



Vocabulary Sharing and Maintenance using HL7Master File / Registry Infrastructure

Review Paper

Mestrado em Informática Médica (FMUP)



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Discussion (What does it mean?)

Further Research (So what?)





Introduction

- One of the fundamental goals of computerized medical information is that of precise, accurate and unambiguous communication *
- “Any meaningful exchange of utterances depends upon the prior existence of an agreed upon set of semantic and syntactic rules” **
- Terminology interoperability in Medical IT is a big requirement for the implementation of Electronic Health Record (EHR)

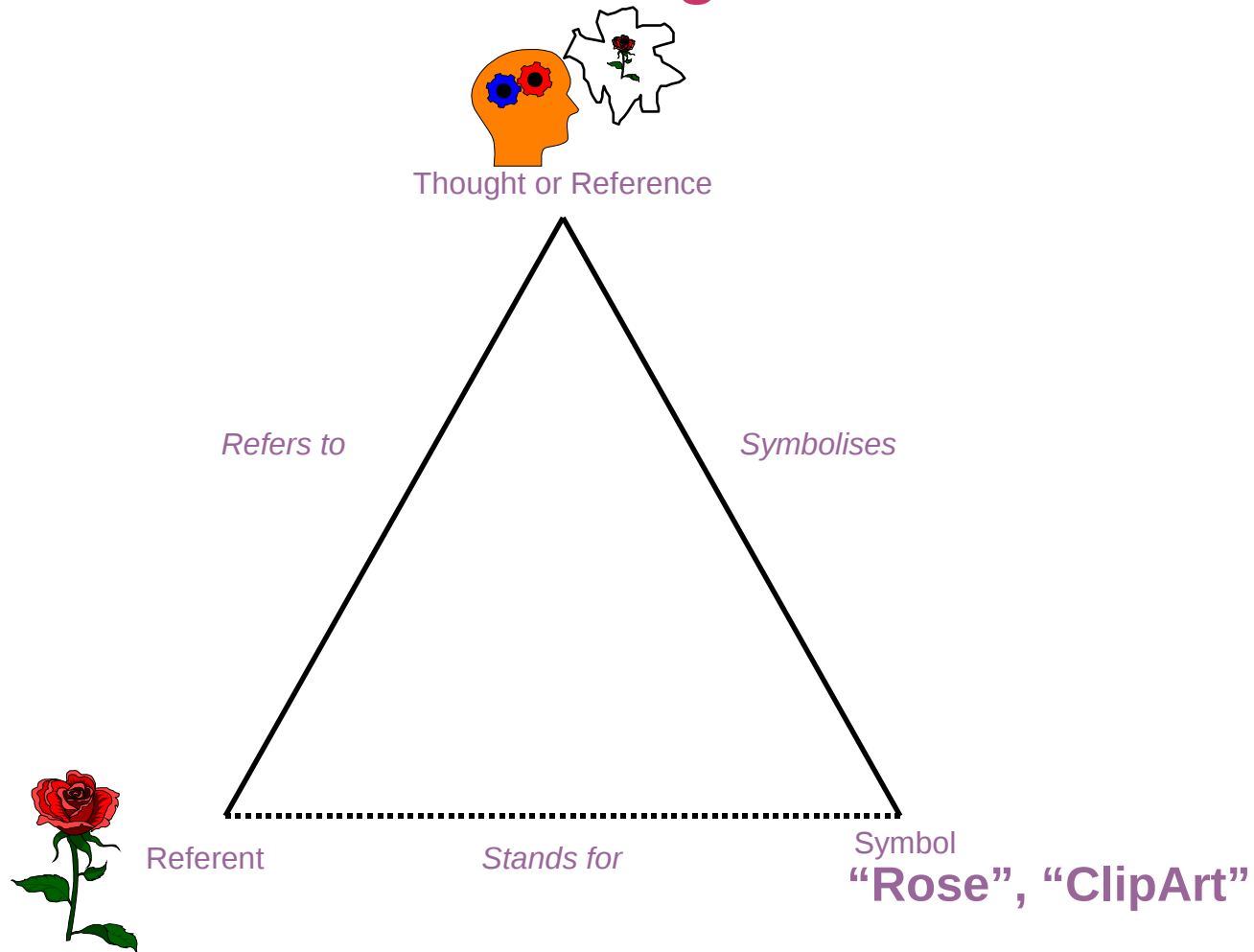
* Woody Beeler 2006, *HL7 vocabularies: Bridging information models and vocabulary in HL7*

** ISO TR9007:1987 Information Processing Systems – Concepts and Technology for the Conceptual Schema and the Information Base



Introduction

Ogden's Semiotic Triangle

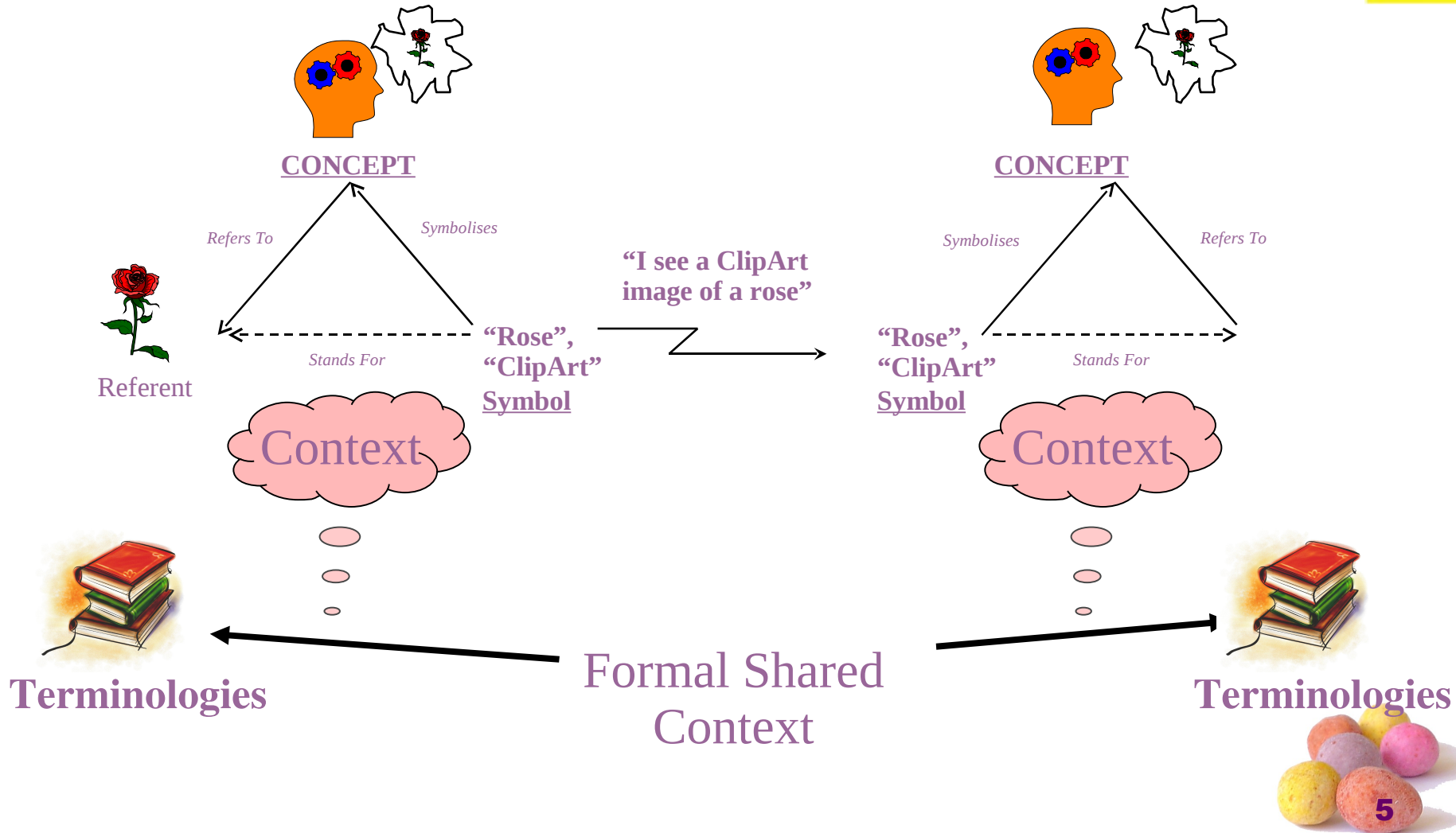


Adapted from C.K Ogden and I. A. Richards. *The Meaning of Meaning*.



Introduction

Making Shared Context Explicit





Introduction

Many terminologies / code systems

- LOINC
- CPT-4
- NIC
- NOC
- ICD-9-CM
- ICD-10
- SNOMED International
- SNOMED-CT
- ISO 4217 Currency codes
- ISO 639 Language Codes
- UMLS Metathesaurus
- RxNorm
- FDA
- ISO 3166-2 Country Codes
- NANDA
- International Classification of Nursing Practice
- HL7 Version 3 Code System Identifiers
- IANA Character Sets
- International Airport Codes





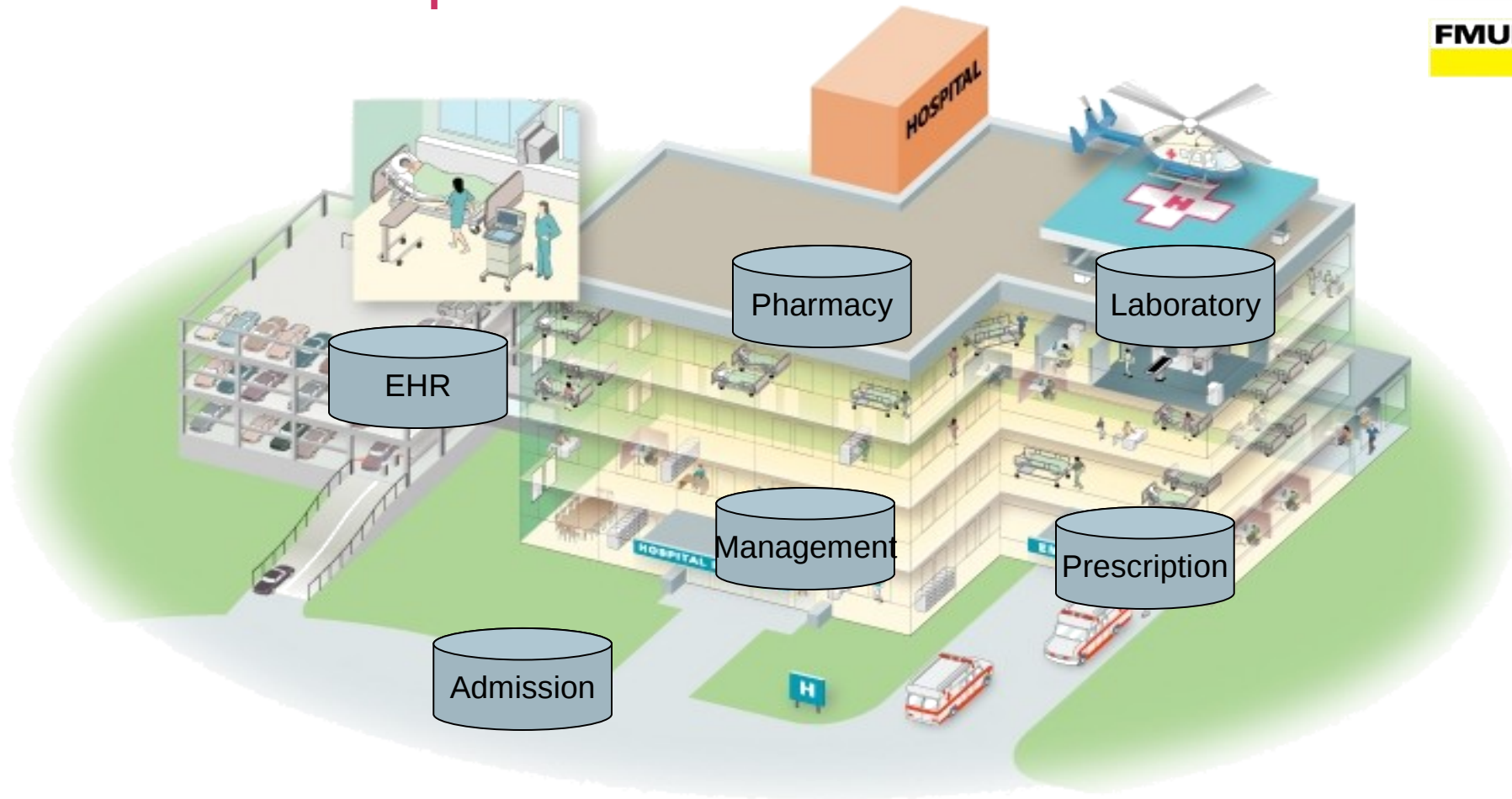
Introduction

- Producing reliable information is the ultimate goal of data processing
- An 'ocean' of data (petabytes of it)
- Modern technologies enable efficient fusion of heterogeneous data
- Danger of producing unreliable information if the process of integration is based on erroneous assumptions
- **How do we share and maintain vocabularies ??**



Introduction

What is the problem

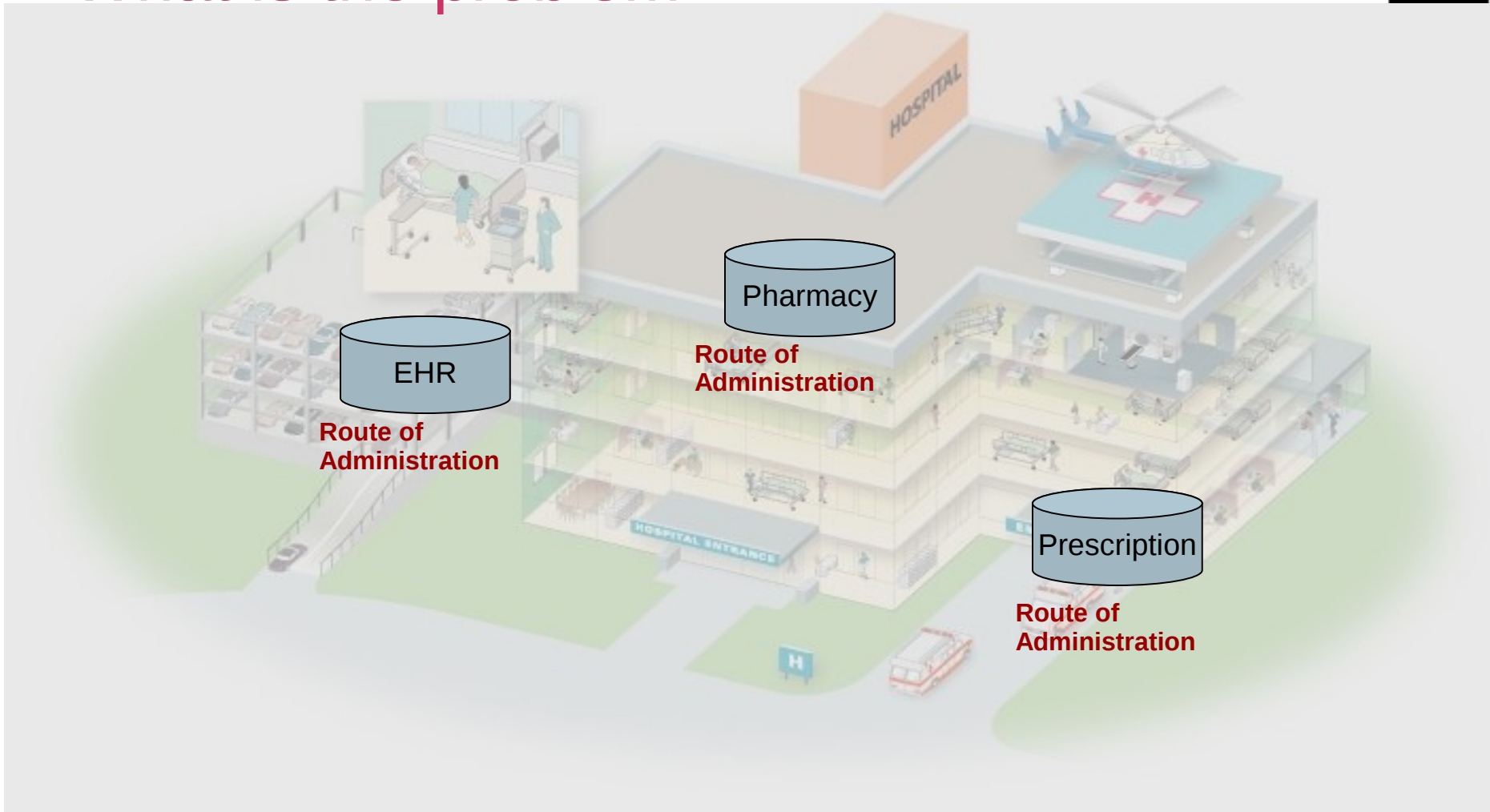


*EHR - Electronic Health Record



Introduction

What is the problem





Introduction

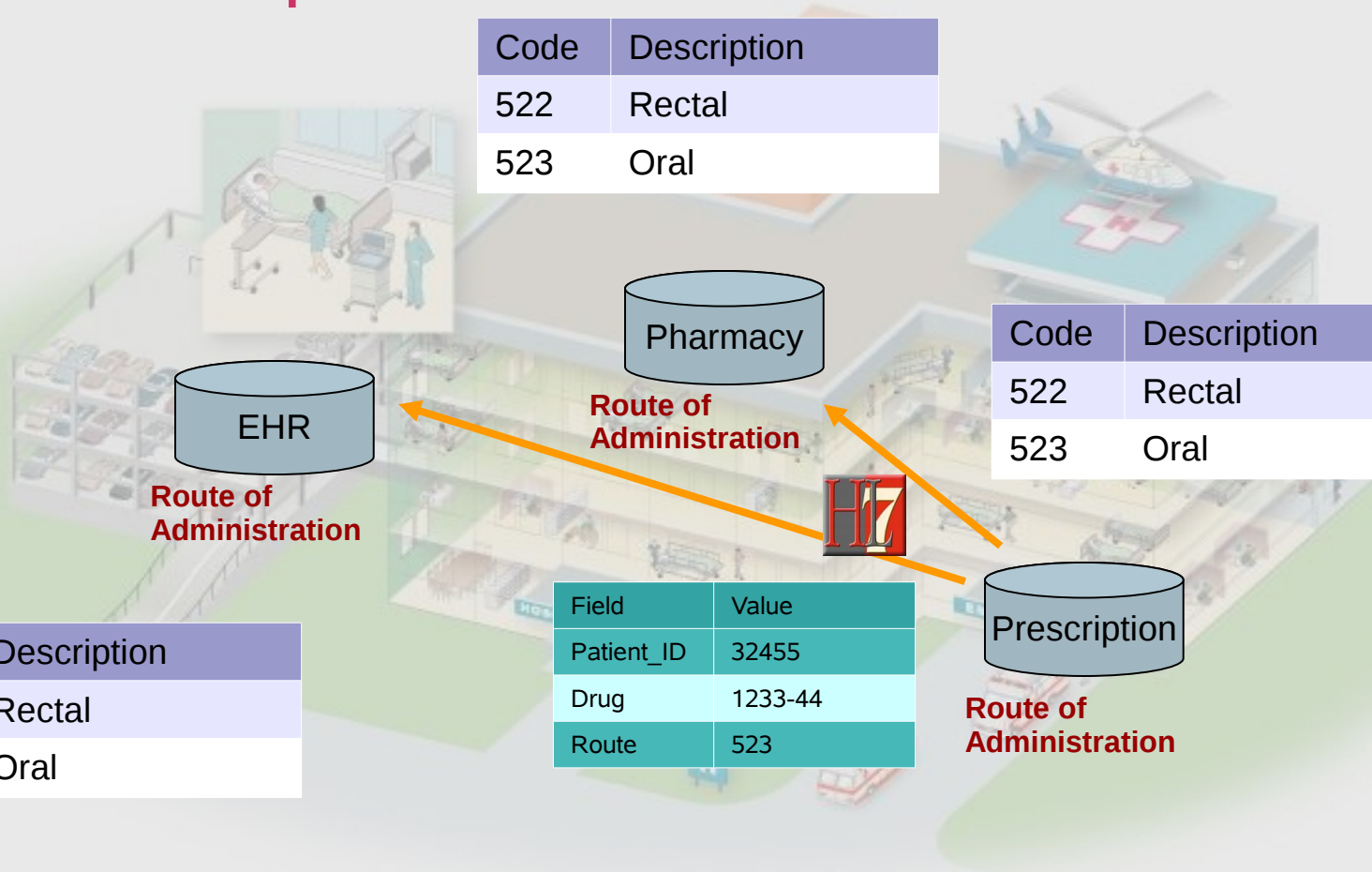
What is the problem

Code	Description
522	Rectal
523	Oral

Code	Description
522	Rectal
523	Oral

Code	Description
522	Rectal
523	Oral

Field	Value
Patient_ID	32455
Drug	1233-44
Route	523





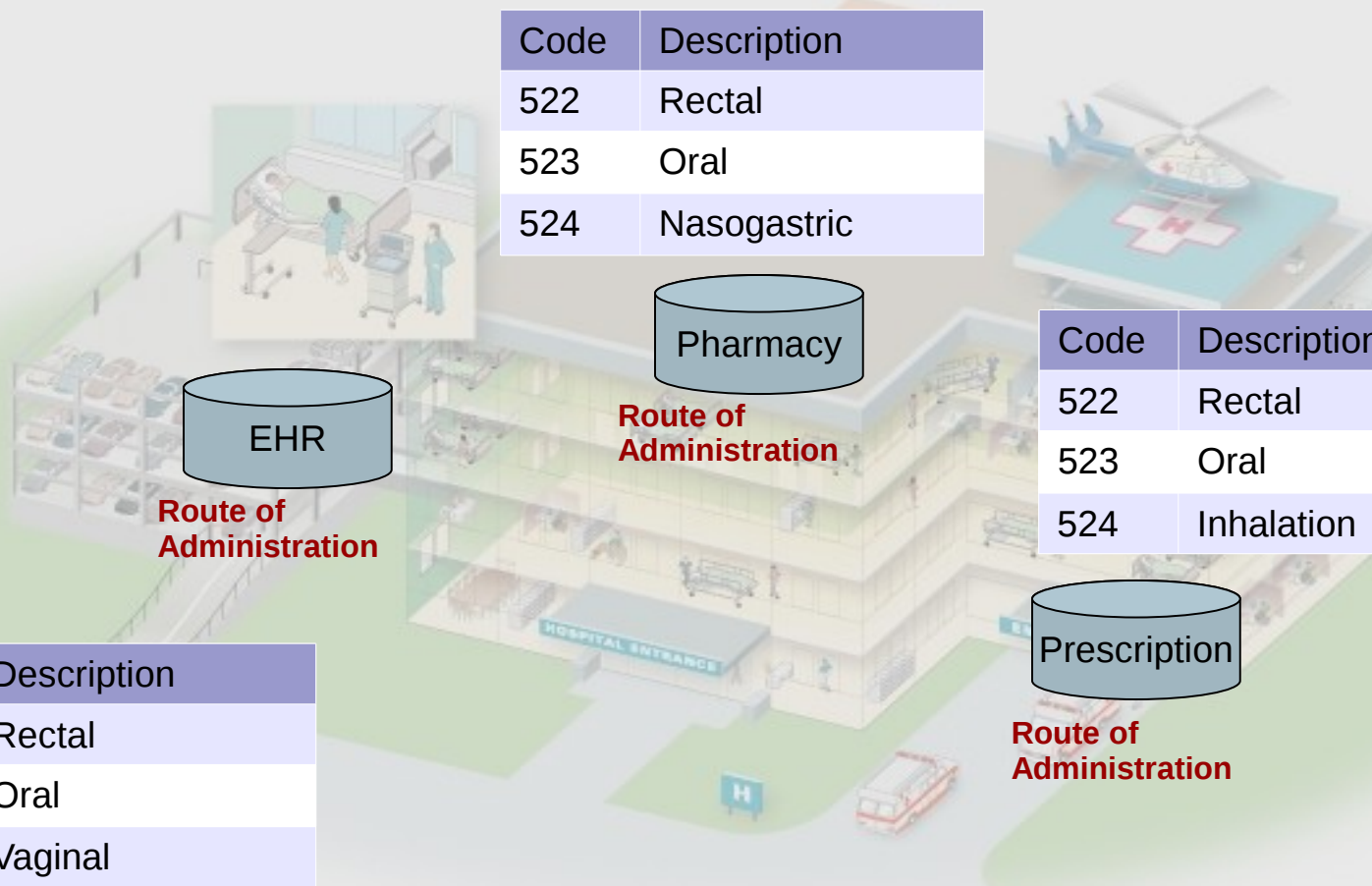
Introduction

What is the problem

Code	Description
522	Rectal
523	Oral
524	Nasogastric

Code	Description
522	Rectal
523	Oral
524	Inhalation

Code	Description
522	Rectal
523	Oral
524	Vaginal





Introduction

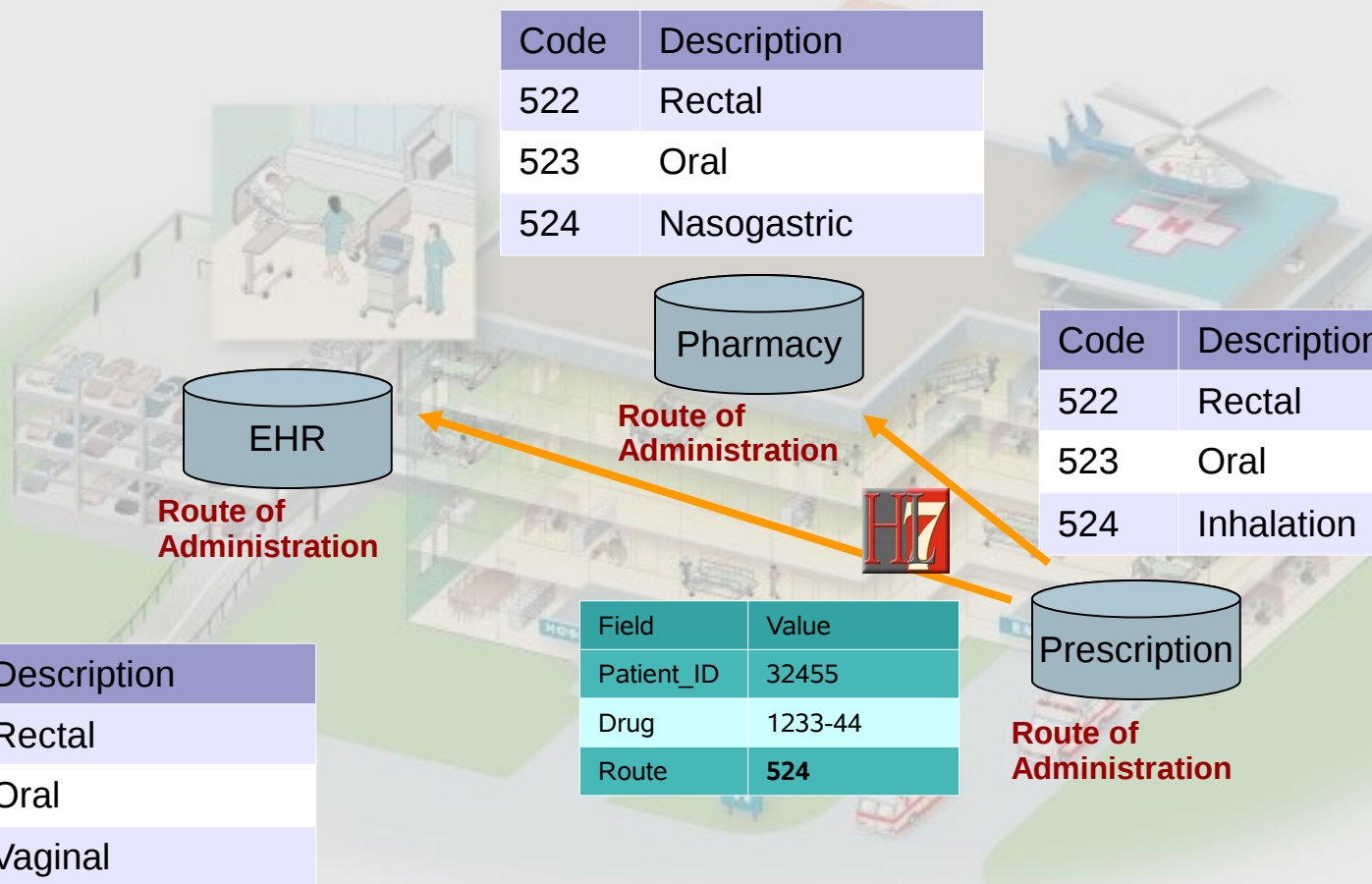
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Code	Description
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Field	Value
Patient_ID	32455
Drug	1233-44
Route	524





Introduction

Keywords

About the semantics

Taxonomy

Ontology

Terminology

Semantic interoperability

Controlled vocabulary

Vocabulary domain

Classifications

About the syntax (information model)

Data types

Code set

Coded attributes

About the sharing of vocabularies

Master Files

Registries

Repositories

Common Terminology Services





Introduction Concepts

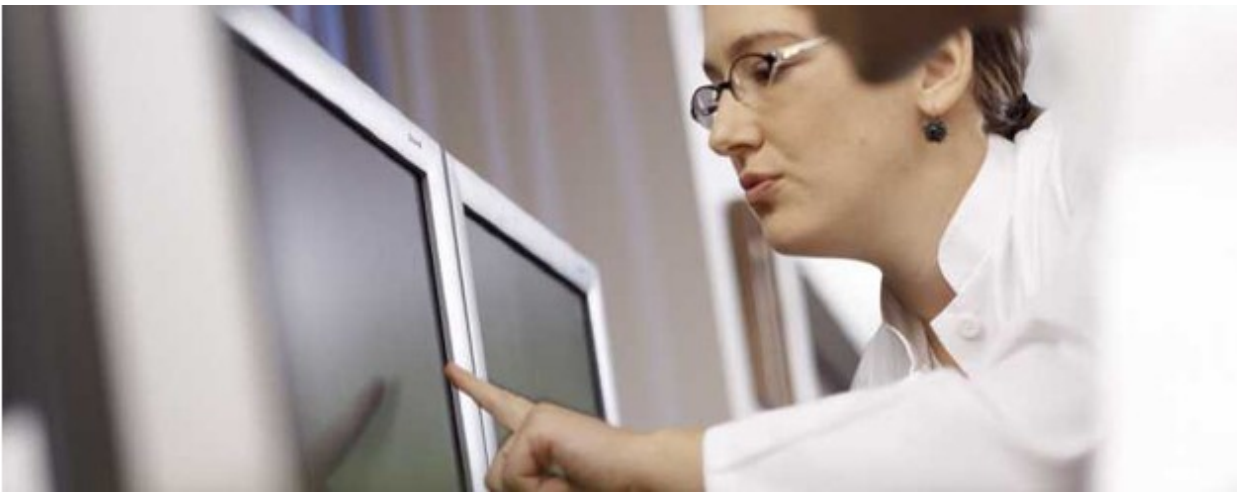
- Vocabulary - Deal with the content, communication and data storage of encoded information in HL7
- Code Set - Unique set of codes that represent a corresponding set of concepts in the real world
- Master File - Set of common reference files (or terminologies) used by one or more application systems
- Registry – Special case of a Master File as it allows applications to add and update new codes





Objectives

- Gather scientific publications and other documentation
- Try to define how vocabularies can be shared and maintained between any 2 applications, using standards
- Propose pointers for further study of the subject



Methods Search in PubMed

"terminology as topic"[MeSH Terms]

OR "vocabulary"[MeSH Terms]

OR "semantics"[MeSH Terms]

OR "classification"[MeSH Terms]

OR "registries"[MeSH Terms]

OR "semantics"[MeSH Terms]

AND (

terminology[All Fields]

OR **ontology**[All Fields]

OR **"vocabulary"**[All Fields]

OR **"semantic"**[All Fields] OR **"semantics"**[All Fields]

)

AND **HL7**[All Fields]

AND (**interoperability**[All Fields] OR interoperable[All Fields])



Results: 18

A screenshot of a PubMed search results page. The search bar contains the query "terminology as topic"[MeSH Terms] OR "vocabulary"[MeSH Terms]. The results are displayed in a list format with 18 items. The first four items are visible, each with a checkbox, a title, authors, journal information, and PMID. A "Recent Activity" sidebar is visible on the right, showing search history for "terminology as topic".

NCBI PubMed A service of the U.S. National Library of Medicine and the National Institutes of Health My NCBI [Sign In] [Preferences]

All Databases PubMed Nucleotide Protein Genome Structure OMIM PMC Journals

Search PubMed for "terminology as topic"[MeSH Terms] OR "vocabulary"[MeSH Terms] Go Clear Advanced Search Save Search

Limits Preview/Index History Clipboard Details

Display Summary Show 20 Sort By Send to

All: 18 Review: 0

Items 1 - 18 of 18 One page.

1: [A framework for semantic interoperability in healthcare: a service oriented architecture based on health informatics standards.](#)
Ryan A, Eklund P.
Stud Health Technol Inform. 2008;136:759-64.
PMID: 18487823 [PubMed - indexed for MEDLINE]
[Related Articles](#)

2: [Enhanced semantic interpretability by healthcare standards profiling.](#)
Lopez DM, Blobel BG.
Stud Health Technol Inform. 2008;136:735-40.
PMID: 18487819 [PubMed - indexed for MEDLINE]
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3: [Analysis and evaluation of EHR approaches.](#)
Blobel BG, Pharow P.
Stud Health Technol Inform. 2008;136:359-64.
PMID: 18487757 [PubMed - indexed for MEDLINE]
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4: [The BRIDG project: a technical report.](#)
Fridsma DB, Evans J, Hastak S, Mead CN.
J Am Med Inform Assoc. 2008 Mar-Apr;15(2):130-7. Epub 2007 Dec 20.
PMID: 18096907 [PubMed - indexed for MEDLINE]
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Recent Activity Turn Off Clear

- Search "terminology as topic" [Me...] (18)
- Search "terminology as topic" [Me...] (16)
- Search "terminology as topic" [Me...] (39)
- Search "terminology as topic" [Me...] (16)
- Search "terminology as topic" [Me...] (16)



Methods ScienceDirect - Search

HL7

AND terminology

AND ("Master Files"

OR registry OR registries)

AND TITLE-ABSTR-KEY

(vocabulary

OR ontology

OR terminology

OR semantic

OR interoperability

OR interoperable)



Results: 21

ScienceDirect

Home Browse Search My Settings Alerts Help

Quick Search All fields Author search tips Journal/book title Volume Issue Page Clear Go Advanced Search

21 articles found for: HL7 AND terminology AND ("Master Files" OR registry OR registries) and TITLE-ABSTR-KEY(vocabulary OR ontology OR terminology OR semantic OR interoperability OR interoperable)

Edit Search | Save Search | Save as Search Alert | RSS Feed

Full-text available Abstract only Font Size: +

Search Within Results: Search

Refine Results Limit To Exclude

Content Type

- Journal (19)
- Book (2)

Journal/Book Title

- International Journal of Medical Informatics (10)
- Journal of Biomedical Informatics (4)
- Clinical Decision Support (1)
- Information Sciences (1)
- Information and Software Technology (1)

view more

Year

- 2009 (1)
- 2008 (4)
- 2007 (6)
- 2006 (5)
- 2005 (2)

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- Inter-organizational future proof EHR systems: A review of the security and privacy related issues**
International Journal of Medical Informatics, Volume 78, Issue 3, March 2009, Pages 141-160
Helma van der Linden, Dipak Kalra, Arie Hasman, Jan Talmon
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- SANDS: A service-oriented architecture for clinical decision support in a National Health Information Network**
Journal of Biomedical Informatics, Volume 41, Issue 6, December 2008, Pages 962-981
Adam Wright, Dean F. Sittig
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- Knowledge-data integration for temporal reasoning in a clinical trial system**
International Journal of Medical Informatics, In Press, Corrected Proof, Available online 13 September 2008
Martin J. O'Connor, Ravi D. Shankar, David B. Parrish, Amar K. Das
[Preview](#) [PDF \(775 K\)](#) | [Related Articles](#)
- Web-based infectious disease reporting using XML forms**
International Journal of Medical Informatics, Volume 77, Issue 9, September 2008, Pages 630-640
Danhong Liu, Xia Wang, Feng Pan, Yongqiong Xu, Peng Yang, Keqin Rao
[Preview](#) [PDF \(446 K\)](#) | [Related Articles](#)
- An evaluation and selection framework for interoperability standards**
Information and Software Technology, Volume 50, Issue 3, February 2008, Pages 176-197
J.A. Mykkänen, M.P. Tuomainen
[Preview](#) [PDF \(733 K\)](#) | [Related Articles](#)





Results

- There is a very small number of publications addressing the vocabulary sharing using standards
- Almost none refers to their maintenance
- Large number of different terminologies
- The language localization is an obstacle
- International differences





Discussion

- Many people solved the problem communication between 2 systems, not the vocabulary sharing and synchronization of any 2 systems

The most promising options are:

- HL7 Master Files / Registries
- Common Terminology Services (CTS)





Discussion

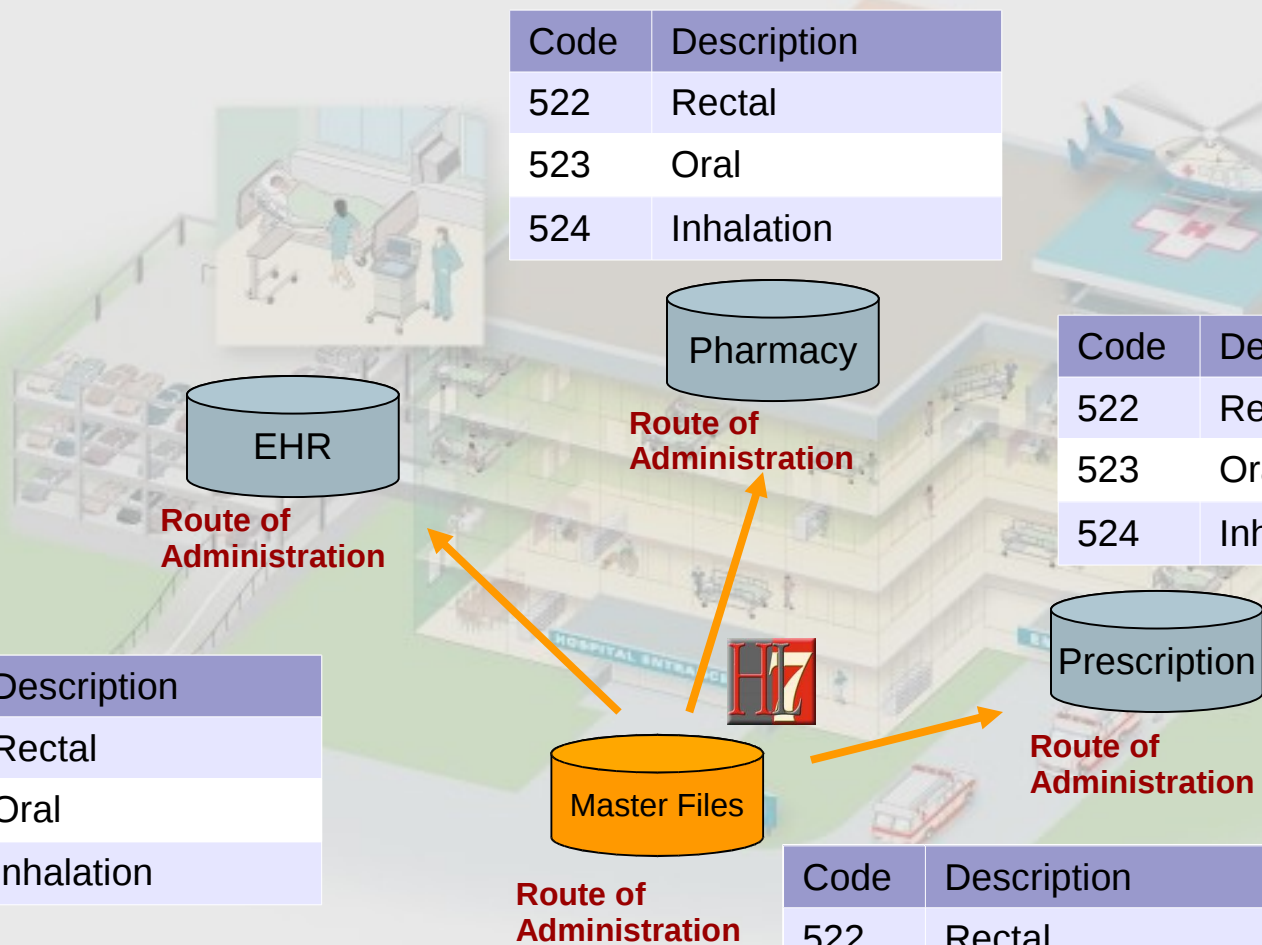
Master File / Registry Infrastructure

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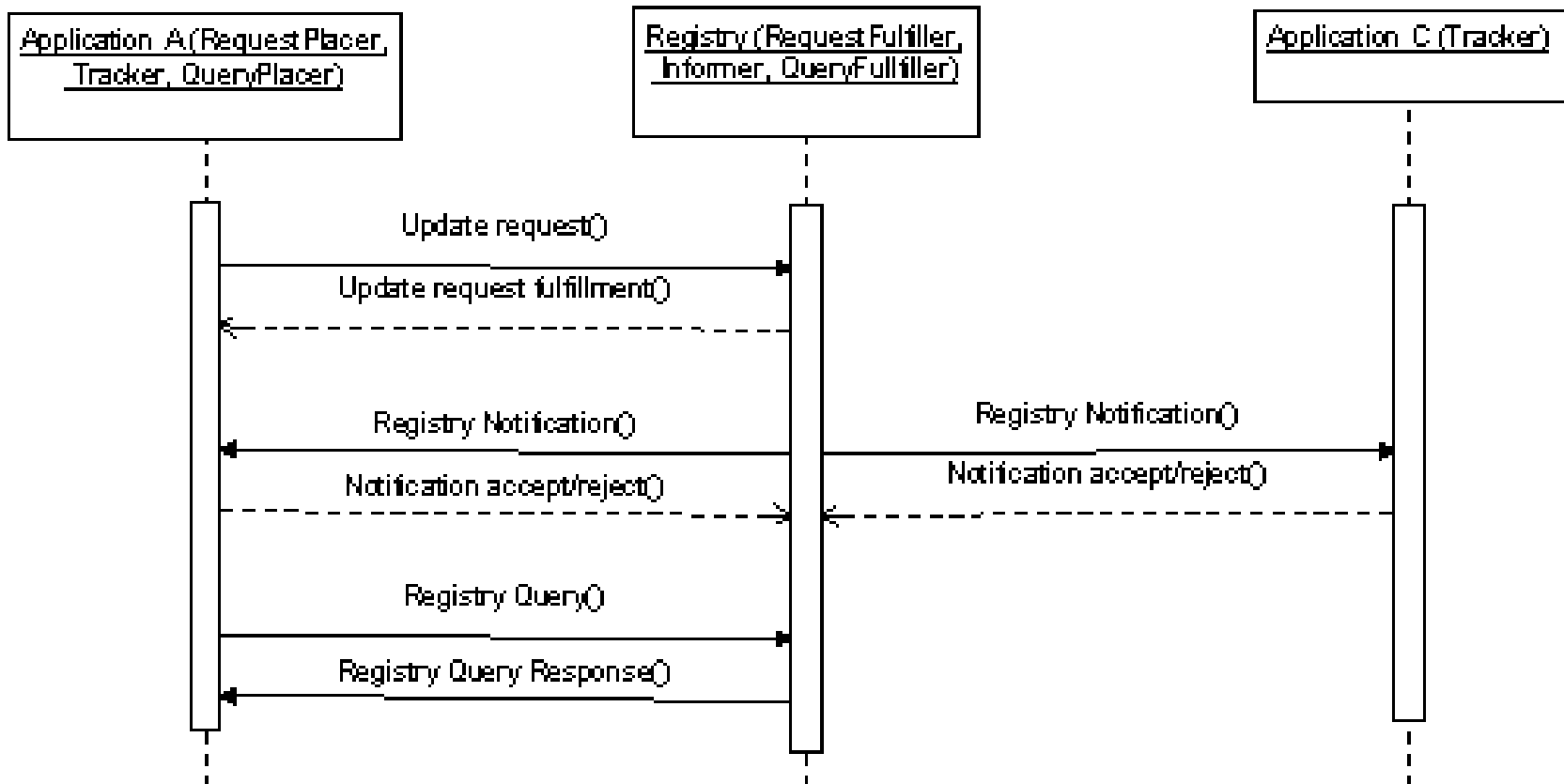
Code	Description
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Discussion

Master File / Registry Infrastructure

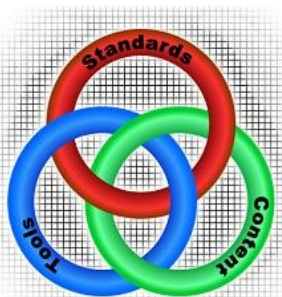




Discussion

Common Terminology Services (CTS)

- The HL7 Common Terminology Services (HL7 CTS) is an Application Programming Interface (API) specification
- Proposed standard API for vocabulary functions required to enable use of a variety of code systems in HL7 standards and messages
- Intended to describe the basic functionality that will be needed by HL7 Version 3 software implementations to query and access terminological content



LexGrid, <https://cabig-kc.nci.nih.gov/Vocab/KC/index.php/LexGrid>





Further research

- How to **integrate legacy** systems
 - Integration engines
- How to **decentralize maintenance** of large terminologies
 - Internet management of small parts
- How to deal with **updates / deprecation**
 - Versioning **
- Different **language** support
 - Internationalization (i18n)
- How to create a **common repository** **
 - UMLS * metathesaurus

* Unified Medical Language System

** Stanley M. Huff et al. 1998, *A Proposal for Incorporating Health Level Seven (HL7) Vocabulary in the UMLS Metathesaurus*



Questions?

