Giving Access to Multimedia Objects in Libraries with Emulation

Implementing a Solution

Tobias Steinke

Deutsche Nationalbibliothek, Germany

t.steinke@dnb.de

https://orcid.org/0000-0002-3999-1687

Abstract – The German National Library makes collected multimedia objects available onsite within emulated environments. The framework is based on Emulation as a Service and optimized for automatically handling big collections. The paper describes the development in a German research project and the practical integration in the access environment of the library. It also gives an overview of legal aspects related to the emulation framework.

Keywords – Emulation, Access, Multimedia, Libraries, Licenses

Conference Topics – Designing and Delivering Sustainable Digital Preservation; The Cutting Edge: Technical Infrastructure and Implementation

I. Introduction

The German National Library has a huge collection of multimedia publications on data carriers. The legal deposit includes digital publications like encyclopedias, educational applications and interactive literature. These multimedia objects were published on floppy discs, CD-ROMs, DVD-ROMs and other data carriers. As these are mostly computer programs, a suitable environment of hardware and software is needed. Although mostly made for different versions of Windows, there are also programs for older computer systems like Apple II, C64 and Atari ST. Access to the collection is only available at Windows based terminals in the reading rooms of the German National Library. In order to provide access to all these kinds of objects a flexible and scalable framework with support for emulations of many systems is needed.

II. The German Project EMiL

In the project Emulation of Multimedia objects in Libraries (EMiL) [1] an emulation-based flexible and automatable access framework for multimedia objects in libraries and museums was developed. The project was funded by the German Research Foundation (DFG) and ran from 2014 to 2016. Project partners were German National Library, Bavarian State Library, Karlsruhe University of Art and Design and University of Freiburg.

In a first step the project partners defined their requirements. The libraries have to deal with huge collections of very different objects. No manual effort for preservation actions on each object is possible on this scale. In the context of museums on the other hand the quality of the presentation of each object (mainly art) is most important. In any case the access is restricted to onsite access due to legal reasons. A flexible framework was needed, that supports emulations for many different systems and that could work automatically for many objects as well as with pre-installed highly optimized emulation environments for special objects. There was no need to work over the internet, but the access should scale for a certain amount of local users.

In a second step existing emulation frameworks were validated based on the requirements and with a set of test objects by the project partners. These were basically the framework of the European project KEEP [2] and the Emulation-as-a-Service system of the German project bwFLA [3]. The result of the evaluation was that the system of bwFLA provided the best starting point for the development. It was also developed by the project partner University of Freiburg.

One of the key developments needed for EMiL was a module to automatically assign a fitting emulation environment for a given object. There are catalogue entries for the huge amount of multimedia objects in the collections of the libraries, but these lack accurate technical metadata. There is no existing information of the needed software and hardware for accessing the object, which could be used to start a best fitting emulation. Manual examination of each object is no option for collections of thousands of objects. The university of Freiburg developed a module that tries to identify all executable files of an object (usually CD-ROM images) and match one of the pre-installed emulation environments. If no executable file is found, an environment is chosen with an installed player for the mostly found file format in the disk image.

The basic access use case for the framework was defined as: A user at a Windows based terminal uses the library catalogue in the reading rooms and finds the entry of a multimedia publication (floppy disk, CD-ROM, DVD-ROM). After clicking on a link in the catalogue entry page in the browser, a new browser window will open and automatically start a suitable emulation. The selected object will be mapped as drive within the emulation so it can be used in the same way as if the disk would be inserted in a disk drive at the original machine. By closing the browser window the emulation will be closed and everything done within the emulation will be wiped out.

The developed framework by University of Freiburg supported several existing emulators for different machines and allowed adding new environments based on existing ones. E. g. a Windows 95 environment could be enhanced with an installation of MS Office and then be saved as a new additional environment.

At the end of the project in 2016 there were test installations of the developed frameworks at the partner institutions. These test installations were not integrated in the local infrastructures and featured not all the functionalities wished by the partners.

III.   EMiL Integration

The German National Library decided to start an internal project called EMiL Integration in 2017 to further develop the EMiL framework according to the institution's needs and to integrate it in the existing infrastructure.

The team of University Freiburg that had developed the EMiL framework established a company called OpenSLX[1]. The actual software is available as open source[2], but OpenSLX continues developing the system and supports it.

The main new functionalities that were identified as requirements for the usage in the reading rooms of the German National Library were session management and printing. Session management means that users should be able to save the state of the used emulated environments for later usage. Many Windows CD-ROMs need to be installed before using them and allow individual user configurations. Without session management a library user wanting to use the same object on several days would have to re-install and configure the object every day. A certain percentage of a publication is allowed to be printed out by users. This should be possible for publications in emulated environments as well. OpenSLX was able to implement this depending on the emulation. For some emulators it is possible to re-direct the emulated printer output in a PDF file that can then be used by the local Windows machine for printing.

The thousands of multimedia publications on data carriers (mainly disks) in the collections of the German National Library are not yet migrated to the digital preservation system. Until now disks with multimedia content needed to be ordered by users and are then converted to disk images for access via the commercial software Virtual CD.

At the end of 2018 the EMiL system became available for the users in the reading rooms of the German National Library, but just with a handful of objects. In a next step the existing created images for access with Virtual CD will be stored in the preservation system and this will make them available for access with the EMiL framework. That way at least the most requested multimedia publications

[1]   http://openslx.com/

[2]   https://gitlab.com/emulation-as-a-service

iPRES 2019

will be available for emulation, but it is of course only a small percentage of all objects in the collection. A systematic migration of the content of all disks will be needed in the future.

The usage of available objects is implemented like the basic use case of the original project. Access links were added to the catalogue entries of the multimedia objects. A click triggers the EMiL system installed within the infrastructure of the German National Library. The software is called with the parameters object ID and user ID (if a user is logged in). In a new browser window the interface of EMiL is displayed together with a screen of the emulated system (see figure 1).
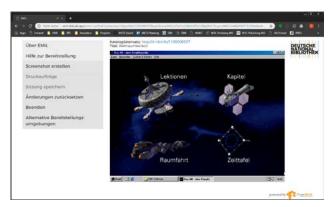

Figure 1 Emulation of a Windows 98 system with a learning program about space travel

Within the emulated environment the selected disk is mapped to a drive. The user has to to open the drive and start the program or the installation process if needed. A help button shows general information on how objects are normally started in the currently running environment. If the same user used the same object before and saved the session, the emulation will start with the saved environment. It is possible to reset the current emulated environment to its default state. It is also possible to get a list of other available environments that would (probably) work with the selected object and start one of these alternative emulated environments. E. g. although Windows 98 was automatically selected as best fitting environment for this object, the user could decide to use it in a Windows XP environment. If a specific information is available for the selected object like a registration code for installation this will be displayed. Users are able to save a screenshot of the emulated system and they can use existing

printing functionalities within the emulation (for supported systems). The print output will be stored as PDF in a queue for using with the local printers in the reading rooms. Session saving is only available after shutting down of the emulated system. This is necessary to avoid corrupted environments.

An administration interface gives an overview of all existing environments, saved sessions and objects with assigned environments. Within the browser based interface it is possible to edit or add environments. New environments based on existing ones can be created with the same interface as the normal access. Default software that needs to be added will be mapped within the emulation, can be installed and then saved like a session. The resulting new environment might be manually assigned to existing objects or might be used by the automatic assigning process. Completely new emulators can only be added by OpenSLX, because these need to be integrated in the framework.

IV. Legal Aspects

One task of the project EMiL Integration was to examine legal aspects related to the emulated environments and acquire licenses if necessary. The EMiL framework itself and all integrated emulators are free software. But operating systems (OS) are needed for the emulation of hardware systems. Most of the OS - even very old ones – are (still) copyrighted and therefore usage requires getting a license by the right holders. For some of the older systems it was not so easy to find and contact the right holders. Emulation can be treated as normal usage unless license agreements say otherwise. For some OS there are free alternatives.

These are the results of the project for the emulated systems in the EMiL framework:

- MS-DOS 6.22: Use FreeDOS as a free alternative.
- Windows 3.11 to 7: Licensed as part of an existing framework contract with Microsoft.
- Apple II DOS, System 7: License agreements prohibit copying of ROMs.
- Apple MacOS X: License agreements prohibit usage on non-Apple machines.
- Linux: Free software.

iPRES 2019

- C64, Amiga: Bought license from right holders Cloanto Corp.
- Atari ST: Use EmuTOS as free alternative.

Solutions were found for all systems except for the systems by Apple. Several requests to Apple to acquire licenses to emulate Apple II and Macs remain unanswered. There was no answer at all. So for now all emulations of Apple systems are not available in the EMiL installation of the German National Library.

Of course all software installed within emulated environments (viewers, players, plugins) need to be licensed as well. For every creation of an additional environment a check of the newly installed software in this regard will be necessary.

V.   SUMMARY AND OUTLOOK

For interactive digital objects in the collections of libraries emulation is the only suitable preservation strategy. The emulation framework developed in the German project EMiL and integrated in the access environment of the German National Library implements a practical solution for giving access to those kinds of objects. It is flexible enough to integrate a variety of emulated environments.

Next steps will be migrating more multimedia content of disks in the collection of the German National Library to the repository to make these objects available with the EMiL framework. The emulation framework could also be used for other object types like eBooks or archived web sites.

REFERENCES

[1]   T. Steinke, F. Padberg, A. Schoger, and K. Rechert, "Project EMiL – Emulation of Multimedia Objects," iPRES 2016 proceedings, 2016, pp. 167-170.

[2]   B. Lohman, B. Kiers, D. Michel, and J. v. d. Hoeven, "Emulation as a Business Solution: the Emulation Framework," iPRES 2011 proceedings, 2011.

[3]   K. Rechert, I. Valizada, D. v. Suchodoletz, and J. Latocha, "bwFLA – A Functional Approach to Digital Preservation," PIK – Praxis der Informationsverarbeitung und Kommunikation, 35, 4, 2012, pp. 259–267.

iPRES 2019