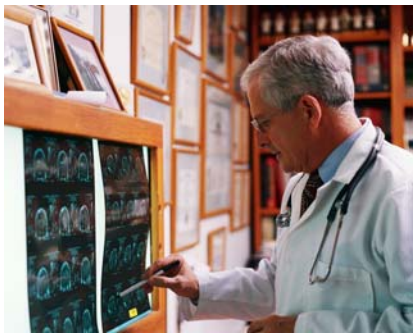
The Management of *open*EHR Archetypes for Semantically Interoperable Electronic Health Records

Sebastian Garde[1,*], Sam Heard[1,2], Jana Gränz[1,3], Evelyn J.S. Hovenga[1]

GMDS 2006, Leipzig
13 September 2006



[1]Health Informatics Research Group, Central Queensland University
[2]Ocean Informatics
[3]University of Applied Sciences Ulm, Germany
[*]Austin Centre for Applied Clinical Informatics, Austin Health

Ziele

- Analysieren der funktionalen Anforderungen an ein web-basiertes System, das die internationale Zusammenarbeit bei der Erstellung und Wartung von Archetypen ermöglicht, sowie das systematische Management von Archetypen unterstützt (Domain Knowledge Governance).
- Präsentieren einer prototypischen Umsetzung eines solchen Archetype Repositories zur Unterstützung von Domain Knowledge Governance

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openEHR Archetype

Problem as defined by a clinician: *EVALUATION*

Generated by the Ocean HTML generator: 1/06/2005 *Comments to* Ocean Informatics openEHR Foundation © 2005

Concept description:	Identification:	Information structure:
A problem, condition or issue defined by the clinician which is deemed summative of a range of symptoms or concerns of the person and a useful label of these.	*Id*: openEHR-EHR-EVALUATION.problem.v1 *Reference model*: EHR	

Intuitives Modell klinischer Konzepte

Data: *TREE*

Concept	Description	Type	Cardinality	Values
T **Problem**	The index problem, condition or issue described	***Text***	mandatory 1..1	*Free or coded text*
Date of initial onset	The date that the problem began from the perspective of the clinician	***Date_Time***	optional 0..1	Partial date yyyy-??-XX
Q **Age at initial onset**	The age of the at the onset of the problem	***Quantity***	optional 0..1	*Property* = TIME *Units*: yr, (0..200) wk, (0..52) mth, (0..36) day, (0..56)
Severity	The severity of the index problem	***Ordinal***	optional 0..1	1, Mild 4, Moderate 7, Severe
T **Clinical description**	Description of the clinical aspects of the problem	***Text***	optional 0..1	*Free or coded text*
Date clinically recognised	Date the problem was recognised by clinicians	***Date_Time***	optional 0..1	Partial date yyyy-??-XX

Location, Location of the problem in terms of body site. ***Cluster*** (0..*) optional, repeating

Concept	Description	Type	Cardinality	Values
T **Body site**	The body site affected	***Coded_text***	optional 0..1	*Terminology* Any term that describes a body site

Done

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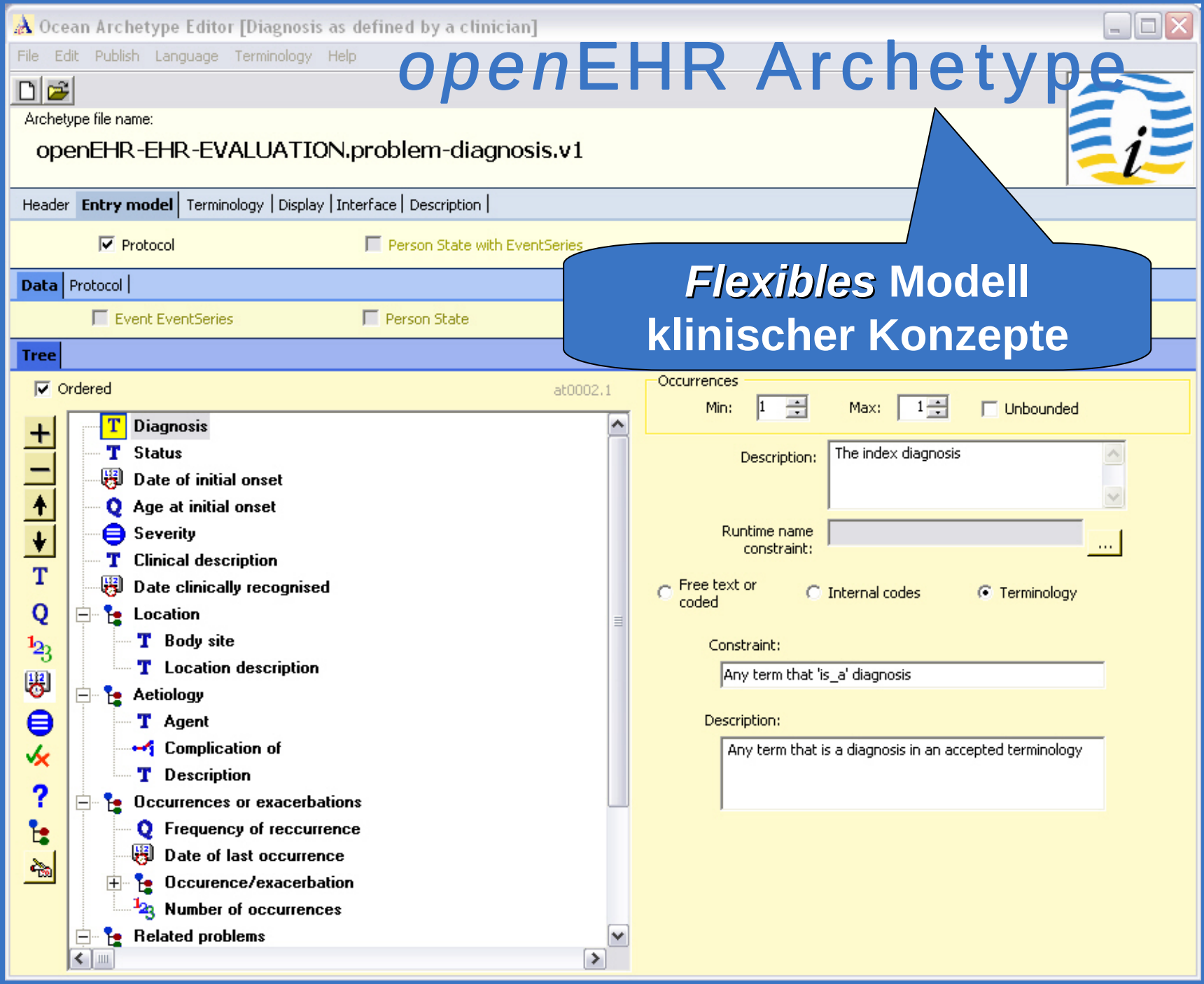
*open*EHR Archetype

```
archetype
        openEHR-EHR-OBSERVATION.blood_pressure.v1

concept
        [at0000]        -- blood pressure measurement
description
        author = <"Sam Heard <sam.heard@oceaninformatics.biz>
        submission = <
                organisation = <"openEHR Foundation">
                date = <2004-05-18>
        >
                version = <"version">
        status = <"draft">
        revision = <"1.0">
        description("en") = <
                purpose = <"Describe systemic blood pressure measurement result and protocol">
                use = <"">
                misuse = <"">
        >
        adl_version = <"1.2">
        rights = <"">

definition
        OBSERVATION[at0000] matches {          -- blood pressure measurement
                data matches {
                        HISTORY[at0001] matches {       -- history
                                events cardinality matches {1..*; ordered} matches {
                                        EVENT[at0002] matches {         -- baseline reading
```

***Formales* Modell klinischer Konzepte**


openEHR Archetype
Ocean Archetype Editor [Diagnosis as defined by a clinician]
File Edit Publish Language Terminology Help
Archetype file name:
openEHR-EHR-EVALUATION.problem-diagnosis.v1
Header Entry model Terminology Display Interface Description
Protocol
Person State with EventSeries
Data Protocol
Event EventSeries
Person State
Tree
Ordered
at0002.1
Diagnosis
Status
Date of initial onset
Age at initial onset
Severity
Clinical description
Date clinically recognised
Location
Body site
Location description
Aetiology
Agent
Complication of
Description
Occurrences or exacerbations
Frequency of reccurrence
Date of last occurrence
Occurence/exacerbation
Number of occurrences
Related problems
Occurrences
Min: 1
Max: 1
Unbounded
Description:
The index diagnosis
Runtime name constraint:
Free text or coded
Internal codes
Terminology
Constraint:
Any term that 'is_a' diagnosis
Description:
Any term that is a diagnosis in an accepted terminology
Flexibles Modell klinischer Konzepte

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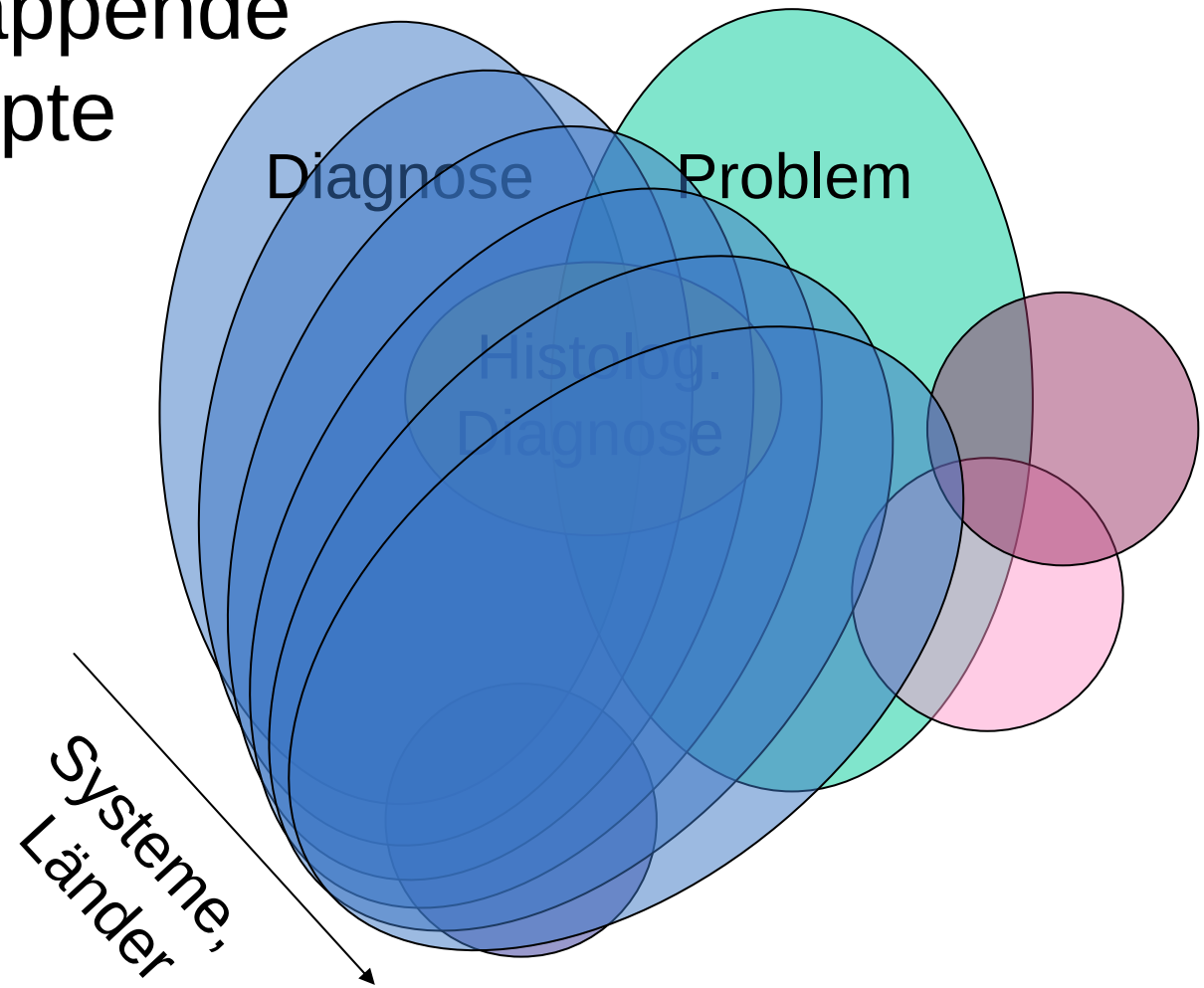
Warum brauchen wir ein "Archetype Repository"

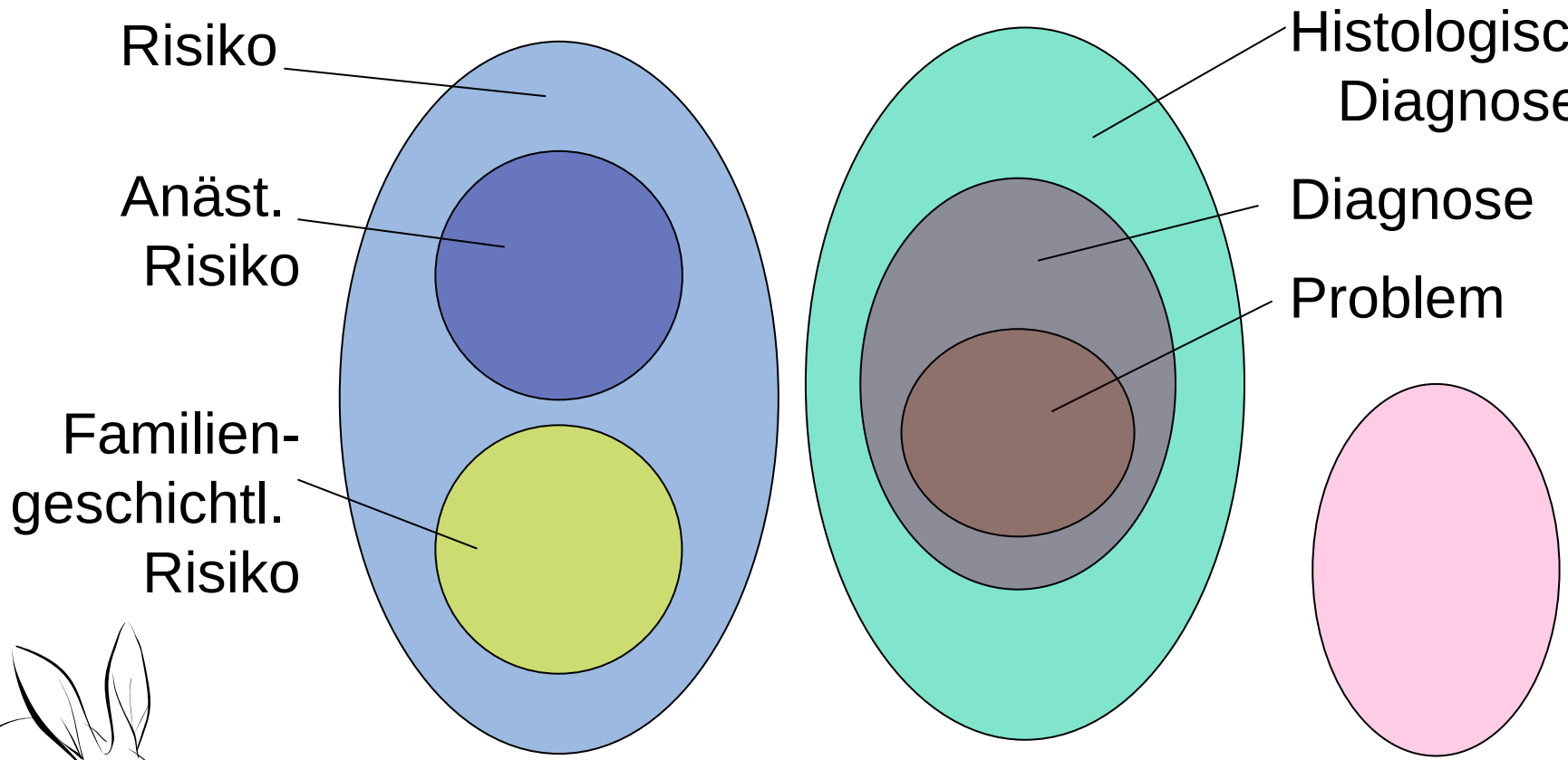
Undisciplined creation and application of archetypes threatens the goal of semantic interoperability.

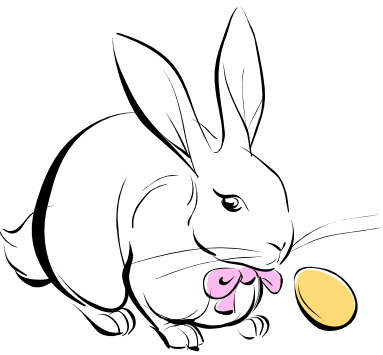
Undisziplliniertes Design von Archetypen

- Überlappende Konzepte



“Gutes” Archetypen Design





Easter-Egg-Approach

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Domain Knowledge Governance

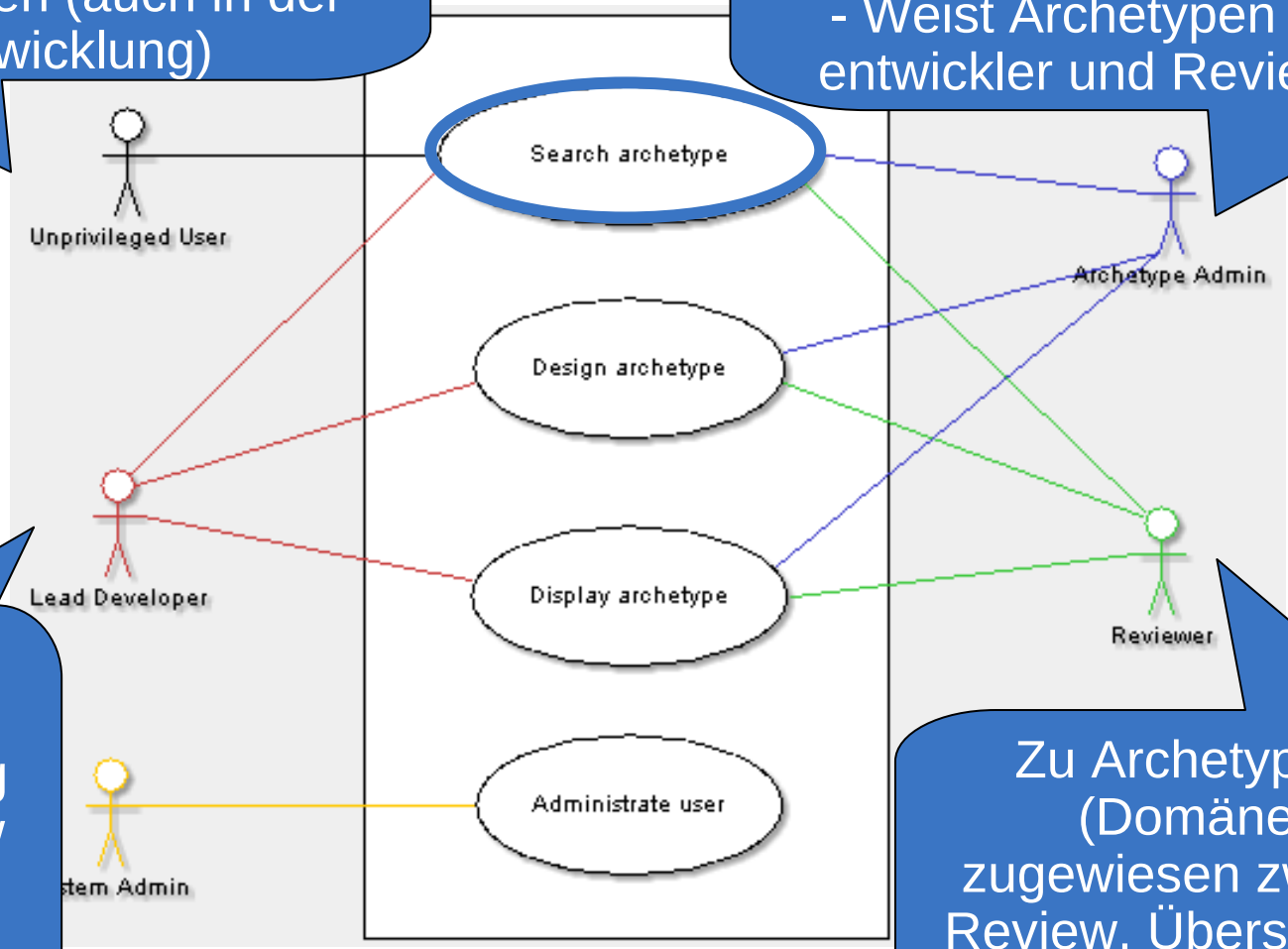
…umfaßt alle Aufgaben, die sich mit der Etablierung, und Beeinflussung formaler sowie informeller organisationsbezogener Mechanismen und Strukturen befassen, …
…um das Erstellen, Verbreiten, Warten von Wissen innerhalb und zwischen Domänen systematisch zu beeinflussen.

***Übersetzt aus: Garde S, Heard S, Hovenga E. Archetypes in Electronic Health Records: Making the case and showing the path for domain knowledge governance. Health Informatics Conference Australia, Melbourne August 2005**

rchetyp
G mit

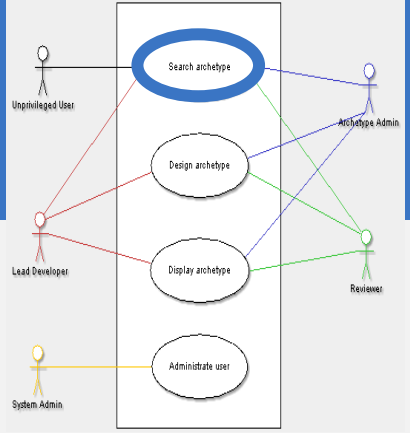
Anschauen, Herunterladen, unverbindliches Kommentieren von Archetypen (auch in der Entwicklung)

- Identifziert zu erstellende Archetypen(- Domänen) für Entwicklung und Review
- Weist Archetypen Haupt-entwickler und Reviewer zu



Koordiniert die Entwicklung und Review von Archetypen (-Domänen)

Zu Archetypen-(Domäne) zugewiesen zwecks Review, Übersetzung



Anwendungsfall *Suche Archetypen:* Archetypefinder

Mehrsprachig;

Ontologie-basiert

Find Archetypes

Search for archetypes

Finde Archetypen

Archetyp-Suche

Arketipleri bul

Arketipleri ara

یافتن الگوها

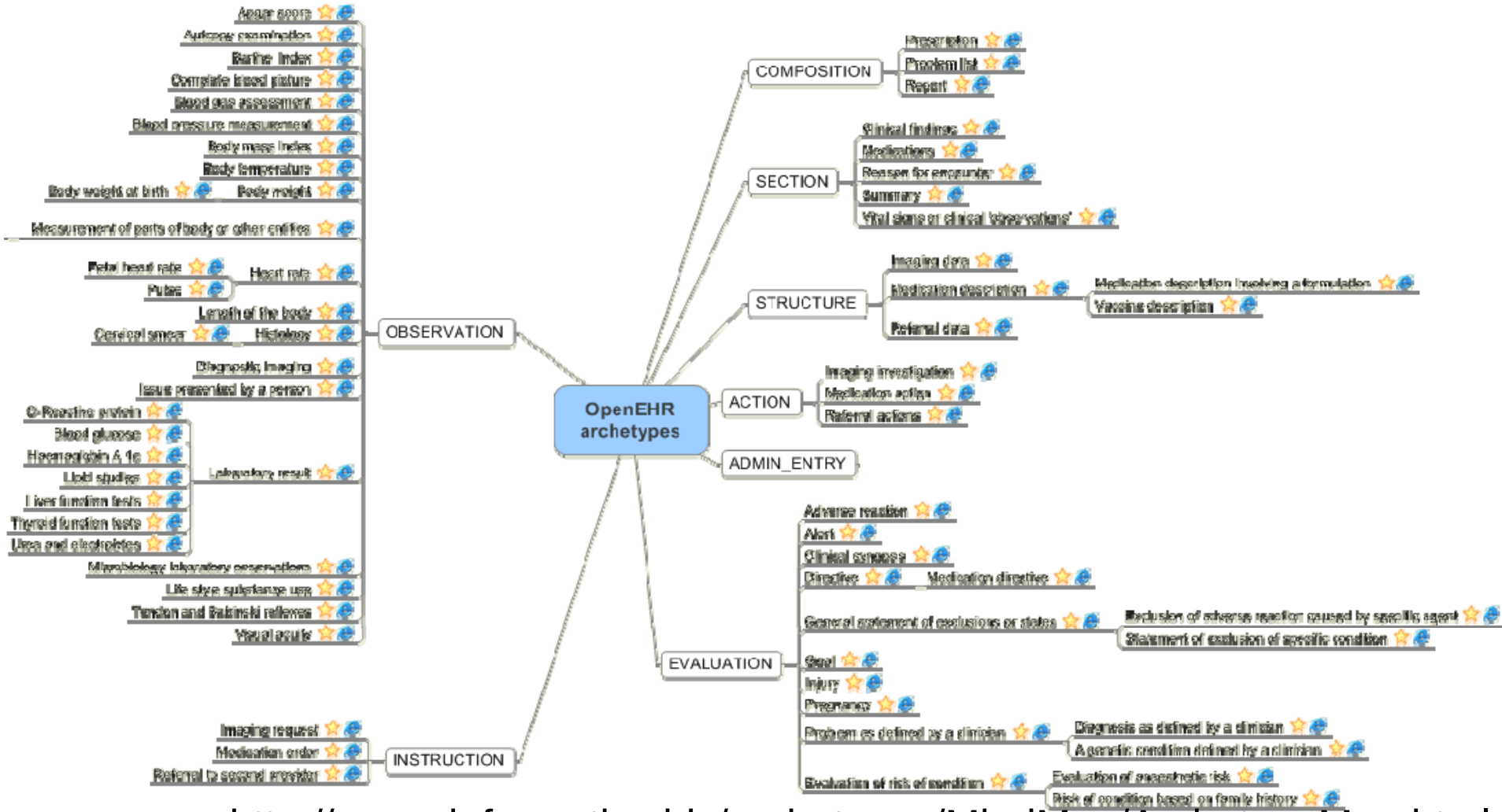
جستجوی الگوها

Change Language

Supported by the General Practice Comp

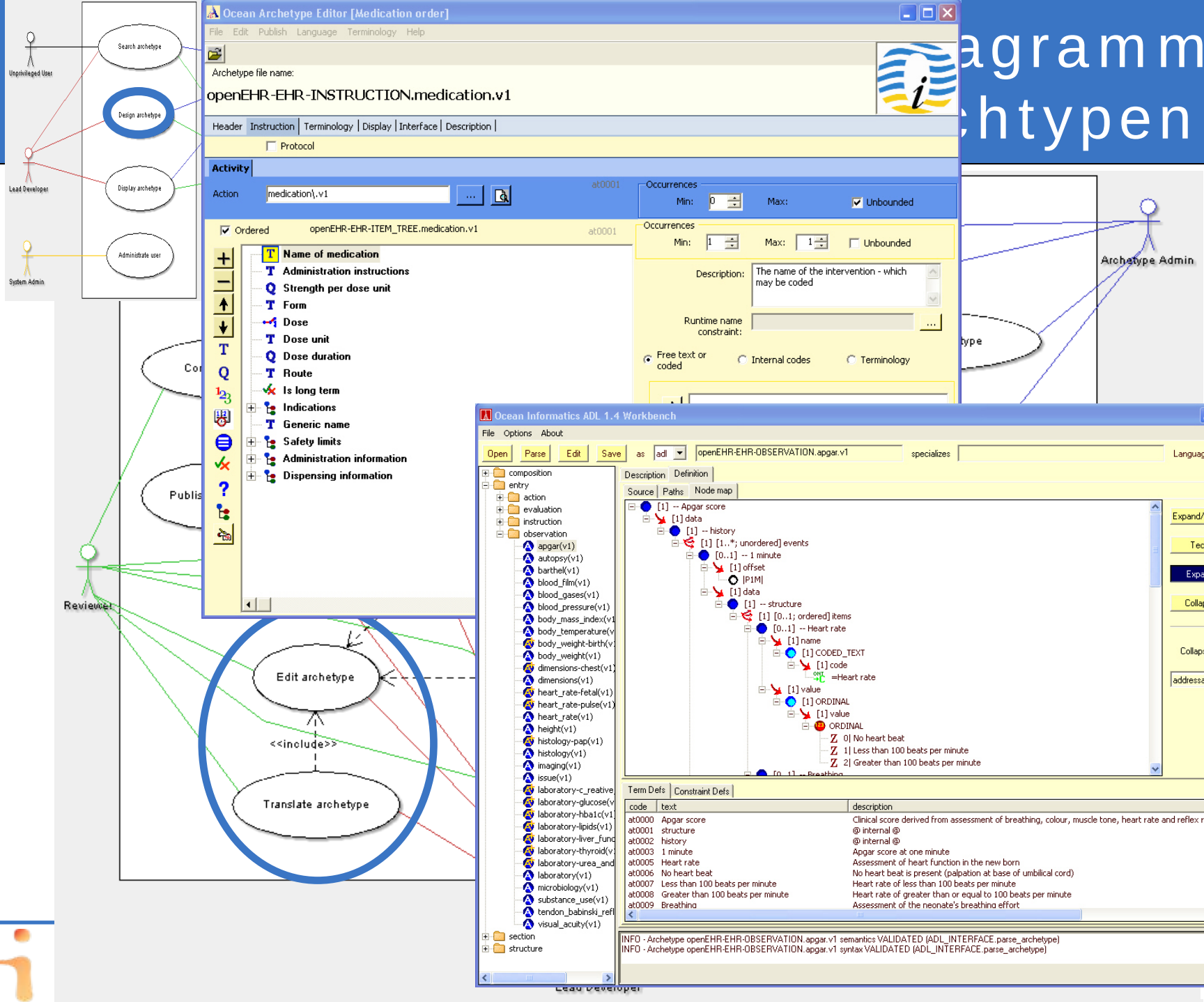
Developed in cooperation with Health Infor

Anwendungsfall *Suche Archetypen:* Mindmap

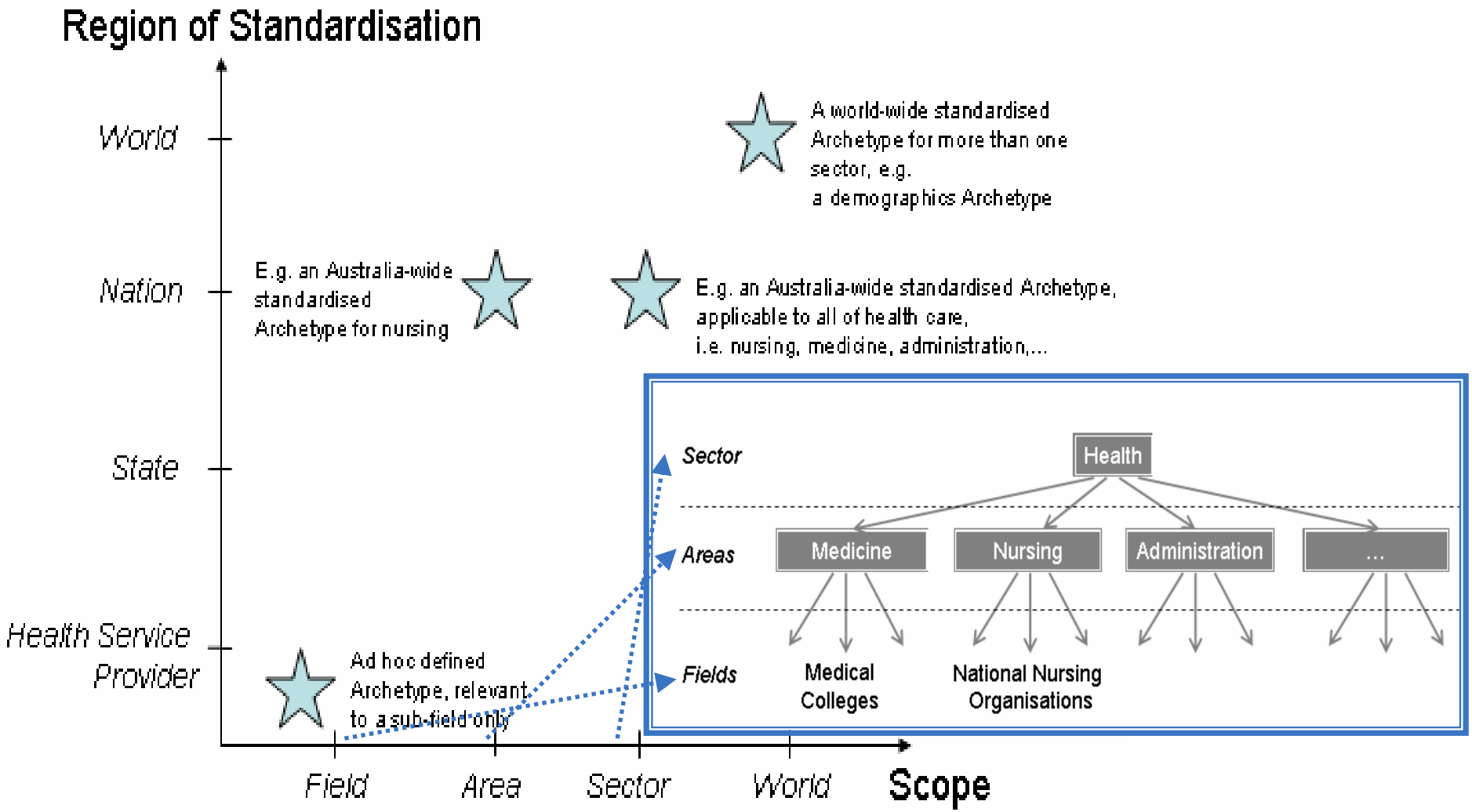


http://oceaninformatics.biz/archetypes/MindMap/ArchetypeMap.html

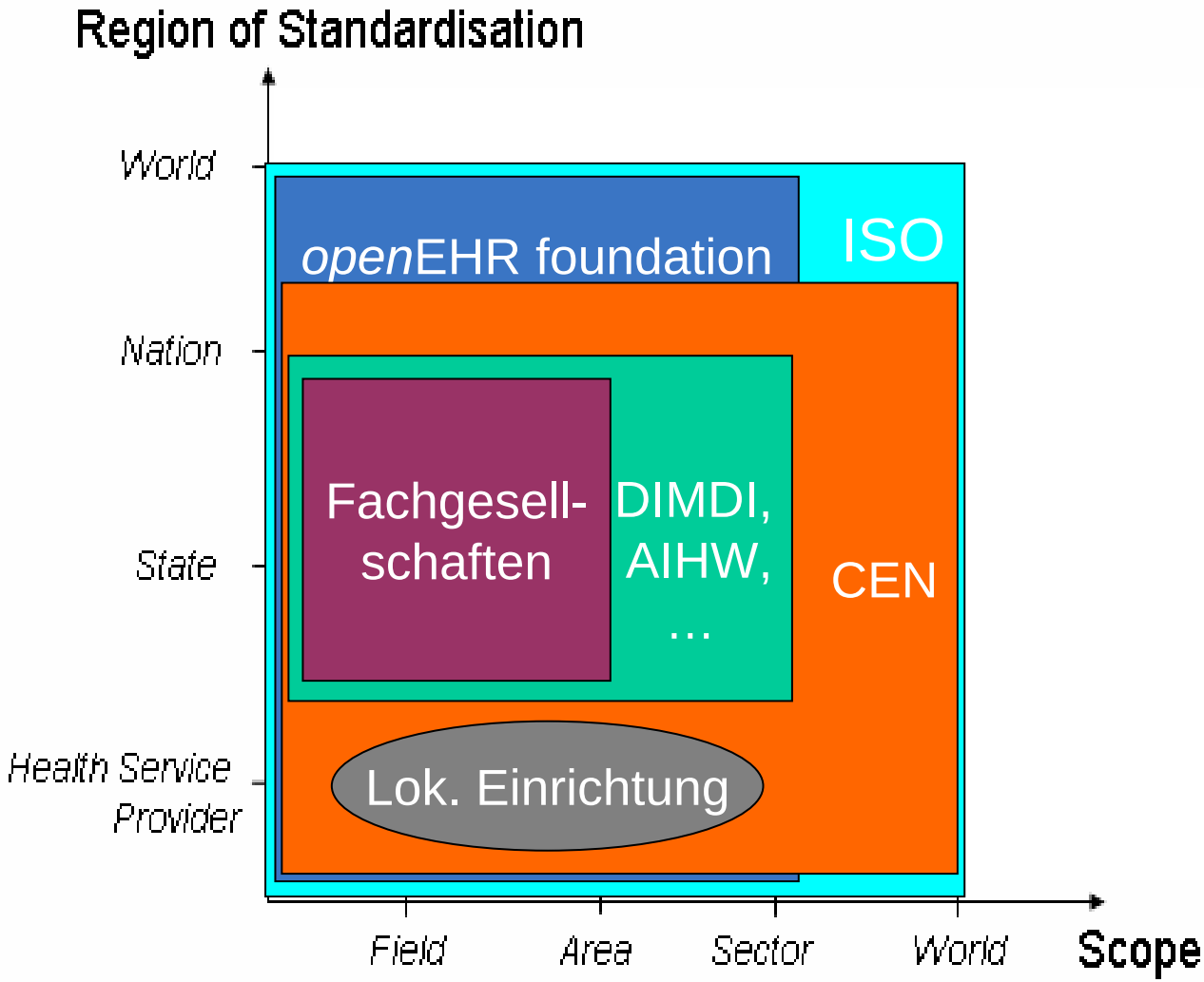
agramm: chtypen



Erstellen der Archetypen: Region und Bereich



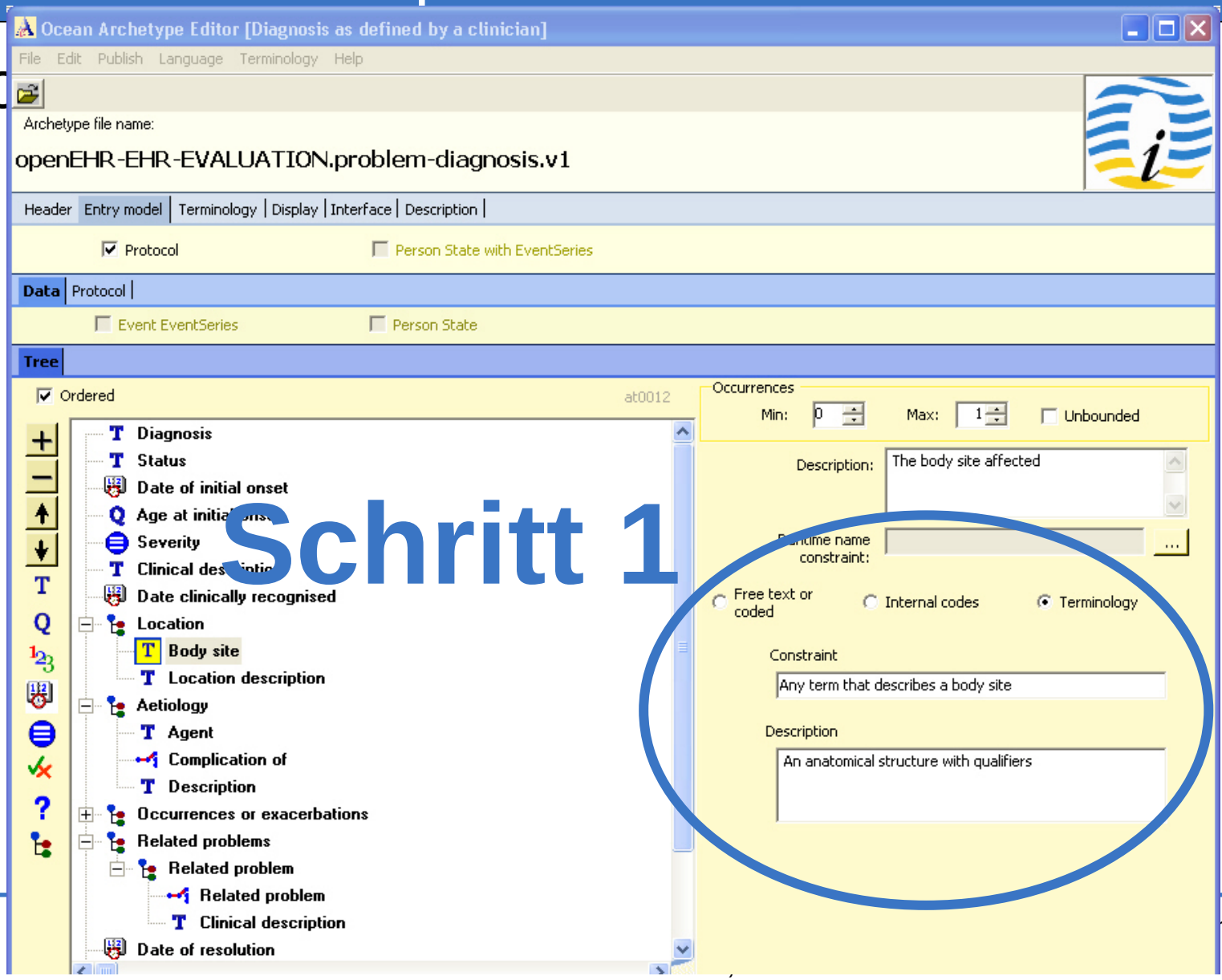
Erstellen von Archetypes: Prozesse?



Die Vision ist *international*…
...finanzielle Unterstützung aus *nationalen Töpfen*?

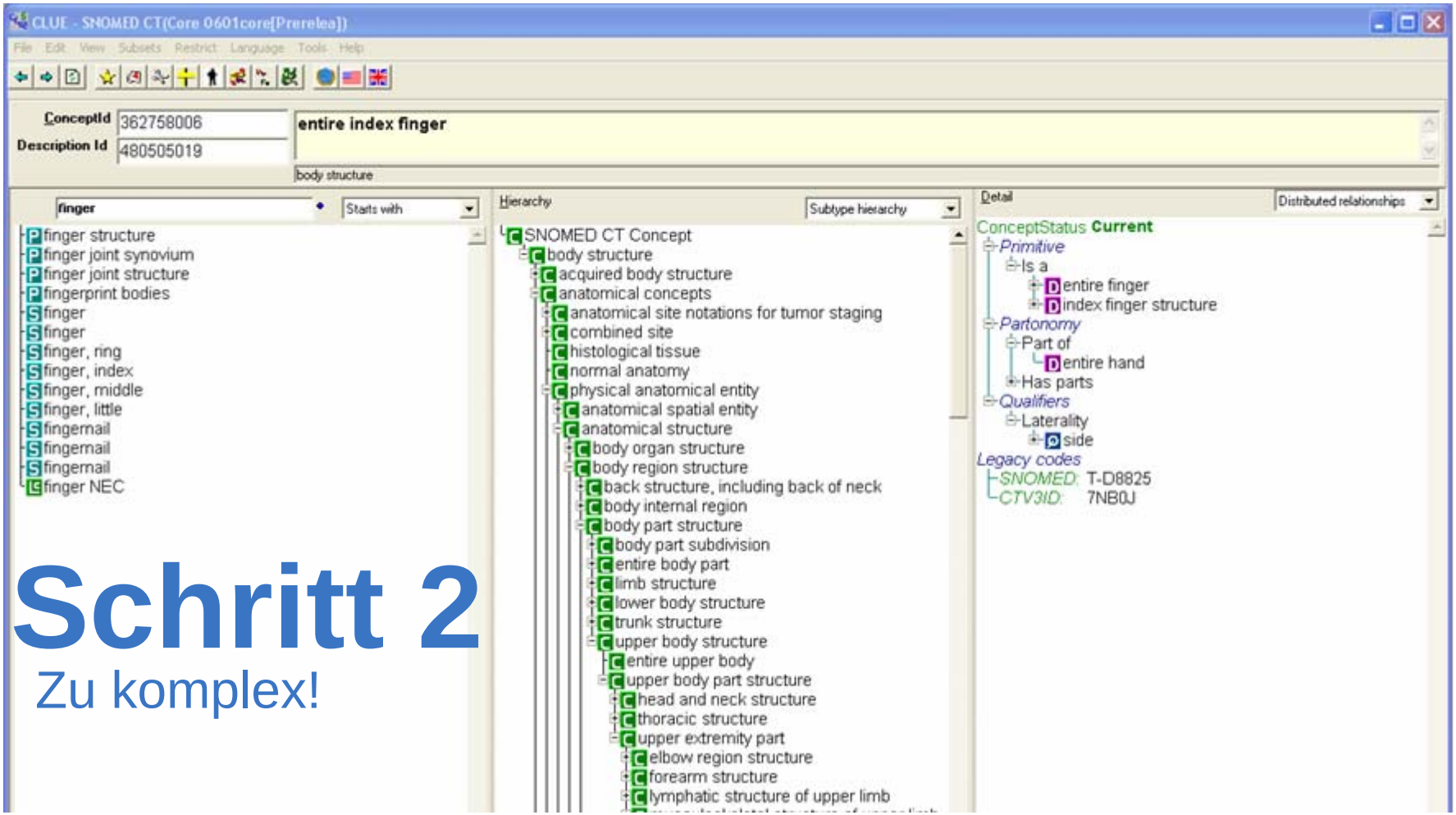
Snomed und Archetypen: Wie paßt das zusammen?

- Ho



Schritt 1

Snomed und Archetypen



Schritt 2

Zu komplex!

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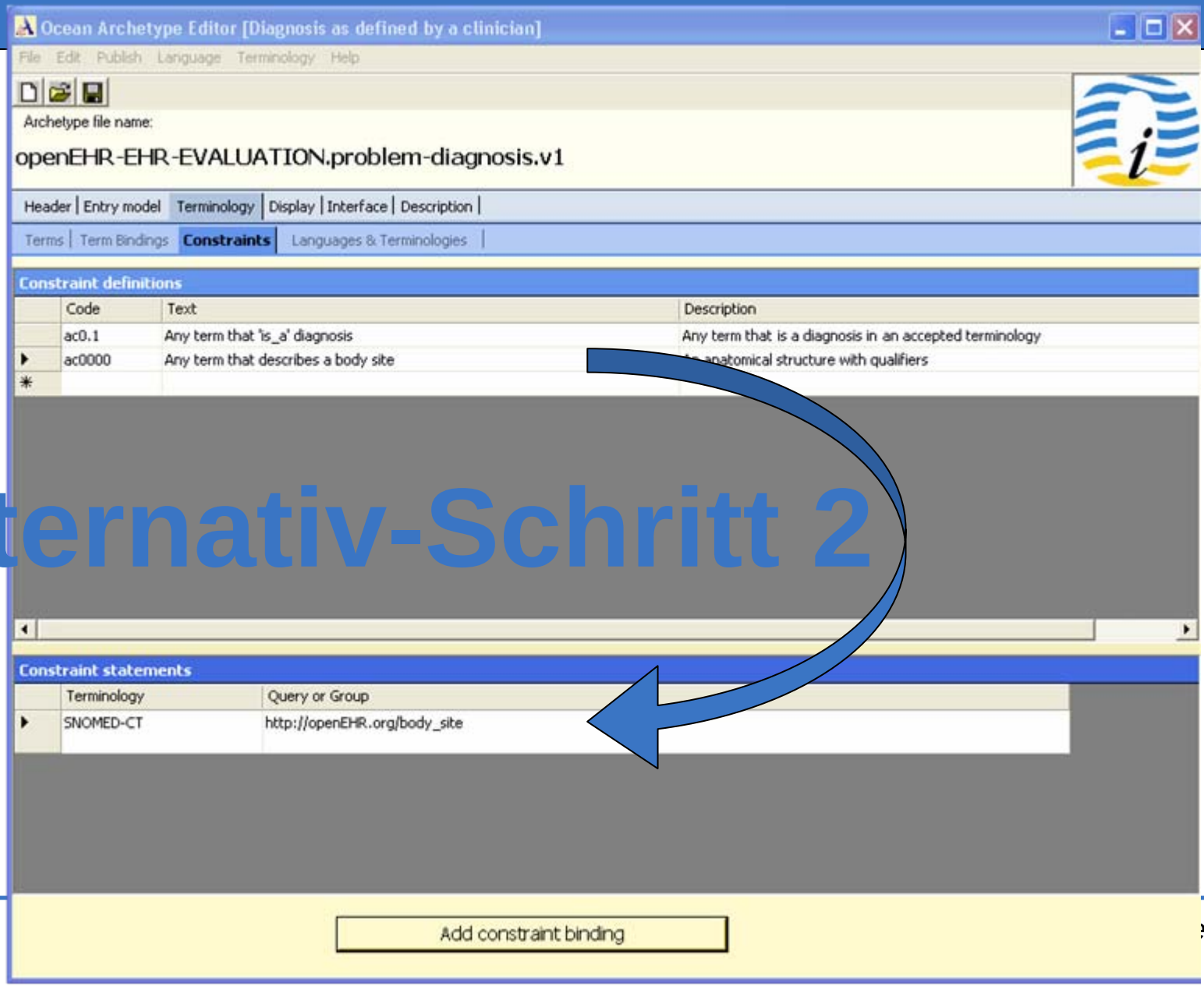
Snomed und Archetypen



Alternativ-Schritt 2

Snomed und Archetypes

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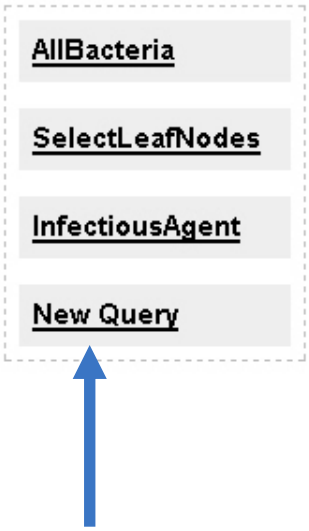
Constraint statements

	Terminology	Query or Group
▶	SNOMED-CT	http://openEHR.org/body_site

Alternativ-Schritt 3: Neue vordefinierte Anfrage



AllBacteria
>
Bacterium
>
Aerobic bacteria
>
Bacillus (organism)
Aneurinibacillus (organism)

Aneurinibacillus (organism)

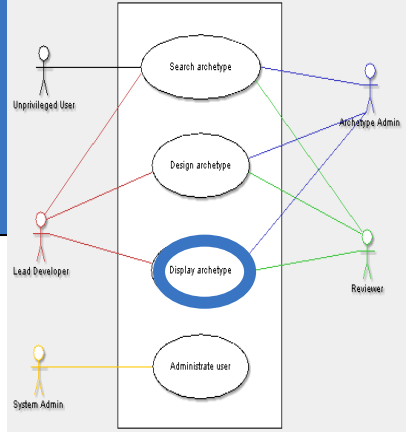
Aneurinibacillus aneurinilyticus
Aneurinibacillus aneurinilyticus (organism)
Aneurinibacillus migulanus
Aneurinibacillus migulanus (organism)
Aneurinibacillus species
Aneurinibacillus species (organism)
Aneurinibacillus thermoaerophilus
Aneurinibacillus thermoaerophilus (organism)
Bacillus aneurinolyticus
Bacillus migulans
Bacillus thermoaerophilus

Terms Total: 11

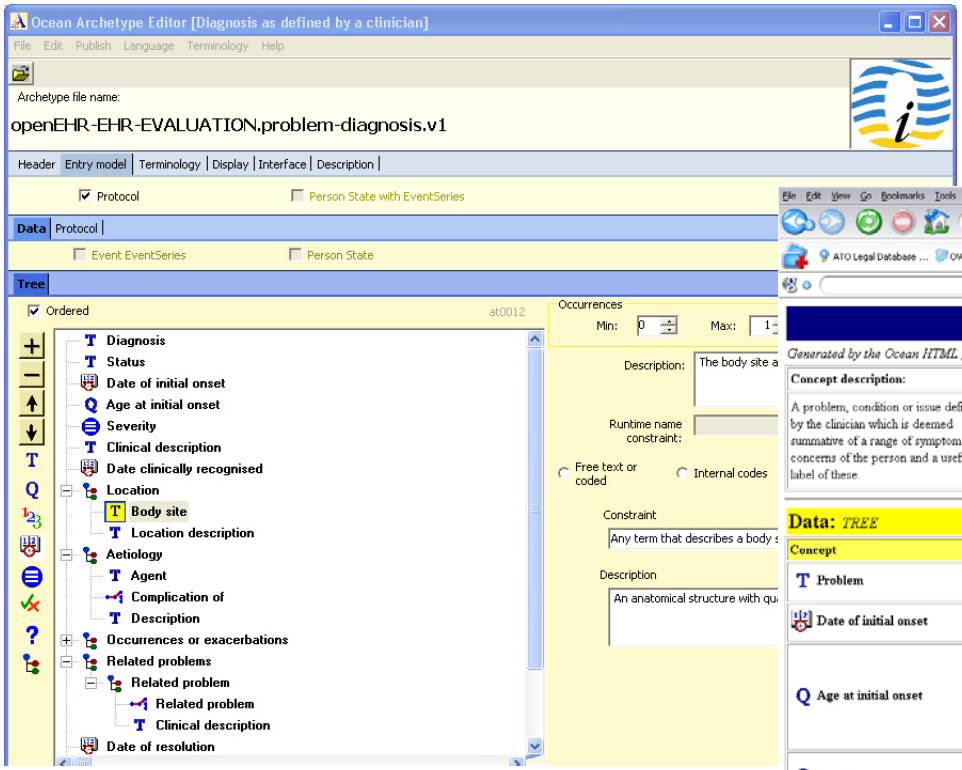
z.B. Body site:
Definiert exakt die Navigation für die SNOMED-Subsets,
die benutzt werden können, um eine Körperstelle zu beschreiben

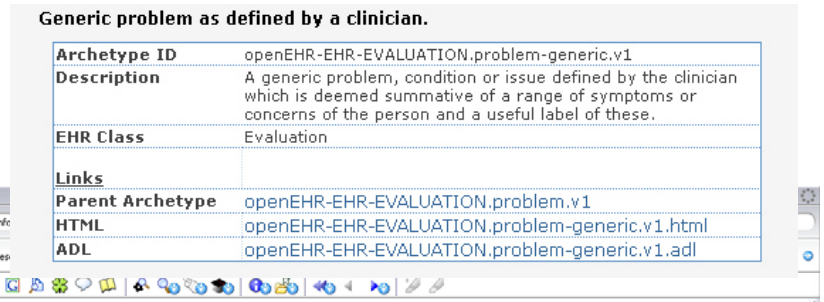
javascript:useServlet('goDown' , 'AllBacteria' , '114125006' , '41146007,27471002,44762009,', 'Aneurinibacillus (organism)' , 'Bacterium,Aerobic bacteria,Bacillus (organism),')

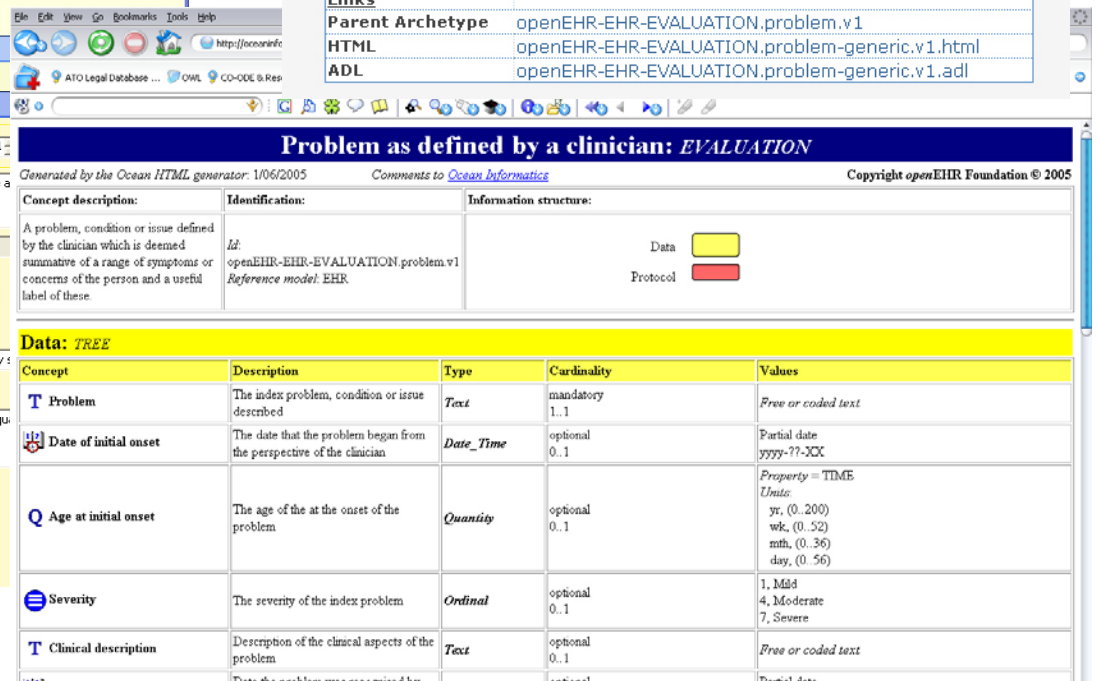
Anendungsfall: *Archetypen anzeigen*

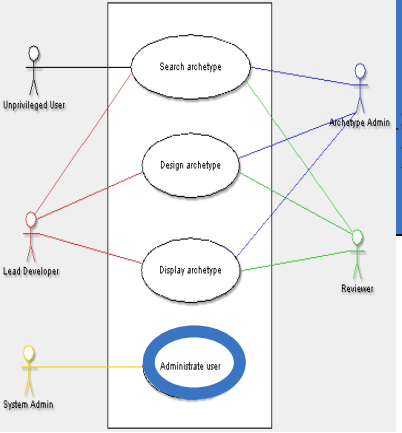


Prinzipiell erfüllt durch Archetype Editor Workbench and Finder.









Anwendungsfall: Benutzer verwalten

Dieser Anwendungsfall wird erst relevant bei einem weitgehend integriertem Archetype Repository…

Diskussion: Für ein Archetype Repository...

- ...existieren bereits viele Komponenten
  - Einige benötigen Erweiterung/Verfeinerung ($$$)
- ...ist mehr Integration nötig
  - Web Services
- ... müssen klare Prozesse definiert und eingehalten werden
  - Eine gemeinsame Web-Plattform wird benötigt
- ...benötigen wir eine internationale Vision für umfassende semantische Interoperabilität
  - Basierend auf nationalen Business-Cases?!

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Schlußfolgerung

- Domain Knowledge Governance ist essentiell, um semantische Interoperabilität zu erreichen
  - NEHTA*: ‘Undisciplined creation and application of archetypes threatens the goal of semantic interoperability’
- Eine umfassendes (internationales) Archetype Repository ermöglicht Domain Knowledge Governance
  - Mit klaren Prozessen und Zuständigkeiten
- Hoch-qualitative Archetypen sind der Schlüssel zu semantischer Interoperabilität klinischer Systeme

Fragen?

12 Apostel, Great Ocean Road, Australien

s.garde@cqu.edu.au

http://healthinformatics.cqu.edu.au

http://www.archetypes.com.au

http://www.openEHR.org

Fragen?

Heidelberg, Germany

s.garde@cqu.edu.au

http://healthinformatics.cqu.edu.au

http://www.archetypes.com.au

http://www.openEHR.org

http://www.oceaninformatics.biz

Electronic Health Records*

- **Patient-centred**
  - EHR relates to one subject of care, not to an episode of care at an institution
- **Longitudinal**
  - EHR is a long-term record of care, possibly birth to death
- **Comprehensive**
  - Includes a record of care events from all types of carers and provider institutions tending to a patient
- **Prospective**
  - Not only record of previous events
  - Also: decisional and prospective information (orders, goals, plans, …)

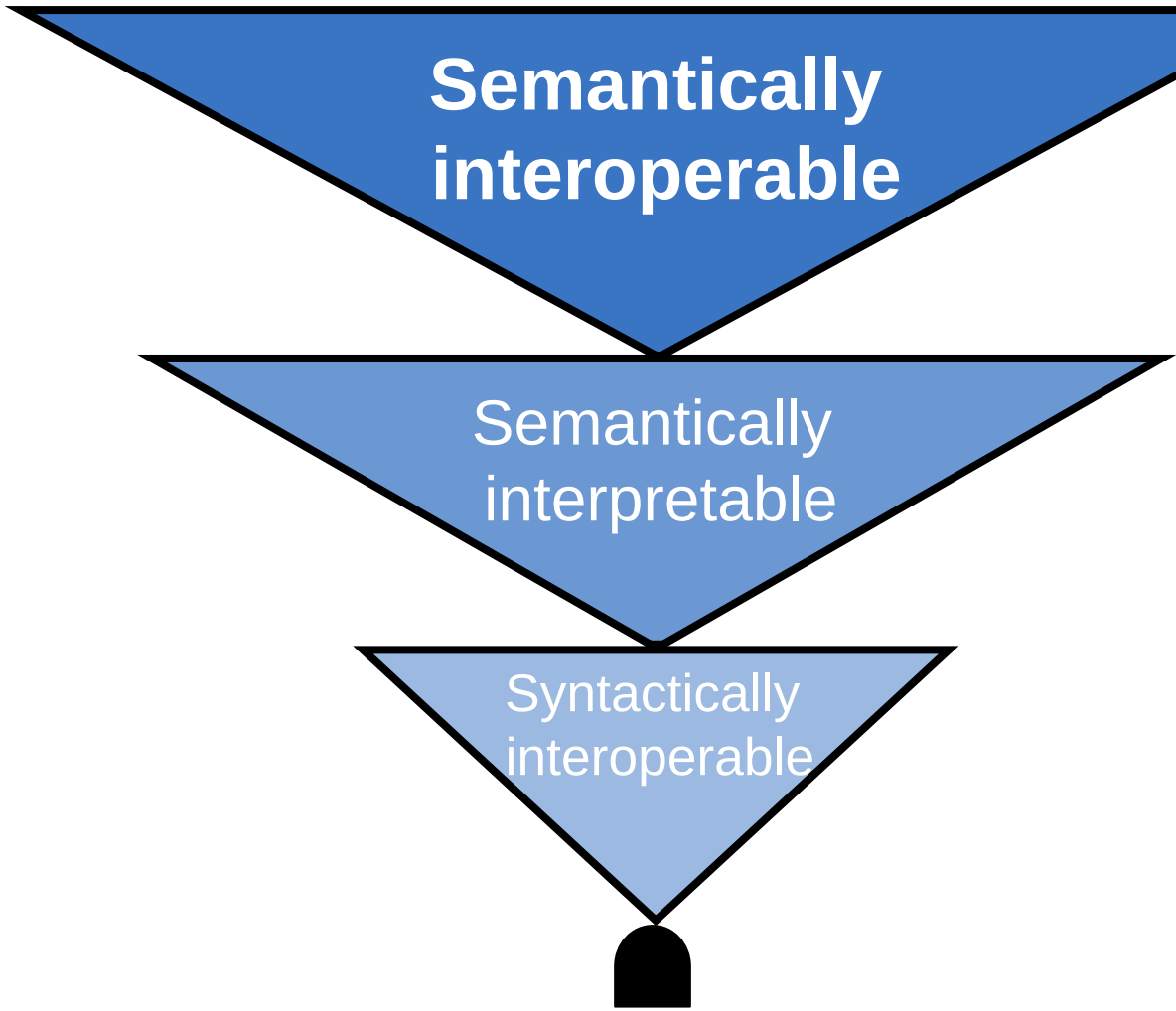
- Archetypes are the building blocks for EHRs

* cp.: ISO 20514 Draft Technical Report: EHR Definition, Scope and Context.

Archetype Repository: Actors

- **Lead Developer:** Responsible for coordination of the development/maintenance of a set of archetypes
- **Reviewers:** Assigned to sets of archetypes to review, translate, etc. archetypes
- **Unprivileged User**: View or otherwise access published archetypes (drafts) & submit comments
- **Archetype Admin:** Identify archetypes that are due for review or for other reasons need to be reviewed and assign appropriate Lead Developers and Reviewers to archetypes.
- **System Admin:** User administration etc.

A closer look: Syntax and Semantics



Achieved by Domain Knowledge Governance

Achieved by defining archetypes

Achieved by Reference Model

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Domain Knowledge Governance

- *Some* archetypes need to be standardised
  - Region
  - Scope
  - Concept overlaps betw… (redundancy)
- Archetypes need to be…
  - Easily accessible and …
  - Evidence-based where…
  - Maintained and system…
- Domain experts need basic …rstanding

…comprises all tasks related to establishing or influencing formal and informal organizational mechanisms and structures in order to systematically influence the building, dissemination, and maintaining of knowledge within and between domains.*

➡ Domain Knowledge Governance

* Garde S, Heard S, Hovenga E. Archetypes in Electronic Health Records: Making the case and showing the path for domain knowledge governance. HIC 2005

Why Domain Knowledge Governance?

Because it is the

to

semantic interoperability

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Governance Framework*

- Clear process for authoring, updating, managing, disseminating & version control
- Maintain documentation of archetypes at 3 levels:
  1. Meta-data for safe use, local editing and identification of archetypes
  2. Meta-data in archetype repository to assist clinicians to locate correct archetype for purpose
  3. Meta-data explaining design issues & referencing best practice to be published on the Internet

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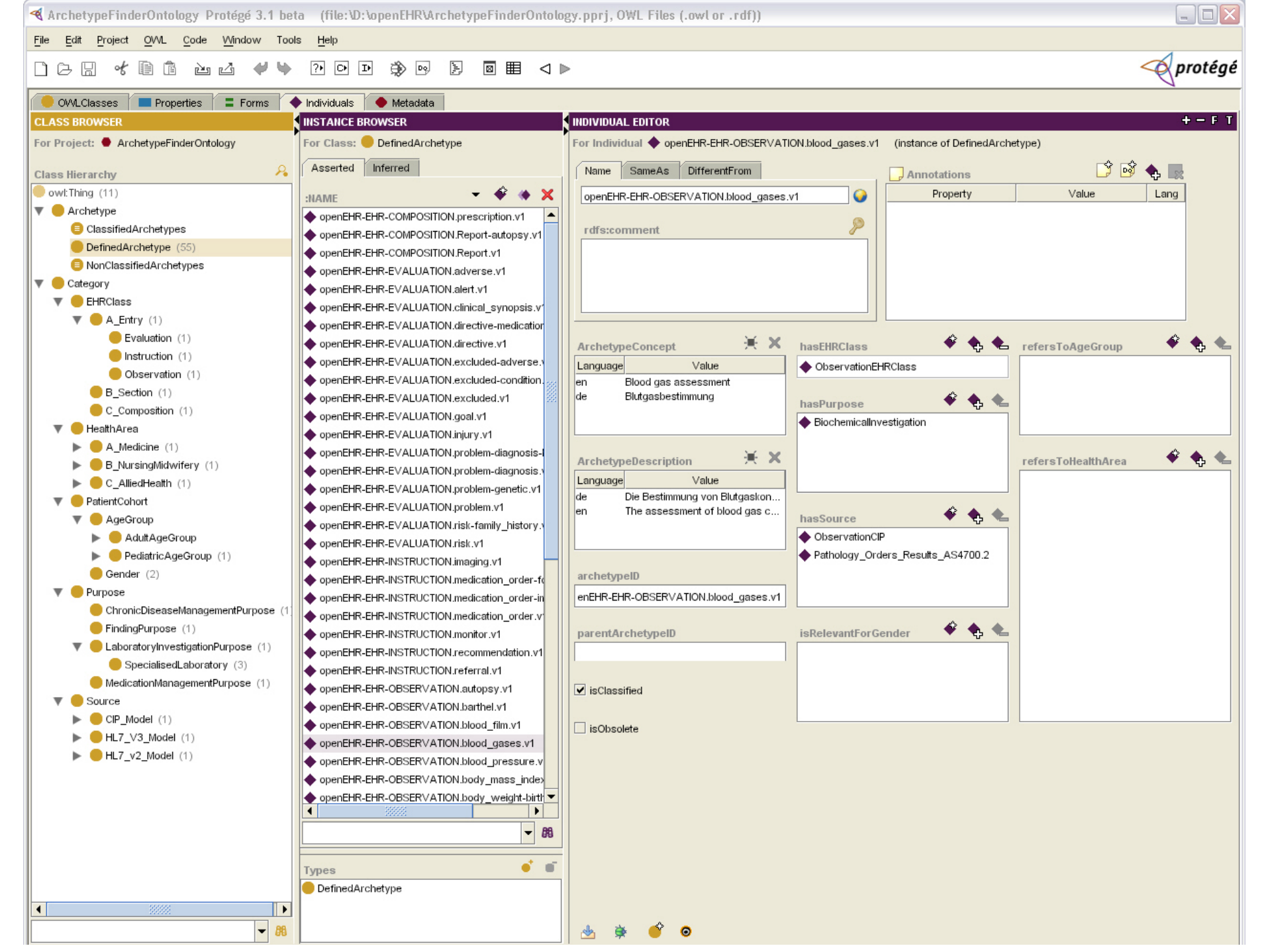
Archetype Ontology

- OWL – Ontology Web Language
  - facilitates greater machine interpretability of Web content than that supported by XML or RDF
- Protégé
  - Ontology Editor and Knowledge Acquisition System

- Archetype OWL-Ontology
  - Characteristics of Archetypes to facilitate domain knowledge governance


ArchetypeFinderOntology Protégé 3.1 beta (file:\D:\openEHR\ArchetypeFinderOntology.pprj, OWL Files (.owl or .rdf))
File Edit Project OWL Code Window Tools Help
protégé
OWLClasses Properties Forms Individuals Metadata
CLASS BROWSER
For Project: ArchetypeFinderOntology
Class Hierarchy
owl:Thing (11)
Archetype
ClassifiedArchetypes
DefinedArchetype (55)
NonClassifiedArchetypes
Category
EHRClass
A_Entry (1)
Evaluation (1)
Instruction (1)
Observation (1)
B_Section (1)
C_Composition (1)
HealthArea
A_Medicine (1)
B_NursingMidwifery (1)
C_AlliedHealth (1)
PatientCohort
AgeGroup
AdultAgeGroup
PediatricAgeGroup (1)
Gender (2)
Purpose
ChronicDiseaseManagementPurpose (1)
FindingPurpose (1)
LaboratoryInvestigationPurpose (1)
SpecialisedLaboratory (3)
MedicationManagementPurpose (1)
Source
CIP_Model (1)
HL7_V3_Model (1)
HL7_v2_Model (1)
INSTANCE BROWSER
For Class: DefinedArchetype
Asserted Inferred
:NAME
openEHR-EHR-COMPOSITION.prescription.v1
openEHR-EHR-COMPOSITION.Report-autopsy.v1
openEHR-EHR-COMPOSITION.Report.v1
openEHR-EHR-EVALUATION.adverse.v1
openEHR-EHR-EVALUATION.alert.v1
openEHR-EHR-EVALUATION.clinical_synopsis.v1
openEHR-EHR-EVALUATION.directive-medication
openEHR-EHR-EVALUATION.directive.v1
openEHR-EHR-EVALUATION.excluded-adverse.v
openEHR-EHR-EVALUATION.excluded-condition.
openEHR-EHR-EVALUATION.excluded.v1
openEHR-EHR-EVALUATION.goal.v1
openEHR-EHR-EVALUATION.injury.v1
openEHR-EHR-EVALUATION.problem-diagnosis-
openEHR-EHR-EVALUATION.problem-diagnosis.
openEHR-EHR-EVALUATION.problem-genetic.v1
openEHR-EHR-EVALUATION.problem.v1
openEHR-EHR-EVALUATION.risk-family_history.
openEHR-EHR-EVALUATION.risk.v1
openEHR-EHR-INSTRUCTION.imaging.v1
openEHR-EHR-INSTRUCTION.medication_order-f
openEHR-EHR-INSTRUCTION.medication_order-in
openEHR-EHR-INSTRUCTION.medication_order.v
openEHR-EHR-INSTRUCTION.monitor.v1
openEHR-EHR-INSTRUCTION.recommendation.v1
openEHR-EHR-INSTRUCTION.referral.v1
openEHR-EHR-OBSERVATION.autopsy.v1
openEHR-EHR-OBSERVATION.barthel.v1
openEHR-EHR-OBSERVATION.blood_film.v1
openEHR-EHR-OBSERVATION.blood_gases.v1
openEHR-EHR-OBSERVATION.blood_pressure.v
openEHR-EHR-OBSERVATION.body_mass_index
openEHR-EHR-OBSERVATION.body_weight-birth
Types
DefinedArchetype
INDIVIDUAL EDITOR
For Individual openEHR-EHR-OBSERVATION.blood_gases.v1 (instance of DefinedArchetype)
Name SameAs DifferentFrom
openEHR-EHR-OBSERVATION.blood_gases.v1
rdfs:comment
Annotations
Property Value Lang
ArchetypeConcept
Language Value
en Blood gas assessment
de Blutgasbestimmung
ArchetypeDescription
Language Value
de Die Bestimmung von Blutgaskon...
en The assessment of blood gas c...
archetypeID
enEHR-EHR-OBSERVATION.blood_gases.v1
parentArchetypeID
isClassified
isObsolete
hasEHRClass
ObservationEHRClass
hasPurpose
BiochemicalInvestigation
hasSource
ObservationCIP
Pathology_Orders_Results_AS4700.2
isRelevantForGender
refersToAgeGroup
refersToHealthArea

Archetype Repository

- OWL – Ontology Web Language
- Protégé
  - Archetype OWL-Ontology
- Java-Servlet
- Tomcat – Servlet Container
  - Archetype-Repository/Archetype-Finder

Find Archetypes

Search for archetypes

Archetype | Archetype Description | **Clinical Description** | Country | Patient | Source

Health Area:

- ☐ Medical care
- ☐ Nursing
- ☐ Allied Health
- ☐ Consumer health

Purpose:

- ☐ Chronic disease management
- ☐ Statements of exclusion
- ☐ Physical examination finding
- ☐ Investigation
  - ☐ Imaging investigation
  - ☐ Laboratory investigation
    - ☐ Biochemical investigation
    - ☐ Histological investigation
    - ☐ Haematological investigation
- ☐ Medication management

Connect search items using:

- (•) or
- ( ) and

Search | Reset

Change Language

Supported by the General Practice Computing Group of Australia *through funding from the* Australian Government Department of Health and Ageing.
Developed in cooperation with Health Informatics, Central Queensland University.

http://healthinformatics.cqu.edu.au/archetypefinder

search... Go

Find Archetypes

11 Archetype(s) found

You can now narrow or broaden your search result or start a new search .

Generic problem as defined by a clinician.

Archetype ID	openEHR-EHR-EVALUATION.problem-generic.v1
Description	A generic problem, condition or issue defined by the clinician which is deemed summative of a range of symptoms or concerns of the person and a useful label of these.
EHR Class	Evaluation
Links	
Parent Archetype	openEHR-EHR-EVALUATION.problem.v1
HTML	openEHR-EHR-EVALUATION.problem-generic.v1.html
ADL	openEHR-EHR-EVALUATION.problem-generic.v1.adl

Family history of condition

Archetype ID	openEHR-EHR-EVALUATION.FamilyHistory.v1
Description	Evaluation to indicate that there is, or is not, a significant risk of this subject of care having, now or in the future, a condition due to prior occurrence in a family member.
EHR Class	Evaluation
Links	
HTML	openEHR-EHR-EVALUATION.FamilyHistory.v1.html
ADL	openEHR-EHR-EVALUATION.FamilyHistory.v1.adl

Histological diagnosis as defined by a clinician.

Archetype ID	openEHR-EHR-EVALUATION.problem-diagnosis-histological.v1
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EHR Class	Evaluation
Links	
Parent Archetype	openEHR-EHR-EVALUATION.problem-diagnosis.v1
HTML	openEHR-EHR-EVALUATION.problem-diagnosis-histological.v1.html
ADL	openEHR-EHR-EVALUATION.problem-diagnosis-histological.v1.adl

Diagnosis as defined by a clinician

11 Archetype(s) found

You can now narrow or broaden your search result or start a new search .

Generic problem as defined by a clinician.

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Links	
Parent Archetype	openEHR-EHR-EVALUATION.problem.v1
HTML	openEHR-EHR-EVALUATION.problem-generic.v1.html
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Family history of condition

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Diagnosis as defined by a clinician

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HTML	openEHR-EHR-EVALUATION.problem-generic.v1.html
ADL	openEHR-EHR-EVALUATION.problem-generic.v1.adl

Problem as defined by a clinician: *EVALUATION*

Generated by the Ocean HTML generator: 1/06/2005 *Comments to* Ocean Informatics

Concept description:	Identification:	Information structure:
A problem, condition or issue defined by the clinician which is deemed summative of a range of symptoms or concerns of the person and a useful label of these.	*Id*: openEHR-EHR-EVALUATION.problem.v1 *Reference model*: EHR	Data Protocol

Data: *TREE*

Concept	Description	Type	Cardinality	Values
Problem	The index problem, condition or issue described	***Text***	mandatory 1..1	*Free or coded text*
Date of initial onset	The date that the problem began from the perspective of the clinician	***Date_Time***	optional 0..1	Partial date yyyy-??-XX
Age at initial onset	The age of the at the onset of the problem	***Quantity***	optional 0..1	*Property* = TIME *Units*: yr, (0..200) wk, (0..52) mth, (0..36) day, (0..56)
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Clinical description	Description of the clinical aspects of the problem	***Text***	optional 0..1	*Free or coded text*
Date clinically recognised	Date the problem was recognised by clinicians	***Date_Time***	optional 0..1	Partial date yyyy-??-XX

Location, Location of the problem in terms of body site. ***Cluster*** (0..*) optional, repeating

Concept	Description	Type	Cardinality	Values
Body site	The body site affected	***Coded_text***	optional 0..1	*Terminology* Any term that describes a body site

The Health Problem Space

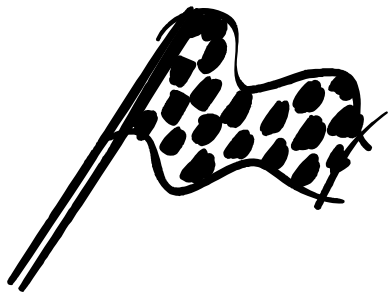
- Mobile population
- More providers
- More complex treatments
- Increasing health costs
- Lifelong records (100 yrs!)
- Preventable harm to patients
- Increasing knowledge
- Maximum privacy

The Problem

- Items of clinical patient information are all over the place, in different formats
- No single *patient-centred* view is available
- Consequences of fragmented information:
  - Repeated tests & questions ($$$)
  - Workflow & resource management difficult
  - Clinical errors due to lack of ability to see *relevant* information in a *timely* fashion
  - Decision support limited to local episodes
- Cost of care is higher, quality lower than it should be

Or in other words...

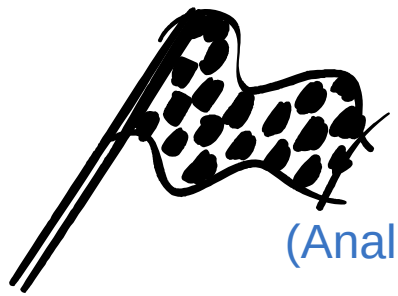
- If the patient is a racing car driver, she makes pit-stops at each health care facility
- Each pit-stop has a video camera, recording what is done to her
  - local pit-stop records, all different, all disconnected
  - no one has a picture of the whole race (= patient's life!)



(Analogy by Thomas Beale, *open*EHR foundation)

.. or in other words

- Our patient now has a video camera in her racing car, taking pictures no matter where the car goes, *and* broadcasting them to pit-stop crews
  - The stream from this camera is the longitudinal, patient-centred EHR...
- The pit-stops may still have their own cameras
  - Electronic Patient Records (EPRs) – local detail
- Patient can have a navigator/co-driver
  - Local GP (care team)
  - Continuity of care



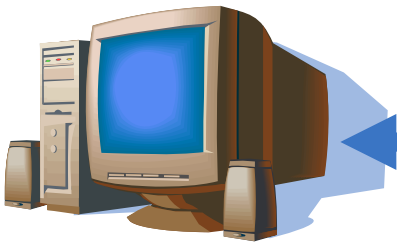
(Analogy by Thomas Beale, *open*EHR foundation)

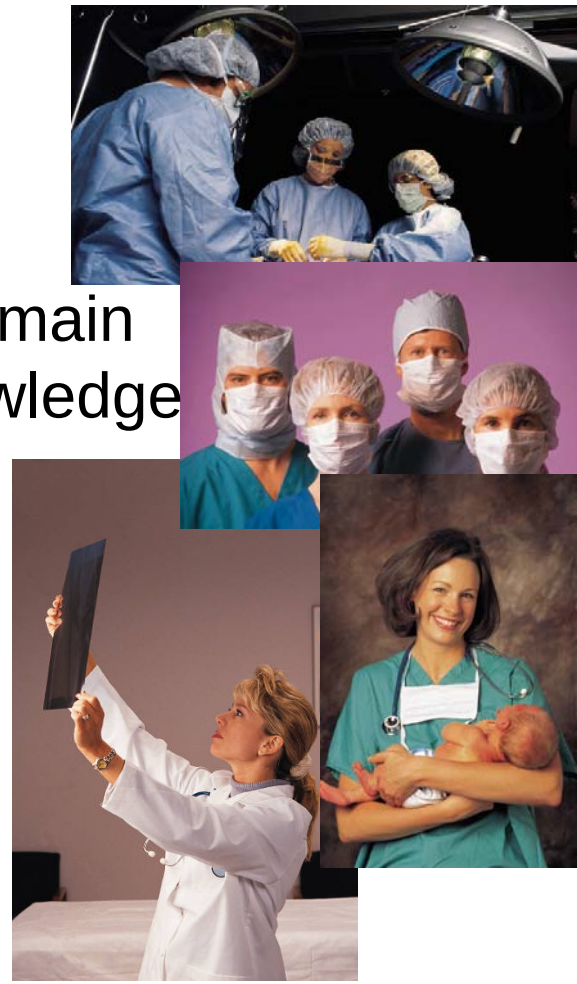
Traditional EHR Approach

Application System

Technical Development

Domain Knowledge





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However...

- Both the total number of concepts and the rate of change is high
  - SNOMED medical termset codes some 366,170 atomic concepts and 1.46 million relationships
- Not only is health care big, it is open-ended*:
  - *In breadth*, because new information is always being discovered or becoming relevant
  - *In depth*, because finer-grained detail is always being discovered or becoming relevant
  - *In complexity*, because new relationships are always being discovered or becoming relevant

*** After A.L. Rector, Clinical Terminology: Why is it so hard?, Methods Inf Med 38 (1999) 239-252.**

*open*EHR

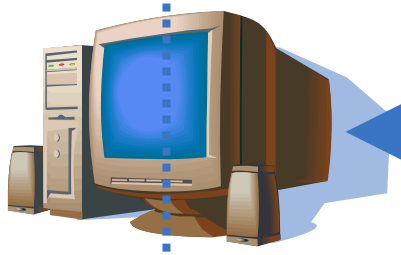
- A new way of structuring, storing and managing patient data so that it can be shared and exchanged between different healthcare providers and other stakeholders in a safe and secure manner
- The *open*EHR foundation develops free tools and specifications for Electronic Health Records

www.openEHR.org

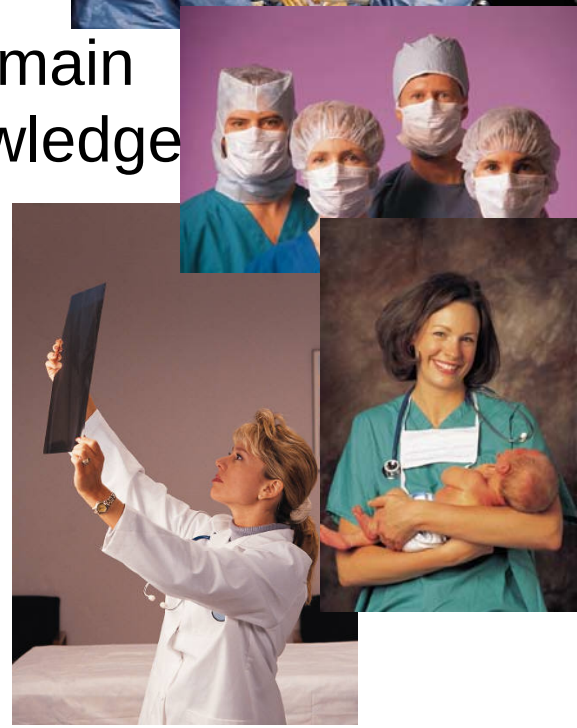
Two Level *open*EHR-Approach

Technical Development

Application System

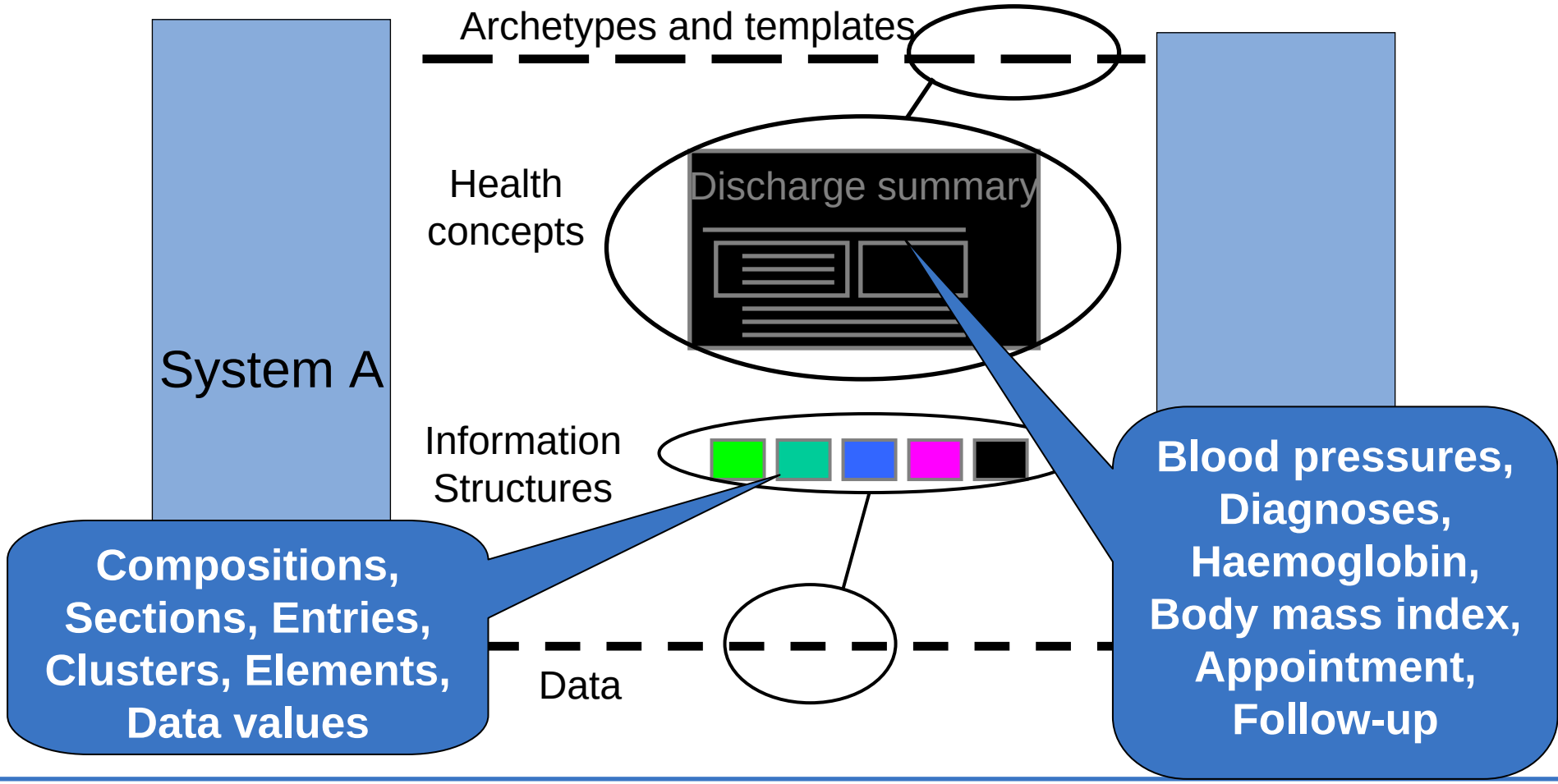


Domain Knowledge



Information | Knowledge

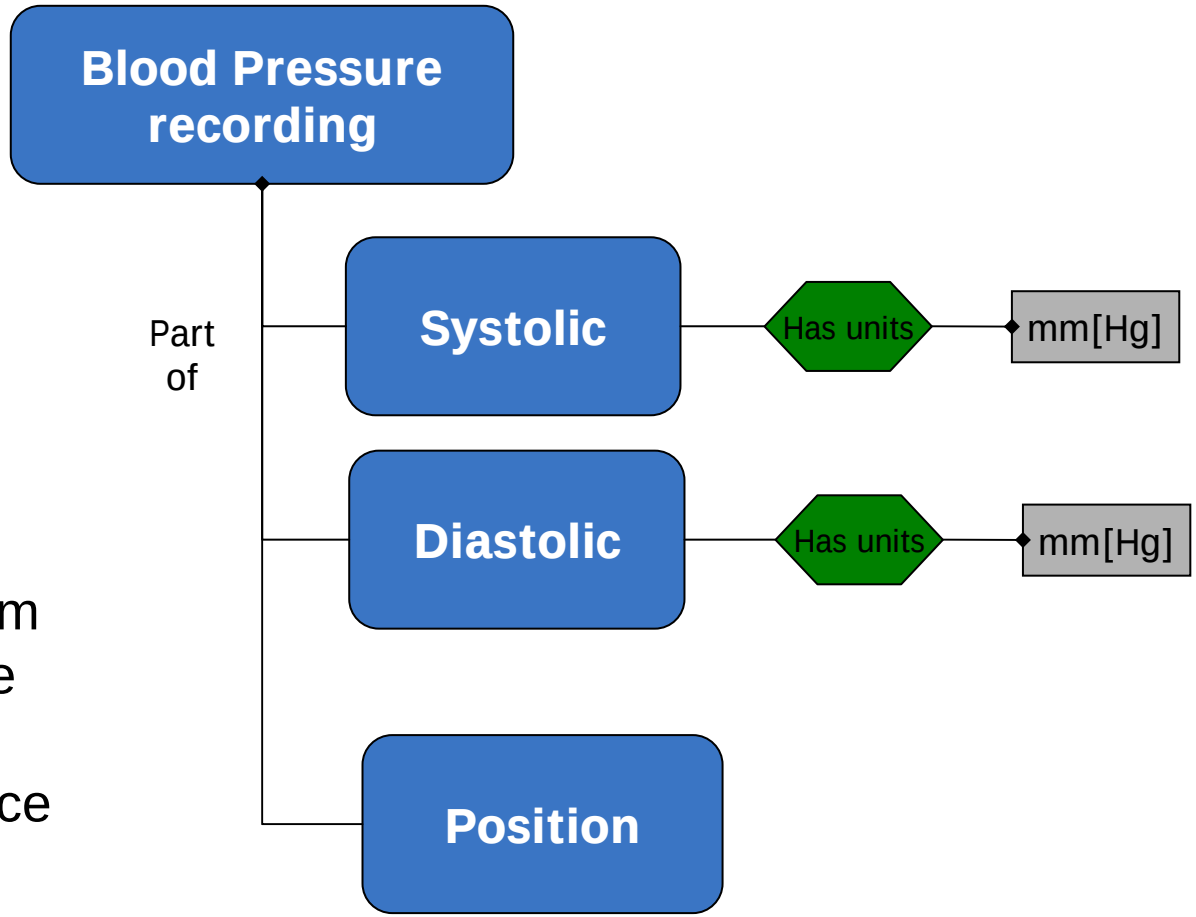
Two-level Interoperability



A simple Archetype

Archetype:

- A formal model of a clinical concept
- Separate from the reference model used for persistence



Archetype "Entry" types

Evaluation

e.g.
diagnosis,
adverse reaction

Observation

e.g. weight,
effectiveness
of anti-emetics,
lab results

Instruction

e.g. medication
order, monitoring

Action

e.g. procedure,
drug admin

Clinicians define domain knowledge

- Empowerment of domain experts: The domain experts create & change the knowledge on their own
- Standardisation of archetypes helps to maximise the use of information
  - Document data once – use multiple times!
  - Data aggregation when reporting
  - Semantic interoperability between systems
  - Enable lifelong electronic records

Find Archetypes

11 Archetype(s) found

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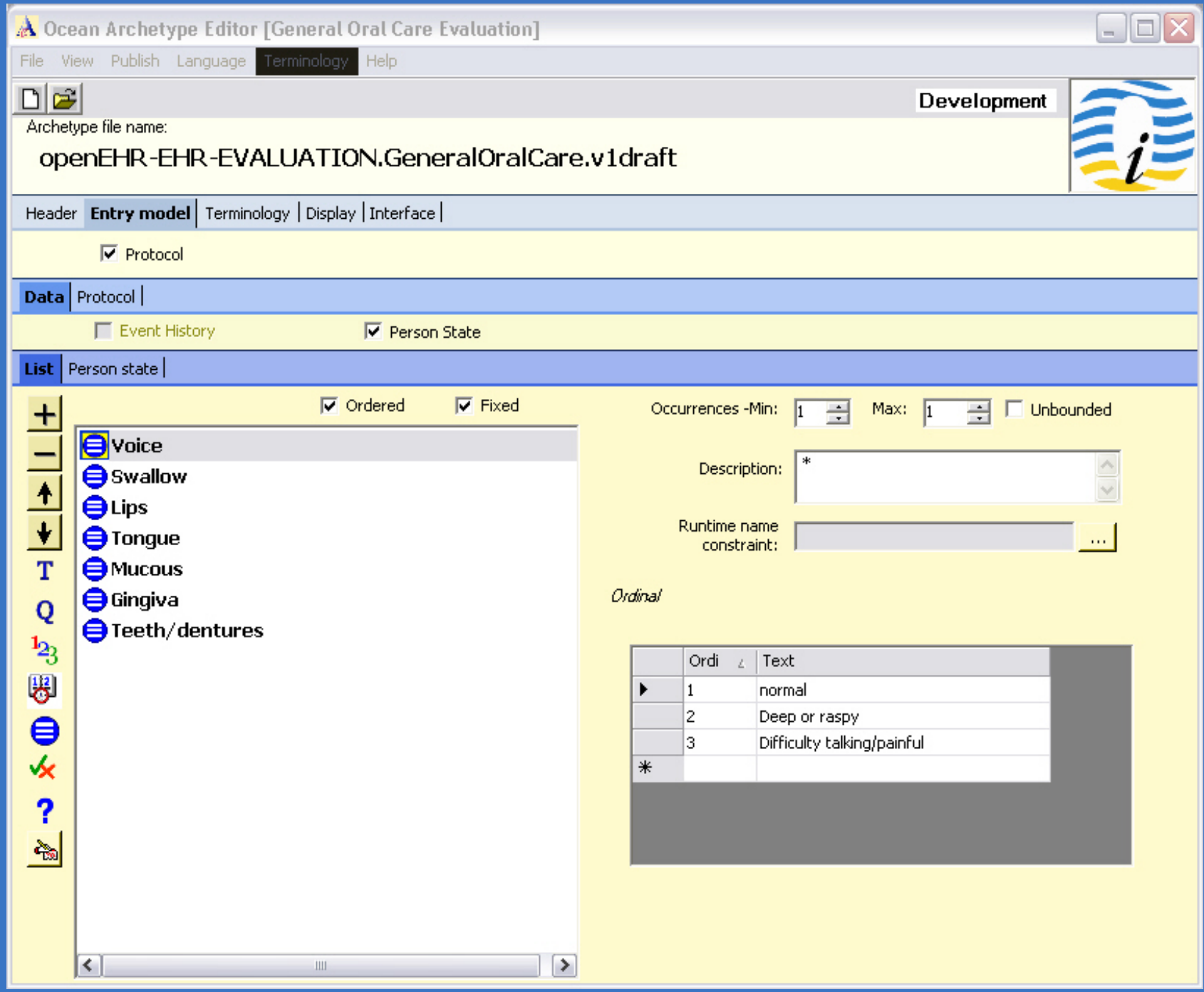
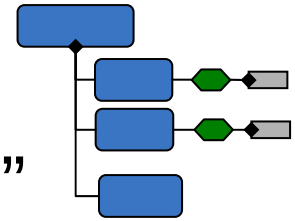

Ocean Archetype Editor [General Oral Care Evaluation]
File View Publish Language Terminology Help
Development
Archetype file name:
openEHR-EHR-EVALUATION.GeneralOralCare.v1draft
Header Entry model Terminology Display Interface
Protocol
Data Protocol
Event History
Person State
List Person state
Ordered
Fixed
Voice
Swallow
Lips
Tongue
Mucous
Gingiva
Teeth/dentures
Occurrences -Min: 1 Max: 1 Unbounded
Description: *
Runtime name constraint:
Ordinal
Ordi
Text
1 normal
2 Deep or raspy
3 Difficulty talking/painful

Summary

- Archetypes
  = Formal model of a clinical concept “in-use”



- The definition of archetypes is an important step for the realisation of EHRs and semantic interoperability
- Archetypes empower the clinician and ensure that the information clinicians need is in the EHR and can be exchanged

Questions?

Heidelberg, Germany

s.garde@cqu.edu.au

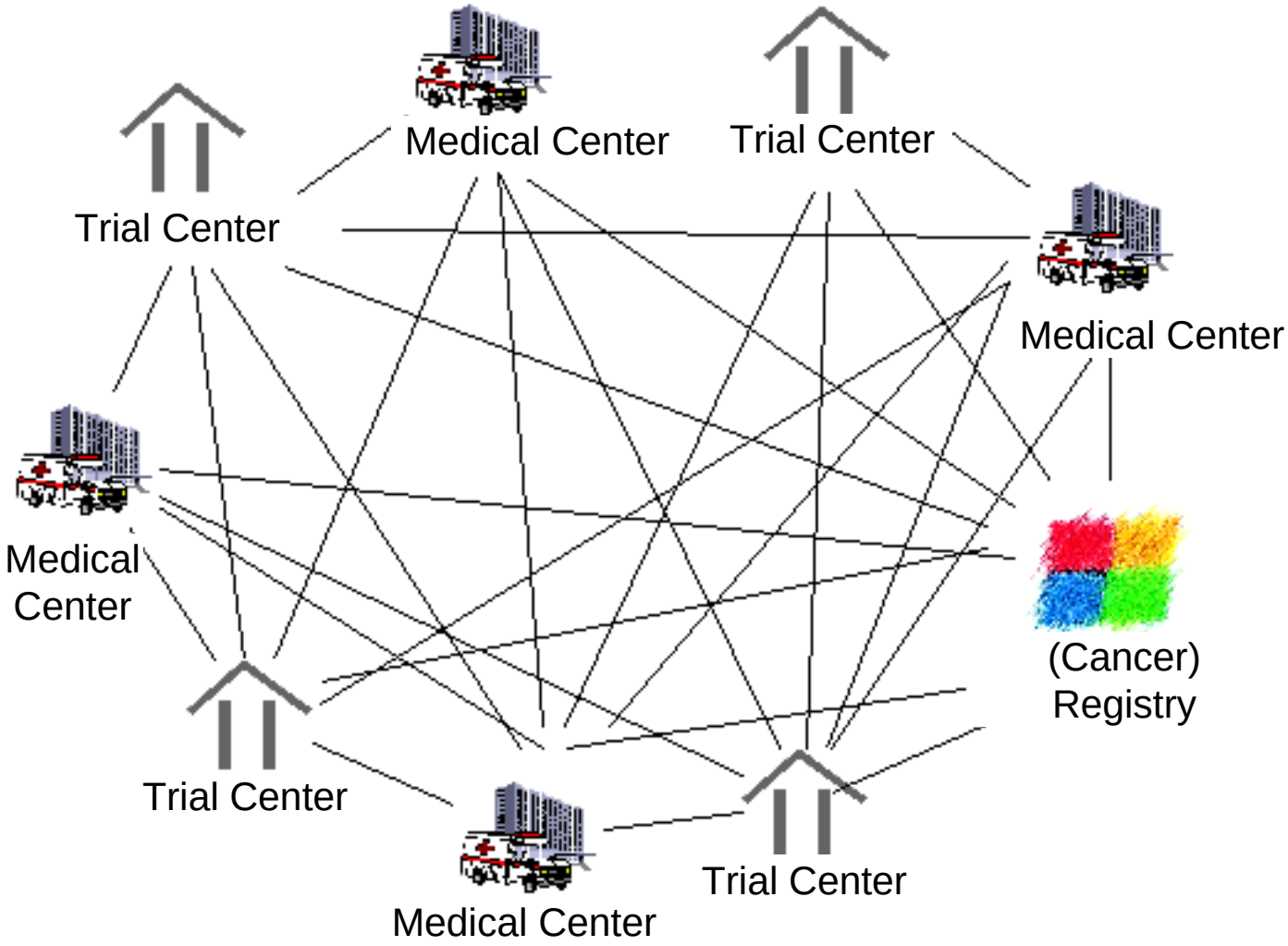
http://healthinformatics.cqu.edu.au

http://www.archetypes.com.au

http://www.openEHR.org

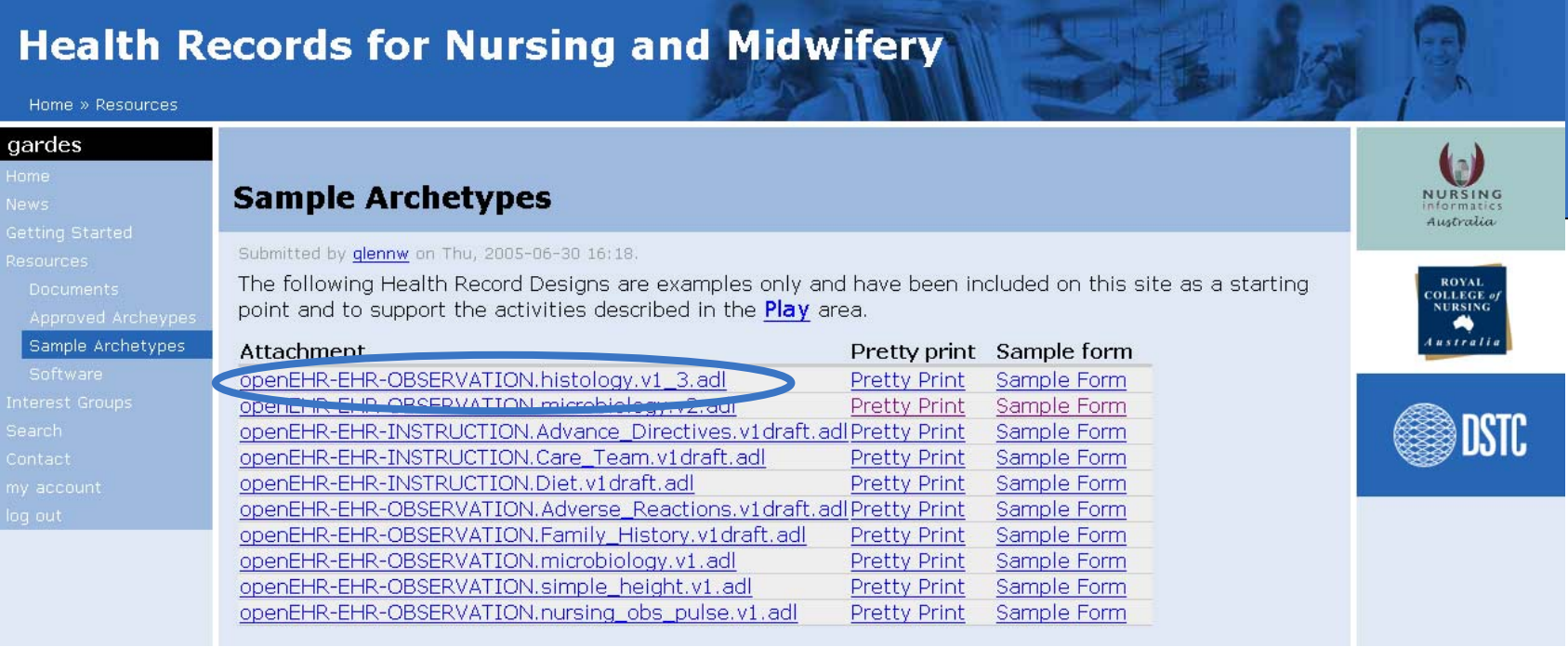
http://www.oceaninformatics.biz

Multi-Centre Clinical Trials:* The example of Paed. Onc.

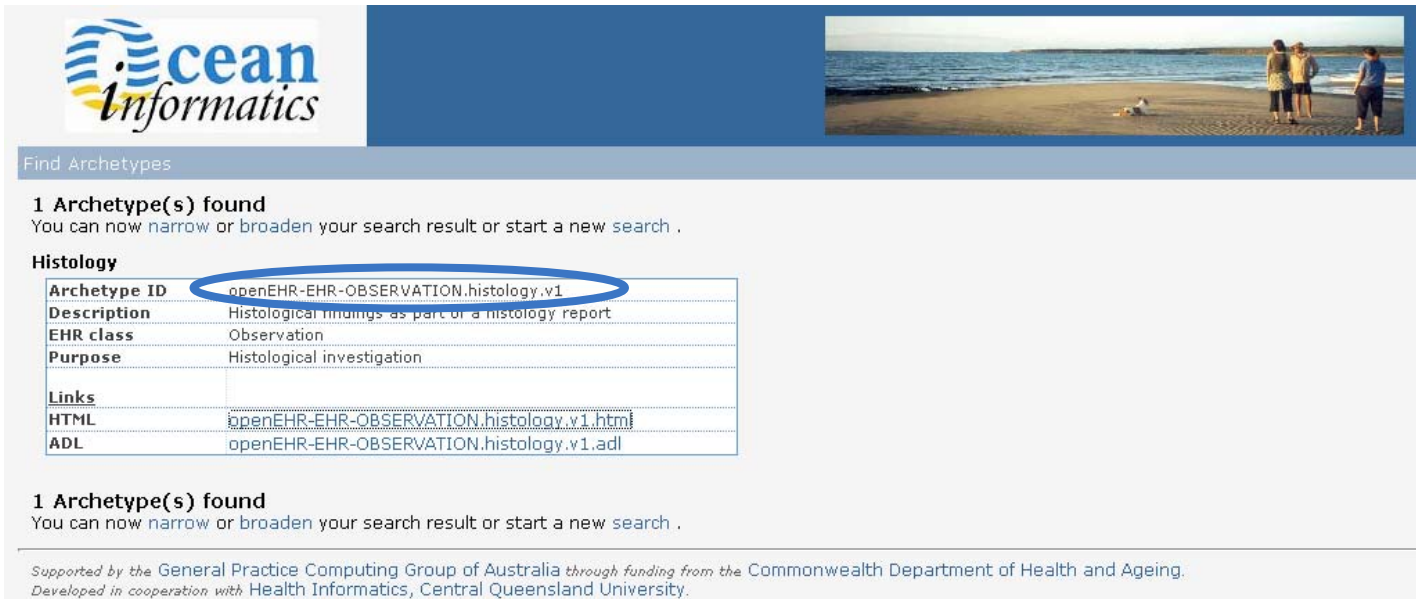


- Highly integrated
  - Vertical
  - Horizontal

*Garde S, Knaup P, Schuler T, Hovenga E: Can *open*EHR archetypes empower Multi-centre Clinical Research? Stud Health Technol Inform 2005; 116: 971-6.



The same archetype or two archetypes defining the same concept differently from two perspectives?



*open*EHR research

- University College London, UK
- University of Manchester, UK
- Technical University of Valencia, Spain
- Mayo Clinic, USA
- University of Moratuwa, Sri Lanka
- Central Queensland University, Australia
- …

...and some companies

2cure	An EPR based on *open*EHR (NL)
ethidium HEALTH SYSTEMS	A health record system based on the *open*EHR architecture (USA)
‹acode›	Open source Java implementation of *open*EHR kernel (Sweden)
ocean informatics	Significant contribution to the *open*EHR specifications, open source Archetype Workbench and .NET *open*EHR Archetype Editor (Australia)

- HealthConnect Brisbane Southside Trial*:
  - Archetypes to define the clinical knowledge
  - openEHR as the "structure behind the scenes"
- Nehta Review of Electronic Health Record Standards (http://www.nehta.gov.au)
  - *Benefit:* Significantly greater where EHR information can be shared and used by all involved in an individual's care
  - *Recommendation*: Adopt the European EN13606 standard on EHR Communication (parts 1 to 3) as the basis of an Australian Shared EHR Architecture Standard

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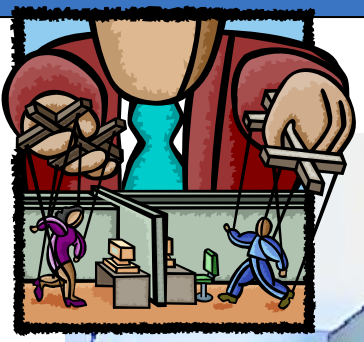
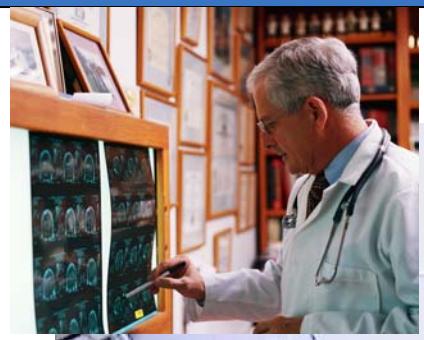
Conclusion: How it is and how it should be





Computer desk pictures by Peter Schloeffel, *open*EHR foundation

Questions?

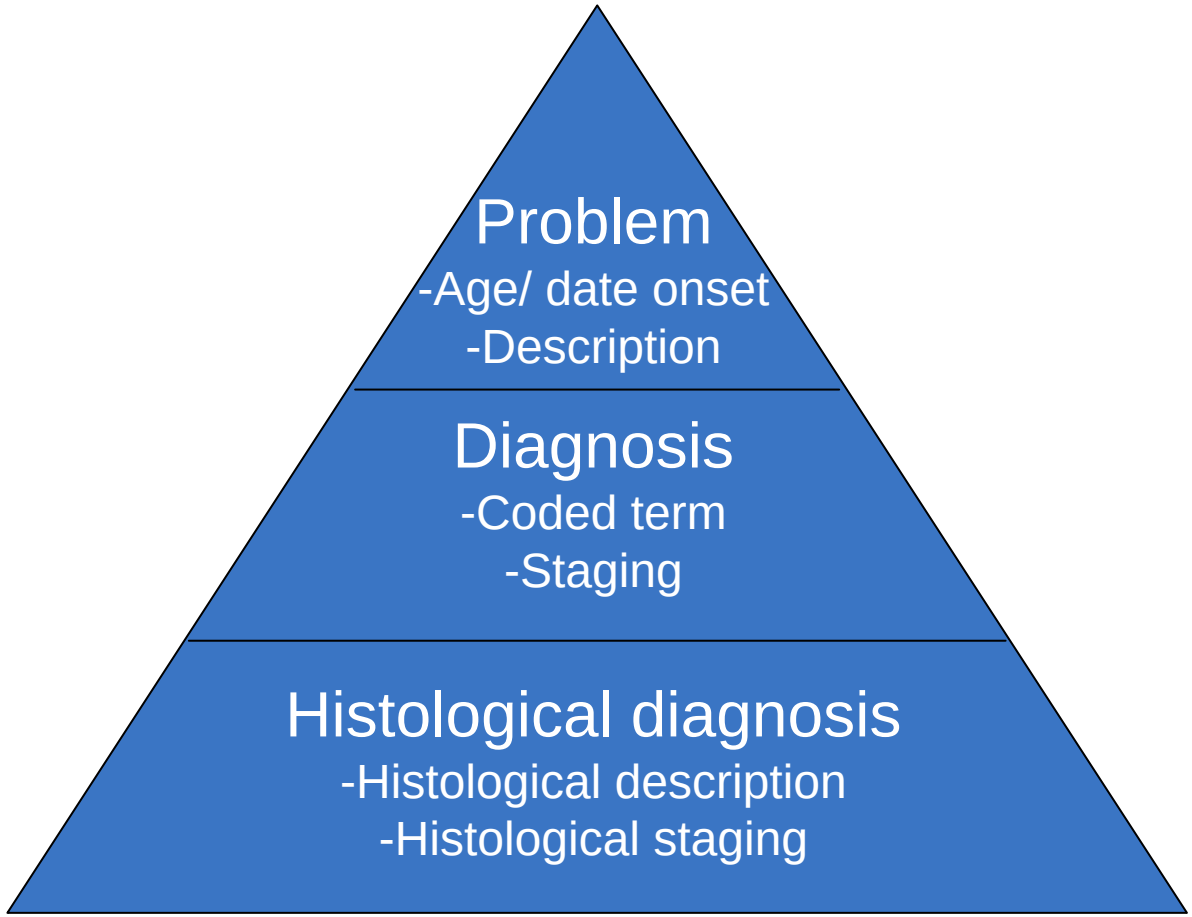
s.garde@cqu.edu.au

http://healthinformatics.cqu.edu.au

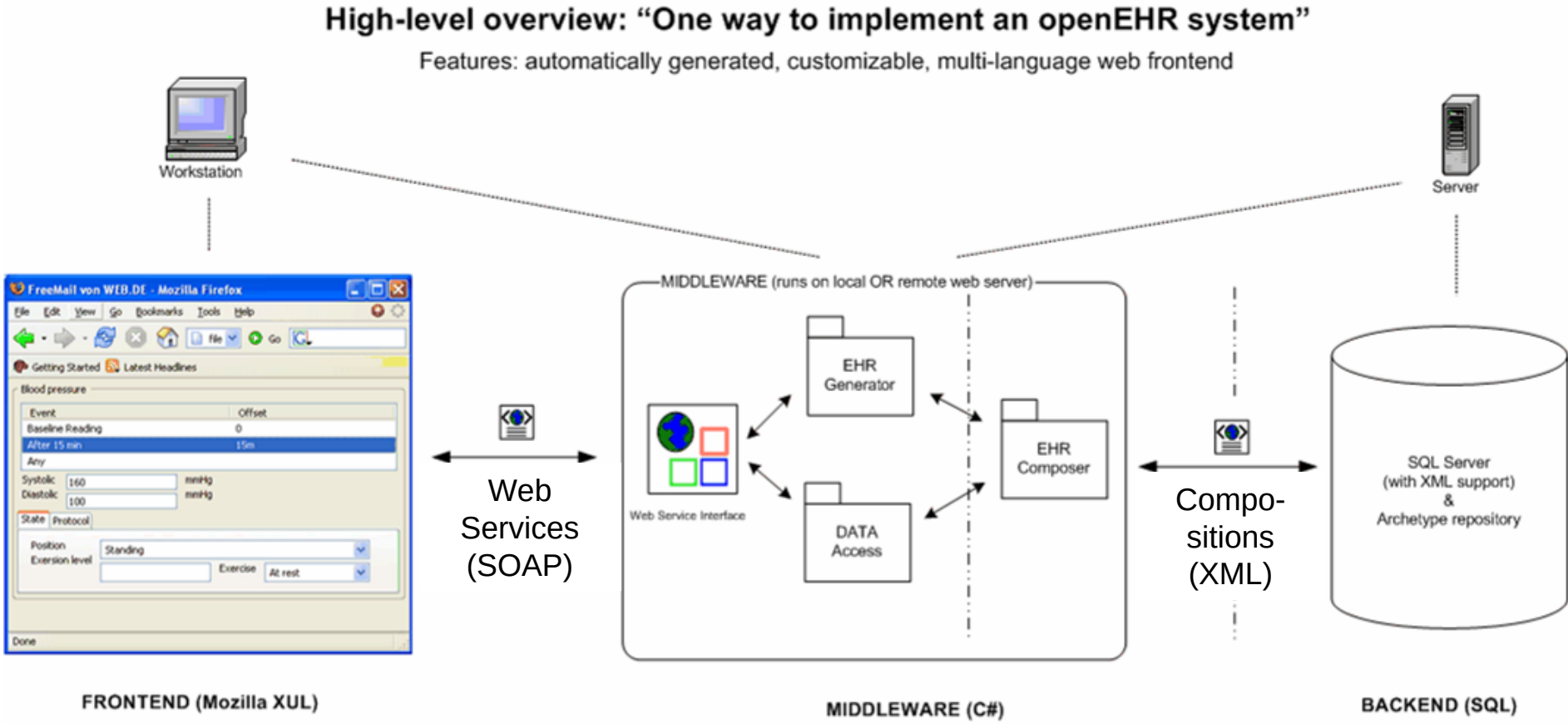
http://www.openEHR.org

http://www.oceaninformatics.biz

Archetype Specialisation



Scenario 3: EHR (User Interface) Generator

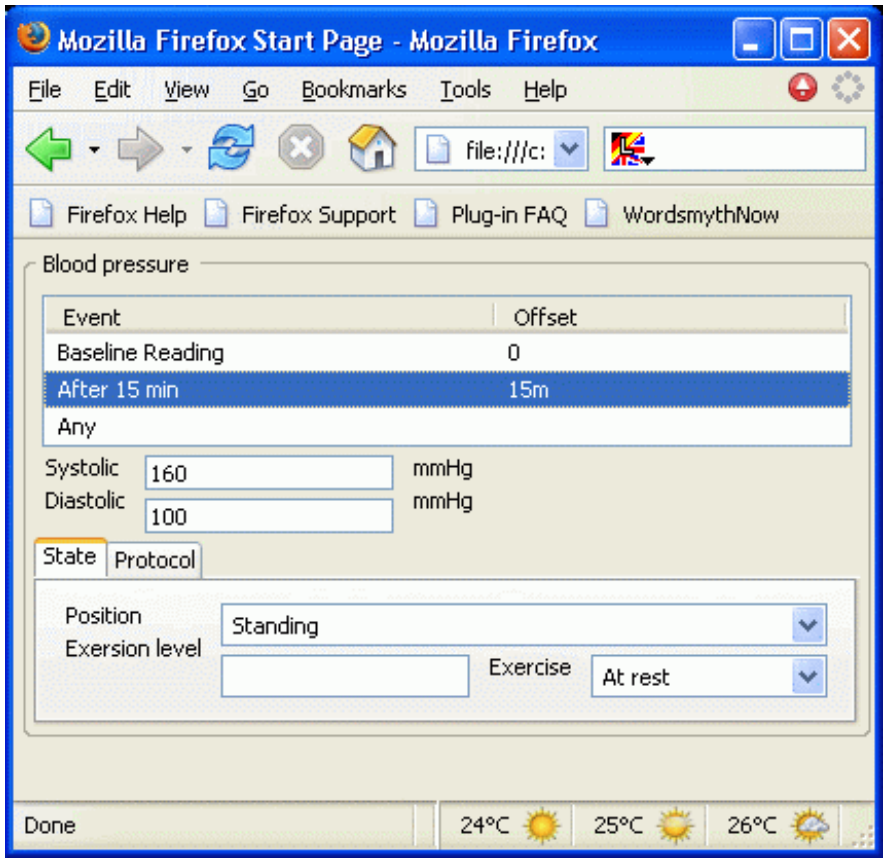


Automatically generate the user interface from archetypes: Consistent, inexpensive, easy to change, fulfils clinician's needs.

By Thilo Schuler, Sebastian Garde, Sam Heard

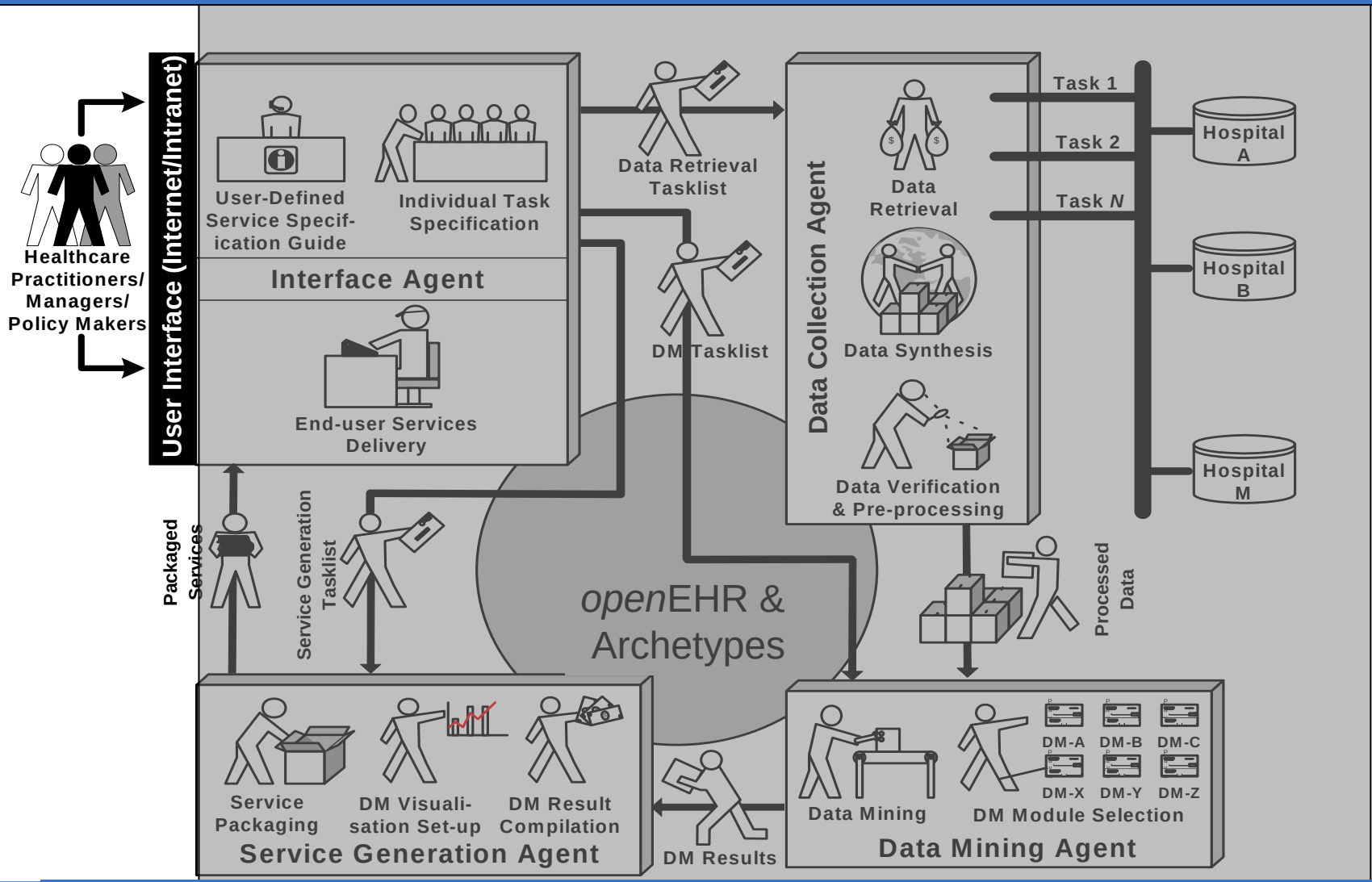
Edit and view a blood pressure

- Edit a blood pressure



- View a blood pressure

Scenario 4: Data Mining

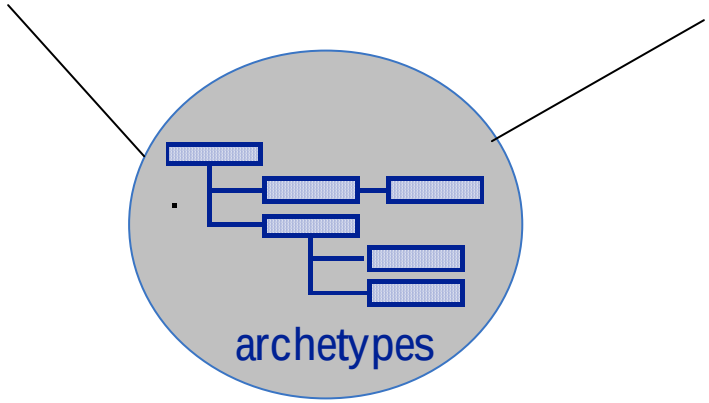


Hassan SZ, Garde S, Hovenga E (2005): Applying Knowledge Discovery in Healthcare Repositories: Towards Multi-Agents Collaboration. *ITA05* Wrexham, UK.

States and Protocols

State:
Data about person which is required for safe interpretation

e.g.
Patient sitting or standing when measuring blood pressure



Protocol:
Data about everything else, not required for safe interpretation

e.g.
type of instrument used.

Information & Knowledge

Information

- Statements about specific entities
- For example, the statement "**Gina Smith (2y) has an atrial septal defect, 1 cm x 3.5 cm**" is a statement about Gina Smith, and does not apply to other people in general.

Knowledge

- Statements which apply to all entities of a class
- For example, the statement "**the atrial septum divides the right and left atrial chambers of the human heart**", which might be found in a medical knowledge-base.

Archetype Levels

- Different levels:
  - Descriptive (Entry types)
    - Observation *(e.g. blood pressure measurement)*
    - Evaluation *(e.g. adverse event)*
    - Instruction *(e.g. medication order)*
    - Action (*e.g. drug administration*)
  - Organisational
    - Section *(Document Headings)*
  - Thematic
    - Composition *(Documents)*

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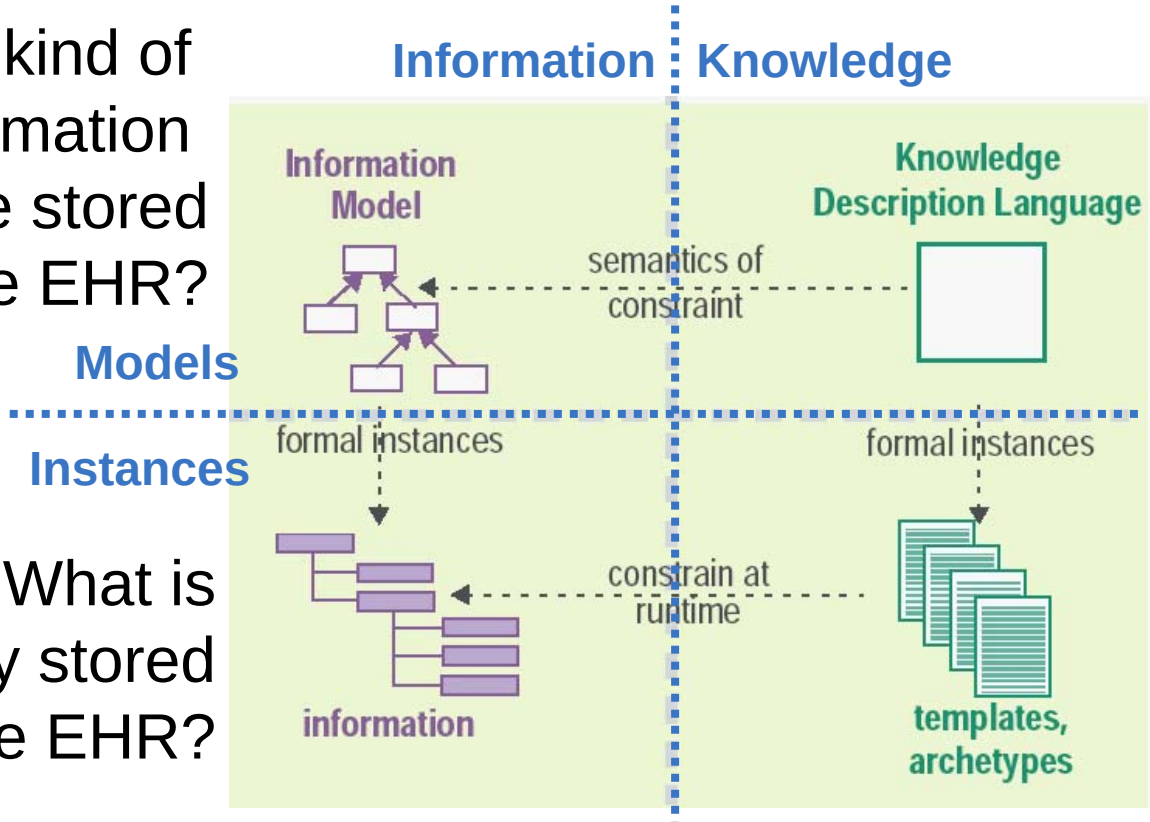
Archetypes and Two-Level Modelling*

What kind of information can be stored in the EHR?

How do we describe what makes sense to store in the EHR?

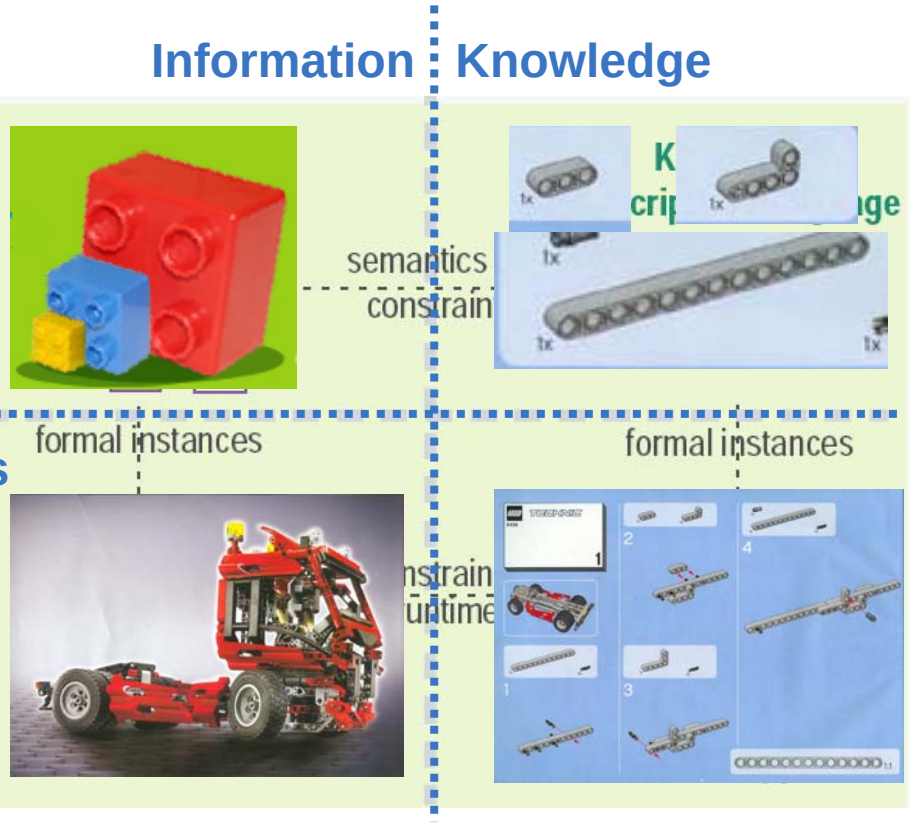


What is actually stored in the EHR?

What makes sense to store in the EHR?

* After: Beale T. Archetypes: Constraint-based Domain Models for Future-proof Information Systems. OOPSLA 2002 workshop on behavioural semantics, 2002.

Archetypes and Lego®



What happens if you do not have this?

Archetypes and Lego®

What could be put together?

Models

Instance

What is actually put together?

How do we describe what makes sense to put together?

What makes sense to put together (design plan)?


Interoperability:
There must be an easier way?

Expectations

Timely information
for ALL professions
with a minimum of trouble

EHR

Customizable and
maintainable without too
much effort – even when
knowledge changes;
No vendor lock-in

The information that is
relevant to me
in the structure I need it

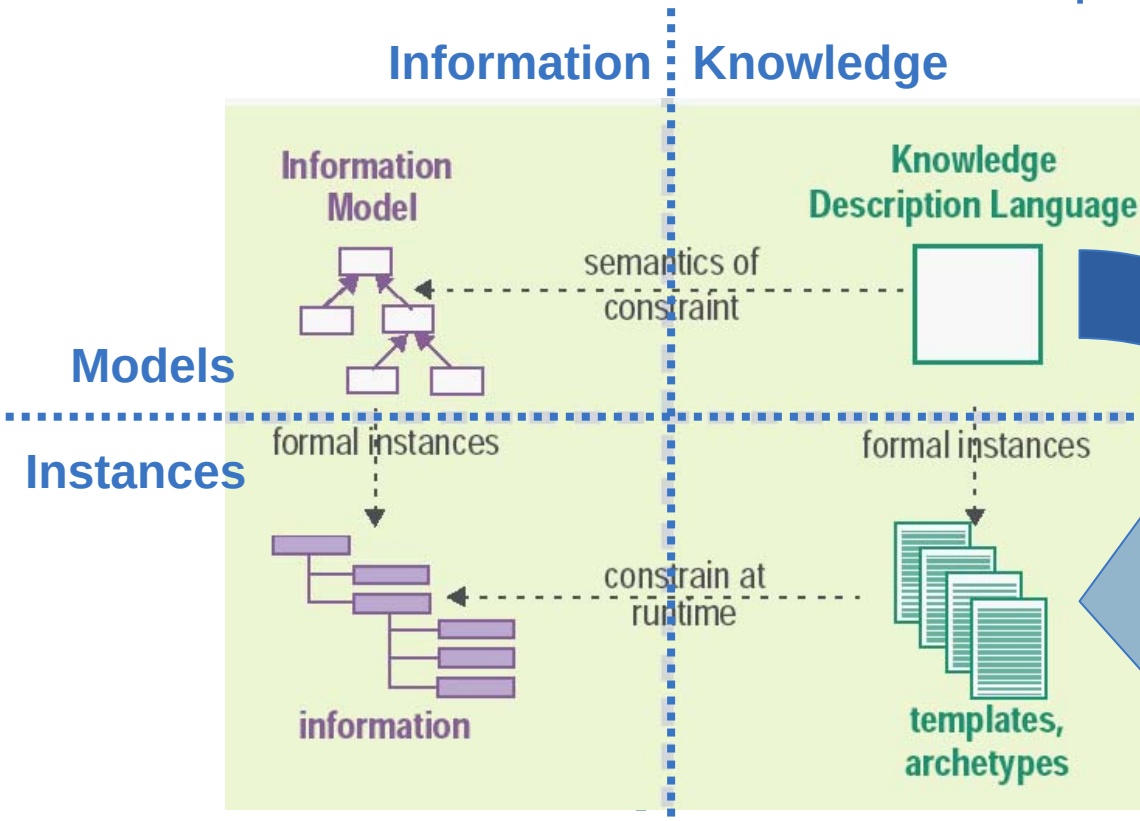
But clinicians don't want to learn this...

```
archetype
        openEHR-EHR-OBSERVATION.blood_pressure.v1

concept
        [at0000]        -- blood pressure measurement
description
        author = <"Sam Heard <sam.heard@oceaninformatics.biz>">
        submission = <
                organisation = <"openEHR Foundation">
                date = <2004-05-18>
        >
                version = <"version">
        status = <"draft">
        revision = <"1.0">
        description("en") = <
                purpose = <"Describe systemic blood pressure measurement result and protocol">
                use = <"">
                misuse = <"">
        >
        adl_version = <"1.2">
        rights = <"">

definition
        OBSERVATION[at0000] matches {          -- blood pressure measurement
                data matches {
                        HISTORY[at0001] matches {       -- history
                                events cardinality matches {1..*; ordered} matches {
                                        EVENT[at0002] matches {         -- baseline reading
```

Archetype Definition Language (ADL)

Archetype Editor

..uses the abstract archetype model to develop archetypes



Ocean informatics

Archetype editor

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