Expert Address Series
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Day In The Life Of eHealth Technologies

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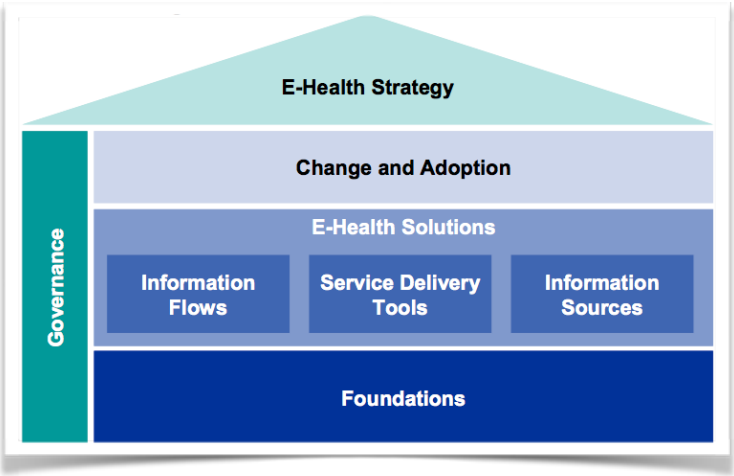
Overview

- eHealth Principles and Strategies
- eHealth Architectures
- Clinical Information
  - Clinical Documents and Data
- Clinical Terminologies
  - SNOMED
- eHealth Solutions
  - ePrescriptions
  - National eHealth Record Systems
- Towards Semantic eHealth
  - The future path

eHealth Strategy

- Foundations
  - Core foundations for information exchange
- eHealth Solutions
  - Stimulate the delivery of priority solutions by the marketplace
- Change and Adoption
  - Foster consumer and provider adoption with training, tools, and services
- Governance
  - Effective leadership, coordination, accountability and oversight of the eHealth program



eHealth Pri

- eHealth architecture princi
  architecture developments
  eHealth environment

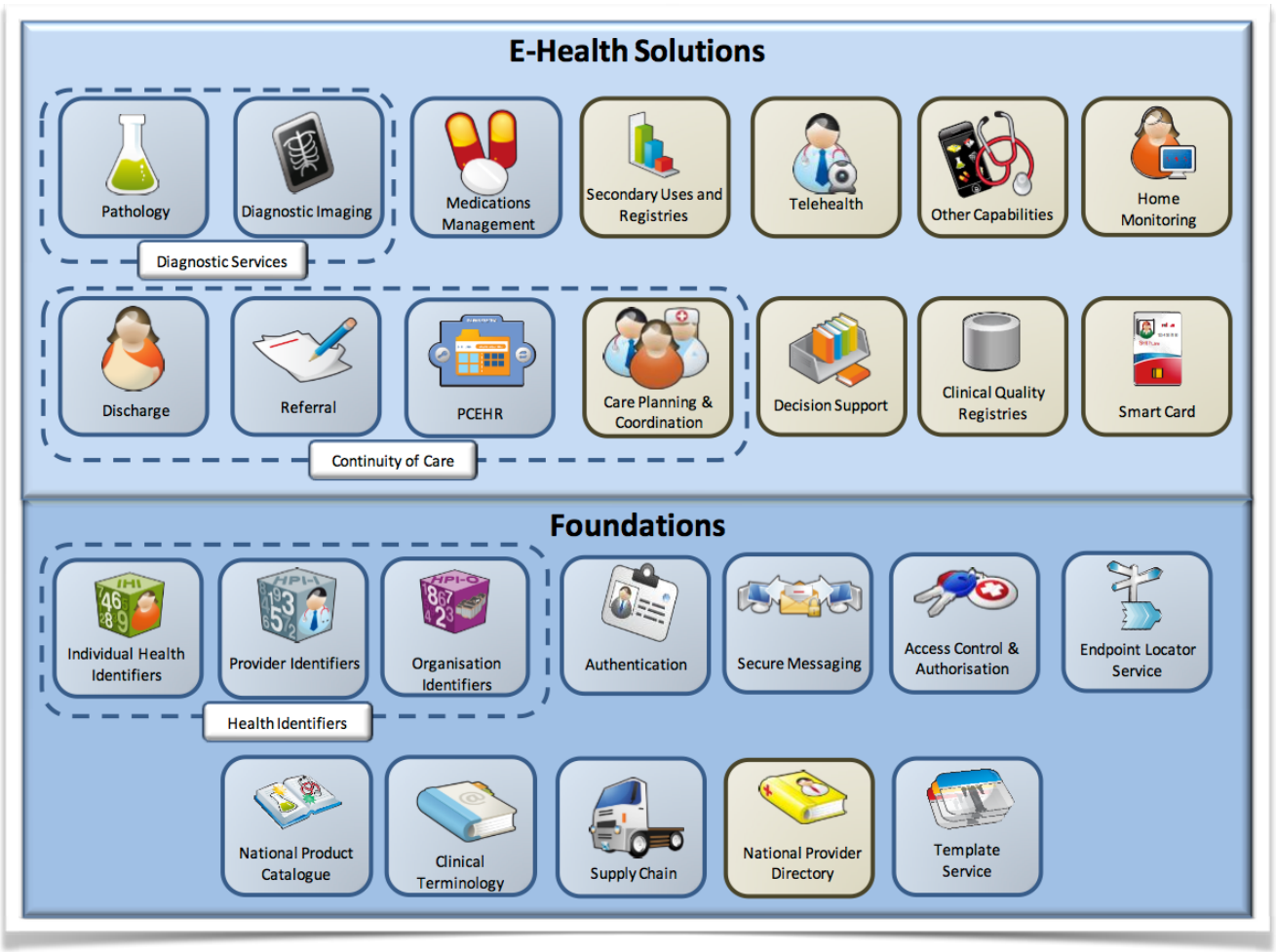
- eHR development should be go
  HA's systems and know-how
- Data privacy and system secur
  be accorded paramount impor
- Participation in eHR sharing sl
  compulsory for both patients a
- eHR Sharing System should be
  common technical standards a
- Development of eHR Sharing S
  block approach, involving part
- http://www.ehealth.gov.hk/en/about_eh

- Improve the safety and quality of healthcare
- Improve the efficiency of healthcare services
- Ensure eHealth solutions support interoperability
- Ensure solutions are fit for purpose
- Support services-based approaches
- Comply with legislative and policy requirements
- Re-use eHealth components
- Adopt pragmatic approaches
- Engage with all relevant stakeholders
- Maintain security
- Assess whole-of-life costs
- Use common terminologies and data definitions
- Manage information quality
- Manage information assets
- Ensure information consistency in distributed environments
- Express policy compliance as business rules
- Support loose coupling
- Express policy in technology-independent terms
- Observe standards
- Ensure supportability, sustainability and continuity
- Govern change
- Manage technical diversity

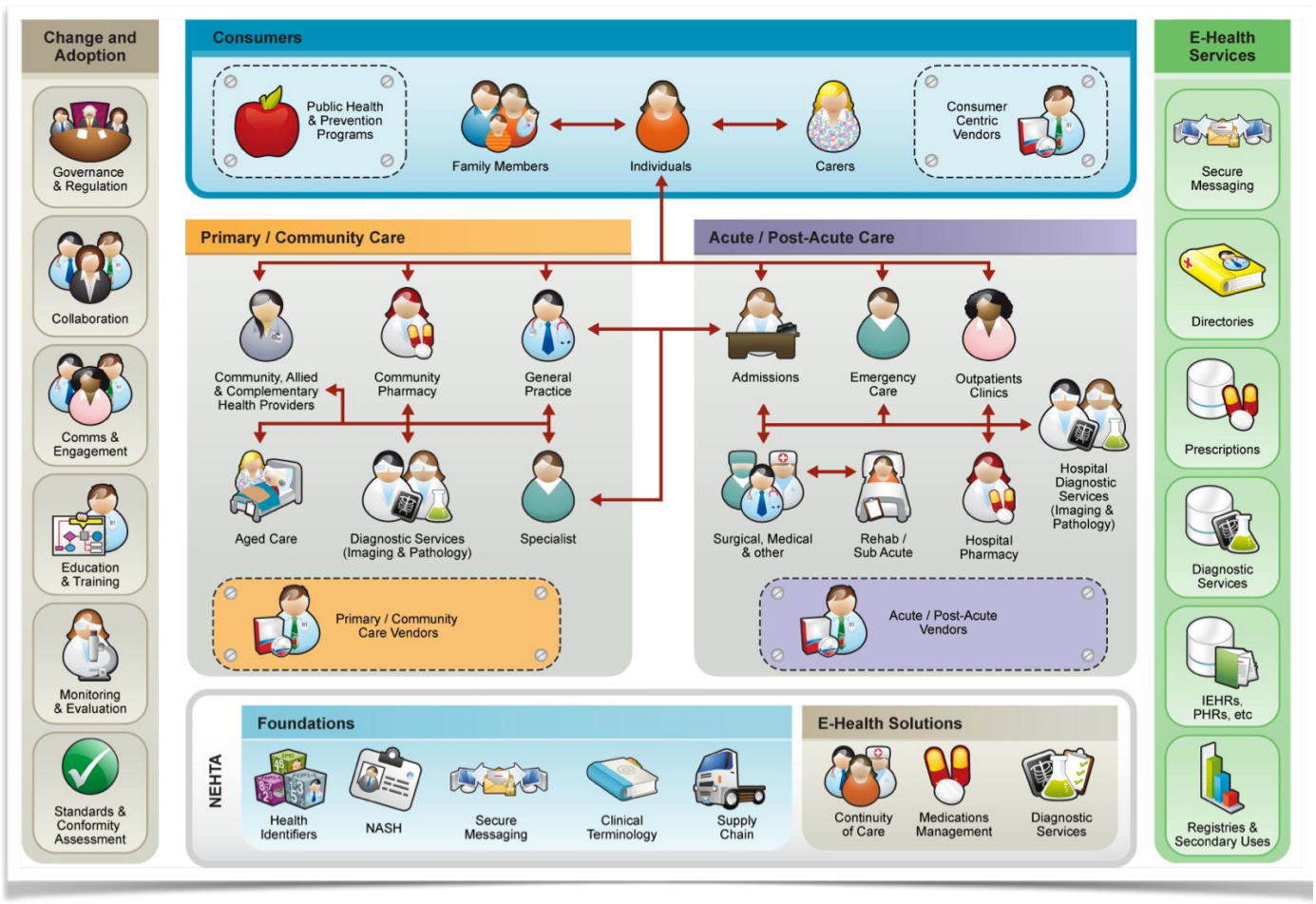
eHealth Architecture

- eHealth is a complex sector and ICT environment
  - Huge Stakeholder base
  - Serious consequences from failures
- eHealth Architecture design
  - Requirements Driven approaches
    - Use cases and Scenarios
  - Community & Capability Models
  - Capture Current-State and Target-State Architectures
    - Conceptual, Logical, Implementable Views
    - Information and Services
  - High-Level System Architecture
- Architecture Design Authority

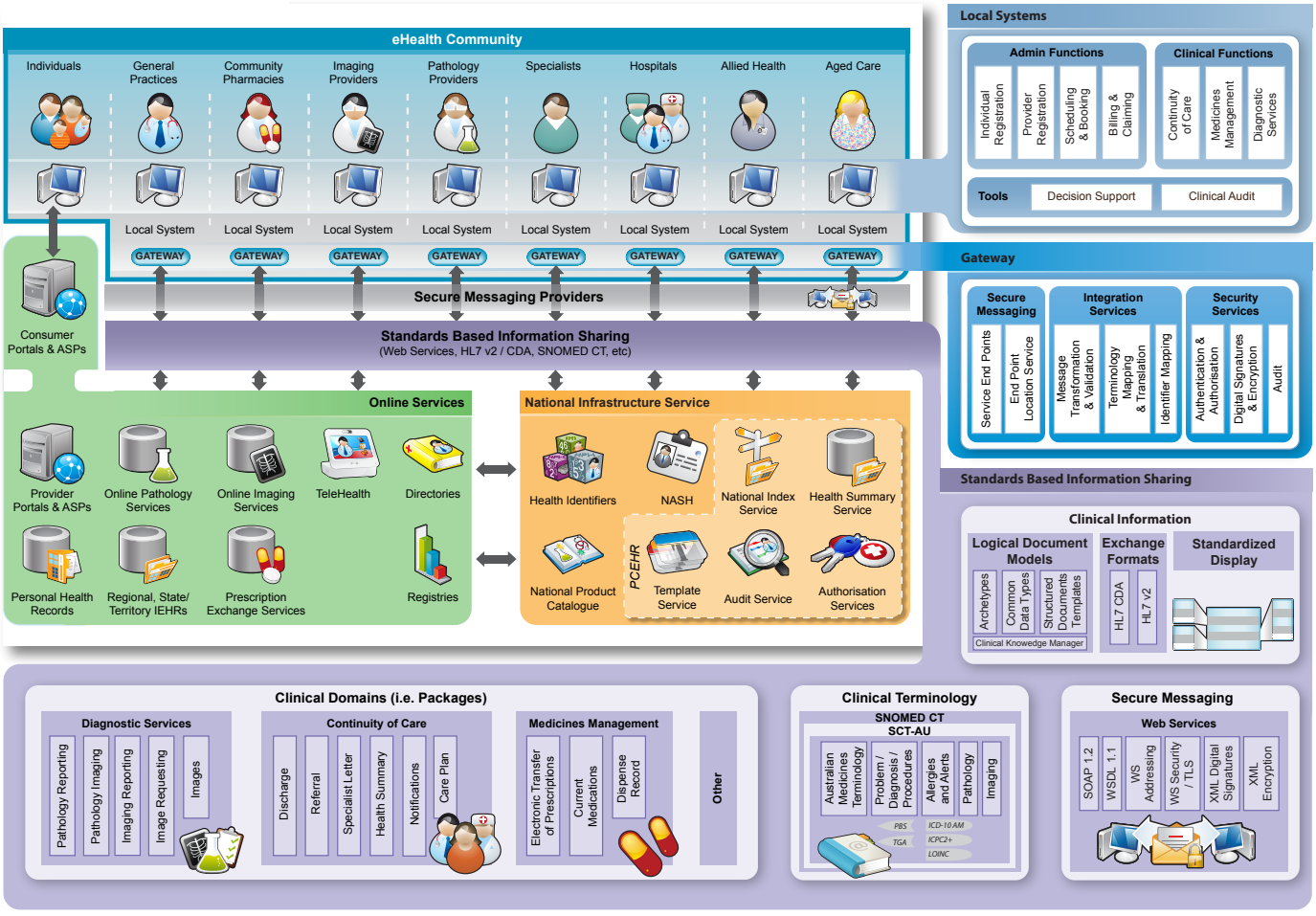
eHealth Solution Capability Model



Community Model

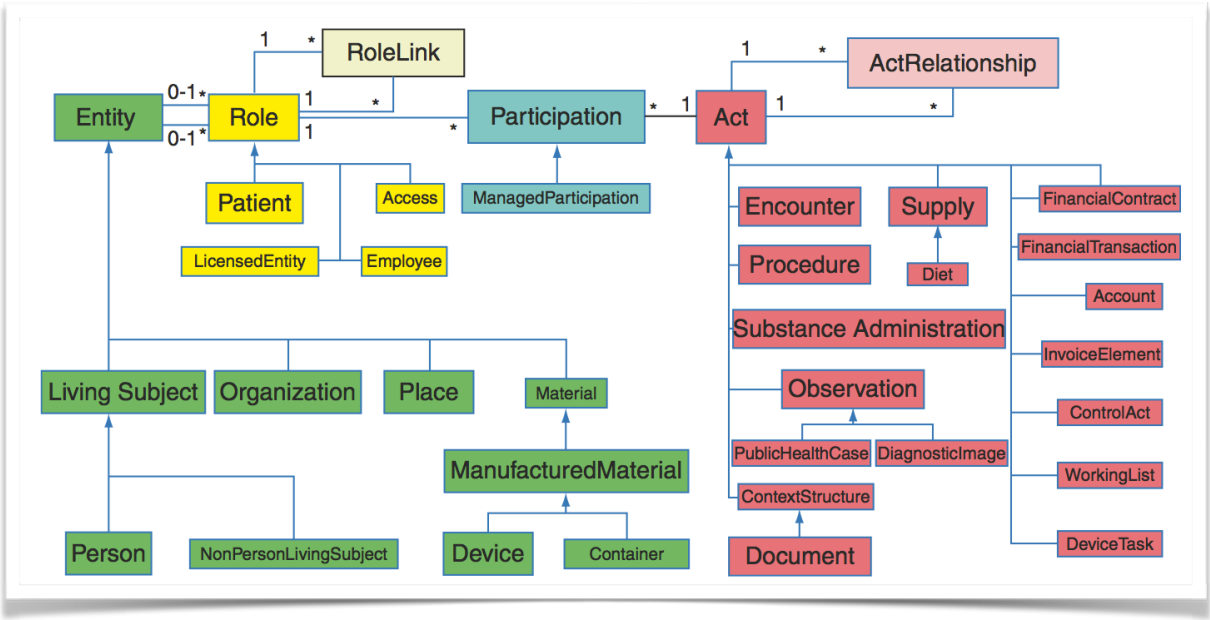


Architecture



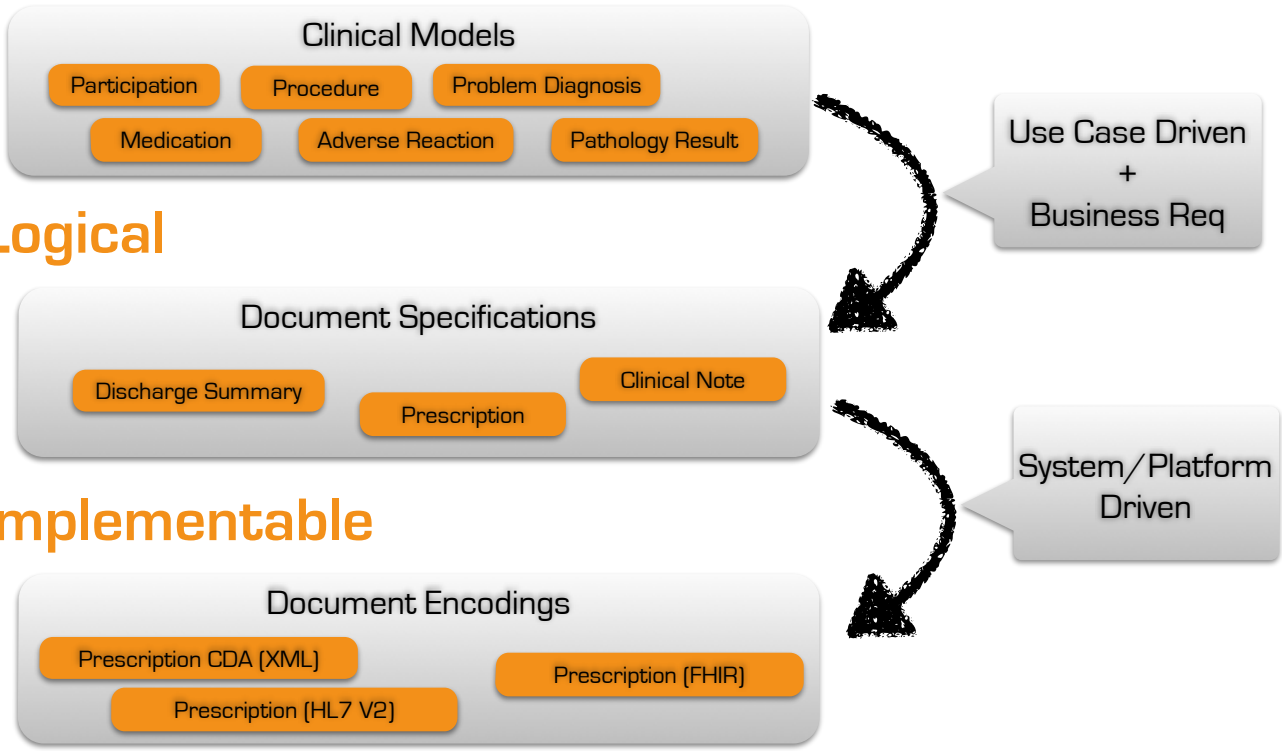
Clinical Information

- **HL7 Reference Information Model (RIM)**
  - **A universal model covering the entire healthcare domain**
  - **Grammar for messages, permitted relationships, data types**



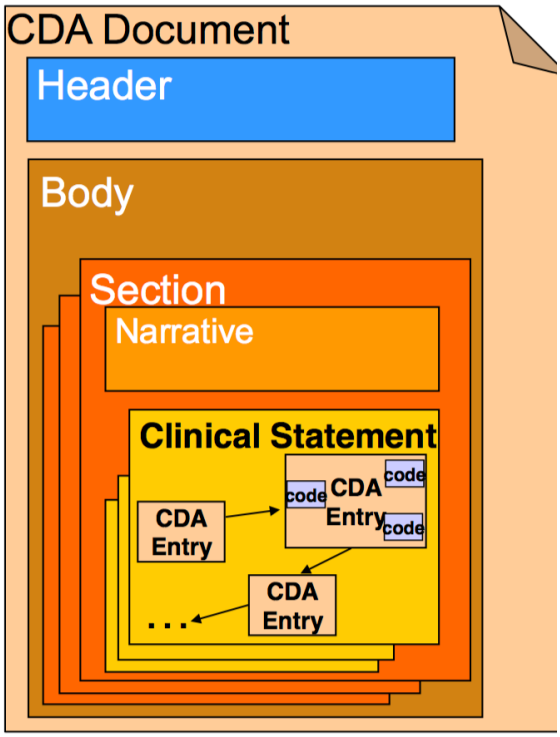
Information Model

Conceptual



Document Architecture

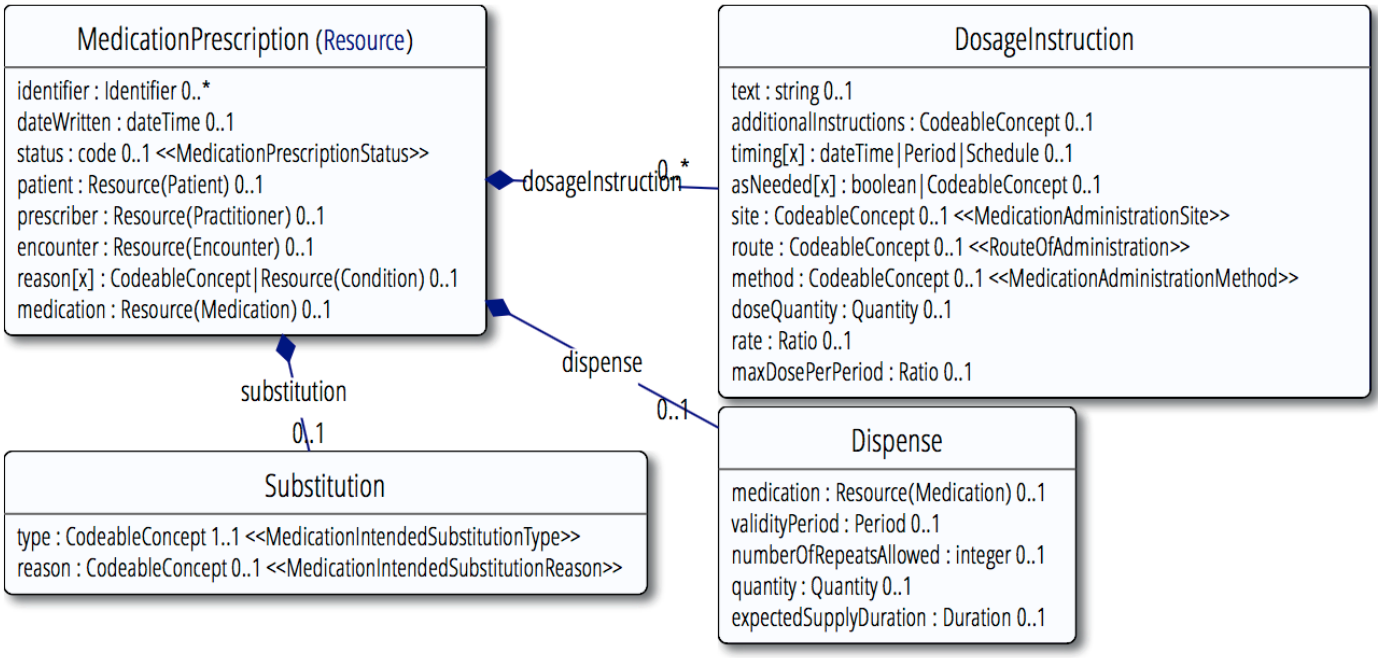
- Clinical Document Architecture (CDA) is a mechanism to encode the HL7 RIM in machine format (XML)
  - Typically for message payload
- Follows the "Document paradigm"
  - Header - Who, Where, When
  - Body - What
  - Human-readable parts
    - Render as HTML
  - Coded Entries (from Terminologies)



HL7 FHIR

- Fast Healthcare Interoperability Resources (FHIR)
- FHIR solutions are built from a set of modular components called Resources
  - Can easily be assembled into working systems that solve real world clinical and administrative problems
- Strong focus on implementation
  - Simple XML, JSON, RESTful interfaces
- Evolutionary development from HL7 Version 2 and CDA
- Interoperability – base resources can be used as is - can also be adapted for local requirements
- "Backed by solid ontologies and rigorous formal mapping for correctness"

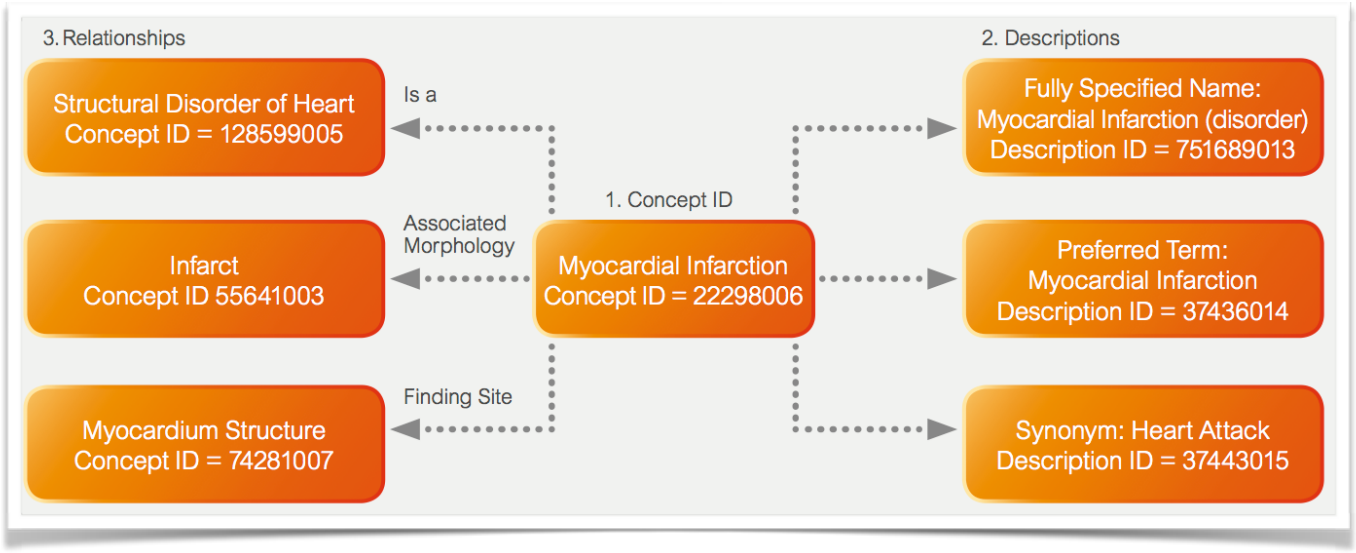
FHIR Model Example



Clinical Terminologies

- **ICD-10 - classify diseases and other problems for payment, management, and research/statistical purposes**
- **LOINC - laboratory and other clinical observations**
- **SNOMED - Systematized Nomenclature of Medicine - Clinical Terms (CT)**
  - **Comprehensive multilingual clinical healthcare terminology**
  - **Collection of about 400,000 clinical concepts, associated with about 800,000 description terms, and a hierarchy consisting of about 1,200,000 relationships**
  - **Can be profiled into smaller "Reference Sets" for specific domains**

SNOMED-CT



Post-coordination

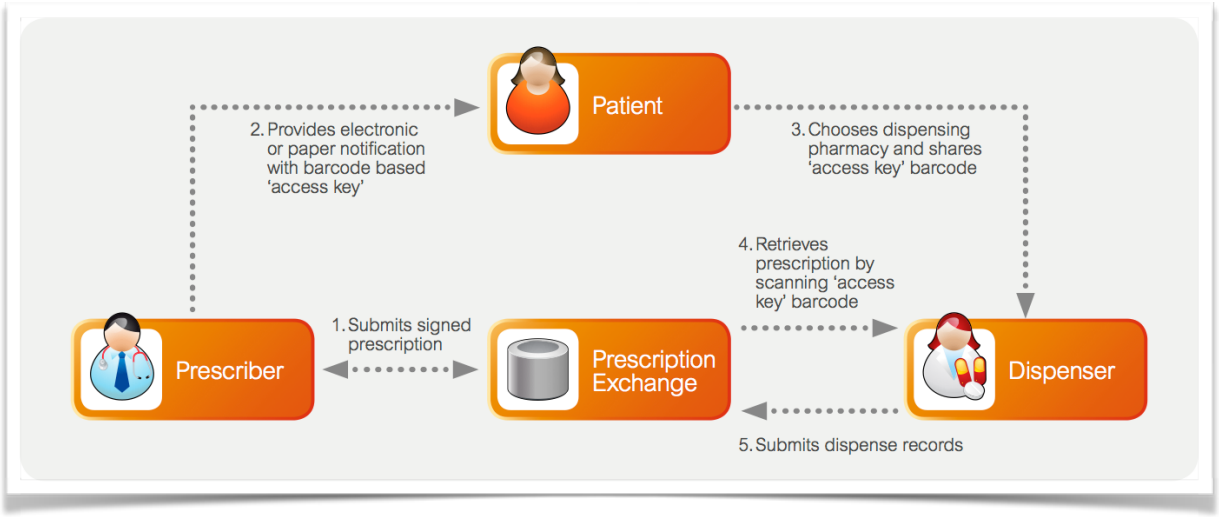
- SNOMED CT provides a compositional syntax that can be used to create expressions that represent new clinical ideas
- For example, there is no explicit concept for
  - "third degree burn of left index finger caused by hot water"
- Using the compositional syntax it can be represented as

```
284196006 | burn of skin | :
   116676008 | associated morphology | = 80247002 | third degree burn injury |
 , 272741003 | laterality | = 7771000 | left |
 , 246075003 | causative agent | = 47448006 | hot water |
 , 363698007 | finding site | = 83738005 | index finger structure
```

- SNOMED is based on a formal model that is extensible and still preserves semantics (can infer outcomes)

eHealth Solutions - ETP

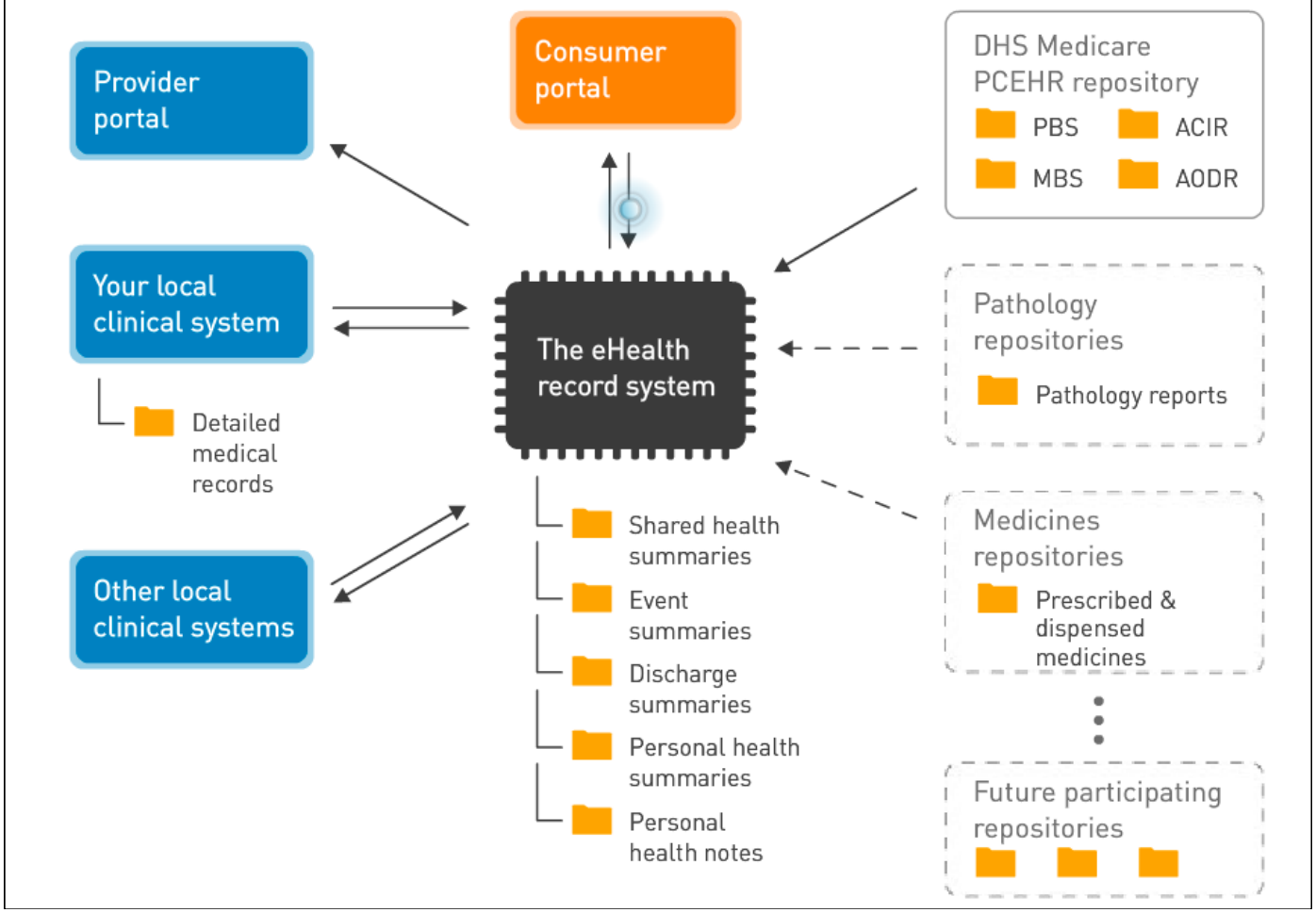
- **Medication errors cost the public hospital system approximately $380 million each year (Australia)**
- **ETP - manage prescriptions and dispense via PES**
- **The complete Electronic Medication Management (EMM) will cover plans, schedule, order, notification, administration**



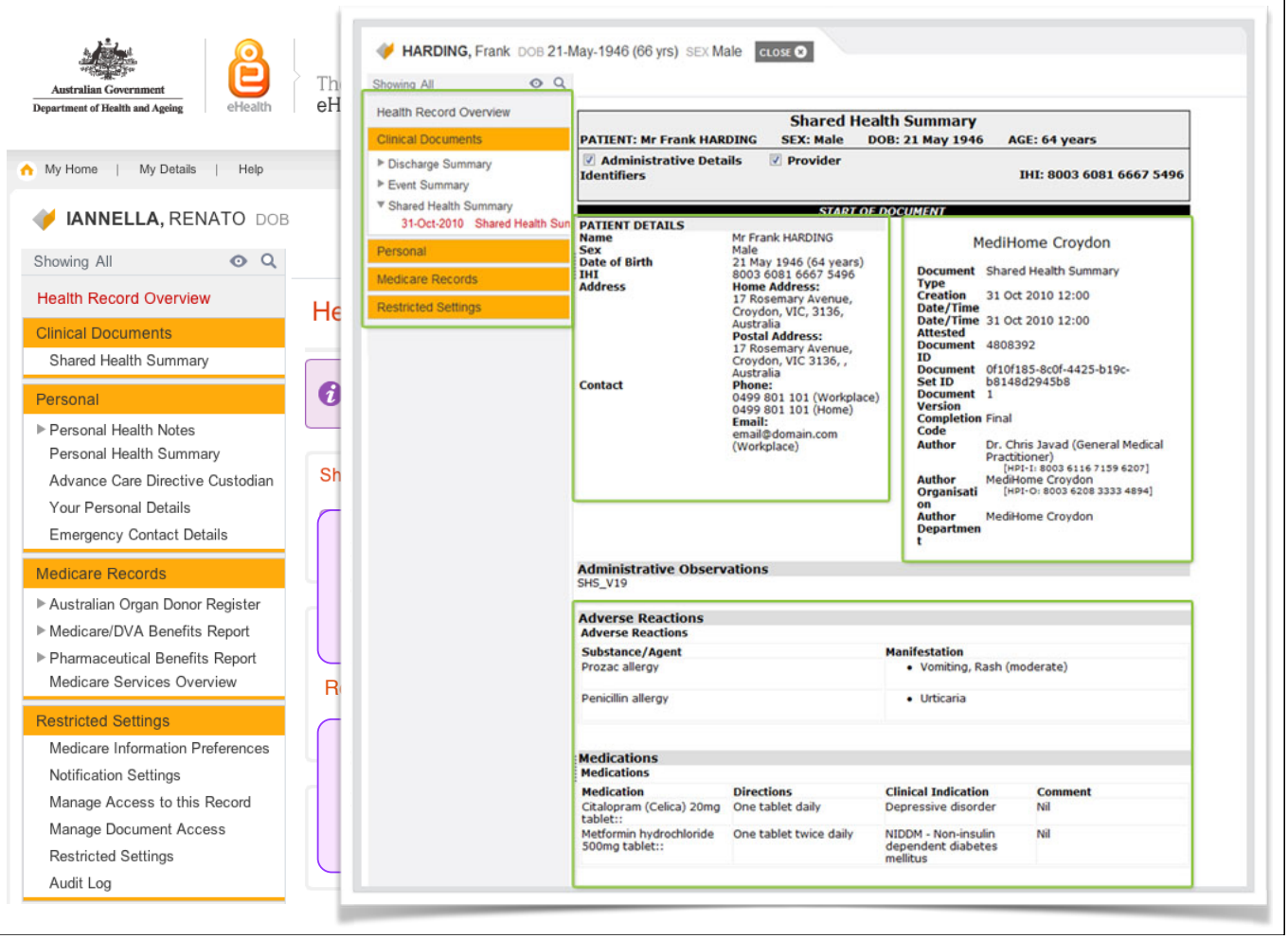
National eHR Systems

- **Electronic Health Record (eHR) provides:**
  - **Improved continuity of care for consumers accessing multiple providers**
  - **Access to consolidated information about an individual's medicines**
    - **Reductions in avoidable medication-related adverse events**
  - **Enabling individuals to participate more actively in their healthcare**
  - **Improved diagnostic and treatment capabilities through enhanced access to health information**
- **Supported by National Legislation and Regulations**

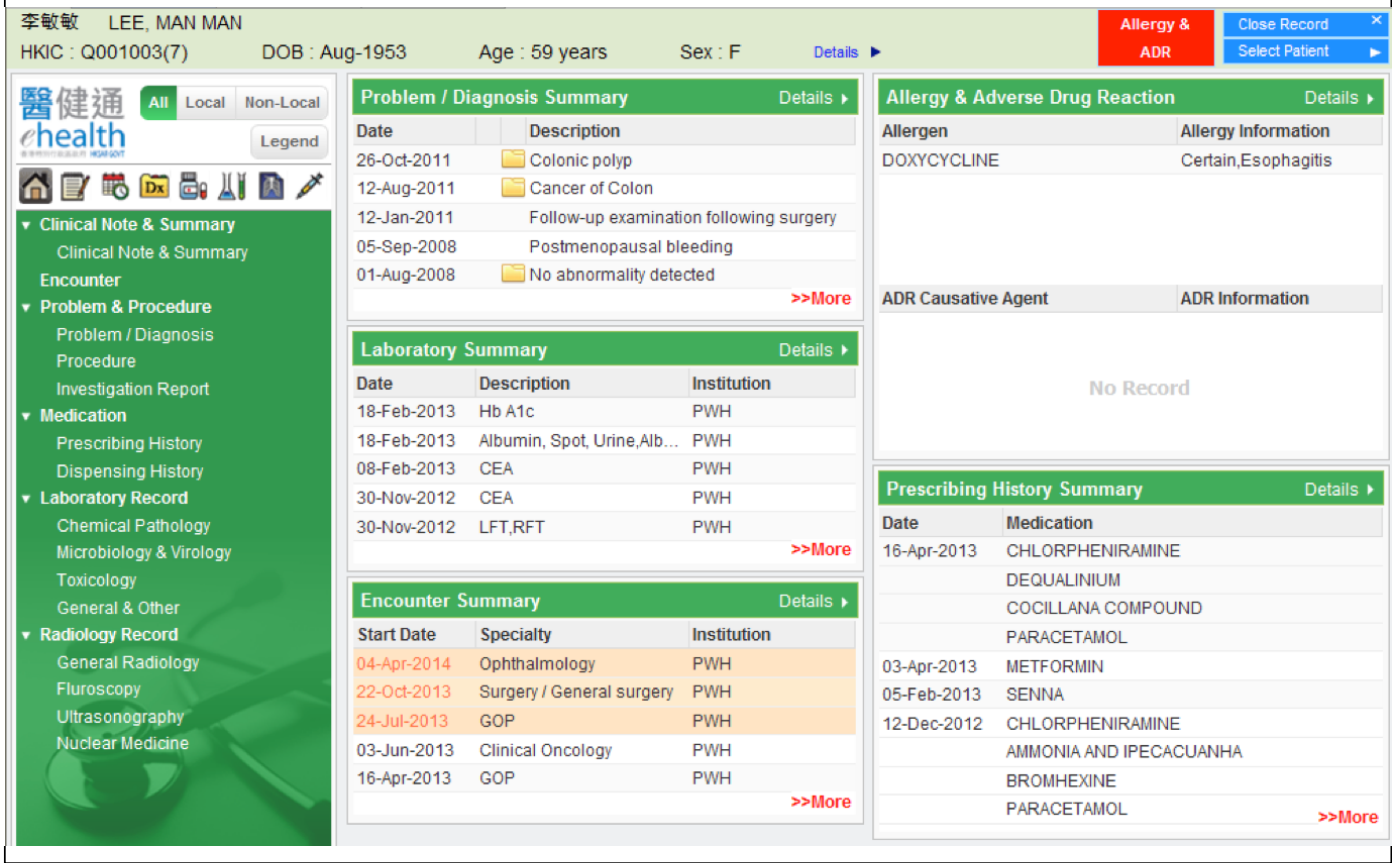
National eHR Information Flows



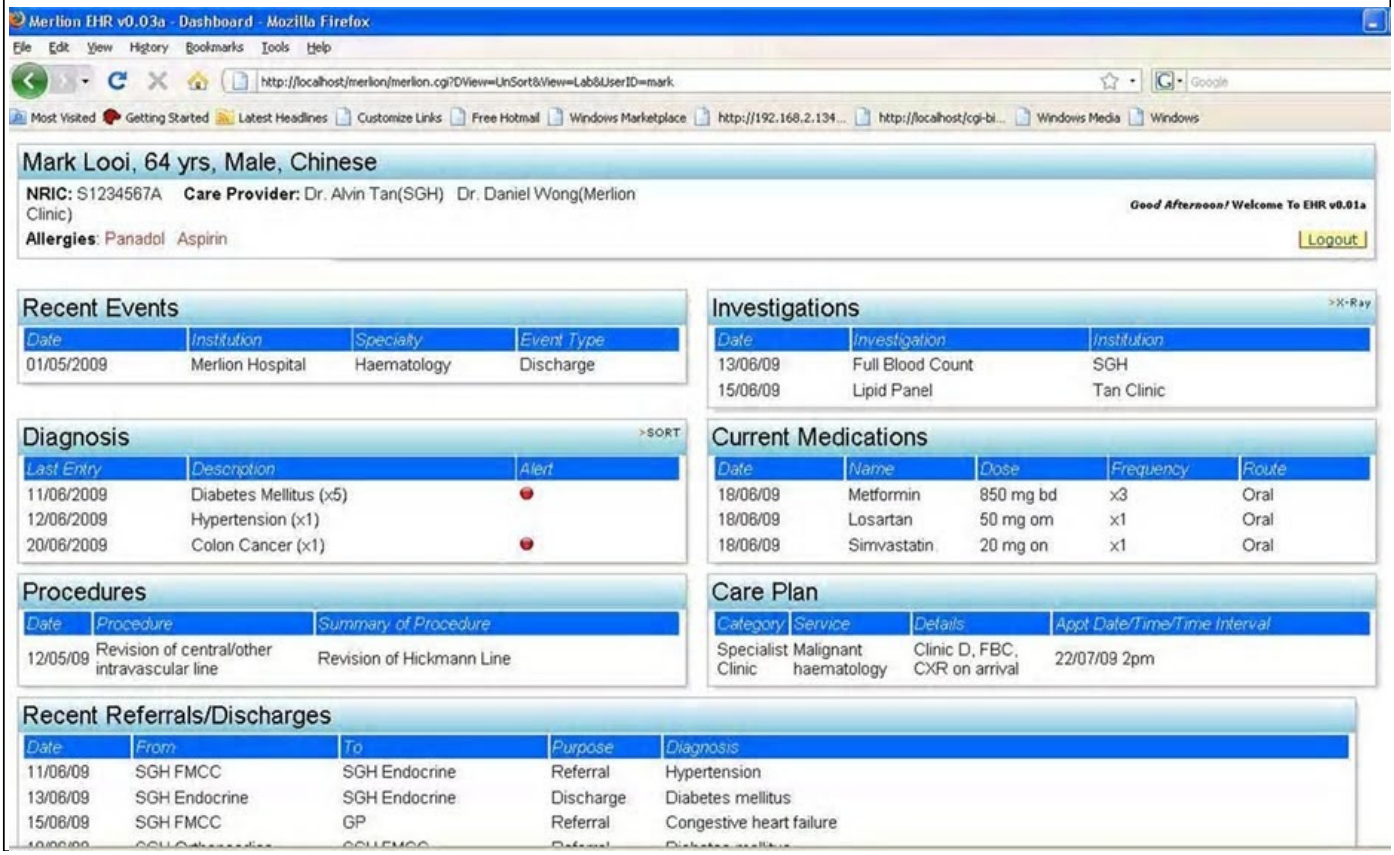
National EHR Interface - National Consumer Portal



Hong Kong eHR System



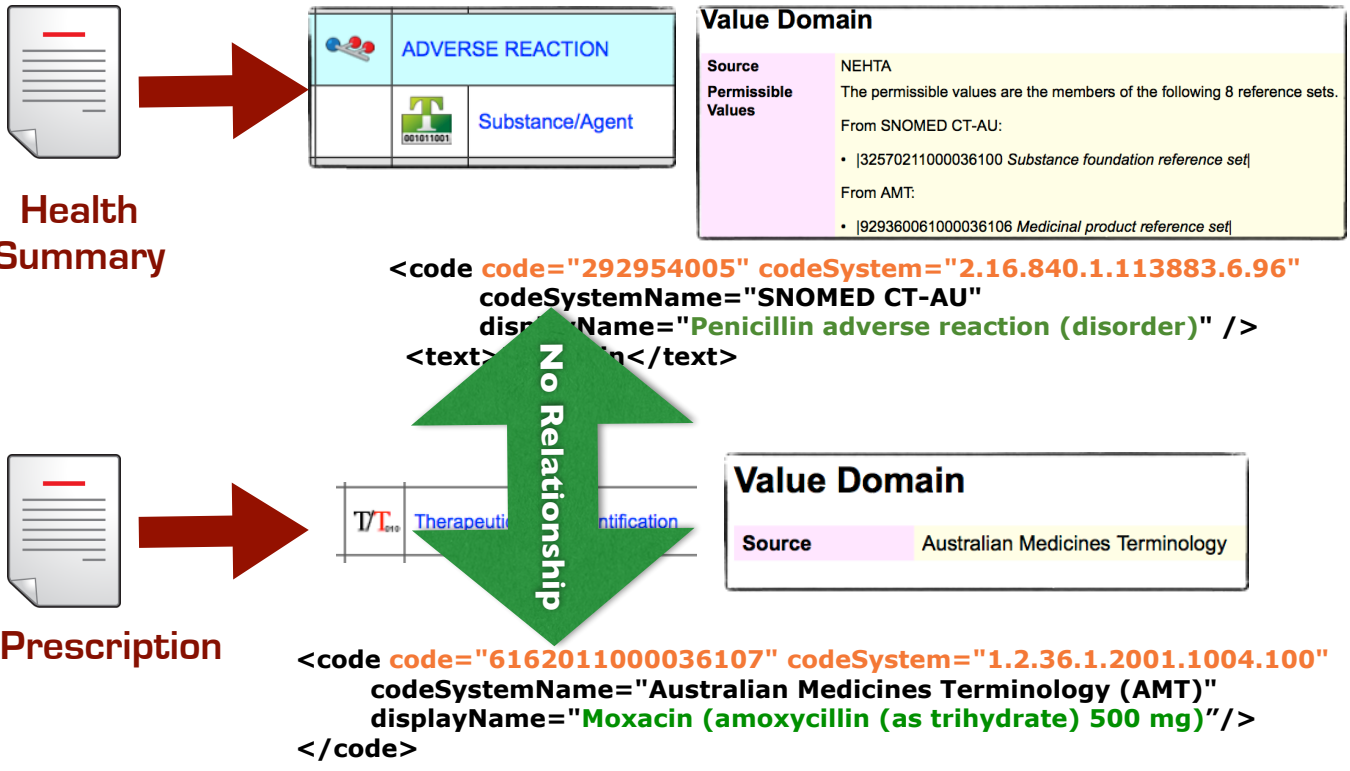
Singapore NEHR



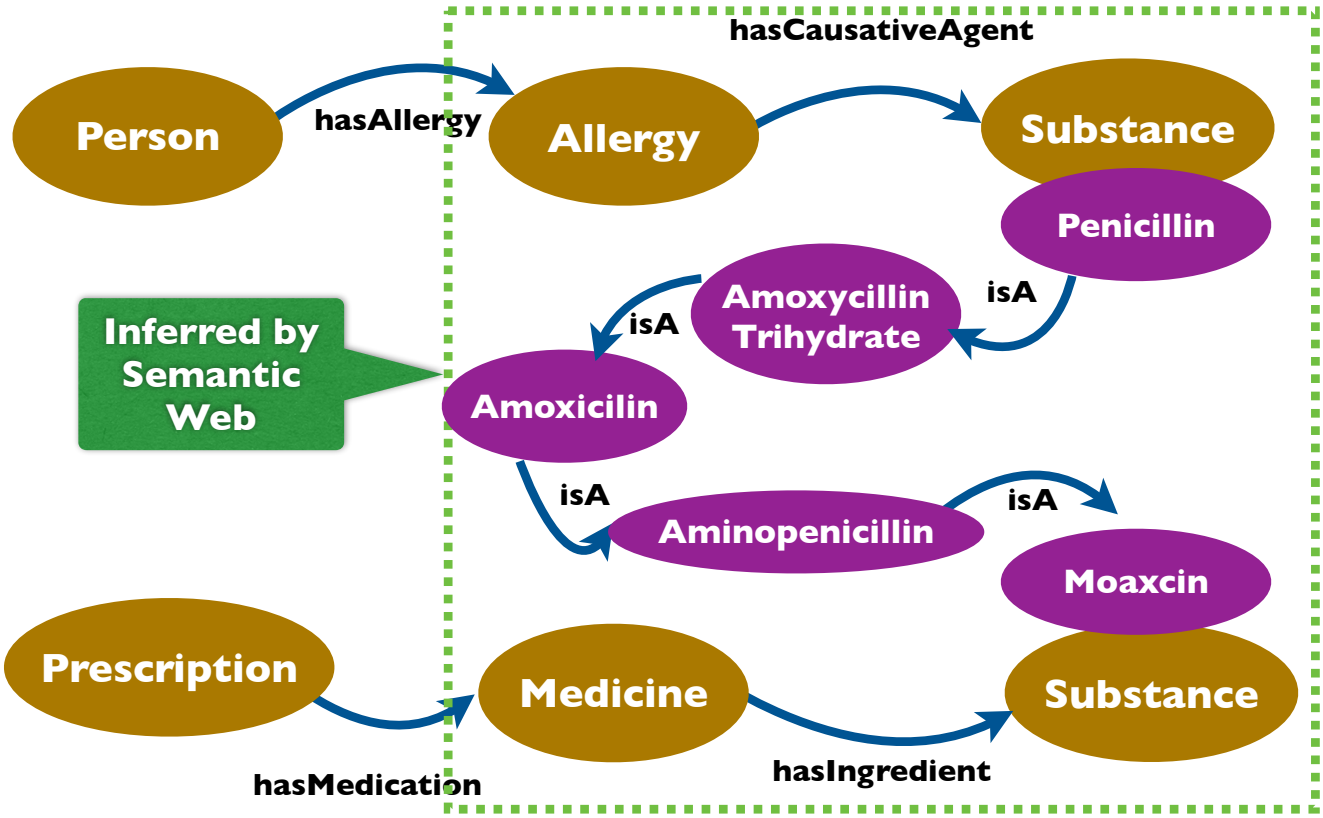
Towards Semantic eHealth

- RIM Modelled as a "closed system"
  - Designed for "constraint"-based modelling (not common)
  - Scope of Acts very large and overwhelming
  - CDA produces very complex XML
- The independent layers (conceptual/logical/implementable) causes interoperability issues - **No Connections or Linkages**
- The same information can be expressed in different ways using SNOMED and HL7 CDA structures
  - BUT modelled fundamentally different
- The W3C Semantic Web is a collection of standards for modelling and representing information (open-world assumption)
  - Based on formal model so can guarantee reasoning outcomes

Case Study: Medications



Semantic eHealth Model



Summary

- eHealth has many complex information standards
  - HL7 CDA v FHIR for the immediate future
- Challenge now to preserve semantics between closed info models (eg RIM) and open terminology models (ie SNOMED)
- Move towards the information model based on the same model as terminologies
- Semantic eHealth can achieve a level of functionality that current methods/technologies cannot provide
  - Decision support can have guaranteed outcome and hence reduce clinical errors
- Benefits will be significant - by improving provider decisions and consumers healthcare outcomes - in the long term