IPS on openEHR

Intro

- Gašper Andrejc
- Co-author of FHIRConnect spec
- Main implementer of openFHIR core
- Independent Health IT Consultant, 12+ year in the industry

- Founder of Syntaric, a healthcare IT consultancy, and creator of openFHIR

Syntaric
https://syntaric.com

openFHIR®
https://open-fhir.com

Agenda

- International Patient Summary FHIR IG
- Relation to openEHR
- Gap between FHIR and openEHR
- Technical overview of a hybrid architecture (openEHR+FHIR)

- FHIRConnect
- openFHIR IPS Demo

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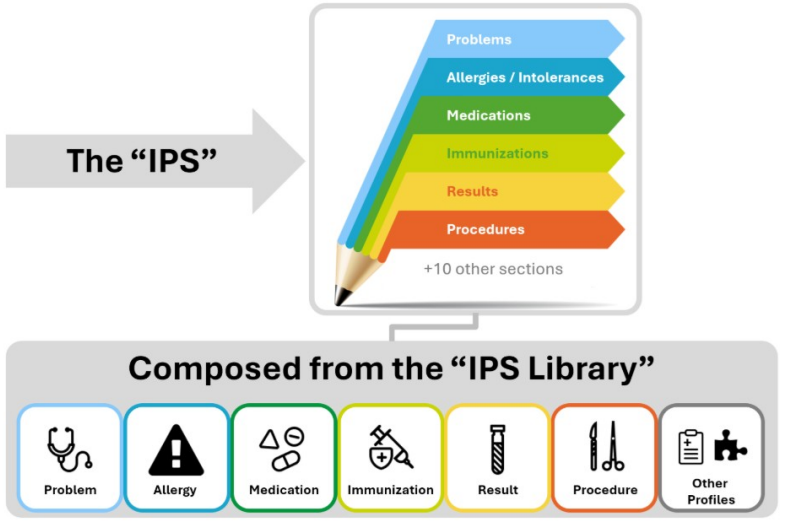
International Patient Summary

- A FHIR Implementation Guide
- All about the exchange (how and what)
- Rules on sections, composition of a summary, recommendations
- Says nothing on how data is stored anywhere or how it's gathered from *there*



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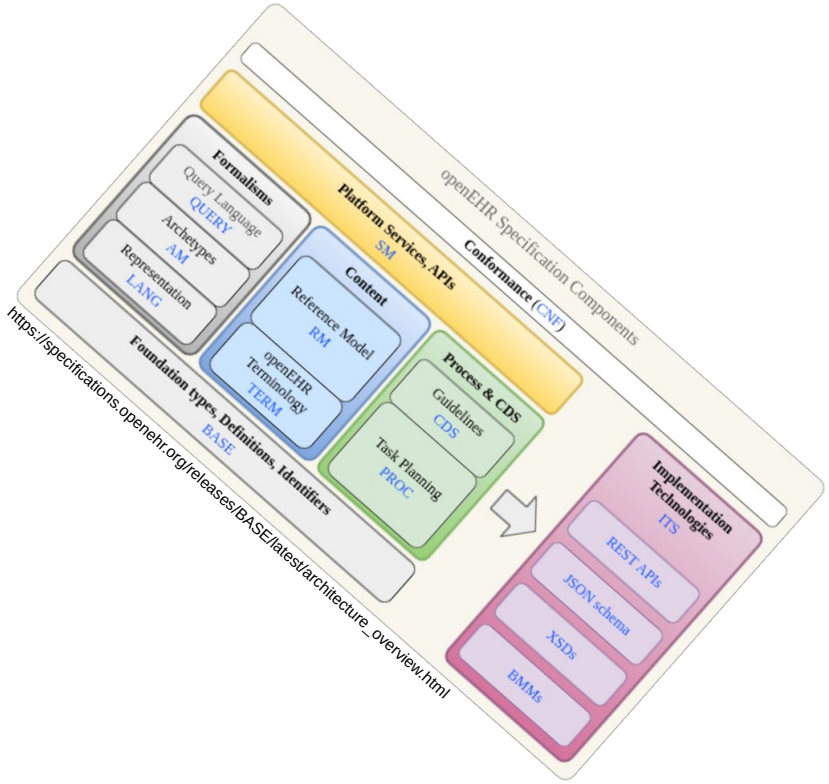
IPS - FHIR

- Aligned with FHIR mantra
- FHIR – exchange
- Building blocks rarely use case agnostic
- 80/20 rule
- Developer friendly, innovation driven
- FHIR native applications

openEHR



- Data for life
- Use case agnostic, reusable building blocks
- Defines a reference model
- Definition governance
- Clinicians / clinical informaticians major role in the process
- Properly modelled, future proof
- 100%
- OpenEHR native applications?

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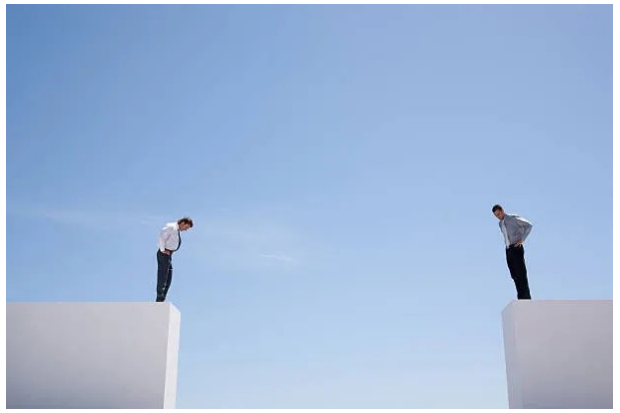
OpenEHR and IPS (or EHDS or ..)

- OpenEHR seen as *just another storage*
- Each openEHR vendor left to implement its own mappings and EHDS/IPS/*<any FHIR IG>* compliance
- Building a FHIR API on top of *your data*

The gap (from openEHR perspective)

- You're **looking into openEHR,** but:
  - You know you can't get rid of FHIR
  - You want to be compliant to FHIR Igs (IPS, EHDS, MedMij, ..)
  - You're worried *going openEHR* will hinder your FHIR native innovation
- You're **already using openEHR**, but
  - FHIR native applications are struggling
  - Adoption of use cases on top of openEHR is slow
  - You're forced to have an alternative or duplicated FHIR store to exchange data with FHIR
  - ..or have expensive and non-scalable integration engines



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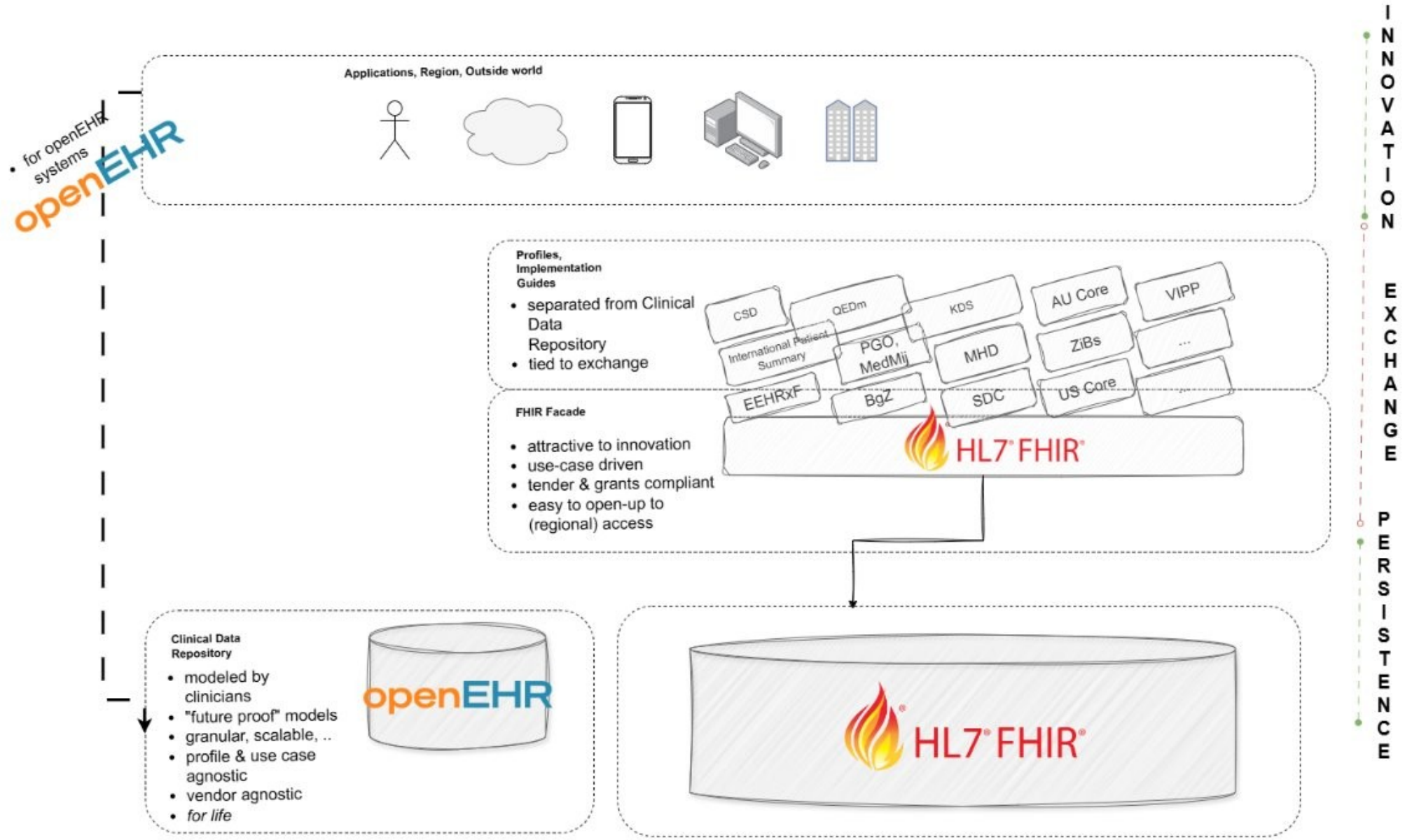
Why


WAIT!
HAMMER
NO!
QUIET
NAIL.
FHIR
Clinical
Data
Repository


WAIT!
HAMMER
NO!
QUIET
NAIL.
openEHR
Innovation,
Exchange,
Use cases

What



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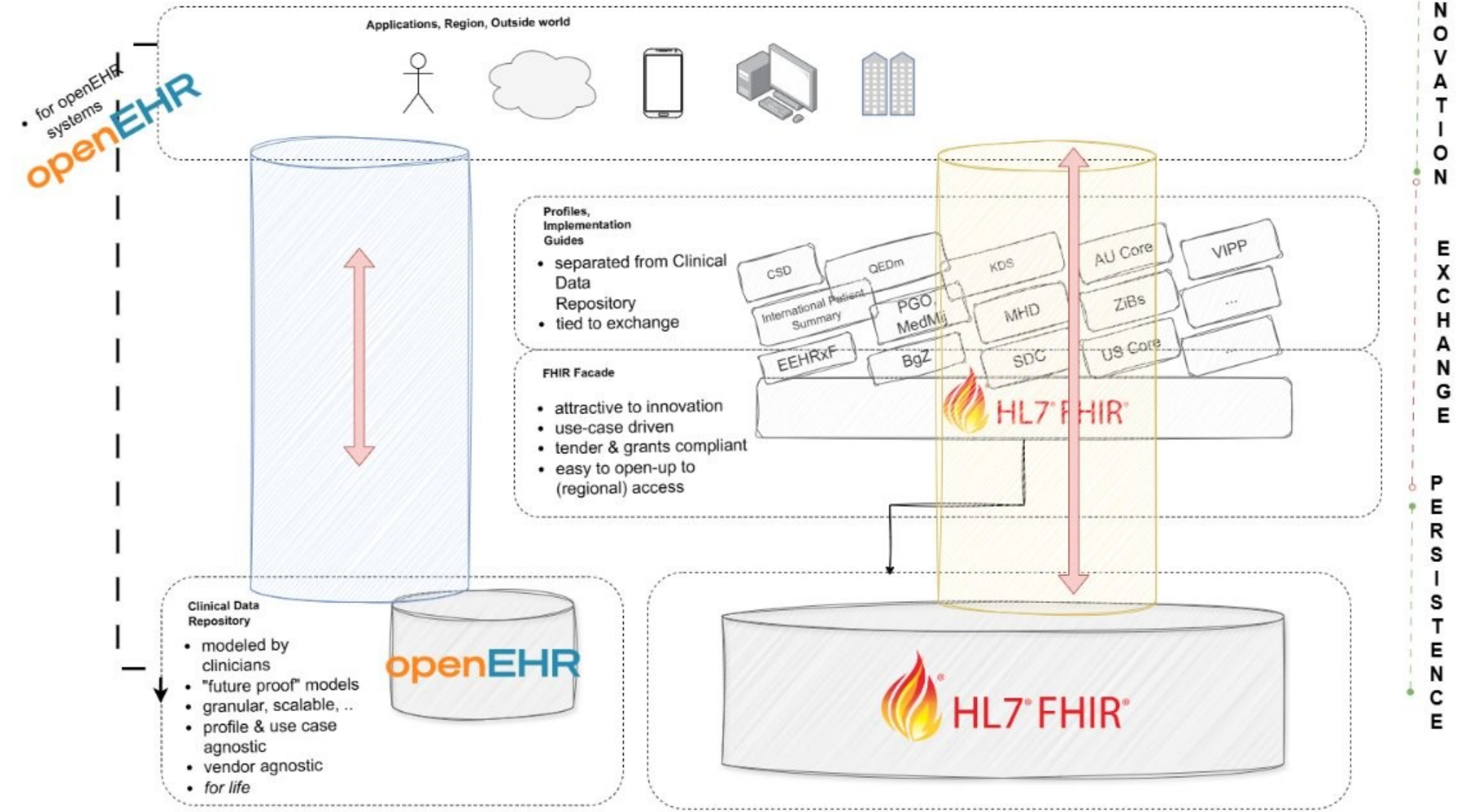
Applications, Region, Outside world
for openEHR systems
openEHR
Profiles, Implementation Guides
separated from Clinical Data Repository
tied to exchange
CSD
QEDm
KDS
AU Core
VIPP
International Patient Summary
PGO, MedMij
MHD
ZiBs
...
EEHRxF
BgZ
SDC
US Core
FHIR Facade
attractive to innovation
use-case driven
tender & grants compliant
easy to open-up to (regional) access
HL7 FHIR
Clinical Data Repository
modeled by clinicians
"future proof" models
granular, scalable, ..
profile & use case agnostic
vendor agnostic
for life
openEHR
HL7 FHIR
INNOVATION
EXCHANGE
PERSISTENCE

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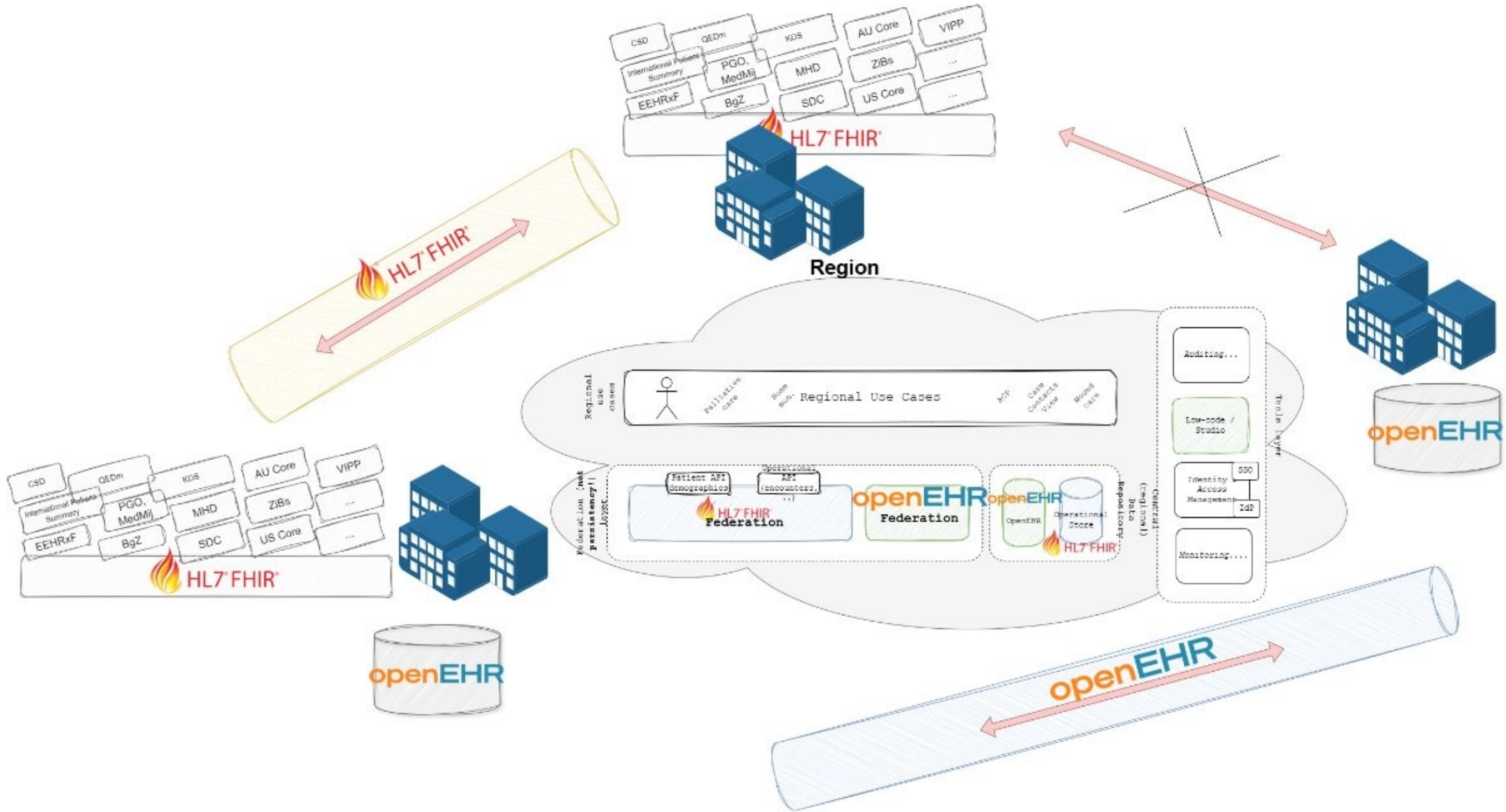
CSD
QEDm
KDS
AU Core
ViPP
International Patient Summary
PGO, MedMij
MHD
Z/Bs
...
EEHRxF
BgZ
SDC
US Core
...
HL7 FHIR
Region
openEHR
Regional Use Cases
Palliative care
Home Mon.
MCP
Care Contacts View
Wound Care
Federation (not persistency!) layer
Patient API (demographics)
Observations API (encounters, ...)
Federation
openEHR Federation
openEHR
Operational Store
Repository
Central (regional) Data
Auditing...
Low-code / Studio
Identity Access Management
SSO
IdP
Monitoring....
Tools layer

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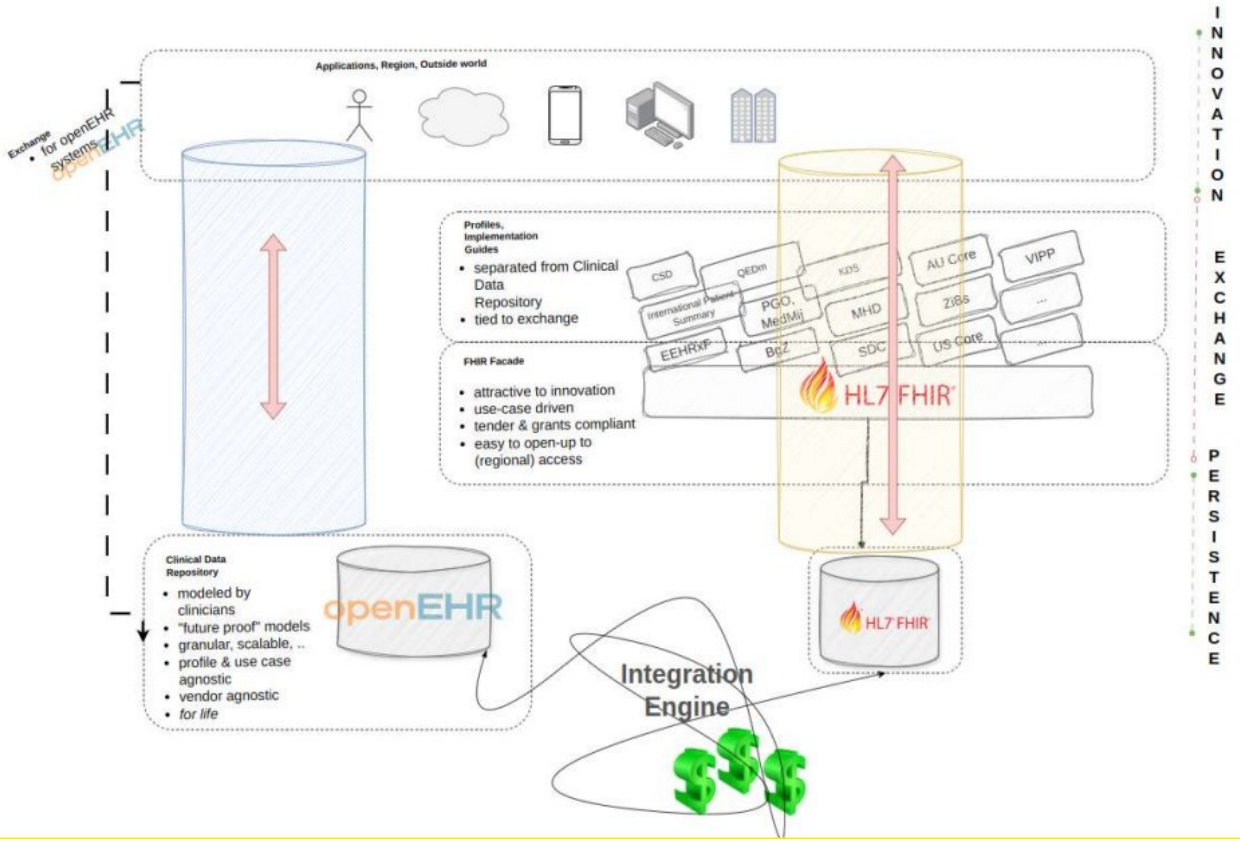
How

- Proprietary mappings
- Integration Engines
- Use-case driven



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FHIR Connect

- Specification for expressing bi-directional mappings between openEHR and FHIR
- Started by Better 4 years ago, revised by HighMed, openFHIR, Medblocks in '24
- Descriptive YAML, not code
- Open sourced specification and open sourced engine (openFHIR)
    - Working on FHIR Connect being a part of openEHR spec itself

FHIR Connect

FHIR connect

CKM

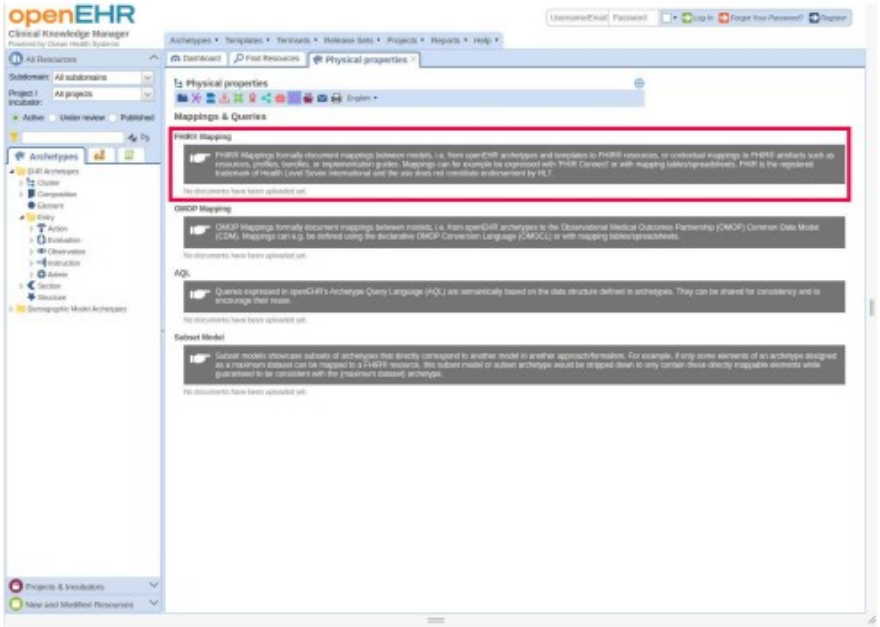
Vendor agnostic

Bidirectional

Community collaboration

Modular

Extensible



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FHIR Connect

CKM

Vendor agnostic

Bidirectional

Community collaboration

Modular

Extensible

- Open source specification
- No vendor specifics
- Anyone can implement it
- Mappings you write can be run by another engine / vendor
- Vendor agnostic: FHIR, openEHR, FHIR Connect

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FHIR Connect


CKM


Vendor agnostic


Bidirectional

- 1 mapping doing
  - FHIR > openEHR
  - OpenEHR > FHIR


Community collaboration


Modular


Extensible

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FHIR Connect


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Vendor agnostic


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Extensible

- Library of mappings (github+ ckm)
- Ideally shared with the community, like openEHR templates, FHIR Implementation Guides, ..

FHIR Connect

CKM

Vendor agnostic

Bidirectional

- Mappings per archetype and as such, reusable (just like archetypes)
- Re-usability = increased scalability through different use cases

Community collaboration

Modular

Extensible

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FHIR Connect


CKM


Vendor agnostic


Bidirectional


Community collaboration


Modular


Extensible

- Archetypes can be extended, changed to suit a specific use case
- FHIR Connect follows the same principle

Mapping process

- Prerequisites:
  - Prepared FHIR profile or implementation guide for the use case
  - Prepared openEHR Template for the use case
  - Human readable mapping table (excel specifying which data point correlates to one and the other)

	A	B	C	D	E	F
1	MII PR Fall Kontakt mit einer Gesundheitseinrichtung					
2	https://simplifier.net/medizininformatikinitiative-modulfall/mii_pr_fall_kontaktgesundheitseinrichtung					
3	FHIR-Profil		Cardinality (FHIR)		FHIR-Item	
4	Encounter	I	Kardinalität	Datentyp	*Must-Support (Elemente mit * markiert werden im Profil Patho Composition dup*	openEHR
5	Id	S Σ	0..1	string	Encounter.Id	
6	meta	S Σ	0..1	Meta	Encounter.meta	
7	source	S Σ	0..1	url	Encounter.meta.source	
8	profile	S Σ	0..*	canonical(StructureDefinition)	Encounter.meta.profile	
9	extension	I	0..*	Extension		
10	Aufnahmegrund	S I	0..1	Extension(Complex)	Encounter.extension:Aufnahmegrund	Stationärer Versorgungsfall.Aufnahmeanlass
11	extension	I	0..*	Extension		
12	ErsteUndZweiteStelle	S I	0..1	Extension	Encounter.extension:Aufnahmegrund.extension:ErsteUndZweiteStelle	Stationärer Versorgungsfall.Aufnahmegrund - 1. und 2. Stelle
13	url		1..1	uriFixed Value		

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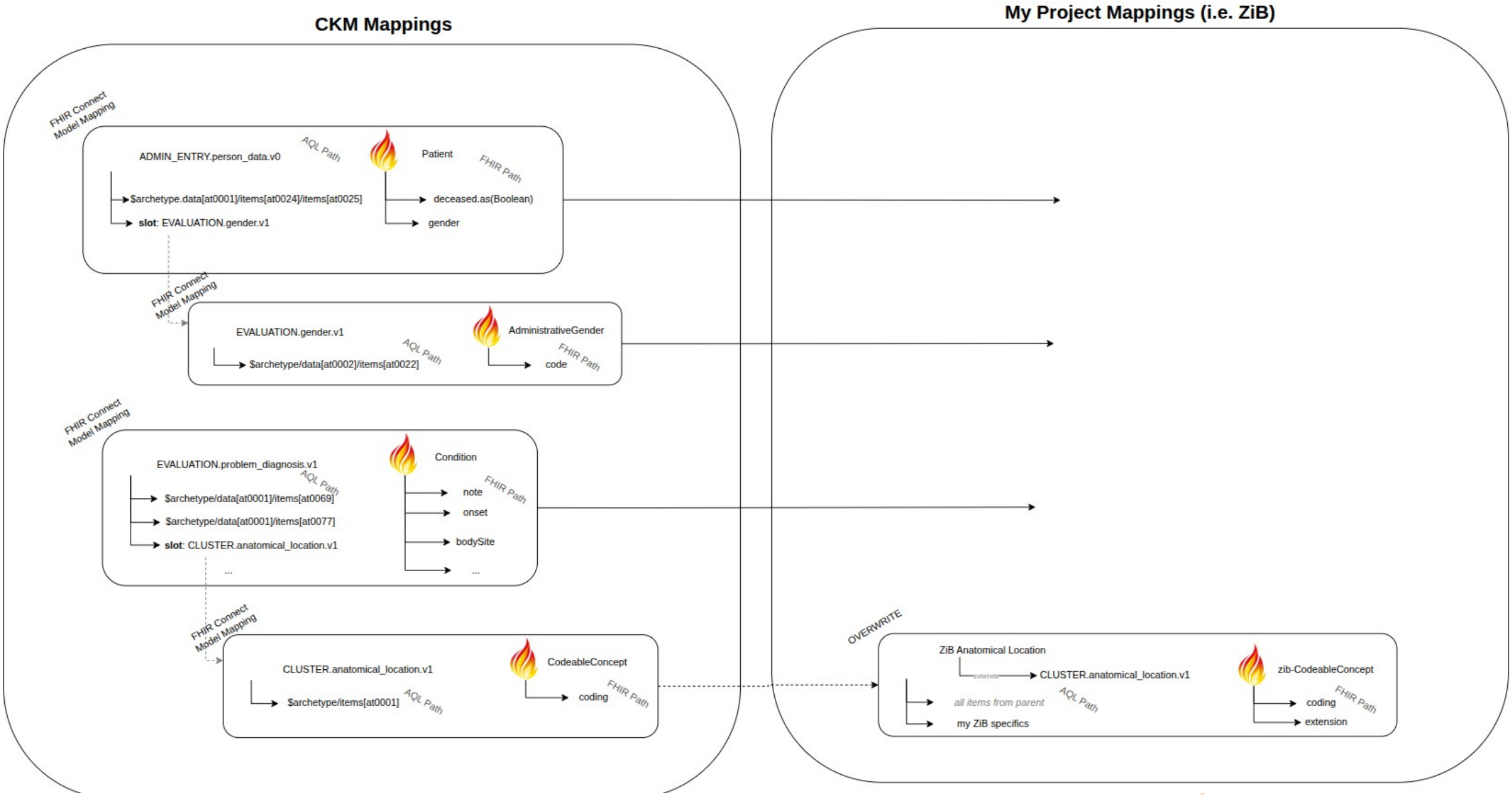
Context mapping

```
grammar: FHIRConnect/v0.0.1
type: context
metadata:
  name: health_summary.context
  version: 0.0.1-alpha
spec:
  system: FHIR
  version: R4

context:
  profile:
    url: "http://hl7.org/fhir/uv/ips/StructureDefinition/Composition-uv-ips"
    version: "2.0.0"
  template:
    id: "International Patient Summary"
  archetypes:
    - "COMPOSITION.health_summary.v1"
    - "SECTION.adhoc.v1_problem_list"
    - "SECTION.adhoc.v1_adverse_reaction_list"
    - "SECTION.adhoc.v1_medication_list"
    - "EVALUATION.problem_diagnosis.v1"
    - "EVALUATION.adverse_reaction_risk.v2"
    - "CLUSTER.clinical_evidence.v1"
    - "CLUSTER.problem_qualifier.v2"
    - "CLUSTER.adverse_reaction_event.v1"
  extensions:
    - "IPS_problem_diagnose"
  start: "COMPOSITION.health_summary.v1"
```


CKM Mappings
My Project Mappings (i.e. ZiB)
FHIR Connect Model Mapping
ADMIN_ENTRY.person_data.v0
AQL Path
Patient
FHIR Path
$archetype.data[at0001]/items[at0024]/items[at0025]
deceased.as(Boolean)
slot: EVALUATION.gender.v1
gender
FHIR Connect Model Mapping
EVALUATION.gender.v1
AQL Path
AdministrativeGender
FHIR Path
$archetype/data[at0002]/items[at0022]
code
FHIR Connect Model Mapping
EVALUATION.problem_diagnosis.v1
AQL Path
Condition
FHIR Path
$archetype/data[at0001]/items[at0069]
note
$archetype/data[at0001]/items[at0077]
onset
slot: CLUSTER.anatomical_location.v1
bodySite
...
...
FHIR Connect Model Mapping
CLUSTER.anatomical_location.v1
CodeableConcept
$archetype/items[at0001]
AQL Path
coding
FHIR Path
OVERWRITE
ZiB Anatomical Location
extends
CLUSTER.anatomical_location.v1
zib-CodeableConcept
all items from parent
AQL Path
coding
FHIR Path
my ZiB specifics
extension

problem_diagnosis.v1.yml

```yaml
grammar: FHIRConnect/v0.9.0
type: model
metadata:
  name: EVALUATION.problem_diagnosis.v1
  version: 0.0.1-alpha
spec:
  system: FHIR
  version: R4
  openEhrConfig:
    archetype: openEHR-EHR-EVALUATION.problem_diagnosis.v1
    revision: 1.4.1
  fhirConfig:
    structureDefinition: http://hl7.org/fhir/StructureDefinition/Condition

preprocessor:
  fhirCondition:
    targetRoot: "$resource" # exclude all conditions with entered-in-error, si
    targetAttribute: "verificationStatus.coding.code"
    operator: "not of"
    criteria: "entered-in-error"

mappings:
  - name: "problemDiagnose"
    with:
      fhir: "$resource.code"
      openehr: "$archetype/data[at0001]/items[at0002]"


  - name: "note"
    with:
      fhir: "$resource.note.text"
      openehr: "$archetype/data[at0001]/items[at0069]"


  - name: "dateTime"
    with:
      fhir: "$resource.onset"
      openehr: "$archetype/data[at0001]/items[at0077]"


  - name: "bodySite"
    with:
      fhir: "$resource.bodySite"
      openehr: "$archetype/data[at0012]"

  - name: "severity"
    with:
      fhir: "$resource.severity"
      openehr: "$archetype/data[at0001]/items[at0005]"
```

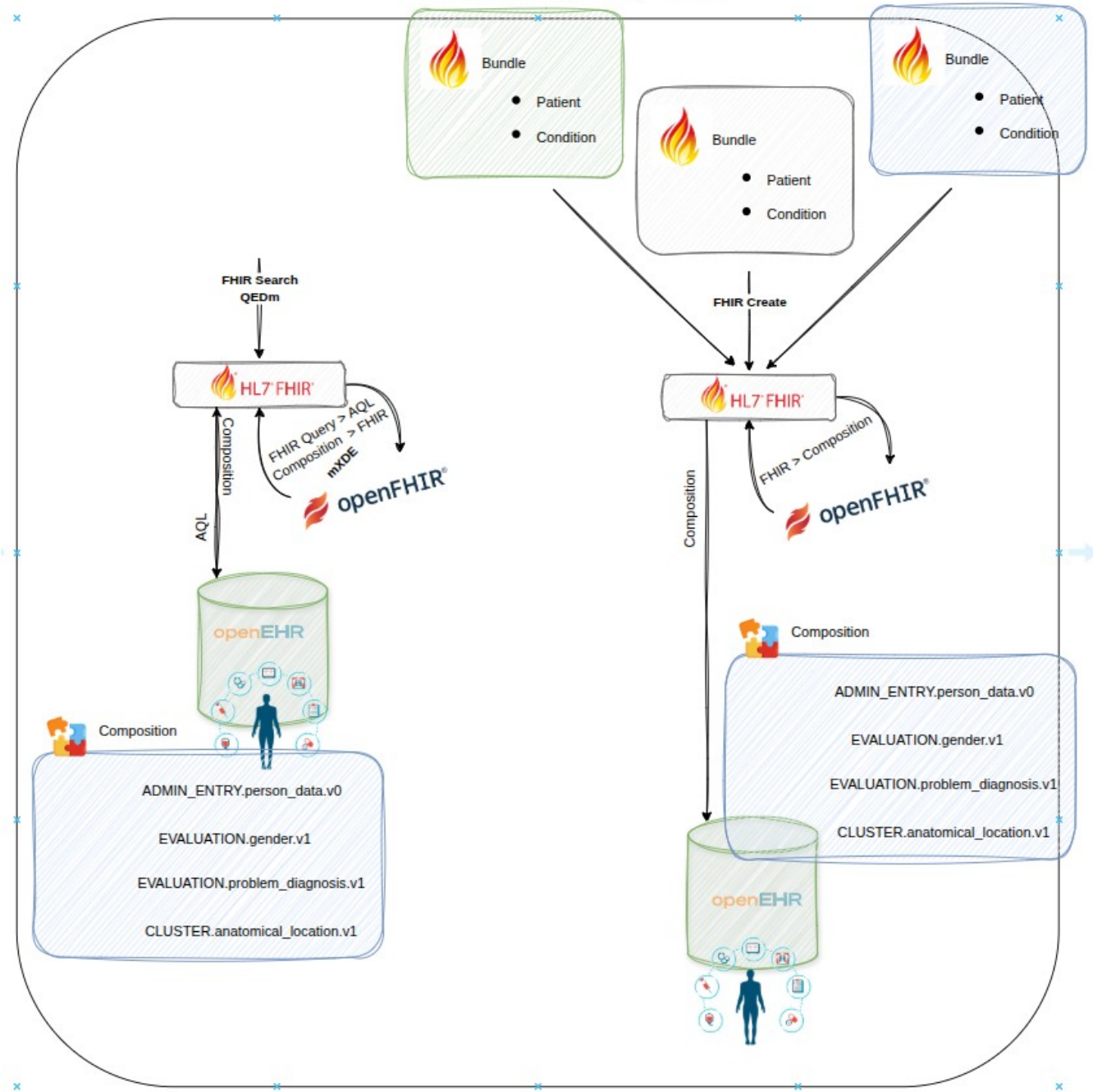
ips.problem_diagnosis.v1.yml

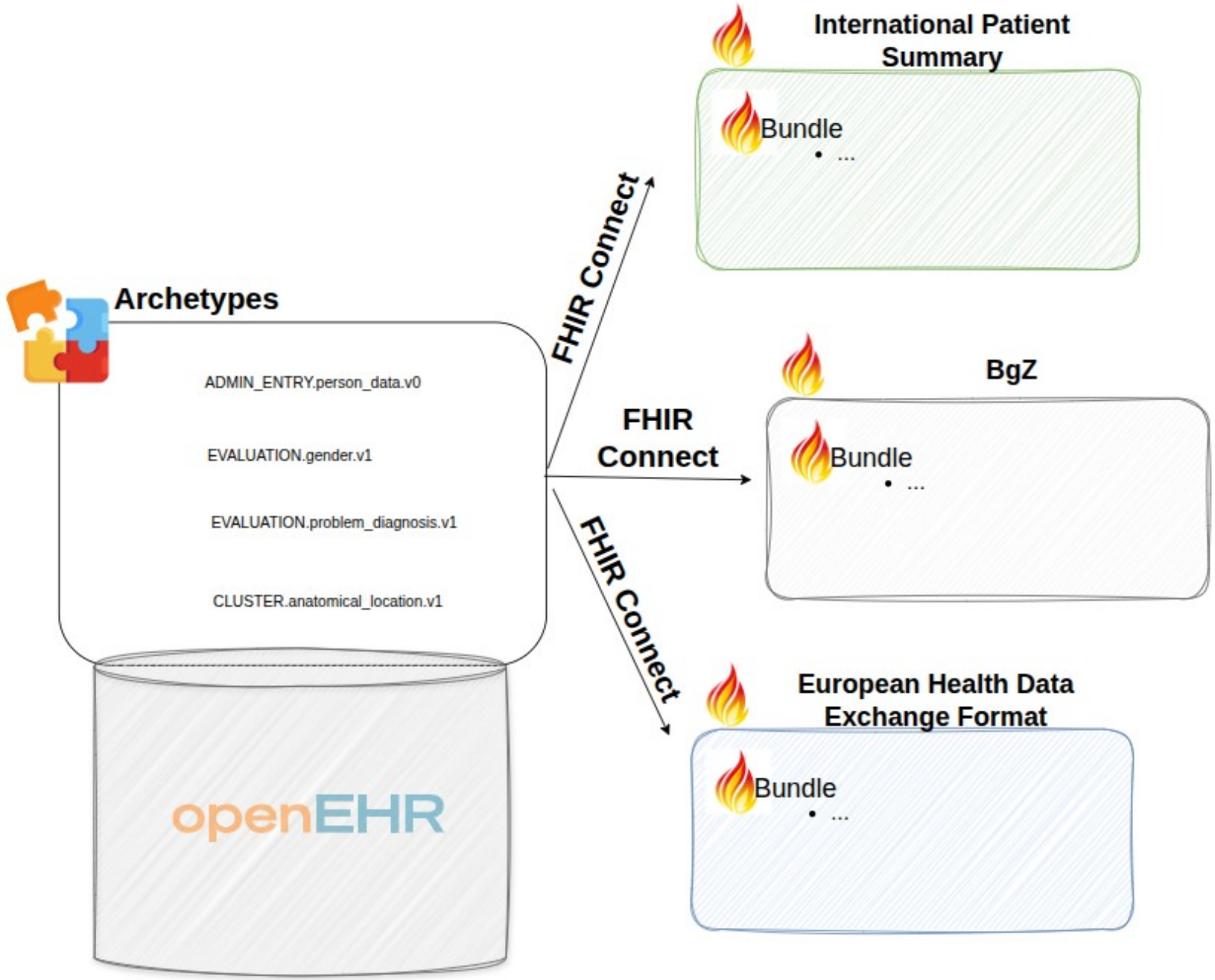
```yaml
grammar: FHIRConnect/v0.9.0
type: extension
metadata:
  name: IPS_problem_diagnose
  version: 0.0.1-alpha
spec:
  system: FHIR
  version: R4
  extends: EVALUATION.problem_diagnosis.v1

terminology:
  type: "local"
  conceptmap: "http://hl7.org/fhir/ConceptMap/ips-fhirconnect"

mappings:
  - name: "dateTime"
    extension: add
    with:
      fhir: "$resource.abatement.as(DateTime)"
      openehr: "$archetype/data[at0001]/items[at0030]"

  - name: "certainty"
    extension: add
    with:
      fhir: "$resource.verificationStatus.coding"
      openehr: "$archetype/data[at0001]/items[at0073]"
    openehrCondition:
      targetRoot: "$archetype/data[at0001]/items[at0073]"
      targetAttribute: "defining_code/code_string"
      operator: "one of"
      criteria: "at0076"

  - name: "stage"
    extension: add
    with:
      fhir: "$resource.stage"
      openehr: "$archetype"
    followedBy:
      mappings:
        - name: "type"
          with:
            fhir: "type"
            openehr: "$archetype/data[at0001]/items[openEHR-EHR-CLUSTER.clinic
        - name: "summary"
          with:
            fhir: "summary"
            openehr: "$archetype/data[at0001]/items[openEHR-EHR-CLUSTER.clinic
#       - name: "assessment"
#         with:
```

ips_conceptmap.json

```json
{
  "resourceType": "ConceptMap",
  "id": "e1a90f56-4773-44a6-8004-0ef178ce85a8",
  "url": "http://hl7.org/fhir/ConceptMap/ips-fhi
  "description": "IPS Mappings",
  "group": [
    {
      "source": "local",
      "target": "http://terminology.hl7.org/Code
      "element": [
        {
          "code": "at0076",
          "display": "Confirmed",
          "target": [
            {
              "code": "confirmed",
              "display": "Confirmed",
              "equivalence": "equivalent"
            }
          ]
        }
      ]
    },
    {
      "source": "http://terminology.hl7.org/Code
      "target": "local",
      "element": [
        {
          "code": "confirmed",
          "display": "Confirmed",
          "target": [
            {
              "code": "at0076",
              "display": "Confirmed",
              "equivalence": "equivalent"
            }
          ]
        }
      ]
    },

    {
      "source": "local",
      "target": "http://snomed.info/sct",
      "element": [
        {
          "code": "at0047",
          "target": [
            {
```

Execution - QEDm, mXDE




International Patient Summary
Bundle
...
FHIR Connect
Archetypes
ADMIN_ENTRY.person_data.v0
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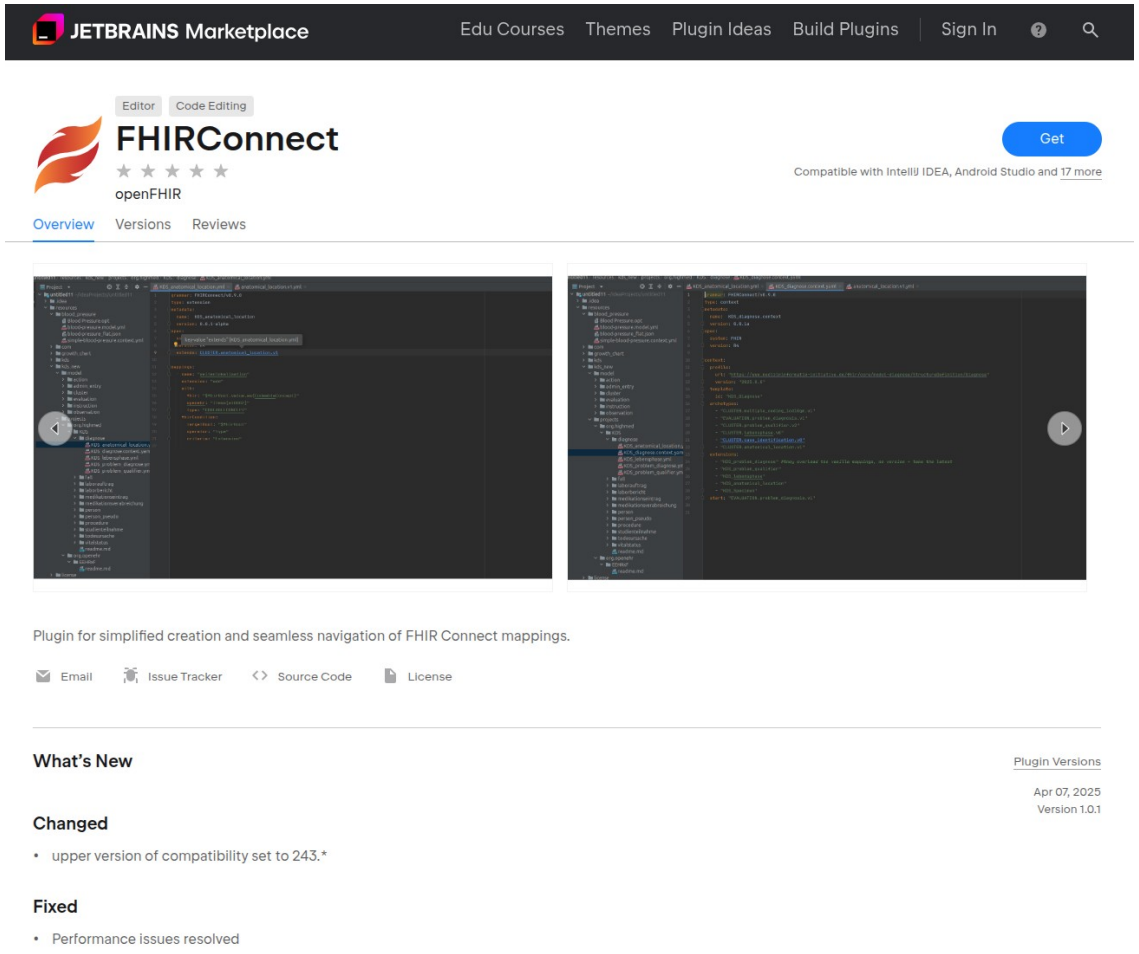
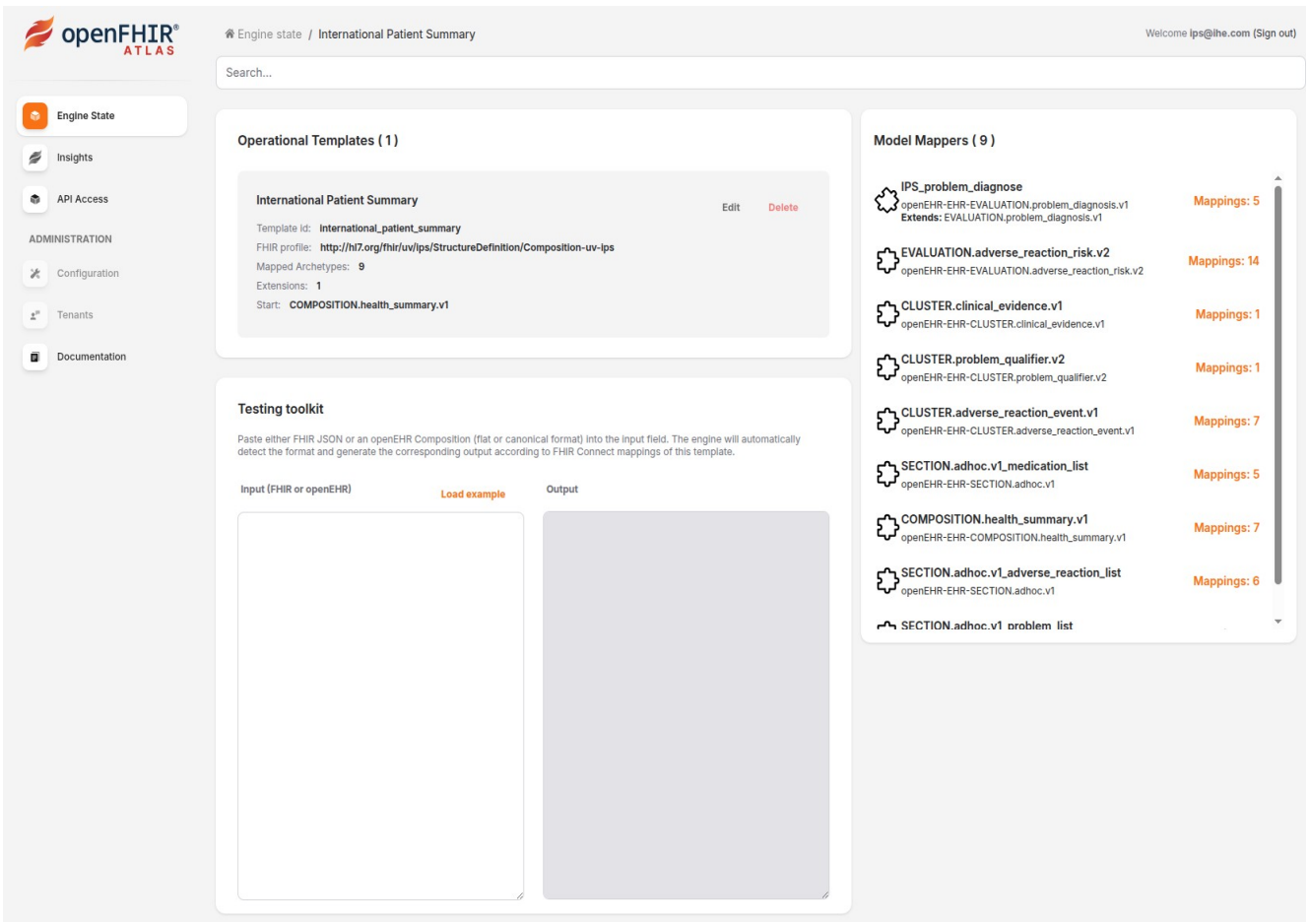
EVALUATION.problem_diagnosis.v1
CLUSTER.anatomical_location.v1
FHIR Connect
BgZ
Bundle
...
FHIR Connect
European Health Data Exchange Format
Bundle
...
openEHR

Mapping challenges

- Requirement for a good foundation on both sides (properly structuredFHIR profile and openEHR Template)
- Clinical knowledge to know what maps to what
- Technical and domain knowledge of both standards
    - Yaml files, FHIRPath, AQL Path
- Differently layered concepts
    - Sometimes archetype maps to a Resource, other times to a specific FHIR datatype
    - Hierarchy and recurrence: when does one composition result in severalResources and vice versa
    - ...
- Terminology

FHIR Connect Learning Curve & Tools





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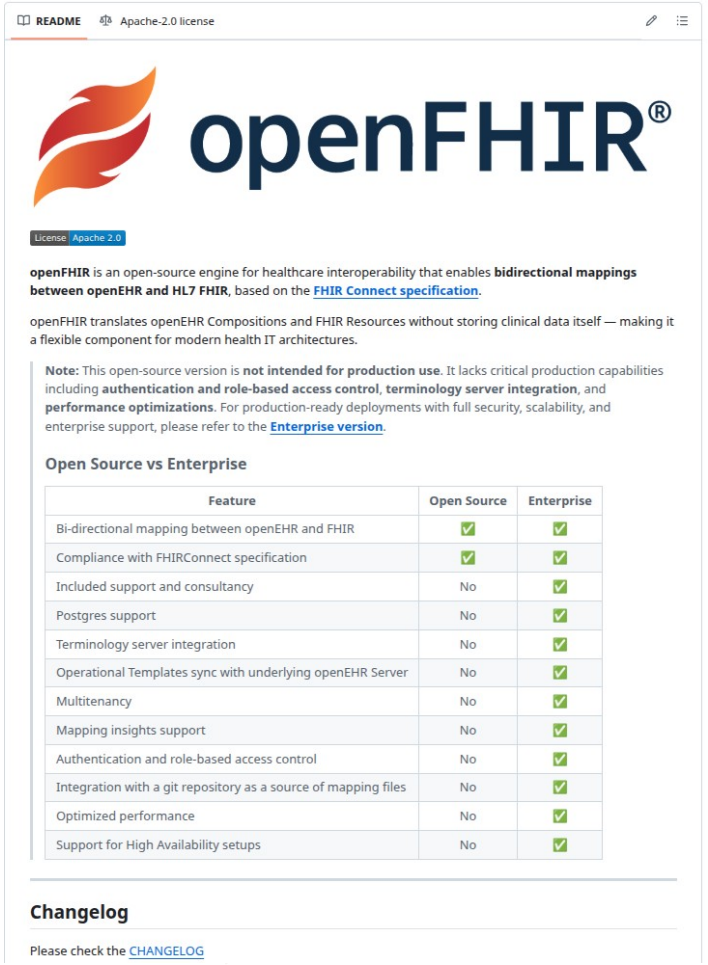
FHIR Connect Learning Curve & Tools

- **Open source engine & sandbox**
  - https://github.com/openFHIR/openfhir
  - https://sandbox.open-fhir.com/atlas



README Apache-2.0 license

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License Apache 2.0

openFHIR is an open-source engine for healthcare interoperability that enables **bidirectional mappings between openEHR and HL7 FHIR**, based on the **FHIR Connect specification**.

openFHIR translates openEHR Compositions and FHIR Resources without storing clinical data itself — making it a flexible component for modern health IT architectures.

> **Note:** This open-source version is **not intended for production use**. It lacks critical production capabilities including **authentication and role-based access control**, **terminology server integration**, and **performance optimizations**. For production-ready deployments with full security, scalability, and enterprise support, please refer to the **Enterprise version**.

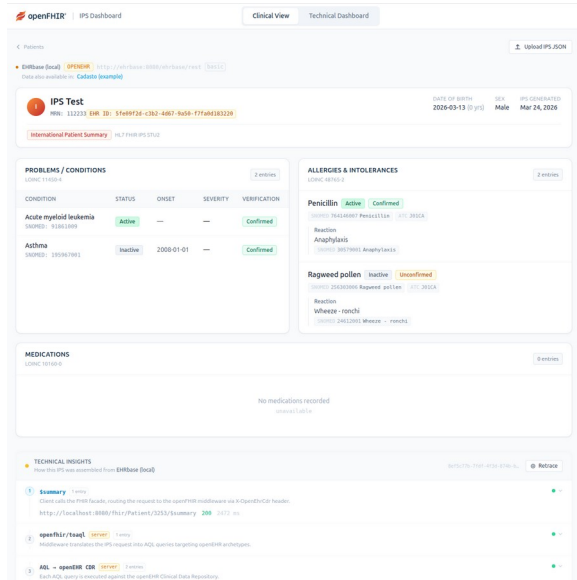
Open Source vs Enterprise

Feature	Open Source	Enterprise
Bi-directional mapping between openEHR and FHIR	✅	✅
Compliance with FHIRConnect specification	✅	✅
Included support and consultancy	No	✅
Postgres support	No	✅
Terminology server integration	No	✅
Operational Templates sync with underlying openEHR Server	No	✅
Multitenancy	No	✅
Mapping insights support	No	✅
Authentication and role-based access control	No	✅
Integration with a git repository as a source of mapping files	No	✅
Optimized performance	No	✅
Support for High Availability setups	No	✅

Changelog

Please check the CHANGELOG

IPS Demo



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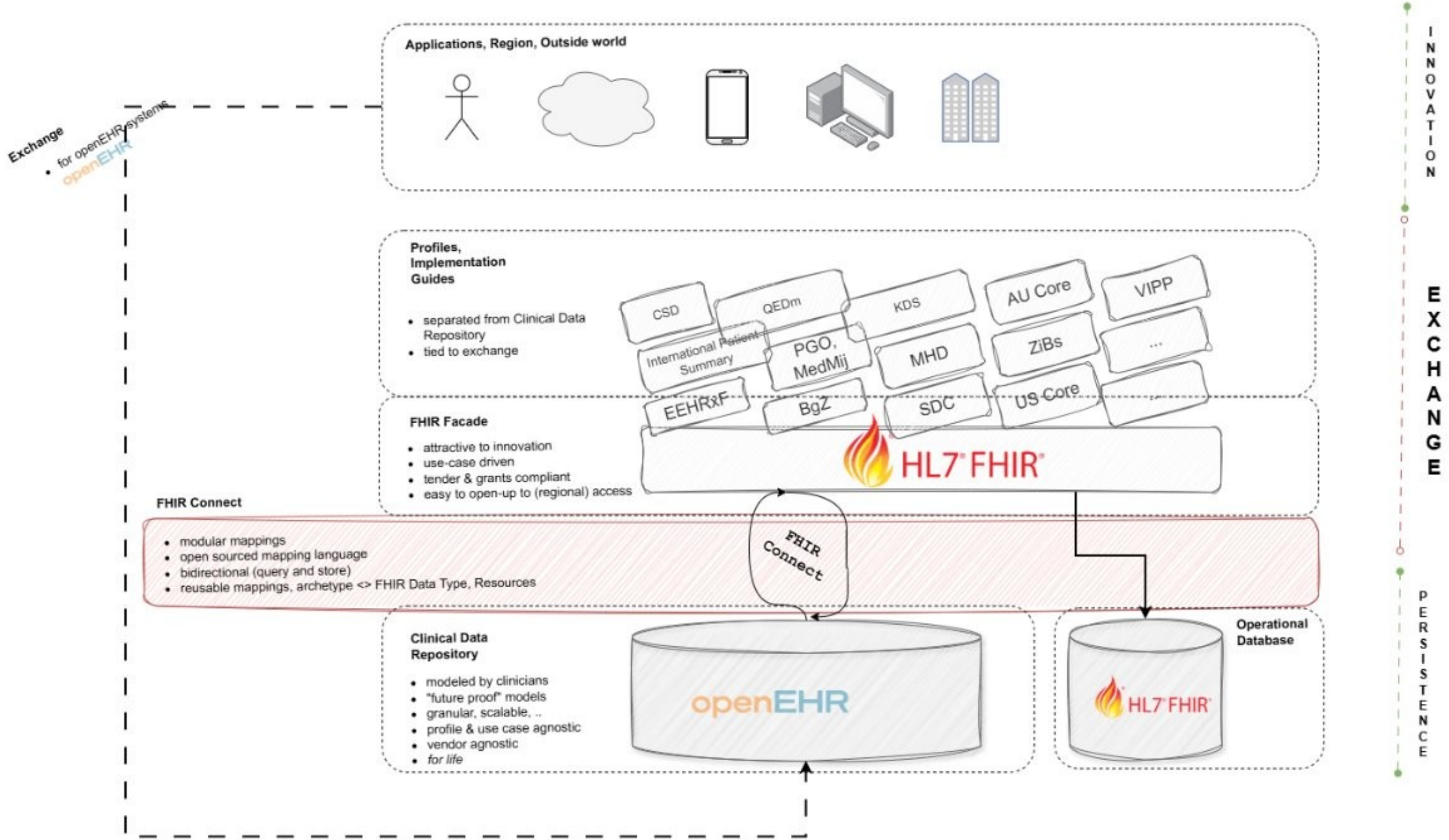
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FHIR Facade
attractive to innovation
use-case driven
tender & grants compliant
easy to open-up to (regional) access
HL7 FHIR
FHIR Connect
modular mappings
open sourced mapping language
bidirectional (query and store)
reusable mappings, archetype <> FHIR Data Type, Resources
FHIR Connect
Clinical Data Repository
modeled by clinicians
"future proof" models
granular, scalable, ..
profile & use case agnostic
vendor agnostic
for life
openEHR
Operational Database
HL7 FHIR
INNOVATION
EXCHANGE
PERSISTENCE

Enterprise vs open-source

- Performance optimizations
  - 16ms avg mapping response time
  - 9ms median
  - P99 95ms
- Terminology integration
- Additional integration capabilities
- Authn
- HA support
- ...

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Support for High Availability setups	No	✅

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Getting started

- Sandbox access: https://sandbox.open-fhir.com
- Local installation (docker)
- Documentation: https://open-fhir.com/documentation
- Open sourced repo (Apache2 license): github openFHIR/openfhir

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- Commercial version & support: https://open-fhir.com

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Contact

- https://open-fhir.com
- gasper.andrejc@open-fhir.com

https://syntaric.com