

# OpenEHR Technical



# Sophie de Klerk

Bewegingswetenschapper

Signaal analyse

Data science

Creative Media & Game  
Technologies

Health Informatics



# Project examples

1) Predicting falls

1



# Project examples

1) Predicting falls

2) Predicting bladder infections

1



2



Figure 1: Abena Nova, the intelligent incontinence product for everyday use  
1. ACCURATE BUILT-IN SENSORS: Residents wear an Abena Nova continence product with imprinted sensors and a small attachable clip.  
2. STABLE INFRASTRUCTURE: Data is transmitted to the cloud irrespective of the facility's physical environment and IT set-up.  
3. REAL TIME ACTIONABLE INSIGHTS: Caregivers are notified (tablet, PC, smart phone) and take action.

# Project examples

1) Predicting falls

2) Predicting bladder infections

3) Matching interventions

1



2



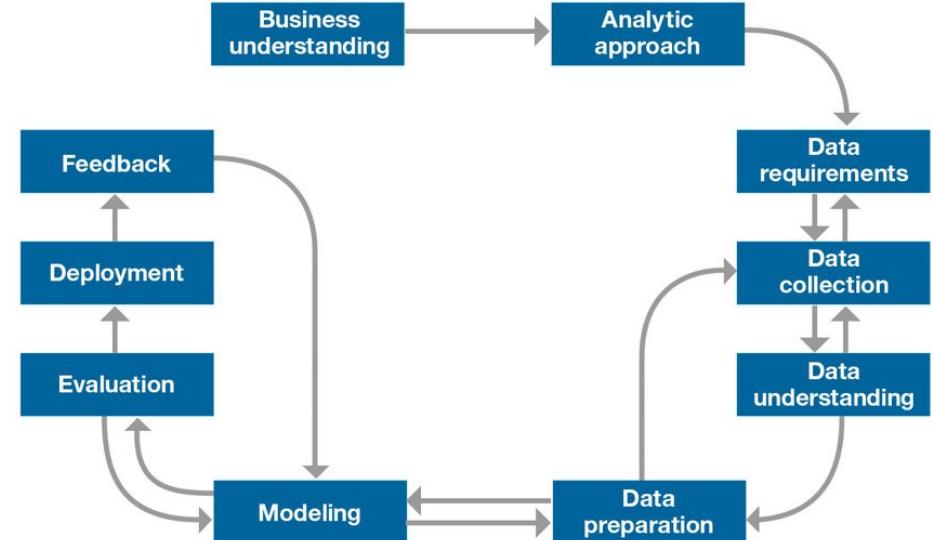
Figure 1: Abena Nova, the intelligent incontinence product for everyday use  
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3

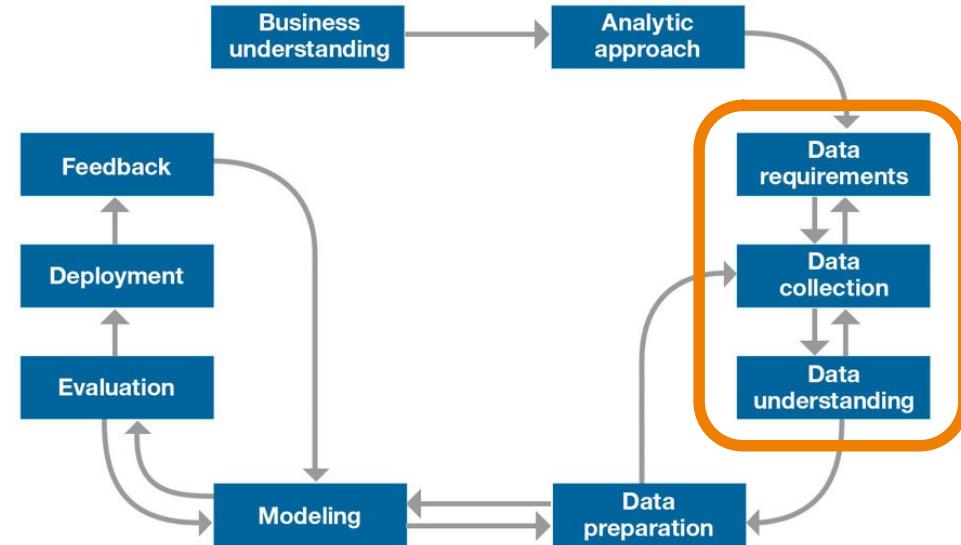
# Challenges

- 1) Data availability
- 2) Data quality
- 3) Data quantity
- 4) Data types



# Challenges

- 1) Data availability
- 2) Data quality
- 3) Data quantity
- 4) Data types



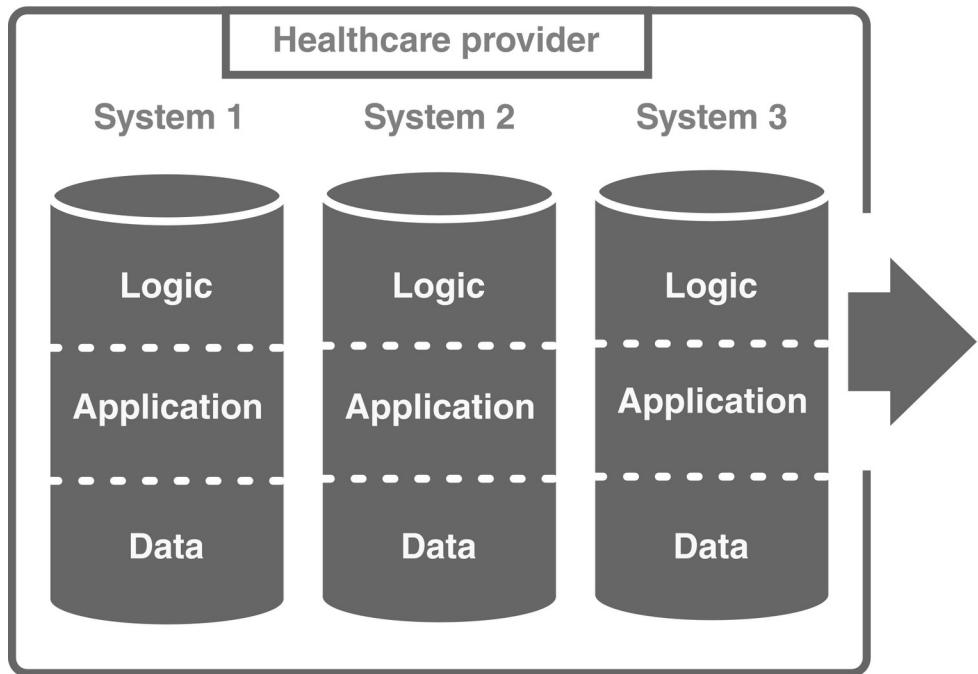
# Research line Health Informatics

# Key concepts

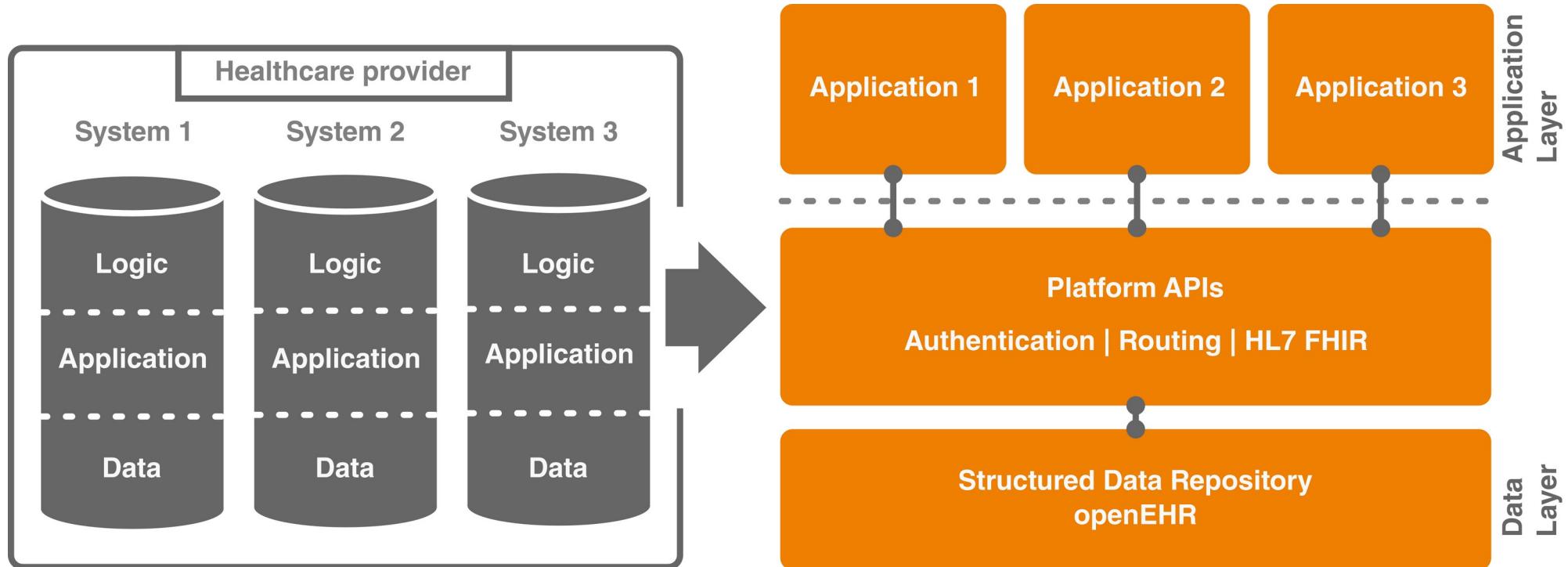
- Data centric
- Open standards
- Platform
- Critical approach
- FAIR



# Application versus data driven

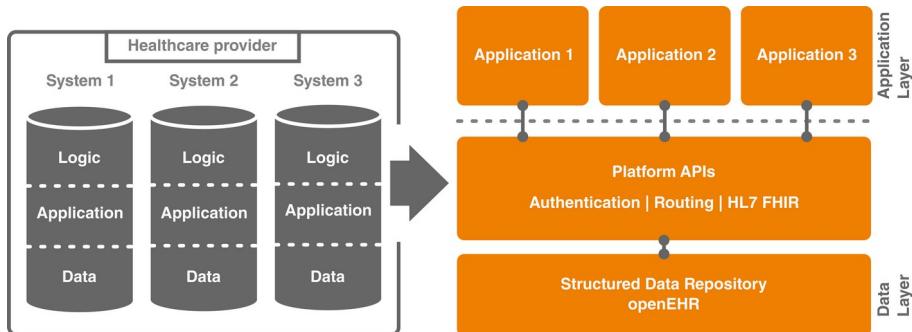


# Application versus data driven



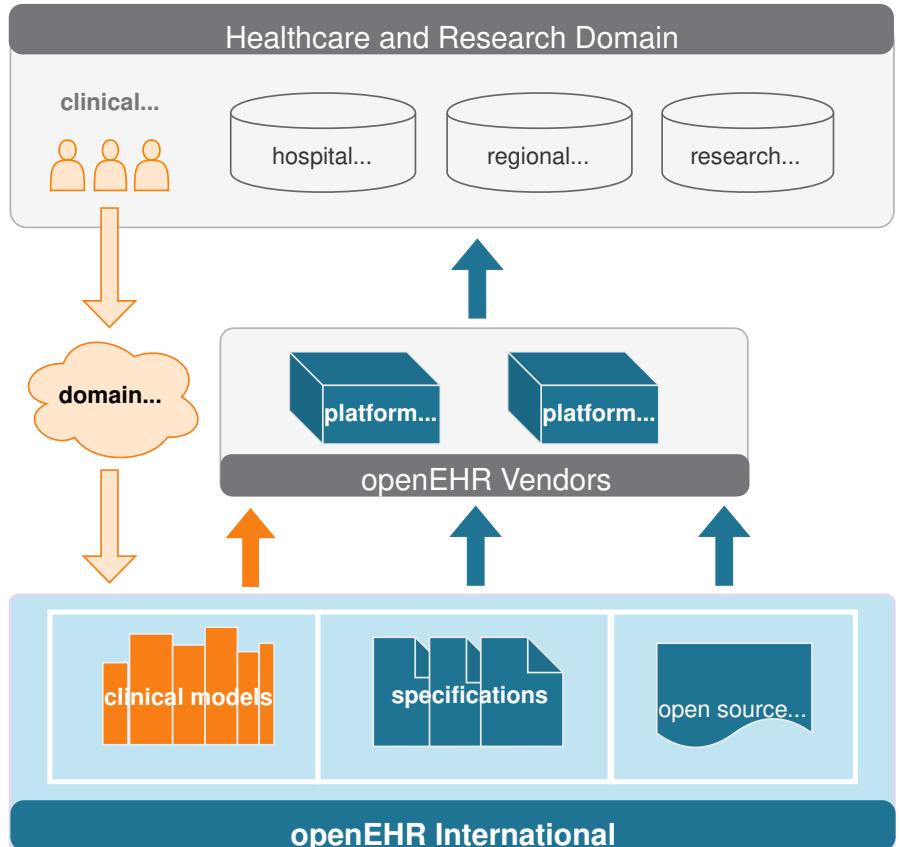
# Modern EHRs

- Data centric
- Open standards
- Platform
- Secondary use
- Prevent vendor lock-in



# openEHR

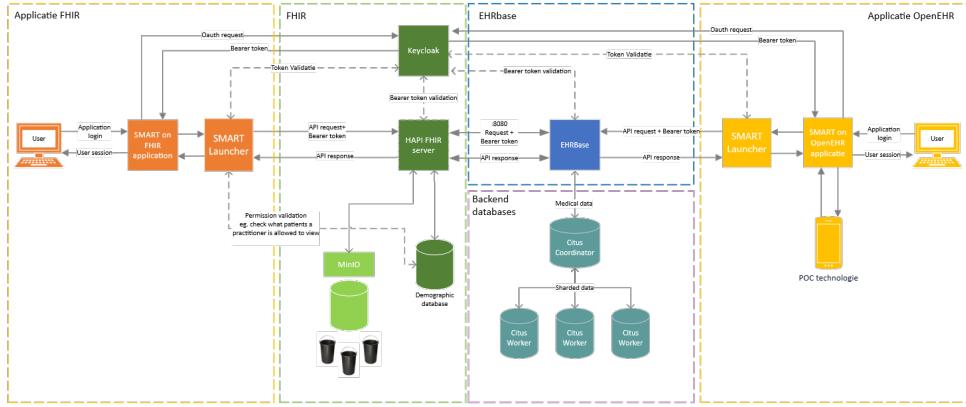
- Electronic Health Record
- Open specification
- Non-profit
- International community



# Previous work

## Open source reference implementation

- Open source stack is incomplete



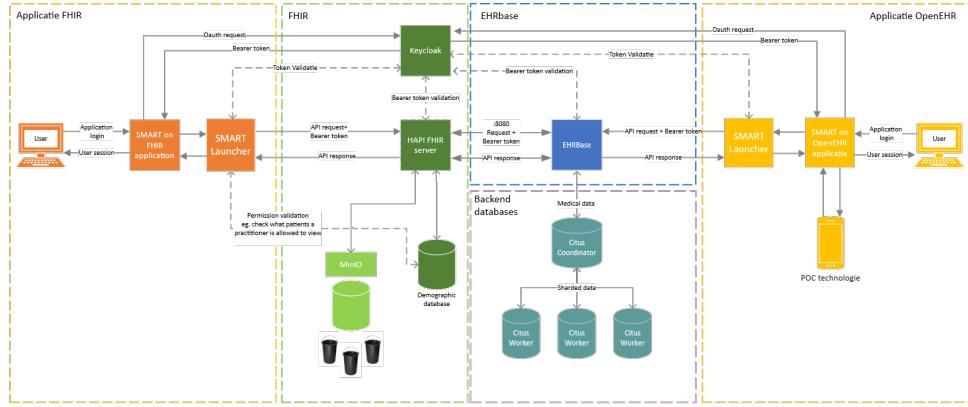
# Previous work

## Open source reference implementation

- Open source stack is incomplete

## Application backend

- openEHR is too big for this application



# Future projects on OpenEHR

Hospital use case (Isala): Requirements of storage of clinical data

- Own database (current situation)
- FHIR DB
- OMOP
- OpenEHR



# Future projects on OpenEHR

Hospital use case (Isala): Requirements of storage of clinical data

- Own database (current situation)
- FHIR DB
- OMOP
- OpenEHR

Federation of openEHR instances (multi-vendor)

- Code24
- EHRBase



# OpenEHR





# Workshop openEHR

Zoeken

Ctrl + K

Introductie openEHR

openEHR

Casus

Archetypes

Templates



Inhoud

Planning

Inhoudsopgave

Bronnen en leeswerk

# Workshop openEHR 2024

In deze workshop nemen we je mee in de wereld van openEHR. We zullen het hebben over openEHR zelf: "wat is het, waarom bestaat het, en wat kan je er mee?" en we gaan inhoudelijk in op de technologie. We zullen aan de slag gaan met het datamodel van openEHR en de openEHR REST API ontginnen. We doen dit door een hele 'cyclus' door te gaan door het modelleren van de data, het plaatsen van de data in openEHR, en tot slot de data weer op te halen.

Deze website dient als handleiding en als naslagwerk voor de workshop. Tijdens de workshops zullen slides gepresenteerd worden die dezelfde volgorde aanhouden als deze documentatie.

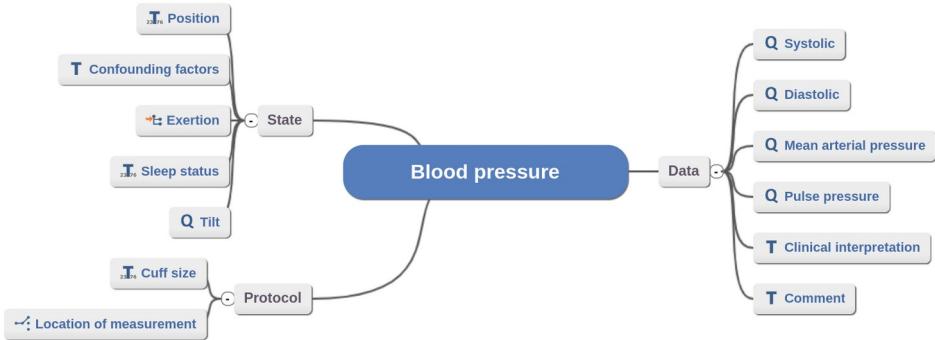
## Planning

Tijd	Onderwerp
10:00-11:00	Setting the Scene 🎭

<https://sophiedkk.github.io/openEHR-Hanze>

# openEHR

- Archetypes
- Templates
- Compositions
- Standard APIs



# openEHR

- Archetypes
- Templates
- Compositions
- Standard APIs

The screenshot shows the openEHR Archetype Designer application. The main window displays the 'Definition' tab of an archetype named '2prescribe-basisgegevens-v1'. The definition tree on the left includes nodes for 'Comment', 'Protocol' (with 'Last-updated' and 'Extension'), 'Exclusion of pregnancy' (with 'Any point in time event' and 'Exclusion statement'), and 'Occupation summary' (with 'Description', 'Employment-status', and 'Occupation episode'). On the right, the 'Constraints' panel shows an 'atCode' of 'at0006.0.1', an 'Occurrences' of '0..1', and a 'Type' of 'CODED TEXT'. Below these are sections for 'Terminology' (using 'External Coded') and 'Value set' (with entries for '0' and '1'). A 'Default value' is set to 'not pregnant'. At the bottom, there are buttons for 'Repository: OpenEHR Tutorial - export - reload - analyze' and a version number 'v1.24.9'.

# openEHR

- Archetypes
- Templates
- Compositions
- Standard APIs

The screenshot shows a Postman interface for a GET request to `(ehrApiUrl)/template/prescribe-basisgegevens-v1/example?format=FLAT&exampleFilter=INPUT`. The 'Params' tab is selected, showing the following query parameters:

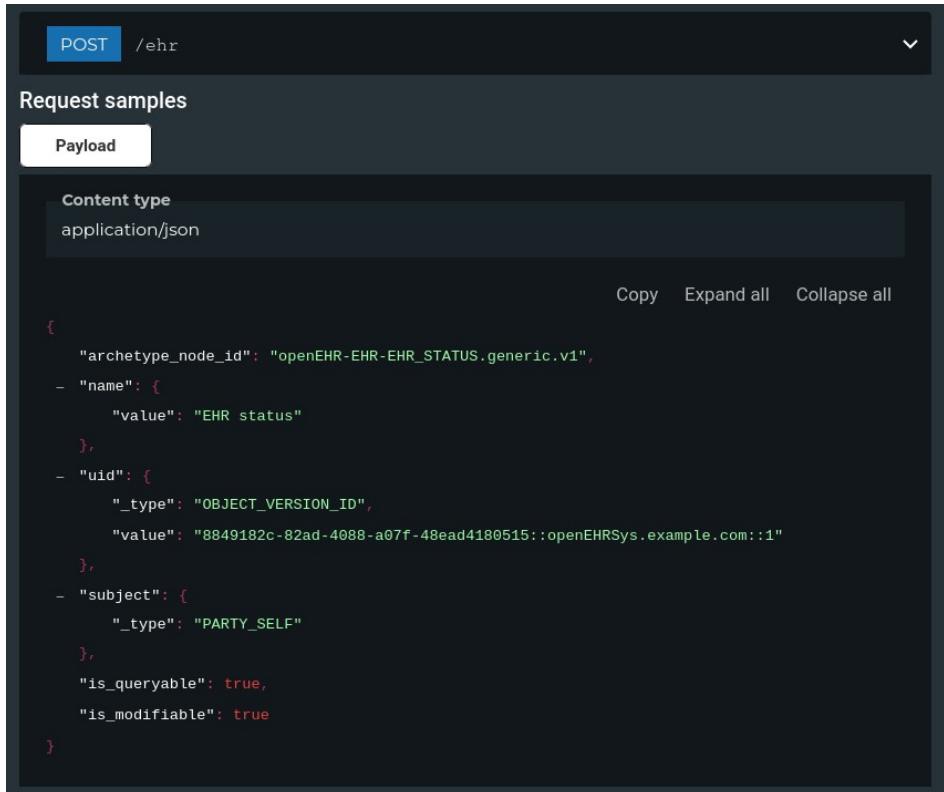
Key	Value	Description	Bulk Edit
format	FLAT		
exampleFilter	INPUT	Populate example values with something meaningful	
language	de		

The 'Body' tab displays the JSON response:

```
1 "prescribe-basisgegevens-v1/category|code": "433",
2 "prescribe-basisgegevens-v1/category|value": "event",
3 "prescribe-basisgegevens-v1/category|terminology": "openEHR",
4 "prescribe-basisgegevens-v1/context/start_time": "2022-02-03T04:05:06",
5 "prescribe-basisgegevens-v1/context/setting|terminology": "openEHR",
6 "prescribe-basisgegevens-v1/context/setting|code": "229",
7 "prescribe-basisgegevens-v1/context/setting|value": "home",
8 "prescribe-basisgegevens-v1/context/_end_time": "2022-02-03T04:05:06",
9 "prescribe-basisgegevens-v1/context/_health_care_facility|name": "DOE, John",
10 "prescribe-basisgegevens-v1/age/chronological|age": "PT0S",
11 "prescribe-basisgegevens-v1/age/time": "2022-02-03T04:05:06",
12 "prescribe-basisgegevens-v1/age/language|terminology": "ISO_639-1",
13 "prescribe-basisgegevens-v1/age/language|code": "en",
14 "prescribe-basisgegevens-v1/age/encoding|terminology": "IANA_character-sets",
15 "prescribe-basisgegevens-v1/age/encoding|code": "UTF-8",
16 "prescribe-basisgegevens-v1/age/_work_flow_id|id": "e18862c7-d42b-39f1-a91b-481629a89b05",
17 "prescribe-basisgegevens-v1/age/_work_flow_id|id_scheme": "scheme",
18 "prescribe-basisgegevens-v1/age/_work_flow_id|namespace": "unknown",
19 "prescribe-basisgegevens-v1/age/_work_flow_id|type": "ANY",
20 "prescribe-basisgegevens-v1/age/_guideline_id|id": "cce814ae-bf17-33c9-9d60-158b0f8f0d63",
21 "prescribe-basisgegevens-v1/age/_guideline_id|id_scheme": "scheme",
```

# openEHR

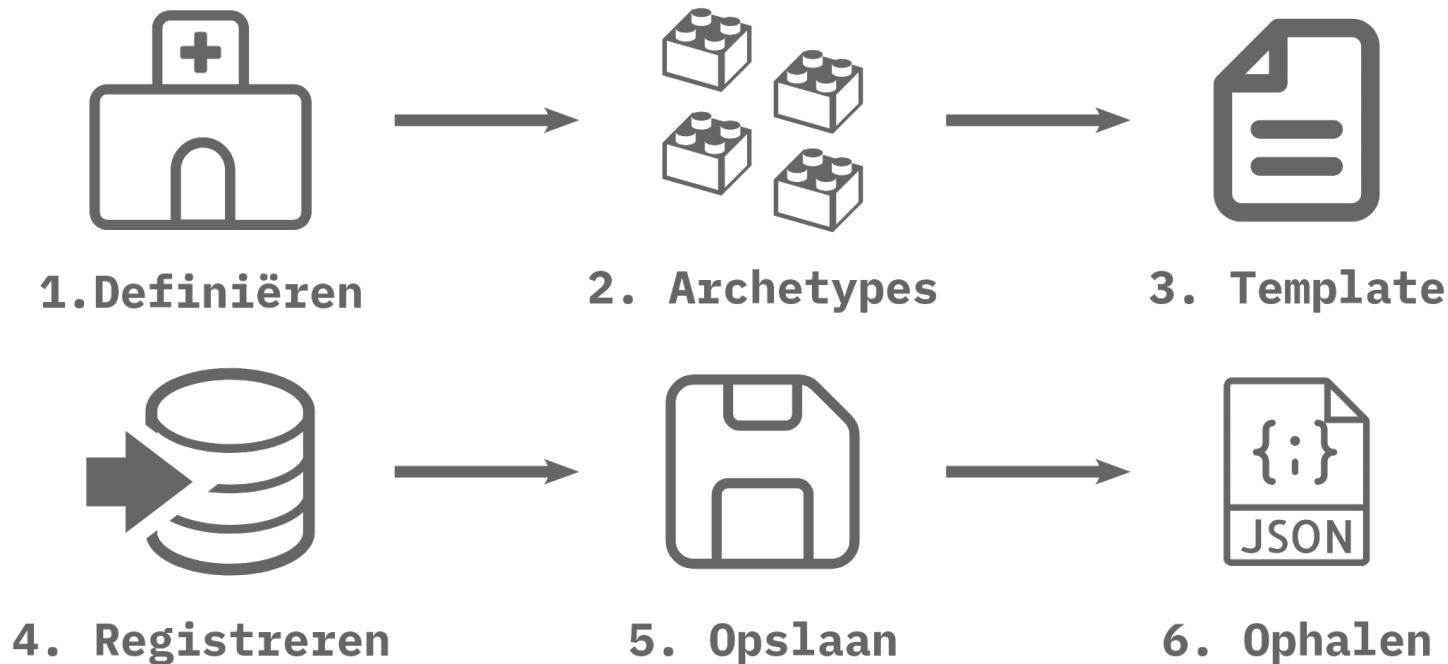
- Archetypes
- Templates
- Compositions
- Standard APIs



The screenshot shows a dark-themed API request editor with a "POST /ehr" header. Below it, a "Request samples" section has a "Payload" tab selected. The payload content type is set to "application/json". The JSON payload itself is a complex object representing an archetype, structured as follows:

```
{  
  "archetype_node_id": "openEHR-EHR-EHR-STATUS.generic.v1",  
  "name": {  
    "value": "EHR status"  
  },  
  "uid": {  
    "_type": "OBJECT_VERSION_ID",  
    "value": "8849182c-82ad-4088-a07f-48ead4180515::openEHRSystem.example.com::1"  
  },  
  "subject": {  
    "_type": "PARTY_SELF"  
  },  
  "is_queryable": true,  
  "is_modifiable": true  
}
```

At the bottom right of the payload editor, there are buttons for "Copy", "Expand all", and "Collapse all".



# Archetypes



# Archetypes

- Clinical Knowledge Manager
- Klinische concepten
- Exporteren
- Inspecteren

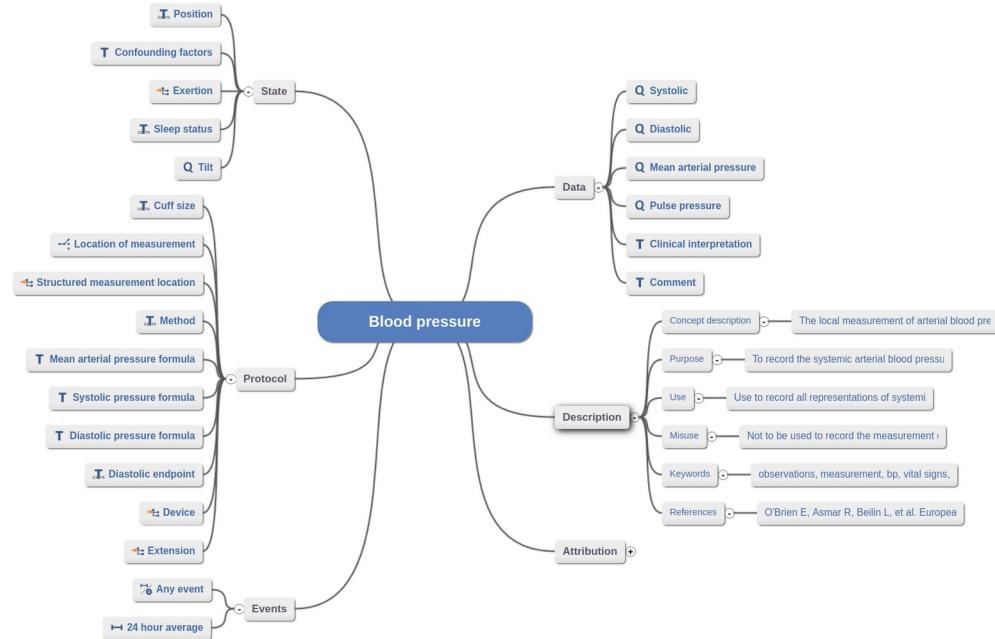
The screenshot shows the CKM dashboard with the following sections:

- Left Sidebar:** A navigation tree under "Archetypes" includes categories like EHR Archetypes, Cluster, Composition, Element, Entry, Action, Evaluation, Observation, Instruction, Admin, Section, and Structure.
- Header:** Includes links for Archetypes, Templates, Termsets, Release Sets, Projects, Reports, Help, Dashboard, and Find Resources.
- Top Right:** Login and registration fields.
- Middle Left:** A "Become a Part of Our Online Community" section with a CKM logo, a "Register Today!" button, and a note about participation in eHealth projects.
- Middle Right:** A "Our CKM Community in Action" section showing a donut chart of users per health domain and a news feed table.
- Bottom Center:** A "What Do You Need to Know?" section with icons for Archetypes, Templates, Termsets, Release sets, Projects, and Incubators.

<https://ckm.openehr.org/ckm/>

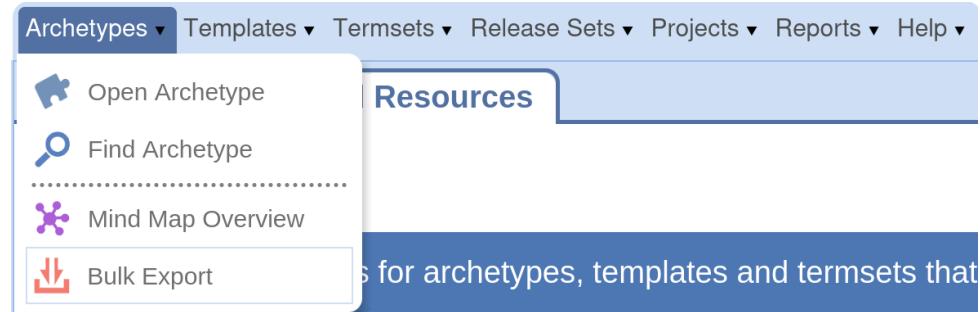
# Archetypes

- Clinical Knowledge Manager
- Klinische concepten
- Exporteren
- Inspecteren



# Archetypes

- Clinical Knowledge Manager
- Klinische concepten
- Exporteren
- Inspecteren



# Archetypes

- Clinical Knowledge Manager
- Klinische concepten
- Exporteren
- Inspecteren

```
1 archetype (adl_version=1.4; uid=f2e042ea-1137-49a9-9205-1f96bc608d82)
2   openEHR-DEMOGRAPHIC-ADDRESS.address.v0
3
4 concept
5   [at0000]-- Address
6 language
7     original_language = <[ISO_639-1::en]>
8     translations = <
9       ["ko"] = <
10         language = <[ISO_639-1::ko]>
11         author = <
12           ["name"] = <"Seung-Jong Yu">
13           ["organisation"] = <"NOUSCO Co., Ltd.">
14           ["email"] = <"seungjong.yu@gmail.com">
15         >
16         accreditation = <"Certified Board of Family Medicine in Korea">
17       >
18       ["pt-br"] = <
19         language = <[ISO_639-1::pt-br]>
20         author = <
21           ["name"] = <"Sergio Miranda Freire">
22           ["organisation"] = <"Universidade do Estado do Rio de Janeiro - UERJ">
23           ["email"] = <"sergio@lampada.uerj.br">
24         >
25       >
26       ["es-py"] = <
27         language = <[ISO_639-1::es-py]>
28         author = <
29           ["name"] = <"Ellen Mendez">
30           ["organisation"] = <"Facultad Politecnica UNA">
31         >
32       >
33     >
34 description
35   original_author = <
36     ["name"] = <"Sergio Miranda Freire & Rioleota Dutra Mediano Dias">
```

# Aan de slag!

# Archetypes & Templates



# Templates

- Archetype Designer
- Repositories
- Root archetype
- Content
- Tweaken
- Exporteren

**openEHR**  
**Archetype Designer**

Log In      Sign Up

---

**Username**

**Password**

---

**Log In**

---

— OR —

---

 Log in with Google

---

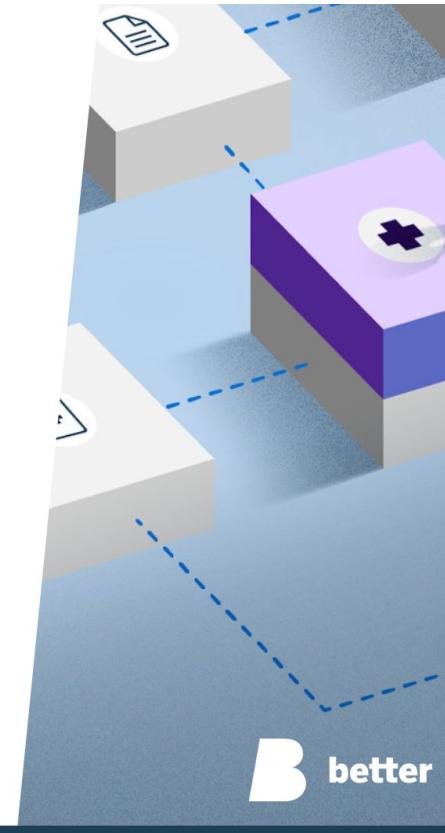
 Log in with Microsoft Account

---

 Log in with GitHub

---

Service provided by Better and openEHR International      v1.24.14-A3



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

# Templates

- Archetype Designer
- **Repositories**
- Root archetype
- Content
- Tweaken
- Exporteren

The screenshot shows the OpenEHR archetype designer interface. At the top, there's a search bar with a magnifying glass icon, an 'Extended search' button, and a '+ New repository' button. Below the search bar, there are tabs for 'Repositories' (which is selected) and 'Recent'. A list of repositories is shown, with 'workshop' being the first item. In the center, there's a large 'Import' dialog box. It has a 'Drop here' area with dashed lines, a 'Browse' button, an 'OR' button, and an 'Import from repository' button. Below the import dialog, there's a section titled 'Upload queue' with a table showing five items. Each item has columns for Name, Size, Progress, Status, and Actions. The names of the files are related to demographic and capability archetypes. At the bottom of the dialog, there are buttons for 'Upload all', 'Cancel all', 'Remove all', 'Import', and checkboxes for 'Import concepts with warnings' and 'Overwrite existing'. There's also a 'Queue progress:' bar at the bottom.

Name	Size	Progress	Status	Actions
openEHR-DEMOGRAPHIC-ADDRESS.address.v0.adl	40.00 kB	<div style="width: 100%;"> </div>	<input checked="" type="checkbox"/>	<input type="button" value="Remove"/>
openEHR-DEMOGRAPHIC-ADDRESS.address-provider.v0.adl	31.37 kB	<div style="width: 100%;"> </div>	<input checked="" type="checkbox"/>	<input type="button" value="Remove"/>
openEHR-DEMOGRAPHIC-ADDRESS.electronic_communic...	17.70 kB	<div style="width: 100%;"> </div>	<input checked="" type="checkbox"/>	<input type="button" value="Remove"/>
openEHR-DEMOGRAPHIC-ADDRESS.electronic_communic...	20.06 kB	<div style="width: 100%;"> </div>	<input checked="" type="checkbox"/>	<input type="button" value="Remove"/>
openEHR-DEMOGRAPHIC-CAPABILITY.individual_credential...	19.19 kB	<div style="width: 100%;"> </div>	<input checked="" type="checkbox"/>	<input type="button" value="Remove"/>

# Templates

- Archetype Designer
- Repositories
- **Root archetype**
- Content
- Tweaken
- Exporteren

Create new template x

Rm Type

COMPOSITION

Root Archetype Id

Click to select...

Template Id

Close Create

# Templates

- Archetype Designer
- Repositories
- Root archetype
- Content
- Tweaken
- Exporteren

The screenshot shows the openEHR Archetype Designer interface. The top navigation bar includes tabs for 'workshop' (highlighted in green), 'workshop-example' (highlighted in blue), and a search bar. The main content area displays the 'workshop-example (openEHR-EHR-COMPOSITION.encounter.v1)' archetype definition. The 'Definition' tab is selected, showing a tree structure of archetype components. A 'Constraints' panel on the right lists an 'atCode' constraint for the 'content' attribute. Below it, a 'Type' section indicates the attribute is of type 'ATTRIBUTE'. A 'Mandatory' checkbox is unchecked. A 'Add archetype' section shows a search bar and a list of recent archetypes: '4AT' (openEHR-EHR-OBSERVATION.four\_a\_test.v1) and '6 Item Cognitive Impairment Test (6CIT)' (openEHR-EHR-OBSERVATION.six\_cit.v0). The bottom right corner shows a language selector set to 'en'.

# Templates

- Archetype Designer
- Repositories
- Root archetype
- Content
- Tweaken
- Exporteren

The screenshot shows the Archetype Designer interface with two tabs open: 'workshop-example' and 'Birth'. The 'workshop-example' tab is active, displaying its structure and properties.

**workshop-example Structure:**

- atCode: at0026.1
- Occurrences: 0..0
- Type: POINT EVENT
- Point in time: (dropdown)
- Set offset: (checkbox)

**Content Structure:**

- context
  - other\_context
    - Extension
- content
  - Body temperature
  - Body weight
    - data
      - Any event
      - data
        - Weight
        - Comment Δ [0..1] to [0..0]
      - state
        - State-of-dress Δ [0..1] to [0..0]
        - Confounding-factors Δ [0..\*] to [0..0]
    - Birth Δ [0..1] to [0..0] (highlighted)
      - 0..1
      - Min: >= 0
      - Max: <= 1000
    - data
      - Weight
      - Comment Δ [0..1] to [0..0]

# Templates

- Archetype Designer
- Repositories
- Root archetype
- Content
- Tweaken
- Exporteren

```
1 |<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
2 |<template xmlns="http://schemas.openehr.org/v1">
3 |  <language>
4 |    <terminology_id>
5 |      <value>ISO_639-1</value>
6 |    </terminology_id>
7 |    <code_string>en</code_string>
8 |  </language>
9 |  <description>
10 |    <original_author id="date">2024-12-15</original_author>
11 |    <lifecycle_state>unmanaged</lifecycle_state>
12 |    <other_details id="licence"></other_details>
13 |    <other_details id="custodian_organisation"></other_details>
14 |    <other_details id="original_namespace"></other_details>
15 |    <other_details id="original_publisher"></other_details>
16 |    <other_details id="custodian_namespace"></other_details>
17 |    <other_details id="sem_ver">0.1.0</other_details>
18 |    <other_details id="build_uid"></other_details>
19 |    <other_details id="Generated By">Archetype Designer v1.24.14-A3, user=33315062@github, repositoryId=workshop-cca</other_details>
20 |  <details>
21 |    <language>
22 |      <terminology_id>
23 |        <value>ISO_639-1</value>
24 |      </terminology_id>
25 |      <code_string>en</code_string>
26 |    </language>
27 |    <purpose>Not Specified</purpose>
28 |  </details>
29 |  </description>
30 |  <uid>
31 |    <value>f12e2bb2-4e33-4c00-b4e3-2a7bc340f4d6</value>
32 |  </uid>
33 |  <template_id>
34 |    <value>workshop-example</value>
35 |  </template_id>
36 |  <connect>workshop-example</connect>
```

# Aan de slag!

# EHRBase



# EHRBase

- Open Source
- Gebaseerd op Archie
- Vitagroup
- Optie 1: Sandbox
- Optie 2: Docker



<https://sandkiste.ehrbase.org/>

<https://docs.ehrbase.org/>

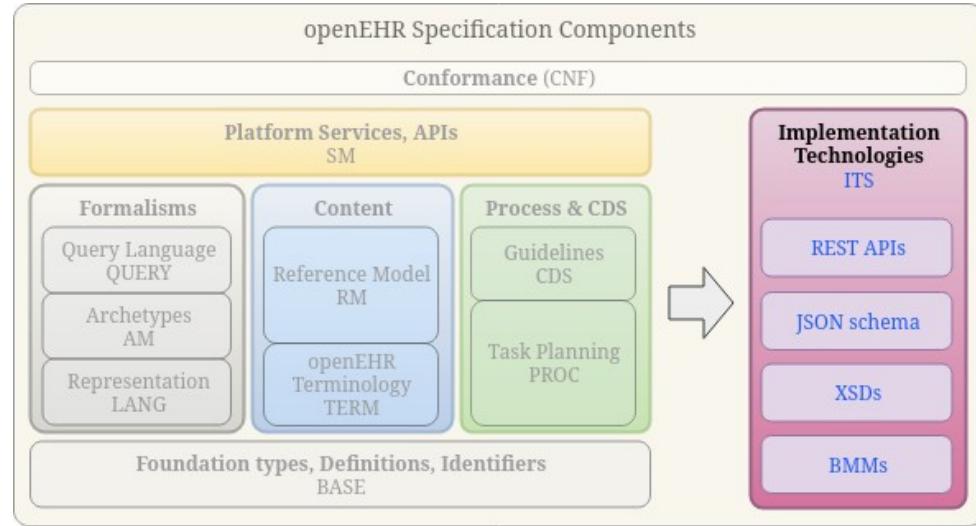
# Aan de slag!

# openEHR API



# openEHR API

- OpenEHR Specificatie
- EhrScape API
- Documentatie
- API Client

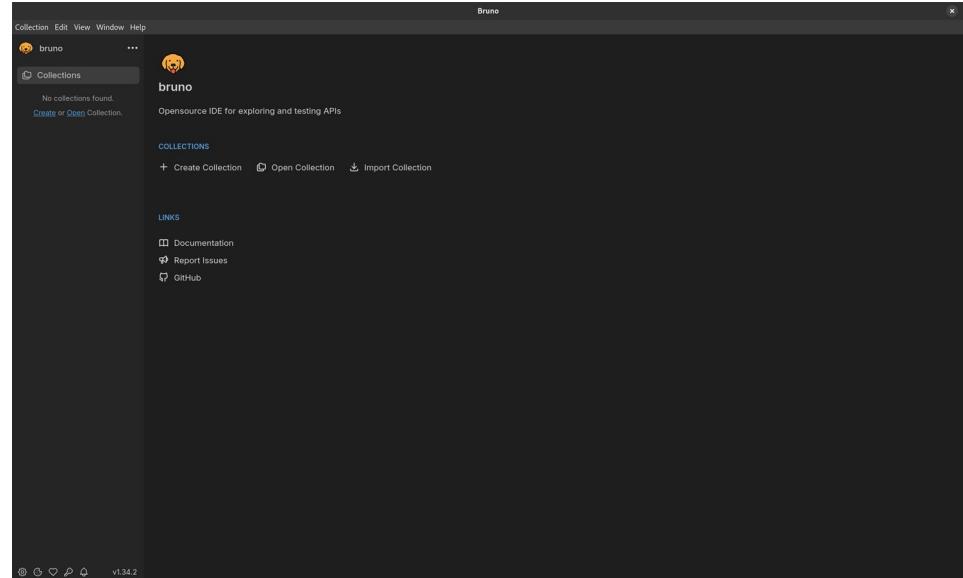


<https://docs.ehrbase.org/api/hip-ehrbase/ehr>

<http://localhost:8080/ehrbase/swagger-ui/index.html>

# Bruno

- Open Source
- Git friendly
- Collection
- New Request
- New Environment



<https://www.usebruno.com/>

# Bruno

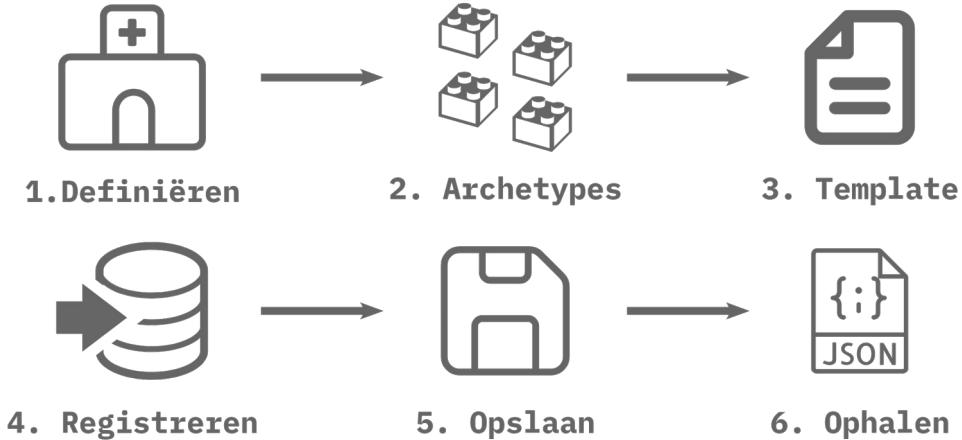
- Open Source
- Git friendly
- Collection
- New Request
- New Environment

The screenshot shows the Bruno application interface. On the left, a modal window titled "NEW REQUEST" is open, allowing users to choose between "HTTP" (selected), "GraphQL", and "From cURL". Below this are fields for "Name" (Request Name) and "URL" (with a dropdown menu showing "GET"). On the right, a larger panel titled "ENVIRONMENTS" displays an environment named "ehrbase" (with a "+ Create" button). This environment is associated with an "openEHR Workshop" entry. A table lists a single variable: "ehrbase\_url" (Enabled, Value: "http://localhost:8080/ehrbase"). At the bottom of the environment panel are buttons for "Import", "Save", and "Reset".

<https://www.usebruno.com/>

# API stappen

- Template uploaden
- EHR aanmaken
- Compositie posten
- Compositie ophalen



Screenshot of a browser-based API tool showing a POST request to the URL `https://openEHR.org/api/definition/template/add14`. The request body contains XML code for defining a template. The response shows a successful `201 Created` status with various headers and a detailed JSON representation of the created template.

```
POST https://openEHR.org/api/definition/template/add14
```

Param	Body *	Headers	Auth	Vars	Script	Asset	Tests	Docs	XML	Pretty	Response	Headers	Timeline	Tests
date	Sat, 14 Dec 2024 14:12:22 GMT										date	date		
content-type	application/xml										content-type	content-type		
content-length	0										content-length	content-length		
connection	keep-alive										connection	connection		
vary	Origin,Access-Control-Request-Method,Access-Control-Request-Headers										vary	vary		
location	https://values-app.378x.ondigitalocean.app/ehrbase/rest/openEHR/v1/definition/template/add14/workshop-example										location	location		
etag	"workshop-example"										etag	etag		
last-modified	Fri, 02 Jan 10:12:04 GMT										last-modified	last-modified		
x-content-type-options	noself										x-content-type-options	x-content-type-options		
x-ssrf-protection	0										x-ssrf-protection	x-ssrf-protection		
cache-control	no-cache, no-store, max-age=0, must-revalidate										cache-control	cache-control		
pragma	no-cache										pragma	pragma		
expires	0										expires	expires		
strict-transport-security	max-age=31536000; includeSubDomains										strict-transport-security	strict-transport-security		
x-frame-options	DENY										x-frame-options	x-frame-options		
x-dto-app-origin	2156c3f9-a7f7-46cc-97e1-be12d53384fe										x-dto-app-origin	x-dto-app-origin		
x-dto-orig-status	201										x-dto-orig-status	x-dto-orig-status		
cf-cache-status	DYNAMIC										cf-cache-status	cf-cache-status		
set-cookie	Set-Cookie: JSESSIONID=178a-8fb4-4097-a511-9b0b3c9f4a6f; Path=/; Max-Age=3600; HttpOnly; Secure; SameSite=None										set-cookie	set-cookie		
server	cloudflare										server	server		
cf-ray	8f1ec3d34bc0d5a3-AMS										cf-ray	cf-ray		
alt-svc	h3-*:443; ma=86400										alt-svc	alt-svc		