The Configurable Data Curation System (CDCS)

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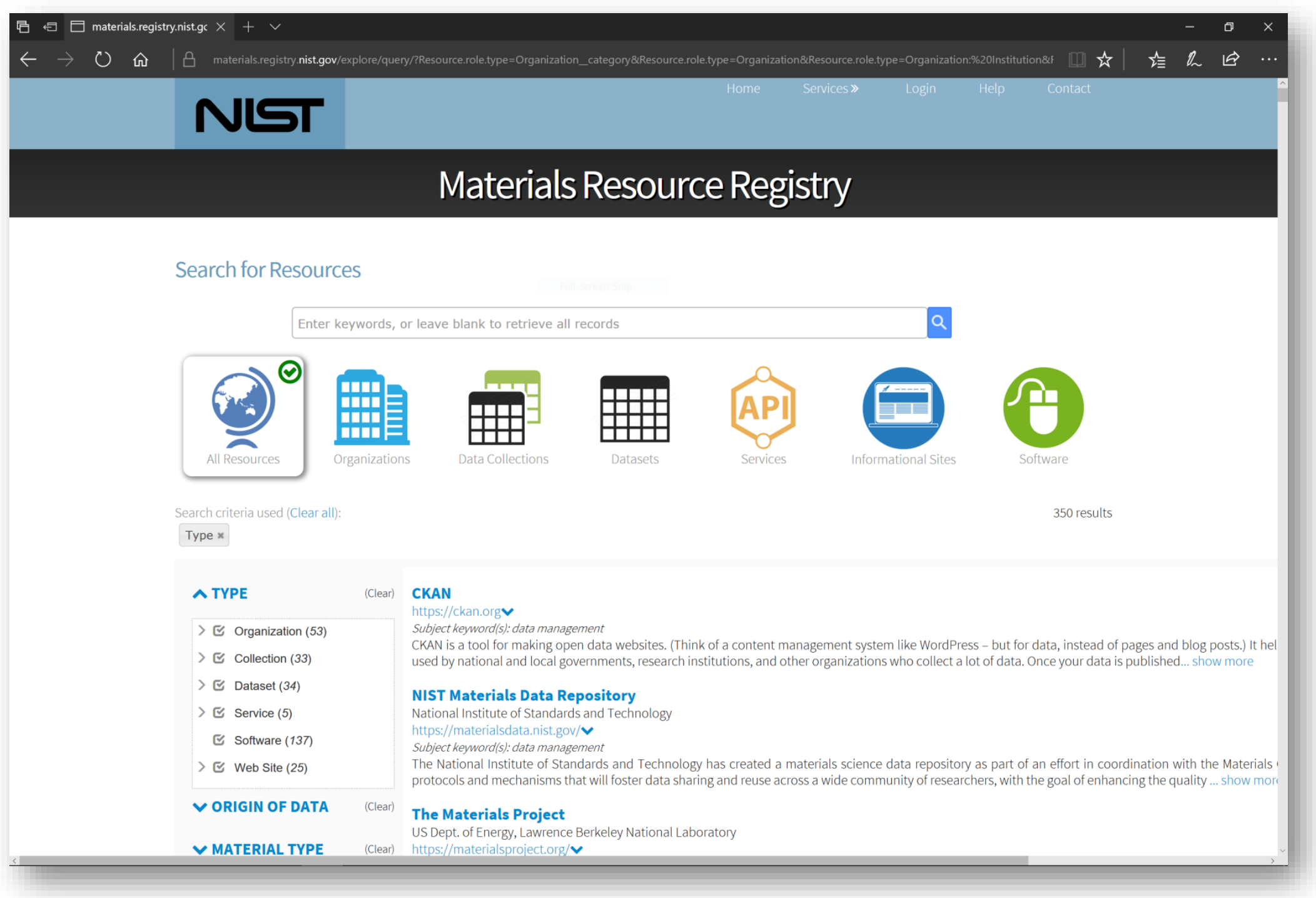
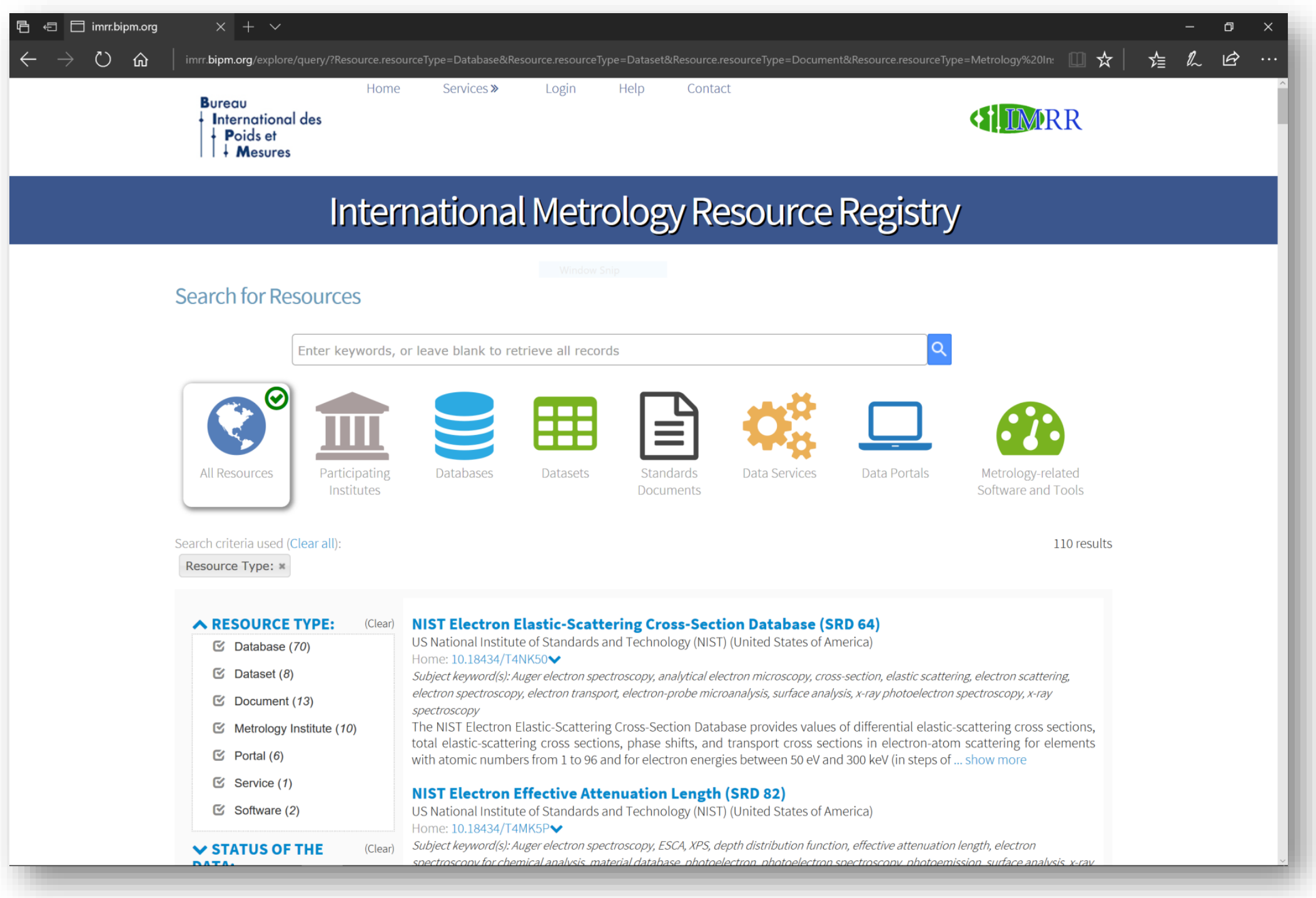
Registries

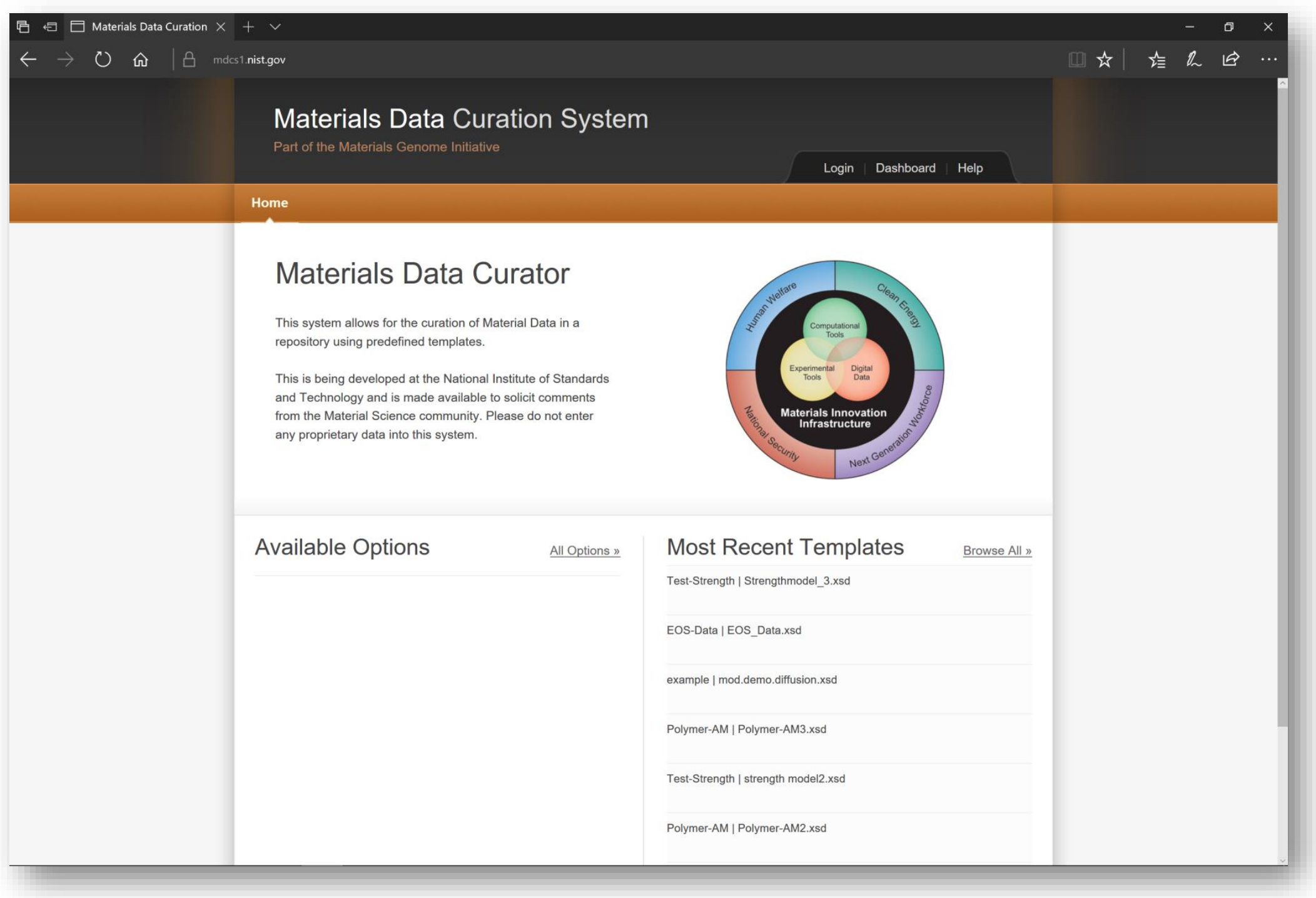
The CDCS empowers communities to deploy and operate specialized registries by enabling **Findability** of data and resources. Examples for materials and metrology are shown below.





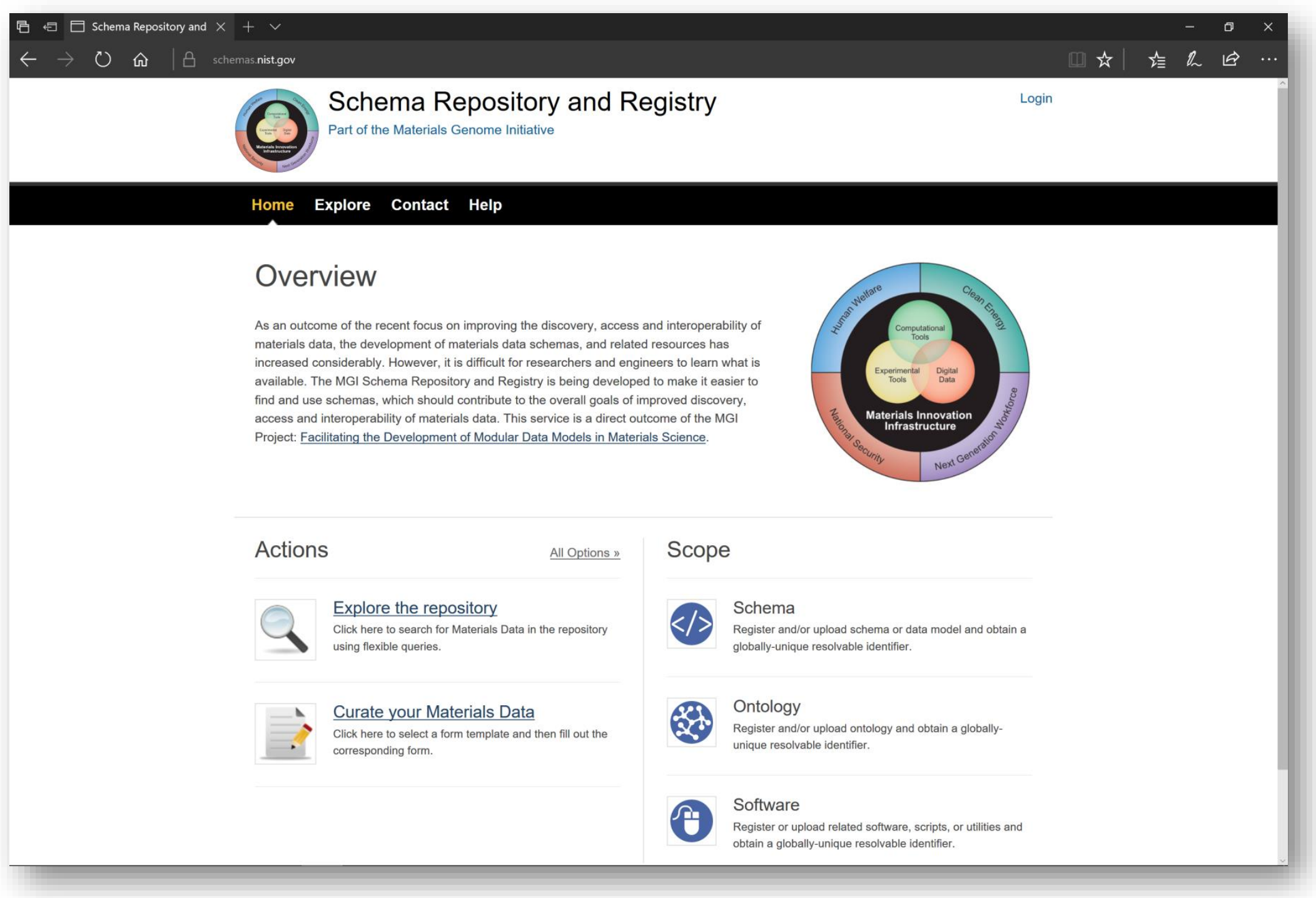
Data Ingest

The CDCS enables **Acquisition** and **Storage** of data in **Interoperable** formats early in the data lifecycle. For example, the Materials Data Curation System[2] (MDCS) is shown below. The MDCS API enables automated curation.



Schemas

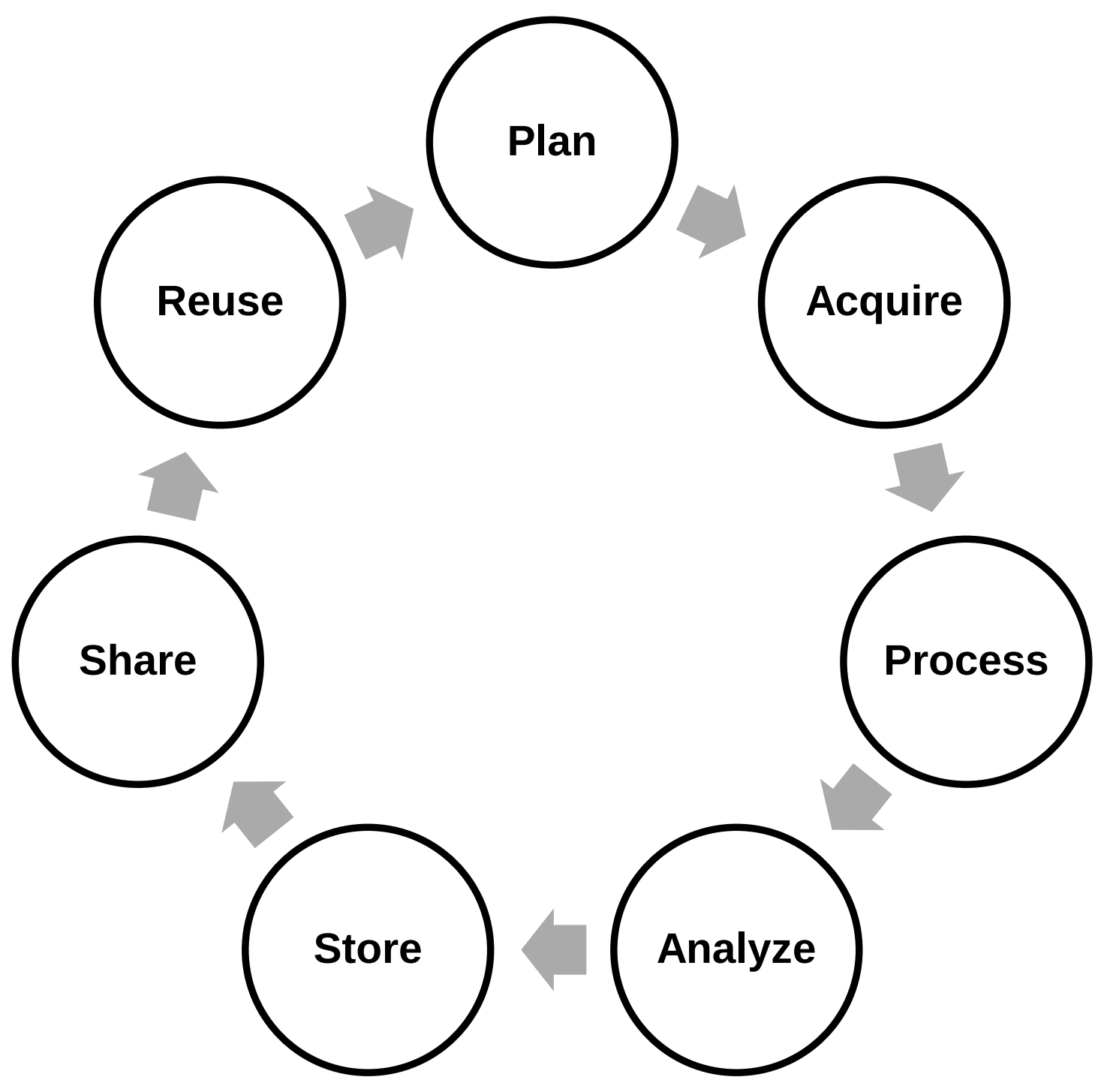
The CDCS enables **Interoperability** of data and metadata via XML technologies such as XML Schemas. In this way, it can support existing XML-based data standards, such as MatML, ThermoML, and MTConnect, which have a stable following in scientific and engineering communities. The CDCS also support data reuse through creation and exchange of modular, community-based schemas, supporting diverse users who leverage shared concepts. The MGI is developing a registry and repository for supporting this kind of exchange which will enable the **Findability**, **Accessibility**, and **Reuse** of these resources.



Vision

The Configurable Data Curation System (CDCS) aims to support and enable:

- An Effective Research Data Lifecycle
- FAIR Data Principles[1]
  (Findable, Accessible, Interoperable, and Reusable)
- Modular System Design



Visit:
https://cdcs.nist.gov/

Findable

- (meta)data are assigned a globally unique and persistent identifier
- data are described with rich metadata
- metadata clearly and explicitly include the identifier of the data it describes
- (meta)data are registered or indexed in a searchable resource

Accessible

- (meta)data are retrievable by their identifier using a standardized communications protocol
  - the protocol is open, free, and universally implementable
  - the protocol allows for an authentication and authorization procedure, where necessary
- metadata are accessible, even when the data are no longer available

Interoperable

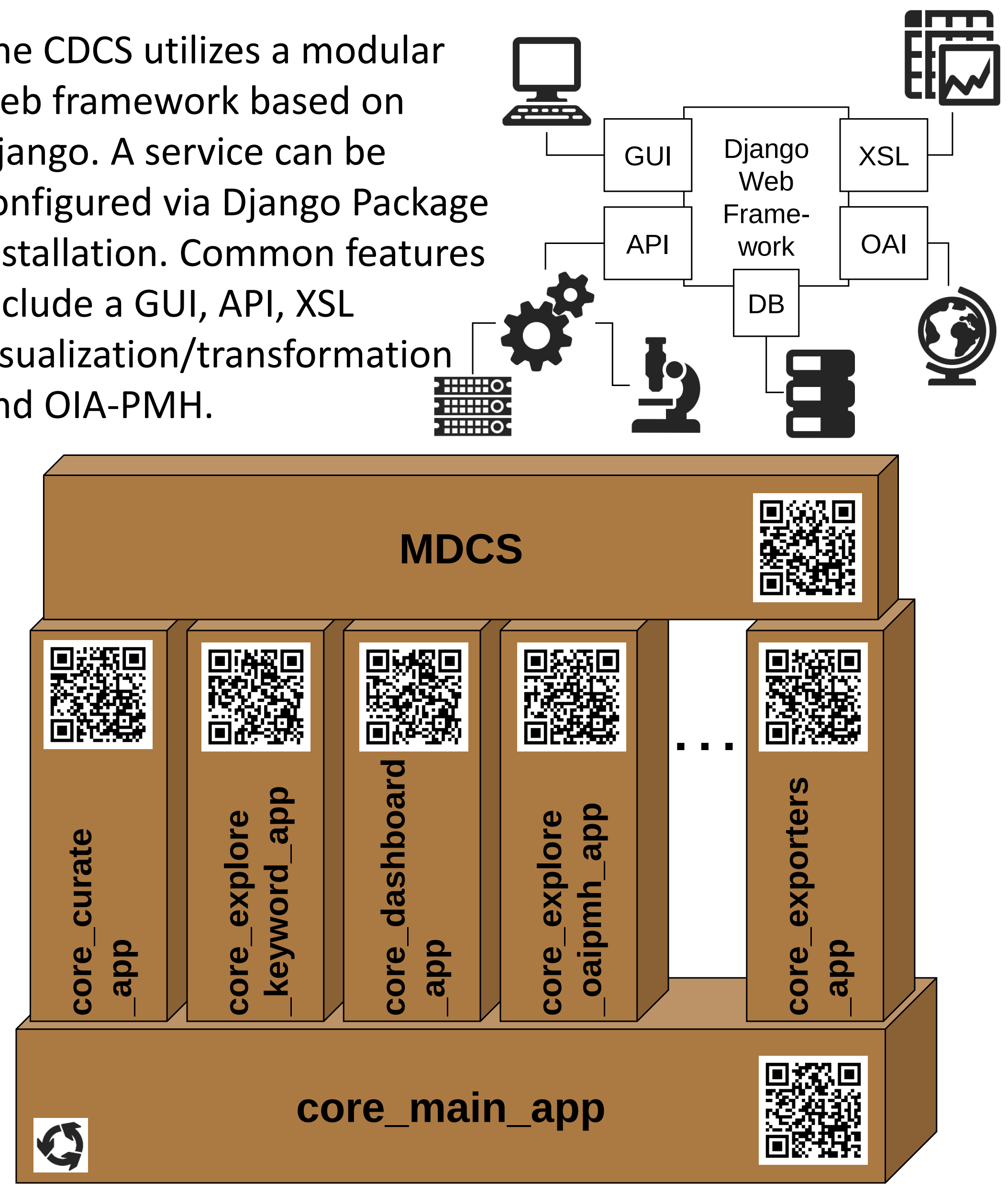
- (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.
- (meta)data use vocabularies that follow FAIR principles
- (meta)data include qualified references to other (meta)data

Reusable

- meta(data) are richly described with a plurality of accurate and relevant attributes
  - (meta)data are released with a clear and accessible data usage license
  - (meta)data are associated with detailed provenance
  - (meta)data meet domain-relevant community standards

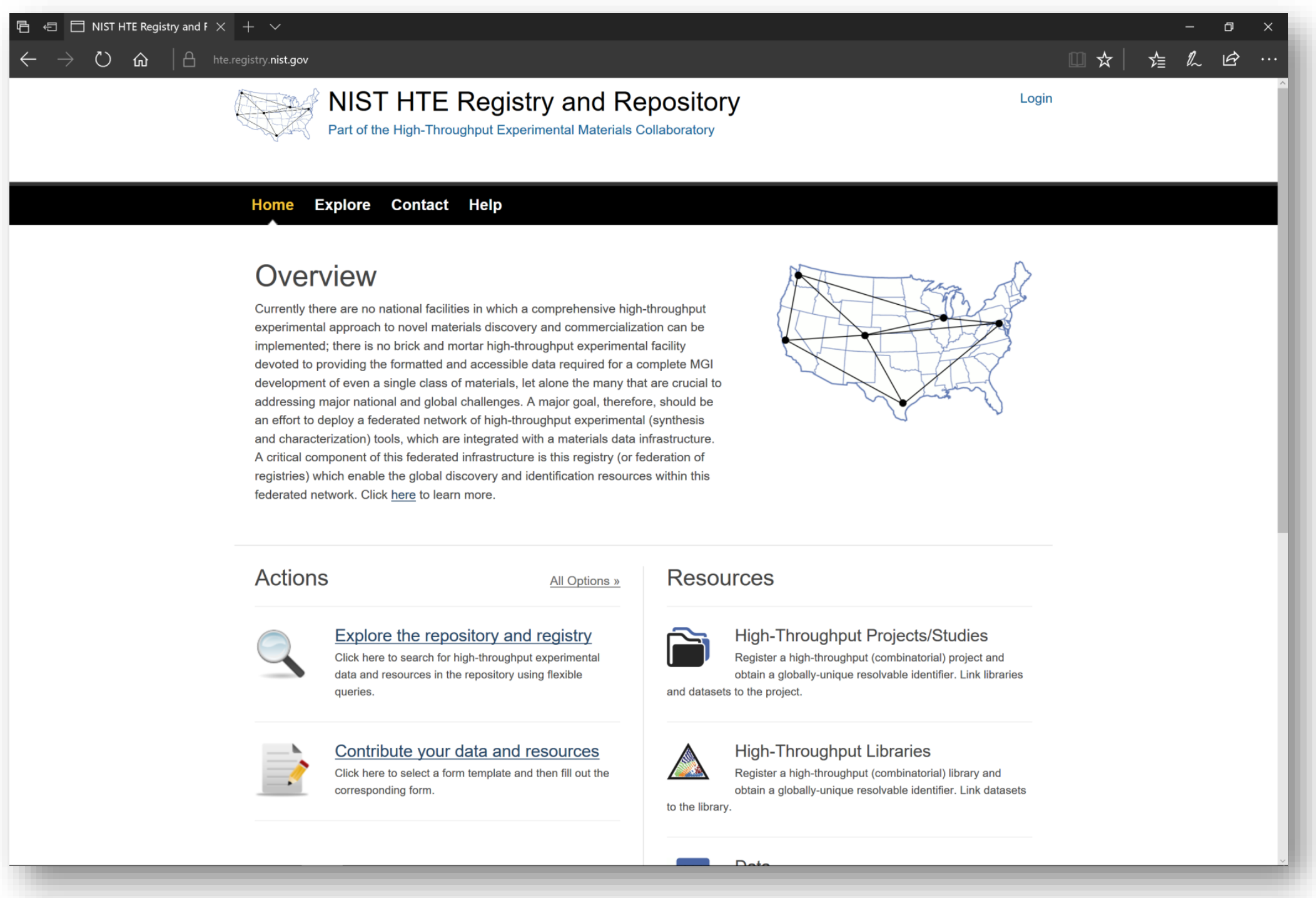
Modular System Design

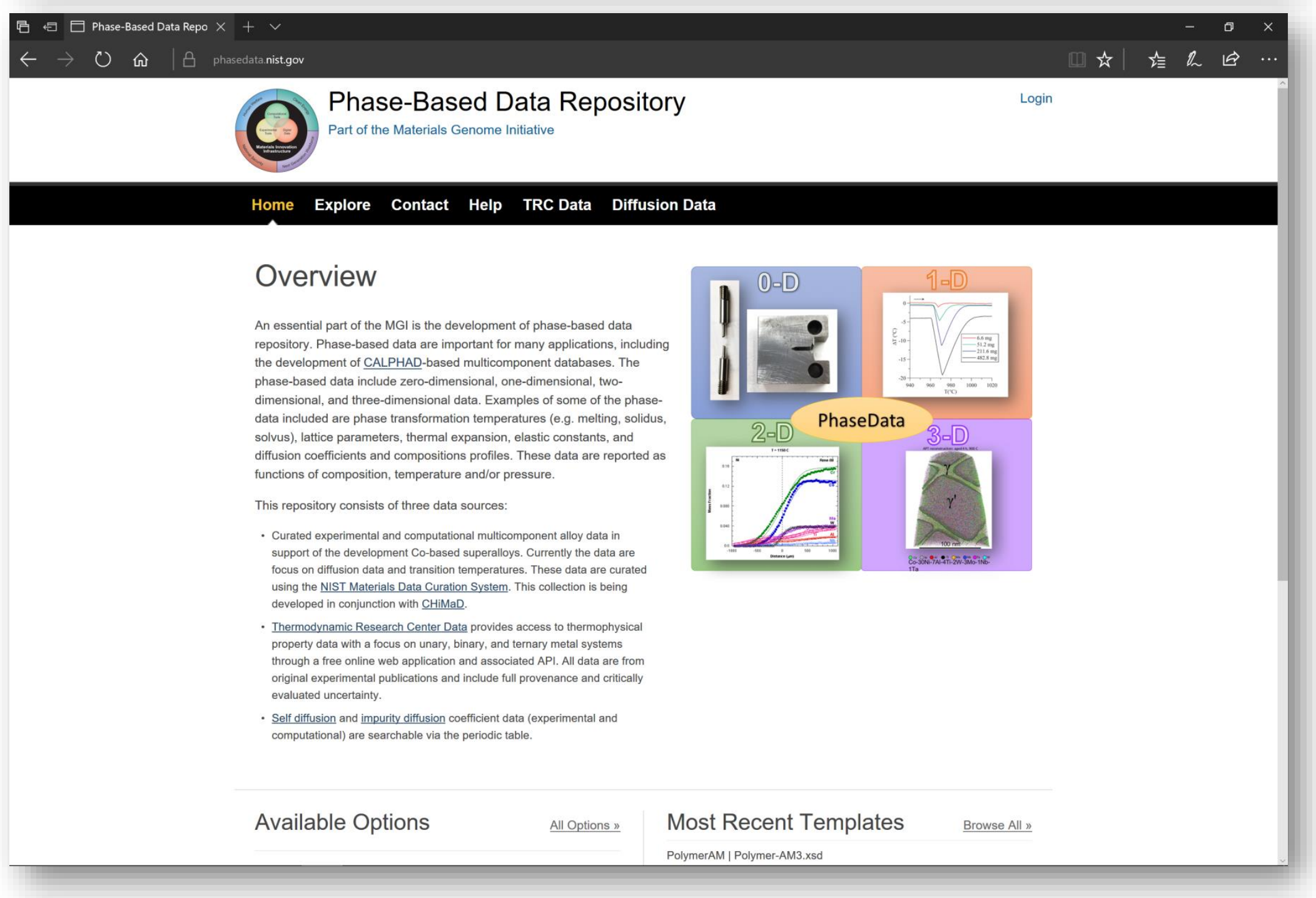
The CDCS utilizes a modular web framework based on Django. A service can be configured via Django Package installation. Common features include a GUI, API, XSL visualization/transformation and OIA-PMH.

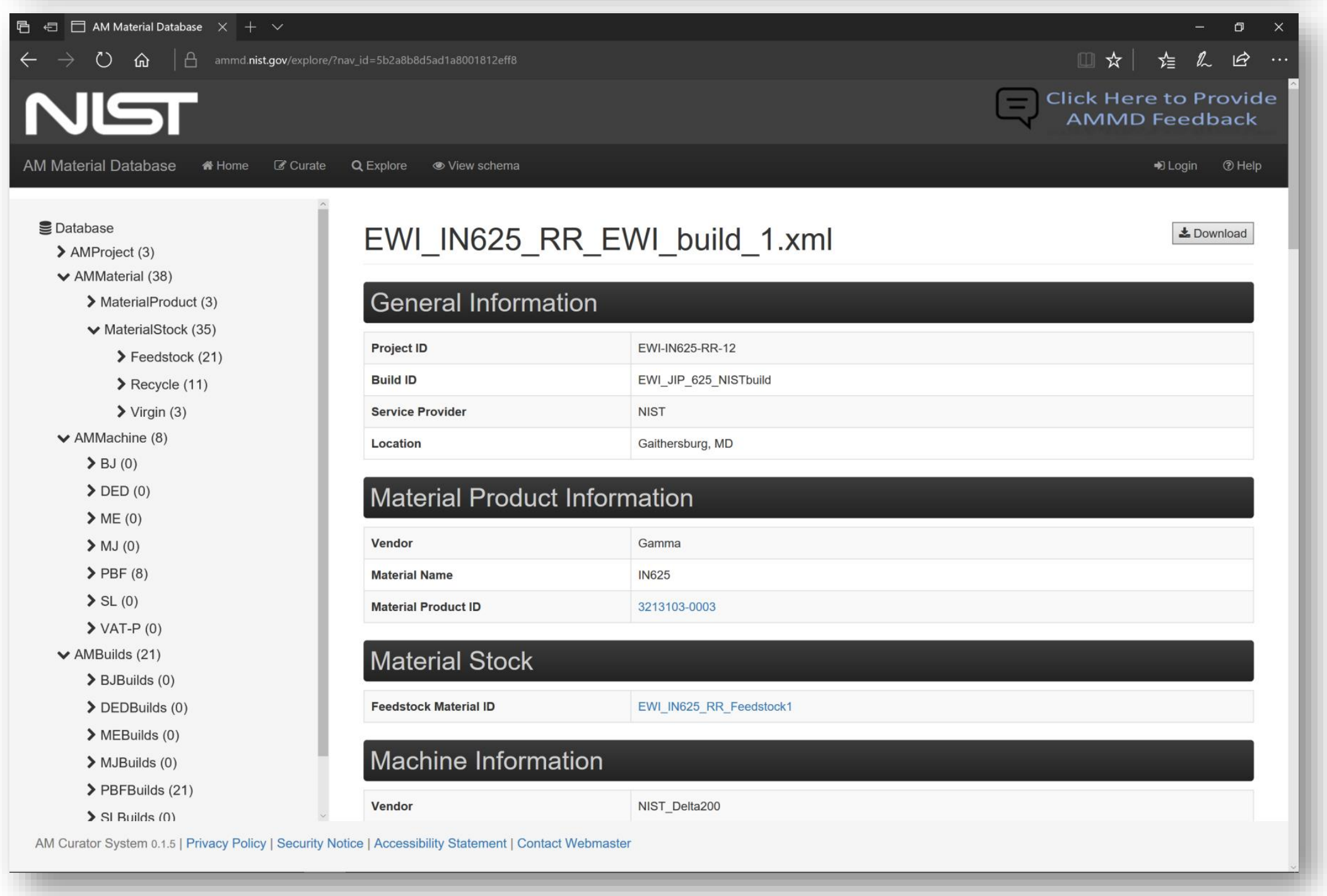


Repositories

The CDCS empowers communities to deploy and operate specialized repositories, which enables **Accessibility** of data and metadata. Data and metadata are stored in **Interoperable** formats and can be retrieved by API. Examples of three materials repositories are shown below.


NIST HTE Registry and Repository
Part of the High-Throughput Experimental Materials Collaboratory
Overview
Actions
Resources


Phase-Based Data Repository
Part of the Materials Genome Initiative
Overview
PhaseData
Available Options
Most Recent Templates



Engagement

The CDCS represents a platform through which NIST and related communities have begun to mutually engage in discussion, development, and problem-solving. Driven by FAIR data principles, this has given rise to a number of activities through NIST, including:

- **Community standards:** To increase the availability and quality of community standards, NIST hosted workshops focused on community data model development.
- **Interoperability:** To increase integration among data platforms (for materials science and beyond), NIST hosted a hackathon focused on such integrations.
- **Community development:** To support the development of FAIR data communities (in materials science and elsewhere), NIST began an annual convention for growing and nurturing the CDCS community of users.

	(Optional) pre-convention Tutorials	Annual Convention	(Optional) post-convention Code Sprints
Duration	1-2 Days	2-3 Days	1-2 Days
Organizers	Stakeholders	NIST Development Team	Stakeholders
Format	Parallel Track	Single Track	Parallel Track
Objective	Education	Stakeholder Networking & Annual Roadmapping Exercise	Software Development Planning & Implementation

References

[1] Wilkinson, M. D., Dumontier, M., Aalbersberg, Ij. J., Appleton, G., Axton, M., Baak, A., et al. (2016). The FAIR Guiding Principles for scientific data management and stewardship. Scientific Data, 3, 160018. https://doi.org/10.1038/sdata.2016.18

[2] Dima, A., Bhaskarla, S., Becker, C., Brady, M., Campbell, C., Dessauw, P., et al. (2016). Informatics Infrastructure for the Materials Genome Initiative. JOM, 68(8), 2053–2064. https://doi.org/10.1007/s11837-016-2000-4