Health Level Seven Version 3.0
and the
Reference Information Model

V3 Methodology Mission

- To bring modern software engineering practices, such as Object Oriented Analysis and Design and formal modeling, to the standards development process
- To bring the highest level of quality, understandability, and flexibility to a messaging standard
- Incorporate concept abstractions and behavior modeling using roles in a rigorous set of work products
- Express the standard in widely accepted UML notation

Version 3 Goals

- Provide a framework for coupling events, data elements and messages
- Improve clarity and precision of specification
- Improve adaptability of standards to change
- Begin to approach “plug and play”

Version 3 is a change to the HL7 Architecture

- **The HL7 2.x specifications have:**
  - Segments that imply information entities
  - Events that indicate implied behaviors
  - Descriptive content that suggests use cases
  - but never formally documents these
- **Version 3 seeks to formalize this by applying object analytic methods and style**
  - to improve the internal consistency of HL7
  - to provide sound semantic definitions
  - to enable future architectures
  - to produce an evolution not a revolution
  - Done by applying MODELING to the HL7 process

Description of the HL7 2.x Standard

- The Application Protocol for Electronic Data Exchange in Healthcare Environments is an HL7 messaging standard that enables disparate healthcare applications to exchange data.
- The standard provides the layout of messages that are exchanged between two or more applications based upon a particular trigger event.
- A message is comprised of an ordered collection of segments.
- A segment is an ordered collection of data elements that typically share a common subject.
- The HL7 standard specifies which data elements are to be sent, the data type and suggested length of each, and indicates whether the data element is required or optional and whether it may repeat.
- The message specification includes a declaration of the delimiters used to separate message segments, elements, and element components.

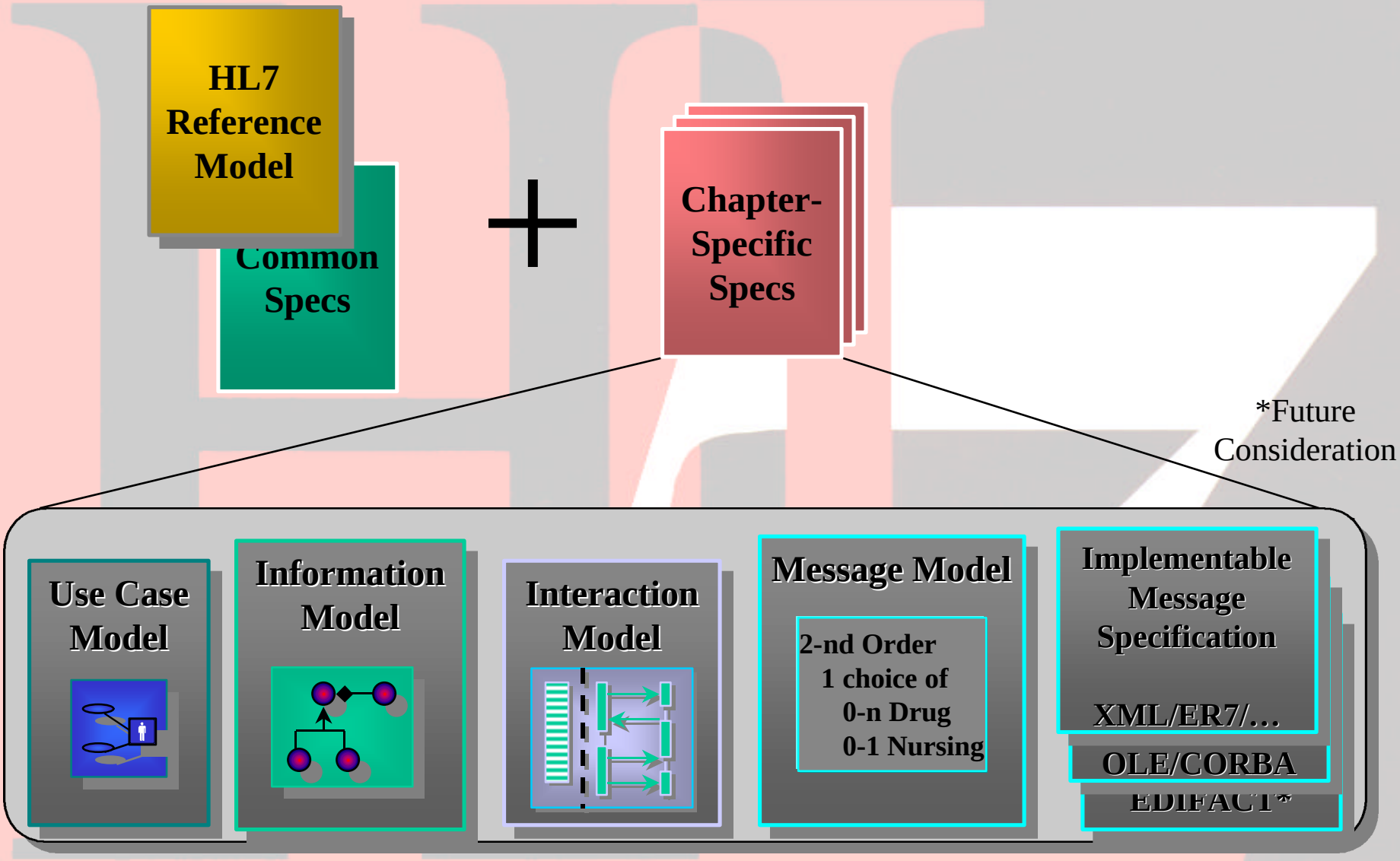
HL7 Version 3.0

- HL7 version 3.0 will be the most definitive HL7 standard to date, incorporating more trigger events and message formats with very little optionality.
- Version 3.0 uses an object-oriented development methodology and a Reference Information Model (RIM) to create message specifications.
- The RIM is an essential part of the HL7 Version 3.0 development methodology, as it provides an explicit representation of the semantic and lexical connections that exist between the information carried in the fields of HL7 messages.
- As part of version 3.0, the HL7 Vocabulary Technical Committee is developing methods that will allow HL7 messages to draw upon codes and vocabularies from a variety of sources.
- The V3.0 vocabulary work will assure that the systems sending and receiving V3.0 HL7 messages have an unambiguous understanding of the code sources and code value domains they are using.
- HL7's primary goal for version 3.0 is to offer a standard that is definite and testable, and to provide certification of vendor's conformance.

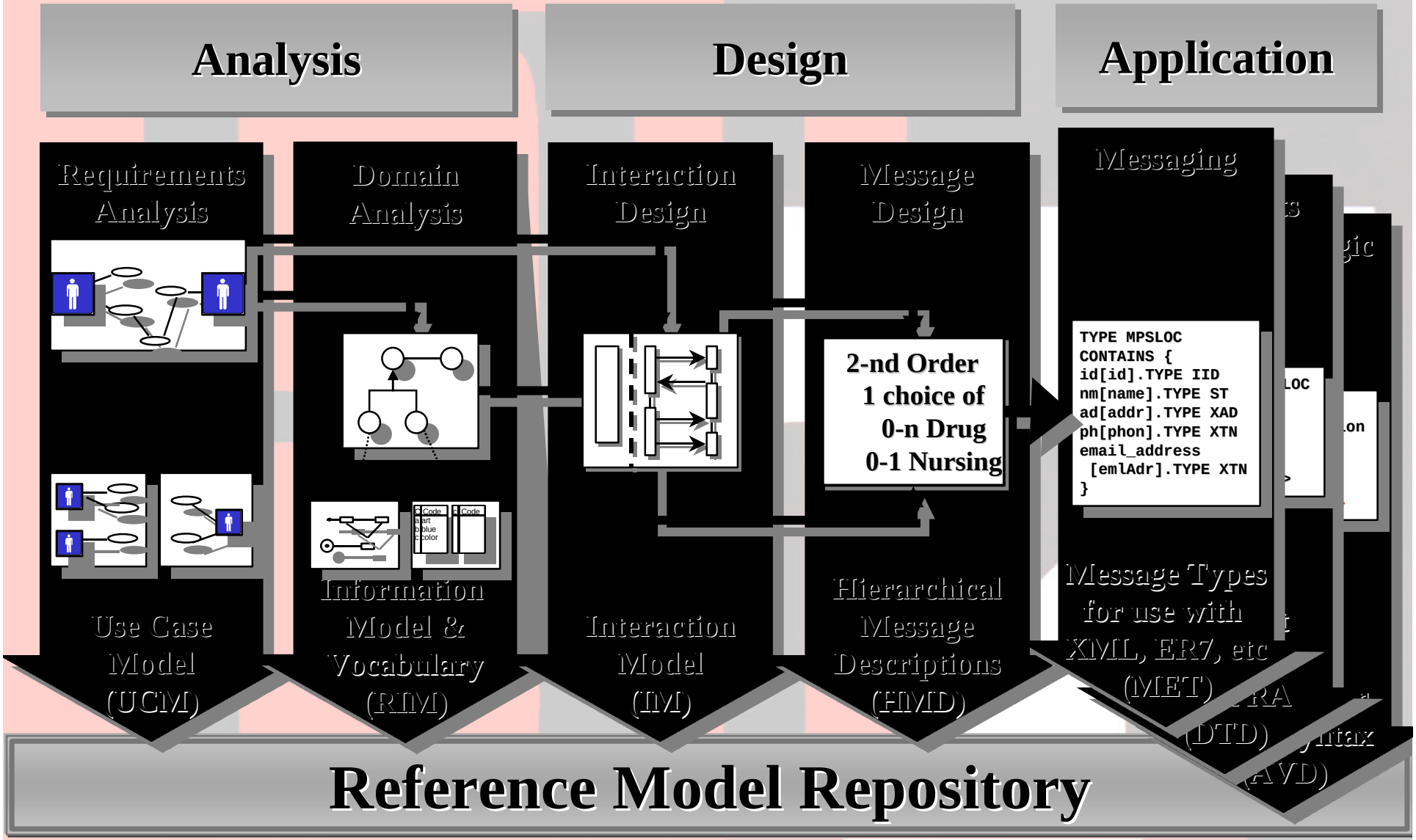
History of HL7 V3 Activities

- **1996**
  - Introduce modeling to TC Chairs
  - First V3 Tutorial to general membership
  - Vocabulary SIG established
- **1997**
  - Roll-out of first RIM, version 0.80
  - First Message Development Framework
  - First RIM Harmonization meetings
- **1998**
  - Adopted Rational Rose for modeling
  - Work begins on V3 XML ITS
  - First RoseTree tools appear
- **1999**
  - V3 Data type proposal reviewed
  - Notion of R-MIM added to MDF
  - Vocabulary enters the V3 MDF
- **2000**
  - V3 data types out to ballot
  - First vocabulary harmonization
  - V3 Acceleration Project started
- **2001 (projected)**
  - XML and Datatype ballots complete
  - RIM and Vocabulary stabilized
  - Message specifications balloted

An HL7 Version 3.X Spec



HL7 V3 Message Development Lifecycle



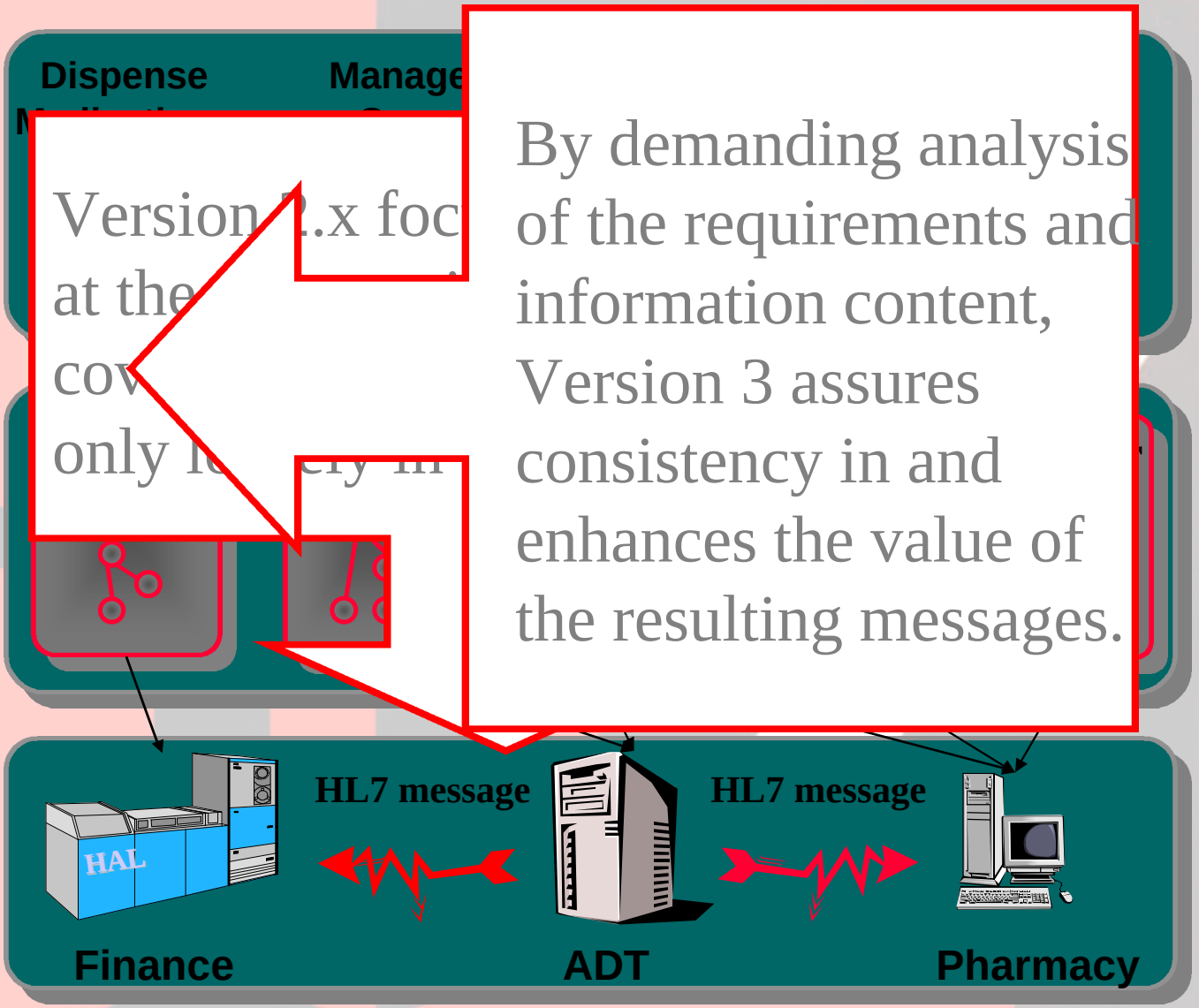
HL7 Modeling

Abstractions:

Activities
(Use Case Model)

Objects
(Information Model)

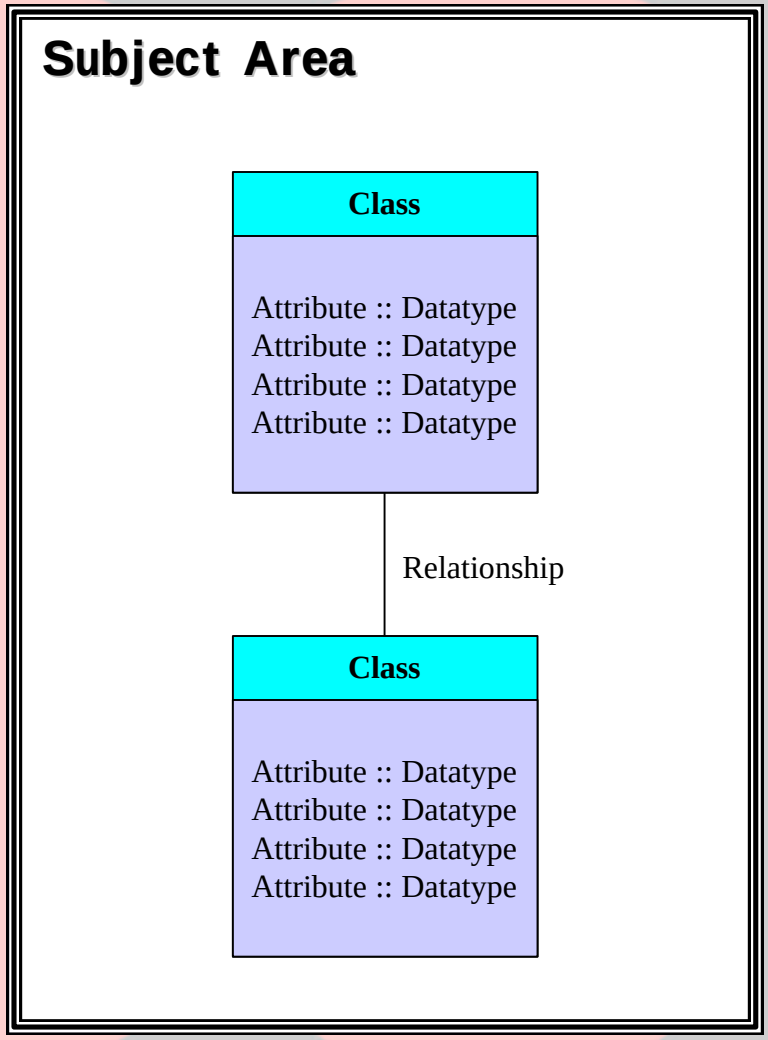
Communication
(Interaction and Message Models)



The Reference Information Model (RIM)

- Expresses the information content for the collective work of the HL7 Working Group in UML notation.
- A coherent, shared information model that is the source for the data content of all HL7 messages.
- Maintained by a collaborative, consensus building process involving all Technical Committees and Special Interest Groups.
- RIM change proposals are debated, enhanced, and reconciled by technical committee representatives and applied to the RIM during the model harmonization process

Information Model Components



Subject Area: a major partition of a information model.

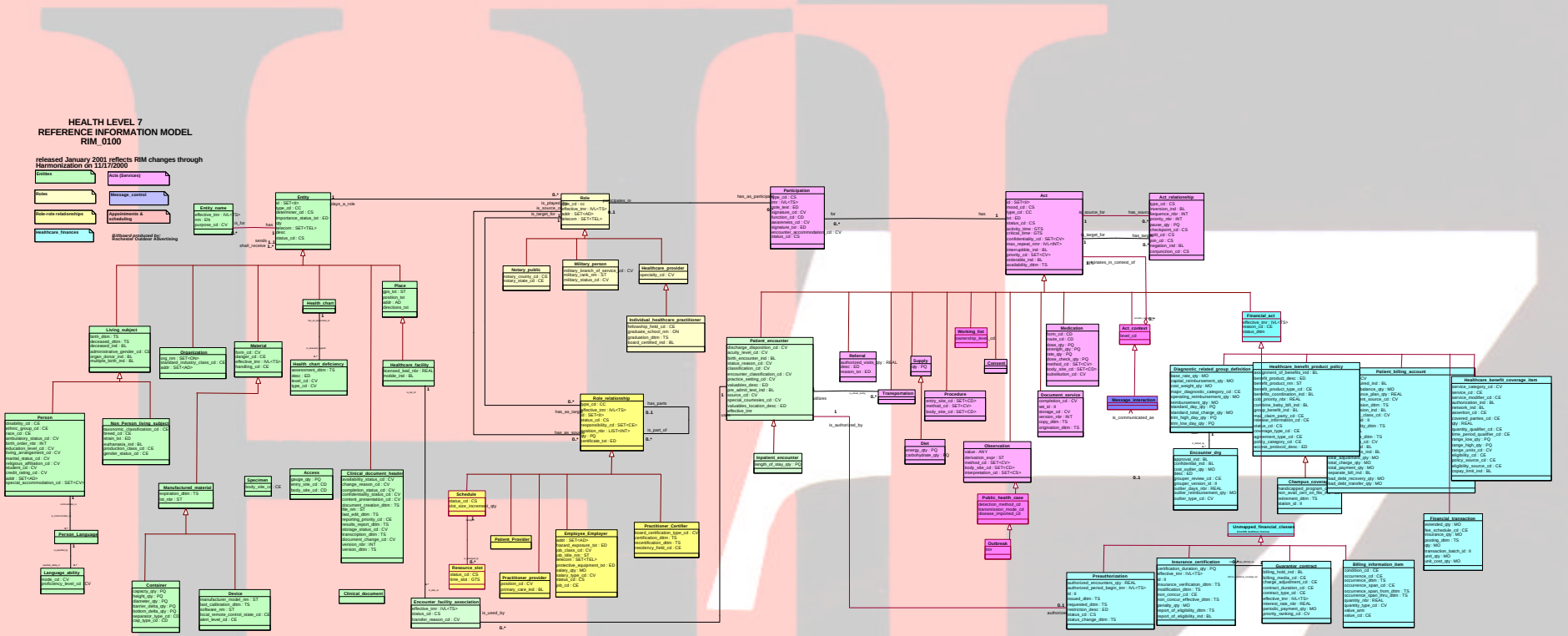
Class: something about which information is collected.

Relationship: an affiliation between two classes.

Attribute: information about a class.

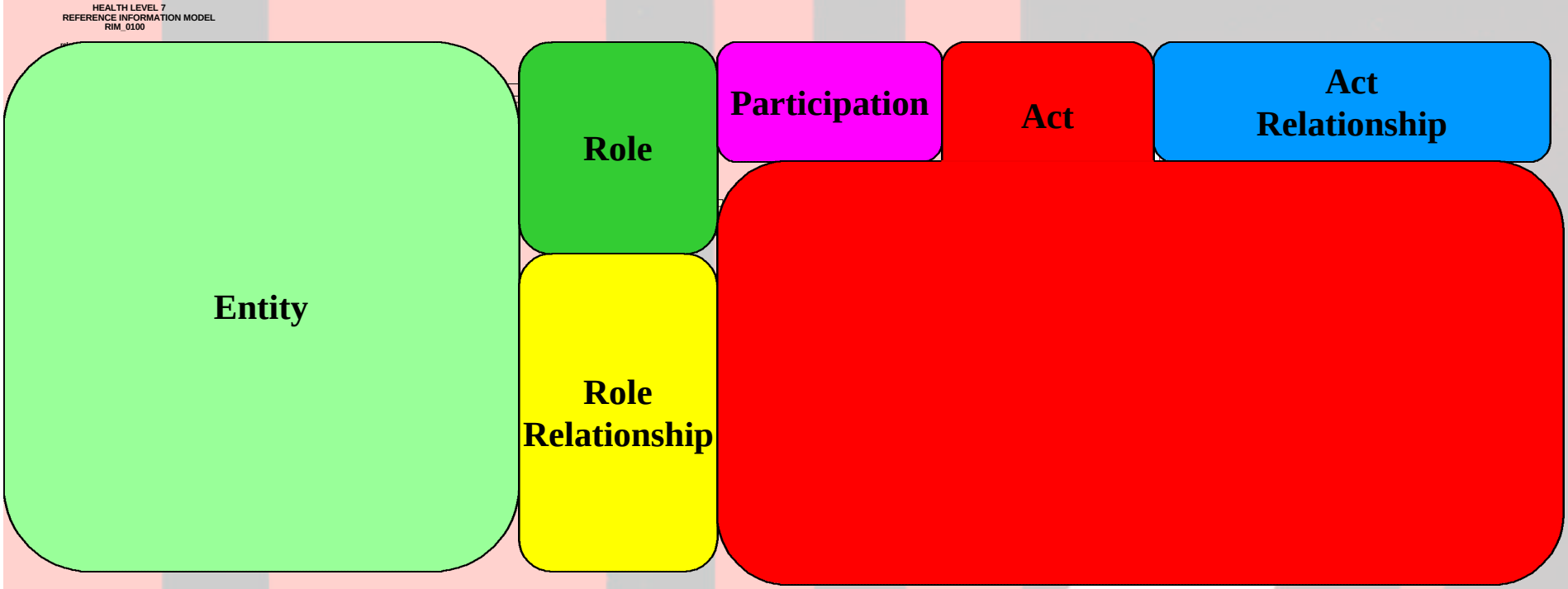
Data Type: a specification of the format of an attribute.

RIM Class Diagram V1.00

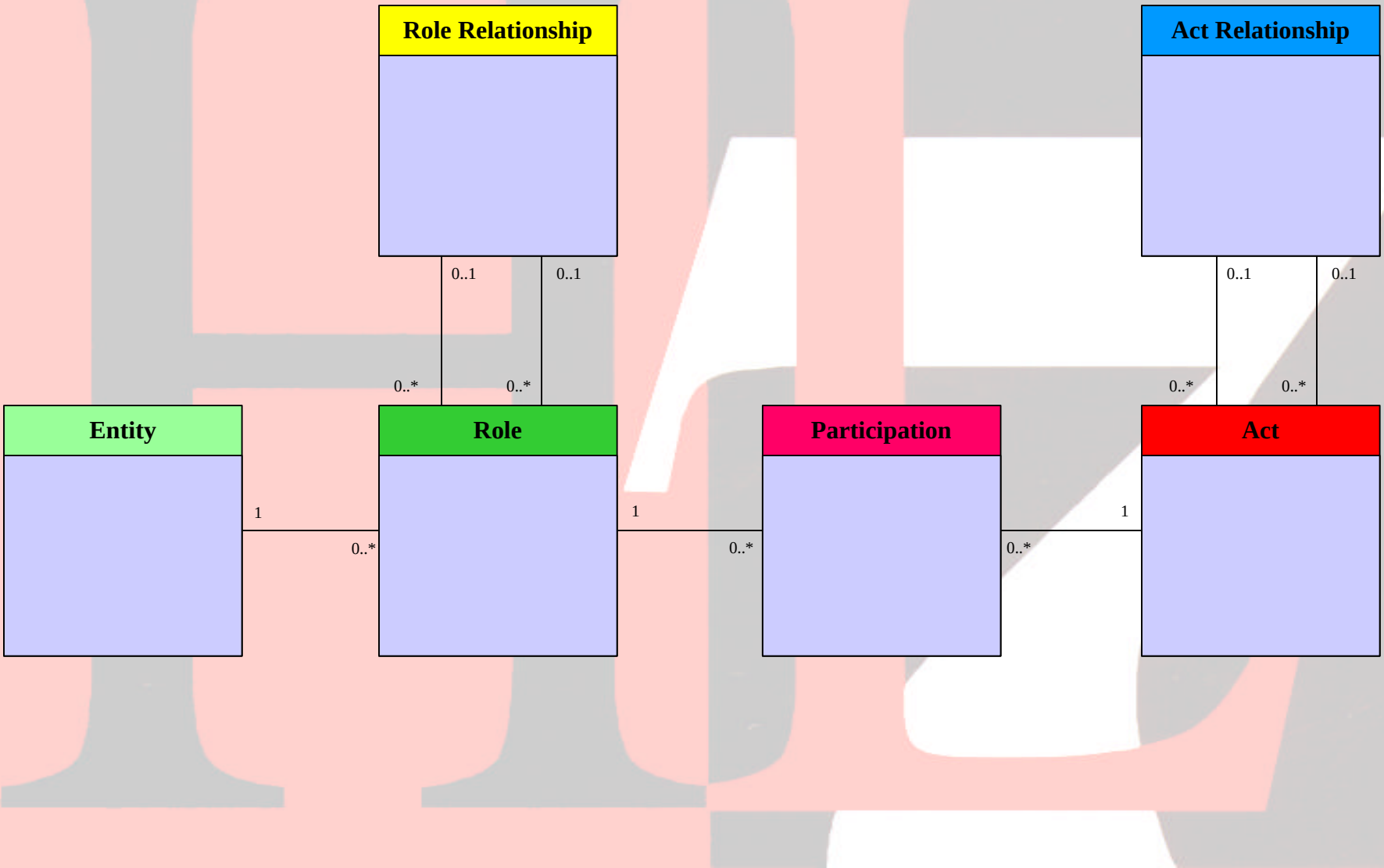


- **6 Primary Subject Areas**
- **64 Classes**
- **348 Attributes**
- **73 Relationships**
- **45 Data types**

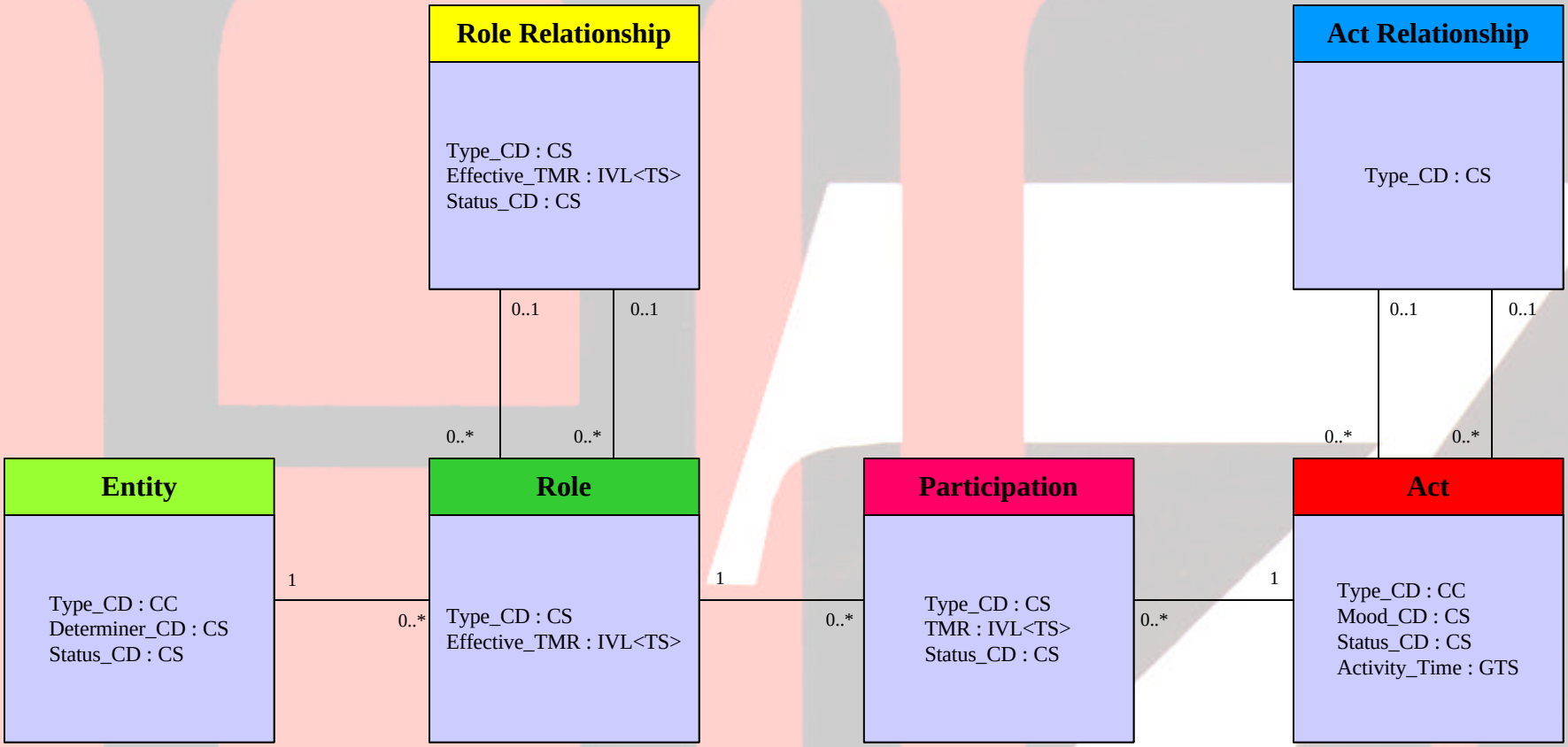
RIM Primary Subject Areas



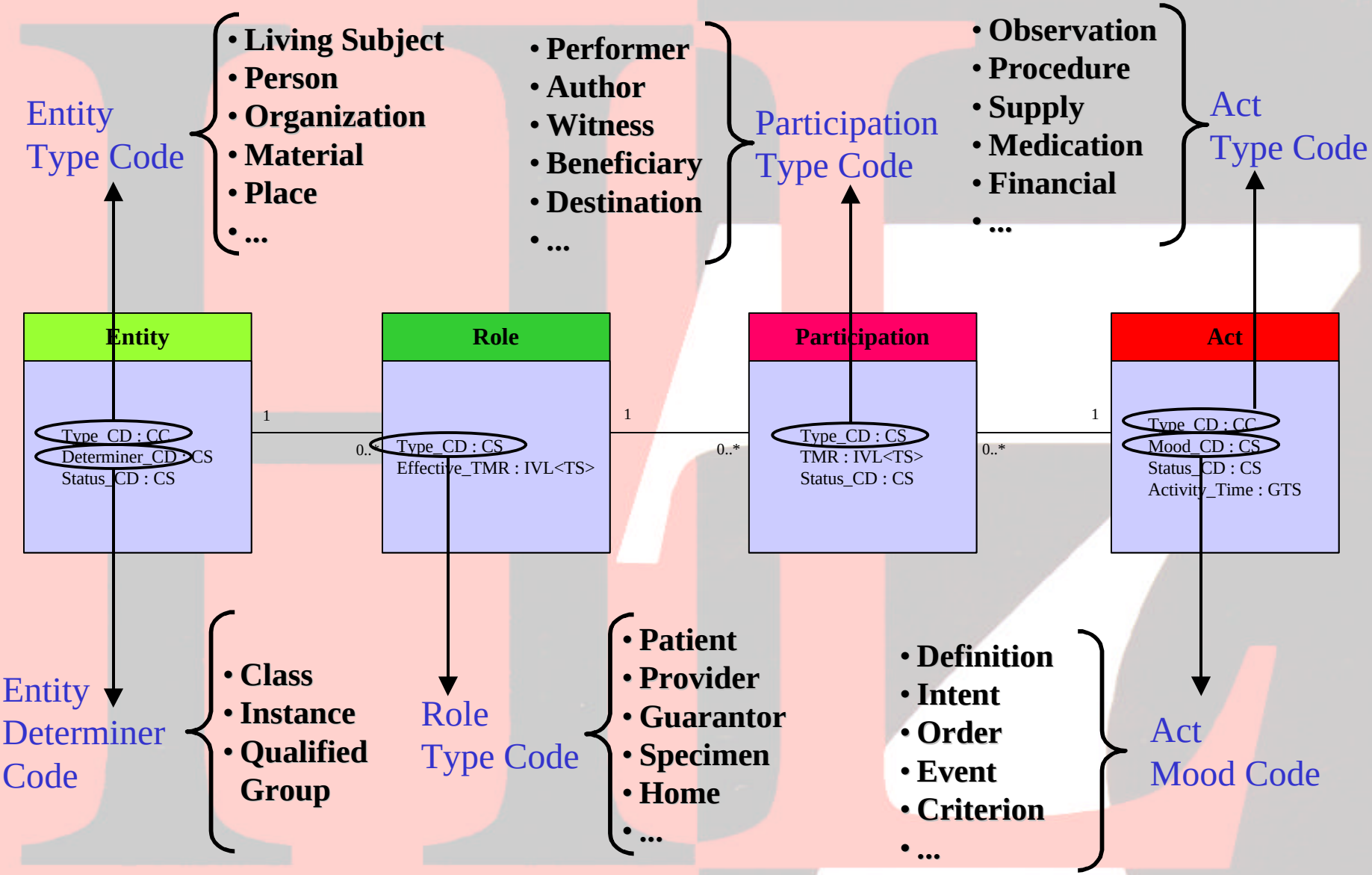
RIM Core Classes



RIM Core Attributes



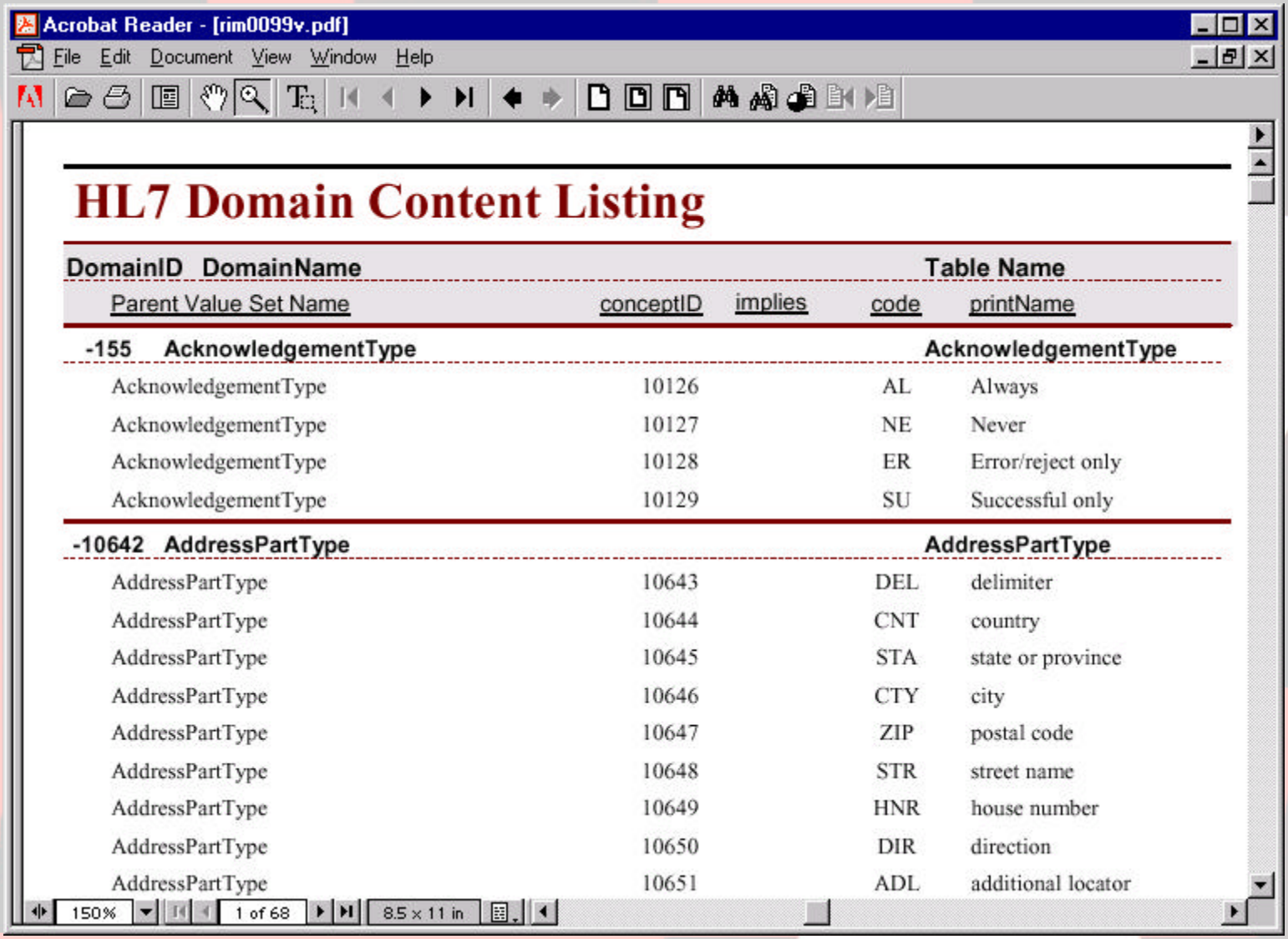
RIM Core Attribute Value Sets



Vocabulary Domains and Codes

- Coded attributes in the RIM must be associated with one and only one Vocabulary Domain prior to being used in a message specification.
- A vocabulary domain is “The set of all concepts that can be taken as valid values in an instance of a coded field or attribute.”
- Each concept in the vocabulary domain is represented using a code from a specific vocabulary.
- A vocabulary is a defined set of coded concepts.
- A vocabulary may be specified as an enumerated list of coded concepts (HL7 defined) or as a reference to an externally maintained list of coded concepts (e.g., SNOMED, LOINC, CPT, . . .).

Vocabulary Domain Specification



HL7 Domain Content Listing

DomainID	DomainName			Table Name
Parent Value Set Name	conceptID	implies	code	printName
-155	AcknowledgementType			AcknowledgementType
AcknowledgementType	10126		AL	Always
AcknowledgementType	10127		NE	Never
AcknowledgementType	10128		ER	Error/reject only
AcknowledgementType	10129		SU	Successful only
-10642	AddressPartType			AddressPartType
AddressPartType	10643		DEL	delimiter
AddressPartType	10644		CNT	country
AddressPartType	10645		STA	state or province
AddressPartType	10646		CTY	city
AddressPartType	10647		ZIP	postal code
AddressPartType	10648		STR	street name
AddressPartType	10649		HNR	house number
AddressPartType	10650		DIR	direction
AddressPartType	10651		ADL	additional locator

Vocabulary Codes & Definitions

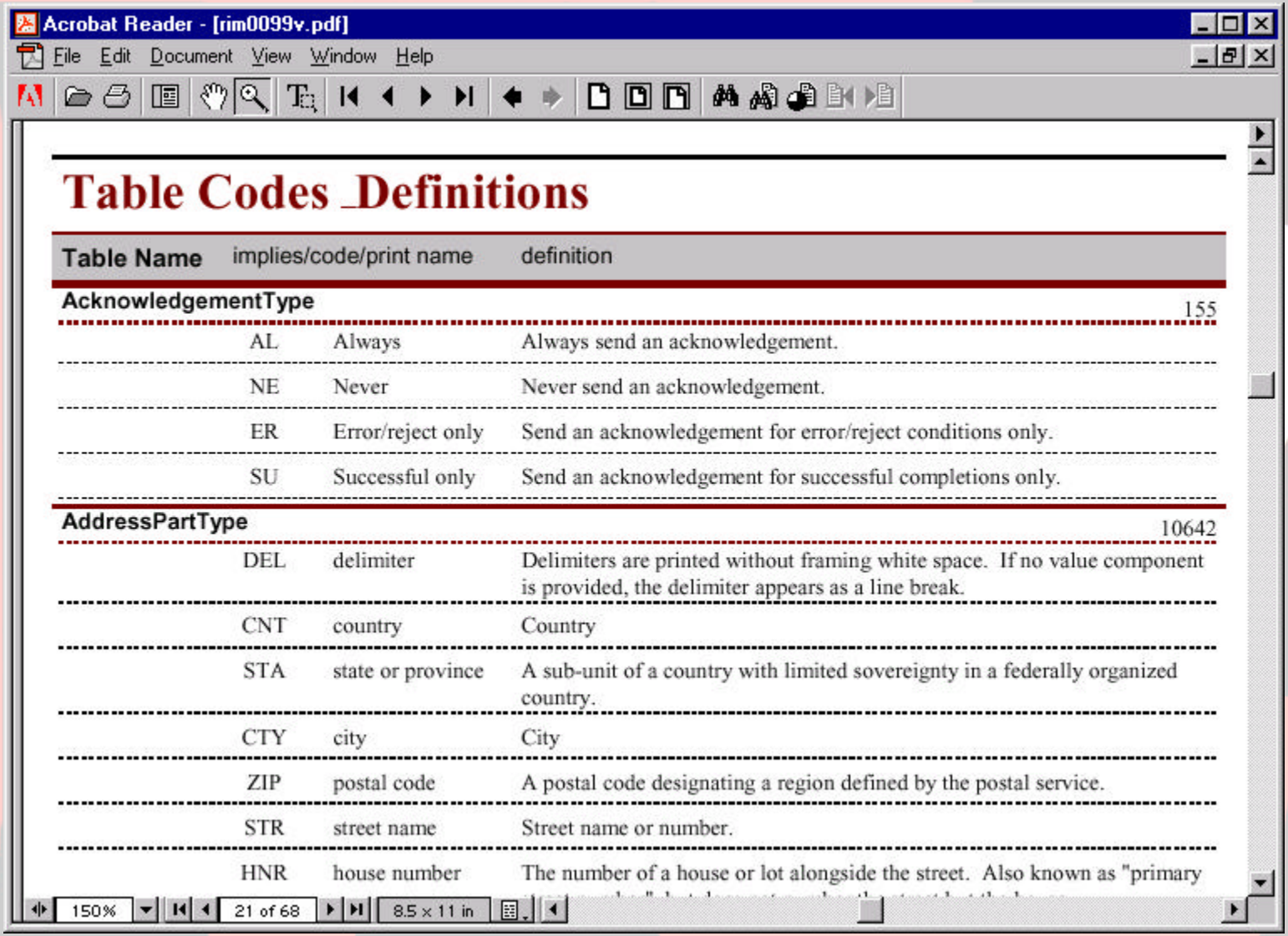


Table Codes _Definitions

Table Name	implies/code/print name	definition
AcknowledgementType		155
AL	Always	Always send an acknowledgement.
NE	Never	Never send an acknowledgement.
ER	Error/reject only	Send an acknowledgement for error/reject conditions only.
SU	Successful only	Send an acknowledgement for successful completions only.
AddressPartType		10642
DEL	delimiter	Delimiters are printed without framing white space. If no value component is provided, the delimiter appears as a line break.
CNT	country	Country
STA	state or province	A sub-unit of a country with limited sovereignty in a federally organized country.
CTY	city	City
ZIP	postal code	A postal code designating a region defined by the postal service.
STR	street name	Street name or number.
HNR	house number	The number of a house or lot alongside the street. Also known as "primary

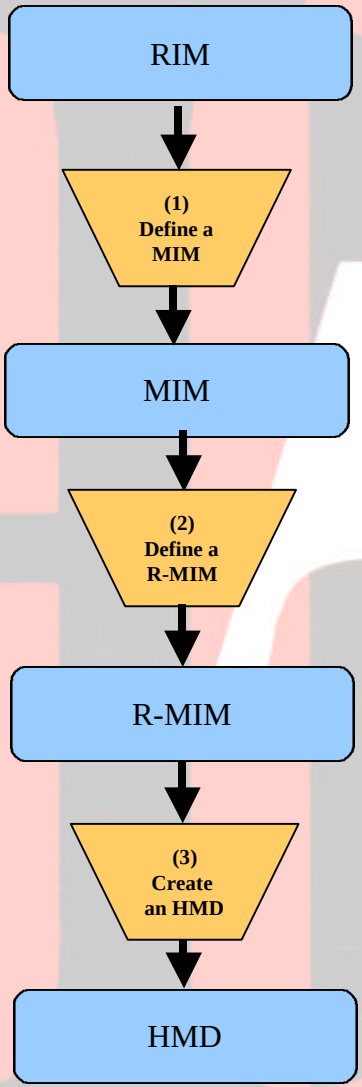
RIM Implementation

RIM
Reference Information Model

MIM
Message Information Model

R-MIM
Refined Message Information Model

HMD
Hierarchical Message Definition

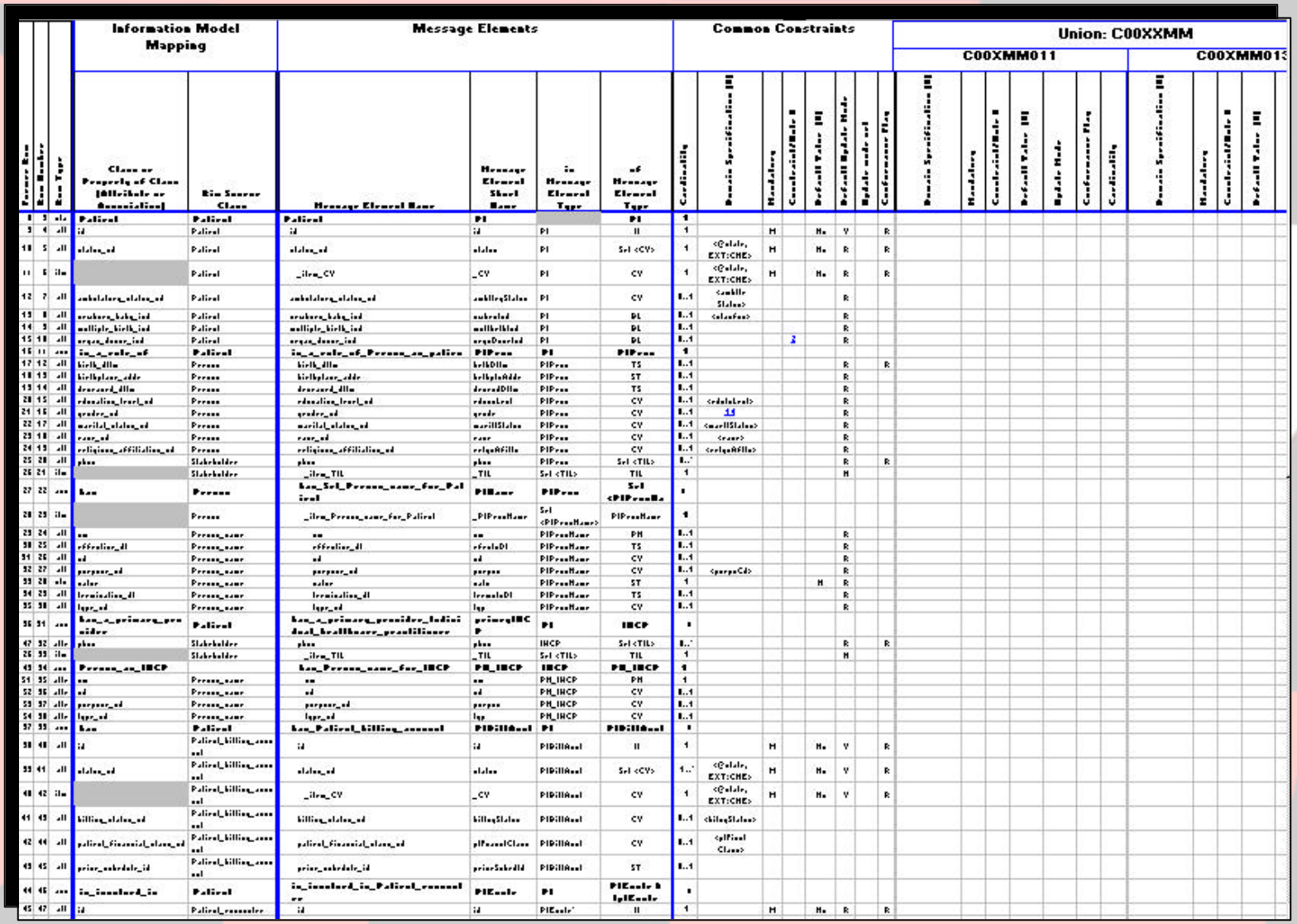


- **Select a subset of the RIM classes**
- **Select a subset of class relationships**
- **Select a subset of class attributes**
- **Select a subset of attribute datatypes**
- **Select a subset of attribute domains and value sets**

- **Created clones of classes and attributes**
- **Assign alias class and attribute names**
- **Eliminate unnecessary class hierarchies**
- **Finalize class relationships and multiplicity**
- **Finalize attribute domains and value sets**

- **Select a root class for the message**
- **Arrange classes and attributes hierarchically**
- **Declare inclusion and repetition constraints**
- **Declare domain value constraints**
- **Assign message element names**

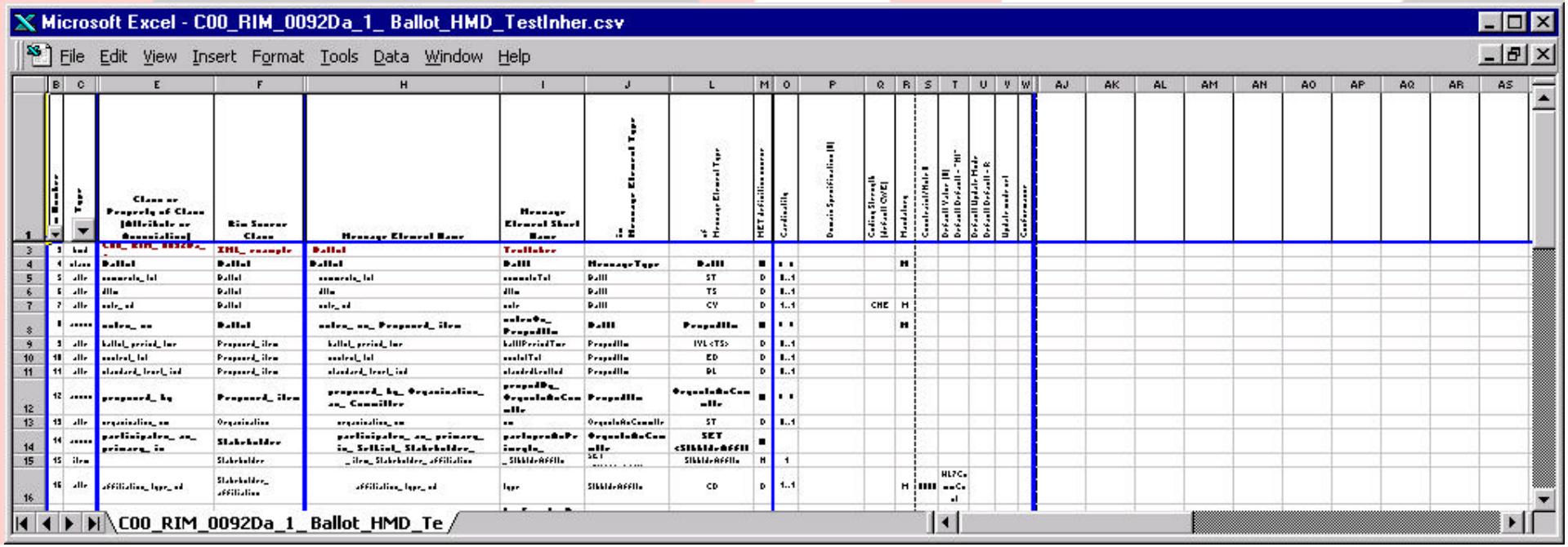
Hierarchical Message Definition



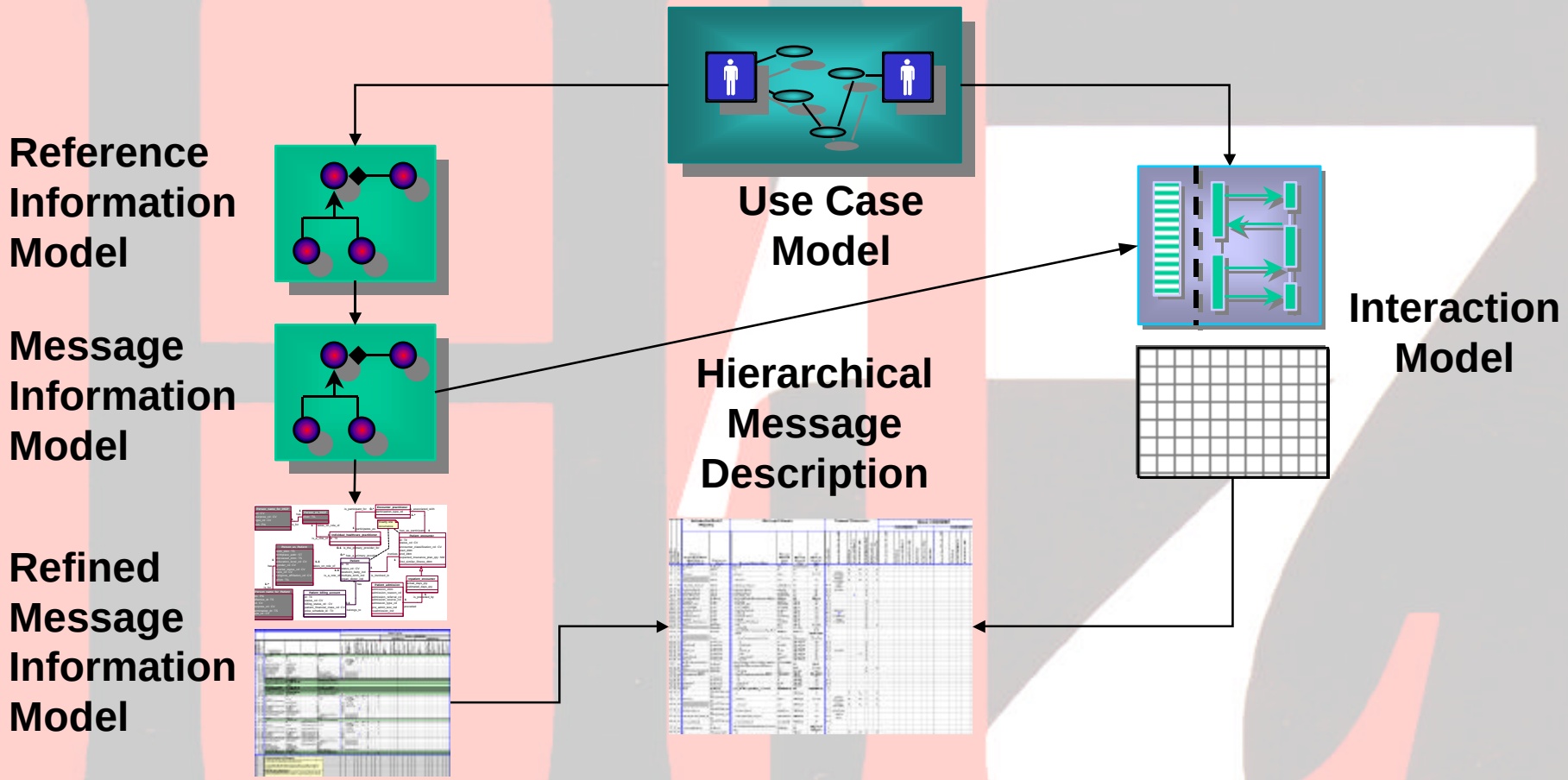
Former Row	Row Number	Row Type	Information Model Mapping: Class or Property of Class [Attribute or Association]	Information Model Mapping: Rim Source Class	Message Elements: Message Element Name	Message Elements: Message Element Short Name	Message Elements: In Message Element Type	Message Elements: of Message Element Type	Common Constraints: Cardinality	Common Constraints: Domain Specification [0]	Common Constraints: Mandatory	Common Constraint/Rule [0]	Common Constraints: Default Value [0]	Common Constraints: Default Update Mode	Common Constraints: Update mode ucd	Common Constraints: Conformance Flag	Union: C00XXMM / C00XMM011: Domain Specification [0]	C00XMM011: Mandatory	C00XMM011: Constraint/Rule [0]	C00XMM011: Default Value [0]	C00XMM011: Update Mode	C00XMM011: Conformance Flag	C00XMM011: Cardinality	C00XMM013: Domain Specification [0]	C00XMM013: Mandatory	C00XMM013: Constraint/Rule [0]	C00XMM013: Default Value [0]
1	1	sta	**Patient**	**Patient**	**Patient**	**PT**		**PT**	1																		
3	4	all	id	Patient	id	id	PT	II	1		M		No	V		R											
10	5	all	status_cd	Patient	status_cd	status	PT	Set <CV>	1	<@state, EXT:CNE>	M		No	R		R											
11	6	ilm		Patient	_ilrm_CV	_CV	PT	CV	1	<@state, EXT:CNE>	M		No	R		R											
12	7	all	ambulatory_status_cd	Patient	ambulatory_status_cd	ambReqStatus	PT	CV	0..1	<ambReqStatus>				R													
13	8	all	newborn_baby_ind	Patient	newborn_baby_ind	nwbrnInd	PT	BL	0..1	<classCode>				R													
14	9	all	multiple_birth_ind	Patient	multiple_birth_ind	multBrthInd	PT	BL	0..1					R													
15	10	all	organ_donor_ind	Patient	organ_donor_ind	orgnDnorInd	PT	BL	0..1			2		R													
16	11	ass	**is_a_role_of**	**Patient**	**is_a_role_of_Person_as_patient**	**PIPrsn**	**PT**	**PIPrsn**	1																		
17	12	all	birth_dttm	Person	birth_dttm	brthDttm	PIPrsn	TS	0..1					R		R											
18	13	all	birthplace_addr	Person	birthplace_addr	brthplsAddr	PIPrsn	ST	0..1					R													
19	14	all	deceased_dttm	Person	deceased_dttm	deceasDttm	PIPrsn	TS	0..1					R													
20	15	all	education_level_cd	Person	education_level_cd	educnLevel	PIPrsn	CV	0..1	<educLevel>				R													
21	16	all	gender_cd	Person	gender_cd	gende	PIPrsn	CV	0..1	11				R													
22	17	all	marital_status_cd	Person	marital_status_cd	maritlStatus	PIPrsn	CV	0..1	<maritlStatus>				R													
23	18	all	race_cd	Person	race_cd	race	PIPrsn	CV	0..1	<race>				R													
24	19	all	religious_affiliation_cd	Person	religious_affiliation_cd	relgnAffils	PIPrsn	CV	0..1	<relgnAffils>				R													
25	20	all	phon	Stakeholder	phon	phon	PIPrsn	Set <TEL>	0..*					R		R											
26	21	ilm		Stakeholder	_ilrm_TEL	_TEL	PIPrsn	Set <TEL>	TEL	1				M													
27	22	ass	**has**	**Person**	**has_Set_Person_name_for_Patient**	**PIName**	**PIPrsn**	**Set <PIPrsnNa**	1																		
28	23	ilm		Person	_ilrm_Person_name_for_Patient	_PIPrsnName	Set <PIPrsnName>	PIPrsnName	1																		
29	24	all	nm	Person_name	nm	nm	PIPrsnName	PN	0..1					R													
30	25	all	effective_dt	Person_name	effective_dt	efftvDt	PIPrsnName	TS	0..1					R													
31	26	all	cd	Person_name	cd	cd	PIPrsnName	CV	0..1					R													
32	27	all	purpose_cd	Person_name	purpose_cd	purpos	PIPrsnName	CV	0..1	<purposCd>				R													
33	28	sta	**value**	**Person_name**	**value**	**valu**	PIPrsnName	ST	1				H	R													
34	29	all	termination_dt	Person_name	termination_dt	termnDt	PIPrsnName	TS	0..1					R													
35	30	all	lqpr_cd	Person_name	lqpr_cd	lqp	PIPrsnName	CV	0..1					R													
36	31	ass	**has_a_primary_provider**	**Patient**	**has_a_primary_provider_Individual_Healthcare_practitioner**	**primrgIHCP**	**PT**	**IHCP**	1																		
47	32	all	phon	Stakeholder	phon	phon	IHCP	Set <TEL>	0..*					R		R											
26	33	ilm		Stakeholder	_ilrm_TEL	_TEL	IHCP	Set <TEL>	TEL	1				M													
49	34	ass	**Person_as_IHCP**		**has_Person_name_for_IHCP**	**PN_IHCP**	**IHCP**	**PN_IHCP**	1																		
51	35	all	nm	Person_name	nm	nm	PN_IHCP	PN	1																		
52	36	all	cd	Person_name	cd	cd	PN_IHCP	CV	0..1																		
53	37	all	purpose_cd	Person_name	purpose_cd	purpos	PN_IHCP	CV	0..1																		
54	38	all	lqpr_cd	Person_name	lqpr_cd	lqp	PN_IHCP	CV	0..1																		
57	39	ass	**has**	**Patient**	**has_Patient_billing_account**	**PIBillAcct**	**PT**	**PIBillAcct**	1																		
38	40	all	id	Patient_billing_account	id	id	PIBillAcct	II	1		M		No	V		R											
39	41	all	status_cd	Patient_billing_account	status_cd	status	PIBillAcct	Set <CV>	1..*	<@state, EXT:CNE>	M		No	V		R											
40	42	ilm		Patient_billing_account	_ilrm_CV	_CV	PIBillAcct	CV	1	<@state, EXT:CNE>	M		No	V		R											
41	43	all	billing_status_cd	Patient_billing_account	billing_status_cd	billngStatus	PIBillAcct	CV	0..1	<billngStatus>																	
42	44	all	patient_financial_class_cd	Patient_billing_account	patient_financial_class_cd	ptFncnlClass	PIBillAcct	CV	0..1	<ptFncnl Class>																	
43	45	all	prior_subsidy_id	Patient_billing_account	prior_subsidy_id	priorSubsdId	PIBillAcct	ST	0..1																		
44	46	ass	**is_insured_in**	**Patient**	**is_insured_in_Patient_account**	**PIEnsr**	**PT**	**PIEnsr B IpIEnsr**	1																		
45	47	all	id	Patient_insurer	id	id	PIEnsr	II	1		M		No	R		R											

HMD Components

- The **Information Model Mapping**. The columns that are in this section describe classes and attributes of the R-MIM, organized in a sequence that describes a "walk" from class to class on the R-MIM.
- The **Message Elements**. The columns in this section describe the message elements and define the Message Element Types. The message elements compose a hierarchy. This hierarchy is illustrated by indentation in the column Message Element Name.
- **General constraints and defaults**. Describe specific constraints and defaults for the message element defined in the row. The columns are the same as the corresponding section of the R-MIM. The values in the columns may be the same or may be a more restrictive constraint.



Message Specification



Additional Questions