LOCKSS DISTRIBUTED DIGITAL PRESERVATION NETWORKS

Conference on Grey Literature and Repositories 2018

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University Libraries have two main **missions**

To guarantee access to objects
selected by curators

To preserve those objects
especially our own production

For analog objects, guaranteeing access and preservation is relatively simple

Books Images Public Domain Free Clipart

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To guarantee access to objects
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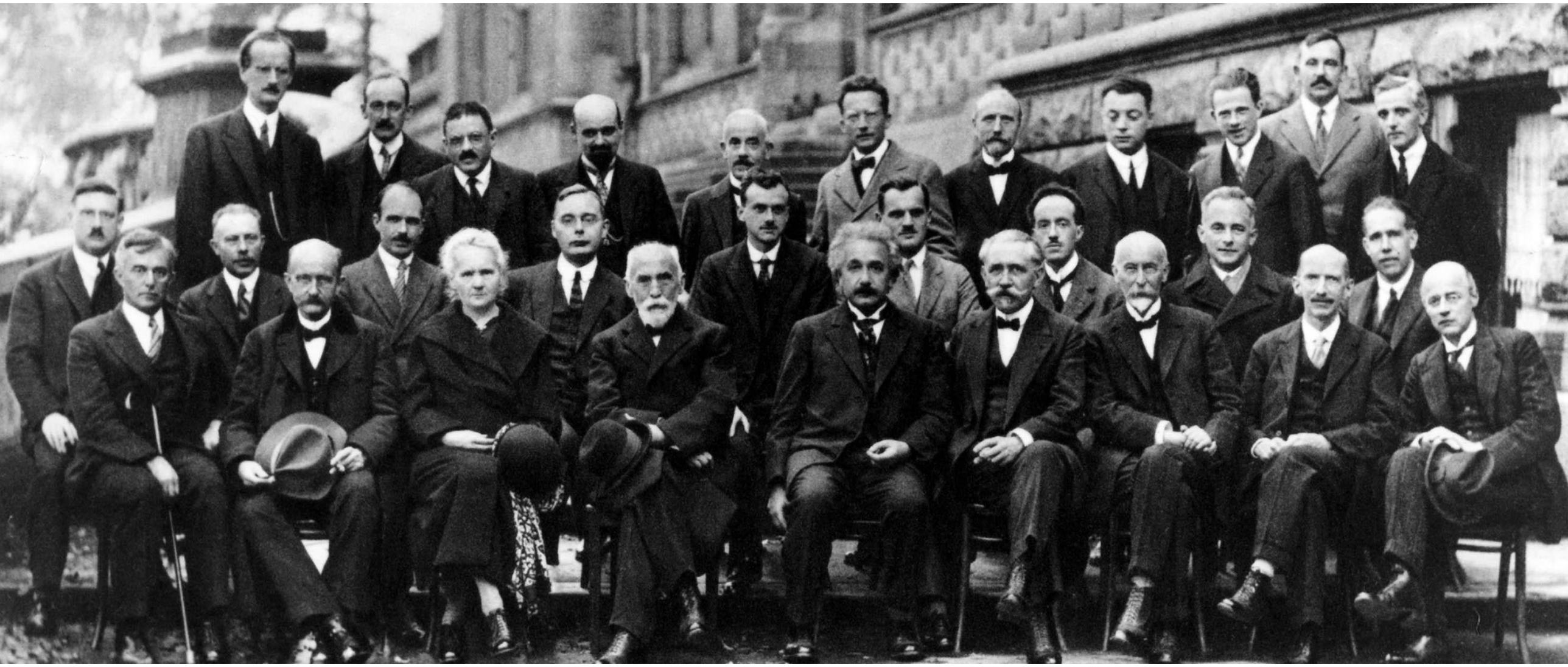
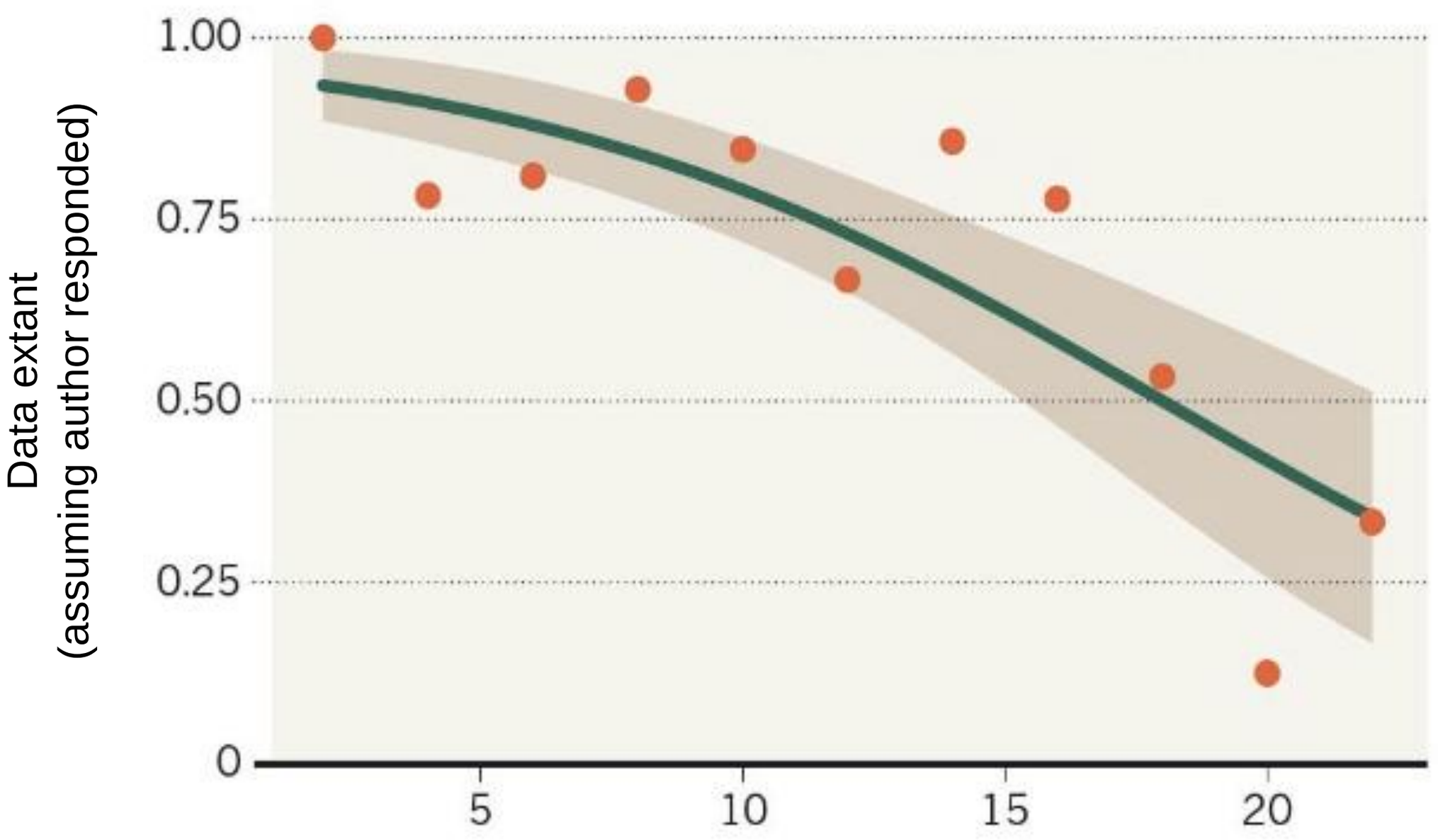
In the digital era, those missions are compromised:
- we lost control on some digital objects (access via subscription)
- the vulnerability of digital objects

What will happen to the current research outcome in 10 yrs? 100 yrs?



Attendees of the 5th Solvay Congrès, October 1927, Institut international de physique Solvay, Brussels

Massive loss of research data in the last 25 years



80% of data in zoology linked to publications in the nineties are definitely lost

VINES ET AL., THE AVAILABILITY OF RESEARCH DATA DECLINES RAPIDLY WITH ARTICLE AGE, CURRENT BIOLOGY (2014), hTTP://DX.DOI.ORG/10.1016/J.CUB.2013.11.014

As a digital library, our core business is to develop the software infrastructure to describe, submit, disseminate and preserve digital objects

Dissemination

Digital object (digitized)

Description

Submission or Digitization

Preservation

What exactly is digital preservation ?

Strategies and processes to **protect** against the **threats** endangering digital objects of interest with the aim of (**re)using** them in the future on the **very long term**.

Not to be confused with :

- **storage:** recording data on a physical medium
- **backup :** replicating data in order to restore them quickly in case of loss
- **archiving in the ordinary IT meaning**: moving less frequently used data on cheaper storage media (typically magnetic tapes)

An effective digital preservation solution should thus be based on a threat-model.

Multiple threats endanger our archives

Natural disasters

►**Geo-replication**

Storage media failure

►**Data monitoring**

Internal or external attacks

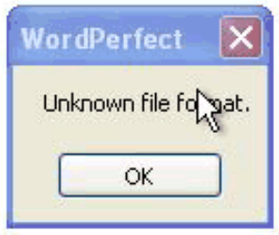
►**Authentication**

Media obsolescence

►**Media migration**

Human failure

►**Independent site technical admin**



Format obsolescence

►**Format migration**

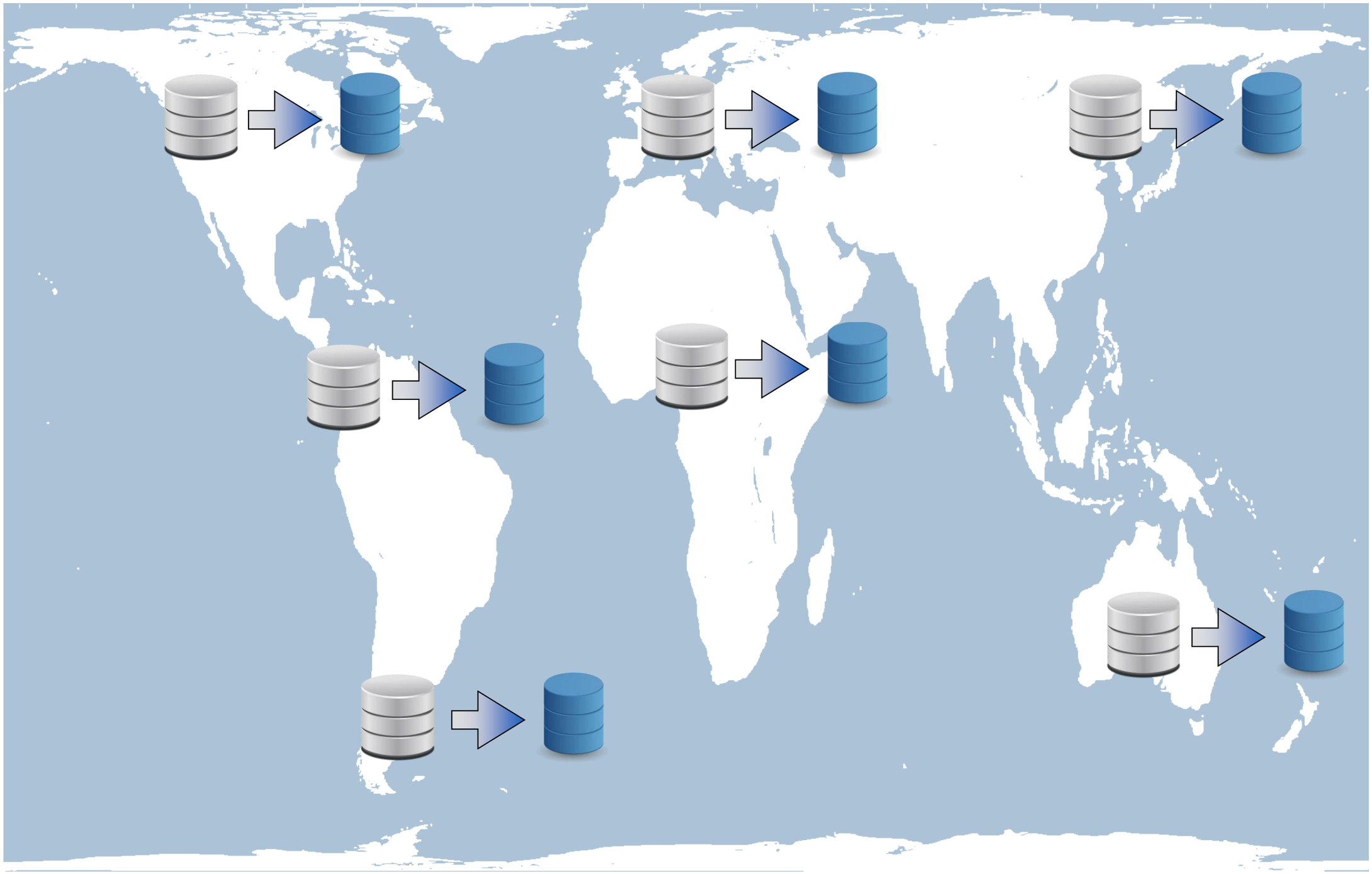
Economic breakdown

►**Cost control**

Organizational issues

►**Independent site administrations**

A robust preservation solution should provide mitigation measures for all these risks



https://commons.wikimedia.org/wiki/File:Peters_projection,_white_%26_blue.png

“We need to be active players of preservation,
not passive clients of third-party preservation services”
(Skinner11)

As clients, our only guarantee of preservation would be the **service level agreement.**

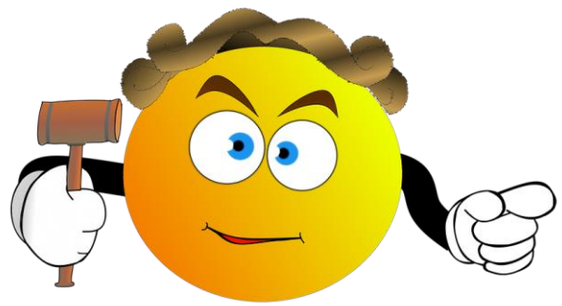
No more technical problems...

Legal issues

- What if the service provider goes bankrupt?
- What if data gets lost? Can we claim for damages?

Technical issues

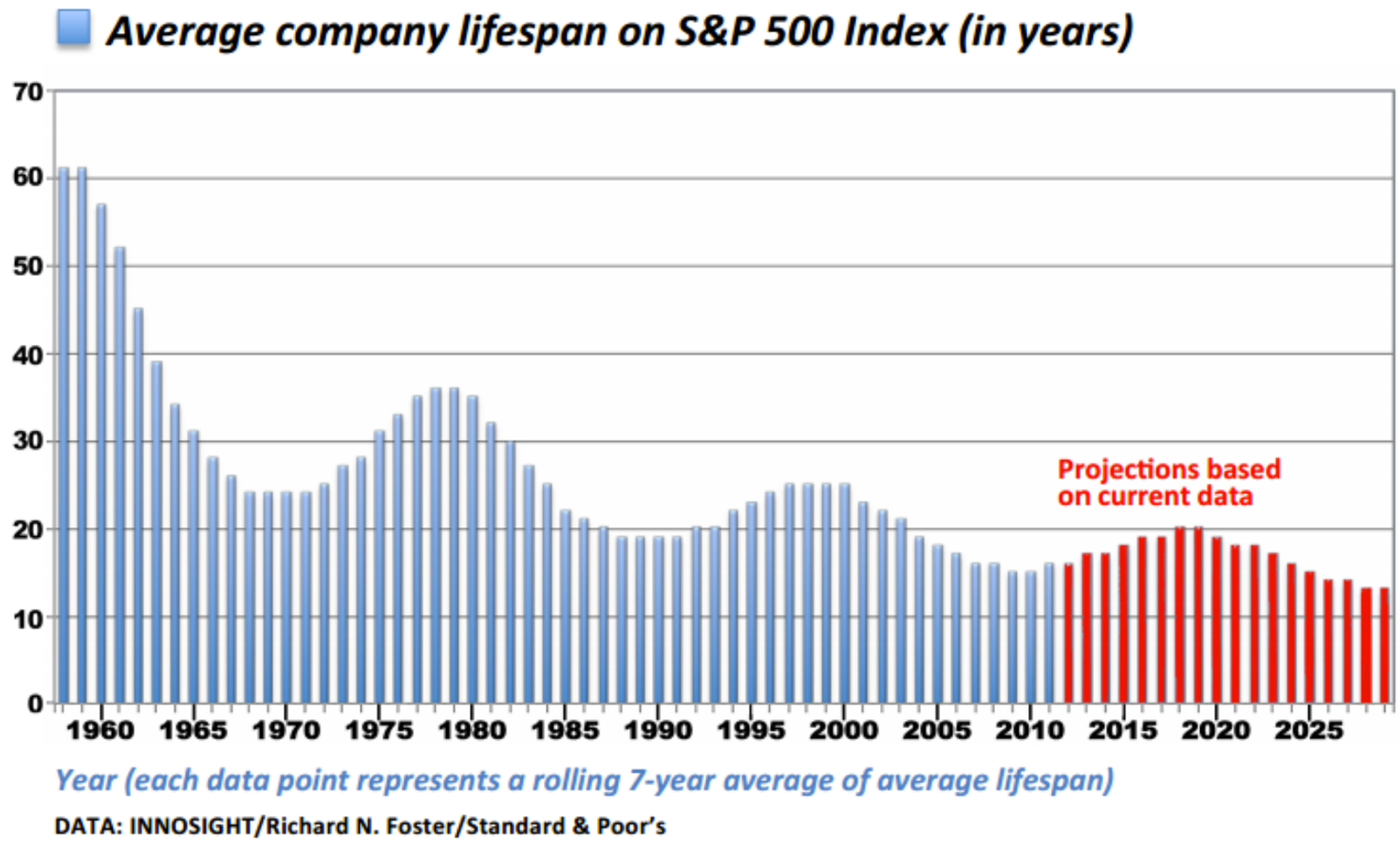
- No control on the archiving technical policy
- Is migration to another provider possible?



at the cost of many legal and economical issues

Control is key in digital preservation

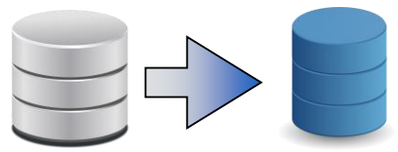
Universities are amongst the oldest institutions around



What organization is better qualified to preserve data on the long term?

The ideal preservation solution should involve all the aspects previously discussed

Lots of copies
regularly verified
stored on reliable monitored media,
periodically updated,
in a secure software environment,

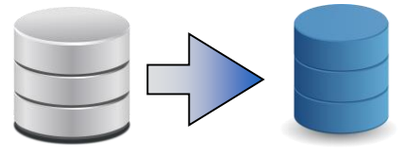


managed by different people
in independent institutions

and at low cost.

The ideal preservation solution should involve all the aspects previously discussed

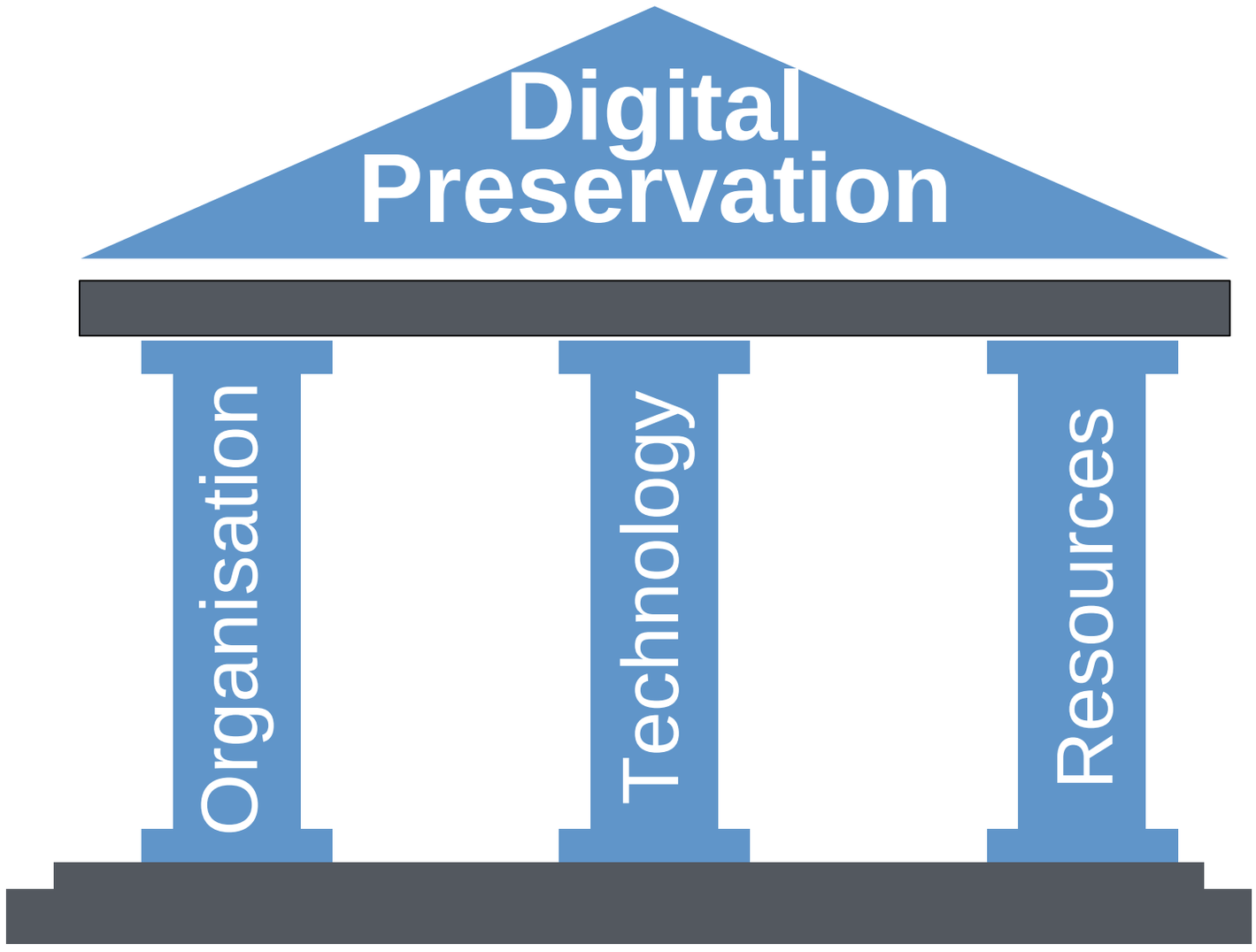
Technology



Organization

Resources

The 3 pillars of digital preservation: organisation, ressources and technology



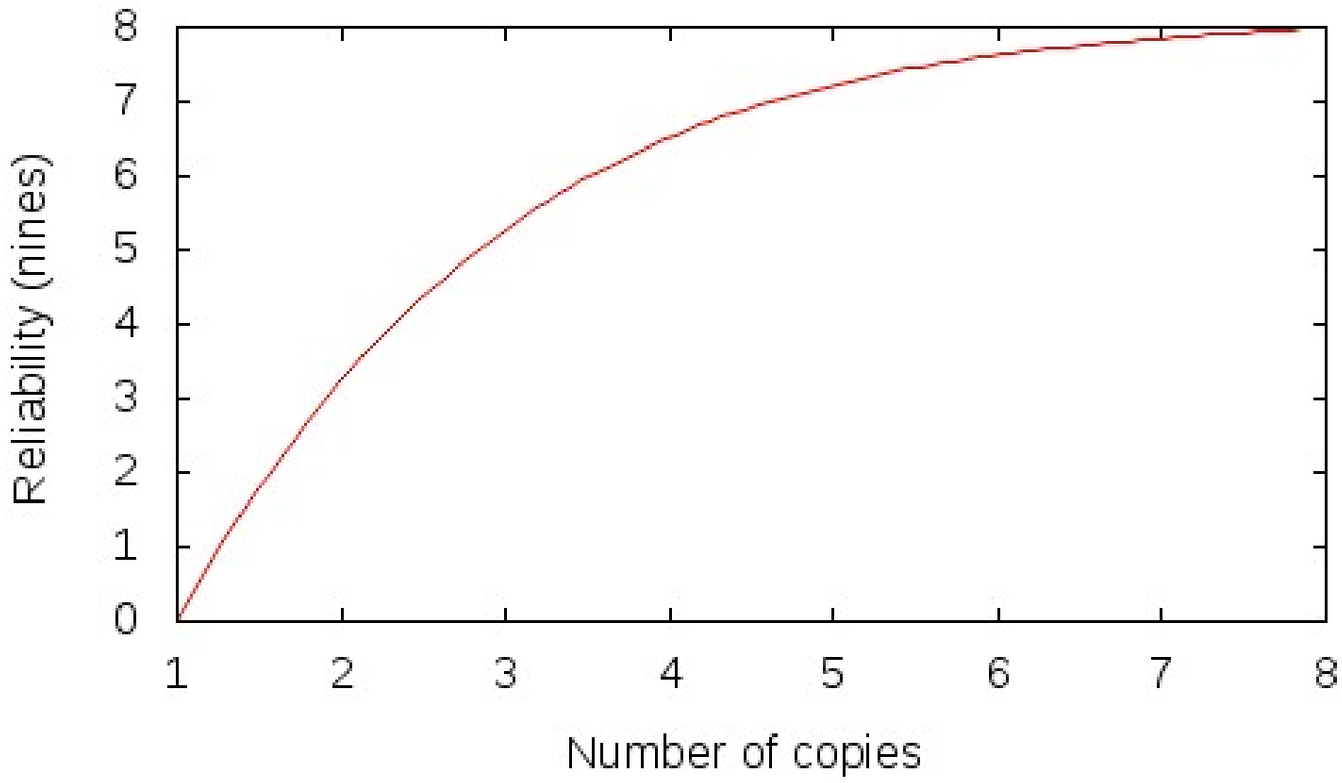
There is a whole spectrum of preservation grades

When is a digital preservation solution good **enough** ?

It all depends on your threat-model (which includes your limited resources).

How many copies **?**

Ideally, it should be evaluated based on a detailed **risk and threat assessment**.



https://blog.dshr.org/2011/03/how-few-copies.html

But in practice, the reliability is very difficult to evaluate.

Hence, the more copies, the

Lots of Copies Keep Stuff

More copies

Less correlated copies

More reliable copies

Faster failures detection and repair

Less aggressive compression

LOCKSS is a well-proven technology

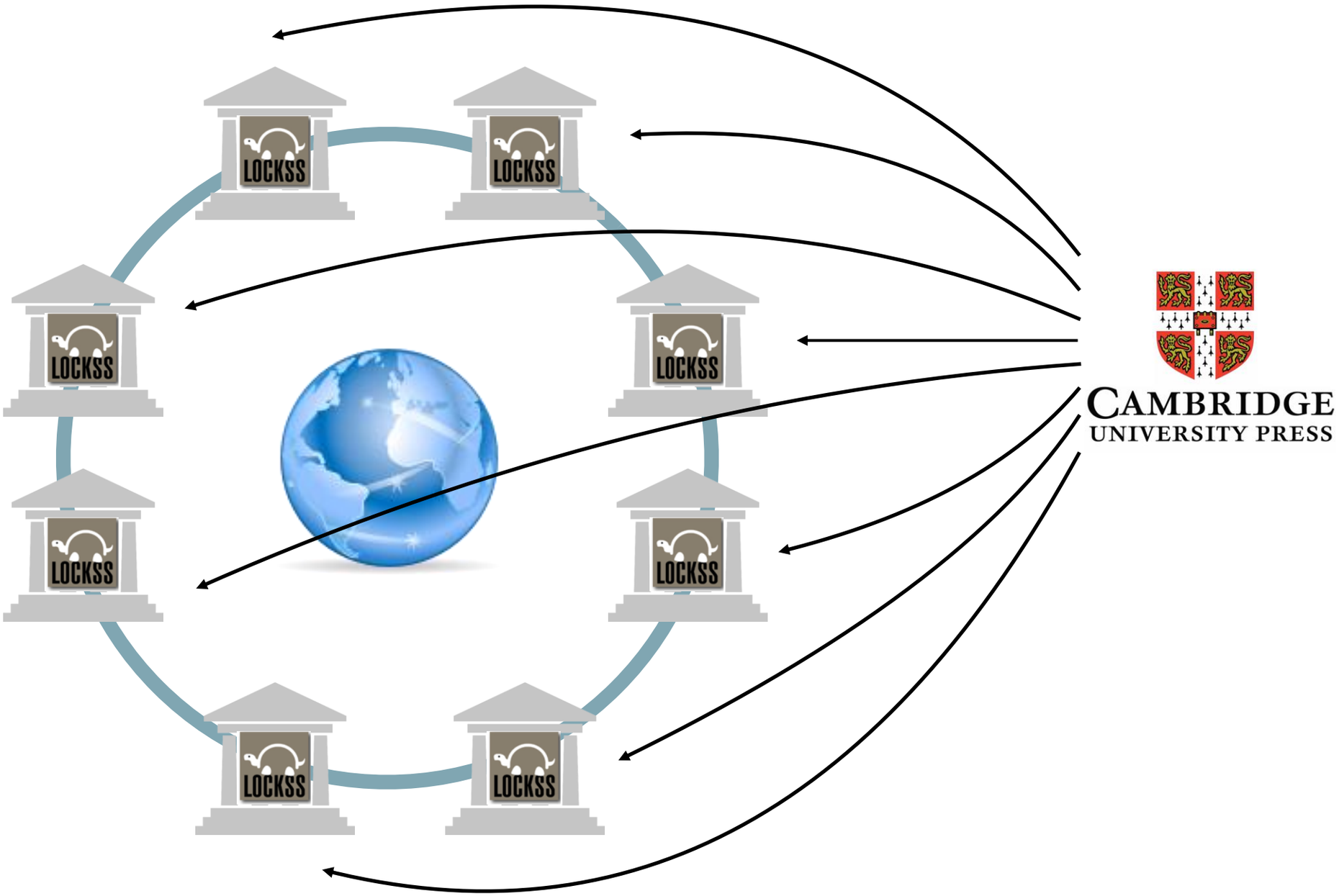
open source software

originally for PCA (Global LOCKSS Network)

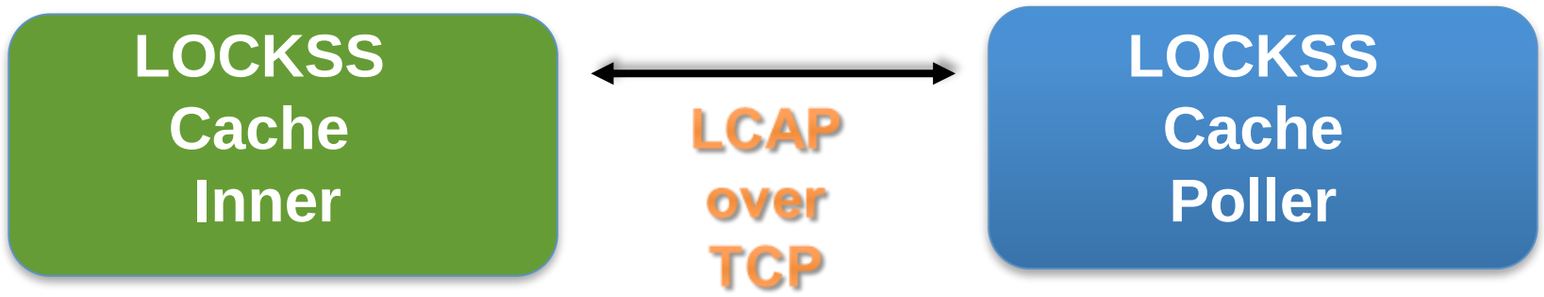
awarded technology (perfect score - TRAC certif.)

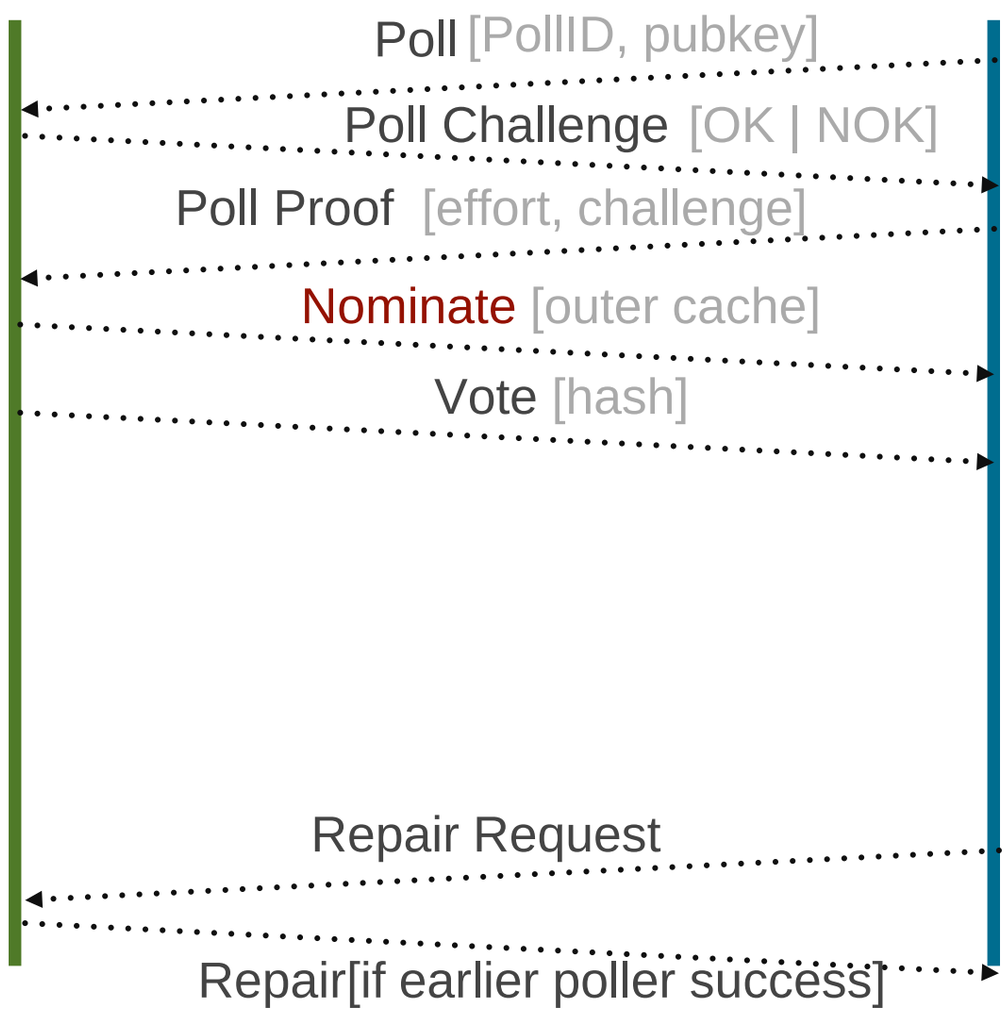
a robust integrity check and repair protocol

How does LOCKSS work in practice ?
Illustration with the **Global LOCKSS Network**



LOCKSS core : a unique robust integrity monitoring and repairing protocol





A brand new architecture: LAAWS
LOCKSS Architected As Web Services

state-of-the-art community OSS to cope with fast evolving web

independent modules interacting through REST-API

de-silo components: make poll/repair an independent module

support for large-scale distributed storage (HDFS)

aligning with web archiving standards (WARC-native)

one box = multiple containers possibly on different machines

LOCKSS preservation capabilities are equally well-suited to any other type of digital content

Your repository

A diversity of LOCKSS networks preserve a wide range of digital content

General interest scientific journals

LOCKSS

CLOCKSS

PKP
PUBLIC KNOWLEDGE PROJECT

Scientific journals of local interest

COPPUL

Cariniana

Government information

CGI

FDSYS
FEDERAL DIGITAL SYSTEM

Content of local interest (incl. grey literature)

Meta Archive

SAFE

The Alabama Digital Preservation Network
Preserving Alabama's Digital Resources

WestVault

DIGITALCOMMONS™
powered by bepress

international federation

geo-replication in completely independent sites

light organizational structure

7+ nodes

distributed technical administration

local admin only, no automation

each partner monitors the status of his content in the network

global verification that the preservation is performed correctly

budgets remain fully independent

economic risk mitigation

Key LOCKSS aspects for SAFE

“poll/repair” is the key component for us

share resources, not money

distributed technical administration, no automation and centralized administration of boxes

LOCKSS empowers university libraries to fulfill their essential mission of preserving digital knowledge

SAFE