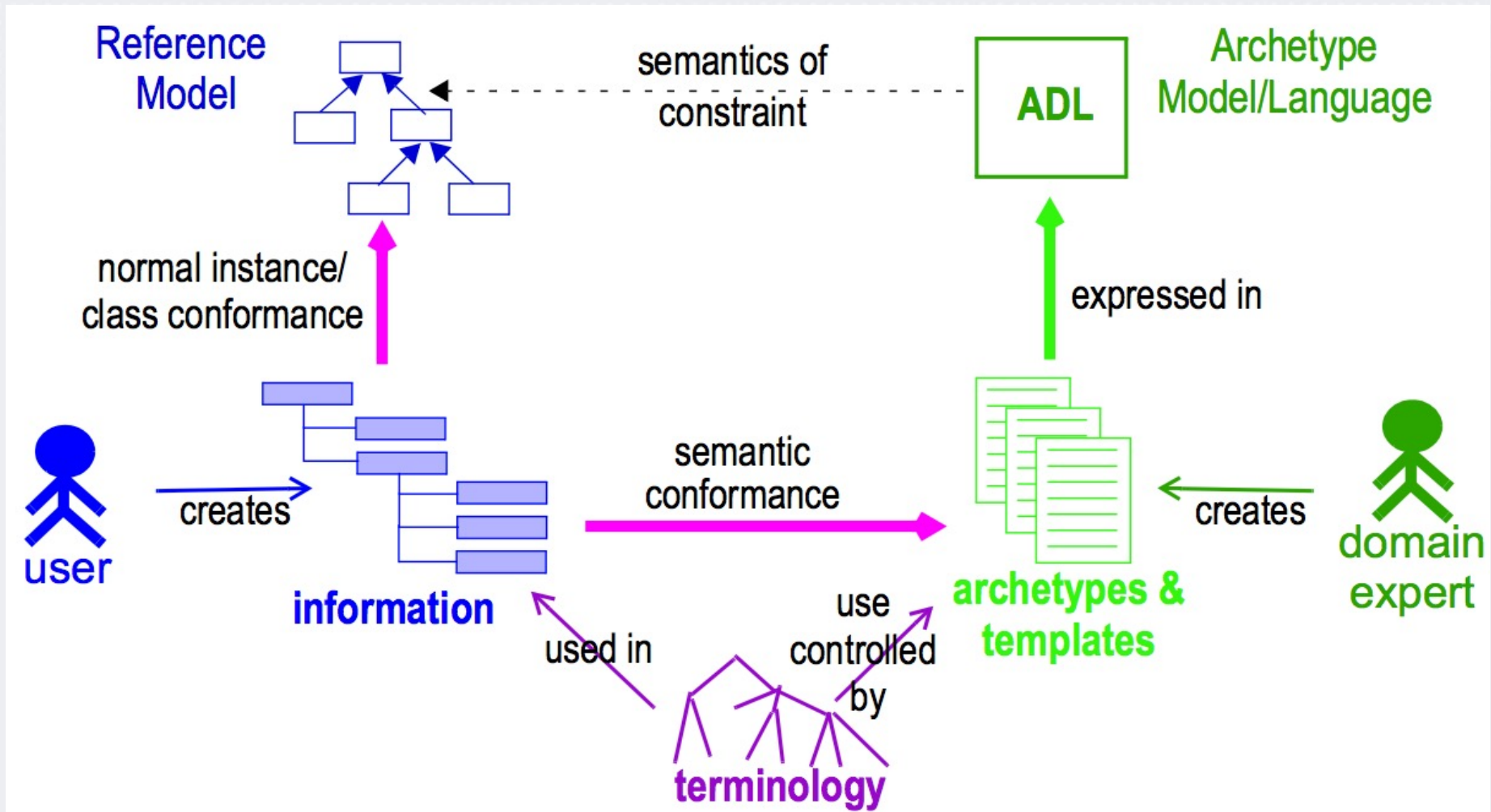


# OpenEHR Archetype Model

## 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



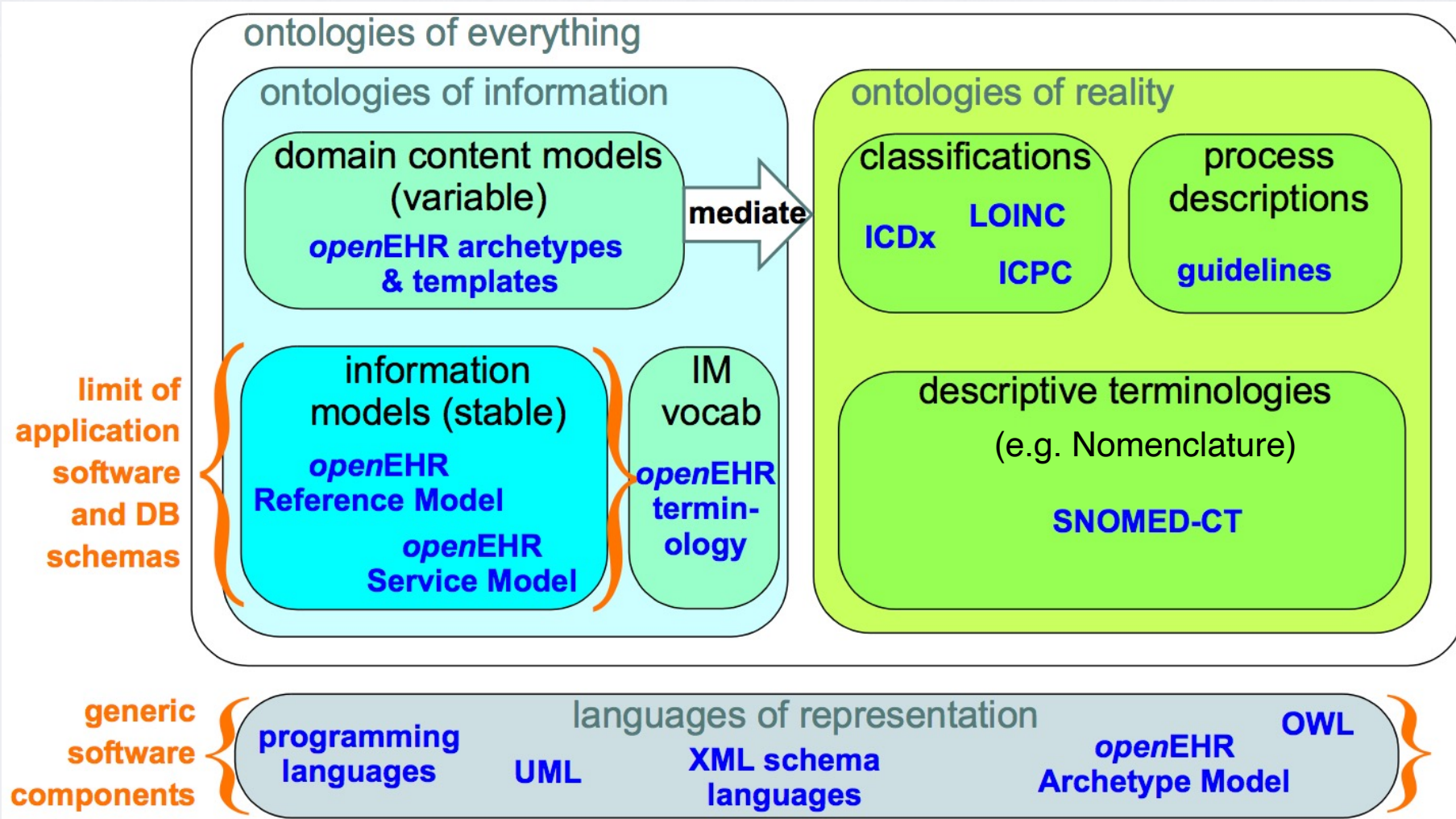
# OpenEHR

## 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

# openEHR Archetypes and Ontologies

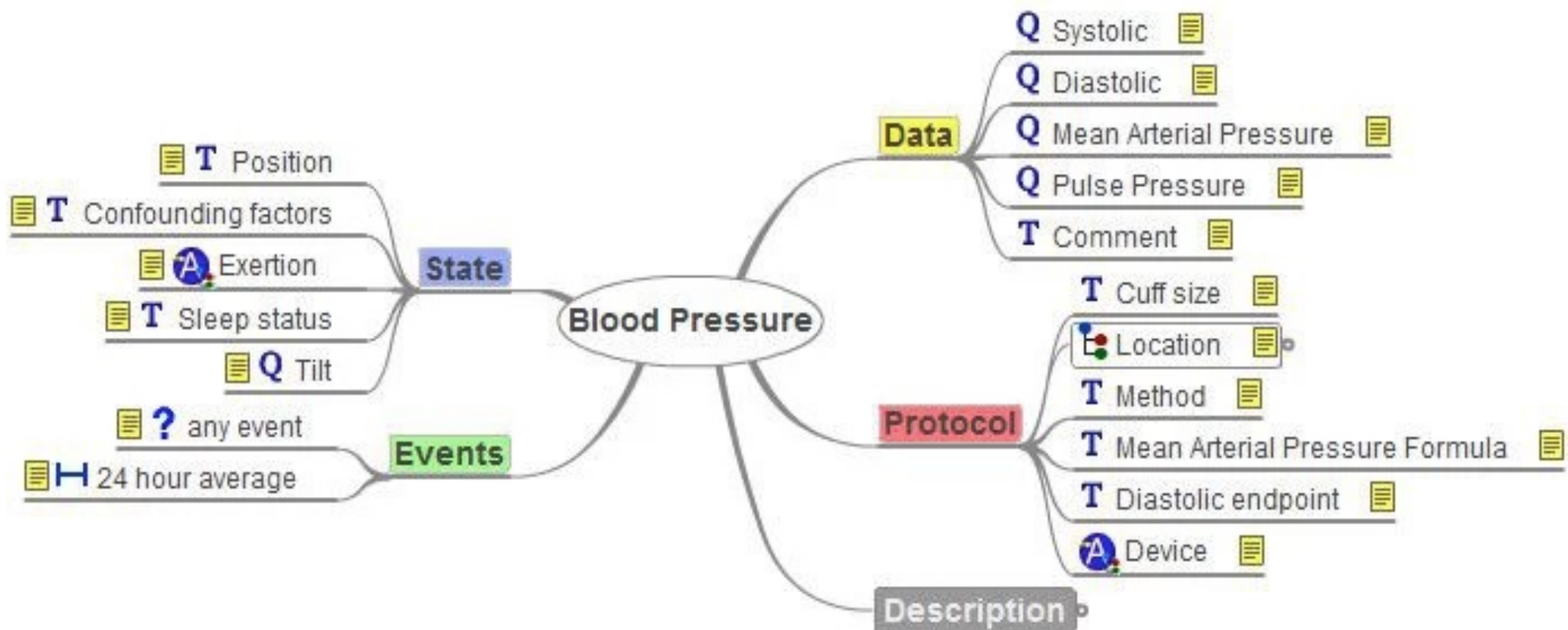




# OpenEHR

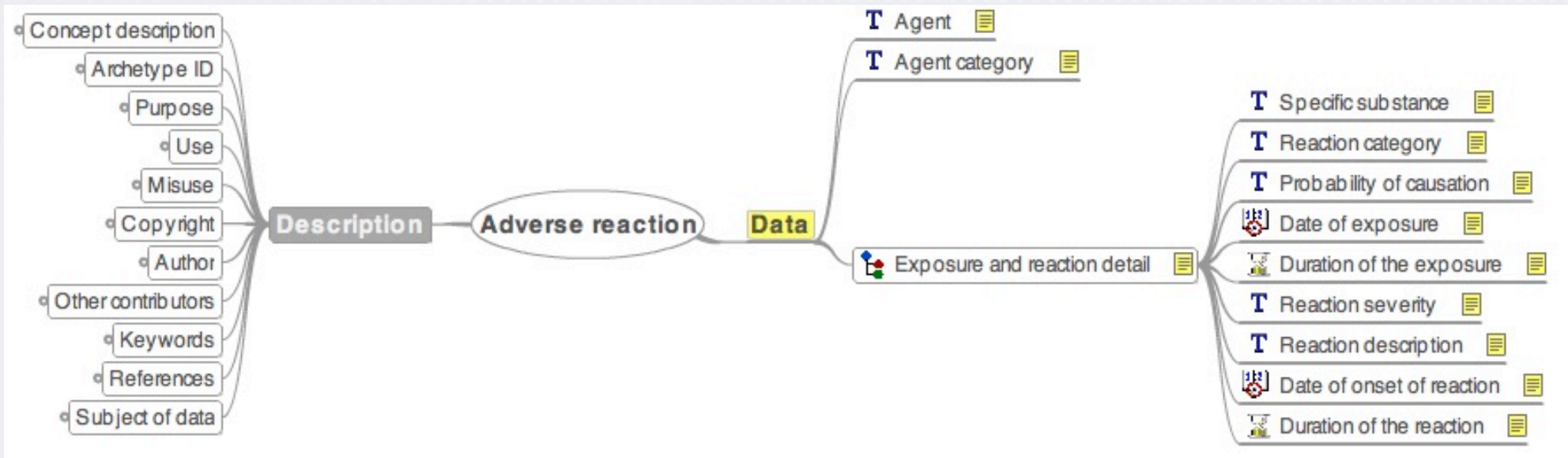
## Archetype Model: Example

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



# OpenEHR

## Archetype Model: Example



**T**

### Certainty

Coded Text

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.]

**Probable** [Likely to be the causative agent, but not confirmed by testing or rechallenge.]

**Confirmed** [Confirmed as the causative agent, by testing or rechallenge.]

# OpenEHR 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>

# OpenEHR Archetype Editor

The screenshot displays the OpenEHR Archetype Editor interface for the archetype 'openEHR-EHR-OBSERVATION.blood\_pressure.v1'. The interface is divided into several panes and sections:

- Top Menu:** File, Edit, Language, Terminology, Tools, Help.
- Header:** openEHR-EHR-OBSERVATION.blood\_pressure.v1. Includes tabs for Header, Definition, Terminology, Display, Interface, and Description.
- Definition Section:** Contains checkboxes for ☒ Protocol, ☐ Participation, and ☐ Person State with EventSeries.
- Data Section:** Includes a tab for Data and a checkbox for ☒ Person State.
- Person State Section:** Includes a tab for Person State and a checkbox for ☒ Ordered.
- Left Pane (at0004):** Lists data elements: Systolic, Diastolic, Mean Arterial Pressure, Pulse Pressure, and Comment. It also includes a 'Constraint' section with 'Occurrences' (Min: 0) and 'Description'.
- Right Pane (at0008):** Lists data elements: Position, Activity, Exercise, Exertion level, and Tilt. It includes a 'Constraint' section with 'Occurrences' (Min: 0, Max: 1, Unbounded), 'Description' (The position of the person at the time of measuring blood pressure), 'Runtime name constraint', and 'Free text or coded' options (Internal codes selected).
- Bottom Pane:** A list of values: Standing, Sitting, Reclining, Lying, Trendelenburg, and Left Lateral. It includes a 'Set assumed value' button and a 'Sitting' button.



# OpenEHR

## 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

# *OpenEHR*

## 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

# OpenEHR Clinical Knowledge Manager (CKM)

The screenshot displays the OpenEHR Clinical Knowledge Manager (CKM) web interface. The browser address bar shows `openehr.org/ckm/`. The user is logged in as Silje Ljosland Bakke, with a 'Log out' button. The interface includes a sidebar with navigation options like 'All Resources', 'Archetypes', 'Projects & Incubators', and 'Resource Watchlist'. The main content area features a 'Dashboard' with a 'Welcome' message, 'Quick Tasks' (Propose new archetype, View change requests, Find a discussion, Explore resources), and 'Our CKM Community in Action' section showing a donut chart for 'Resources (Projects)' with 409 total resources. The 'Editor's Active Review Rounds' table lists resources for review, and the 'My Active Reviews' table shows the user's current review status.

**Dashboard** Find Resources

**Welcome**  
Silje Ljosland Bakke  
Clinical Knowledge Administrator  
Last log-in: 03-Apr-2017  
[FIND OUT MORE »](#)  
[FREQUENTLY ASKED QUESTIONS »](#)

**Quick Tasks**

- Propose new archetype: [Upload File](#)
- View change requests: [Open List](#)
- Find a discussion: [Search Discussions](#)
- Explore resources: [Open Project](#)

**Our CKM Community in Action**

Resources (Projects)

409

Archetypes  
Templates  
Termsets

**Editor's Active Review Rounds**

Resource	No.	Initiated	Deadline	Completed
Housing	1	17-Mar-2017	31-Mar-2017	11/52
Exclusion - specific	1	17-Mar-2017	31-Mar-2017	7/52
Exclusion - global	1	17-Mar-2017	31-Mar-2017	7/52
Fluid Balance	1	16-Mar-2017	30-Mar-2017	18/73

**My Active Reviews**

Resource	No.	Deadline
<b>Status: invited (12 Reviews)</b>		
Exclusion - global	1	31-Mar-2017
Exclusion - specific	1	31-Mar-2017
Housing	1	31-Mar-2017

# OpenEHR 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**

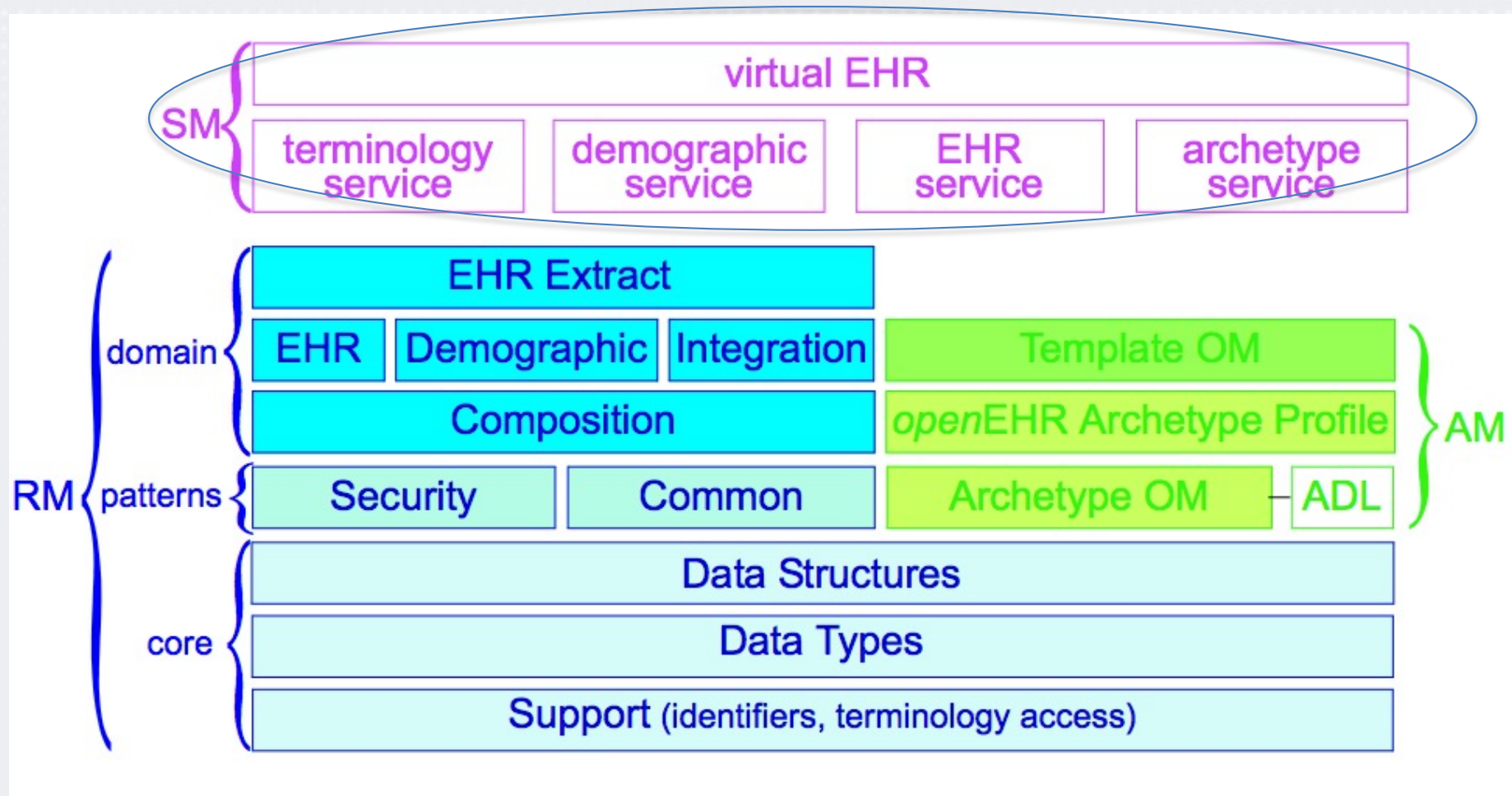
- Provides an API for connecting to all available coding systems, such as ICD, CPT, SNOMED CT, and so on.

- E. Demographic Service**

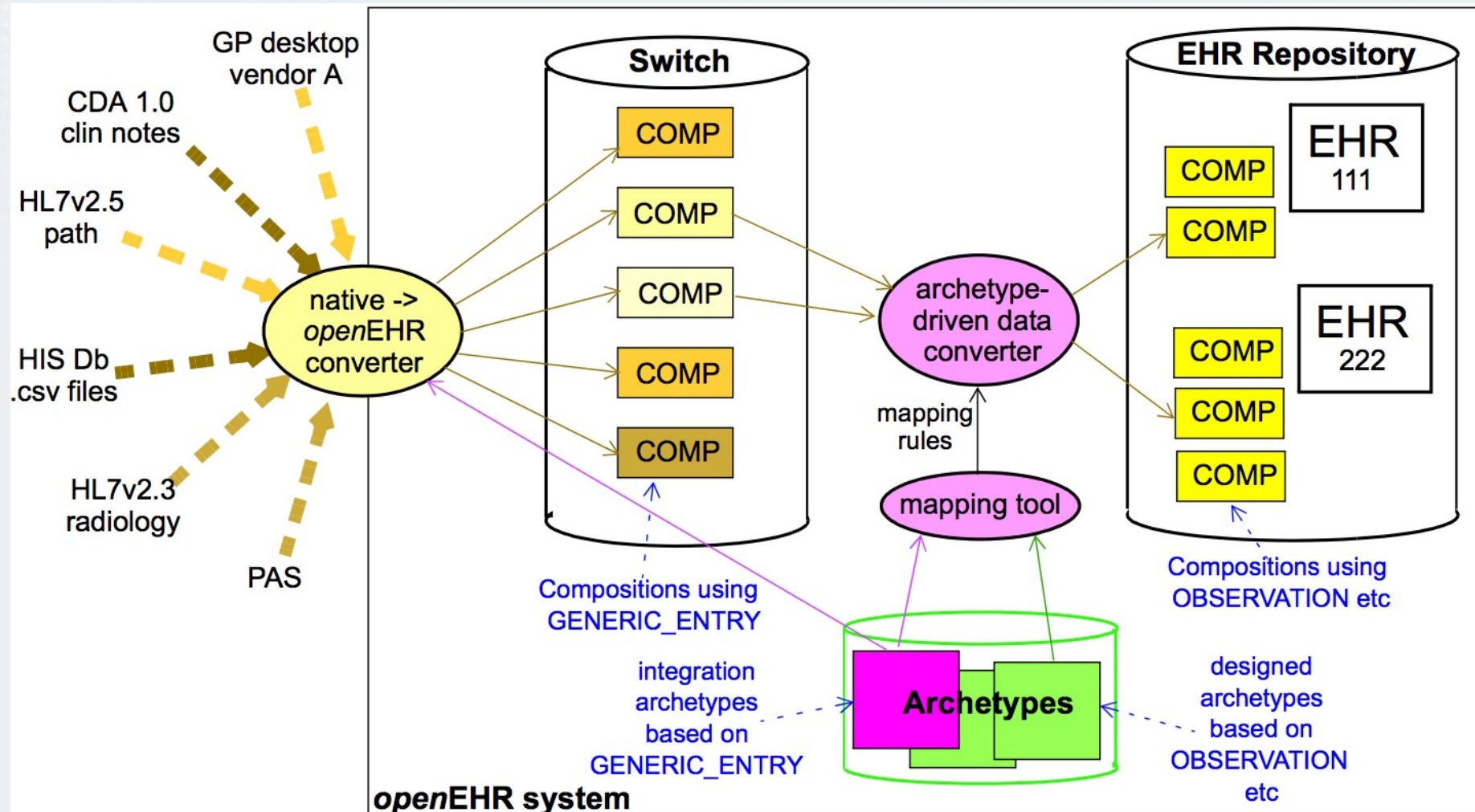
- Provides an API for accessing, storing, and updating information of entities involved in care.



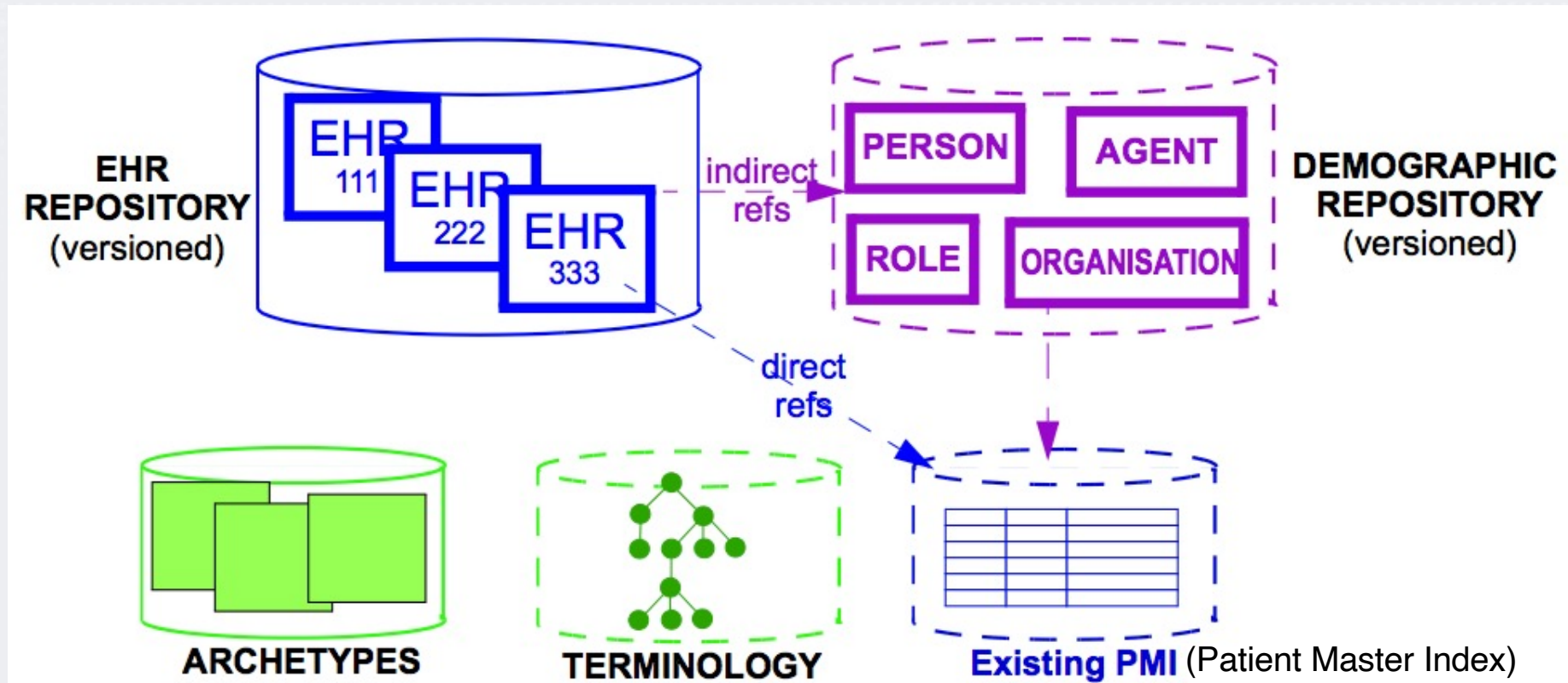
# openEHR Package Structure



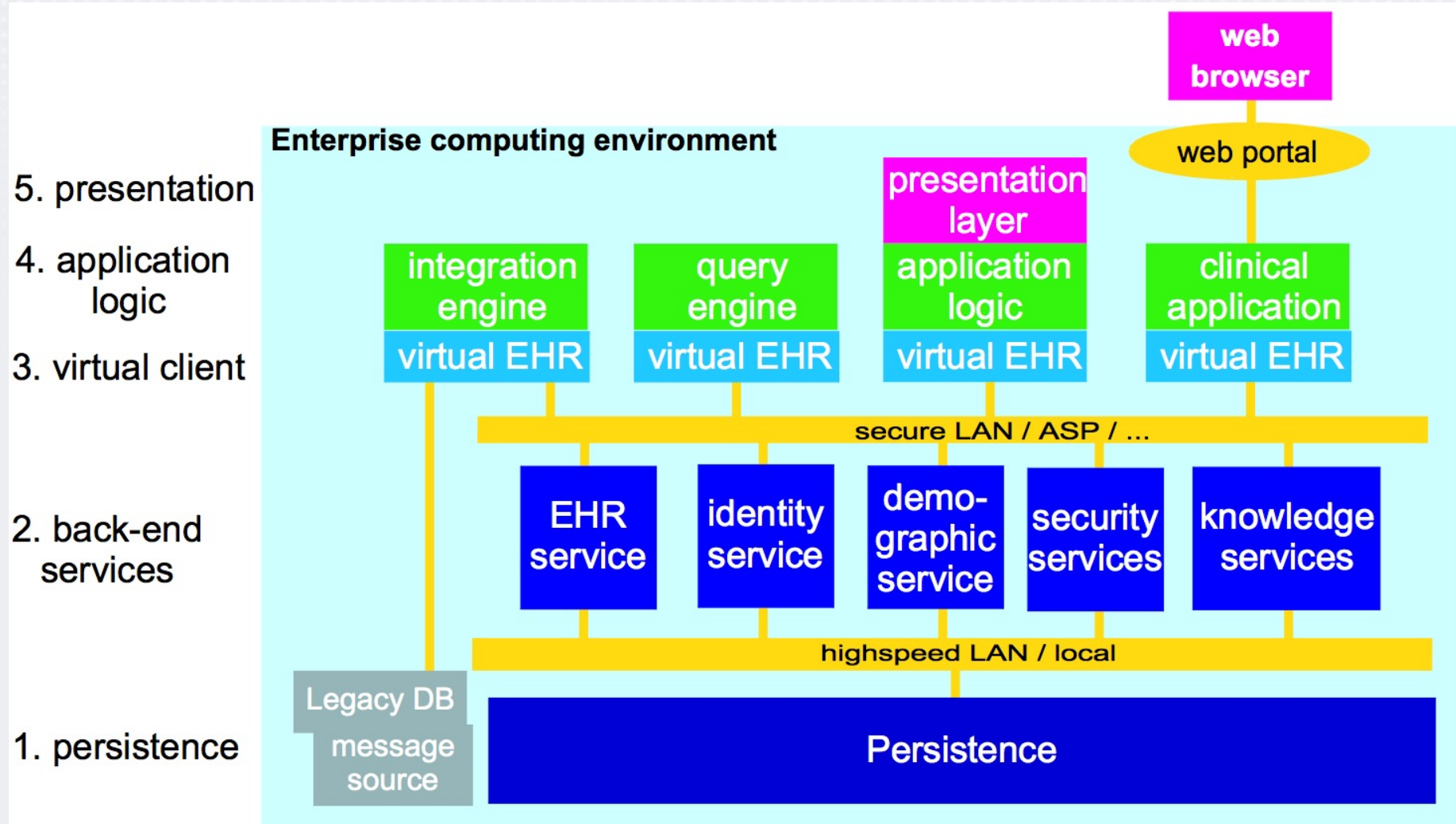
# openEHR: Data Integration Architecture



# Minimal *open*EHR EHR System

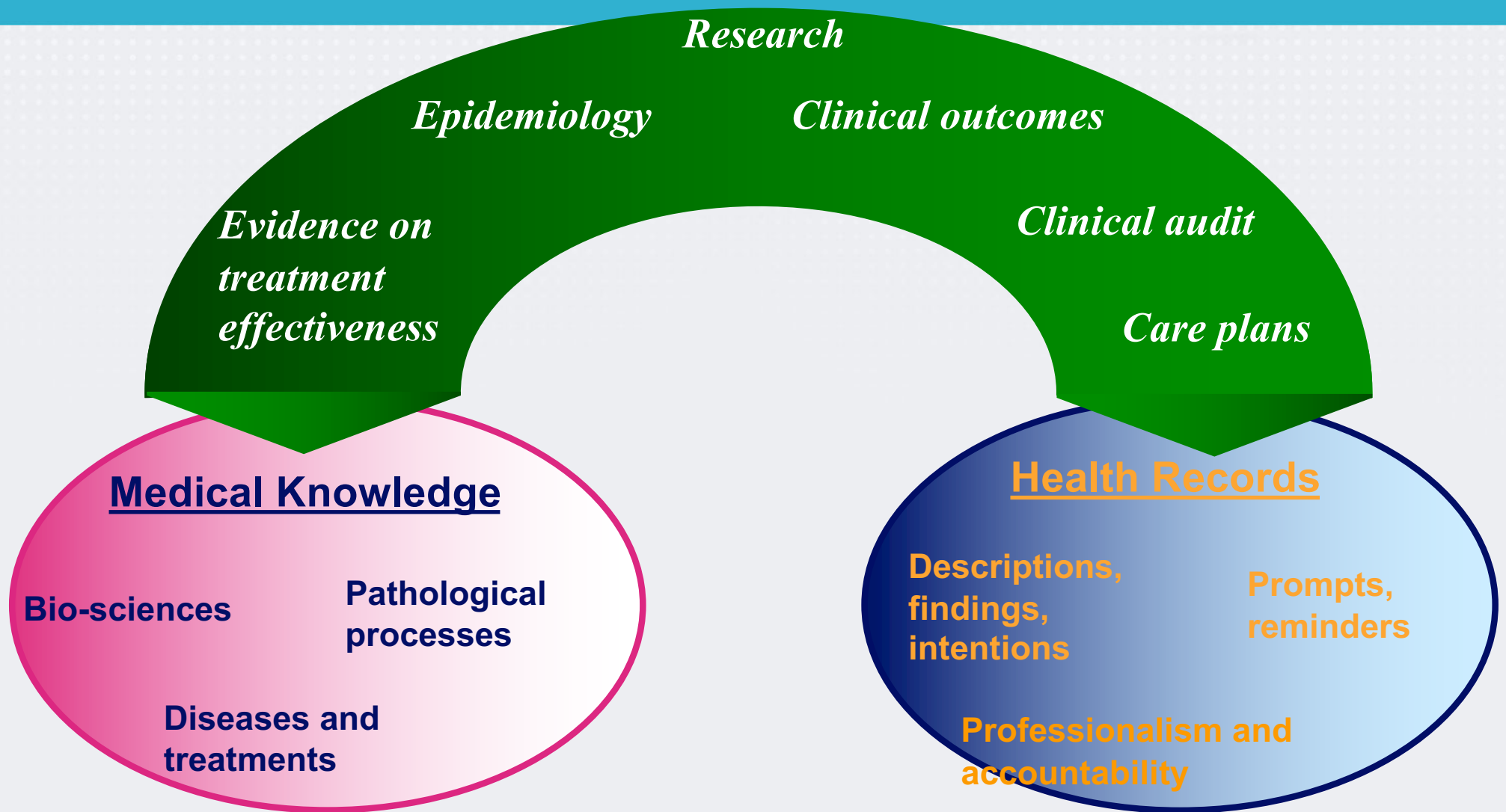


# Enterprise EHR System Architecture





# EHR and knowledge integration



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

© HiCure 2015-2018

# 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

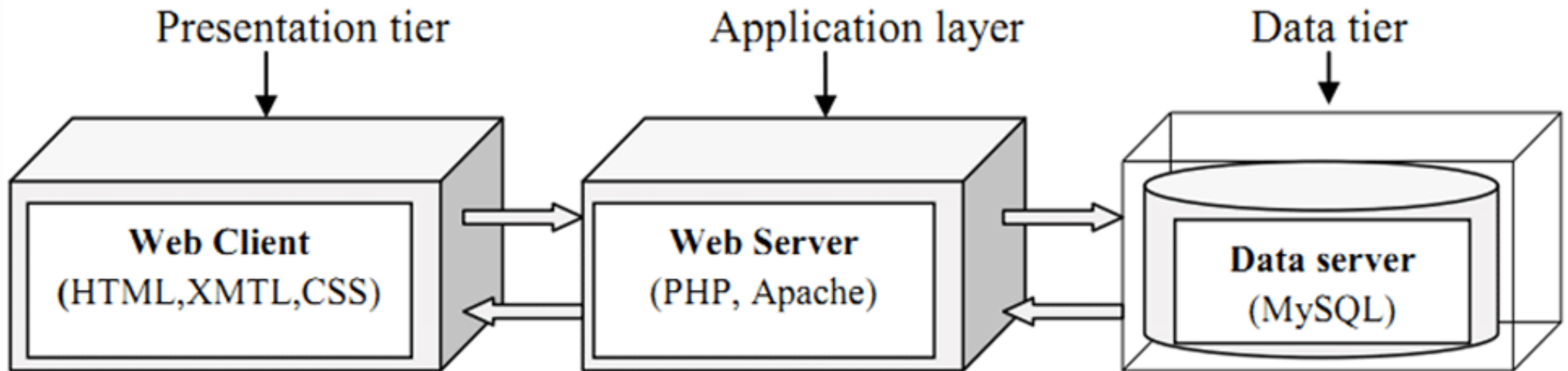
- OpenEMR data are stored using MySQL database management system

### 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

# OpenEMR Reference Architecture



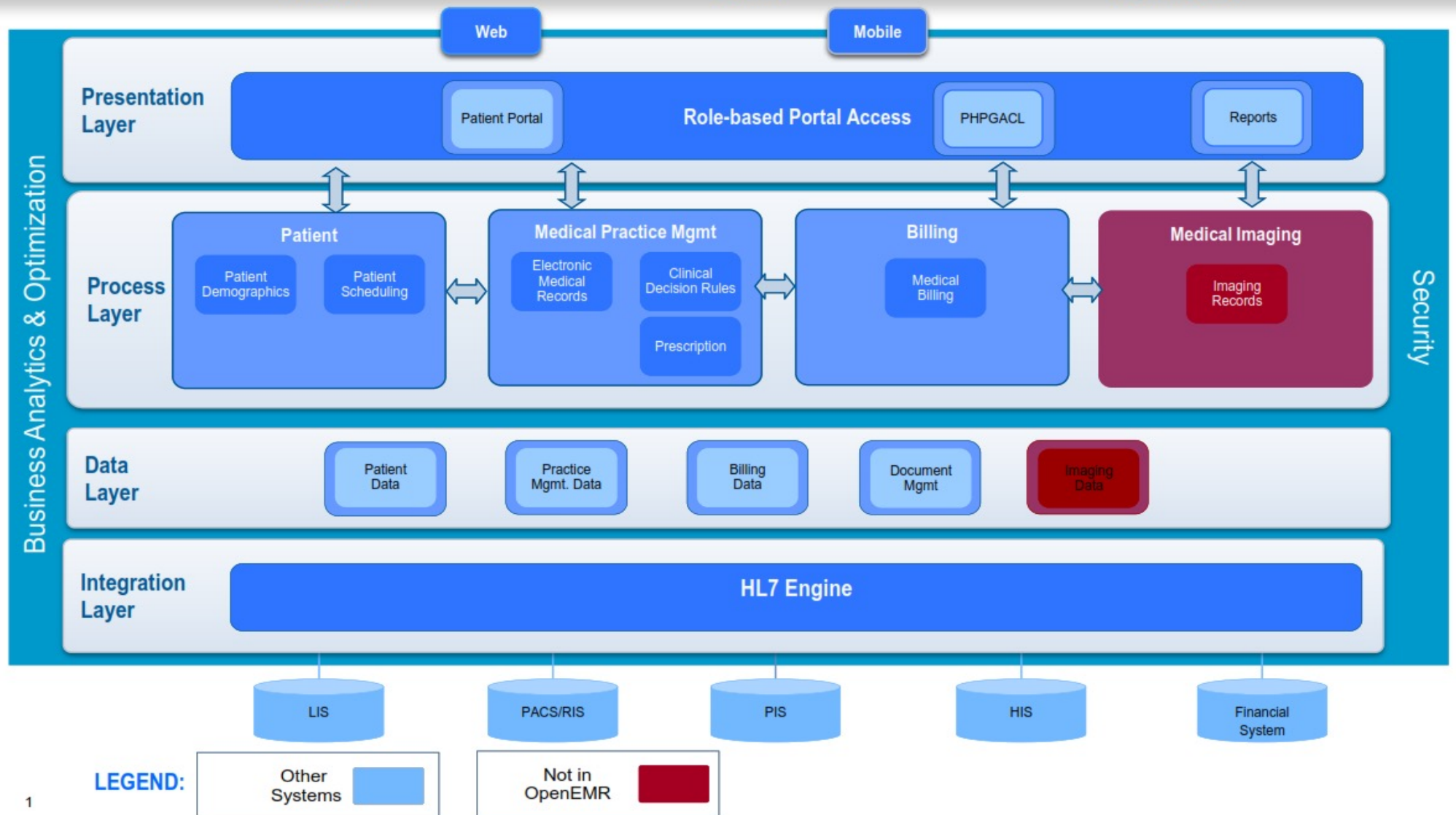
Providers



Hospitals



Regional Clinics



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](http://www.openehr.org)
- OpenEMR
  - [www.openemr.org](http://www.openemr.org)

Thanks!

**Any questions?**

You can find me at:  
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