DDI-Cross-Domain Integration (DDI-CDI): Current Status and Further Developments

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Outline

- Overview of DDI-CDI
- Status
- Dagstuhl and Upcoming Events
- Topics for Further Work
- Prototypes
- Prospects
- Summary

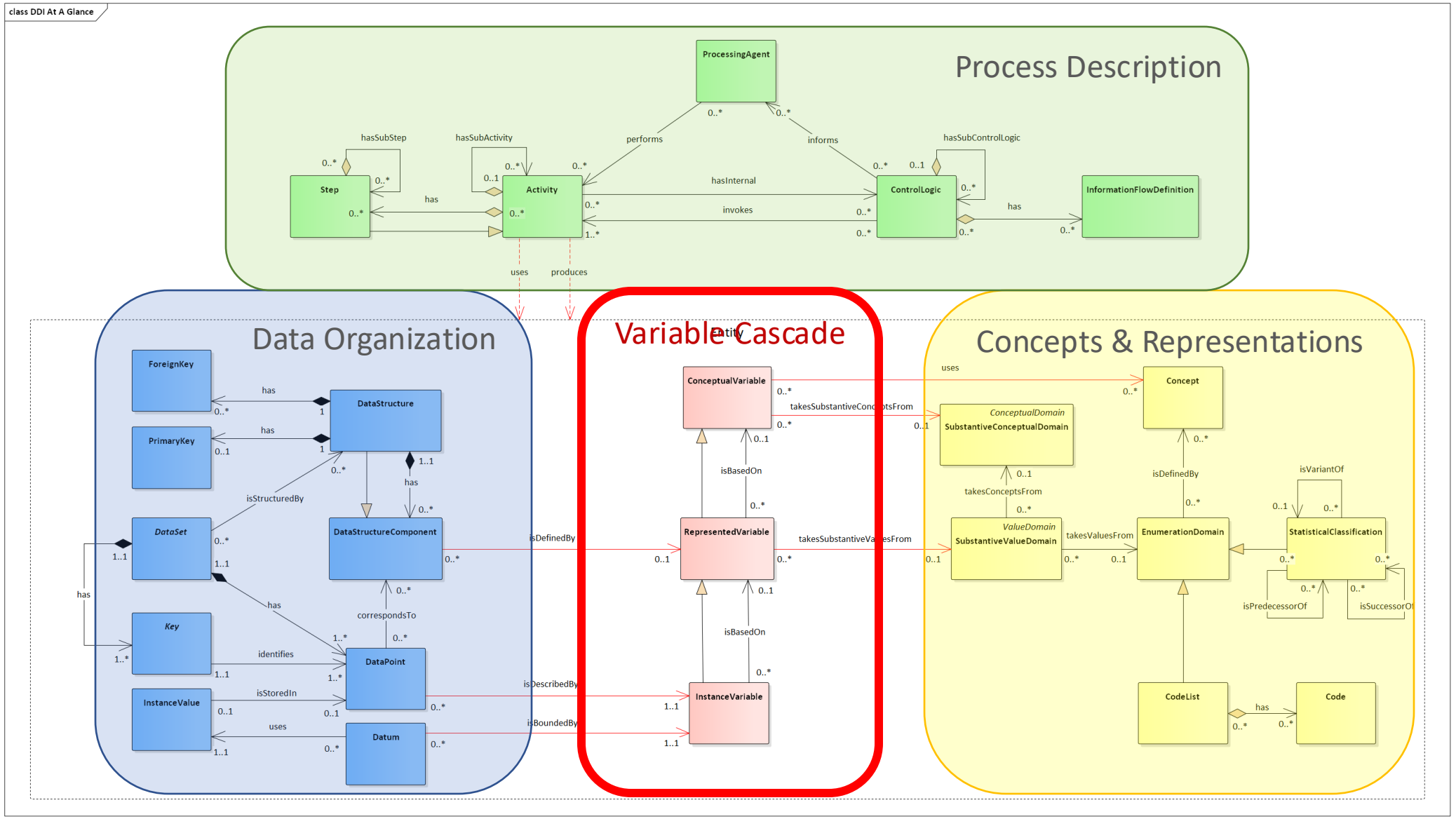
Overview of DDI-CDI

- Model-driven standard
  - UML model in Canonical XMI is the core specification (UCMIS subset of UML features)
  - XML and RDF syntax representations (OWL, JSON-LD) produced programmatically
  - Other representations in development (Python, ShEx, SHACL, Java, etc.)
- Domain-neutral, but designed to work with DDI-C and DDI-L
- Designed to work with other popular web standards (Schema.org, DCAT, SKOS/XKOS, SDTL, PROV-O, etc.) and domain standards
- Supports machine-actionability for dissemination/reuse
- Based on the DDI 4/”Moving Forward” model

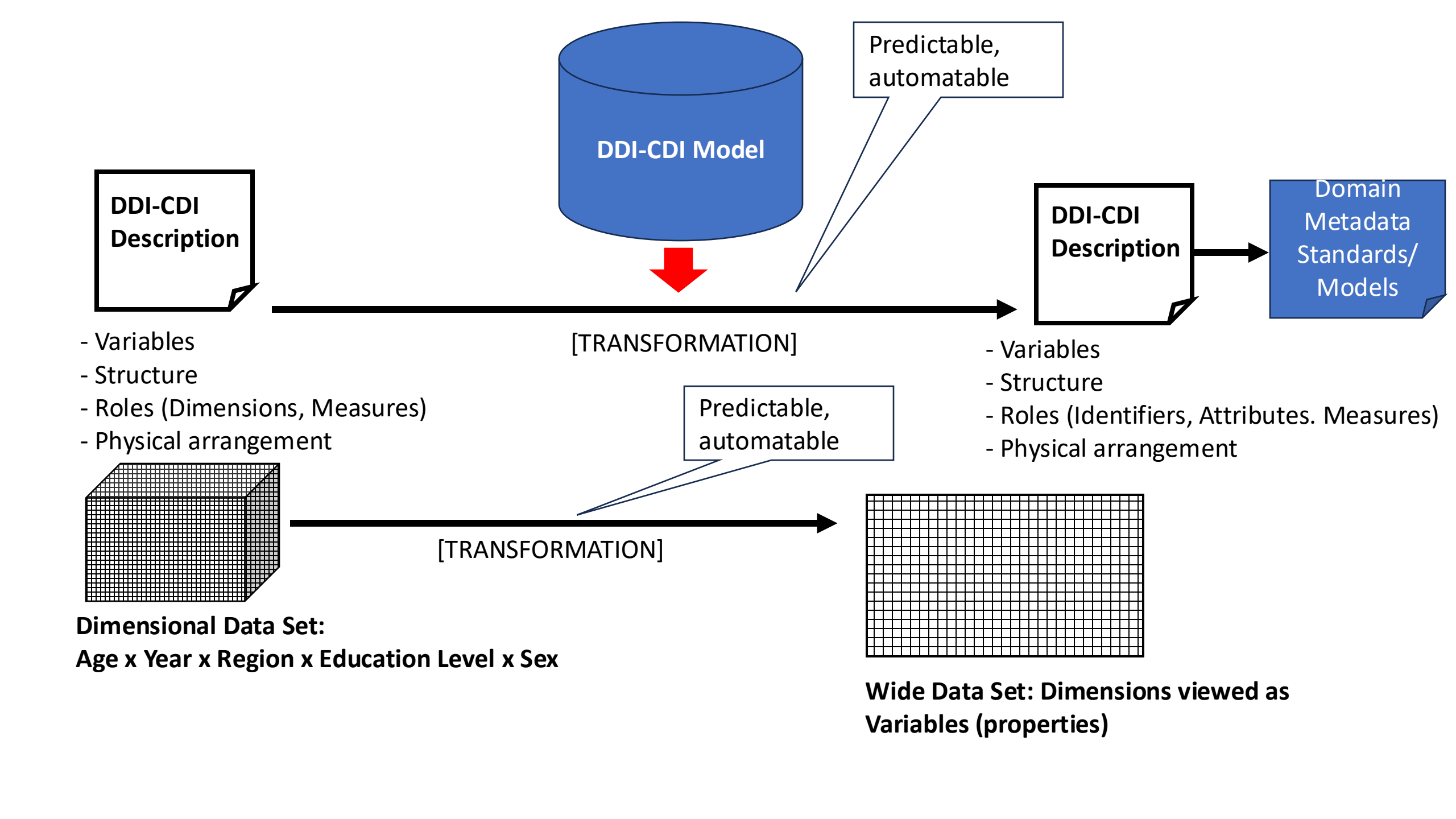
What Does It Do?

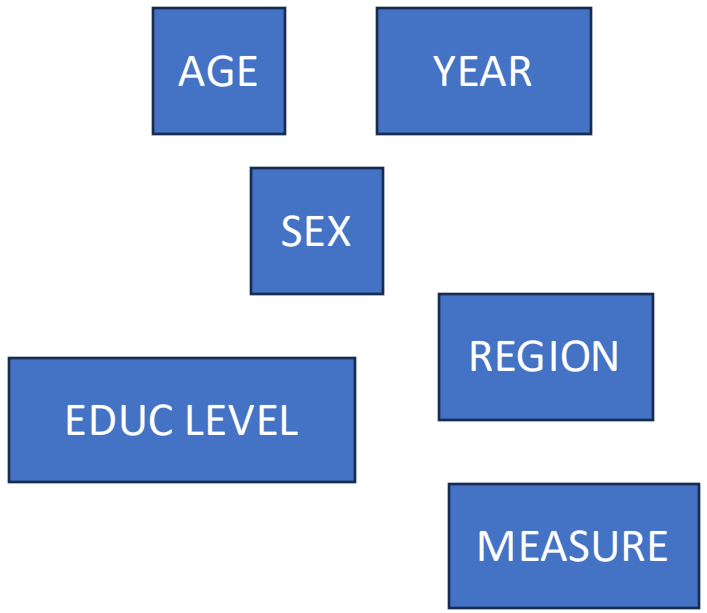
- Describes data in new formats for easier integration with traditional data
  - Wide (traditional) data
  - Long data (sensor/event)
  - Key-value (big) data
  - Multi-dimensional (cube) data
- Exposes data resources for easier integration by users from *any domain*
  - Describes the variables/datums in a data set
  - Describes how semantics (codelists/ontologies/concepts) as attached to the data and the *roles* they play
  - Supports re-assembly of variables/datums into any needed data structure
- Describes the *process* of data integration so that users can understand unfamiliar data
- DDI-CDI does not cover study-level metadata: it relies on other standards to provide this

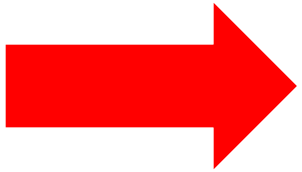
DDI-CDI at-a-glance



Courtesy of the amazing Flavio Rizzolo, Statistics Canada

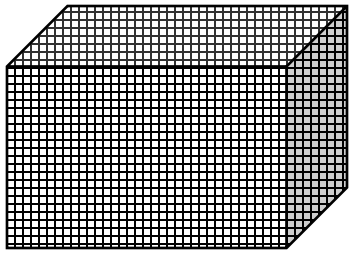

DDI-CDI Model
Predictable, automatable
DDI-CDI Description
DDI-CDI Description
Domain Metadata Standards/ Models
- Variables
- Structure
- Roles (Dimensions, Measures)
- Physical arrangement
[TRANSFORMATION]
- Variables
- Structure
- Roles (Identifiers, Attributes. Measures)
- Physical arrangement
Predictable, automatable
[TRANSFORMATION]
Dimensional Data Set:
Age x Year x Region x Education Level x Sex
Wide Data Set: Dimensions viewed as Variables (properties)





AGE	YEAR	SEX	REGION	EDUC LEVEL	MEASURE

VARIABLES



The target format is wide, with the dimensions treated as variables (properties): at least one must be a place where integration can be performed with another data set (typically time and geography). Other variables may be combined into compound identifiers, or may be treated as additional descriptors or measures, depending on what they are. The roles of variables Change according to the structures – the meanings/values do not.

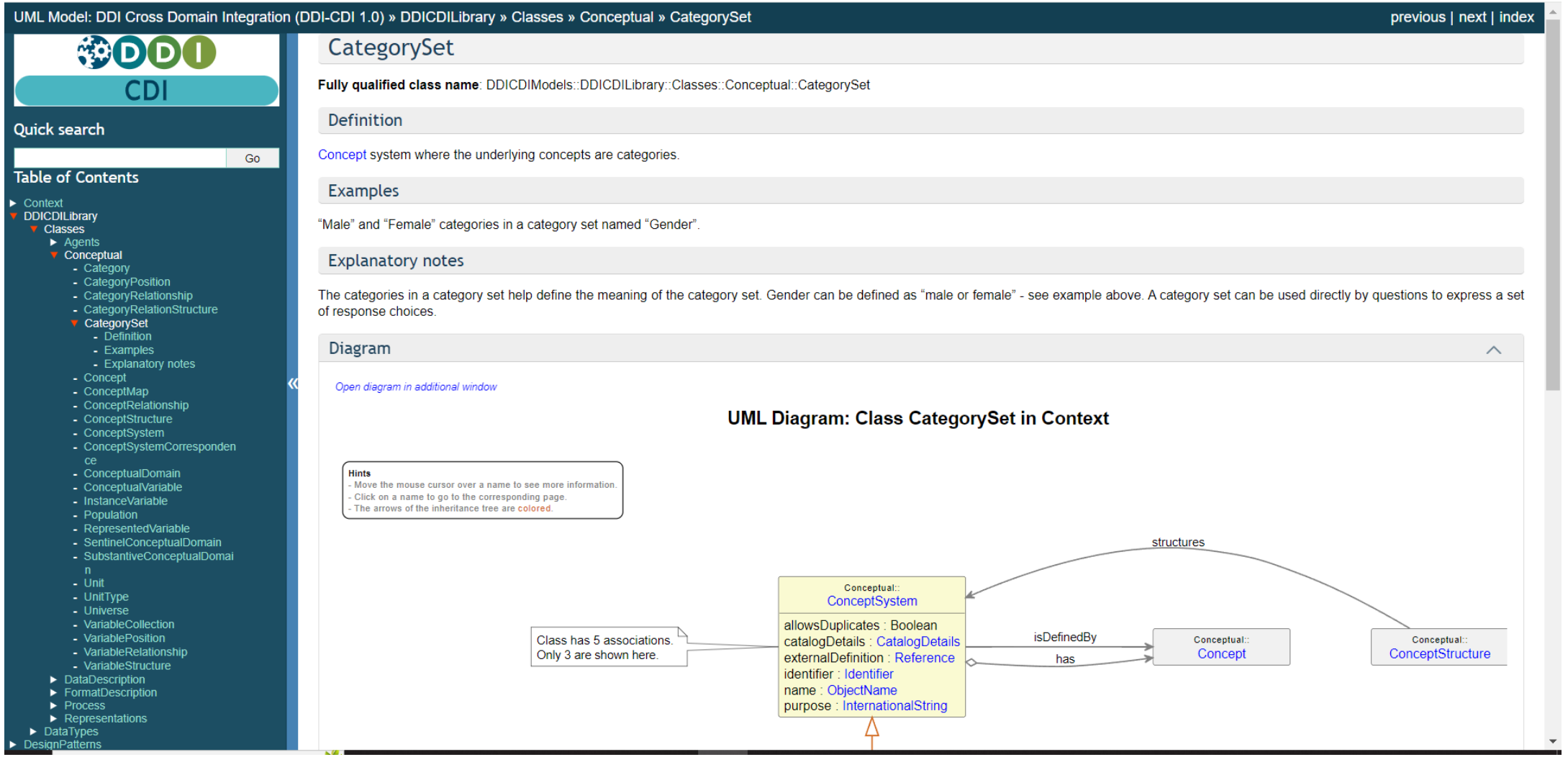
Aggregate values would be repeated to align with micro-data records as needed to provide the “complete” records for analysis.

Recoding/semantic transformations are handled separately as appropriate to the structural re-arrangement.

Status

- Candidate release turned over to DDI Technical Committee in May 2023
  - Download: https://bitbucket.org/ddi-alliance/ddi-cdi/
- Revised candidate release now being finalized after implementation/testing
  - Finalize XML schema optimization for generation of syntax representations
  - Updated examples of XML and RDF syntaxes
- Focused review of syntax representations
  - Detailed notes on generation of syntaxes prepared
- Vote for release as specification
  - Webinar for DDI community

Integrated Field-Level Documentation



Dagstuhl and Upcoming Events

- Workshop in September 2023 at Schloss Dagstuhl
- Groups:
  - Implementation guides/supporting implementation
  - Non-numeric, non-coded datums (“qualitative”)
  - Using DDI-CDI: documentation on what the standard is for and how it can be used by organizations
  - Dependencies between variables (O-ADOPT, O&M, etc.)
  - Syntax representations
- Informal face-to-face at EDDI 2023
- Face-to-face in Paris, April 2024 (margins of COSMOS)
- Dagstuhl 2024

Topics for Further Work

- Finalize “Using DDI-CDI” documentation (explanatory)
- Implementation Guides: creating community profiles for use
  - Subset of model
  - Syntax representations
  - Other standards
- Tools
  - Improve community subset documentation tool
  - DDI transformations (DDI-C, DDI-L)
  - Collaborate with Developer’s Group
- Non-numeric, non-coded datums (N3CD) – qualitative sub-group?
- Further syntax representations
- “Beta” release process to support implementers
  - Coordinate with TC
- Refinements to model (Complex Units of Measure, etc.)

Prototypes

- UKDA Data Product Builder
  - Variables
  - Wide, long, multi-dimensional data structures
- EOSC Future Science Project “Climate Neutral and Smart Cities” (Sikt)
  - DDI-CDI Process description
  - Integration with DDI Lifecycle/Colectica
- Transformation tools
  - CSV-to-CDI (JSON-LD) : https://ddialliance.github.io/ddi-cdi-sample-generator
  - STATA/SPSS Sample Generator (Sikt): https://bbeuster.pythonanywhere.com/
  - Bureau of Labor Statistics
  - Indicator model

Prospects

- FAIR Implementation offers new users
  - WorldFAIR “Cross-Domain Interoperability Framework” (CDIF)
  - Other EOSC Implementations (FAIR Impact, EOSC Interoperability Framework)
- Cross-domain FAIR implementations within DDI Community
  - Combined with DDI-C/DDI-L

Cross-Domain Interoperability Framework (CDIF)

- Guidelines for the coordinated use of a set of cross-domain standards as a “lingua franca” for FAIR data exchange and use
  - Specific profiles of DDI-CDI for data description
- CDIF has gathered 30 experts from different standards communities
  - Working Group: Meets bi-weekly to draft CDIF recommendations
  - Advisory Group: Reviews drafts and identifies direction/advises
- Major inputs:
  - WorldFAIR FAIR Implementation Profiles and 11 Domain Use Cases, from social science to bio-diversity to nano-technology to geo-chemistry…
  - FAIR domain and cross-domain metadata standards
  - FAIR initiatives (EOSC IF, FAIR Impact, EOSC Future, GO FAIR, DRUM, etc.)
- Initial draft of CDIF to be delivered as part of WorldFAIR outputs in Summer 2024

WorldFAIR

FAIR Activities and Standards: CDIF

- Foundational: FAIR Digital Object Framework (**FDOF**)
- Find
  - Discover FAIR resources and explore/evaluate their utility prior to access (coverage, etc.)
  - **Schema.org, DCAT. DDI-CDI (variables)**
- Access
  - Negotiate access to non-public data
  - Enhance efficiencies through automation
  - **ODRL, DPV**
- Assess/Integrate
  - Understand data structure (**DDI-CDI**)
  - Understand semantics (**SKOS/XKOS, OWL, SSSOM**)
  - Determine origination/context (**PROV-O**, **I-ADOPT/O&M**)

Summary

- DDI-CDI extends existing DDI specifications to use different types of data from other domains
- It is a vehicle for cross-domain FAIR implementation
- Version 1.0 in coming months
  - Well-documented
  - Well-tested
  - Builds on existing specifications/processes
- Helps bring DDI products in line with current technologies and modular standards approaches

Questions?