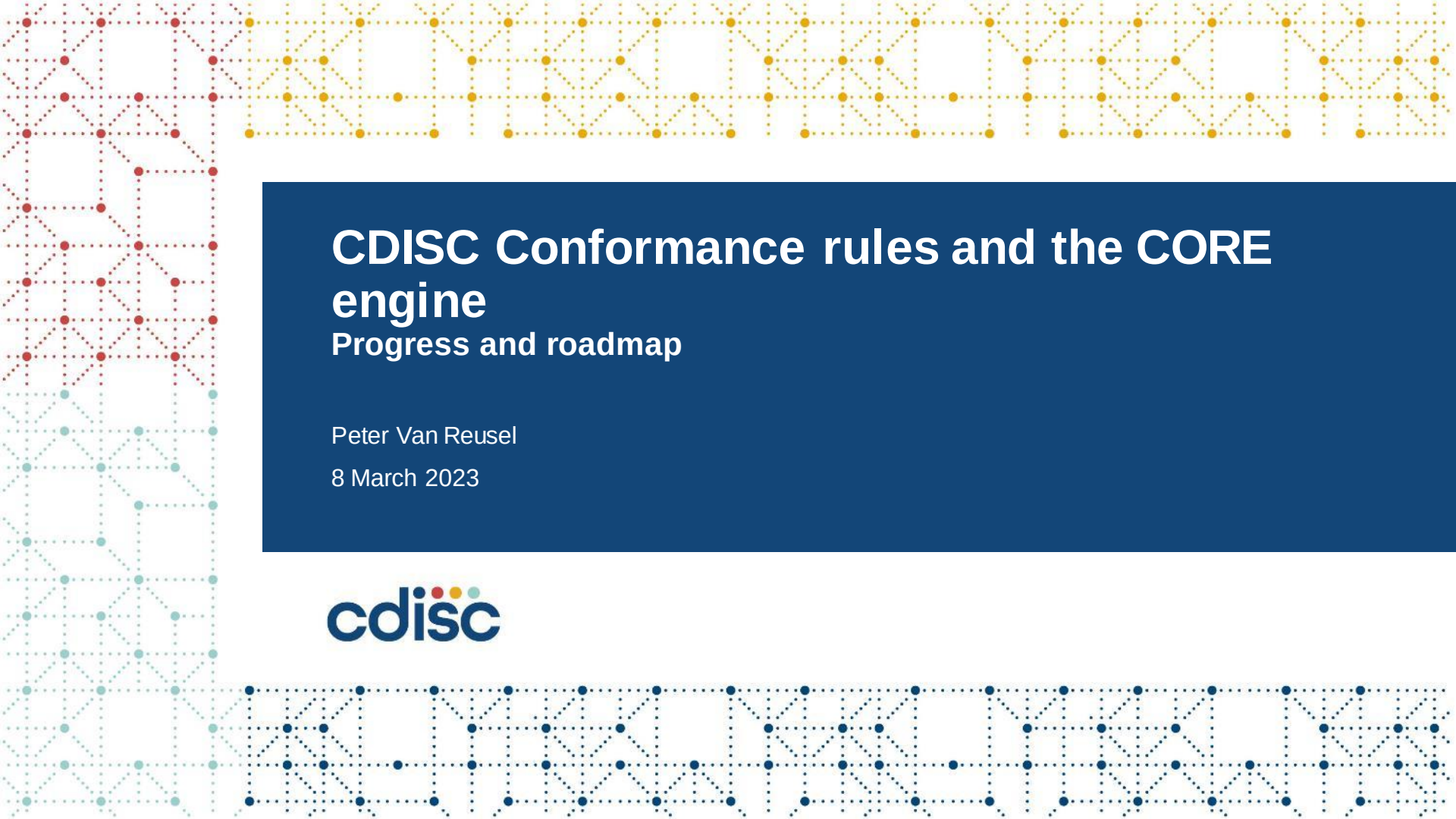




CDISC Conformance rules and the CORE engine

Progress and roadmap

Peter Van Reusel

8 March 2023





Meet the Speaker

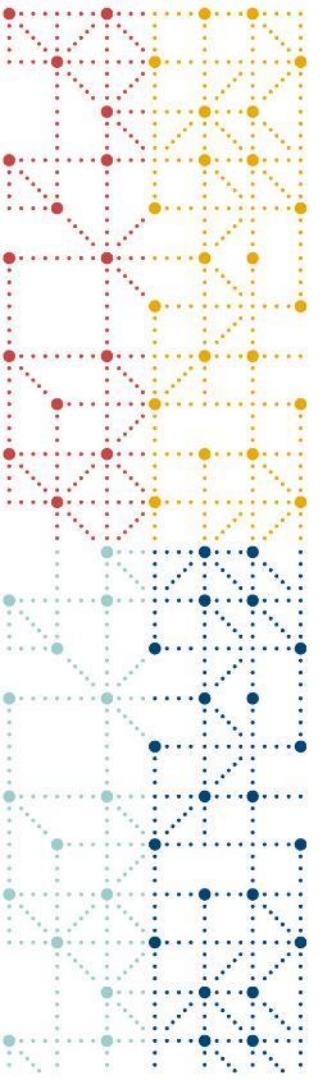
Peter Van Reusel

Title: Chief Standards Officer

Organization: CDISC

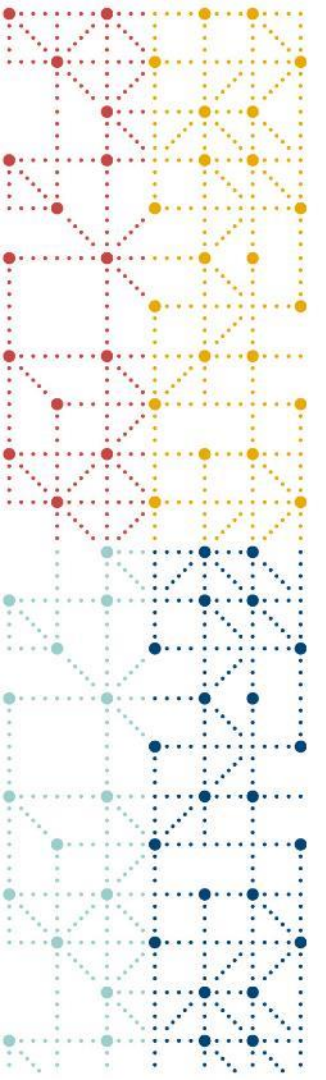
Peter Van Reusel provides executive leadership to the development and implementation of clinical standards in line with CDISC's strategy and operational plans, working closely with the President and CEO, as well as CDISC staff and stakeholders. He has over 20 years' experience in senior roles in pharma 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.



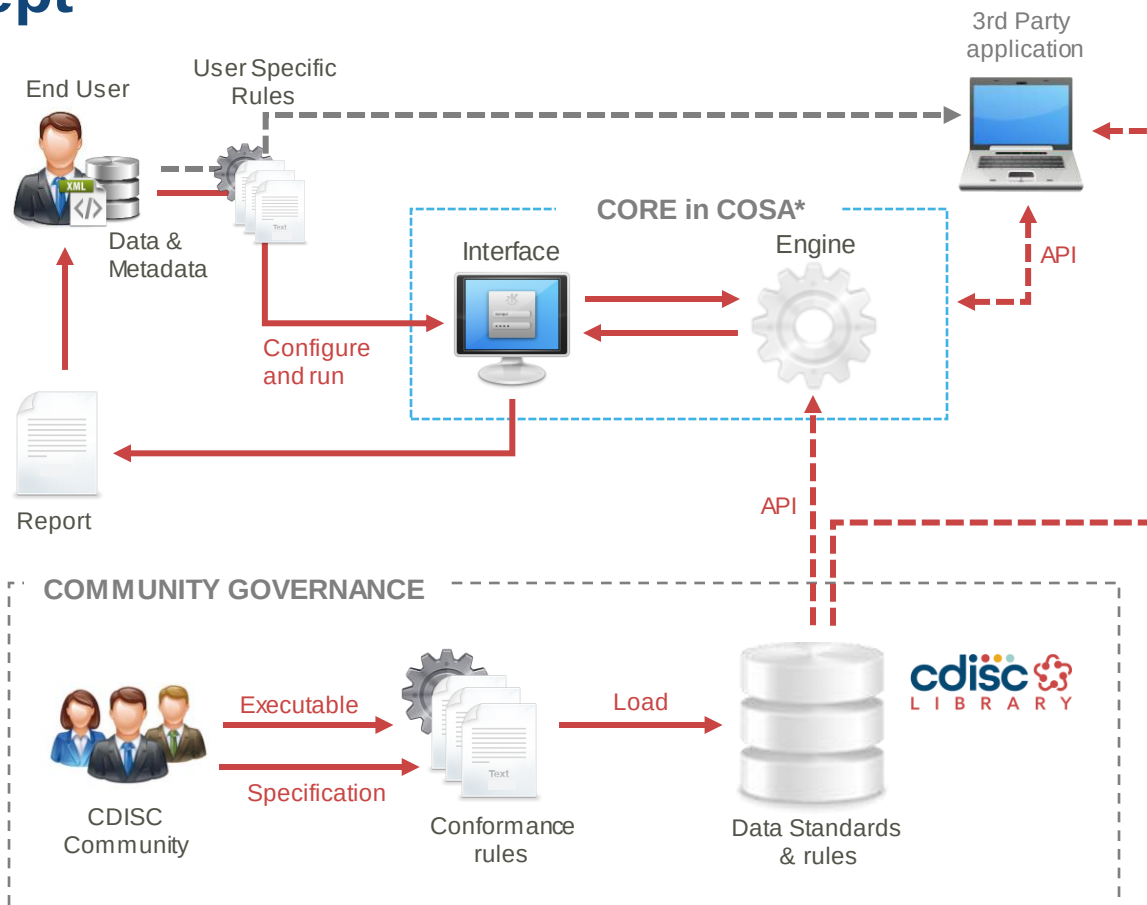
Agenda

1. Concept of CORE
2. High-level Status and Roadmap
3. CORE Rules
4. CORE Engine
5. CORE Roadmap Board
6. Next Steps

A decorative vertical bar on the left side of the slide, featuring a grid of dots in red, yellow, and blue, connected by thin lines to form a complex geometric pattern.

Concept of CORE

CORE Concept



* CDISC Open-Source Alliance

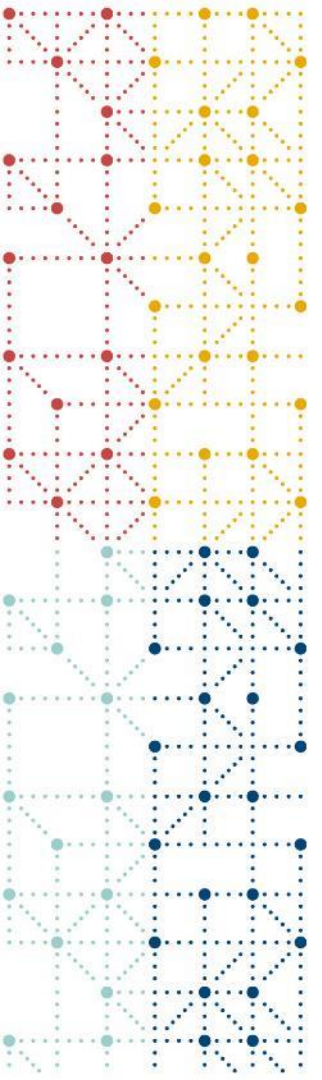
Why is CDISC doing CORE?

- 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
- Develop an open-source engine that serves as a Reference Implementation
- Publish the Rules in the CDISC Library and the engine under the CDISC Open Source Alliance (COSA)

➡ *CORE Initiative = Rules + Engine*



<https://www.cdisc.org/core>



High-level Status and Roadmap

CORE To Date

2022 - SEP Transition to Open-Source

- Start of CORE Roadmap Board
- CORE in GitHub
- Initiation of SDTMIG 3.2, 3.3, SENDIG, ADaMIG

2022 - JUL Next Phase

- Azure Marketplace Evaluation Deployment
- End Microsoft engagement

2021 – APR EU Interchange

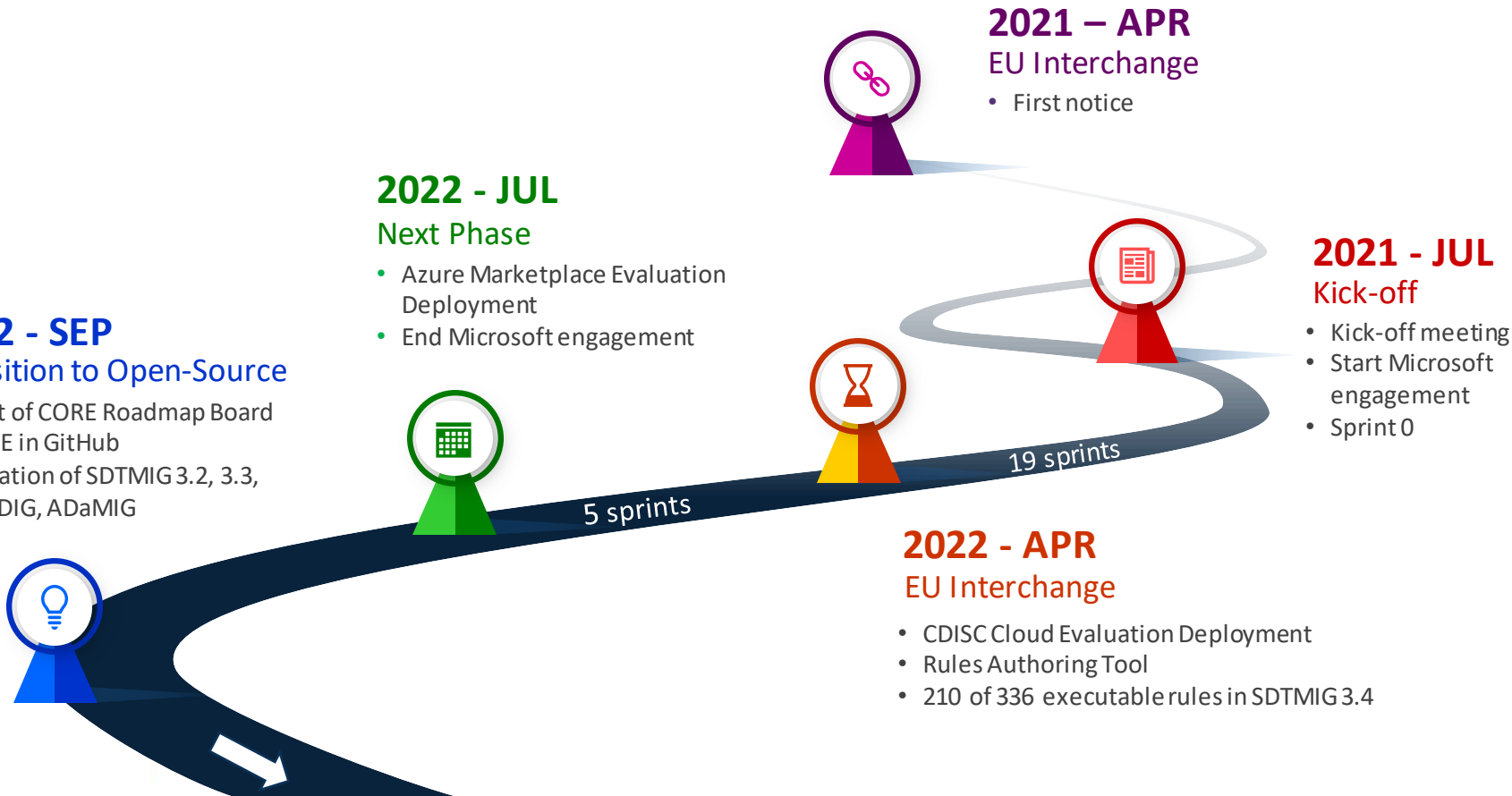
- First notice

2021 - JUL Kick-off

- Kick-off meeting
- Start Microsoft engagement
- Sprint 0

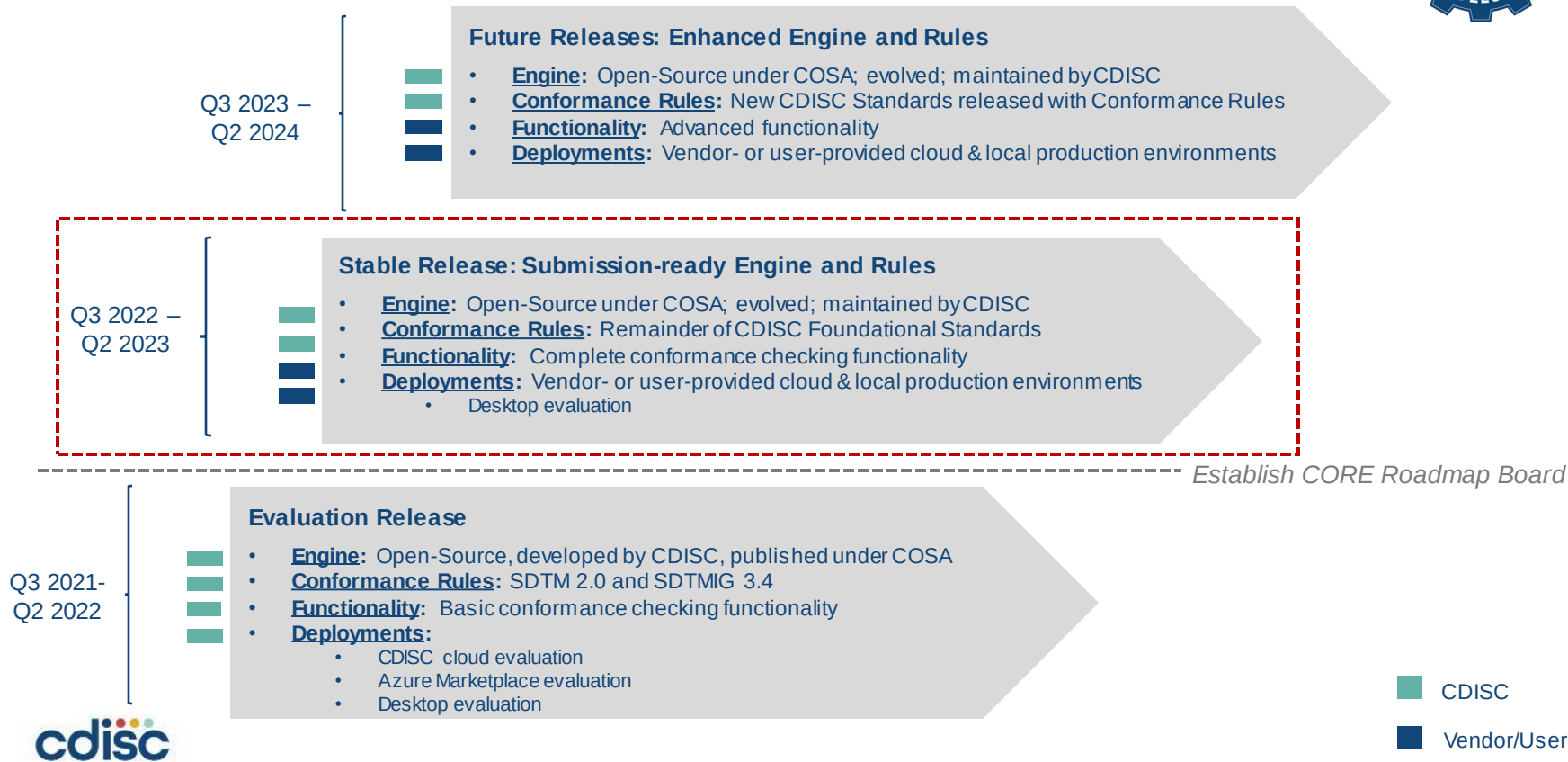
2022 - APR EU Interchange

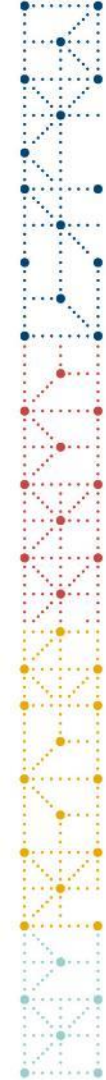
- CDISC Cloud Evaluation Deployment
- Rules Authoring Tool
- 210 of 336 executable rules in SDTMIG 3.4





CORE Program Roadmap





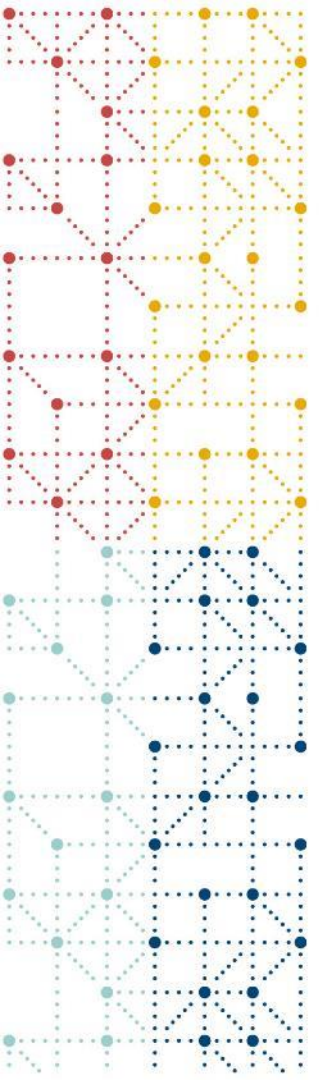
Assessment to Date

Major accomplishments

- Quick establishment of YAML schema
- Rule authoring tool
- Signs of life - deployment of evaluation versions in 2022
- Released as open-source in GitHub
- Vendor engagement and adoption

Next focus

- Standalone desktop deployment to drive adoption
- Complex rules and volunteer engagement
- Acceptance by Regulatory Agencies



CORE Rules

Rules Development Process

- Express human-readable rule specification in machine-readable form
- Enter it in CORE Rule Editor using a structured language (YAML)
- Start with a template or copy from an existing similar rule
- Rule Editor provides hints & completion suggestions, & structures the syntax for visual review

Human-readable Specification

Rule ID	SDTMIG Version	Rule Version	Class	Domain	Variable	Condition	Rule
CG0225	3.4	1	ALL	ALL	VISITDY	VISITNUM is NOT in <u>TV.VISITNUM</u>	VISITDY = null
Document	Section	Item	Cited Guidance				
IG v3.4	4.4.5		VISITDY must not be populated for unplanned visits, since VISITDY is, by definition, the planned study day of visit, and since the actual study day of an unplanned visit belongs in a --DY variable.				

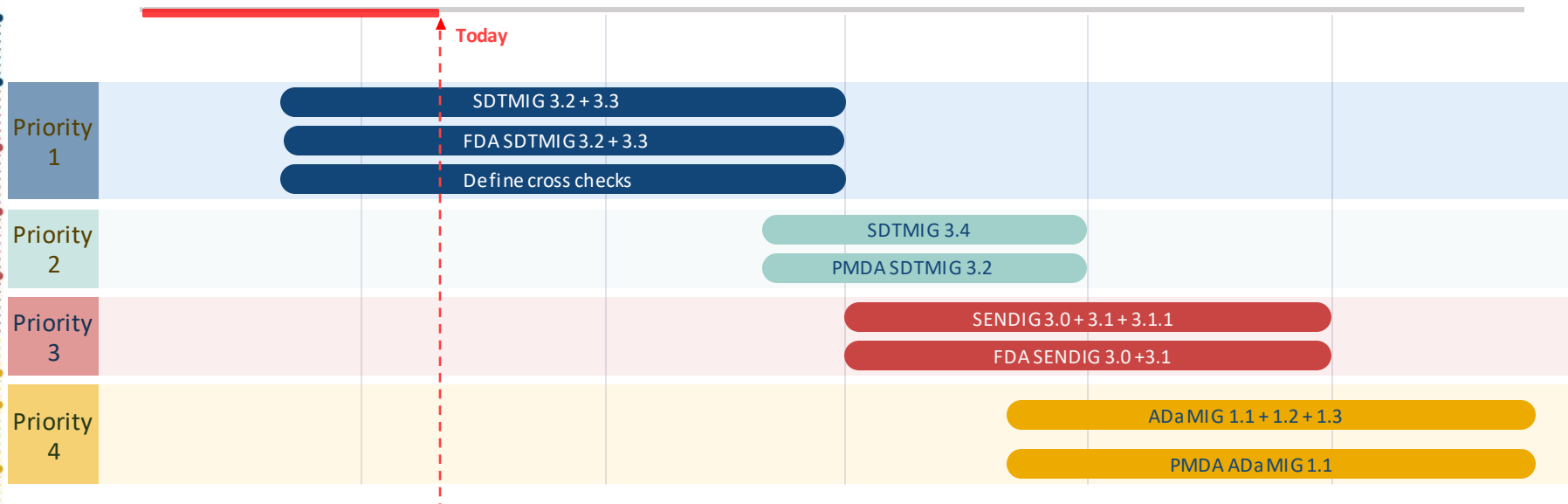
Executable Rule (YAML) in Rule Editor

```
1 Core:
2   Id: CDISC.SDTMIG.CG0225
3   Version: '1'
4   Authority:
5     Organization: CDISC
6   Description: Trigger error if VISITDY is populated when VISITNUM is not in TV.
7   References:
8     - Origin: SDTM and SDTMIG Conformance Rules
9       Rule Identifier:
10         Id: CG0225
11         Version: '1'
12   Version: '2.0'
13   Sensitivity: Record
14   Severity: warning
15   Rule Type: Value Presence
16   Scopes:
17     Classes:
18       Include:
19         - All
20     Domains:
21       Include:
22         - All
23     Standards:
24       - Name: SDTMIG
25         Version: '3.4'
26   Operations:
27     - domain: TV
28       id: tv.visitnum
29       name: VISITNUM
30       operator: distinct
```

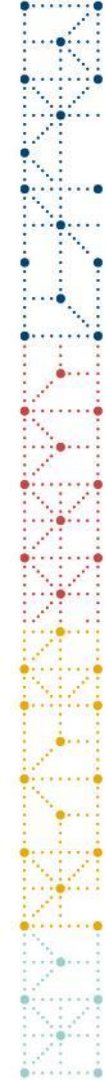
Rules Development Progress

Components	Status										
	OPEN	DONE	BLOCKED	UNIT TESTING	QC IN PROGRESS	READY TO PUBLISH	PUBLISHED	AWAITING QC	AUTHOR IN PROGRESS	BACK TO AUTHOR	T:
ADaMIG v1.0	321	0	0	0	0	0	0	0	0	0	321
ADaMIG v1.1	426	0	0	0	0	0	0	0	0	0	426
ADaMIG v1.2	597	0	0	0	0	0	0	0	0	0	597
ADaMIG v1.3	581	0	2	2	1	0	0	2	8	0	596
FDA SDTMIG v3.2	493	0	0	0	0	0	0	0	0	0	493
FDA SDTMIG v3.3	501	0	0	0	0	0	0	0	0	0	501
FDA SENDIG DART v1.1	348	0	0	0	0	0	0	0	0	0	348
FDA SENDIG v3.0	315	0	0	0	0	0	0	0	0	0	315
FDA SENDIG v3.1	330	0	0	0	0	0	0	0	0	0	330
FDA SENDIG v3.1.1	335	0	0	0	0	0	0	0	0	0	335
FDA SENDIG-AR v1.0	466	0	0	0	0	0	0	0	0	0	466
SDTMIG v3.2	350	17	8	0	4	2	17	12	2	4	416
SDTMIG v3.3	371	26	8	1	5	2	17	12	3	4	449
SDTMIG v3.4	4	65	50	19	1	0	273	1	34	0	447
SENDIG v3.0	264	0	0	0	1	0	0	0	0	0	265
SENDIG v3.1	174	2	2	3	1	9	0	100	11	1	303
SENDIG v3.1.1	311	0	0	0	1	0	0	0	0	0	312
SENDIG-DART v1.1	359	0	0	0	1	0	0	0	0	0	360
Total Unique Issues:	6546	110	70	25	15	13	307	127	57	9	7279

Rules Development Priority



Timelines depend on community engagement



Rules Developer Skill Set

Core Skills

- Data savvy with science background; e.g., statistics, biometrics, data science
- A CDISC standards practitioner. Solid implementation experience with SEND, SDTM, and/or ADaM
- Experience in data specifications & associated verification & validation tasks

“Plus” Skills

- Some familiarity with the associated conformance rules
- Knowledgeable in structured data, such as XML, JSON, YAML
- A member of an organizational standards council or governance body

Rules Developer Onboarding Process and Support



Training tools on
the wiki, will further
refine



Training webinars



Rule Workshops at
F2F meetings



Weekly 1-hour
CORE Rules
Developer Meeting



Weekly 2-hour
CORE Rules
Developer "Office
Hours"

Dedicated volunteers needed!

Currently limited number of active
volunteers from industry

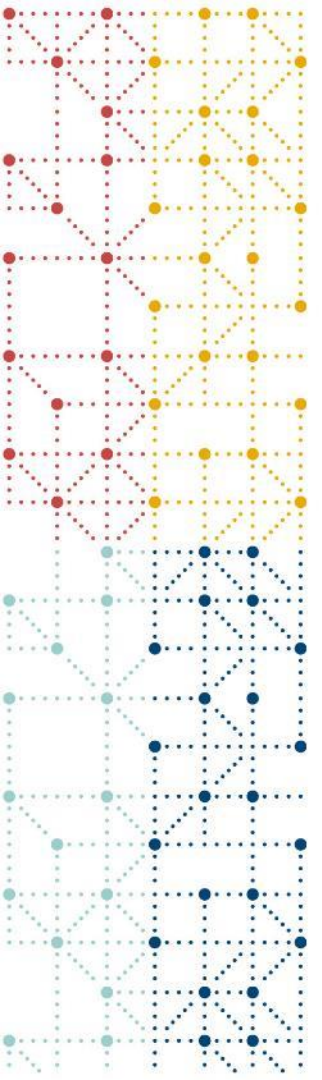
How to sign up as a volunteer

- <https://www.cdisc.org/volunteer/form>
 - Select CORE Rules Team

Select the CDISC Standards Development team that you would like to join. (Please choose one)

- | | | |
|---|---|--|
| ☐ CORE Rules | ☐ Controlled Terminology | ☐ Medical Devices |
| ☐ DDF | ☐ QRS | ☐ Tobacco Implementation Guide |
| ☐ Safety User Guide | ☐ SDS | ☐ Genomics Subteam |
| ☐ ADaM | ☐ SEND | ☐ Other... |
| ☐ CDASH | ☐ Data Exchange (ODM, Define-XML) | |

Additional standards information can be found on our [Standards Page](#).



CORE Engine & Deployments

What does the CORE Engine do?

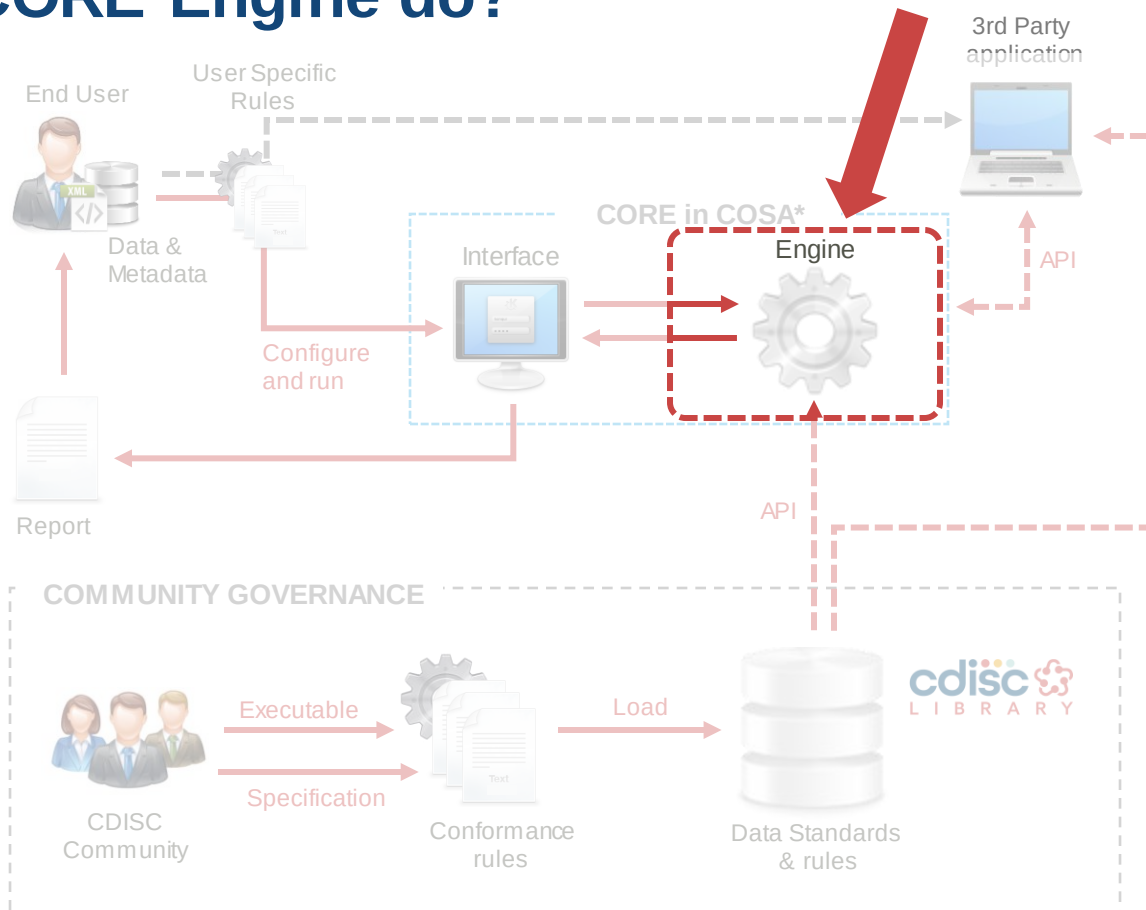
CORE Engine

Functionality:

- Executes CORE Rules (YAML) against clinical data and returns results
- Deployment agnostic
- Open-source, available in GitHub

Current focus:

- Process new YAML operators added to express new rules
- Process new clinical data formats
- Support enhanced reporting



* CDISC Open-Source Alliance

CORE Engine is Open-Source

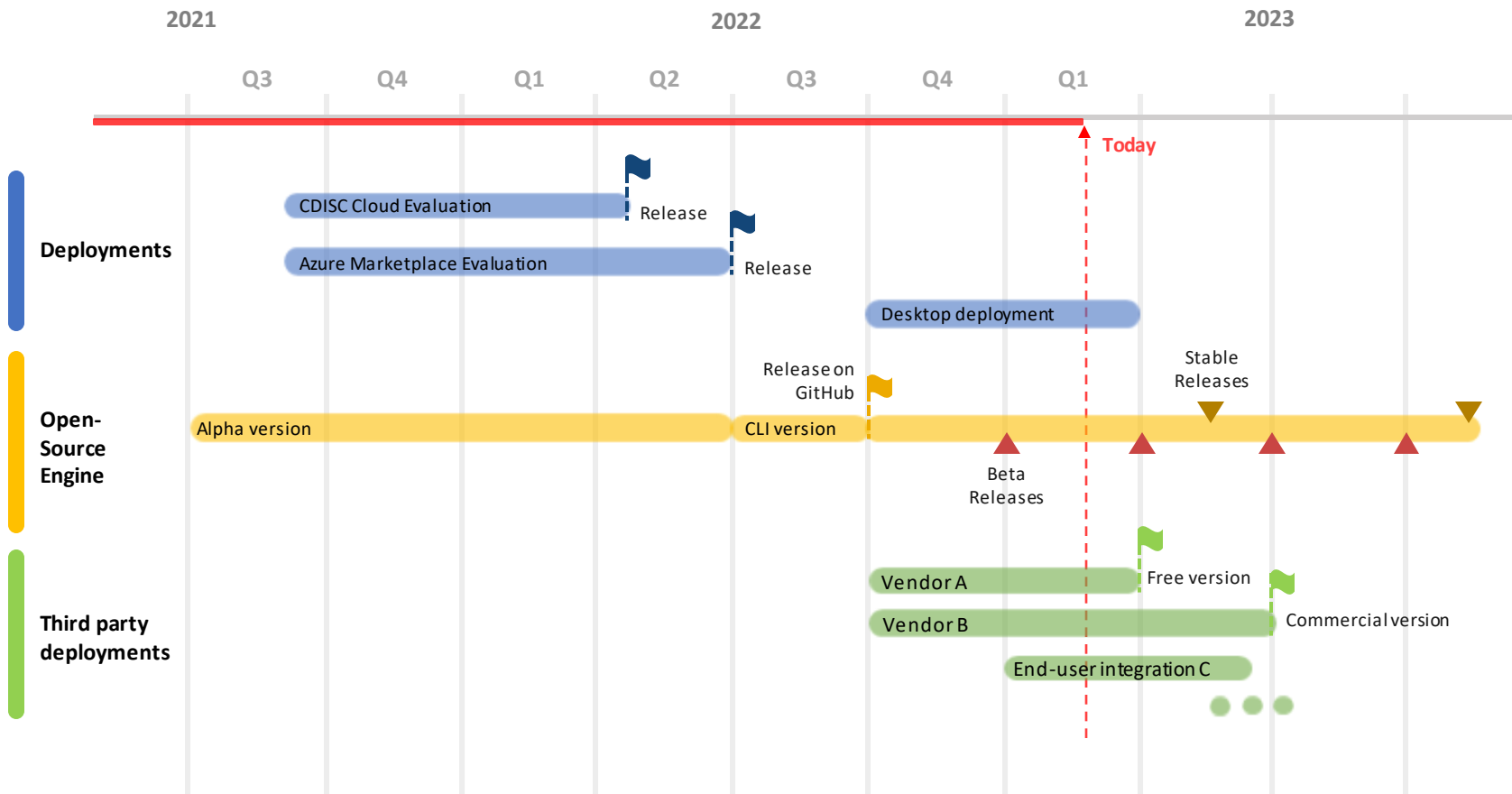
- Development transitioned to open-source framework during summer of 2022
 - Guided by the CORE Roadmap Board and CORE Technical Committee
 - Listed in the COSA (CDISC Open-Source Alliance) directory
 - Permissive MIT open-source license
- Development and validation is the domain of the open-source community
- Free to all in greater CDISC community, who can deploy it in their preferred environment (e.g., cloud, on-premises standalone/desktop, on-premises server)
- Provided to greater CDISC community via GitHub
- CORE Engine in GitHub has a command line interface (CLI) for execution



CORE Engine Deployment

- CORE Engine deployments are the domain of the greater CDISC community, including commercial software vendors
 - Prepared by and for the user community
 - Commercial vendors offerings for the user community
- CORE deployments may include
 - Enhanced UI / Enhanced reporting and issue tracking
 - Additional clinical data formats
 - Ongoing support (e.g., service level agreement)
- CORE deployments must be validated by the deployer
 - Is separate from CORE Engine validation which is done by the open-source community

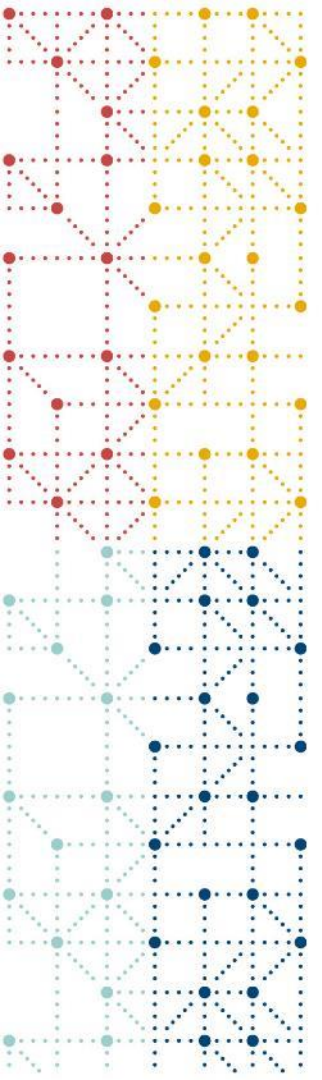
Engine and Deployments Overview





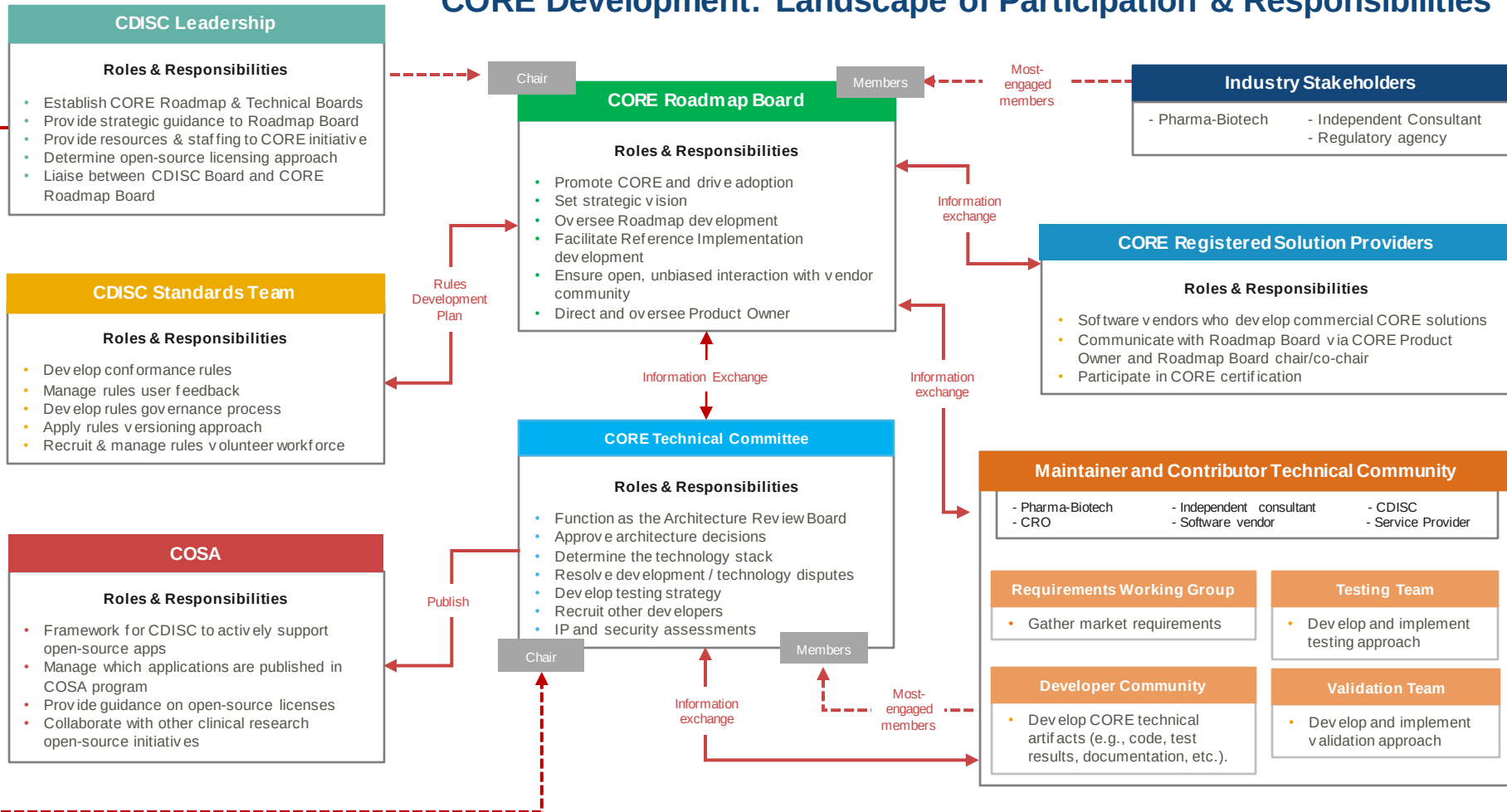
CORE Registered Solution Provider

- Program purpose
 - For CORE vendors (solution providers)
 - A means to officially certify with CDISC that their CORE solutions correctly use the CORE Rules
 - For CDISC
 - A means to treat all CORE vendors equally regarding
 - Certifying vendor solutions – by testing all solutions with the same “certification test package” – Rules, test data, and test run set
 - Informing the CDISC community of available vendor CORE solutions – by announcing every and only certified solutions
 - A means to achieve a level playing field re use of any Engine with the CORE Rules
- Testing for certification will include
 - Generating results with CORE Rules and test study data reflecting an “average study”
 - No system functionality testing



CORE Roadmap Board

CORE Development: Landscape of Participation & Responsibilities



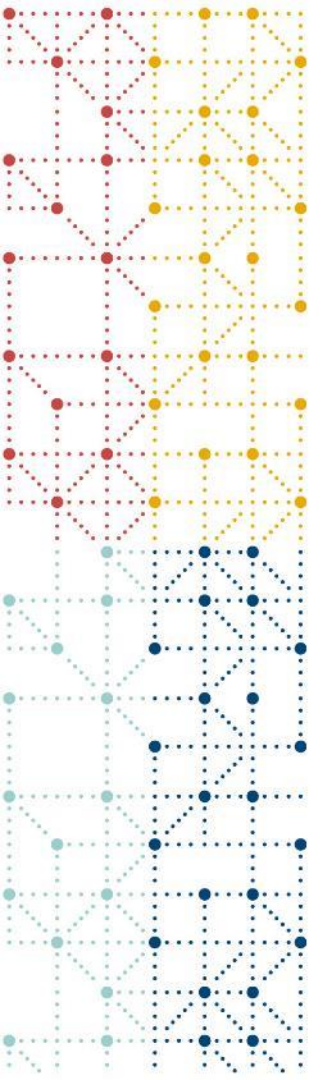
CORE Roadmap Board Overview

Highlights of Responsibilities

- Promote CORE and drive adoption
- Set strategic vision
- Oversee Roadmap development
- Facilitate Reference Implementation development
- Ensure open, unbiased interaction with vendor community

Membership from

- Most-engaged Pharma-Biotech; CDISC; Independent consultants; Service providers
- (Software vendors opportunity to participate on CORE Technical Committee and as CORE Registered Solution Providers)



Next Steps



First Release

- The complete ruleset for
 - SDTM 3.2 and SDTM 3.3
 - Define.xml crosscheck rules
 - FDA validator rules v1.6 (that apply to SDTM 3.2 and SDTM 3.3)
 - FDA rejection rules
- CORE Engine Stable Release
 - Engine can run all of the rulesets above
 - Thorough testing and validation documentation
- Purpose
 - Test with real study data and roll-out rules governance process



*Implementers can integrate this stable version
Drive adoption and test with real study data*



CORE future state

- Rules
 - Full set of validated rules for submission standards (SDTM, SEND, ADaM)
 - Including Regulatory-specific rules
 - Including Define.xml cross-check rules
- CORE is the Reference Engine
 - Engine with all basic functionality for full set of machine-executable rules
 - Includes a validation package
- CDISC will establish a CORE certification program
 - To verify output of different applications versus the CORE Reference Engine
 - CDISC conformance rules are the single version of the truth



Rules are part of the Standards!

Expect Regulatory Agencies to mandate use of CDISC Conformance Rules



Thank You!

