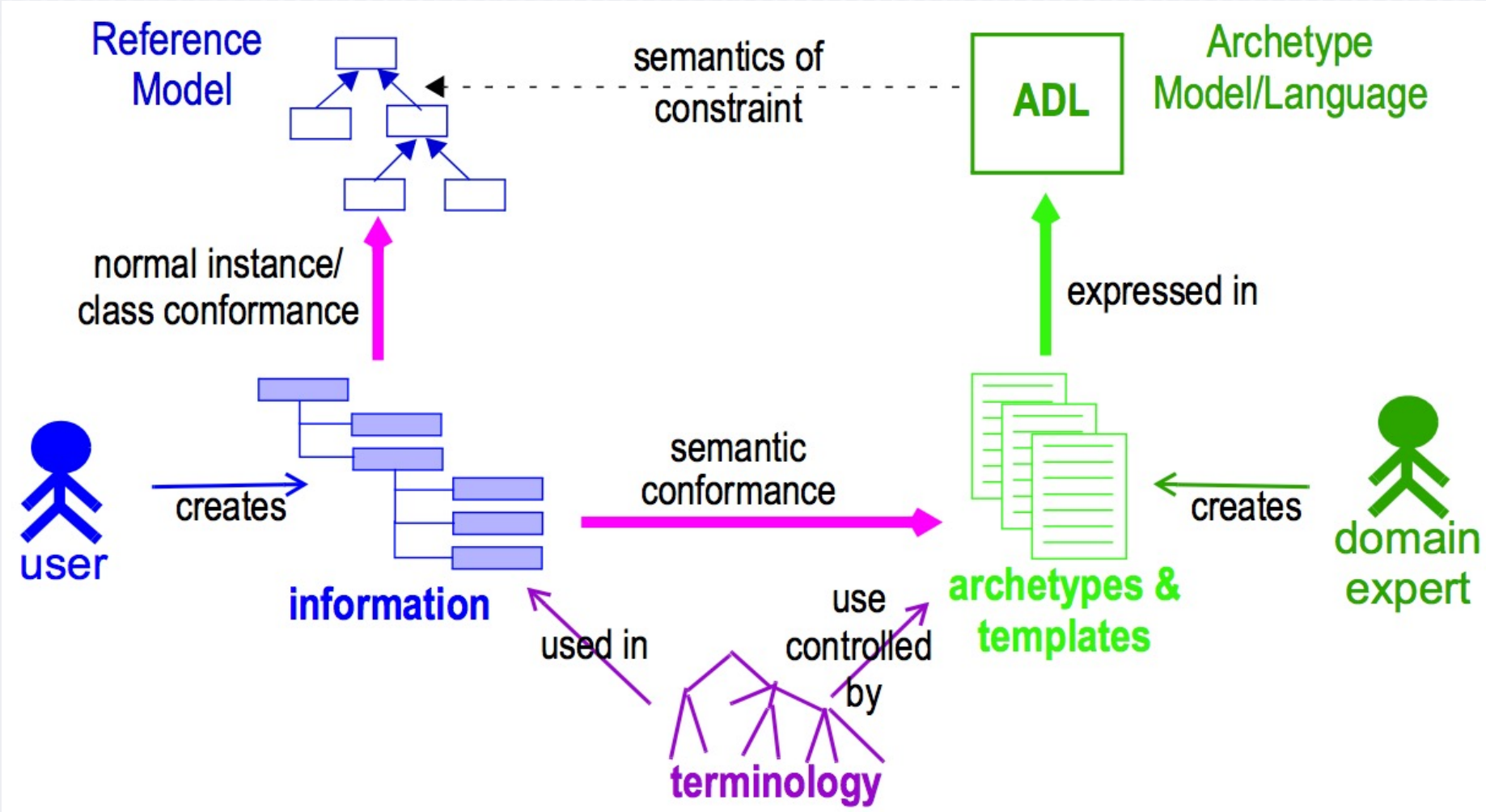
# *Open*EHR
# Archetype Model

## 2. Archetype Model

- Clinical in nature (used for representing clinical information)
- Allowing **clinician** and **domain specialists** to be involved in the development of **ontology concepts** (**archetypes**) based on domain constraints
- **Archetype**:
  - A machine readable specification for a **single, discrete clinical concept** that is defined as a set of **Constraints** on an information model
  - **Archetype key feature** ➔ complete separation of **information models** (such as database schemas) from **domain models**
  - Providing a way to formally define **re-usable clinical concepts** and **group of reusable concepts** definitions
  - Archetype can be re-used in numerous contexts

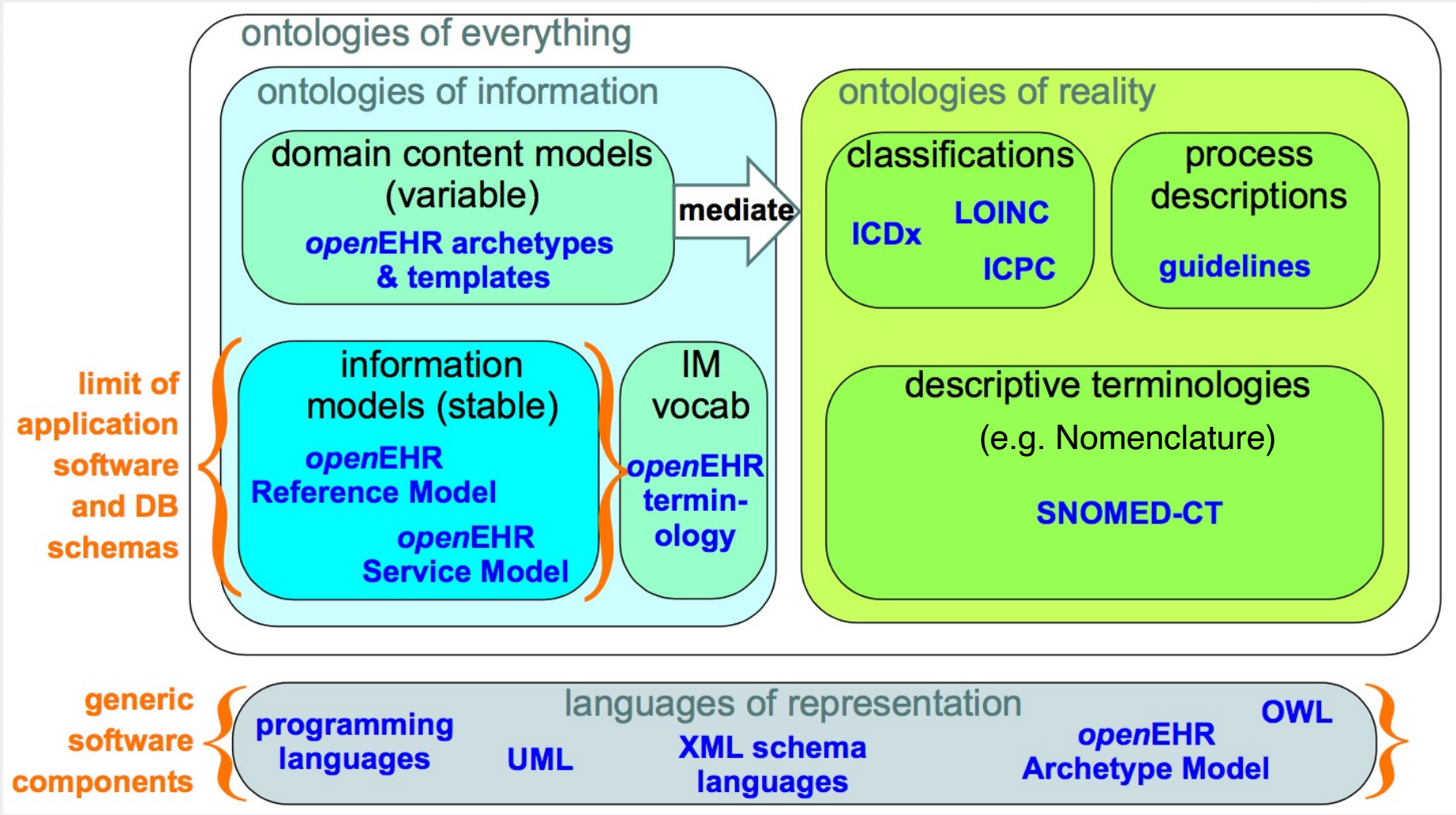
# Archetype Meta Architecture



# *Open*EHR
# Archetype Model

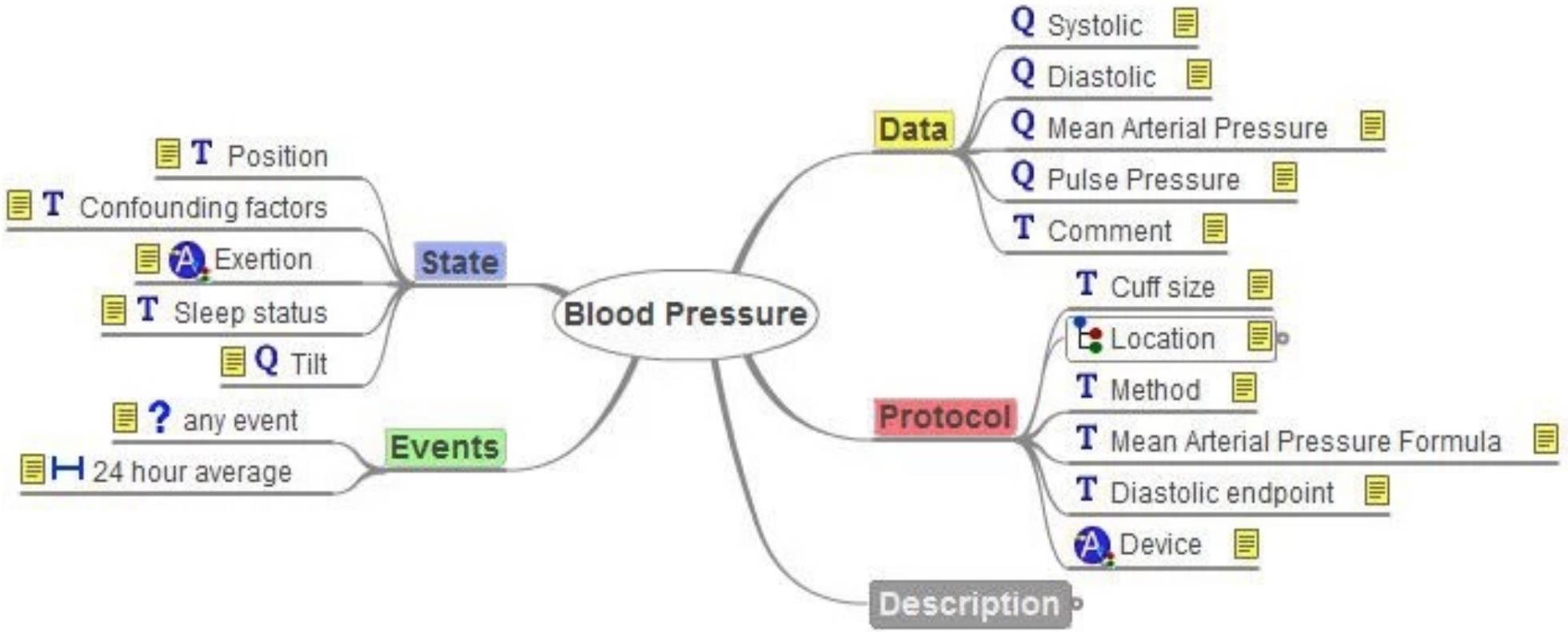
- **Archetypes Functions**
  - Allowing domain experts such as **clinicians** to create a library of data element and group definitions for the data in their information systems
  - Providing runtime validation of data input via GUI or any batch process
  - Providing a basis for semantic querying of data.
- Modelling of clinical concepts using archetypes
  - **Observations** ➔ weight measurement, blood pressure, microbiology results
  - **Reports** ➔ discharge referral
  - **Orders** ➔ prescription
  - **Assessments** ➔ diagnosis

# *open*EHR Archetypes and Ontologies

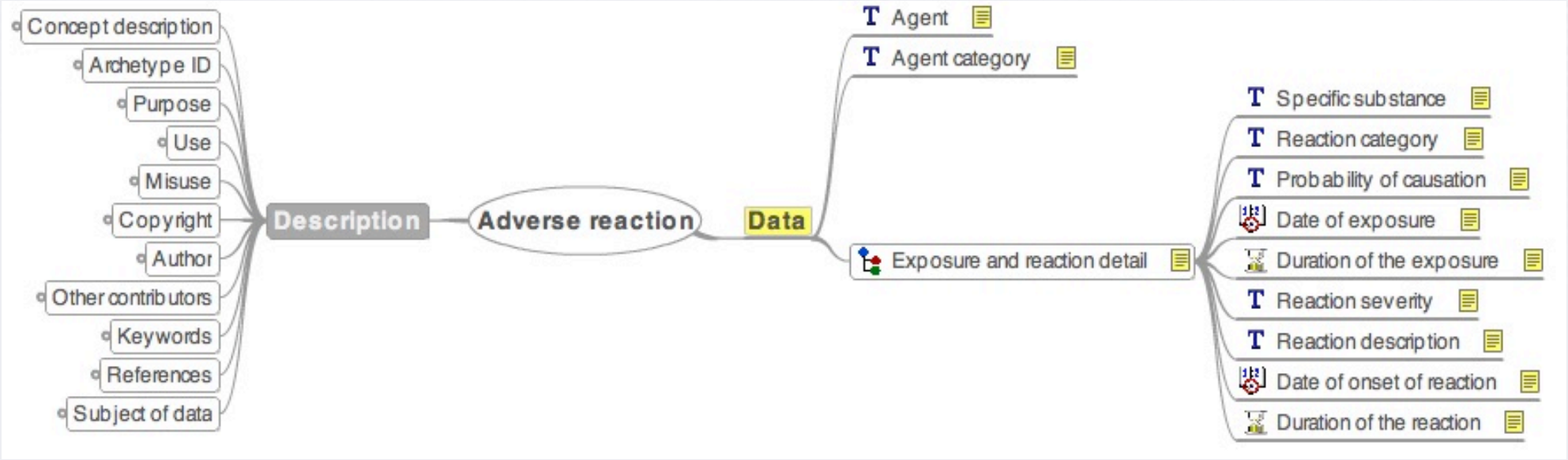


# *Open*EHR
# Archetype Model: Example

- Archetype example – Blood Pressure concept
  - A set of **constrains** are specified on blood pressure concept as shown in figure below



# *Open*EHR
# Archetype Model: Example

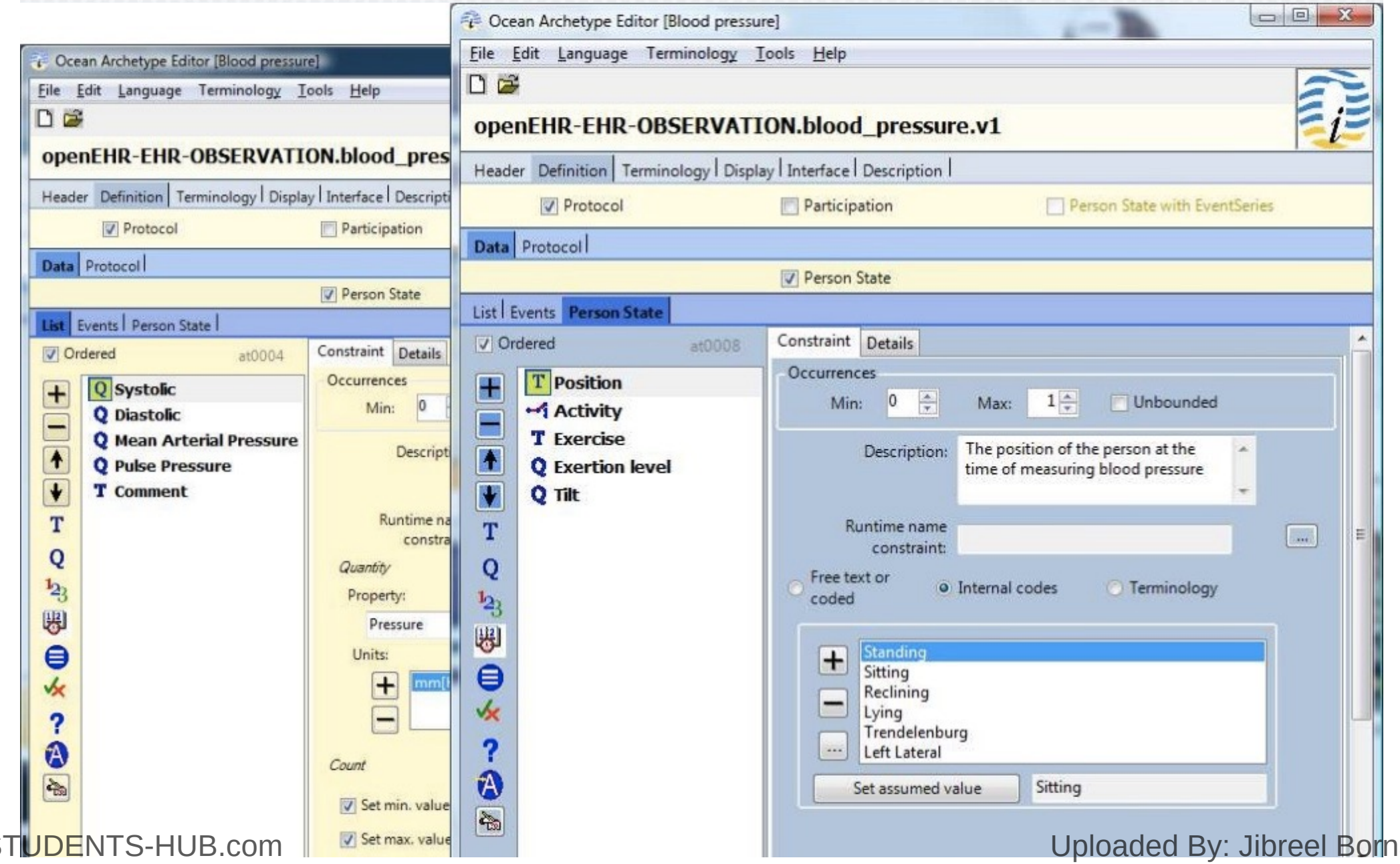



| | | | |
|---|---|---|---|
| T | **Certainty**<br>Coded Text<br>Occurrences: 0..1 (optional) | Degree of certainty, as assessed by a clinician, that the specific Substance/Agent was the cause of the Adverse Reaction. | **Suspected** [Possibly the causative agent.]<br>**Probable** [Likely to be the causative agent, but not confirmed by testing or rechallenge.]<br>**Confirmed** [Confirmed as the causative agent, by testing or rechallenge.] |

# *Open*EHR Archetype Model

- Archetype Tools
  - To utilise archetype, you can:
    - Create new archetype (using **Archetype Editor**)
    - Reuse existing archetype (from Clinical Knowledge Manager (CKM))
- Archetype Editor
  - A software tool that facilitates authoring of OpenEHR **clinical and administrative archetypes** in ADL and XML format.
    - ADL ➔ Archetype Definition Language
    - XML ➔ eXtensible Markup Language
    - Download and documentation link:
      - http://www.openehr.org/downloads/archetypeeditor/home

# *Open*EHR
# Archetype Editor



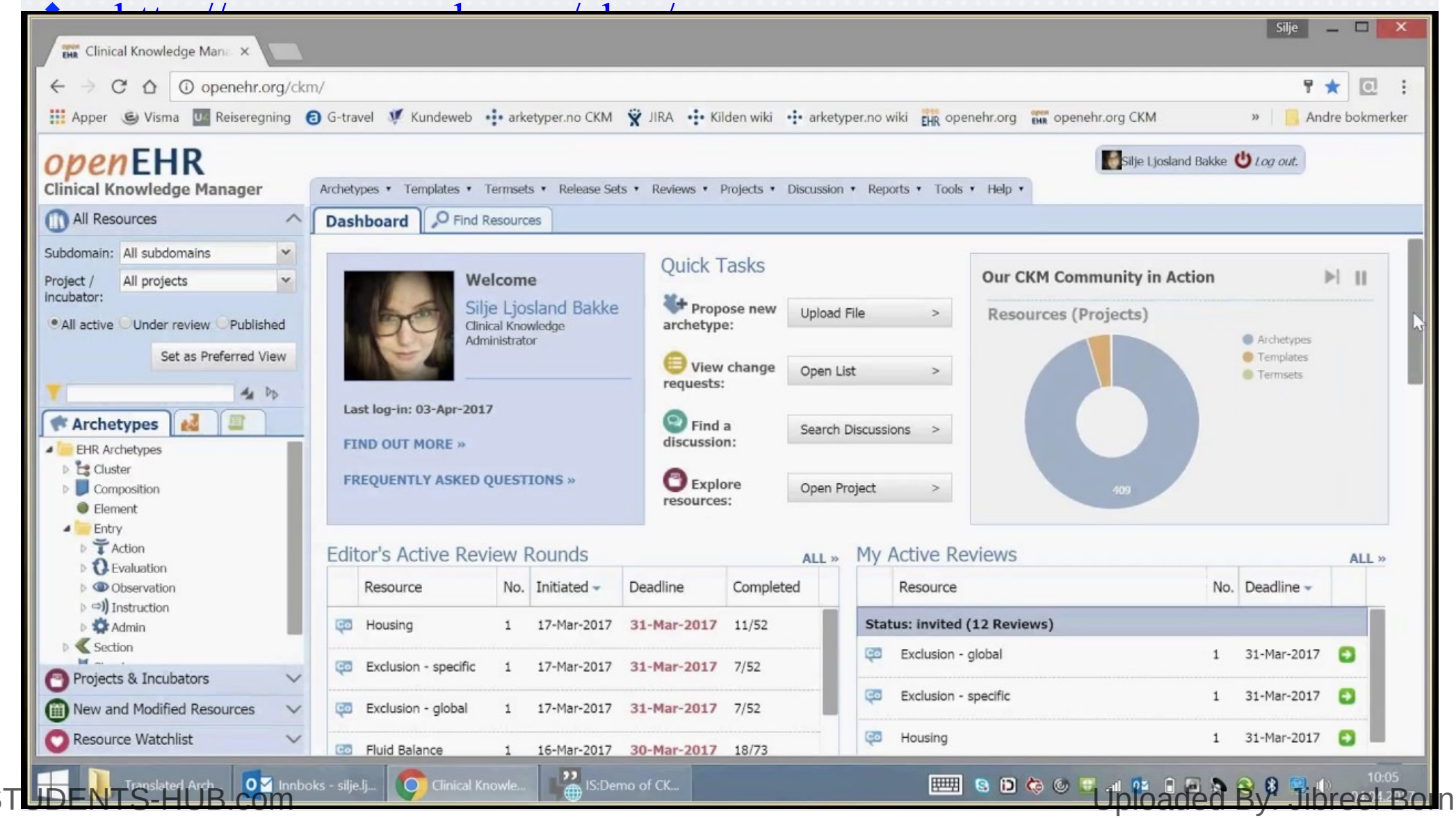
# *Open*EHR Archetype Model

- Archetype Template
  - Used to logically represent a **use case-specific data-set**, such as the data items making up the following use cases:
    - Patient discharge summary
    - Radiology report
    - GP referral
  - A template is constructed by referencing relevant items from a number of archetypes
    - Templates are almost always developed for local use by software developers and clinical analysts.
    - Templates are typically defined for **GUI screen forms, message definitions and document definitions**
    - **CKM** ➔ used for creating Archetype template

# *Open*EHR
# Clinical Knowledge Manager (CKM))

- CKM is a Web-based system for collaborative development, management and publishing of a wide range of **clinical knowledge resources**
  - It enables the implementation of knowledge governance within and across the health enterprise.
  - Resources include archetypes, templates, term sets, artefact release sets, metadata relating to clinical models and related resources

# *Open*EHR
# Clinical Knowledge Manager (CKM))



# *Open*EHR Service Model

## 3. Service Model

- Describes the services provided within an EHR system to support its functions and data for the user (e.g. clinician)

- **Services :**

**A. Virtual EHR API**: facilitates users in creating
- A new EHR artifact (through related archetype),
- Requesting a part or a complete EHR, and
- Modifying an existing EHR artifact locally.

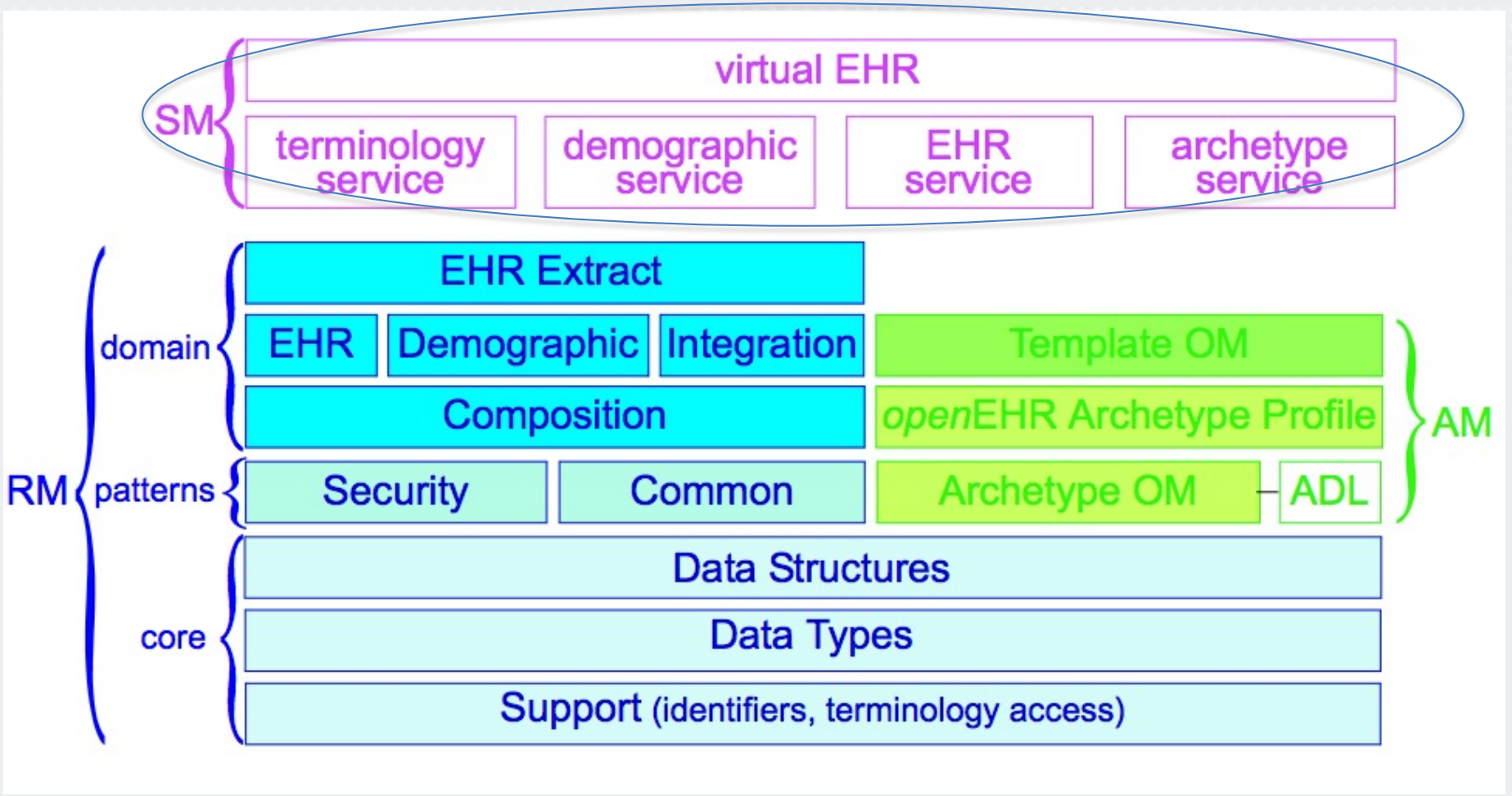
**B. EHR Service**
- Provides an API for inserting, accessing, and updating EHR data at server side.
- Virtual EHR API calls this service for performing the above-mentioned operations on an EHR

**C. Archetype Service**
- Provides an API for connecting to an online archetype repository for accessing archetypes for use and validation in an EHR application.

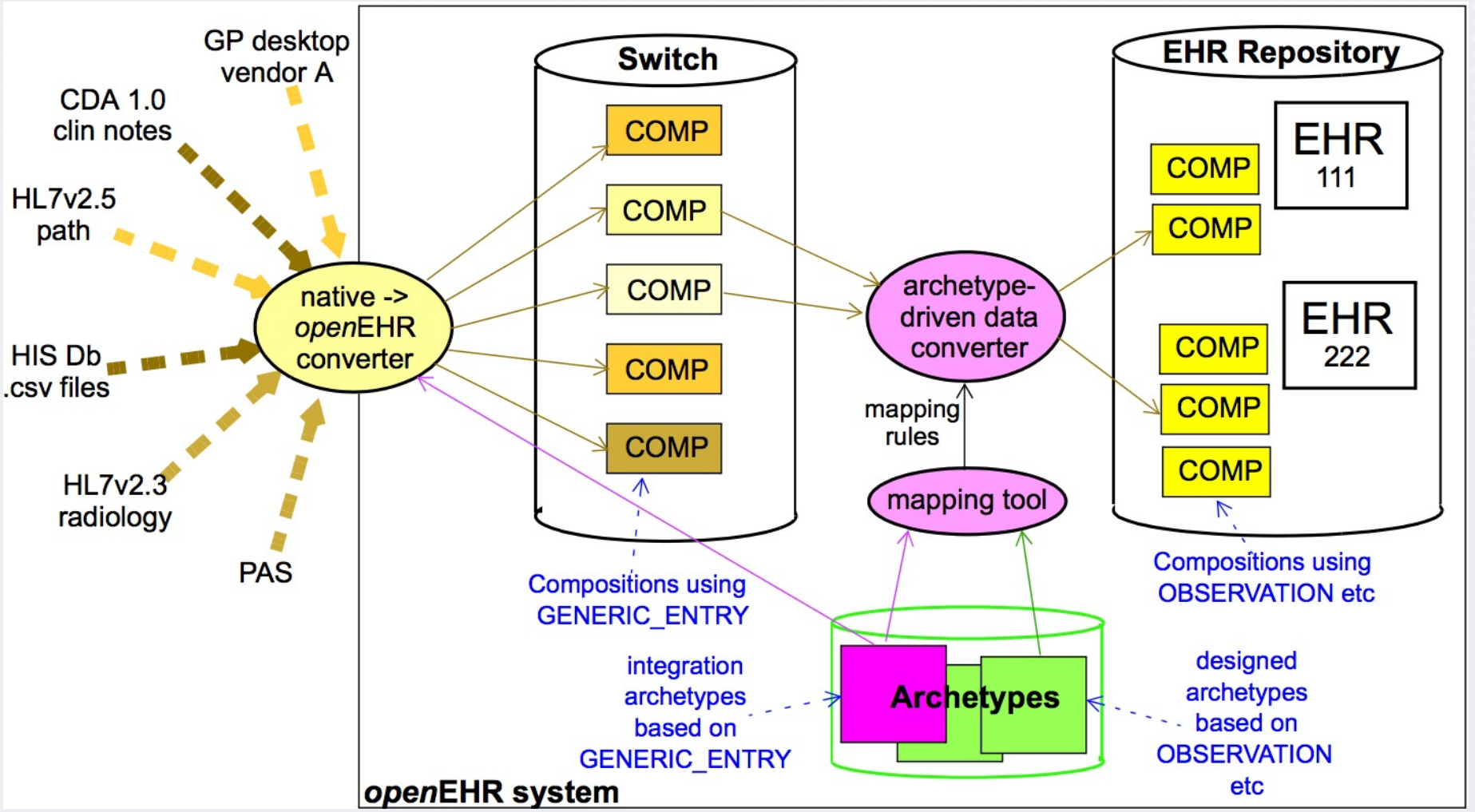
**D. Terminology Service**
- Provides an API for connecting to all available coding systems, such as ICD, CPT, SNOMED CT, and so on.

**E. Demographic Service**
- Provides an API for accessing, storing, and updating information of entities involved in care.

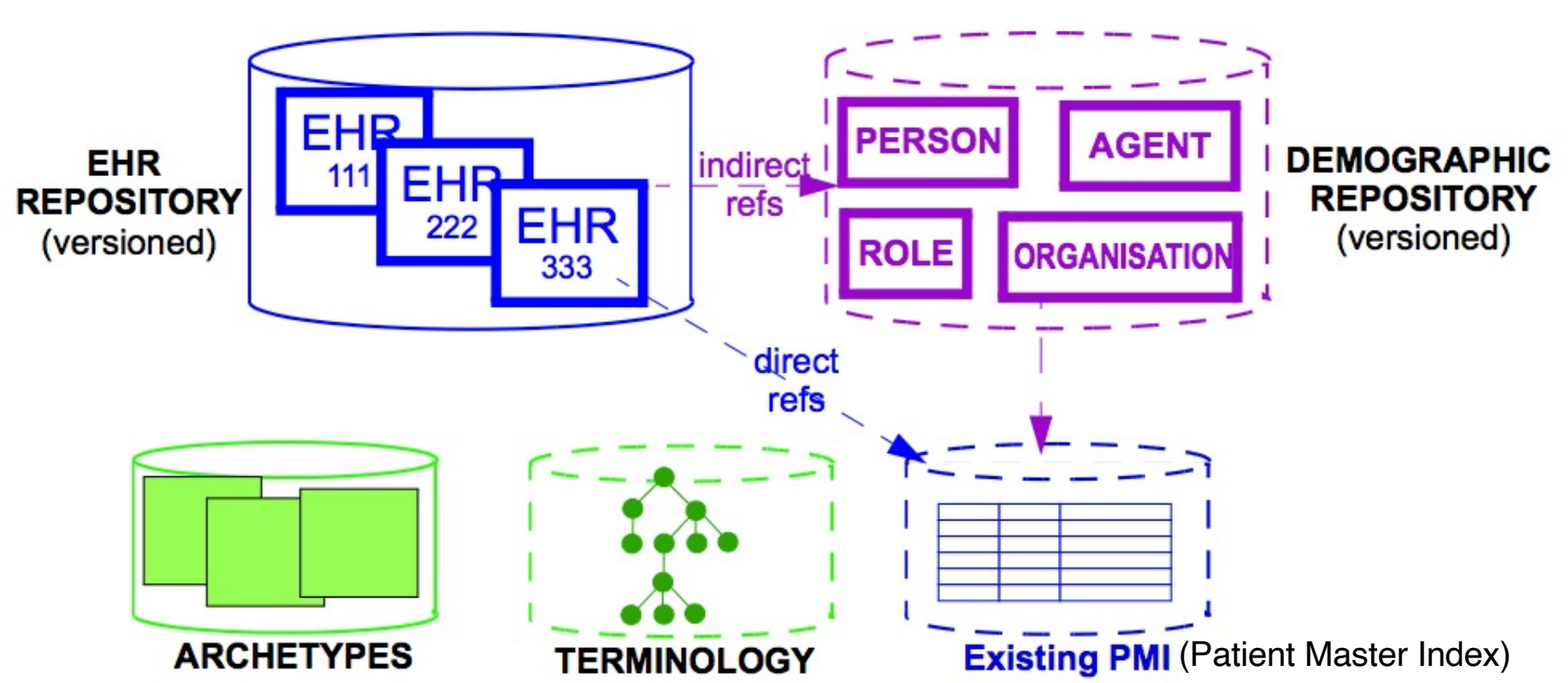
# *open*EHR Package Structure



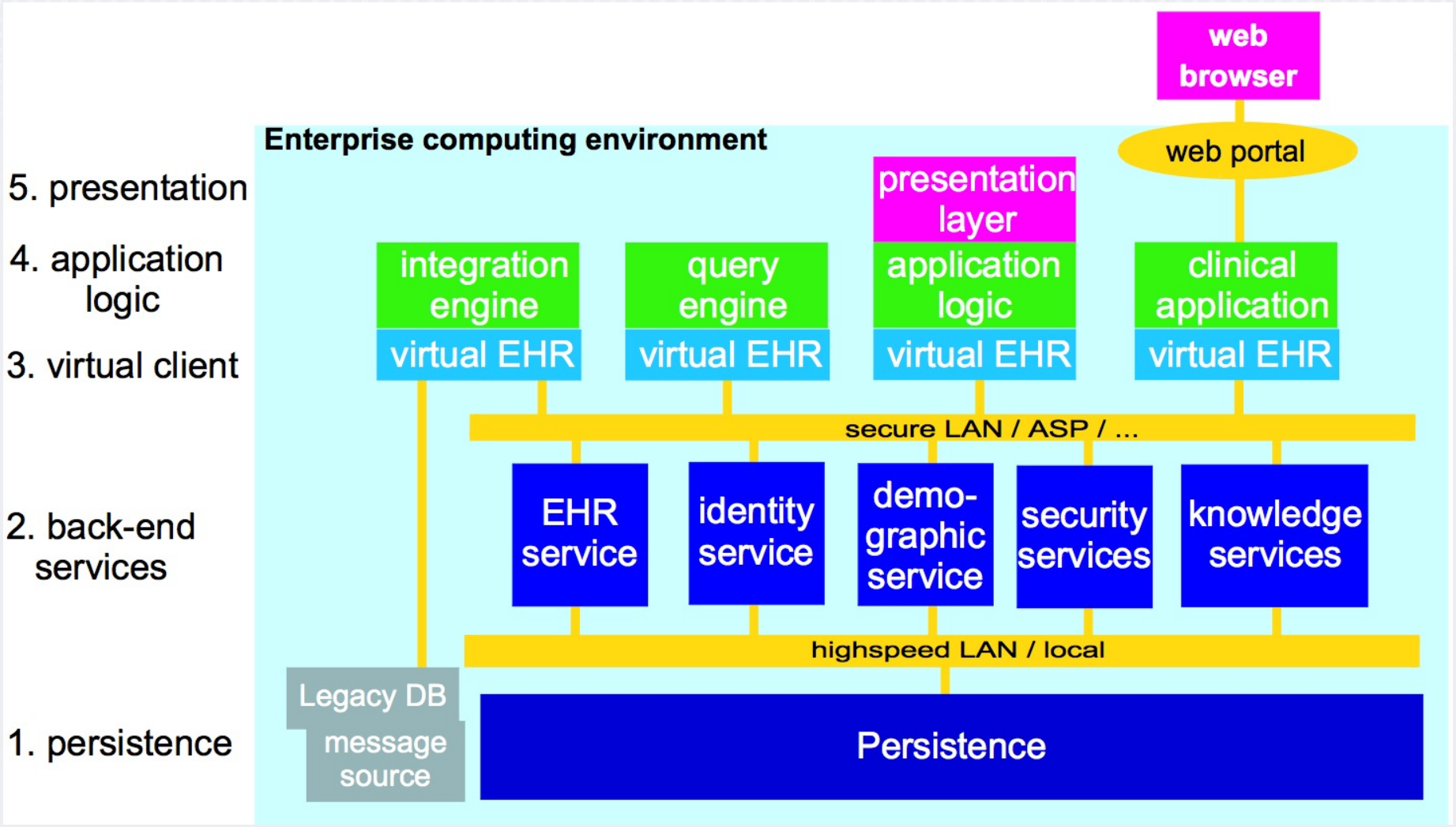
# *open*EHR: Data Integration Architecture



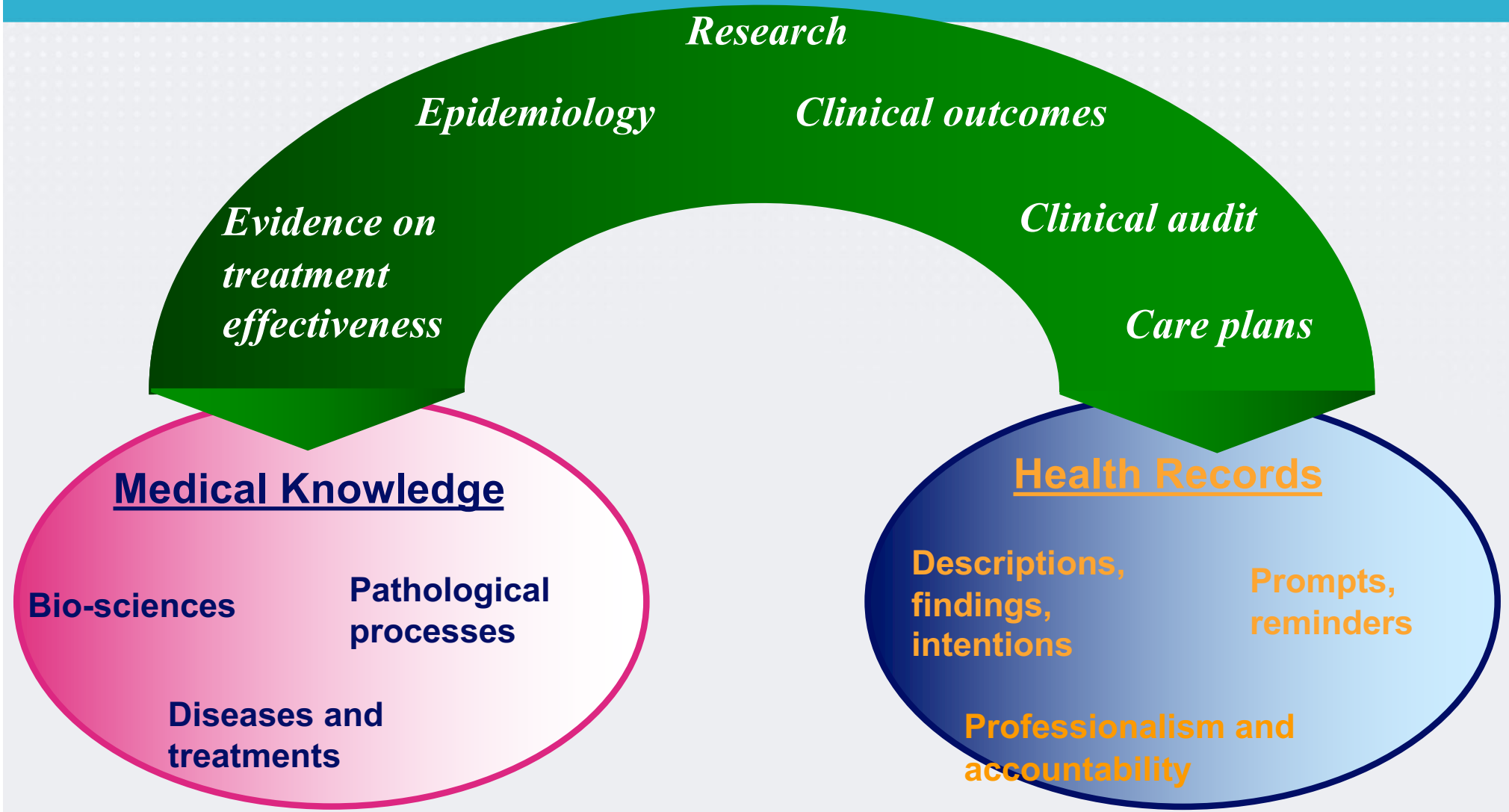
# Minimal *open*EHR EHR System



# Enterprise EHR System Architecture

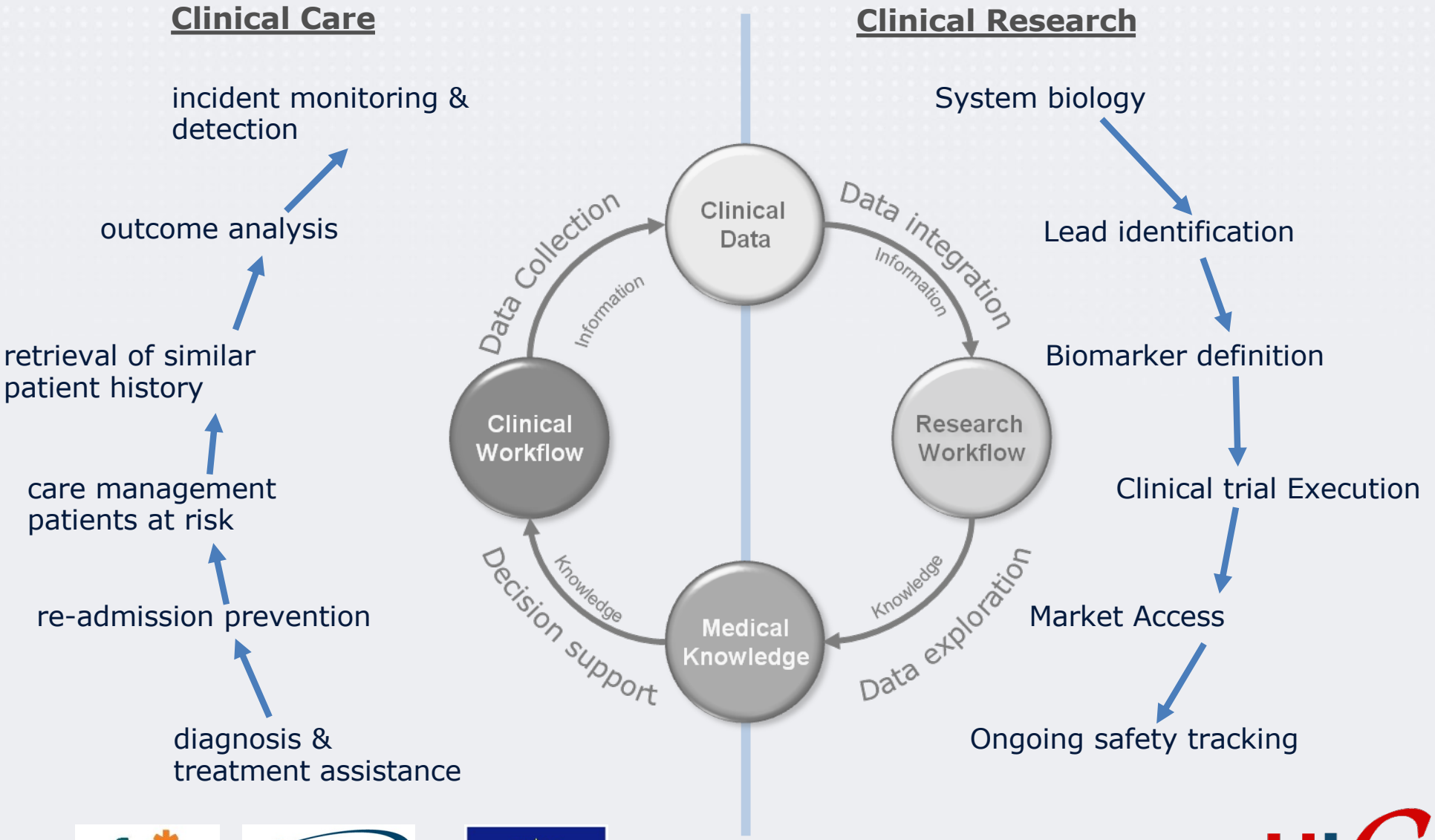


# EHR and knowledge integration




These areas need to be represented consistently to deliver meaningful and safe interoperability

# Long-term View



# openEMR

*An example EHR system that implements openEHR standards (or part of)*

# OpenEMR
# Free & Open Source Web Application

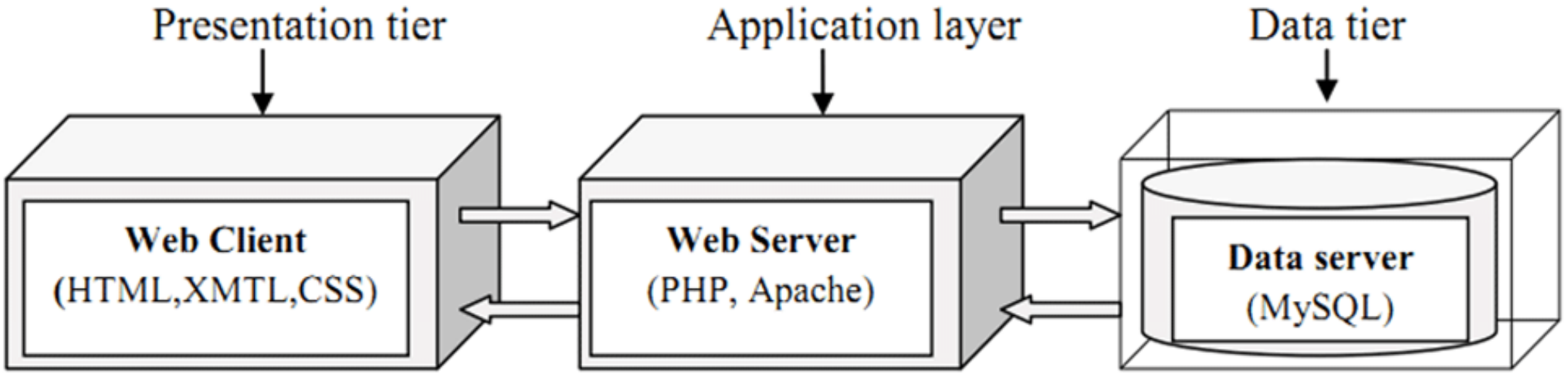
- Free
  - Anyone is freely licensed to **use, copy, study, and change** the software in any way
- Open source
  - The source code is **openly shared** so that people are encouraged to improve the design of the software voluntarily

# OpenEMR
# Free & Open Source Web Application

- OpenEMR Based on **3-tier client–server Web architecture**:

1. **Application/process layer**
   - OpenEMR processes and services are built using **PHP programming language** (called Application server)
2. **Data layer**
   - OpenEMR data are stored using MySQL database management system
3. **Presentation layer**
   - Users (Clients) can access OpenEMR processes and services via **internet** (or local computer network) using a **Web browser** and via **HTTP** protocol.

# OpenEMR
# 3-Tier Client-Server Web Architecture

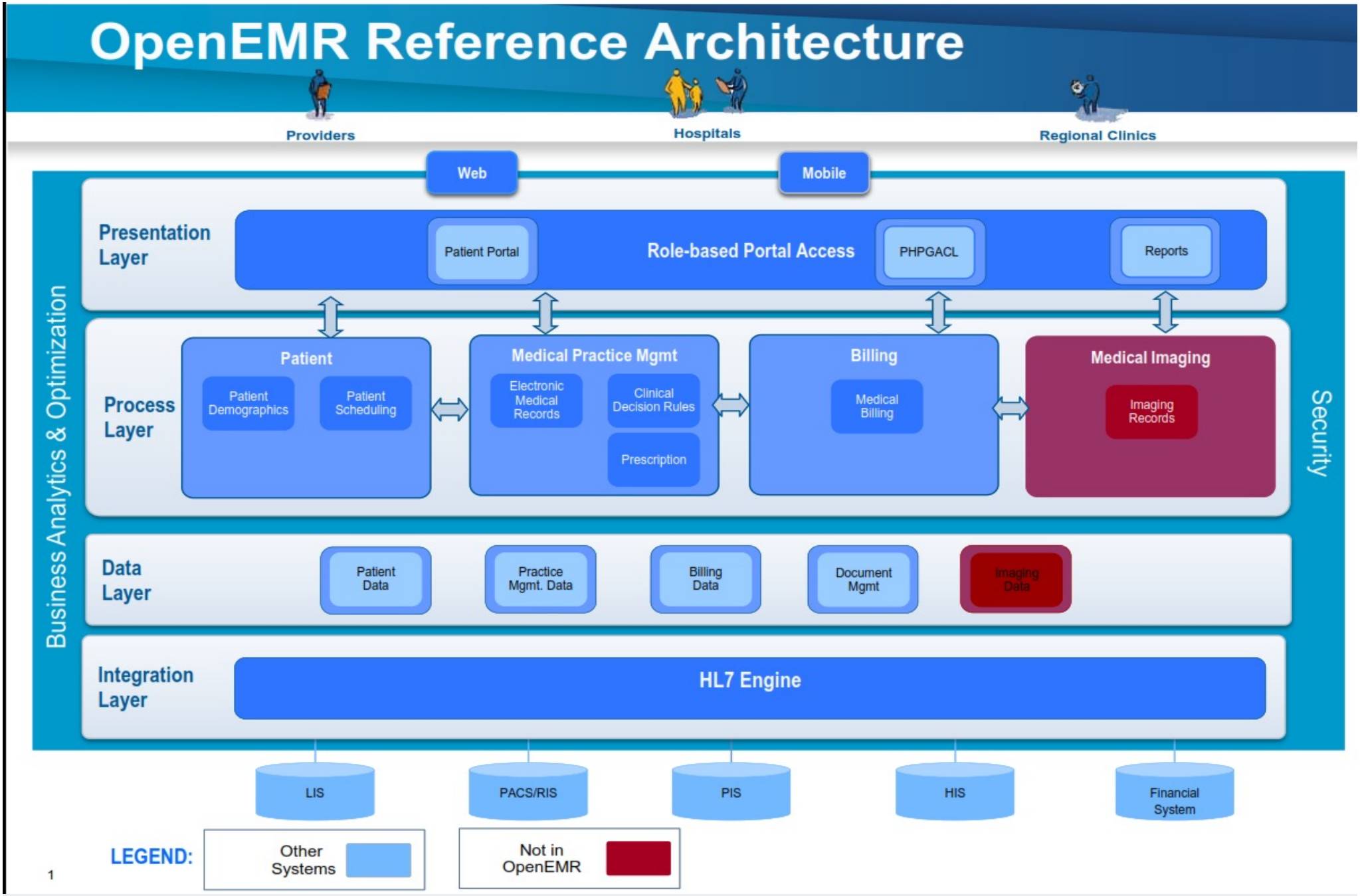


# OpenEMR
# Medical Practice Management Software

- Deals with the **day-to-day operations** of a medical practice
  - Management and tracking of **Patient Demographics**
  - Patient **appointments and Scheduling**
  - **Prescriptions** management and tracking
  - Medical **billing support**
  - **Clinical decision** rules
  - **Medical and managements** reporting

# OpenEMR
# Supports Electronic Health Record

- OpenEMR facilitates **management and sharing** of patients' health information
  - Patient's **encounters** data collection and management
  - Patient's **medical issues and clinical notes**
  - Patient's **medications and immunizations**
  - Patient's **Lab reports and radiology images**
  - Clinical **messaging and referrals**
  - Electronic Syndrome Surveillance reporting
  - Other EHR-related data/information




Reference: http://www.open-emr.org/wiki/, 05/08/2017

# OpenEHR & OpenEMR

- OpenEMR manage Patient using two process modules:
  1. Patient module
     - Responsible for managing patient demographic data and patient scheduling
  2. Medical practice management module
     - Responsible for managing **patient medical record (encounters)**, **clinical decision rules, and prescription**
- This separation enhance facilitate patient's privacy (e.g., **anonymization and pseudonymization**)
- Also, it is compatible with OpenEHR architecture

# References


- Pradeep Sinha, Gaur Sunder, Prashant Bendale, Manisha Mantri, Atreya Dande, Electronic Health Record - Standards, Coding Systems, Frameworks, and Infrastructures, John Wiley, 2012
- OpenEHR
  - https://openehr.atlassian.net/wiki/, accessed on 10 Jan 2018
  - www.openehr.org
- OpenEMR
  - www.openemr.org

# Thanks!

## Any questions?

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