(Re-)publication of Preserved, Interactive Content – Theresa Duncan CD-ROMs: Visionary Videogames for Girls

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ABSTRACT

This poster presents implementation details, reception and lessons learned from a Cloud-based emulation project for world-wide interactive access to preserved CD-ROMs.

General Terms

Infrastructure opportunities and challenges; Frameworks for digital preservation

Keywords

Emulation, CDROM Preservation, Access, Case-Study

1. INTRODUCTION

A core mission of Rhizome, a born-digital art institution founded in 1996, is to make it possible to experience digital art on the Internet. A piece of software art that is part of a collection but cannot be accessed or circulated within the current conditions of digital communication, doesn't make much sense. Especially, software needs to run and be experienced, it cannot be substituted with representational media. Hence, making legacy software accessible for a (world-)wide audience is an important challenge, in particular if the items cannot be downloaded and executed locally, but require an outdated operating system and hardware to run.

Within the project *The Theresa Duncan CD-ROMs* Rhizome's goal was to re-enact three style-defining art game CD-ROMs from the 1990's on the web. Without users having to install any additional software or download an emulator or a disk image, the games should be played in their completeness on any modern browser. Rhizome launched a Kickstarter project [1] to make the three titles–*Chop Suey*, *Smarty* and *Zero Zero*–available to their audience free of charge.

This poster presents implementation details, usage statistics and user perception of a Cloud-based emulation experiment, using *Emulation as a Service* (EaaS)[2].

2. THERESA DUNCAN'S VIDEO GAMES FOR GIRLS

The Theresa Duncan CD-ROMs, published in between 1995 and 1997, are culturally important and pioneering "female games," but have been out of print for more than 15 years and remain inaccessible on contemporary computing hardware. These titles represent an important counterbalance in the "pink gaming" explosion of 1990's girls' CD-ROMs that were dominated by the template of the highly successful Barbie series, perpetuating a very traditional image of girlhood.

Figure 1: Chop Suey (Magnet Interactive, 1995, co-created with Monica Gesue) one of the three CD-ROMs re-published online. Lily and June Bugg embark on a strange, hallucinatory adventure through the small town of Cortland, Ohio.

2.1 Dramaturgy & Technical Requirements

None of the three games features fast-paced action or 60 Hz animation, like a typical 8-bit action game, but use the CD-ROM medium to present large amounts of animations, audio, and lots of surprises in the game's narration. None of the games is linear, there is no "progress" to be achieved, and no game status to be saved.

So there is no benefit of increasing the reaction time of the

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[1] https://www.kickstarter.com/projects/710593842/theresa-duncan-cd-roms-visionary-videogames-for-gi

[2] http://eaas.uni-freiburg.de

software by running an emulator locally; the high volume of data never needs to be downloaded; since no states of the system need to be saved, there is also no need for accounts or write-back storage. Instead, the easiest possible access to the software could be established via a simple link, comparable to a YouTube video. EaaS runs emulators on remote computers and offers a "window" via a web browser to interact with them. EaaS not only creates the possibility to run legacy computing environments and make them available on the web, but also allows the steward to control access to the objects. Users can experience the games in their full interactivity without having or being able to download the game data.

The CD-ROMs use a hand-drawn pixel graphic style that cannot be meaningfully represented with typical video codecs, like h264 or VP8, which are optimized for lens-based motives. The games' fine 1-pixel lines and patterns would result in halos and unpleasant artifacts. EaaS uses lossless (compressed) graphics to deliver pixel-perfect graphics to users.

The rich soundtracks of the games use uncompressed 16 Bit 22.05 kHz audio, and feature long voice-narrated sequences and music. Continuity of the sound is much more important than audio quality. Additionally, most of the audio was created in home-recording settings, which adds to its charm and affect. For this project EaaS was configured to use OGG/Vorbis audio compression to stream sound, since it offers a balance between speed of encoding, quality and browser support.

Unlike online video streaming services, the output of an emulator's screen can not be buffered or pre-fetched, since it is dependent on user input. Hence, a short network distance between the emulator's computing node and the user accessing it is highly desirable. To achieve low network latency, we chose cloud computing services [3] to be able to allocate computing resources close to the user's location.

Different legacy operating systems were tested for the re-enactment, the games themselves support as many as four different ones. Goals were: a quick start of the game after a user gets access to an emulator, system stability, reasonably authentic performance, and usability. Macintosh System 7.5 proved to be the best option, other systems being ruled out due to slow startup time, Quicktime video rendering problems or unstable mouse pointer movement.

3. TECHNICAL BACKEND

The technical setup for this project consists of three core components, the Rhizome web site, an EaaS gateway and a dynamic number of emulator compute nodes running in the cloud.

Rhizome's web site provides the front-end for users to select a game for emulation. It further implements a user queue and issues bulk requests to the EaaS gateway (e.g. three sessions for Chop Suey, five sessions Zero Zero). The EaaS gateway processes these requests by assigning free CPUs, ie. pre-allocated CPUs, to requested emulated environments and responds with one *iframe*-URL for every newly created emulation session.

In case of insufficient CPU resources, the EaaS gateway allocates a new cloud machine and returns less emulation ses-

sions than requested. It is then up to the front-end to manage the waiting queue. If the user has to wait for a compute node to become ready, the front-end displays a waiting animation. If a single user's request was successful, the front-end embeds the iframe-URL, enabling interaction with the emulated environment, ie. playing one of the CD-ROM games. Once an emulation session is active, the EaaS gateway is in charge of session management. The session ends when the user leaves the specific emulator page (or closes the browser window or tab). The EaaS backend recognizes an expired session and releases all resources used, especially paid on-demand computing resources.

In coordination with the online publication of The Verge[4], the games were disseminated online and embedded into several online magazines, personal blogs and gaming sites, just like a regular youtube video. For each user one virtual CPU was assigned at the Google Compute Cloud's (US-central). During the peak phase, when the project was just disseminated and discussed on social media, 16 CPU machines were used, always preallocating 16 spare CPUs on top of the current demand to reduce potential waiting time. After the first big rush, smaller machines were allocated.
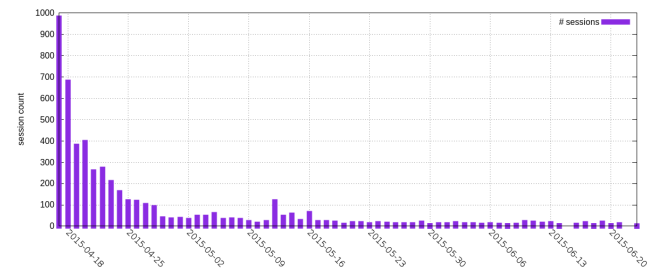

Figure 2: EaaS sessions per day.

4. PERCEPTION AND USAGE

From launch of the project April 17 to June 23, 4644 emulation sessions were served, from that 976 sessions during release day (cf. Fig. 2). During the launch phase, users mostly tried the games out very briefly. For the plateau phase, the usage pattern changed to less users that were more "devoted" and played the games for up to two hours. The median session time was 99 seconds, with a wide variance between users. Top-20 users' session time was at least 109 minutes.

The online versions of the CD-ROMs have been discussed and embedded on *The Verge*, *itch.io*, *Artforum* and the *Huffington Post*, along with a few personal *alt.game* blogs. Complete, hour-long emulation play-throughs created by enthusiasts of all three titles appeared on YouTube. A *github* snippet of a simple `iframe` code was circulated on social media, enabling the games to be embedded into any website.[5]

Interestingly, none of the publications or fan productions were paying much attention to the technical form of delivery of the games, but rather indulged in cultural analysis and interpretation. This can be seen as sign of EaaS functioning reliably and transparently.

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[3]Google Compute was chosen because of the very quick deployment process and the simple, predictable pricing structure.

[4]http://www.theverge.com/2015/4/17/8436439/theresa-duncan-chop-suey-cd-rom-preservation

[5]https://gist.github.com/despens/098823cd5b6c577fb5a5