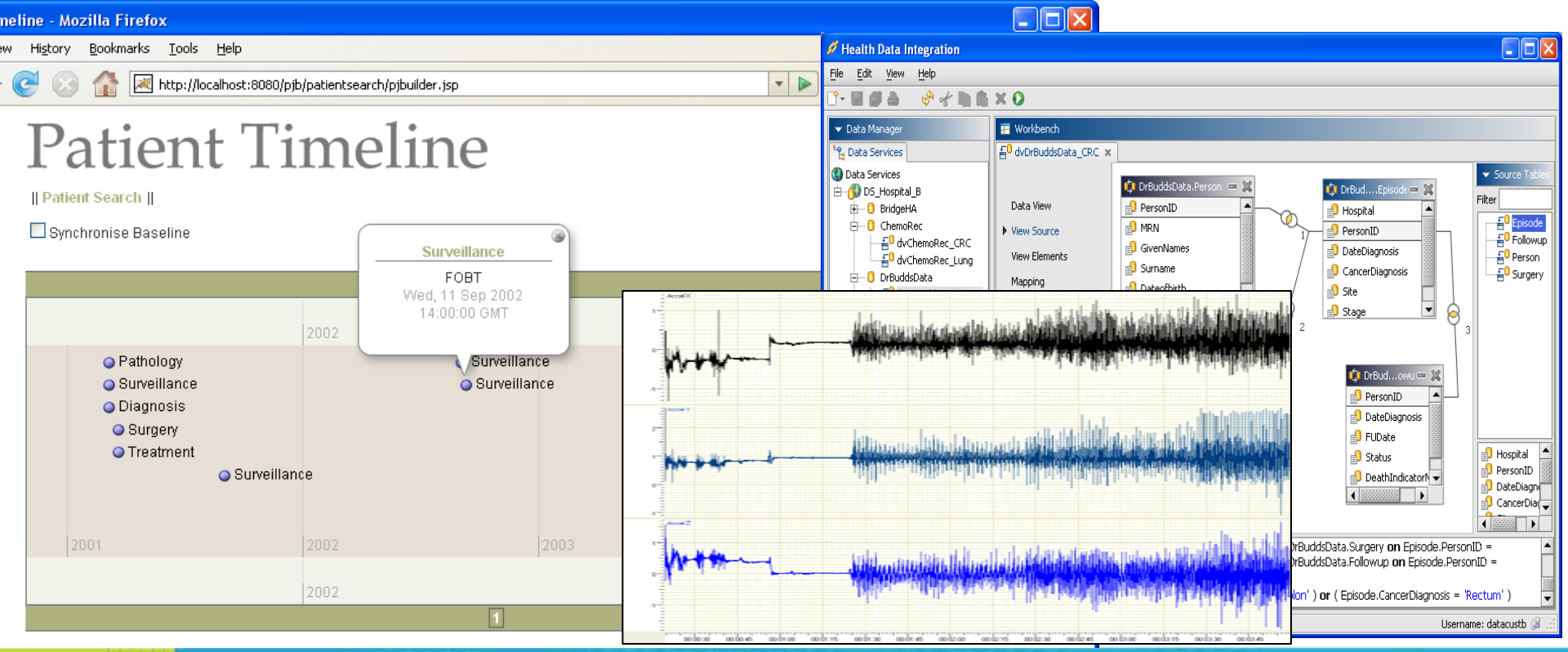

Linked Data: Fast, low cost semantic interoperability for health care?

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About the presentation

- **Part I: Motivation**
  - Why we need semantic operability in health care
  - Why enhancing existing systems to increase semantic interoperability may be necessary
- **Part II: A Linked Data-based solution**
  - Linked Data background
  - Applying the Linked Data approach in health care
  - Work at AEHRC

Pt 1: Semantic interoperability in health care

- **Definitions**
  - ... means that the information exchanged by different computer systems can be interpreted by both computer applications and human users (NeHTA)
  - … means ensuring that the precise meaning of exchanged information is understandable by any other system or application not initially developed for this purpose (EC Recommendation COM(2008) 3282 final)
  - … is the seamless inter- and intra-organisational co-operation between health information systems of fully machine interpretable, standardised and coded data (Stroetmann, 2009; Walker et al., 2005)

- **Maturity models (e.g. Walker's Levels 1-4)**

- **High semantic interoperability maturity is assumed**
  - Canada Health InfoWay
  - NHS Connecting for Health
  - Australian Department of Health & Aging Health*Connect*
  - Interoperability is a significant part of NeHTA's work program

Options for increasing maturity

- **The reality of the health care system is that budgets are less important than treating patients**
  - IT projects rarely get funded to simply replace existing functionality
  - Increasing the scope of a system implementation increases costs
- **Enhancing existing systems to support higher levels of semantic interoperability may be a preferred (or only) option**
- **Using open standards is a good idea**
  - Avoid silos (and vendor lock-in) down the track
  - Information models: openEHR
  - Clinical terminologies: SNOMED CT

So where are we?

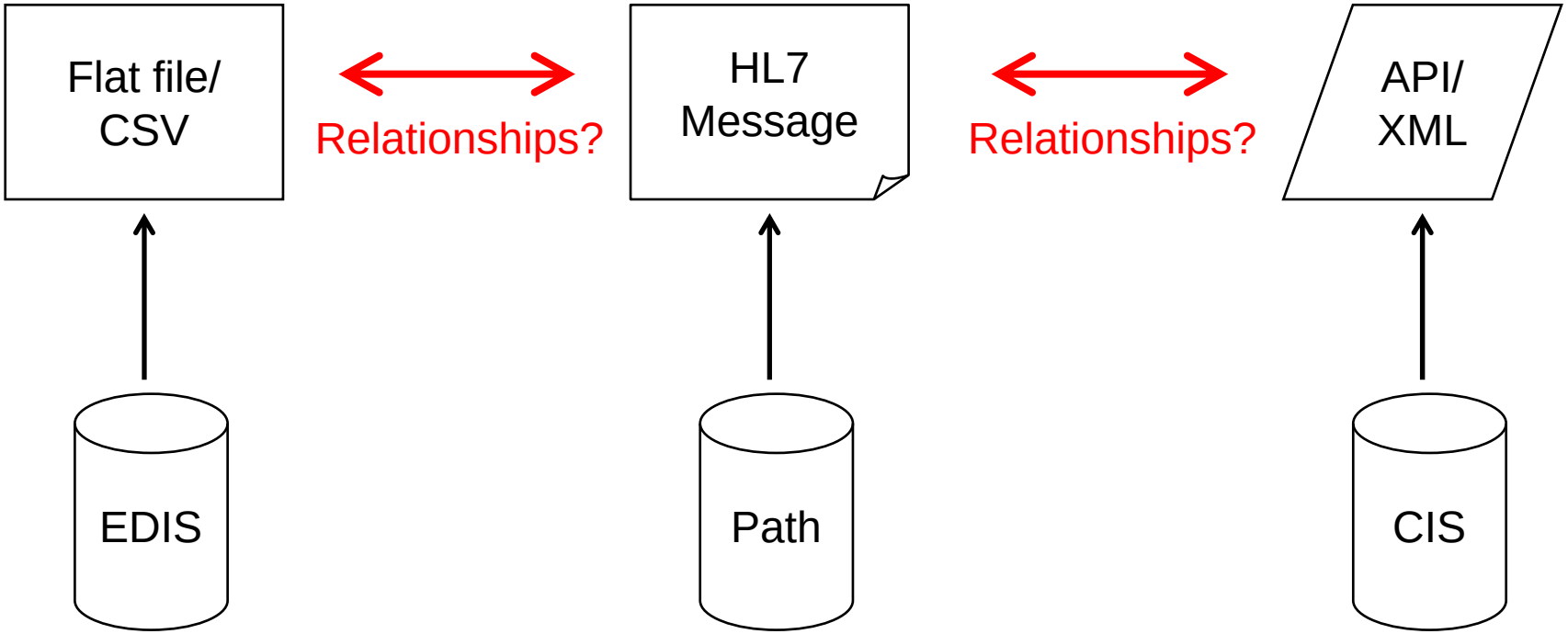
- **Increasing semantic interoperability maturity is a Good Thing.**
- **It's not always possible or appropriate to increase semantic interoperability maturity with new system development.**
- **We'd like a way to quickly increase semantic interoperability maturity for existing systems at a low cost**

Pt 2: Linked data for health system interoperability?

- **Linked data background**
  - Conceptual difference in integration styles
  - What is it
  - How does it work

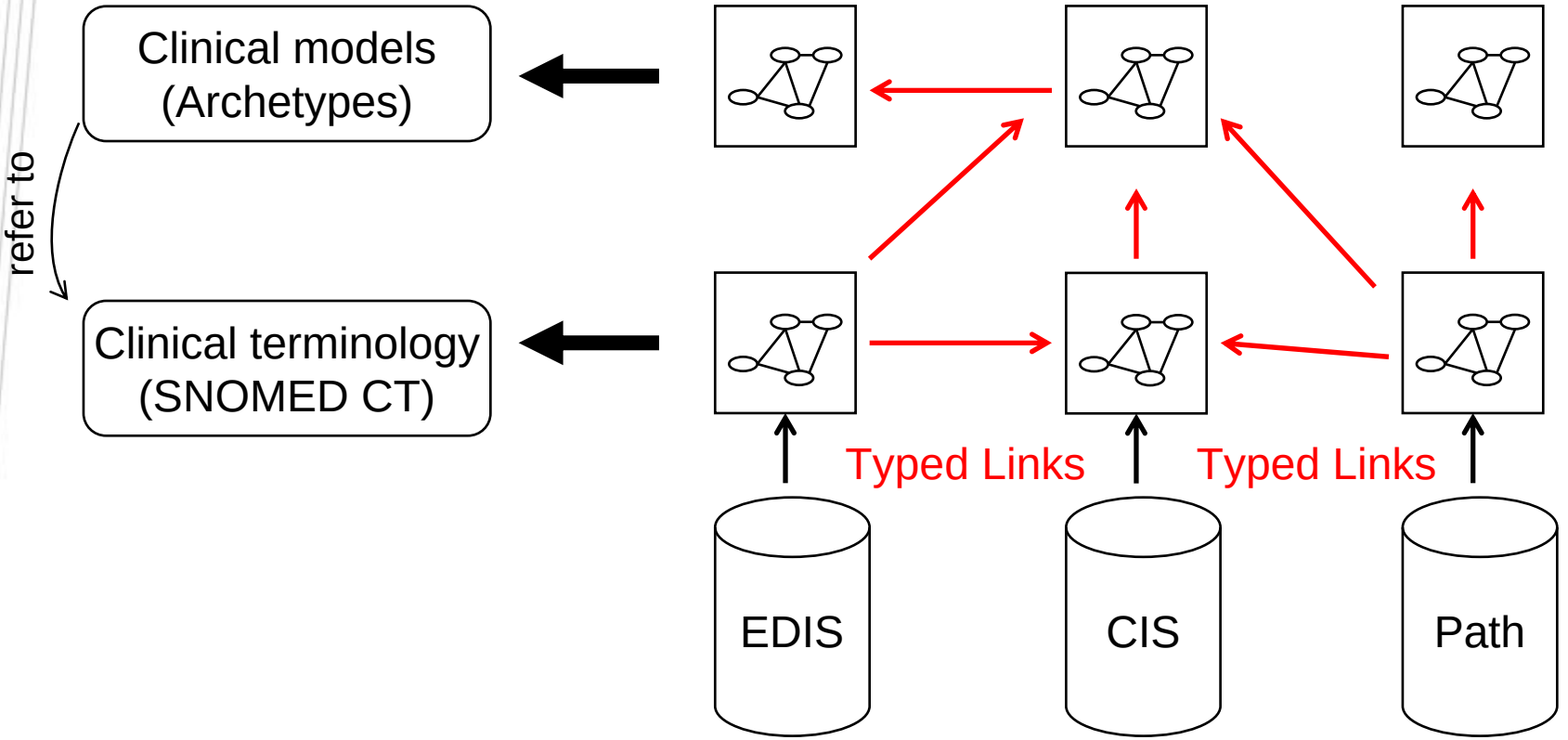
- **Applying the linked data approach to health care**
  - Vocabulary
  - What tools are and are not available?
  - Applications
  - Issues

Approaches to Integration: Typical



Inspired by Heath 2009

Approaches to Integration: Linked Data



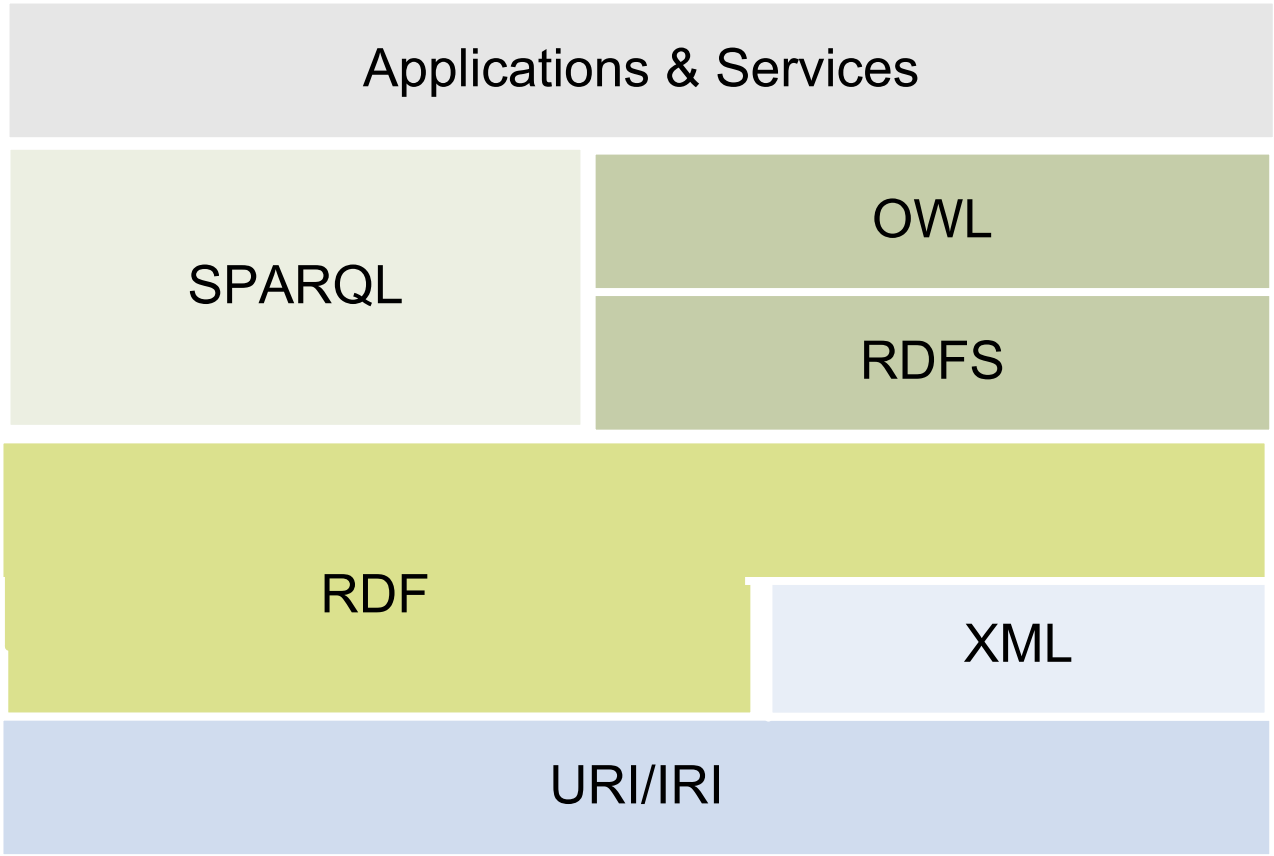
What is Linked Data?

- **Linked data is about using Web technologies to create typed links between data from different sources.**
- **A recommended best practice for exposing, sharing, and connecting pieces of data, information, and knowledge on the Web using URIs and RDF (Wikipedia, 16 August 2009)**
- **A step on the road to the Semantic Web that provides a method for publishing data that:**
  - encourages reuse
  - reduces redundancy
  - maximises its (real and potential) inter-connectedness
  - enables network effects to add value to data (Health 2009)

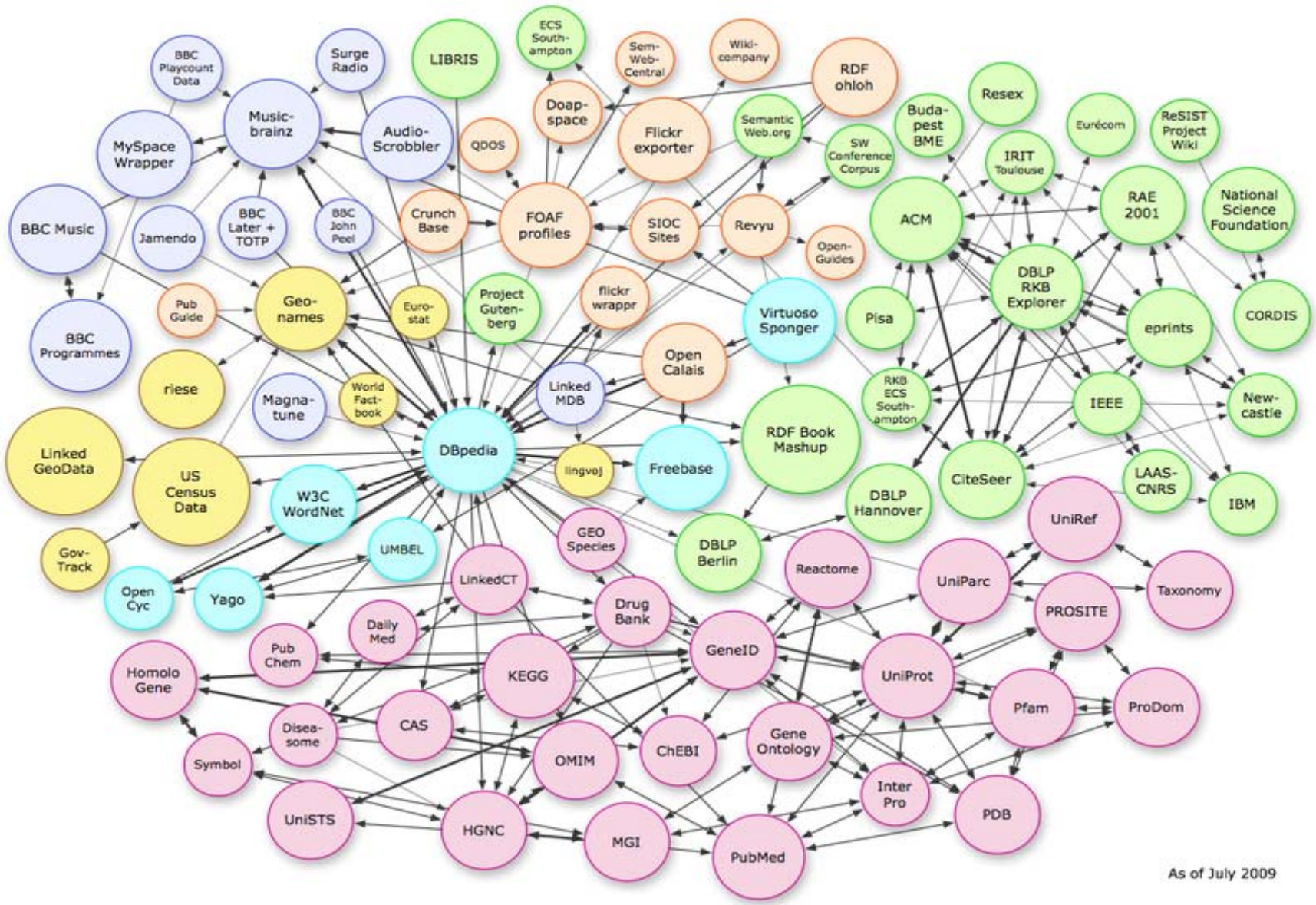
Linked Data Technology Stack

- **URIs**
  - Uniform Resource Identifier
  - A simple and extensible means for identifying a “resource”
- **HTTP**
  - Hypertext Transfer Protocol
  - A widely accepted data access mechanism
- **RDF**
  - Resource Description Framework
  - Data format for describing things and their interrelations
- **(RDFS/OWL)**
  - RDF Vocabulary Definition Language (RDFS)
  - Web Ontology Language (OWL)
  - More expressive ways for describing “things” in the world and how they are related using classes and properties
  - Vocabularies: collections of RDFS/OWL classes and properties

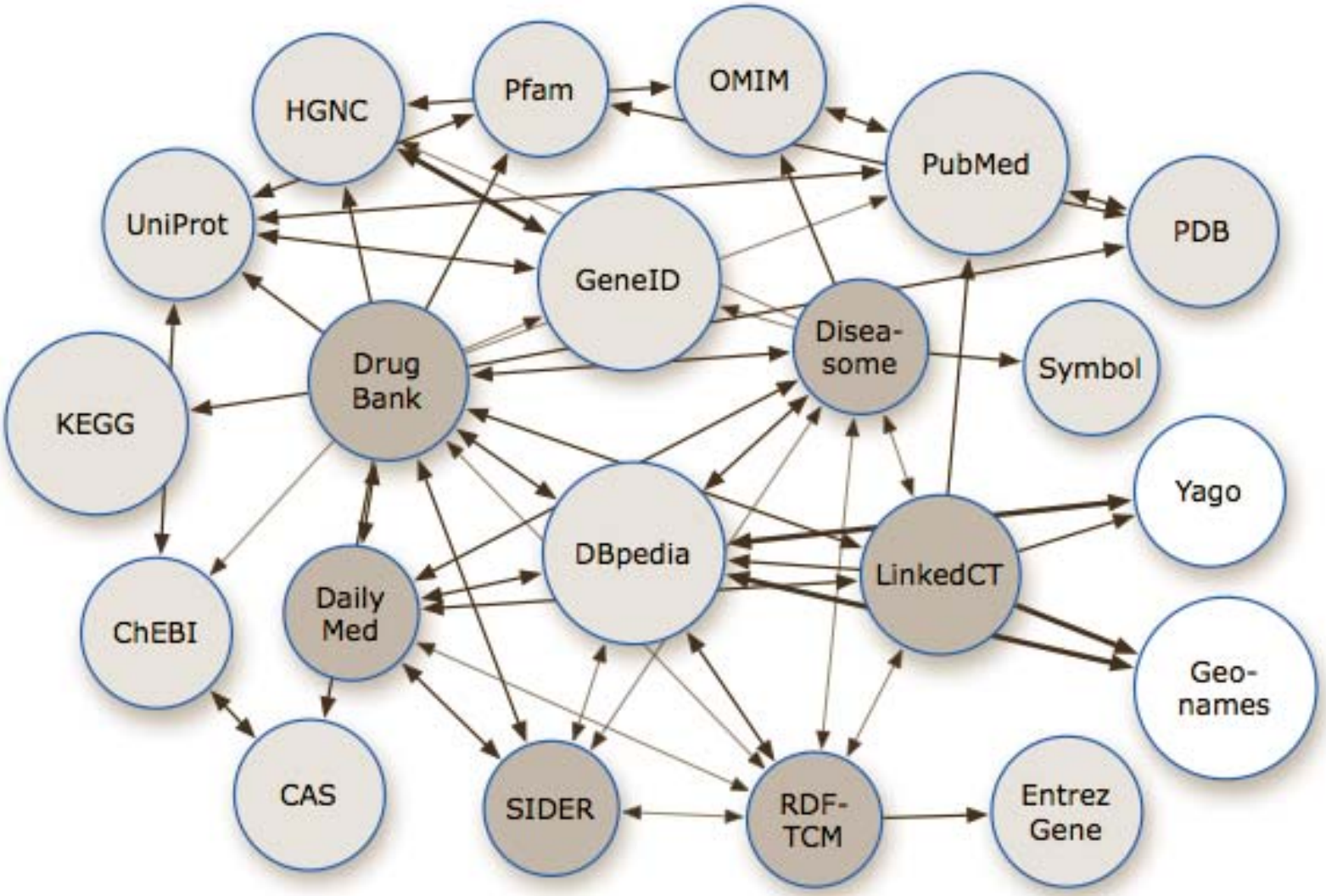
Linked Data Technology Stack



Linking Open Data Cloud (Bizer 2009)



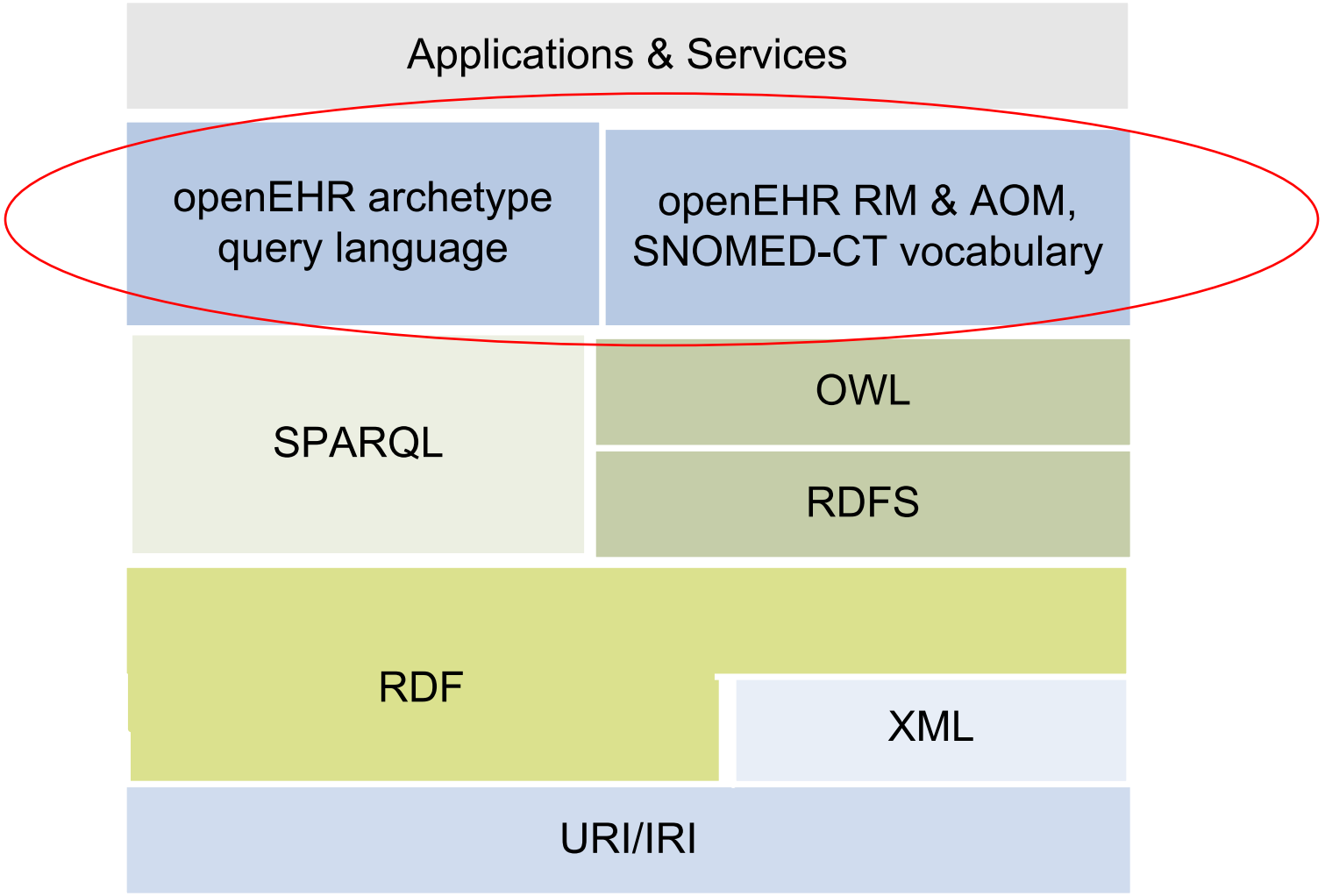
Linked Open Drug Data (LODD) Cloud



Clinical Linked Data Vocabulary

- **Many useful vocabularies already exist (re-use)**
  - LODD vocabularies
  - FOAF – describes people (identities, affiliations, social networks)
  - Geo-names - describes places
- **Clinical Model**
  - Map archetypes to OWL (Kilic 2005)
- **Terminology**
  - OWL representation of SNOMED-CT

Clinical Linked Data Technology Stack



Clinical Linked Data Tooling

- **Clinical Linked Data publishing tool**
  - Generating compliant Linked Data for clinical data based on openEHR mappings
- **Semantic link discovery**
  - Use vocabulary property-based matching algorithms to find relationships between data
    - Identity resolution -> patient master list
    - Clinical case matching
- **Patient Journey Browser**
  - Faceted browsing Linked Data for a particular patient
- **Archetype Query Language**
  - Domain specific SPARQL
  - Queries involving other vocabularies (e.g. Gene Ontology)

Summary

- **Linked data is an increasingly popular approach to semantic integration on the Web**
- **The approach can be applied to systems integration both within and between health care organisations**
  - Existing tools and vocabularies provide assistance, although some tools are missing
  - Enables the development of applications that leverage other Linked Data sets
- **Our work is in building tools for and applying the approach in health care**

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Thank you

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