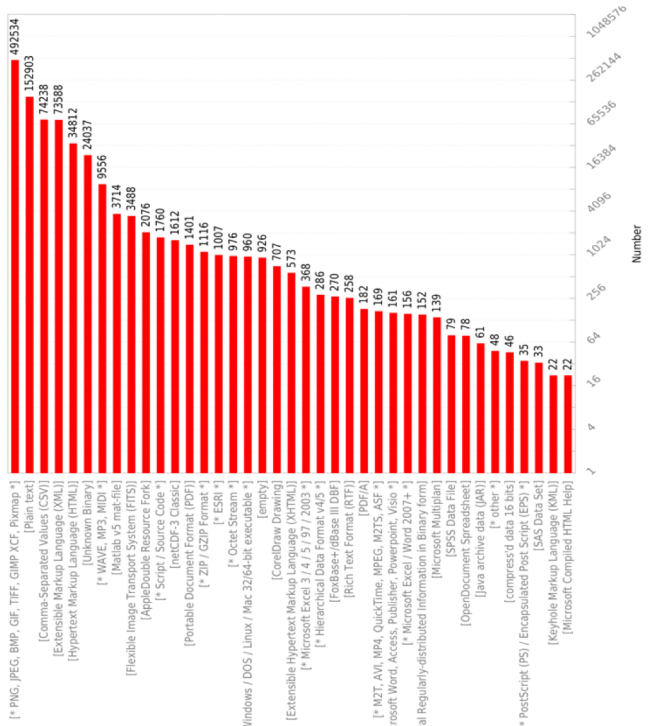
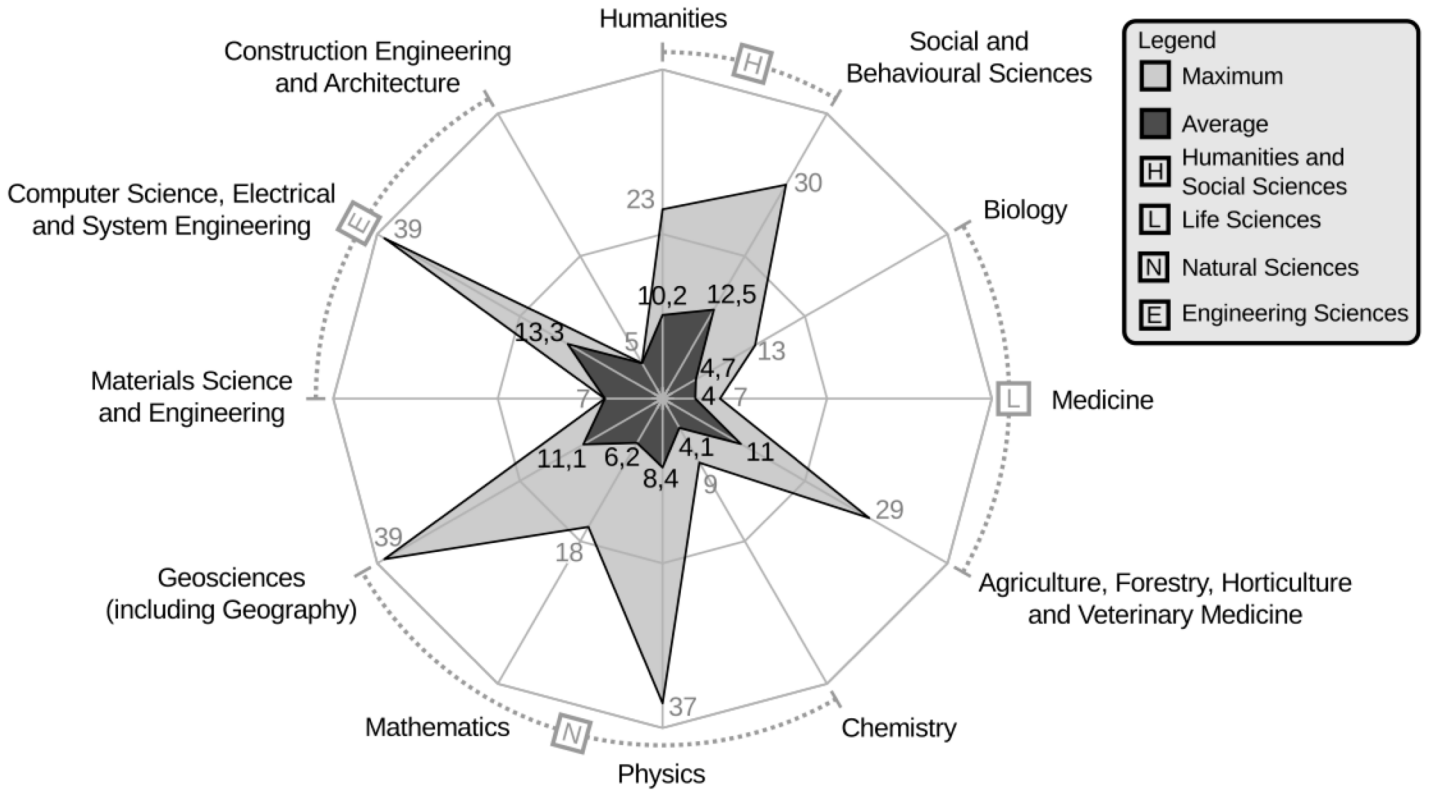
Emulation and Software Preservation

Klaus Rechert

@kurau5u



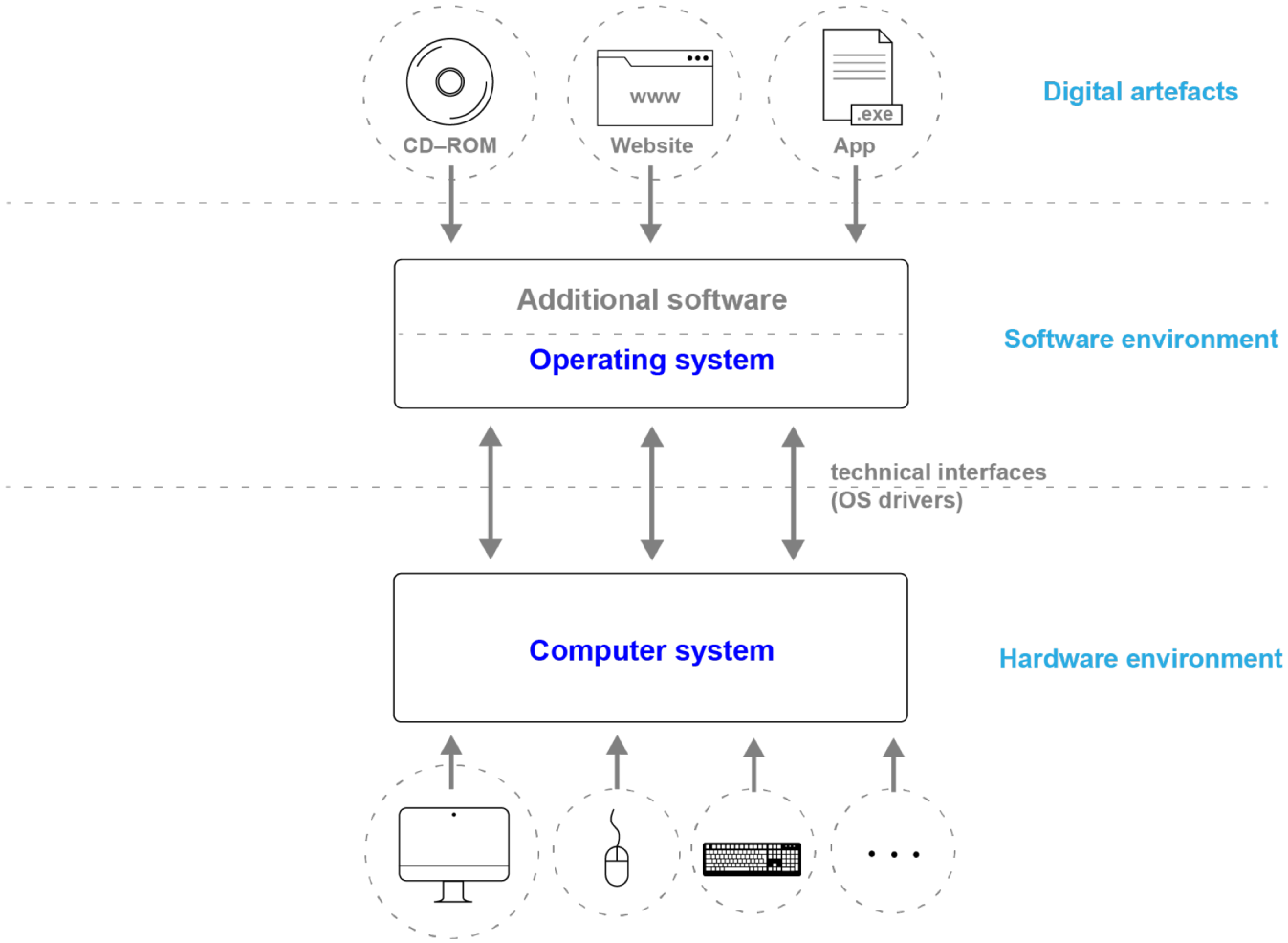


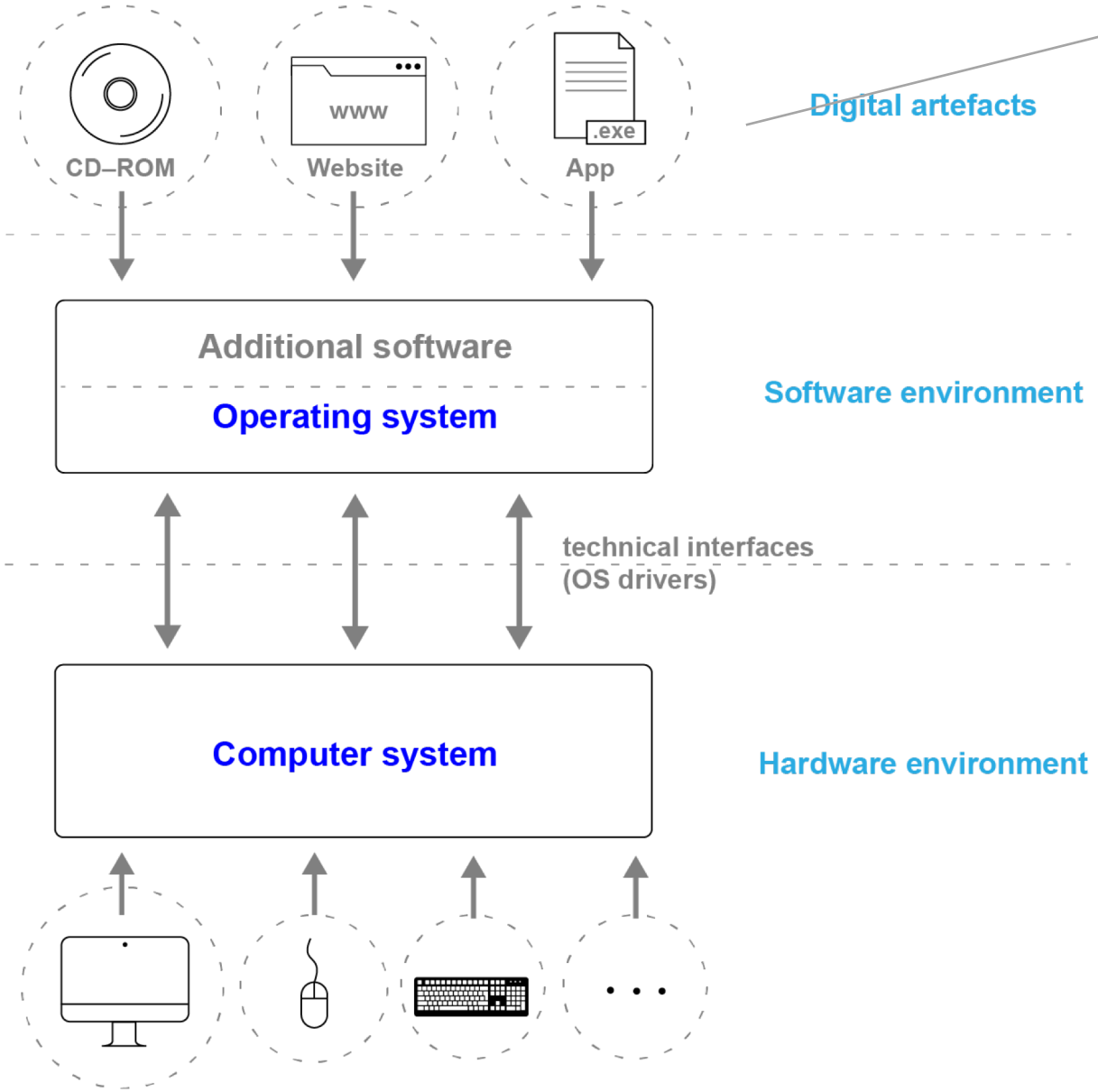
Random data sets from 92 public repositories (1,95 TB / 3.5 Mio. files):

- At least 140 different file formats (lower boundary)
- 4 to 39 different file formats per dataset. E.g. humanities use an avg. of 10,2 formats / data set.

Are research data sets FAIR in the long run? Wehrle & Rechert, iDCC 2018

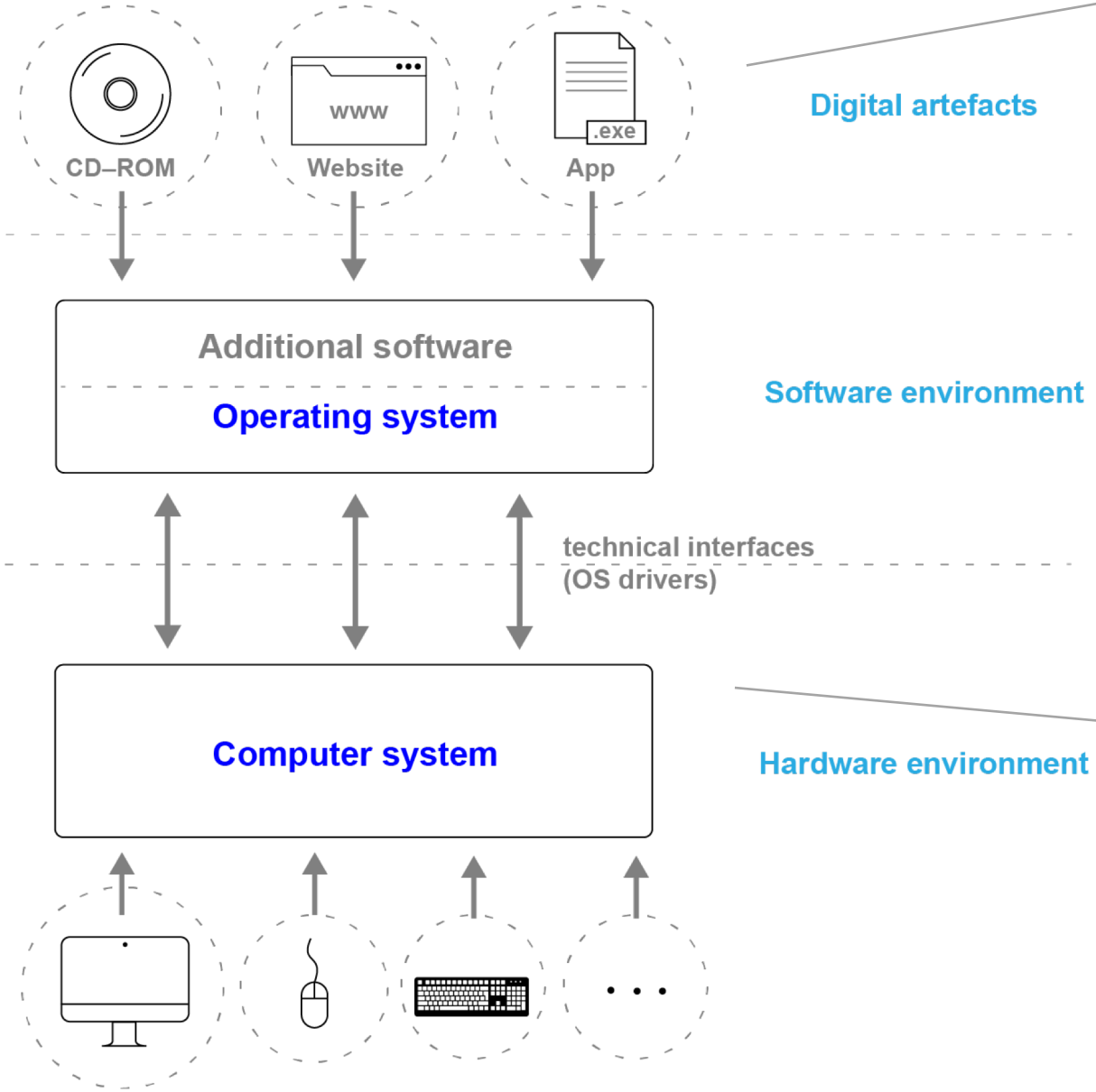
Rendering a Digital Artefact





Huge number of different dig. object types

Objects fixed. Archived objects do not change over time.

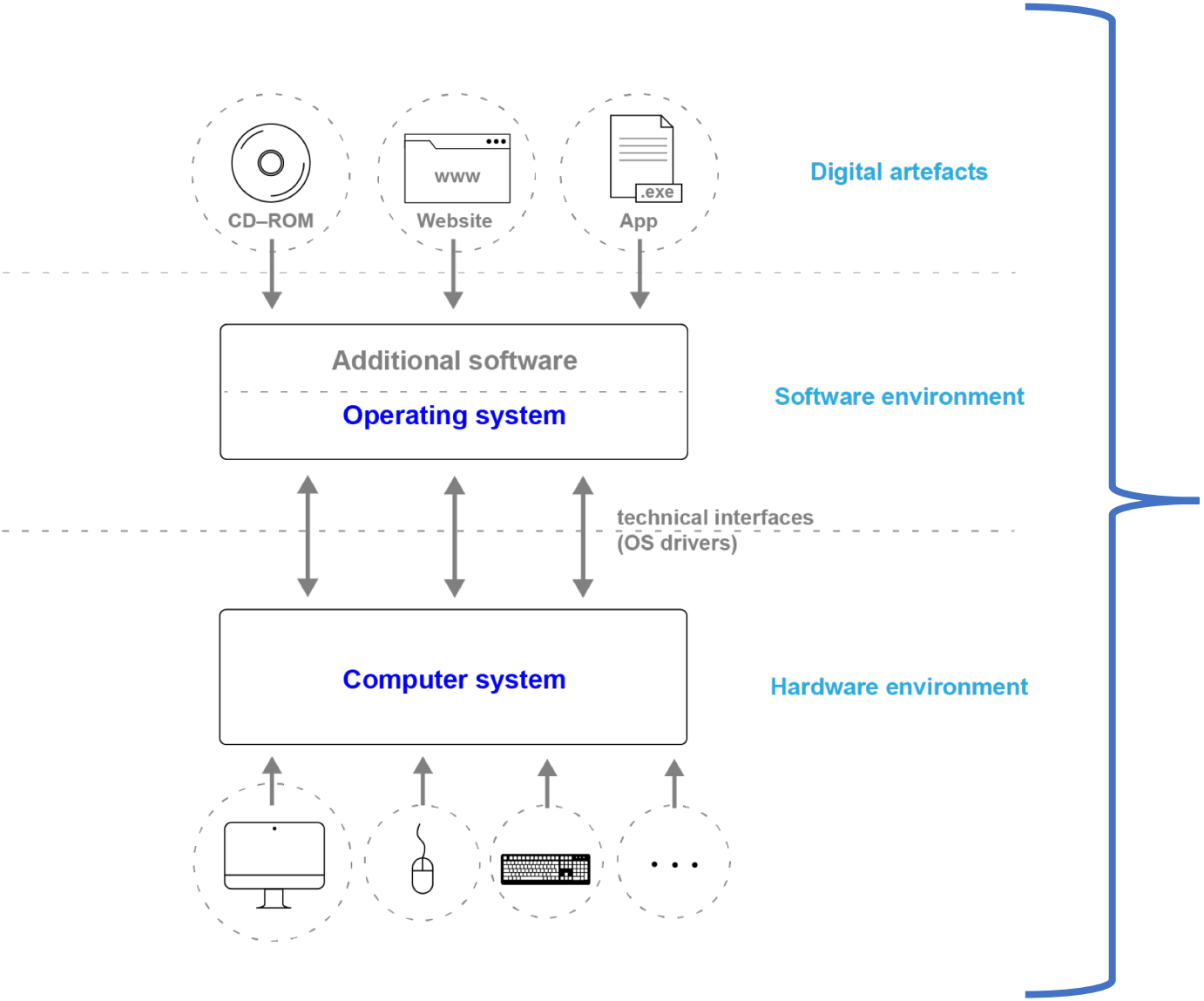


Huge number of different dig. objects.

Fixed. Do usually not change over time.

Rather small number of different hardware environments.

Require replacements (continuously).

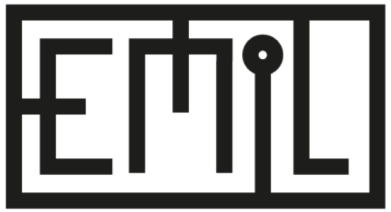


Emulation as a Service

- **Store and maintain contents of all three layers separately**
- **Combine theses three layers to a executable environment “on-demand”**
  - ➢ Supply the right emulator version and preconfigures common settings
  - ➢ Enable access to emulators over the web via browser interface
  - ➢ Smooth creation of new emulated computing environments

Emulation as a Service

- In development by the bwFLA team at the University of Freiburg since 2011



- Since 2016 EMiL – Reading Room Solution (German Nat. Library)

- Since 2017 OpenSLX GmbH provides commercial support

EaaS in Production

Chop Suey
1995

Play

Smarty
1996

Play

Zero Zero
1997

Play

Run the emulator close to your location: United States

▶ About Emulation as a Service

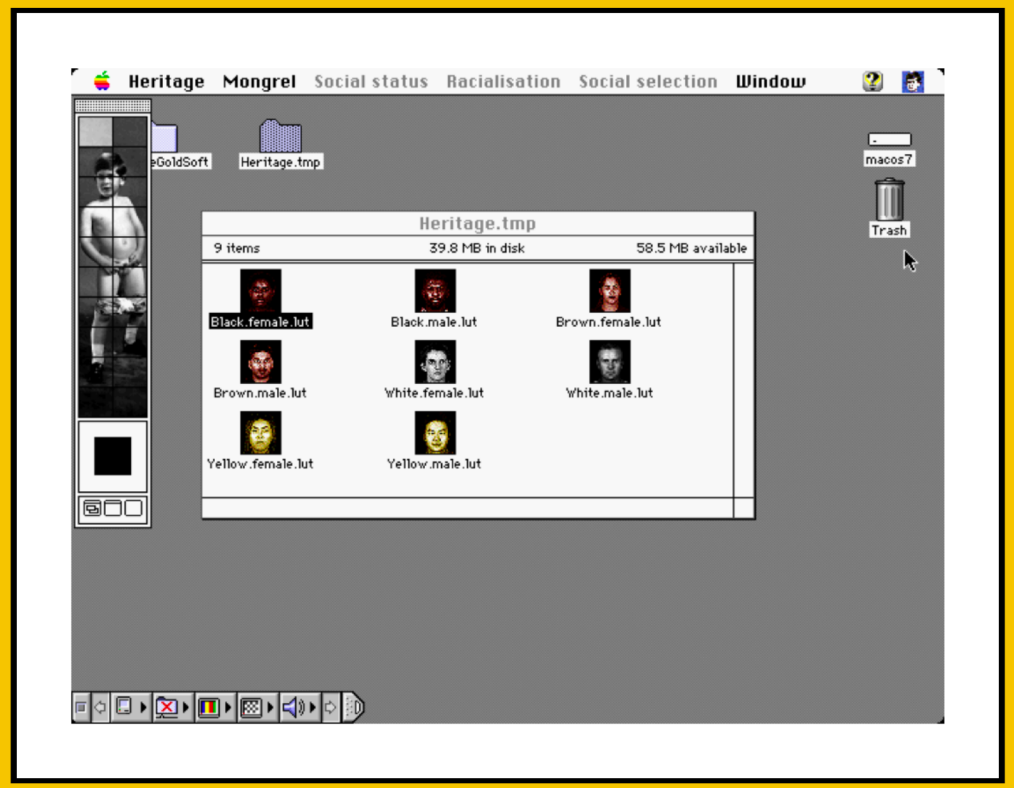
RHIZOME
The Theresa Duncan CD-ROMs

http://archive.rhizome.org/theresa-duncan-cdroms

HERITAGE GOLD

MONGREL

1998



http://archive.rhizome.org/anthology/heritage-gold.html

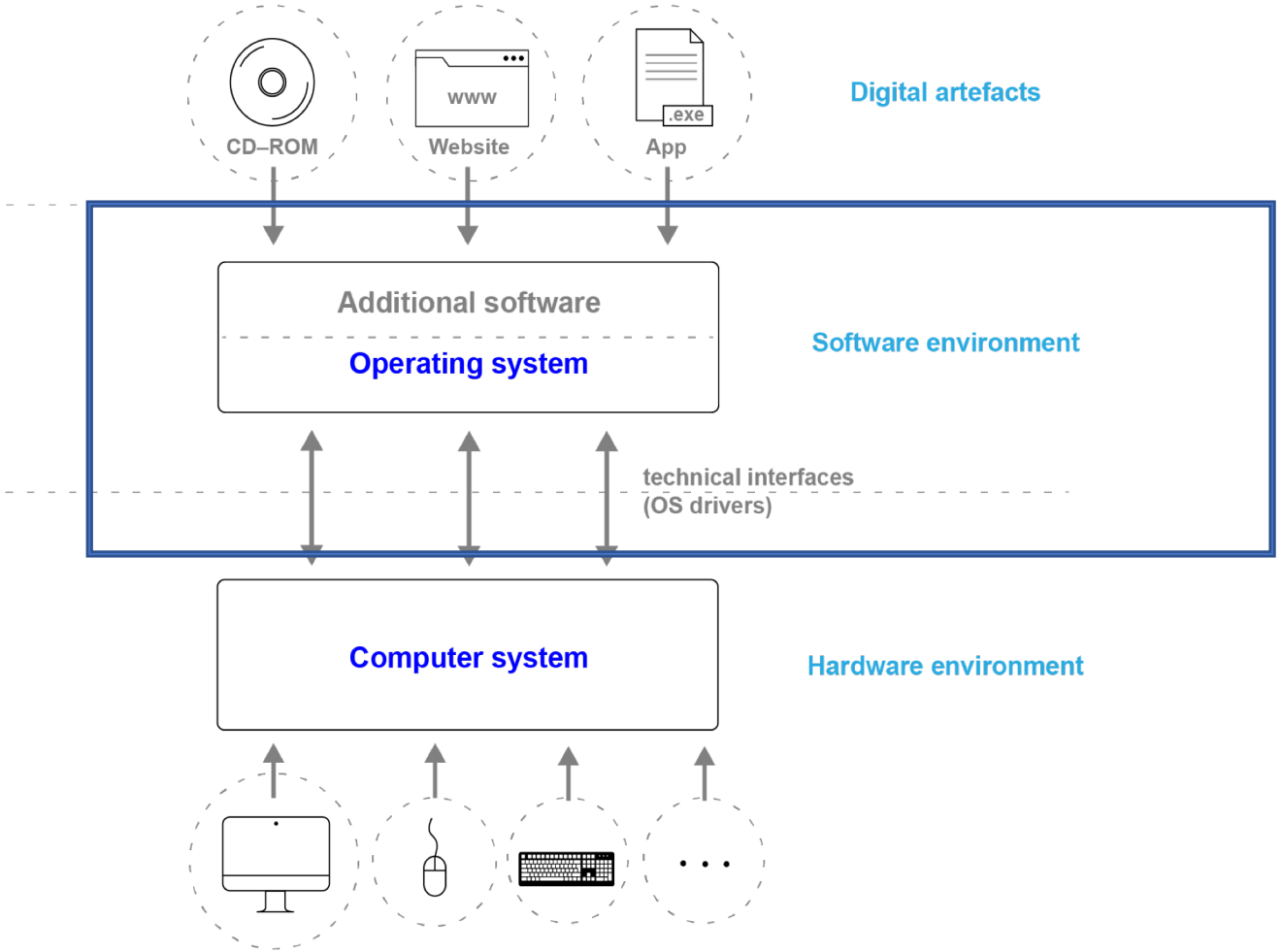
Emulation is becoming **EaaSIer**

- Improve usability
  - new UI developed by UX experts
  - Multi tenancy
  - Streamlined deployment and operation
- Distributed Emulation Service
  - Working together - share work & expertise
- Discovery and Description
- Access

Alfred P. Sloan
FOUNDATION

Yale

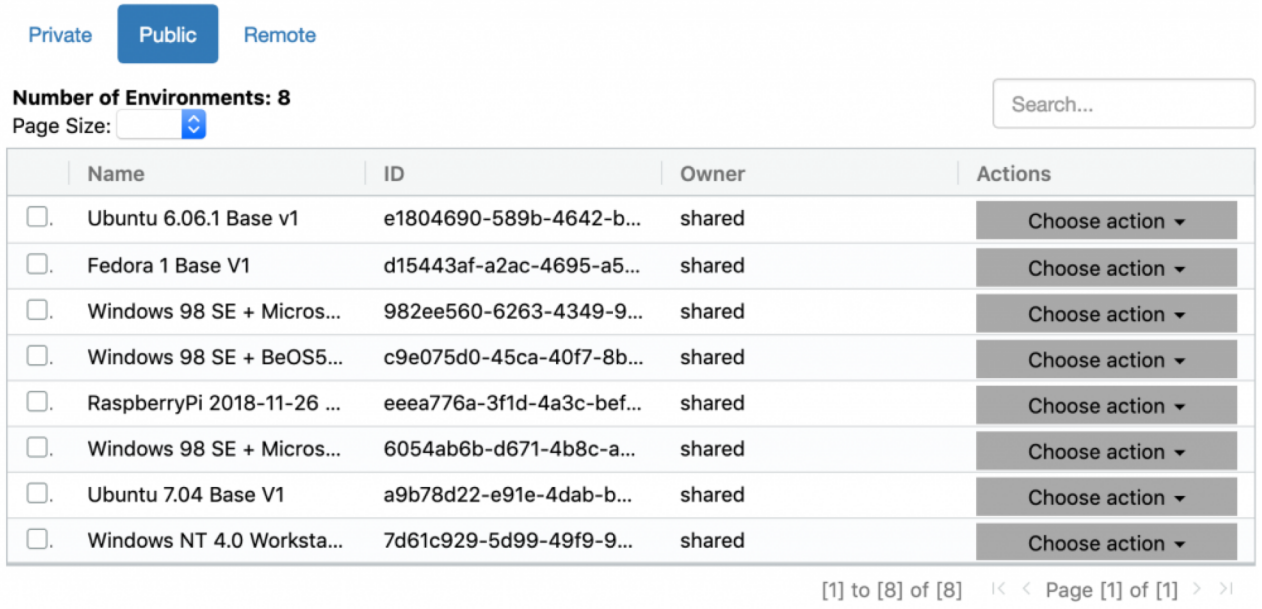
EaaSI a Distributed Emulation Service



Share Work & Expertise

- Share software resources and emulation environments in the network
  - OAI-PMH to distribute metadata
  - Containerized emulators
- Thousands of pre-configured software environments and software resources provided by Yale University Library

EaaSI a Distributed Emulation Service



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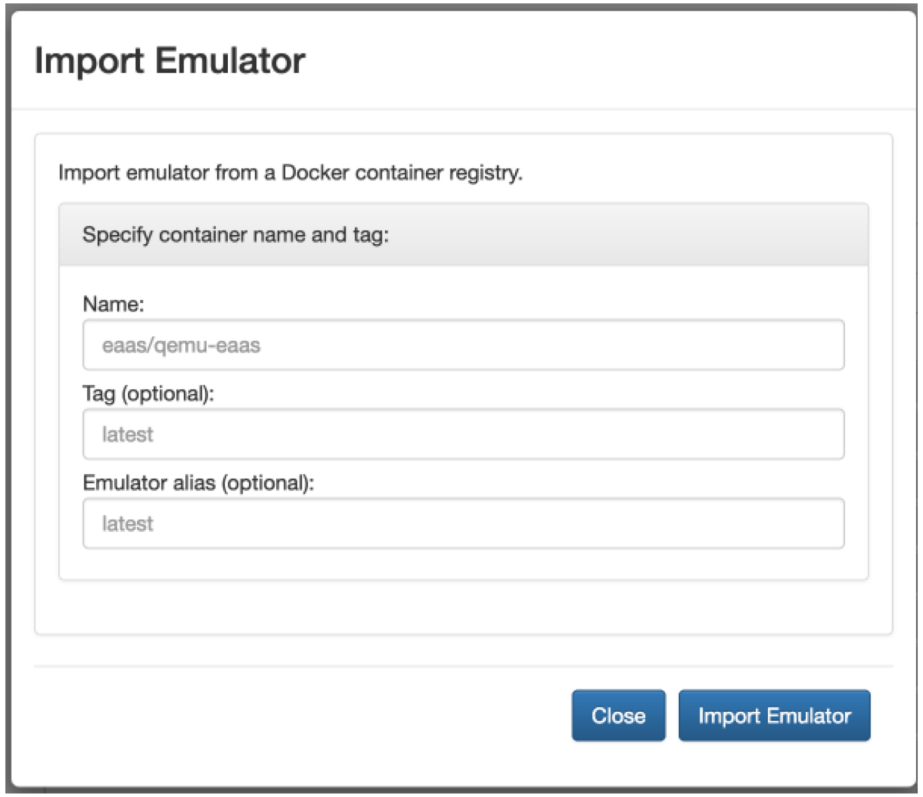

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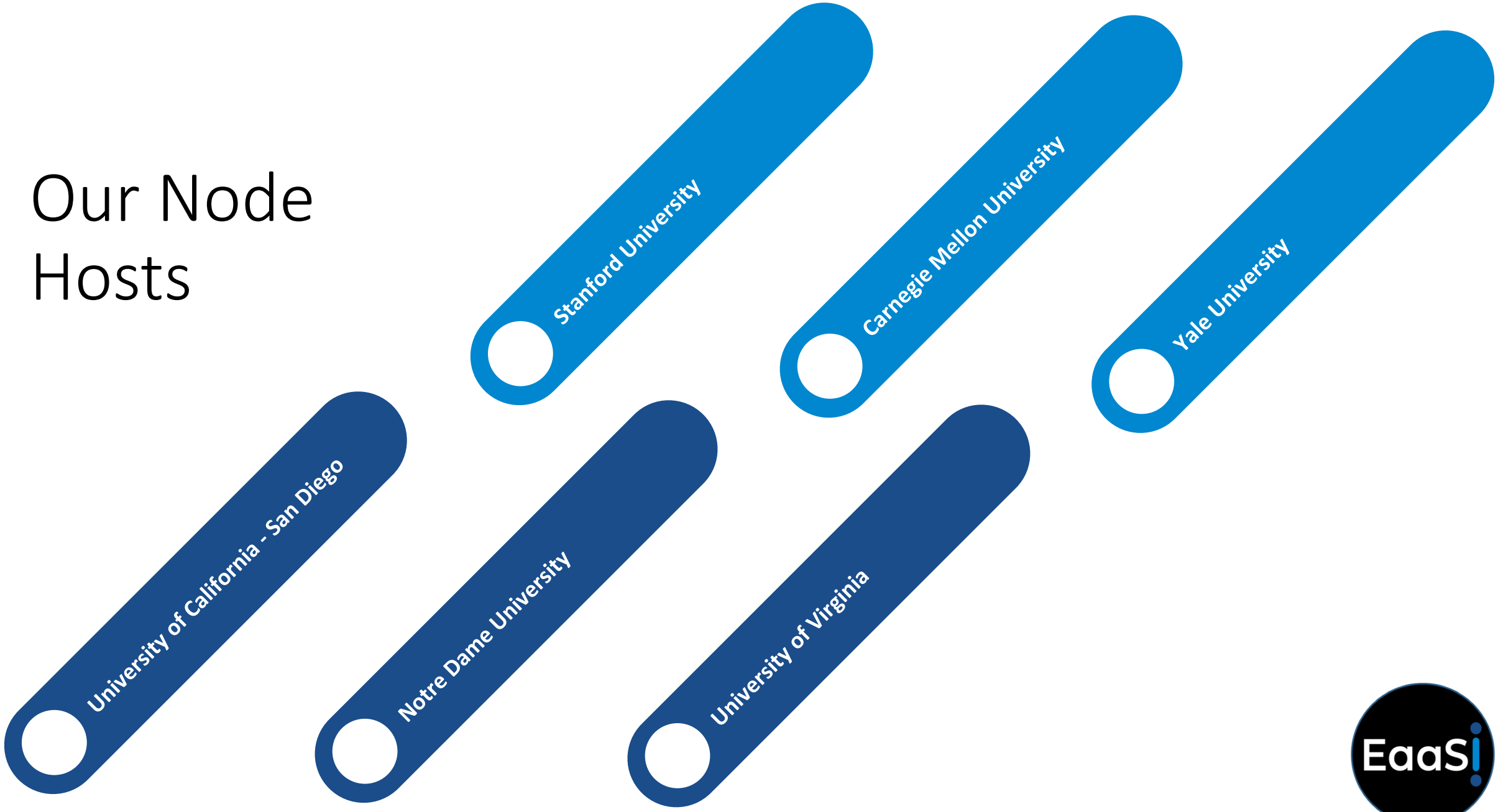
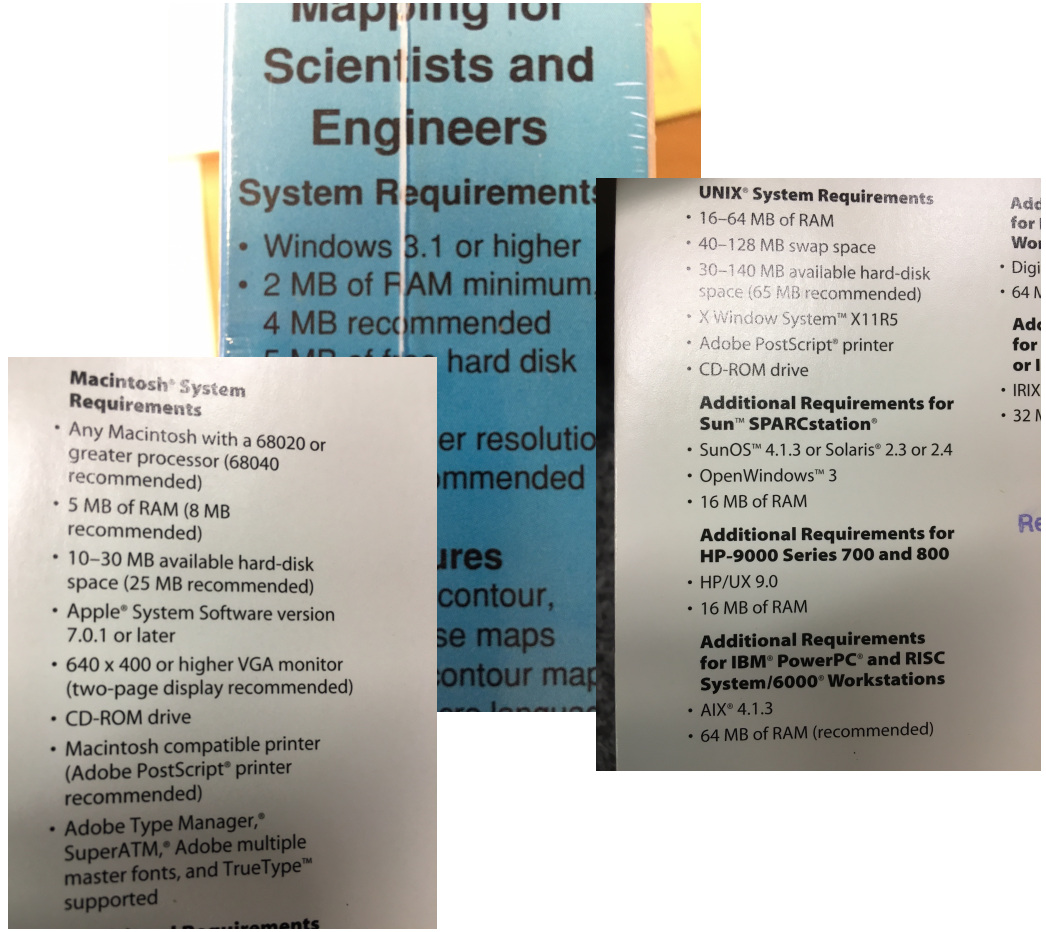
Our Node Hosts



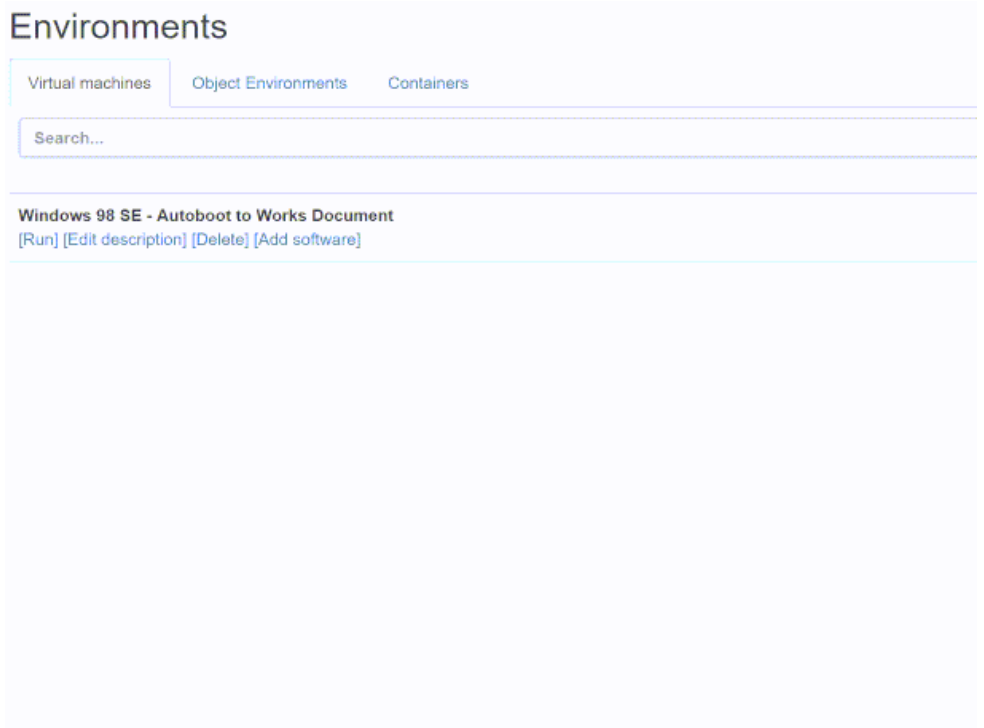
Discovery & Description

- Defining profile for description of software and computer environments
- Comprehensive, open, machine-readable documentation
- Incorporating services developed by Wikidata for Digital Preservation

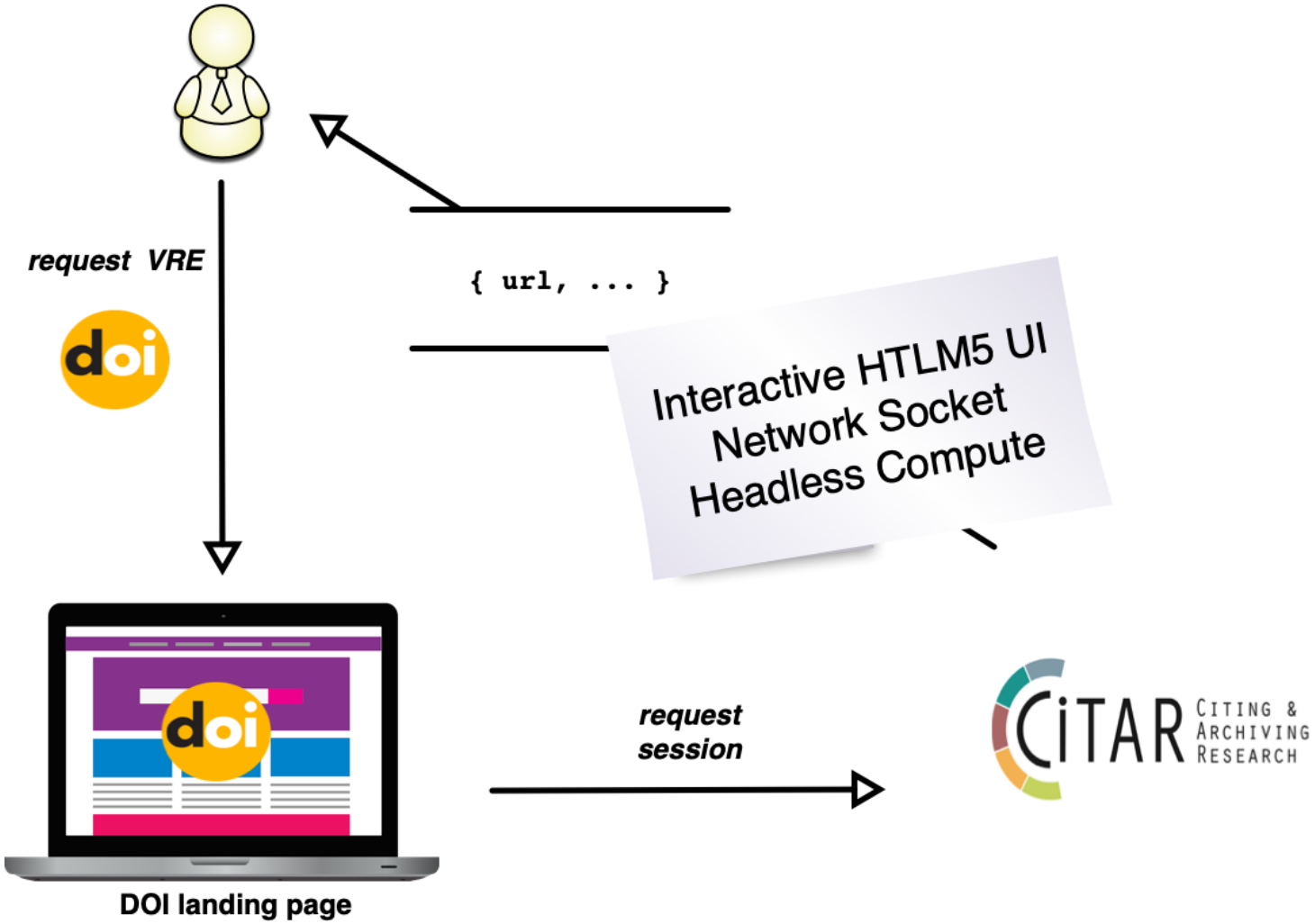


Access

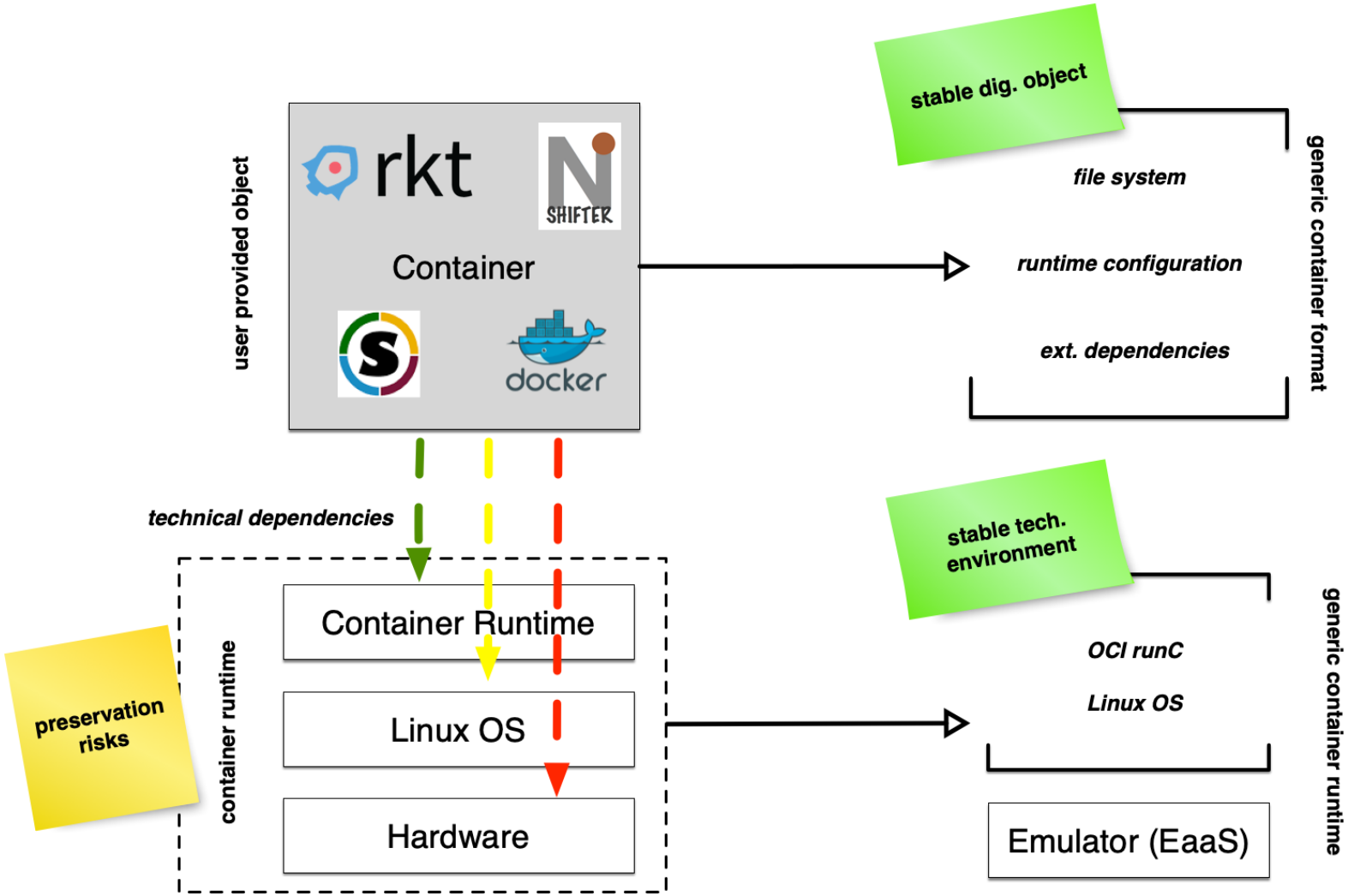
- Emulated CD-ROM environment sharing service
- Virtual Reading Rooms Service
- Scientific Open Source Software Portal
- API to automatically render objects in original software via emulation



Introducing CiTAR

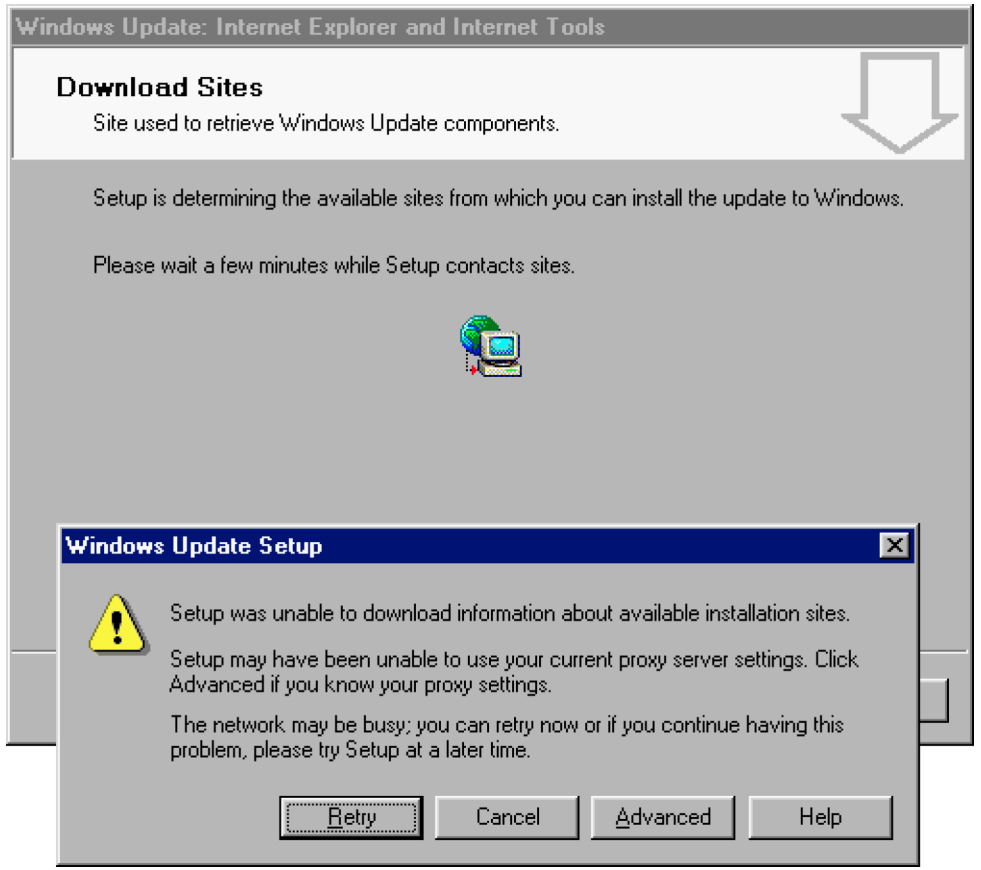


Preserving Containers

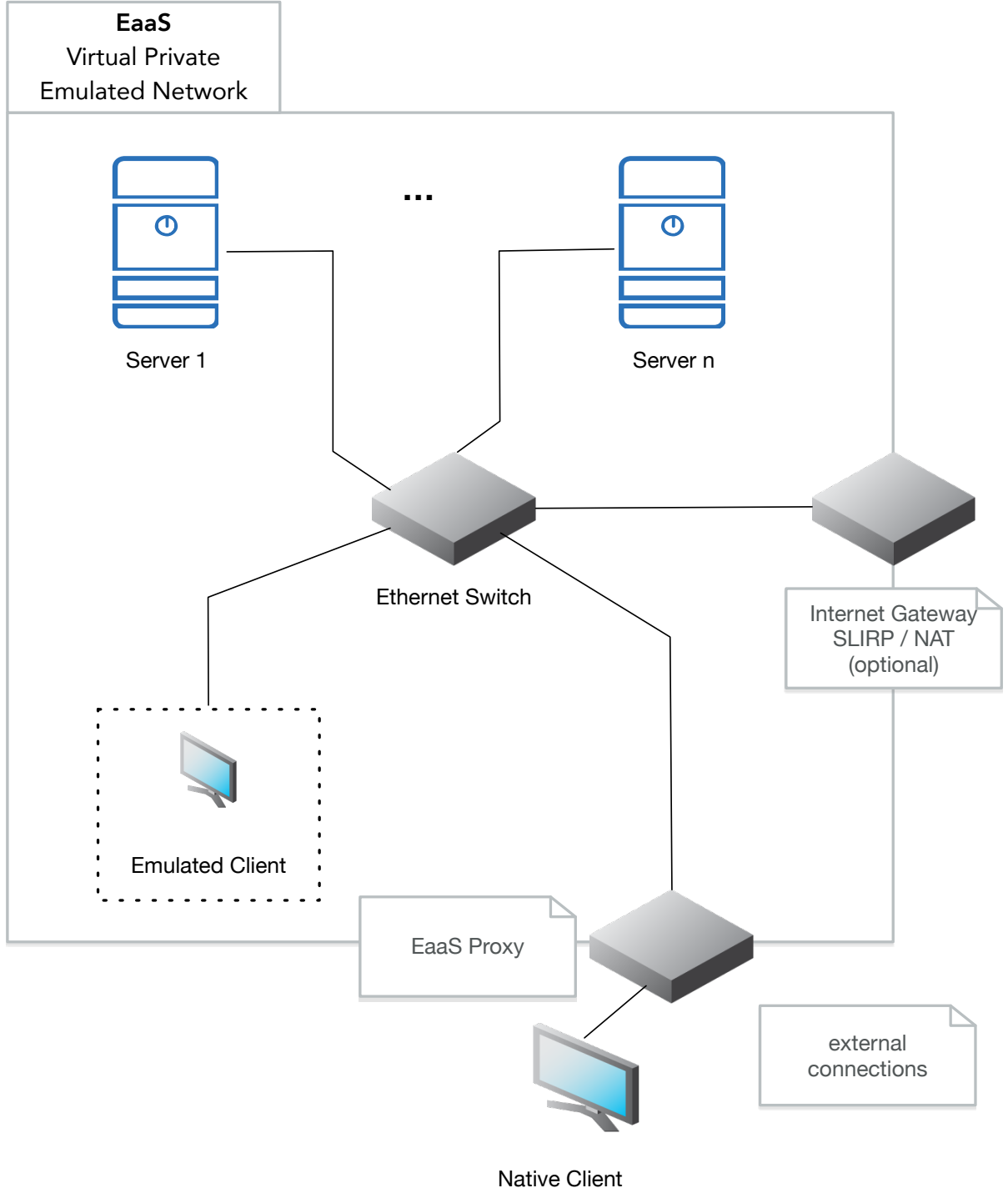


CiTAR Citing & Archiving Research

Emulating Servers – Emulating a Network



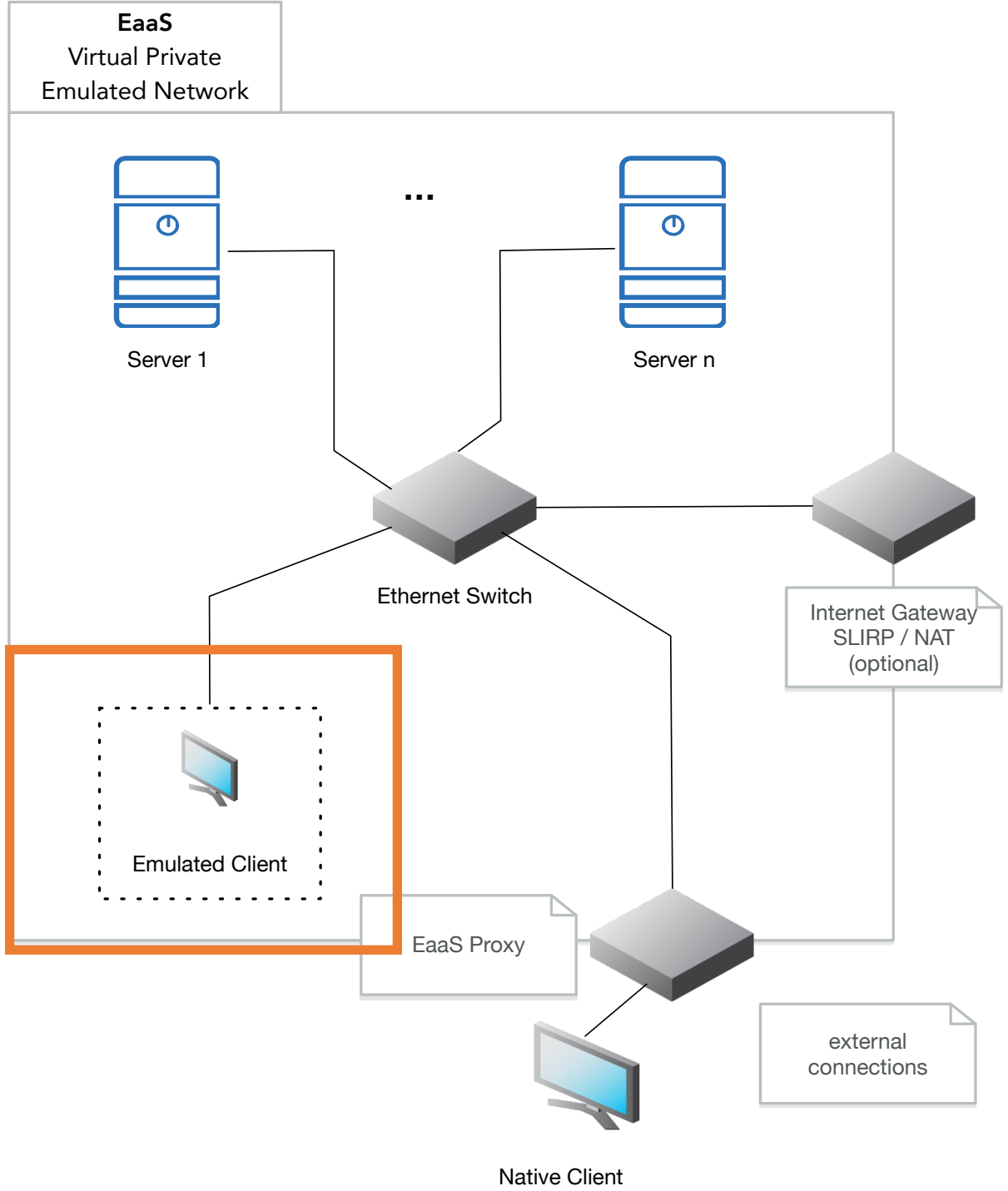
CiTAR Citing & Archiving Research

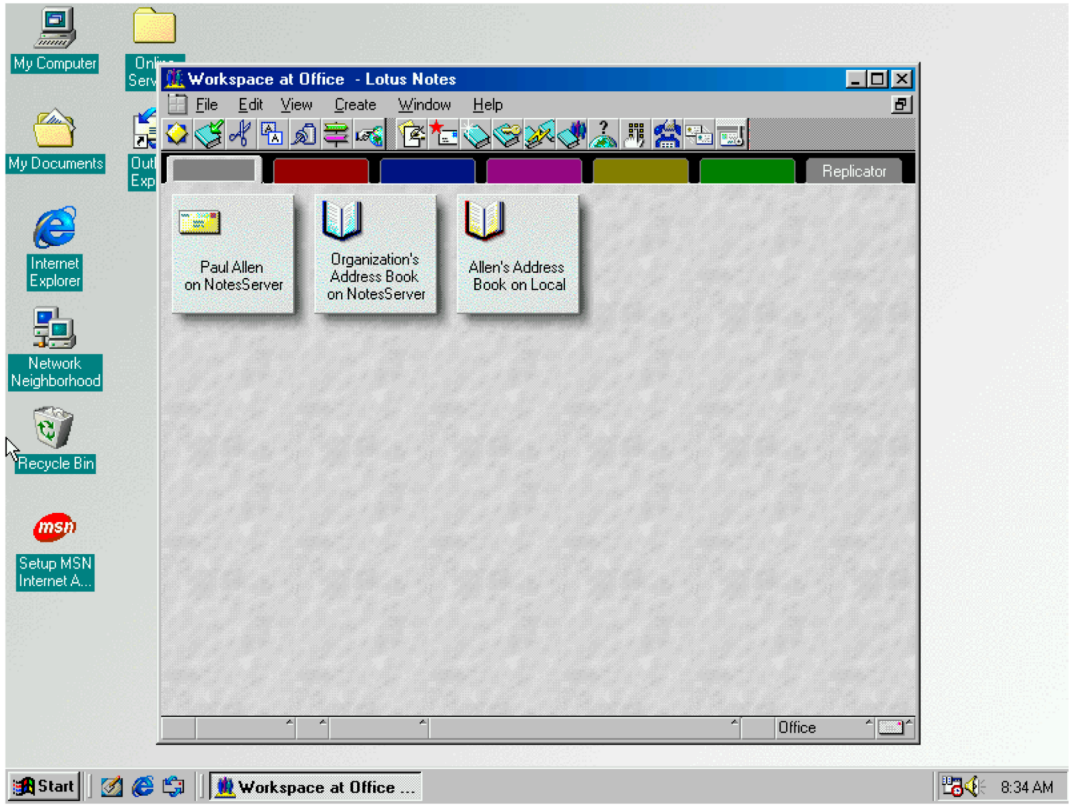


- Emulate *cable, copper* and Ethernet components
- Orchestration & Lifecycle
- Isolation & Security
- Access models

CITAR Citing & Archiving Research

Connect an emulated client to the network



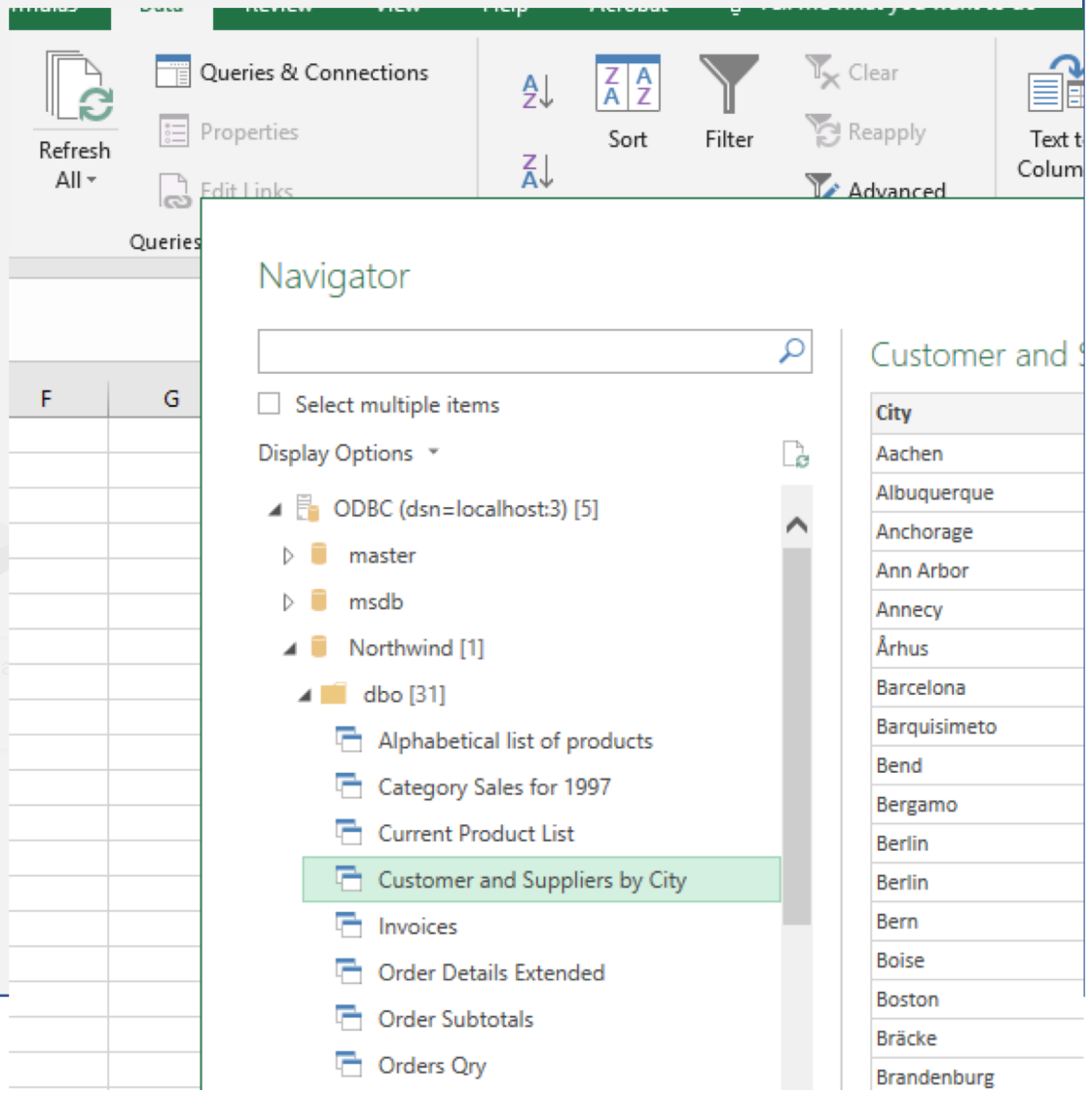


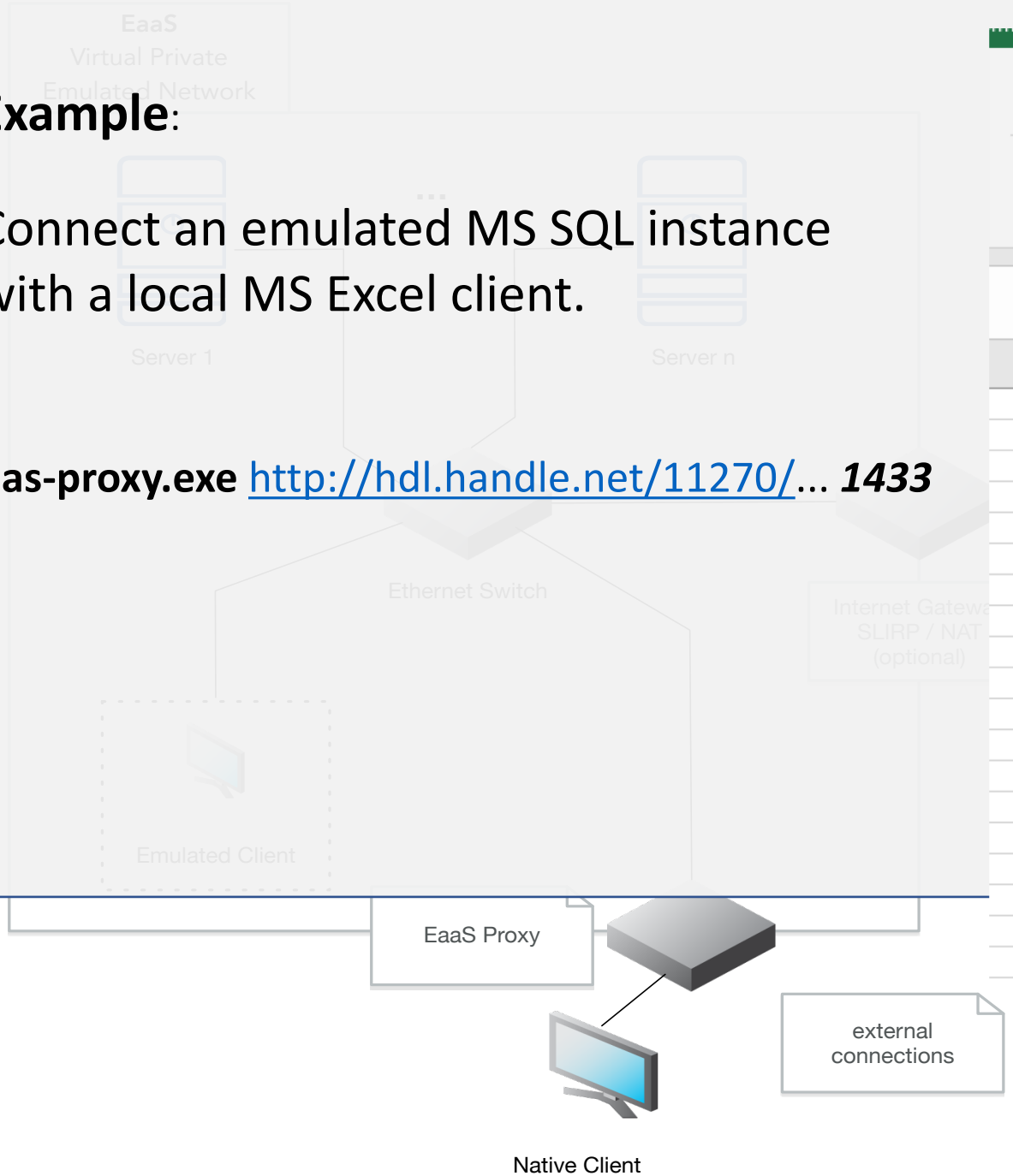
CITAR Citing & Archiving Research

Example:

Connect an emulated MS SQL instance with a local MS Excel client.

./eaas-proxy.exe http://hdl.handle.net/11270/... ***1433***





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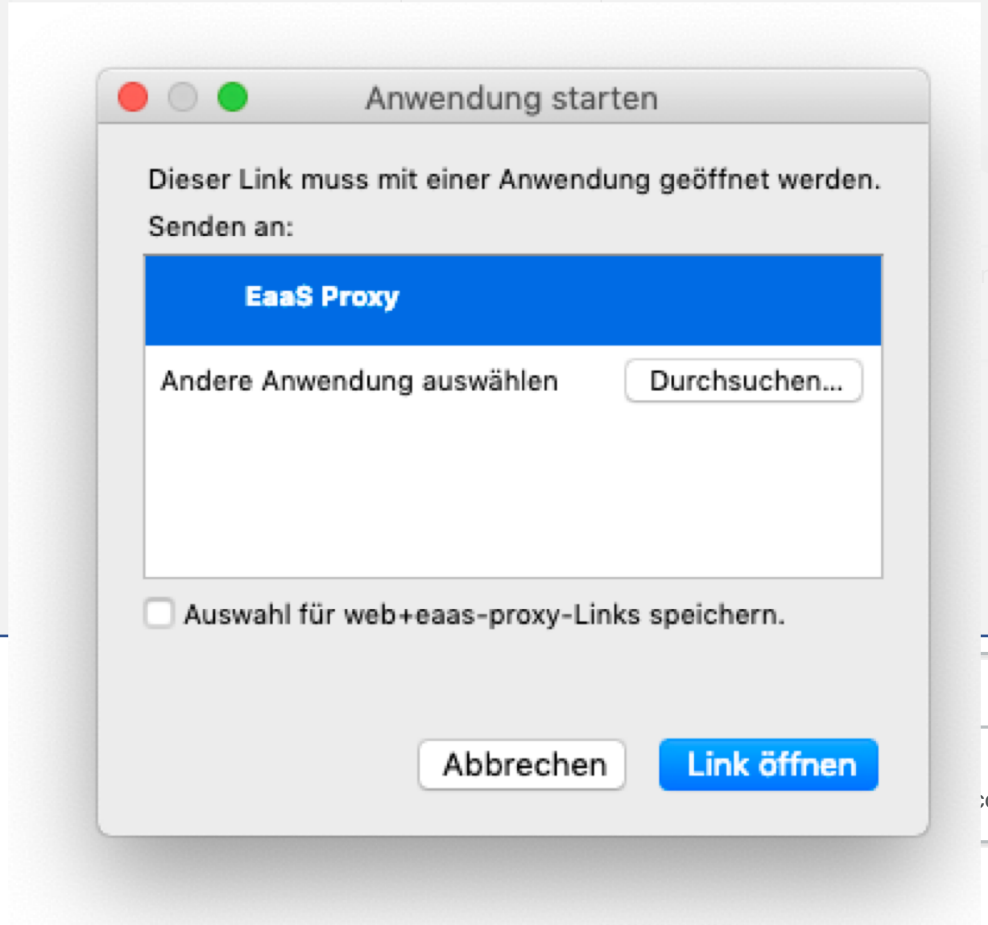

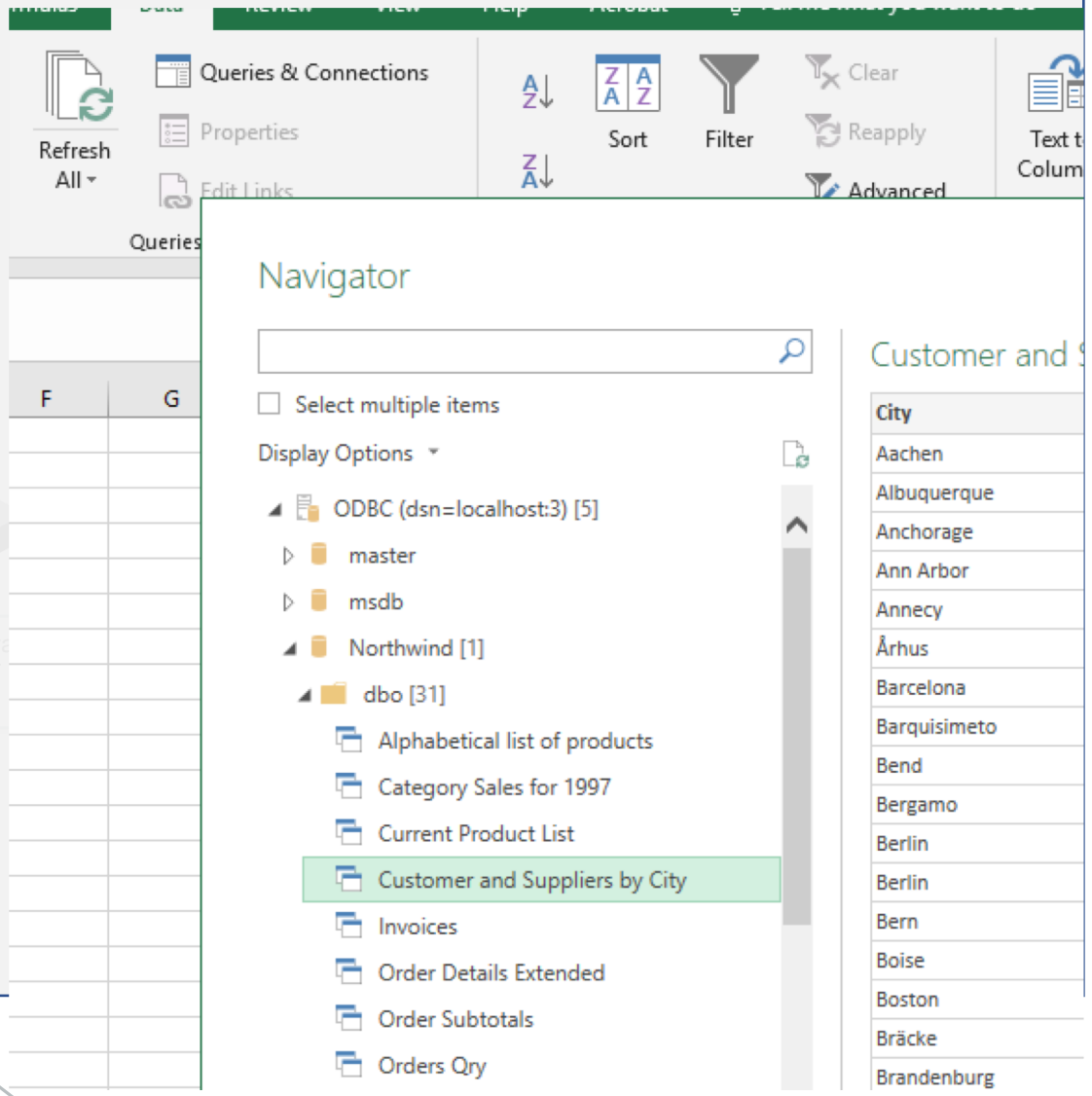

Digital Dark Ages? No! But Dark Clouds Ahead

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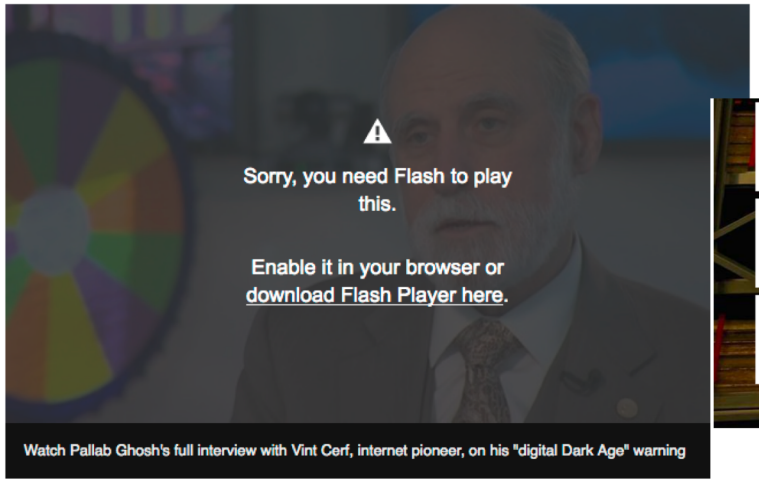
Google's Vint Cerf warns of 'digital Dark Age'

By Pallab Ghosh
Science correspondent, BBC News, San Jose

13 February 2015 Share



Watch Pallab Ghosh's full interview with Vint Cerf, internet pioneer, on his "digital Dark Age" warning

Vint Cerf, a "father of the internet", says he is worried that all the images and documents we have been saving on computers will eventually be lost.

TECH

Why the 'Father of the Internet' Thinks You Should Print Out Your Photos

ternet governance in Sao

Resident engineer John Roberts poses as he looks at the millions of newspapers stored on racks at the National Newspaper Archive in Boston Spa. The British Library's brand new National Newspaper Building has officially opened. The newly built storage void

Google vice president recommends printing out important pictures, so that they can be preserved for history

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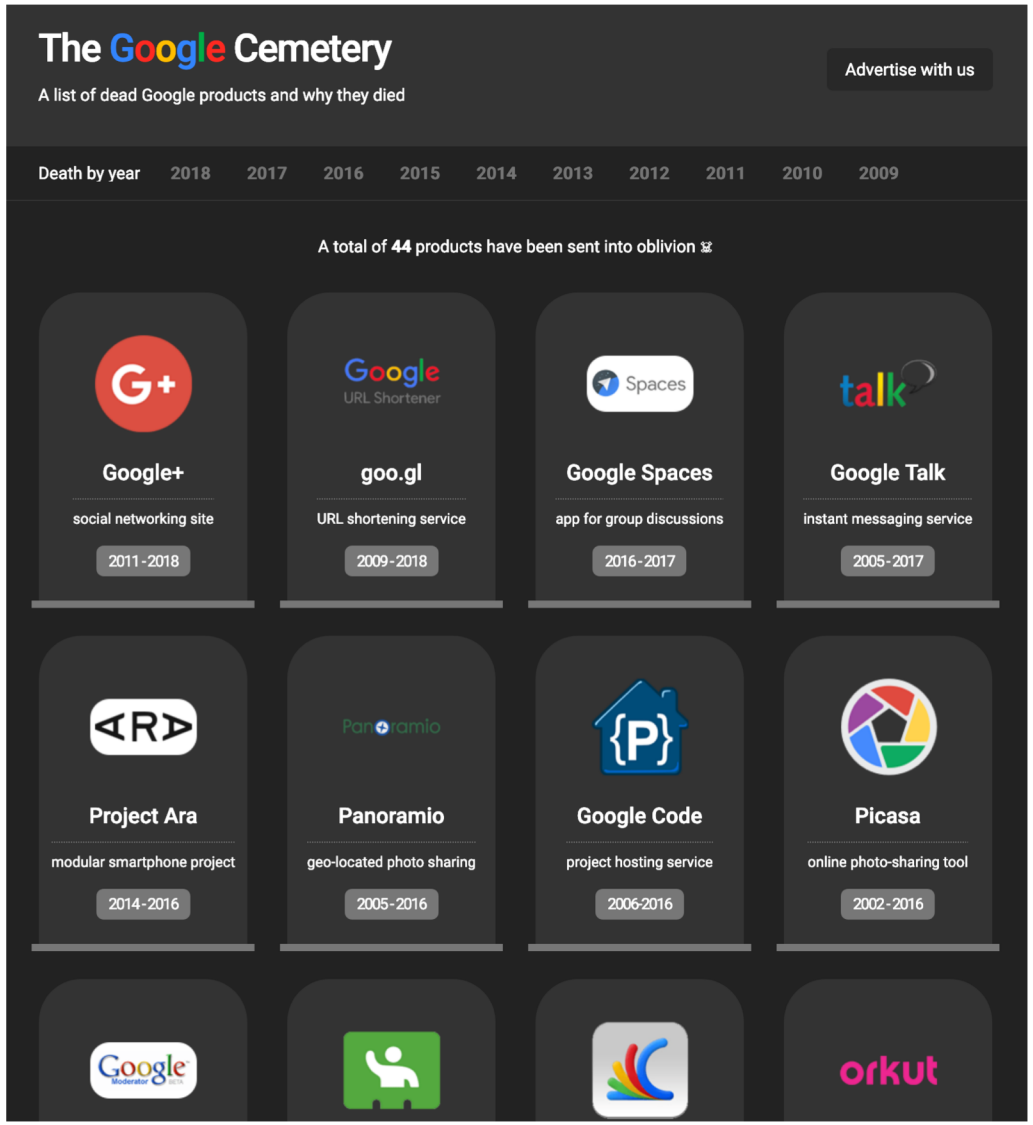
New Type of Objects
New Type of Obsolescence
New Preservation Methods

- Software-objects became “blurry”, boundaries are difficult to define
- Difficult to inspect, to capture and to store
- Complex on-demand relationships



https://gcemetery.co/

Thank you!

- klaus@openslx.com (@kurau5u)
- http://www.softwarepreservationnetwork.org/eaasi
- http://citar.eaas.uni-freiburg.de