



The *openEHR* Demographic Information Model

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 2. Centre for Health Informatics and Multi-professional Education, University College London

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Amendment Record

Issue	Details	Who	Completed
1.4.4	CR-000041. Visually differentiate primitive types in openEHR documents.	D Lloyd	04 Oct 2003
1.4.3	CR-000013. Rename key classes, according to CEN ENV 13606.	S Heard, D Kalra, T Beale	15 Sep 2003
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1.4	Formally validated using ISE Eiffel 5.2. Minor corrections to invariants.	T Beale	25 Feb 2003
1.3.1	Review by H Frankel, MCA. Corrections to diagrams and class texts. Improved PARTY_RELATIONSHIP semantics. Added Patient instance example. Made <i>time_validity</i> attributes optional.	T Beale	13 Feb 2003
1.3	Corrections to diagrams and class texts. Inheritance changed to ARCHETYPED for most key classes. Some instance examples added.	Z Tun, T Beale	08 Jan 2003
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1.0	Created from EHR RM.	T Beale	28 Aug 2002

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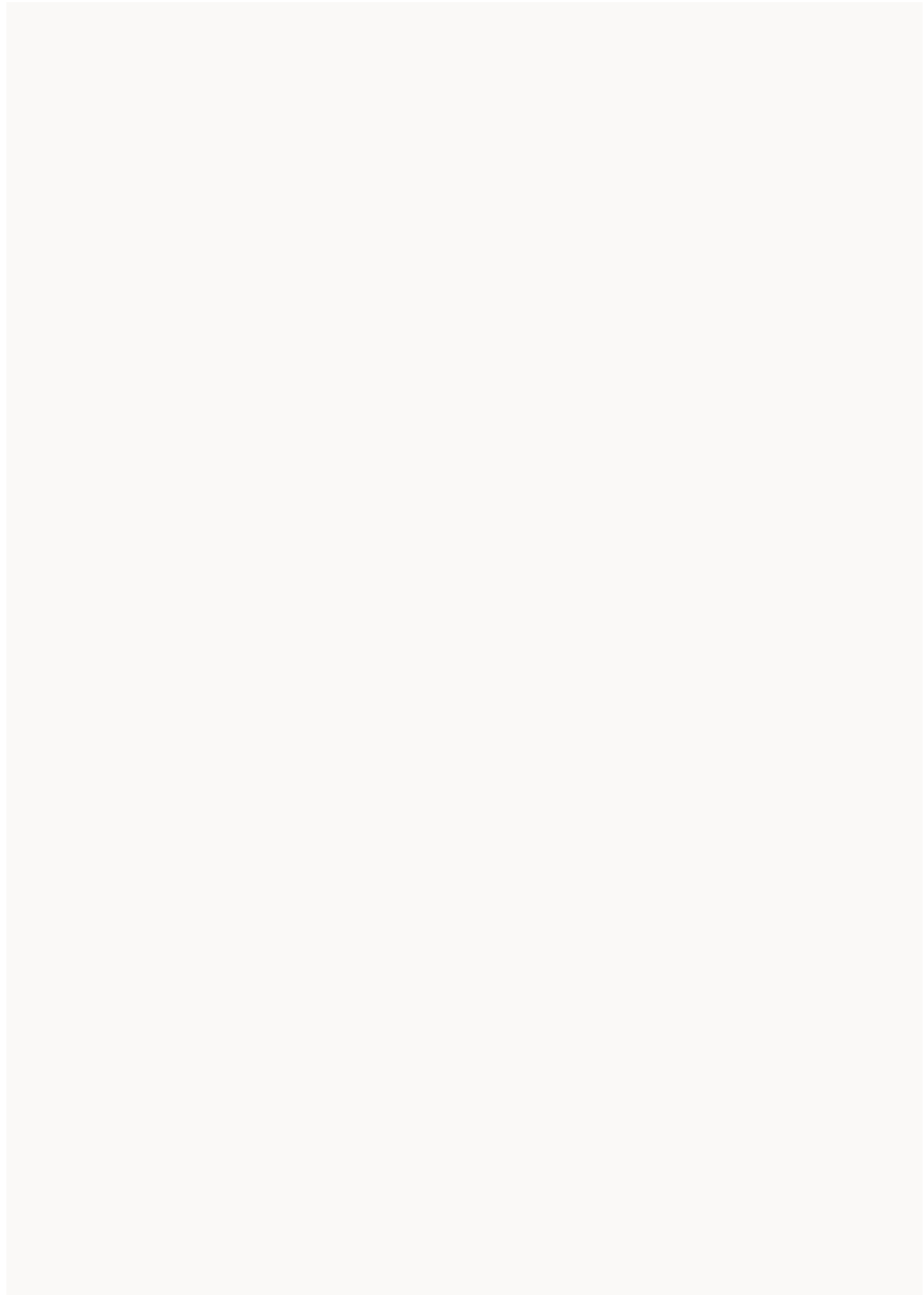


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1 Introduction

1.1 Purpose

This document describes the architecture of the *openEHR* Demographic Reference Model. The semantics are drawn from previous work in GEHR, existing models in CEN 13606 and the HL7v3 RIM, and other work done in Australia.

The intended audience includes:

- Standards bodies producing health informatics standards;
- Software development groups using *openEHR*;
- Academic groups using *openEHR*;
- The open source healthcare community;
- Medical informaticians and clinicians interested in health information;
- Health data managers.

1.2 Related Documents

Prerequisite documents for reading this document include:

- The *openEHR* Modelling Guide
- The *openEHR* Data Types
- The *openEHR* Common Reference Model

Other documents describing related models, include:

- The *openEHR* EHR reference model
- The *openEHR* demographic model

1.3 Status

This document is under development, and will be published as a proposal for input to standards processes and implementation works. The formal specification should be considered experimental at the moment, and changes may occur due to implementation experience. Concepts from the HL7 RIM have been included, however, these are also in flux at this time (Jan 2003) and subject to change.

Currently the UML diagrams are hand-produced. None of the existing tools (e.g. Rose, Objecteering), includes sufficient support of UML or has good enough visual quality to use here. However, UML tools are constantly under investigation, and this situation may change in the future.

The latest version of this document can be found in PDF and HTML formats at http://www.openEHR.org/Doc_html/Model/Reference/demographic_rm.htm. New versions are announced on openehr-announce@openehr.org.

1.4 Peer review

Known omissions or questions are indicated in the text with a “to be determined” paragraph, as follows:

TBD_1: (example To Be Determined paragraph)

Areas where more analysis or explanation is required are indicated with “to be continued” paragraphs like the following:

To Be Continued: more work required

Reviewers are encouraged to comment on and/or advise on these paragraphs as well as the main content. Please send requests for information to info@openEHR.org. Feedback should preferably be discussed on one of the appropriate mailing lists, openehr-technical@openehr.org or openehr-clinical@openehr.org.

2 Background

This section describes the inputs to the modelling process which created the *openEHR* Reference Model.

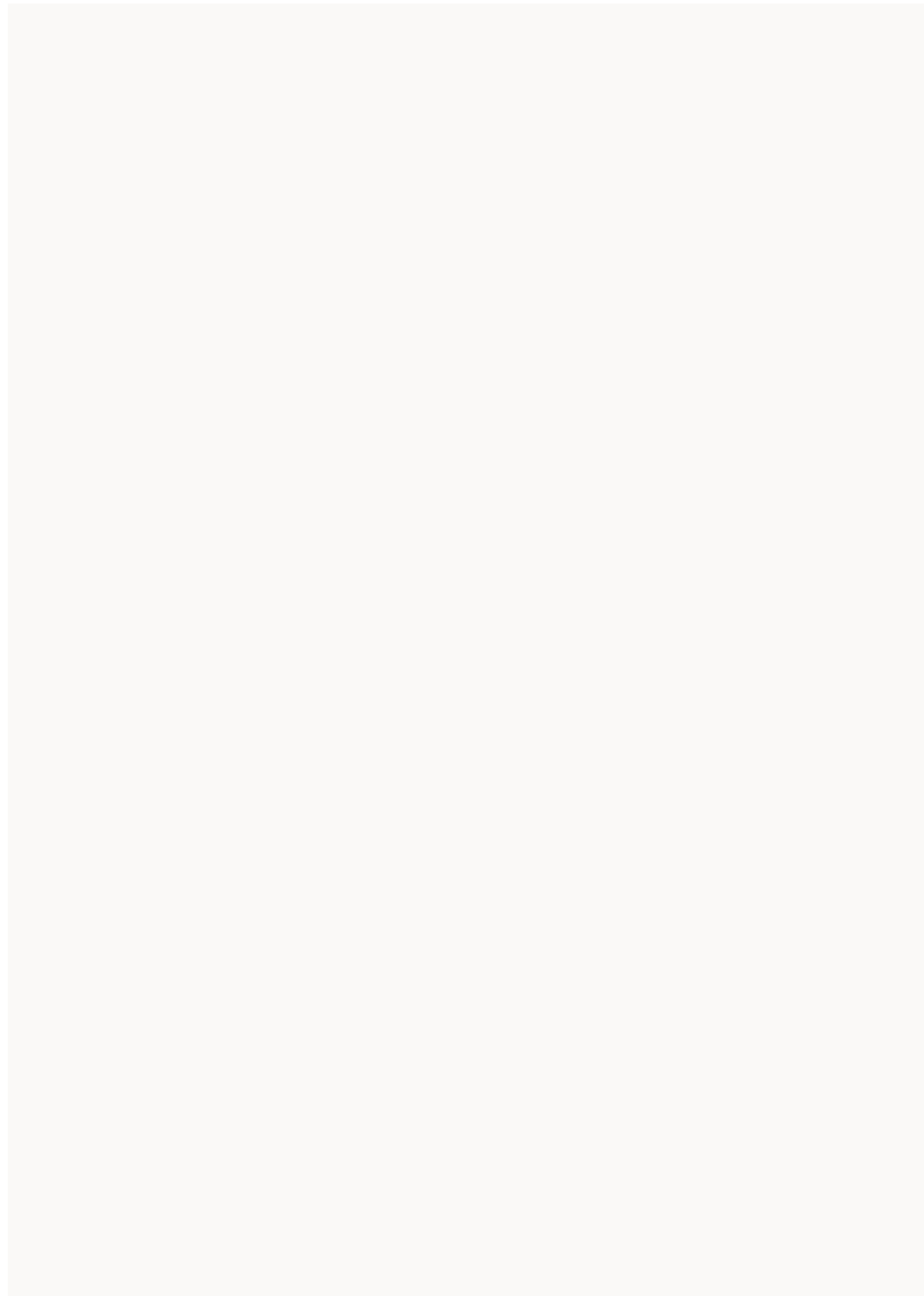
2.1 Requirements

2.2 Design Principles

Corbamed,

PIDS

Archetypes



3 RM.DEMOGRAPHIC Package

3.1 Overview

The demographic model illustrated in FIGURE 1 is a generalised model of the facts one might expect to see in a demographic server. The purpose of the model is as a specification of a demographic service, either standalone, or a “wrapper” service for an existing system such as a patient master index (PMI). In the latter situation, it is used to add the required *openEHR* semantics, particularly versioning, to an existing service.

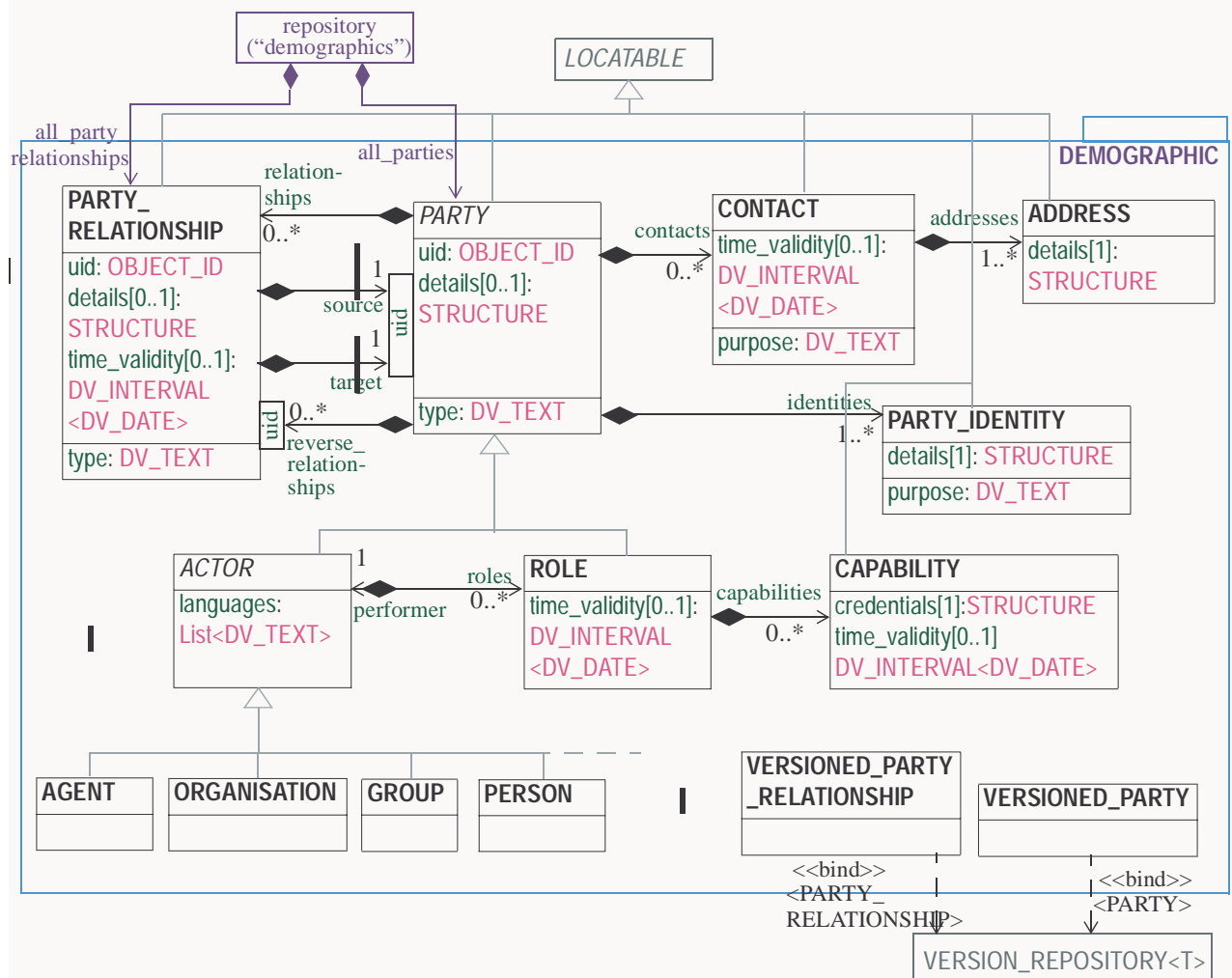


FIGURE 1 RM.DEMOGRAPHIC Package

The general design is based on the scheme of party and accountability described by Fowler [19], and is influenced by clinical adaptations including work done in Australia [11] and the HL7v3 RIM [15] (itself influenced by the Fowler models).

One of the main design criteria of the model is that it expresses attributes and relationships of demographic entities which exist *regardless* of particular clinical involvements or participations in particular events. Participations are meaningful only within the context of the health record or other relevant model where they record context-specific relationships between demographic entities and events in the real world.

Another criterion is that instances of the classes in the model must be serialisable into an EHR Extract in an unambiguous way. This requires that each PARTY be a self-contained hierarchy of data, in the same way as distinct COMPOSITIONS in the EHR model are distinct hierarchies in an Extract. In order to ensure this condition, PARTY_RELATIONSHIPS must be implemented correctly, so as to prevent endless traversal of all PARTY objects through their relationships, when serialising. See Party Relationships below for details.

3.1.1 Archotyping

The model is designed to be used with archetypes, hence the generic nature of all entities. Every class containing an attribute of the form *details*:STRUCTURE is a completely archetypable structure. As a result, archetypes can be defined for concepts such as particular kinds of PERSON, ORGANISATION; for actual ROLES such as “health care practitioner”, and for party identities and addresses.

3.1.2 Names and Addresses

Classes have been included for PARTY_IDENTITY and ADDRESS, even though they contain only a link to details, in the form of the generic STRUCTURE class. This is not strictly necessary - it could have been done simply using appropriately named attributes in the classes PARTY and CONTACT - but is done to provide a place to add specific semantics in future releases of the model. It is also expected to make software development easier, since it provides explicit classes to which behaviour and other implementation attributes can be added. Lastly, it allows the notions of PARTY_IDENTITY and ADDRESS to be explicitly used in archetype-authoring tools.

Instances of PARTY_IDENTITY, linked to PARTY by the attribute *identities* are intended to express the names of people, organisations, and other actors - that is names which are “owned” by the party, e.g. self-declared (in the case of institutions and companies) or by virtue of social relations (names given by parents, tribes etc). Identifiers of Parties given by other organisations, or the state are not represented in this way, and should be recorded in the PARTY.details structure instead (see below).

3.1.3 Unique Identification

Identifiers of Parties given by organisations or the state are treated as any other attribute of a Party, i.e. recorded as part of the data in the PARTY.details structure.

To Be Continued: id used by the demographic system itself - probably an OID inherited from LOCATABLE

3.1.4 Party Relationships

Relationships between parties in the real world may be expressed using PARTY_RELATIONSHIP objects, as illustrated in FIGURE 2.

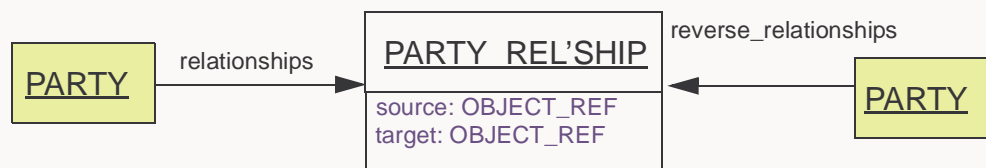


FIGURE 2 General Relationship Model

Relationships are considered *directional*, hence the use of the attribute names *source* and *target*, however, these names are otherwise neutral, and give no indication as to the meaning of the relationships, such as which party is responsible and which accountable (for comparison, see the demographic mod-

els of Fowler [19]). Accordingly, each party involved in a relationship includes it in its *relationships* list, if it is at the source end, or in the *reverse_relationships* list, if at the target end.

The usual way to determine which ends of a relationship the two parties should go is usually by which party's actions caused the relationship to come into being. For example, a relationship representing the concept "patient", between a health consumer and a health care organisation would have the consumer as source and the organisation as target.

Relationships are also *shared objects* whose existence is dependent upon both source and target `PARTY`s being present. There is no official way to show this in UML, but it is approximated by using white diamonds from the `PARTY` to the `PARTY_RELATIONSHIP` class. The semantics are such that if either party is deleted, the relationship must also be deleted.

Serialising `PARTY_RELATIONSHIPS` requires that they function like `LINKS` in the EHR model, i.e. express symbolic references, not physical ones.

To Be Continued:

3.1.5 Versioning Semantics

The class `PARTY` and its descendants `ACTOR` and `ROLE` are all potentially versioned in a demographic system. A version of a `PARTY` takes in all the compositional parts, such as identities, contacts etc.

To Be Continued: versioning semantics of relationships

3.2 Class Definitions

3.2.1 PARTY Class

CLASS	<i>PARTY (abstract)</i>	
Purpose	Ancestor of all party types, including real world entities and their roles. A party is any entity which can participate in an activity. The <i>meaning</i> attribute inherited from <code>LOCATABLE</code> is used to indicate the actual type of party.	
CEN	healthcare agent	
HL7	Entity	
Inherit	<code>LOCATABLE</code>	
Attributes	Signature	Meaning
	uid : <code>OBJECT_ID</code>	Unique id of this party.
	identities : <code>Set<PARTY_IDENTITY></code>	Identities used by the party to identify itself, such as legal name, stage names, aliases, nicknames and so on.
	contacts : <code>Set<CONTACT></code>	Contacts for this party.
	relationships : <code>Set<PARTY_RELATIONSHIP></code>	Relationships in which this role takes part as source.

CLASS	<i>PARTY (abstract)</i>	
	reverse_relationships : Set<OBJECT_REF>	Relationships in which this role takes part as target.
	details : STRUCTURE	All other details for this party.
Functions	Signature	Meaning
	type : DV_TEXT	Type of party, such as “PERSON”, “ORGANISATION”, etc. Role name, e.g. “general practitioner”, “nurse”, “private citizen”. Taken from inherited <i>name</i> attribute.
Invariants	<p>Uid_exists: uid /= Void Type_valid: type.is_equal(name) Identities_valid: identities /= Void and then not identities.empty Contacts_valid: contacts /= Void implies not contacts.empty Relationships_validity: relationships /= Void implies (not relationships.empty and then relationships.for_all({PARTY_RELATIONSHIP}.source = Current)) Reverse_relationships_validity: reverse_relationships /= Void implies (not reverse_relationships.empty and then reverse_relationships.for_all(repositories(“demographics”).all_party_relationships.has_object(item) and then repositories(“demographics”).all_party_relationships.object(item).target = Current)) Details_valid: details /= Void Is_archetype_root: is_archetype_root</p>	

3.2.2 PARTY_IDENTITY Class

CLASS	PARTY_IDENTITY	
Purpose	An identity “owned” by a PARTY, such as a person name or company name, and which is used by the party to identify itself. Actual structure is archetyped.	
CEN	Person Name (data type).	
HL7	Person Name (PN) (data type).	
Inherit	LOCATABLE	
Attributes	Signature	Meaning
	details : STRUCTURE	The value of the indenty. This will often taken the form of a parsable string or a small structure of strings.
Functions	Signature	Meaning
	purpose : DV_TEXT	Purpose of identity, e.g. “legal”, “stage-name”, “nickname”, “tribal name”, “trading name”. Taken from value of inherited <i>name</i> attribute.
	as_string : String	Identity in the form of a single string.
Invariants	<i>Purpose_valid</i> : purpose = name <i>Details_exists</i> : details /= Void	

TBD_2: may define DV_RWE_ID type for use here e.g. as
LIST_S<DV_RWE_ID>

3.2.3 CONTACT Class

CLASS	CONTACT	
Purpose	Description of a means of contact of a party. Actual structure is archetyped.	
Inherit	LOCATABLE	
Attributes	Signature	Meaning
	time_validity : DV_INTERVAL <DV_DATE>	Valid time interval for this contact descriptor.
	addresses : List<ADDRESS>	A set of address alternatives for this purpose and time validity.
Functions	Signature	Meaning

CLASS	CONTACT	
	purpose: DV_TEXT	Purpose for which this contact is used, e.g. “mail”, “daytime phone”, etc. Taken from value of inherited <i>name</i> attribute.
Invariants	<i>Purpose_valid</i> : purpose = name <i>Addresses_exists</i> : addresses /= Void and then not addresses.empty	

3.2.4 ADDRESS Class

CLASS	ADDRESS	
Purpose	Address of contact, which may be electronic or geographic.	
CEN	Address (data type)	
HL7	Address (AD) (data type)	
Inherit	LOCATABLE	
Attributes	Signature	Meaning
	details: STRUCTURE	The details of the address, in the form of a STRUCTURE. This may take the form of a SINGLE_S, whose data item is a parsable string or a list or tree of many parts.
Functions	Signature	Meaning
	type: DV_TEXT	Type of address, e.g. “electronic”, “locality”. Taken from value of inherited <i>name</i> attribute.
	as_string: String	Address in the form of a single string.
Invariants	<i>Type_valid</i> : type = name <i>Details_exists</i> : details /= Void	

3.2.5 ACTOR Class

CLASS	ACTOR (<i>abstract</i>)	
Purpose	Ancestor of all real-world types, including people and organisations. An actor is any real-world entity capable of taking on a role.	
CEN	healthcare party	
HL7	Entity	

CLASS	ACTOR (<i>abstract</i>)	
Inherit	PARTY	
Attributes	Signature	Meaning
	roles : Set<ROLE>	Roles played by this party.
	languages : Set<DV_TEXT>	Languages which can be used to communicate with this actor.
Functions	Signature	Meaning
	has_legal_identity : Boolean	True if one there is an identity with purpose "legal identity"
Invariants	<i>Roles_valid</i> : roles /= Void <i>implies not</i> roles.empty <i>Languages_valid</i> : languages /= Void <i>implies not</i> languages.is_empty <i>Legal_identity_exists</i> : has_legal_identity	

3.2.6 PERSON Class

CLASS	PERSON	
Purpose	Generic description of persons. Provides a dedicated type to which Person archetypes can be targeted.	
CEN	healthcare person	
GEHR	G1_PERSON	
HL7	Person	
Inherit	ACTOR	
Attributes	Signature	Meaning
Invariants		

3.2.7 ORGANISATION Class

CLASS	ORGANISATION	
Purpose	Generic description of organisations. An organisation is a legally constituted body whose existence (in general) outlives the existence of parties considered to be part of it.	
CEN	healthcare organisation	

CLASS	ORGANISATION	
GEHR	G1_HCF	
HL7	ORGANIZATION	
Inherit	ACTOR	
Attributes	Signature	Meaning
Invariants		

3.2.8 GROUP Class

CLASS	GROUP	
Purpose	A group is a real world group of parties which is created by another party, usually an organisation, for some specific purpose. A typical clinical example is that of the specialist care team, e.g. “cardiology team”. The members of the group usually work together.	
Inherit	ACTOR	
Attributes	Signature	Meaning
Invariants		

3.2.9 AGENT Class

CLASS	AGENT	
Purpose	Generic concept of any kind of agent, including devices, software systems, but not humans or organisations.	
CEN	healthcare software, healthcare device	
HL7	DEVICE	
Inherit	ACTOR	
Attributes	Signature	Meaning
Invariants		

3.2.10 ROLE Class

CLASS	ROLE	
Purpose	Generic description of a role performed by an actor. The role corresponds to a competency of the party. Roles are used to define the responsibilities undertaken by a party for a purpose. Roles should have credentials qualifying the performer to perform the role.	
Use	Roles correspond to concepts like “general practitioner”, “nurse” and so on.	
CEN	healthcare agent in context	
HL7	ROLE	
Inherit	PARTY	
Attributes	Signature	Meaning
	capabilities : List <CAPABILITY>	The capabilities of this role.
	time_validity : DV_INTERVAL <DV_DATE>	Valid time interval for this role.
	performer : ACTOR	Actor playing the role.
Invariants	<i>Capabilities_valid</i> : capabilities /= Void <i>implies not</i> capabilities.empty <i>Performer_exists</i> : performer /= Void	

3.2.11 CAPABILITY Class

CLASS	CAPABILITY	
Purpose	Capability of a role, such as “ehr modifier”, “health care provider”. Capability should be backed up by credentials.	
Use		
Inherit	LOCATABLE	
Attributes	Signature	Meaning
	credentials : STRUCTURE	The qualifications of the performer of the role for this capability. This might include professional qualifications and official identifications such as provider numbers etc.
	time_validity : DV_INTERVAL <DV_DATE>	Valid time interval for this role.
Invariants	<i>Credentials_exists</i> : credentials /= Void	

To Be Continued: to be considered - accreditation, credentialling

3.2.12 PARTY_RELATIONSHIP Class

CLASS	PARTY_RELATIONSHIP	
Purpose	Generic description of a relationship between parties.	
HL7	RELATIONSHIP_LINK	
Inherit	LOCATABLE	
Attributes	Signature	Meaning
	uid : OBJECT_ID	Unique id of this relationship.
	details : STRUCTURE	The detailed description of the relationship
	time_validity : DV_INTERVAL <DV_DATE>	Valid time interval for this relationship.
	source : OBJECT_REF	Source of relationship.
	target : OBJECT_REF	Target of relationship.
Functions	Signature	Meaning
	type : DV_TEXT	Type of relationship, such as “employment”, “authority”, “health provision”
Invariants	<i>Uid_exists</i> : uid /= Void <i>Type_validity</i> : type = meaning <i>Source_valid</i> : source /= Void and then source.relationships.has(Current) <i>Target_valid</i> : target /= Void and then not target.reverse_relationships.has(Current)	

3.3 Instance Examples

In the following instance examples, the values of the attributes *uid*, *source*, *target*, and *reverse_relationships* are not meant to be taken as literally valid OBJECT_IDS - for the purposes of clarity, simple integers have been used.

3.3.1 Parties

3.3.1.1 Person

FIGURE 3 illustrates a possible set of instances for a PERSON, with home and work contact information. There are separate archetypes for the PERSON, each ADDRESS, and each PARTY_IDENTITY.

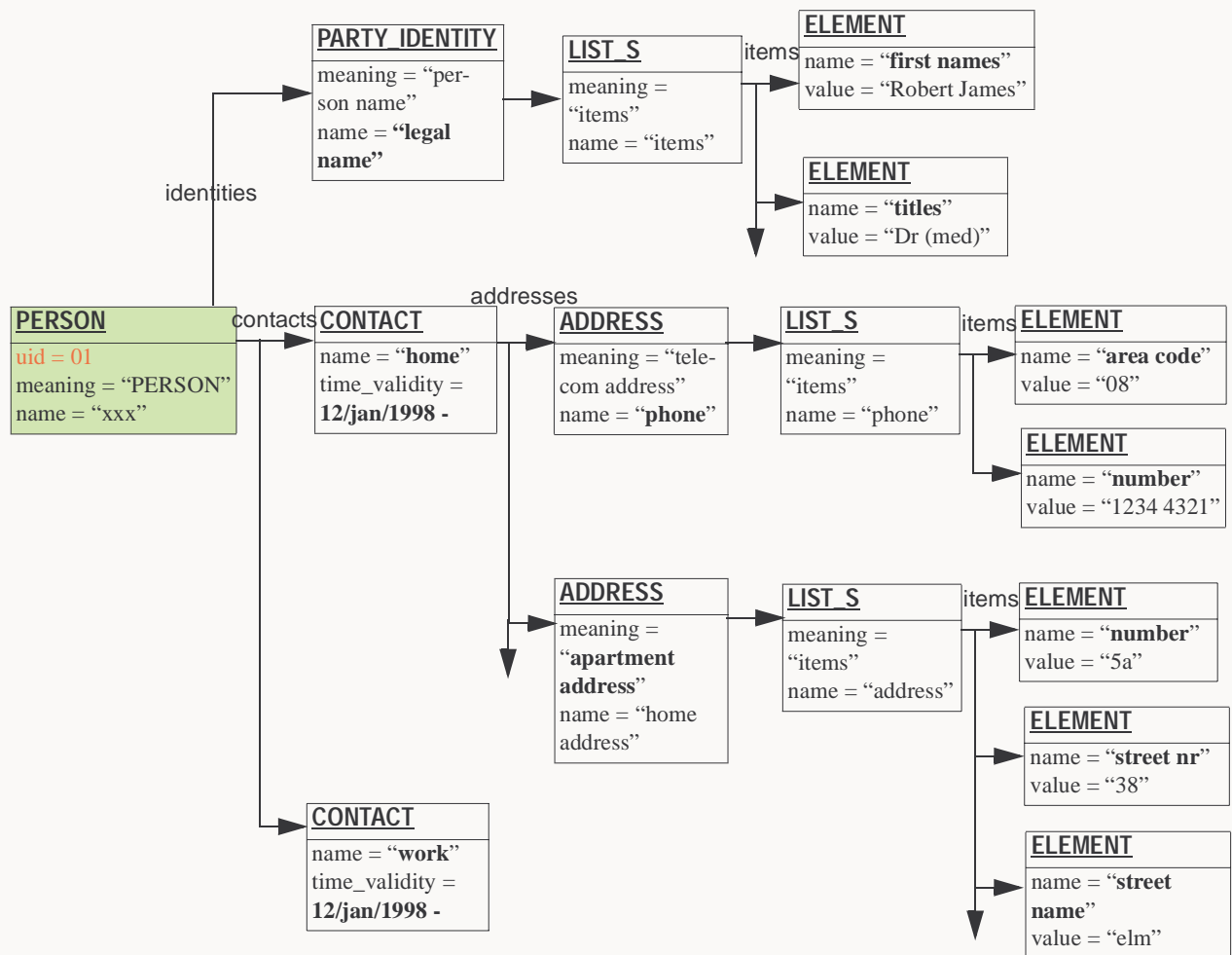


FIGURE 3 Person Demographic Information

3.3.1.2 Clinician

Credentials

3.3.1.3 Health Care Facility

3.3.1.4 Group

FIGURE 4 illustrates the demographic information for a cardiac surgery team in a hospital. The group includes a head surgeon, anaesthetist, assistant surgeon, and presumably others (not shown). Each of

these members of the team have an employment relationship with the hospital (shown only for one surgeon, in the interests of clarity).

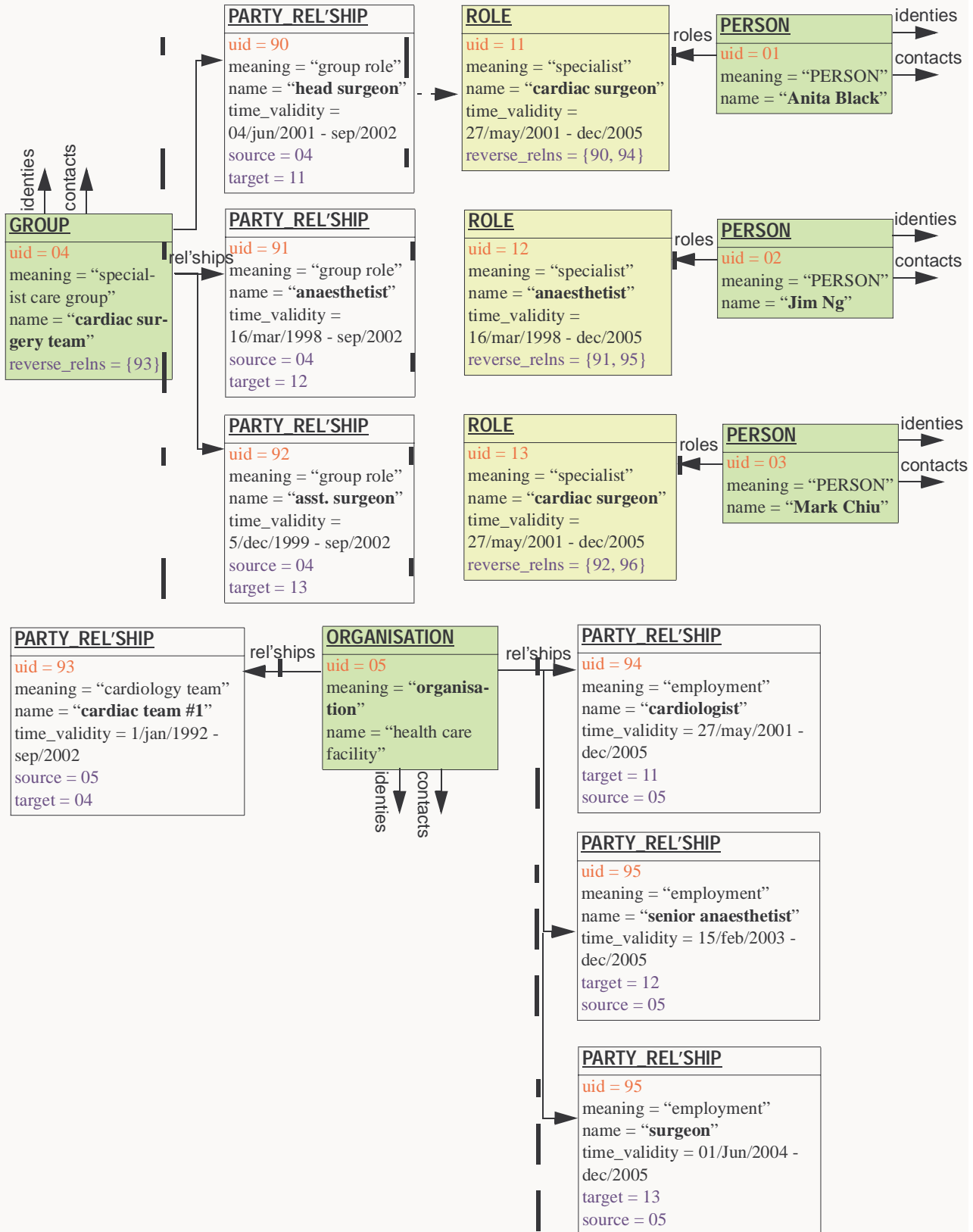


FIGURE 4 Group Demographics

3.3.2 Relationships

3.3.2.1 Familial Relationship

3.3.2.2 Employment Relationship

3.3.2.3 Patient

FIGURE 5 shows a simple way of representing the patient relationship between a person and a health care organisation.

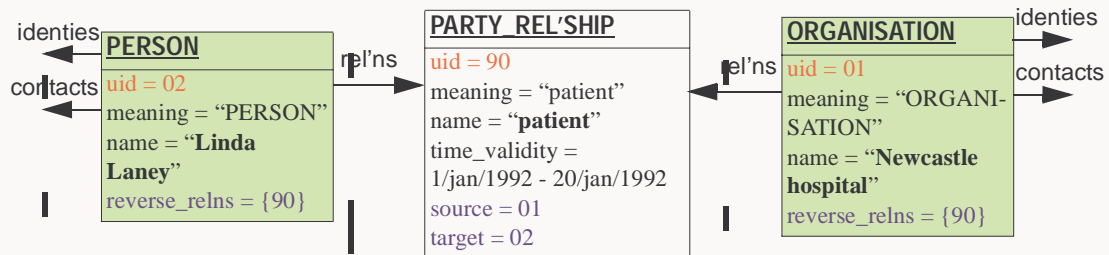


FIGURE 5 Simple Patient Relationship

FIGURE 6 shows the same logical relationship, but with both Parties acting through Roles, representing their status as healthcare consumer and healthcare provider respectively. Each of these Roles has associated credentials which document its official nature within the healthcare system.

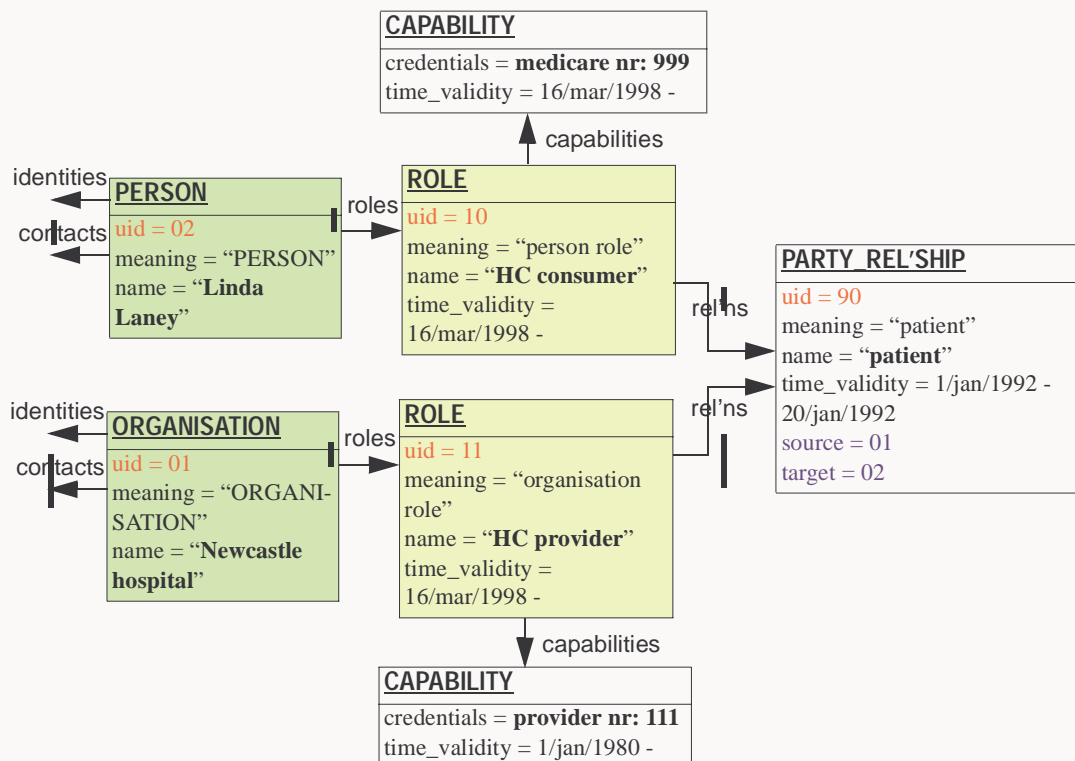
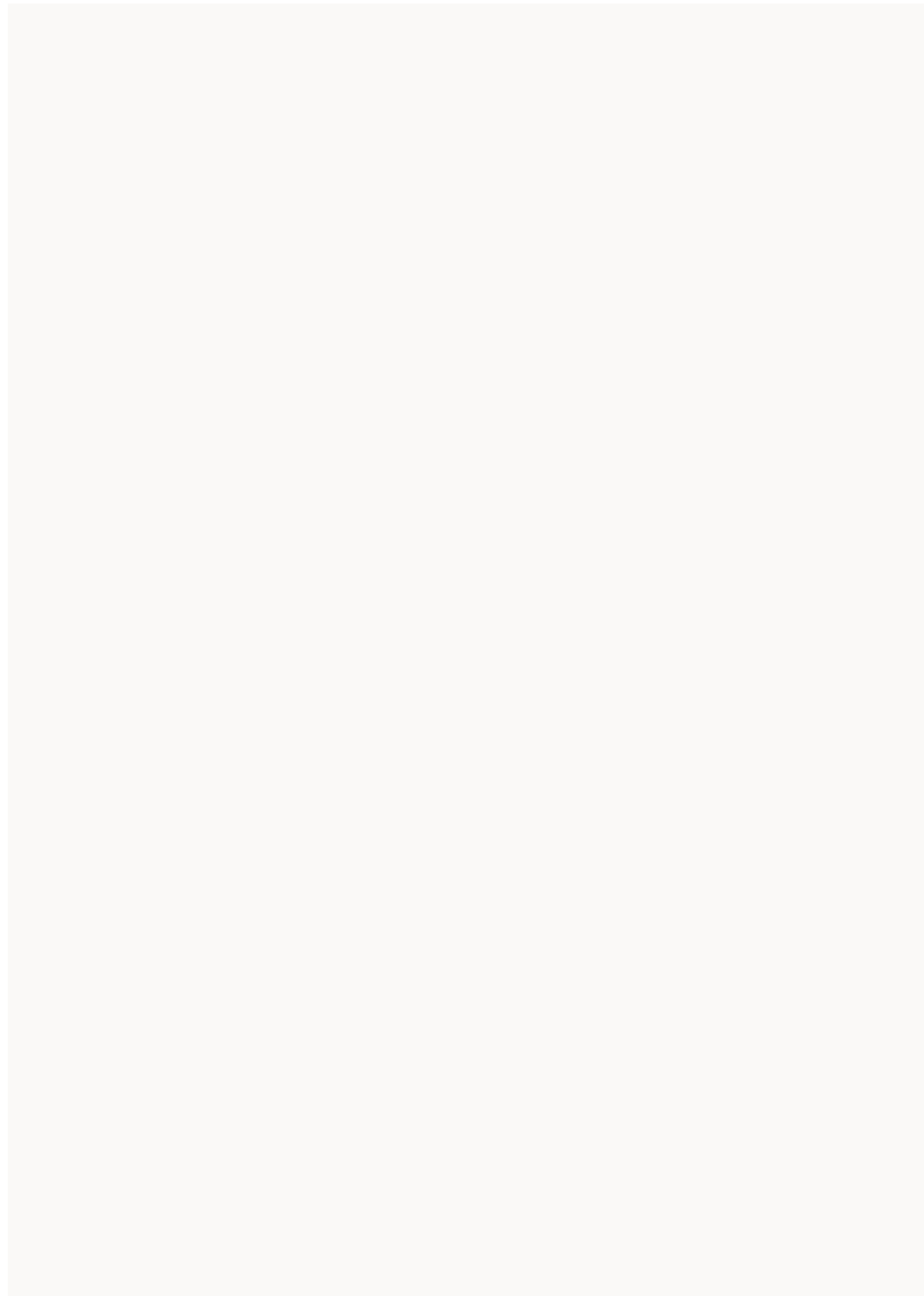


FIGURE 6 Patient Relationship with Roles and Credentials



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