

EHR Standards

*open*EHR

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Health Framework Standards

OpenEHR

- openEHR:
 - Virtual community working on means of **turning health data from the physical form into electronic form** and ensuring universal **interoperability** among all forms of electronic (health) data.
- Describes the **management, storage, retrieval and exchange** of health data in EHRs
- OpenEHR architecture
 - Consists of the following key elements:
 - Information models (also called Reference Model - RM)
 - The archetype formalism and the archetype query language (AM)
 - Service models (SM)

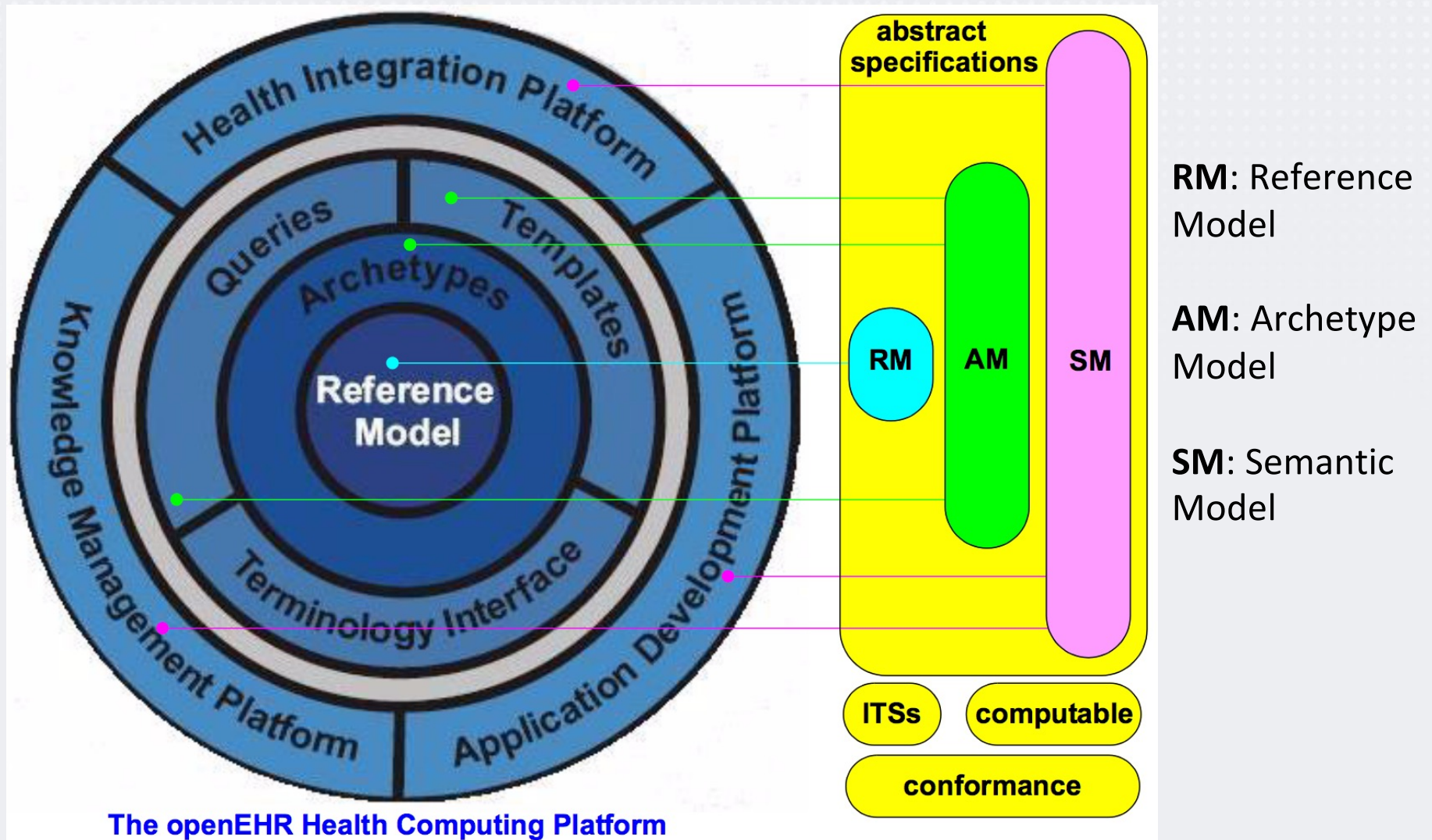
OpenEHR

- *OpenEHR* refers to both **foundation** and **specifications**
 - ***OpenEHR* Foundation**
 - Non-Profit organisation
 - Provides a membership to those who desires to contribute to the development & implementation of *OpenEHR* specifications.
 - **Vision** of *OpenEHR* Foundation: Enables healthcare sectors to obtains benefits from ICT:
 - Life-long **interoperable** electronic health records (EHRs)
 - Design EHRs to improve the **quality** of health care and clinical research.
 - More information about OpenEHR foundation:
 - <http://www.openehr.org/about/foundation>

*Open*EHR Specifications

- *Open*EHR Specifications
 - **Open** specifications for a health information model (opposed to proprietary closed specifications)
 - Capable of supporting an **open** platform health system
 - Vendor neutral
 - Technology neutral
 - Licensed to allow open and closed source business models
 - *Open*EHR specifications aim at:
 - Separating **clinical concepts** from the **EHR information model**
- *Open*EHR specifications include:
 - *Open*EHR Process Model (or workflow)
 - *Open*EHR Architecture

*open*EHR Specifications



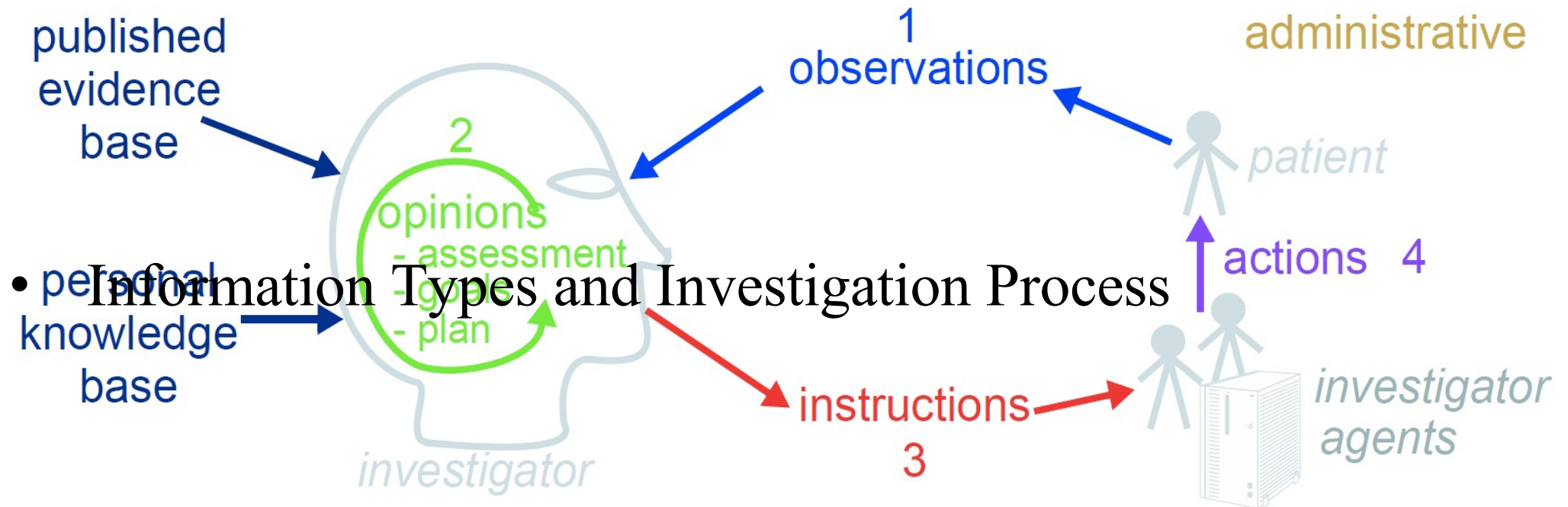
*Open*EHR Process Model

- OpenEHR is based on the problem-solving approach used in the "**Clinical Investigator Model**" or **CIM**.
- Clinical Investigator Model:
 - Includes **patient** & **care provider** as two participating entities
 - Based on **SOAP** (Subjective-Objective-Assessment-Plan) concept
 - During the clinical workflow, a set of clinical information is generated
 - The major types of **clinical information/statements** includes:
 - **Observations, Opinions, Instructions, Actions**
 - OpenEHR represents major types as **EHR_Entry** (discussed later)

*Open*EHR Process Model

- **Clinical Process or workflow (CIM)**
 - Starts from the patient's **observations** provided by care provider(s)
 - Then, care provider(s) provide
 - their **opinion(s)**
 - an **assessment** of the **current situation**,
 - **goals** for a future situation
 - Finally, **plans** for achieving the **goals**
- **Evidence and care providers' knowledge** always play an important part in this process
 - This leads to **instructions** designed to achieve the **planned goals**

OpenEHR Process Model

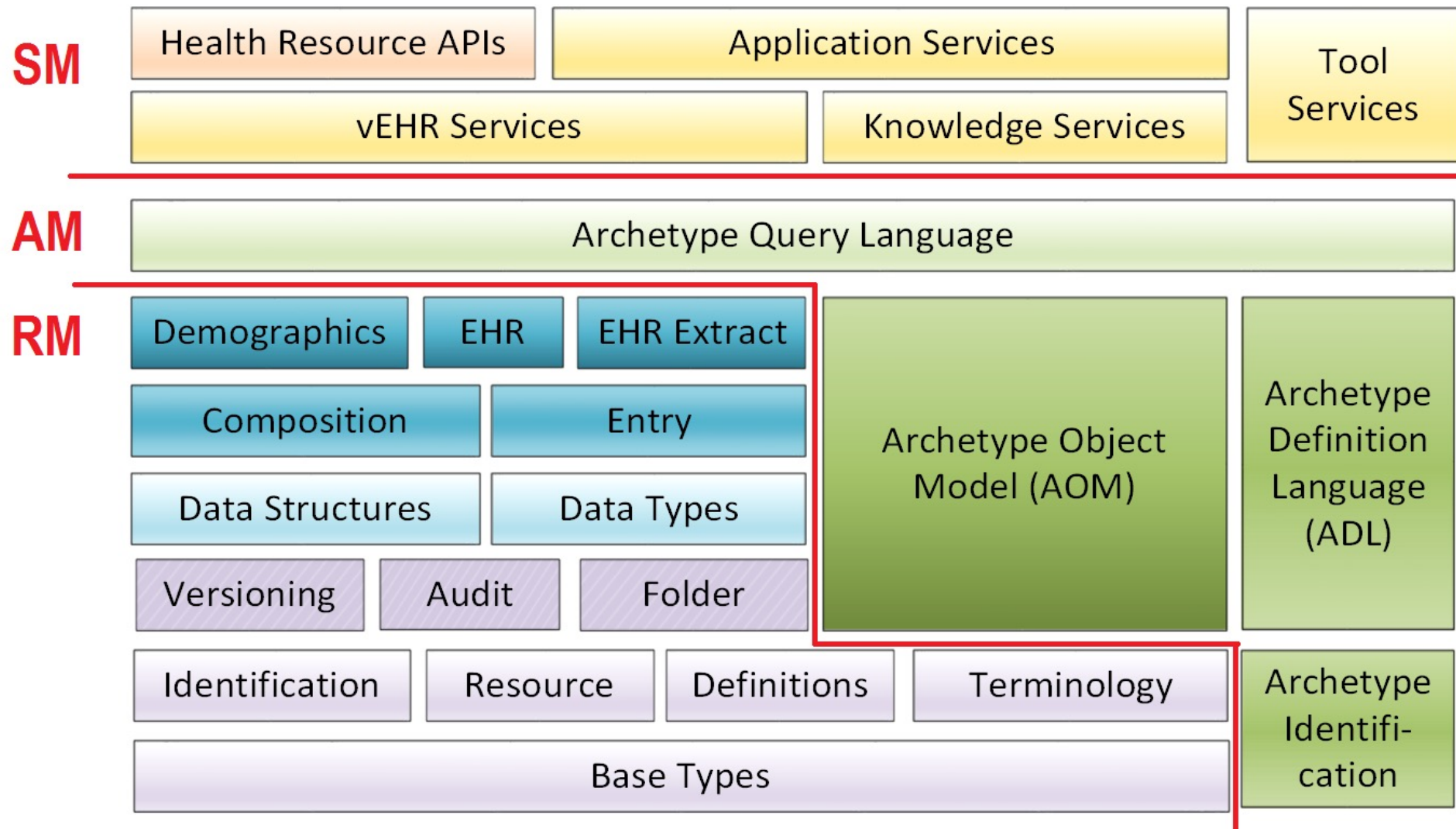


Clinical Investigator Model

*Open*EHR Architecture

- ***Open*EHR architecture :**
 - Is based on CEN/ISO 13606
 - Compliments other work developed by other standards organisations, including HL7 v3 & IHTDSO
- *Open*EHR architecture includes:
 - **Reference Model (RM)** – Information Model
 - **Archetype Model (AM)**
 - **Service Model (SM)**

OpenEHR Architecture



Dependency between components is from the bottom to top

All components use data types & data structures from RM

*Open*EHR Architecture

1. OpenEHR Reference Model (RM)

- Technical in nature
- General framework for all Clinical data
- Represents a collection of **information models** for:
 - Generic EHR Information Model (**Core Model**)
 - Generic **Domain** Information Models
 - Generic **Patterns** Information Models

*Open*EHR Architecture

- **Core Information Models**
 - Generic data types
 - Text, Quantity (values and units), date/time, multimedia, URIs
 - Generic data structures
 - Single, List, Table, and Tree
 - Generic supportive components
 - Includes definitions, identification, terminology, and measurement
 - All other information models use these components for data processing
 - **Terminology package** → provides structures & interfaces for use of services that give access to coding system data
 - It also provides the description of basic data types of other external systems that integrate with OpenEHR

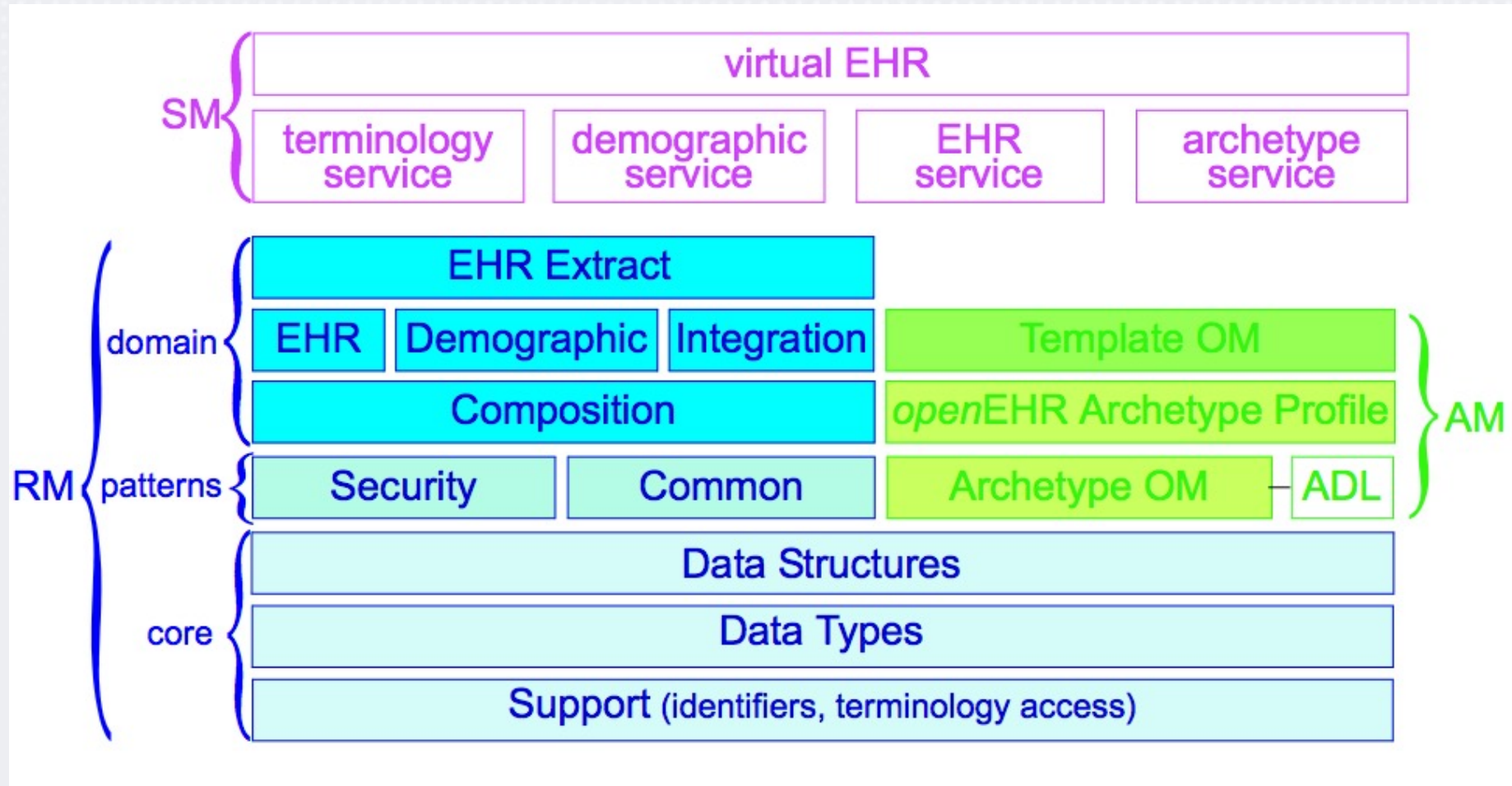
*Open*EHR Architecture

- **Domain Information Models**
 - Generic EHR Extract Model
 - Describes the various ways of building an EHR (full & partial EHR)
 - Support **interoperability** with external EHR systems.
 - EHR Information Model
 - It defines the components and their relationship with reference to EHR
 - It includes **COMPOSITION, SECTION, and ENTRY** as the major components of EHR.
 - These concepts are similar to the concepts defined in CEN/ISO 13606
 - Also, it closely mapped to the concepts defined in CDA
 - Generic Demographics Model
 - Includes concepts that are required to describe **demographics** of a participated persons (**patient, healthcare providers**, etc.)
 - Generic Integration Model
 - supports the **integration** of data from **legacy systems**

*Open*EHR Architecture

- **Patterns Information Models**
 - Generic Security Model
 - Includes the packages and classes that are related to **access control** and **privacy setting** for the data in an EHR.
 - Generic common model
 - Holds the common packages required by all other models
 - **Versioning & change management** are part of the common model
 - Links **Reference Model** and **Archetype Model**

openEHR Package Structure



OpenEHR Architecture - RM

EHR Information Model

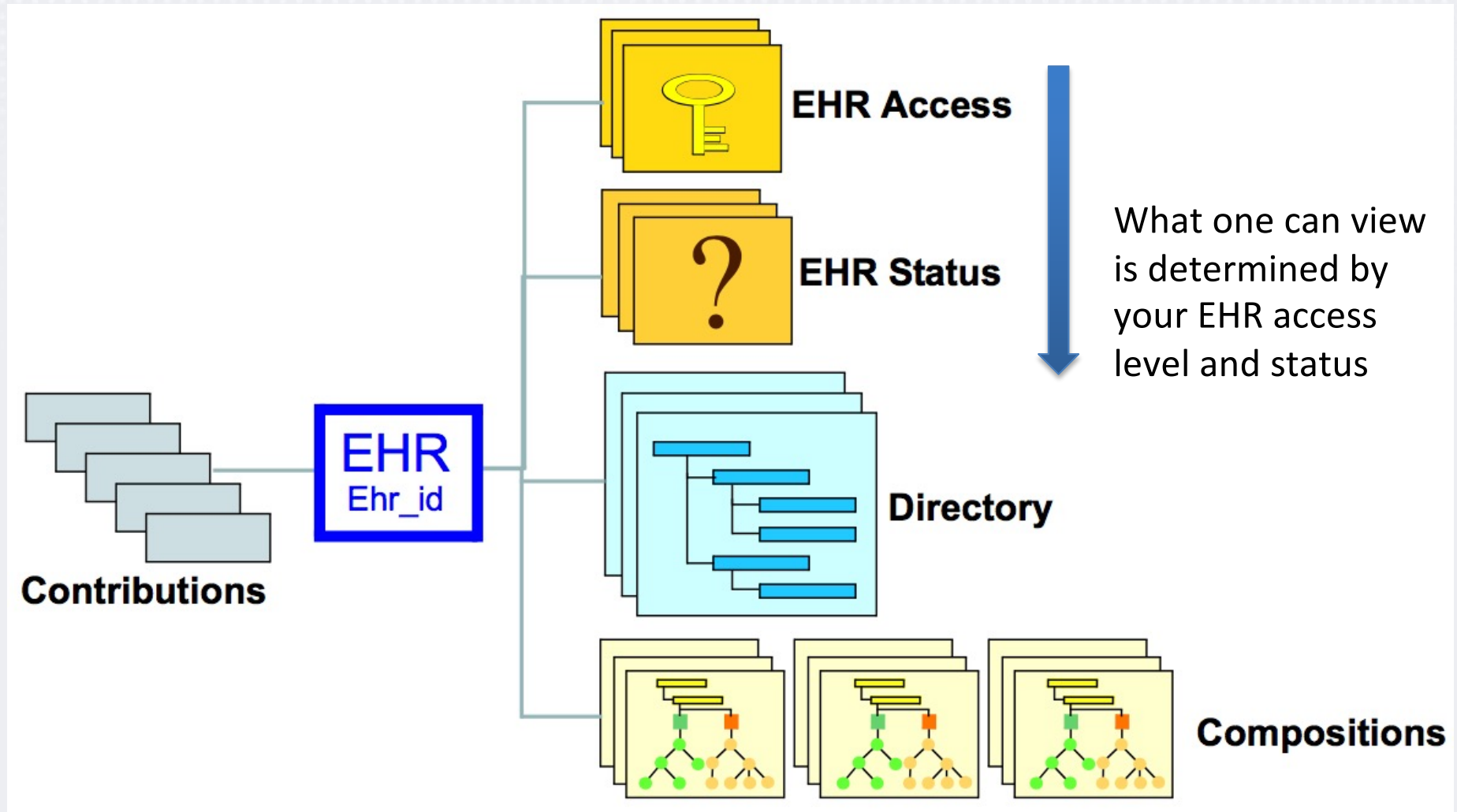
- EHR information Model Parts
 - **EHR** → The root object, identified by a globally unique EHR identifier
 - **EHR_access** → An object containing **access control settings** for the record
 - **EHR_status** → An object contains **various status & control information**
 - It includes an identifier for the subject (i.e., patient) that is currently associated with EHR
 - **Contributions** → maintains change log of an EHR
 - **Directory** → A hierarchical structure of Folders that is logically organise **Compositions**

OpenEHR Architecture - RM

EHR Information Model

- EHR information Model Parts – Cont.
 - **Composition** → Holds clinical and administrative information produced during a clinical activity.
 - Patient's cases, number of diseases, and chronological order
 - Every Composition has a **Section**
 - Section briefly describes the contents of **composition**
 - Section is used for searching of data in an EHR
 - **EHR_Entry** → Holds a **single clinical statement/concepts** for representing the activity in health care process
 - EHR_Ent types
 - EHR_Enrty has a **clusters** and **items**
 - » **Cluster**: represent a **complex** entry such as test result, ante-natal visit, etc.
 - » **Item**: represents a **single** entry that contains a data value for a specific type

*open*EHR EHR: High-level Structure



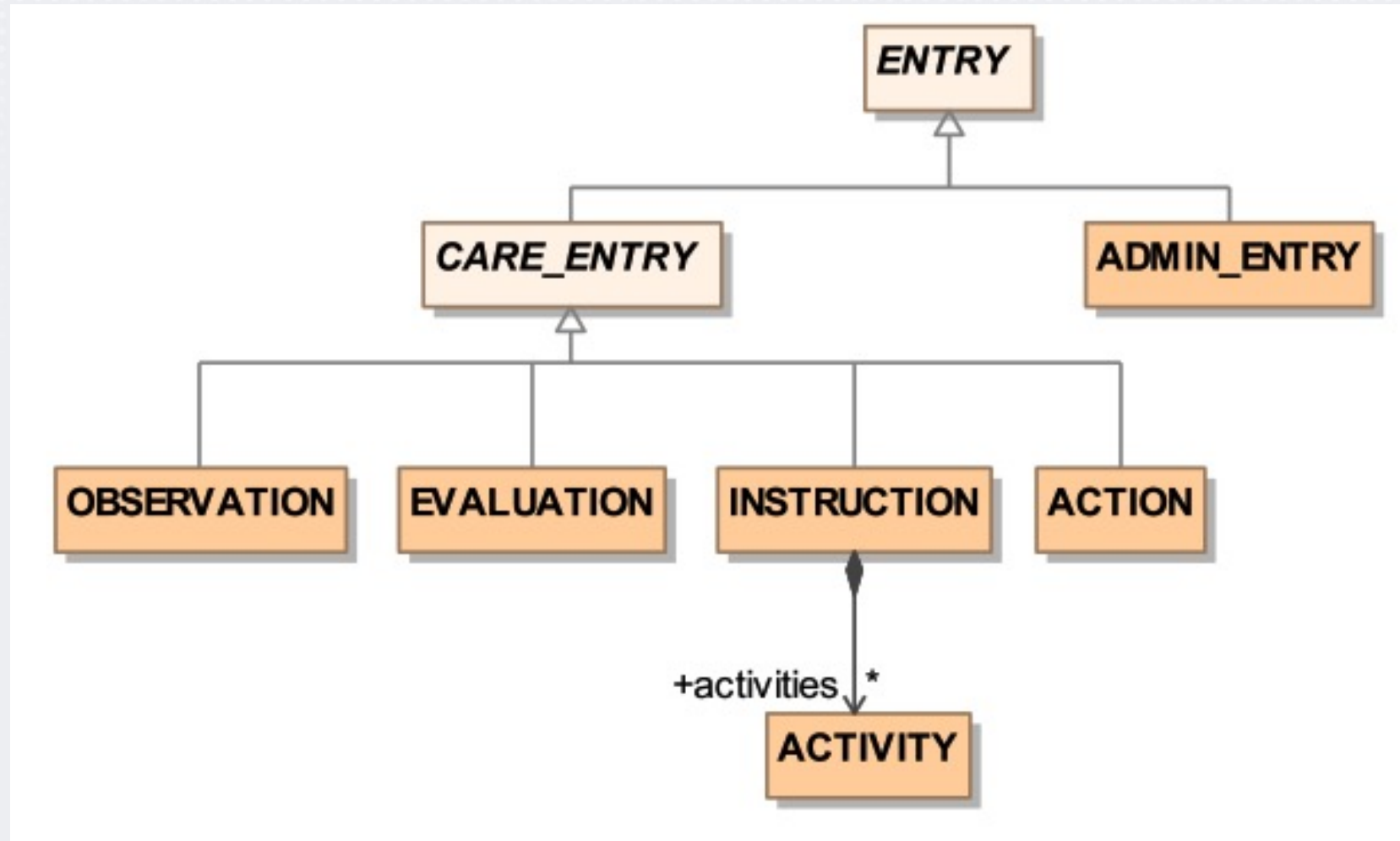
OpenEHR Reference Model

EHR Information Model - Entry Types

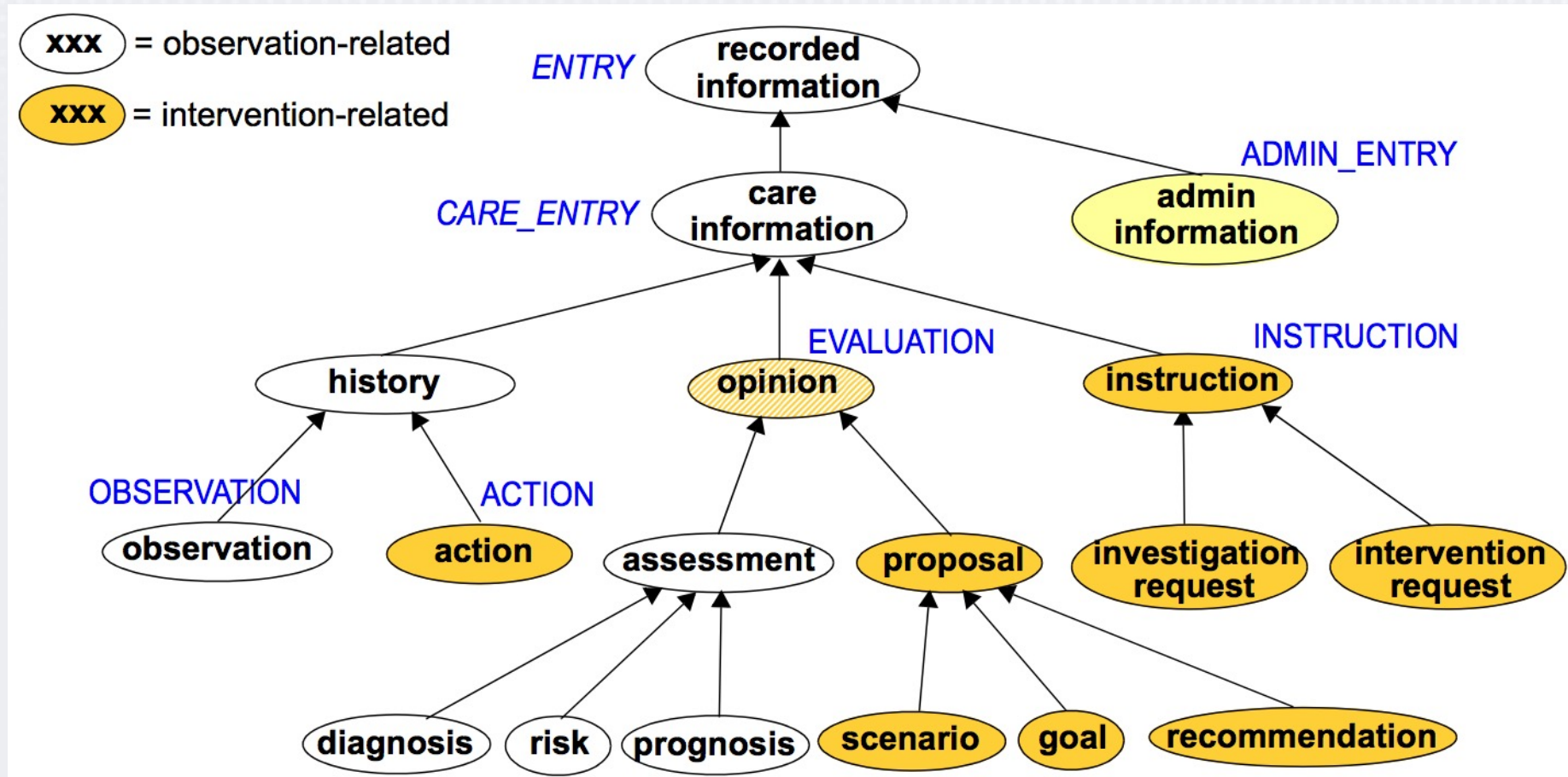
- OpenEHR **Entry** is categorised into five types:
 - **OBSERVATION**
 - Recording information about **patient's status**
 - Anything measured by a clinician, a laboratory, or reported by the patient as a symptom, event or concern
 - **EVALUATION**
 - Recording **opinions & summary** statements (usually clinical)
 - Examples → Problems, diagnoses, risk assessments, goals, etc.
 - Generally, based on **Observation evidence**
 - **INSTRUCTION**
 - Recording orders, prescriptions, directives and any other requested interventions
 - **ACTION**
 - Recording **actions**, which may be due to Instructions such as **drug administrations, procedures**, etc.
 - **ADMIN_ENTRY**
 - Recording administrative events
 - Examples → **admission, discharge, consent**, etc.

*Open*EHR Reference Model

EHR Information Model - Entry Types



openEHR: Ontology of Recorded Information



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