



Emulation: a permanent preservation strategy

A problem that cultural heritage institutions are facing these days is providing continued access to their digital information over time. A proven strategy for simple digital objects such as images and documents is migration: the transferring of data to newer system environments. However, complex digital objects such as databases, multimedia applications and games have behaviour and other properties that is harder to preserve via migration and thus run the risk of losing some, if not all of their functionality.

Emulation, where the digital object's original environment is recreated, offers a permanent preservation strategy that is capable of providing continued access to all digital objects.

Focus on the environment

Whereas migration is aimed at the digital object itself by changing or updating the format of an object in such a way it is possible to render these objects on current systems, emulation focuses on the hard- and software environment in which the object is rendered. It aims at (re) creating the original computer environment of the digital object, which results in a greater authenticity.

An emulator is a software program that runs on one computer (the 'host') and creates a different computer environment in software (the 'guest') from the ground up – including CPU, memory and peripherals. The digital object, along with the

required (obsolete) operating system and software runs in the guest environment, and so believes itself to be running in its original environment.

This focus on exact reproduction of behaviour is in contrast to some other forms of computer simulation such as virtualisation. A common misconception is that virtualisation software, such as VMWare or VirtualBox, may be able to create any guest environment. This is not true; only the same hardware architecture can be simulated. Only an emulator can, for example, emulate a Commodore64 guest environment on an IBM PC clone.



Emulation: collaboration

Tessella has played an important role in developing emulation as a preservation strategy.

In 2004, the National Library of the Netherlands (Koninklijke Bibliotheek, KB) and the Nationaal Archief of the Netherlands pooled their resources to tackle the problem of digital object obsolescence. Tessella was selected to research, design and develop an emulator specifically for digital preservation: Dioscuri, the modular emulator. A durable and flexible solution was selected to make the emulator sustainable for the long term: introducing an intermediate layer between the current platform and the emulator, dependency on the underlying system could be avoided. This offered more stability and less maintenance as changes in the host platform have few effects on the execution of the emulator.

Dioscuri was released as an open-source emulator to the general public in July 2007.

Emulation as a service

Tessella have continued work on the problems in the digital preservation sector, especially emulation, as part of the Planets (Preservation and Long-term Access through Networked Services) project.

Planets is a four-year project co-funded by the European Union with the primary goal to build practical services and tools to help ensure long-term access to cultural and scientific digital assets.

Planets consists of several partners, including the British, Dutch, Austrian and Danish national libraries, the Swiss, Dutch and English archives, several universities and commercial partners such as IBM, Microsoft and Tessella.

Within Planets, as part of the 'Preservation Actions' workgroup, Tessella has helped develop tools that transform and emulate obsolete digital assets. This includes extending the functionality of Dioscuri, and integrating it in the Planets Testbed, providing a consistent and coherent evidence-base for the

objective evaluation of different protocols, tools, services and complete preservation plans.

A complete framework

With the Planets project still ongoing, Tessella has expanded the research and development of their emulation strategy along with partners from the KEEP (Keeping Emulation Environments Portable) consortium. Partners here include several European institutions: the Dutch, German and French national libraries and a computer game museum.

Again co-financed by the European Union, the KEEP project aims to develop an Emulation Access Platform to enable accurate rendering of both static and dynamic digital objects. It will address the problems of transferring digital objects stored on outdated computer media. Tessella is involved in offering services to end-users via an emulation framework that, given a digital object, will automatically select, configure and run the appropriate emulator. This way, KEEP will create the foundation for the next generation of permanent access strategies based on emulation.

Current status

As well as involvements in these projects, Tessella continues development on Dioscuri, integrating it into the Tessella Safety Deposit Box (SDB). SDB is a complete digital archiving system currently in use at many archives and libraries around the world. As a tool in the enhanced active preservation system that provides preservation action as well as planning, the Dioscuri emulator will provide a preservation strategy by providing permanent access to those digital objects in the archive for which migration is not a viable option.

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