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Emulation: From Digital Artefact to Remotely Rendered Environments

Dirk von Suchodoletz, University of Freiburg
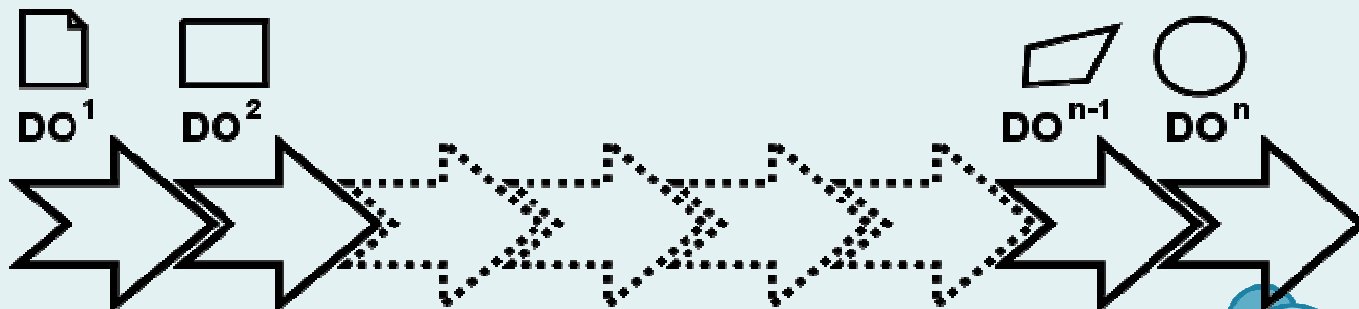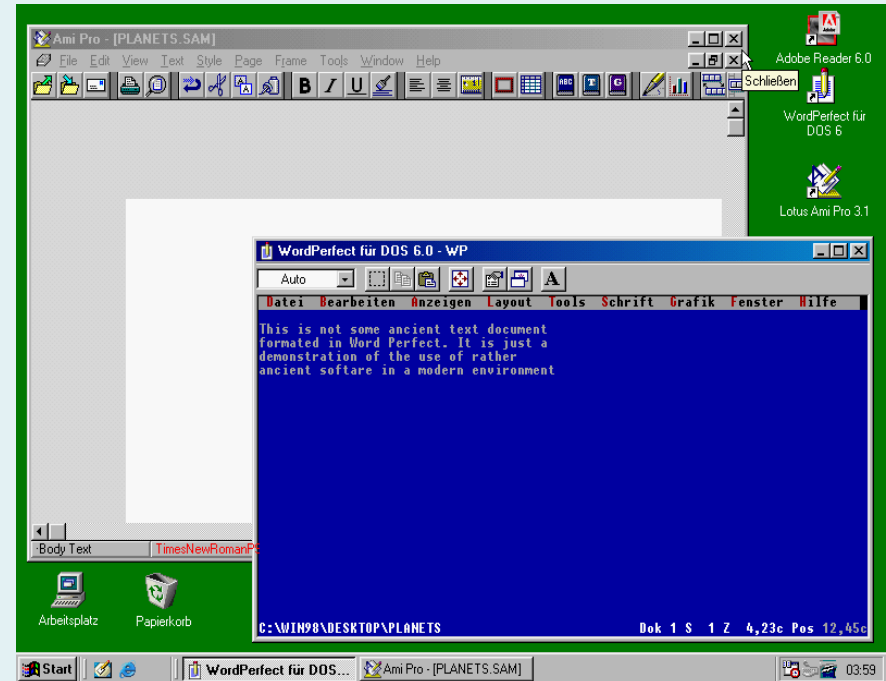Jeffrey van der Hoeven, Koninklijke Bibliotheek

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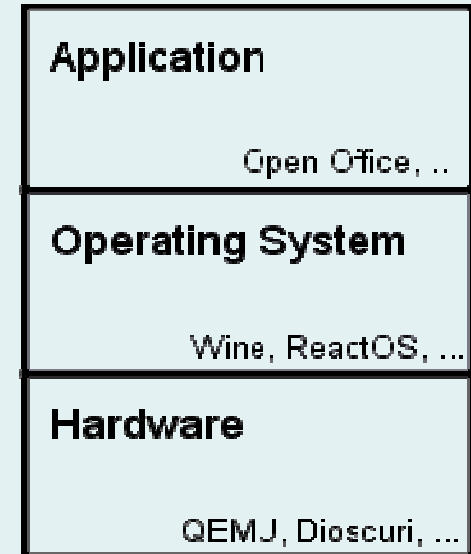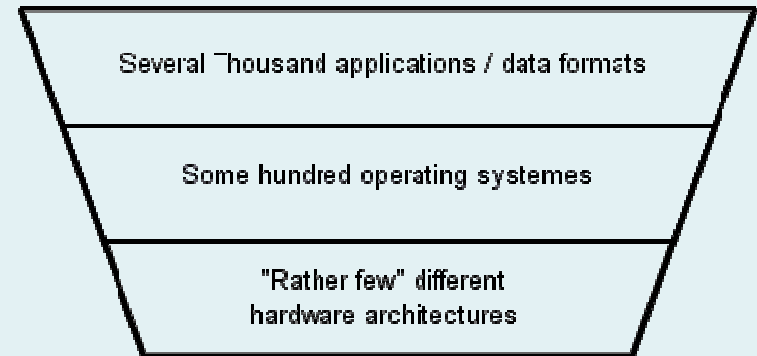
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Preservation Challenges

- ❑ Digital objects require software / hardware environments to be accessed
- ❑ Environments change over time and results in obsolete digital material
- ❑ Main strategy: *Migration*
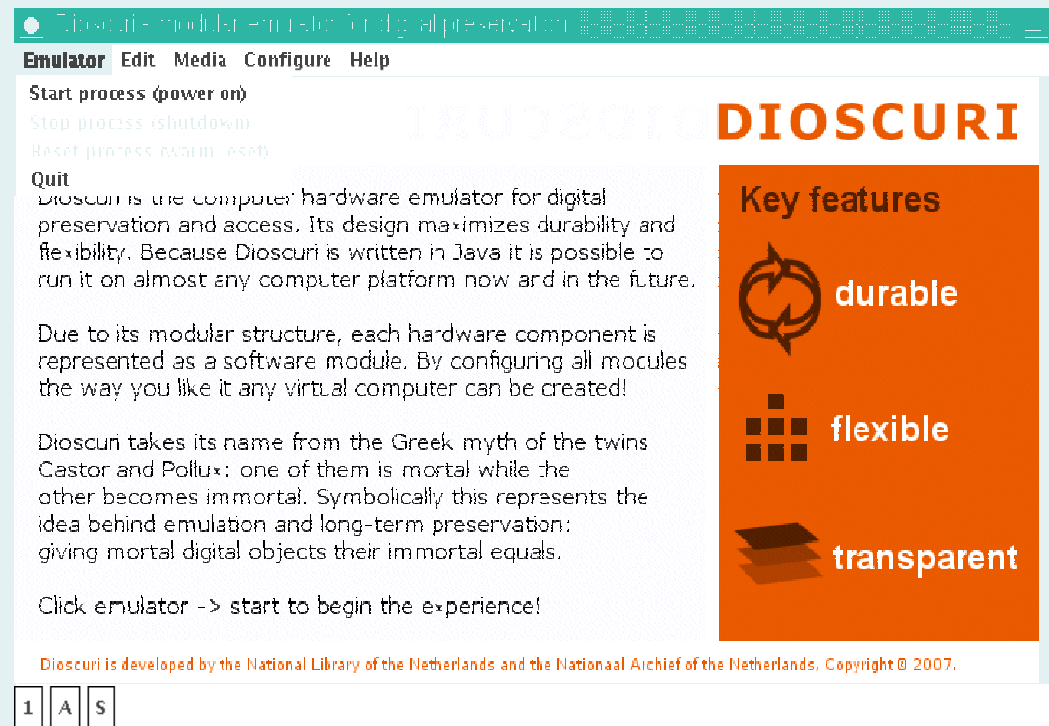 - ▪ Several risks to rely on it completely

Alternate Approach: Emulation

❑ Emulation – no changes on the object, but recreation of original environment
- Emulators are around for quite a while, supplemented by virtualization
- Can operate on different layers of software/hardware stack

❑ Bridging widening gap of the computers from past to future

❑ Emulators are software too – to prevent emulators becoming obsolete, several strategies exist:
- Emulator migration
- Stacked emulation
- Virtual machine + modular emulation

Several Thousand applications / data formats

Some hundred operating systemes

"Rather few" different hardware architectures

Application

Open Office, ..

Operating System

Wine, ReactOS, ...

Hardware

QEMJ, Dioscuri, ...

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Dioscuri: The Long term Preservation Tool

❑ Hardware emulation

❑ Dioscuri X86 emulator recreating an 286, 386 PC of the early 90th

- ▪ **Durable:** using Java Virtual Machine
- ▪ **Flexible:** using modular approach for components such as hard disk, floppy, VGA, CPU, RAM put together form the machine
- ▪ Running DOS and Windows 3.0

DIOSCURI

Key features

durable

flexible

transparent

Dioscuri modular emulator for digital preservation

Emulator Edit Media Configure Help

Start process (power on)
Stop process (shutdown)
Reset process (warm reset)
Quit

Dioscuri is the computer hardware emulator for digital preservation and access. Its design maximizes durability and flexibility. Because Dioscuri is written in Java it is possible to run it on almost any computer platform now and in the future.

Due to its modular structure, each hardware component is represented as a software module. By configuring all modules the way you like it any virtual computer can be created!

Dioscuri takes its name from the Greek myth of the twins Castor and Pollux: one of them is mortal while the other becomes immortal. Symbolically this represents the idea behind emulation and long-term preservation: giving mortal digital objects their immortal equals.

Click emulator -> start to begin the experience!

Dioscuri is developed by the National Library of the Netherlands and the Nationaal Archief of the Netherlands. Copyright © 2007.

Requirements
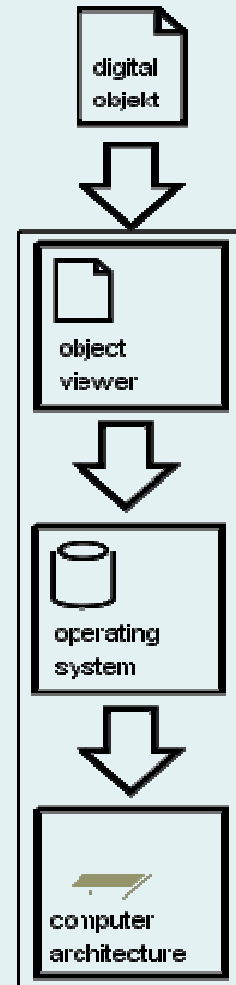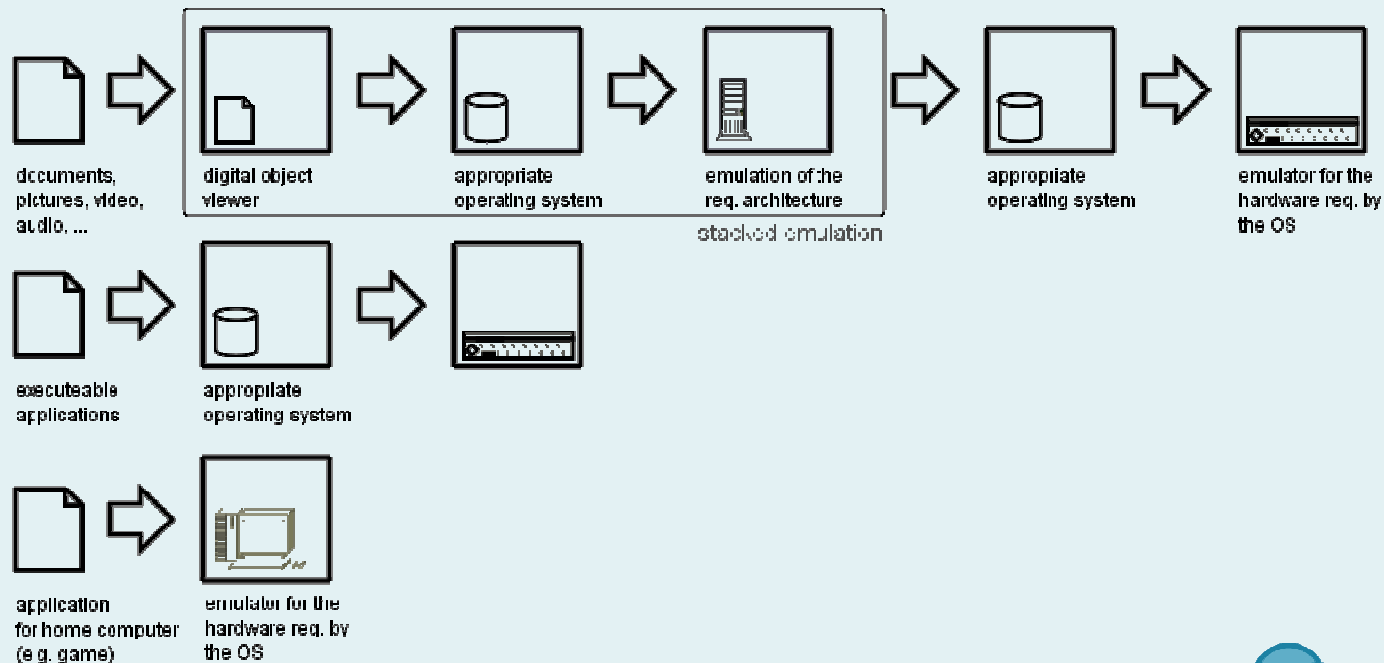
- ❑ Independently of migration or emulation – digital object is to be handled somehow
  - ▪ (Re)creation of a certain hardware + software environment for access / execution. For example:

    Text document requires text processing tool for interpretation and displaying.
  - ▪ Text processing software is dependent on certain operation system
  - ▪ Operating system was programmed for a certain range of hardware architectures
- ❑ Environment's age depends on preservation strategy
- ❑ Emulation not working just on its own – additional software and documentation (metadata) is required
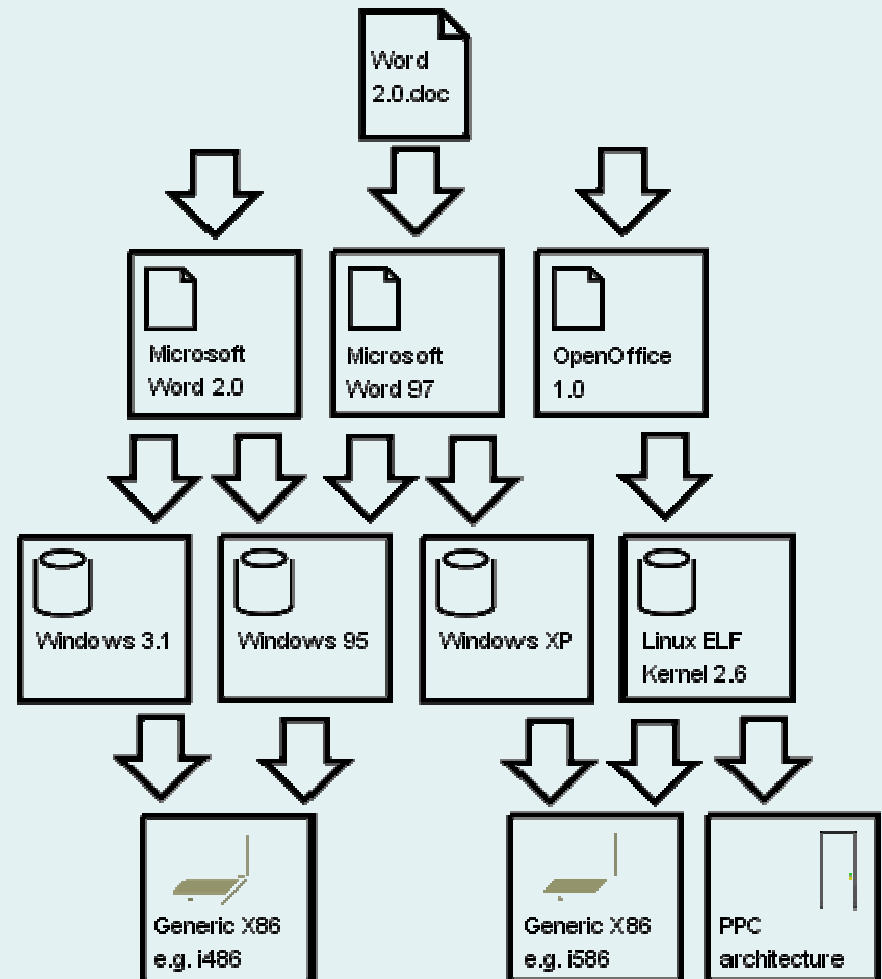
View Path – Pathway from Object to Environment

❑ Reference environment – specifically defined software hardware combination for access

❑ Formalization needed – view path as the requirements to be followed to actually access / display the object of interest

documents, pictures, video, audio, ...

digital object viewer

appropriate operating system

emulation of the req. architecture

stacked emulation

appropriate operating system

emulator for the hardware req. by the OS

executeable applications

appropriate operating system

application for home computer (e.g. game)

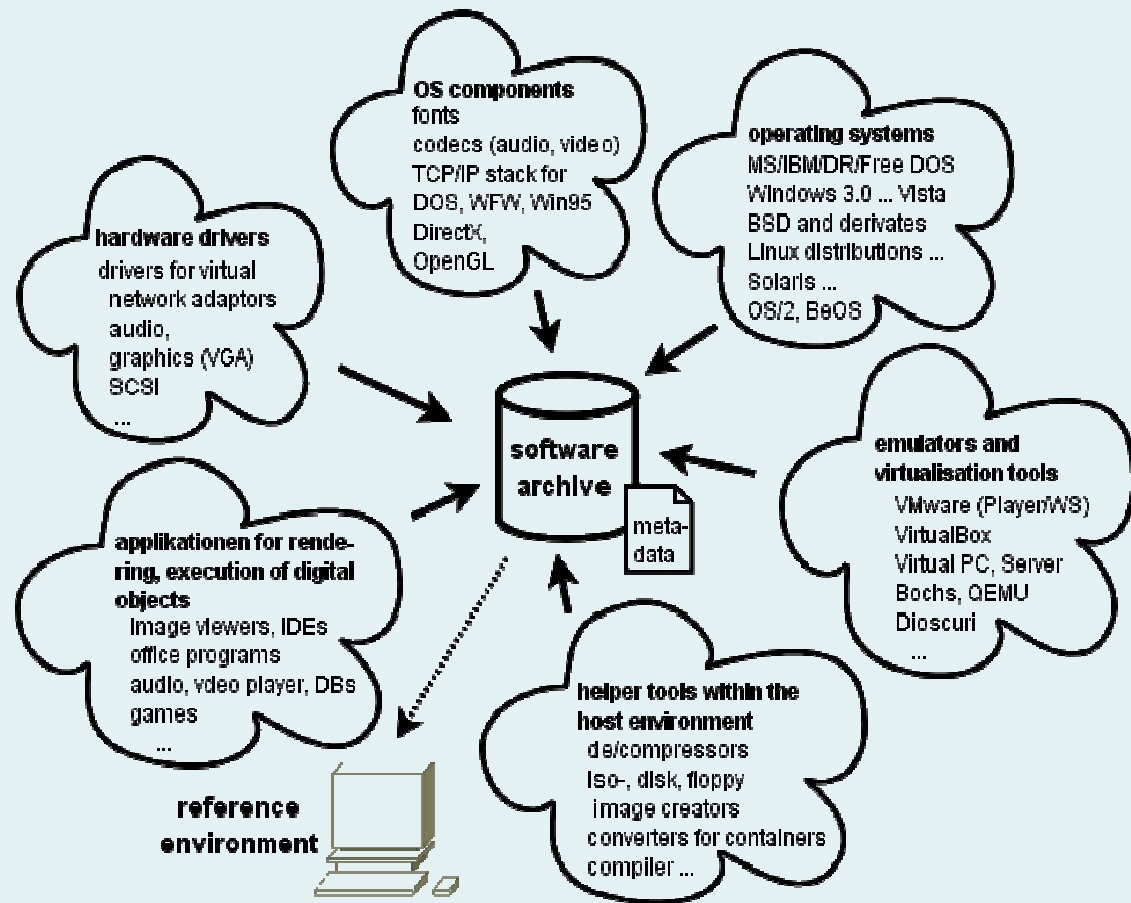emulator for the hardware req. by the OS

View Path Metrics

- ❑ Often more than one view path exists
  - ▪ Depending on object more than one renderer available
  - ▪ Results may differ (significantly)
  - ▪ Simpler or less expensive view path
- ❑ Introduce metrics for decision making
- ❑ Offer users options to choose
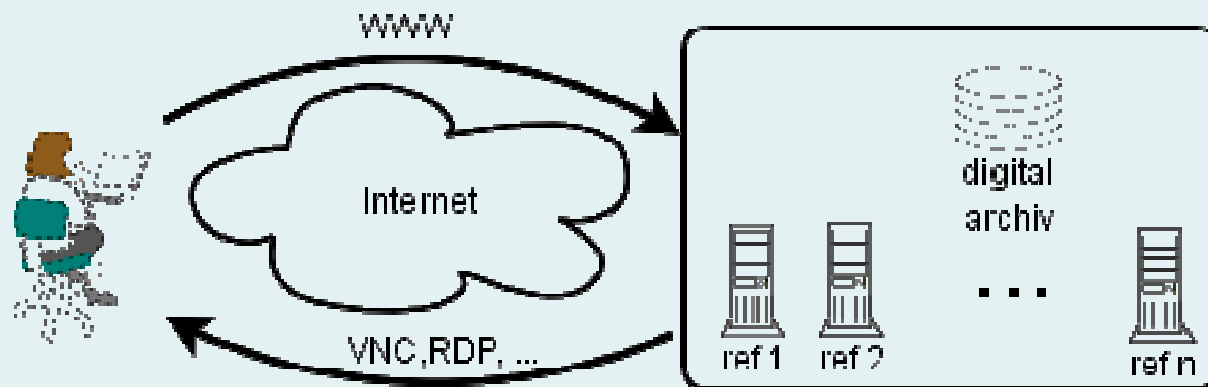- ❑ Use users experience, feedback to improve results for similar objects

Software Archive

- ❑ Each step in view path might add software requirements:
    - ▪ Applications
    - ▪ Operating systems
    - ▪ Helper tools (utilities)
    - ▪ Hardware drivers
- ❑ Format and tools registries
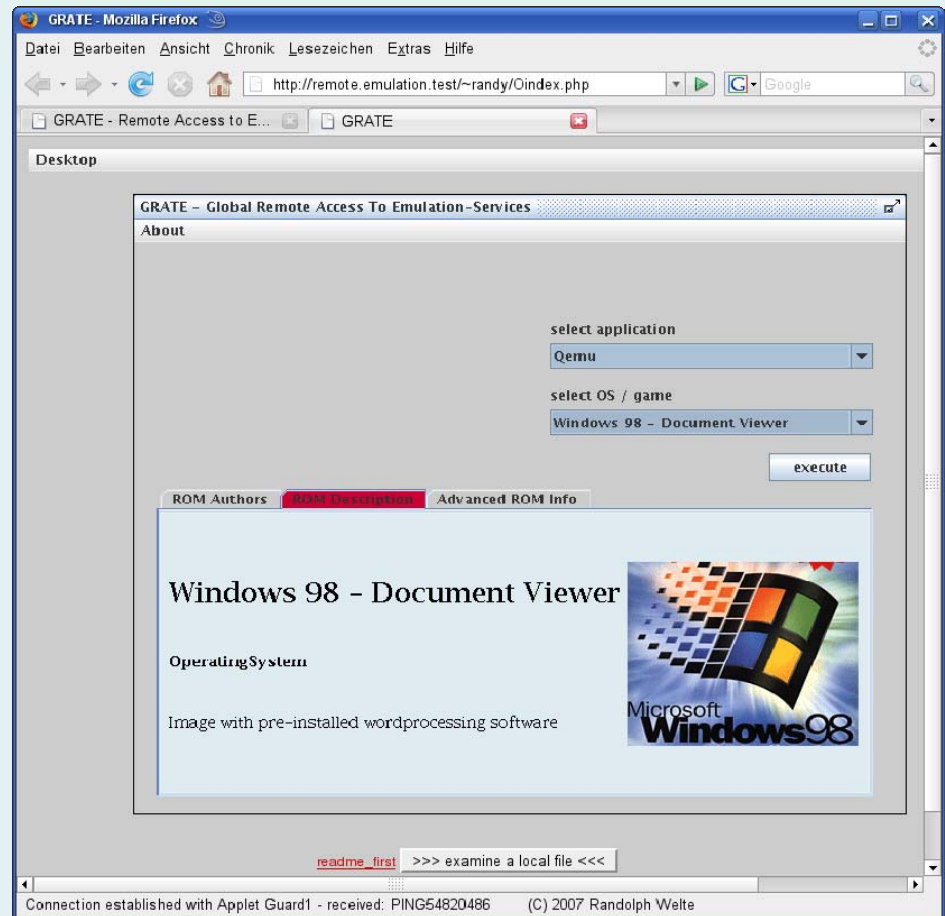- ❑ Additional metadata such as handbooks, tutorials, license keys

Reference Environment

❑ Emulation might require quite some steps until object is actually accessible

  ▪ Average archive user is often not trained computer professional
  ▪ Lots of problems to setup emulation environment on average machines
  ▪ Many software components needed are proprietary

❑ Offer pre-created environments over a network

WWW

Internet

VNC,RDP, ...

digital archiv

ref 1   ref 2   . . .   ref n

GRATE – Demonstrator for Web Access

❑ **Global Remote Access To Emulation (services)**

- Java application executable in average browsers with JRE 1.5
- Access to different emulation environments such as: Dioscuri, MESS, QEMU, ... for Windows 3.11, Windows 98, C64, Atari, ...
- Up- and download of objects
- PRONOM integration – detection of object type and view path suggestion

Questions!?

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