Emulation for digital preservation in practice: the results

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The cause of all trouble...

Refs:
Digital preservation action!

Three basic criteria for defining action:

- Policy of the institution
- (Future) user requirements
- Kind of digital object:

![Diagram with categories: Content, Structure, Context, Appearance, Behaviour]
Migration & emulation

Migration

Original platform

Emulator

Current platform
Migration & emulation

Original platform

Emulator

Current platform

Migration
Emulation

= adapt the computer environment to render the digital object authentically.

- **Pros**
  - Rendering of original computer environment
  - No changes to digital object
  - Proven technology

- **Cons**
  - Complexity
  - Initial costs (effort)
  - Isolated process limiting information reuse
  - Knowledge of original environment required

Never applied to an operational digital archiving environment.
Emulation Expert Meeting 2006

- Held on 20 October 2006
- Focused on emulation for DP
- Attended by selected group of experts in the field of digital preservation, emulation and IT.
- States that:
  - “Emulation is a vital piece of the puzzle for retaining long-term access to the wide range of digital objects.”
  - “…important steps to be taken to make emulation appropriate for DP.”

Full statement can be downloaded from www.kb.nl
### Project outline

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>2004</td>
<td>KB preliminary study: feasibility emulation</td>
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<tr>
<td>2005</td>
<td>New DP-proof design: modular emulation. KB and Nationaal Archief start joint project. <strong>Goal</strong>: build and test modular emulator. <strong>Scope</strong>: PDF, databases, multimedia apps.</td>
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<td>2006</td>
<td>Tessella leads development. Jeff Rothenberg supports project.</td>
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<tr>
<td>2007</td>
<td>First release of modular emulator. On July 1st, Dioscuri becomes part of Planets.</td>
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What is modular emulation?

Two key features: durability and modularity

- Durable -> emulator has to endure time. This can be done by making the emulator portable to a wide range of computer platforms using a Virtual Machine (VM).
What is modular emulation?

- Modular -> emulator consists of modules. Each module emulates the functionality of a hardware component. This way, the modular emulator can be configured much like a real computer.
Results

- Dioscuri – modular emulator for digital preservation
- Current version: 0.2.0 (Beta)
- Programmed in Java using JVM
- Capable of:
  - Running MS-DOS, FreeDOS, Linux 16-bit (ELKS)
  - Norton Commander 3.0, WordPerfect 5.1, DrawPerfect 1.1, many games like PC-versions of PacMan, Tetris, Chess, Ironman and many more. Even DOS-based webbrowser Arachne works!
  - XML-based module configuration
  - Text extraction from emulated environment into the clipboard of host computer.
  - Running on many platforms like Intel Windows, PowerPC Mac, Sun Sparc Solaris.
Things to improve

- Performance must be increased (limit of 100x slower)
- Data extraction and insertion
- More modules:
  - improved CPU (32-bit)
  - Mouse
  - Sound
  - Network
  - …
- Module library
- Replacing JVM by more universal virtual machine
Next steps

**Planets**

- **2007**: Improve Dioscuri (32-bit, mouse, etc.)
- **2008**: Experiments and module library
- **2009**: Integration with interoperability framework (IF)
- **2010**: Emulation service

**KB**

- **2007**: Test elaboration with Dioscuri in reading rooms
- **2008**: First case: combining emulation with web archiving
- **2009**: Integration with e-Depot process flow
Future situation

- Rendering process
- Digital object + metadata
- characterisation
- Format registry
- Tool registry
- Network interface
- Emulation service
  - Target environment
  - emulator
  - Host environment
- Software repository
  - Contains emulators and environment software
- Other service
Things to note

- Software repository
- Disk image preparation
  - Pre-installed disk images
  - Created on demand
- Old documentation (manuals, tutorials, tips & tricks)
- Data insertion and extraction
  - Transfer text
  - Transfer images
  - Transfer files
  - Transfer (user-defined) stream
Dioscuri - the modular emulator

Dioscuri is an 8-bit computer hardware emulator written in Java. It is designed by the digital preservation community to ensure documents and programs from the past can still be accessed in the future.

The Dioscuri emulator has two key features: it is durable and flexible. Because it is implemented in Java, it can be ported to any computer platform which supports the Java Virtual Machine (JVM), without any extra effort. This reduces the risk that an emulator will fail to work on a single architecture in the future, as it will continue to work on another architecture.

Dioscuri is flexible because it is completely component-based. Each hardware component is emulated by a software surrogate called a module. Combining several modules allows the user to configure any computer system, as long as these modules are compatible. New or upgraded modules can be added to the software library, giving the emulator the capability to run these.

Dioscuri is the best choice to retain access to your old documents, games and other applications!

Latest news

3 September 2007
Dioscuri version 0.2.0 is out now! This release is capable of running various versions of MS-DOS, FreeBSD 0.9 Beta (included in package) and ELKS (Embeddable Linux Kernel Simulator). The following improvements have been made:

- Fixed minor bugs in CPU instructions and added some new instructions
- Fixed keyboard status LEDs on GUI
- Improved system timer and PIT
- Improved GUI for image file selection
- Improved keyboard controller for mouse/keyboard control
- Added functionality to copy text to clipboard (text mode only)

For a complete overview of all changes in recent versions, please check the changelog. See the disk images download section for various new disk image downloads.

Download Dioscuri version 0.2.0
Questions?

References:

Dioscuri website:
http://dioscuri.sourceforge.net

Emulation project KB-NL / Nationaal Archief and Emulation Expert Meeting (EEM) 2006:

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