



# Standards for Interoperability

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Abies Ltd, 11 December 2012

# Outline

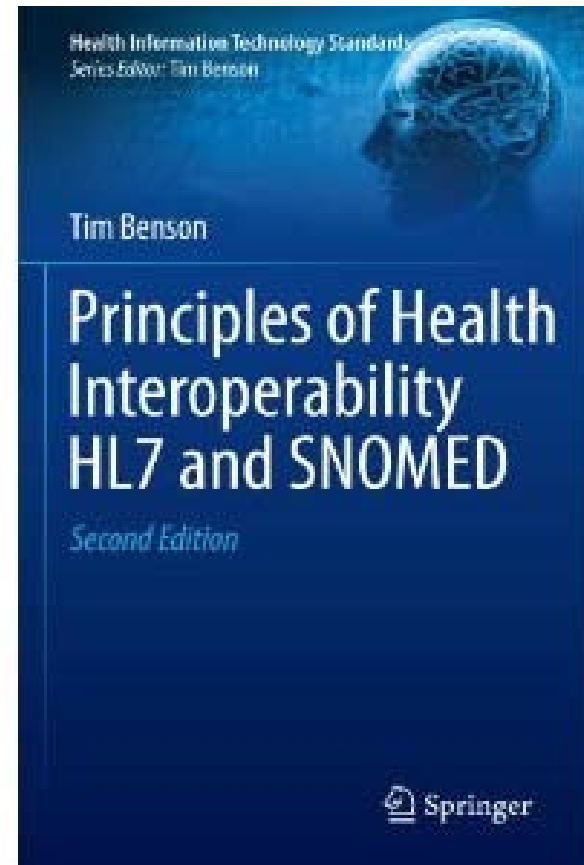
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1. Definitions
2. Why we have to use standards
3. Why interoperability is hard
  - What helps
4. Syntax
  - HL7 V2, V3, CDA and FHIR
5. Semantics
  - LOINC and SNOMED CT

# The Book

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- “The second edition is even better than the first”
  - Ed Hammond



# Standards Definition

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- A standard is a document, established by consensus and approved by a recognised body, that provides, for common and repeated use, rules, guidelines, or characteristics for activities or their results, aimed at the optimum degree of order in a given context
  - ISO 2004

# Benefits of Standards

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- Reduce Cost
- Reduce Risk
- Competition (avoidance of lock-in)
- Change control (real costs of upgrades)
- Quality (levelling up)
- Testable for correctness



# Eight “C”s Criteria

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- Comprehensive within scope
- Complete in detail
- Coherent internally
- Consistent with other standards
- Comprehensible to users and developers
- Composed from reusable elements
- Conformance-testable
- Computer-readable and traceable



# Standards

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- “The nice thing about standards is that you have so many to choose from.”
  - Andrew Tanenbaum
- Standards are there to help
- Most standards are over-specified
  - Long
  - Complex
  - Arcane jargon
- Need agreed “profiles”
  - the minimum viable product for your use case



# And lots of SDOs ...

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- HL7
- IHTSDO
- DICOM
- GS1
- ISO TC215
- CEN TC251
- IHE
- Continua



# Interoperability Definition

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- Interoperability is the ability of two or more systems or components to exchange information and to use the information that has been exchanged
  - IEEE 1990

# Types of interoperability

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## ■ Technical

- Move data from A to B
- Domain-independent
- Information theory
- Now commodity

## ■ Semantic

- A and B understand data in the same way
- Domain specific
- What HL7 mainly does
- Use of codes and identifiers

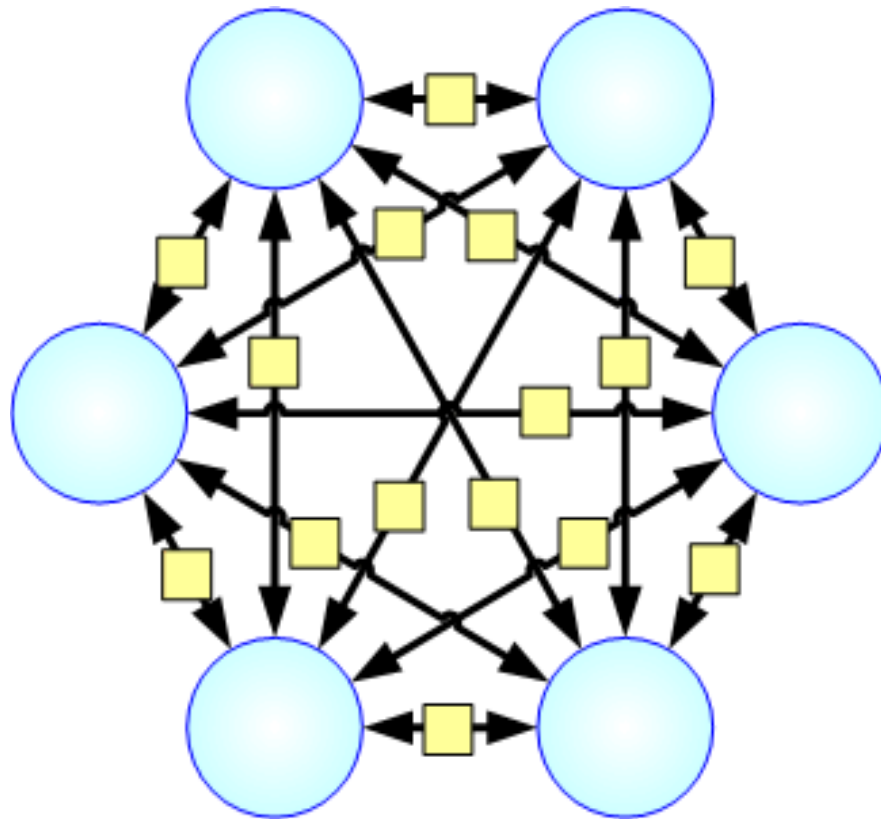
## ■ Process

- Business systems at A and B interoperate
- Business process-specific
- Requires re-engineering
- 10 ➤ Generates all the benefit



# Number of paths = $(N^2 - N)/2$

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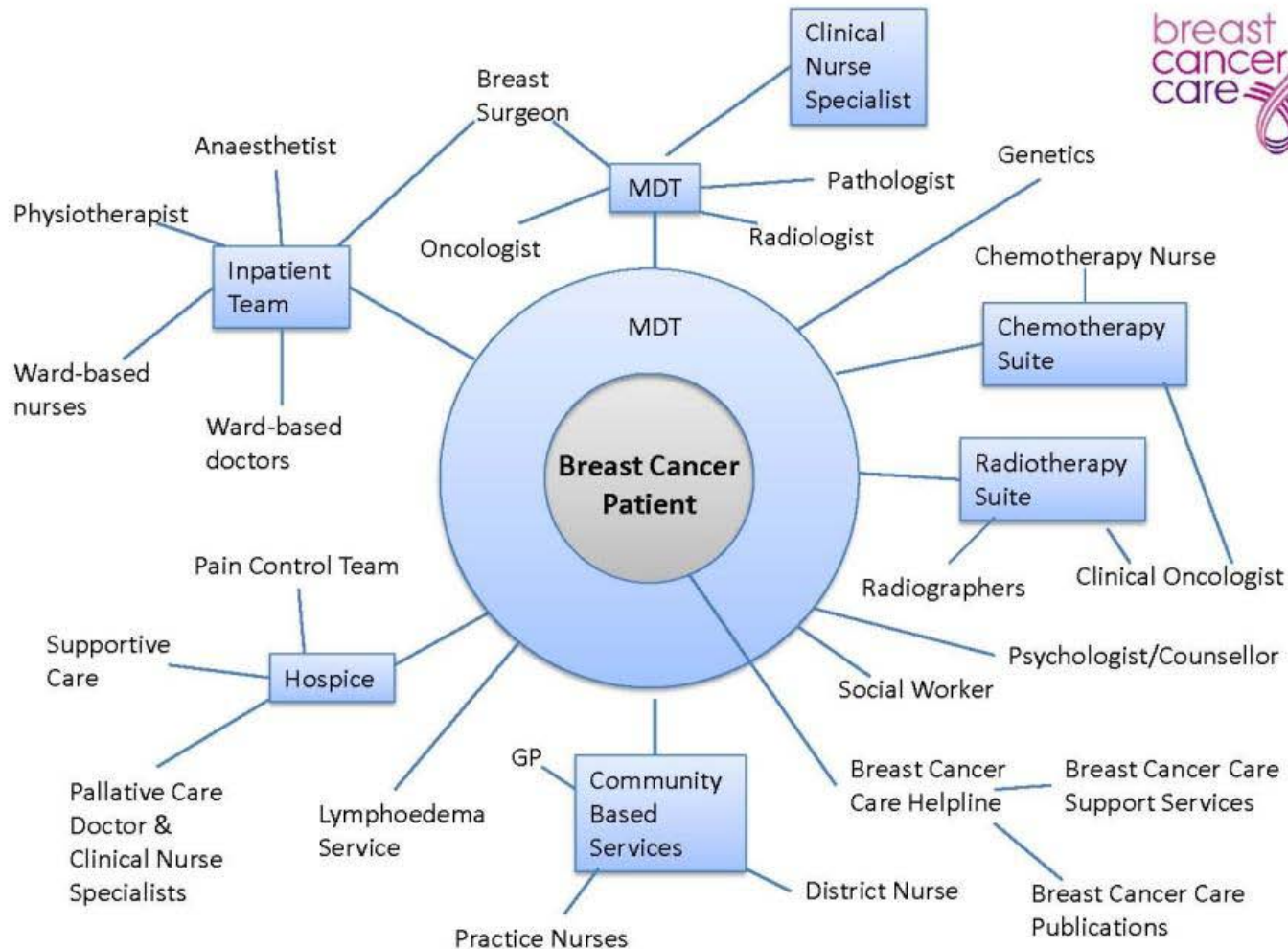


# An Exponential Problem

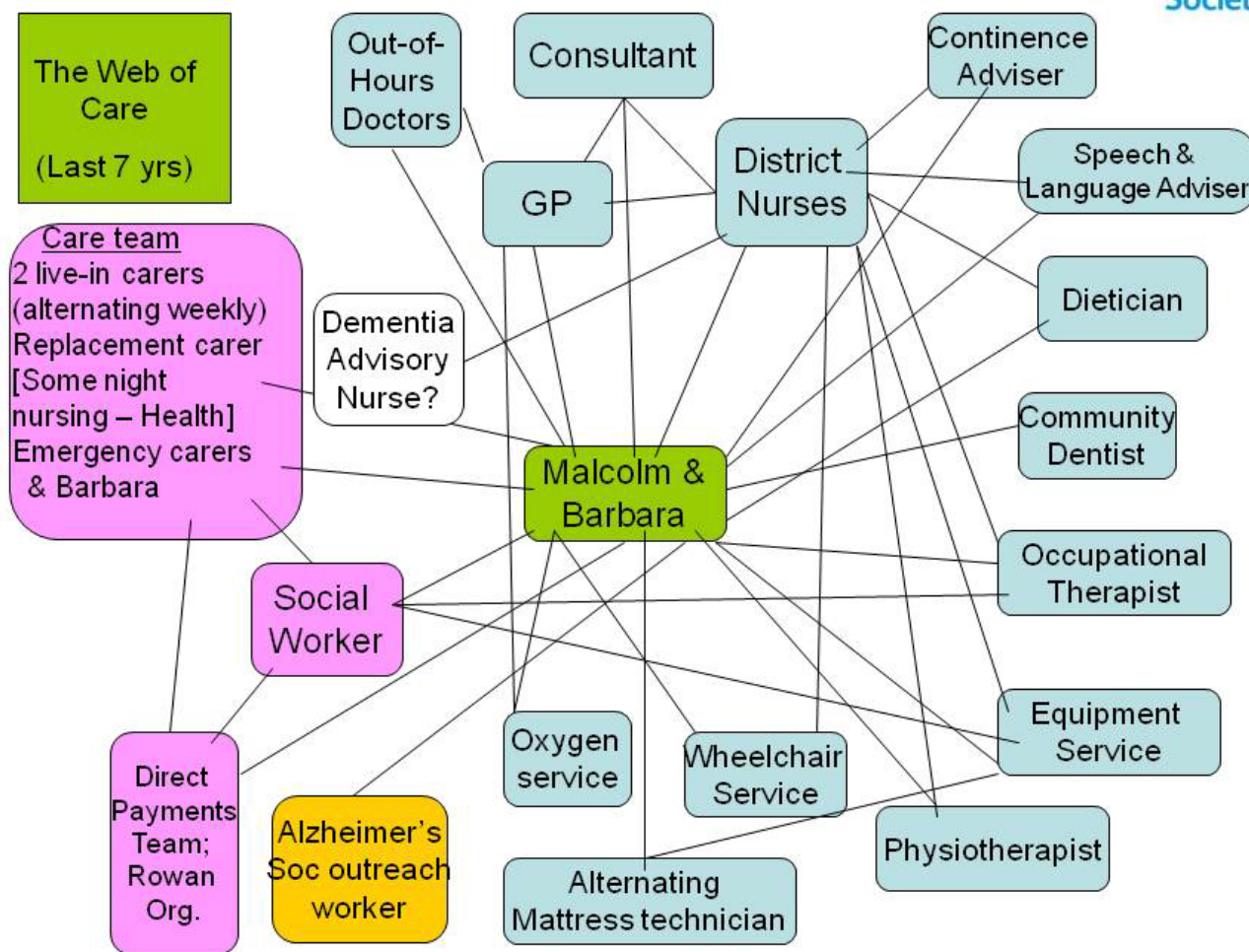
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No of Nodes	N	2	10	100
No of links without standard	$(N^2-N)/2$	1	45	4,950

# Webs of Care – Breast Cancer

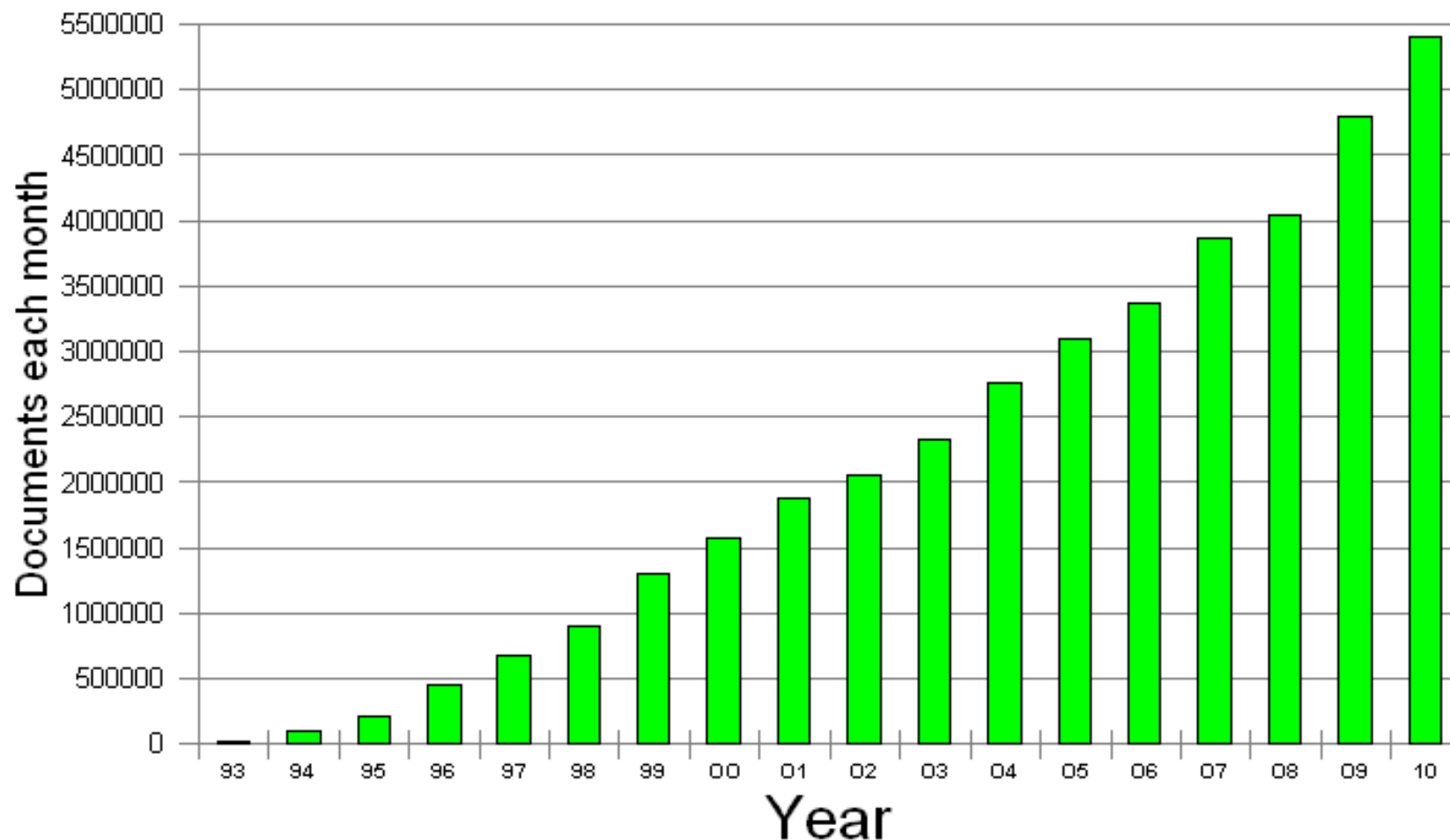


# Webs of Care – Alzheimer's



# MedCom -The Danish Health Data Network

## Messages/Month



Total number of documents / month

# Why is it hard?

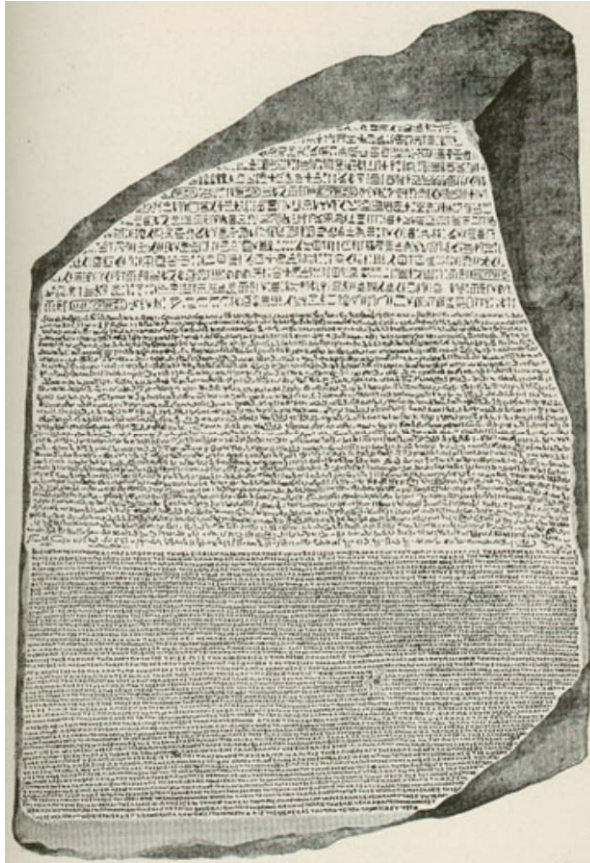
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# The Rosetta Stone

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- One Message
- Three renderings
  - Hieroglyphic
  - Greek
  - Demotic
- EDI
  - Sender system
  - Wire format
  - Receiver system

# How to avoid errors

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## ■ Complexity

- Avoid long arcane specifications

## ■ People

- Minimise the number of people who need to understand them

## ■ Choices

- Eliminate optionality

## ■ Volume

- 99.9999% (sigma-6) accuracy means 1,000 errors per billion messages



# Sources of problems

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- Every system has its own language
  - Developers often do not recognise this
  - Aggravated by IP and deliberate “lock-in”
- Developers and Users talk but fail to communicate
  - “Both believed they were in perfect agreement”
- Few people understand the whole business process
  - Especially integration between providers and specialties
- Managers try to re-use what they have
- Heterogeneity of clinical practice
- Ever-changing regulations
  - Major differences between jurisdictions



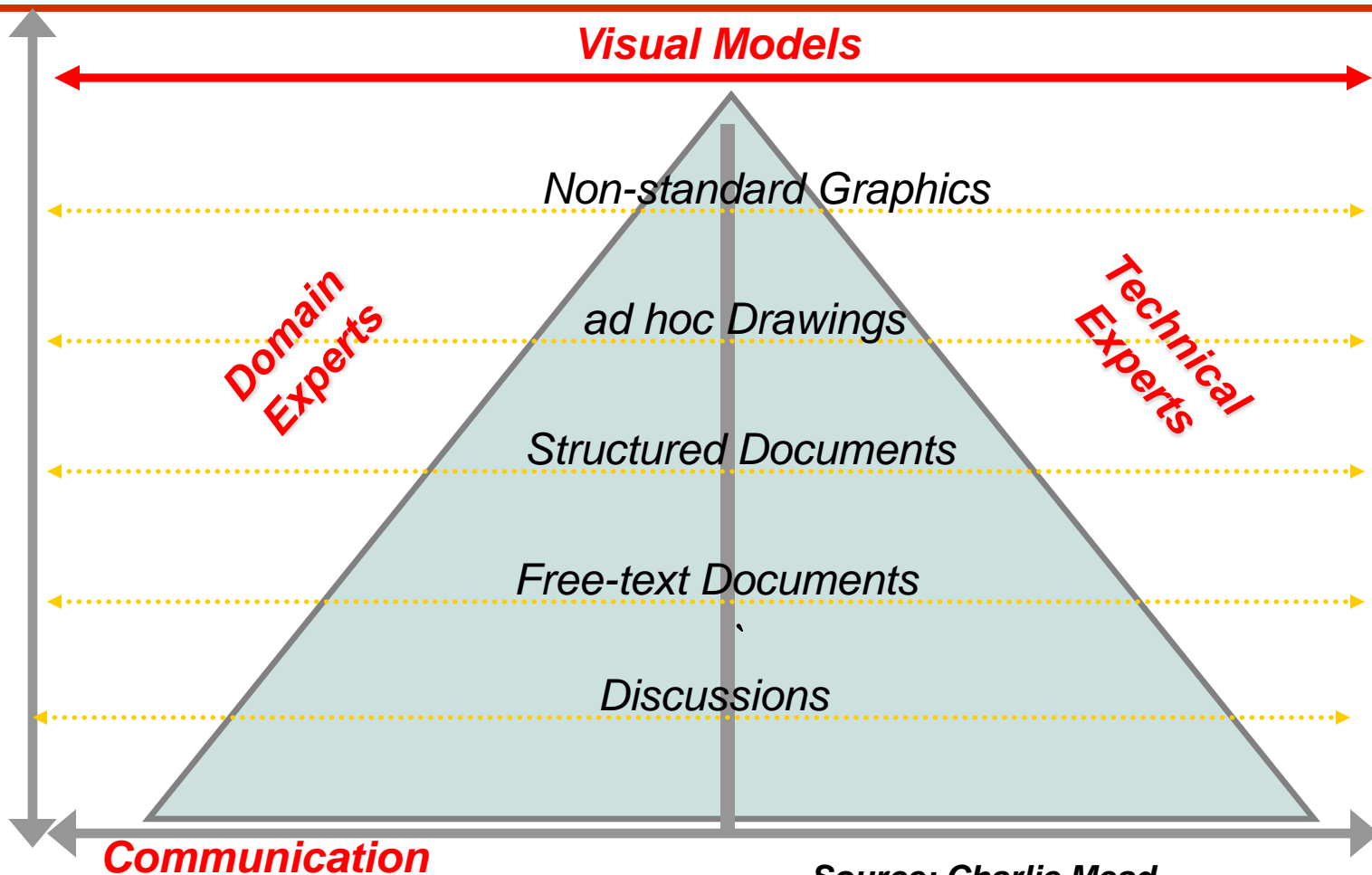
# The Trouble with English

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- Synonyms
- Homonyms
- Local dialects
  - Specialty specific
  - System specific
  - Location specific
- Neologisms (inventing new terms)



# The Communication Pyramid



Source: Charlie Mead



# Diagrams: part of the solution

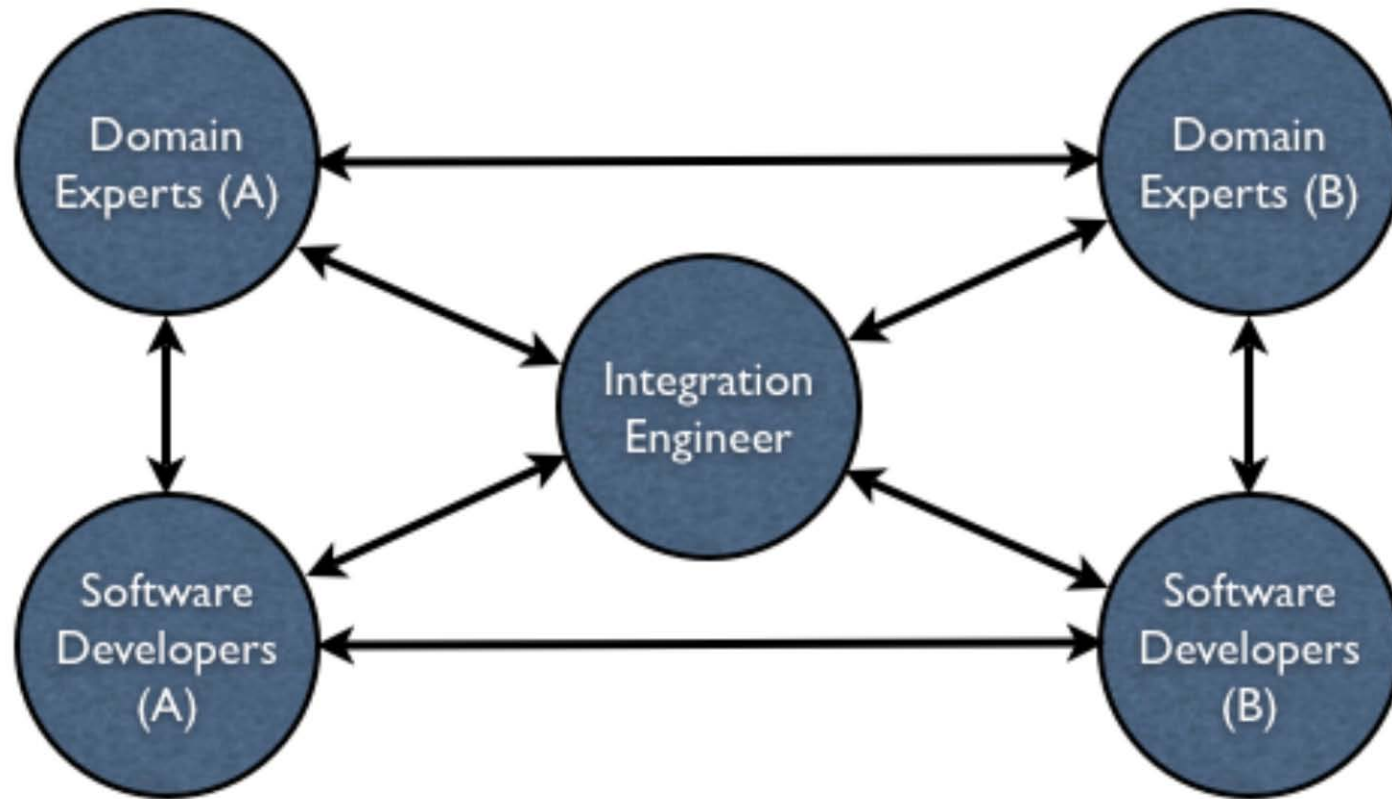
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- Used by engineers, architects and navigators
- Conceptual design specification
  - Understandable by everyone
- Implementation specification
  - Only understood by technologists



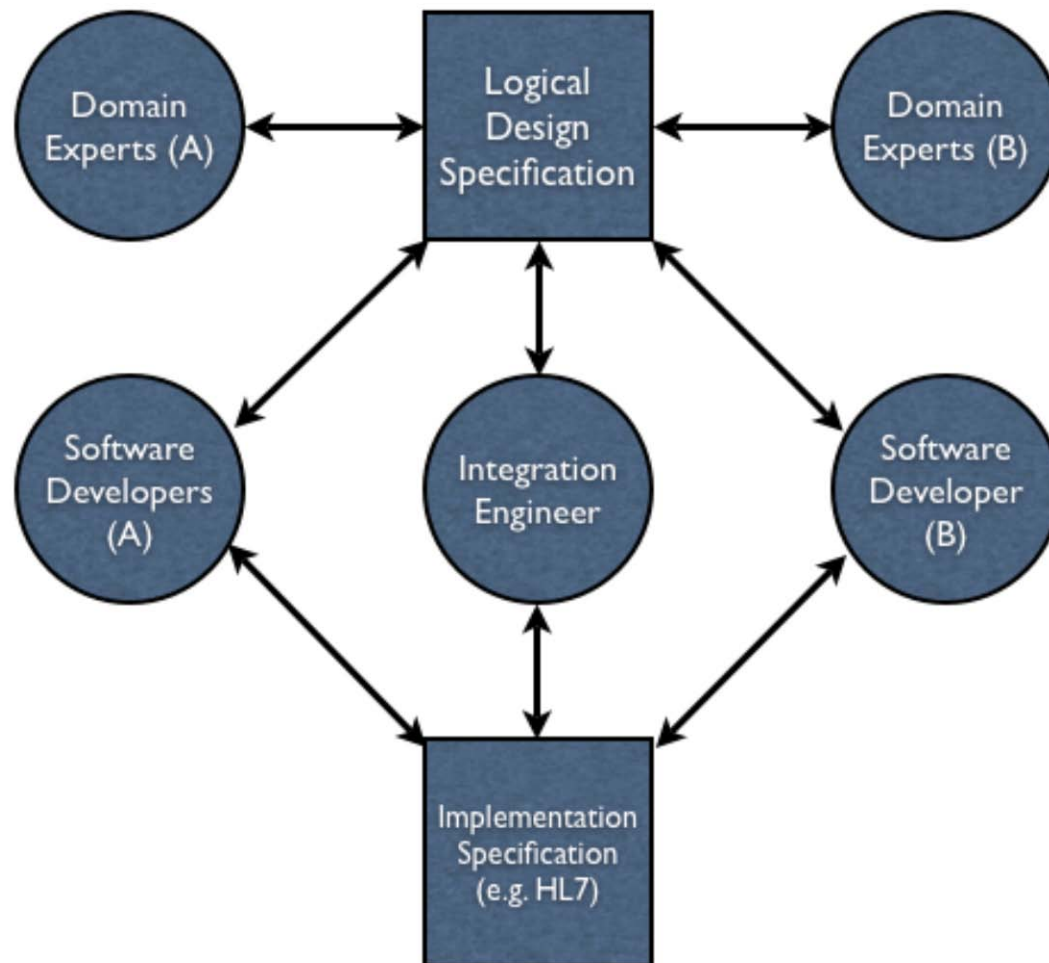
# Human-Human Communication

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# Specifications in human-human communication

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# Ubiquitous Language

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- A language structured around the domain model and used by all team members to connect all of the activities of the team with software
  - Eric Evans. *Domain driven design: tackling complexity in the heart of software*. Addison-Wesley, 2004



# CDA Document metaphor

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- Wholeness
- Persistence
- Authentication
- Stewardship
- Human readability

# Document Metadata

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- What
  - content, purpose, status
- When
  - created, about
- Who
  - about, from, to,
- Where
  - origin, storage

# Constraint or extension

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- Most HL standards are based on constraint
  - Define the universe, but only use what you need
- Multiple constraints
  - Information model elements and multiplicities, data types, vocabulary
- The Kernel principle
  - Define a small core and extend as required within clear rules
  - UNIX is an exemplar
  - FHIR (Fast Health Interoperability Resources)



# Desiderata for clinical terminology

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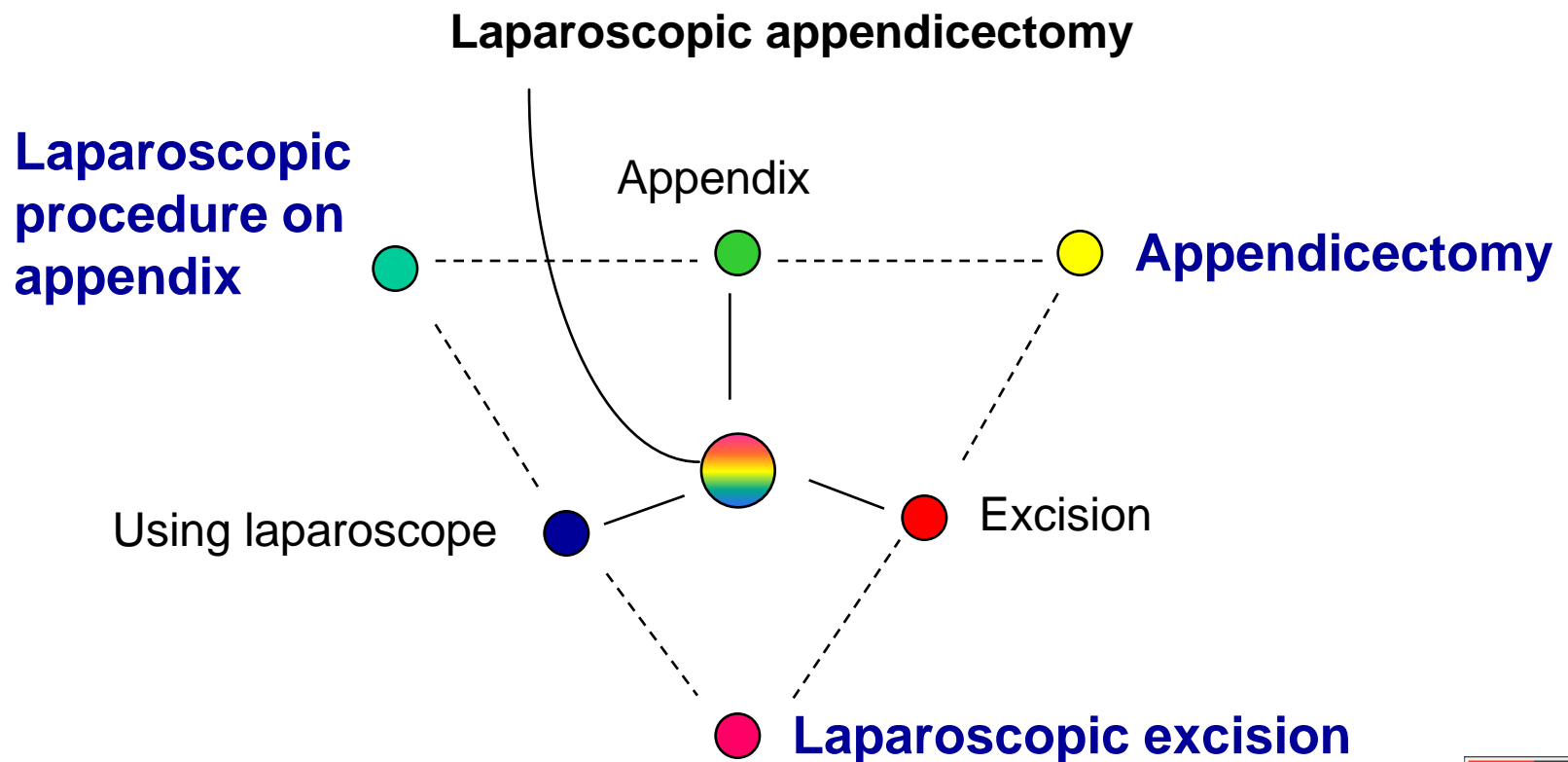
1. Content completeness
2. Concept orientation
3. Concept permanence
4. Meaningless identifiers
5. Polyhierarchy
6. Formal definitions
7. Reject NEC
8. Multiple granularities
9. Multiple consistent views
10. Context representation
11. Evolve gracefully
12. Recognize redundancy

Source J Cimino 1997



# Reference Terminology Example

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# Finally ...

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- Syntax
  - HL7 standards
- Semantics
  - Vocabulary
- For SDOs to separate Syntax and Semantics is deeply unhelpful
- It simply transfers the problem onto the implementer.



Q + A