With Standards – Science Will Prevail!

2021 US INTERCHANGE



Conference | Trade Show

Virtual Event | 20-21 October

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CDISC Open Rules Engine (CORE)

Peter Van Reusel, Chief Standards Officer, CDISC Sam Hume, DSc, VP Data Sciences, CDISC



Meet the Speaker

Peter Van Reusel

Title: Chief Standards Officer Organization: CDISC

Peter Van Reusel provides executive leadership to the development and implementation of clinical standards in line with CDISC's strategy and operational plans, working closely with the President and CEO, as well as CDISC staff and stakeholders. He has over 20 years' experience in senior roles in pharma and at CROs, providing standards expertise and carrying out other standards work in various organizational settings. A long-time, CDISC-authorized instructor, Peter has helped significantly in developing CDISC training courses.

He previously served as CDISC's European Liaison, shepherding relationships with key European regulatory, academic, and biopharma stakeholders. Peter is also an active PhUSE collaborator.





Meet the Speaker

Sam Hume

Title: VP, Data Science

Organization: CDISC

Sam Hume leads the CDISC Data Science team, which collaborates with CDISC staff and stakeholders to develop tools and standards that support clinical and translational data science. Sam directs delivery of the CDISC Library metadata repository that houses all CDISC standards, co-leads the CDISC Data Exchange Standards team, and leads the technical CDISC RWD efforts. He has 25 years' experience in clinical research informatics and has held a number of senior technology positions in the biopharmaceutical industry. He holds a doctorate in information systems.

Agenda

- 1. CORE Overview
- 2. CORE Project Approach
- 3. CORE Project Status



CORE Overview

CORE Goals and Objectives

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CORE

Overview Participate Webinar FAQ



CDISC Conformance Rules are an integral part of the Foundational Standards and serve as the specific guidance to Industry for the correct implementation of the Standards in clinical studies. An emerging Industry best practice is to use Conformance Rules on anopoing basis, throughout the study to keen the data as close to submission ready as possible and to ensure unality in all data exchange scanges.

Current CDISC Conformance Rules need to be expressed in a common specification to be loaded to the CDISC Library. In addition, an executable component must be developed for every Conformance Rule.

Project Goals and Objectives

The overall goal of the CORE Project is to deliver a governed set of unambiguous and executable Conformance Rules for each Foundational Standard, and to provide a minimum viable product of an open-source execution engine for the executable Rules.

CDISC is partnering with Microsoft to develop the CDISC Open Rules Engine (CORE), open-source software, which will execute machine-readable CDISC Conformance Rules retrieved from the CDISC Library. The global clinical research community will be able to leverage the free and open, Microsoft Azure-based CORE software to test study data for conformance to CDISC standards as well as to regulatory and sponsor-specific conformance rule sets.

The CORE Project objectives are to:

- · Ensure each standard has a set of unambiguous, executable Conformance Rules
- Ensure consistency across Conformance Rule implementations
- · Expedite the availability of executable Conformance Rules for new Foundational Standards
- Create executable Conformance Rules vetted by the CDISC standards development teams
- Release the Rules under the CDISC Open Source Alliance (COSA)
- Create an open-source engine that executes the Rules

https://www.cdisc.org/core





CORE Concept

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* CDISC Open-Source Alliance

CORE – Further Considerations

- CORE will be released as open source under the MIT license
 - Not offered by CDISC as a commercial product or service
- Executable rules next step in the evolution of the conformance rules that CDISC publishes with every standard
- Executable rules published by CDISC should make it much easier for rule vendors to adapt these rules for use in their own software
- Existing rule vendors are free to contribute to or use the CORE engine software
- https://www.cdisc.org/core

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Home / CORE							
Overview Participate	CDISC Conformance Rules are an integral implementation of the Standards in clinic: throughout the study, to keep the data as Current CDISC Conformance Rules need to executable component must be develope Project Goals and Objectives The overall goal of the CORE Project is to	part of the Foundationa I studies. An emerging close to submission rea o be expressed in a com d for every Conformance deliver a governed set of	Standards and Industry best pra dy as possible ar mon specificatio a Rule. unambiguous a	serve as the spe ictice is to use C id to ensure qua in to be loaded t nd executable C	cific guidance to onformance Rule lity in all data exo o the CDISC Libr onformance Rule	Industry for t es on an ongo change scena ary . In additio es for each Fo	he correct ping basis, rios. pn, an pundational



CORE Minimum Viable Product

- Roadmap calls for three releases: Minimum Viable Product, Release 1, Release 2
- Evaluation version obtain feedback for future engine development
 - Align all CDISC Stakeholders on future release needs (Features, Technology, Timeline)
- Two deployment options
 - Easy and flexible evaluation options
 - Public and private cloud
- Conformance rules scope for MVP
 - SDTM 2.0 and SDTMIG 3.4
 - Does not exclude other (ADaM, SEND, Define.xml) but not critical for MVP





CDISC-Provided Cloud Evaluation Deployment

Deployment Attributes

- CDISC-provided SaaS public cloud environment
 - Quick account creation
- A development version for user evaluation
- Test data and rules provided by CDISC and not extendible
- Simple environment for hands-on introduction
- See key CORE features in action, on limited data and metadata
- Users cannot execute with their own data and rules
- CDISC seeks feedback from evaluators
- CDISC expects to update features, rules and test data during evaluation period



SaaS Evaluation Deployment Strategy

Virtual Private Cloud Evaluation Deployment

Deployment Attributes

- Private cloud environment
 - Some setup required
- A development version for user evaluation, released after the CDISC-provided cloud deployment
- Engine executes in cloud, but user data reside locally
- A simple environment for hands-on introduction, including ability to add sponsordefined rules
- Evaluate CORE features on different studies
- CDISC seeks feedback from evaluators
- CDISC expects to update features, rules and test data during evaluation period



CORE Project Approach





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•	CORE team	 Peter Van Reusel Sam Hume Charles Shadle Nick De Donder 	CORE Leadership Anne-Sophie Bekx Venkata Maguluri Stephen Matteson 	Tianna Umann Michael Topp Kim Mattox Jr.
	wembers	Anthony Chow Sam Hume	Architecture Tarun Khurana Tianna David Crawford Mallikh	Umann arjuna Rao Satyavolu
		CORE Software Engineering DEV team Jim Blanchard Satyandra Vishwakarma Aman Sextus Vivek Kumar Siqi Liu Ankita Kumari	CDISC Library DEV team Anthony Chow Nic Haydel Gerry Campion Omar Garcia Calderon	Conformance Rules DEV team Next Slide
		 Dan Li Jagruti Patel Jinkyu Lee John McDade Mike Heenan 	CORE QA team Narasimhan Kaliyamoorthy Nikhil Upadhyay Sangeeta Sama Shaun Maraj 	Shaveta Bansal Haiping Yu Hanumanta Kavuluru Gleb Strus Aleksei Culei
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CORE team Members Cont'd







Volunteer participation

- Very active volunteers
 - Many 1st time CDISC Volunteers
 - > 50 team members
 - Adding new team members weekly
- Project started July
- Volunteer teams began meeting weekly mid-September







CORE Project Status



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UX/UI: CORE Dashboard

CDISC Open Rules Engine

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Welcome to CDISC CORE Conformance Validator The single truth for Conformance Rules checking Define XML Generator @ Reviewer's Guide \odot U View My Studies E Conformance Validator > Define-XML Generator > Manage My Rule Sets Validate your study with the most recent Conformance rules from the CDISC Library Create a Define-XML based on your loaded data Help Recent Studies

Study Name Data Bundle Standard Last Update Date CDISC01 SDTM_TD SDTM 2021-08-19 T21:10:15 CDISC02 TFL_210818 ADaM 2021-08-17 T13:15:16 CDISC03 DSMB SDTM 2021-08-01 T20:56:23 CDISC04 Pre-Lock SDTM 2021-07-29 T22:17:23 CDISC56 2021-07-29 T22:16:23 Submission SDTM CDISC57 Database Lock SDTM 2021-07-28 T08:10:21

See all Resources

- > API Documentation
- > CDISC Library XML Schema
- > CDISC Library Website Landing Page

Populate the Issue Summary section of the Reviewer's Guide with the information from the Conformance

Product Inquiry Form
 Service Desk

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Reports.

Reviewer's Guide

- > Release Notes
- > How-to Articles

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UX/UI: Conformance Validator

CDISC Open Rules Engine

🛱 Dashboard 🧹	Dashboard / Conformance Valid	lator				
Conformance Validator	Configure Conforma					
Define XML Generator	SDTM	3.4 Publisher CDISC. FDA	Proprietary Rules		D Carro Dala Ca	
🖉 Reviewer's Guide				My Rule Set	→ Save Rule Set	
View My Studies	Conformance Rules	Q Search		Rule Type 👻	Rule Severity 🗸 C	
Manage My Rule Sets	Rule ID	Rule Type	Description	Version	Rule Severity	
Э Help	CDISC.SDTM.3.4.1	Variable Consistency	Rule CDISC.SDTM.3.4.1 description. Rule belogs to Variable Consistency type of rules. CDISC. Model: SDTM. Ig Version: 3.4.	1.1.1	() Error	
	CDISC.SDTM.3.4.2	Metadata Conformance	Rule CDISC.SDTM.3.4.2 description. Rule belogs to Metadata Conformance type of rules. CDISC. Model: SDTM. Ig Version: 3.4.	1.1.1	Marning	
	CDISC.SDTM.3.4.3	Value Validity	Rule CDISC.SDTM.3.4.3 description. Rule belogs to Value Validity type of rules. CDISC. Model: SDTM. Ig Version: 3.4.	1.1.1	(i) Info	
	CDISC.SDTM.3.4.4	Dataset Integrity	Rule CDISC.SDTM.3.4.4 description. Rule belogs to Dataset Integrity type of rules. CDISC. Model: SDTM. Ig Version: 3.4.	1.1.1	Reject	
	CDISC.SDTM.3.4.5	IG Compliance	Rule CDISC.SDTM.3.4.5 description. Rule belogs to IG Compliance type of rules. CDISC. Model: SDTM. Ig Version: 3.4.	1.1.1	() Error	
	CDISC.SDTM.3.4.6	Value Checks	Rule CDISC.SDTM.3.4.6 description. Rule belogs to Value Checks type of rules. CDISC. Model: SDTM. Ig Version: 3.4.	1.1.1	A Warning	
	CDISC.SDTM.3.4.7	Cross-Checks	Rule CDISC.SDTM.3.4.7 description: Rule belogs to Cross-Checks type of rules. CDISC. Model: SDTM. Ig Version: 3.4.	1.1.1	(i) Info	
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	Versions CDISC CT SDTM CT 2021-09	• UNII •	MED-RT •			
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UX/UI: Study Management

. **CDISC Open Rules Engine** ③ ✓ Dashboard Dashboard / View My Studies E Conformance Validator My Studies Define XML Generator Q Search Collapse All + Add Study Reviewer's Guide CDISC001 Therapeutic area: Oncology Phase IIA Client: Parexel O View ∧ + Add Bundle Uiew My Studies Manage My Rule Sets Data Bundle Data Bundle Data Bundle SDTM ADaM ADaM 0 0 0 DSMB TFL_210818 SDTM_TD Help Ô Ô Ô Last update date: Last update date: Last update date: 2021-08-19T22:10:15 2021-08-19T21:10:15 2021-08-19T22:15:13 Resume Validate View Report CDISC013 Client: Business & Decision Life Sciences Therapeutic area: Oncology Phase III + Add Bundle 0 View CDISC056 Therapeutic area: Oncology Phase I Client: Janssen + Add Bundle 0 View CDISC063 Therapeutic area: Oncology Phase IIA Client: Business & Decision Life Sciences + Add Bundle 0 View V CDISC082 Therapeutic area: Oncology Phase | Client: Janssen + Add Bundle O View \sim



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Metadata components

- □ Rule identifiers
 - + Coreld, Version, Status, ...

□ Authority

+ Organization, RuleId, ...

□ Scope

+ Standards & Version, Classes, Domains, ...

□ Rule

- + Dependency, Type, Condition, ...
- Outcome
 - + Message

□ Citations

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+ Document, Section, Item, Cited Guidance

Benefits

- Explicit rule logic
- Common expression & syntax
- Information about each rule
- "Hints" to optimize runtime performance

Notes

Do expect continuous refinement

CORE Rule Editor

+ 🖬 🕤 🛢	Q findings	×				1 CoreId: Rule9 2 Version: "1" 2 Authority:
Core ID Q Search	Rule Type Q Search	Creator Q Search	Universal ID Q. Search	Created Timestamp ↓ Q Search	Changed Timestamp Q Search	a organization: CDISC 5 Reference: 6 Origin: SDTM Conformance Rules
Rule18	Variable Presence	gcampion	94d60e88-4304-4356- a209-8af7f9276af1	10/7/2021, 3:44:55 PM	10/7/2021, 3:44:55 PM	9 Description: Verify 10 Sanctivity: Barned
Rule17	Variable Presence	gcampion	82d89b6a-1264-4850- a35d-bf42b37921ac	10/7/2021, 1:19:44 PM	10/7/2021, 1:19:44 PM	1 Scopes: 1 Standards: 1 Nume: STUTE
Rule16	Variable Presence	gcampion	9de1792c-ca3e-46a1- a4eb-9c7530e43c79	10/7/2021, 1:15:33 PM	10/7/2021, 1:15:33 PM	13 - Mane: SOTRIG 14 Version: "3.3" 15 - Name: SOTRIG
Rule13	Variable Presence	gcampion	699477f6-d794-494c- 9637-18b3920c635d	10/7/2021, 9:56:48 AM	10/7/2021, 9:56:48 AM	10 Version: 3.4 17 Classes: 18 Include:
Contains.period	Variable Presence	gcampion	012a1b27-7605-4758- 9e18-77de07f04a4d	10/7/2021, 9:55:56 AM	10/7/2021, 9:55:56 AM	19 - Events 20 - Findings 21 Domains:
Rule10	Variable Presence	gcampion	8670c8ab-e2c1-434a- bfd6-49b928738e42	9/12/2021, 7:39:12 PM	9/12/2021, 7:39:12 PM	22 Exclude: 23 - 05 24 - 0V
Rule9	Variable Presence	gcampion	f2957f2b-ab4b-43c6- af7d-05ae64db293f	9/12/2021, 7:39:02 PM	9/12/2021, 7:39:02 PM	25 - EX 26 Rule Type: 27 Vincible Bessence:
Rule8	Variable Presence	gcampion	483be4c3-4c4a-4212- a37b-b447ecf78f7c	9/12/2021, 7:38:54 PM	9/12/2021, 7:38:54 PM	28 Check: 29 all:
Rule7	Variable Presence	gcampion	696#56a-c12d-45e2- 88ea-fb3be135b319	9/12/2021, 7:38:45 PM	9/12/2021, 7:38:45 PM	30 - name:STAT 31 operator: present 32 - name:PRESP
Rule6	Variable Presence	gcampion	af12e5d3-6934-4485- 9c3a-ee4371b4db05	9/12/2021, 7:38:34 PM	9/12/2021, 7:38:34 PM	33 operator: missing 34 Outcome: 35 Message:STAT is present, butPRESP is not present in the dataset
Rule5	Variable Presence	gcampion	5683720e-25ff-47ee- a2ab-9ed249785241	9/12/2021, 7:38:13 PM	9/12/2021, 7:38:13 PM	36 Citations: 37 - Document: SDTM V1.4 38 Section: 2.2.1 Interventions
Rule4	Variable Presence	gcampion	2829df05-958d-410c- 9471-db856d23d558	9/12/2021, 7:34:51 PM	9/12/2021, 7:34:51 PM	39 Cited Guidance:PRESP Used when a specific intervention is pre-specified on a CRF. Values should be "Y" 40 - Document: SDTH V1.4
Rule12	Variable Presence	gcampion	797d7319-4301-4d5c- b6ea-918fbc179035	9/12/2021, 7:34:38 PM	9/15/2021, 5:05:46 PM	42 Cited Guidance: Used when a specific intervention is pre-specified on a CRF. Values should be "Y" or null
Rule2	Variable Presence	gcampion	e11b2f02-b5e6-4ca5- b09e-eb7a37f398a5	9/12/2021, 7:34:27 PM	9/29/2021, 11:01:11 AM	
Rule1	Variable Presence	nhaydel	6120e1cf-f36a-496e- b0b6-1702ec8ad1ed	9/10/2021, 1.26:22 PM	9/12/2021, 7:37:45 PM	
		A	Il rules loaded.			

- Web-based application, no software to install
- Structured document, 1 CORE rule per file containing rule's metadata & check logic
- Real-time syntax checking

CORE Rule Authoring

- Employs a no- & low-code configuration approach
- Emphasizes on explicit metadata, such as versioning, scoping, applicable standards, etc.
- Supports multiple rule types: Value presence, value comparison, data pattern & matching, etc.
- Rule authoring guide and supporting documentations are being maintained as new capabilities are added
- Coming soon: Rule testing to verify logic using positive & negative test data



Rule Development Process

- Evaluate existing rules
 - Do they need revisions?
 - Are they testing what we expect them to test?
 - Assist QA team in evaluating rules
 - Scope includes both rule specification and executable version of rule
- Identify missing rules
- Evaluate existing test data
 - Perform gap analysis
 - Augment test data as needed to accurately test rules
- Compile test data for evaluation
 - Positive and negative results





Validation Approach - SDLC

- An agile SDLC will be followed for the project
 - Define process (e.g., planning, sprints, hardening, testing, release, documents)
 - Incorporating validation into an agile SDLC
 - Validation deliverables
 - · Define when artifacts are finalized and approved
 - Need for a hardening phase/sprint for formal testing of a release candidate
 - Define change control approach for future releases
- The process is currently in draft and will be used as a 'dry run' for the Minimum Viable Product (MVP)
- The process will be finalized prior to Release 1
 - Additional processes will be developed as needed





Sign Up

First Name *	Last Name *	Organization *	Email *	Alternate Email
			This email will be used for tea	am
			mailing lists and Wiki/Jira	
			account creation if you do no	ot
			already have one.	
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https://www.cdisc.org/volunteer/form





Thank You!

