

The logo consists of the text 'EaaS' in white, with a blue dot above the 'i' and a blue vertical bar to its right. This is enclosed in a dark blue circle, which is itself inside a larger, lighter blue circle.

EaaS

Building an EaaS Network

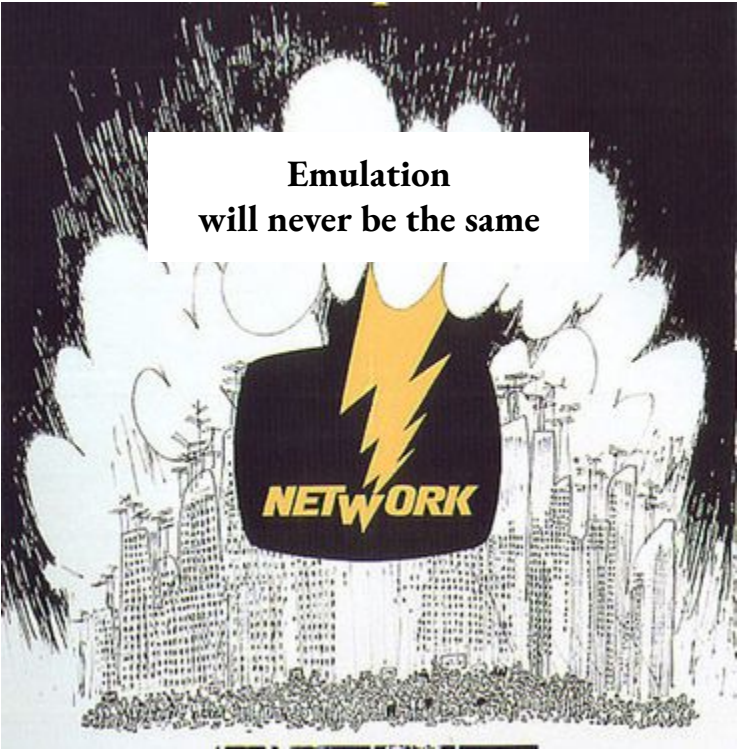
EaaS Training Module #6

A series of five concentric white circles on a black background, located in the bottom right corner of the slide.

During This Module

- What are EaaS “nodes” and how do they communicate with each other?
- What is OAI-PMH?
- What happens when I “Publish” an EaaS resource?

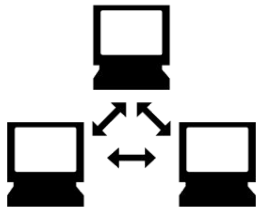




**Emulation
will never be the same**

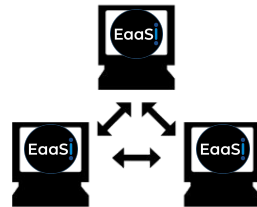
But first...what is a computing “network” anyhow?

Networks

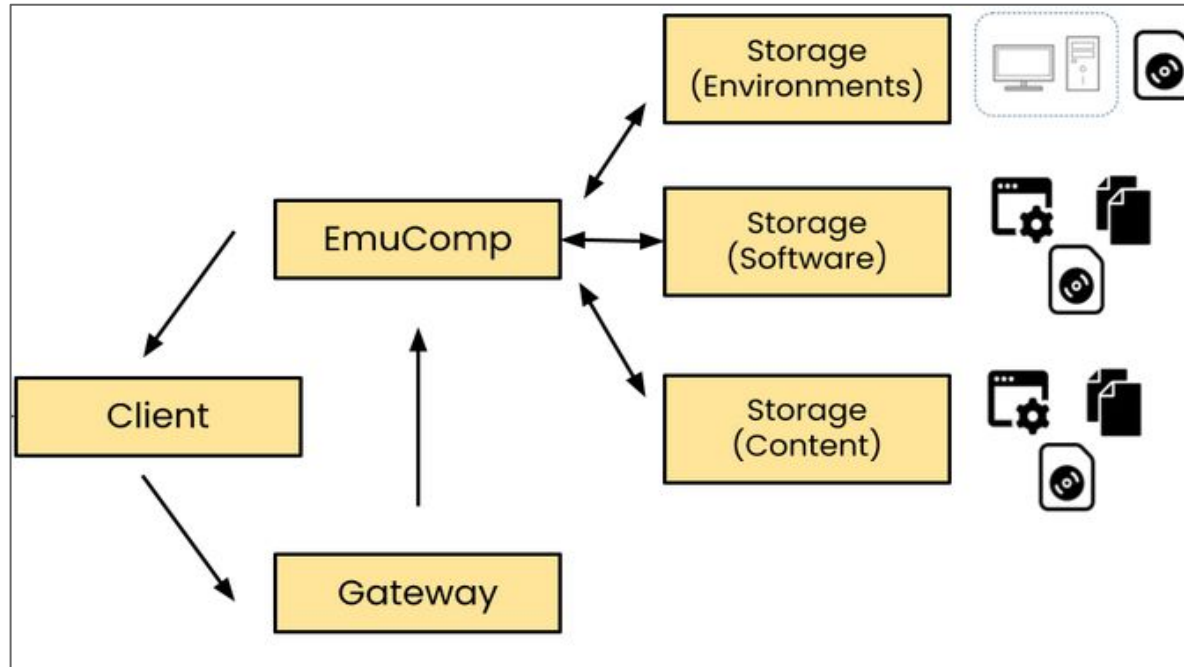


- A set of computers able to communicate and/or share data with each other
- Communicate according to agreed-upon standards and protocols
- Whether it sends or receives information, each individual computer is referred to as a “node”

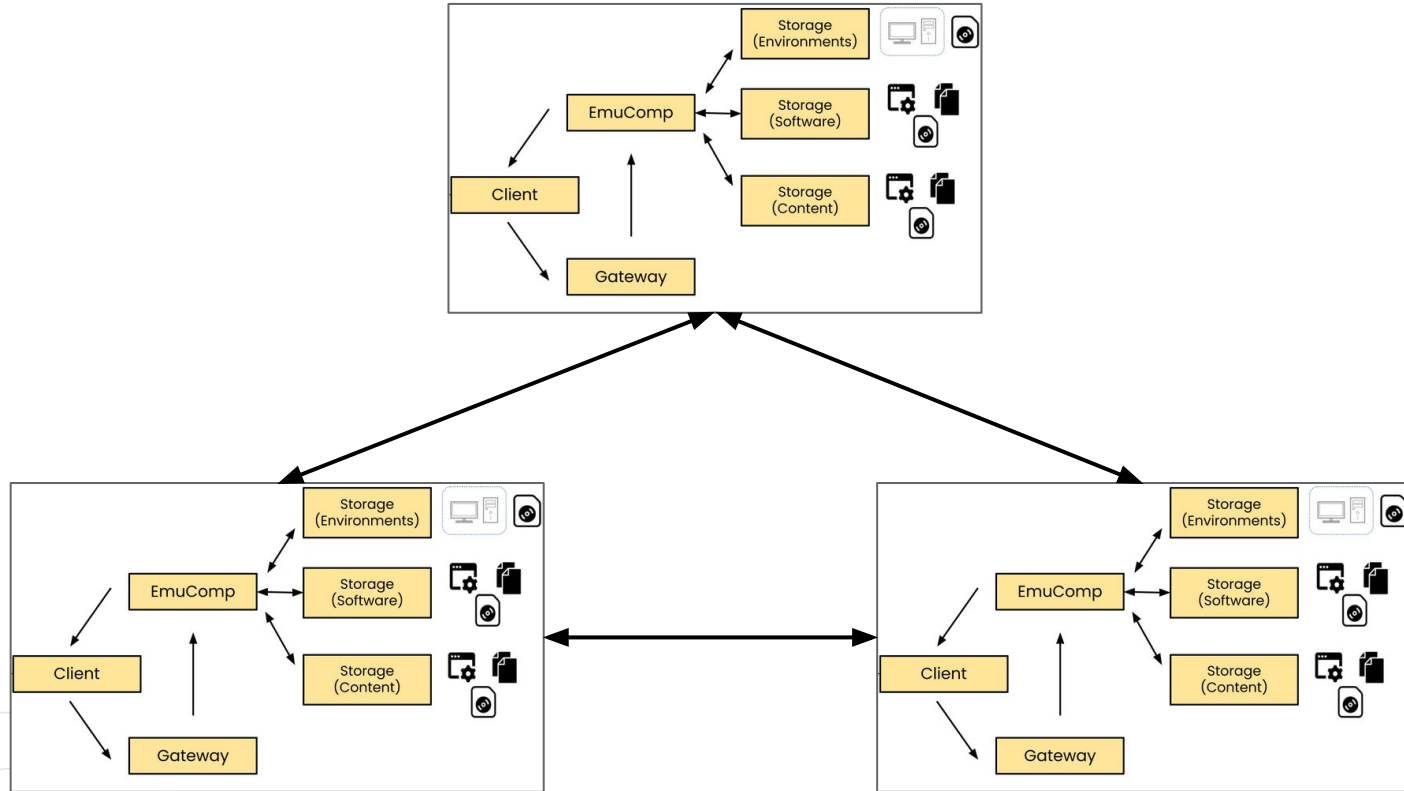
EaaS Networks



- A set of institutions, organizations, or users able to exchange EaaS-specific resources with each other (i.e. Environments, Software)
- Communicate over the web, using standard internet and metadata exchange protocols
- One EaaS “node” = one installation of the EaaS stack
- Within a node, the organization/institution/user controls their set of resources: which data stays within their node, and which is available to other nodes in the network



EaaSI “Node” (see Training Module #3 for details on the EaaSI software stack):
<https://www.softwarepreservationnetwork.org/eaasi-training-module-3-the-eaas-eaasi-stack>



EaaS "Network" (not precise)

Connecting Nodes: OAI-PMH

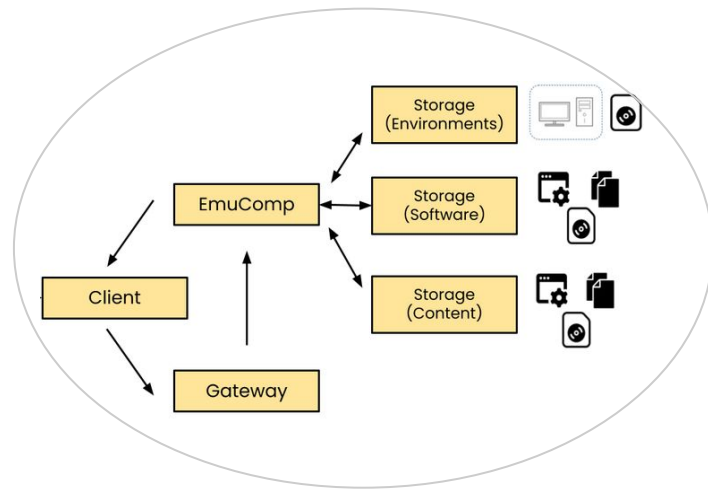
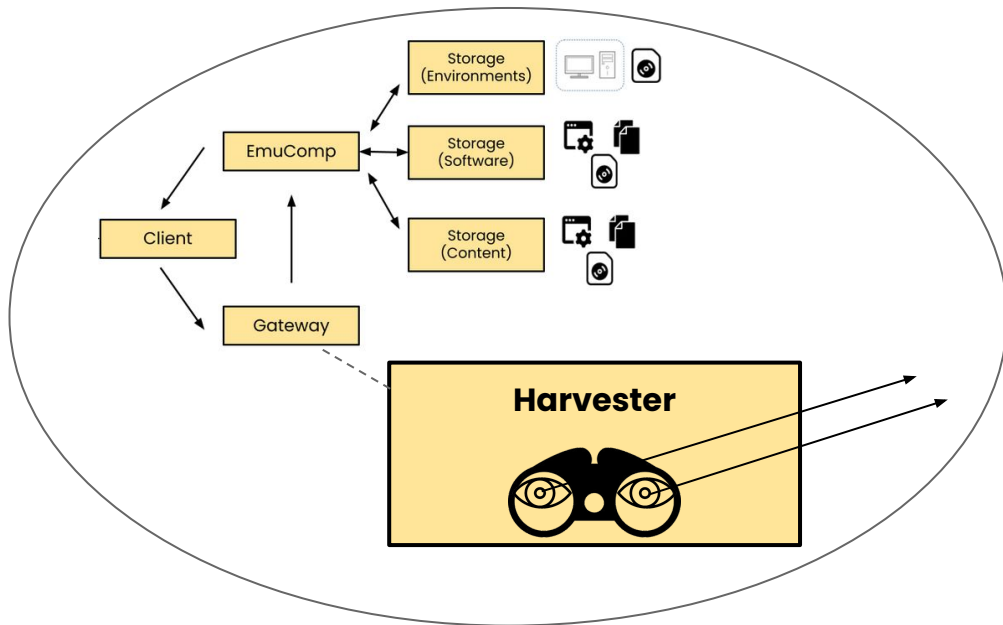


- **O**pen **A**rchives **I**nitiative **P**rotocol for **M**etadata **H**arvesting
- Specifies a mechanism and roles for digital repositories to exchange metadata
 - *Data Providers* are repositories that expose structured metadata for requests
 - *Harvesters* are client applications that request metadata from the Data Provider
- OAI-PMH requests are expressed in HTTP for easy communication over the internet and integration with web apps

EaaS OAI-PMH



Each EaaS node stores resource metadata according to OAI-PMH's Data Provider specification, and incorporates a Harvester module to request metadata from other EaaS nodes



EaaS OAI-PMH



- Resource metadata made available as XML records
- Every resource assigned a UUID (**U**niversally **U**nique **ID**entifier) by EaaS to make them identifiable across distributed nodes
- Communicates storage location of the resource from the repository/Data Provider, so that other nodes can later find and save that resource to their own storage if desired

Publish



- A decision by the *data provider* node, performed by Admin-level users
- Selecting “Publish” on a resource in the EaaS UI makes it visible and shareable to other nodes in your network
- Makes resource’s metadata, including all emulation settings, **read-only**
 - Any revision to a published resource will maintain the published resource as-is AND create a new Private resource that incorporates the revisions at the same node with a new UUID

EaaS

MY DASHBOARD

EXPLORE RESOURCES

MY RESOURCES

EMULATION PROJECT

IMPORT RESOURCE

MANAGE NODE

Search resources...

← Back to All Results

Mac OS 7.5 + WordPerfect 3.5.1 Details

MetadataHistory

Review ModeEdit Mode

EnvironmentPublicSaved Locally

Mac OS 7.5 + WordPerfect 3.5.1

Configured Drives

Environment Options

Emulator

Mac OS 7.5 + WordPerfect 3.5.1

View Details

Run in Emulator

Bookmark This Resource

Add to Emulation Project

Add Software

Save to My Node

Publish to Network

Delete

0 Processes Running

Publishing 1 environment(s) to network.

After selecting “Publish to Network,” the process completes and the Environment’s tags have changed to “Public” (visible and shareable to other nodes) and “Saved Locally” (still available for use within the Yale node).

Sync and Save



- Decisions by the *harvester* node, performed by Admin-level users
- Sync gathers *metadata* (via OAI-PMH requests)
 - Goal: check what resources have been published remotely at other, specified nodes
- Save gathers *data*
 - Goal: copy the specified resource to your node for local use and storage



Yale University

NODE MANAGEMENT

- Emulators
- Endpoints / Metadata Sync
- Running Tasks
- Install & Updates
- Troubleshooting

NODE USER ADMINISTRATION

- Create New User
- Manage Users

APPLICATION VERSION

2021.10

Node Endpoints

[Add New Endpoint](#)

Provider URL:

API Key:

Records 1-5 of 5

Available OAIP-MH Harvester Endpoints

ENDPOINT NAME

university-virginia	SYNC INCREMENTAL	SYNC FULL	DETAILS
stanford	SYNC INCREMENTAL	SYNC FULL	DETAILS
notre-dame	SYNC INCREMENTAL	SYNC FULL	DETAILS
carnegie-mellon	SYNC INCREMENTAL	SYNC FULL	DETAILS
uc-san-diego	SYNC INCREMENTAL	SYNC FULL	DETAILS

Node Admins can set which other nodes to harvest from - and whether to run an “Incremental” Sync (only pick up on changes to available metadata since last sync) or “Full” Sync (completely refresh all that node’s available metadata)

EaaS

MY DASHBOARD

EXPLORE RESOURCES

MY RESOURCES

EMULATION PROJECT

IMPORT RESOURCE

MANAGE NODE

Q Search resources...

[← Back to All Results](#)

Windows XP + Mathematica 5.2 Details

Metadata

History

Review Mode Only

Environment

Remote

Windows XP + Mathematica 5.2

Configured Drives

Environment Options

Emulator

DISK
Filesystem: Not specified

CDROM
Filesystem: ISO

FLOPPY
Filesystem: fat12

Environment Can Print ✓ TRUE

Relative Mouse (Pointerlock) ✓ TRUE

Virtualize CPU ✓ TRUE

WebRTC Audio ✗ FALSE

XPRA Video ✗ FALSE

Requires Clean Shutdown ✗ FALSE

Internet Enabled ✗ FALSE

NAME
Qemu

EMULATOR CONFIGURATION
-m 512 -soundhw ac97 -net nic,model=rtl8139 -

Linux Runtime ✗ FALSE

EMULATOR VERSION
v3.1 (latest)

Windows XP + Mathematica 5.2

View Details
Review full resource details

Run in Emulator
Emulate this resource without changes

Bookmark This Resource
Add resource to my bookmarks in my resources

Add to Emulation Project
Add this resource to my emulation project

Add Software
Associate software with this environment

Save to My Node
Make this resource available to all users of my node

Publish to Network
Make this resource available to all users in my network.

Delete
Delete this resource

Example: tags indicate this is a “Remote” Environment (available from another node). It can not be “Run in Emulator” - an Admin user must first “Save to My Node.”

16

EaaS

MY DASHBOARD

EXPLORE RESOURCES

MY RESOURCES

EMULATION PROJECT

IMPORT RESOURCE

MANAGE NODE

Q Search resources...

← Back to All Results

Windows XP + Mathematica 5.2 Details

MetadataHistory

Review ModeEdit Mode

EnvironmentPublicSaved Locally

Windows XP + Mathematica 5.2

Configured Drives

DISK
Filesystem: Not specified

CDROM
Filesystem: ISO

FLOPPY
Filesystem: fat12

Environment Options

Environment Can Print✓ TRUE

Relative Mouse (Pointerlock)✓ TRUE

Virtualize CPU✓ TRUE

WebRTC Audio✗ FALSE

XPRA Video✗ FALSE

Requires Clean Shutdown✗ FALSE

Internet Enabled✗ FALSE

Emulator

NAME
Qemu

EMULATOR CONFIGURATION
-m 512 -soundhw ac97 -net nic,model=rtl8139 -

Linux Runtime✗ FALSE

EMULATOR VERSION
v3.1 (latest)

Yale UniversityEthan Gates

Windows XP + Mathematica 5.2

View Details
Review full resource details

Run in Emulator
Emulate this resource without changes

Bookmark This Resource
Add resource to my bookmarks in my resources

Add to Emulation Project
Add this resource to my emulation project

Add Software
Combine software with this environment

Save to My Node
Make this resource available to all users of my node

Publish to Network
Make this resource available to all users in my network.

Delete
Delete this resource

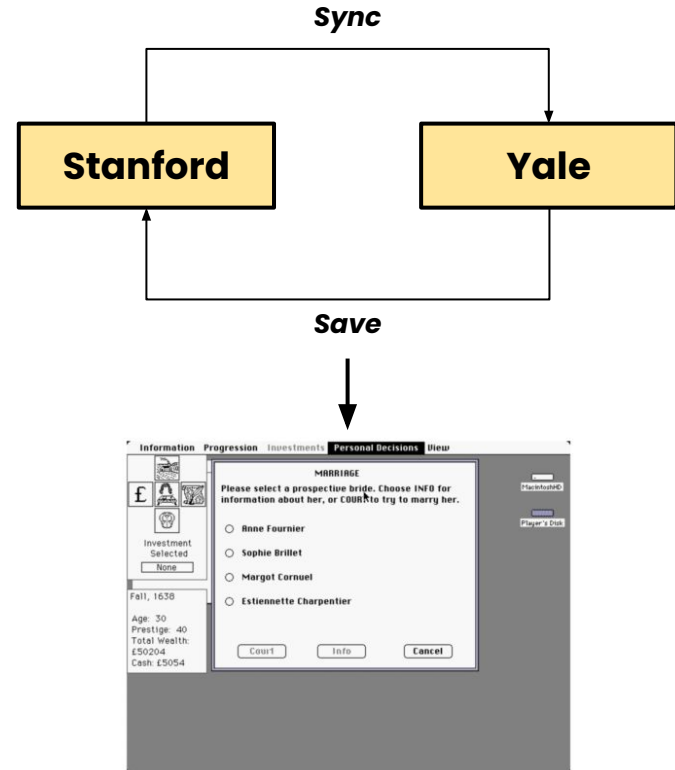
0 Processes Running

Save To My Node: Windows XP + Mathematica 5.2

After selecting “Save to My Node,” the process completes and the Environment’s tags change to “Public” (still visible and shareable to all nodes) and “Saved Locally” (now copied and can be Run in the Yale node).

Case Study: “The Would-Be Gentleman”

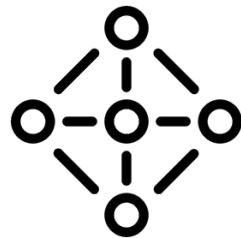
1. Stanford has a piece of Content (“The Would-Be Gentleman”) written for early Mac OS systems, but no compatible Environment
2. Yale has a compatible Environment – Mac OS 7.01 running on emulated Mac IIci hardware
3. Admin user at Yale publishes Mac OS 7.01 Environment to network
4. Admin user at Stanford syncs to Yale node, saves Mac OS 7.01 Environment
5. Admin user at Stanford uses saved Environment to run Content in emulation



Read the full write-up for more!

<https://www.softwarepreservationnetwork.org/eaasi-case-study-1-the-would-be-gentleman/>

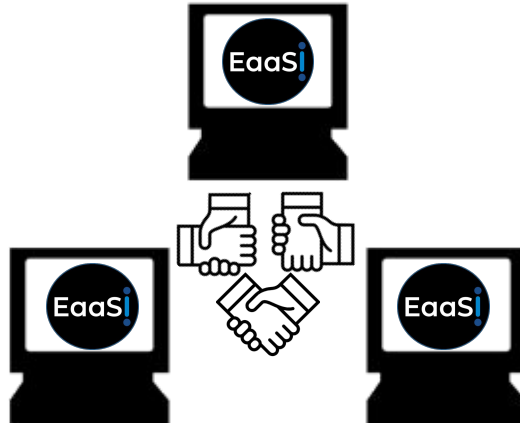
Towards a Distributed Network



- No single node controls all of an EaaSI network's data
- Each node can decide who can harvest from them, and who they harvest from
- Nodes entering or exiting a network does not disrupt the Environments other nodes have created from saved resources
- No obligation to communicate with other nodes; you can use EaaSI without joining an EaaSI network at all, create only Private resources, and never use the stack's OAI-PMH functionality

The Network is the Emulator

- Sharing resources reduces redundant effort
- Collective effort demands collective management
- Requires coordinating standards, schema, acquisition policies



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](#)
- EaaSI program of work sponsored by the Alfred P. Sloan Foundation and the Andrew W. Mellon Foundation, hosted by Yale University Library



Yale

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