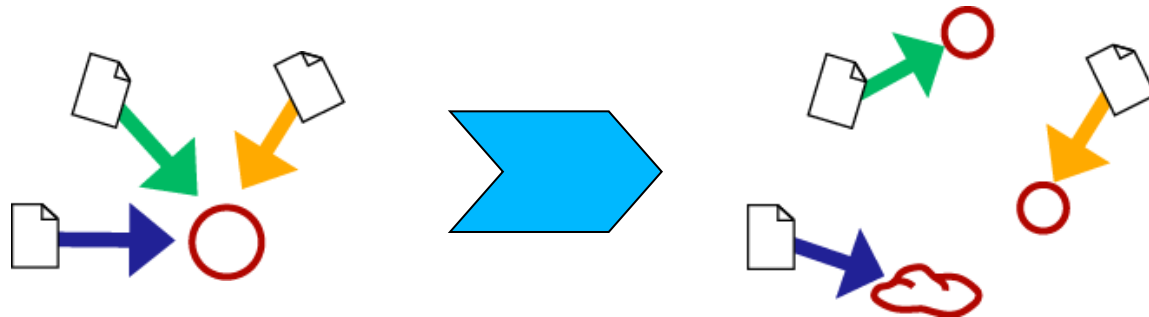
In the good (?) old days...



(... though that's not quite the whole story.)



The paradigm shift.



Federation of personal data

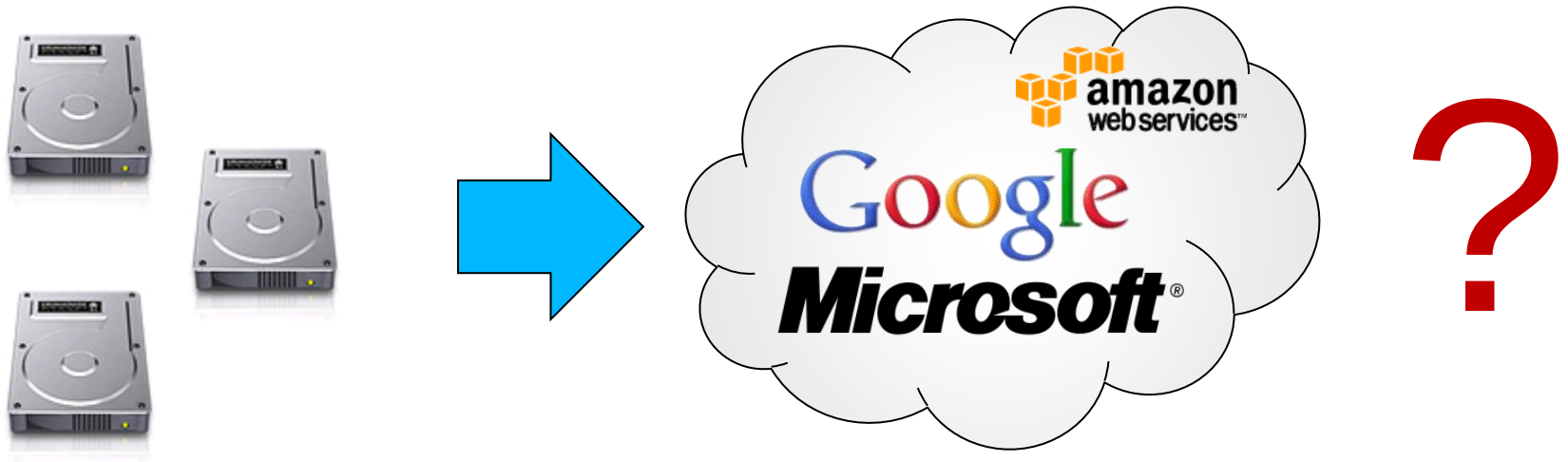
Archival?

Controlled sharing?

Platform control?

Provenance?

Re-centralise in the cloud?



(Image source: Apple xSan marketing material, http://images.apple.com/au/xsan/deployments/images/storage_icon20080208.jpg)

Hang on, there are others!



ACROBAT.COM



Not quite.

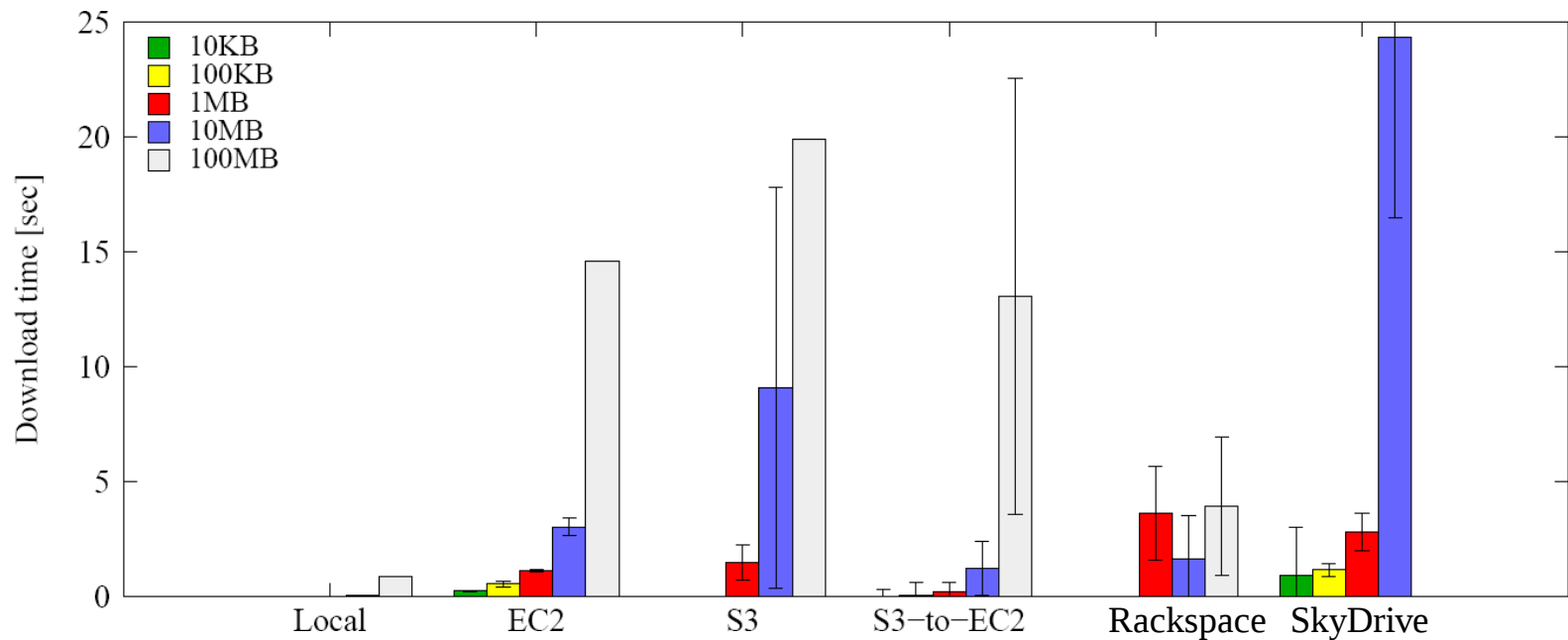


Classic “cloud storage”



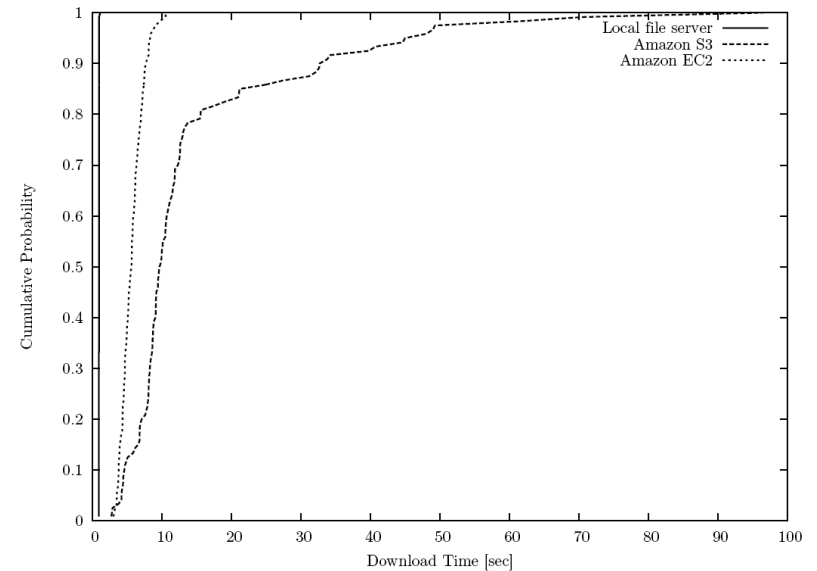
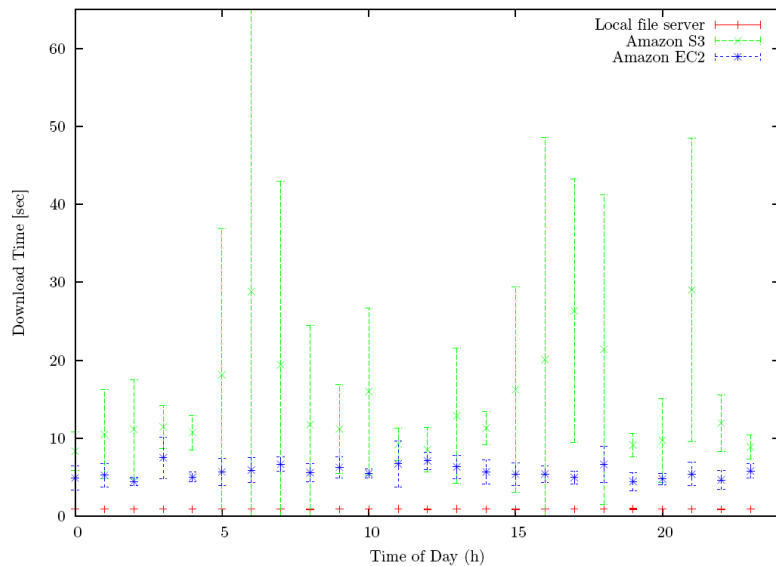
Wider sense

Cloud storage performance.



Intra-service variance ← → *Inter-service variance*

Cloud storage performance, cont.



Work

(network) file systems

Shy writing

Personal Containers

for scientific compute, webhosting etc. => ignore

databases

- NoSQL
- Spotlight with data etc.

location-based for server caching/prefetch?

(prog. langs.: lazy eval, graph traversal)

store base level data <- transform only

Long-term archival

tracking, reverse DAGs

data provenance

pub' sus?

data as D(A)s?
base object -> derived objects (via transformations)

Cloud Storage

Local vs. cloud-based computation/data use and access

Database

access frontends

ABST interface

file system (POSIX style)

has metadata writing set size?

Personal Data

home directory

direct write the data to be written on local networking, down cables, prefetching

typical metadata

- documents (doc, metadata)
- pictures, videos, audio files
- messages
- temporary files
- search results
- settings, preferences, browser history
- backups

distributed storage -> backups

storage management

large different buckets

type of concern ->

Properties

	Engineering	Conceptual
Availability		
- bandwidth (easy)	✓	
- latency (hard!)		(ignore in this first instance?)
Security		
- on the cloud		✓
- in network transit		
Consistency		
- sharing		✓
- multiple access		
Archival (long-term storage)	(✓)	✓
Privacy		✓
Synchronization & conflict resolution	(✓)	✓
Provenance tracking	✓	(✓)

(ignore in this first instance?)

FOCUS

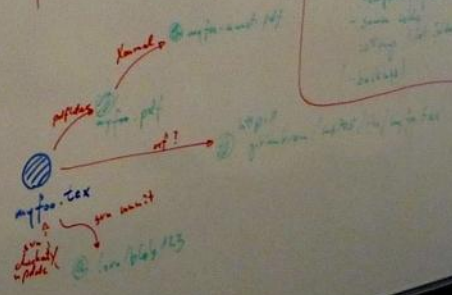
ignore for now (not that relevant for pers. data)

FOCUS

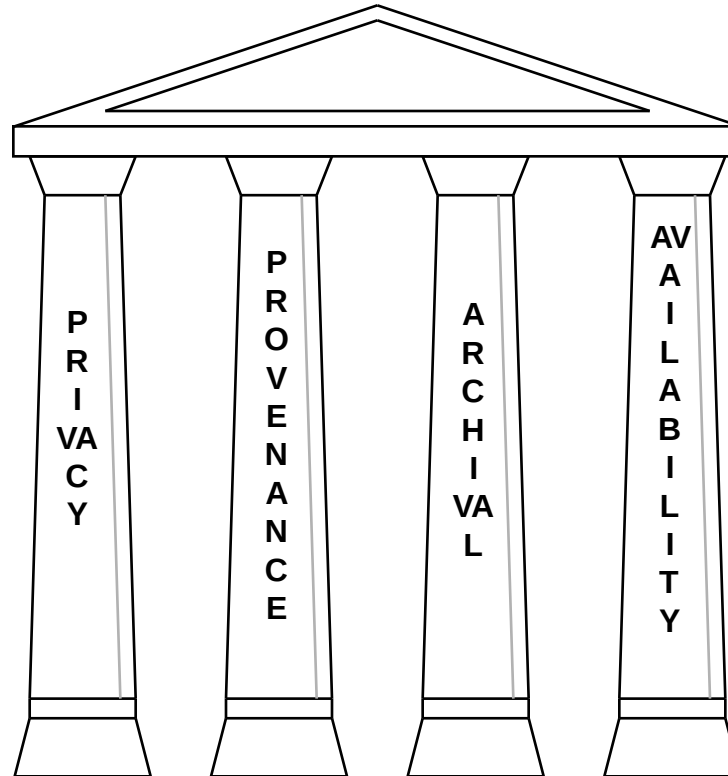
FOCUS

ignore for now

FOCUS



The pillars of personal storage.

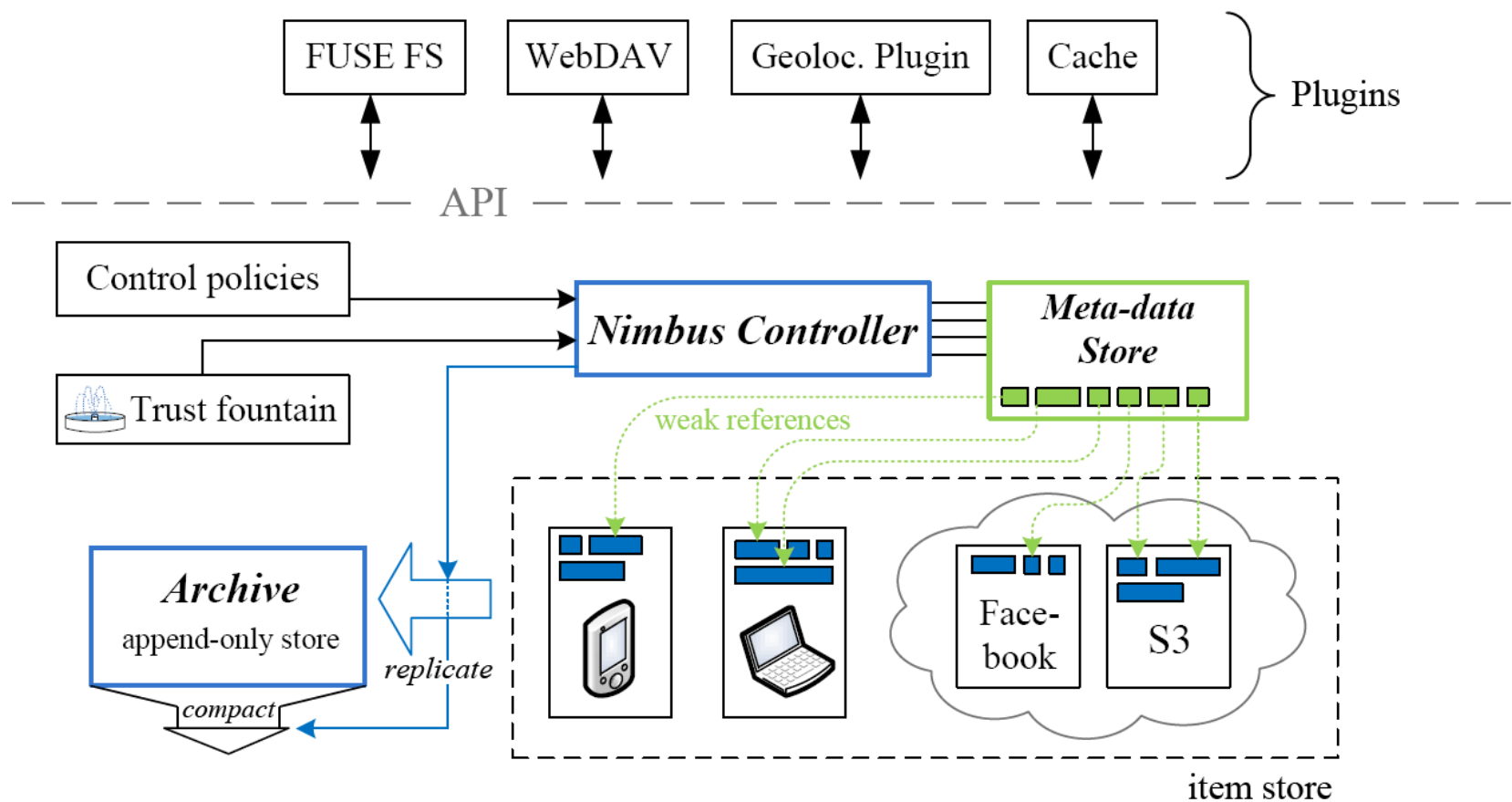


Introducing: Nimbus

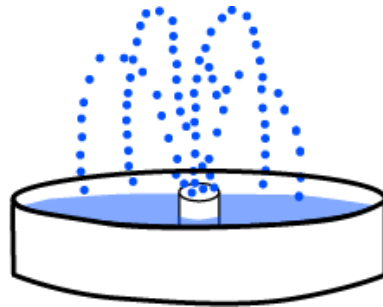


“a cloud, aura, atmosphere, etc., surrounding a person or thing”

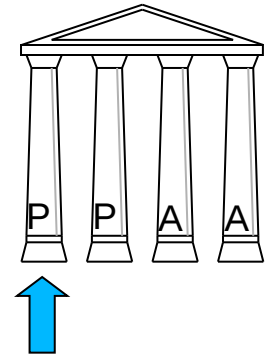
The anatomy of a Nimbus.



Fountains of trust.



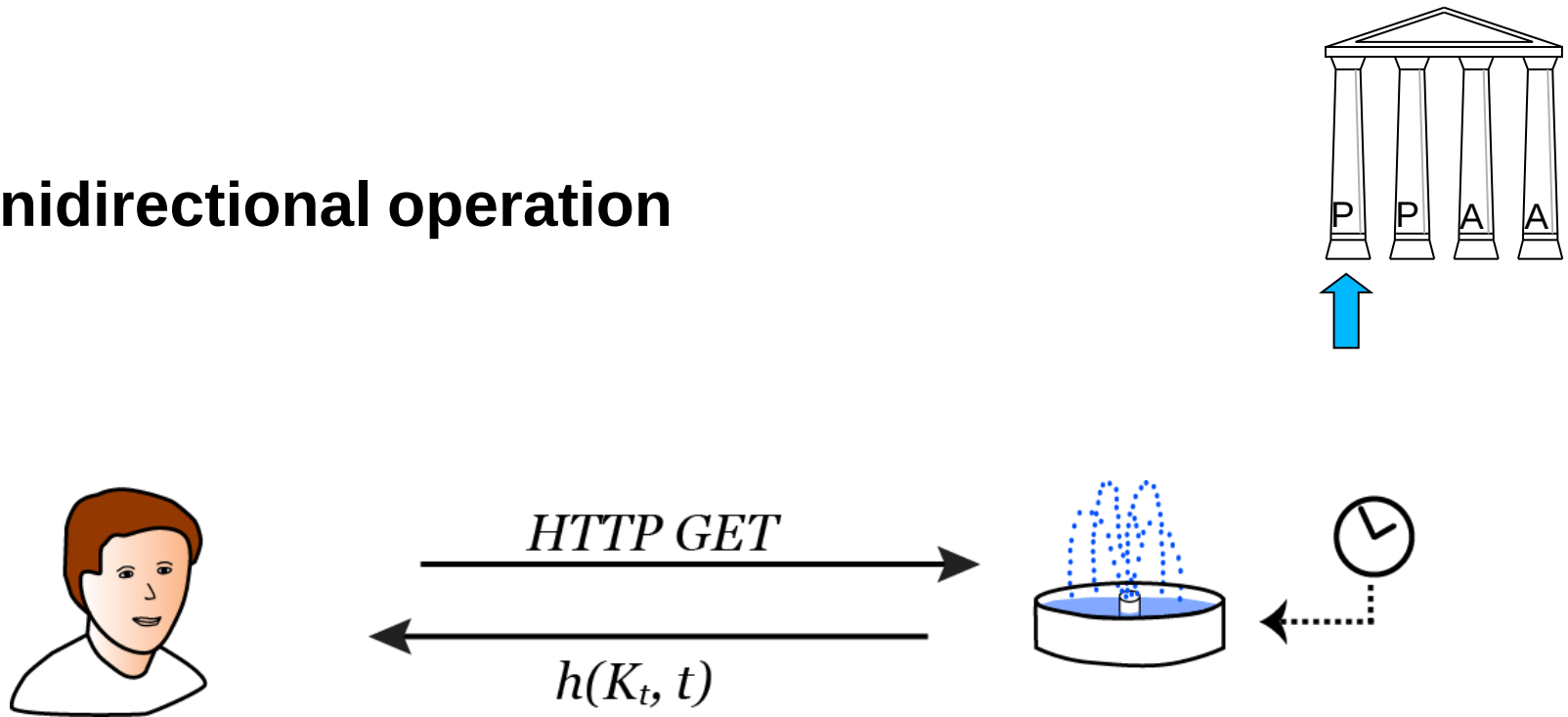
Trust fountain



- Lightweight server
- HTTP interface

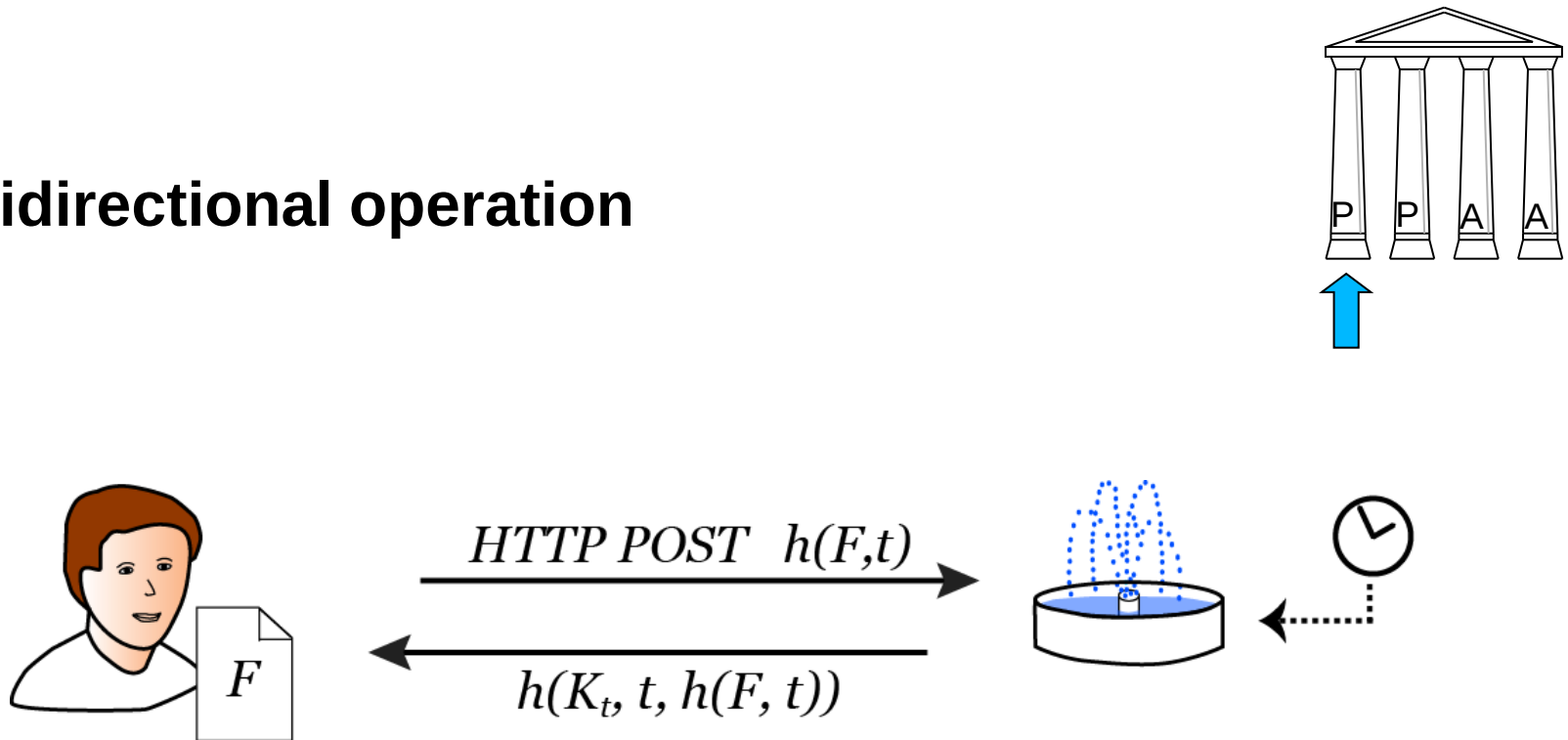
Fountains of trust.

1) Unidirectional operation



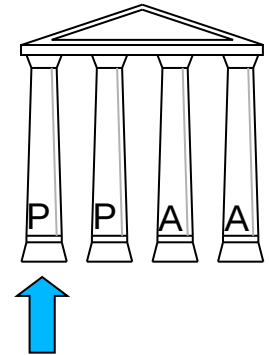
Fountains of trust.

2) Bidirectional operation



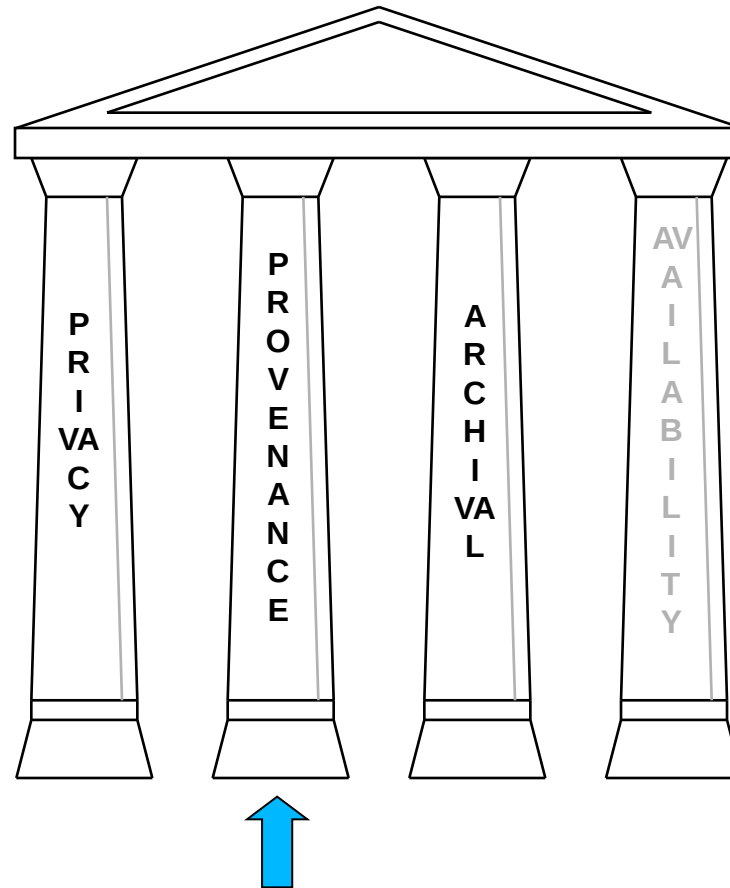
Fountains of trust are NOT PGP™

Why not just use PGP?

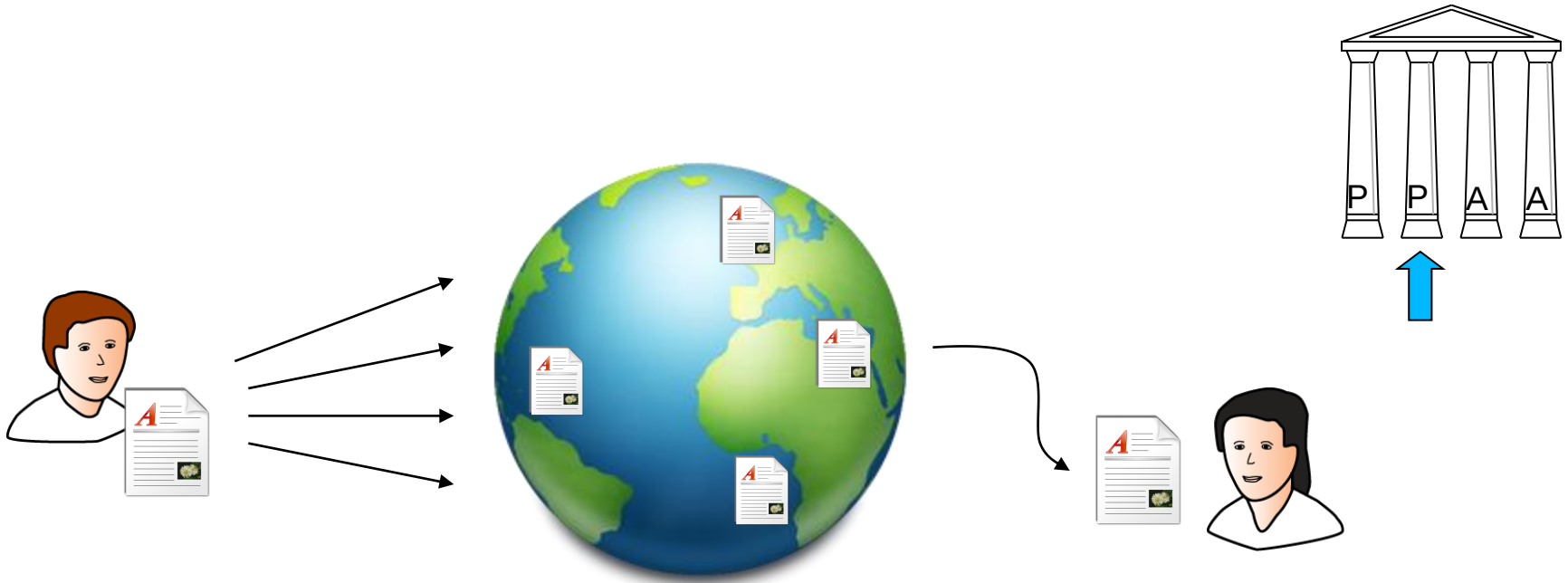


- | | | |
|--------------------------------|---|-------------------------------|
| Clunky and complicated | ↔ | Lightweight and simple |
| Trust path/hierarchy | ↔ | One-hop communication |
| (Semi-)centralised key servers | ↔ | No centralised infrastructure |

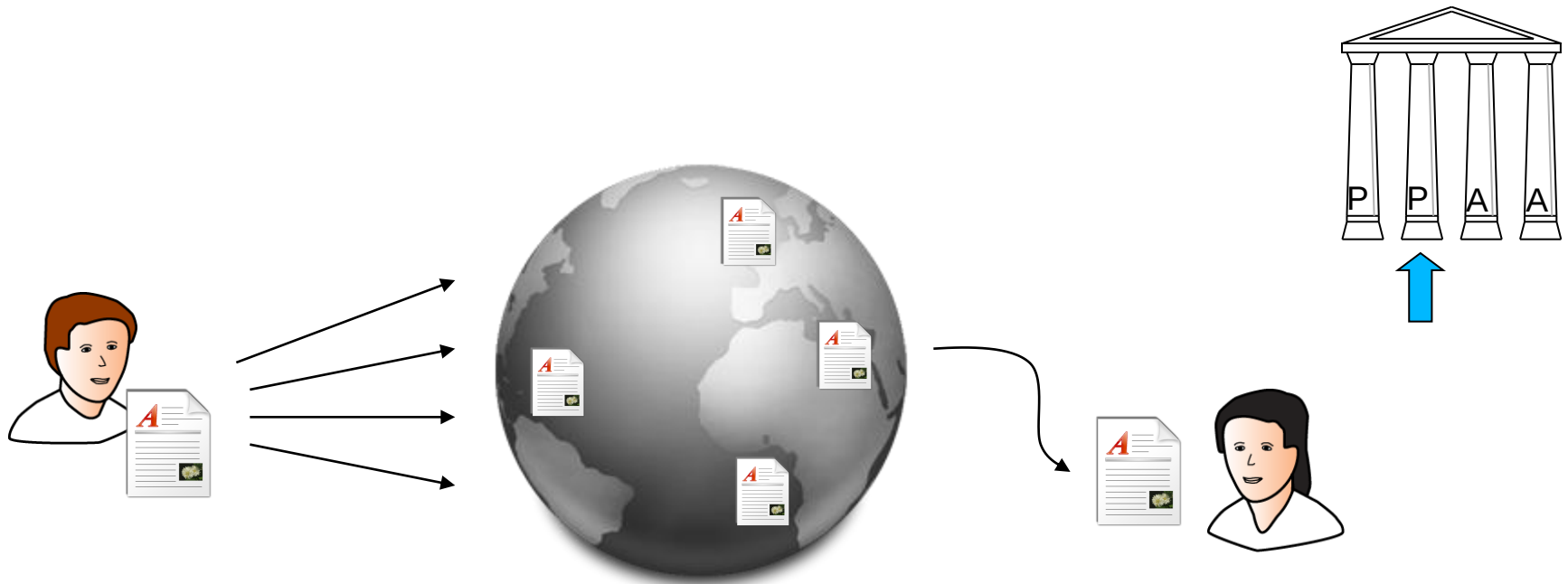
The pillars of personal storage.



Fuzzy provenance.

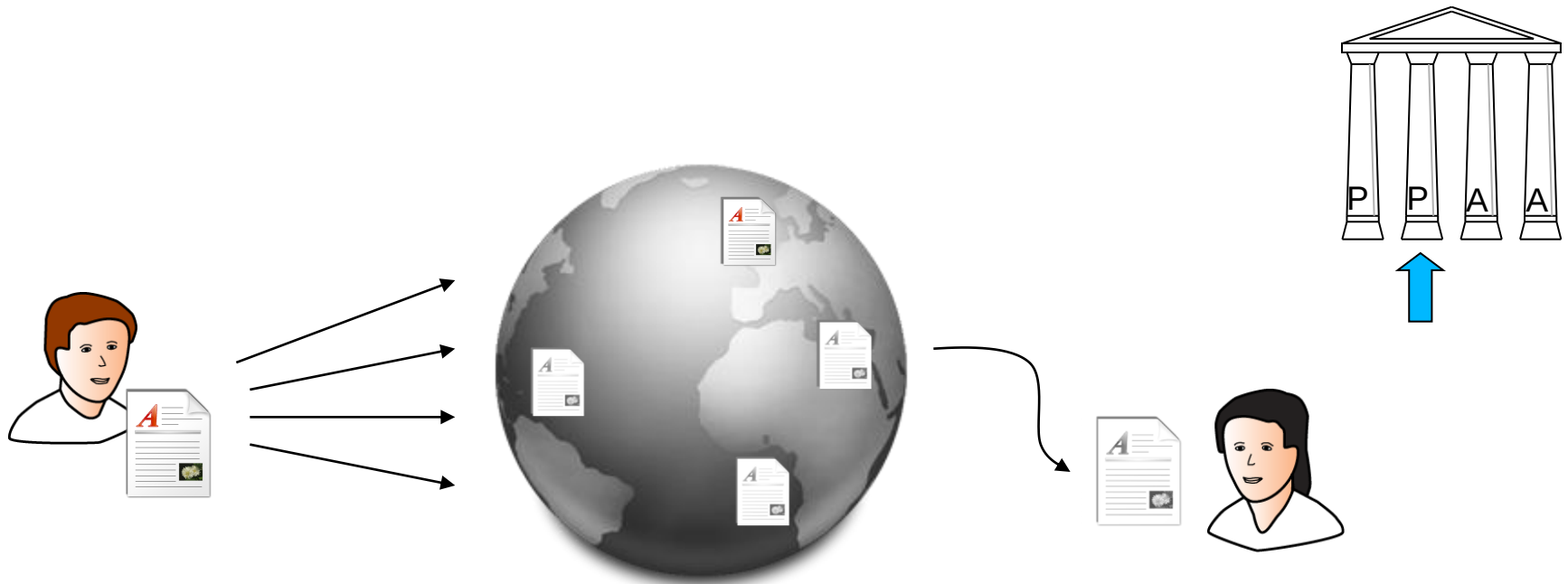


Fuzzy provenance.



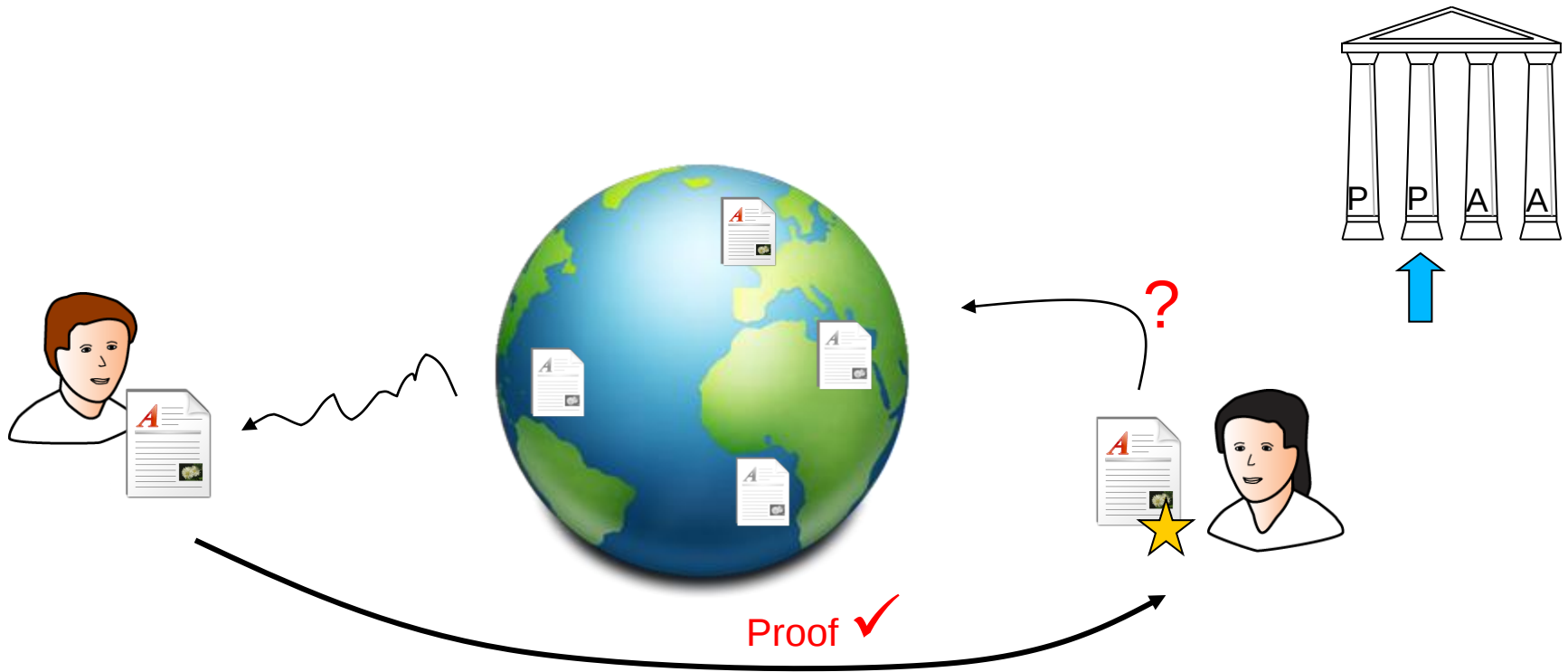
Full provenance.

Fuzzy provenance.



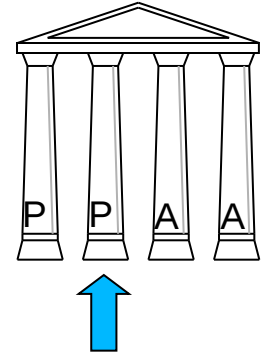
Fuzzy provenance.

Fuzzy provenance.



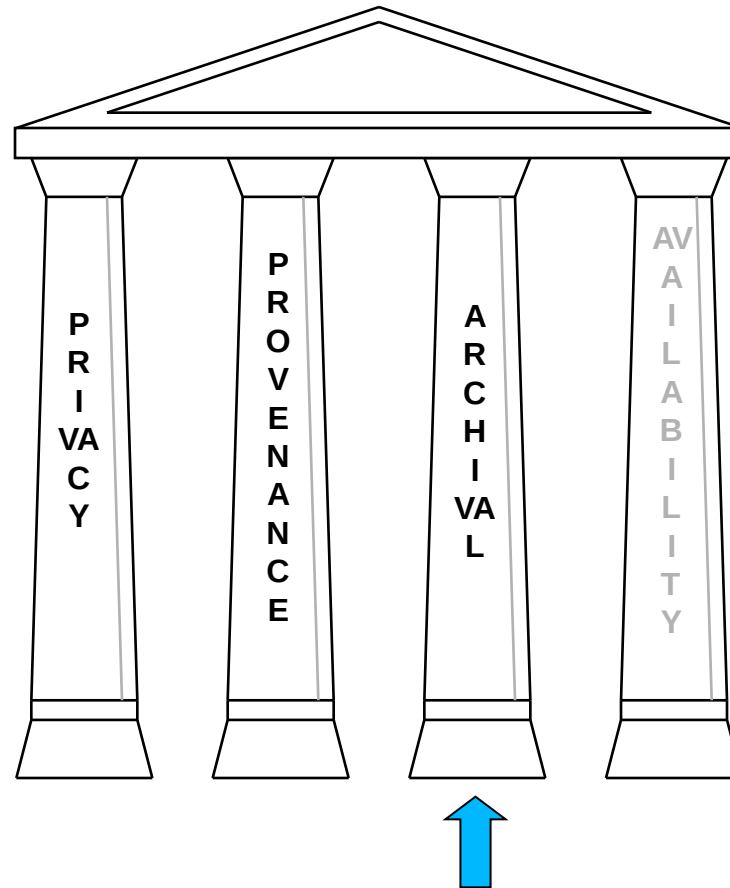
Fuzzy provenance.

Fuzzy provenance.

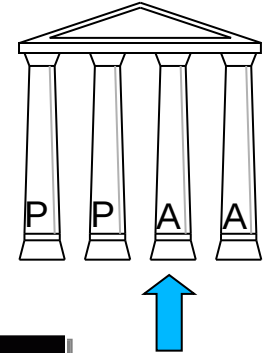


*We can always find out **where data came from**,
but not necessarily **where it went**.*

The pillars of personal storage.



Archival – or: the long-term picture.



```
H:INTRO PAGE 1 LINE 9 COL 11          INSERT ON
      <<< MAIN MENU >>>
--Cursor Movement-- | -Delete- | -Miscellaneous- | -Other Menus-
^S char left ^D char right | ^G char | ^I Tab ^B Reform | (from Main only)
^A word left ^F word right | DEL chr lf | ^V INSERT ON/OFF | ^J Help ^K Block
^E line up ^X line down | ^T word rt | ^L Find/Replce again | ^Q Quick ^P Print
--Scrolling-- | ^Y line | RETURN End paragraph | ^O Onscreen
^Z line down ^W line up | | ^N Insert a RETURN | 
^C screen up ^R screen down | | ^U Stop a command | 
!----!----!----!----!----!----!----!----!----!-----R
```

1. Introducing WordStar

WordStar is highly flexible and very visible. Watch the screens as you give commands, and information in various parts of the screen will guide you. You won't see all the information all the time, but it will be there when you need it.

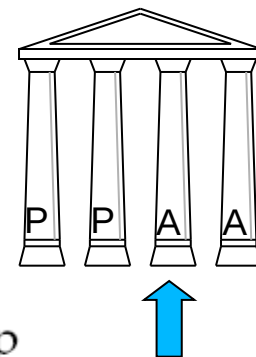
WHERE YOU ARE

The seven WordStar menus are your greatest aids. They are like signposts at the top of your screen, showing you where you are.

[HELP] [2INDENT] [3SET LM] [4SET RM] [5UNDLIN] [6BLDFCE] [7BEGBLK] [8ENDBLK] [9BEGFTL] [10ENDFTL]

Personal data has *strong* temporal locality!

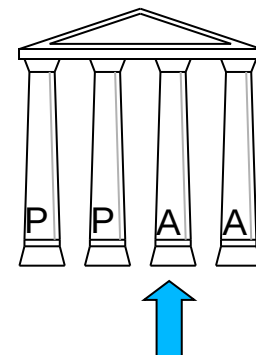
/home/malte



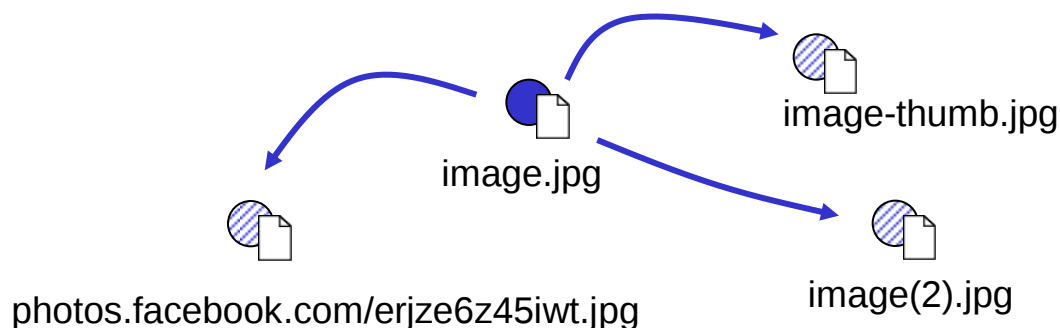
Last modification	Home desktop	Laptop	Work desktop
pre-2006	8,522 (6.9%)	46 (0.0%)	61 (0.3%)
2006	3,097 (3.1%)	281 (0.4%)	10 (0.0%)
2007	31,955 (25.7%)	396 (0.6%)	30 (0.1%)
2008	28,640 (23.0%)	81 (0.1%)	59 (0.3%)
2009	33,523 (26.9%)	20,681 (32.1%)	6,639 (33.8%)
2010	17,868 (14.4%)	42,986 (66.7%)	12,856 (65.4%)
last month	2,015 (1.6%)	4,525 (7.0%)	1,400 (7.1%)

Archival – or: the long-term picture.

- Information explosion
- Need to *compact* archived data

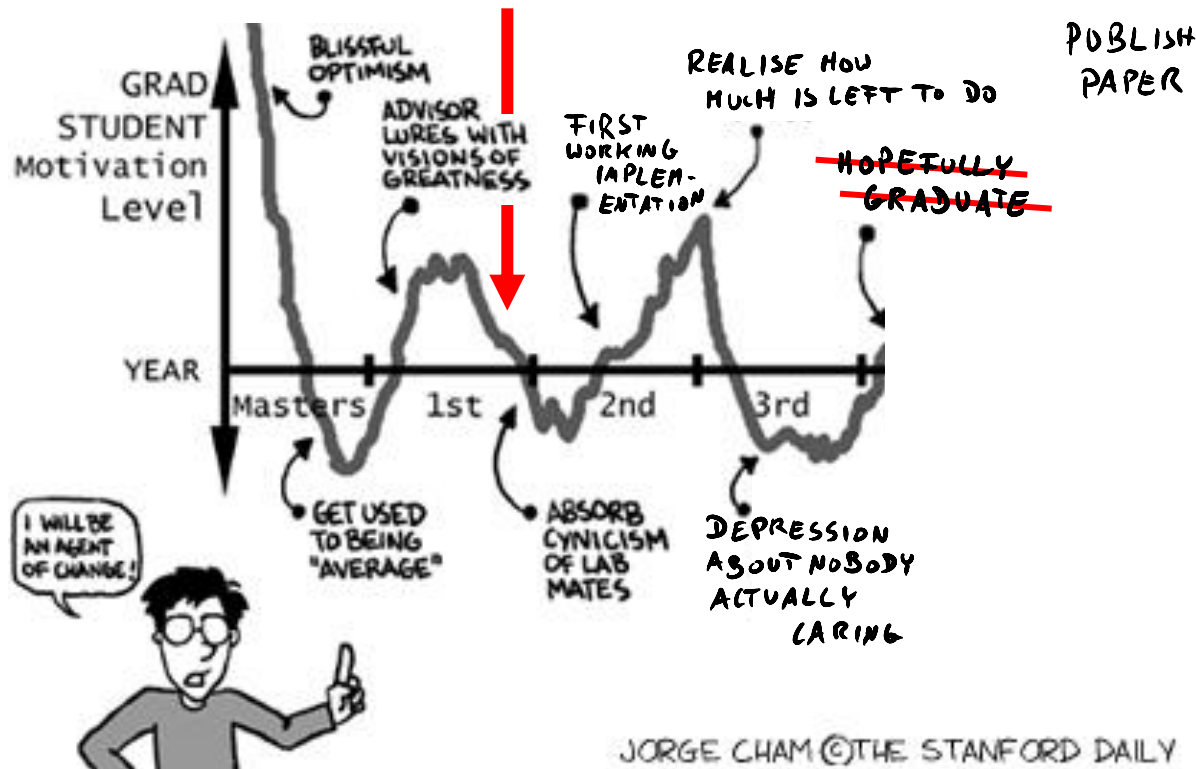


Idea: We can **derive** data items from others through transformations.

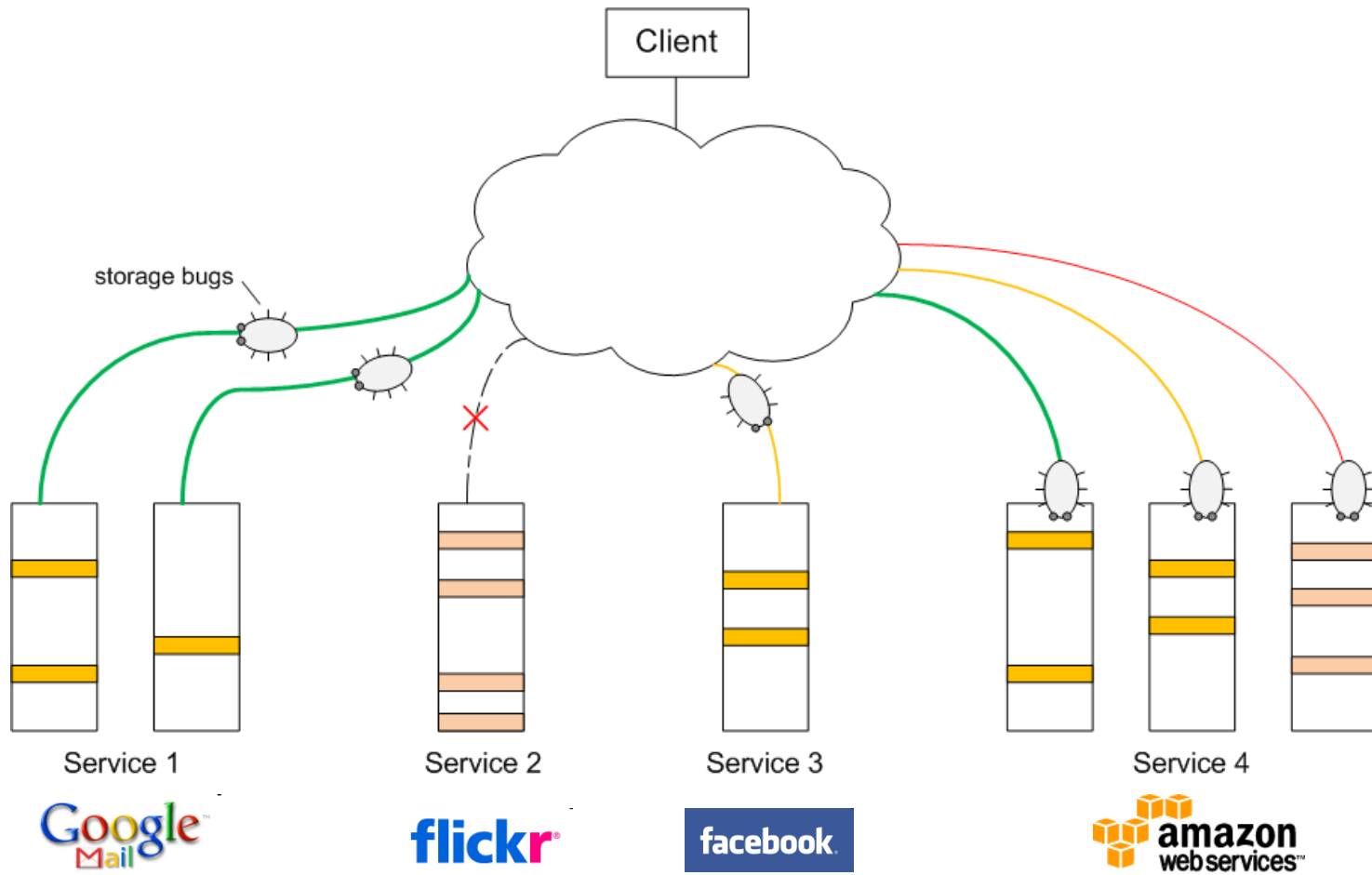


That's it!

I am here ☺



Parasitic storage.



An interesting observation.

