Crafting credentials with code

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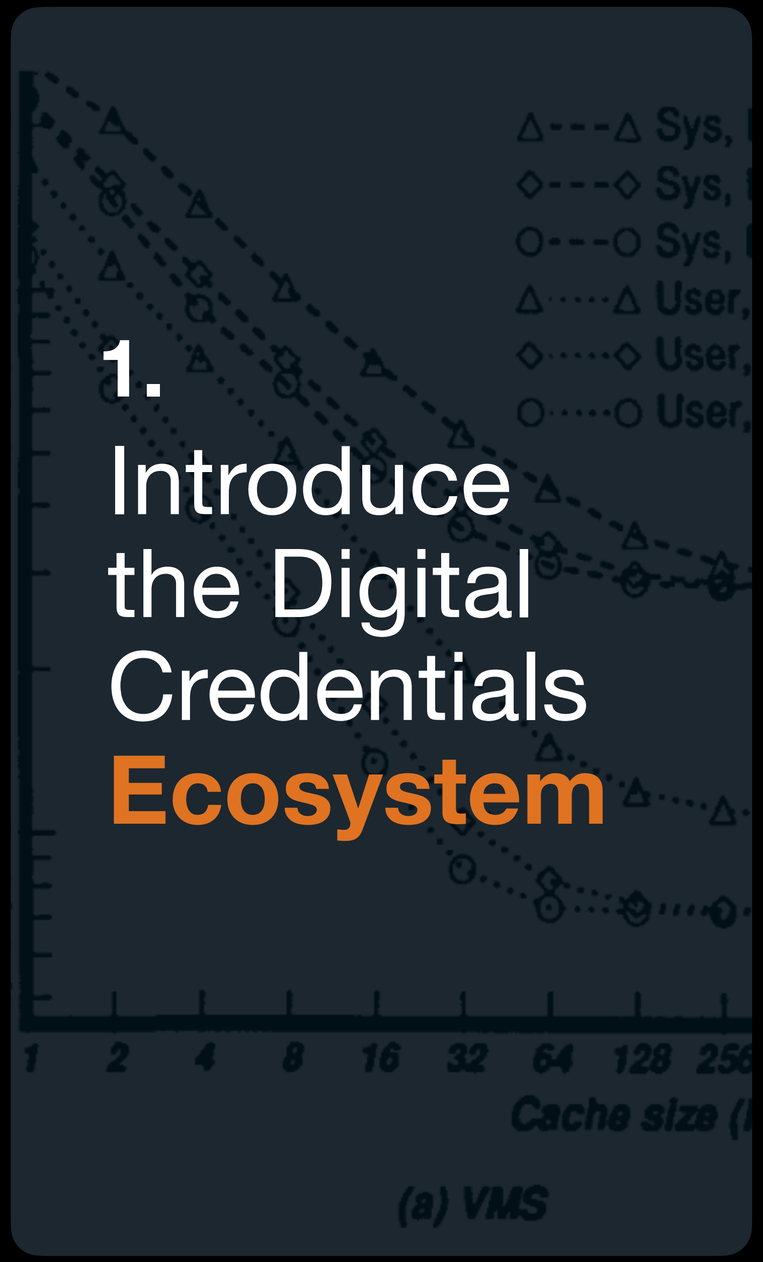
Research interests at the intersection of educational technology innovations and cultural, historical activities.

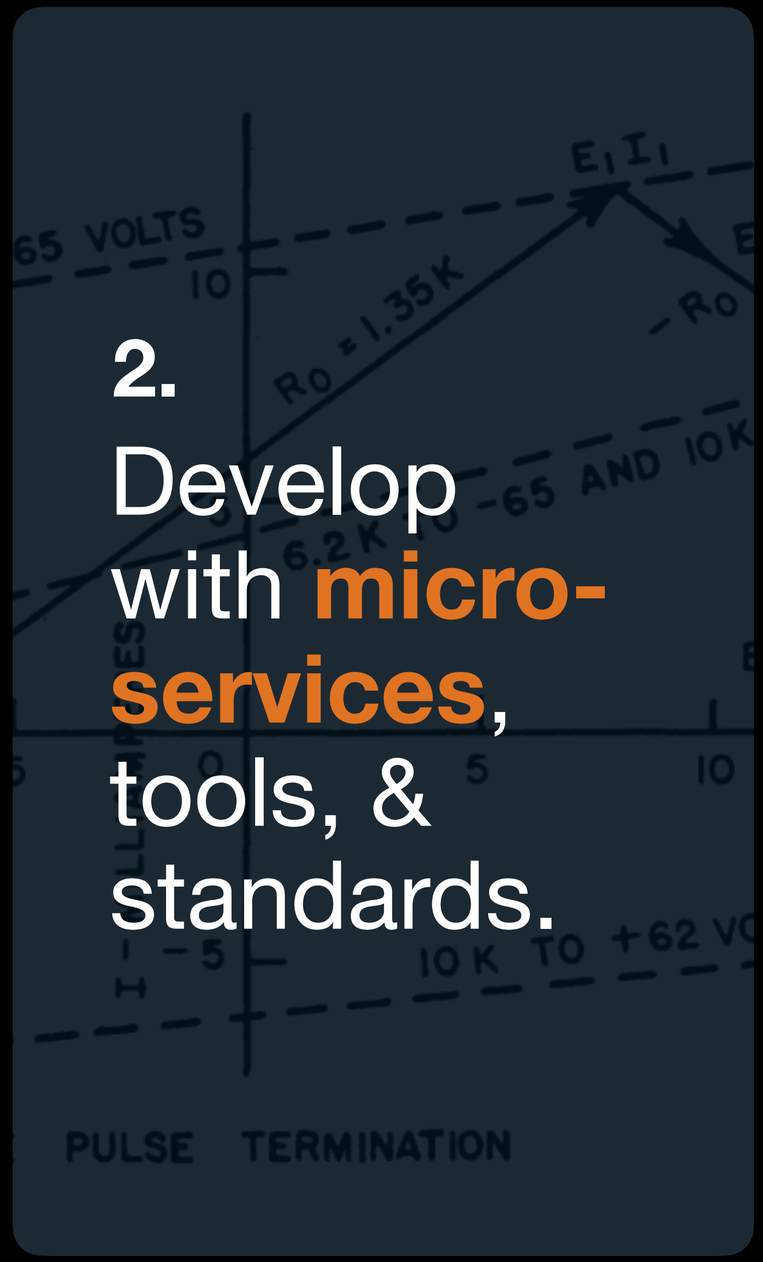
Visit my portfolio website, let's chat.

Find out more about my work in Lifetime Learning.



1.

Introduce the Digital Credentials **Ecosystem**

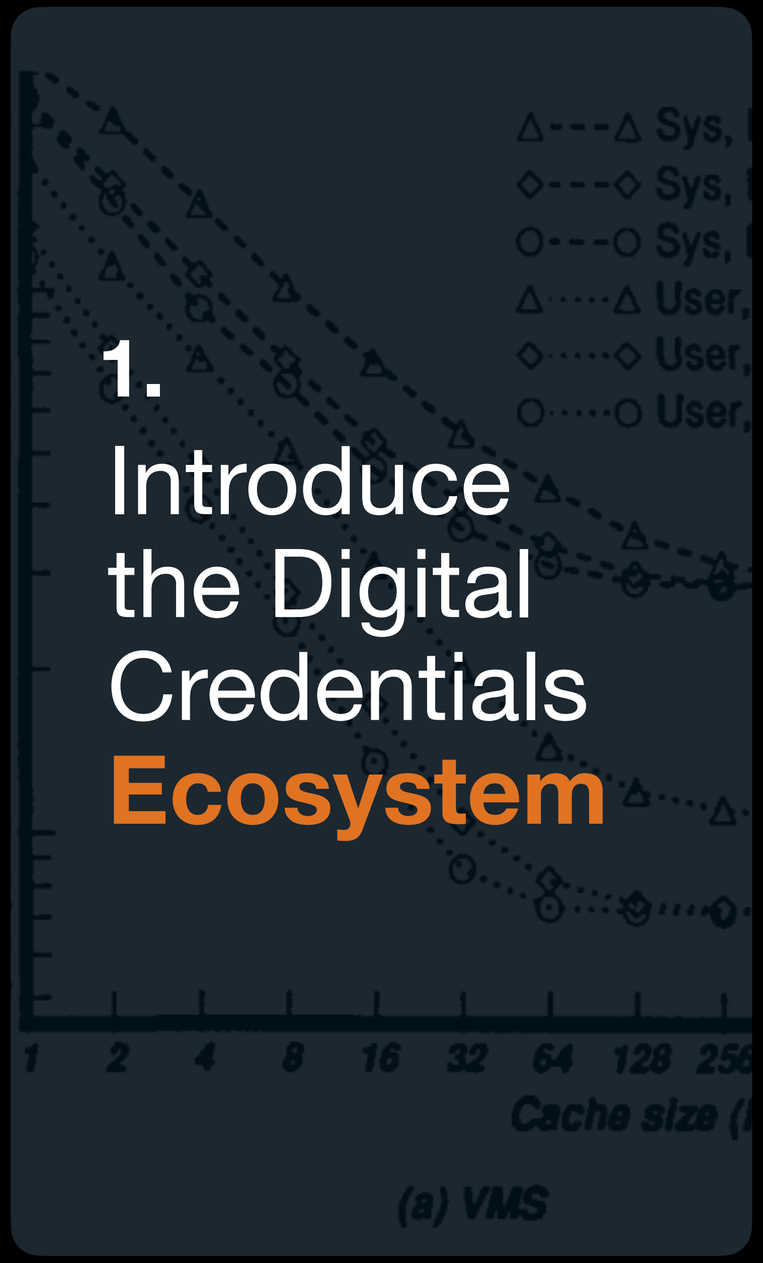


2.

Develop with **micro-services**, tools, & standards.

3.

The future: **work**, **initiatives**, & how to **contribute**.



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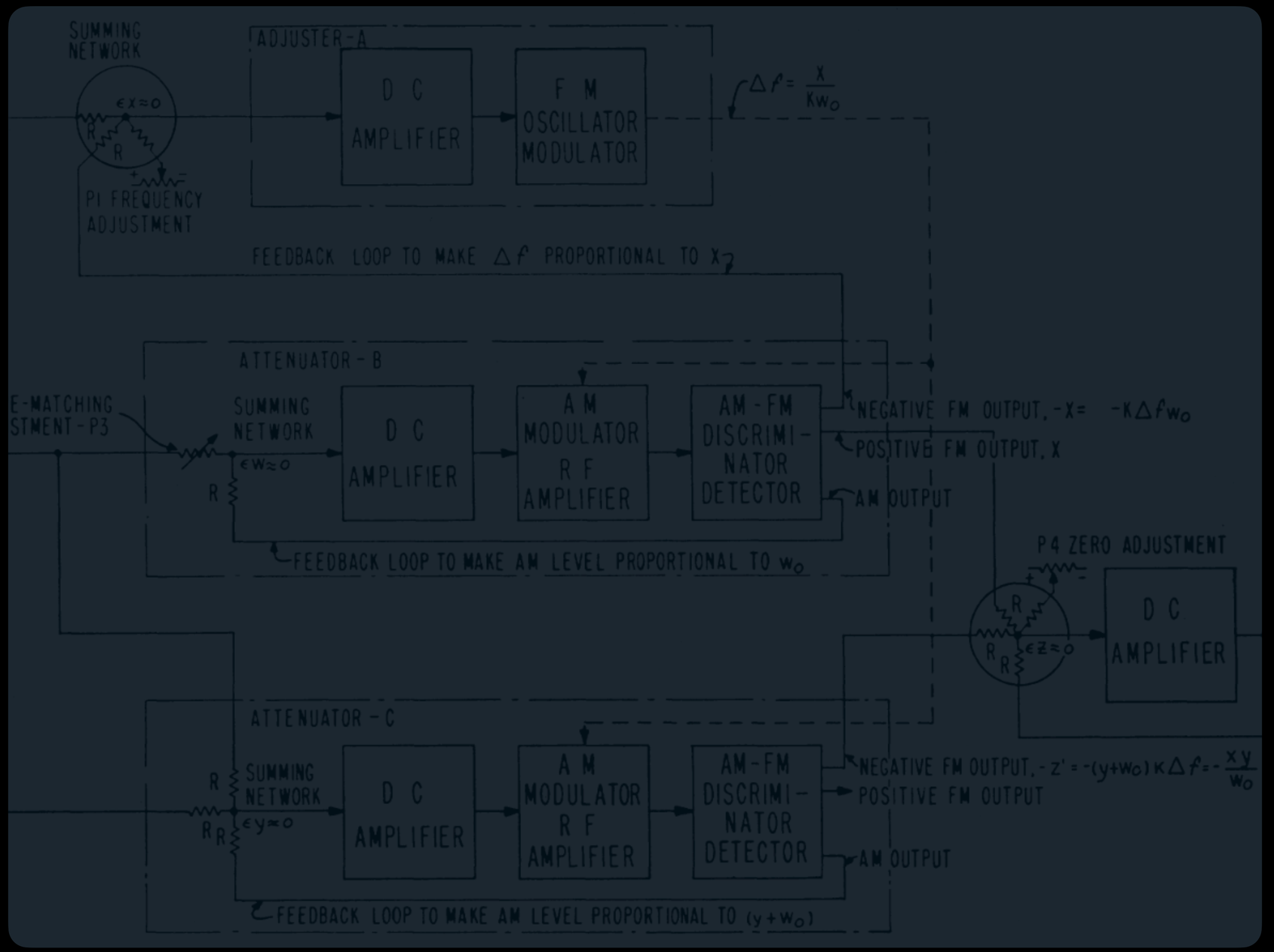

Untangling Terminology

- Educational research into digital credentials is plagued by ambiguous terminology.
- Since we've got new terminology to cover, let's first **define a digital credential *and its permutations***.


micro-credential
badge
digital badge
open badge
alternative credential
digital credential

Digital credential

Alternative credential

Microcredential

(Digital) Badge

Open Badge

Digital credential

Digital equivalent of a credential.
Serves both as a:

Document of record
Security or **protection**

Digital credential

Alternative credential

Microcredential

A non-degree credential offered by an issuing organization (e.g. higher education)

Open Badge

Digital credential

Alternative credential

Microcredential

A non-degree credential centered around micro-learning of a skill, competency.

Open Badge

Digital credential

An online representation of an accomplishment.

Usually, has an image (the ‘badge’) and underlying metadata of some format.

(Digital) Badge

Open Badge

Digital credential

Alt

Badge

A technical specifications standard contains **metadata** pertaining to:

learning accomplishment, and
any corresponding assessment,
validation, and endorsements.

Open Badge

Digital credential

Alternative credential

Microcredential

(Digital) Badge

Open Badge

Open Badges standard

v1

moz://a

v2

1EDTECH
Power Learner Potential

v3

1EDTECH
Power Learner Potential

So, what’s a digital credential?

- Historical usage of digital credentials focused on **badges** with underlying **metadata**.
  - Badge is the visual image.
  - Metadata is the pedagogical assessment and validation.


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UWG
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JSON
Field
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UWG
INTERDISCIPLINARY CERTIFICATE IN DATA ANALYTICS
JSON
Embed


JSON
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OpenBadges v3

Verifiable Credentials

Secure Verifiable Credentials

- W3C’s Verifiable Credentials specification defines and situates the cryptographic processes.

W3C Verifiable Credentials
Specification Documentation

Terminology

- Common definitions derived from AACRAO's Learner Employment Records (LER) Accelerator work.

- Recent 1EdTech presentation.
- "**Words Matter** - Digital Credentials: Terms, Definitions, Functionality

Issuer

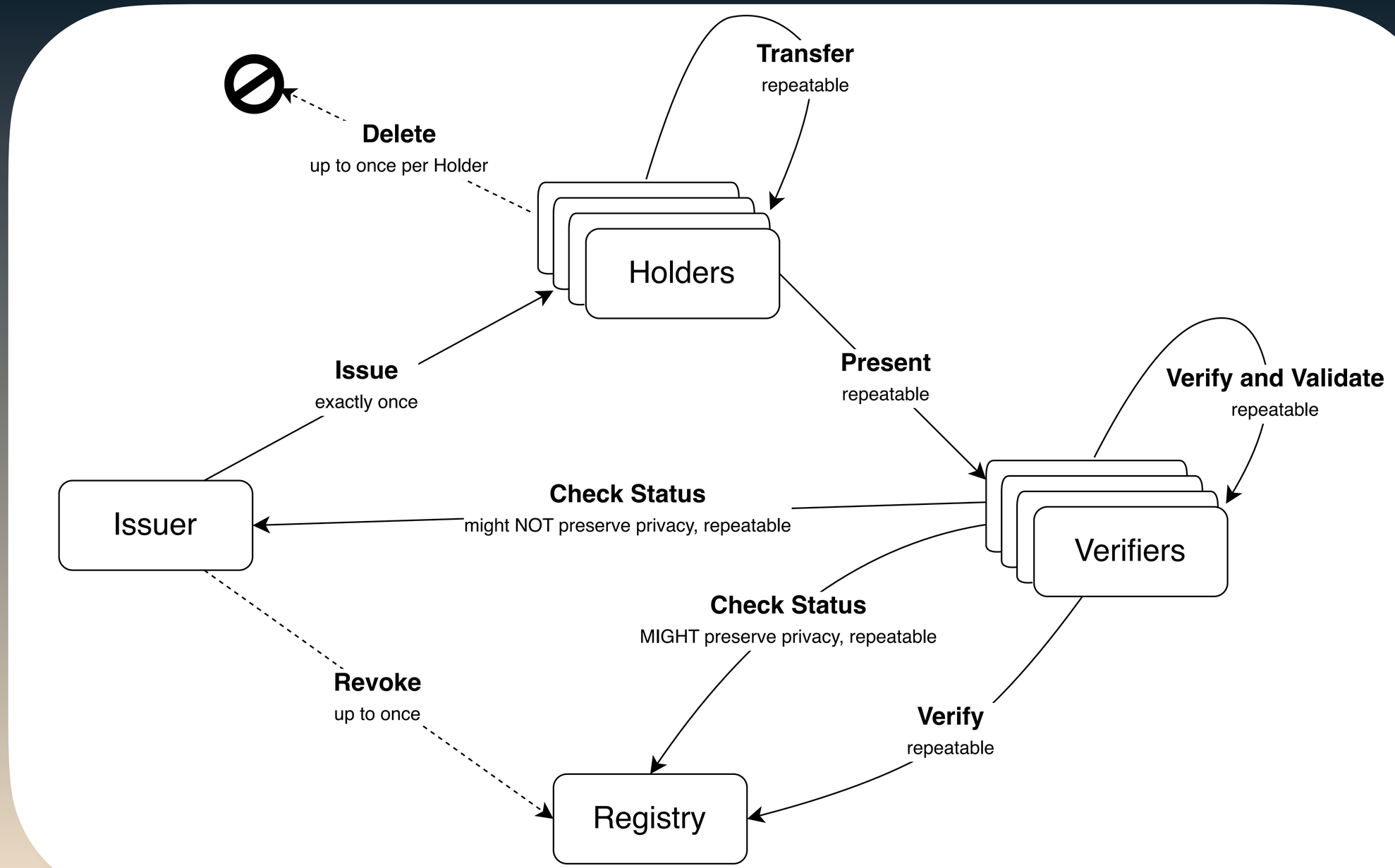
- Issuers create digital credentials & underlying metadata.
  - Typically an individual, entity, or **organization**.
  - Control to whom they issue digital credentials to.
- Issuers **issue digital credentials to learners.**
  - Includes content describing achievement to learner.
  - Includes achievement details.

Holders

- **Holders** receive digital credentials and store them (in digital wallets).
  - Engaged in learning experiences and acquiring skills and knowledge.
  - These are your **learners**.

Verifiers

- **Verifiers** are the **middleware** validating trust-checks for a holder-provided digital credential.
  - Validates its issuance from an Issuer.
  - Verifies the digital credential has not been revoked.
  - Verifies the digital credential data matches digital signature and has not been tampered with.


Transfer
repeatable
Delete
up to once per Holder
Holders
Issue
exactly once
Present
repeatable
Verify and Validate
repeatable
Issuer
Check Status
might NOT preserve privacy, repeatable
Verifiers
Check Status
MIGHT preserve privacy, repeatable
Revoke
up to once
Verify
repeatable
Registry

Enter the vendors 

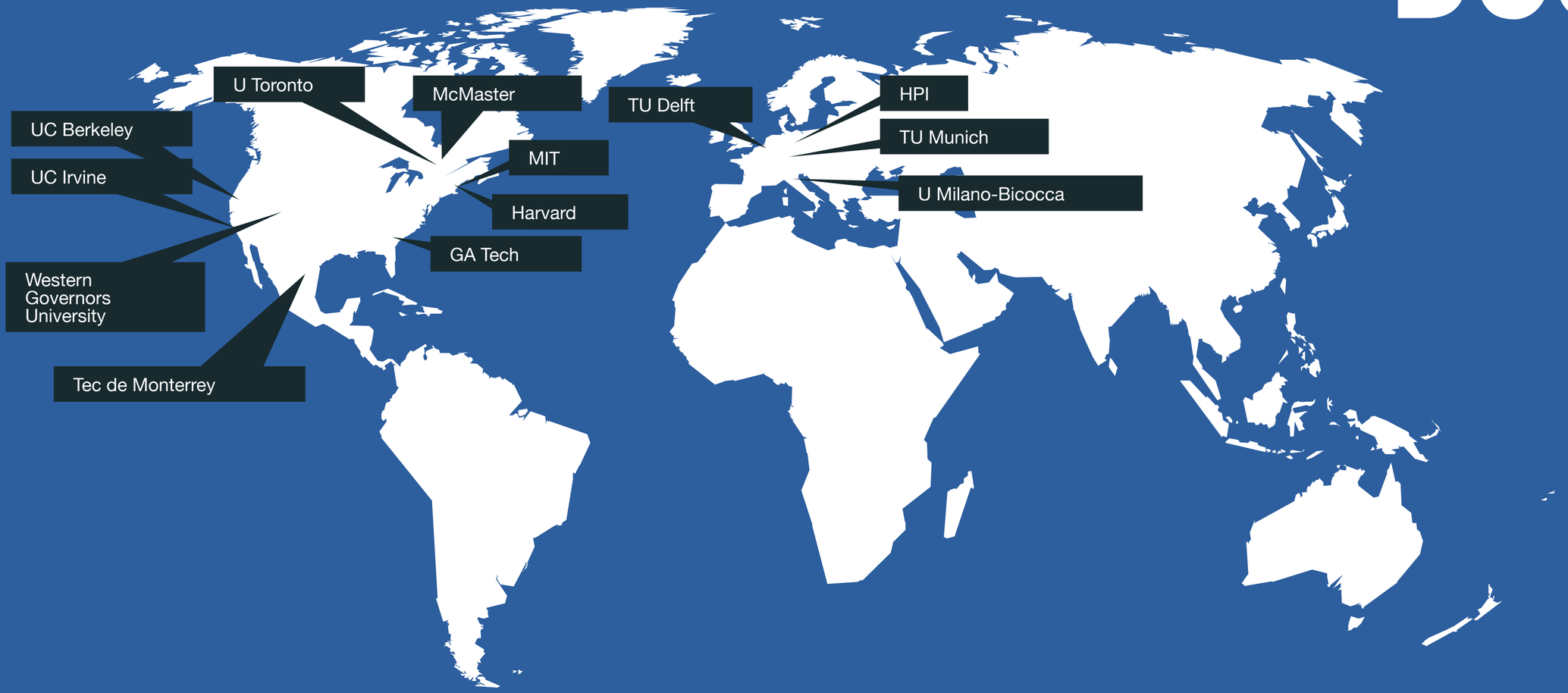
- Vendor platforms provide the technical scaffold:
  - Issuer framework
  - Digital wallet (digital credential storage)
  - Integrations (e.g. learning management systems)

What about open source?

- As the technology stack centers around OpenBadges and Verifiable Credentials, wouldn’t it be nice if the hardest part of these processes were **developed as micro-services**?

- Enter the **Digital Credentials Consortium**.

DCC DIGITAL CREDENTIALS CONSORTIUM



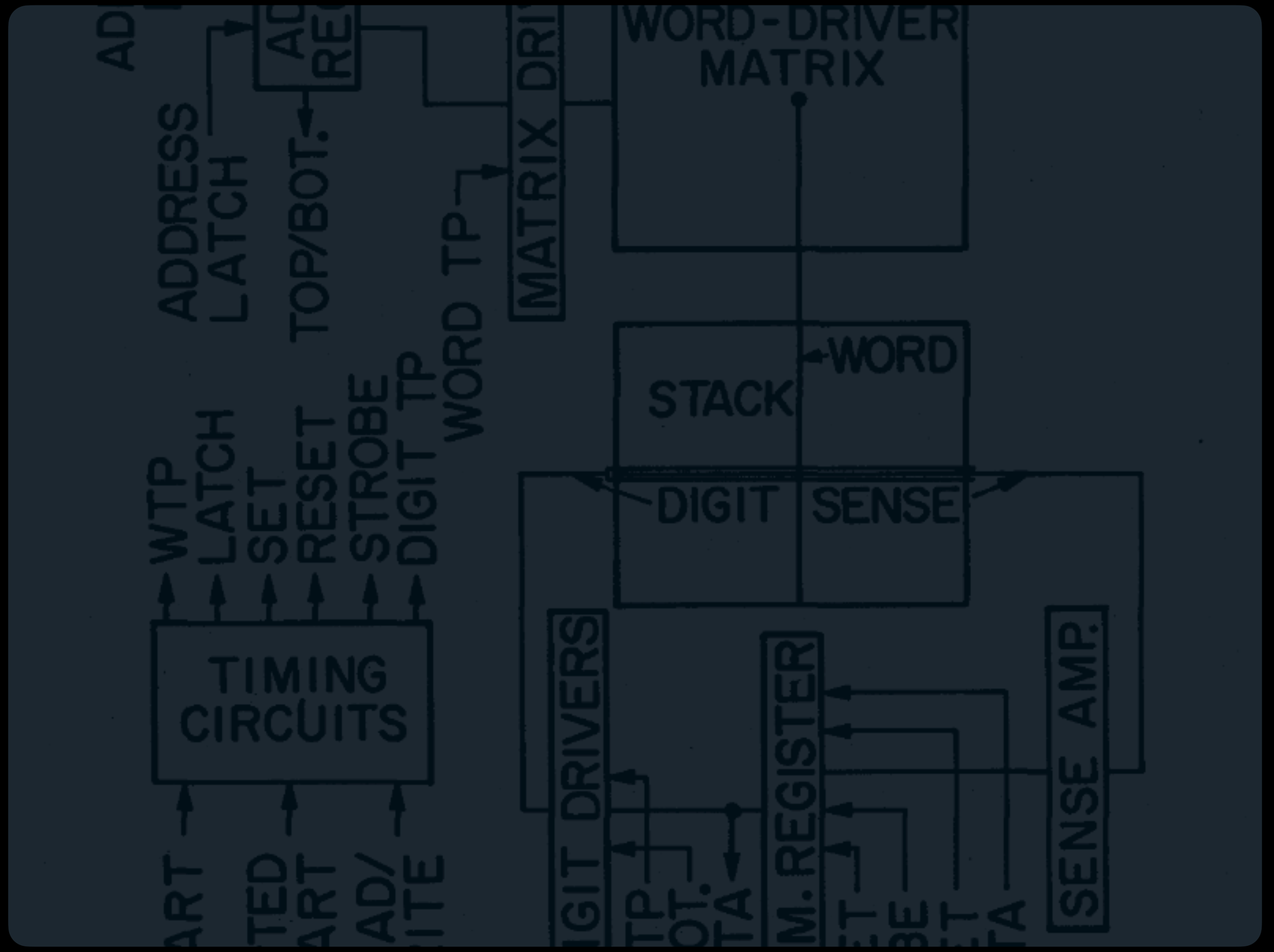
https://digitalcredentials.mit.edu/

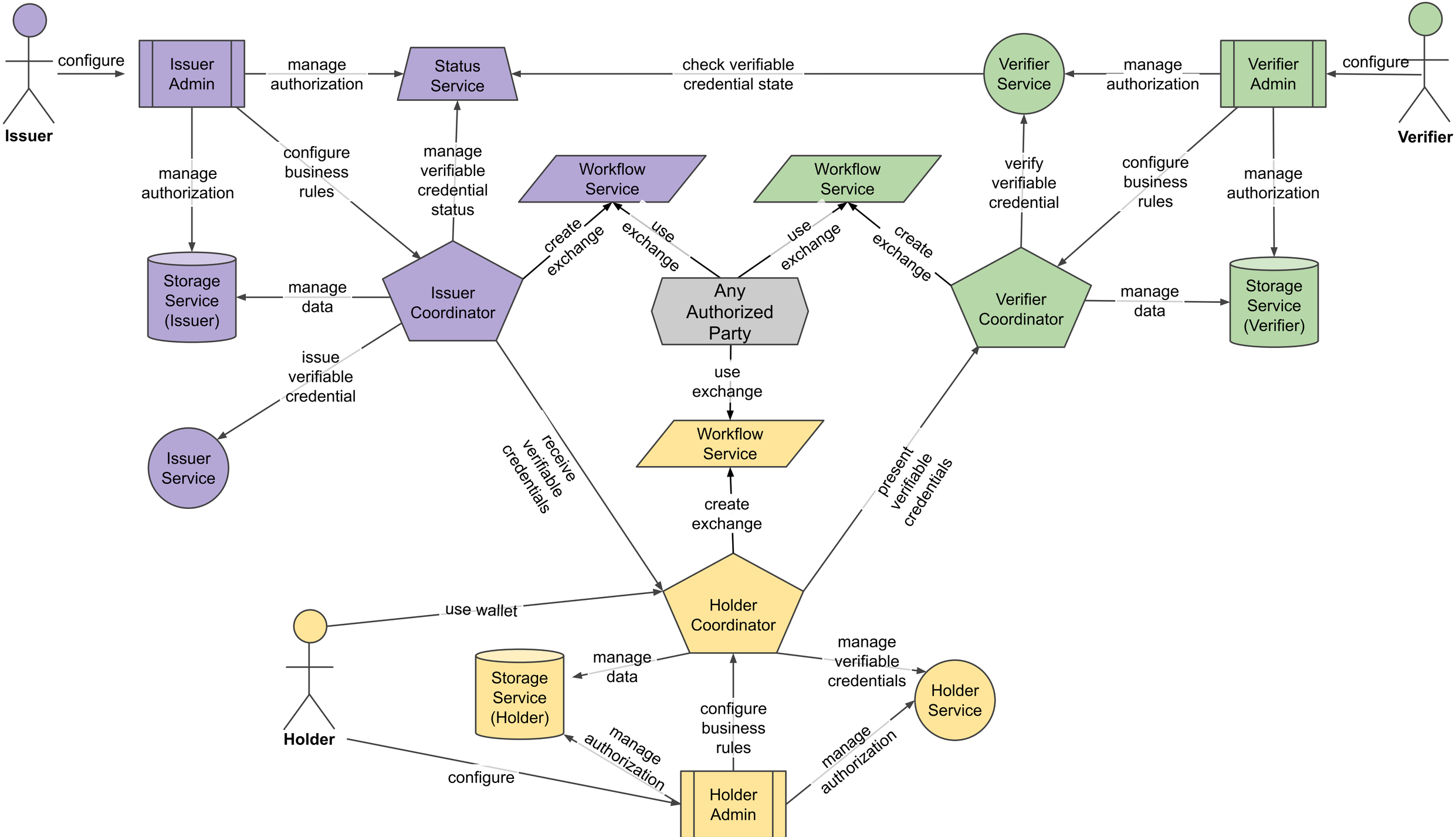
Digital Credentials Consortium

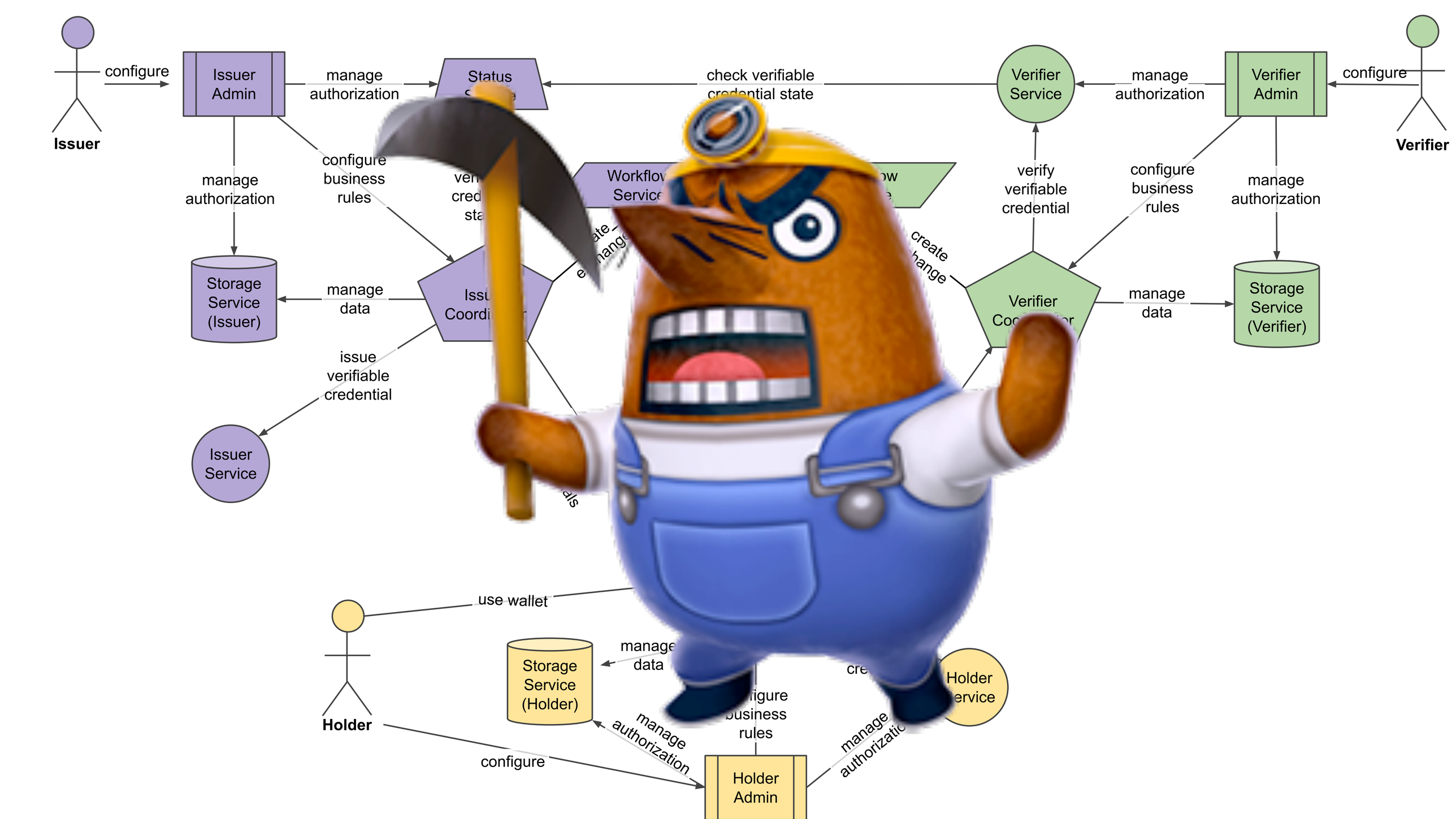
- Founded in 2018.
- Mission towards “portable, verifiable digital academic credentials in higher education through **open source technology development and leadership, research, and advocacy.**”

2.

Develop with **micro-services**, tools, & standards.




Issuer
configure
Issuer Admin
manage authorization
Status Service
check verifiable credential state
Verifier Service
manage authorization
Verifier Admin
configure
Verifier
manage authorization
configure business rules
manage verifiable credential status
Workflow Service
Workflow Service
verify verifiable credential
configure business rules
manage authorization
Storage Service (Issuer)
manage data
Issuer Coordinator
create exchange
use exchange
use exchange
create exchange
Any Authorized Party
Verifier Coordinator
manage data
Storage Service (Verifier)
issue verifiable credential
Issuer Service
use exchange
Workflow Service
receive verifiable credentials
present verifiable credentials
create exchange
Holder Coordinator
use wallet
Holder
Storage Service (Holder)
manage data
manage verifiable credentials
Holder Service
configure business rules
manage authorization
configure
Holder Admin
manage authorization


Issuer
configure
Issuer Admin
manage authorization
Status
check verifiable credential state
Verifier Service
manage authorization
Verifier Admin
configure
Verifier
manage authorization
configure business rules
Workflow Service
verify verifiable credential
configure business rules
manage authorization
Storage Service (Issuer)
manage data
Issuer Coordinator
create
Verifier Coordinator
manage data
Storage Service (Verifier)
issue verifiable credential
Issuer Service
use wallet
Holder
Storage Service (Holder)
manage data
Holder Service
configure business rules
manage authorization
configure
Holder Admin
manage authorization

Admin Dashboard

- A self-contained web application connecting DCC produced micro-services.
- Features:
  - **User Management**
  - **Credential Management**: Manage individual credentials: searching, viewing, status checking, and revocation.
  - **Batch Management**
  - **VC & Email Template Management**
  - **Claim Page**
  - **VC-API**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What we’re doing

- Historical work with cred-admin prior to DCC micro-services.
  - Digital credential issuances as part of campus pilots.
    - Course level.
    - Program level.
- Migrating to Admin Dashboard in Fall 2024.

cred-admin

- VC API server constructed for early Verifiable Credentials issuance and management.
- Based on work with ***blockcerts***.
- Deprecated for Admin Dashboard integrations.

VC LTI

- A 1EdTech Learning Tools Interoperability (LTI) tool for learning management systems or platforms to interact with **cred-admin**.
- Create, and issue digital credentials from the Course and module lesson configuration.
- Developed for pilot, experimental use-cases.
  - Will need modernizations for VCAPI, digital credentials governance workflows.

OpenBadges JSON builder

- Admin Dashboard provides a raw JSON field for constructing digital credential templates.
  - Not ideal for producing digital credentials at-scale.
  - Not ideal for hosting digital credential badge images.
- So, what did we do?

Fixing the issue

- Short term
  - Quick fix to enable research opportunities.
- Long term
  - Intentional, collaborative fix in Admin Dashboard.


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Prototyping an editor

- Enter **Credence**, a proof-of-concept builder for digital credentials.
- Leverages Drupal content management system architecture to host digital credential images and organize/repurpose metadata.
- Facilitates customization via Drupal entity and field configuration.

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credence

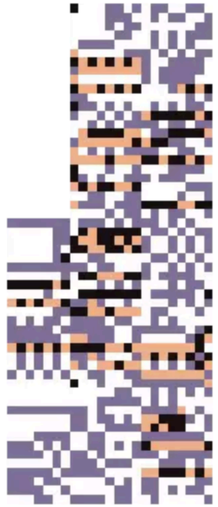
Home | Credentials

View Edit Delete

Missingno

MissingNo. (Japanese: けつばん Ketsuban, lit. "missing number"), as it is displayed in-game due to the ten-character limit in Western Generation I games, is a dual-type Bird/Normal glitch Pokémon in Pokémon Red and Blue, and a dual-type Normal/randomly named glitch type (which often has '9' in it) glitch Pokémon in Pokémon Yellow. It is arguably the best known glitch Pokémon, closely followed by 'M (00), and it is the easiest glitch Pokémon to find in the localizations. It has five distinct forms, but the most frequent forms (the Red/Blue and Yellow normal forms) share 36 index numbers each.

Achievement



Drupal Custom Entity Type

Translates Drupal entity/value stores into a PHP object for serialization.

PHP Classes with getters/setters, constructors

Leverages Symfony Normalizers and Serializers to construct JSON.

JSON context output

Drupal Custom Entity Type

Media image

Taxonomy references (with key/value pairs)

Base fields (e.g. text, integer, date time)

Bundled sub-entities (e.g. Criteria, Alignments) via Paragraphs

Drupal Custom Entity Type

Media image

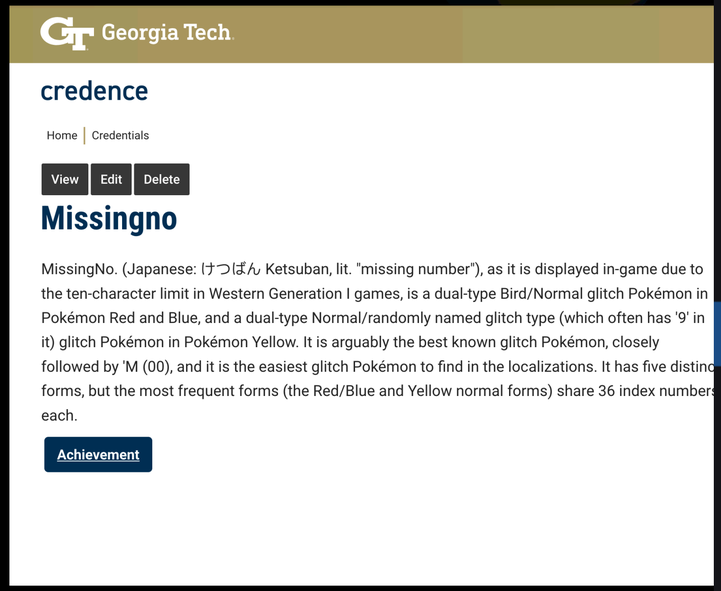
Taxonomy references
(with key/value pairs)

Reusable entities

Drupal Custom Entity Type

One-time use, per entity sub-entities

Bundled sub-entities (e.g. Criteria, Alignments) via Paragraphs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credence
Home | Credentials
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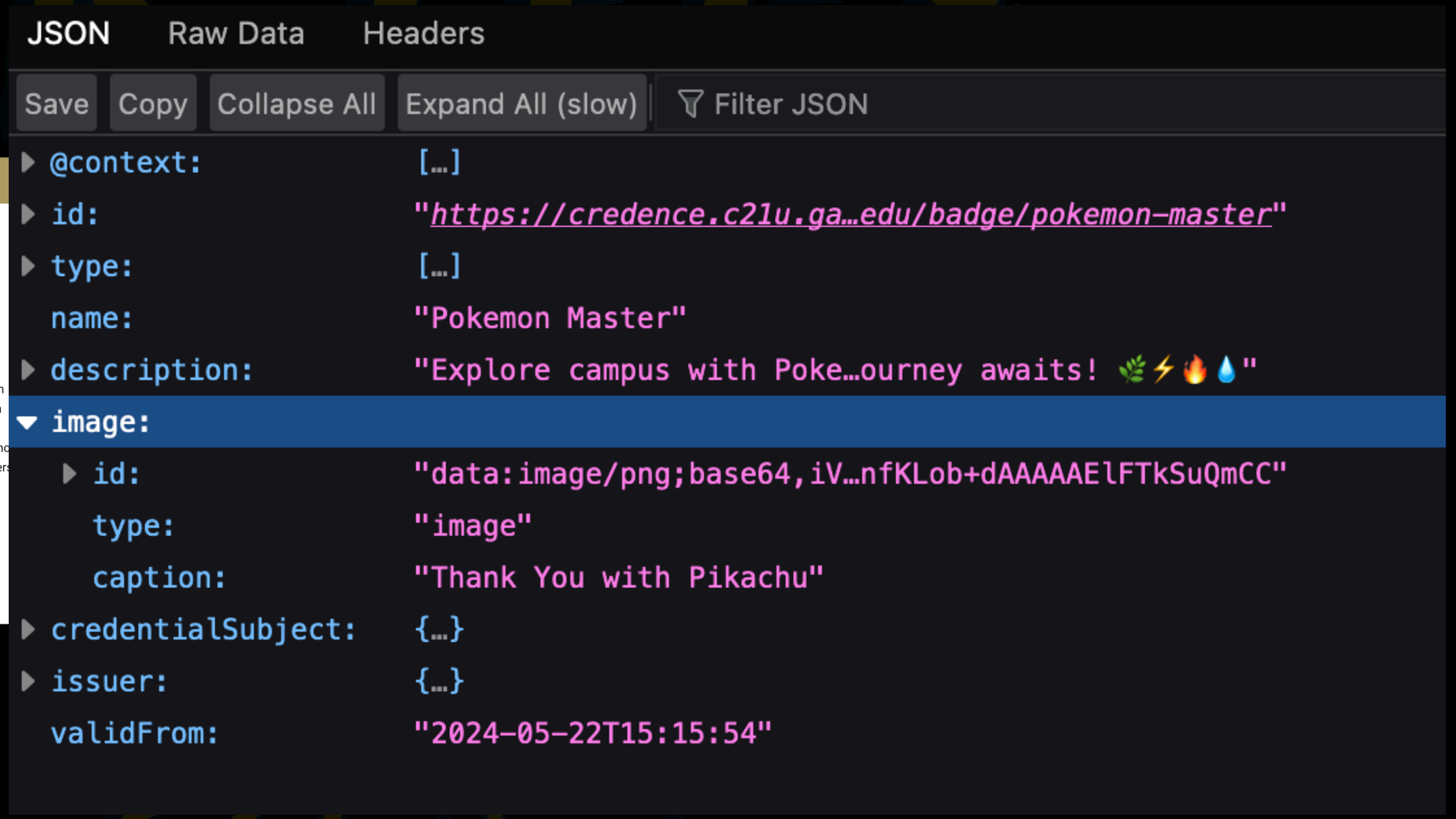
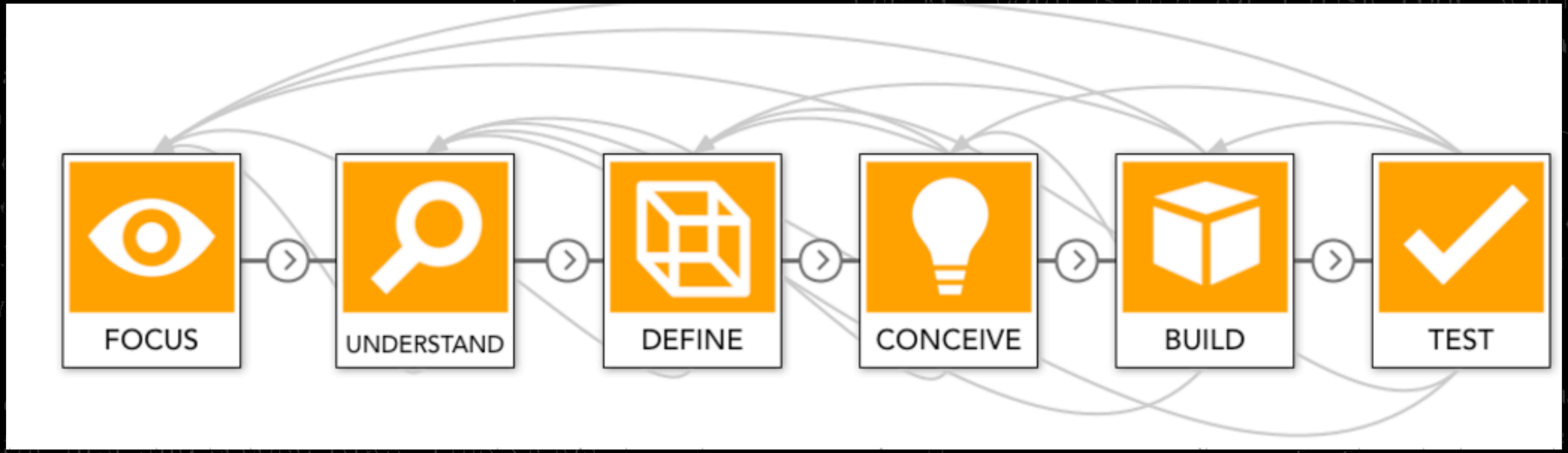

JSON
Raw Data
Headers
Save
Copy
Collapse All
Expand All (slow)
Filter JSON
@context: […]
id: "https://credence.c21u.ga…edu/badge/pokemon-master"
type: […]
name: "Pokemon Master"
description: "Explore campus with Poke…ourney awaits! 🌿⚡🔥💧"
image:
id: "…nfKLob+dAAAAAElFTkSuQmCC"
type: "image"
caption: "Thank You with Pikachu"
credentialSubject: {…}
issuer: {…}
validFrom: "2024-05-22T15:15:54"

Why use Drupal?

- Low operating costs.
- Quick, iterative development cycles with normalized default interactions from Drupal Core and Contrib API specs
- Content organization, auditing, moderation, authoring experience.

Design based Research (DBR)



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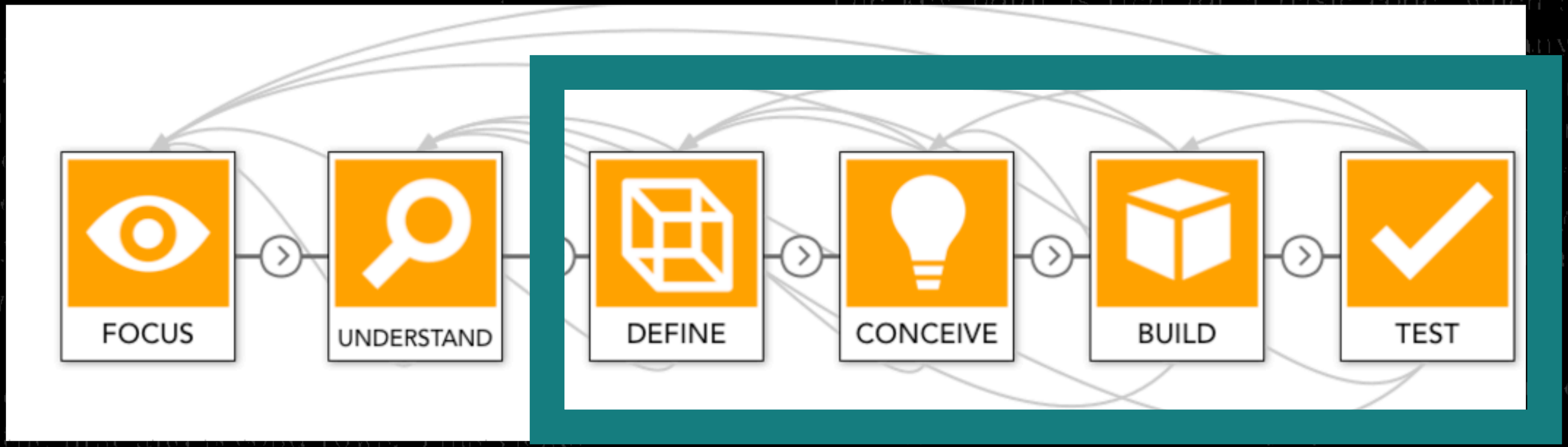


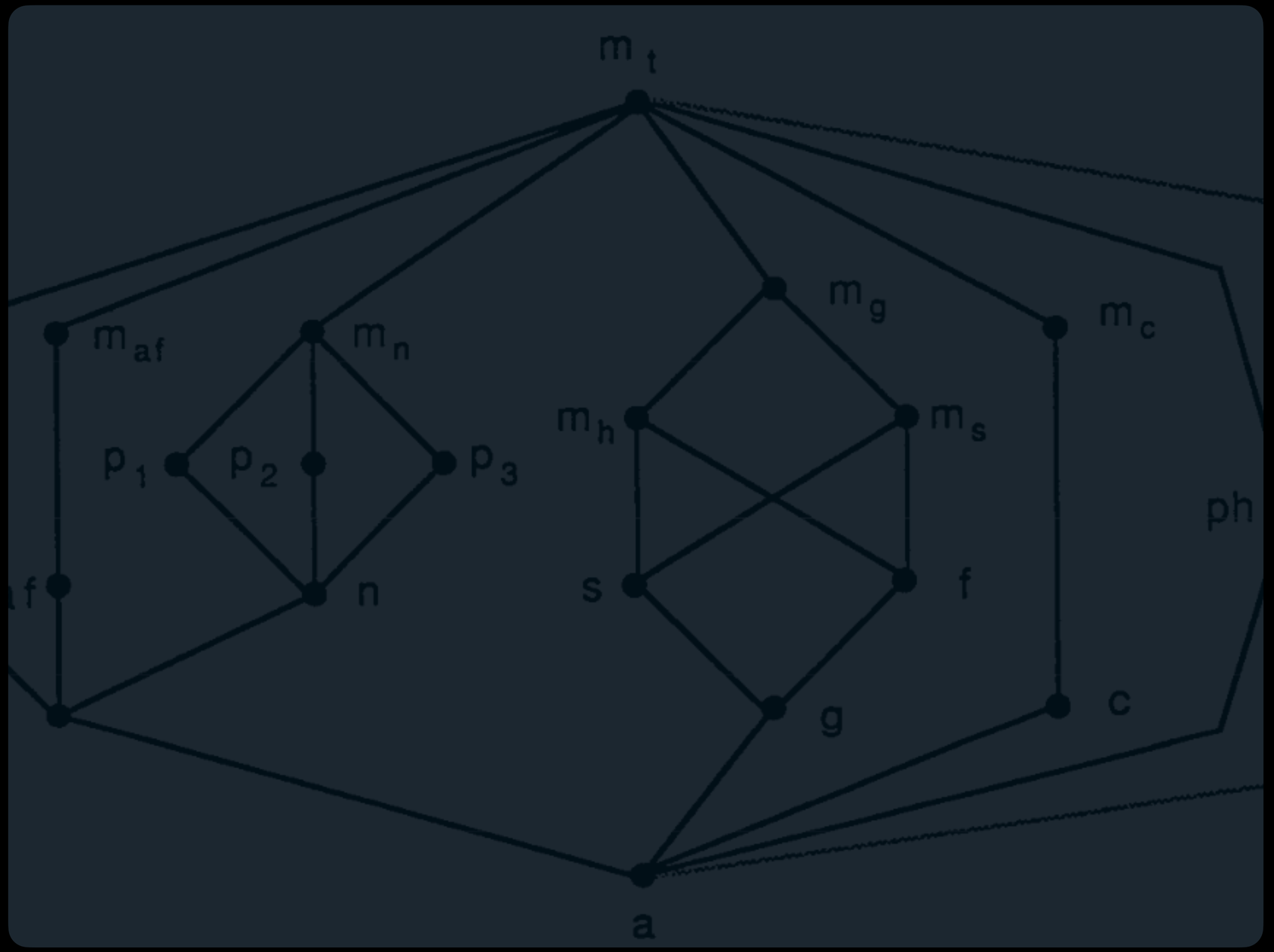
We’re just getting started.

- Georgia Tech’s **College of Lifetime Learning**
- Academic article development
  - Visual design patterns in digital credentials badges
  - Design research of
    - Digital credentials software
    - Digital credential implementation & governance

g. 1—System block diagram.

3.

The future: **work**, **initiatives**, & how to **contribute**.



Issuer Registry advisory group

- Partnership between DCC & Credential Engine
- Development of an **interoperable issuer registry model**.
- Forecasting issuer registry ecosystems in associations, education, government, enterprise
  - Building interoperability, trust, transparency

Degrees working group

- Formalizing a data model for a verifiable credential standard for **conferred degrees**
- Builds off of the trailblazing work by McMaster University’s e-Diploma
- Explore future-facing VC capabilities
  - Credential presentation templates
  - Assistive tools for digital degree generation

Get Involved

- Collaboratively build the infrastructure for digital academic credentials that can support the **education systems of the future**.
- Join leading institutions from around the world developing this infrastructure and issuing digital credentials for your learners and graduates.
- DCC members focus on collaborative projects and individual institutional priorities leveraging the consortium’s technical leadership and expertise.

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Research faculty, Director of Digital Learning Technologies
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Digital Credentials Consortium

Access micro-services, code repository
Join for community collaboration

questions?