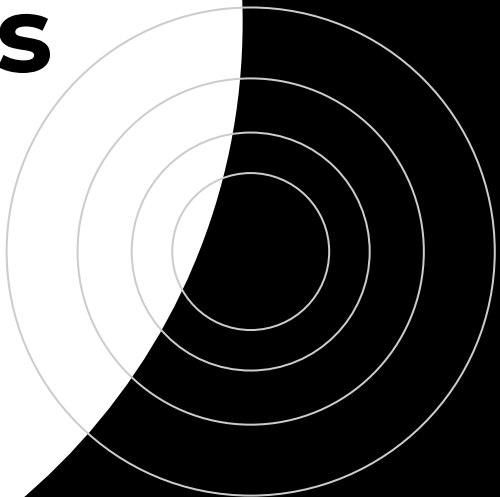


The logo for EaaS, featuring the text 'EaaS' in white on a dark blue circular background. The letter 'i' is stylized with a blue dot above it and a blue vertical bar to its right. The logo is enclosed in a white circular border.

EaaS

Emulation Environments

EaaS Training Module #1
Released 10/14/2020

A series of five concentric white circles of varying sizes, positioned on the right side of the slide, partially overlapping the large white circle.

During This Module

- Why does the EaaSI team refer to emulation and computing “environments”?
- What is an EaaSI “Environment” resource?
- What sort of details do we need to describe and maintain environments?



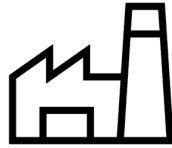


But first...what computer are you using right now to view this slideshow?

Try to describe it in as much detail as possible.

Did you mention...

- The manufacturer?



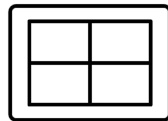
- The model?



- Desktop, laptop, tablet?



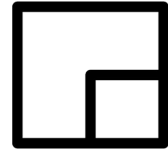
- The operating system?



- The color, the look, the feel?



- The size of your monitor?

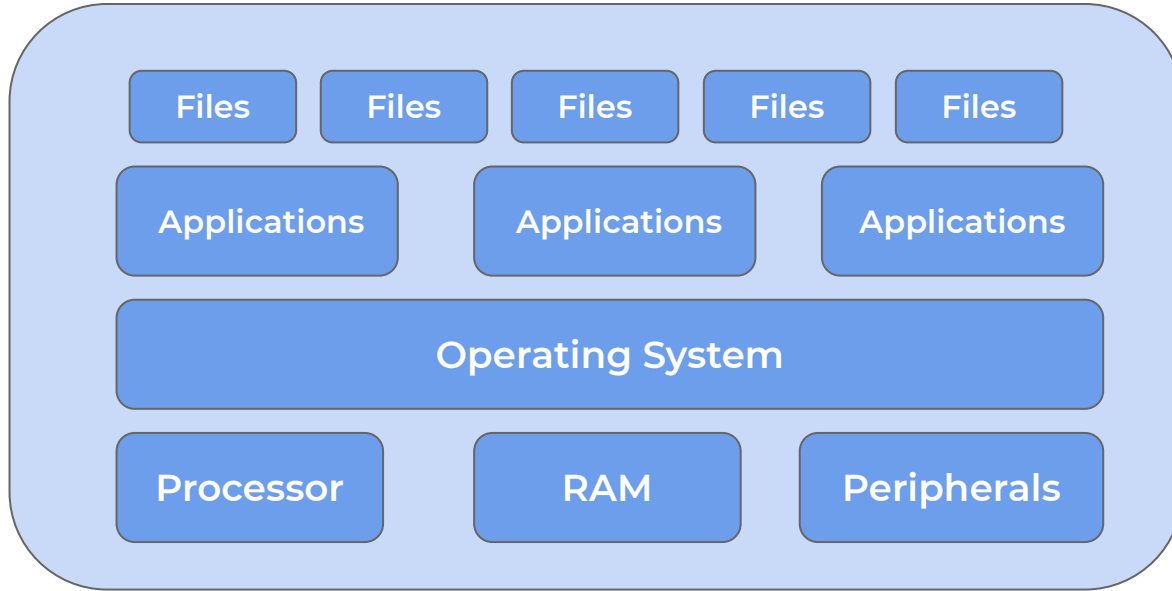


- Your peripheral devices? (a mouse, a keyboard, headphones)

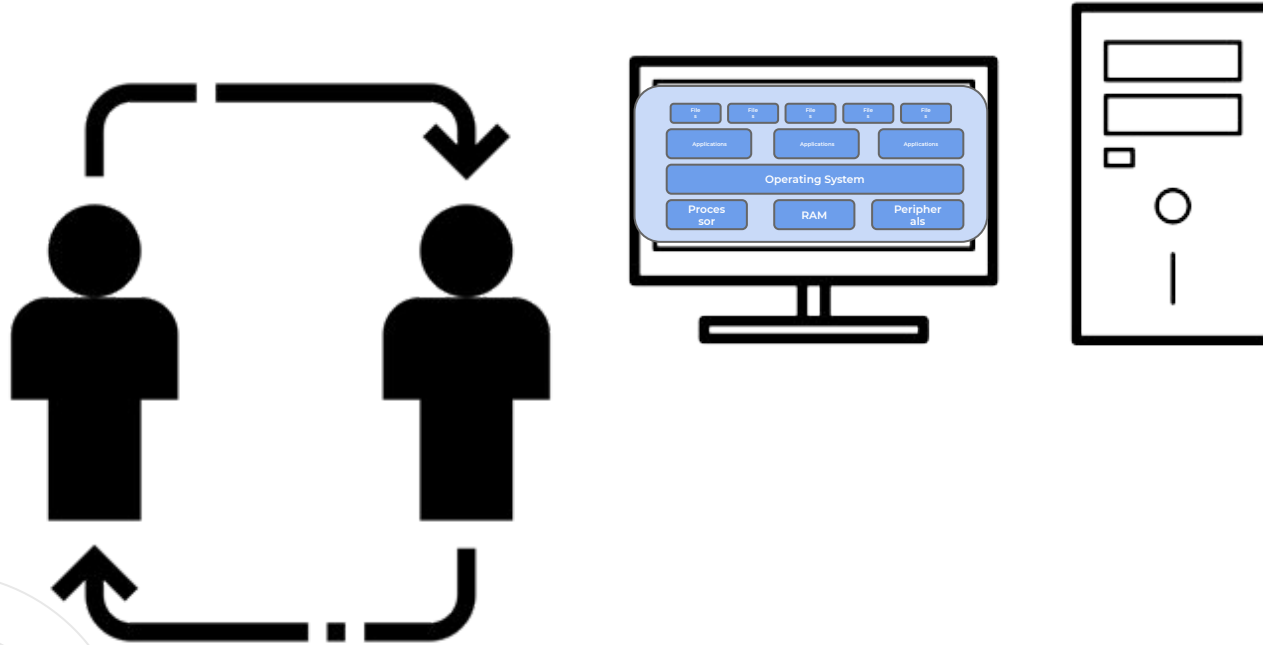


- Something else?

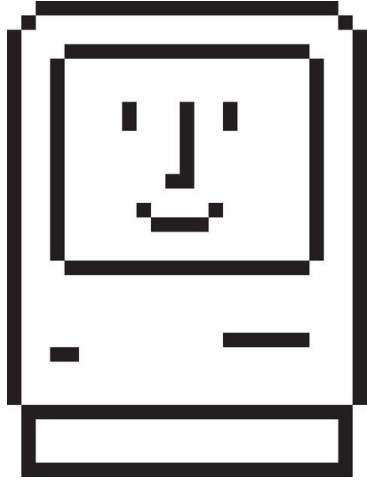




Computers are a complex stack of hardware, software, and the digital content we create with them



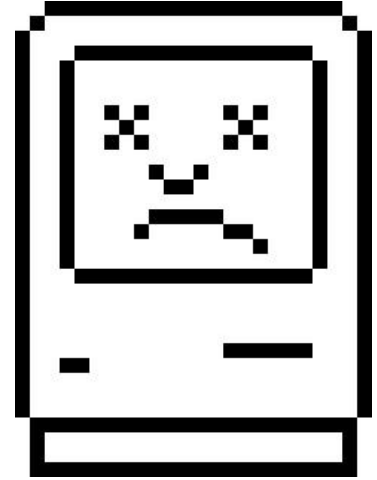
Each one has unique potential depending on who is using it, and how



I have System 7 and MacWrite installed. I **can** open this!



MacWrite word processing files



I also have System 7 but no MacWrite installed. I **can't** open this!

Change one piece of the stack, and the entire thing may behave differently

“Environments”

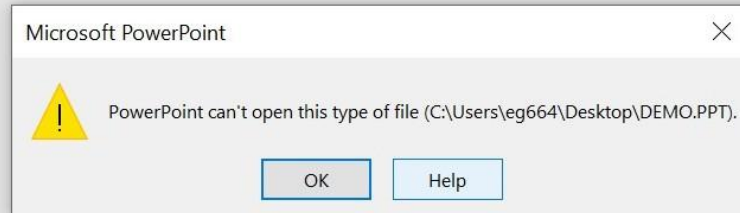


This is why we think about computing in terms of “environments”

Digital objects are *surrounded* by a certain set of conditions

The EaaSI project maintains that preserving the object may not be enough to provide meaningful access

You must also preserve and present its computing environment



Microsoft Office 365 refusing to open a file created with Microsoft PowerPoint 3.0



"App" needs to be updated.

The developer of this app needs to update it to work with this version of macOS. Contact the developer for more information.

Learn More...

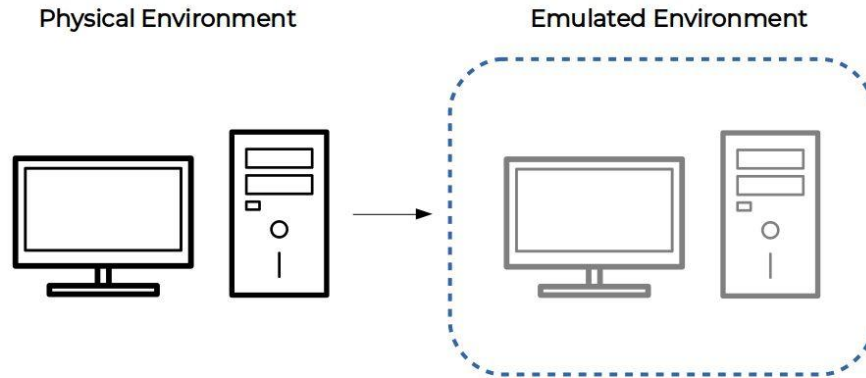
OK

macOS Catalina (10.15) refusing to run a 2000s-era, 32-bit application

Emulation

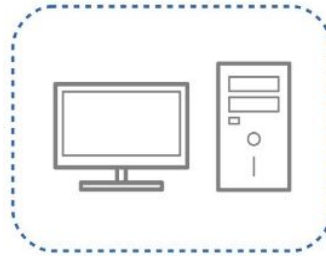
Emulation helps us do that by recreating hardware

In an emulation environment, we replace physical devices with virtual equivalents

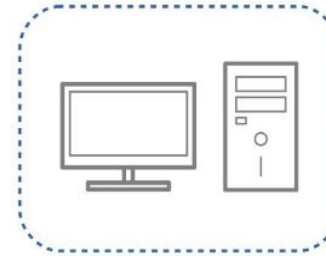




**Windows 95 (Service
Release 2.5)**



**Apple MacOS 9.0.1 +
iTunes**



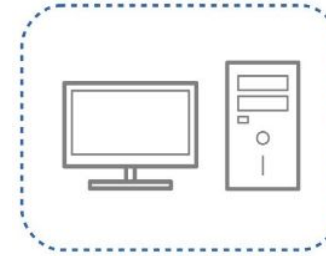
**Windows XP + Winamp
+ VLC Media Player 1.0.10**



**Windows 95
+ Adobe Acrobat 4.0**



Commodore 64



**Ubuntu 12.04.5 LTS
+ RStudio 0.97**

Environments are the core Resource type in the EaaSI platform

That means each Environment is a distinct unit that can be uniquely saved, edited, described, exchanged and interacted with

Environments

Virtual machines **Object Environments**

Private Public Remote

Number of Environments: 517

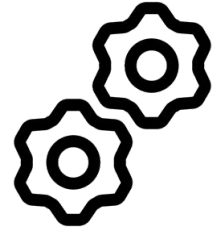
Page Size: 10

	Name ↑	ID	Owner	Actions
<input type="checkbox"/>	Adobe Dreamweaver CS3	c3b52b3c...	shared	Choose action ▾
<input type="checkbox"/>	Aldus FreeHand 1.0 for Macintosh	c33fc8e5-...	shared	Choose action ▾
<input type="checkbox"/>	Alpine Linux Virtual 3.11.5 - Base V1	3381c162...	shared	Choose action ▾
<input type="checkbox"/>	Apple Mac OS 7.01 (configurable drives)	ccf3c8e1-...	shared	Choose action ▾
<input type="checkbox"/>	Apple Mac OS 7.5 (base) + Microsoft_Bookshelf96	d3ad520...	shared	Choose action ▾
<input type="checkbox"/>	Apple Mac OS 7.5 (configurable drives)	36342eb...	shared	Choose action ▾
<input type="checkbox"/>	Archivists Toolkit 1.0	ce6e2807...	shared	Choose action ▾
<input type="checkbox"/>	BitCurator 2.0.16	27188e9...	shared	Choose action ▾
<input type="checkbox"/>	CentOS 2.1	1ab57a54...	shared	Choose action ▾
<input type="checkbox"/>	CentOS 3.9	7651aa0c...	shared	Choose action ▾
<input type="checkbox"/>	CentOS 4.8	2055065...	shared	Choose action ▾
<input type="checkbox"/>	Debian 3.0 - Base V1	fe2c86ab...	shared	Choose action ▾
<input type="checkbox"/>	Debian 4.0 - Base V1	79fc2ec2-...	shared	Choose action ▾
<input type="checkbox"/>	Debian 5.0 - Base V1	c6cec947...	shared	Choose action ▾
<input type="checkbox"/>	DragonflyBSD 1.0	3e45734...	shared	Choose action ▾
<input type="checkbox"/>	Email Rendering Demo	f8f39671-...	shared	Choose action ▾
<input type="checkbox"/>	Fedora 1 Base V1 + WordPerfect Office 2000 Deluxe for L...	532df0c8...	shared	Choose action ▾
<input type="checkbox"/>	Fedora Core 2	d00ac079...	shared	Choose action ▾
<input type="checkbox"/>	Fedora Core 3	fad36efb-...	shared	Choose action ▾
<input type="checkbox"/>	Fedora Core 4	f89b2273...	shared	Choose action ▾

[1] to [20] of [517] << >> Page [1] of [26] >

We have a lot of them, from across the history of computing

Environment Components



- Emulator:
Software recreating hardware
- Software:
Legacy and contemporary applications
- Content:
Digital objects – files, data sets, code, artwork, etc.
- Metadata:
Settings and description necessary to tie these pieces together

Operating System

RESOURCE NAME	Windows 95 C (OSR 2.5) - Base V2
DISPLAY RESOLUTION	800x600
COLOR DEPTH	True Color
REGION	U.S.
TIME ZONE	Eastern Standard Time
DATE/TIME	1:19PM 5/3/2019
LANGUAGE	English
LOGIN NAME	<username>
LOGIN PASSWORD	<password>

Example EaaS Metadata

Emulator

NAME	Qemu
EMULATOR CONFIGURATION	-m 64 -vga cirrus -soundhw sb16 -net nic,model=pcnet
<input type="checkbox"/> Linux Runtime	
EMULATOR VERSION	emucon-rootfs/qemu-system v2.12
OPERATING SYSTEM	Microsoft Windows 9x

Configured Drives





DISK	Filesystem: fat32	 
FLOPPY	Filesystem: fat12	 
CDROM	Filesystem: ISO	 
+ Add Drive		





The screenshot displays the EaaS (Elastic As-a-Service) interface. At the top, there is a navigation bar with buttons for 'Exit Emulation', 'Restart Emulation', and 'Save Environment'. Below this, a secondary bar contains 'Download Print Jobs', 'Change Resource Media', 'Save Screen Image', 'Esc', and 'Ctrl/Alt/Del'. The main content area is split into two panels. The left panel, titled 'Base Environment', shows 'Windows 95 C (OSR 2.5) - Base V2' with the status 'imported, saved'. It features two tabs: 'Saved Metadata' and 'Configure New'. Under 'Configure New', there is a section for 'New Configuration' with the subtitle 'Document changes you make to the environment'. This section contains three expandable cards, each with a question and a dropdown arrow: 'Did you change OS settings?', 'Did you install new software?', and 'Did you make software changes?'. The right panel is a large, dark grey area representing the emulated environment, which currently shows a central EaaS logo.

When we put all those pieces together, we can render and interact in emulation

What can I do with an Environment?

Anything you can do with a computer, you can do with an emulation environment

- Open those files with your embarrassing high school poetry 
- Host web content 
- Manipulate, convert, and analyze data sets 
- Provide access to born-digital records 

- Study digital aesthetics and design 
- Play Minesweeper 
- Watch or exhibit multimedia art 
- Assess and migrate obsolete file formats 

Everything is Environments



All the work the EaaSI platform does revolves around the creation and presentation of Environments

Got software? Make an Environment and install it.

Got digital content? Make an Environment and access it.

Credits

- Training Module written and designed by Ethan Gates, Software Preservation Analyst, Yale University Library
- All photos, screenshots, and videos recorded by Ethan Gates
- Icons sourced from [The Noun Project](#)
 - Exception: “Happy Mac” and “Sad Mac” icons by Susan Kare (Slide 7)
- EadSI program of work sponsored by the Alfred P. Sloan Foundation and the Andrew W. Mellon Foundation, hosted by Yale University Library



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