Multi-Level Health Information Modelling

Reference Manual

Release 2.1.0
2011-05-01

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Front Matter

Acknowledgements

Using the MLHIM Reference Manual

This section describes typographical conventions and other information to help you get the most from this document.

The intended audience for this manual includes; software developers, systems analysts and knowledge workers in the healthcare domain. It is assumed that the reader has knowledge of object-oriented notation, concepts and software construction practices.

Release Information

The official published version is in PDF format in the English language. The ODT version is always considered a work in progress. Each version of the PDF release will carry a version number that is the date of release followed by the a language code and locality code. As an example; a release in English on January 1, 2011 will have the filename:
    mlhim-ref-man-2011-01-01-en-US.pdf

Pronunciation

MLHIM is pronounced *muh-leem*. Click *Hear How It Sounds* for when it is used in spoken English language such as presentations or general discussions.

Conformance

Conformance to these specification are represented in a Language Implementation Specification (LIS). A LIS is formal document detailing the mappings and conventions used in relation to these specifications.

A LIS is in direct conformance to these specifications when:

1. All datatypes are defined and mapped.

2. the value spaces of the healthcare datatypes used by the entity to be identical to the value spaces specified herein

3. to the extent that the entity provides operations other than movement or translation of values, define operations on the healthcare datatypes which can be derived from, or are otherwise consistent with the characterizing operations specified herein

Compliance

These specifications:

- are in indirect conformance with ISO/DIS 21090/2008

- are in compliance with applicable sections of ISO 18308/2008

- are in compliance with applicable sections of ISO/TR 20514:2005

- are in compliance with applicable sections of ISO 13606-1:2007

Introduction

The Multi-Level Health Information Modeling (MLHIM) specifications are partially derived from ISO Healthcare Information Standards and the openEHR 1.0.2 specifications and the intent is that MLHIM 1.x be technologically inter-operable.
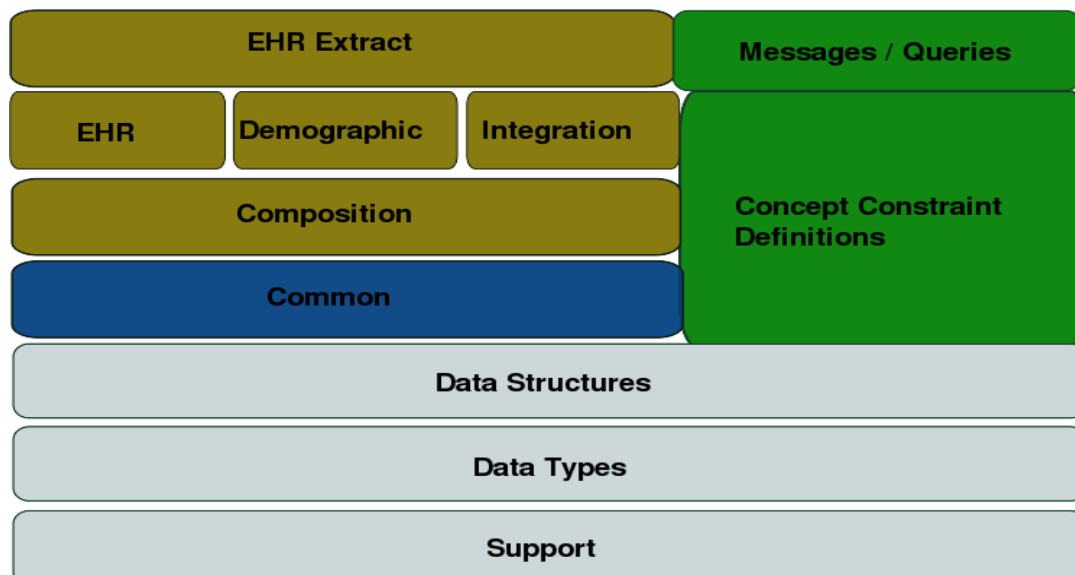
MLHIM 2.x (this document) introduces modernization through the use of XML technologies and improved modeling tools as well as application development platforms. These specifications can be implemented in any object oriented language. While a certain level of knowledge is assumed; the primary goal of these specifications is to make them 'readable' by the widest possible number of people. The primary motivator for these specifications is the complexity involved in the recording of the temporal-spatial relationships in healthcare information while maintaining the original semantics across all applications; for all time.

We invite you to join us in this effort to maintain the specifications and build great, translatable healthcare tools and applications for global use.

International input is encouraged in order for the MLHIM specifications to be truly inter-operable, available to everyone in all languages and most of all; implementable by mere mortals.

In actual implementation, the packages/classes should be implemented per the standard language naming format. A Language Implementation Specification (LIS) should be created for each language. For example; MLHIM-Python-LIS.odt or MLHIM-Java-LIS.odt.

Drawing 1 depicts the overall layered relationship of the packages.

Drawing 1: MLHIM Overview

Each of the package chapters lists the classes to be implemented. The format is:
- The generic class name

- The purpose

- Use

- Potential misuses

- Class or classes it should inherit from

- Class type (abstract or concrete)

- Attributes

- Methods

- Class invariants

The generic class names in the specification documents are in CamelCase type. Since this is most typical of implementation usage. This convention avoids confusion with major programming languages.

Only the reference model is implemented in software. The domain knowledge models are implemented in the XML Schema language and they represent constraints on the reference model. These knowledge models are called Concept Constraint Definitions and the acronyms CCD and CCDs are used throughout MLHIM documents to mean these XML Schema files. This means that CCDs form a model that data instances can be created from and according to a specific CCD, the data will be valid. However, any data instance should be able to be imported into any MLHIM based application since the root data model is the reference model. But, the full semantics of that data will not be known unless and until the defining CCD is available to that application.

The above paragraph describes the foundation of semantic interoperability in MLHIM implementations. You must understand this and the implications it carries to be successful with implementing MLHIM based applications. See the Constraint Definition section for an indepth discussion of CCD.

MLHIM Modelling

The MLHIM specifications are arranged into packages. These packages represent logical groupings of classes; providing ease of consistent implementation. The fundamental concepts, expressed in the reference model classes, are based on basic philosophical concepts of real world entities. These broad concepts can then be constrained to more specific concepts; using models created by domain experts, in this case healthcare experts.

In MLHIM 1.x.x these constraints were known as archetypes, expressed in what is called the archetype definition language (ADL). In MLHIM 2.x and later, we use an XML Schema (XSD) representation called a Concept Constraint Definition (CCD).

CCDs may contain other CCDs in a structure called a Slot. This provides a basis for selection and reuse of commonly occurring concepts within a larger concept; at runtime. A CCD is a maximal data model for a concept. Therefore it may be further constrained at the implementation level through the use of implementation templates in the given framework. These templates shall be constructed in the implementation and may or may not be sharable

across applications.

Managing CCDs

An open source content management system; Healthcare Knowledge Component Repository (HKCR) is being deployed to provide an easy path for the development and distribution of CCDs on a global basis. See the HKCR documentation for more information.

To demonstrate the differences between the MLHIM approach and the typical data model design approach; We will use two common metaphors.

1. The first is for the data model approach to developing software. This is where a set of database definitions are created based on a requirements statement representing an information model. An application is then developed to support all of the functionality required to input, manipulate and output this data as information; all built around the data model. This approach is akin to a jigsaw puzzle (the software application) where the shape of the pieces are the syntax and the design and colors are the semantics, of the information represented in an aggregation of data components described by the model. This produces an application that, like the jigsaw puzzle, can provide for pieces (information) to be exchanged only between exact copies of the same puzzle. If you were to try to put pieces from one puzzle, into a different puzzle you might find that a piece has the same shape (syntax) but the picture on the piece (semantics) will not be the same. Even though they both belong to the same domain; jigsaw puzzles. You can see that getting a piece from one puzzle to correctly fit into another is going to require manipulation of the basic syntax (shape) and /or semantics (picture) of the piece. This can also be extended to the relationship that the puzzle has a defined limit of its six sides. It cannot, reasonably, be extended to incorporate new pieces (concepts) discovered after the initial design.

2. The multi-level approach used in MLHIM is akin to creating models (applications) using the popular toy blocks made by Lego and other companies. If you compare a box of these interlocking blocks to the reference model and the instructions to creating a specific toy model (software application), where these instructions present a concept constraint. You can see that the same blocks can be used to represent multiple toy models without any change to the physical shape, size or color of each block. Now we can see that when new concepts are created within healthcare, they can be represented as instructions for building a new toy model; using the same fundamental building blocks that the original software applications where created upon.

Support

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!-- Copyright 2011 Timothy W. Cook and Contributors. See http://www.mlhim.org-->
<xs:schema elementFormDefault="qualified" id="support"
targetNamespace="http://www.mlhim.org/mlhim2" version="2.1.0"
xmlns:mlhim2="http://www.mlhim.org/mlhim2"
xmlns:xs="http://www.w3.org/2001/XMLSchema">
        <xs:complexType abstract="true" name="ExceptionalValue">
        <xs:annotation>
        <xs:documentation>
        Subclasses are used to indicate why a value is missing (Null) or is outside a
measurable range.
        </xs:documentation>
        </xs:annotation>
                <xs:sequence>

                        <xs:element maxOccurs="1" minOccurs="1"
name="ev_name" type="xs:string">
                <xs:annotation><xs:documentation>The class names (complexType names) are
abbreviations according to the ISO 21090 Null Flavours. This attribute is the full
name.</xs:documentation></xs:annotation>
                        </xs:element>

                        <xs:element maxOccurs="1" minOccurs="1"
name="ev_meaning" type="xs:string">
                <xs:annotation><xs:documentation></xs:documentation>The descriptive
meaning/usage for the class/complexType.</xs:annotation>
                        </xs:element>
                </xs:sequence>
        </xs:complexType>

        <xs:complexType name="NI">
        <xs:annotation>
        <xs:documentation>
        The value is exceptional (missing, incomplete, improper). No information is
available as to the reason
        for being an exceptional value is provided. This is the most general and default
value.
        </xs:documentation>
        </xs:annotation>
         <xs:complexContent>
           <xs:extension base="mlhim2:ExceptionalValue"></xs:extension>
         </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="MSK">
        <xs:annotation>
        <xs:documentation>
        There is inforamtion on this item available but it has not been provided by the
sender due to security, privacy or other reasons.
        There may be an alternate method of obtaining the information.
```

```
            </xs:documentation>
          </xs:annotation>
            <xs:complexContent>
              <xs:extension base="mlhim2:NI"></xs:extension>
            </xs:complexContent>
          </xs:complexType>

          <xs:complexType name="NA">
          <xs:annotation>
          <xs:documentation>
          No proper value is applicable in this context e.g.,the number of cigarrettes smoked
per day by a non-smoker subject.
          </xs:documentation>
          </xs:annotation>
            <xs:complexContent>
              <xs:extension base="mlhim2:NI"></xs:extension>
            </xs:complexContent>
          </xs:complexType>

          <xs:complexType name="UNK">
          <xs:annotation>
          <xs:documentation>
          A proper value is applicable, but not known
          </xs:documentation>
          </xs:annotation>
            <xs:complexContent>
              <xs:extension base="mlhim2:NI"></xs:extension>
            </xs:complexContent>
          </xs:complexType>

          <xs:complexType name="INV">
          <xs:annotation>
          <xs:documentation>
      The value as represented in the instance is not a member of the set of permitted data
values in the constrained
      value domain of a variable.
          </xs:documentation>
          </xs:annotation>
            <xs:complexContent>
              <xs:extension base="mlhim2:NI"></xs:extension>
            </xs:complexContent>
          </xs:complexType>

          <xs:complexType  name="DER">
          <xs:annotation>
          <xs:documentation>
          An actual value may exist, but it must be derived from the provided information;
usually an expression is provided directly.
          </xs:documentation>
          </xs:annotation>
            <xs:complexContent>
              <xs:extension base="mlhim2:INV"></xs:extension>
            </xs:complexContent>
```

```xml
        </xs:complexType>

        <xs:complexType name="UNC">
        <xs:annotation>
        <xs:documentation>
        No attempt has been made to encode the information correctly but the raw source
information is represented, usually in free text
        </xs:documentation>
        </xs:annotation>
          <xs:complexContent>
            <xs:extension base="mlhim2:INV"></xs:extension>
          </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="OTH">
        <xs:annotation>
        <xs:documentation>
    The actual value is not a member of the permitted data values in the variable. (e.g.,
when the value of the variable is not
        by the coding system)
     </xs:documentation>
        </xs:annotation>
          <xs:complexContent>
            <xs:extension base="mlhim2:INV"></xs:extension>
          </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="ASKU">
        <xs:annotation>
        <xs:documentation>
        Information was sought but not found (e.g., patient was asked but did not know).
        </xs:documentation>
        </xs:annotation>
          <xs:complexContent>
            <xs:extension base="mlhim2:UNK"></xs:extension>
          </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="ASKR">
        <xs:annotation>
        <xs:documentation>
        Information was sought but refused to be provided (e.g., patient was asked but
refused to answer)
        </xs:documentation>
        </xs:annotation>
          <xs:complexContent>
            <xs:extension base="mlhim2:UNK"></xs:extension>
          </xs:complexContent>
        </xs:complexType>

        <xs:complexType  name="NASK">
        <xs:annotation>
        <xs:documentation>
```

This information has not been sought (e.g., patient was not asked).
                </xs:documentation>
            </xs:annotation>
            <xs:complexContent>
                <xs:extension base="mlhim2:UNK"></xs:extension>
            </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="QS">
            <xs:annotation>
                <xs:documentation>
The specific quantity is not known, but is known to non-zero and it is not specified because it makes up the bulk of the material;
                "Add 10mg of ingredient X, 50mg of ingredient Y and sufficient quantity of water to 100mL."
                </xs:documentation>
            </xs:annotation>
            <xs:complexContent>
                <xs:extension base="mlhim2:UNK"></xs:extension>
            </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="TRC">
            <xs:annotation>
                <xs:documentation>
The content is greater or less than zero but too small to be quantified.
                </xs:documentation>
            </xs:annotation>
            <xs:complexContent>
                <xs:extension base="mlhim2:UNK"></xs:extension>
            </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="NINF">
            <xs:annotation>
                <xs:documentation>
Negative infinity of numbers
                </xs:documentation>
            </xs:annotation>
            <xs:complexContent>
                <xs:extension base="mlhim2:OTH"></xs:extension>
            </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="PINF">
            <xs:annotation>
                <xs:documentation>
Positive infinity of numbers
                </xs:documentation>
            </xs:annotation>
            <xs:complexContent>
                <xs:extension base="mlhim2:OTH"></xs:extension>
            </xs:complexContent>

```xml
</xs:complexType>

<xs:complexType name="NAV">
<xs:annotation>
<xs:documentation>
Information is unavailable at this time but is expected that it will be available
later.
</xs:documentation>
</xs:annotation>
  <xs:complexContent>
    <xs:extension base="mlhim2:ASKU"></xs:extension>
  </xs:complexContent>
</xs:complexType>

<xs:complexType name="ObjectRef">
<xs:annotation>
<xs:documentation>
Class describing a reference to another object, which may exist locally or be
maintained outside the current namespace,
e.g. in another service. Services are usually external, e.g. available in a LAN
(including on the same host) or the internet via
Corba, SOAP, or some other distributed protocol. However, in small systems they
may be part of the same executable as the
data containing the Id.
</xs:documentation>
</xs:annotation>
        <xs:sequence>

                <xs:element name="uuid" maxOccurs="1"
minOccurs="1" type="xs:string">
        <xs:annotation><xs:documentation>Universally unique id of an object,
regardless of where it is stored.</xs:documentation></xs:annotation>
                <xs:element>

                <xs:element name="namespace" maxOccurs="1"
minOccurs="1" type="xs:string">
        <xs:annotation><xs:documentation>Namespace to which this identifier belongs
in the local system context. </xs:documentation></xs:annotation>
                <xs:element>

                <xs:element name="obj_type" maxOccurs="1"
minOccurs="1" type="xs:string">
        <xs:annotation><xs:documentation>Name of the class (concrete or abstract) of
object to which this identifier type refers, e.g. "PARTY", "PERSON", "GUIDELINE" etc.
These class names are from the relevant reference model. The type name "ANY" can be used
to indicate that any type is accepted (e.g. if the type is
unknown).</xs:documentation></xs:annotation>
                        <xs:element>
                </xs:sequence>
</xs:complexType>

<xs:complexType name="EntityRef">
<xs:annotation>
```

<xs:documentation>
Identifier for entities in an identity service. There are typically a number of subtypes of the Entity class, including Person,
Organization, Device, etc. Abstract supertypes are allowed if the referenced object is of a type not known by the current
implementation of this class. For example, if the entity model is changed by the addition of a new subtype, valid EntityRefs
can still be constructed to them.
</xs:documentation>
</xs:annotation>
<xs:complexContent>
<xs:extension base="mlhim2:ObjectRef"></xs:extension>
</xs:complexContent>
</xs:complexType>

</xs:schema>

Datatypes

<?xml version="1.0" encoding="UTF-8"?>
<!-- Copyright 2011 Timothy W. Cook and Contributors. See http://www.mlhim.org-->
<xs:schema elementFormDefault="qualified" id="datatypes" targetNamespace="http://www.mlhim.org/mlhim2" version="2.1.0" xmlns:mlhim2="http://www.mlhim.org/mlhim2" xmlns:xs="http://www.w3.org/2001/XMLSchema">

<xs:complexType name="DvAny" abstract="true">
<xs:annotation>
<xs:documentation>
Serves as a common ancestor of all datatypes in MLHIM models.
</xs:documentation>
</xs:annotation>
  <xs:sequence>

<xs:element name="valid_time_begin" maxOccurs="1" minOccurs="0" type="xs:string">
<xs:annotation><xs:documentation>If present this must be a valid datetime string including timezone</xs:documentation></xs:annotation>
</xs:element>

<xs:element name="valid_time_end" maxOccurs="1" minOccurs="0" type="xs:string">
<xs:annotation><xs:documentation>If present this must be a valid datetime string including timezone</xs:documentation></xs:annotation>
</xs:element>

<xs:element name="ev" maxOccurs="1" minOccurs="0" type="mlhim2:ExceptionalValue">
<xs:annotation><xs:documentation>The exceptional value. Often referred to as Null Flavour. </xs:documentation></xs:annotation>
</xs:element>

```xml
                    </xs:sequence>
                </xs:complexType>

        <xs:complexType name="DvText" abstract="false">
                <xs:annotation>
                <xs:documentation>
                A text item, which may contain any amount of legal characters arranged as e.g.
words, sentences etc. as its data value (dv)
                </xs:documentation>
                </xs:annotation>
            <xs:complexContent>
            <xs:extension  base="mlhim2:DvAny">
              <xs:sequence>

                    <xs:element name="uuid" maxOccurs="1" minOccurs="1" type="xs:string"
nillable="false">
                        <xs:annotation><xs:documentation>UUID in order to track
translations.</xs:documentation></xs:annotation>
                    </xs:element>

                    <xs:element name="language" maxOccurs="1" minOccurs="0" type="xs:string"
nillable="true">
                        <xs:annotation><xs:documentation>Optional indicator of the localised
language in which the value is written. Coded IAW IETF RFC 5646.
http://tools.ietf.org/html/rfc5646  Only used when the text object is in a different language
from the enclosing CCD.</xs:documentation></xs:annotation>
                    </xs:element>

                    <xs:element name="dv" maxOccurs="1" minOccurs="0" type="xs:string"
nillable="true">
                        <xs:annotation><xs:documentation>Displayable rendition of the
item.</xs:documentation></xs:annotation>
                    </xs:element>
                  </xs:sequence>
                </xs:extension>
                </xs:complexContent>
        </xs:complexType>

          <xs:complexType name="DvCodedText"   abstract="false">
                <xs:annotation>
                <xs:documentation>
                A text item whose dv attribute must be the long name or description from a
controlled terminology, the key (i.e. the 'code')
                of which is the code_string attribute.
                </xs:documentation>
                </xs:annotation>
            <xs:complexContent>
            <xs:extension base="mlhim2:DvText">
              <xs:sequence>

                    <xs:element name="code_string" maxOccurs="1" minOccurs="0"
type="xs:string">
                        <xs:annotation><xs:documentation>The key used by the terminology service to
```

identify a concept or coordination of concepts. This string is most likely parsable inside the terminology service, but nothing can be assumed about its syntax outside that context. In the NLM Metathesarus this would be the Concept Unique Identifier (CUI).</xs:documentation></xs:annotation>
                </xs:element>

                <xs:element name="terminology_name" maxOccurs="1" minOccurs="0" type="xs:string">
                    <xs:annotation><xs:documentation>Full Source Name from NLM Metathesarus; or similar.</xs:documentation></xs:annotation>
                </xs:element>

                <xs:element name="terminology_abbrev" maxOccurs="1" minOccurs="0" type="xs:string">
                    <xs:annotation><xs:documentation>Version Source Abbreviation (VSAB) from NLM Metathesarus; or similar </xs:documentation></xs:annotation>
                </xs:element>
            </xs:sequence>
            </xs:extension>
            </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="DvIdentifier" abstract="false">
            <xs:annotation>
            <xs:documentation>
            Type for representing identifiers of real-world entities. Typical identifiers include: drivers licence number,
            social security number, veterans affairs number, prescription id, order id, and so on.
            </xs:documentation>
            </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:DvText">
          <xs:sequence>

                <xs:element name="issuer" maxOccurs="1" minOccurs="0" type="xs:string">
                    <xs:annotation><xs:documentation>Authority which issues the kind of id used in the id field of this object.</xs:documentation></xs:annotation>
                </xs:element>

                <xs:element name="assigner" maxOccurs="1" minOccurs="0" type="xs:string">
                    <xs:annotation><xs:documentation>Organisation that assigned the id to the item being identified.</xs:documentation></xs:annotation>
                </xs:element>

                <xs:element name="name" maxOccurs="1" minOccurs="0" type="xs:string">
                    <xs:annotation><xs:documentation>The identifier common name, such as "Driver's License" or "SSN".</xs:documentation></xs:annotation>
                </xs:element>
            </xs:sequence>
            </xs:extension>
            </xs:complexContent>
        </xs:complexType>

```xml
<xs:complexType name="DvBoolean"  abstract="false">
    <xs:annotation>
    <xs:documentation>
    Items which are truly boolean data, such as true/false or yes/no answers. Use for
such data, it is important to devise
    the meanings (usually questions in subjective data) carefully, so that the only
allowed results are in fact true or false.
    Potential MisUse: The DvBoolean class should not be used as a replacement for
naively modelled enumerated types such
    as male/female etc. Such values should be coded, and in any case the enumeration
often has more than two values.
    </xs:documentation>
    </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:DvAny">
     <xs:sequence>

        <xs:element name="dv" maxOccurs="1" minOccurs="0"  type="xs:string"
nillable="true">
            <xs:annotation><xs:documentation>A string indicating a boolean type result
according to the rules described below. Boolean True values are represented by any one of
these strings:  ["True","1","T"]. Boolean False values are represented by any one of these
strings:  ["False","0","F"]. Note that the strings are not case-sensitive; i.e. "T" == "t" and
"TRUE" == "t". The empty string; "" represents a Void or Null value, in which case the ev
attribute cannot be empty. </xs:documentation></xs:annotation>
        </xs:element>
     </xs:sequence>
    </xs:extension>
    </xs:complexContent>
</xs:complexType>

<xs:complexType name="DvURI"  abstract="false">
    <xs:annotation>
    <xs:documentation>
    A reference to an object which conforms to the Universal Resource Identifier
(URI) standard, as defined by W3C RFC 2936.
    See "Universal Resource Identifiers in WWW" by Tim Berners-Lee at
http://www.ietf.org/rfc/rfc2396.txt. This is a World-Wide
    Web RFC for global identification of resources. See
http://www.w3.org/Addressing for a starting point on URIs.
    See http://www.ietf.org/rfc/rfc2806.txt for new URI types like telephone, fax and
modem numbers. Enables external resources
    to be referenced from within the content of the EHR. A number of functions
return the logical subparts of the URI string.
    </xs:documentation>
    </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:DvAny">
     <xs:sequence>

        <xs:element name="dv" maxOccurs="1" minOccurs="0"  type="xs:anyURI"
nillable="true">
```

<xs:annotation><xs:documentation>Value of URI as a String.</xs:documentation></xs:annotation>
          </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
      </xs:complexType>

      <xs:complexType name="DvParagraph" abstract="false">
        <xs:annotation>
        <xs:documentation>
        A logical composite text value consisting of a series of DvTexts, i.e. plain or coded text to form a larger tract of prose,
        which may be interpreted for display purposes as a paragraph. DvParagraph is the standard way for constructing longer
        text items in summaries, reports and so on.
        </xs:documentation>
        </xs:annotation>
      <xs:complexContent>
      <xs:extension base="mlhim2:DvAny" >
       <xs:sequence>

        <xs:element name="items" maxOccurs="unbounded" minOccurs="0" type="mlhim2:DvText" nillable="false">
          <xs:annotation><xs:documentation>List of Items making up the paragraph, each of which is a text item. The items should be displayed in sequential order from smallest index number to highest index number.</xs:documentation></xs:annotation>
          </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
      </xs:complexType>

      <xs:complexType name="DvEncapsulated" abstract="true">
        <xs:annotation>
        <xs:documentation>
        Abstract class defining the common meta-data of all types of encapsulated data.
        </xs:documentation>
        </xs:annotation>
      <xs:complexContent>
      <xs:extension base="mlhim2:DvAny">
       <xs:sequence>

        <xs:element name="size" maxOccurs="1" minOccurs="1" type="xs:integer">
          <xs:annotation><xs:documentation>Original size in bytes of unencoded encapsulated data. I.e. encodings such as base64, hexadecimal etc do not change the value of this attribute.</xs:documentation></xs:annotation>
          </xs:element>

        <xs:element name="charset" maxOccurs="1" minOccurs="0" type="xs:string">
          <xs:annotation><xs:documentation>Name of character encoding scheme in which this value is encoded. Coded from MLHIM Code Set "character sets". Unicode is the default assumption in MLHIM, with UTF-8 being the assumed encoding. This attribute

allows for variations from these assumptions.</xs:documentation></xs:annotation>
</xs:element>

<xs:element name="language" maxOccurs="1" minOccurs="0" type="xs:string">
<xs:annotation><xs:documentation>Optional indicator of the localised language in which the value is written. Coded IAW IETF RFC 5646. http://tools.ietf.org/html/rfc5646 Only used when the text object is in a different language from the enclosing CCD.</xs:documentation></xs:annotation>
</xs:element>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>

<xs:complexType name="DvParsable" abstract="false">
<xs:annotation>
<xs:documentation>
Encapsulated data expressed as a parsable String. The internal model of the data item is not described in the MLHIM
model in common with other encapsulated types, but in this case, the form of the data is assumed to be plaintext, rather
than compressed or other types of large binary data.
</xs:documentation>
</xs:annotation>
<xs:complexContent>
<xs:extension base="mlhim2:DvEncapsulated">
<xs:sequence>

<xs:element name="dv" maxOccurs="1" minOccurs="0" type="xs:string" nillable="true">
<xs:annotation><xs:documentation>The string, which may validly be empty in some syntaxes</xs:documentation></xs:annotation>
</xs:element>

<xs:element name="formalism" maxOccurs="1" minOccurs="0" type="xs:string">
<xs:annotation><xs:documentation>name of the formalism, e.g. "MAG 1.0", "GLIF 1.0", "PROforma" etc. </xs:documentation></xs:annotation>
</xs:element>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>

<xs:complexType name="DvMultimedia" abstract="false">
<xs:annotation>
<xs:documentation>
A specialisation of DvEncapsulated for audiovisual and biosignal types. Includes further metadata relating to multimedia
types which are not applicable to other subtypes of DvEncapsulated.
</xs:documentation>
</xs:annotation>
<xs:complexContent>

```
<xs:extension base="mlhim2:DvEncapsulated">
  <xs:sequence>

    <xs:element name="dv" maxOccurs="1" minOccurs="0" type="xs:base64Binary"
nillable="true">
      <xs:annotation><xs:documentation>The actual data found at uri, if supplied
inline</xs:documentation></xs:annotation>
    </xs:element>

    <xs:element name="mime_type" maxOccurs="1" minOccurs="0"
type="xs:string">
      <xs:annotation><xs:documentation>Content type as defined in RFC2045 and
RFC 2046</xs:documentation></xs:annotation>
    </xs:element>

    <xs:element name="compression_algorithm" maxOccurs="1" minOccurs="0"
type="xs:string">
      <xs:annotation><xs:documentation>Compression type, a coded value from the
MLHIM "Integrity check" code set. Void means  no
compression.</xs:documentation></xs:annotation>
    </xs:element>

    <xs:element name="integrity_check" maxOccurs="1" minOccurs="0"
type="xs:base64Binary" nillable="true">
      <xs:annotation><xs:documentation>Binary cryptographic integrity
checksum</xs:documentation></xs:annotation>
    </xs:element>

    <xs:element name="integrity_check_algorithm" maxOccurs="1" minOccurs="0"
type="xs:string">
      <xs:annotation><xs:documentation>Type of integrity check, a coded value
from the MLHIM "Integrity check" code set.</xs:documentation></xs:annotation>
    </xs:element>

    <xs:element name="thumbnail" maxOccurs="1" minOccurs="0"
type="xs:base64Binary" nillable="true">
      <xs:annotation><xs:documentation>The thumbnail for this item, if one exists;
mainly for graphics formats.</xs:documentation></xs:annotation>
    </xs:element>

    <xs:element name="uri" maxOccurs="1" minOccurs="0" type="mlhim2:DvURI"
nillable="true">
      <xs:annotation><xs:documentation>URI reference to electronic information
stored outside the record as a file, database entry etc, if supplied as a
reference.</xs:documentation></xs:annotation>
    </xs:element>

    <xs:element name="alt_text" maxOccurs="1" minOccurs="0" type="xs:string"
nillable="true">
      <xs:annotation><xs:documentation>Text to display in lieu of multimedia
display/replay</xs:documentation></xs:annotation>
    </xs:element>
  </xs:sequence>
```

```xml
            </xs:extension>
          </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="DvInterval"  abstract="false">
          <xs:annotation>
          <xs:documentation>
          Generic class defining an interval (i.e. range) of a comparable type. An interval is
a contiguous subrange of a comparable
          base type. Used to define intervals of dates, times, quantities (whose units match)
and so on.
          </xs:documentation>
          </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:DvAny">
          <xs:sequence>

            <xs:element name="lower" maxOccurs="1" minOccurs="0"
type="mlhim2:DvOrdered">
                <xs:annotation><xs:documentation>Lower
boundary.</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="upper" maxOccurs="1" minOccurs="0"
type="mlhim2:DvOrdered">
                <xs:annotation><xs:documentation>Upper
boundary.</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="lower_included" maxOccurs="1" minOccurs="1"
type="xs:boolean">
                <xs:annotation><xs:documentation>Is the lower boundary included in the
interval?</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="upper_included" maxOccurs="1" minOccurs="1"
type="xs:boolean">
                <xs:annotation><xs:documentation>Is the upper boundary included in the
interval?</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="lower_unbounded" maxOccurs="1" minOccurs="1"
type="xs:boolean">
                <xs:annotation><xs:documentation>If True, there is no lower
boundary</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="upper_unbounded" maxOccurs="1" minOccurs="1"
type="xs:boolean">
                <xs:annotation><xs:documentation>If True, there is no upper
boundary</xs:documentation></xs:annotation>
            </xs:element>
          </xs:sequence>
```

```xml
        </xs:extension>
        </xs:complexContent>
      </xs:complexType>

      <xs:complexType name="ReferenceRange"  abstract="false">
        <xs:annotation>
        <xs:documentation>
        Defines a named range to be associated with any Ordered datum. Each such range
is particular to the patient and context,
        e.g. sex, age, and any other factor which affects ranges. May be used to represent
normal, therapeutic, dangerous,
        critical etc ranges.
        </xs:documentation>
        </xs:annotation>
      <xs:complexContent>
      <xs:extension base="mlhim2:DvAny">
        <xs:sequence>

        <xs:element name="definition" maxOccurs="1" minOccurs="1"
type="mlhim2:DvText">
            <xs:annotation><xs:documentation>Term whose value indicates the meaning
of this range, e.g. "normal", "critical", "therapeutic"
etc.</xs:documentation></xs:annotation>
          </xs:element>

        <xs:element name="data_range" maxOccurs="1" minOccurs="1"
type="mlhim2:DvInterval">
            <xs:annotation><xs:documentation>The data range for this
meaning.</xs:documentation></xs:annotation>
          </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
      </xs:complexType>

      <xs:complexType name="DvOrdered" abstract="true">
        <xs:annotation>
        <xs:documentation>
        Abstract class defining the concept of ordered values, which includes ordinals as
well as true quantities. It defines the
        functions less than and is_strictly_comparable_to, the latter of which must
evaluate to True for instances being compared with
        the  less than function, or used as limits in the DvInterval class. Data value types
which are to be used as limits must inherit from
        this class, and implement the function is_strictly_comparable_to to ensure that
instances compare meaningfully.
        For example, instances of DvQuantity can only be compared if they measure the
same kind of physical quantity.
        </xs:documentation>
        </xs:annotation>
      <xs:complexContent>
      <xs:extension  base="mlhim2:DvAny">
        <xs:sequence>
```

```xml
<xs:element name="normal_range" maxOccurs="1" minOccurs="0" type="mlhim2:DvInterval">
    <xs:annotation><xs:documentation>Optional normal range.</xs:documentation></xs:annotation>
</xs:element>

<xs:element name="other_reference_ranges" maxOccurs="unbounded" minOccurs="0" type="mlhim2:ReferenceRange">
    <xs:annotation><xs:documentation>List of ReferenceRanges. Optional tagged other reference ranges for this value in its particular measurement context.</xs:documentation></xs:annotation>
</xs:element>

<xs:element name="normal_status" maxOccurs="1" minOccurs="0" type="xs:string">
    <xs:annotation><xs:documentation>Optional normal status indicator of value with respect to normal range for this value. Often included by lab, even if the normal range itself is not included. Coded by ordinals in series HHH, HH, H, (nothing), L, LL, LLL, etc.</xs:documentation></xs:annotation>
</xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="DvOrdinal"  abstract="false">
        <xs:annotation>
        <xs:documentation>
        Models rankings and scores, e.g. pain, Apgar values, etc, where there is a) implied ordering, b) no implication that the distance
        between each value is constant, and c) the total number of values is finite. Note that although the term 'ordinal' in mathematics
        means natural numbers only, here any integer is allowed, since negative and zero values are often used by medical professionals
        for values around a neutral point. Examples of sets of ordinal values: -3, -2, -1, 0, 1, 2, 3 -- reflex response values 0, 1, 2 -- Apgar values
        Used for recording any clinical datum which is customarily recorded using symbolic values. Example: the results on a urinalysis strip,
        e.g. {neg, trace, +,++, +++} are used for leucocytes, protein, nitrites etc; for non-haemolysed blood {neg, trace, moderate};
        for haemolysed blood {neg, trace,small, moderate, large}.
        </xs:documentation>
        </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:DvOrdered">
        <xs:sequence>

        <xs:element name="dv" maxOccurs="1" minOccurs="0" type="xs:integer">
            <xs:annotation><xs:documentation>Value in ordered enumeration of values. Any integer value can be used.</xs:documentation></xs:annotation>
        </xs:element>
```

```xml
<xs:element name="symbol" maxOccurs="1" minOccurs="0" type="xs:string">
    <xs:annotation><xs:documentation>Coded textual representation of this value
```
in the enumeration, which may be strings made from "+" symbols, or other enumerations of terms such as "mild", "moderate", "severe", or even the same number series as the values, e.g. "1", "2", "3". Codes come from archetype.
```xml
</xs:documentation></xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

<xs:complexType name="DvQuantified"  abstract="true">
  <xs:annotation>
  <xs:documentation>
  Abstract class defining the concept of true quantified values, i.e. values which are
```
not only ordered, but which have a
```xml
  precise magnitude.
  </xs:documentation>
  </xs:annotation>
<xs:complexContent>
<xs:extension base="mlhim2:DvOrdered">
  <xs:sequence>

    <xs:element name="magnitude" maxOccurs="1" minOccurs="0"
type="xs:long">
        <xs:annotation><xs:documentation>Numeric value of the quantity in canonical
```
(i.e. single value) form. Implemented as constant, function or attribute in subtypes as appropriate. The type Ordered_numeric is mapped to the available appropriate type in each implementation technology.
```xml
</xs:documentation></xs:annotation>
        </xs:element>

    <xs:element name="magnitude_status" maxOccurs="1" minOccurs="0"
type="xs:string">
        <xs:annotation><xs:documentation><!--Optional status of magnitude with
```
values:

- "=" : magnitude is a point value

- "<" : value is < magnitude

- ">" : value is > magnitude

- "<=" : value is <= magnitude

- ">=" : value is >= magnitude

- "~" : value is approximately magnitude If not present, meaning is "=".--
```xml
></xs:documentation></xs:annotation>
        </xs:element>

    <xs:element name="error" maxOccurs="1" minOccurs="1" type="xs:long">
        <xs:annotation><xs:documentation>Error margin of measurement, indicating
```
error in the recording method or instrument (+/- %). Implemented in subtypes. A logical

value of 0 indicates 100% accuracy, i.e. no error.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="accuracy_unknown" maxOccurs="1" minOccurs="1"
type="xs:boolean">
        <xs:annotation><xs:documentation>True if accuracy is not known, e.g. due to
not being recorded or discernable.</xs:documentation></xs:annotation>
        </xs:element>
      </xs:sequence>
      </xs:extension>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="DvDateTime" abstract="false">
      <xs:annotation>
      <xs:documentation>
      All dates and times representations in MLHIM use this class. Represents an
absolute point in time, specified to the second.
      Used for recording a precise point in real world time, and for approximate time
stamps, e.g. the origin of a History in an
      Observation which is only partially known. All dates and times are assumed to be
in the "current era"; somewhere between
      0001-01-01T00:00:00Z and 9999-12-31T23:59:59Z AD. The difference function
is redefined to produce a DvDuration.
      </xs:documentation>
      </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:DvQuantified">
   <xs:sequence>

      <xs:element name="dv" maxOccurs="1" minOccurs="0" type="xs:string">
      <xs:annotation><xs:documentation><!--ISO8601:2004 date/time string
including UTC offset. <date>T<time>Z --></xs:documentation></xs:annotation>
      </xs:element>
    </xs:sequence>
    </xs:extension>
    </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="DvQuantity" abstract="false">
      <xs:annotation>
      <xs:documentation>
      Quantitified type representing "scientific" quantities, i.e. quantities expressed as a
magnitude and units. Units were inspired
      by the Unified Code for Units of Measure (UCUM), developed by Gunther
Schadow and Clement J. McDonald of The Regenstrief
      Institute. Can also be used for time durations, where it is more convenient to treat
these as simply a number of individual
      seconds, minutes, hours, days, months, years, etc.
      </xs:documentation>
      </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:DvQuantified">

```xml
        <xs:sequence>

            <xs:element name="units" maxOccurs="1" minOccurs="0" type="xs:string">
                <xs:annotation><xs:documentation>Stringified units, expressed in UCUM unit
syntax, e.g. "kg/m2", "mm[Hg]", "ms-1", "km/h". Implemented accordingly in
subtypes.</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="precision" maxOccurs="1" minOccurs="0"
type="xs:integer">
                <xs:annotation><xs:documentation>Precision to which the value of the
quantity is expressed, in terms of number of decimal places. The value 0 implies an integral
quantity. The value -1 implies no limit, i.e. any number of decimal
places.</xs:documentation></xs:annotation>
            </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="DvCount" abstract="false">
        <xs:annotation>
        <xs:documentation>
        Countable quantities. Used for countable types such as pregnancies and steps
(taken by a physiotherapy patient),
        number of cigarettes smoked in a day, etc. Misuse:Not used for amounts of
physical entities (which all have units)
        </xs:documentation>
        </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:DvQuantified" >
      <xs:sequence>

            <xs:element name="count" maxOccurs="1" minOccurs="0" type="xs:integer">
                <xs:annotation><xs:documentation>Number of items
counted.</xs:documentation></xs:annotation>
            </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="DvDuration"  abstract="false">
        <xs:annotation>
        <xs:documentation>
        Durations are a component of time intervals and define the amount of intervening
time in a time interval.
        They should only be used as part of a time interval as prescribed by the standard.
Durations are represented by the
        format P[n]Y[n]M[n]DT[n]H[n]M[n]S or P[n]W as shown to the right. In these
representations, the [n] is replaced by the
        value for each of the date and time elements that follow the [n]. Leading zeros are
not required, but the maximum number
```

of digits for each element should be agreed to by the communicating parties. The capital letters 'P', 'Y', 'M', 'W', 'D', 'T', 'H', 'M',
and 'S' are designators for each of the date and time elements and are not replaced.

* P is the duration designator (historically called "period") placed at the start of the duration representation.
* Y is the year designator that follows the value for the number of years.
* M is the month designator that follows the value for the number of months.
* W is the week designator that follows the value for the number of weeks.
* D is the day designator that follows the value for the number of days.
* T is the time designator that precedes the time components of the representation.
* H is the hour designator that follows the value for the number of hours.
* M is the minute designator that follows the value for the number of minutes.
* S is the second designator that follows the value for the number of seconds.

For example, "P3Y6M4DT12H30M5S" represents a duration of "three years, six months, four days, twelve hours, thirty minutes,
and five seconds". Date and time elements including their designator may be omitted if their value is zero, and lower order
elements may also be omitted for reduced precision. For example, "P23DT23H" and "P4Y" are both acceptable duration
representations. To resolve ambiguity, "P1M" is a one-month duration and "PT1M" is a one-minute duration
(note the time designator, T, that precedes the time value). The smallest value used may also have a decimal fraction,
as in "P0.5Y" to indicate half a year. This decimal fraction may be specified with either a comma or a full stop, as in
"P0,5Y" or "P0.5Y". The standard does not prohibit date and time values in a duration representation from exceeding their
"carry-over points" except as noted below. Thus, "PT36H" could be used as well as "P1DT12H" for representing the same duration.
Alternately, a format for duration based on combined date and time representations may be used by agreement between the
communicating parties either in the basic format PYYYYMMDDThhmmss or in the extended
format P[YYYY]-[MM]-[DD]T[hh]:[mm]:[ss]. For example, the first duration shown above would be "P0003-06-04T12:30:05".
However, individual date and time values cannot exceed their moduli (e.g. a value of 13 for the month or 25 for the hour would
not be permissible).
          </xs:documentation>
          </xs:annotation>
       <xs:complexContent>
       <xs:extension base="mlhim2:DvQuantified">
        <xs:sequence>

          <xs:element name="dv" maxOccurs="1" minOccurs="0" type="xs:string">
             <xs:annotation><xs:documentation>The duration in the form of a
string.</xs:documentation></xs:annotation>
          </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>

```
            </xs:complexType>

        <xs:complexType name="DvRatio"  abstract="true">
            <xs:annotation>
            <xs:documentation>
            Models a ratio of values, i.e. where the numerator and denominator are both pure
numbers.
            </xs:documentation>
            </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:DvQuantified">
         <xs:sequence>

            <xs:element name="numerator" maxOccurs="1" minOccurs="0" type="xs:long">
                <xs:annotation><xs:documentation>numerator of
ratio</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="denominator" maxOccurs="1" minOccurs="0"
type="xs:long">
                <xs:annotation><xs:documentation>denominator of
ratio</xs:documentation></xs:annotation>
            </xs:element>
         </xs:sequence>
            </xs:extension>
            </xs:complexContent>
        </xs:complexType>

         <xs:complexType name="DvRate"  abstract="false">
            <xs:annotation>
            <xs:documentation>
            Models a ratio of values, i.e. where the numerator and denominator are both pure
numbers, and the numerator is not
            contained (it is not a subset of the denominator). Example 1: Numerator =
Number of episodes of seizures;
            Denominator = Number of days Example 2 = Number of hospital admissions;
Denominator = Number of bed-days
            </xs:documentation>
            </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:DvRatio">
         <xs:sequence>

            <xs:element name="rate_type" maxOccurs="1" minOccurs="0" type="xs:string">
                <xs:annotation><xs:documentation>Indicates semantic type of coefficient:
  pk_coefficient        = coefficient type. Numerator and denominator may be any value.
  pk_unitary            = Denominator must be 1.
  pk_per10^n            = Denominator is 10^2, numerator is understood as a real number
divided by an exponent of 10 (10^n).
  pk_fraction           =              Numerator and denominator are real numbers, allowing
rational and irrational fractions, and the presentation method uses a slash, e.g. "1/2"; if the
numerator is greater than the denominator, e.g. n=3, d=2, the presentation is "1
1/2".</xs:documentation></xs:annotation>
```

```
        </xs:element>
      </xs:sequence>
      </xs:extension>
      </xs:complexContent>
    </xs:complexType>

      <xs:complexType name="DvProportion"  abstract="false">
        <xs:annotation>
        <xs:documentation>
        Models a ratio of values, i.e. where the numerator and denominator are both pure
numbers. The proportion_kind
        property is used to control the type attribute to be one of a defined set. Used for
recording titers (e.g. 1:128),
        concentration ratios, e.g. Na:K (unitary denominator), albumin:creatinine ratio,
and percentages, e.g. red cell distirbution
        width (RDW). Should not be used to represent things like blood pressure which
are often written using a '/' character,
        giving the misleading impression that the item is a ratio, when in fact it is a
structured value. Similarly, visual acuity, often
        written as (e.g.) "6/24" in clinical notes is not a ratio but an ordinal (which
includes non-numeric symbols like CF = count fingers etc).
        Should not be used for formulations.
        </xs:documentation>
        </xs:annotation>
      <xs:complexContent>
      <xs:extension base="mlhim2:DvRatio">
        <xs:sequence>

        <xs:element name="proportion_type" maxOccurs="1" minOccurs="0"
type="xs:string">
          <xs:annotation><xs:documentation>Indicates semantic type of proportion:
  pk_proportion       = proportion type. Numerator and denominator may be any value.
  pk_unitary          = Denominator must be 1.
  pk_per10^n          = Denominator is 10^2, numerator is understood as a real number
divided by an exponent of 10 (10^n).
  pk_fraction         =          Numerator and denominator are real numbers, allowing
rational and irrational fractions, and the presentation method uses a slash, e.g. "1/2"; if the
numerator is greater than the denominator, e.g. n=3, d=2, the presentation is "1
1/2".</xs:documentation></xs:annotation>
        </xs:element>
      </xs:sequence>
      </xs:extension>
      </xs:complexContent>
    </xs:complexType>


  </xs:schema>
```

Structures

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- Copyright 2011 Timothy W. Cook and Contributors. See http://www.mlhim.org-->
```

```xml
<xs:schema elementFormDefault="qualified" id="structures"
targetNamespace="http://www.mlhim.org/mlhim2" version="2.1.0"
xmlns:mlhim2="http://www.mlhim.org/mlhim2"
xmlns:xs="http://www.w3.org/2001/XMLSchema">

        <xs:complexType name="DataStructure"  abstract="true">
          <xs:annotation>
          <xs:documentation>
          Abstract parent class of all data structure types.
          </xs:documentation>
          </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:Locatable">
          </xs:extension>
          </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="ItemStructure" abstract="true">
          <xs:annotation>
          <xs:documentation>
          Abstract parent class of all item structure types.
          </xs:documentation>
          </xs:annotation>
        <xs:complexContent>
        <xs:extension  base="mlhim2:DataStructure">
          </xs:extension>
          </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="Event" abstract="true">
          <xs:annotation>
          <xs:documentation>
          Defines the abstract notion of a single event in a series. This class is generic,
allowing types to be generated which are
          locked to particular spatial types. Subtypes express point or interval data.
          </xs:documentation>
          </xs:annotation>
        <xs:complexContent>
        <xs:extension  base="mlhim2:Locatable">
         <xs:sequence>

        <xs:element name="time" maxOccurs="1" minOccurs="1"
type="mlhim2:DvDateTime">
             <xs:annotation><xs:documentation>Time of this event. If the width is non-
zero, it is the time point of the trailing edge of the
event.</xs:documentation></xs:annotation>
          </xs:element>

        <xs:element name="data" maxOccurs="1" minOccurs="1"
type="mlhim2:DvAny">
             <xs:annotation><xs:documentation>The data of this
event.</xs:documentation></xs:annotation>
          </xs:element>
```

```xml
            <xs:element name="state" maxOccurs="1" minOccurs="1"
type="mlhim2:ItemStructure">
                <xs:annotation><xs:documentation>Optional state data for this
event.</xs:documentation></xs:annotation>
            </xs:element>
          </xs:sequence>
          </xs:extension>
          </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="PointEvent"  abstract="false">
          <xs:annotation>
          <xs:documentation>
          Defines a single point event in a series.
          </xs:documentation>
          </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:Event">
          </xs:extension>
          </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="IntervalEvent"  abstract="false">
          <xs:annotation>
          <xs:documentation>
          Defines a single interval event in a series.
          </xs:documentation>
          </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:Event">
          <xs:sequence>

            <xs:element name="width" maxOccurs="1" minOccurs="1"
type="mlhim2:DvInterval">
                <xs:annotation><xs:documentation>Length of the interval during which the
state was true.</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="math_function" maxOccurs="1" minOccurs="1"
type="mlhim2:DvCodedText">
                <xs:annotation><xs:documentation>Mathematical function of the data of this
event, e.g. "maximum", "mean" etc. Coded  using MLHIM Terminology group "event  math
function".</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="sample_count" maxOccurs="1" minOccurs="1"
type="xs:integer">
                <xs:annotation><xs:documentation>Optional count of original samples to
which this event corresponds.</xs:documentation></xs:annotation>
            </xs:element>
          </xs:sequence>
          </xs:extension>
```

```xml
        </xs:complexContent>
      </xs:complexType>

      <xs:complexType name="Item" abstract="true">
         <xs:annotation>
         <xs:documentation>
         The abstract parent of Slot, Cluster and Element representation classes.
         </xs:documentation>
         </xs:annotation>
      <xs:complexContent>
      <xs:extension base="mlhim2:Locatable">
         </xs:extension>
         </xs:complexContent>
      </xs:complexType>

      <xs:complexType name="Slot"  abstract="false">
         <xs:annotation>
         <xs:documentation>
         A structure allowing the inclusion of one CCD inside a CCD. An unbounded list
of allowable CCDs to choose from
         should be available at runtime.
         </xs:documentation>
         </xs:annotation>
      <xs:complexContent>
      <xs:extension base="mlhim2:Item">
       <xs:sequence>

         <xs:element name="ccd" maxOccurs="1" minOccurs="1" type="xs:string">
            <xs:annotation><xs:documentation>The CCD ID selelcted at run-
time.</xs:documentation></xs:annotation>
         </xs:element>

         <xs:element name="allowed_ccds" maxOccurs="unbounded" minOccurs="1"
type="xs:string">
            <xs:annotation><xs:documentation>A list of allowed CCD IDs of which one is
selelcted at runtime.</xs:documentation></xs:annotation>
         </xs:element>
       </xs:sequence>
         </xs:extension>
         </xs:complexContent>
      </xs:complexType>

      <xs:complexType name="Element" abstract="false">
         <xs:annotation>
         <xs:documentation>
         The leaf variant of Item, to which a DvAny instance is attached.
         </xs:documentation>
         </xs:annotation>
      <xs:complexContent>
      <xs:extension  base="mlhim2:Item">
       <xs:sequence>

         <xs:element name="dv" maxOccurs="1" minOccurs="1"
```

```
type="mlhim2:DvAny">
                    <xs:annotation><xs:documentation>data value of this
leaf</xs:documentation></xs:annotation>
              </xs:element>
            </xs:sequence>
            </xs:extension>
            </xs:complexContent>
          </xs:complexType>

          <xs:complexType name="Cluster"  abstract="false">
            <xs:annotation>
            <xs:documentation>
            The grouping variant of Item, which may contain further instances of Item, in an
ordered list.
            </xs:documentation>
            </xs:annotation>
          <xs:complexContent>
          <xs:extension base="mlhim2:Item">
            <xs:sequence>

                  <xs:element name="items" maxOccurs="unbounded" minOccurs="1"
type="mlhim2:Item">
                    <xs:annotation><xs:documentation>List of
Items.</xs:documentation></xs:annotation>
              </xs:element>
            </xs:sequence>
            </xs:extension>
            </xs:complexContent>
          </xs:complexType>

          <xs:complexType name="History"  abstract="false">
            <xs:annotation>
            <xs:documentation>
            Root object of a linear history, i.e. time series structure. For a periodic series of
events, period will be set, and the time
            of each Event in the History must correspond; i.e. the Event.offset must be a
multiple of period for each Event.
            Missing events in a period History are however allowed.
            </xs:documentation>
            </xs:annotation>
          <xs:complexContent>
          <xs:extension base="mlhim2:DataStructure">
            <xs:sequence>

                  <xs:element name="origin" maxOccurs="1" minOccurs="1"
type="mlhim2:DvDateTime">
                    <xs:annotation><xs:documentation>Time origin of this event history. The first
event is not necessarily at the origin point.</xs:documentation></xs:annotation>
              </xs:element>

                  <xs:element name="events" maxOccurs="unbounded" minOccurs="1"
type="mlhim2:Event">
                    <xs:annotation><xs:documentation>The events in the
```

series.</xs:documentation></xs:annotation>
          </xs:element>

          <xs:element name="period" maxOccurs="1" minOccurs="1"
type="mlhim2:DvDuration">
                <xs:annotation><xs:documentation>Period between samples in this segment if
periodic.</xs:documentation></xs:annotation>
          </xs:element>

          <xs:element name="duration" maxOccurs="1" minOccurs="1"
type="mlhim2:DvDuration">
                <xs:annotation><xs:documentation>Duration of the entire History; either
corresponds to the duration of all the events, and/or the duration represented by the summary,
if it exists.</xs:documentation></xs:annotation>
          </xs:element>

          <xs:element name="summary" maxOccurs="1" minOccurs="1"
type="mlhim2:ItemStructure">
                <xs:annotation><xs:documentation>Optional summary data expressing e.g.
text or image which summarises entire History.</xs:documentation></xs:annotation>
          </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
      </xs:complexType>

      <xs:complexType name="ItemSingle" abstract="false">
        <xs:annotation>
        <xs:documentation>
        Used to represent any data which is logically a single value, such as a
person's height or weight.
        </xs:documentation>
        </xs:annotation>
      <xs:complexContent>
      <xs:extension base="mlhim2:ItemStructure">
        <xs:sequence>

          <xs:element name="item" maxOccurs="1" minOccurs="0"
type="mlhim2:Element">
                <xs:annotation><xs:documentation>Element, Cluster or Slot for this
Item.</xs:documentation></xs:annotation>
          </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
      </xs:complexType>

      <xs:complexType name="ItemList" abstract="false">
        <xs:annotation>
        <xs:documentation>
        Logical list data structure, where each item has a value and can be referred to by a
name and a positional index in the list.

The list may be empty.
```
            </xs:documentation>
            </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:ItemStructure">
         <xs:sequence>

            <xs:element name="items" maxOccurs="unbounded" minOccurs="0"
type="mlhim2:Element">
                <xs:annotation><xs:documentation>List of Elements, Clusters or Slots for this
Item.</xs:documentation></xs:annotation>
            </xs:element>
         </xs:sequence>
         </xs:extension>
         </xs:complexContent>
    </xs:complexType>

        <xs:complexType name="ItemTable"  abstract="false">
        <xs:annotation>
        <xs:documentation>
        Logical relational database style table data structure, in which columns are named
and ordered with respect to each other.
        Implemented using Cluster-per-row encoding. Each row Cluster must have an
identical number of Elements, each of which
        in turn must have identical names and value types in the corresponding postions in
each row. Some columns may be
        designated 'key' columns, containing key data for each row, in the manner of
relational tables. This allows row-naming,
        where each row represents a body site, a blood antigen etc. All values in a column
have the same data type.
        </xs:documentation>
        </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:ItemStructure">
         <xs:sequence>

            <xs:element name="rows" maxOccurs="unbounded" minOccurs="0"
type="mlhim2:Cluster">
            <xs:annotation><xs:documentation>List of Clusters for this
Item.</xs:documentation></xs:annotation>
            </xs:element>
         </xs:sequence>
         </xs:extension>
         </xs:complexContent>
    </xs:complexType>


        <xs:complexType name="ItemTree" abstract="false">
        <xs:annotation>
        <xs:documentation>
        Logical tree data structure. The tree may be empty. Used to represent data which
are logically a tree such as audiology results,
        microbiology results, biochemistry results.
```

```
            </xs:documentation>
          </xs:annotation>
      <xs:complexContent>
      <xs:extension  base="mlhim2:ItemStructure">
        <xs:sequence>

          <xs:element name="items" maxOccurs="unbounded" minOccurs="0"
type="mlhim2:ItemStructure">
              <xs:annotation><xs:documentation>List of structures to define the root of the
tree.</xs:documentation></xs:annotation>
          </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
      </xs:complexType>

  </xs:schema>
```

Common

```
  <?xml version="1.0" encoding="UTF-8"?>
  <!-- Copyright 2011 Timothy W. Cook and Contributors. See http://www.mlhim.org-->
  <xs:schema elementFormDefault="qualified" id="common"
targetNamespace="http://www.mlhim.org/mlhim2" version="2.1.0"
xmlns:mlhim2="http://www.mlhim.org/mlhim2"
xmlns:xs="http://www.w3.org/2001/XMLSchema">

        <xs:complexType name="PartyProxy" abstract="true">
          <xs:annotation>
          <xs:documentation>
        Abstract concept of a proxy description of a party, including an optional link to
data for this party in a demographic
        or other identity management system. Sub-typed into PARTY_IDENTIFIED and
PARTY_SELF.
          </xs:documentation>
          </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:DvAny">
        <xs:sequence>
          <xs:element name="external_ref" maxOccurs="1" minOccurs="0"
type="mlhim2:EntityRef">
          <xs:annotation><xs:documentation>
        Optional reference to more detailed demographic or identification information for
this party, in an external system.
          </xs:documentation></xs:annotation>
          </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
      </xs:complexType>
```

```xml
<xs:complexType name="PartySelf"  abstract="false">
    <xs:annotation>
    <xs:documentation>
    Party proxy representing the subject of the record. Used to indicate that the party is the owner of the record.
    May or may not have external_ref set.
    </xs:documentation>
    </xs:annotation>
  <xs:complexContent>
    <xs:extension base="mlhim2:PartyProxy">
  </xs:extension>
    </xs:complexContent>
</xs:complexType>

<xs:complexType name="PartyIdentified" abstract="false">
    <xs:annotation>
    <xs:documentation>
    Proxy data for an identified party other than the subject of the record, minimally consisting of human-readable identifier(s),
    such as name, formal (and possibly computable) identifiers such as NHS number, and an optional link to external data.
    There must be at least one of name, identifier or external_ref present.Used to describe parties where only identifiers may
    be known, and there is no entry at all in the demographic system (or even no demographic system). Typically for health care
    providers, e.g. name and provider number of an institution. Should not be used to include patient identifying information.
    </xs:documentation>
    </xs:annotation>
  <xs:complexContent>
  <xs:extension base="mlhim2:PartyProxy">
   <xs:sequence>
    <xs:element name="name" maxOccurs="1" minOccurs="0" type="xs:string">
    <xs:annotation><xs:documentation>
    Optional human-readable name (in String form).
    </xs:documentation></xs:annotation>
    </xs:element>
    <xs:element name="identifiers" maxOccurs="unbounded" minOccurs="0" type="mlhim2:DvIdentifier">
    <xs:annotation><xs:documentation>List of DvIdentifiers - One or more formal identifiers (possibly computable).</xs:documentation></xs:annotation>
    </xs:element>
   </xs:sequence>
  </xs:extension>
  </xs:complexContent>
  </xs:complexType>

<xs:complexType name="PartyRelated" abstract="false">
    <xs:annotation>
    <xs:documentation>
    Proxy type for identifying a party and its relationship to the subject of the record. Use where the relationship between the
```

party and the subject of the record must be known.
        </xs:documentation>
        </xs:annotation>
      <xs:complexContent>
      <xs:extension base="mlhim2:PartyIdentified">
       <xs:sequence>
       <xs:element name="relationship" maxOccurs="1" minOccurs="1"
type="mlhim2:Relationship">
          <xs:annotation><xs:documentation>
          Relationship of subject of this Entry to the subject of the record. May be coded. If
it is the patient, coded as "self".
          </xs:documentation></xs:annotation>
        </xs:element>
       </xs:sequence>
      </xs:extension>
      </xs:complexContent>
      </xs:complexType>

        <xs:complexType name="FeederAuditDetails" abstract="false">
        <xs:annotation>
        <xs:documentation>
        Audit details for any system in a feeder system chain. Audit details here means
the general notion of who/where/when the
        information item to which the audit is attached was created. None of the attributes
is defined as mandatory, however, in
        different scenarios, various combinations of attributes will usually be mandatory.
This can be controlled by specifying feeder
        audit details in legacy archetypes.
        </xs:documentation>
        </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:DvAny">
         <xs:sequence>
          <xs:element name="system_id" maxOccurs="1" minOccurs="0"
type="xs:string">
            <xs:annotation><xs:documentation>Identifier of the system which handled the
information item.</xs:documentation></xs:annotation>
          </xs:element>
            <xs:element name="version_id" maxOccurs="1" minOccurs="0"
type="xs:string">
            <xs:annotation><xs:documentation>Any identifier used in the system such as
"interim", "final", or numeric versions if available.</xs:documentation></xs:annotation>
          </xs:element>
            <xs:element name="provider" maxOccurs="1" minOccurs="0"
type="mlhim2:PartyIdentified">
          <xs:annotation><xs:documentation>Optional provider(s) who created, committed,
forwarded or otherwise handled the item.</xs:documentation></xs:annotation>

          </xs:element>
            <xs:element name="location" maxOccurs="1" minOccurs="0"
type="mlhim2:Location">
          <xs:annotation><xs:documentation>Identifier of the particular site/facility within
an organisation which handled the item. For computability, this identifier needs to be e.g. a

PKI identifier which can be included in the identifier list of the PARTY_IDENTIFIED object.</xs:documentation></xs:annotation>
			</xs:element>
			<xs:element name="time" maxOccurs="1" minOccurs="0" type="mlhim2:DvDateTime">
		<xs:annotation><xs:documentation>Time of handling the item. For an originating system, this will be time of creation, for an intermediate feeder system, this will be a time of accession or other time of handling, where available.</xs:documentation></xs:annotation>
			</xs:element>
			<xs:element name="subject" maxOccurs="1" minOccurs="0" type="mlhim2:PartyProxy">
		<xs:annotation><xs:documentation>Identifiers for subject of the received information item.</xs:documentation></xs:annotation>
			</xs:element>
		  </xs:sequence>
		</xs:extension>
		</xs:complexContent>
		</xs:complexType>

	  <xs:complexType name="FeederAudit" abstract="false">
		<xs:annotation>
		<xs:documentation>
		Audit and other meta-data for systems in the feeder chain.
		</xs:documentation>
		</xs:annotation>
		<xs:complexContent>
		<xs:extension base="mlhim2:DvAny">
		 <xs:sequence>
		 <xs:element name="originating_system_audit" maxOccurs="1" minOccurs="1" type="mlhim2:FeederAuditDetails">
		<xs:annotation><xs:documentation>Any audit information for the information item from the originating system.</xs:documentation></xs:annotation>
			</xs:element>
			<xs:element name="originating_system_item_ids" maxOccurs="unbounded" minOccurs="1" type="mlhim2:DvIdentifier">
		<xs:annotation><xs:documentation>Identifiers used for the item in the originating system, e.g. filler and placer ids.</xs:documentation></xs:annotation>
			</xs:element>
			<xs:element name="feeder_system_audit" maxOccurs="1" minOccurs="1" type="mlhim2:FeederAuditDetails">
		<xs:annotation><xs:documentation>Any audit information for the information item from the feeder system, if different from the originating system.</xs:documentation></xs:annotation>
			</xs:element>
			<xs:element name="feeder_system_ids" maxOccurs="unbounded" minOccurs="1" type="mlhim2:DvIdentifier">
		<xs:annotation><xs:documentation>Identifiers used for the item in the feeder system, where the feeder system is distinct from the originating system.</xs:documentation></xs:annotation>
			</xs:element>
			<xs:element name="original_content" maxOccurs="1" minOccurs="1" type="mlhim2:DvEncapsulated">
		<xs:annotation><xs:documentation>Optional inline inclusion of or reference to

original content corresponding to the MLHIM content at this node. Typically a URI reference to a document or message in a persistent store associated with the EHR.</xs:documentation></xs:annotation>
              </xs:element>
            </xs:sequence>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>

      <xs:complexType name="Locatable" abstract="true">
        <xs:annotation>
        <xs:documentation>
        Root class of all information model classes that can be expressed in a constraint
model.
        </xs:documentation>
        </xs:annotation>
      <xs:complexContent>
      <xs:extension base="mlhim2:DvAny">
        <xs:sequence>
        <xs:element name="feeder_audit" maxOccurs="1" minOccurs="0"
type="mlhim2:FeederAudit">
              <xs:annotation><xs:documentation>Audit trail from non-MLHIM system of
original commit of information forming the content of this node, or from a conversion
gateway which has synthesised this node.</xs:documentation></xs:annotation>
              </xs:element>
              <xs:element name="name" maxOccurs="1" minOccurs="1" type="xs:string">
              <xs:annotation><xs:documentation>Runtime name of this fragment, used to build
runtime paths. This is the term provided at design time to name this EHR construct. Its
retention in the EHR faithfully preserves the original label by which this entry was known to
end users. When created in English; it shall consist only of lowercase letters a-z, digits 0-9
and use the _ (underscore) as a separator.   Other languages should follow similar naming
rules in order to not conflict with implementations,</xs:documentation></xs:annotation>
              </xs:element>
              <xs:element name="uuid" maxOccurs="1" minOccurs="1" type="xs:string">
              <xs:annotation><xs:documentation>UUID for each Locatable
structure.</xs:documentation></xs:annotation>
              </xs:element>
              <xs:element name="parent" maxOccurs="1" minOccurs="1" type="xs:string">
              <xs:annotation><xs:documentation>Parent of this node in compositional hierarchy.
Usually a UUID of another Locatable.</xs:documentation></xs:annotation>
              </xs:element>
            </xs:sequence>
          </xs:extension>
        </xs:complexContent>
      </xs:complexType>

      <xs:complexType name="Folder" abstract="false">
        <xs:annotation>
        <xs:documentation>
        A container for other items representing a logical grouping. In implementations
this may also inherit from
              library components providing the required functionality.
              </xs:documentation>

```xml
        </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:Locatable">
     <xs:sequence>
     <xs:element name="items" maxOccurs="unbounded" minOccurs="1"
type="mlhim2:Composition">
        <xs:annotation><xs:documentation>A list of  UUIDs of Compositions logically in
this folder.</xs:documentation></xs:annotation>
        </xs:element>
     </xs:sequence>
    </xs:extension>
    </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="Attestation" abstract="false">
     <xs:annotation>
     <xs:documentation>
     Record an attestation by a party of item(s) of record content. The type of
attestation is recorded by the reason attribute,
     which may be coded.
     </xs:documentation>
     </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:Locatable">
     <xs:sequence>
     <xs:element name="attested_view" maxOccurs="1" minOccurs="1"
type="mlhim2:DvMultimedia">
        <xs:annotation><xs:documentation>Optional visual representation of content
attested e.g. screen image.</xs:documentation></xs:annotation>
        </xs:element>
     <xs:element name="proof" maxOccurs="1" minOccurs="1"
type="mlhim2:DvParsable">
        <xs:annotation><xs:documentation>Proof of attestation such as an GPG
signature.</xs:documentation></xs:annotation>
        </xs:element>
     <xs:element name="reason" maxOccurs="1" minOccurs="1"
type="mlhim2:DvCodedText">
        <xs:annotation><xs:documentation>Reason of this attestation. Optionally coded by
the MLHIM Terminology group "attestation reason"; includes values like "authorisation",
"witness" etc.</xs:documentation></xs:annotation>
        </xs:element>
     <xs:element name="commiter" maxOccurs="1" minOccurs="1"
type="mlhim2:PartyProxy">
        <xs:annotation><xs:documentation>Identity and optional reference into identity
management service, of user who committed the item.</xs:documentation></xs:annotation>
        </xs:element>
     <xs:element name="time_commited" maxOccurs="1" minOccurs="1"
type="mlhim2:DvDateTime">
        <xs:annotation><xs:documentation>Time of committal of the
item.</xs:documentation></xs:annotation>
        </xs:element>
     <xs:element name="is_pending" maxOccurs="1" minOccurs="1"
type="xs:boolean">
```

<xs:annotation><xs:documentation>True if this attestation is outstanding; False means it has been completed.</xs:documentation></xs:annotation>
</xs:element>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>

<xs:complexType name="Participation" abstract="false">
<xs:annotation>
<xs:documentation>
Model of a participation of a Party (any Actor or Role) in an activity. Used to represent any participation of a Party in some
activity, which is not explicitly in the model, e.g. assisting nurse. Can be used to record past or future participations.
Should not be used in place of more permanent relationships between demographic entities.
</xs:documentation>
</xs:annotation>
<xs:complexContent>
<xs:extension base="mlhim2:DvAny">
<xs:sequence>
<xs:element name="performer" maxOccurs="1" minOccurs="0" type="mlhim2:PartyProxy">
<xs:annotation><xs:documentation>The id and possibly demographic system link of the party participating in the activity.</xs:documentation></xs:annotation>
</xs:element>
<xs:element name="function" maxOccurs="1" minOccurs="1" type="xs:string">
<xs:annotation><xs:documentation>The function of the Party in this participation (note that a given party might participate in more than one way in a particular activity). This attribute should be coded.</xs:documentation></xs:annotation>
</xs:element>
<xs:element name="mode" maxOccurs="1" minOccurs="1" type="mlhim2:DvCodedText">
<xs:annotation><xs:documentation>The mode of the performer / activity interaction, e.g. present, by telephone, by email etc.</xs:documentation></xs:annotation>
</xs:element>
<xs:element name="time" maxOccurs="1" minOccurs="1" type="mlhim2:DvDateTime">
<xs:annotation><xs:documentation>The time interval during which the participation took place, if it is used in an observational context (i.e. recording facts about the past); or the intended time interval of the participation when used in future contexts, such as EHR Instructions.</xs:documentation></xs:annotation>
</xs:element>
</xs:sequence>
</xs:extension>
</xs:complexContent>
</xs:complexType>

<xs:complexType name="Link" abstract="false">
<xs:annotation>
<xs:documentation>
The LINK type defines a logical relationship between two items, such as two

ENTRYs or an ENTRY and a COMPOSITION.

Links can be used across compositions, and across EHRs. Links can potentially be used between interior

nodes, although this probably should be prevented in CCDs. Multiple LINKs can be attached to the root object of any

structure to give the effect of a 1->N link. 1:1 and 1:N relationships between content elements (e.g. ENTRYs) can be

expressed by using one, or more than one. Chains of links can be used to see "problem threads" or other logical groupings

of items. Links should be between structures only, i.e. between objects representing complete domain concepts because

relationships between sub-elements of whole concepts are not necessarily meaningful, and may be downright confusing.

Sensible links only exist between whole ENTRYs, SECTIONs, COMPOSITIONs and so on.

</xs:documentation>

</xs:annotation>

<xs:complexContent>

<xs:extension base="mlhim2:DvAny">

<xs:sequence>

<xs:element name="relation" maxOccurs="1" minOccurs="1" type="xs:string">

<xs:annotation><xs:documentation>The relation attribute is used to indicate a clinical or domain-level meaning for the kind of link. This attribute should describe the relationship with the target object. Normally this relationship is found in the semantic relations found in the NLM Semantic Network.</xs:documentation></xs:annotation>

</xs:element>

<xs:element name="target" maxOccurs="1" minOccurs="1" type="xs:string">

<xs:annotation><xs:documentation>The 'uuid' of the logical "to" object in the link relation, as per the linguistic sense of the meaning attribute.</xs:documentation></xs:annotation>

</xs:element>

</xs:sequence>

</xs:extension>

</xs:complexContent>

</xs:complexType>

<xs:complexType name="AuthoredResource" abstract="true">

<xs:annotation>

<xs:documentation>

Abstract idea of an online resource created by a human author. The attributes are derived primarily from the Dublin Core

Metadata Initiative http://www.dublincore.org http://dublincore.org/documents/2010/10/11/dces/

</xs:documentation>

</xs:annotation>

<xs:complexContent>

<xs:extension base="mlhim2:DvAny">

<xs:sequence>

<xs:element name="language" maxOccurs="1" minOccurs="0" type="xs:string">

<xs:annotation><xs:documentation>Optional indicator of the localised language in which the value is written. Coded IAW IETF RFC 5646. http://tools.ietf.org/html/rfc5646 Only used when the text object is in a different language from the enclosing

CCD.</xs:documentation></xs:annotation>
        </xs:element>
        <xs:element name="locales" maxOccurs="1" minOccurs="0" type="mlhim2:Folder">
        <xs:annotation><xs:documentation>A container for the gettext translation files as described in the MLHIM reference manual Chapter 16 section 3.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="description" maxOccurs="1" minOccurs="0" type="xs:string">
        <xs:annotation><xs:documentation>An optional textual description of any length in the same language as the original_language attribute. Description may include but is not limited to: an abstract, a table of contents, a graphical representation, or a free-text account of the resource. http://dublincore.org/documents/dcmi-terms/#terms-description </xs:documentation></xs:annotation>
        </xs:element>
        <xs:element name="contributor" maxOccurs="1" minOccurs="0" type="xs:string">
        <xs:annotation><xs:documentation>An entity responsible for making contributions to the resource. Examples of a Contributor include a person, an organization, or a service.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="coverage" maxOccurs="1" minOccurs="0" type="xs:string">
        <xs:annotation><xs:documentation>The spatial or temporal topic of the resource, the spatial applicability of the resource, or the jurisdiction under which the resource is relevant. http://dublincore.org/documents/dcmi-terms/#terms-coverage </xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="license" maxOccurs="1" minOccurs="0" type="xs:string">
        <xs:annotation><xs:documentation>A legal document giving official permission to do something with the resource. http://dublincore.org/documents/dcmi-terms/#terms-license </xs:documentation></xs:annotation>
        </xs:element>
        <xs:element name="creator" maxOccurs="1" minOccurs="0" type="xs:string">
        <xs:annotation><xs:documentation>An entity primarily responsible for making the resource. Comment: Examples of a Creator include a person, an organization, or a service. http://dublincore.org/documents/dcmi-terms/#terms-creator </xs:documentation></xs:annotation>
        </xs:element>
        <xs:element name="created" maxOccurs="1" minOccurs="0" type="xs:string">
        <xs:annotation><xs:documentation>Date of creation of the resource. http://dublincore.org/documents/dcmi-terms/#terms-created </xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="dateCopyrighted" maxOccurs="1" minOccurs="0" type="xs:string">
        <xs:annotation><xs:documentation>Date of copyright. http://dublincore.org/documents/dcmi-terms/#terms-dateCopyrighted

```
</xs:documentation></xs:annotation>
            </xs:element>


            <xs:element name="identifier" maxOccurs="1" minOccurs="0"
type="xs:string">
            <xs:annotation><xs:documentation>An unambiguous reference to the resource
within a given context. Comment:  Recommended best practice is to identify the resource by
means of a string conforming to a formal identification system.  Example: A CCD should be
identified by a UUID version #4 as described in IETF RFC 4122.
http://tools.ietf.org/html/rfc4122.html </xs:documentation></xs:annotation>
            </xs:element>


            <xs:element name="issued" maxOccurs="1" minOccurs="0" type="xs:string">
            <xs:annotation><xs:documentation>Date of formal issuance (e.g., publication) of
the resource. </xs:documentation></xs:annotation>
            </xs:element>


            <xs:element name="relation" maxOccurs="1" minOccurs="0" type="xs:string">
            <xs:annotation><xs:documentation>A related resource. Comment:
            Recommended best practice is to identify the related resource by means of a string
conforming to a formal identification system.  In the case of CCDs the relationship  text
should come from the UMLS semantic network. </xs:documentation></xs:annotation>
            </xs:element>


            <xs:element name="replaces" maxOccurs="1" minOccurs="0" type="xs:string">
            <xs:annotation><xs:documentation>A related resource that is supplanted,
displaced, or superseded by the described resource. In the case of CCDs this is the 'identifier'
of the replaced CCD. </xs:documentation></xs:annotation>
            </xs:element>


            <xs:element name="rights" maxOccurs="1" minOccurs="0" type="xs:string">
            <xs:annotation><xs:documentation>Information about rights held in and over the
resource. Comment:     Typically, rights information includes a statement about various
property rights associated with the resource, including intellectual property
rights.</xs:documentation></xs:annotation>
            </xs:element>


            <xs:element name="rightsHolder" maxOccurs="1" minOccurs="0"
type="xs:string">
            <xs:annotation><xs:documentation>A person or organization owning or
managing rights over the resource. </xs:documentation></xs:annotation>
            </xs:element>


            <xs:element name="source" maxOccurs="1" minOccurs="0" type="xs:string">
            <xs:annotation><xs:documentation>A related resource from which the described
resource is derived. Comment:      The described resource may be derived from the related
```

resource in whole or in part. Recommended best practice is to identify the related resource by means of a string conforming to a formal identification system.
</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="subject" maxOccurs="1" minOccurs="0" type="xs:string">
            <xs:annotation><xs:documentation>The topic of the resource. Comment:
            Typically, the subject will be represented using keywords, key phrases, or classification codes. Recommended best practice is to use a controlled vocabulary. To describe the spatial or temporal topic of the resource, use the Coverage element. With CCDs this is a list of MeSH terms. </xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="title" maxOccurs="1" minOccurs="0" type="xs:string">
            <xs:annotation><xs:documentation>A descriptive name given to the resource. In CCDs possibly derived from the UMLS semantic network</xs:documentation></xs:annotation>
            </xs:element>

        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
      </xs:complexType>

   </xs:schema>

Content

<?xml version="1.0" encoding="UTF-8"?>
<!-- Copyright 2011 Timothy W. Cook and Contributors. See http://www.mlhim.org-->
<xs:schema elementFormDefault="qualified" id="content"
targetNamespace="http://www.mlhim.org/mlhim2" version="2.1.0"
xmlns:mlhim2="http://www.mlhim.org/mlhim2"
xmlns:xs="http://www.w3.org/2001/XMLSchema">

      <xs:complexType name="EventContext" abstract="false">
        <xs:annotation>
        <xs:documentation>
        Documents the context information of a healthcare event involving the subject of care and the health system.
        The context information recorded here is independent of the attributes recorded in the version audit, which document
        the "system interaction" context, i.e. the context of a user interacting with the health record system. Healthcare events
        include patient contacts, and any other business activity, such as pathology investigations which take place on behalf of
        the patient.
        </xs:documentation>
        </xs:annotation>

```xml
<xs:complexContent>
<xs:extension  base="mlhim2:Locatable">
 <xs:sequence>

        <xs:element name="healthcare_facility" maxOccurs="1" minOccurs="0"
type="mlhim2:Organization">
            <xs:annotation><xs:documentation>The health care facility under whose care the
event took place. This is the most specific workgroup or delivery unit within a care delivery
enterprise that has an official identifier in the health system, and can be used to ensure
medico-legal accountability.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="start_time" maxOccurs="1" minOccurs="0"
type="mlhim2:DvDateTime">
            <xs:annotation><xs:documentation>Start time of the clinical session or other kind
of event during which a provider performs a service of any kind for the
patient.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="end_time" maxOccurs="1" minOccurs="0"
type="mlhim2:DvDateTime">
            <xs:annotation><xs:documentation>Optional end time of the clinical
session.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="participation" maxOccurs="1" minOccurs="0"
type="mlhim2:Participation">
            <xs:annotation><xs:documentation>Parties involved in the healthcare
event.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="location" maxOccurs="1" minOccurs="0"
type="mlhim2:Location">
            <xs:annotation><xs:documentation>The actual location where the session
occurred, e.g. "microbiol lab 2", "home", "ward A3" and so
on.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="setting" maxOccurs="1" minOccurs="0"
type="mlhim2:DvCodedText">
            <xs:annotation><xs:documentation>The setting in which the clinical session took
place. Coded using the MLHIM Terminology, "setting"
group.</xs:documentation></xs:annotation>
        </xs:element>
    </xs:sequence>
    </xs:extension>
    </xs:complexContent>
</xs:complexType>

<xs:complexType name="ContentItem"  abstract="true">
    <xs:annotation>
    <xs:documentation>
    Abstract ancestor of all concrete content types.
```

```xml
            </xs:documentation>
            </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:Locatable">
         <xs:sequence>

            <xs:element name="links" maxOccurs="unbounded" minOccurs="0"
type="mlhim2:Link">
                <xs:annotation><xs:documentation>A list of links to other content
items.</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="attestation" maxOccurs="1" minOccurs="0"
type="mlhim2:Attestation">
                <xs:annotation><xs:documentation>Sign off on completeness and accuracy of the
content.</xs:documentation></xs:annotation>
            </xs:element>
         </xs:sequence>
            </xs:extension>
            </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="Section" abstract="false">
            <xs:annotation>
            <xs:documentation>
            Represents a heading in a heading structure, or "section tree". Created according
to structures for typical headings
            such as SOAP, physical examination, but also pathology result heading structures.
Should not be used instead of
            ENTRY hierarchical structures.
            </xs:documentation>
            </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:ContentItem">
         <xs:sequence>

            <xs:element name="items" maxOccurs="1" minOccurs="0"
type="mlhim2:ContentItem">
                <xs:annotation><xs:documentation>Ordered list of content items under this
section, which may include more SECTIONs or
ENTRYs</xs:documentation></xs:annotation>
            </xs:element>
         </xs:sequence>
            </xs:extension>
            </xs:complexContent>
        </xs:complexType>

        <xs:complexType name="Entry" abstract="true">
            <xs:annotation>
            <xs:documentation>
            The abstract parent of all ENTRY subtypes. An ENTRY is the root of a logical
item of "hard" clinical information created in the
            "clinical statement" context, within a clinical session. There can be numerous
```

such contexts in a clinical session.

Observations and other Entry types only ever document information captured/created in the event documented by the enclosing

Composition. An ENTRY is also the minimal unit of information any query should return, since a whole ENTRY (including sub-parts)

records spatial structure, timing information, and contextual information, as well as the subject and generator of the information.
```
        </xs:documentation>
      </xs:annotation>
    <xs:complexContent>
    <xs:extension  base="mlhim2:ContentItem">
     <xs:sequence>

        <xs:element name="language" maxOccurs="1" minOccurs="0" type="xs:string">
        <xs:annotation><xs:documentation>Mandatory indicator of the localised
language in which this Entry is written. Coded from MLHIM Code Set
"languages".</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="encoding" maxOccurs="1" minOccurs="0" type="xs:string">
        <xs:annotation><xs:documentation>Name of character set in which text values in
this Entry are encoded. Coded from MLHIM Code Set "character
sets".</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="subject" maxOccurs="1" minOccurs="0" type="xs:string">
        <xs:annotation><xs:documentation>Id of human subject of this ENTRY, e.g.:
organ donor, foetus, family member, another clinically relevant
person.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="provider" maxOccurs="1" minOccurs="0"
type="mlhim2:PartyProxy">
        <xs:annotation><xs:documentation>Optional identification of provider of the
information in this ENTRY, which might be: the patient, a patient agent, e.g. parent, guardian,
the clinician, a device or software.  Generally only used when the recorder needs  to make it
explicit. Otherwise, Composition  composer and other participants are
assumed.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="other_participations" maxOccurs="unbounded"
minOccurs="0" type="mlhim2:Participation">
        <xs:annotation><xs:documentation>Other participations at ENTRY
level.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="workflow_id" maxOccurs="1" minOccurs="0"
type="mlhim2:ObjectRef">
        <xs:annotation><xs:documentation>Identifier of externally held workflow engine
data for this workflow execution, for this subject of
care.</xs:docomentation></xs:annotation>
        </xs:element>
      </xs:sequence>
```

```
            </xs:extension>
            </xs:complexContent>
        </xs:complexType>


        <xs:complexType name="AdminEntry" abstract="false">
            <xs:annotation>
            <xs:documentation>
            Entry subtype for administrative information, i.e. information about setting up the
clinical process, but not itself clinically relevant.
            CCDs will define contained information. Used for admistrative details of
admission, episode, ward location, discharge,
            appointment (if not stored in a practice management or appointments system). Not
used for any clinically significant information.
            </xs:documentation>
            </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:Entry" >
         <xs:sequence>

            <xs:element name="data" maxOccurs="1" minOccurs="0"
type="mlhim2:ItemStructure">
            <xs:annotation><xs:documentation>The data of the
Entry.</xs:documentation></xs:annotation>
            </xs:element>
         </xs:sequence>
            </xs:extension>
            </xs:complexContent>
        </xs:complexType>


        <xs:complexType name="CareEntry"  abstract="true">
            <xs:annotation>
            <xs:documentation>
            The abstract parent of all clinical ENTRY subtypes. Defines protocol and
guideline attributes for all clinical Entry subtypes.
            </xs:documentation>
            </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:Entry">
         <xs:sequence>

            <xs:element name="protocol" maxOccurs="1" minOccurs="0"
type="mlhim2:ItemStructure">
            <xs:annotation><xs:documentation>Description of the method (i.e. how) the
information in this entry was arrived at. For OBSERVATIONs, this is a description of the
method or instrument used. For EVALUATIONs, how the evaluation was arrived at. For
INSTRUCTIONs, how to execute the Instruction. This may take the form of references to
guidelines, including manually followed and executable; knowledge references such as a
paper in Medline; clinical reasons within a larger care
process.</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="guideline_id" maxOccurs="1" minOccurs="0"
type="mlhim2:ObjectRef">
```

```
                    <xs:annotation><xs:documentation>Optional external identifier of guideline
creating this action if relevant</xs:documentation></xs:annotation>
                    </xs:element>
                  </xs:sequence>
                  </xs:extension>
                  </xs:complexContent>
              </xs:complexType>

              <xs:complexType name="Observation" abstract="false">
                  <xs:annotation>
                  <xs:documentation>
                    Entry subtype for all clinical data in the past or present, i.e. which (by the time it
is recorded) has already occurred.
                    Observation data is expressed using the class History, which guarantees that it is
situated in time.
                    Observation is used for all notionally objective (i.e. measured in some way)
observations of phenomena, and patient-reported
                    phenomena, e.g. pain. Not used for recording opinion or future statements of any
kind, including instructions, intentions, plans etc.
                  </xs:documentation>
                  </xs:annotation>
                  <xs:complexContent>
                  <xs:extension base="mlhim2:CareEntry">
                    <xs:sequence>

                      <xs:element name="data" maxOccurs="1" minOccurs="0"
type="mlhim2:History">
                      <xs:annotation><xs:documentation>The data of this observation, in the form of a
history of values which may be of any complexity.</xs:documentation></xs:annotation>
                      </xs:element>

                      <xs:element name="state" maxOccurs="1" minOccurs="0"
type="mlhim2:History">
                      <xs:annotation><xs:documentation>Optional recording of the state of subject of
this observation during the observation process, in the form of a separate history of values
which may be of any complexity. State may also be recorded within the History of the data
attribute.</xs:documentation></xs:annotation>
                      </xs:element>
                    </xs:sequence>
                    </xs:extension>
                    </xs:complexContent>
              </xs:complexType>

              <xs:complexType name="Evaluation"  abstract="false">
                  <xs:annotation>
                  <xs:documentation>
                    Used for all kinds of statements which evaluate other information, such as
interpretations of obvservations, diagnoses,
                    differential diagnoses, hypotheses, risk assessments, goals and plans.
                  </xs:documentation>
                  </xs:annotation>
                  <xs:complexContent>
                  <xs:extension base="mlhim2:CareEntry">
```

```xml
        <xs:sequence>

            <xs:element name="data" maxOccurs="1" minOccurs="0"
type="mlhim2:ItemStructure">
            <xs:annotation><xs:documentation>The data from the
evaluation.</xs:documentation></xs:annotation>
            </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
    </xs:complexType>

        <xs:complexType name="Action" abstract="false">
        <xs:annotation>
        <xs:documentation>
        Used to record a clinical action that has been performed, which may have been
adhoc, or due to the execution of an
        Activity in an Instruction workflow. Every Action corresponds to a careflow step
of some kind or another.
        </xs:documentation>
        </xs:annotation>
        <xs:complexContent>
        <xs:extension  base="mlhim2:CareEntry">
          <xs:sequence>

            <xs:element name="time" maxOccurs="1" minOccurs="0"
type="mlhim2:DvDateTime">
            <xs:annotation><xs:documentation>Point in time at which this action
completed.</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="description" maxOccurs="1" minOccurs="0"
type="mlhim2:ItemStructure">
            <xs:annotation><xs:documentation>Description of the activity to be performed,
in the form of a defined structure.</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="ism_transition" maxOccurs="1" minOccurs="0"
type="mlhim2:DvCodedText">
            <xs:annotation><xs:documentation>Details of transition in the Instruction state
machine caused by this Action.</xs:documentation></xs:annotation>
            </xs:element>

            <xs:element name="instruction_details" maxOccurs="1" minOccurs="0"
type="mlhim2:DvCodedText">
            <xs:annotation><xs:documentation>Details to of the Instruction that caused this
Action to be performed, if there was one.</xs:documentation></xs:annotation>
            </xs:element>
          </xs:sequence>
        </xs:extension>
        </xs:complexContent>
    </xs:complexType>
```

```xml
<xs:complexType name="Instruction"  abstract="false">
    <xs:annotation>
    <xs:documentation>
    Used for any actionable statement such as medication and therapeutic orders,
monitoring, recall and review.
    Enough details must be provided for the specification to be directly executed by
an actor, either human or machine.
    </xs:documentation>
    </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:CareEntry">
     <xs:sequence>

        <xs:element name="expiry_time" maxOccurs="1" minOccurs="0"
type="mlhim2:DvDateTime">
        <xs:annotation><xs:documentation>Optional expiry date/time to assist
determination of when an Instruction can be assumed to have expired. This helps prevent
false listing of Instructions as Active when they clearly must have been terminated in some
way or other.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="narrative" maxOccurs="1" minOccurs="1"
type="mlhim2:DvText">
        <xs:annotation><xs:documentation>Mandatory human-readable version of what
the Instruction is about.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="wf_definition" maxOccurs="1" minOccurs="0"
type="mlhim2:DvParsable">
        <xs:annotation><xs:documentation>Optional workflow engine executable
expression of the Instruction.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="activities" maxOccurs="unbounded" minOccurs="1"
type="mlhim2:Activity">
        <xs:annotation><xs:documentation>List of all activities in
Instruction.</xs:documentation></xs:annotation>
        </xs:element>
     </xs:sequence>
    </xs:extension>
    </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="Composition"  abstract="false">
    <xs:annotation>
    <xs:documentation>
    One version in a VersionedComposition. A composition is considered the unit of
modification of the record, the unit of
    transmission in record extracts, and the unit of attestation by authorising
clinicians. In this latter sense, it may be considered
    equivalent to a signed document.
    </xs:documentation>
    </xs:annotation>
```

```xml
<xs:complexContent>
<xs:extension base="mlhim2:Locatable">
 <xs:sequence>

        <xs:element name="attestation" maxOccurs="1" minOccurs="0"
type="mlhim2:Attestation">
            <xs:annotation><xs:documentation>The signoff of this
Composition.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="links" maxOccurs="unbounded" minOccurs="0"
type="mlhim2:Link">
            <xs:annotation><xs:documentation>A list of links to other content
items.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="original" maxOccurs="1" minOccurs="0" type="xs:string">
            <xs:annotation><xs:documentation>The UUID of the original composition if this
is a new version. Void if this is an original composition. This attribute along with the
predecessor form the versioning function for compositions.
</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="predecessor" maxOccurs="1" minOccurs="0"
type="xs:string">
            <xs:annotation><xs:documentation>The UUID of the preceeding composition if
this is a new version. Void if this is an original
composition.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="created" maxOccurs="1" minOccurs="0"
type="mlhim2:DvDateTime">
            <xs:annotation><xs:documentation>DateTime created.  Since Compositions are
never modified, only copied and edited. </xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="composer" maxOccurs="1" minOccurs="0"
type="mlhim2:PartyProxy">
            <xs:annotation><xs:documentation>The person primarily responsible for the
content of the Composition (but not necessarily its committal into the EHR system). This is
the identifier which should appear on the screen. It may or may not be the person who entered
the data. When it is the patient, the special "self"  instance of PARTY_PROXY will be
used.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="territory" maxOccurs="1" minOccurs="0"
type="mlhim2:Location">
            <xs:annotation><xs:documentation>Name of territory in which this Composition
was written. </xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="category" maxOccurs="1" minOccurs="0"
type="mlhim2:DvCodedText">
```

<xs:annotation><xs:documentation>Indicates what broad category this Composition is belongs to, e.g. "persistent" - of longitudinal validity, "event", "process".</xs:documentation></xs:annotation>
         </xs:element>

         <xs:element name="language" maxOccurs="1" minOccurs="0" type="xs:string">
         <xs:annotation><xs:documentation>Mandatory indicator of the localised language in which this Composition is written. Coded from MLHIM Code Set "languages". The language of an Entry if different from the Composition is indicated in ENTRY.language.</xs:documentation></xs:annotation>
         </xs:element>

         <xs:element name="context" maxOccurs="1" minOccurs="0" type="mlhim2:EventContext">
         <xs:annotation><xs:documentation>The clinical session context of this Composition, i.e. the contextual attributes of the clinical session.</xs:documentation></xs:annotation>
         </xs:element>

         <xs:element name="content" maxOccurs="1" minOccurs="0" type="mlhim2:Locatable">
         <xs:annotation><xs:documentation>The content of this Composition. Any Locatable content items or structures may be added here. </xs:documentation></xs:annotation>
         </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
       </xs:complexType>

  </xs:schema>

Entity

  <?xml version="1.0" encoding="UTF-8"?>
  <!-- Copyright 2011 Timothy W. Cook and Contributors. See http://www.mlhim.org-->
  <xs:schema elementFormDefault="qualified" id="entity" targetNamespace="http://www.mlhim.org/mlhim2" version="2.1.0" xmlns:mlhim2="http://www.mlhim.org/mlhim2" xmlns:xs="http://www.w3.org/2001/XMLSchema">

        <xs:complexType name="Role" abstract="false">
         <xs:annotation>
         <xs:documentation>
         A role defines some activity that an entity may participate in.
         </xs:documentation>
         </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:Locatable">
         <xs:sequence>

         <xs:element name="details" maxOccurs="1" minOccurs="0" type="mlhim2:ItemStructure">

```xml
        <xs:annotation><xs:documentation>The details are a structural segment that
may be used to create machine processable capabilities.  For example in a workflow or
authentication service. </xs:documentation></xs:annotation>
          </xs:element>

          <xs:element name="description" maxOccurs="1" minOccurs="0"
type="xs:string">
            <xs:annotation><xs:documentation>A human readable description for this
role.</xs:documentation></xs:annotation>
          </xs:element>

          <xs:element name="is_primary" maxOccurs="1" minOccurs="0"
type="xs:boolean">
            <xs:annotation><xs:documentation>A binary attribute indicating if this is the
primary role in the list of roles.</xs:documentation></xs:annotation>
          </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
      </xs:complexType>

      <xs:complexType name="Location" abstract="false">
        <xs:annotation>
        <xs:documentation>
        A location should be meaningful to human readers as well as contain machine
processable components.
          See ISO 19115  The details attribute can be constrained to describe specific
address details or any other
          physical world location information.
        </xs:documentation>
        </xs:annotation>
      <xs:complexContent>
      <xs:extension base="mlhim2:Locatable" >
        <xs:sequence>

          <xs:element name="details" maxOccurs="1" minOccurs="0"
type="mlhim2:ItemStructure">
            <xs:annotation><xs:documentation>The details are a structural segment that
may be used to create machine processable capabilities.  For example in a GIS it may contain
longitude/latitude/altitude information. </xs:documentation></xs:annotation>
          </xs:element>

          <xs:element name="description" maxOccurs="1" minOccurs="0"
type="xs:string">
            <xs:annotation><xs:documentation>A human readable description for this
location.</xs:documentation></xs:annotation>
          </xs:element>

          <xs:element name="is_primary" maxOccurs="1" minOccurs="0"
type="xs:boolean">
            <xs:annotation><xs:documentation>A binary attribute indicating if this is the
primary location in the list of locations.</xs:documentation></xs:annotation>
          </xs:element>
```

```xml
      </xs:sequence>
      </xs:extension>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="Relationship"  abstract="false">
      <xs:annotation>
      <xs:documentation>
      A relationship exists in a source and points to a target.  Sources and Targets can
be persons, places, or things.
      Relationships are locatable objects and they may only reference locatable objects
by uuid.
      </xs:documentation>
      </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:Locatable">
     <xs:sequence>

      <xs:element name="targets" maxOccurs="unbounded" minOccurs="0"
type="xs:string">
          <xs:annotation><xs:documentation>The List of target UUIDs.  Relationships
can only be established  between instances.   </xs:documentation></xs:annotation>
      </xs:element>
     </xs:sequence>
      </xs:extension>
      </xs:complexContent>
    </xs:complexType>

     <xs:complexType name="Party" abstract="true">
      <xs:annotation>
      <xs:documentation>
      Any type of real world living entity.
      </xs:documentation>
      </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:Locatable" >
     <xs:sequence>

      <xs:element name="valid_time_begin" maxOccurs="1" minOccurs="0"
type="xs:string">
          <xs:annotation><xs:documentation>If present this must be a valid datetime
string including timezone</xs:documentation></xs:annotation>
      </xs:element>

      <xs:element name="valid_time_end" maxOccurs="1" minOccurs="0"
type="xs:string">
          <xs:annotation><xs:documentation>If present this must be a valid datetime
string including timezone</xs:documentation></xs:annotation>
      </xs:element>

      <xs:element name="ev" maxOccurs="1" minOccurs="0"
type="mlhim2:ExceptionalValue">
          <xs:annotation><xs:documentation>The exceptional value. Often referred to as
```

Null Flavour. </xs:documentation></xs:annotation>
    </xs:element>

        <xs:element name="identifiers" maxOccurs="unbounded" minOccurs="0"
type="mlhim2:DvIdentifier">
            <xs:annotation><xs:documentation>A List of identifiers used to relate this
entity to the real world.</xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="roles" maxOccurs="unbounded" minOccurs="0"
type="mlhim2:Role">
            <xs:annotation><xs:documentation>A List of roles that this entity may
participate. </xs:documentation></xs:annotation>
        </xs:element>

        <xs:element name="locations" maxOccurs="unbounded" minOccurs="0"
type="mlhim2:Location">
            <xs:annotation><xs:documentation>A list of locations for this entity.
</xs:documentation></xs:annotation>
        </xs:element>
      </xs:sequence>
      </xs:extension>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="Device" abstract="false">
      <xs:annotation>
      <xs:documentation>
      Any one instance of an inanimate object.
      </xs:documentation>
      </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:Party">
      <xs:sequence>

        <xs:element name="details" maxOccurs="1" minOccurs="0"
type="mlhim2:ItemStructure">
            <xs:annotation><xs:documentation>structural details about the
device</xs:documentation></xs:annotation>
        </xs:element>
      </xs:sequence>
      </xs:extension>
      </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="Organization" abstract="false">
      <xs:annotation>
      <xs:documentation>
      A legally defined entity allowed to operate as one unit of identity.
      </xs:documentation>
      </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:Party">

```xml
        <xs:sequence>

            <xs:element name="details" maxOccurs="1" minOccurs="0"
type="mlhim2:ItemStructure">
                <xs:annotation><xs:documentation>structural details about the
organization</xs:documentation></xs:annotation>
            </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="Group"  abstract="false">
        <xs:annotation>
        <xs:documentation>
        A collection of persons existing as a conceptual entity for some period of time.
        </xs:documentation>
        </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:Party">
        <xs:sequence>

            <xs:element name="members" maxOccurs="1" minOccurs="0"
type="mlhim2:Party">
                <xs:annotation><xs:documentation>A Set of Partys composing the
Group.</xs:documentation></xs:annotation>
            </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="Person"  abstract="false">
        <xs:annotation>
        <xs:documentation>
        A singular human being.
        </xs:documentation>
        </xs:annotation>
    <xs:complexContent>
    <xs:extension base="mlhim2:Party">
        <xs:sequence>

            <xs:element name="details" maxOccurs="1" minOccurs="1"
type="mlhim2:ItemStructure">
                <xs:annotation><xs:documentation>structural details about the
person</xs:documentation></xs:annotation>
            </xs:element>
        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
    </xs:complexType>

    <xs:complexType name="NonHuman"  abstract="false">
```

```
            <xs:annotation>
            <xs:documentation>
            Any nonhuman living animal or plant.
            </xs:documentation>
            </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:Party">
         <xs:sequence>

            <xs:element name="details" maxOccurs="1" minOccurs="1"
type="mlhim2:ItemStructure">
                <xs:annotation><xs:documentation>structural details about the non-
human</xs:documentation></xs:annotation>
            </xs:element>
         </xs:sequence>
         </xs:extension>
        </xs:complexContent>
        </xs:complexType>

    </xs:schema>
```

Constraint

```
    <?xml version="1.0" encoding="UTF-8"?>
    <!-- Copyright 2011 Timothy W. Cook and Contributors. See http://www.mlhim.org-->
    <xs:schema elementFormDefault="qualified" id="constraint"
targetNamespace="http://www.mlhim.org/mlhim2" version="2.1.0"
xmlns:mlhim2="http://www.mlhim.org/mlhim2"
xmlns:xs="http://www.w3.org/2001/XMLSchema">

        <xs:complexType name="Ontology" abstract="false">
        <xs:annotation>
        <xs:documentation>
        The pre-coordinated ontology for this CCD.  The contents of the ontology are
created during design time by the CCD author.
            The ontology provides the means to create a set of options to restrict data in the
context of the CCD.
            </xs:documentation>
            </xs:annotation>
        <xs:sequence>

            <xs:element name="names" maxOccurs="unbounded" minOccurs="1"
type="xs:string">
                <xs:annotation><xs:documentation>Contains the list of 'name' attributes in the
CCD;in the original language. They are connected to the name points in the CCD via a uuid.
This allows translations using the uuid as the GETTEXT msgid.
</xs:documentation></xs:annotation>
            </xs:element>


            <xs:element name="internalVocabularies" maxOccurs="unbounded"
```

```xml
minOccurs="1" type="xs:string">
                <xs:annotation><xs:documentation>Internal vocabularies useful for options such
as DvText.dv  The DvText.dv attribute will contain the uuid link to the named element.  This
element will contain the options.  </xs:documentation></xs:annotation>
            </xs:element>

                <xs:element name="lookupTables" maxOccurs="unbounded" minOccurs="1"
type="xs:string">
                <xs:annotation><xs:documentation>Lookup tables used for data points in the
CCD.  Such as DvText.dv options.  These tables may be in a variety of formats such as csv.
Therefore the implementation will have to handle how this table is handled.
</xs:documentation></xs:annotation>
            </xs:element>

                <xs:element name="terminologies" maxOccurs="unbounded" minOccurs="1"
type="xs:string">
                <xs:annotation><xs:documentation>References to teminology
entries.</xs:documentation></xs:annotation>
            </xs:element>

        </xs:sequence>
        </xs:complexType>

        <xs:complexType name="CCD"  abstract="false">
            <xs:annotation>
            <xs:documentation>
            Concept Constraint Definition
            </xs:documentation>
            </xs:annotation>
        <xs:complexContent>
        <xs:extension base="mlhim2:AuthoredResource">
          <xs:sequence>

                <xs:element name="definition" maxOccurs="1" minOccurs="1"
type="mlhim2:Locatable">
                <xs:annotation><xs:documentation>Contains one Locatable entry as the root
term for this CCD.</xs:documentation></xs:annotation>
            </xs:element>

                <xs:element name="ontology" maxOccurs="1" minOccurs="0"
type="mlhim2:Ontology">
                <xs:annotation><xs:documentation>Provides the semantic context for the data
described by the definition.</xs:documentation></xs:annotation>
            </xs:element>

        </xs:sequence>
        </xs:extension>
        </xs:complexContent>
        </xs:complexType>
```

</xs:schema>

MLHIM2

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!-- Copyright 2011 Timothy W. Cook and Contributors. See http://www.mlhim.org-->
<xs:schema elementFormDefault="qualified" id="mlhim2"
targetNamespace="http://www.mlhim.org/mlhim2" version="2.1.0"
xmlns:mlhim2="http://www.mlhim.org/mlhim2"
xmlns:xs="http://www.w3.org/2001/XMLSchema">
        <xs:include schemaLocation="support.xsd"></xs:include>
        <xs:include schemaLocation="datatypes.xsd"></xs:include>
        <xs:include schemaLocation="common.xsd"></xs:include>
        <xs:include schemaLocation="structures.xsd"></xs:include>
        <xs:include schemaLocation="content.xsd"></xs:include>
        <xs:include schemaLocation="constraint.xsd"></xs:include>
        <xs:include schemaLocation="entity.xsd"></xs:include>

        <xs:annotation>
        <xs:documentation>
        Multi-Level Health Information Modelling Reference Model - Use this schema
when creating bindings to other languages.
        </xs:documentation>
        </xs:annotation>

</xs:schema>
```