

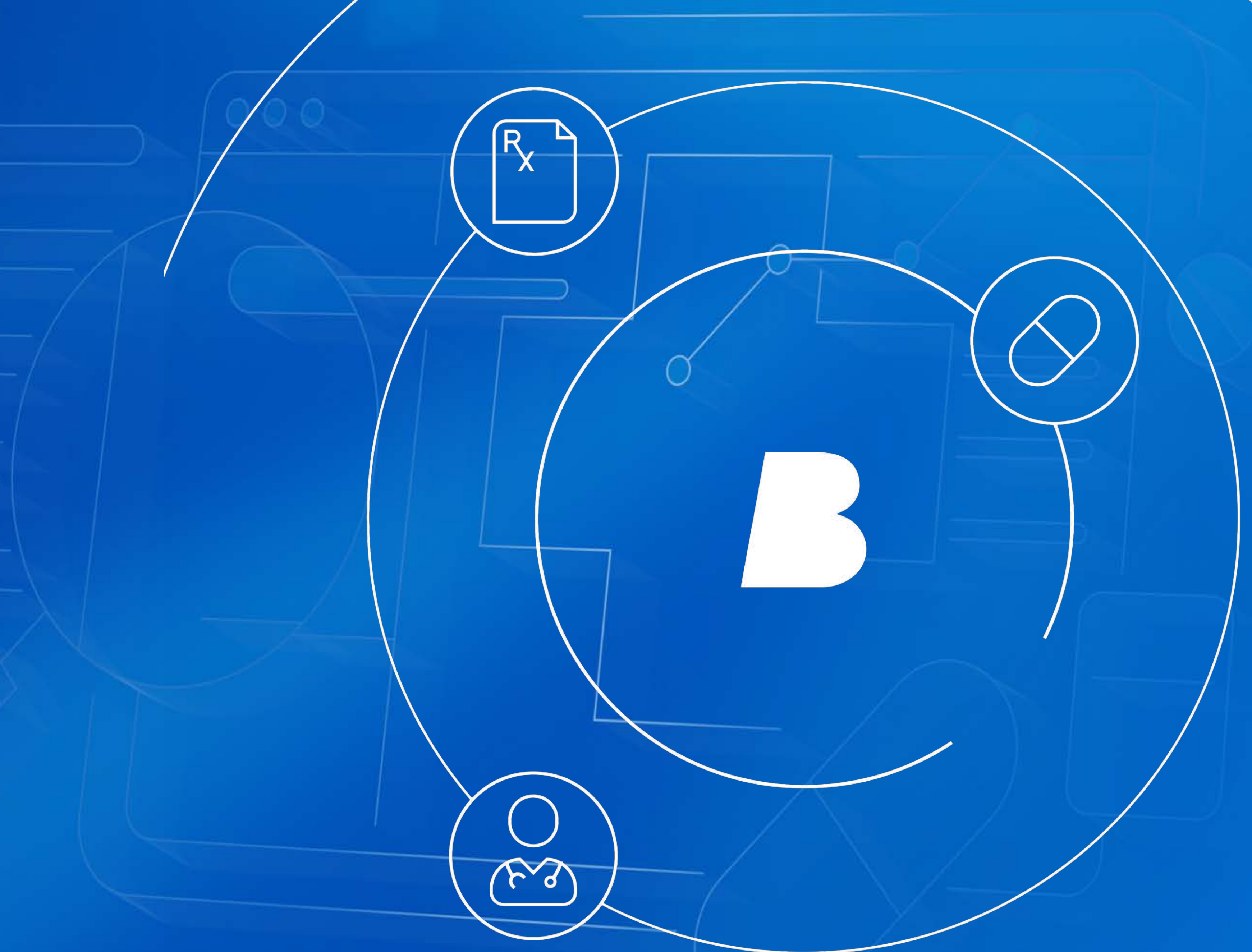


openEHR

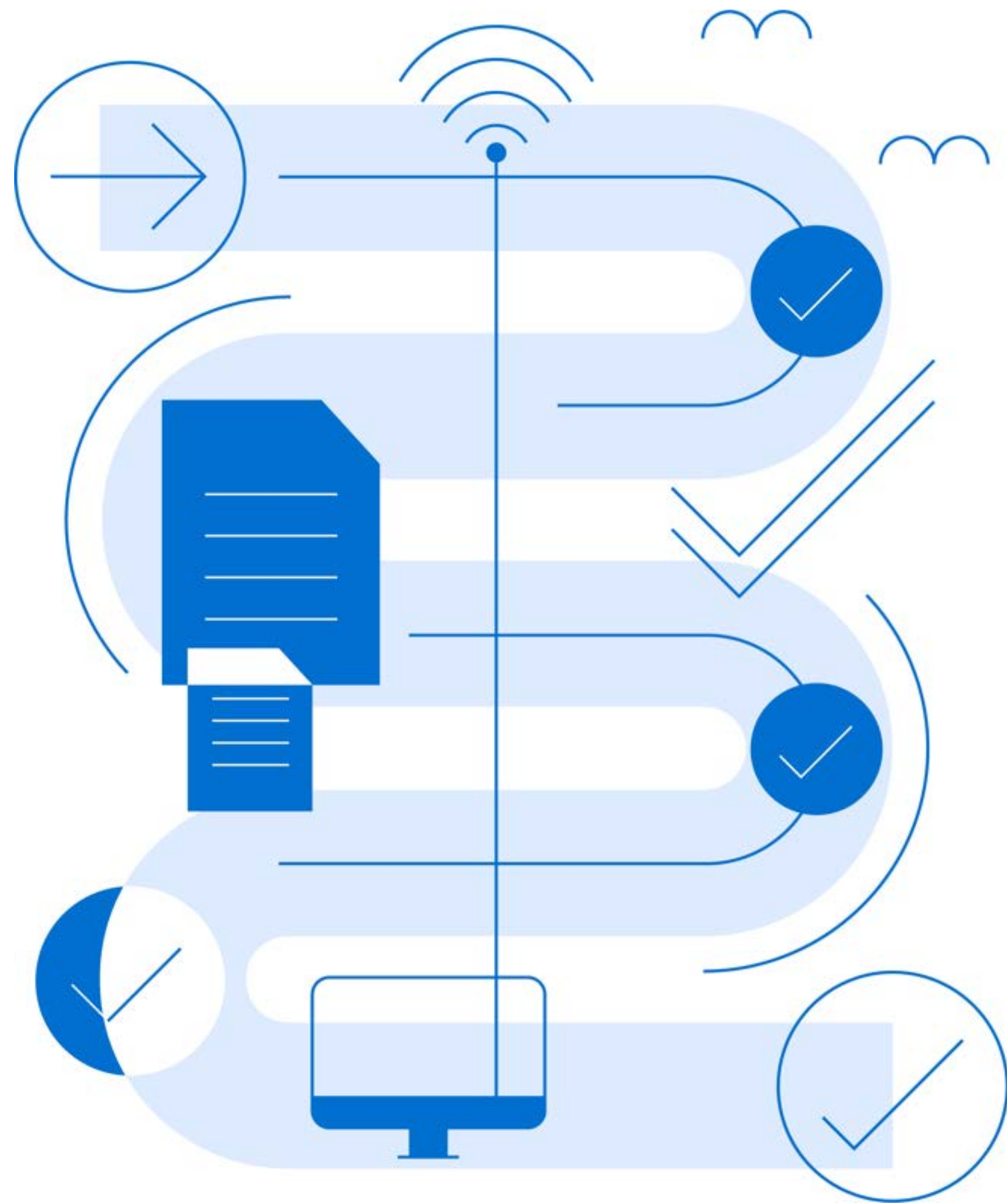
An introduction

Richard Kavanagh

Head of Technology



About Me



Richard Kavanagh

- Healthcare Standards advocate
- 19 Years Standards Experience
NHS Digital / Graphnet / Kainos / Better
- Board Member
openEHR UK / HL7 UK / INTEROPen

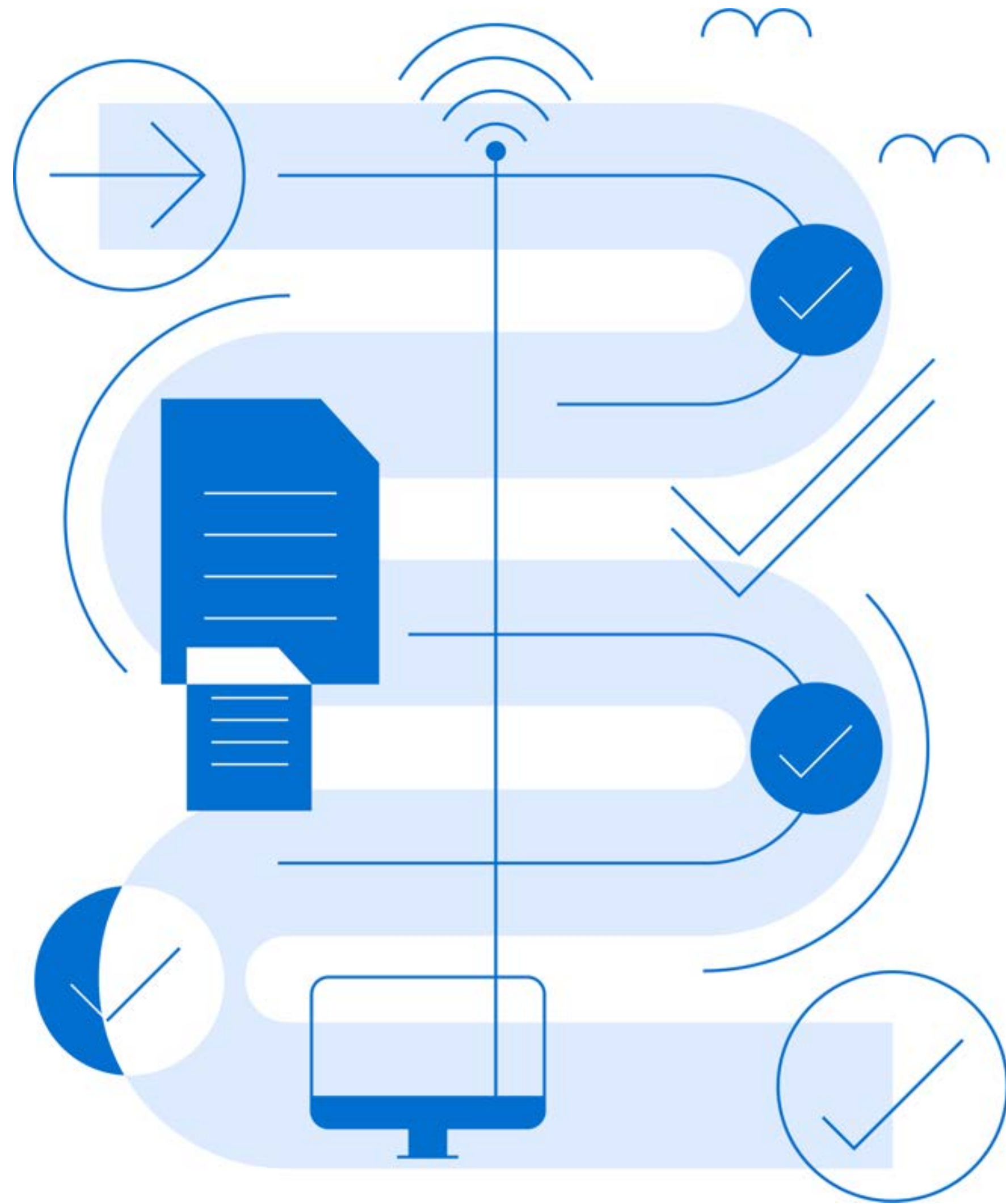


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<https://x.com/RKavanagh>

Agenda



- openEHR what is it ?
- Modelling approach
- Tools
- Clinical Data Repositories
- Querying Data
- APIs
- openEHR & FHIR

openEHR ?

- An **open specification** for a health information model.
 - defines clinical data models
 - how to store and manage them
 - governance processes
- A collaboration between **clinicians, industry & health organisations** to store data and share clinical data
 - **vendor neutral**
 - **technology neutral**
- Creates the infrastructure for an **Open Platform Ecosystem**
- Significant deployments across the UK
 - London UCP
 - Christies PROMs
 - Wales ePMA
 - etc.

- A **specification** for healthcare systems not a **software product**
- A set of **modular components** that are evolving, whilst **maintaining stability** for implementation.

https://specifications.openehr.org/release_baseline

- Allows **implementation feedback** to shape and improve **openEHR** standards components.

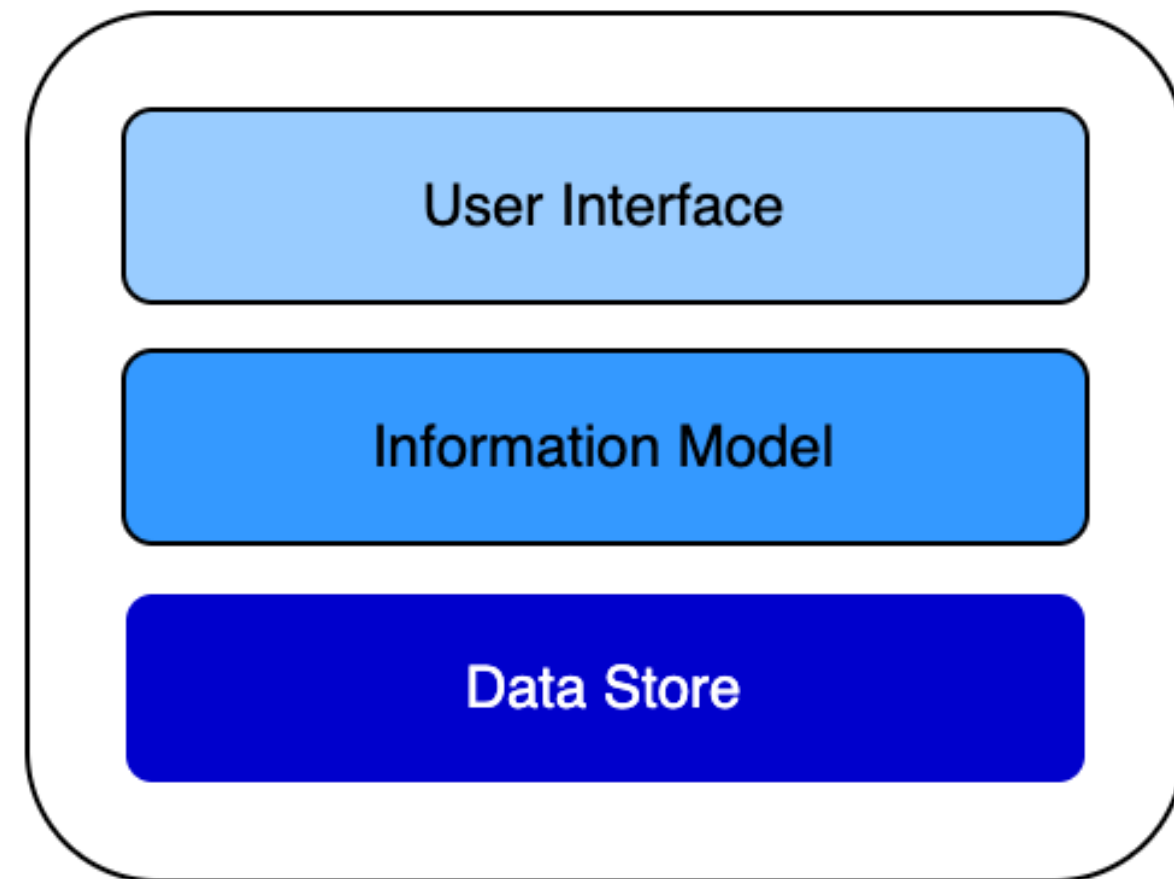
QUERY (Query Languages) PRs CRs	AQL S Archetype Query Language		AQL Examples D AQL Examples		1.1.0 (14-May-2021) 1.0.1 (26-Jul-2020) 1.0.0 (15-Nov-2017)	
AM (Archetype Model) PRs CRs AOM2 UML AOM1.4 UML	Archetype Technology S Business case for archotyping; overview of archetype specifications	ADL 2 S Archetype Definition Language 2	AOM 2 S ADL 2 Object Model (enhanced AST)	OPT 2 D Operational Template 2	Identification S Archetype / template identifiers & versioning rules	2.3.0 (20-Mar-2024) 2.2.0 (18-Jun-2019) 2.1.0 (24-Aug-2018) 2.0.6 (07-Jan-2017) 1.4 (31-Dec-2008)
	ADL 1.4 S Archetype Definition Language 1.4		AOM 1.4 S ADL 1.4 Object Model (enhanced AST)		OPT 1.4 S Operational Template 1.4	
LANG (Generic Languages) PRs CRs LANG UML	ODIN S Object Data Instance Notation	BMM T Basic Meta-Model of models & expressions	P_BMM S BMM human-readable serial format	Expression Language D A syntax for formal expressions	1.0.0 (11-May-2020)	

Legend: D - Development T - Trial S - Stable R - Retired

https://specifications.openehr.org/release_baseline

Architecture

A view of a typical healthcare system ...

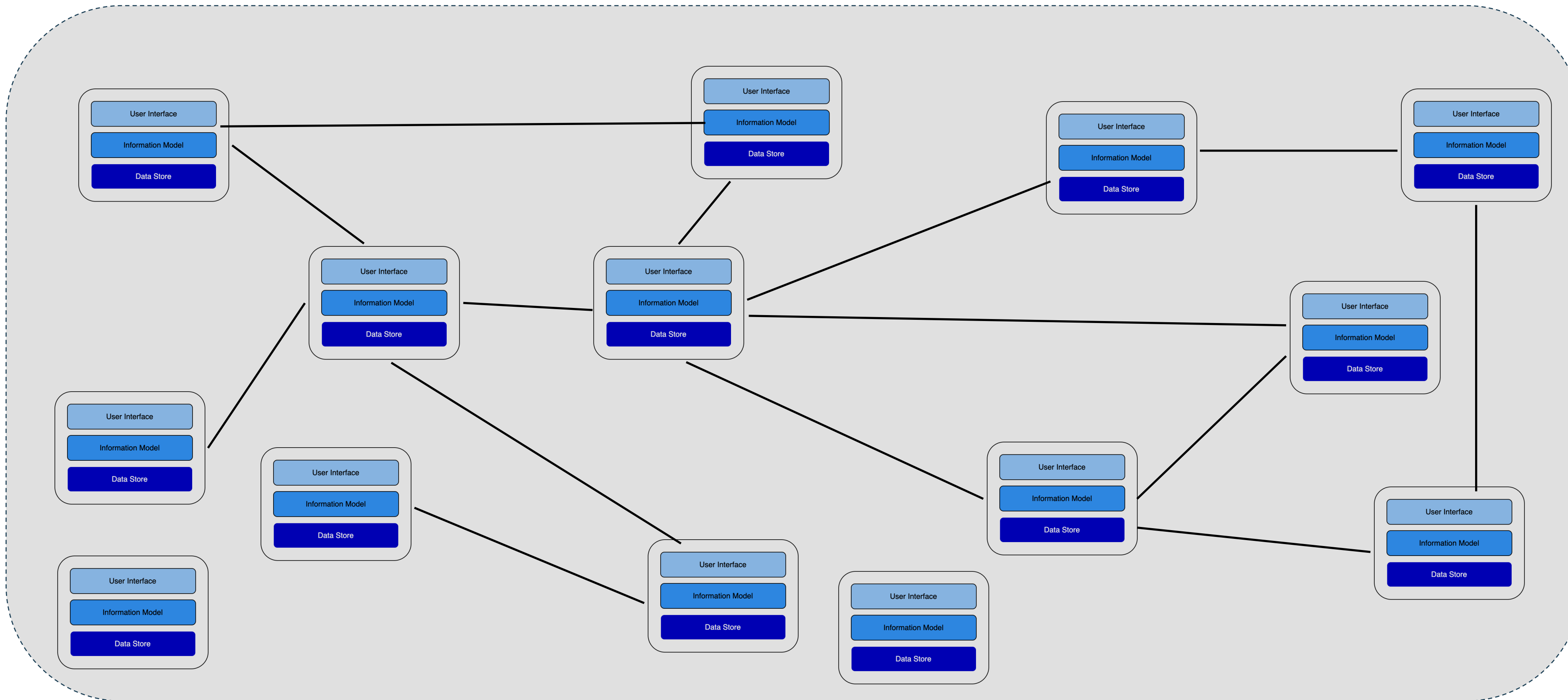


Different between vendors, specialties, countries, etc.

Proprietary and semantically unaligned

Different technologies with different schema

A healthcare organisation...



A web of interfaces

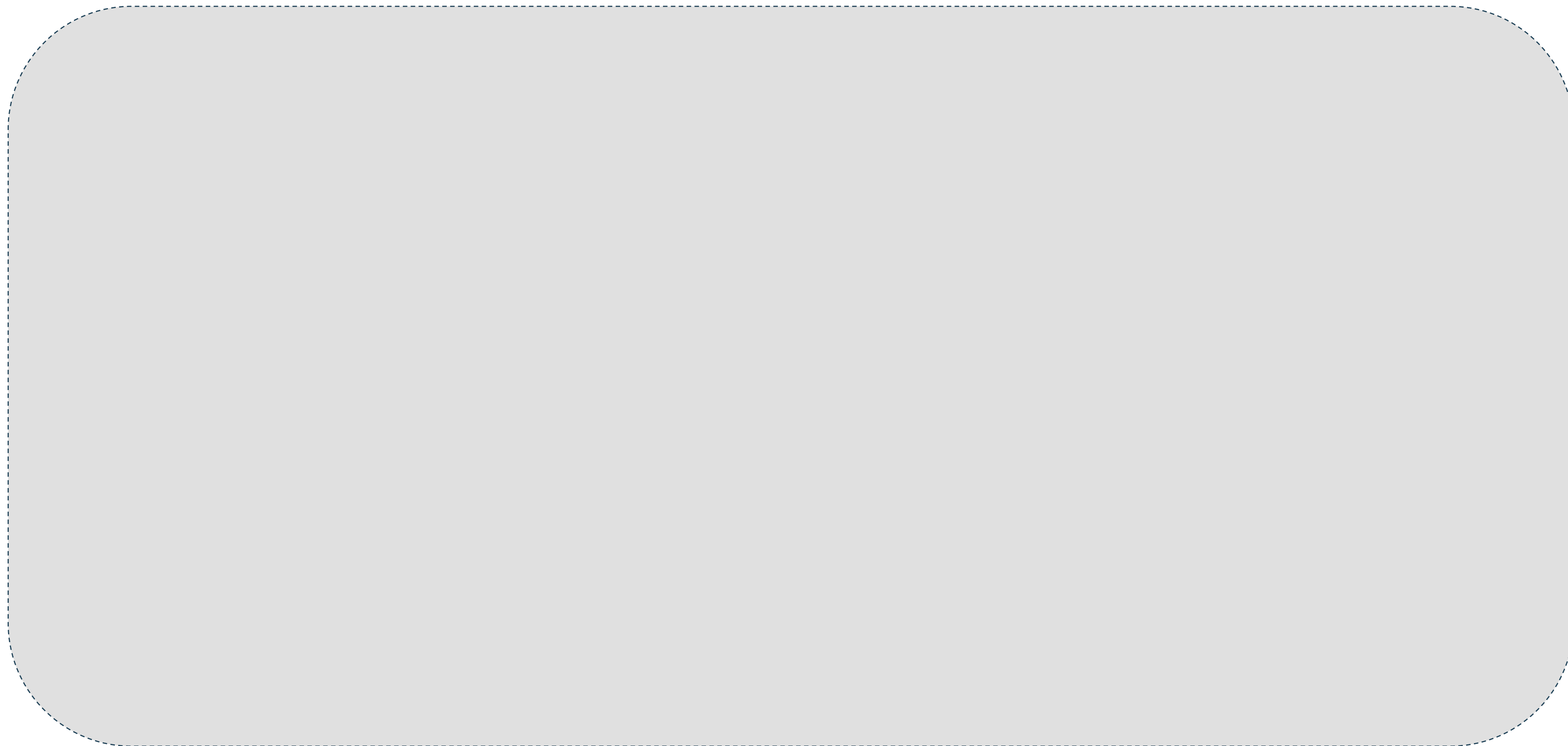
HL7v2
HL7v3
FHIR

Interoperability
challenges

Data migration
challenges

Data liquidity
challenges

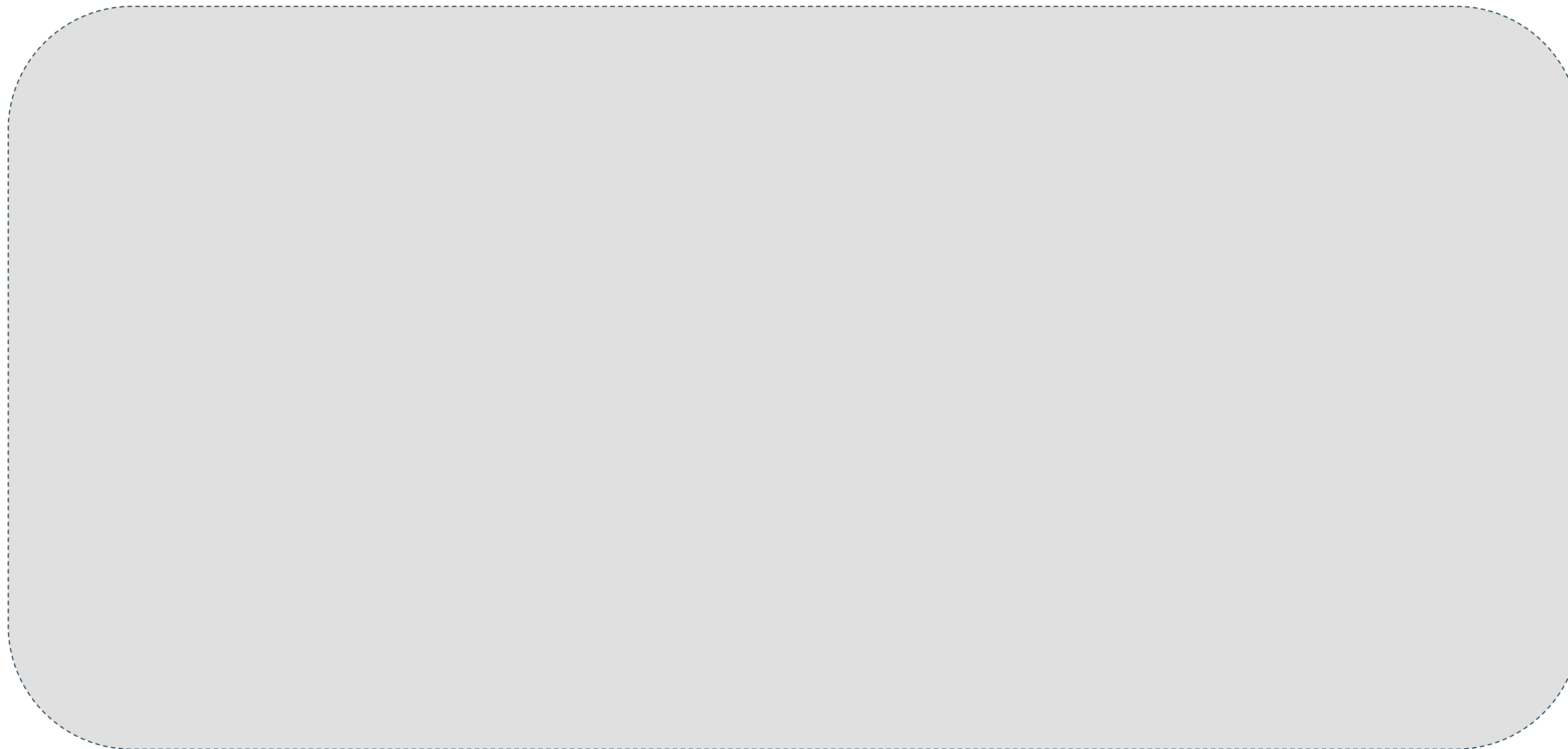
A healthcare organisation – using an open data platform



A shared data platform

- **Common open data models**
- **Common data APIs**
- **Technology neutrality**

A healthcare organisation – the components of the data platform



OpenEHR CDR

- **Clinical data models**

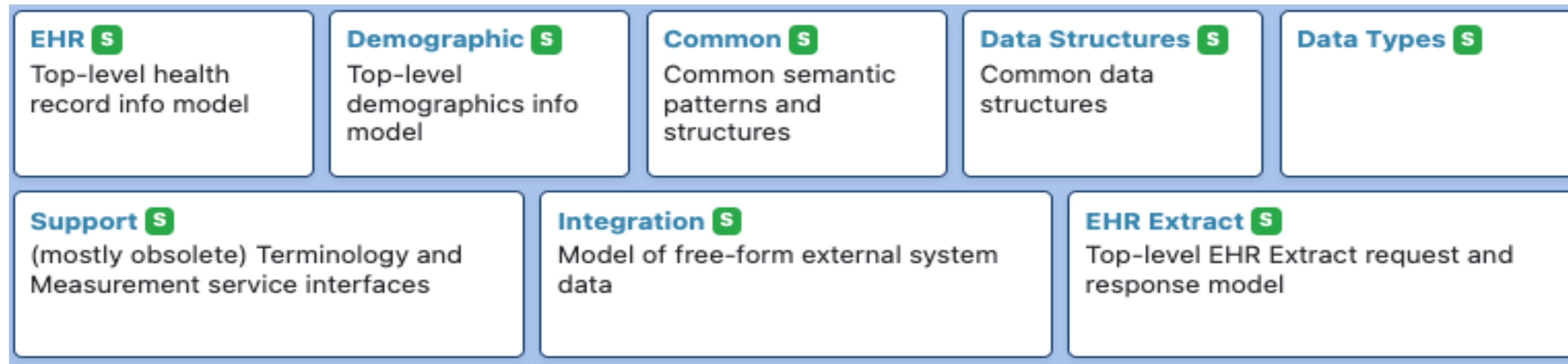
FHIR Data Store

- **Demographics**
- **Transactional Data**
- **Organisational Data**

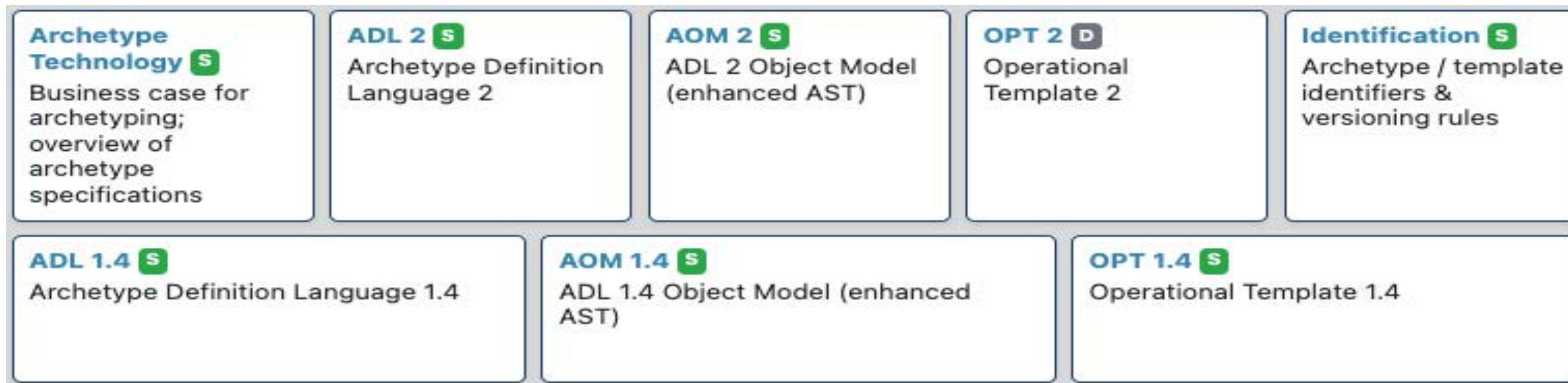
Data Models

openEHR makes use of a **two level** data modelling approach which provides both **flexibility** and **stability**

Level 1 – Reference Model



Level 2- Archetypes & Templates



The **Reference Model** is the overarching model for **openEHR**

The model is **implemented in software** using the vendor's **technology choice**.

It consists of :

- The EHR information model, defining the class models to be used
- Data types & data structures
- EHR extract information model for extracting data

The **Reference Model** is extremely stable and consistent between implementations, ensuring **data portability** and **interoperability** between openEHR data stores.

Archetype Models are **knowledge artefacts** using the **reference model** to describe a single clinical concept.

- Blood pressure
- Medication supply
- Diagnosis
- Allergy
- Laboratory Test Result
- Medical Device
- Apgar Score
- Body Temperature

The models are described using a **maximal data** set, attempting to cater for all clinical viewpoints.

A rigorous **governance** process is used to ensure the **quality** of models being created and any ongoing **maintenance**.

Although not optimal, **local archetypes** can be created to address gaps and ensure delivery timelines.

Template Models are used to create use-case specific models.

They typically consist of **multiple archetypes** and allow the archetypes to be **constrained** to meet the requirements of the use-case.

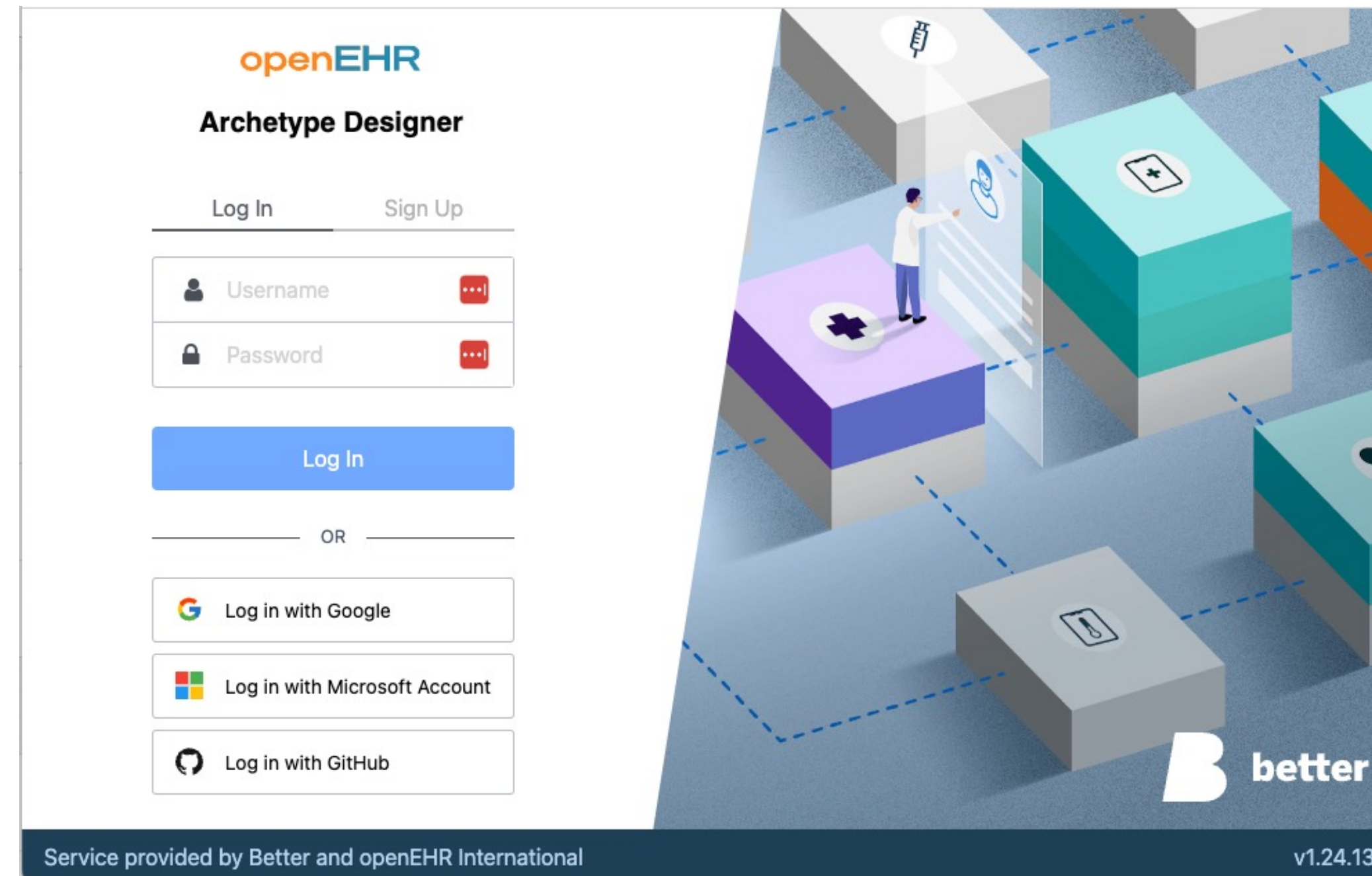
Template Models still conform to the **reference model** and as such any **template** and any **archetype** is valid on any openEHR data store.

Both **archetypes** and **templates** have a formal modelling approach and constrain language to computably describe them.

openEHR tooling ensures that data modellers can focus on the models not the underlying technical mechanisms.

Specialised tooling exists for creating both **archetypes** and **templates**.

Free **web-based** tools are available to the community to author, maintain and share models.



<https://tools.openehr.org/designer/#/>



Data Modelling Tools

The image displays four overlapping screenshots of the Archetype Designer web application. The top-left screenshot shows a tree view of a data model for 'Food and nutrition summary'. The top-right screenshot shows a 'Details' panel for a path with occurrences of 1.1 and type 'EVALUATION'. The middle-left screenshot shows a mindmap view of the same data model. The middle-right screenshot shows a table view of the data model's attributes, including 'Description', 'Food security status', 'Food security description', 'Nutrition status', 'Weight status', 'Dietary preference', 'Dietary constraints', 'Milk supply', and 'Comment'. The bottom-right screenshot shows the source code for the archetype, including the ADL version, UID, and the XML structure for the data model, including language and accreditation information.

FREE!

<https://tools.openehr.org/designer/#/>

- The **openEHR community** makes use of the **CKM (Clinical Knowledge Manager)** platform as the governance platform for **archetypes** and **templates**.

- Several CKM instances exist in a federated manner across different jurisdictions.

<https://ckm.openehr.org/ckm/> the international CKM

<https://ckm.apperta.org/ckm/> the CKM used for UK projects

- CKM is used to both catalogue the models and facilitate the model review process.
- The value of the data models within CKM is fundamental to the openEHR value proposition .

Clinical Data Repositories

Clinical Data Repositories are the data stores for **openEHR** content.

The unit of data storage is a **Composition** a data structure from the **reference model**.

These consist of three key components:

- content – the data as represented by a template/archetype
- context – the context around the composition (archetyped)
- composer – who authored the composition

Clinical Data Repositories standards define not just the model of the composition but also how they are managed, stored, located and organised within a **CDR**.

CDRs

There are a variety of options when considering the use of a **CDR**. They are complicated components and require expertise to develop.

- Create your own by following the **specifications** (not recommended)
- Use an **open-source** version on manage it yourself.
- Use a cloud hosted offering.
- Use a **managed service** where it is delivered as part of an overall platform offering.

A **CDR** is not a clinical system, it still requires other components to operate as a data platform.

Data Queries



Archetype Query Language

The ability to discover and **efficiently query data** within a **CDR** is essential for the functionality of health applications.

AQL (Archetype Query Language) is a declarative language designed specifically for querying data based on the **openEHR reference model**.

There are many similarities with **SQL** as seen in **relational databases** and **AQL** offers comparable power and functionality.

AQL has the following clauses:

- The **SELECT** clause specifies the data elements to be returned.
- The **FROM** clause specifies the result source and the corresponding containment criteria.
- The **WHERE** clause specifies data value criteria within the result source.
- The **ORDER BY** clause indicates the data items used to order the returned result set.
- The **LIMIT** clause indicates which portion of the result set will be returned.

An example **AQL** query to illustrate the syntax

```
SELECT
  o/data[at0001]/.../items[at0004]/value AS systolic,
  o/data[at0001]/.../items[at0005]/value AS diastolic,
  c/context/start_time AS date_time
FROM
  EHR[ehr_id/value=$ehrUid]
  CONTAINS
    COMPOSITION c
      [openEHR-EHR-COMPOSITION.encounter.v1]
    CONTAINS
      OBSERVATION o [openEHR-EHR-OBSERVATION.blood_pressure.v1]
WHERE
  o/data[at0001]/.../items[at0004]/value/value >= 140 OR
  o/data[at0001]/.../items[at0005]/value/value >= 90
ORDER BY
  c/context/start_time DESC
```

-- Select clause
-- Identified path with alias

-- From clause
-- RM class expression
-- containment
-- RM class expression
-- archetype predicate

-- Where clause
-- value comparison

-- order by datetime, latest first

<https://specifications.openehr.org/releases/QUERY/Release-1.1.0/AQL.html>

https://specifications.openehr.org/releases/QUERY/Release-1.1.0/AQL_examples.html



Archetype Query Language

Scenario: Get all blood glucose values and their corresponding subject ids, where blood glucose > 11 mmol/L or blood glucose >= 200 mg/dL

```
SELECT
  e/ehr_status/subject/external_ref/id/value,
  o/data[at0001]/events[at0002 and name/value='Any event']/data[at0003]/items[at0013.1]/value
FROM EHR e CONTAINS COMPOSITION c
  CONTAINS OBSERVATION o [openEHR-EHR-OBSERVATION.laboratory-glucose.v1]
WHERE
  o/data[at0001]/events[at0002 and name/value='Any event']/data[at0003]/items[at0013.1]/value
matches {
  C_DV_QUANTITY<
    list = <
      ["1"] = <
        units = <"mmol/L">
        magnitude = <|>=11|>
      >
      ["2"] = <
        units=<"mg/dL">
        magnitude=<|>=200|>
      >
    >
  >
}
```

APIs (x3)



openEHR APIs

As would be expected the interaction with the **CDR** is via **RESTful APIs**

There are three different sets of APIs within **openEHR**.

EHR APIs <https://specifications.openehr.org/releases/ITS-REST/Release-1.0.2/ehr.html>

- Used to create/update/delete and retrieve compositions from the CDR
- Used to manage the internal configuration of the CDR

Query APIs <https://specifications.openehr.org/releases/ITS-REST/Release-1.0.2/query.html>

- Used to execute adhoc AQL queries against the CDR
- Used to execute stored AQL queries against the CDR

Definition APIs <https://specifications.openehr.org/releases/ITS-REST/Release-1.0.2/definitions.html>

- Used to add/retrieve templates used within the CDR
- Used to manage stored queries (AQL) within the CDR

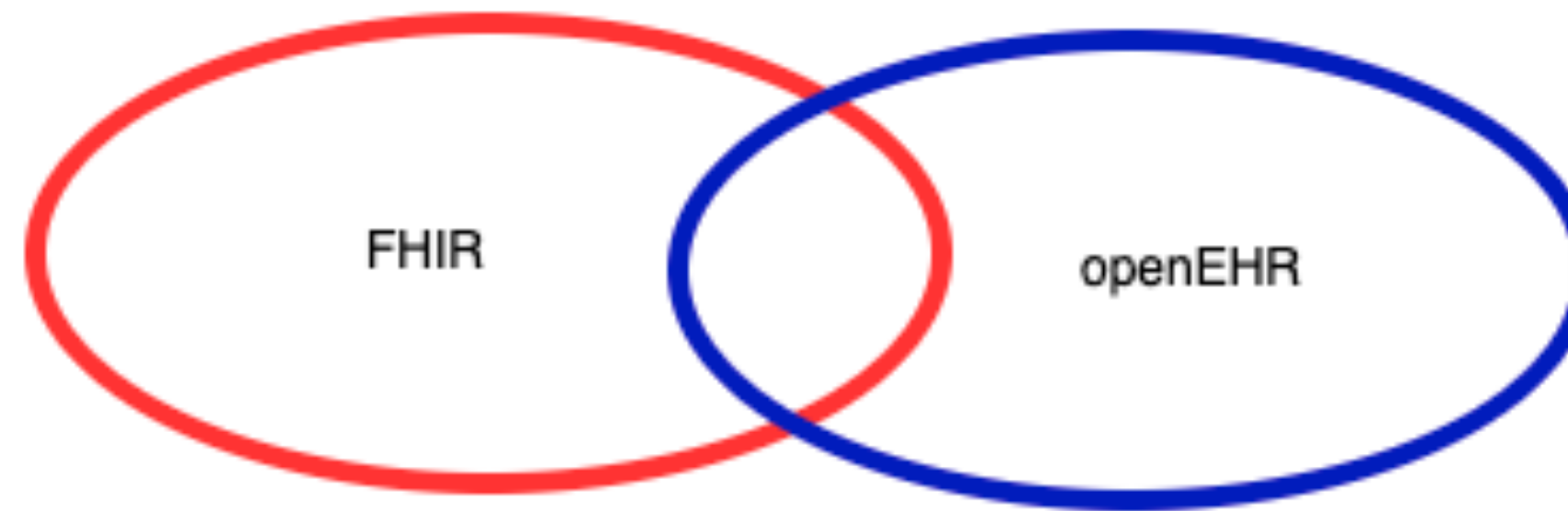
(openEHR + FHIR) = ?



openEHR
+
FHIR

- There is now growing recognition that **openEHR** and **FHIR** would benefit from closer alignment.
- Statements by **Grahame Grieve (FHIR)** and **Rachel Dunscombe (openEHR)** in **May 2024** have met (mostly) positivity in the standards communities.
- So, what happens, next ?
- My thoughts...

- **FHIR** and **openEHR** serve different purposes for different communities.
- There is overlap and hence some of the historic tensions



- Will the standards merge in to one – **No**
- Will change be quick – **No**
- Does everyone in each community agree/care – **No**
- Both standards are built by volunteer communities – **change will be slow.**



openEHR
+
FHIR

- **Stream 1 – Organisational**
 - Organisationally there will be efforts to align and signpost areas of interest
 - Governance will be a challenge; there is not a unified desire to achieve this
 - Standards development is slow and is volunteer led
- **Stream 2 – Technical**
 - Both communities have excellent tool smiths mainly volunteers
 - Focus will tend to be on the interesting rather than the useful
 - Without focus, there could will be inefficiencies and duplication
 - Commercial stimulation on tools is historically poor
- **Stream 3 – User Centric**
 - Community driven to address real life use-cases, evidence driven.
 - Voices in the overlap areas to articulate the need on priorities



openEHR
+
FHIR

- Progress will be made (it already is), the pace and extent of alignment is unknown.
- Areas of potential focus:
 - FHIR Terminology Usage
 - Model <> Model transforms
 - Package Management
 - Smart-On-FHIR vs Smart-On-OpenEHR
 - Implementation Guide development
 - Modelling tools
 - Semantic Alignment
 - Governance processes

Curious ... ?

Useful Links

openEHR has a friendly, supportive online community at <https://discourse.openehr.org/> - register for free.

The screenshot shows the openEHR Discourse forum homepage. The top navigation bar includes the openEHR logo, a search icon, and links for CKM, Website, and Specifications. The main content area is divided into a left sidebar with navigation options like Topics, My Posts, and Categories, and a main forum area. The forum area features a 'Categories' tab and a list of topic categories with their respective topic counts and unread counts. The 'Latest' tab shows a list of recent posts with their titles, authors, and timestamps.

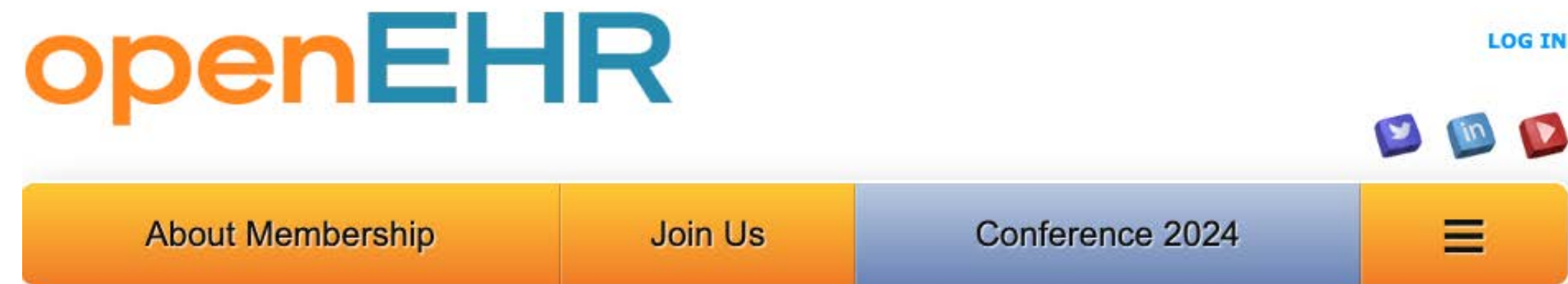
Category	Topics	Latest
New to openEHR? Just starting in openEHR? Ask questions here! Some useful resources: ■ openEHR & standards ■ Resources	41	<input checked="" type="checkbox"/> How to correctly specify the time window within which the fluid balance applies • ■ Ask an editor archetype 1 5h
openEHR news Announcements from openEHR International ■ openEHR days ■ Affiliates ■ Releases 1 unread	77 1 unread	Relationship between FHIR and openEHR ■ HL7 FHIR 22 2d
Community News from the community, including: ■ Releases ■ Procurements 1 unread ■ Confs & Events 3 unread ■ News ■ Covid-19	97 4 unread	<input checked="" type="checkbox"/> Problems creating an EHR with Swagger EHRbase API ■ Resources rest-apis 7 6d
openEHR affiliates Forum for general issues relating to all openEHR Affiliates. See geography level sub-categories for your region. ■ openEHR.nl ■ openEHR.de ■ openEHR.br ■ openEHR.jp ■ openEHR.cn ■ openEHR.si ■ openEHR.es ■ openEHR.uk ■ openEHR.se ■ openEHR.pt ■ openEHR.UK Private ■ openEHR.no ■ openEHR.ch	73	How do we relate the clinical notes (in one template) with the associated diagnosis (in another Template)? ■ Clinical 0 6d
Regional communities	1	<input checked="" type="checkbox"/> Definition of ACTION ISM_TRANSITION.careflow_steps ■ Archetype Designer 2 6d
Tool Support For user community support for clinical modelling and other tools. ESSENTIAL: watch sub-category of tools you use to get notifications.	113 2 unread	Occurrences bug on export of .adls archetype ■ Tool Support ckm, archetype-designer, bug 0 7d
		"Times of the day" vocabulary? ■ Ask an editor 14 8d

Useful Links

openEHR specifications are freely available online. The community will help with any questions. https://specifications.openehr.org/release_baseline

Release Baseline						
Conformance						
CNF (Conformance Specifications) PRs CRs	Conformance Guide D Guide to conformance testing in openEHR.	Platform Conformance Test Schedule D System Under Test (SUT), Test, Conformance Schedule, Profiles, Certification	Platform Profiles D Platform component profiles.	Conformance Certificate D openEHR Conformance Certificate.		
Implementation Technologies						
ITS (Implementation Technology Specifications) PRs CRs	REST APIs S openEHR REST API specifications	SDT D Simplified Data Template	XSDs S XML Schemas for the openEHR BASE, RM and AM	XSDs v2 T XML Schemas v2 for openEHR components	JSON Schemas D JSON Schemas for all openEHR components	2.0.0 (03-May-2021) 1.0.2 (31-Dec-2018)
	BMMs D BMM schemas for Task Planning, RM, Expressions, BASE					
Abstract Specifications Technology-independent primary specifications for the openEHR health computing platform						
Platform Service Interface						
SM (Service Model) PRs CRs SM UML	Platform Services T Ehr, Query, Definitions, Ehrindex, Admin, Demographic, Terminology, Message, SystemLog	SIM B D Simplified Information Model 'B' for use with Simplified Data Template	SDF D Serial data formats for use in REST and other contexts			
Process and CDS						
CDS (Clinical Decision Support) PRs CRs CDS UML	GDL S Guideline Definition Language v1		GDL2 S Guideline Definition Language v2			2.0.0 (17-Aug-2023)
PROC (Process Model) PRs CRs PROC UML	Overview T Overview of CDS, Guidelines, and Planning specifications.	Task Planning (TP) T An adaptive, executable, team-based model of clinical workflow	TP Visual Modelling Language (TP_VML) T A visual modelling language for clinical plans and workflows.	Process CDS, Guidelines and Planning Examples D Real-world CDS/Process examples.		1.6.0 (12-Jun-2021) 1.5.0 (05-May-2020) 1.0.0 (01-Dec-2017)
Content						
RM (Reference Model) PRs CRs	EHR S Top-level health record info model	Demographic S Top-level demographics info model	Common S Common semantic patterns and structures	Data Structures S Common data structures	Data Types S	1.1.0 (29-Sep-2020) 1.0.4 (04-Jan-2019)

openEHR's first International conference is in the UK in November
<https://openehrfoundation26.wildapricot.org/Conference-2024>



[About Membership](#) > [Conference 2024](#)

openEHR International 1st Annual Conference

Join us at openEHR International's 1st Annual Conference - it's going to be a blast!

Date and time:

Tue, 5 Nov 2024 08:30 - Wed, 6 Nov 2024 18:00 GMT

Location: UK

Wokefield Estate Golf Club, Goodboy's Lane, Reading, RG7 3AE.

[Directions](#)

About this event

WELCOME to the 1st openEHR International Annual Conference, which is **open to both members and non-members of openEHR**.

Join us for 2-days filled with insightful discussions, networking opportunities, and innovative ideas looking at openEHR and health data.

The beautiful Wokefield Estate - set in the English countryside - will provide a unique community event and the perfect backdrop for learning and collaboration.

Whether you are a healthcare professional, software developer, vendor, user of openEHR or simply interested in openEHR and the future of healthcare technology, this conference is the place to be.

Learn from industry experts, participate in workshop sessions, and connect with like-minded individuals who share your passion for improving healthcare data.

Don't miss out on this exciting event - [BOOK NOW](#) to secure your spot!

Q&A



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<https://x.com/RKavanagh>





**Better data,
better care.**

WWW.BETTER.CARE