

Semantic Interoperability Using Archetypes in Regional EHR

TIS Meeting at SKL

2008.12.02



Dr. Rong Chen

Chief Medical Information Officer



- Medical Doctor
- PhD Candidate (EHR semantic interoperability)
- Implementing *openEHR* since 2004
- Lead of the *openEHR* Java Implementation Project since 2005
- Member of the Architecture Review Board at the *openEHR* Foundation since 2008
- +10 years in e-Health

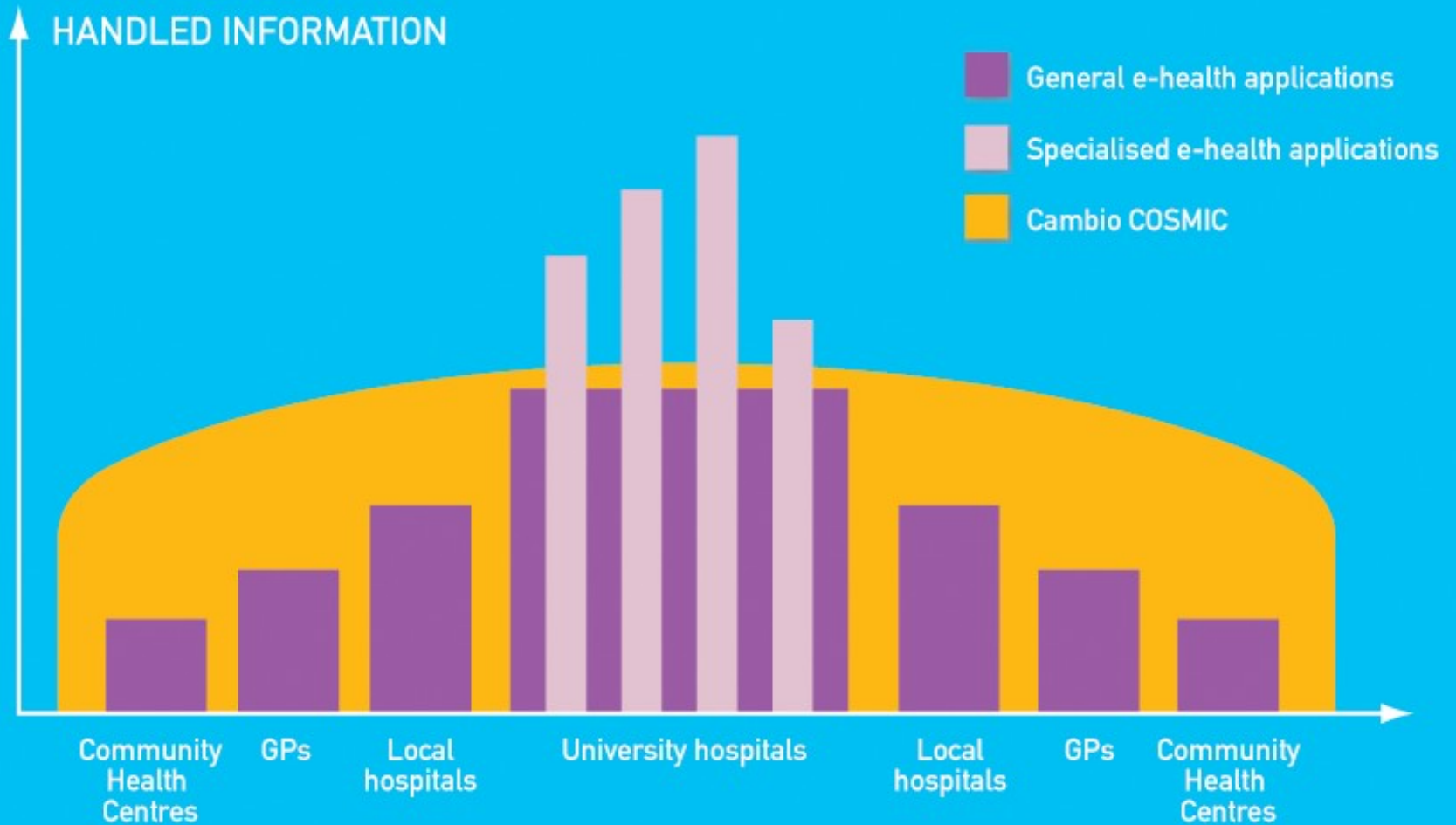


Cambio COSMIC

CAMBIO – the company

- In e-Health since 1993
- Turnover 14 M€ and 170 employees
- More than 70 000 licensed users
- Present in Sweden, Denmark and the U.K.
 - Expanding into the Netherlands
- Leader in regional EHR
 - 8 Proven Regional installations

COSMIC Reality and CAMBIO'S Vision of Regional EHR



Towards Next Level of Functionality

- Both human users and IT-systems have to understand the meaning of the shared data
- **Semantic Interoperability** is the real challenge
- We think this can be achieved through **archetypes**

Cambio's **Archetypes** Initiatives

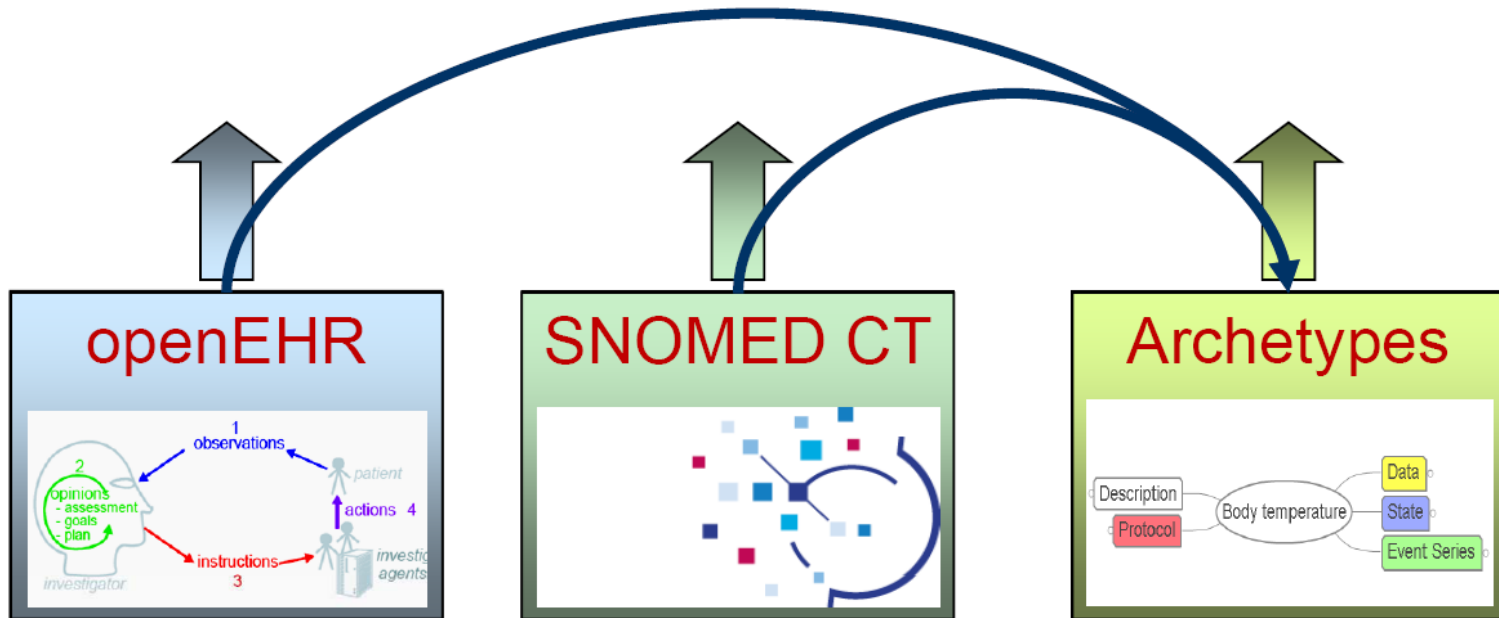
- **CEN** standardization: **EN13606** etc
- ***openEHR***
 - Sponsor the ref. Java project
 - Member of **Architecture Review Board**
 - Participate in archetypes review process
- **OHT, Open Health Tools**
 - open source e-Health projects

Cambio's **Archetypes** Initiatives

- **Research Partnership with IMT (Linköping Univ.)**
 - Advanced EHR architecture & CDSS
 - Part of **NovaMedTech** consortium
- **Archetype-based Quality Registry**
 - Joint dev. by SKL & Uppsala in 2009
 - Archetypes based semantic layer
 - Advance analytic queries & knowledge discovery
- **Danish Archetype Trial-out project**
 - Digital Health Denmark (SDSD)

The three EHR pillars

EHR system
- exchanging and sharing data



DIGITAL SUNDHED
SÄMMAFÖRÄNDRINGENDE DIGITALT SUNDHED I DANMARK



Background for the archetype project

- ❑ Clinical content documents and the lack of structure
 - A lot of descriptions produced for several years
- ❑ Need for a common format to ensure sharing and reuse of the clinical content
 - No agreement on a common format between the regions
- ❑ *openEHR* - archetypes
 - Many countries have shown interest (Sweden, UK, Netherlands....)
- ❑ Archetypes on the way to becoming a standard in ISO 13606 part 3

Standard aktivitet (SA)	Standard resultat (SR)	SR / værdi	SR / værdi	Kommentar
Planlægning	⊕ Booking kardiologisk amb.	Dato/klokkeslæt (tal. værdi)		
Undersøgelser	Blodprøver ⊕ LABKA*	Na	K	Tidsaspekt 3. mdr.

Export COSMIC Template as Archetype

The screenshot displays a software interface for managing templates. On the left, a list of templates is shown, with 'Anteckning Avd KK' selected. A context menu is open over this selection, offering options such as 'Uppdatera', 'Ny mall', 'Kopiera mall...', 'Ta bort mall', 'Generera TTX', and 'Export Template'. On the right, the 'Mallnamn' field contains 'Anteckning Avd KK', and the 'Hjälpstext' field is empty. Below the main list, a detailed view of the 'Anteckning Avd KK' template structure is visible, showing a hierarchical tree of elements including 'Anamnes', 'Kontaktersak', 'Status', and various clinical observations like 'Allmäntillstånd', 'Psykliska funktioner', 'Andning', 'Hjärta, kärl', 'Blodtryck', 'Puls', and 'Hud'.

Exported COSMIC Template in Archetype Editor

Ocean Archetype Editor [Anteckning Avd KK]

File Edit Publish Language Terminology Tools Help

Archetype file name: **openEHR-EHR-EVALUATION.Anteckning_Avd_KK.v1**

Header Definition Terminology Display Interface Description

Protocol Participation

Data

Tree

Ordered at0016

- Anamnes
 - Kontaktersak
 - Aktuellt
- Status
 - Allmäntillstånd
 - Psyksiska funktioner
 - Andning
 - Hjärta, kärl
 - Blodtryck
 - Systoliskt
 - Diastoliskt
 - Puls
 - Hud
- Matsmältning, endokrint
- Blod-, immunsystemet
- Urin, könsorgan
- Övriga sinnen
- Smärta
 - Smärta VAS
- Aktivitet, delaktighet
 - Kommunikation
 - Förflyttning
 - Personlig vård
- Bedömning

- Åtgärd
- Planerade åtgärder
- Utförda åtgärder

Constraint Details

Occurrences

Min: 1 Max: 1 Unbounded

Description: description

Runtime name constraint: ...

Quantity

Property: Pressure

Units: mmHg

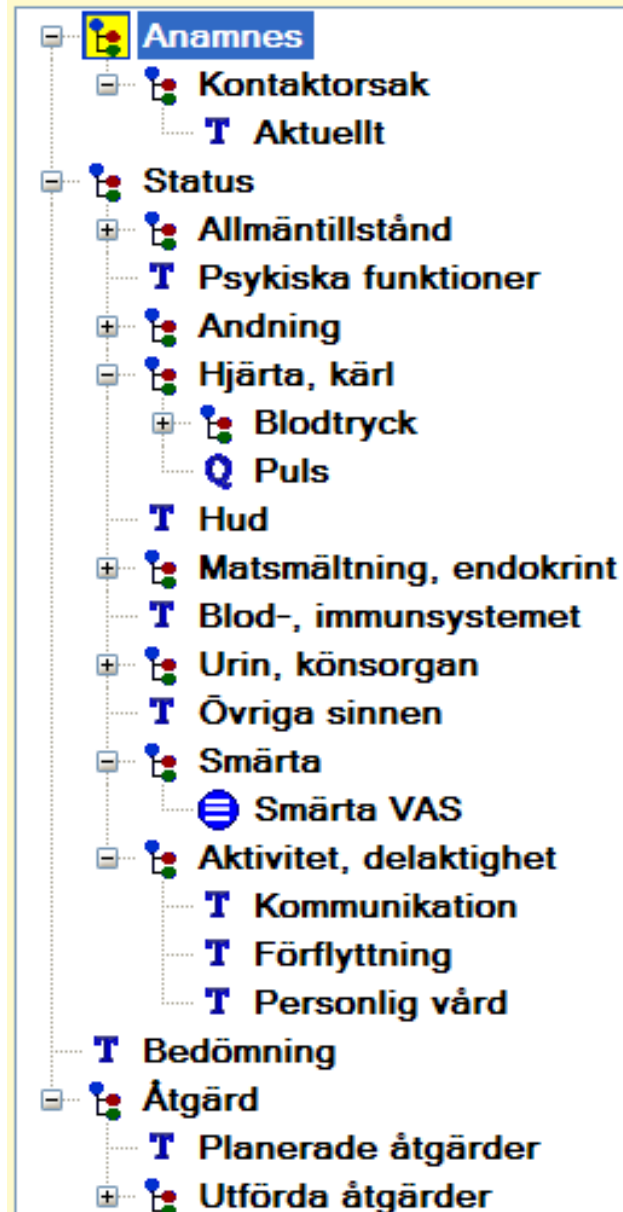
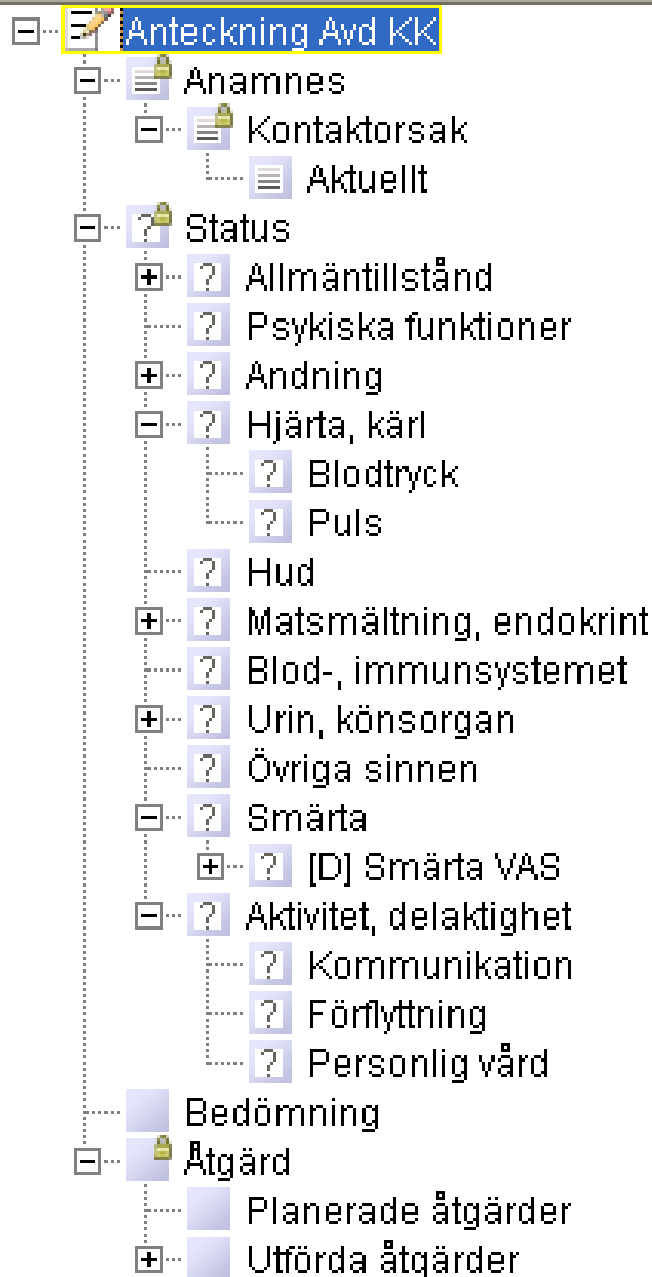
Count

Limit decimal places 0

Set min. value >= 35

Set max. value <= 300

COSMIC Template & Archetype Side-by-side



Archetype from Danish Archetype Project

Ocean Archetype Editor [Diagnosis]

File Edit Publish Language Terminology Tools Help

Archetype file name:
openEHR-EHR-EVALUATION.problem-diagnosis.v1

Header Definition Terminology Display Interface Description

Protocol Participation

Data Protocol

Tree

Ordered at0002.1

Diagnosis

- T Status
- Date of initial onset
- Age at initial onset
- Severity
- T Clinical description
- Date clinically recognised
- Location
 - T Body site
 - T Location description
- Aetiology
 - T Agent
 - Complication of
 - T Description
- Occurrences or exacerbations
 - Q Frequency of recurrence
 - Date of last occurrence
 - Occurrence/exacerbation
 - Number of occurrences
- Related problems
 - Related problem
 - Related problem
 - T Clinical description
- Date of resolution
- Age at resolution
- Diagnostic criteria
 - T Criterion
- Clinical staging
 - T Stage
 - Tumour
 - Nodes
 - Metastases

Constraint Details

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

Imported Archetype as COSMIC Template

The screenshot displays the 'Template manager' application window. On the left, a list of templates is shown, with 'openEHR-EHR-EVALUATION.problem-diagnosis.v1' selected. The main area shows the template's structure, including categories like 'Diagnosis', 'Aetiology', and 'Related problems'. The right side features a control panel with buttons for 'Add', 'Delete', 'Move up', 'Move down', 'Blocked', 'Required', 'Load', 'Connect', 'Dynamic', and 'Set standard text'. The bottom of the window contains a toolbar with buttons for 'Import Template', 'New template', 'Copy to presentation template', 'Copy form...', 'Remove template', 'Modify template', 'Generate TTX files', 'Save', and 'Close'.

Template name: openEHR-EHR-EVALUATION.problem-diagnosis.v1

Type of template: Standard

Help text: [Empty field]

URLs: [Empty field]

Structure:

- Diagnosis
 - structure
 - 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 recurrence
 - Date of last occurrence
 - Occurrence/exacerbation
 - Clinical description
 - Outcome
 - Date of onset of occurrence
 - Date of resolution of occurrence
 - Number of occurrences
 - Related problems
 - Related problems
 - defining_code
 - Related problem
 - Related problem
 - defining_code
 - Related problem
 - Related problem
 - defining_code
 - Related problem
 - Related problem
 - defining_code
 - Related problem
 - Related problem
 - defining_code
 - Related problem
 - Clinical description
 - Date of resolution
 - Age at resolution
 - Diagnostic criteria
 - Criterion
 - Clinical staging
 - Stage
 - Tumour
 - Nodes
 - Metastases

Cambio COSMIC, Rong Chen, (RongC)

GroovyConsole Patient Medical record Referral Overviews Order management Administration Window Help

Load... Clear 19 121212-1212 Tolvan Tolvansson 95 year Search 19... [Warning] [Error] [Print] [Refresh] [Home] P G U

Medical record 19 121212-1212 Tolvansson, Tolvan

Medical Record Write

- All notes
- 20 latest notes
- My notes
- Health overview
 - Health sheet
- Care episodes
- Documents
- Growth chart

20 latest notes < No filter > [Filter] [Print] [Refresh] [Home]

20 of 20 notes in the view has been loaded. [Load next]

23/10/2008 15:05 problem Chen, Rong, Medicine Clinic
 Unsigned Medicinkliniken

Diagnosis Header

- structure
- Status provisional
- Date of initial onset 23/10/1996 15:05
- Age at initial onset 56
- Severity Moderate
- Clinical description The most important feature of the graphical designer tool is that it includes support for both the business analyst as well as the technical developer. This enables a smooth transition from business process modelling to the practical implementation.
- Clinical staging
 - Tumour T2 - Tumour invading 1 cm
 - Nodes N0 - no regional nodes involved
 - Metastases M1 - Distant metastases

27/05/2008 10:14 Chen, Rong, Medicine Clinic
 Unsigned

Unsigned

- Lipid studies**
 - data 2008-05-22T20:04:26
 - Any event 2008-05-22T20:04:26

Ngw note Delete Print... Sign Save Close

Environment: Archetype Research Active user role: Care Provider Active working location: Medicine Clinic

Medical record entry created with imported archetype

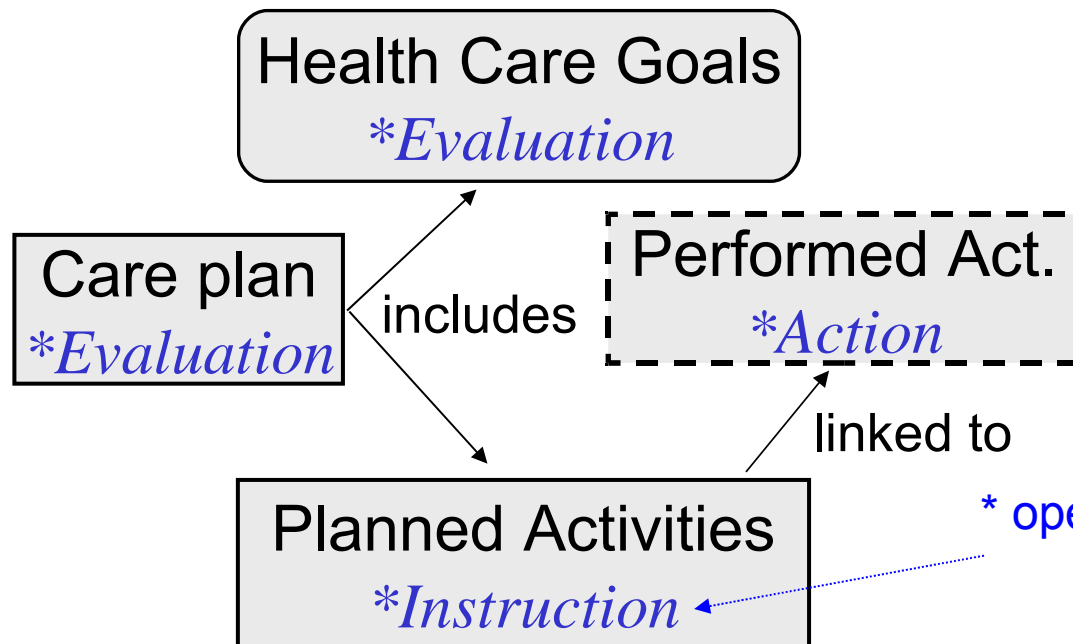
Already achieved all the end goals at the mid-way demonstration

Interoperable Care Plans

Rewarded Presentation at MI, Läkarsämman 2008.11.28

Concepts from **CONTsys** (EN13940, System of concepts to support continuity of care) the **openEHR** EHR Reference Model (RM) are used to represent care plans

- Goals (what)
- Planned activities (when & how)
- Performed activities (status)

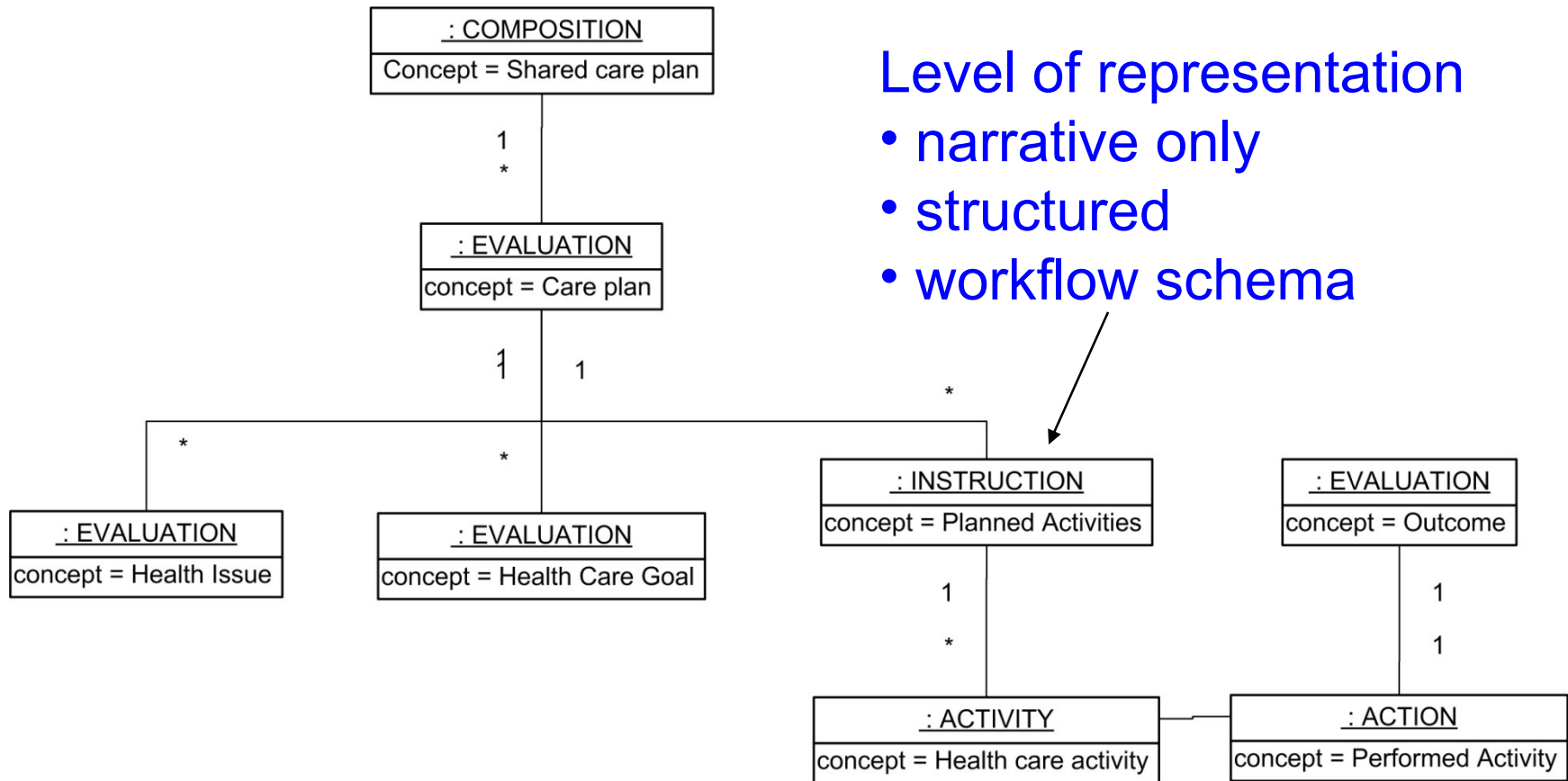


Advantages

- Improved **Interoperability**
- Enabling decision support
- Facilitating process support
- Reusable clinical models

* openEHR EHR model Entry types

Interoperable Care Plan in *openEHR* RM



Level of representation

- narrative only
- structured
- workflow schema

Clinical Decision Support

Elective

- links to literature that requires manual interpretation

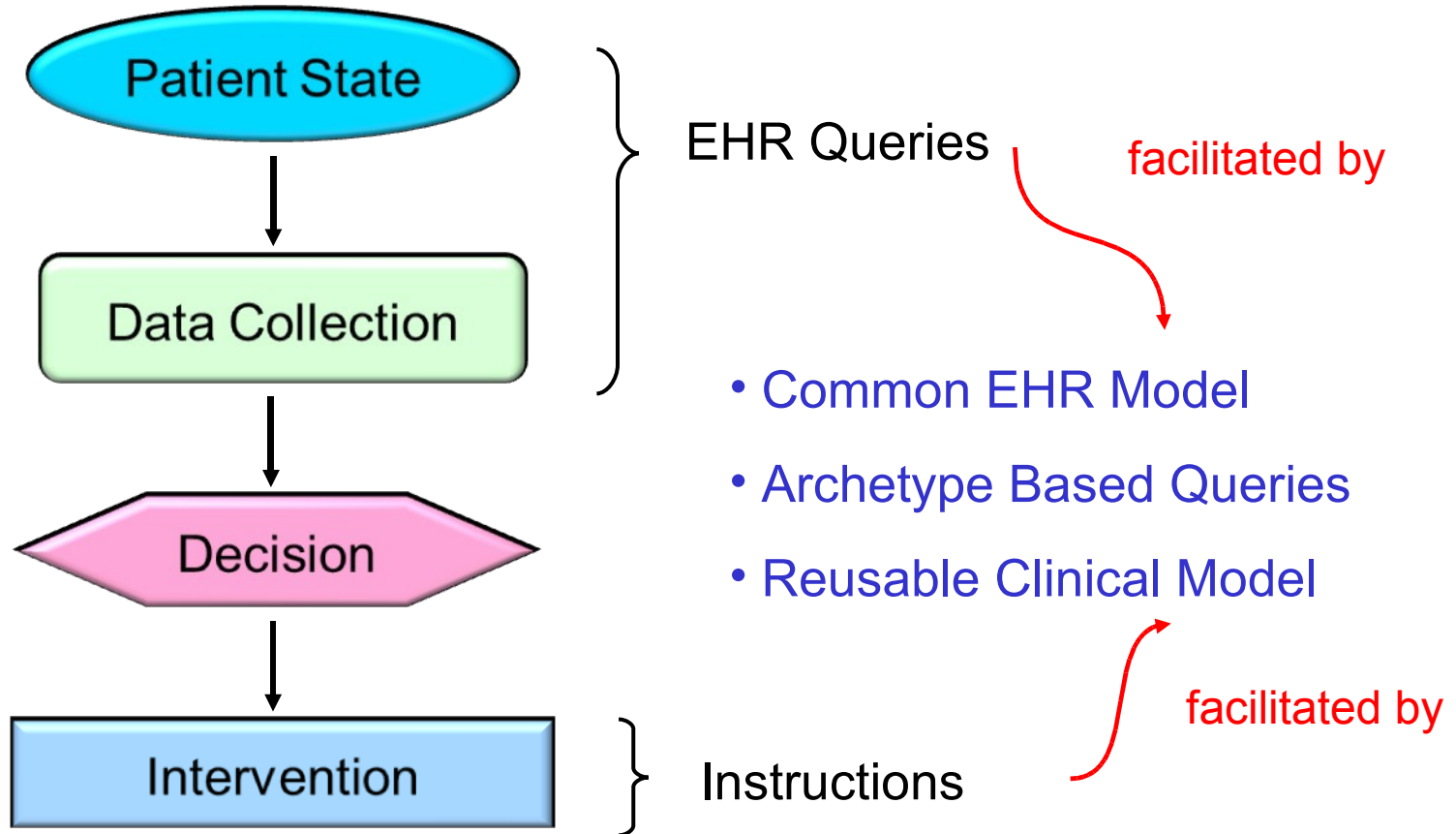
Passive

- templates for order sets, formularies & protocols
- simple rules for limited context based alerts

Active

- evidence-based clinical **guidelines**
- **context** sensitive alerts & reminders
- integrated with **care process**

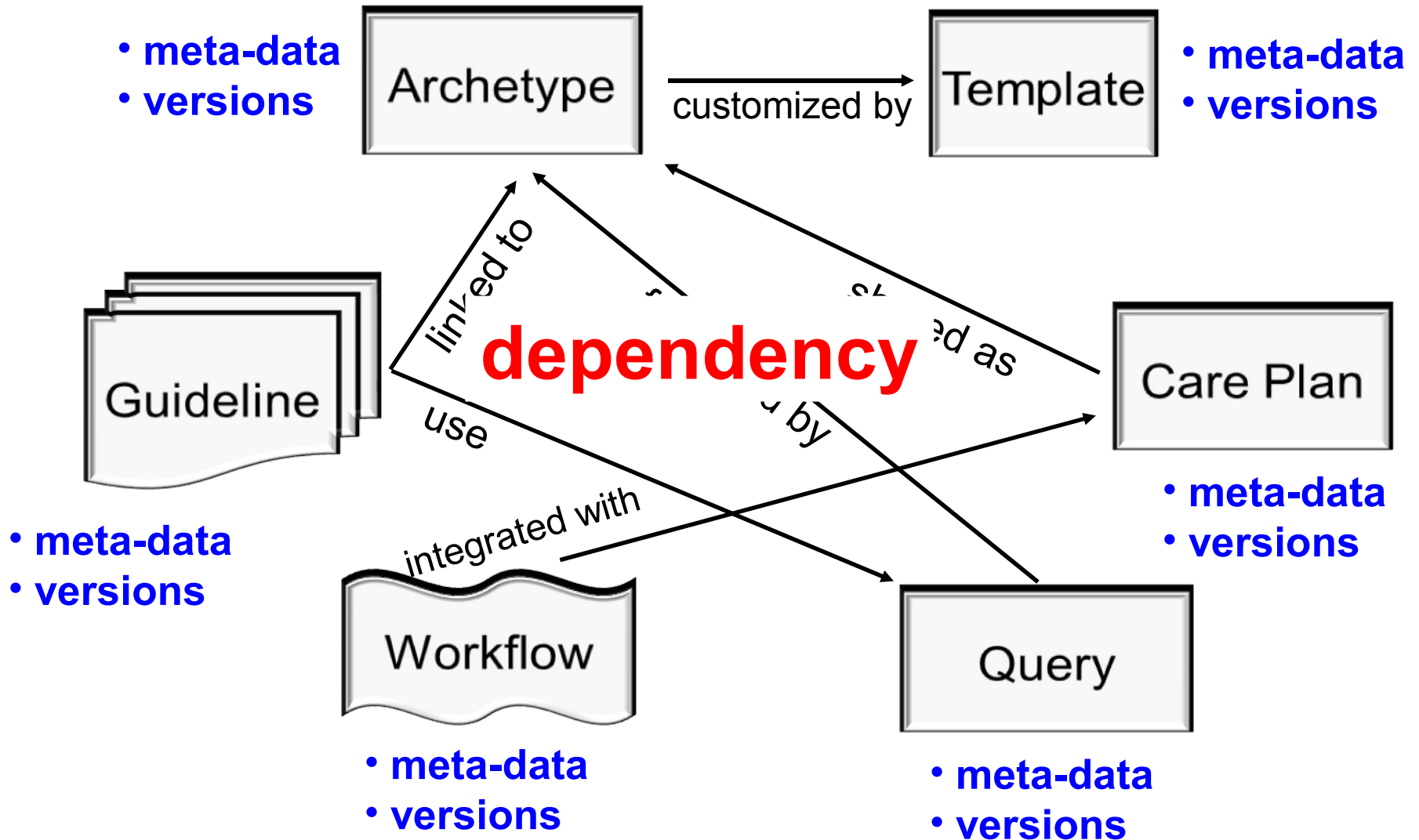
Decision Support Benefited from Archetype Based Interoperability



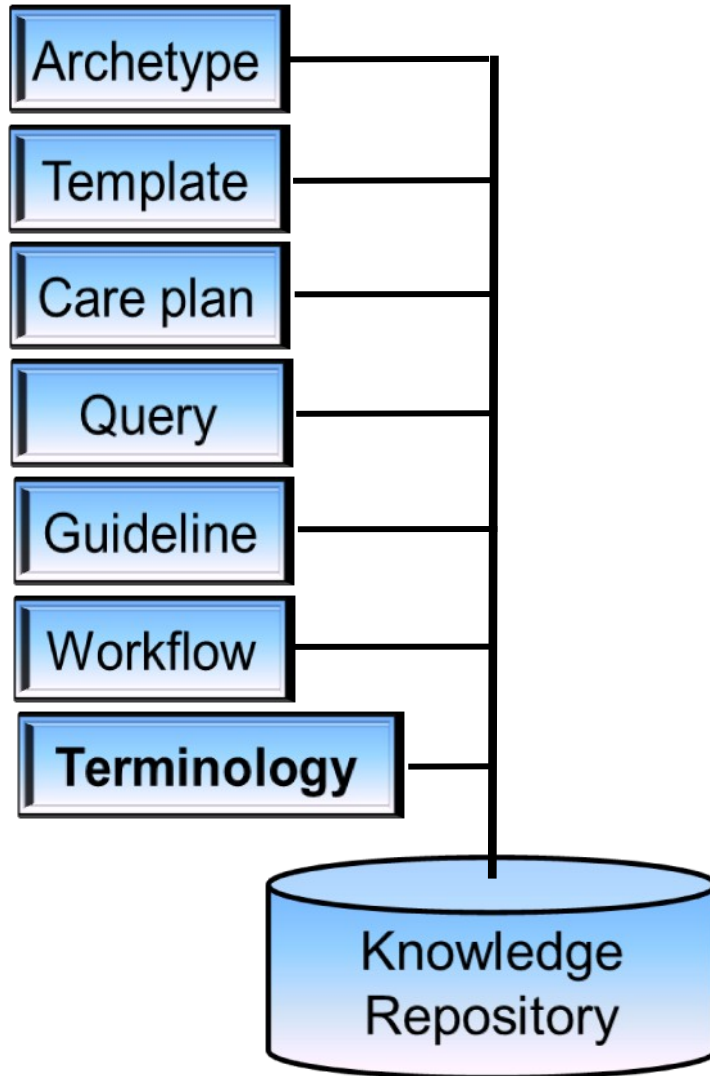
Guideline Representation Primitives

source: D. Wang et al. *Int J Med Inform.* 2002;68(1-3):59-70

Interrelated Knowledge Artefacts



Knowledge Management



Features

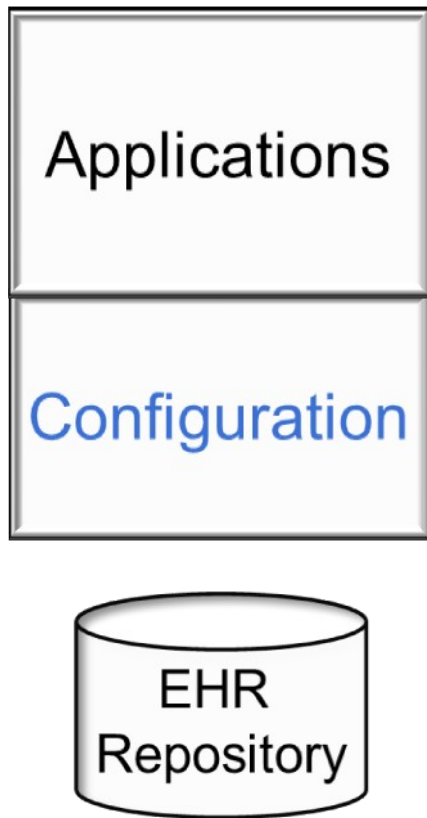
- Indexing / searching
- Consistence checking
- Change management
- Release management
- Online authoring
- Exists at difference levels

Benefits

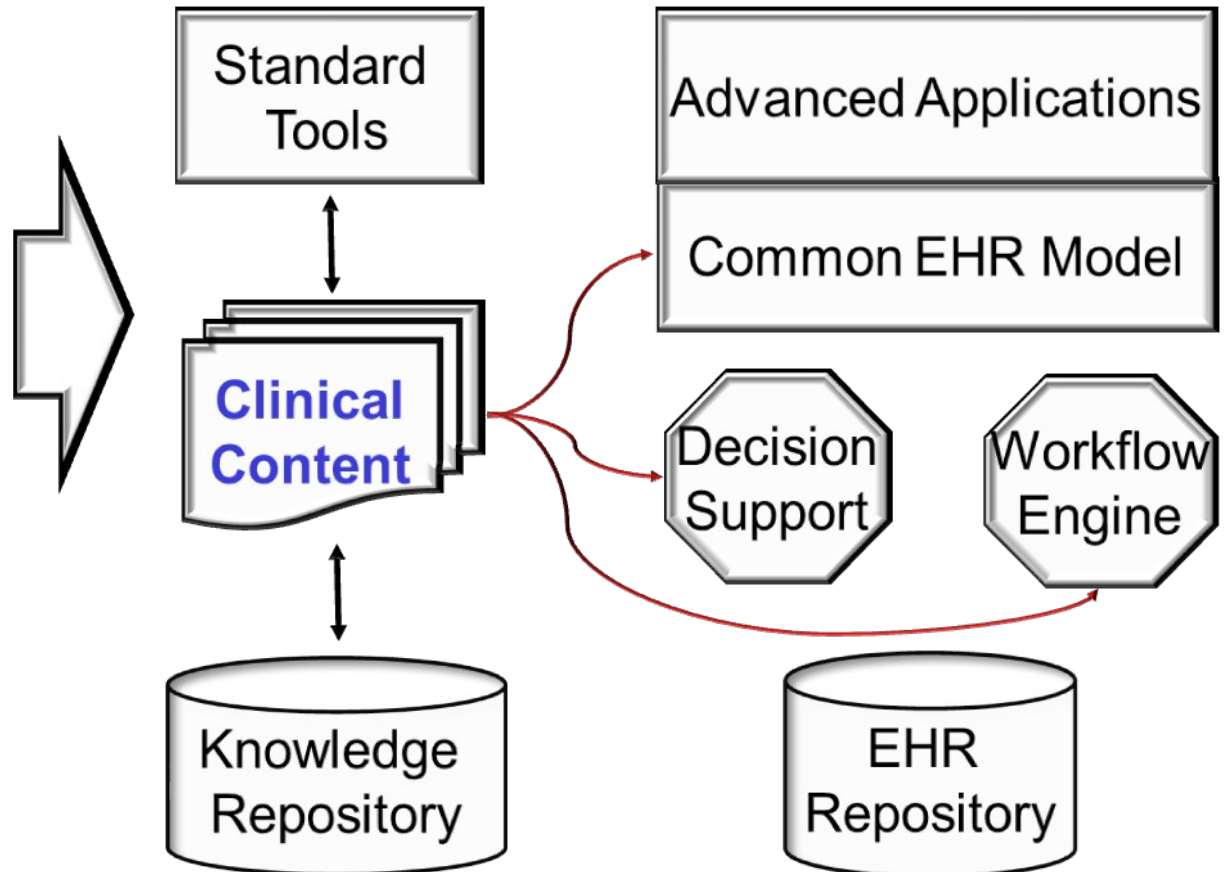
- Encouraging reuse
- Quality assurance
- Proper maintenance
- Empower care professionals
- **Open-ended & sustainable**

Evolution of Regional EHR Architecture

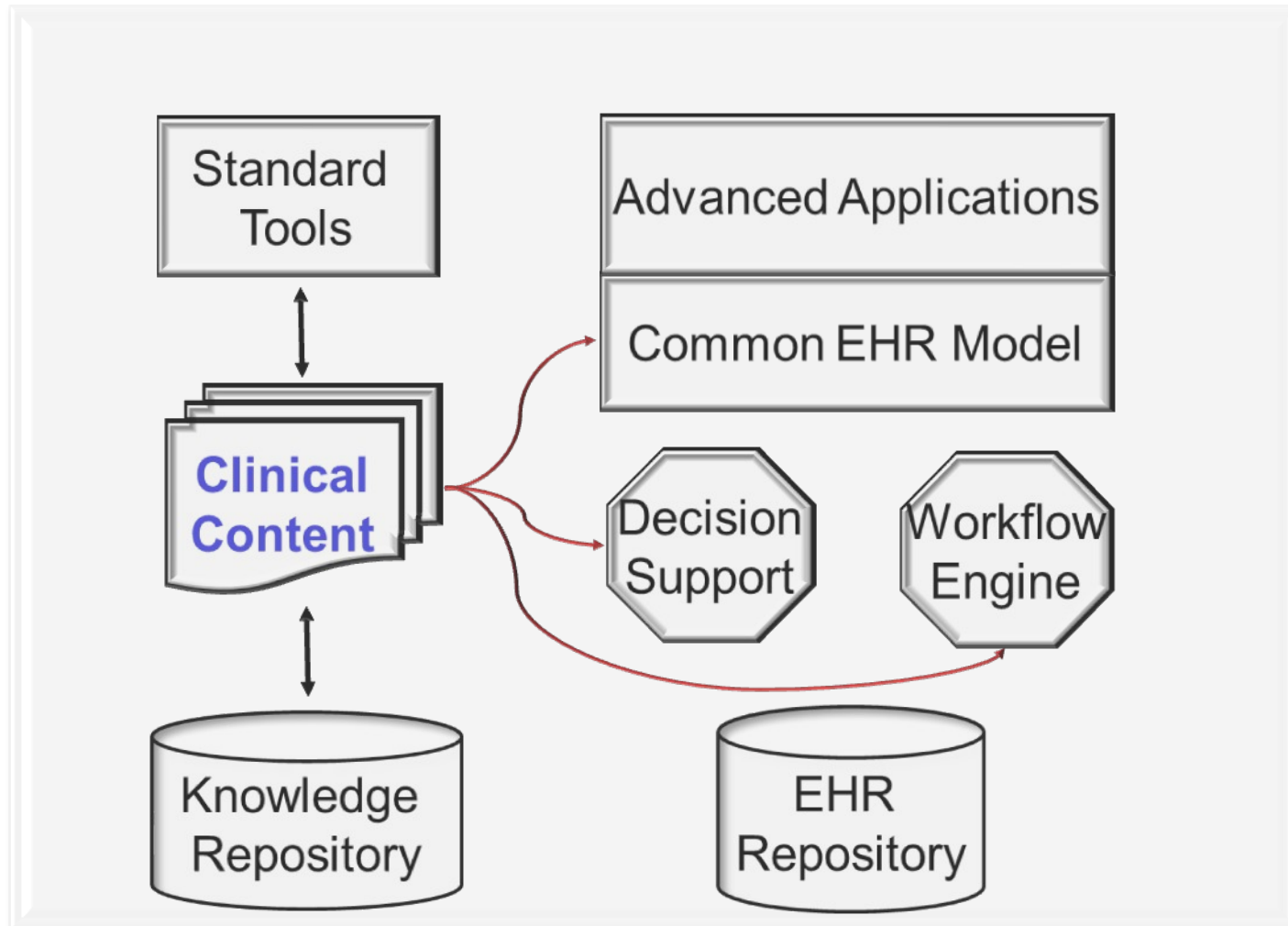
Legacy View



Current View



The Next Generation **COSMIC** EHR



Built on **Semantic Interoperability**

Conclusions

Semantic interoperability is the major challenge of a regional EHR solution.

Archetypes based logical EHR architecture is the corner-stone of an interoperable regional EHR.

Integrated **guidelines, care plans** and **process support** provide the foundation for the next generation EHR functionality.

Clinical **knowledge management** must be in place to ensure sustainable development and quality of entire regional EHR solution.