

The logo for EaaS is a black circle with a blue border. Inside the circle, the text "EaaS" is written in white, with a blue exclamation point as the letter "i".

EaaS!

An Introduction to Emulation

Ethan Gates
NYU IFA Workshop
October 13, 2019



Agenda

1. A (Very) Brief History of Emulation
2. The “Virtual Machine”
 - a. Emulation vs. Virtualization
3. Strategic Uses of Emulation (“Rendering Matters”)
 - a. Evaluation + Assessment
 - b. Exhibition
 - c. Format Migration/Transcoding
4. Challenges and SPN/EaaS Efforts
 - a. Software Description
 - b. Sustainability
 - c. Scale
5. Copyright and Confidence
6. Lab: Running Legacy Software in VirtualBox

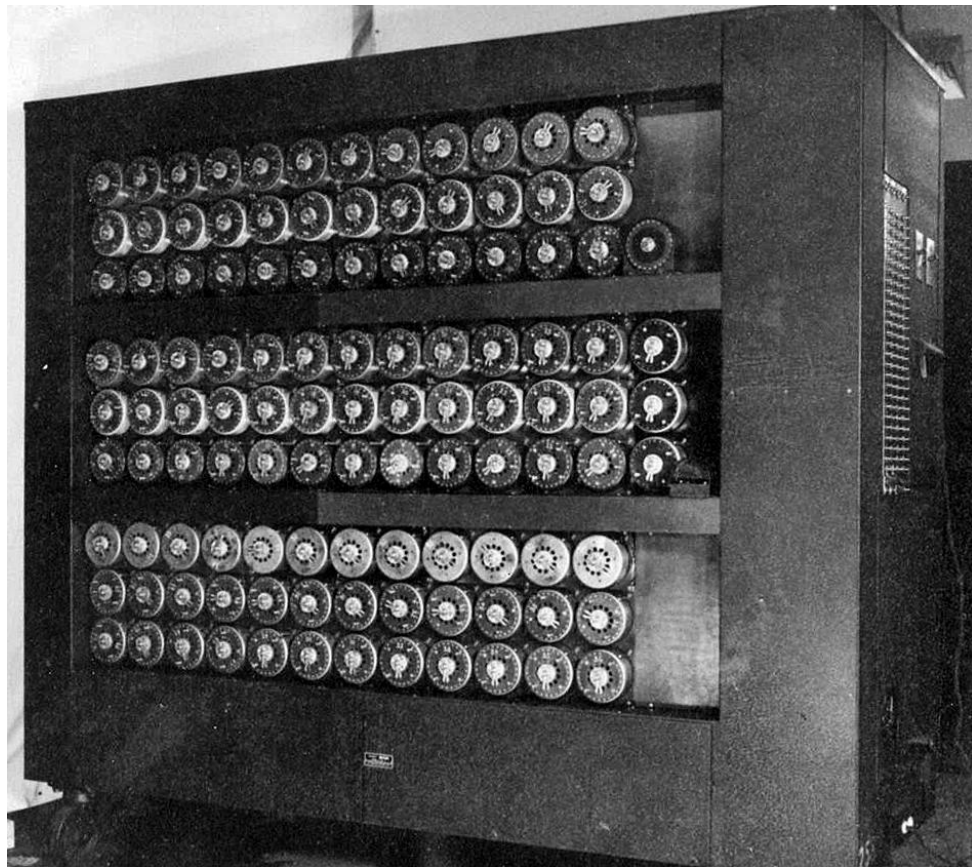


A Brief History of Emulation



Two presentations of *The Erl-King* (Grahame Weinbren
and Roberta Friedman, 1982-1985)

Seeing Double: Emulation in Theory and Practice
(Guggenheim, 2004)



Bombe at Bletchley Park



IBM System/360 Model 50



PlayStation Classic
(bad implementation of PCSX emulator)

Billy Mitchell threatens legal action over vacated Donkey Kong scores

Lawyers demand retraction from Twin Galaxies, Guinness, or they'll sue

By [Owen S. Good](#) | Sep 14, 2019, 12:26pm EDT

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Most Read



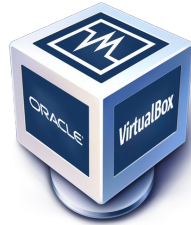
New Pokémon revealed in 24-hour Sword and Shield stream appears to be a Galarian Ponyta



<https://www.polygon.com/2019/9/14/20865828/billy-mitchell-the-king-of-kong-records-thrown-out-twin-galaxies-guinness-lawsuit>



vmware



WinUAE



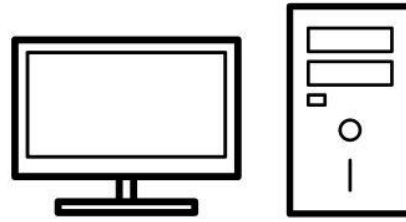
Logos taken from project/product websites for: VICE, MAME, DOSBOX, vmware, VirtualBox, MESS, WinUAE, QEMU, Mini vMac, SheepShaver, Hatari



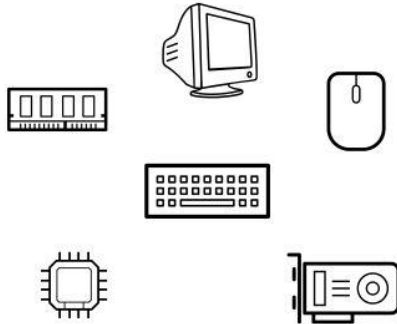
**The “Virtual
Machine”**



Physical Environment



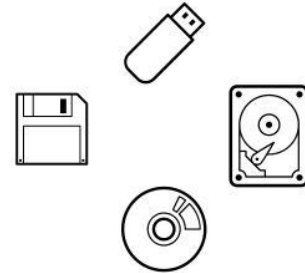
Hardware



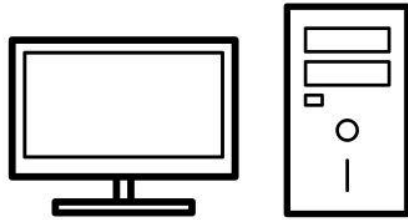
Bootable System: Operating System, File System, Drivers, Applications, etc. (Physical Storage)



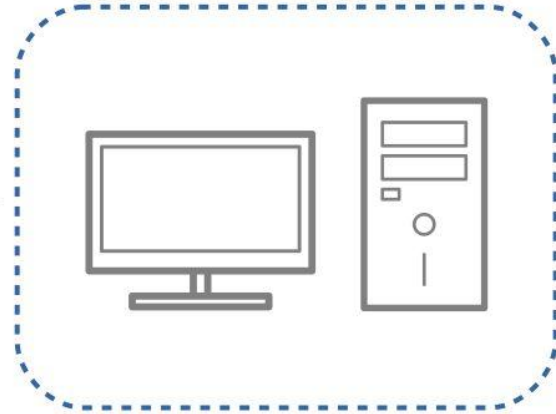
Additional Software or Content (Physical Storage)



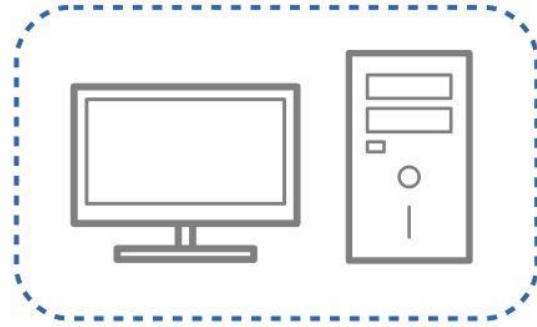
Physical Environment



Emulated Environment



Emulated Environment



Emulator Settings

- Specific to application used

Bootable System:

Operating System,
File System, Drivers,
Applications, etc.

(Disk Image)

- Raw (.dd, .img, .bin, etc.)
- VirtualBox (.vdi)
- Virtual PC (.vhd)
- VMWare (.vmdk)
- Expert Witness Format (.E01)
- QEMU (.qcow/qcow2)

Additional Software or Content (Disk Image)

- Raw (.dd, .img, .ima, .bin, etc.)
- ISO (.iso, .cdr, .img, etc.)

Emulation or Virtualization?

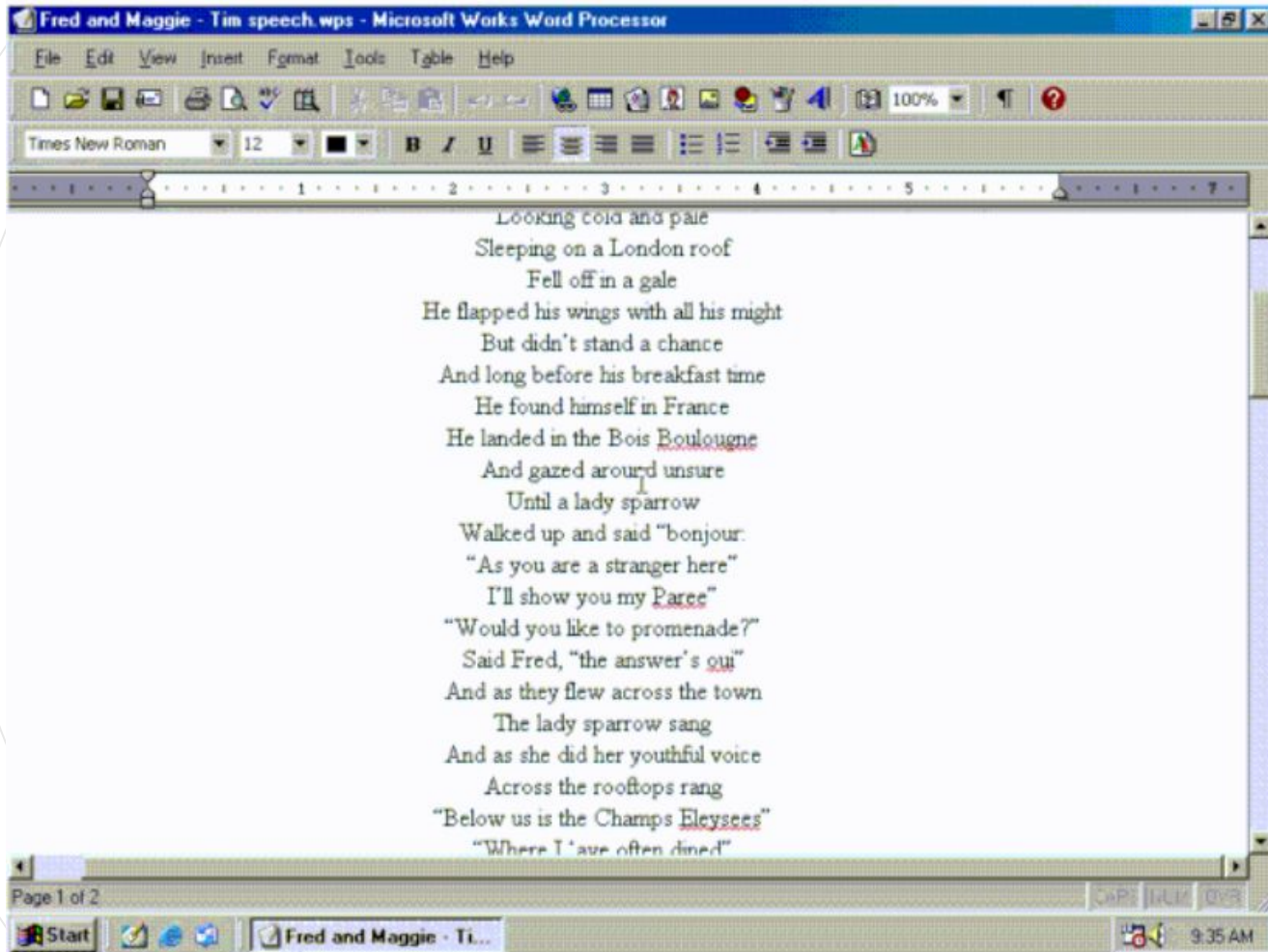
- Guest hardware recreated entirely in software
- Overcoming incompatibility or obsolescence
- Guest software can run at least in part directly on host hardware
- Managing and using hardware more efficiently



EaaS



Strategic Uses of Emulation in Preservation





Examples

Evaluation and Assessment:

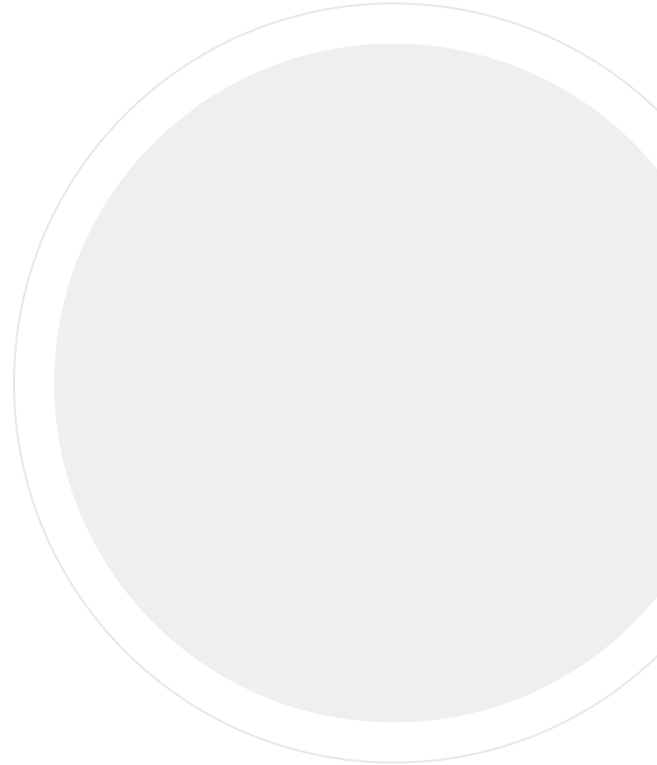
- Imports of Merchandise CD-ROMs, Clip-Poemas

Exhibition and Access:

- Theresa Duncan CD-ROMs, *Amnesia* by Thomas Disch

Format Migration and Transcoding:

- Sibelius examples





Challenges and SPN/EaaS Efforts



Software Description

- Software-as-object
- Schema shortcomings

EaaSI Solution: EaaSI metadata model
(expressed in PostgreSQL, METS XML,
export to Wikidata)



Sustainability

- Software preservation paradox
- Maintaining shared digital platforms

EaaS Solution: Emulator packaging and metadata, business modeling and community investment with Educopia



Scale

- Collection size
- Variability of software, operating systems, emulator applications
- Staff time and training for optimization

EaaS Solution: Improvements to the EaaS platform, public resources, UVI



Copyright and Confidence



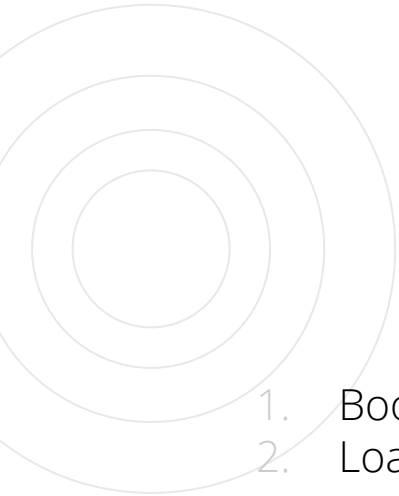


Required Reading

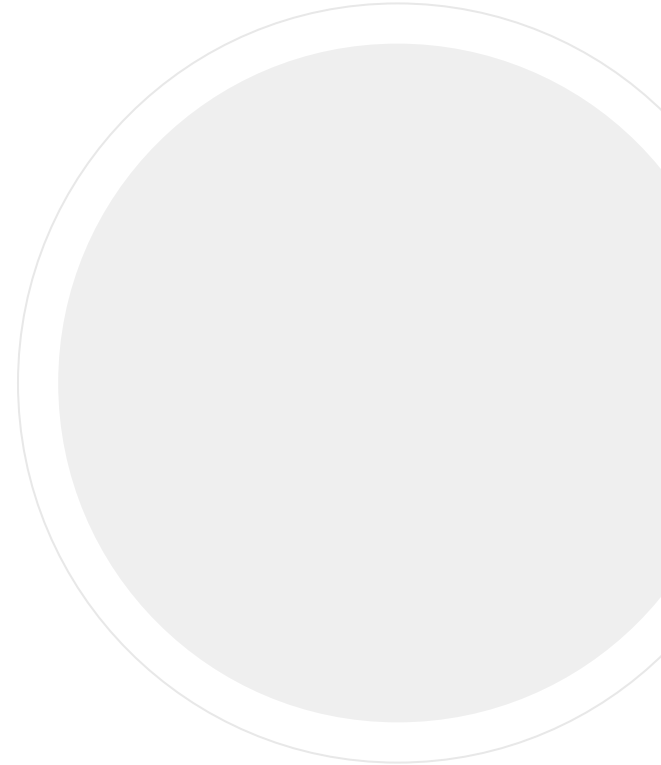
- [ARL Code of Best Practices in Fair Use for Software Preservation](#)
- [A Preservationist's Guide to the DMCA for Software Preservation](#)



Lab: Running Legacy Software in VirtualBox



1. Boot Windows 2000
2. Load the "Demo.img" floppy file and try to open the included file
3. Load the Microsoft Office 97 ISO file
4. Install
5. Open the file again





Thanks!

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- Mastodon: @The_BFOOL@digipres.club
- ethan.gates@yale.edu

Learn more at

- www.softwarepreservationnetwork.org/eaasi
- github.com/EG-tech/emulation-resources



Yale



Software
Preservation
Network

Image Credits

- http://tutorials.nmdprojects.net/types_of_emulation/
- https://en.wikipedia.org/wiki/Bombe#/media/File:Wartime_picture_of_a_Bletchley_Park_Bombe.jpg
- https://upload.wikimedia.org/wikipedia/commons/thumb/3/39/IBM_system_360-50_console_-_MfK_Bern.jpg/1200px-IBM_system_360-50_console_-_MfK_Bern.jpg
- <https://dpconline.org/blog/idpd/designing-a-uvi-for-digital-objects>
- Emulation logos:
 - <http://vice-emu.sourceforge.net/>
 - <https://www.mamedev.org/>
 - <https://www.dosbox.com/>
 - <http://www.winuae.net/>
 - <https://www.virtualbox.org/>
 - <https://www.qemu.org/>
 - <https://www.gryphel.com/c/minivmac/index.html>
 - <https://sheepshaver.cebix.net/>
 - <https://hatari.tuxfamily.org/>

