

- DRAFT -

Why Standards are Not Enough to Solve Healthcare's Interoperability Problem (And How RDF Can Help)

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Latest version of these slides:

<http://dbooth.org/2014/standards/>

See also associated paper

Definition

Semantic interoperability:

The ability of computer systems to transmit data with unambiguous, shared meaning.

– [Wikipedia](#)

Healthcare today



Tower of Babel, Abel Grimmer (1570-1619)

Obviously we need
standards.

And yet

HOW STANDARDS PROLIFERATE:

(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)



<http://xkcd.com/927/>

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Standard Vocabularies in UMLS

AIR ALT AOD AOT BI CCC CCPSS CCS CDT CHV COSTAR CPM
CPT CPTSP CSP CST DDB DMDICD10 DMDUMD DSM3R DSM4 DXP
FMA HCDT HCPCS HCPT HL7V2.5 HL7V3.0 HLREL ICD10 ICD10AE
ICD10AM ICD10AMAE ICD10CM ICD10DUT ICD10PCS ICD9CM ICF
ICF-CY ICPC ICPC2EDUT ICPC2EENG ICPC2ICD10DUT
ICPC2ICD10ENG ICPC2P ICPCBAQ ICPCDAN ICPCDUT ICPCFIN
ICPCFRE ICPCGER ICPCHEB ICPCHUN ICPCITA ICPCNOR ICPCPOR
ICPCSPA ICPCSWE JABL KCD5 LCH LNC_AD8 LNC_MDS30 MCM
MEDLINEPLUS MSHCZE MSHDUT MSHFIN MSHFRE MSHGER MSHITA
MSHJPN MSHLAV MSHNOR MSHPOL MSHPOR MSHRUS MSHSCR
MSHSPA MSHSWE MTH MTHCH MTHHH MTHICD9 MTHICPC2EAE
MTHICPC2ICD10AE MTHMST MTHMSTFRE MTHMSTITA NAN NCISEER
NIC NOC OMS PCDS PDQ PNDS PPAC PSY QMR RAM RCD
RCDAE RCDSA RCDSY SNM SNMI SOP SPN SRC TKMT ULT UMD
USPMG UWDA WHO WHOFRE WHOGER WHOPOR WHOSPA

Standard Vocabularies in UMLS

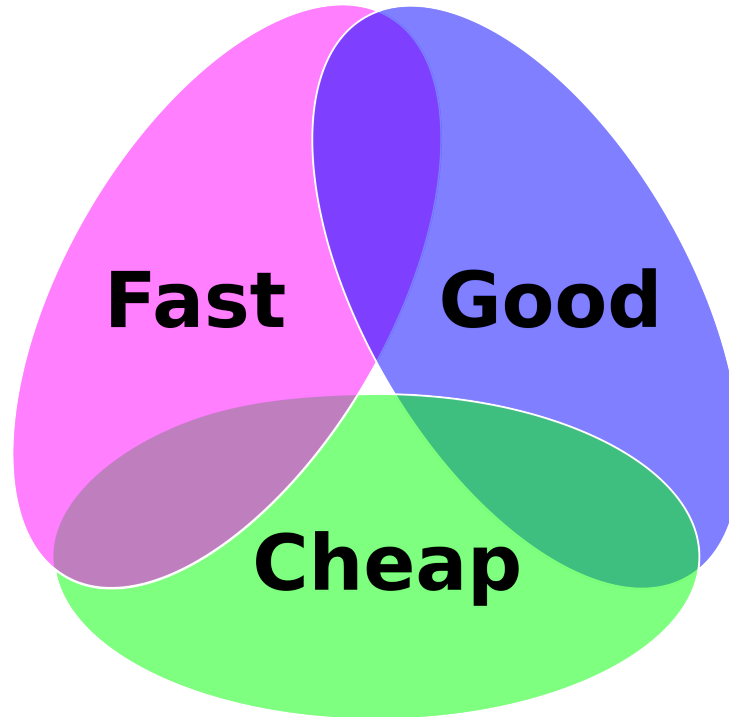
AIR ALT AOD AOT BI CCC CCPSS CCS CDT CHV COSTAR CPM
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ICPCFRE ICPCGR ICPCHE ICPCJPN ICPCMEX ICPCNOR ICPCPOR
ICPCSPA ICPCWVA ICPCZAF ICPCZWE LCH LNC AD LNCMS30 MCM
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Why are standards
not enough
to solve the problem?

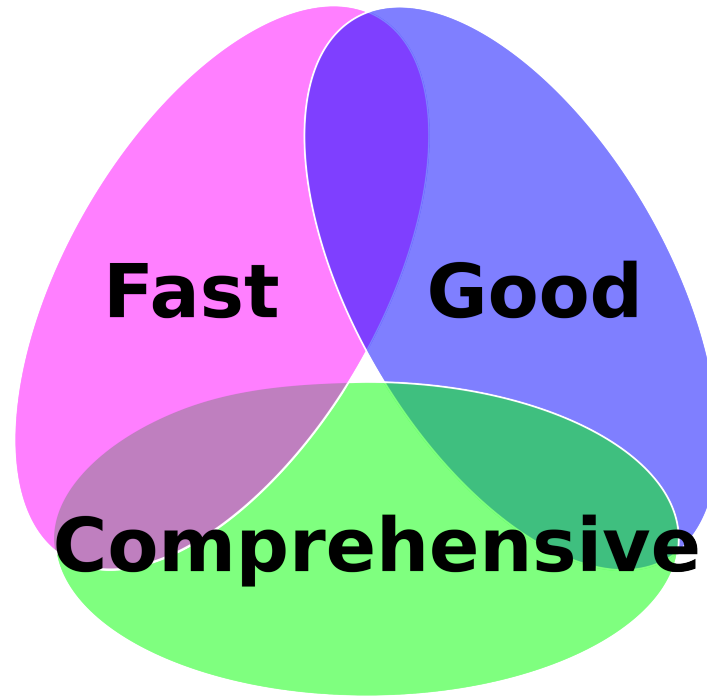
Why does this happen?

- Standards are imperfect
 - Version n+1 improves on version n
- Diversity of needs
 - Different uses require different data
 - Different uses require different granularity
- Problem complexity
- Committee size
- Changing requirements
- Medicine and technology do not stand still!
- Proprietary standards
- Legacy systems
- Risk mitigation

Software trilemma: Pick any two



Standards trilemma: Pick any two



- Comprehensive: Handles all use cases
- Good: High quality
- Fast: Completed quickly

Why standards and innovation?

- Dilemma: Standards are necessary for semantic interoperability, BUT standards are a moving target
 - Medical science and technology are continually changing
 - Medicine is too big and diverse to suddenly adopt one monster standard
 - UMLS lists over 100 vocabularies!
- Change is the norm!

Embracing standards and innovation

A universal healthcare exchange language MUST:

- Leverage existing and future standards – both de facto and de jure
- Support decentralized innovation – new terms, vocabularies and data models
- Allow continual incorporation of new standards
- Support a graceful transition from innovation to standard – without re-tooling
- *RDF is the best available candidate!*

Why is it so difficult to standardize?

- Healthcare information is complex
- Lack of incentive
- Standardization takes time
 - Progress goes toward zero as committee size grows
- Moving target: medical science and technology continually changing

Key requirements

- Continually incorporate new vocabularies and data models
- Support existing and future healthcare standards
- Support decentralized innovation

Why include non-standard concepts?

- Important to send *all* requested information in machine-processable form
- Receiver may be able to use it
- Helps bootstrap standardization

Additional requirements for graceful adoption of new concepts

- Enable new concepts to be semantically linked to existing ones
- Enable authoritative definitions of new concepts to be obtained automatically

Best available candidate: RDF

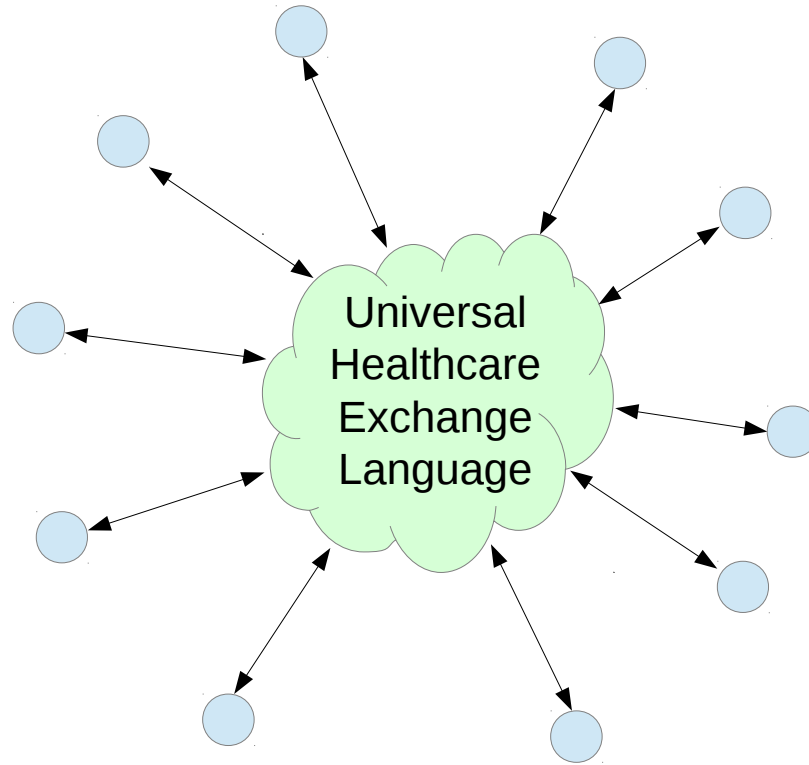
What does semantic interoperability involve?

- Machine processable information
- Common vocabularies
- Unambiguous concepts

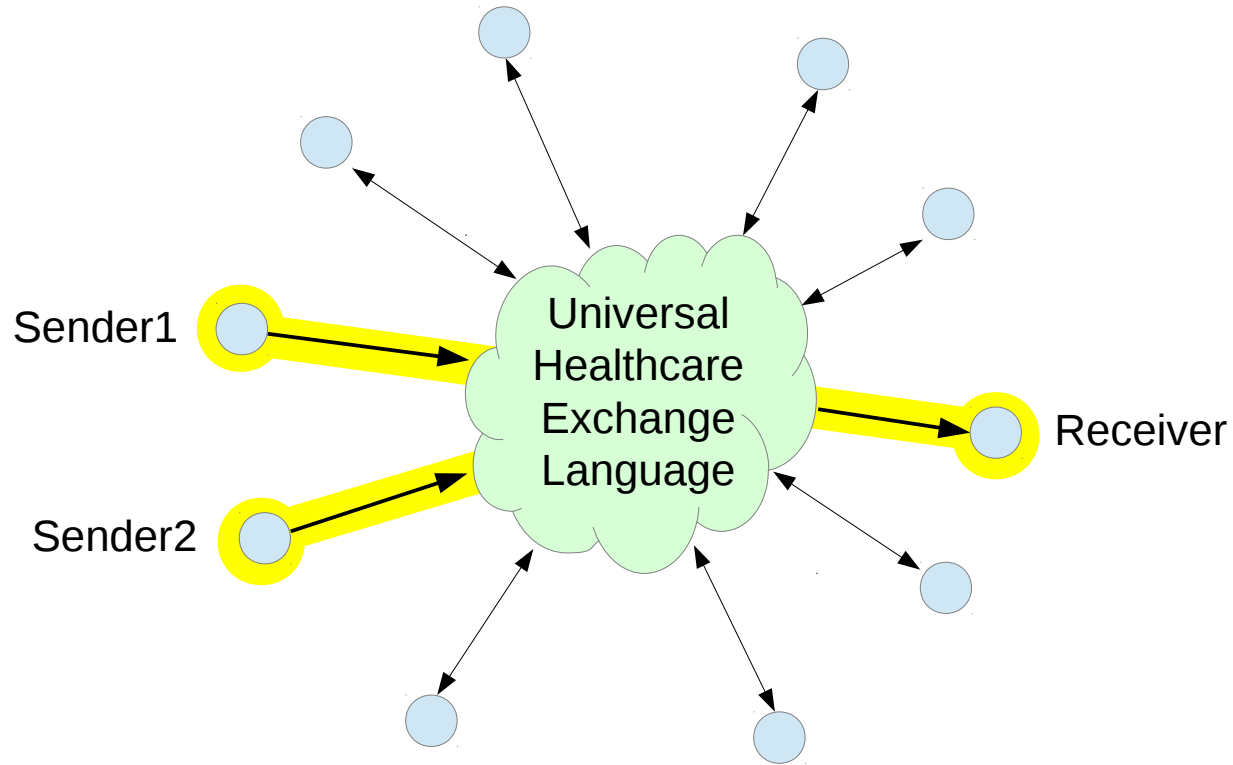
Why is this so difficult to standardize?

- Healthcare is complex: thousands of interrelated concepts, many domains
- Standardization progress diminishes toward zero as committee size grows
- Moving target: medical science and technology continually changing

Role of a common language



Role of a common language



Semantic relevance is relative

- Blood Pressure measurement:
 - Sitting versus Standing
- Is the difference semantically relevant?
- Depends on the application!
- `v:BP_Machine rdfs:subClassOf v:BP .`
- `v:BP_Manual rdfs:subClassOf v:BP .`
- `{ ?bp a v:BP_Machine . }`
=> `{ ?bp a v:BP . } .`