The PHIN Logical Data Model

An Introduction and Executive Overview

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Agenda

- Overview of Modeling
- Background – Goals, Compliance, History
- High Level View of the LDM
- Future

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The Purpose of Information Modeling (Apple Pie)

- To aid in understanding information in a particular domain
- To communicate the modeler's understanding of information and allow that understanding to be assessed by others
- To aid in reconciling multiple perspectives of information by combining the perspectives into a single specification
- To document the design of the data component of an information system so that the design may be evaluated

Interoperability

- How can systems communicate?
- How can SMEs and Developers communicate?
- Requires
  - Semantic Interoperability
    - Consistent structure
    - Consistent semantics
    - Consistent terminology

- To understand information/data you must know **both**:
- The definition of each element of data, and its relationship with each of the other elements – you must have a semantic model of the data

and

- The terminology to be used to represent coded elements, including the definitions, and relationships within the terminology.

What is the PHIN LDM?

- The PHIN LDM is a highly abstract data model
  - Provides semantic interoperability. Stores domain concepts in a manner that is understandable for reference. Provides a set of technology neutral specifications to facilitate database modeling and schema design supporting the development of PHIN compliant systems.
- It is not a recipe for a deployable physical model, although insights to that model may be gained.
  - Provides a bridge between the subject matter expert's view and the system developer's view of the information requirements for public health.

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Goals of PHIN LDM 1.0

It is a *Logical* Data Model for Public Health

- based on incremental refinements and extensions to the current NBS LDM V1.1.
- Includes concept modeling required by NBS, STARRS, PVS, Outbreak Management and Rash Surveillance. The focus is on moving all systems forward to a consistent model, rather then absorbing inconsistent models.
- Provides a target for new areas and domains, and thus will be extendable and shareable with concepts required by additional projects

Goals of PHIN LDM 1.0

- Is consistent with the HL7 V3 development framework; uses the HL7 ANSI standard Reference Information Model (RIM), datatypes, and vocabulary.
- Does not address physical database modeling, does not model to, or provide specific behavior for any existing physical schema.

Adaptation to Change

- "Living" document
- Will ALWAYS be under revision
  - Versions approx bi-annually
  - Technical corrections as needed
- Establish stakeholder active participation
  - Feed forward through HL7 PHER (Public Health and Emergency Response)
  - PHIN Data Model stakeholder group

What does this mean for PHIN Compliance?

- PHIN compliance with respect to the logical data model simply means that a derivative system (the Database Data Model and Physical Data Model) is able to accurately represent each of the information concepts in its domain in a manner consistent with the PHIN LDM

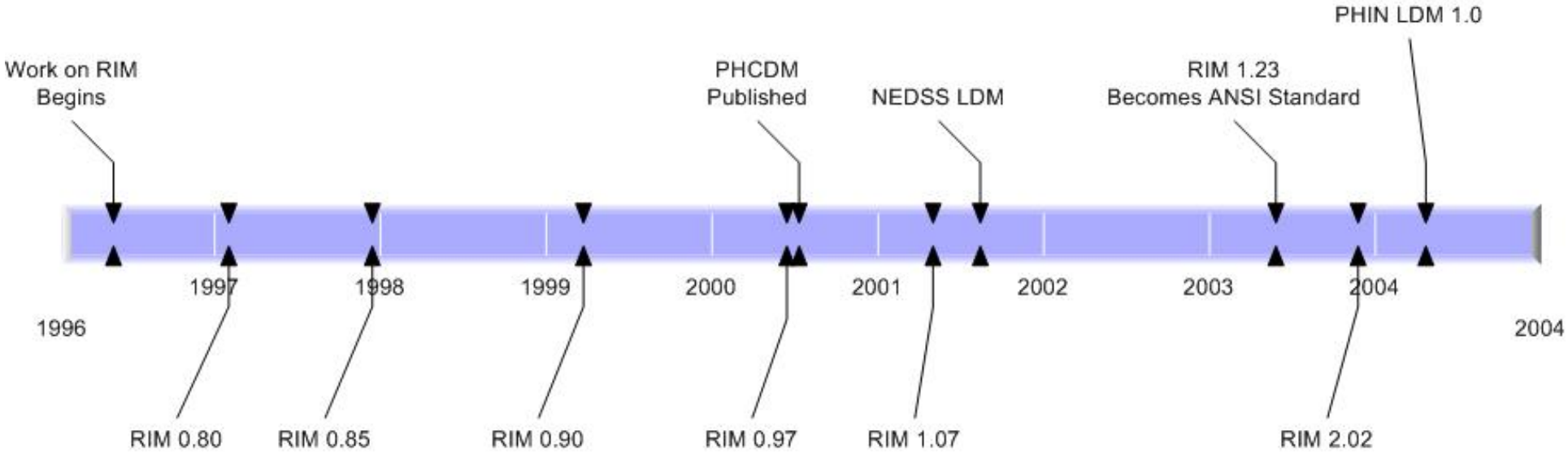
Models

- Different model types for different modeling needs
  - Choose appropriate model:
  - High level planning activities
    - Require high level of abstraction
    - Require low level of technical detail
  - Implementation activities
    - Require low level of abstraction
    - Require high level of technical detail

Model Hierarchies

- Conceptual Model
  - Determine if particular concepts can be expressed (scope). Models the domain. Does not provide detail such as normalization, keys, attribute specification.
- Logical Model
  - Constraint of conceptual model into application space. Normalized. Determine how particular concepts are expressed. Typically graphical.
- Database Model
  - Constrains, denormalizes, decorates with tables, columns, datatypes, primary/foreign keys. May not yet be DBMS specific. Designing for access patterns, performance.
- Physical Model
  - Indexes, table spaces. Optimizations. Machine processable. Litmus test=DDL

A Brief History of Time



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PHIN Model Evolution

Conceptual	Logical	Database/Physical
Public Health Conceptual Data Model (PHCDM) (2000)	NEDDS Logical Data Model 1.0 (2001)	NBS 1.x
Reference Information Model (RIM) 2.03 (2004)	PHIN LDM 1.0 (2004)	*[future]*

What is the HL7 RIM?

- The RIM (Reference Information Model) is documentation of information from the healthcare domain.
- It is used as a common reference for the data content of all HL7 version 3 standards.
- The RIM has graphical expression and an accompanying data dictionary.
- It is expressed using the Unified Modeling Language notation.

The RIM as Conceptual Model

- The PHIN Logical Data Model models public health concepts in a fashion that is consistent with the HL7 RIM. The RIM is the primary conceptual information model from which public health concepts are derived

The PHIN LDM V1.0 is

- consistent with the HL7 RIM V2.03,
- includes only those classes that are needed for public health
- extends the RIM with public health classes and attributes, specifically to handle nationally notifiable conditions, and syndromic surveillance, bioterrorism response related health related activities.

HL7 RIM *based* means that:

- The LDM “backbone” classes directly correspond to core classes in the HL7 RIM.
- Not all RIM backbone classes are represented
- Classes not pertaining to public health are omitted.
- Datatypes are limited to those required to express public health concepts.

What is the Relationship of HL7 V3 RIM to the LDM?

- The RIM does not define any particular application, but RIM-based models can be used in specific applications
- The PHIN LDM defines a data model that is conformant to the RIM
- Thus information from any particular public health or healthcare application can be expressed by the RIM (structures+behavior+vocabulary); and, in turn, can be mapped onto the PHIN LDM.
- This guarantees that all information in the PHIN LDM, irrespective of the 'domain' application in which it was created, can be re-used interoperably by any other 'domain' application, as well as across 'domain' applications
- The use of the RIM and PHIN LDM models and vocabulary are what guarantee this interoperability not only of data, but between applications

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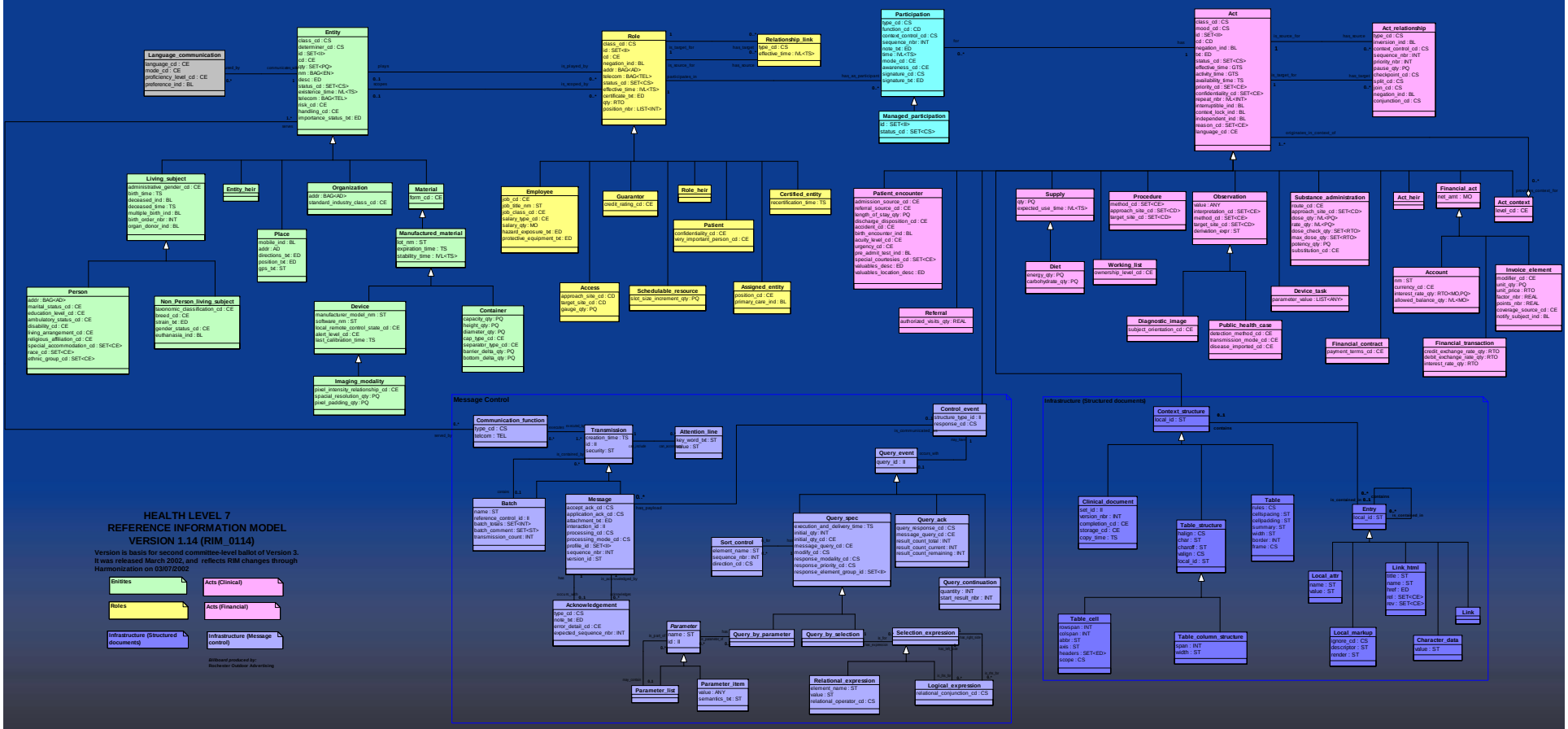
Reference Information Model V2.02 November 2003



HEALTH LEVEL 7
REFERENCE INFORMATION MODEL
VERSION 1.14 (RIM_0114)

Version is basis for second committee-level ballot of Version 3. It was released March 2002, and reflects RIM changes through Harmonization on 03/07/2002

Entities | Acts (Clinical)
Roles | Acts (Financial)
Infrastructure (Structured documents) | Infrastructure (Message control)

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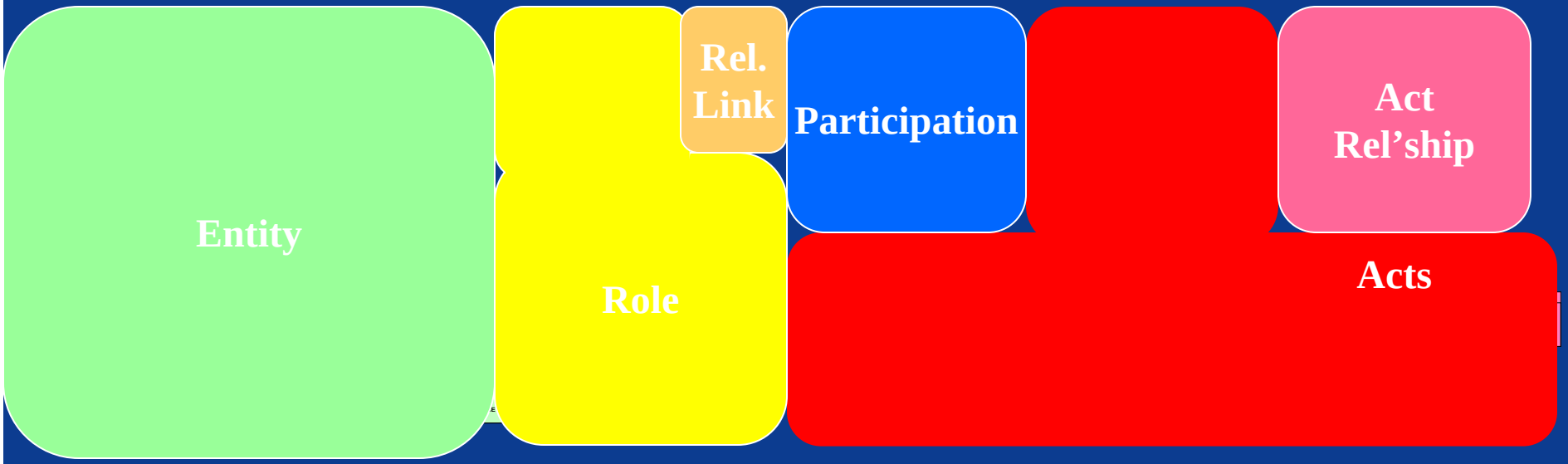
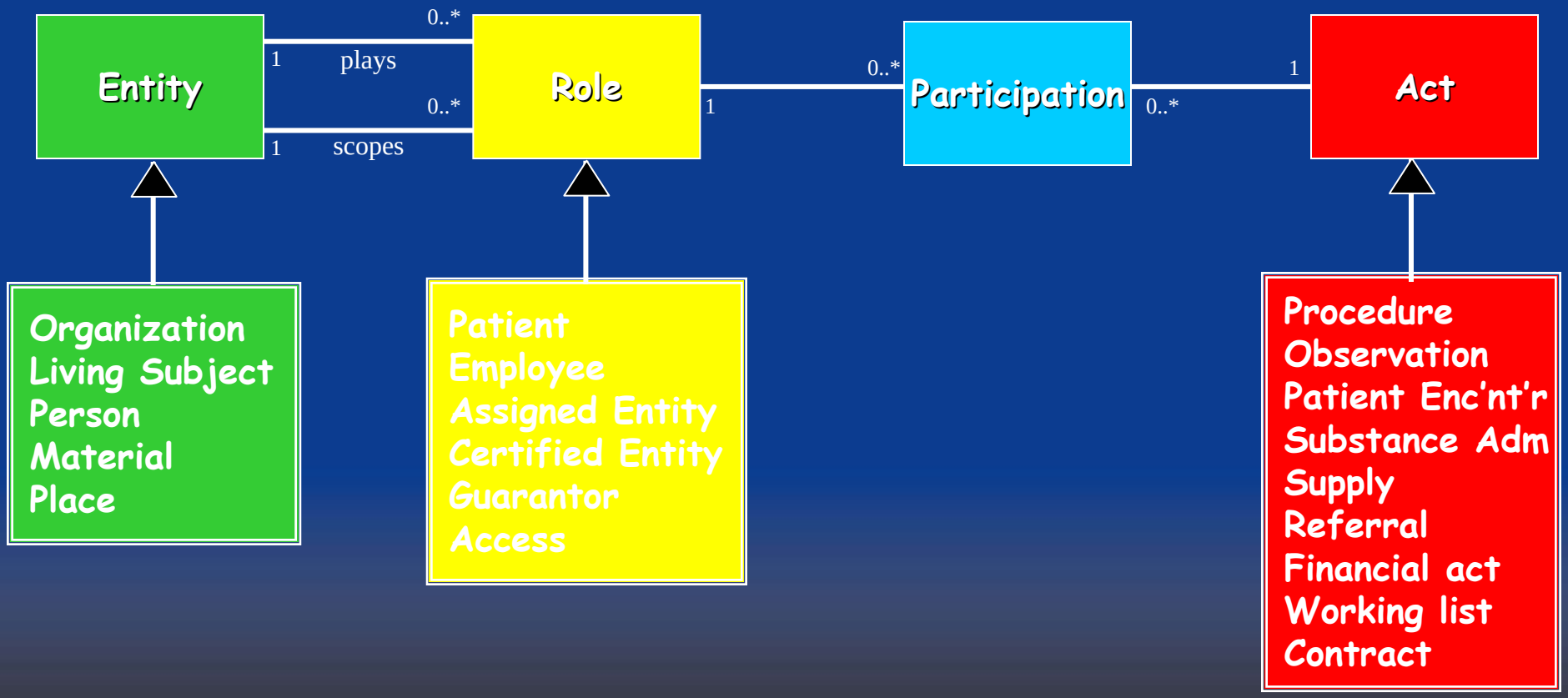
RIM Class Diagram V2.03 – March 2004



Core concepts of RIM

- Every happening is an Act
  - Procedures, observations, medications, supply, registration, etc.
- Acts are related through an ActRelationship
  - composition, preconditions, revisions, support, etc.
- Participation defines the context for an Act
  - author, performer, subject, location, etc.
- The participants are Roles
  - patient, provider, practitioner, specimen, specimen, etc.
- Roles are played by Entities
  - persons, organizations, material, places, devices, etc.

RIM Core Classes

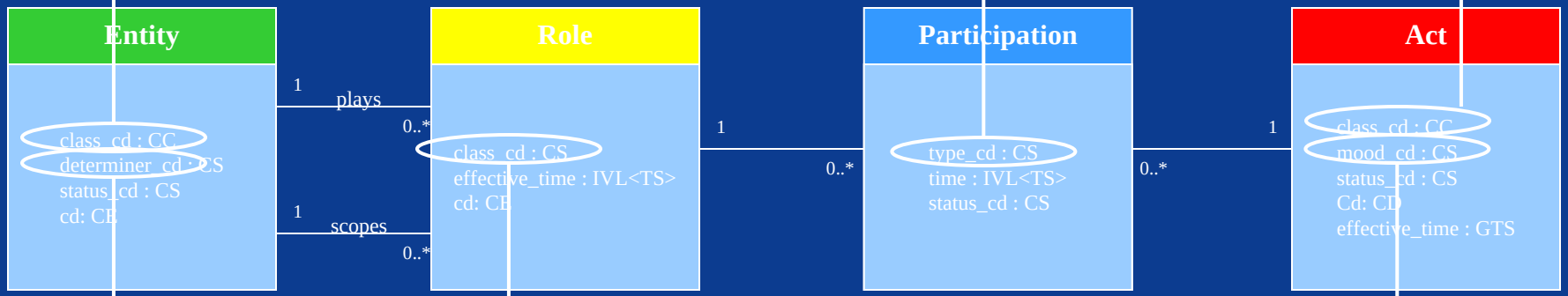


RIM Core Attribute Value Sets

Entity Class Code
- Living Subject
- Person
- Organization
- Material
- Place
- ...

Participation Type Code
- Performer
- Author
- Witness
- Subject
- Destination
- ...

Act Class Code
- Observation
- Procedure
- Supply
- Medication
- Financial
- ...



Entity Determiner Code
- Kind
- Instance
- (Qualified Group)

Role Class Code
- Patient
- Provider
- Employee
- Specimen
- Practitioner
- ...

Act Mood Code
- Definition
- Intent
- Order
- Event
- Criterion
- ...

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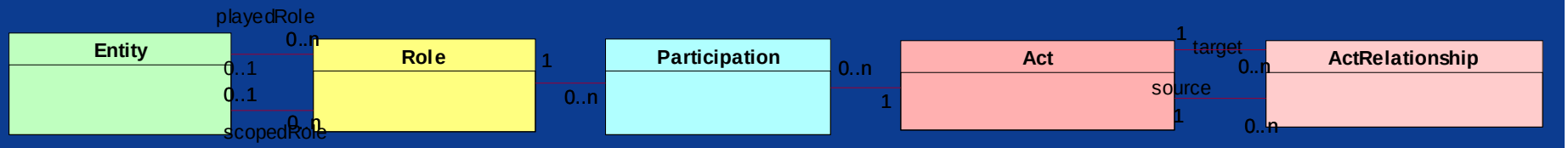
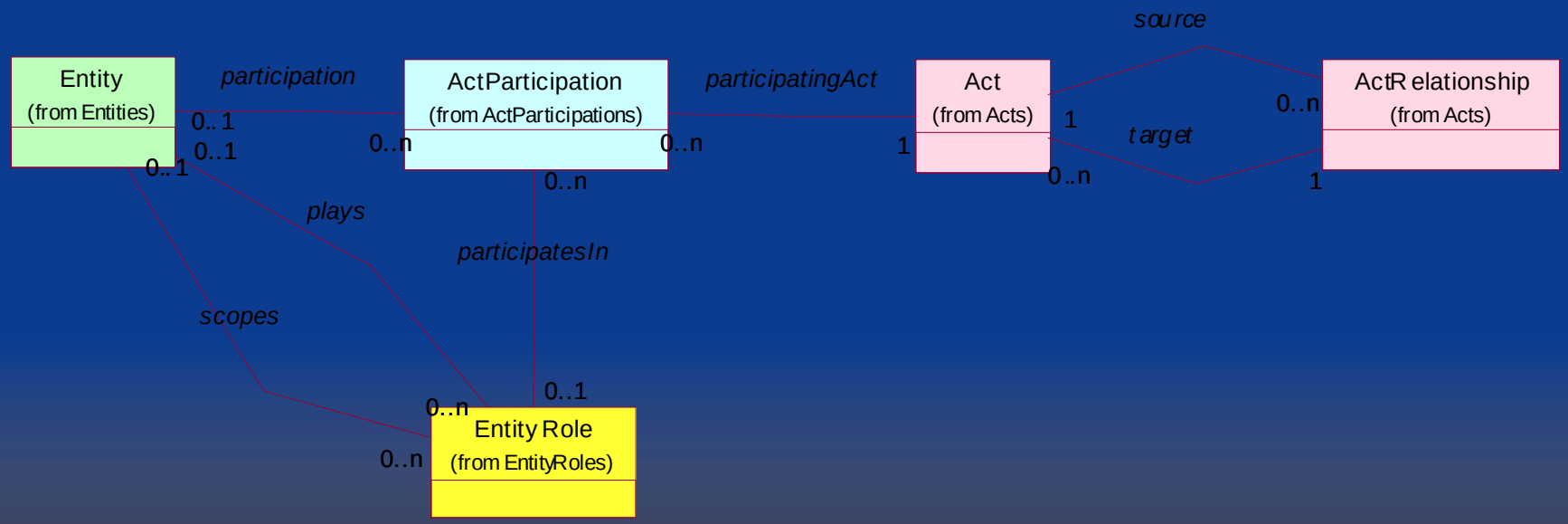
RIM Backbone



PHIN LDM Backbone



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PHIN LDM V1.0 Banner

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How do we move to this model?

- "Live" the RIM
  - Become active in modeling
    - Go / send modelers to HL7 WGMs
  - Think in terms of Acts, Roles, Entities, Participations
  - How do you represent a concept (Questions)
- Question/answer model not
  - RIM based/consistent
  - Generalizable
  - Useful for analysis with larger scope than single PAM
    - must understand the raw question set, rather than RIM semantics
  - But, some questions/answers are useful

Example

- Was the patient hospitalized? (YN)
- If the patient was hospitalized, what hospital?
- When was patient hospitalized?

RIM Model might represent this as

Act(Encounter) with participant(subj) = patient

Encounter.code = inpatient

Encounter.effectiveTime = date of stay

Encounter.participant(loc) = hospital

Modeling Goals

- Encourage business analysts to include complete information model mapping of ALL concepts in domain
- PAM specifications must be informed by the
  - RIM
  - LDM
  - Vocabularies

Issue to think about:

- Data Stereotype should represent the concepts consistently, according to the RIM (Domain model)
  - Logical model should represent concept rather than question and answer.

Future Upkeep

- Changes to the LDM
  - The LDM will ALWAYS be under revision
- Releases
  - Versions approx bi-annually
  - Technical corrections as needed

Evolution of the LDM

- Recognize this is a starting point, not a stopping point.
  - Input from states is required to refine and further develop the PHIN LDM.
- Establish a process to
  - Evolve the model
    - gather input from stakeholders for future modeling needs
    - Establish stakeholder active participation
      - Feed forward to HL7 through HL7 PHER SIG (Public Health and Emergency Response)
      - “Local” PHIN Data Model stakeholder group
        - Details TBD
  - We are early in this process and value your input
    - How best to gather requirements and incorporate
    - How to be dynamic to state requirements

Harmonization

- The PHIN LDM needs to become consistent with the HL7 RIM on an ongoing basis and the PHIN data modeling efforts need to feed into the HL7 ballot process.

- Evolution occurs two ways
  - Local (Public Health) modeling brought forward to HL7
  - HL7 changes harmonized to PHIN LDM

Material Things

http://www.cdc.gov/phin/data_models/index.htm

- PHIN LDM 1.0 User Guide.pdf
- PHIN LDM 1.0 Rose Model.mdl
- PHIN LDM 1.0 Web Browsable Rose Model.zip

http://www.hl7.org
http://www.hl7.org/v3ballot/html/index.htm

- RIM 2.03
- Latest Version 3 Standards, Ballots, Specs, DSTUs

Questions ?

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