Digital Credentials Consortium Learner Credential Wallet

DCC Community Meeting, July 7, 2022

Brandon Muramatsu, MIT
Dmitri Zagidulin, MIT

Guiding Principles | Values

Learners - Commitment to <u>learner agency</u> and participation
- Learners retain primary control over their credentials

Issuers - Commitment to <u>issuer control</u> of the design of the credential
- Issuers control to whom they issue credentials, the particular achievement that the credential represents, and which credential options are available to the learner

**Trust** - Commitment to <u>open processes</u>, <u>open standards</u>, and <u>open source software</u>
- Credentials can be verified without consulting original issuer

DCC DIGITAL CREDENTIALS CONSORTIUM

How does DCC do its work?

- Implements open standards, develops open source reference libraries and software, provides core infrastructure services
  - **W3C Verifiable Credentials for Education** (W3C VC-EDU)
  - **Invited expert** to IMS Global on Comprehensive Learner Record and **Open Badges v3 specifications**
  - Connected to international efforts (e.g., EU, EBSI, Europass)
  - Software & Libraries: https://github.com/digitalcredentials
- DCC **members build and launch pilots**
  - Supported through Technical Working Group (DCC TWG)

DCC DIGITAL CREDENTIALS CONSORTIUM

About the Open Source Wallet Project
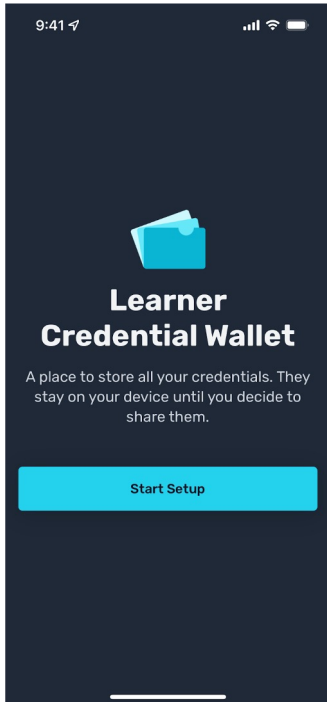
- Key component of digital credential ecosystem
    - Prioritizes learner agency
    - Prevents lock-in
    - Establishes reference implementation
- Wallet specification released (May 2021)
- Open-source code hosted on Github (Dec 2021)
- iOS and Android mobile apps published (Feb 2022)
- Deployment pilots with U.S. institutions (March 2022)
    - Georgia Tech, College Unbound, San Jose City College
- Funded by Department of Education, Walmart

MIT | Open Learning   DCC DIGITAL CREDENTIALS CONSORTIUM

Learner Credential Wallet Specification

Published May 2020
https://digitalcredentials.mit.edu/docs/Learner-Credential-Wallet-Specification-May-2021.pdf

- Implements W3C Verifiable Credentials Data Model
- Informed by LER Wrapper and Wallet Specification for functional requirements
- Builds upon Universal Wallet 2020 Interoperability Specification
- Thanks to VC-EDU for input!

Defined the **Minimum Viable Product** implemented as the Learner Credential Wallet at https://lcw.app

Learner Credential Wallet

A place to store your digital learner credentials

Download on the App Store

GET IT ON Google Play

Learner Credential Wallet is an open source mobile wallet developed by the Digital Credentials Consortium, a network of leading international universities designing an open infrastructure for academic credentials.

Digital Credentials Consortium · MIT Open Learning

Terms of Service · Privacy Policy · Accessibility
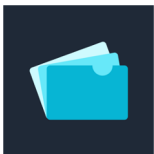
# Current Features in Learner Credential Wallet

- iOS and Android cross platform
- Wallet is entirely stored on the mobile device: no user account
- Add VC-based credentials from a:
  - deep link from a **registered issuer**
  - **QR code**, either fully contained or deep link to a registered issuer
- Supports **diploma-like or program certificate-like** credentials using DCC context; **Open Badges v3-draft** context
- Preview credential as human readable display (or JSON)
- Share credential using mobile OS share sheets (JSON VP, can be multiple VCs)
- Backup and Restore wallet (unencrypted)
- Delete Credential

- Tech details: Supports VC-API; did:key, did:web; OIDC & challenge for authentication

MIT | Open Learning   DCC DIGITAL CREDENTIALS CONSORTIUM
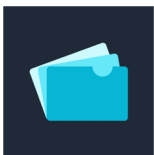
LCW Status

- LCW is in active development!
- LCW in use
    - Add Georgia Tech Canvas course (demo today)
    - Add (and issue) College Unbound Bachelor's Degree
    - Add JFF Plugfest #1 Badge (demo today)
    - Add VC from QR code (demo today)
    - DiBiHo Project
- Forthcoming LCW enhancements (July 2022)
    - Granular verification status (preview)
    - Share a public link from LCW
    - Support for OS biometric features, auto-lock wallet
    - Additional display support, context support
- Forthcoming Issuer enhancements: revocation, registry

DCC **DIGITAL CREDENTIALS CONSORTIUM**

LCW Development

- Maintainer: Dmitri Zagidulin / MIT
- Contributions from Atomic Jolt, Kayode Ezike, Dirk Uys

- TUM contributions starting
- McMaster contributions soon
- Discussions with University of Toronto

Install & Setup Learner Credential Wallet
https://lcw.app

Learner Credential Wallet

A place to store your digital learner credentials

Download on the App Store

GET IT ON Google Play

Learner Credential Wallet is an open source mobile wallet developed by the Digital Credentials Consortium, a network of leading international universities designing an open infrastructure for academic credentials.

Digital Credentials Consortium · MIT Open Learning

Terms of Service · Privacy Policy · Accessibility

‹ Search

Learner Credential Wallet
Store your learner credentials

TestFlight version 1.1.9 is installed.
View in TestFlight

AGE	CATEGORY	DEVELOPER
4+ Years Old	🌐 Education	👤 Massachusetts Inst

What's New
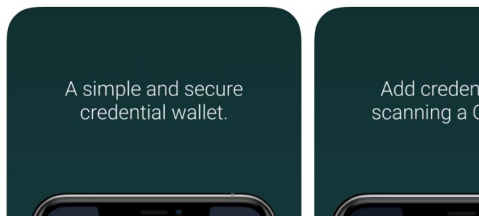**Version History**

Version 1.1.9   6d ago

Bug fixes and UI updates. Support for did:web signed credentials, swipe to delete, and more.

Preview

A simple and secure credential wallet.

Add creden scanning a C

Today	Games	Apps	Arcade	Search

Download on the App Store

←   🔍 ⋮

Learner Credential Wallet
MIT

[Uninstall] [Open]

What's new •
→
Last updated Mar 24, 2022

Add support for more issuers.

Rate this app
Tell others what you think

☆ ☆ ☆ ☆ ☆

Write a review

Developer contact   ⌄

About this app   →

A place to store your digital educational credentials

Education

GET IT ON Google Play

Learner Credential Wallet

A place to store all your credentials. They stay on your device until you decide to share them.

Start Setup

Step 1 —— 2

Password

Setup a password to secure your wallet. You will not be able to recover a lost password.

Password

Confirm Password

Cancel   Next →

---

1 —— **Step 2**

Creating Wallet

This will only take a moment.

✓

Wallet Initialization:
- Subject DID created on wallet initialization
- Password unlocks LCW
- Password used for encrypted backups (coming soon!)
- Biometric support (coming soon!)

Take Me To My Wallet

Home

Looks like your wallet is empty.

Add Credential   ⊕

Walkthrough #1

JFF Plugfest 1 Badge (Open Badges v3 Draft Specification)
Email -> Deep Link -> Receive Badge

Note: June 2022 demo uses developer build, public release coming soon

What are the Jobs For the Future (JFF) Plugfests?

- 3 events: June 2022, likely November 2022, and a 3rd TBD
- Goal: "Learners move their credentials across multiple wallets and platforms, as needed"
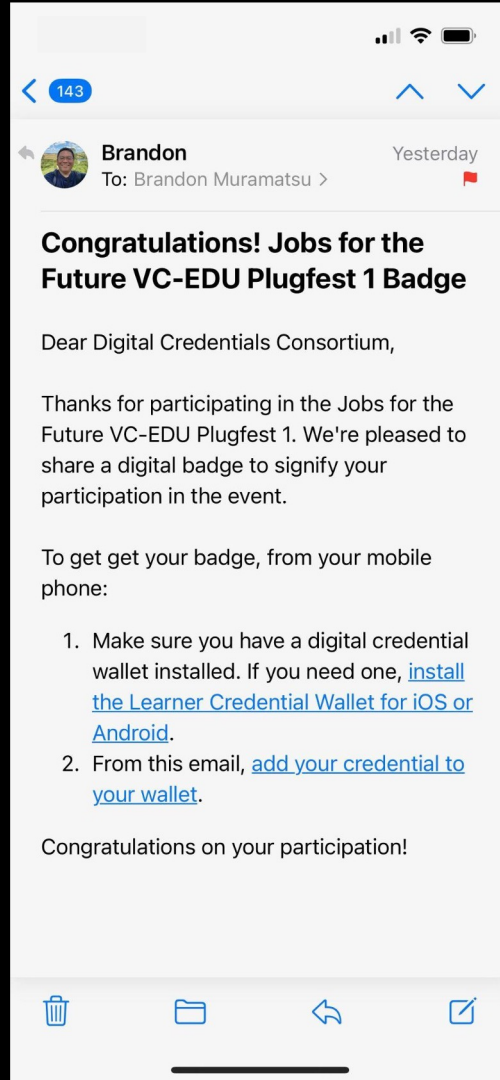- Supported by VC-EDU

JFF Plugfest #1 Wallet must:

- Display: Open Badges v3 (draft, Verifiable Credentials-based)
- Display: Badge image
- Display: Issuer name, achievement name, achievement description, achievement criteria
- Optional: Issuer logo & other Open Badges v3 terms
- Stretch: Badge verification

Standards and specifications are great, but what can learners do today with digital credentials?

Workflow:

- Receive email
- Is a wallet installed?
  *How? Link takes user to
  https://lcw.app where they can
  select OS and install wallet*
- Add credential
  *How? LCW had registered dcc://
  with OS and responds to hyperlinks
  starting with dcc:// that triggers
  LCW to receive the credential; if
  multiple wallets installed iOS
  (randomly) chooses which app to
  use and Android shows a picker*

Brandon   Yesterday

To: Brandon Muramatsu ›

Congratulations! Jobs for the Future VC-EDU Plugfest 1 Badge

Dear Digital Credentials Consortium,

Thanks for participating in the Jobs for the Future VC-EDU Plugfest 1. We're pleased to share a digital badge to signify your participation in the event.

To get get your badge, from your mobile phone:

1. Make sure you have a digital credential wallet installed. If you need one, install the Learner Credential Wallet for iOS or Android.
2. From this email, add your credential to your wallet.

Congratulations on your participation!

5:44

Credential Preview

5:44

Credential Preview

5:44

Verification Status

Our Wallet Passed JFF Plugfest #1 2022

Issuer

Jobs for the Future (JFF)

Issuer Website

https://www.jff.org/

Issuance Date
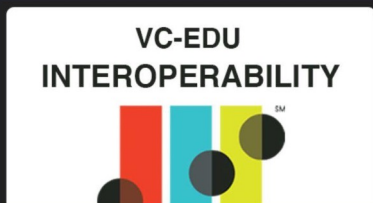Aug 16, 2020

Expiration Date
Aug 16, 2025

Description

This wallet can display this Open Badge 3.0

Criteria

The first cohort of the JFF Plugfest 1 in May/June of 2022 collaborated to push interoperability of VCs in education forward.

VC-EDU
INTEROPERABILITY

Issuance Date
Aug 16, 2020

Expiration Date
Aug 16, 2025

Description

This wallet can display this Open Badge 3.0

Criteria

The first cohort of the JFF Plugfest 1 in May/June of 2022 collaborated to push interoperability of VCs in education forward.

VC-EDU
INTEROPERABILITY

JFF
PLUGFEST #1

✓ Credential Verified ›

✓ Credential Verified

This means that the credential:

- is in a recognized format

- the digital signature validates

- has been issued by a registered institution

- the issuing institution could be reached to verify the credential

- has not expired(expires on Aug 16, 2025)

Please contact your issuing organization if you have any problems with the verification status.

Screen 1

Credential:

{
  "@context": [
    "https://www.w3.org/2018/credentials/v1",
    "https://w3id.org/security/suites/ed25519-2020/v1",
    "https://w3c-ccg.github.io/vc-ed/plugfest-1-2022/jff-vc-edu-plugfest-1-context.json"
  ],
  "type": [
    "VerifiableCredential",
    "OpenBadgeCredential"
  ],
  "issuer": {
    "type": "Profile",
    "id": "did:key:z6MkpMKDNykeb9hSQkz8RWCRrqHoo3y56gQb3Lj78xWgkNZh",
    "name": "Jobs for the Future (JFF)",
    "url": "https://www.jff.org/",
    "image": "https://kayaelle.github.io/vc-ed/plugfest-1-2022/images/JFF_LogoLockup.png"
  },
  "issuanceDate": "2020-08-16T12:00:00.000+00:00",
  "credentialSubject": {
    "type": "AchievementSubject",
    "id": "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR",
    "achievement": {
      "type": "Achievement",
      "name": "Our Wallet Passed JFF Plugfest #1 2022",
      "description": "This wallet can display this Open Badge 3.0",
      "criteria": {
        "type": "Criteria",
        "narrative": "The first cohort of the JFF Plugfest 1 in May/June of 2022 collaborated to push interoperability of VCs in education forward."
      },
      "image": "https://w3c-ccg.github.io/vc-ed/plugfest-1-2022/images/plugfest-1-badge-image.png"
    }
  },
}

Screen 2

  },
  "expirationDate": "2025-08-16T12:00:00.000+00:00",
  "proof": {
    "type": "Ed25519Signature2020",
    "created": "2022-06-05T21:11:11Z",
    "verificationMethod": "did:key:z6MkpMKDNykeb9hSQkz8RWCRrqHoo3y56gQb3Lj78xWgkNZh#z6MkpMKDNykeb9hSQkz8RWCRrqHoo3y56gQb3Lj78xWgkNZh",
    "proofPurpose": "assertionMethod",
    "proofValue": "z47B4NF6oRTM8Z66qaCHDdjr8TBZeaXzGMKKi6ahETmbLY1DMDP2iKQNEYo2MVwdMVins8CdU1fgimc1G8UAQewne"
  }
}

DID Document:

{
  "@context": [
    "https://www.w3.org/ns/did/v1",
    "https://w3id.org/security/suites/ed25519-2020/v1",
    "https://w3id.org/security/suites/x25519-2020/v1"
  ],
  "id": "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR",
  "verificationMethod": [
    {
      "id": "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR#z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR",
      "type": "Ed25519VerificationKey2020",
      "controller": "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR",
      "publicKeyMultibase": "z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR"
    }
  ],
  "authentication": [

Screen 3

  "authentication": [
    "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR#z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR"
  ],
  "assertionMethod": [
    "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR#z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR"
  ],
  "capabilityDelegation": [
    "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR#z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR"
  ],
  "capabilityInvocation": [
    "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR#z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR"
  ],
  "keyAgreement": [
    {
      "id": "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR#z6LSnLiqFLHuJpEwgNEHGXLCXWj5vBWTadecG2FF9SMB416n",
      "type": "X25519KeyAgreementKey2020",
      "controller": "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR",
      "publicKeyMultibase": "z6LSnLiqFLHuJpEwgNEHGXLCXWj5vBWTadecG2FF9SMB416n"
    }
  ]
}

Verification Key:

{
  "id": "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLki

Screen 4

    }
  ]
}

Verification Key:

{
  "id": "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR#z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR",
  "controller": "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR",
  "type": "Ed25519VerificationKey2020",
  "publicKeyMultibase": "z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR",
  "privateKeyMultibase": "zruzgp16uy5CMXM5ryj4NrCoSpYn788pZCNiQ1t4FiBPgzfV7ND6APU74hiSbgNHTNhce6twPRMDh3NtFsuCdKtc13w"
}

Key Agreement Key:

{
  "id": "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR#z6LSnLiqFLHuJpEwgNEHGXLCXWj5vBWTadecG2FF9SMB416n",
  "controller": "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR",
  "type": "X25519KeyAgreementKey2020",
  "publicKeyMultibase": "z6LSnLiqFLHuJpEwgNEHGXLCXWj5vBWTadecG2FF9SMB416n",
  "privateKeyMultibase": "z3weYyf8AwwqvkRaP3woUzRhxf7Qm6Xbcv3tuUDgcAKpwQfc"
}

~/Holding/plugfest-1-ex-2.json (no function selected)

```json
{
    "@context": [
        "https://www.w3.org/2018/credentials/v1",
        "https://w3c-ccg.github.io/vc-ed/plugfest-1-2022/jff-vc-edu-plugfest-1-context.json"
    ],
    "type": [
        "VerifiableCredential",
        "OpenBadgeCredential"
    ],
    "issuer": {
        "type": "Profile",
        "id": "did:key:z6MkrHKzgsahxBLyNAbLQyB1pcWNYC9GmywiWPgkrvntAZcj",
        "name": "Jobs for the Future (JFF)",
        "url": "https://www.jff.org/",
        "image": "https://kayaelle.github.io/vc-ed/plugfest-1-2022/images/JFF_LogoLockup.png"
    },
    "issuanceDate": "2022-05-01T00:00:00Z",
    "credentialSubject": {
        "type": "AchievementSubject",
        "id": "did:key:123",
        "achievement": {
            "type": "Achievement",
            "name": "Our Wallet Passed JFF Plugfest #1 2022",
            "description": "This wallet can display this Open Badge 3.0.",
            "criteria": {
                "type": "Criteria",
                "narrative": "The first cohort of the JFF Plugfest 1 in May/June of 2021 collabor
            },
            "image": "https://w3c-ccg.github.io/vc-ed/plugfest-1-2022/images/plugfest-1-badge-i
        }
    },
    "proof": {
        "type": "Ed25519Signature2018",
        "created": "2022-05-31T21:09:29Z",
        "verificationMethod": "did:key:z6MkrHKzgsahxBLyNAbLQyB1pcWNYC9GmywiWPgkrvntAZcj#z6Mkr
        "proofPurpose": "assertionMethod",
        "jws": "eyJhbGciOiJFZERTQSIsImI2NCI6ZmFsc2UsImNyaXQiOlsiYjY0Il19..Q05Nb7ufRWi8b8MO11e
}
```

L: 1 C: 1   Saved: 6/6/22, 7:45:17 AM

~/Holding/LCW shared JFF VC.json @context

```json
{
    "@context": [
        "https://www.w3.org/2018/credentials/v1",
        "https://w3id.org/security/suites/ed25519-2020/v1",
        "https://w3c-ccg.github.io/vc-ed/plugfest-1-2022/jff-vc-edu-plugfest-1-context.json"
    ],
    "type": [
        "VerifiableCredential",
        "OpenBadgeCredential"
    ],
    "issuer": {
        "type": "Profile",
        "id": "did:key:z6MkpMKDNykeb9hSQkz8RWCRrqHoo3y56gQb3Lj78xWgkNZh",
        "name": "Jobs for the Future (JFF)",
        "url": "https://www.jff.org/",
        "image": "https://kayaelle.github.io/vc-ed/plugfest-1-2022/images/JFF_LogoLockup.png"
    },
    "issuanceDate": "2020-08-16T12:00:00.000+00:00",
    "credentialSubject": {
        "type": "AchievementSubject",
        "id": "did:key:z6Mkio7bza9fnLWzomusXDpdxRsdsPJQxYLkiPGpw6Nic3iR",
        "achievement": {
            "type": "Achievement",
            "name": "Our Wallet Passed JFF Plugfest #1 2022",
            "description": "This wallet can display this Open Badge 3.0.",
            "criteria": {
                "type": "Criteria",
                "narrative": "The first cohort of the JFF Plugfest 1 in May/June of 2022 collabor
            },
            "image": "https://w3c-ccg.github.io/vc-ed/plugfest-1-2022/images/plugfest-1-badge-i
        },
        "expirationDate": "2025-08-16T12:00:00.000+00:00",
        "proof": {
            "type": "Ed25519Signature2020",
            "created": "2022-06-05T21:11:11Z",
            "verificationMethod": "did:key:z6MkpMKDNykeb9hSQkz8RWCRrqHoo3y56gQb3Lj78xWgkNZh#z6Mkp
            "proofPurpose": "assertionMethod",
            "proofValue": "z47B4NF6oRTM8Z66qaCHDdjr8TBZeaXzGMKKi6ahETmbLY1DMDP2iKQNEYo2MVwdMVins8
```

100%

Comparing JFF OBv3 Credential and What's Added to LCW

|	
Extra lines in Right before 4 in Left (File plugfest-1-ex-2.json; Line 4; File LCW shared JFF VC.json; Line 4)	DCC issuer added context for signing
Nonmatching Lines (File plugfest-1-ex-2.json; Line 12; File LCW shared JFF VC.json; Line 13)	DCC issuer created DID and assigned it to VC
Nonmatching Lines (File plugfest-1-ex-2.json; Line 17; File LCW shared JFF VC.json; Line 18)	DCC issuer utilized internal data format including milliseconds and timezone offset
Nonmatching Lines (File plugfest-1-ex-2.json; Line 20; File LCW shared JFF VC.json; Line 21)	DCC issuer created DID and assigned it to VC
Nonmatching Lines (File plugfest-1-ex-2.json; Line 27; File LCW shared JFF VC.json; Line 28)	Corrected year from 2021 to 2022
Extra lines in Right before 32 in Left (File plugfest-1-ex-2.json; Line 33) File LCW shared JFF VC.json; Line 33)	DCC issuer added expiration date
Nonmatching Lines (File plugfest-1-ex-2.json; Line 33:35; File LCW shared JFF VC.json; Line 35:37)	DCC issuer signed credential and assigned creation date
Nonmatching Lines (File plugfest-1-ex-2.json; Line 37:38; File LCW shared JFF VC.json; Line 39)	DCC issuer signed credential with proofValue (vs. jws)
Extra lines in Right before 40 in Left (File plugfest-1-ex-2.json; Line 40; File LCW shared JFF VC.json; Line 41)	

Walkthrough #2
Georgia Tech Certificate
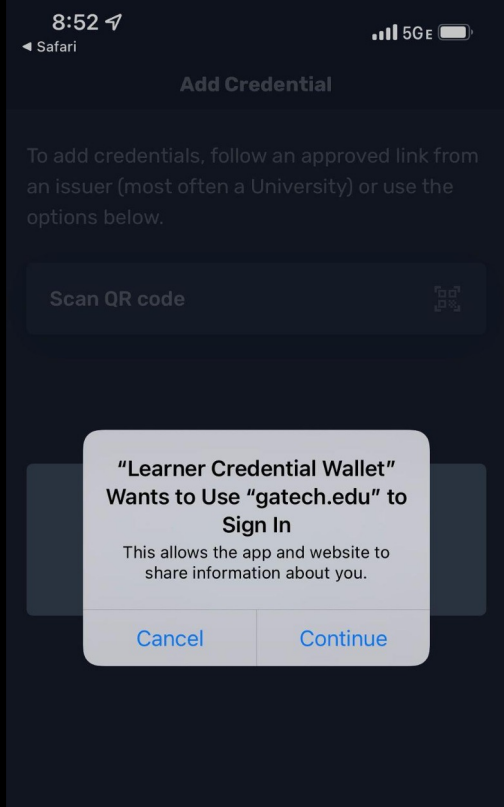LMS -> Link -> OIDC Authentication -> Receive Credential
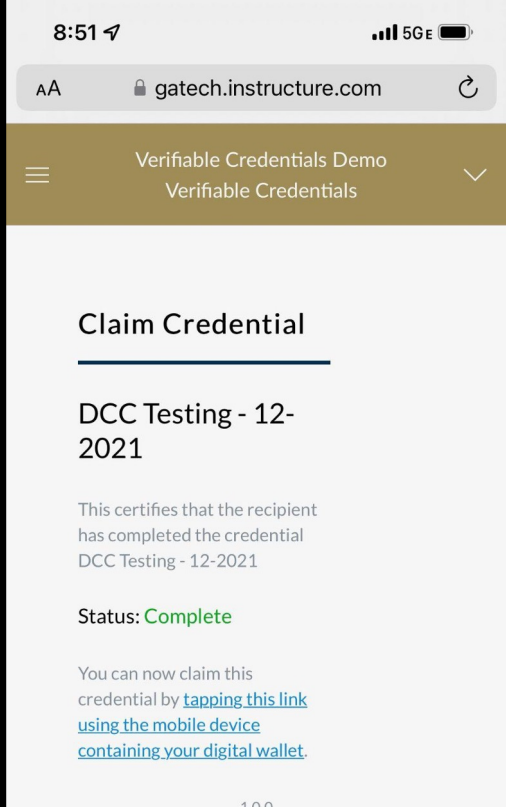
User, logged into Canvas, begin adding (claiming, issuing) credential
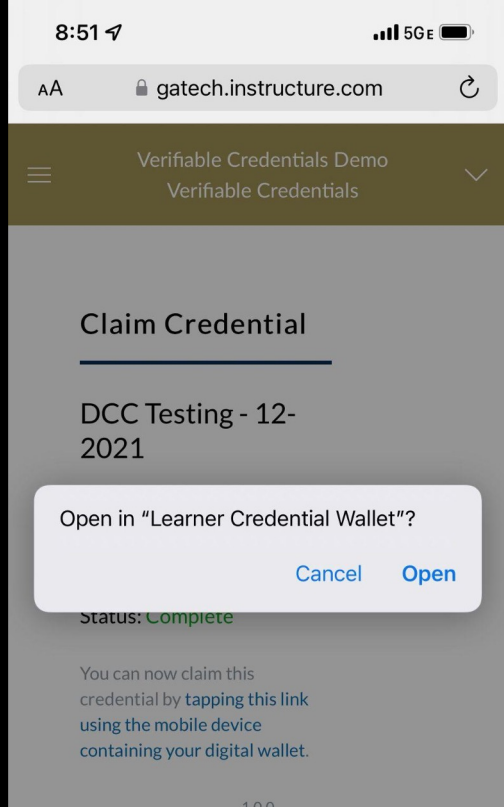
iOS asks permission to open LCW

LCW asks to sign in (authenticate via Open ID Connect) with Georgia Tech (Identity Provider)

Sign in (authenticate) with Georgia Tech to help ensure request for credential is as expected

After signing in (authenticating), Georgia Tech (Identity Provider) asks user to grant access

LCW associates user identifier (Subject DID) with the authenticated user, begins receiving credential

DCC Testing - 12-2021
C21U

Decline | Accept

DCC Testing - 12-2021
C21U

✓ Added to Wallet

DCC Testing - 12-2021

Issuer

C21U

Issuer Website

https://c21u.gatech.edu

Issuance Date

Dec 9, 2021

Subject Name

Brandon Muramatsu

Description

This is a test credential for DCC testing.

✓ Credential Verified

✓ Credential Verified

This means that the credential:

- is in a recognized format
- the digital signature validates
- has been issued by a registered institution
- the issuing institution could be reached to verify the credential
- has not expired

Please contact your issuing organization if you have any problems with the verification status.
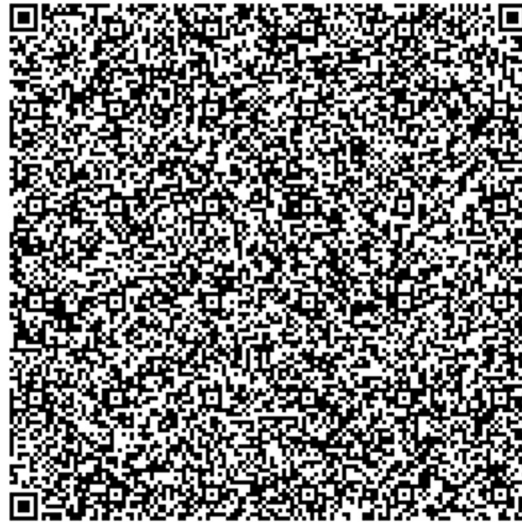
Walkthrough #3

College Unbound Diploma
QR Code -> Receive Credential

QR Code with CU Mock Credential

Bachelor of Arts in Organizational Leadership & Change

Issuer

COLLEGE UNBOUND College Unbound

Issuer URL

https://www.collegeunbound.org

Issuance Date

Dec 31, 2021

Subject Name

CU Graduate

Start Date

Jan 19, 2022

End Date

Jan 19, 2022

Description

College Unbound's Organizational Leadership and Change Bachelor's Degree program provides students with a grounded understanding of the leadership and change skills necessary to make a positive difference in their workplaces and communities. Through theoretical and practical exploration, this degree program

---

CU Graduate

Start Date

Jan 19, 2022

End Date

Jan 19, 2022

Description

College Unbound's Organizational Leadership and Change Bachelor's Degree program provides students with a grounded understanding of the leadership and change skills necessary to make a positive difference in their workplaces and communities. Through theoretical and practical exploration, this degree program prepares students to apply leadership and change skills in evolving organizational environments and cultural contexts. Students' research, practice, and project-based work provide critical training in project management, leadership development, and driving social change. Each student's comprehensive, customized personal learning plan features a multitude of opportunities to hone these competencies while developing high-value, field-specific knowledge and skills related to his or her area of interest, culminating in a capstone project and presentation.

✅ Credential Verified

More on JFF Plugfest #1

More on JFF Plugfest #1

- 20+ Wallet vendors / developers participated
- "Show" JFF credential in a wallet
- Both a low bar, and too high a bar for some

LCW for JFF Plugfest #1:

- ✓ Display: Open Badges v3 (draft, Verifiable Credentials-based)
- ✓ Display: Badge image
- ✓ Display: Issuer name, achievement name, achievement description, achievement criteria
- ✓ Optional: Issuer logo & other Open Badges v3 terms
- ✓ Stretch: Badge verification

Questions?

Brandon Muramatsu, mura@mit.edu