Emulation: From Digital Artefact to Remotely Rendered Environments

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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
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

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Dioscuri takes its name from the Greek myth of the Dioscuri, 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.

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