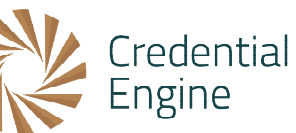


Credential Engine

Innovating Technology for the
Emerging Digital Marketplace

PESC
Spring 2017 Data Summit
May 4, 2017



Topics

- Credential Engine Background
- Credentialing Partners
- Credential Engine Technologies
- Credential Transparency Description Language
- Credential Registry & CTDL Editor
- Workit™ Search App Prototype
- Q & A

Credential Engine Background

Transitioning to Scale

Credential Transparency Initiative (CTI) was a pilot project to engage key stakeholders in signing, developing, and piloting a Credential Registry, common terms (CTDL), and prototype application (Workit™)—and evaluating the potential for scaling the initiative under non-profit management.

Credential Engine (CE) is a 501(c)(3) non-profit organization whose mission is to improve transparency in the credentialing marketplace, building on the CTI pilot. Credential Engine will pursue this mission by (1) scaling the web-based, open-licensed Credential Registry (CR), (2) maintaining the Credential Transparency Description Language (CTDL), (3) maintaining Workit™ prototype open-source credential search app to demonstrate the power of the registry, and promoting an open applications marketplace.

Three years of funding have been secured and planning is underway for long-term sustainability.

Sponsors are Lumina Foundation and JP Morgan Chase & Co.

- Key metrics and outcomes through 2020 have been identified.

Board and Advisory Groups

**Credential
Engine Board of
Directors**
(11 Members)

**Business
Advisory Group**
(13 Members)

**Certification
and Licensure
Advisory Group**
(20 Members)

**Higher
Education
Advisory Group**
(30 Members)

**Quality
Assurance
Advisory Group**
(14 Members)

**Technical
Advisory Group**
(57 Members)

Transparency through Technology

Develop common terms
Credential Transparency
Description Language -
(DL) to describe key
features of:

Credentials
Credentialing organizations
Quality assurance (QA)
Bodies

- Create & populate
voluntary, web-based
credential registry with
credential issuers and
QA bodies

- Bring the registry to
scale under non-profit
governance

- Develop, test, & dep
prototype search app
facilitate use of the
registry by stakeholders

- Foster competitive a
marketplace

Credentials Addressed by Credential Engine

Registry Includes All Kinds of Credentials,
Credentialing Organizations, and
Quality Assurance Bodies



Apprenticeship



Badge



Certificate



Certification



Degree



Diploma



License



Micro-Credential



QA Bodies

Timeline: Transitioning to Scale

rior to Jan. 2017

Pilot CTDL, registry, app
Recruit/add participants
Evaluate results
Fine-tune registry & Workit
pp

2017

- Scale-up with registry participants, provide assistance as needed
- Identify state partners to demonstrate state applications

April - forward

- Credential Engine Board & Executive Director in place; advised by advisory groups
- Test process to allow credential issuers to self-publish to the registry

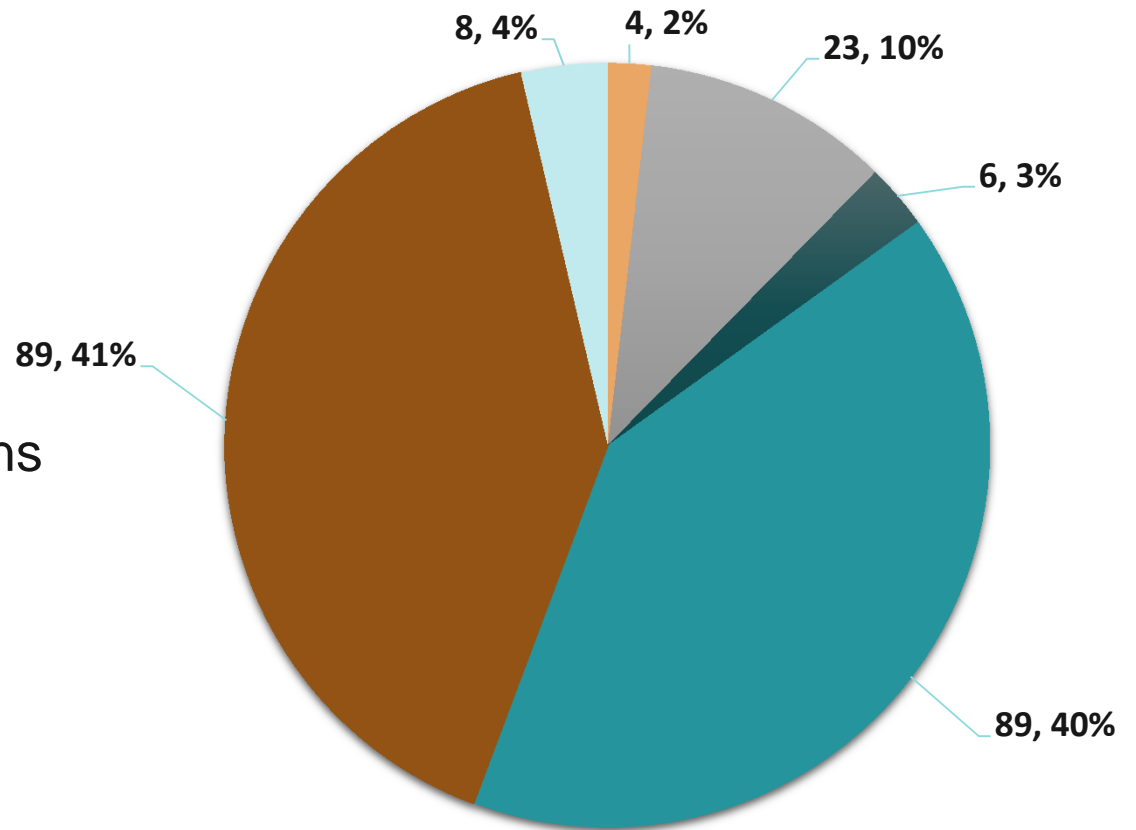
Credentialing Partners

Profile of Current Registry Participants

Participant Organizations (April 2017)

- total participants**
- Private Colleges & Universities
 - for Profit Colleges & Universities
 - Public Colleges & Universities
 - Community Colleges
 - Industry Certification Bodies
 - Industry Certificate Granting Institutions
 - Quality Assurance Organizations
 - Other

Credentials (as of April 17, 2017 = 209)



Associate's Degree Bachelor's Degree Master's Degree Certificate Certification

Benefits to Participants

Gain greater visibility to vast market of students, employers, others.

Demonstrate commitment to credential and QA transparency.

Be at forefront of groundbreaking technology effort driving new credentialing ecosystem.

Receive suite of services beneficial to short—and long-term technology planning including:

- technical and non-technical materials
- information about Web 3.0 technologies
- roadmap document showing where they are now and what steps can be taken to enable W3C vision for Linked Data

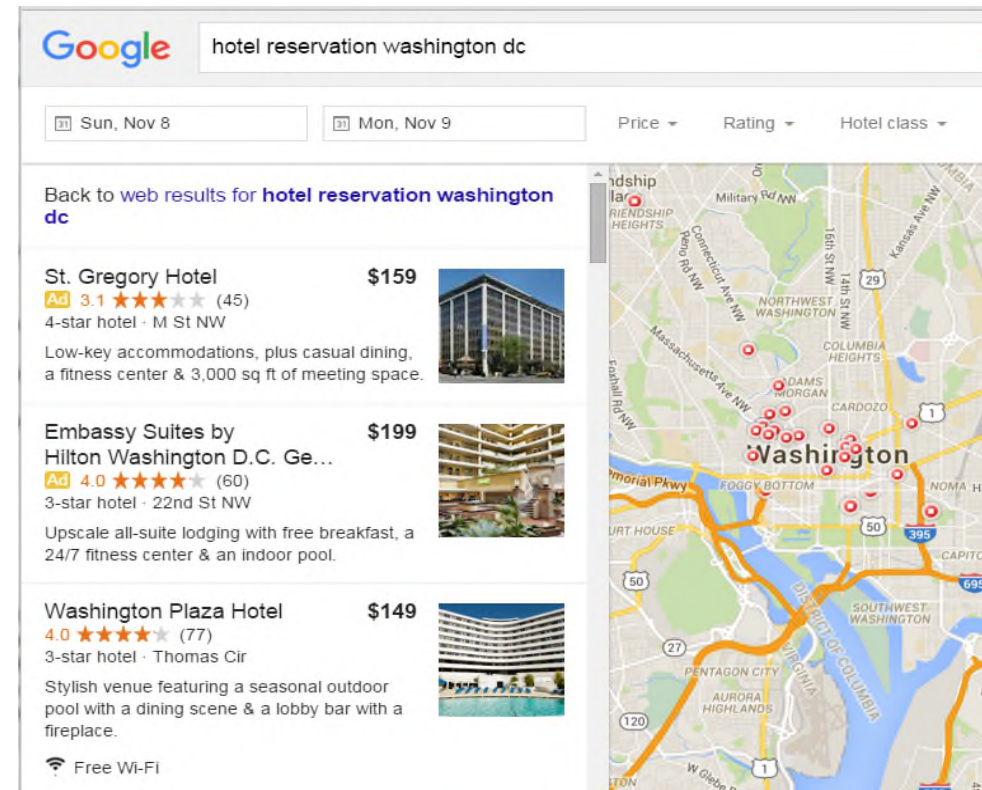
Influence initiative by providing feedback throughout the process.

Moving to a Web of Linked Data: Improving Web Formats

The World Wide Web is moving from a web of “linked” documents to “linked data.”

Google, job and travel aggregators use common terminology (metadata) that has been accepted as web standard (e.g., Schema.org)

Using consistent metadata for key features of credentials, the registry enables job seekers, students, workers, and employers to search for and compare credentials, just as travel apps are used to compare flights, rental cars, and hotels.



The screenshot shows a Google search interface for "hotel reservation washington dc". The search results are filtered for "Sun, Nov 8" and "Mon, Nov 9". The results list three hotels:

Hotel Name	Price	Rating	Star Rating	Reviews
St. Gregory Hotel	\$159	3.1	4-star	(45)
Embassy Suites by Hilton Washington D.C. Georgetown	\$199	4.0	4-star	(60)
Washington Plaza Hotel	\$149	4.0	4-star	(77)

The map on the right shows the Washington D.C. area with red pins indicating the locations of the hotels listed in the results.

**The web is moving to Linked Data.
Don't get left off the map!**

Credential Engine Technologies

Credential Engine (CE) Technologies



**Credential
Transparency
Description
Language (CTDL)**
– DR6 Metadata
Infrastructure



CTDL Editor –
Transforms Partner's
credential and quality
assurance information
to CTDL and publishes
it to the Registry.



**Credential
Engine
Registry –** Set of
services and
repository.



**Credential Find
Search App
Prototype –** Ba
search to
demonstrate,
review, and ge
feedback.

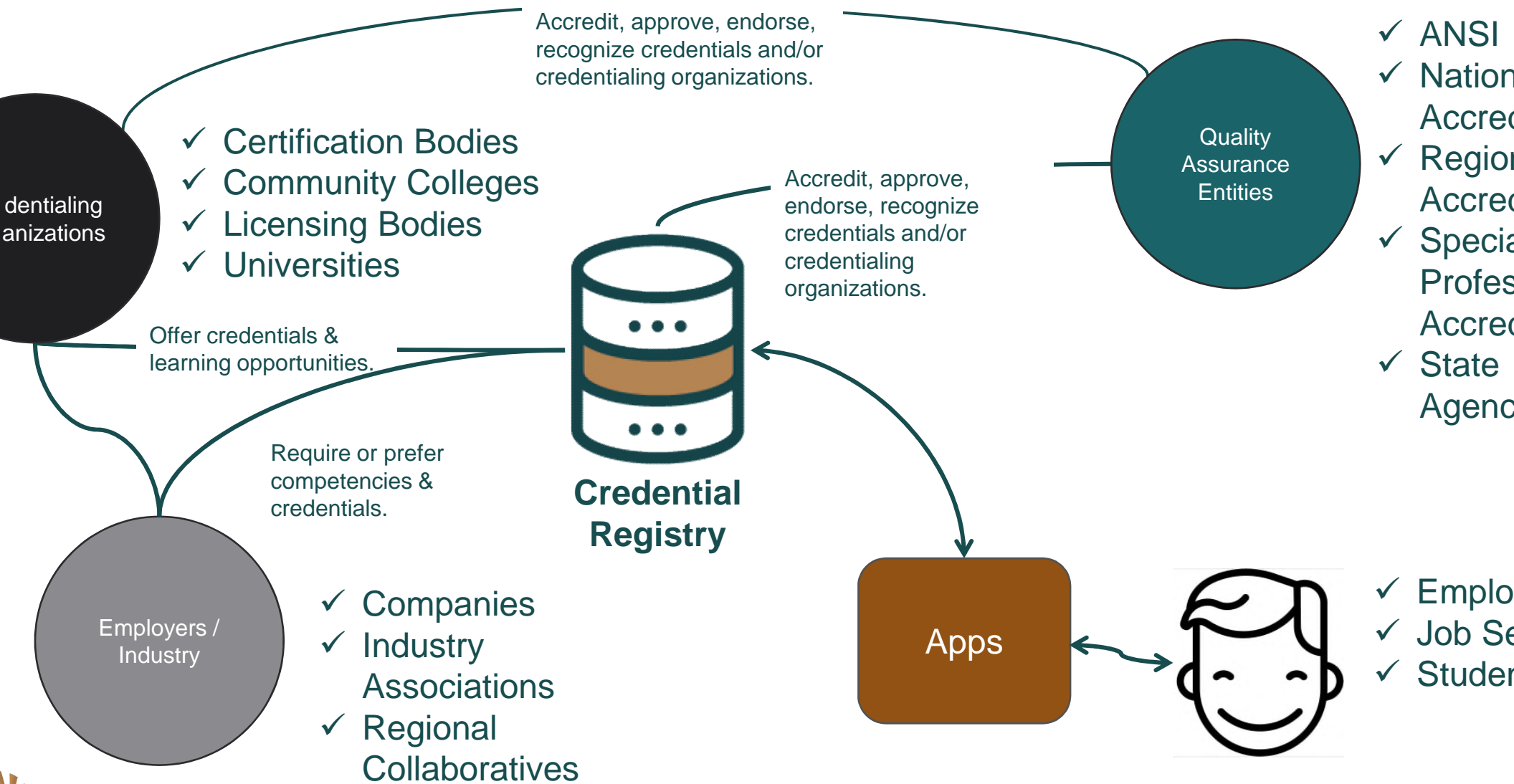
Slide 14

DR6

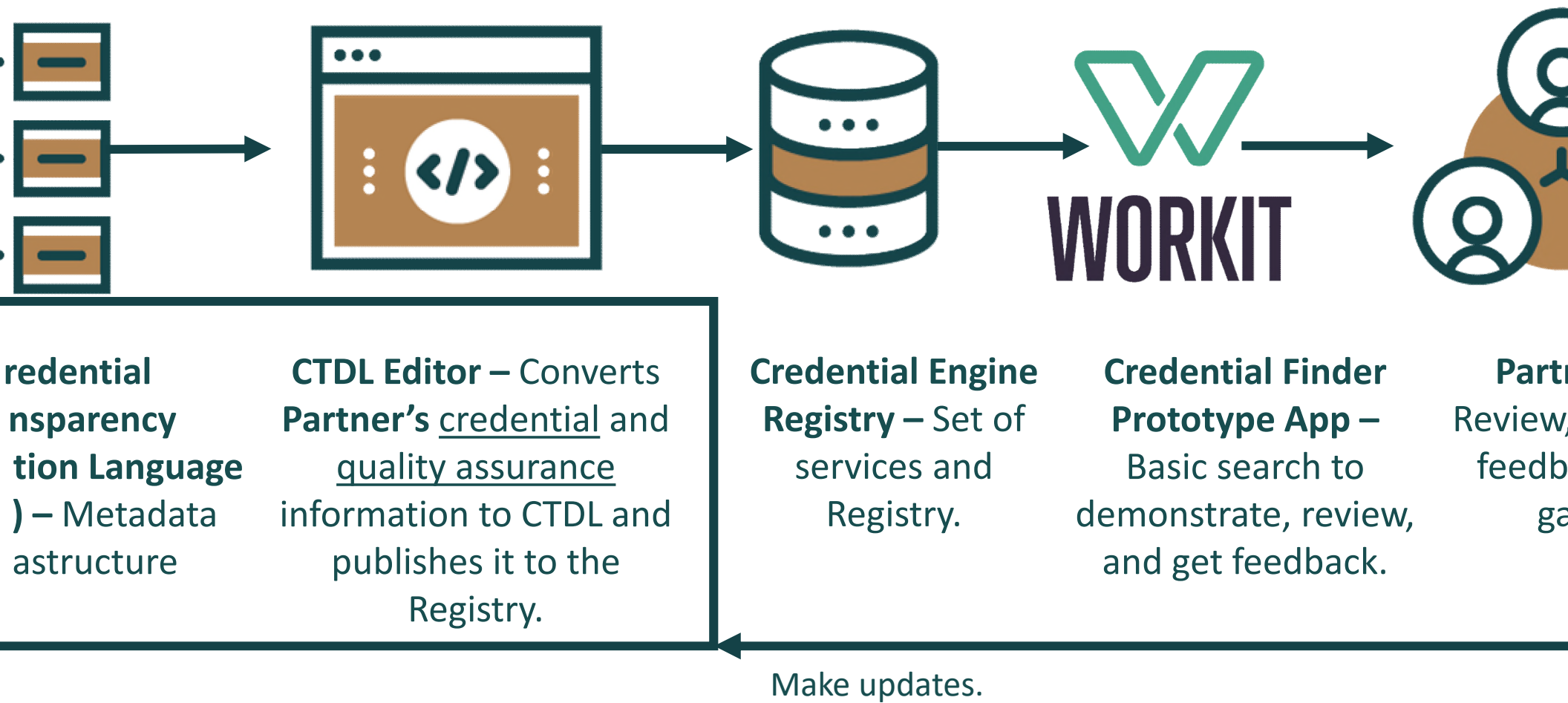
bolded hyphens next to CTDL and CTDL Editor for consistency

David Reischman, 5/1/2017

Example Stakeholder Relationships



How it Works Now



Credential Transparency Language – Metadata structure

CTDL Editor – Converts Partner's credential and quality assurance information to CTDL and publishes it to the Registry.

Credential Engine Registry – Set of services and Registry.



Credential Finder Prototype App – Basic search to demonstrate, review, and get feedback.

Partner Review and feedback

Make updates.


Pilot Period

- Design/Develop CE technologies and garner feedback



Maintaining Quality on the Registry at Scale

 Denotes CE quality control already in place or in planning.

 **What are key quality indicators (apparent on the 'face' of the data)?**

- Existence of recognized QA.
- Explicit statements of competencies.
- Metadata level of completeness.








What are key quality indicators (not apparent on the 'face' of the data)?

- Accuracy of the assertions.
- Currency of the credential information.




Everything must scale.

 **Automated quality mechanisms:**

-  Data validation including minimum expected data.
-  Forward notification of 3rd party assertions (e.g., "accreditedBy") (notify/embargo assertion).
-  Periodic reaffirmation of credential currency (embargo/notify).
-  Reports.
-  Systematic link checking (embargo/notify).



Community, Capacity & Consensus:

-  Advisory/Stakeholder input.
- Code of Ethics.
- Crowd "reporting" (from broken links to sp)
- Crowd rating & ranked ordering of display
- Data auditing review service.
- Expert/peer review of credentials.
-  Open CTDL with guidance.
-  Technical assistance & training.

Credential Transparency Description Language & Competency Frameworks

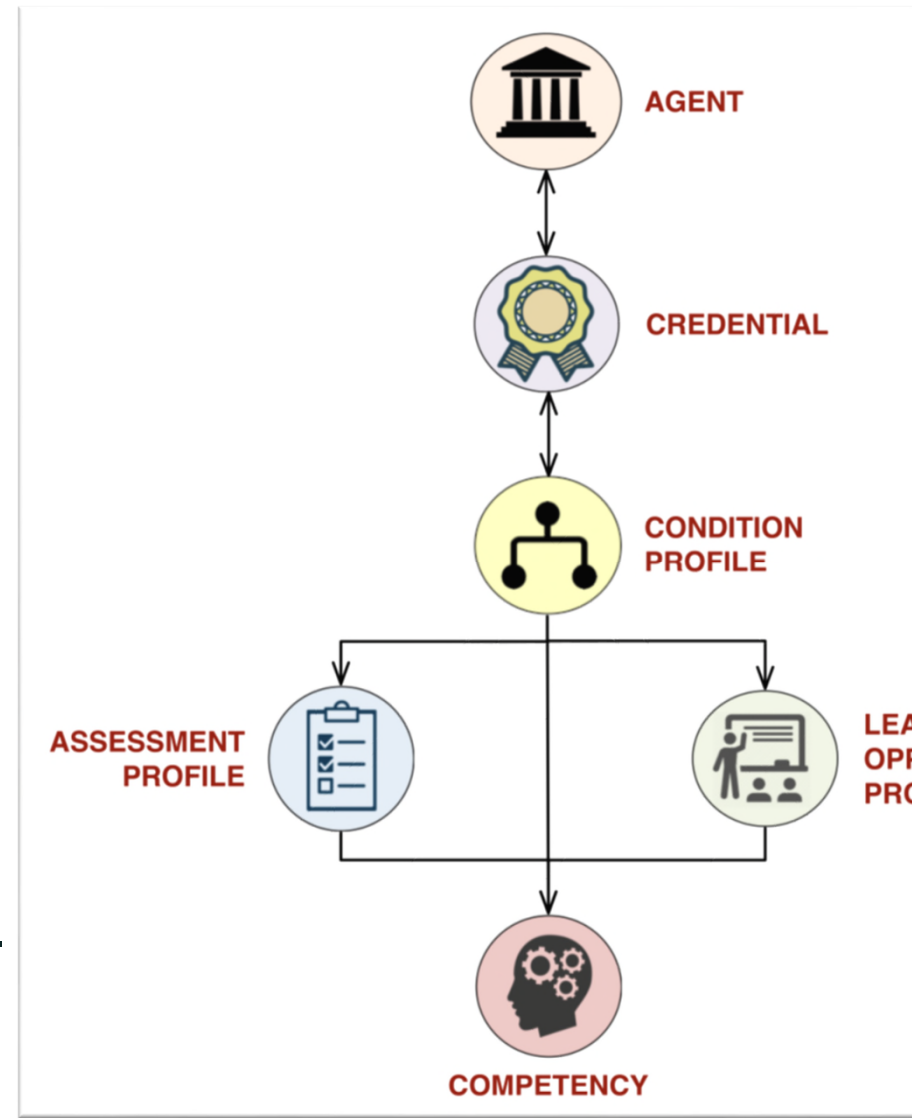
Credential Transparency Description Language (CTDL)

about:

CTDL is a dictionary of terms for descriptions of credentials offered.

Enables simple statements and rich descriptions of entities in the credentialing ecosystem.

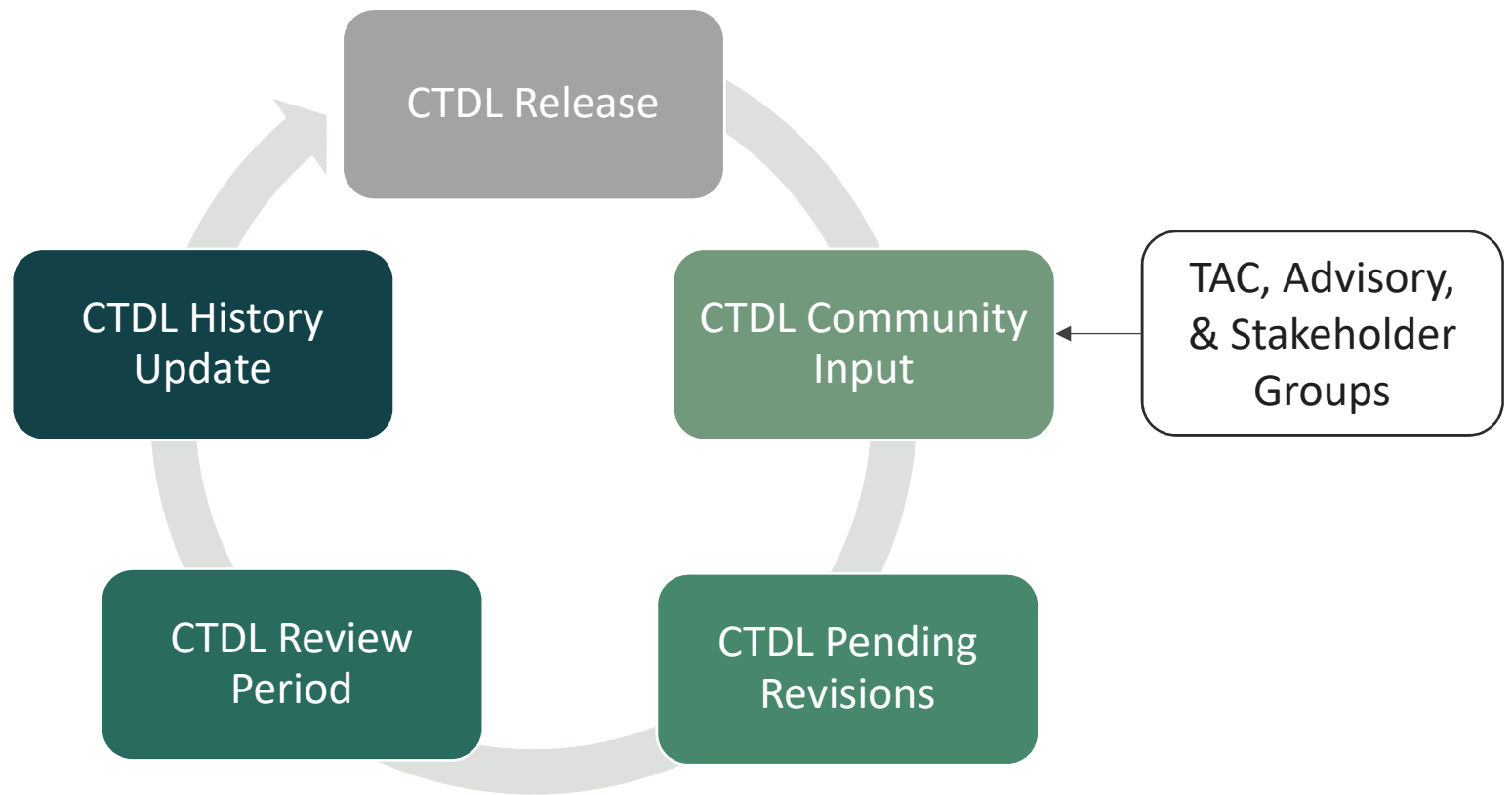
Modeled as a directed graph using the W3C's Resource Description Language [RDF] for describing data on the Web. RDF extends the linking structure of the Web to use URIs to name the relationship between things as well as the two ends of the link (this is usually referred to as a "triple"). Using this simple model, RDF allows structured and semi-structured data to be mixed, exposed, and shared across different applications.



CTDL Continuous Review

CTDL is updated periodically through "releases" (stable snapshots).

Next release is June30, 2017



R11 Linking Data & Harmonizing

The CTDL is developed based on important tenets:

The CTDL is modeled using W3C specifications for Linked Data.

Build off schema.org.

Harmonize with key standards bodies and promote wide adoption.



Slide 22

DR11

tabbed title to be at the same level as the others

David Reischman, 5/1/2017

Credential Transparency Description Language (CTDL)

Declaring Name, Purpose, Type of Credential and Credentialing Organization

- credentialing organization identification
- credential organization type
- credential identification
- credential type
- purpose of credential
- where credentialing is offered
- jurisdiction

Declaring What Is Inside the Credential

- credentialing eligibility requirements
- competencies/learning outcomes required to attain credential
- assessments required to attain credential
- education and training for the credential
- time required to attain credential
- credentialing costs
- maintaining credential
- credential removal
- credential holder authentication
- version management
- employer engagement

Declaring Other Key Characteristics and Connections

- primary scope of application: subject/discipline area
- primary scope of application: career preparation and advancement
- role of occupational regulation and licensing
- geographic portability of credential
- connections to other credentials
- Career Pathway Connections**
- external quality assurances
- employer recognition
- Number and characteristics of credential holders**
- Employment and earnings of credential holders**

**Italicized descriptors are not yet*

Credential Transparency Description Language (CTDL) Quality Assurance

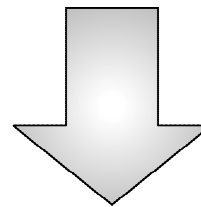
Use & Scope of the QA Body	QA Process	Public Information about QA Decisions	Additional Information
<p> Name of QA body Main purpose Missions/Objectives What is accredited, endorsed, approved, recognized? How is QA used? Primary geographic scope Minimum period of approval, recognition, endorsement, accreditation? When did the body begin operating? </p>	<ul style="list-style-type: none"> ▪ Activities used to assess credential in QA process ▪ Process used to validate quality criteria? ▪ Quality criteria, standards, and requirements used in QA process ▪ Outcomes reviewed as part of QA process ▪ Stakeholders involved in developing quality criteria ▪ Criteria for selecting and evaluating assessors and reviewers? 	<ul style="list-style-type: none"> ▪ Types of decisions made and how they are defined ▪ Directory of accredited, approved, recognized and/or endorsed providers and their current status ▪ Information about QA body made public with request ▪ Information about QA body made public without request 	<ul style="list-style-type: none"> ▪ General Information ▪ Policies and procedures for managing conflict of interest, complaints, appeals ▪ External recognition

CTDL Dictionary to Applications

CTDL Dictionary

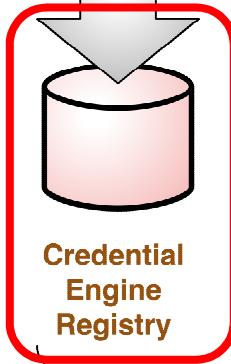
(The Credentialing Community's Domain Model)

Open & Unconstrained Vocabulary

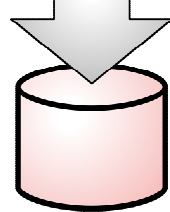


1-n APPLICATION PROFILES

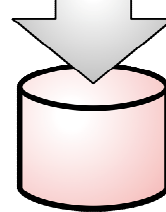
Tightly Constrained, Selective Use of CTDL Vocabulary Terms



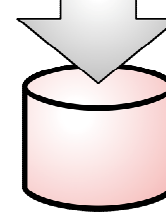
Credential Engine Registry



Learning Management System



Verifiable Claims Service



Transcript / Portfolio Service



University Credential Offerings



Board Certifications

Examples of Content Management System Records

Examples of Webpage Markup

ETDL Profile of ASN-DL

DL application profile for the description of competency frameworks using the Achievement Standards Network Description Language (ASN-DL).

Developed through NSF funding between 1999-2013

What is ASN-DL intended to do?

- Designed to consistently describe any assertion of knowledge, skill, and ability.
- Serves as a data representation of the canonical (official) version.
- Supports the Semantic Web and Linked Data processes through its basis in W3C's Resource Description Framework (RDF).
- Supports cross-framework comparison and linking by means of a common abstract data model.
- Supports design of profiles through refinement and extension:
 - Refinement through creation of subproperties and subclasses to meet local/national needs;
 - Extension through the judicious addition of new properties and classes.
- Express competencies at any (arbitrary) level of granularity.

Profiles exist for the U.S., Australia, and Canada—this work will be the CE-ASN Profile

ASN model...

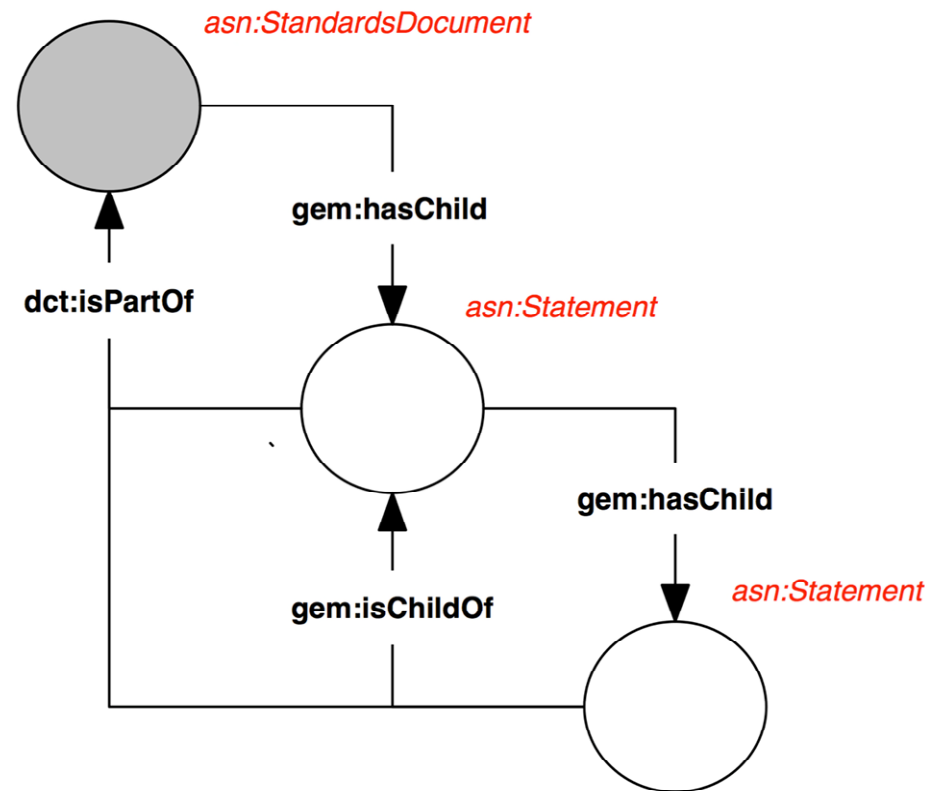
wo-Entity Model:

Standards Document

The competency framework as a whole including provenance information

Statement

The individual competencies of which a competency framework is comprised
Each concept is declared using "isPartOf" to be a member of one (or more) competency frameworks.



Term Declarations

Properties

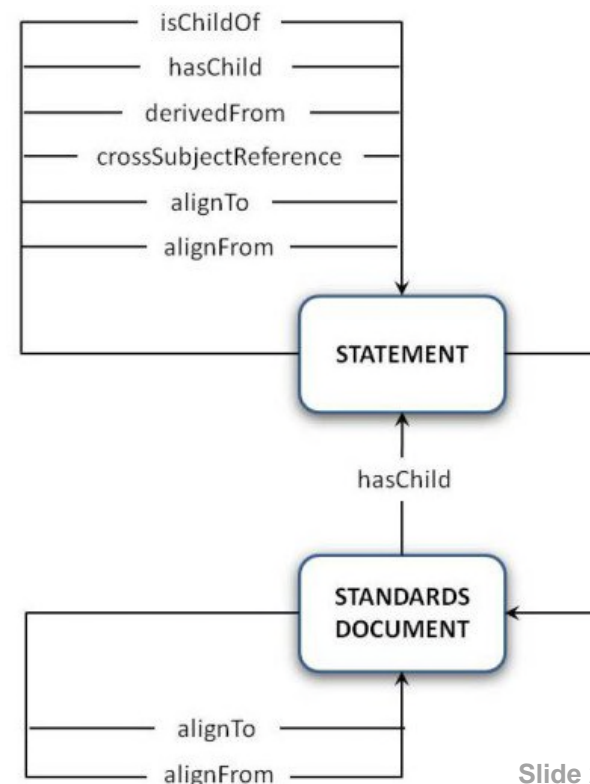
- 5.1.1 **Align From**
- 5.1.2 **Align To**
- 5.1.3 **Alternative Statement Notation**
- 5.1.4 **Assesses Competency**
- 5.1.5 **Authority Status**
- 5.1.6 **Broad Alignment**
- 5.1.7 **Broad Correlation**
- 5.1.8 **Comment**
- 5.1.9 **Comprised Of**
- 5.1.10 **Concept Keyword**
- 5.1.11 **Concept Term**
- 5.1.12 **Cross Subject Reference**
- 5.1.13 **Derived From**
- 5.1.14 **Exact Alignment**
- 5.1.15 **Exact Correlation**
- 5.1.16 **Export Version**
- 5.1.17 **File Created [Deprecated]**
- 5.1.18 **Identifier**
- 5.1.19 **Indexing Status**
- 5.1.20 **Jurisdiction**
- 5.1.21 **List ID**
- 5.1.22 **Local Subject**

- 5.1.23 **Major Alignment**
- 5.1.24 **Major Correlation**
- 5.1.25 **Minor Alignment**
- 5.1.26 **Minor Correlation**
- 5.1.27 **Narrow Alignment**
- 5.1.28 **Narrow Correlation**
- 5.1.29 **Prerequisite Alignment**
- 5.1.30 **Prerequisite Competency**
- 5.1.31 **Proficiency Level**
- 5.1.32 **Publication Status**
- 5.1.33 **Repository Date**
- 5.1.34 **Skill Embodied**
- 5.1.35 **Statement Label**
- 5.1.36 **Statement Notation**
- 5.1.37 **Teaches Competency**

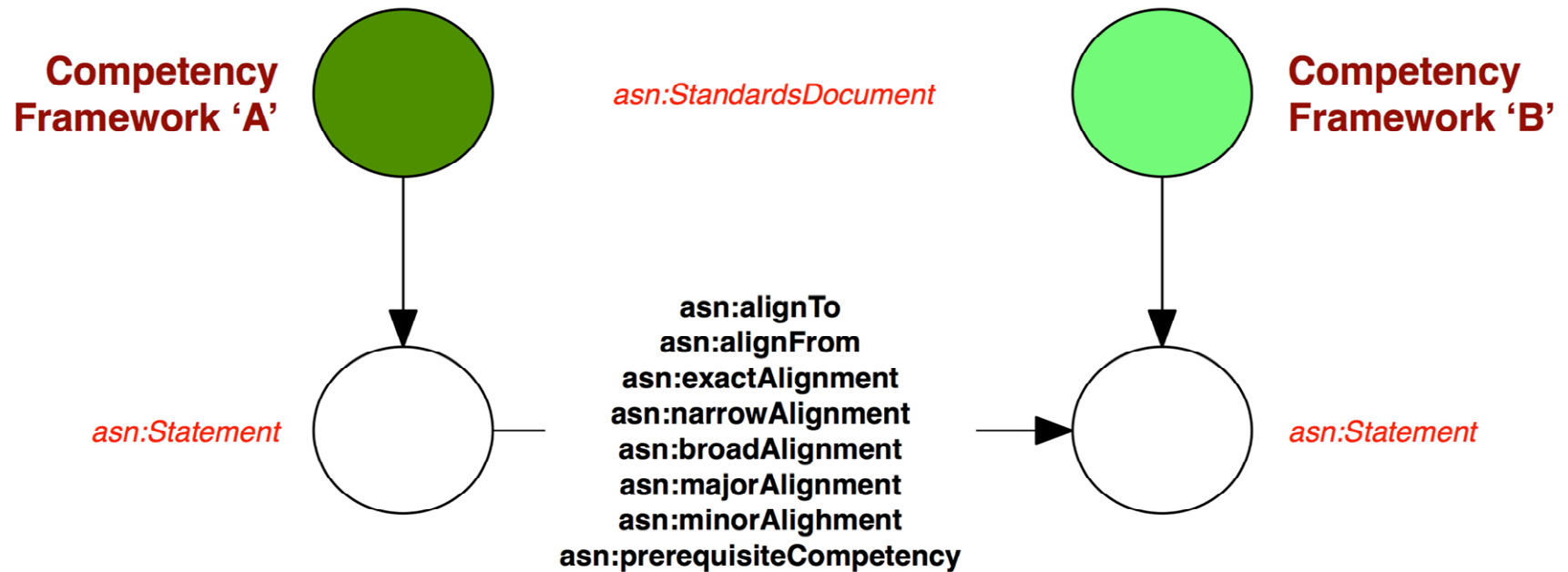
*** Includes additional core properties from Dublin Core**

5.2 Classes

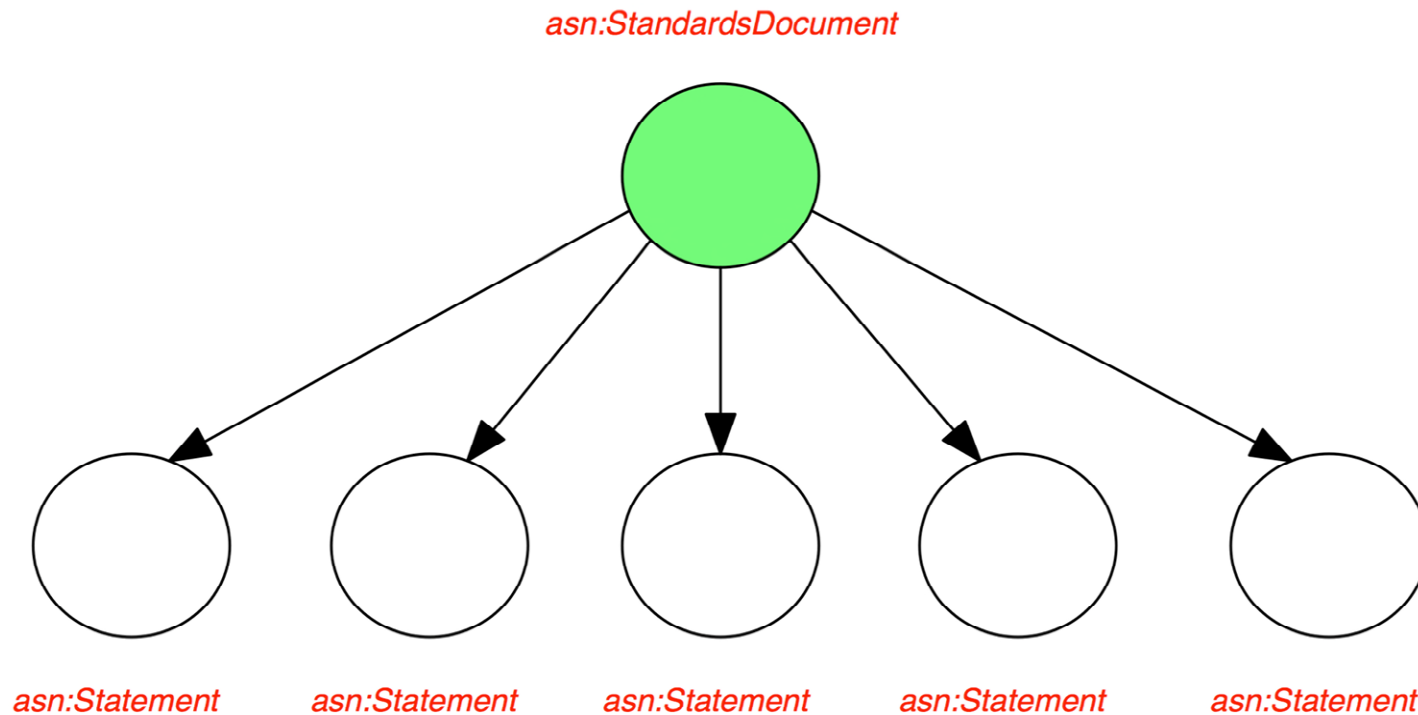
- 5.2.1 **Competency Map**
- 5.2.2 **Correlation Resource**
- 5.2.3 **Jurisdiction Encoding S**
- 5.2.4 **Learning Resource**
- 5.2.5 **Map**
- 5.2.6 **Standard Document**
- 5.2.7 **Statement**
- 5.2.8 **Status Encoding Schem**

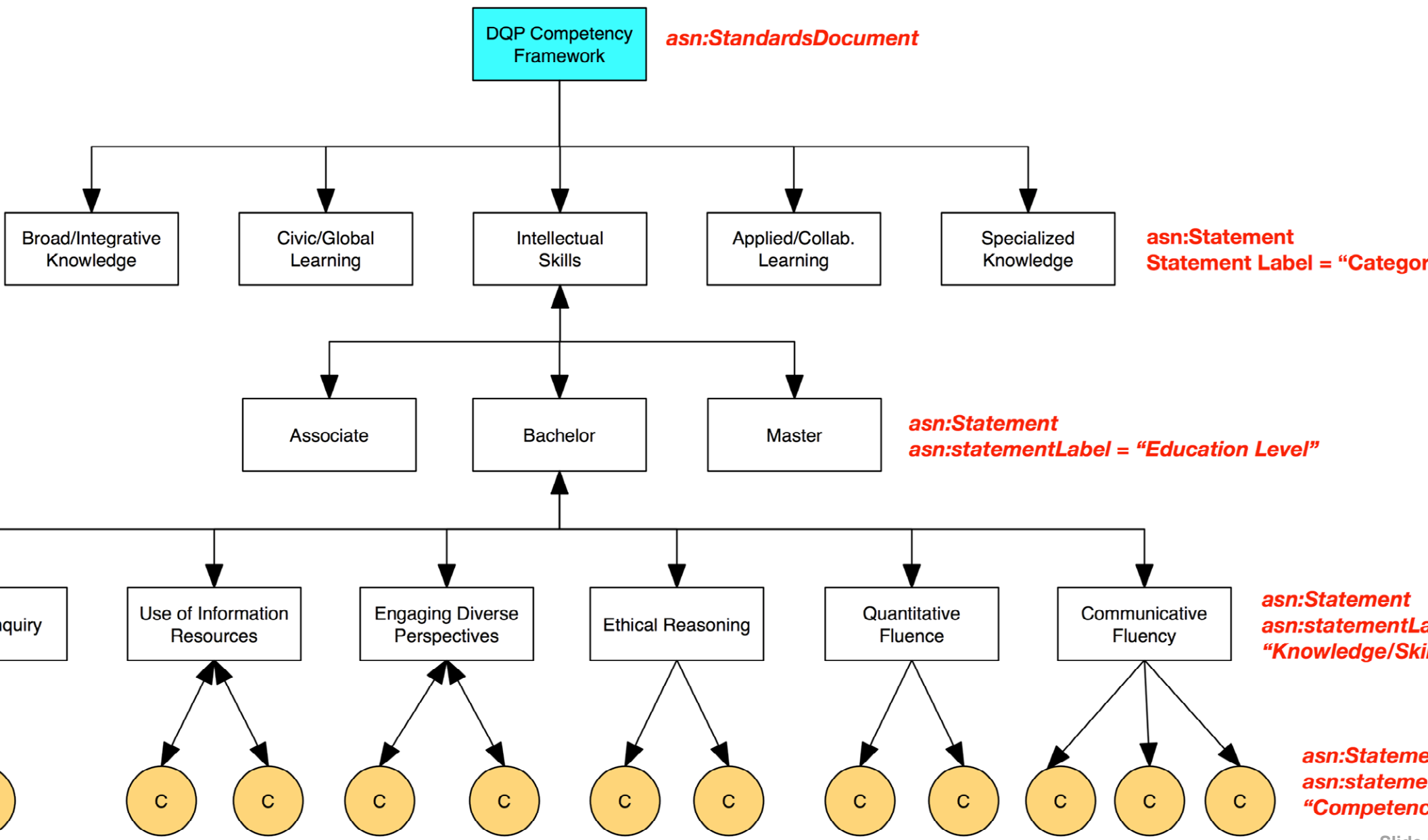


Competency-to-Competency mapping...



Flat "list" concept scheme...





Credential Registry & CTDL Editor

CE Team Works with Partners to Populate CTDL Editor

Stem Cell Technologies Certificate Madison Area Technical College Certificate

Stem Cell Technologies Certificate Madison Area Technical College Certificate

Credential ▾

Credential Name Stem Cell Technologies Certificate
The official name of the credential.

Alternate Name
An alternate name or acronym for the credential.

Owning Organization *Select the organization that 'owns' this credential. Use the custom filter of 'My Associated Organizations' to filter to only organizations with which you are associated.*

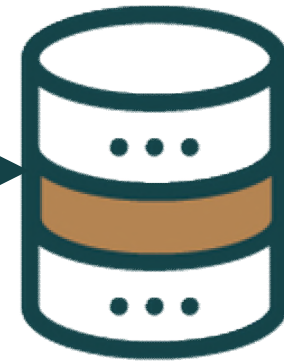
Search
Select an optional Custom Filter
Search... Search Reset

Owning Organization
Madison Area Technical College Edit Remove
With eight convenient locations in Madison and four regional campuses throughout South-Central Wisconsin, it's easy for students throughout Madison College's 12-county district to access our many educational offerings.

Create New Organization Add New Organization (POPUP)

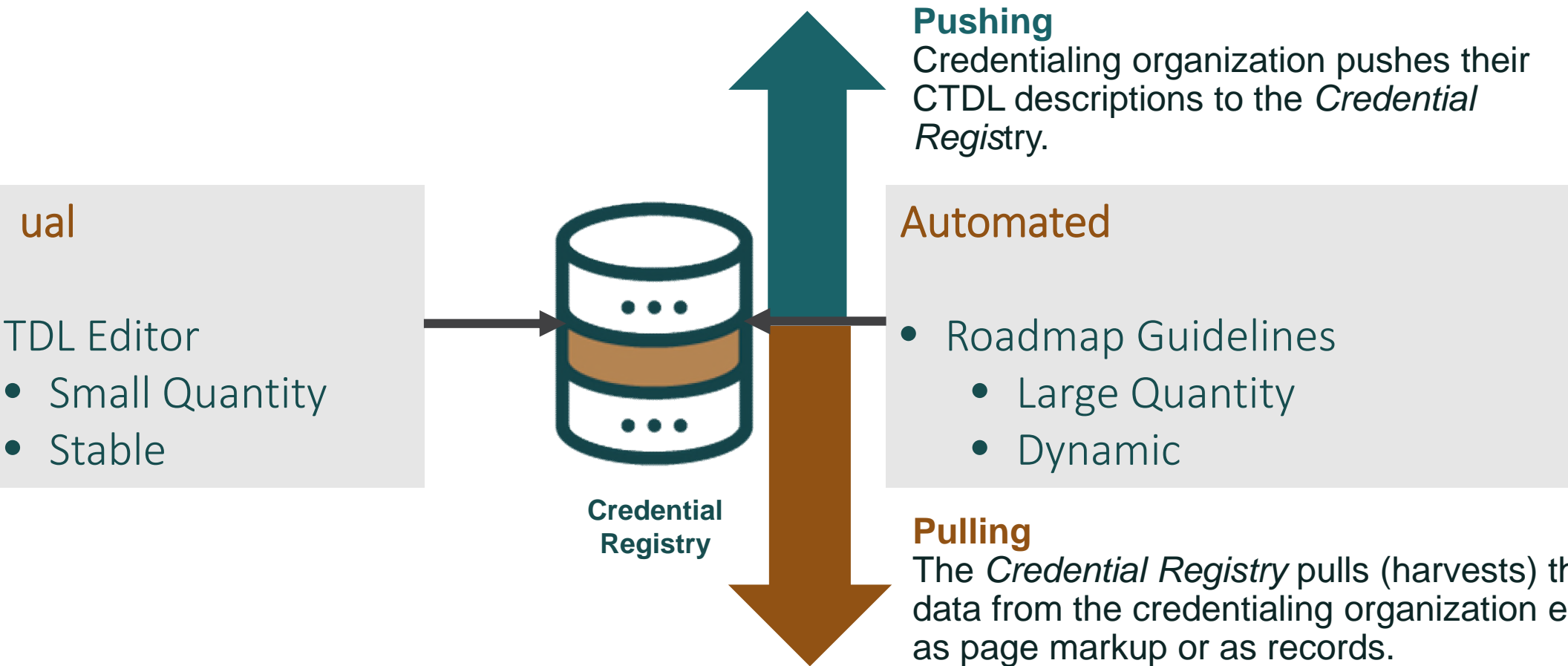
Roles for Owning Organization *Select the type(s) of relationship the owning organization has to this Credential. Check OWNED BY, and all others that apply.*

- Owned By
- Approved By
- Offered By
- Recognized By
- Revoked By



WOR

Co-Designing Automated Updating



<http://credreg.net/registry>

End-to-End Partner Work Flows

Step 1:

Identify the Type(s) of Data

Structured Data

Step 2:

Local Data Analysis & Mapping to CTDL

Roadmap A

CTDL Mapping

Roadmap B

CTDL Mapping

Roadmap C

CTDL Mapping

Roadmap D

RDF-izers for CSV, XML, Excel...

CTDL Mapping

Step 3:

Data Serialization & Storage

Relational Data

Relational Data

Data Source API

RDF Store

Step 4a:

Data Publication

RDB-to-RDF Wrapper (e.g., D2R)

CMS RDFa Output (e.g., Drupal)

Custom Linked Data Wrapper

Linked Data Interface (e.g., Pubby)

Step 4b:

Data to Registry

Linked Data on the Web and to Credential Registry

Workit™ Search App Prototype



DISCOVER CREDENTIALS

[Credential Finder Prototype App] is the ultimate toolkit for students, job-seekers, professionals, and employers who want to build a path toward the right career or new hire.

Search

Credentials



For

Start typing to search...

Search

Workit™ Search App Prototype

Participants view information about the small number of credentials they have selected for testing on the registry in the context of an app.

Shows the credential information from the Registry.

Provides context for understanding the Credential Transparency Description Language (CTDL) and why it's important to have transparent and comparable credential information.

Requires a password.

The screenshot displays the Workit Search App Prototype interface. At the top, the logo "WORKIT" is accompanied by the text "Discover Credentials Powered by Credential Registry Prototype Phase". A search bar contains the text "Credentials" and "Start typing to search...". Below the search bar, it indicates "No filters selected." and "Found 225 results". The results are sorted by "Sort A-Z" and can be viewed as a "List" or "Map".

The first result is "21st Century Skills for Workplace Success" by NOCTI. It includes a "Certificate" icon and a "Compare" button. The description states: "The 21st Century Skills for Workplace Success industry-based credential is included in NOCTI's Employability Skills assessment battery. Employability Skills assessments measure the skills that represent critical knowledge needed for success in the workplace. Employability Skills assessments offer only a written component and can be used at the secondary, post-secondary, and adult levels. Employability Skills assessments can be delivered in an online or paper/pencil format. The current assessment content is based on input from secondary, post-secondary, and business/industry representatives from the states of California, Georgia, Michigan, Ohio, Washington, and the District of Columbia." It also lists "1 Quality Assurance", "3 Levels", "18 Subjects", and "52 Competencies".

The second result is "A.A.S. in Radiologic Technology" by Ivy Tech Community College of Indiana. It includes an "Associate's Degree" icon and a "Compare" button. The description states: "The Imaging Sciences Program offers a degree in radiologic technology. A radiographer is a professional who is skilled in the art and science of radiography and is able to apply scientific knowledge, problem-solving techniques, communication, and the use of high tech equipment, while providing quality patient care. The Associate of Applied Science program includes courses in the following areas: technique, exposure, positioning, protection, physics, patient care and ethics. Clinical practice and supplemental instruction are provided in accredited hospitals and clinics. The Imaging Sciences program is a selective admission program. When you apply to the College, you will be accepted into Healthcare Specialist with a concentration in Imaging Sciences while you complete the prerequisite requirements. The Imaging Sciences program accepts a limited number of students each year and there is a separate application process. Contact your campus of interest below for more details. Students who are admitted to the program will be required to pay for and submit to a criminal background check, drug testing and physical exam. The details and process will be provided at an orientation. Please contact the program faculty for more detailed information." It also lists "2 Connections", "2 Quality Assurance", and "1 Occupation".

At the bottom, a green navigation bar shows "0 Credentials", "0 Organizations", "0 Assessments", "0 Learning Opportunities", "Toggle Details", "Compare Selected", and a trash icon.

Q & A



Contact Information

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BetterCreds