

XML

Technical Overview and Applications for HL7

Paul V. Biron, MLIS
Kaiser Permanente, So Cal Medical Group
Pasadena, CA

Rachael Sokolowski
Magnolia Technologies
Arlington, MA

HL7 Winter Working Group Meetings
Jan 25, 1999

Introduction and Overview

Presentation
by

Paul V. Biron

paul.v.biron@kp.org

SGML Business Analyst
Permanente Clinical Systems Development
Kaiser Permanente, Southern California

2
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Overview

- **Why are we here?**
 - XML as V3 character-based ITS
 - SGML/XML SIG Patient Record Architecture (PRA) Proposal
 - Business case(s) for XML in Healthcare
- **Goals and Objectives**
 - Goals and Objectives
 - Prerequisites
- **What's to come?**
 - XML Basics, Rachael Sokolowski
 - Document Type Definitions, Rachael Sokolowski
 - XML Architectures, Paul V. Biron
 - HIMSS '99 Demo, Paul V. Biron

3
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

XML as a Character-Based ITS

- **During the Summer of 1998, a sub-group of Control Query, SIG XML and SIGOBT developed a draft proposal for an XML encoding of HL7 V3**
- **Draft presented during Control Query meetings in San Diego**
- **Prototype implementations of draft to be demonstrated at HIMSS '99, February 1999**

XML as a Character-Based ITS

- **Some of the many reasons for considering XML as a character-based ITS for V3**
 - The syntax handles recursion
 - allows V3 message to consist of variably nested structures, and unify the artificial differences between segments, fields, components and subcomponents
 - Parsers are “free”
 - Self-documenting data files
 - XML-related tools
 - viewing
 - testing
 - conversion
 - Availability of trained technical personnel

XML as a Character-Based ITS

- One more reason...

**“Five years from now, if V3
does not use XML, people will,
at best, be amused by our
quaint eccentric ways.”**

Wes Rishel

Patient Record Architecture Proposal

- **The Patient Record Architecture is a hierarchical system of document architectures**
 - defines the semantics and structural constraints necessary for the management and interchange of health record information
- **XML Architectures**
 - Non-proprietary, standards-based method of specifying a document architecture with sub-typing and multiple inheritance
 - Architectural Forms Definition Requirements of the SGML Extended Facilities included in the second edition of ISO/IEC 10744, the HyTime Standard

The State of Clinical Information

- **Large amounts of information and data in electronically inaccessible formats (paper)**
- **No standard processes for collection; variety of sources**
- **Heterogeneous healthcare systems and standards**
- **Multiple formats, no standardization**

8
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Sources: Health and wellness data: encounter notes, immunizations

Information drawn from other knowledge sources: treatment protocols, guidelines

Administrative data: demographics, provider identification data, financial

Legal data: consents for treatment, signatures

Formats:

Numeric and textual data: transcribed notes, lab result data, letters

Graphics and Images: scanned documents, clinical digital and analog images

Audio formats: dictated and recorded notes, waveforms

Video: telemedicine consultations

Communications and Messaging standards: Accredited Standards Committee (ASC) X12N, Health Level 7 (HL7), Institute of Electrical and Electronic Engineers, Inc. (IEEE) P1157 Medical Data Interchange Standard (MEDIX), Digital Imaging and Communications (DICOM): This standard is developed by the American College of Radiology - National, ASTM Subcommittees E1238, E31.11, E1394, E1467 Electrical Manufacturers' Association (ACR-NEMA)

.Content and Structure Standards: ASN.1, SGML, HTML, ASTM Subcommittees E31.12, E31.19, E1384. , E1633, E1239-94, and E1715-95.

.Clinical Data Representations (Codes): (International Classification of Diseases (ICD), Current Procedural Terminology (CPT), The Systematized Nomenclature of Human and Veterinary Medicine (SNOMED), Laboratory

Health Care Technology Needs

- **Structural Representation of Information**
 - Collection and Access: “What was the diagnosis?”
 - Quantification: “How many physical exams?”
 - Narrative Text: Retain observer’s notation
- **Format for different outputs**
 - Re-purpose: print, import/export to a database
- **Exchange of information**
 - use of standards for trading partners

Business Cases for XML in Healthcare

- **Increasingly, health care data in electronic format in computers**
- **Much data is text-based, such as a radiology reports**
- **Data should survive changes in technology over time; should be shareable and re-usable**
- **XML addresses these problems in a standards-based manner**

Content and Format

- Information conveyed in 2 ways:
- words, pictures and other information (content)
 - visual clues font, font size and location (format)

FORMAT	CONTENT
<p>Health Level Seven Medical Group 423 Central St Boston, Massachusetts, 02114</p> <hr/> <p>NAME: Jane Doe DATE: October 2, 1997</p> <hr/> <p>ADDRESS:</p> <hr/> <p>R_x Amoxil cap 25 pill</p> <p>Refill: _____ <input type="checkbox"/> No Refill</p> <p>DEANUMBER: BP 1212123 License Number: G-000123 Signature: <i>[Handwritten Signature]</i></p> <p>Dr. Henrietta Levelseven</p>	<p>Name: Jane Doe October 2, 1997 Amoxil Form: capsule Dosage: 25 mg daily Henrietta Levelseven BP 1212123G- 000123</p>

11
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

The Difference between HTML and XML?

- **HyperText Markup Language (HTML)**
- **An application of SGML**
- **A DTD for authoring documents to be distributed via the World Wide Web**
- **Formats documents for viewing on a computer screen**

Patient Information in HTML

```
<HTML>
<HEAD><TITLE>Encounter
  Registration</TITLE></HEAD>
<BODY bgcolor="#FFFFFF">
<H1>Patient Information </H1>
<P> Jane Doe <BR>
MRN:123456789 <BR>
DOB:May 13, 1923 <BR>
Address:123 Main St., Anytown,
  USA (home)<BR>
Phone:555-345-9876 (home)
</BODY>
</HTML>
```



13
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Why not use HTML?

- **Does not offer a rich tag set**
- **No mechanism to structure documents in a clinical manner**
- **Unstable as a standard**
- **Delivery format not a collection technology**
- **Loose document type**

The Future: Increased Use of the Internet

- Healthcare industry looking for solutions
- Barriers have not been removed
- Internet use has created new challenges.
- Enter eXtensible Markup Language (XML), -- a convergence of data processing, communication, and publishing technology.

Patient Information in XML

```
<?xml version="1.0" ?>
<LevelOne><head>
<patient>
<patient.id>123456789</patient.id>
<patient.name>Jane Doe</patient.name>
<patient.date.of.birth>May 13,
1923</patient.date.of.birth>
<patient.address>123 Main St., Anytown,
USA (home)</patient.address>
<patient.phone>555-345-9876
(home)</patient.phone>
</patient>
</head>
</LevelOne>
```



XML Assumptions and Principles

- **Data is hierarchically structured**
- **Structure may be arbitrarily granular**
- **Structure yields semantic meaning of content with appropriate data analysis**
- **Encoding semantic content enables data to be processed for a multitude of purposes**

Goals and Objectives

- **Students will receive**
 - an introduction to the breadth of the XML V1.0 Specification
 - an in-depth introduction to those portions of the XML V1.0 Specification (and related standards) which are the subject of discussion within HL7 at this time
- **Upon completion of this tutorial**
 - participants have enough background to be able to actively participate in XML-related discussions within HL7
 - V3 XML Implementable Technology Specification (ITS)
 - XML SIG, Patient Record Architecture Proposal

Prerequisites

- **Familiarity with HyperText Markup Language (HTML)**
 - It will be helpful if you've seen and/or authored HTML tags or web pages
- **In-depth understanding of HL7 V2.X messages, segments and datatypes**
 - e.g., ORU, OBX, PID, CE
- **Familiarity with HL7 V3 Message Development Framework (MDF)**

What's to come?

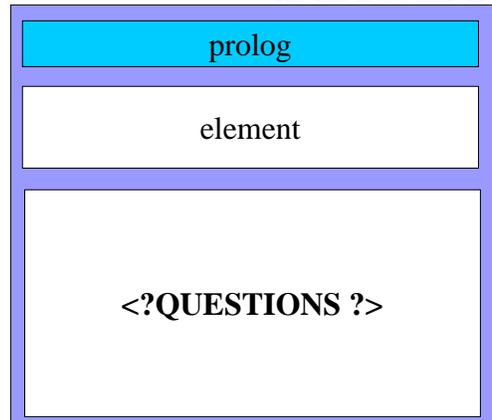
- **XML Basics, Rachael Sokolowski**
 - Overview of the basic components of XML syntax
 - Introduction to the XML Specification itself
- **Document Type Definitions, Rachael Sokolowski**
 - In-depth coverage of the major components of XML syntax for both DTD's and instance documents
- **XML Architectures, Paul V. Biron**
 - Overview of the document exchange problem
 - Introduction to XML Architectures and Transformations
- **HIMSS '99 Demo, Paul V. Biron**
 - V3 XML ITS
 - PRA

20
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Questions?

XML Document



The Basics

Presentation
by

Rachael Sokolowski
rsokolowski@magnoliatech.com

Magnolia Technologies

22
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Outline

- **Introduction to XML**
- **Basics of XML**
 - What is XML?
 - XML vs. HTML
 - Elements
 - Attributes
 - Element vs. Attribute

What is XML?

- **e**Xtensible **M**arkup **L**anguage
- **An activity of the World Wide Web Consortium (W3C)**
- **Offers new and improved Web applications**
- **Changes publishing on the web**
- **Subset of SGML syntax**

XML

- **Communicates information in a way so that the content can be understood by humans**
- **Communicates information to a computer so that a variety of applications including those of the future can use the information**
- **Facilitates the re-purposing of information in different forms**
- **Allows for vendor-neutral interchange**

XML Predictions

- **XML will be the future Web standard instead of HTML**
- **XML will be used for international information exchange**
- **XML may replace all existing word processing and desktop publishing formats**
- **XML documents created today will be readable by computer applications 10 years from now**

The Role of XML

- **When HTML does not meet the needs**
- **When collection of information is required**
- **When information resources are of long term value**
- **When there are complex relationships between information resources (links)**
- **When information needs to be exchanged**

What XML Provides

- **A list of elements which appear in a document**
- **A specification of the order and frequency of elements in the document**
- **A verification that the document is XML (parsers or validators)**
- **A facility for specifying formatting (XSL)**
- **Other supporting standards for various purposes ... “the XML family of standards”**

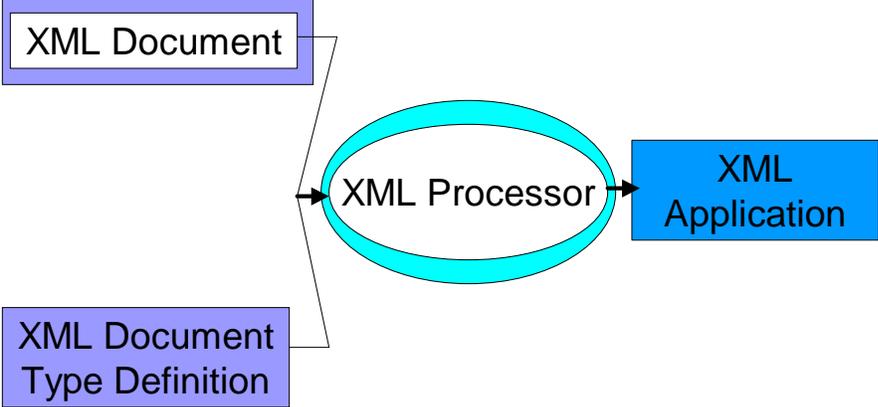
XML Family of Standards

- **W3C Recommendations**
 - DOM (Document Object Model)
 - Tree-based parser API
 - Namespaces in XML
- **W3C Working Group Activities**
 - XSL (eXtensible Stylesheet Language)
 - Transformation and formatting for XML documents
 - XML Linking
 - XLink, high function Hyperlinking
 - XPointer, high function referencing within XML

XML Family of Standards

- **W3C Working Group Activities (continued)**
 - XML Schema
 - Document structure and semantics constraint language (e.g. DTD++)
 - HL7 has representation on the Working Group
 - Prior proposals
 - XML-Data
 - Xschema
 - DCD (Document Content Description)
- **Possible Upcoming W3C Activities**
 - XML-QL/XQL (eXtensible Query Language)
 - Query languages for XML documents

The Big Picture



XML Document

- **Identifies itself as XML**
- **A reference to the DTD (if needed)**
- **The text of the document**
- **The XML markup as specified by the DTD**

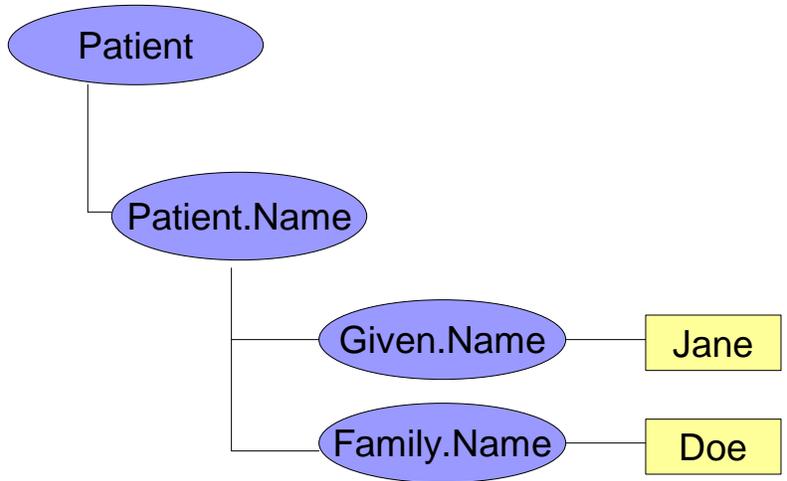
XML Example

```
<?xml version="1.0" ?>  
<PATIENT>  
  <PATIENT.NAME>  
    <GIVEN.NAME > Jane</ GIVEN.NAME >  
    <FAMILY.NAME >Doe</ FAMILY.NAME >  
  </PATIENT.NAME>  
</PATIENT>
```

XML Example

```
<?xml version="1.0" ?> ← Prolog
<PATIENT> ← Start Tag
<PATIENT.NAME>
<GIVEN.NAME > Jane ← Character Data
<FAMILY.NAME >Doe</ FAMILY.NAME >
</PATIENT.NAME>
</PATIENT> ← End Tag
```

Graphical XML Document View

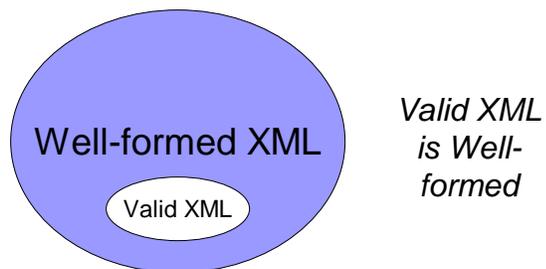


35
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

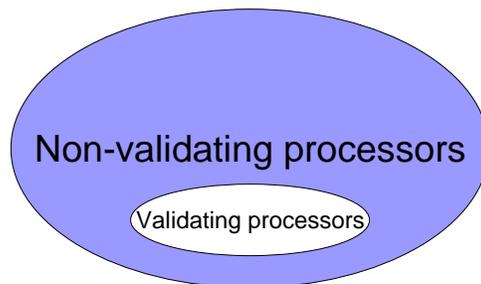
Two Classes of XML Documents

- **Valid**
 - Valid XML documents conform to DTDs
- **Well-formed**
 - Well-formed XML documents do not have DTDs but conform to the basic XML grammar



Two Classes of XML Processors

- **Validating parsers**
 - parse documents according to conformance to the DTD
- **Non-validating**
 - parse XML documents without reference to the DTD



*Any processor
capable of
checking validity
must check for
well-formedness*

Two XML Terms

- **XML document**: a complete unit of information encoded in XML
- **DTD or Document Type Definition**: a specification of the names of the elements being used to markup a document and the relationships between them

Components of XML

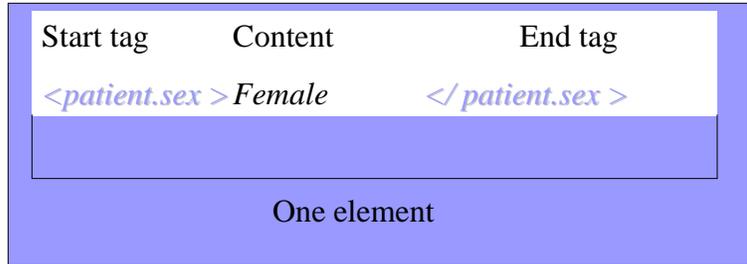
- **Elements (Tags)**
- **Attributes (Modifiers)**
- **Entities (References)**
- **Comments**
- **Processing instructions (information for the parser or application using the XML)**
- **Character Data (Ignore sequences)**

Elements

- **An element is a logical unit of the document.**
 - Patient information might contain the following elements:
 - patient id
 - date of birth
 - given name
 - address
 - family name
- **Each XML document contains one or more elements.**
- **Elements must nest properly within each other, beginning with the document element.**

Elements and Tags

- Elements are delimited with start “tags” and end “tags”
- Have unique names



Element Content

An element's content or the text between that start and end tag has the name #PCDATA.

#PCDATA means parsed character data. Think of it as text.

Special Case

- **The Empty Element**
- **Some information does not have content; in HTML a line break is an empty element**
 - `
</BR>` does not make sense
- **Empty elements in XML have the syntax:**

`<EmptyElement/>`

Attributes

- **An attribute is additional information associated with an element**

Example: A coding scheme such as ICD-9, CPT and a reference to an HL7 table

- **Attributes may appear only within start-tags and empty-element tags.**
- **Attribute-list declarations specify the name, data type, and default value (if any) of each attribute associated with a given element**

Attribute = Modifier

Attributes are immediately specified after the element they are associated with and provide further information

Start tag	Attribute	Content	End tag
<i><</i>	<i>patient.sex table = "HL70001"</i>	<i>> Female</i>	<i></ patient.sex ></i>

One element with one attribute

Attribute Syntax

- Elements may have multiple attributes
- Attributes are name value pairs
- Attribute assignment syntax

[name of attribute] = “[value of attribute]”

Quotation marks are not optional around the value of the attribute in XML

Elements vs. Attributes

**A religious question of SGML/XML DTD designers.
Which is preferable?**

1. Using an element:

```
<patient.sex > <table> HL70001 </table>  
Female</patient.sex>
```

2. Using an attribute:

```
<patient.sex table = "HL70001" > Female</ patient.sex >
```

Elements vs. Attributes

- **Each representation has strengths and limitations. The determination depends on the particular requirements of the application**
- **Information to be exchanged should be in elements**
- **Proprietary information should be encoded in attributes ...Typically system specific processing information such as a database table name are encoded in attributes**

Entities

- Building blocks of XML documents
- May be as simple as a single character or as complex as an entire document
- Entities are essentially substitutions or macros: replace this with that
- Entity references start with & and end with ;
`&SubstituteMe;`

Predefined Entities

- **Characters that would confuse the parser**

<DOCUMENT>

if a < b then a > c

<DOCUMENT>

- **Character entities include**

< <

> >

& &

' '

" "

Using Character Entities

Case A – Parser Error

```
<DOCUMENT>  
  if a<b then a>c  
</DOCUMENT>
```

Error <b then a> not well-formed.

Case B – Using Entities

```
<DOCUMENT>  
  if a&lt;b then a&gt;c  
</DOCUMENT>
```

```
DOCUMENT  
|---ELEMENT DOCUMENT  
| |---PCDATA " if a"  
| |---ENTITYREF lt "<"  
| |---PCDATA " b then a"  
| |---ENTITYREF gt ">"  
| |---PCDATA " c"
```

Comments

- **Comments are allowed in XML documents and in XML DTDs**
- **XML comments look exactly like HTML comments**

`<!-- This a valid comment -->`

`<!-- This an -- invalid comment -->`

Processing Instructions

- Application specific information
- The XML declaration is a processing instruction
`<?XML version="1.0" ?>`
- XML parsers interpret the processing instructions.
- Processing instructions are not mark up
- Processing instructions start with `<?`
- and end with `?>`

CDATA Sections

**Large numbers of characters to be ignored
by the parser; usually used for comments**

<DOCUMENT>

<![CDATA [

Ignore this comment it is rather long

]]>

</DOCUMENT>

XML Rules

- Names beginning with “xml” are reserved
- End Tags are required
- Empty elements are allowed `<foo/>`
- XML documents can identify themselves as XML, but aren't required to.
- Each XML document contains one or more elements.
- Elements must nest properly within each other, beginning with the root, or document element.

XML vs. Standard HL7 Encoding

```

<?xml version="1.0" ?>
<!DOCTYPE ORU.R01 SYSTEM "hl7_v23.dtd">
<ORU.R01>
<MSH>...</MSH>
<PID PID.1="1">
  <PID.3 CX.1="123456789"/>
  <PID.5 XPN.1="Levin" XPN.2="Henry" XPN.3="the 7th"/>
  <PID.7 TS.1="19230513"/>
</PID>
<OBR OBR.1="1">
  <OBR.4 CE.2="Chest X-ray"/>
</OBR>
<OBX OBX.1="1" OBX.2="TX">
  <OBX.3 CE.1="71020" SUB="GDT"/>
  <OBX.5 TX.1="Clinical data: History of..."/>
</OBX>
<OBX OBX.1="2" OBX.2="TX">
  <OBX.3 CE.1="71020" SUB="GDT"/>
  <OBX.5 TX.1="Findings: Comparison is made..."/>
</OBX>
<OBX OBX.1="3" OBX.2="CE">
  <OBX.3 CE.1="71020" SUB="IMP"/>
  <OBX.5 CE.2="RLL nodule, suggestive of ..."/>
</OBX>
<OBX OBX.1="4" OBX.2="CE">
  <OBX.3 CE.1="71020" SUB="REC"/>
  <OBX.5 CE.2="I notified the ordering physician..."/>
</OBX>
</ORU.R01>

```

HL7 Message

```

MSH...<cr>
PID|1||123456789||Levin^Henry^^the
7th||19230513<cr>

OBR|1||^Chest X-ray<cr>

OBX|1|TX|71020&GDT||Clinical data:
History of... <cr>

OBX|2|TX|71020&GDT||Findings:
Comparison is made ... <cr>

OBX|3|CE|71020&IMP||RLL nodule,
suggestive of... <cr>

OBX|4|CE|71020&REC||I notified the
ordering physician... <cr>

```

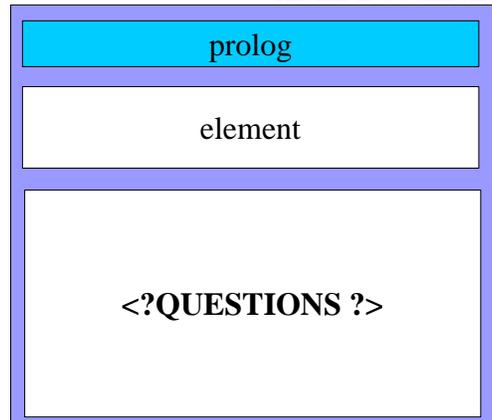
Copyright © 2000 by Henry J. Bokolowski. HL7 '99 Winter Working Group Meeting

The DTD specifying the tags and allowable tag arrangement for the SGML-encoded radiology report of the previous figure is shown here.

The tag or 'element' named 'RadiologyReport' is specified as containing a single occurrence of elements 'PatientInfo', 'ClinicalData', 'Procedure', 'Findings', 'Impressions', and 'Recommendations'. The element named 'PatientInfo' is further specified as containing a single occurrence of elements 'Name', 'MRN', and 'DOB'. The elements 'Name', 'MRN', 'DOB', 'ClinicalData', 'Procedure', 'Findings', 'Impressions', and 'Recommendations' will contain text data and no other tags.

Questions

XML Document



Document Type Definitions

Presentation
by

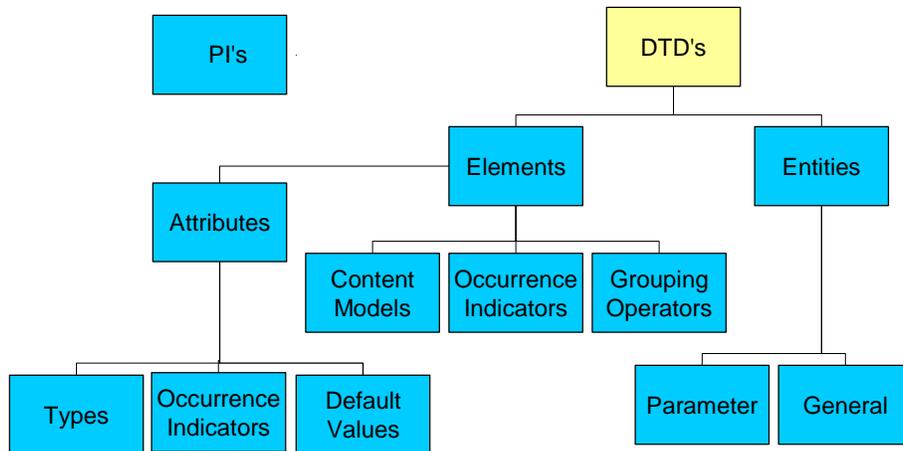
Rachael Sokolowski
rsokolowski@magnoliatech.com

Magnolia Technologies

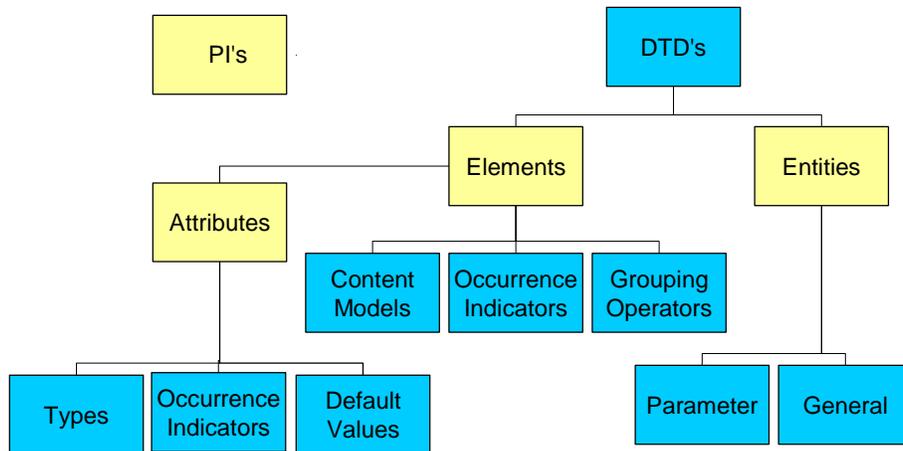
58
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Outline



Outline



Document Type Definitions

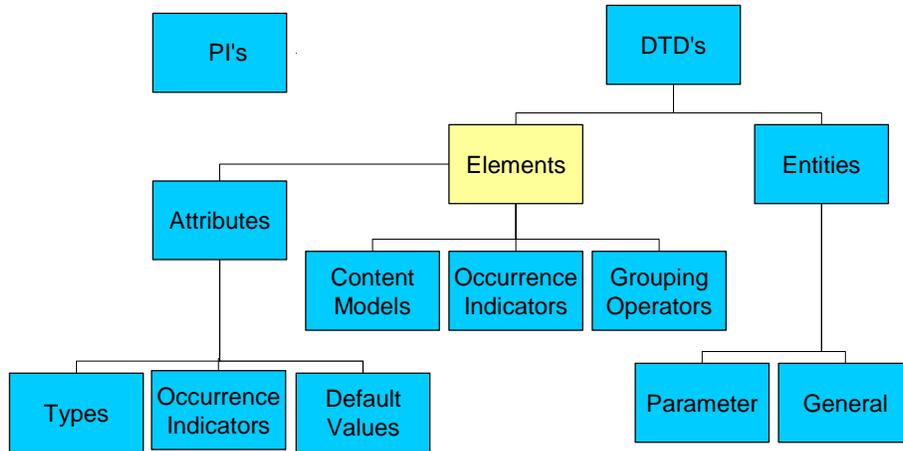
- **Document Type Definitions**
 - also referred to as DTD's
- **DTD contain**
 - The names of allowable elements, attributes and entities
 - The content of each element type; what each element can contain
 - The structure of the document including
 - the order in which elements must appear
 - how often elements can appear
 - The properties of the elements (attributes)
 - The entities or substitutions to make

61
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

The XML document type declaration contains or points to markup declarations that provide a grammar for a class of documents. This grammar is known as a document type definition, or DTD. The document type declaration can point to an external subset (a special kind of external entity) containing markup declarations, or can contain the markup declarations directly in an internal subset, or can do both. The DTD for a document consists of both subsets taken together.

Elements



62
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Elements

- **Elements are the major "building blocks" of XML documents**
- **Element declaration syntax consists means to specify**
 - content models
 - occurrence indicators
 - grouping/sequence operators

63
01/25/99

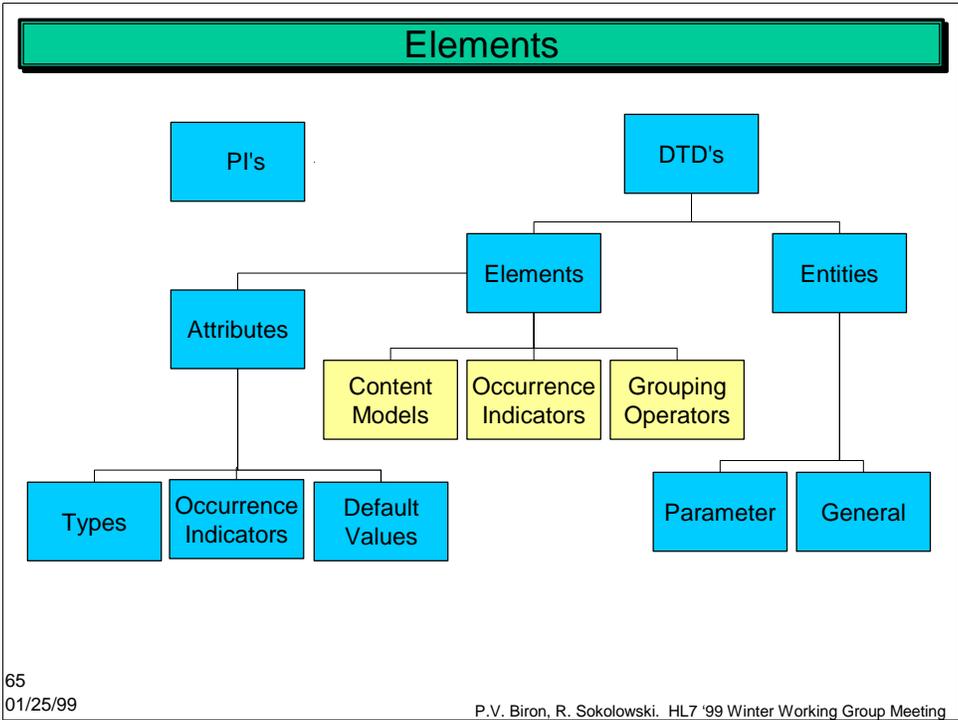
P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Each XML document contains one or more elements, the boundaries of which are either delimited by start-tags and end-tags, or, for empty elements, by an empty-element tag. Each element has a type, identified by name, sometimes called its "generic identifier" (GI), and may have a set of attribute specifications. Each attribute specification has a name and a value.

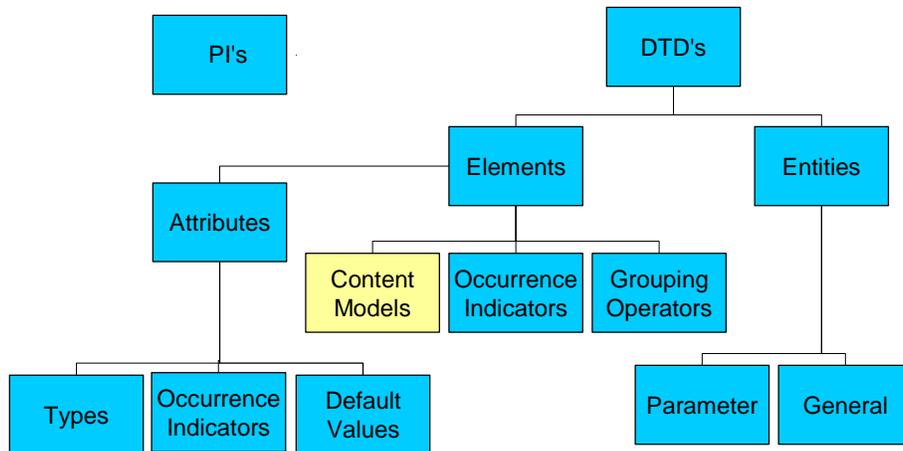
Elements

- Element declarations begin with **<!ELEMENT**
- Followed by **ELEMENT_NAME**
- Followed by the allowable and/or required content of the element (the **content model**)
- Followed by a closing “>”
- e.g.

<!ELEMENT ELEMENT_NAME content_model>



Element Content Models



Content Model Types

- **Element *content models* allow you to control the makeup of an element's *content*, which might be**
 - hierarchically nested sub-elements
 - character data (text)
 - no content whatsoever

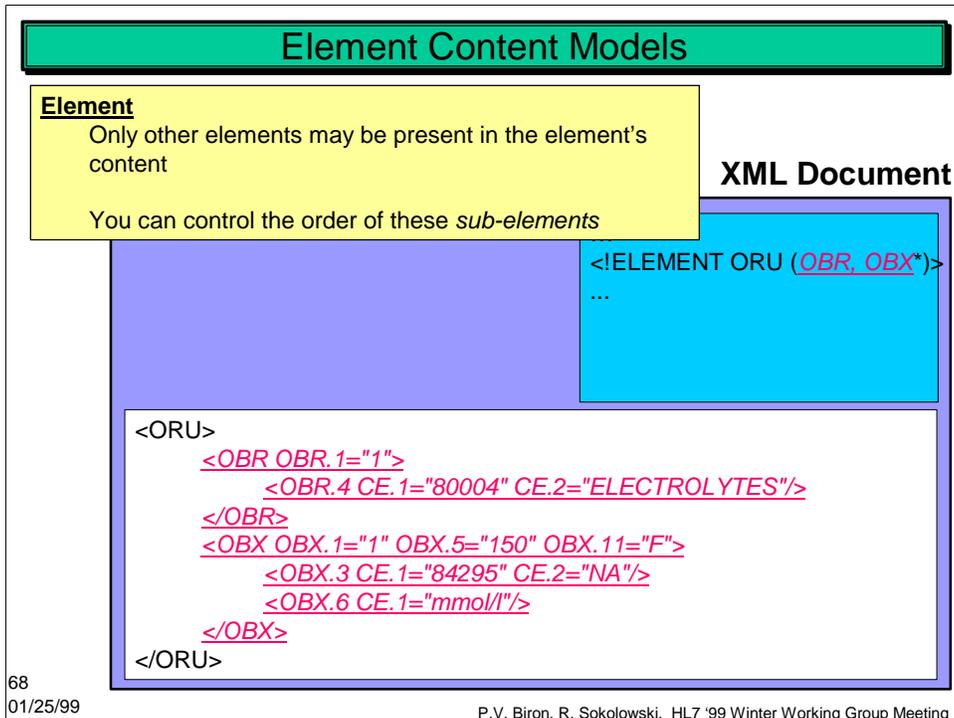
Type	Meaning	Example
Element	Only other elements	<!ELEMENT ORU (<i>OBR, OBX</i> *)>
Mixed	Both character data and other elements	<!ELEMENT CODE (<i>#PCDATA CE</i> *)>
EMPTY	No element or character data (only attributes)	<!ELEMENT OBR.4 <i>EMPTY</i> >
ANY	Any element, but no character data	<!ELEMENT HL7 ANY>

67
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

The element structure of an XML document may, for validation purposes, be constrained using element type and attribute-list declarations. An element type declaration constrains the element's content.

Element type declarations often constrain which element types can appear as children of the element. At user option, an XML processor may issue a warning when a declaration mentions an element type for which no declaration is provided, but this is not an error.



An element type has element content when elements of that type must contain only child elements (no character data), optionally separated by white space (characters matching the nonterminal S). In this case, the constraint includes a content model, a simple grammar governing the allowed types of the child elements and the order in which they are allowed to appear.

[45] elementdecl ::= '<!ELEMENT' S Name S contentspec S? '>'

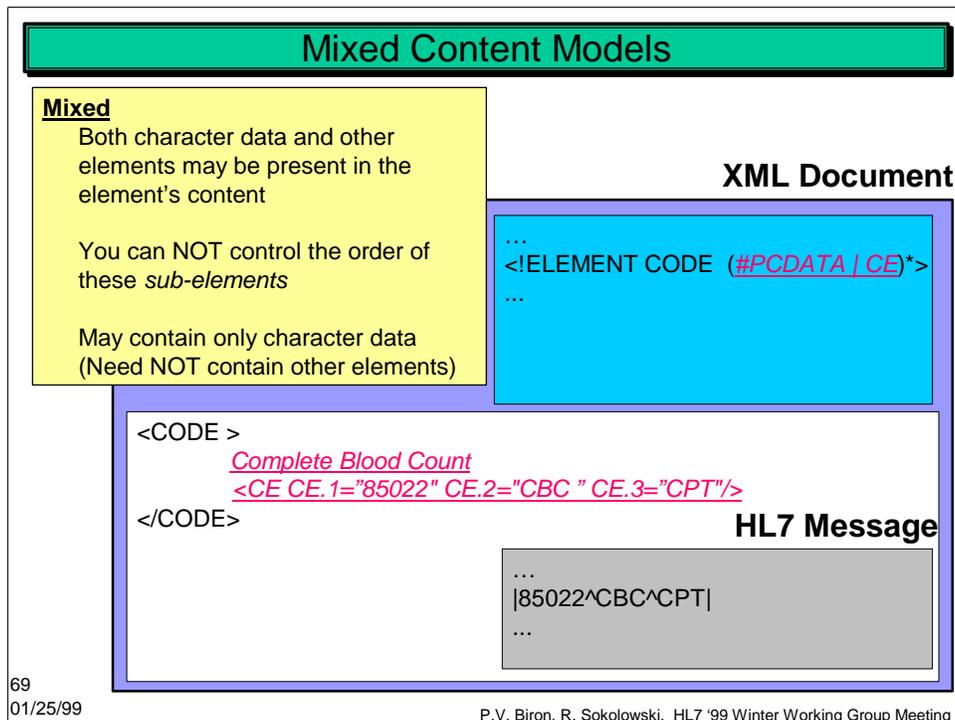
[46] contentspec ::= 'EMPTY' | 'ANY' | Mixed | children

[47] children ::= (choice | seq) ('?' | '*' | '+')?

[48] cp ::= (Name | choice | seq) ('?' | '*' | '+')?

[49] choice ::= '(' S? cp (S? '|' S? cp)* S? ')'

[50] seq ::= '(' S? cp (S? ',' S? cp)* S? ')'



An element type has mixed content when elements of that type may contain character data, optionally interspersed with child elements. In this case, the types of the child elements may be constrained, but not their order or their number of occurrences:

[45] elementdecl ::= '<!ELEMENT' S Name S contentspec S? '>'

[46] contentspec ::= 'EMPTY' | 'ANY' | Mixed | children

[51] Mixed ::=

'(S? '#PCDATA'

(S? '|' S? Name)* S? ')*' | '(S? '#PCDATA' S?)'

[4] NameChar ::= Letter | Digit | '.' | '-' | '_' | ':' | CombiningChar | Extender

[5] Name ::= (Letter | '_' | ':') (NameChar)*

where the Names give the types of elements that may appear as children.

Empty Content Models

Empty

No character data or other elements may be present in the element's content

The element may, however, still have attributes

XML Document

...

<!ELEMENT OBR.4 EMPTY>

<!ELEMENT OBX.3 EMPTY>

<!ELEMENT OBX.6 EMPTY>

...

```

<ORU>
  <OBR OBR.1="1">
    <OBR.4 CE.1="80004" CE.2="ELECTROLYTES"/>
  </OBR>
  <OBX OBX.1="1" OBX.5="150" OBX.11="F">
    <OBX.3 CE.1="84295" CE.2="NA"/>
    <OBX.6 CE.1="mmol/l"/>
  </OBX>
</ORU>

```

70
01/25/99
P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

An empty-element tag takes a special form:

[44] EmptyElemTag ::= '<' Name (S Attribute)* S? '>'

[45] elementdecl ::= '<!ELEMENT' S Name S contentspec S? '>'

[46] contentspec ::= 'EMPTY' | 'ANY' | Mixed | children

Empty-element tags may be used for any element which has no content, whether or not it is declared using the keyword EMPTY. For interoperability, the empty-element tag must be used, and can only be used, for elements which are declared EMPTY.

Content Model Types

- **Element *content models* allow you to control the makeup of an element's *content*, which might be**
 - hierarchically nested sub-elements
 - character data (text)
 - no content whatsoever

Type	Meaning	Example
Element	Only other elements	<!ELEMENT ORU (<i>OBR, OBX</i> *)>
Mixed	Both character data and other elements	<!ELEMENT CODE (<i>#PCDATA CE</i> *)>
EMPTY	No element or character data (only attributes)	<!ELEMENT OBR.4 <i>EMPTY</i> >
ANY	Any element, but no character data	<!ELEMENT HL7 ANY>

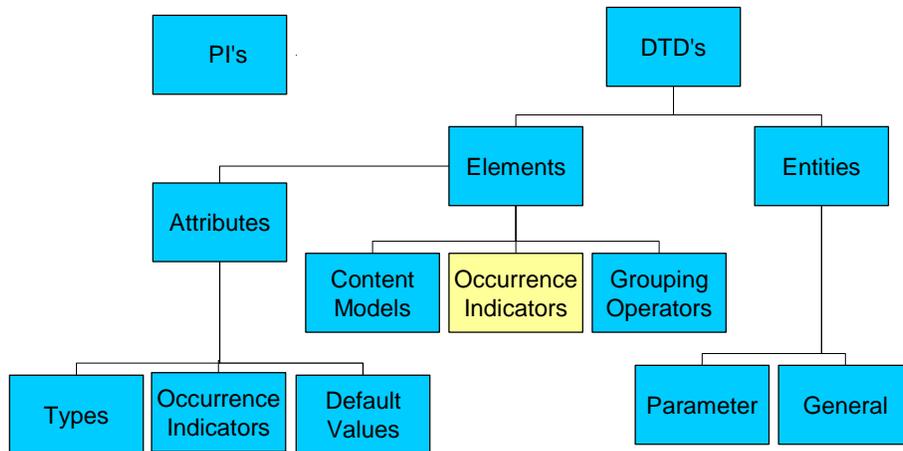
71
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

The element structure of an XML document may, for validation purposes, be constrained using element type and attribute-list declarations. An element type declaration constrains the element's content.

Element type declarations often constrain which element types can appear as children of the element. At user option, an XML processor may issue a warning when a declaration mentions an element type for which no declaration is provided, but this is not an error.

Element Occurrence Indicators



72
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Content Model Occurrence Indicators

- **Occurrence indicators allow you to control the cardinality of sub-elements**

Indicator	Meaning	Example
(none)	exactly one	<!ELEMENT ORU (<i>OBR</i> , <i>OBX</i> *)>
?	zero or one (optional)	<!ELEMENT MSH (..., <i>MSH.3?</i> ,...)>
*	zero or more	<!ELEMENT ORU (<i>OBR</i> , <i>OBX</i> *)>
+	one or more (repeating)	<!ELEMENT PID (<i>PID.3+</i> ,...)>

73
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Element? : matches A or nothing; optional Element.

Element+ : matches one or more occurrences of Element.

Element* : matches zero or more occurrences of Element.

The (optional) optionality character following a name or list governs whether the element or the content particles in the list may occur one or more (+), zero or more (*), or zero or one times (?). The absence of such an operator means that the element or content particle must appear exactly once. This syntax and meaning are identical to those used in the productions in this specification.

Occurrence Indicators: Exactly One

Exactly one: *(none)*

If no occurrence indicator is present, then the sub-element must occur once and only once

XML Document

```
...
<!ELEMENT ORU (OBR, OBX*)>
...

<ORU>
  <OBR OBR.1="1">
    <OBR.4 CE.1="80004" CE.2="ELECTROLYTES"/>
  </OBR>
  <OBR OBR.1="1">
    <OBR.4 CE.1="80004" CE.2="ELECTROLYTES"/>
  </OBR>
  <OBX OBX.1="1" OBX.5="150" OBX.11="F">
    <OBX.3 CE.1="84295" CE.2="NA"/>
    <OBX.6 CE.1="mmol/l"/>
  </OBX>
</ORU>
```

An arrow points from a red box labeled "Invalid" to the second occurrence of the `<OBR OBR.1="1">` element, which is circled in red.

74
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Element? : matches A or nothing; optional Element.

Element+ : matches one or more occurrences of Element.

Element* : matches zero or more occurrences of Element.

The (optional) optionality character following a name or list governs whether the element or the content particles in the list may occur one or more (+), zero or more (*), or zero or one times (?). The absence of such an operator means that the element or content particle must appear exactly once. This syntax and meaning are identical to those used in the productions in this specification.

Content Model Occurrence Indicators

Optional: ?
 If the *optional* occurrence indicator is present, then the sub-element may occur at most once, but need not occur at all

XML Document

```

...
<!ELEMENT MSH (...MSH.3?, MSH.4?,...)>
...

```

```

<MSH>
...
<MSH.3 HD.1="LAB" HD.2="RMS" HD.3=""/>
...
</MSH>

```

75
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Element? : matches A or nothing; optional Element.

Element+ : matches one or more occurrences of Element.

Element* : matches zero or more occurrences of Element.

The (optional) optionality character following a name or list governs whether the element or the content particles in the list may occur one or more (+), zero or more (*), or zero or one times (?). The absence of such an operator means that the element or content particle must appear exactly once. This syntax and meaning are identical to those used in the productions in this specification.

Content Model Occurrence Indicators

Zero or more: *

If the *zero or more* occurrence indicator is present, then the sub-element can be considered to be *optionally repeating*

XML Document

```
...
<!ELEMENT ORU (OBR, OBX)>
...
```

```
<ORU>
  <OBR OBR.1="1">
    <OBR.4 CE.1="80004" CE.2="ELECTROLYTES"/>
  </OBR>
  <OBX OBR.1="1" OBX.5="150" OBX.11="F">
    <OBX.3 CE.1="84295" CE.2="NA"/>
    <OBX.6 CE.1="mmol/l"/>
  </OBX>
  <OBX OBR.1="2" OBX.5="4.5" OBX.11="F">
    <OBX.3 CE.1="84132" CE.2="K+"/>
    <OBX.6 CE.1="mmol/l"/>
  </OBX>
</ORU>
```

76
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Element? : matches A or nothing; optional Element.

Element+ : matches one or more occurrences of Element.

Element* : matches zero or more occurrences of Element.

The (optional) optionality character following a name or list governs whether the element or the content particles in the list may occur one or more (+), zero or more (*), or zero or one times (?). The absence of such an operator means that the element or content particle must appear exactly once. This syntax and meaning are identical to those used in the productions in this specification.

Content Model Occurrence Indicators

Repeating: \pm

If the *repeating* occurrence indicator is present, then the sub-element is required and may also repeat (occur more than once)

XML Document

```
...  
<!ELEMENT PID (PID.3 $\pm$ ,...,PID.5 $\pm$ ,...)>  
...
```

```
<PID>  
  <PID.3 CX.1="000005536641"/>  
  <PID.3 CX.1="146635500000"/>  
  <PID.5 XPN.1="Smith" XPN.2="Jon"/>  
  <PID.5 XPN.1="Smith" XPN.2="Jonathan"/>  
  <PID.11 XPN.1="12345 Main St." XPN.3="Anytown"  
    XPN.4="CA" XPN.5="11111" XPN.6="USA"/>  
  <PID.13 XTN.1="333-555-1212">  
</PID>
```

77
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Element? : matches A or nothing; optional Element.

Element+ : matches one or more occurrences of Element.

Element* : matches zero or more occurrences of Element.

The (optional) optionality character following a name or list governs whether the element or the content particles in the list may occur one or more (+), zero or more (*), or zero or one times (?). The absence of such an operator means that the element or content particle must appear exactly once. This syntax and meaning are identical to those used in the productions in this specification.

Content Model Occurrence Indicators

- **Occurrence indicators allow you to control the cardinality of sub-elements**

Indicator	Meaning	Example
(none)	exactly one	<!ELEMENT ORU (<i>OBR</i> , <i>OBX</i> *)>
?	zero or one (optional)	<!ELEMENT MSH (..., <i>MSH.3?</i> ,...)>
*	zero or more	<!ELEMENT ORU (<i>OBR</i> , <i>OBX</i> *)>
+	one or more (repeating)	<!ELEMENT PID (<i>PID.3+</i> ,...)>

78
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

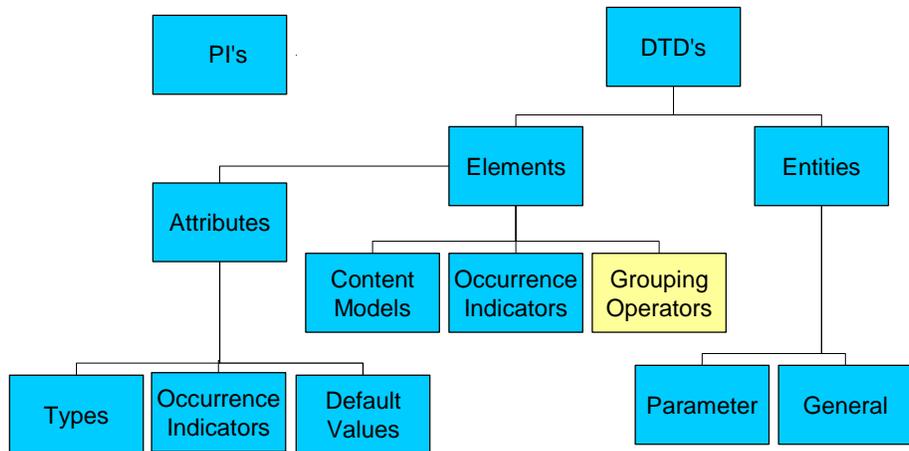
Element? : matches A or nothing; optional Element.

Element+ : matches one or more occurrences of Element.

Element* : matches zero or more occurrences of Element.

The (optional) optionality character following a name or list governs whether the element or the content particles in the list may occur one or more (+), zero or more (*), or zero or one times (?). The absence of such an operator means that the element or content particle must appear exactly once. This syntax and meaning are identical to those used in the productions in this specification.

Element Grouping Operators



Content Model Grouping/Ordering Operators

- **Grouping/sequence operators allow you to exercise some control over the ordering of element content in instance documents**

Operator	Meaning	Example
()	Grouping	<!ELEMENT ORU (...,(OBX , NTE*)*)*>
	Or	<!ELEMENT CODE (#PCDATA CE)*>
,	Ordered Sequence	<!ELEMENT ORU (OBR , OBX*)>

80
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

[45] elementdecl ::= '<!ELEMENT' S Name S contentspec S? '>'

[46] contentspec ::= 'EMPTY' | 'ANY' | Mixed | children

[47] children ::= (choice | seq) ('?' | '*' | '+')?

[48] cp ::= (Name | choice | seq) ('?' | '*' | '+')?

[49] choice ::= '(' S? cp (S? '|' S? cp)* S? ')'

[50] seq ::= '(' S? cp (S? ',' S? cp)* S? ')'

Content Model Grouping/Ordering Operators

Grouping: {}

If the *grouping* operator is present, it serves to group sub-elements. *occurrence* indicators and *ordering* operators may be applied to entire *groups*

XML Document

```

...
<!ELEMENT ORU (...,(OBX.NTE*)>
...

<ORU>
  <OBX OBX.1="1" OBX.5="34.0" OBX.11="F">
    <OBX.3 CE.1="2202" CE.2="PATIENT PTT"/>
    <OBX.6 CE.1="sec"/>
  </OBX>
  <OBX OBX.1="2" OBX.5="28" OBX.11="F">
    <OBX.3 CE.1="2203" CE.2="POP.MEAN"/>
    <OBX.6 CE.1="sec"/>
  </OBX>
  <NTE NTE.1="1" NTE.2="L" NTE.3="PATIENT NOT ON COUMADIN"/>
  <NTE NTE.1="2" NTE.2="L" NTE.3="PATIENT NOT ON HEPARIN"/>
</ORU>

```

81
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

[45] elementdecl ::= '<!ELEMENT' S Name S contentspec S? '>'

[46] contentspec ::= 'EMPTY' | 'ANY' | Mixed | children

[47] children ::= (choice | seq) ('?' | '*' | '+')?

[48] cp ::= (Name | choice | seq) ('?' | '*' | '+')?

[49] choice ::= '(' S? cp (S? '|' S? cp)* S? ')'

[50] seq ::= '(' S? cp (S? ',' S? cp)* S? ')'

Content Model Grouping/Ordering Operators

Or: |

If the *or* operator is present, only one of the sub-elements in the group may be present in instance documents

XML Document

```
...
<!ELEMENT CODE (#PCDATA | CE)*>
...
```

```
<CODE >
  Complete Blood Count
  <CE CE.1="85022" CE.2="CBC " CE.3="CPT"/>
</CODE>
```

HL7 Message

```
...
|85022^CBC^LN|
...
```

82
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

[45] elementdecl ::= '<!ELEMENT' S Name S contentspec S? '>'

[46] contentspec ::= 'EMPTY' | 'ANY' | Mixed | children

[47] children ::= (choice | seq) ('?' | '*' | '+)?

[48] cp ::= (Name | choice | seq) ('?' | '*' | '+)?

[49] choice ::= '(' S? cp (S? '|' S? cp)* S? ')'

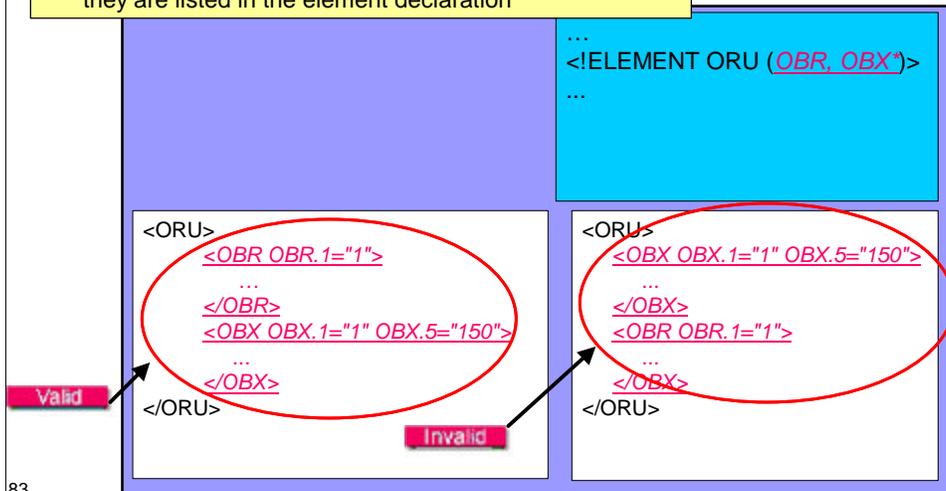
[50] seq ::= '(' S? cp (S? ',' S? cp)* S? ')'

Content Model Grouping/Ordering Operators

Sequence: \downarrow

If the *sequence* operator is present, sub-elements must be present in instance documents in the exact order they are listed in the element declaration

XML Document



83
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

[45] elementdecl ::= '<!ELEMENT' S Name S contentspec S? '>'

[46] contentspec ::= 'EMPTY' | 'ANY' | Mixed | children

[47] children ::= (choice | seq) ('?' | '*' | '+')?

[48] cp ::= (Name | choice | seq) ('?' | '*' | '+')?

[49] choice ::= '(' S? cp (S? '|' S? cp)* S? ')'

[50] seq ::= '(' S? cp (S? ',' S? cp)* S? ')'

Content Model Grouping/Ordering Operators

- **Grouping/sequence operators allow you to exercise some control over the ordering of element content in instance documents**

Operator	Meaning	Example
()	Grouping	<!ELEMENT ORU (...,(OBX , NTE*)*)>
	Or	<!ELEMENT CODE (#PCDATA CE)*>
,	Ordered Sequence	<!ELEMENT ORU (OBR , OBX*)>

84
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

[45] elementdecl ::= '<!ELEMENT' S Name S contentspec S? '>'

[46] contentspec ::= 'EMPTY' | 'ANY' | Mixed | children

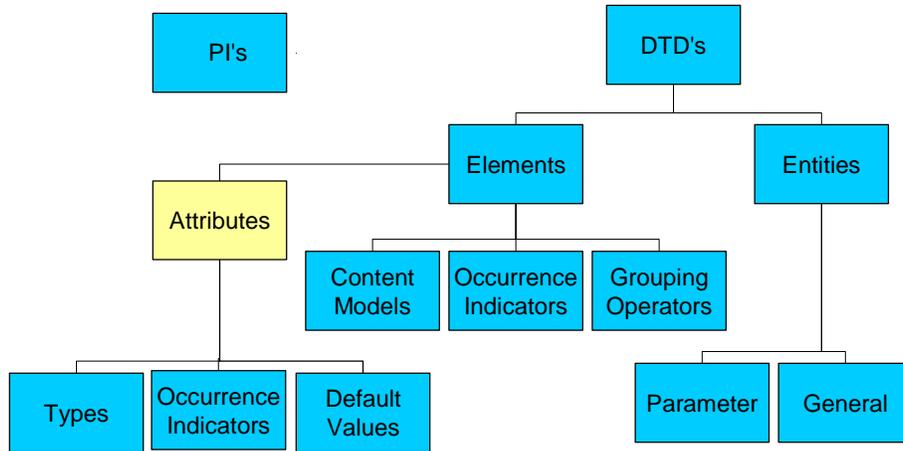
[47] children ::= (choice | seq) ('?' | '*' | '+')?

[48] cp ::= (Name | choice | seq) ('?' | '*' | '+')?

[49] choice ::= '(' S? cp (S? '|' S? cp)* S? ')'

[50] seq ::= '(' S? cp (S? ',' S? cp)* S? ')'

Attributes



85
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Attributes

- **Attributes are a means of associating name/value pairs with an instance of an element**
- **The attributes (name/value pairs) for an element may serve to carry *meta-data* about the instance of the element**
- **Attributes may appear only within start-tags and empty-element tags.**

86
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Attributes are used to associate name-value pairs with elements. Attribute specifications may appear only within start-tags and empty-element tags; thus, the productions used to recognize them appear in "3.1 Start-Tags, End-Tags, and Empty-Element Tags". Attribute-list declarations may be used:

To define the set of attributes pertaining to a given element type.

To establish type constraints for these attributes.

To provide default values for attributes.

Attribute-list declarations specify the name, data type, and default value (if any) of each attribute associated with a given element type:

[52] AttlistDecl ::= '<!ATTLIST' S Name AttDef* S? '>'

[53] AttDef ::= S Name S AttType S DefaultDecl

Attributes

- Attribute declarations begin with **<!ATTLIST**
- Followed by **ELEMENT_NAME**
- Followed by **attr_name**
- Followed by **TYPE**
- Followed by **OCCURRENCE_INDICATOR**
- Followed by a closing **">"**

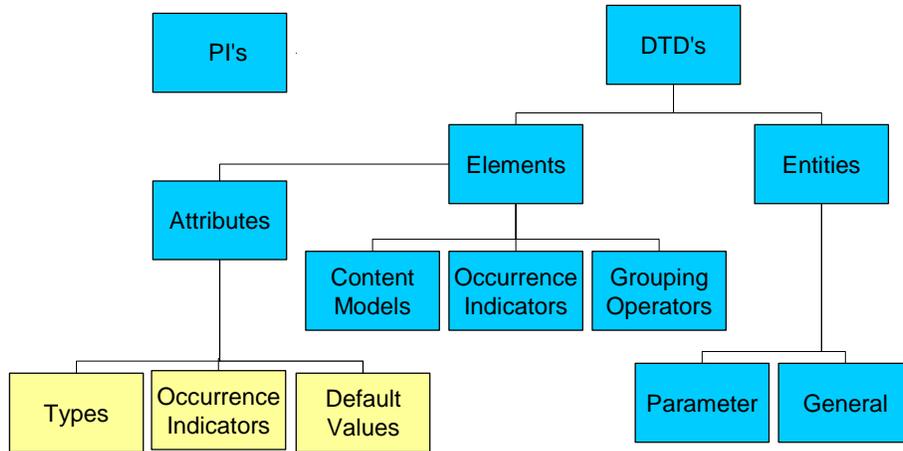
<!ATTLIST ELEMENT_NAME

attr_name TYPE OCCURRENCE_INDICATOR >

<!ATTLIST patient.sex

table CDATA #IMPLIED >

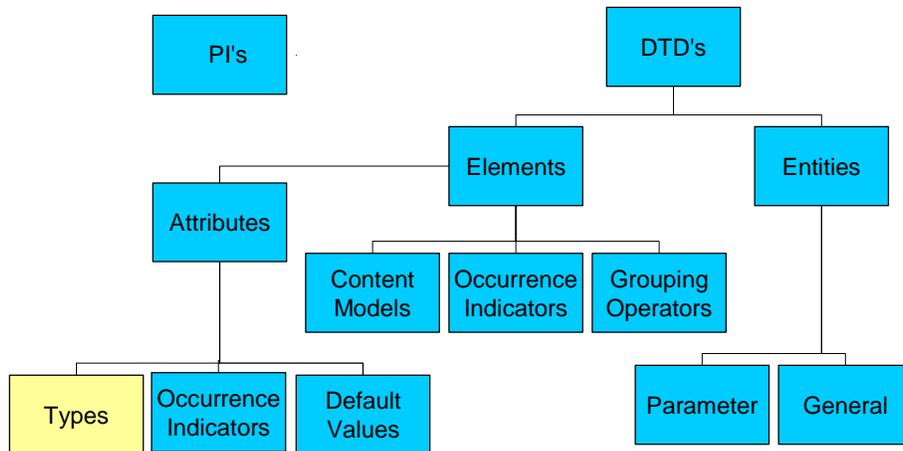
Attributes



88
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Attribute Types



89
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Attribute Types

- **XML supports limited attribute value typing**
 - SGML supports a few more types, but not many

Type	Meaning	Example
CDATA	String	<!ATTLIST OBX.3 CE.1 <u>CDATA</u> #REQUIRED>
Enumerated	Table Value Restrictions	<!ATTLIST OBX.3 CE.1 (<u>12345 / 45678</u>) #IMPLIED>
Tokenized	Lexical/Semantic Constraints	<!ATTLIST CODE CODEID <u>ID</u> #IMPLIED>

90
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

XML attribute types are of three kinds: a string type, a set of tokenized types, and enumerated types. The string type may take any literal string as a value; the tokenized types have varying lexical and semantic constraints, as noted:

[54] AttType ::= StringType | TokenizedType | EnumeratedType

[55] StringType ::= 'CDATA'

[56] TokenizedType ::= 'ID' | 'IDREF' | 'IDREFS' | 'ENTITY' | 'ENTITIES' |
'NMTOKEN' | 'NMTOKENS'

[57] EnumeratedType ::= NotationType | Enumeration

[58] NotationType ::= 'NOTATION' S '(' S? Name (S? '|' S? Name)* S? ')'

[59] Enumeration ::= '(' S? Nmtoken (S? '|' S? Nmtoken)* S? ')'

String Type

String (CDATA)

String (or CDATA) attributes may take any literal string as a value, including whitespace characters

CDATA (character data)

XML Document

```
...
<!ATTLIST OBX.3
  CE.1 CDATA #IMPLIED
  CE.2 CDATA #IMPLIED
  CE.3 CDATA #IMPLIED>
...

<ORU>
  <OBR OBR.1="1">
    <OBR.4 CE.1="80004" CE.2="ELECTROLYTES"/>
  </OBR>
  <OBX OBX.1="1" OBX.5="150" OBX.11="F">
    <OBX.3 CE.1="84295" CE.2="NA"/>
    <OBX.6 CE.1="mmol/l"/>
  </OBX>
</ORU>
```

91
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Enumerated Type

Enumerated

Enumerated attributes can take one of a list of values provided in the declaration

Enumerated values cannot contain whitespace

XML Document

```
...
<!ATTLIST OBX.3
  CE.1 (12345 | 45678) #IMPLIED>
...
```

```
<ORU>
  <OBR OBR.1="1">
    <OBR.4 CE.1="80004" CE.2="ELECTROLYTES"/>
  </OBR>
  <OBX OBX.1="1" OBX.5="150" OBX.11="F">
    <OBX.8 CE.1="12345" CE.2="NA"/>
    <OBX.3 CE.1="98765" CE.2="NA"/>
    <OBX.6 CE.1="mmol/l"/>
  </OBX>
</ORU>
```

Valid

Invalid

92
01/25/99
P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Enumerated attributes can take one of a list of values provided in the declaration. There are two kinds of enumerated types:

[57] EnumeratedType ::= NotationType | Enumeration

[58] NotationType ::= 'NOTATION' S '(' S? Name (S? '|' S? Name)* S? ')'

[59] Enumeration ::= '(' S? Nmtoken (S? '|' S? Nmtoken)* S? ')'

A NOTATION attribute identifies a notation, declared in the DTD with associated system and/or public identifiers, to be used in interpreting the element to which the attribute is attached.

[Note, we will not be discussing NOTATION attributes during this tutorial]

ID Type	
<p>Tokenized : ID</p> <p>Provides a unique identifier for an instance of an element</p> <p>No two elements within an instance document may have the same identifier.</p> <p>Only one attribute of type ID is allowed per element</p>	<p style="text-align: center;">XML Document</p> <div style="border: 1px solid blue; background-color: #00FFFF; padding: 5px;"> <pre>... <!ATTLIST CODE <i>CODEID ID #IMPLIED</i>> ...</pre> </div> <div style="border: 1px solid blue; padding: 5px; margin-top: 10px;"> <pre><RadiologyReport> ... <Impressions> <i><CODE CODEID="c12973"></i>RLL nodule<i></CODE></i>, suggestive of malignancy. Compared with a prior CXR from 6 months ago, nodule size has increased. </Impressions> ... </RadiologyReport></pre> </div>
<p>93 01/25/99</p>	<p style="text-align: right; font-size: small;">P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting</p>

Values of type ID must match the Name production.

[4] NameChar ::= Letter | Digit | '.' | '-' | '_' | ':' | CombiningChar | Extender

[5] Name ::= (Letter | '_' | ':') (NameChar)*

A name must not appear more than once in an XML document as a value of this type; i.e., ID values must uniquely identify the elements which bear them.

No element type may have more than one ID attribute specified.

An ID attribute must have a declared default of #IMPLIED or #REQUIRED.

IDREF Type

Tokenized : IDREF

IDREF attributes act as *pointers*

Values must match the value of some ID attribute in the same instance document

XML Document

```

...
<!ATTLIST CODE
  CODEID ID #REQUIRED
  CODEREF IDREF #IMPLIED>
...

```

```

<RadiologyReport>
...
  <Impressions>
    <CODE CODEID="c12973">RLL nodule</CODE>, suggestive
      of malignancy. Compared with a prior CXR from 6 months
      ago, <CODE CODEREF="c12973">nodule</CODE> size
      has increased.
    </Impressions>
  ...
</RadiologyReport>

```

94
01/25/99
P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Values of type IDREF must match the Name production, and values of type IDREFS must match Names:

[4] NameChar ::= Letter | Digit | '.' | '-' | '_' | ':' | CombiningChar | Extender

[5] Name ::= (Letter | '_' | ':') (NameChar)*

[6] Names ::= Name (S Name)*

Each Name must match the value of an ID attribute on some element in the XML document; i.e. IDREF values must match the value of some ID attribute.

Other Tokenized Types

- **ENTITY/ENTITIES**
 - point to unparsed entities
- **NMTOKEN/NMTOKENS**
 - restrict attribute to a particular string or list of strings
- **NOTATION**
 - point to external, often non-XML information

Attribute Types

- **XML supports limited attribute value typing**
 - SGML supports a few more types, but not many

Type	Meaning	Example
CDATA	String	<!ATTLIST OBX.3 CE.1 <i>CDATA</i> #REQUIRED>
Enumerated	Table Value Restrictions	<!ATTLIST OBX.3 CE.1 (12345 45678) #IMPLIED>
Tokenized	Lexical/Semantic Constraints	<!ATTLIST CODE CODEID <i>ID</i> #IMPLIED>

96
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

XML attribute types are of three kinds: a string type, a set of tokenized types, and enumerated types. The string type may take any literal string as a value; the tokenized types have varying lexical and semantic constraints, as noted:

[54] AttType ::= StringType | TokenizedType | EnumeratedType

[55] StringType ::= 'CDATA'

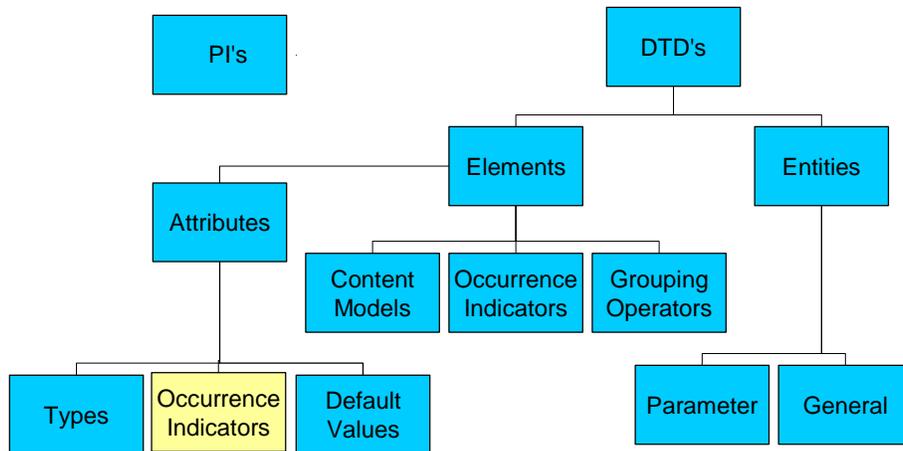
[56] TokenizedType ::= 'ID' | 'IDREF' | 'IDREFS' | 'ENTITY' | 'ENTITIES' |
'NMTOKEN' | 'NMTOKENS'

[57] EnumeratedType ::= NotationType | Enumeration

[58] NotationType ::= 'NOTATION' S '(' S? Name (S? '|' S? Name)* S? ')'

[59] Enumeration ::= '(' S? Nmtoken (S? '|' S? Nmtoken)* S? ')'

Attribute Occurrence Indicators



97
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Attribute Occurrence Indicators

- Using the "attribute occurrence indicators", you may control the conditions under which elements in instance documents have (or do not have) particular attributes
- Notice that there is no "repeating" operator
 - Each element in an instance document may have at most one occurrence of any given attribute name/value pair

Indicator	Meaning	Example
#REQUIRED	required	<!ATTLIST OBX OBX.5 CDATA <i>#REQUIRED</i> >
#IMPLIED	optional	<!ATTLIST OBX.3 CE.1 CDATA <i>#IMPLIED</i> >

98
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

An attribute declaration provides information on whether the attribute's presence is required, and if not, how an XML processor should react if a declared attribute is absent in a document.

```
[60] DefaultDecl ::= '#REQUIRED' | '#IMPLIED' | ((('#FIXED' S)?  
AttValue)
```

In an attribute declaration, #REQUIRED means that the attribute must always be provided, #IMPLIED that no default value is provided.

Attribute Occurrence Indicators

#REQUIRED

If the *#REQUIRED* occurrence indicator is present it means that instances of the element must provide a value for this attribute

XML Document

```

...
<!ATTLIST OBX
  OBX.5 CDATA #REQUIRED>
...

```

```

<ORU>
  <OBR OBR.1="1">
    <OBR.4 CE.1="80004" CE.2="ELECTROLYTES"/>
  </OBR>
  <OBX OBX.1="1" OBX.5="150" OBX.11="F">
    <OBX.3 CE.1="84295" CE.2="NA"/>
    <OBX.6 CE.1="mmol/l"/>
  </OBX>
  <OBX OBX.1="2" OBX.11="F">
    <OBX.3 CE.1="84132" CE.2="K+"/>
    <OBX.6 CE.1="mmol/l"/>
  </OBX>
</ORU>

```

Valid

Invalid

99
01/25/99 P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

An attribute declaration provides information on whether the attribute's presence is required, and if not, how an XML processor should react if a declared attribute is absent in a document.

[60] DefaultDecl ::= '#REQUIRED' | '#IMPLIED' | ((('#FIXED' S)? AttValue)

In an attribute declaration, *#REQUIRED* means that the attribute must always be provided, *#IMPLIED* that no default value is provided. If the default declaration is the keyword *#REQUIRED*, then the attribute must be specified for all elements of the type in the attribute-list declaration.

Attribute Occurrence Indicators

#IMPLIED

If the *#IMPLIED* occurrence indicator is present it means that instances of the element may, but are not required to, provide a value for this attribute

If a value is not provided, the application may "imply" a value if necessary

XML Document

```
...
<!ATTLIST OBX.3
  CE.1 CDATA #IMPLIED>
...
```

```
<ORU>
  <OBR OBR.1="1">
    <OBR.4 CE.1="80004" CE.2="ELECTROLYTES"/>
  </OBR>
  <OBX OBX.1="1" OBX.5="150" OBX.11="F">
    <OBX.3 CE.1="12345" CE.2="NA"/>
    <OBX.3 CE.1="mmol/l" CE.2="NA"/>
    <OBX.6 CE.1="mmol/l"/>
  </OBX>
</ORU>
```

CE.1="12345"

CE.1="mmol/l"

Valid

Valid

100
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

An attribute declaration provides information on whether the attribute's presence is required, and if not, how an XML processor should react if a declared attribute is absent in a document.

[60] DefaultDecl ::= '#REQUIRED' | '#IMPLIED' | ((('#FIXED' S)? AttValue)

In an attribute declaration, **#REQUIRED** means that the attribute must always be provided, **#IMPLIED** that no default value is provided.

Attribute Occurrence Indicators

- Using the "attribute occurrence indicators", you may control the conditions under which elements in instance documents have (or do not have) particular attributes
- Notice that there is no "repeating" operator
 - Each element in an instance document may have at most one occurrence of any given attribute name/value pair

Indicator	Meaning	Example
#REQUIRED	required	<!ATTLIST OBX OBX.5 CDATA <i>#REQUIRED</i> >
#IMPLIED	optional	<!ATTLIST OBX.3 CE.1 CDATA <i>#IMPLIED</i> >

101
01/25/99

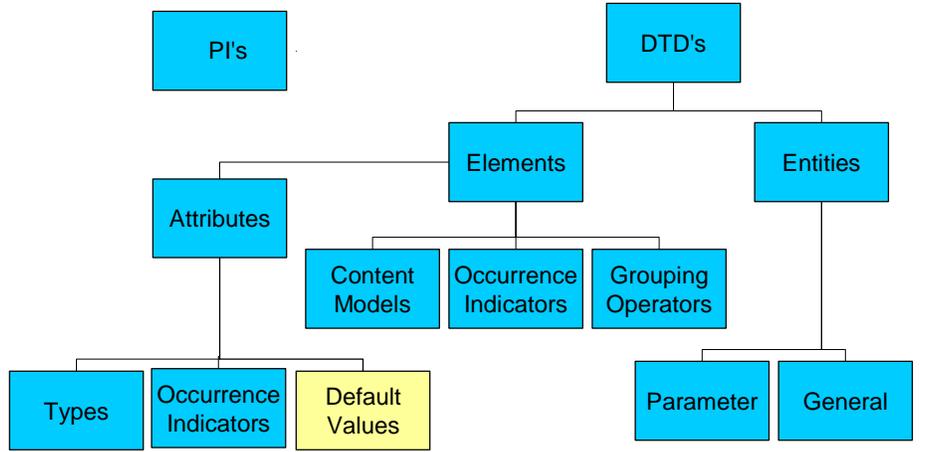
P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

An attribute declaration provides information on whether the attribute's presence is required, and if not, how an XML processor should react if a declared attribute is absent in a document.

```
[60] DefaultDecl ::= '#REQUIRED' | '#IMPLIED' | ((('#FIXED' S)?  
AttValue)
```

In an attribute declaration, #REQUIRED means that the attribute must always be provided, #IMPLIED that no default value is provided.

Attribute Default Values



102
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Attribute Default Values

- Using the "default value operators" you may specify default/fixed values for particular attributes
- If "value", the value may be changed for particular instances by providing another value
- If #FIXED, value can NOT be changed for particular instances by providing another value

Indicator	Meaning	Example
"value"	Default	<! ATTLIST OBX OBX.2 CDATA "ST">
#FIXED	Unchangeable	<!ATTLIST PID.5 longName CDATA #FIXED "PatientName">

103
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

If the declaration is neither #REQUIRED nor #IMPLIED, then the AttValue value contains the declared default value; the #FIXED keyword states that the attribute must always have the default value. If a default value is declared, when an XML processor encounters an omitted attribute, it is to behave as though the attribute were present with the declared default value.

Attribute Default Values

"default value"

Indicates that "default value" should be used when instances of the element do not provide a value for the attribute

XML Document

```
...  
<!-- ATTLIST OBX  
  OBX.2 CDATA "ST"  
  OBX.5 CDATA #IMPLIED-->  
...
```

```
<ORU>  
  <OBX      OBX.5="150">  
    <OBX.3 CE.1="12345" CE.2="NA">  
      <OBX.6 CE.1="mmol/l"/>  
    </OBX>  
</ORU>
```

XML Document

```
...  
<!-- ATTLIST OBX  
  OBX.2 CDATA #IMPLIED  
  OBX.5 CDATA #IMPLIED-->  
...
```

```
<ORU>  
  <OBX OBX.2="ST" OBX.5="150">  
    <OBX.3 CE.1="12345" CE.2="NA"/>  
    <OBX.6 CE.1="mmol/l"/>  
  </OBX>  
</ORU>
```

104
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

If the declaration is neither #REQUIRED nor #IMPLIED, then the AttValue value contains the declared default value; the #FIXED keyword states that the attribute must always have the default value. If a default value is declared, when an XML processor encounters an omitted attribute, it is to behave as though the attribute were present with the declared default value.

The declared default value must meet the lexical constraints of the declared attribute type.

#FIXED Default Values

#FIXED "value"

If the #FIXED keyword is present, it indicates that instances of this element may not give a different value for this attribute

Often used to avoid sending a "static" attribute in the document instance

XML Document

```
...
<!ELEMENT PID.5 EMPTY>
<!--ATTLIST PID.5
  longName CDATA
  #FIXED "PatientName"-->
```

```
<PID>
  <PID.5
    XPN.1="Smith" XPN.2="John"/>
  <PID.11 XPN.1="12345 Main St."
    XPN.3="Anytown"
    XPN.4="CA" XPN.5="11111">
</PID>
```

XML Document

```
...
<!ELEMENT PID.5 EMPTY>
<!--ATTLIST PID.5
  longName CDATA
  #FIXED "PatientName"-->
```

```
<PID>
  <PID.5 longName="PatientName"
    XPN.1="Smith" XPN.2="John"/>
  <PID.11 XPN.1="12345 Main St."
    XPN.3="Anytown"
    XPN.4="CA" XPN.5="11111">
</PID>
```

105
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

If the declaration is neither #REQUIRED nor #IMPLIED, then the AttValue value contains the declared default value; the #FIXED keyword states that the attribute must always have the default value. If a default value is declared, when an XML processor encounters an omitted attribute, it is to behave as though the attribute were present with the declared default value.

If an attribute has a default value declared with the #FIXED keyword, instances of that attribute must match the default value.

Attribute Default Values

- Using the "default value operators" you may specify default/fixed values for particular attributes
- If "value", the value may be changed for particular instances by providing another value
- If #FIXED, value can NOT be changed for particular instances by providing another value

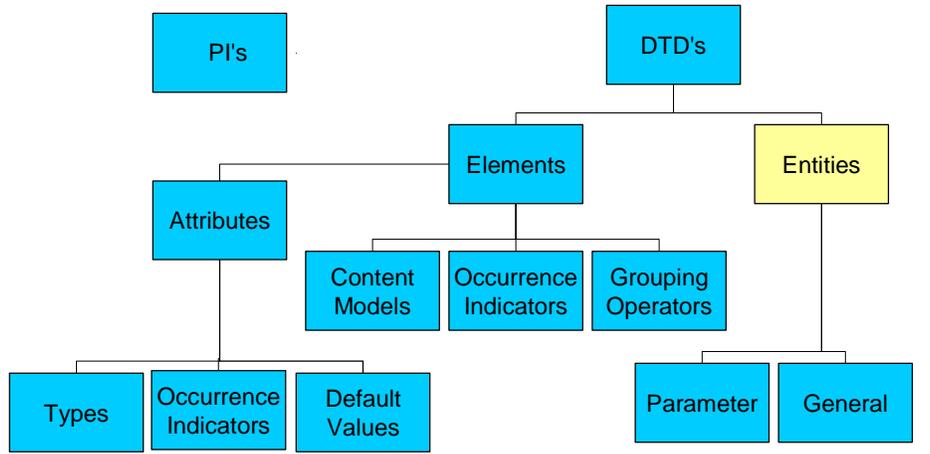
Indicator	Meaning	Example
"value"	Default	<! ATTLIST OBX OBX.2 CDATA "ST">
#FIXED	Unchangeable	<!ATTLIST PID.5 longName CDATA #FIXED "PatientName">

106
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

If the declaration is neither #REQUIRED nor #IMPLIED, then the AttValue value contains the declared default value; the #FIXED keyword states that the attribute must always have the default value. If a default value is declared, when an XML processor encounters an omitted attribute, it is to behave as though the attribute were present with the declared default value.

Entities



107
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Entities

- **Entities provide a shorthand mechanism for "naming" a block of text, known as the *replacement text***
- **When the entity name is encountered, or *referenced*, the XML processor substitutes the replacement text for the name**
- **Entities are defined in the DTD**
- **Entities are references in the DTD or in document**

108
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

A parsed entity's contents are referred to as its replacement text; this text is considered an integral part of the document.

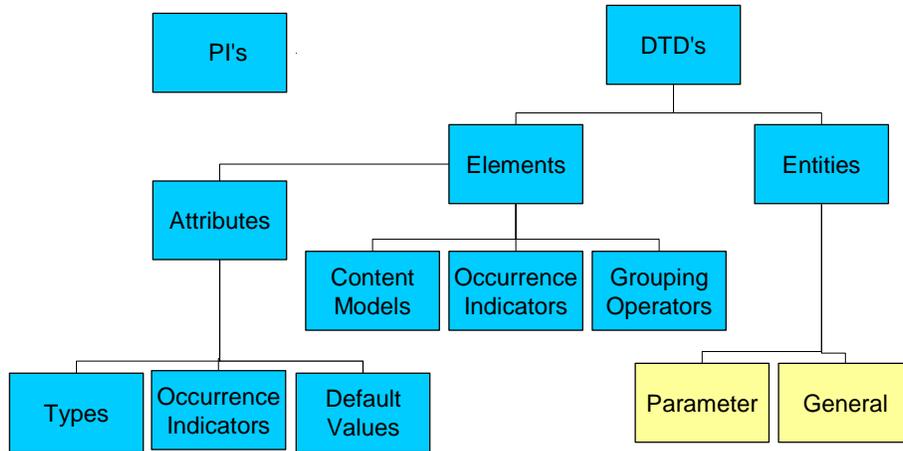
An entity reference refers to the content of a named entity.

Entities

- Entity declarations begin with `<!ENTITY`
- Followed by `ENTITY_NAME`
- Followed by `"replacement text"`
- Followed by a closing `>`

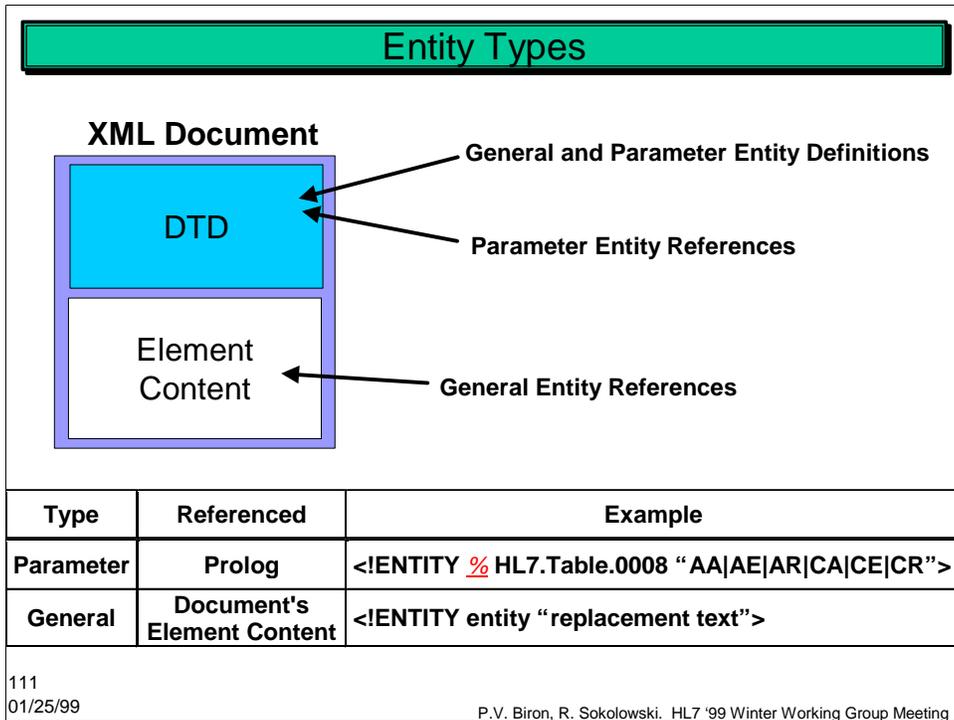
`<!ENTITY ENTITY_NAME "replacement text" >`

Entities



110
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

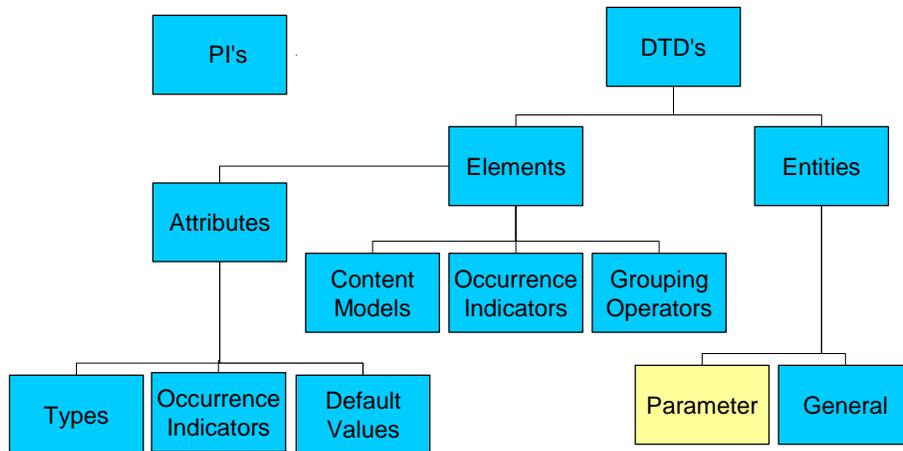


Parameter entities are parsed entities for use within the DTD. These two types of entities use different forms of reference and are recognized in different contexts. Furthermore, they occupy different namespaces; a parameter entity and a general entity with the same name are two distinct entities.

General entities are entities for use within the document content. In this specification, general entities are sometimes referred to with the unqualified term entity when this leads to no ambiguity.

An entity reference refers to the content of a named entity. References to parsed general entities use ampersand (&) and semicolon (;) as delimiters. Parameter entity references use percent-sign (%) and semicolon (;) as delimiters.

Parameter Entities



112
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Parameter Entities

Parameter Entities

References may only be used internally in a DTD

Used to build "table value restrictions" for attribute value declarations

XML Document

```
<ENTITY % HL7.Table.0008 "AA|AE|AR|CA|CE|CR">
<!ELEMENT MSA.1 EMPTY>
<!ATTLIST MSA.1 v (%HL7.Table.0008) #IMPLIED>
```

```
...
<MSA.1 v="AA"/>
<MSA.1 v="ZZ"/>
...
```

← Valid

← Invalid

113
01/25/99
P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Parameter entities are parsed entities for use within the DTD. These two types of entities use different forms of reference and are recognized in different contexts. Furthermore, they occupy different namespaces; a parameter entity and a general entity with the same name are two distinct entities.

General entities are entities for use within the document content. In this specification, general entities are sometimes referred to with the unqualified term entity when this leads to no ambiguity.

An entity reference refers to the content of a named entity. References to parsed general entities use ampersand (&) and semicolon (;) as delimiters. Parameter entity references use percent-sign (%) and semicolon (;) as delimiters.

Parameter Entities

Parameter Entities

References may only be used internally in a DTD

Often used to build consistent, maintainable element and attribute declarations

XML Document

```
<!ENTITY %CE "  
  CE.1 CDATA #IMPLIED  
  CE.2 CDATA #IMPLIED ...">  
<!ATTLIST OBX.3 %CE;>  
<!ATTLIST OBX.6 %CE;>
```

```
<ORU>  
  <OBX OBX.1="1" OBX.5="150" OBX.11="F">  
    <OBX.3 CE.1="12345" CE.2="NA"/>  
    <OBX.6 CE.1="mmol/l"/>  
  </OBX>  
</ORU>
```

114
01/25/99

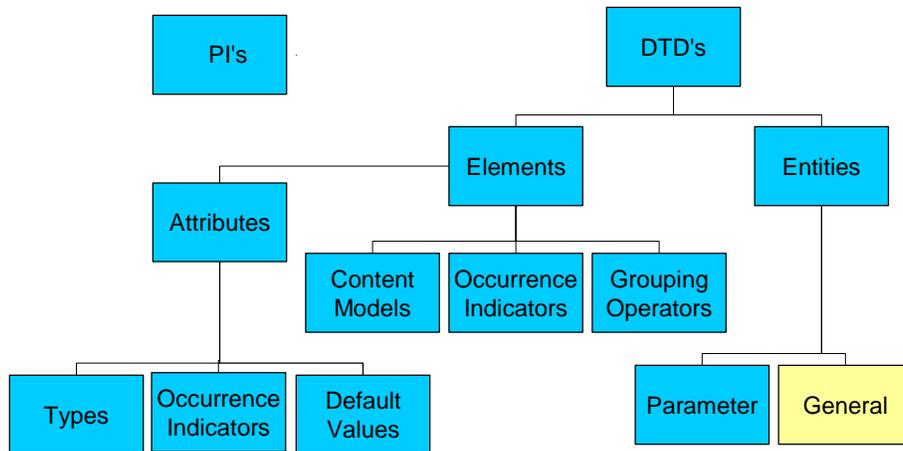
P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Parameter entities are parsed entities for use within the DTD. These two types of entities use different forms of reference and are recognized in different contexts. Furthermore, they occupy different namespaces; a parameter entity and a general entity with the same name are two distinct entities.

General entities are entities for use within the document content. In this specification, general entities are sometimes referred to with the unqualified term entity when this leads to no ambiguity.

An entity reference refers to the content of a named entity. References to parsed general entities use ampersand (&) and semicolon (;) as delimiters. Parameter entity references use percent-sign (%) and semicolon (;) as delimiters.

General Entities



115
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

General Entities

General Entities

References may only be used within a document's element content

Often used to contain long terms/phrases which are used repeatedly

XML Document

Browser Display

...
An entity's contents are referred to as its *replacement text*.
...
5 < 7 & 5 > 2.
...

```
<ENTITY entity
  "replacement text">
<ENTITY lt "<">
<ENTITY amp "&">
<ENTITY gt ">">
```

...
<P>An entity's contents are referred to as its *&entity*.</P>

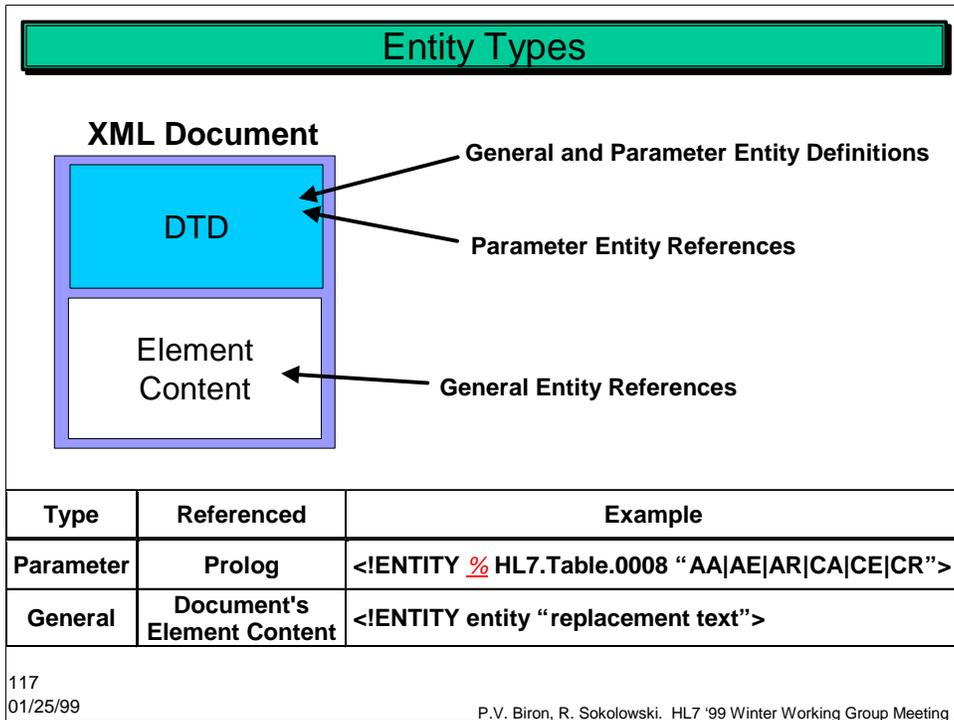
<P>5 *<*; 7 *&*; 5 *>*; 2.</P>
...

116
01/25/99
P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Parameter entities are parsed entities for use within the DTD. These two types of entities use different forms of reference and are recognized in different contexts. Furthermore, they occupy different namespaces; a parameter entity and a general entity with the same name are two distinct entities.

General entities are entities for use within the document content. In this specification, general entities are sometimes referred to with the unqualified term entity when this leads to no ambiguity.

An entity reference refers to the content of a named entity. References to parsed general entities use ampersand (&) and semicolon (;) as delimiters. Parameter entity references use percent-sign (%) and semicolon (;) as delimiters.

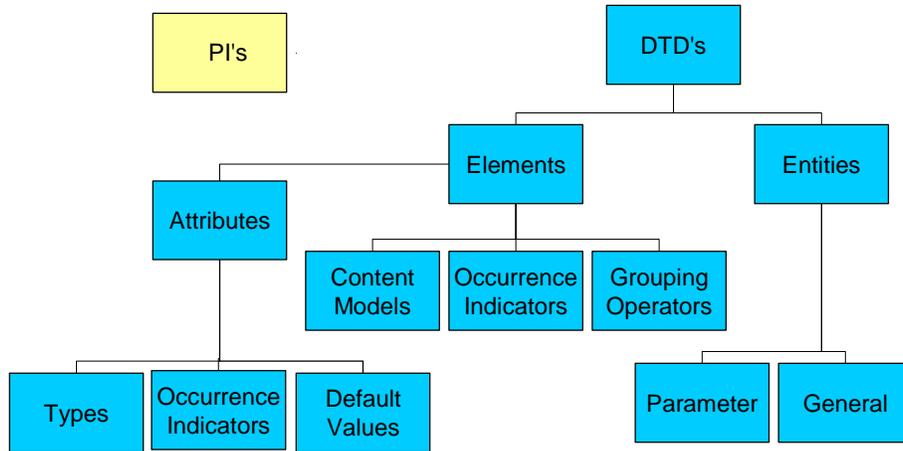


Parameter entities are parsed entities for use within the DTD. These two types of entities use different forms of reference and are recognized in different contexts. Furthermore, they occupy different namespaces; a parameter entity and a general entity with the same name are two distinct entities.

General entities are entities for use within the document content. In this specification, general entities are sometimes referred to with the unqualified term entity when this leads to no ambiguity.

An entity reference refers to the content of a named entity. References to parsed general entities use ampersand (&) and semicolon (;) as delimiters. Parameter entity references use percent-sign (%) and semicolon (;) as delimiters.

Processing Instructions



118
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Processing Instructions

- **Processing instructions (PIs) allow documents to contain instructions for applications**
- **These applications are those which receive the results of parsing the XML document**
- **An XML document may contain PIs for many different "post-processing" applications**
- **PI's may appear in both the Prolog and Element Content (i.e., in a DTD and in instance documents)**

119
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Processing instructions (PIs) allow documents to contain instructions for applications.

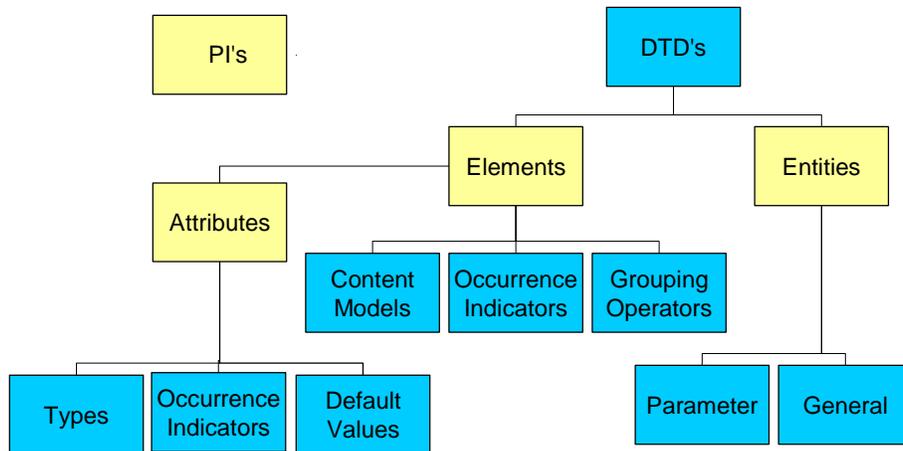
PIs are not part of the document's character data, but must be passed through to the application. The PI begins with a target (PI target) used to identify the application to which the instruction is directed. The target names "XML", "xml", and so on are reserved for standardization in this or future versions of this specification. The XML Notation mechanism may be used for formal declaration of PI targets.

Processing Instructions

- Processing instructions start with `<?`
- Followed by `TARGET_NAME`
- Followed by `arguments`
- and end with `?>`

`<? TARGET_NAME arguments ?>`

Outline

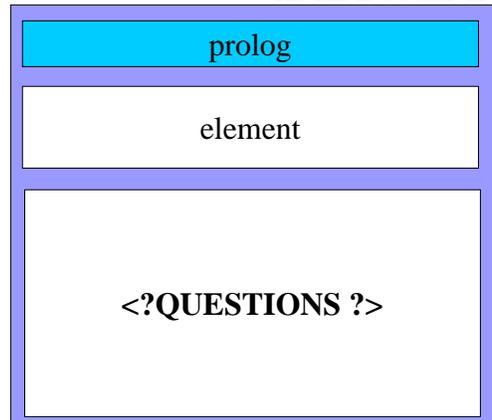


121
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Questions?

XML Document



122
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

XML Architectures
The Patient Record Architecture Proposal

Presentation
by

Paul V. Biron
paul.v.biron@kp.org

SGML Business Analyst
Permanente Clinical Systems Development
Kaiser Permanente, Southern California

123
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Outline

- **Brief description of the Patient Record Architecture (PRA) Proposal**
- **XML Architectures and Architectural Forms**
- **XML Architectural Processing**

The Patient Record Architecture Proposal

- **A hierarchical architectural framework for document-based exchange**
- **A multi-level "interlingua" for exchange**
- **Addresses various information exchange scenarios/requirements**
- **Each level is an XML Architectural DTD**
- **Implemented with XML Architectural Forms**

125
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Please refer to the HL7 SGML / XML SIG's whitepaper on the Kona Proposal for a full explanation, found on the SIG's website,
<http://www.mcis.duke.edu/standards/HL7/committees/sgml/index.html>.

At the time of this writing, the SIG's documentation for the Kona Proposal is very much in draft form and should be understood to be a work in progress.

PRA Goals

- **Use open standards**
- **Support exchange of documents between users, including those with different levels of technical sophistication**
- **Give priority to delivery of patient care**
- **Enable a wide range of post-exchange processing applications**
- **Promote exchange independent of the underlying transfer or storage mechanism**
- **Prepare the design reasonably quickly**
- **Enable policy-makers to control their own information requirements without extension to this specification**
- **Specification of document types for creation and processing other than for exchange lie outside the scope of this effort**

126
01/25/99

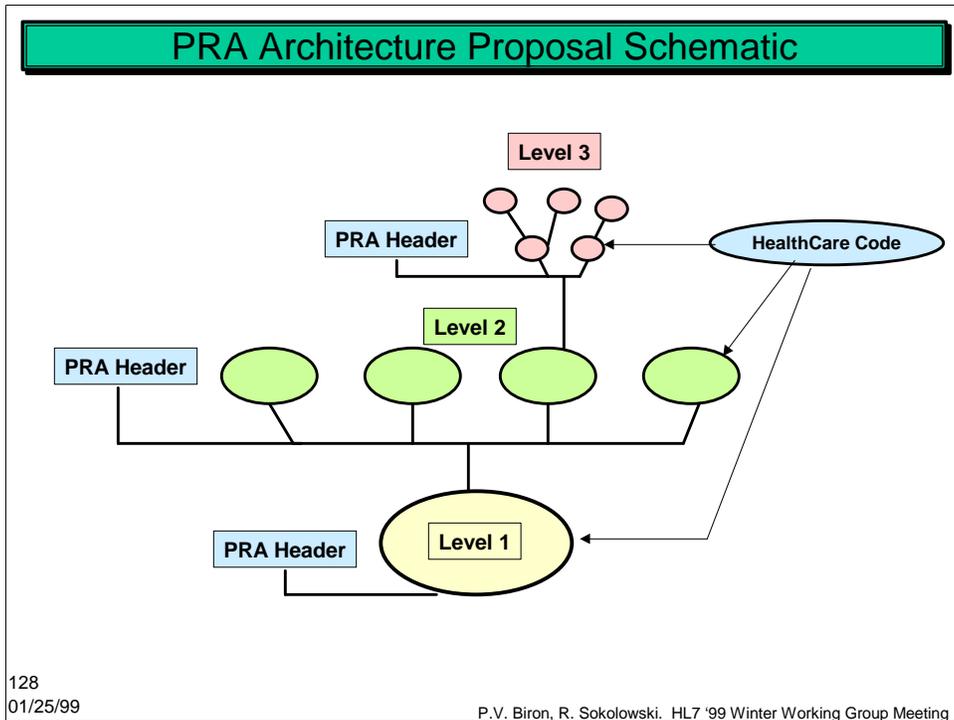
P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

PRA Design Principles

- **Shall be compatible with XML and the HL7 RIM**
- **Technical barriers to entry shall be minimized**
- **Architecture shall specify document types required for exchange**
- **Architecture shall establish minimal constraints on document structure and content required for exchange**
- **Architecture shall be scalable to accommodate highly granular markup such as highly structured text and coded data**
- **Document types based on this architecture shall accommodate such constraints as supplied by appropriate professional, commercial, and regulatory agencies**
- **Documents types for document creation and processing intended for exchange must map to the exchange architecture**

127
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting



The Kona Architecture Proposal proposes a three-tier architecture for enabling the exchange of electronic health record documents encoded in XML. The Proposal does not seek to define standard DTDs to be used by specific clinical applications. The Kona DTDs are meant to encode information that is meant to travel from one system to another. Compare this with HL7 messages: specific applications do not store data in the format of an HL7 message, but when they send the data to another system, it is encoded as an HL7 message.

The first level of the architecture is represented by the large circle at the bottom of the figure. This is the least granular and specific level. The next level, composed of the four circles, is more granular. Note that the second level's granularity is lost when transformed "down" to level 1. Level 3 works in much the same way.

Note that each level of the architecture requires the use of Header. Also, a medical code (such as an HL7 Coded Entry) may exist at any level in the markup at its original level of granularity and specificity.

This graphic is very much simplified and is used for exemplary and illustration purposes only. It does not represent specific features of the Kona Proposal.

PRA Levels

- **Levels**
 - Refers to varying degrees of required markup granularity and specificity and does not refer to the degree of granularity or depth of clinical information contained within the document
- **PRA Header**
 - The header contains required information for identifying the patient, the document, the attesting practitioner, and for classifying the document. The header has the same structure across all levels.
- **Level One: Coded Header**
 - complete interoperability for human-readable content, but does not specify markup for interoperable machine processing beyond the header

129
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

PRA Levels

- **Level Two: Coded Context**

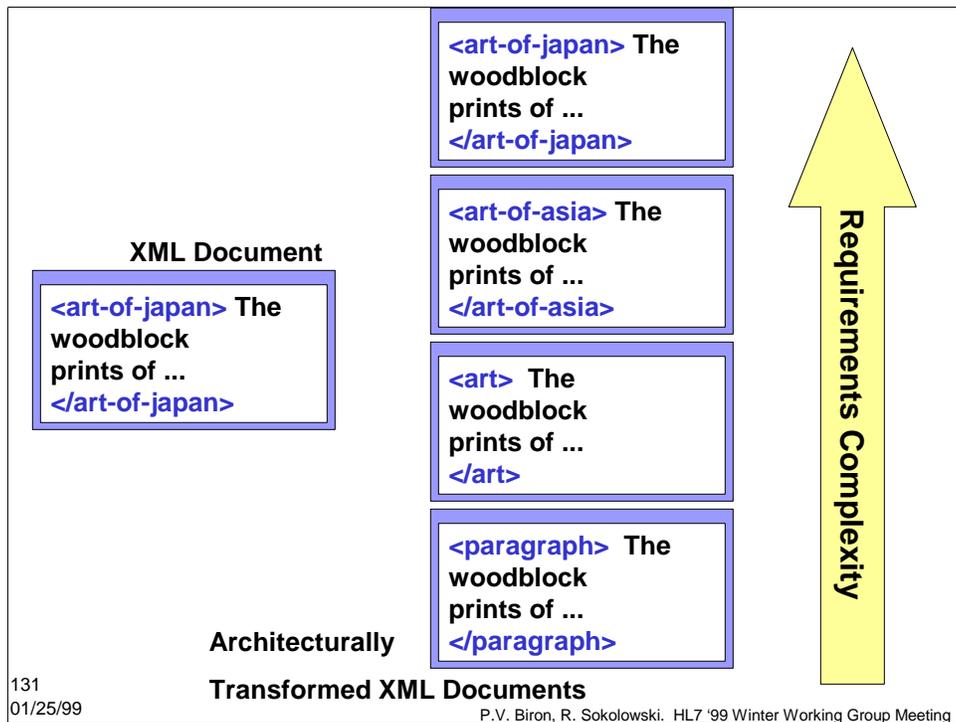
- Document body is structured into sections to support minimal processing
- There will be multiple architectural DTDs derived from one generic level 2 architectural DTD, at least one for each specialty/domain/type of document

- **Level Three: Coded Content**

- Document body must be of sufficient structure and specificity to be consistent with the RIM and be consistent with the coded header and coded context of levels 1 and 2
- The intent of level 3 is to meet the processing requirements for a full computer-based patient record
- There will be multiple architectural DTDs derived from one generic level 3 architectural DTD, at least one for each specialty/domain/type of document.

130
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting



This is an example of how a document might flow through an architectural transformation process, just as a Kona document would. This non-clinical example has been used in order to allow the reader to focus solely on the use of an architectural transformation.

The original document, on the left, has some text that is described by the element "japanese-art."

In a low-level exchange scenario (such as "display this on my browser"), it may be suitable to transform this element to one called "paragraph."

In other scenarios, the processing application might not have to know that the subject of the communication is "japanese-art," but it might be helpful to place the text into the context of "art," or even the more specific "asian art."

The level of exchange with the most rigorous requirements for precise markup is represented at the very top of the four transformed examples, with the markup "art-of-japan."

A document flowing through the Kona Architecture might look something like this at each step along the way.

What is an "Architecture"

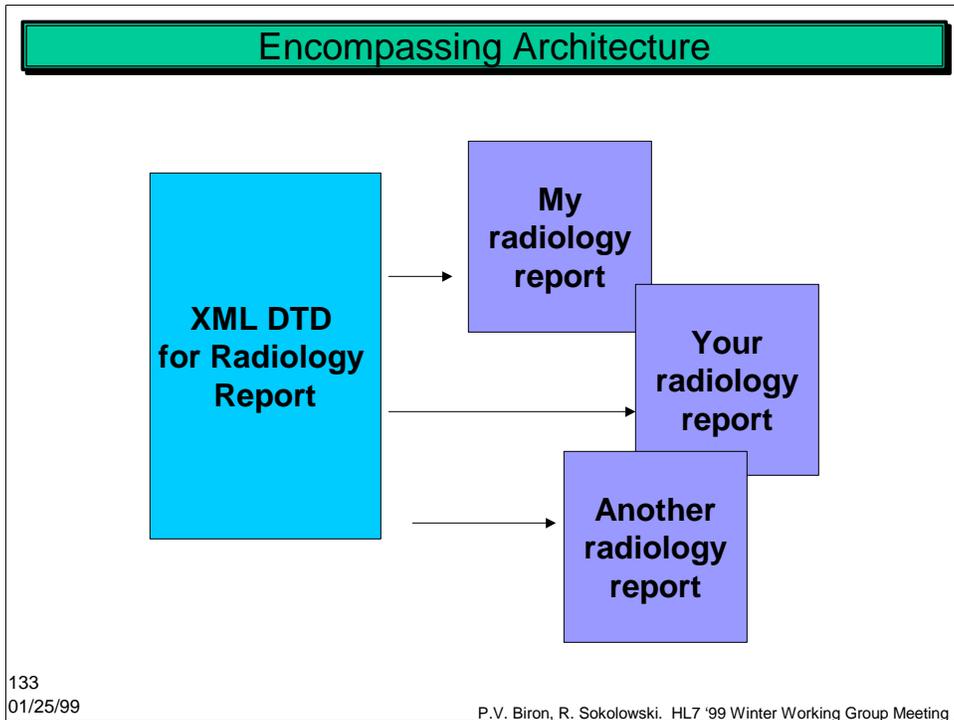
- **a document architecture can be "encompassing," governing every aspect of its documents' representation and processing. The document representation requirements for an encompassing architecture are expressed formally in a DTD.**

-- ISO/IEC 10744:1997

132
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

The SGML Architectural Forms Definition Requirements talks about two kinds of architectures, "encompassing" and "enabling." The Kona Proposal uses both. This portion of the talk will primarily focus on "enabling" architectures.



Essentially, an "encompassing" architecture is a DTD. Here we see that we have a DTD for a radiology report. This is an encompassing architecture.

From that, we can create several instances of a radiology report. They are all different reports, but they conform to one DTD, or encompassing architecture.

What is an "Architecture"

- **a document architecture can also be "enabling," in which case it does not specify complete document types. An enabling architecture defines rules known as "architectural forms" that designers may apply in crafting document type definitions.**

-- ISO/IEC 10744:1997

134
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

This portion of the talk concerns itself with a second type of architecture "Enabling Architectures."

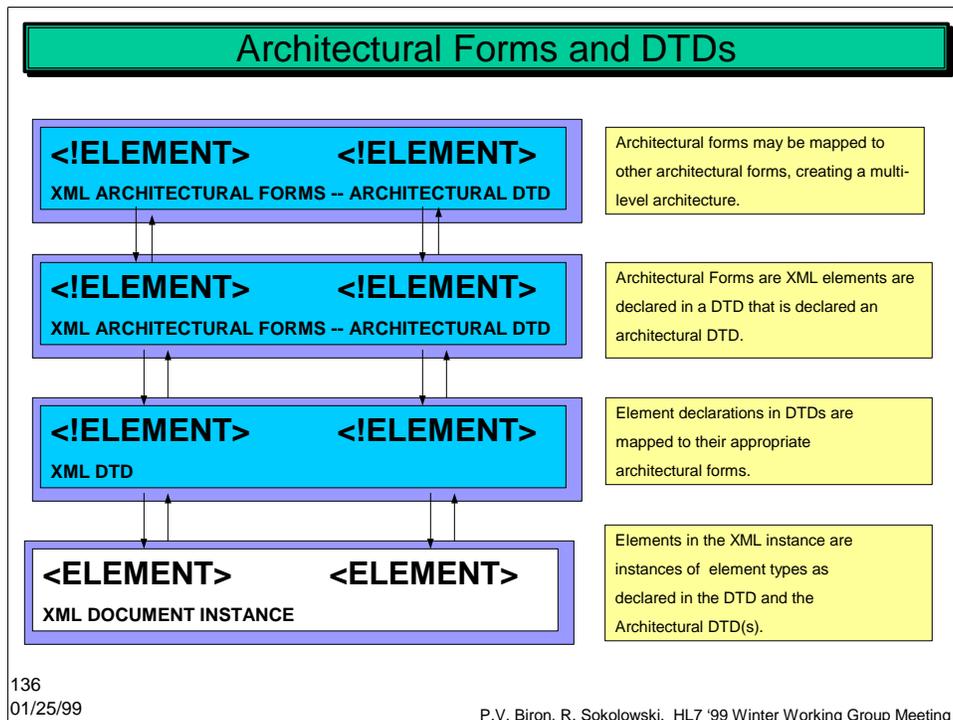
An enabling architecture is something that helps you do something else. In the case of Kona, we are using it to enable the exchange of electronic health record documents.

Other designers are able to, and have, design architectures for completely different purposes. Perhaps the most famous example of this is the HyTime Architecture itself, designed to describe hypermedia and hyperlinking.

Please refer to the note "Architectural Forms and the HyTime Standard" in the references of this tutorial.

What are "Architectural Forms?"

- **The individual components of an enabling architecture**
- **In XML, element and attributes that are declared to be "architectural"**
- **Can be used to create abstract "classes" of elements and their associated attributes**
- **An architectural DTD is a collection of architectural forms**



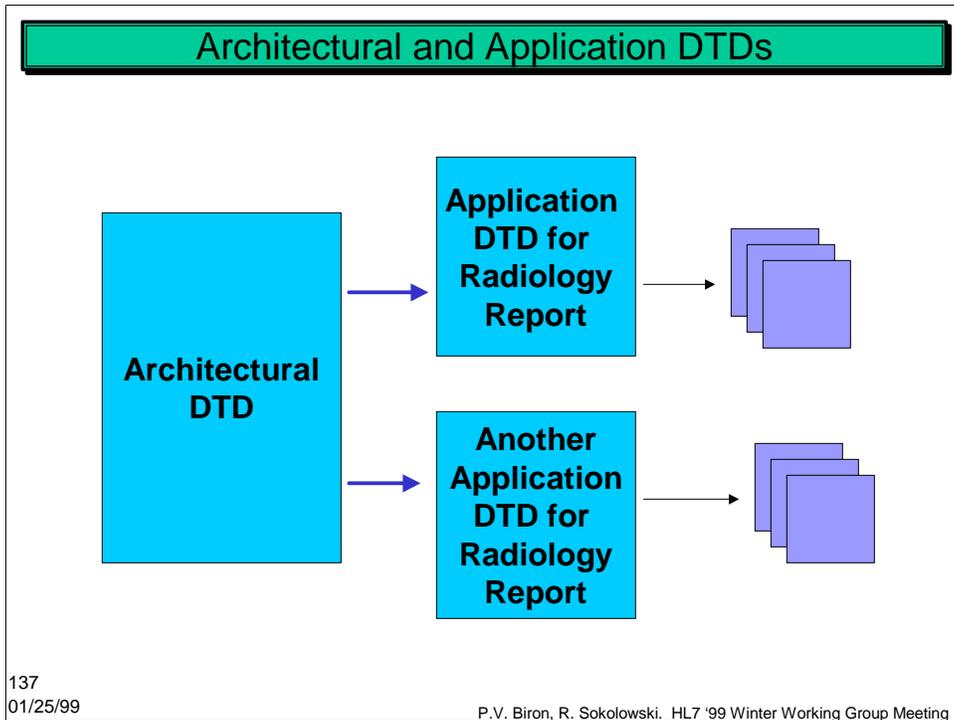
Here we have, at the bottom left, an XML document instance. This document has two elements. These two elements are instances of two elements that have been declared in a DTD.

The two elements in the DTD have been mapped to two corresponding architectural forms in an architectural DTD.

Those two architectural forms have been mapped to two higher-level architectural forms in a second architectural DTD, creating a multi-level architecture. This is basically how the Kona Architecture works.

An architectural DTD is simply an SGML/XML DTD that has been declared to be architectural. We will see how this is done later in the presentation.

If you read the standards documents and the literature on architectural forms, you will find that the terms "meta-DTD" and "architectural DTD" are synonymous and used interchangeably. The preferred term is "Architectural DTD."



137
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Here we see that two different application DTDs may be mapped to (or derived from) an architectural DTD.

XML instance documents (represented by the two "document stacks" on the far right" correspond to both their respective DTDs and also to the one architecture that those DTDs are derived from.

Radiology Report DTD

```
<!ELEMENT RadiologyReport
(PatientInfo, ClinicalData, Procedure, Findings,
Impressions, Recommendations)>

<!ELEMENT PatientInfo (Name, MRN, DOB)>

<!ELEMENT Name (#PCDATA)>
<!ELEMENT MRN (#PCDATA)>
<!ELEMENT DOB (#PCDATA)>

<!ELEMENT ClinicalData (#PCDATA)>
<!ELEMENT Procedure (#PCDATA)>
<!ELEMENT Findings (#PCDATA)>
<!ELEMENT Impressions (#PCDATA | HistoricalProcedure)*>
<!ELEMENT Recommendations (#PCDATA)>

<!ELEMENT HistoricalProcedure (#PCDATA)>
```

138
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

This is an example of a DTD that might be used to encode radiology reports.

The markup structures the document into a header and a sequence of sections. The header contains basic patient information. The individual sections comprise the major sections of a traditional radiology report.

XML Radiology Report	
	<pre><?xml version="1.0"?> <!DOCTYPE RadiologyReport SYSTEM "radiology.dtd"</pre>
<pre><RadiologyReport> <PatientInfo> <Name>Henry Levin, the 7th</Name> <MRN>123456789</MRN> <DOB>May 13, 1923</DOB> </PatientInfo> <ClinicalData>History of smoking for 40 years.</ClinicalData> <Procedure>Chest X-ray</Procedure> <Findings> Comparison is made with a chest-x-ray ... </Findings> <Impressions> RLL nodule, suggestive of malignancy. Compared with a prior <HistoricalProcedure>CXR</HistoricalProcedure> from 6 months ago, nodule size has increased. </Impressions> <Recommendations> I notified the ordering physician of this finding by phone. </Recommendations> </RadiologyReport></pre>	
139 01/25/99	P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Here is a sample Radiology Report, encoded in XML.

The markup structures the document into a header and a sequence of sections. The header contains basic patient information. The individual sections comprise the major sections of a traditional radiology report.

This document would have a natural mapping to a Level One PRA document, as demonstrated in the following slides.

"LevelOne" Architectural DTD

LevelOne.dtd

```
<!ELEMENT LevelOne (header, section+)>
<!ELEMENT header (name?, identifier?, birthdate?)>
<!ELEMENT section (#PCDATA | other)*>
<!ELEMENT other (#PCDATA)>
<!ELEMENT name (#PCDATA)>
<!ELEMENT identifier (#PCDATA)>
<!ELEMENT birthdate (#PCDATA)>
```

140
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

This is an example of an architectural DTD that can be used with a wide array of documents, including the radiology report.

It has a header, much like a PRA document would (only it is very simplified for exemplary purposes). The child elements of "header" have been made optional to demonstrate the concept "architectural suppression" later in the presentation.

The element "other" will be discussed in the "architectural bridge" portion of this presentation.

Note that there is only one generic element called "section" that will be used to encode the markup of more specific elements in the original radiology report and DTD.

Transformed Radiology Report

```
<?xml version="1.0"?>
<!DOCTYPE LevelOne SYSTEM "LevelOne.dtd"

<LevelOne>
<header>
  <name>Henry Levin, the 7th</name>
  <identifier>123456789</identifier>
  <birthdate>May 13, 1923</birthdate>
</header>

<section>History of smoking for 40 years.</section>

<section>Chest X-ray</section>

<section>Comparison is made with a chest-x-ray . . .</section>

<section>RLL nodule, suggestive of malignancy. Compared with a prior CXR from
6 months ago, nodule size has increased.</section>

<section>I notified the ordering physician of this finding by phone.</section>
</LevelOne>
```

The element HistoricalProcedure is no longer present in this architectural instance, yet the data characters "CXR" are still present.

141
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

If we had a very simple or low-level exchange scenario for our radiology report, we might want the markup to look something like this. We've retained the patient information in a standardized header, and everything else has become a section.

Note the element "historical procedure" is no longer present in this architectural instance, yet the data characters "CXR" are still present. This is explained in the following slides.

Architectural Processing

- **Architecture declarations**
- **Creating an architectural instance**
- **Automatic vs. explicit architectural forms mapping**
- **Character data and non-architectural elements**
- **Architectural bridges**
- **Suppression**

142
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Architectural processing allows many things to be done with documents. These examples represent some of the more common things that are often done, but is by no means a complete list.

Architecture Declaration(s)

processing instruction used to declare the architecture with name "LevelOne" for usage in the **RadiologyReport** DTD. This "architecture declaration" is similar to the "doctype declaration."

```
<?IS10744:arch name="LevelOne" dtd-system-id="LevelOne.dtd"?>
<!ELEMENT RadiologyReport
(PatientInfo, ClinicalData, Procedure, Findings, Impressions, Recommendations)>
<!ATTLIST RadiologyReport
  LevelOne NMTOKEN #FIXED "LevelOne">
<!ELEMENT PatientInfo (Name, MRN, DOB)>
<!ATTLIST PatientInfo
  LevelOne NMTOKEN #FIXED "header">
<!ELEMENT Name (#PCDATA)>
<!ATTLIST Name
  LevelOne NMTOKEN #FIXED "name">
```

The element "**PatientInfo**" in this DTD is declared to be architecturally derived from the element "**header**" in the **LevelOne** meta DTD.

"LevelOne" Architectural Instance

```
<?xml version="1.0"?>
```

```
<!DOCTYPE LevelOne SYSTEM "LevelOne.dtd"
```

```
<LevelOne>
<header>
  <name>Henry Levin, the 7th</name>
  <identifier>123456789</identifier>
  <birthdate>May 13, 1923</birthdate>
</header>
<section>History of smoking for 40 years.</section>
<section>Chest X-ray</section>
<section>Comparison is made with a chest-x-ray . . .</section>
<section>RLL nodule, suggestive of malignancy. Compared with a prior CXR from
6 months ago, nodule size has increased.</section>
<section>I notified the ordering physician of this finding by phone.</section>
</LevelOne>
```

The markup designating CXR as an HistoricalProcedure has been lost because that element has no corresponding architectural declaration. The element's data characters have been retained, by default.

144
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Ignoring Data Characters

- **Previous example retained data characters from HistoricalProcedure element**
- **Behavior determined by the "ignore-data-att" attribute**
 - nArclgnD -- data not ignored
 - cArclgnD -- data conditionally ignored (default)
 - ArclgnD -- data always ignored

Data Characters Preserved, By Default

Client Instance

```
<?xml version="1.0"?>
<!DOCTYPE RadiologyReport SYSTEM "radiology.dtd"

<RadiologyReport>
...
<Impressions>RLL nodule, suggestive of malignancy . . .Compared with a prior
<HistoricalProcedure>CXR</HistoricalProcedure>
from 6 months ago, nodule size has increased.</Impressions>

<Recommendations>I notified the ordering physician . .
...
</RadiologyReport>
```

The markup designating CXR as an HistoricalProcedure has been lost because that element has no corresponding architectural declaration. The element's data characters have been retained, by default.

Architectural Instance

```
<?xml version="1.0"?>
<!DOCTYPE LevelOne SYSTEM "LevelOne.dtd"

<LevelOne>...<section>RLL nodule, suggestive of malignancy. Compared with a prior
CXR from 6 months ago, nodule size has increased.</section>...</LevelOne>
```

146
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Declaration to Ignore Data Characters

```
<?IS10744:arch name="LevelOne" dtd-system-id="LevelOne.dtd"
```

```
  ignore-data-att="LevelOneIgnore"
```

```
?>
```

```
...
```

```
<!ELEMENT HistoricalProcedure (#PCDATA)>
```

```
<!ATTLIST HistoricalProcedure  
  LevelOneIgnore NMTOKEN #FIXED "ArclgnD">
```

```
...
```

The "ignore-data-att" has been set to "LevelOneIgnore." It can later be used to describe how data characters are handled in non-architectural elements.

The LevelOneIgnore attribute has been set to "ArclgnD" in this example. This means that the data characters of the element Historical Procedure will not be present in the architectural instance.

Architectural Instance with Ignored Data Characters

```
<?xml version="1.0"?>
<!DOCTYPE LevelOne SYSTEM "LevelOne.dtd"

<LevelOne>
  <header>
    <name>Henry Levin, the 7th</name>
    <identifier>123456789</identifier>
    <birthdate>May 13, 1923</birthdate>
  </header>

  <section>History of smoking for 40 years.</section>

  <section>Chest X-ray</section>

  <section>Comparison is made with a chest-x-ray . . .</section>

  <section>RLL nodule, suggestive of malignancy. Compared with a prior      from
  6 months ago, nodule size has increased.</section>

  <section>I notified the ordering physician of this finding by phone.</section>
</LevelOne>
```

Data characters from HistoricalProcedure are not present in this architectural instance

148
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Automatic Architectural Association

- **Elements with same name as architectural elements may or may not be associated automatically**
- **To control this, use the "auto" attribute**
- **Possible values are**
 - "nArcAuto" -- do not automatically associate
 - "ArcAuto" -- automatically associate

Declaring Automatic Association

```
<?IS10744:arch name="LevelOne" dtd-system-id="LevelOne.dtd"
  auto="ArcAuto"
?>
<!ELEMENT RadiologyReport
(PatientInfo, ClinicalData, Procedure, Findings, Impressions, Recommendations)>
<!ATTLIST RadiologyReport
  LevelOne NMTOKEN #FIXED "LevelOne">
<!ELEMENT PatientInfo (Name, MRN, DOB)>
<!ATTLIST PatientInfo
  LevelOne NMTOKEN #FIXED "header">
<!ELEMENT Name (#PCDATA)>
```

Auto="ArcAuto", so elements with the same name will be associated automatically

No need to explicitly associate "name" with "name" in the Meta DTD -- nArcAuto means this will happen automatically

"LevelOne" Meta DTD

LevelOne.dtd

```
<!ELEMENT LevelOne (header, section+)>
<!ELEMENT header (name?, identifier?, birthdate?)>
<!ELEMENT section (#PCDATA | other)*>
<!ELEMENT other (#PCDATA)>
<!ELEMENT name (#PCDATA)>
<!ELEMENT identifier (#PCDATA)>
<!ELEMENT birthdate (#PCDATA)>
```

Automatic Element Association

```
<?xml version="1.0"?>
```

```
<!DOCTYPE LevelOne SYSTEM "LevelOne.dtd"
```

```
<LevelOne>
<header>
  <name>Henry Levin, the 7th</name>
  <identifier>123456789</identifier>
  <birthdate>May 13, 1923</birthdate>
</header>

<section>History of smoking for 40 years.</section>

<section>Chest X-ray</section>

<section>Comparison is made with a chest-x-ray . . .</section>

<section>RLL nodule, suggestive of malignancy. Compared with a prior CXR from
6 months ago, nodule size has increased.</section>

<section>I notified the ordering physician of this finding by phone.</section>
</LevelOne>
```

152
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Architectural Bridges

- **Not always feasible/necessary to create a specific AF for every element**
- **Every classification system has an "other" (Z segments!)**
- **Use an "architectural bridge"**
- **Set "bridge-form" attribute to the name of the element you choose for the architectural bridge**

153
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Architectural Bridge Declarations

```
<?IS10744:arch name="LevelOne" dtd-sys
```

```
  bridge-form="other"
```

```
?>
```

```
<!ELEMENT RadiologyReport  
(PatientInfo, ClinicalData, Procedure, Findings, Impressions, Recommendations)>
```

```
...
```

```
<!ELEMENT HistoricalProcedure (#PCDATA)>  
<!ATTLIST HistoricalProcedure  
  LevelOne NMTOKEN #FIXED "other">
```

```
...
```

bridge-form="other"; elements that are not architectural, but whose granularity should be preserved with **some** markup can be mapped to "other."

The element `HistoricalProcedure` has been declared to be an architectural bridge element by mapping it to the "other" element in the `LevelOne` architecture.

Architectural Instance with Architectural Bridge

```
<?xml version="1.0"?>
<!DOCTYPE LevelOne SYSTEM "LevelOne.dtd"
```

```
<LevelOne>
  <header>
    <name>Henry Levin, the 7th</name>
    <identifier>123456789</identifier>
    <birthdate>May 13, 1923</birthdate>
  </header>

  <section>History of smoking for 40 years.</section>

  <section>Chest X-ray</section>

  <section>Comparison is made with a chest-x-ray . . .</section>

  <section>RLL nodule, suggestive of malignancy. Compared with a prior
    <other>CXR</other>
    from 6 months ago, nodule size has increased.</section>

  <section>I notified the ordering physician of this finding by phone.</section>
</LevelOne>
```

155
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Architectural Suppression

- **Allows architectural processing to be turned off and on for parts of document**
- **If architectural processing is turned off for an element, its child elements are not present in the architectural instance**
- **Example, hide the "patient information" in the architectural instance**

Architectural Suppression Declarations

```
<?IS10744:arch name="LevelOne"  
dtd-system-id="LevelOne.dtd"
```

Declare the suppressor attribute to be "LevelOneSuppress" in the processing instruction.

```
  suppressor-att="LevelOneSuppress"
```

```
?>
```

```
<!ELEMENT RadiologyReport  
(PatientInfo, ClinicalData, Procedure, Findings, Impressions,  
Recommendations)>
```

```
...
```

```
<!ELEMENT PatientInfo      (Name, MRN, DOB)>
```

```
<!ATTLIST PatientInfo  
  LevelOne NMTOKEN #FIXED "header"  
  LevelOneSuppress NMTOKEN #FIXED "sArcAll"  
>
```

Declare the value of the "LevelOneSuppress" attribute for the element "PatientInfo" to be "sArcAll" to suppress all architectural processing of child elements.

157
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Architectural Instance with PatientInfo Suppressed

```
<?xml version="1.0"?>
<!DOCTYPE LevelOne SYSTEM "LevelOne.dtd"

<LevelOne>
  <header>
</header>
  <section>History of smoking for 40 years.</section>
  <section>Chest X-ray</section>
  <section>Comparison is made with a chest-x-ray . . .</section>
  <section>RLL nodule, suggestive of malignancy. Compared with a prior CXR from
6 months ago, nodule size has increased.</section>
  <section>I notified the ordering physician of this finding by phone.</section>
</LevelOne>
```

All of the **Patient Information** has been suppressed, and it is not present in this architectural instance.

158
01/25/99

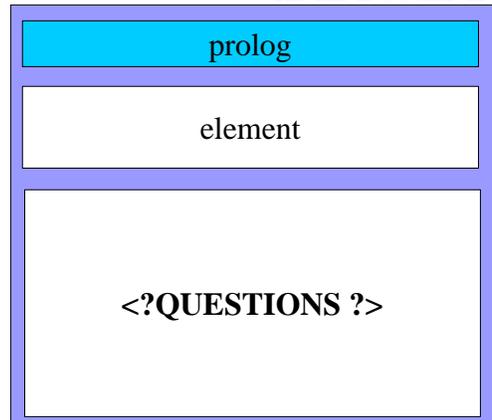
P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Architectural Processing, In a Nutshell

- **Allows for a standards-based, declarative way to describe SGML/XML transformations**
- **This information is encoded directly in the DTD or document instance itself**
- **Can be processed by tools that are conforming SGML/XML architecture engines**

Questions?

XML Document



160
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

V3 XML ITS, PRA and
the HIMSS '99 Demo

Presentation
by

Paul V. Biron

paul.v.biron@kp.org

SGML Business Analyst
Permanente Clinical Systems Development
Kaiser Permanente, Southern California

161
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Outline

- **V3 Improvements Demonstrated**
- **Functional Scenarios**
 - V3 XML ITS
 - Patient Registration
 - Lab Order
 - Lab Result
 - Lab Result Query
 - Patient Record Architecture Documents
 - History and Physical
 - Progress Note
 - Transcription
- **Demo Participants**

162
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

V3 Improvements Demonstrated

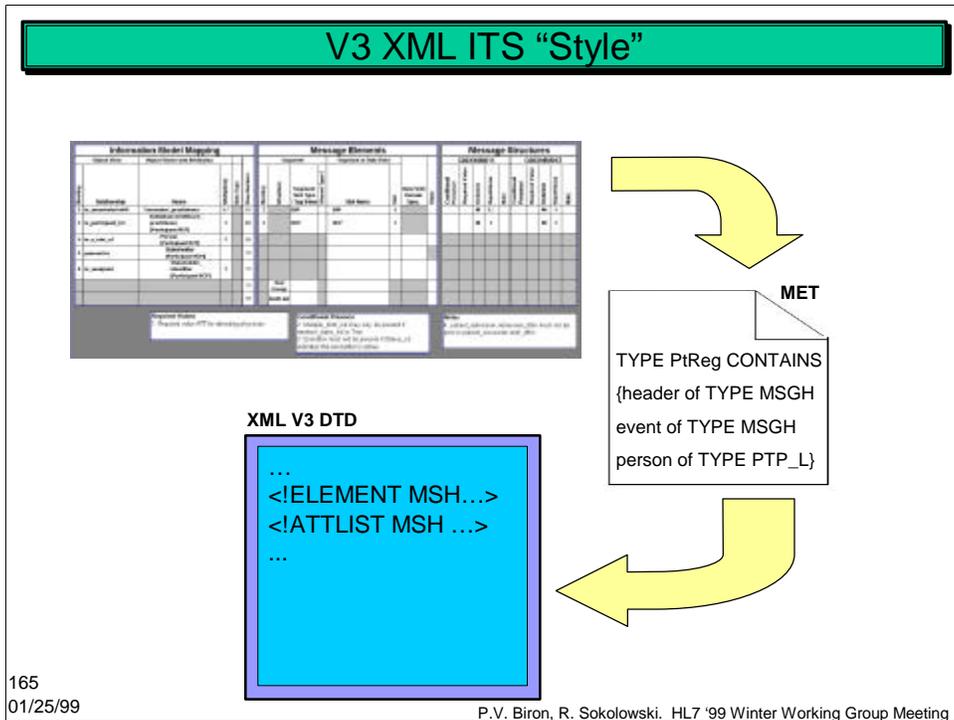
- **Leverages the latest technologies available, including XML**
-
- **The PRA is an XML framework for document exchange, manipulation, portability and longevity in health care**
- **V3 messages will contain less optionality than their V2.x counterparts. In addition, V3 will debut long awaited conformance profiles. More precise messages require less site specific negotiation and custom programming, resulting in decreased implementation costs**

163
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

V3 Improvements Demonstrated

- **PRA documents can import information from V3 messages, and information in PRA documents can be used to generate V3 messages**
- **The cornerstone of all these improvements is the HL7 Reference Information Model (RIM). The RIM makes our new work more precisely defined and assures that the individual initiatives can work together**



The V3 XML DTDs are generated automatically from common information specifications.

The last stage of the basic V3 Message Development Framework (MDF) is the production of a Hierarchical Message Description (HMD). HMD's are usually represented as Excel spreadsheets. The native HMD representation was difficult to translate directly into an XML DTD; hence, the introduction of the Message Element Type Language (METL). METL is similar to type/record definition syntax from programming languages such as Pascal.

The information contained in the MET is equivalent to that in the HMD. The MET is algorithmically converted into an XML DTD. This process insures that every V3 XML DTD follows the same "style" and represents the same message structure as messages in other ITS's derived from the same HMD.

V3 XML ITS "Style"

- **Each message element type is one of:**
 - composite
 - list
 - choice
 - primitive
- **XML element names constructed as follows:**
 - name of composite type "." name of component
 - names derived from shortened version of RIM attribute or data type
- **Each XML element derived from the message element types has attributes for**
 - long names (HL7_name, derived from RIM attributes)
 - data type (T)

166
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Message element: The basic unit of structure of a V3 message. Message elements can contain other message elements.

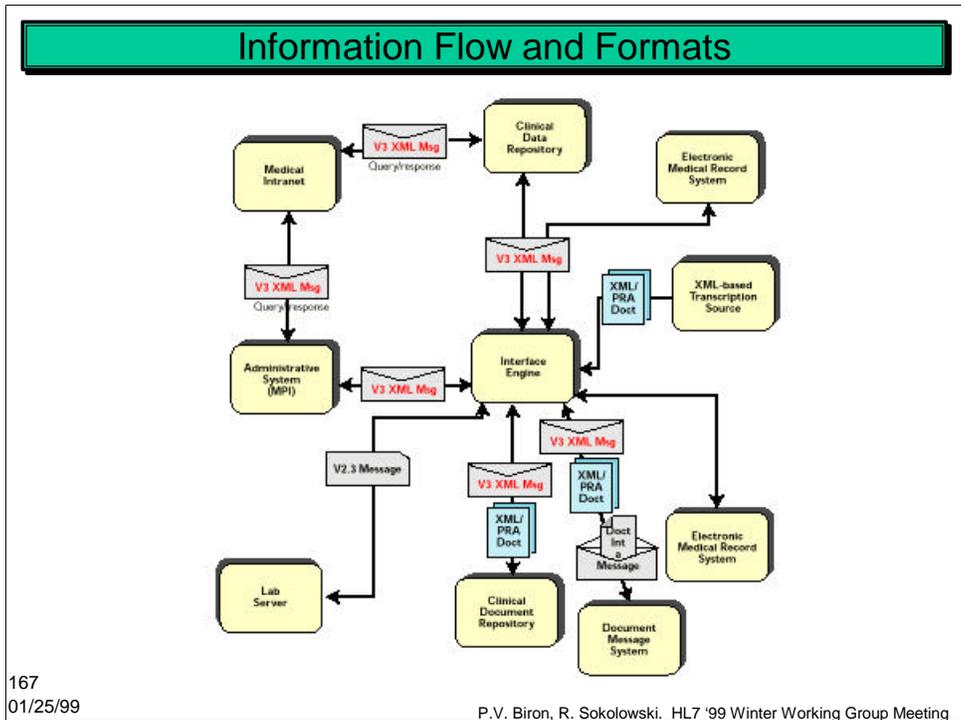
Message element type: A specification for the values that a message can take on in its instances.

Composite message element type: A message element type that contains other message elements (components). Each component message element type has a name and a type. Each component of an element must have a different name, although many may be of the same type

Choice message element type: A composite message element type for which only one of the components will be sent in an instance.

Primitive message element type: A message element type that does not contain other message element types.

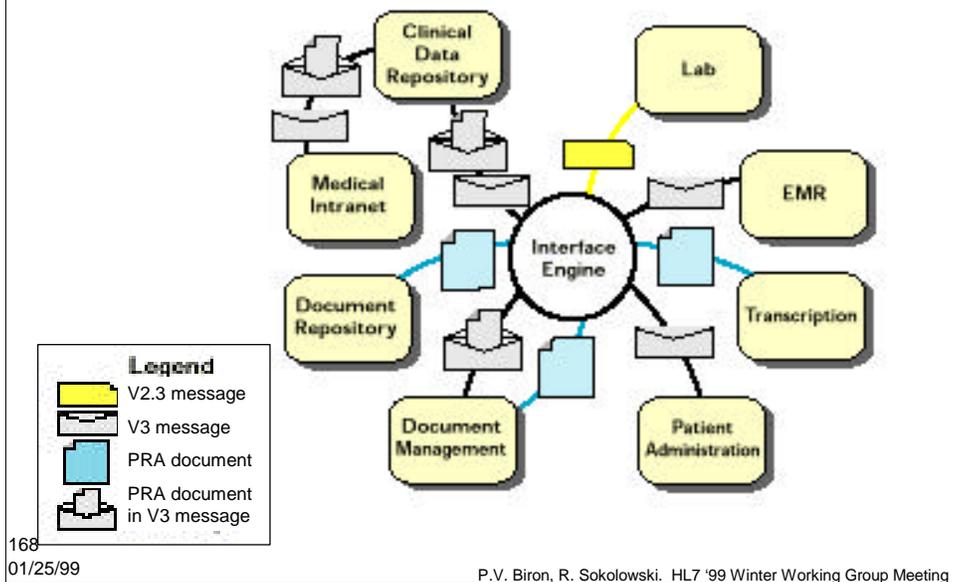
For more info, see Message Element Type Language Tutorial
<http://www.mcis.duke.edu/standards/HL7/sigs/sgml/himss/MessageElementLanguage.pdf>



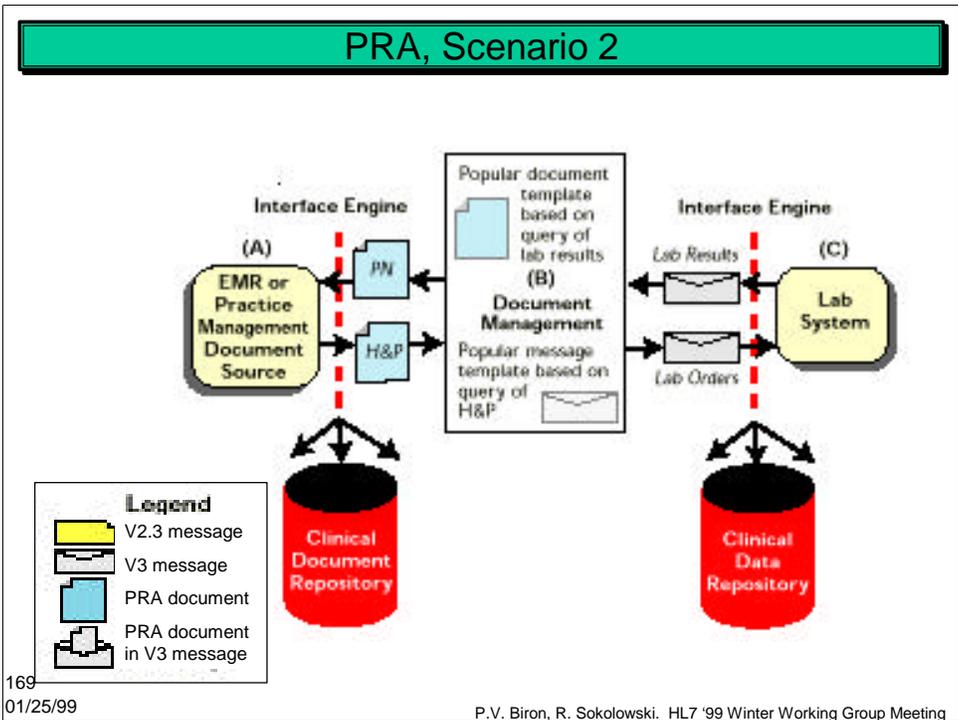
This image represents the overall information flow between systems in the HIMSS demo.

Notice that most of the flow passes through the interface engine. This demonstrates that an interface engine can serve to help with evolutionary deployment of V3 XML and PRA in large enterprises which must also support traditional 2.x HL7 encoded messages.

Messaging, Scenario 1

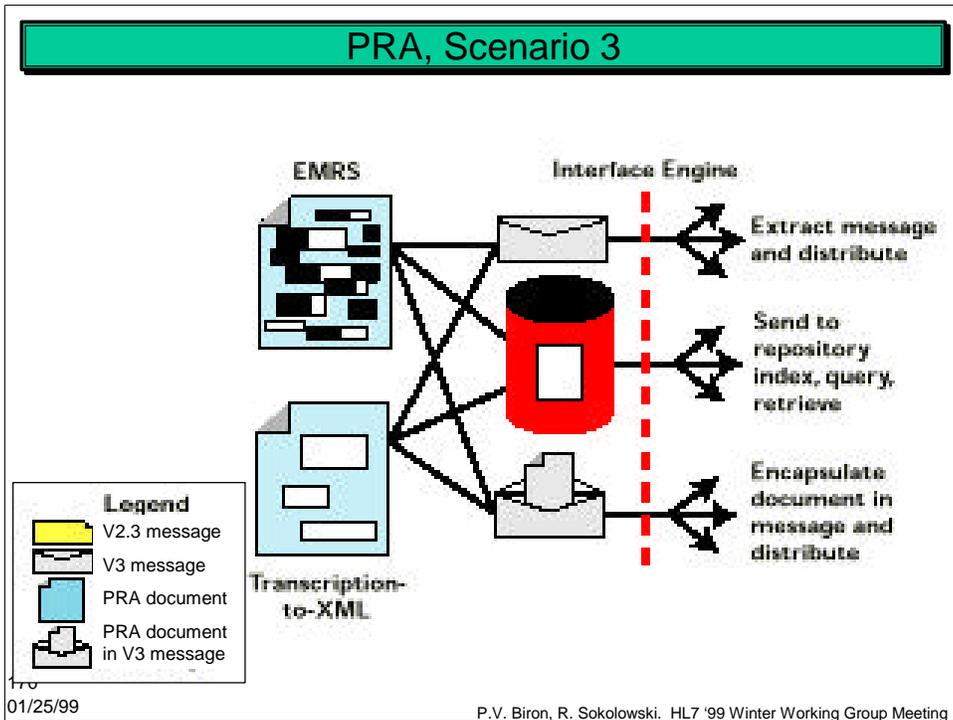


A complex healthcare enterprise may use an interface engine to introduce V3 and document sharing in an evolutionary manner. In the demonstration, the interface engine translates between V3 and V2.3 to support the laboratory system. The interface engine also broadcasts patient administration data and selectively routes PRA documents.



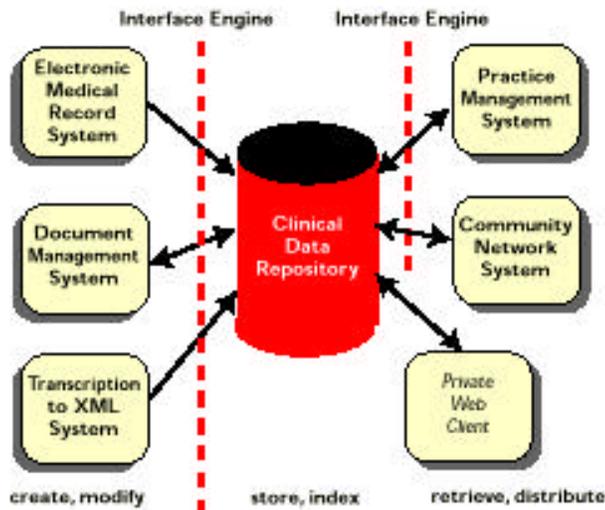
EMR, transcription or other sources of documents (A) sends H&Ps through an interface to a document management system (B) which queries the document for indication that lab work is required. If found, a lab order message template is populated and sent through an interface to a lab system (C).

On receipt of a lab result message, the document management system queries the message to populate a document template. The new document is sent to the interface where it can be distributed.



PRA document with highly granular, complex markup from EMR systems and PRA documents with simple markup from transcription systems can be distributed, stored, queried, and retrieved using common protocols and repositories. Documents can be distributed within messages as stand-alone files and data from documents can be extracted and sent in a message.

PRA, Scenario 4



171
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Documents created in systems of widely disparate characteristics can be stored indexed, and retrieved from a single repository and distributed by query or look-up for display and post-processing.

HIMSS Demo Participants

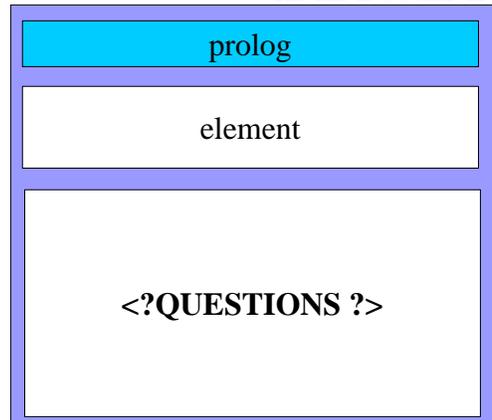
- **Care Data Systems**
- **CareFlow|Net, Inc.**
- **Epic Systems Corporation**
- **Health Network Ventures (HNV)**
- **MedicaLogic, Inc.**
- **Oceania**
- **Orchard Software Corporation**
- **Sequoia Software Corporation**
- **Software Technologies Corporation (STC)**
- **Texcel Research, Inc.**

172
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Questions?

XML Document



173
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Acknowledgements

- **We would like to thank the following people, who help create an earlier version of this tutorial**
 - **Bob Dolin**, Kaiser Permanente, So Cal
 - **Jason Williams**, Oceania, Incorporated

174
01/25/99

P.V. Biron, R. Sokolowski. HL7 '99 Winter Working Group Meeting

Jason Williams would also like to thank

Eliot Kimber, co-author of the HyTime standard, has answered numerous questions, both individually and on the comp.text.sgml newsgroup

David Megginson wrote an excellent tutorial on XML Architectural Forms that formed a partial basis for this presentation

his employer, Oceania, Incorporated, who has made it possible for him to contribute to XML related standards in the context of healthcare informatics

1. REFERENCES

- Standards Documents
 - World Wide Web Consortium. Extensible Markup Language (XML) 1.0. W3C Recommendation, Feb 10, 1998.
<http://www.w3.org/TR/1998/REC-xml-19980210.html>
 - Information processing – Text and office systems – Standard Generalized Markup Language (SGML). ISO 8879:1986. October, 1986.
 - Information processing – Text and office systems – Standard Generalized Markup Language (SGML), Amendment 1. ISO 8879:1986/AMENDMENT 1. July, 1988.
 - World Wide Web Consortium. HTML 3.2 reference specification. W3C Recommendation, Jan 14, 1997.
<http://www.w3.org/TR/REC-html32.html>
 - Document Content Description for XML, Submission to the World Wide Web Consortium 31-July-1998
<http://www.w3.org/TR/NOTE-dcd>
 - ISO (International Organization for Standardization). ISO/IEC 10646-1993 (E). Information technology -- Universal Multiple-Octet Coded Character Set (UCS) - - Part 1: Architecture and Basic Multilingual Plane. [Geneva]: International Organization for Standardization, 1993 (plus amendments AM 1 through AM 7).
 - DSSSL, Front Matter: <ftp://ftp.ornl.gov/pub/sgml/WG8/DSSSL/dsssl96f.pdf>
 - DSSSL, Body: <ftp://ftp.ornl.gov/pub/sgml/WG8/DSSSL/dsssl96b.pdf>
 - Hypermeida/Time-based Structuring Language (HyTime). ISO/IEC 10744:1992(E) Second Edition. (Check the WWW page of the HyTime User's Group, <http://www.hytime.org>, for various on-line formats of the HyTime standard.) (Please refer to the note "Architectural Forms and the HyTime Standard" at the end of this section.).
 - ISO/IEC 10744 Amendment 1. ISO/IEC JTC 1/WG4 N1957.
<http://www.ornl.gov/sgml/wg8/document/1957.htm>. (This ammendment addresses the use of Architectural Forms within the XML 1.0 Recommendation.)
 - World Wide Web Consortium, The W3C XML Activity Statement

- <http://www.w3.org/XML/Activity.html>
- World Wide Web Consortium, Namespaces in XML, W3C Recommendation, January 14, 1999
<http://www.w3.org/TR/REC-xml-names>
 - World Wide Web Consortium, Document Object Model (DOM) Level 1, W3C Recommendation, October 1, 1998
<http://www.w3.org/TR/REC-DOM-Level1>
 - World Wide Web Consortium, XML Linking Language (Xlink), W3C Working Draft, March 03, 1998
<http://www.w3.org/TR/1998/WD-xlink-19980303>
 - World Wide Web Consortium, XML Pointer Language (XPointer), W3C Working Draft, March 03, 1998
<http://www.w3.org/TR/1998/WD-xptr-19980303>
- HL7-Relevant Material
 - HIMMS Demo Messaging Specifications
http://www.mcis.duke.edu/standards/HL7/committees/sgml/himss/HIMSS_DEMO.zip
 - V3 XML Message Element Types (V3 XML ITS)
<http://www.mcis.duke.edu/standards/HL7/committees/sgml/MessageTypeLanguage.pdf>
 - Patient Record Architecture Proposal
<http://www.mcis.duke.edu/standards/HL7/sigs/sgml/WhitePapers/Prap>
 - HL7 SGML/XML Special Interest Group web site.
<http://www.mcis.duke.edu/standards/HL7/committees/sgml>
 - Dolin RH, Rishel W, Biron PV, Spinosa J, Mattison JE. SGML and XML as interchange formats for HL7 messages. JAMIA Fall Symposium Supplement 1998: in press.
 - Dolin RH, Alschuler L, Bray T, Mattison JE. SGML as a message interchange format in healthcare. JAMIA Fall Symposium Supplement 1997: 635-9.
http://www.mcis.duke.edu/standards/HL7/committees/sgml/amia_f97.htm
 - HL7 SGML/XML SIG. SGML as a message interchange format for HL7 Version 2.3 messages. Draft, January, 1999.
<http://www.mcis.duke.edu/standards/HL7/committees/sgml/hl7sgml2.rtf>
 - HL7 SGML/XML SIG. SGML/XML as a message interchange format for HL7 Version 3.0 messages. Draft, February, 1998.
<http://www.mcis.duke.edu/standards/HL7/committees/sgml/hl7sgml3.rtf>
 - HL7 Version 3 - XML Project Document. Draft, Sepember, 1998 (this document is out of date, but may be interesting for historical purposes; see *V3 XML ITS* above for current version)
http://www.mcis.duke.edu/standards/HL7/sigs/control-query/v3_xml_handout_980915.zip

- SGML/XML Web Sites
 - Robin Cover's SGML/XML web site.
(<http://www.sil.org/sgml/sgml.html>)
 - SGML Open web site
(<http://www.sgmlopen.org/>)
 - James Clark's SGML web site.
(<http://www.jclark.com/>)

- Off-the-shelf XML Processors
 - SP, <http://www.jclark.com/SP/>
 - Lark, <http://www.textuality.com/Lark/>
 - XML for Java, <http://www.alphaworks.ibm.com/formula/xml/>
 - Ælfred, <http://www.microstar.com/XML/AElfred/>

- Other SGML/XML Tools
 - <http://www.infotek.no/sgmltool/guide.htm>

- Other SGML/XML Reading Material
 - Alschuler L. ABCD...SGML. Boston, MA: International Thomson Computer Press; 1995.
 - Bradley N. The concise <SGML> companion. New York, NY: Addison-Wesley; 1997.
 - Marchal, B. Basic SGML.
(<http://www.pineapplesoft.com/reports/sgml/>)
 - Goldfarb CF. The SGML Handbook. Y. Rubinsky, ed. Oxford Univ. Press, 1990.
 - Text Encoding Initiative. A gentle introduction to SGML.
(<http://www.sil.org/sgml/gentle.html>)
 - Omnimark White Paper. Content Model Algebra. OmniMark Technologies Corporation, 1996.
(<http://www.omnimark.com/white/cma/>)
 - van Herwijnen E. Practical SGML, Second edition. Boston, MA: Kluwer Academic Publishers; 1994.
 - Goldfarb CF, Pepper S, Ensign, C. SGML Buyer's Guide™: A Unique Guide to Determining Your Requirements and Choosing the Right SGML and XML Products and Services. Upper Saddle River, New Jersey: Prentice Hall; 1998. (An excellent description and classification of SGML/XML software; additionally provides useful information for those charged with determining requirements for and building complete SGML/XML systems.)

- Hytime and Architectural Forms Reading Material

- Kimber, WE. A Tutorial Introduction to SGML Architectures. An Isogen International Corporation Whitepaper.
<http://www.isogen.com/papers/archintro.html>
- Megginson, D. Using the XAF package for Java. (Includes the tutorial "Basic Architectural Forms.") Megginson Technologies.
<http://www.megginson.com/XAF/index.html>
- Goldfarb CF, Newcomb SR, Kimber WE, Newcomb P. A Reader's Guide to the HyTime Standard. Made available by the HyTime User's Group.
<http://www.hytime.org/papers/htguide.html>.

Note: Architectural Forms and the HyTime Standard

Architectural Forms, defined by the "Architectural Forms Definition Requirements (AFDR)" are a part of the SGML Extended Facilities -- things designed to make SGML more powerful and useful. The AFDR is one of a handful of the extended facilities. The SGML Extended Facilities are published as appendices to the HyTime standard (ISO/IEC 10744(E) Second Edition, instead of (more appropriately) in the SGML standard itself. It is planned that the SGML Extended Facilities will be moved to the SGML standard itself in a future revision. If you want to read the standards documentation for architectural forms, it is not necessary to read or understand all of the HyTime standard, only the appendix that describes architectural forms. An excellent place to begin reading is the excellent "Reader's Guide to the HyTime Standard."

2. HIMSS Demo V3 XML Patient Registration MTL

Revised 1/7 to make certain fields optional (revisions are in HL7_public.mtl).

#

Revised 1/4/99 for updated naming conventions, and to add the query reply

and add Message_event

```
#=====
# Unsolicited Reg Message Regv3P00
#=====
```

MESSAGE TYPE HL7_Patient_Reg CONTAINS

```
{
  Message_header [MSGH] MANDATORY OF TYPE MSGH
  Message_event [MSGEVNT] MANDATORY OF TYPE MSGEVNT
  Patient_person [PTP] MANDATORY OF TYPE PTP
}
```

```
#=====
# Response Message to both Reg Queries is RRegv3P00
#=====
```

MESSAGE TYPE Rspns_HL7_Patient_Reg [RRegv3P00] CONTAINS

```
{
  Message_header [MSGH] MANDATORY OF TYPE MSGH
  Message_ack [MSGA] MANDATORY OF TYPE MSGA
  Patient_person_List [PTP_L] MANDATORY OF TYPE PTP_L
}
```

LIST TYPE Patient_person_L [PTP_L] INCLUDES 1..n OF TYPE PTP

<INCLUDE ..\HL7_public\HL7_public.mtl>

3. HIMSS Demo V3 XML Patient Registration DTD

```
<!--=====
      HL7 Version 3 Prototype Messages: HL7_Patient_Reg [Regv3P00]
                                     Rspns_HL7_Patient_Reg [RRegv3P00]
      =====>

<!ENTITY % DT_MSGH          "sndApp?, sndFacflt?, rcvgApp?, rcvgFacflt?, msgDt?,
                             scrty?, msgTyp, msgCntID, procID, vrsnID, sqncNbr?,
                             contPtr?, acptAckTyp?, applAckTyp?, cntryCd?,
                             charSet?, msgPrimLang?, altCharSetSchm?">

<!ENTITY % DT_HD           "nsid, uid?, uidtyp?">
<!ENTITY % DT_PTP         "PTP.birthDtm?, PTP.gndr?, PTP.martlStats?,
                             PTP.primrNamRprsntn?, PTP.primrNamType,
                             PTP.primrPrsnm, PTP.race?, PTP.addr?,
                             PTP.PhonNubr_L?, PTP.StkID">

<!ELEMENT Regv3P00         (Regv3P00.MSGH, Regv3P00.MSGEVNT, Regv3P00.PTP)>
<!ELEMENT Regv3P00.MSGH   (%DT_MSGH;)>
<!ELEMENT Regv3P00.MSGEVNT (Evtnttyp?, RecrDtm?)>
<!ELEMENT Regv3P00.PTP    (%DT_PTP;)>
<!ELEMENT RRegv3P00       (RRegv3P00.MSGH, RRegv3P00.MSGA, RRegv3P00.PTP_L)>
<!ELEMENT RRegv3P00.MSGH (%DT_MSGH;)>
<!ELEMENT RRegv3P00.MSGA (MSGA.ackCd, MSGA.msgCntID, MSGA.txtmsg?,
                           MSGA.expctdSeqNbr?, MSGA.dlydAckTyp?,
                           MSGA.errCond?)>

<!ELEMENT RRegv3P00.PTP_L (PTP_L.item+)>
<!ELEMENT sndApp          (%DT_HD;)>
<!ELEMENT sndFacflt       (%DT_HD;)>
<!ELEMENT rcvgApp         (%DT_HD;)>
<!ELEMENT rcvgFacflt      (%DT_HD;)>
<!ELEMENT msgDt           (#PCDATA)>
<!ELEMENT scrty           (#PCDATA)>
<!ELEMENT msgTyp          (msgID, intrId?)>
<!ELEMENT msgCntID        (#PCDATA)>
<!ELEMENT procID          (PrmsgIdTyp, PrmsgMod?)>
<!ELEMENT vrsnID          (ID, intCd?, intVID?)>
<!ELEMENT sqncNbr         (#PCDATA)>
<!ELEMENT contPtr         (#PCDATA)>
<!ELEMENT acptAckTyp      (#PCDATA)>
<!ELEMENT applAckTyp      (#PCDATA)>
<!ELEMENT cntryCd         (#PCDATA)>
<!ELEMENT charSet         (#PCDATA)>
<!ELEMENT msgPrimLang     (#PCDATA)>
<!ELEMENT altCharSetSchm  (#PCDATA)>
<!ELEMENT msgID           (#PCDATA)>
<!ELEMENT intrId          (#PCDATA)>
<!ELEMENT MSGA.ackCd      (#PCDATA)>
<!ELEMENT MSGA.msgCntID   (#PCDATA)>
<!ELEMENT MSGA.txtmsg     (#PCDATA)>
<!ELEMENT MSGA.expctdSeqNbr (#PCDATA)>
<!ELEMENT MSGA.dlydAckTyp (#PCDATA)>
<!ELEMENT MSGA.errCond    (#PCDATA)>
<!ELEMENT Evtnttyp        (#PCDATA)>
<!ELEMENT RecrDtm         (#PCDATA)>
<!ELEMENT PTP_L.item      (%DT_PTP;)>
<!ELEMENT PTP.birthDtm    (#PCDATA)>
<!ELEMENT PTP.gndr        (#PCDATA)>
```

```

<!ELEMENT PTP.martlStats (#PCDATA)>
<!ELEMENT PTP.primrNamRprsntn (#PCDATA)>
<!ELEMENT PTP.primrNamType (#PCDATA)>
<!ELEMENT PTP.primrPrsrnm (fmn, gvn?, mdn?, sfx?, pfx?, dgr?)>
<!ELEMENT PTP.race (#PCDATA)>
<!ELEMENT PTP.addr (strtAdrs?, othrDsgn?, city?, sttPrvnc?,
zipPstlCd?, cntry?, addrType, othrGgrphDsgn?,
cntyPrsh?, cnssTract?)>

<!ELEMENT PTP.PhonNmbr_LL (PhonNmbr_LL.item+)>
<!ELEMENT PTP.StkID (StkID.id, StkID.idType)>
<!ELEMENT StkID.id (#PCDATA)>
<!ELEMENT StkID.idType (#PCDATA)>
<!ELEMENT nsid (#PCDATA)>
<!ELEMENT uid (#PCDATA)>
<!ELEMENT uidtyp (#PCDATA)>
<!ELEMENT PrcsgIdTyp (#PCDATA)>
<!ELEMENT PrcsgMod (#PCDATA)>
<!ELEMENT ID (#PCDATA)>
<!ELEMENT intCd (#PCDATA)>
<!ELEMENT intVID (#PCDATA)>
<!ELEMENT fmn (#PCDATA)>
<!ELEMENT gvn (#PCDATA)>
<!ELEMENT mdn (#PCDATA)>
<!ELEMENT sfx (#PCDATA)>
<!ELEMENT pfx (#PCDATA)>
<!ELEMENT dgr (#PCDATA)>
<!ELEMENT strtAdrs (#PCDATA)>
<!ELEMENT othrDsgn (#PCDATA)>
<!ELEMENT city (#PCDATA)>
<!ELEMENT sttPrvnc (#PCDATA)>
<!ELEMENT zipPstlCd (#PCDATA)>
<!ELEMENT cntry (#PCDATA)>
<!ELEMENT addrType (#PCDATA)>
<!ELEMENT othrGgrphDsgn (#PCDATA)>
<!ELEMENT cntyPrsh (#PCDATA)>
<!ELEMENT cnssTract (#PCDATA)>
<!ELEMENT PhonNmbr_LL.item (tlcmnUse, tlcmnEqpTyp, emailAddr?, cntryCode?,
areaCityCode?, phonNmbr, xtnsn?, anytxt?)>

<!ELEMENT tlcmnUse (#PCDATA)>
<!ELEMENT tlcmnEqpTyp (#PCDATA)>
<!ELEMENT emailAddr (#PCDATA)>
<!ELEMENT cntryCode (#PCDATA)>
<!ELEMENT areaCityCode (#PCDATA)>
<!ELEMENT phonNmbr (#PCDATA)>
<!ELEMENT xtnsn (#PCDATA)>
<!ELEMENT anytxt (#PCDATA)>
<!ATTLIST Evnttyp
HL7_name CDATA #FIXED "Event_type_cd"
T CDATA "CE">
<!ATTLIST ID
HL7_name CDATA #FIXED "Version_id"
T CDATA "ID">
<!ATTLIST MSGA.ackCd
HL7_name CDATA #FIXED "Message_ack.acknowledgement_code"
T CDATA "ID">
<!ATTLIST MSGA.dlydAckTyp
HL7_name CDATA #FIXED "Message_ack.delayed_ack_type"

```

```

T          CDATA    " ID">
<!ATTLIST MSGA.errCond
  HL7_name CDATA    #FIXED "Message_ack.error_condition"
  T          CDATA    "CNE">
<!ATTLIST MSGA.expctdSeqNbr
  HL7_name CDATA    #FIXED "Message_ack.expected_seq_number"
  T          CDATA    "NM">
<!ATTLIST MSGA.msgCntID
  HL7_name CDATA    #FIXED "Message_ack.message_control_id"
  T          CDATA    "ST">
<!ATTLIST MSGA.txtmsg
  HL7_name CDATA    #FIXED "Message_ack.text_message"
  T          CDATA    "ST">
<!ATTLIST PTP.PhonNmbr_L
  HL7_name CDATA    #FIXED "Patient_person.phone_number_list"
  T          CDATA    "PhonNmbr_LL">
<!ATTLIST PTP.StkID
  HL7_name CDATA    #FIXED "Patient_person.Stakeholder_ID"
  T          CDATA    "StkID">
<!ATTLIST PTP.addr
  HL7_name CDATA    #FIXED "Patient_person.addr"
  T          CDATA    "XAD">
<!ATTLIST PTP.birthDtm
  HL7_name CDATA    #FIXED "Patient_person.birth_dttm"
  T          CDATA    "DTM">
<!ATTLIST PTP.gndr
  HL7_name CDATA    #FIXED "Patient_person.gender_cd"
  T          CDATA    "CNE">
<!ATTLIST PTP.martlStats
  HL7_name CDATA    #FIXED "Patient_person.marital_status_cd"
  T          CDATA    "CNE">
<!ATTLIST PTP.primrNamRprsntn
HL7_name CDATA    #FIXED "Patient_person.primary_name_representation_cd"
  T          CDATA    "CNE">
<!ATTLIST PTP.primrNamType
  HL7_name CDATA    #FIXED "Patient_person.primary_name_type_cd"
  T          CDATA    "CNE">
<!ATTLIST PTP.primrPrsnm
  HL7_name CDATA    #FIXED "Patient_person.primary_prsnm"
  T          CDATA    "PN">
<!ATTLIST PTP.race
  HL7_name CDATA    #FIXED "Patient_person.race_cd"
  T          CDATA    "CNE">
<!ATTLIST PTP_L.item
  HL7_name CDATA    #FIXED "Patient_person_L.item"
  T          CDATA    "PTP">
<!ATTLIST PhonNmbr_LL.item
  HL7_name CDATA    #FIXED "Patient_Phone_Number_List.item"
  T          CDATA    "XTN">
<!ATTLIST PrcsgIdTyp
  HL7_name CDATA    #FIXED "processing_id_type"
  T          CDATA    " ID">
<!ATTLIST PrcsgMod
  HL7_name CDATA    #FIXED "processing_mode"
  T          CDATA    " ID">
<!ATTLIST RRegv3P00
  HL7_name CDATA    #FIXED "Rspns_HL7_Patient_Reg"

```

```

T          CDATA      "RRegv3P00">
<!ATTLIST RRegv3P00.MSGA
  HL7_name CDATA      #FIXED "Rspns_HL7_Patient_Reg.Message_ack"
  T          CDATA      "MSGA">
<!ATTLIST RRegv3P00.MSGH
  HL7_name CDATA      #FIXED "Rspns_HL7_Patient_Reg.Message_header"
  T          CDATA      "MSGH">
<!ATTLIST RRegv3P00.PTP_L
  HL7_name CDATA      #FIXED "Rspns_HL7_Patient_Reg.Patient_person_List"
  T          CDATA      "PTP_L">
<!ATTLIST RecrDtm
  HL7_name CDATA      #FIXED "Recorded_dtm"
  T          CDATA      "DTM">
<!ATTLIST Regv3P00
  HL7_name CDATA      #FIXED "HL7_Patient_Reg"
  T          CDATA      "Regv3P00">
<!ATTLIST Regv3P00.MSGEVNT
  HL7_name CDATA      #FIXED "HL7_Patient_Reg.Message_event"
  T          CDATA      "MSGEVNT">
<!ATTLIST Regv3P00.MSGH
  HL7_name CDATA      #FIXED "HL7_Patient_Reg.Message_header"
  T          CDATA      "MSGH">
<!ATTLIST Regv3P00.PTP
  HL7_name CDATA      #FIXED "HL7_Patient_Reg.Patient_person"
  T          CDATA      "PTP">
<!ATTLIST StkID.id
  HL7_name CDATA      #FIXED "Stakeholder_ID.id"
  T          CDATA      "ST">
<!ATTLIST StkID.idType
  HL7_name CDATA      #FIXED "Stakeholder_ID.identifier_type_cd"
  T          CDATA      "ID">
<!ATTLIST acptAckTyp
  HL7_name CDATA      #FIXED "accept_ack_type"
  T          CDATA      "ID">
<!ATTLIST addrType
  HL7_name CDATA      #FIXED "address_type"
  T          CDATA      "ID">
<!ATTLIST altCharSetSchm
  HL7_name CDATA      #FIXED "alt_char_set_scheme"
  T          CDATA      "ID">
<!ATTLIST anytxt
  HL7_name CDATA      #FIXED "any_text"
  T          CDATA      "TX">
<!ATTLIST applAckTyp
  HL7_name CDATA      #FIXED "application_ack_type"
  T          CDATA      "ID">
<!ATTLIST areaCityCode
  HL7_name CDATA      #FIXED "area_city_code"
  T          CDATA      "NM">
<!ATTLIST charSet
  HL7_name CDATA      #FIXED "character_set"
  T          CDATA      "ID">
<!ATTLIST city
  HL7_name CDATA      #FIXED "city"
  T          CDATA      "ST">
<!ATTLIST cnsstract
  HL7_name CDATA      #FIXED "census_tract"

```

```

T          CDATA    " IS">
<!ATTLIST cntry
  HL7_name CDATA    #FIXED "country"
  T        CDATA    " ID">
<!ATTLIST cntryCd
  HL7_name CDATA    #FIXED "country_code"
  T        CDATA    " ID">
<!ATTLIST cntryCode
  HL7_name CDATA    #FIXED "country_code"
  T        CDATA    "NM">
<!ATTLIST cntyPrsh
  HL7_name CDATA    #FIXED "county_or_parish_code"
  T        CDATA    " IS">
<!ATTLIST contPtr
  HL7_name CDATA    #FIXED "continuation_pointer"
  T        CDATA    "ST">
<!ATTLIST dgr
  HL7_name CDATA    #FIXED "degree"
  T        CDATA    "ST">
<!ATTLIST emailAddr
  HL7_name CDATA    #FIXED "email_address"
  T        CDATA    "ST">
<!ATTLIST fmn
  HL7_name CDATA    #FIXED "family_name"
  T        CDATA    "ST">
<!ATTLIST gvn
  HL7_name CDATA    #FIXED "given_name"
  T        CDATA    "ST">
<!ATTLIST intCd
  HL7_name CDATA    #FIXED "internationalization_code"
  T        CDATA    "CNE">
<!ATTLIST intVID
  HL7_name CDATA    #FIXED "international_version_id"
  T        CDATA    "CNE">
<!ATTLIST intrId
  HL7_name CDATA    #FIXED "interaction_id"
  T        CDATA    " ID">
<!ATTLIST mdn
  HL7_name CDATA    #FIXED "middle_initial_or_name"
  T        CDATA    "ST">
<!ATTLIST msgCntID
  HL7_name CDATA    #FIXED "message_control_id"
  T        CDATA    "ST">
<!ATTLIST msgDt
  HL7_name CDATA    #FIXED "date_time_message"
  T        CDATA    "DTM">
<!ATTLIST msgID
  HL7_name CDATA    #FIXED "message_id"
  T        CDATA    " ID">
<!ATTLIST msgPrimLang
  HL7_name CDATA    #FIXED "msg_primary_lang"
  T        CDATA    "CNE">
<!ATTLIST msgTyp
  HL7_name CDATA    #FIXED "message_type"
  T        CDATA    "MSGT">
<!ATTLIST nsid
  HL7_name CDATA    #FIXED "name_space_id"

```

```

T          CDATA    "ST">
<!ATTLIST othrDsgn
  HL7_name CDATA    #FIXED "other_designation"
  T        CDATA    "ST">
<!ATTLIST othrGgrphDsgn
  HL7_name CDATA    #FIXED "other_geographic_designation"
  T        CDATA    "ST">
<!ATTLIST pfx
  HL7_name CDATA    #FIXED "prefix"
  T        CDATA    "ST">
<!ATTLIST phonNmbr
  HL7_name CDATA    #FIXED "phone_number"
  T        CDATA    "NM">
<!ATTLIST procID
  HL7_name CDATA    #FIXED "processing_id"
  T        CDATA    "PDG">
<!ATTLIST rcvgApp
  HL7_name CDATA    #FIXED "receiving_application"
  T        CDATA    "HD">
<!ATTLIST rcvgFaclt
  HL7_name CDATA    #FIXED "receiving_facility"
  T        CDATA    "HD">
<!ATTLIST scrty
  HL7_name CDATA    #FIXED "security"
  T        CDATA    "ST">
<!ATTLIST sfx
  HL7_name CDATA    #FIXED "suffix"
  T        CDATA    "ST">
<!ATTLIST sndApp
  HL7_name CDATA    #FIXED "sending_application"
  T        CDATA    "HD">
<!ATTLIST sndFaclt
  HL7_name CDATA    #FIXED "sending_facility"
  T        CDATA    "HD">
<!ATTLIST sqncNbr
  HL7_name CDATA    #FIXED "sequence_number"
  T        CDATA    "NM">
<!ATTLIST strtAdrs
  HL7_name CDATA    #FIXED "street_address"
  T        CDATA    "ST">
<!ATTLIST sttPrvnc
  HL7_name CDATA    #FIXED "state_or_province"
  T        CDATA    "ST">
<!ATTLIST tlcmmEqpTyp
  HL7_name CDATA    #FIXED "telecommunication_equipment_type"
  T        CDATA    "ID">
<!ATTLIST tlcmmUse
  HL7_name CDATA    #FIXED "telecommunication_use_code"
  T        CDATA    "ID">
<!ATTLIST uid
  HL7_name CDATA    #FIXED "universal_id"
  T        CDATA    "ST">
<!ATTLIST uidtyp
  HL7_name CDATA    #FIXED "universal_id_type"
  T        CDATA    "ID">
<!ATTLIST vrsnID
  HL7_name CDATA    #FIXED "version_id"

```

```
T          CDATA    "VID">
<!ATTLIST xtnsn
  HL7_name CDATA    #FIXED "extension"
  T        CDATA    "NM">
<!ATTLIST zipPstlCd
  HL7_name CDATA    #FIXED "zip_or_postal_code"
  T        CDATA    "ST">
```

4. HIMSS Demo V3 XML Patient Registration Message

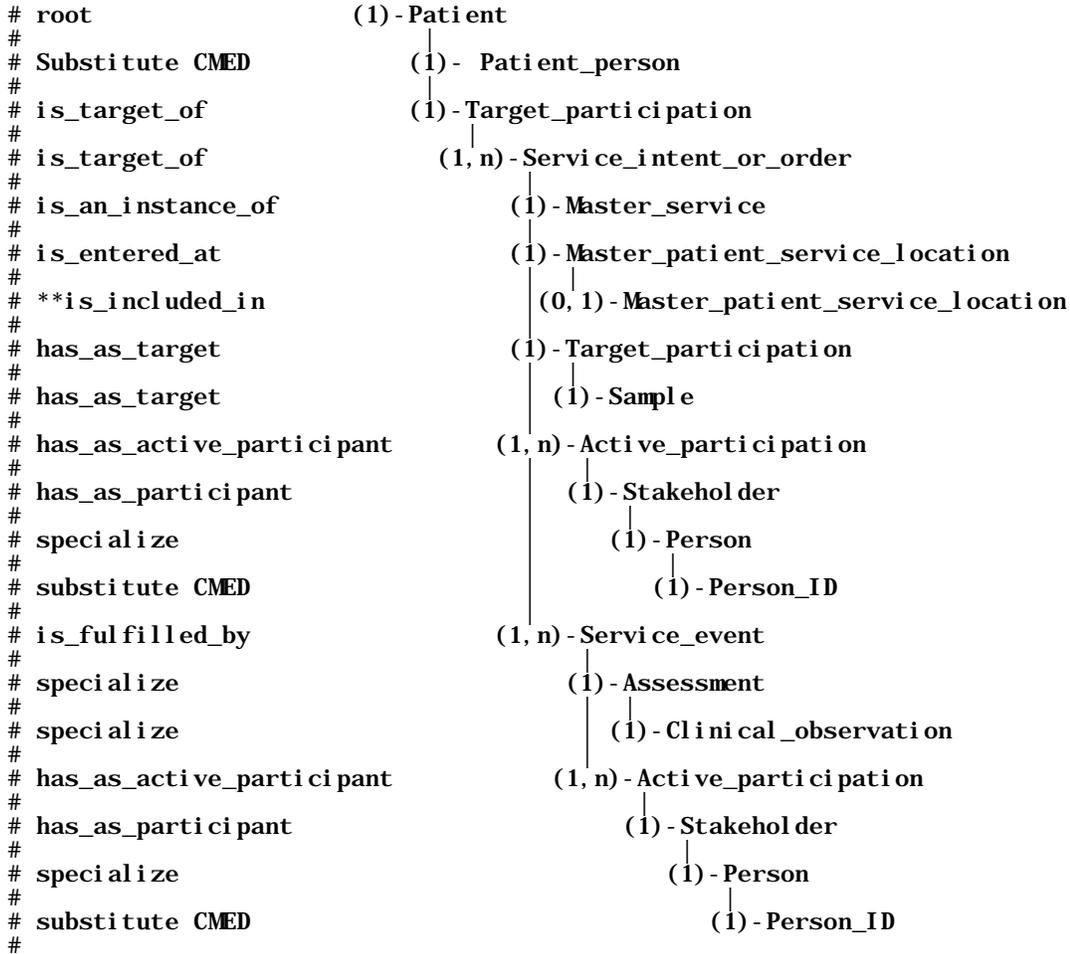
```
<?xml version = "1.0" encoding="US-ASCII"?>
<!DOCTYPE Regv3P00 SYSTEM "Regv3P00.dtd" [ ]>
<Regv3P00 T="Regv3P00">
  <Regv3P00.MSGH T="MSGH">
    <sndApp T="HD">
      <nsid T="ST">REG003</nsid>
    </sndApp>
    <sndFacIt T="HD">
      <nsid T="ST">RGSIIUPI</nsid>
    </sndFacIt>
    <rcvgApp T="HD">
      <nsid T="ST">BCAST</nsid>
    </rcvgApp>
    <rcvgFacIt T="HD">
      <nsid T="ST">RGSIIUPI</nsid>
    </rcvgFacIt>
    <msgDt T="DTM">199808231123</msgDt>
    <msgTyp T="MSGT">
      <msgID T="ID">Regv3P00</msgID>
    </msgTyp>
    <msgCntID T="ST">REG003199808231123.1</msgCntID>
    <procID T="PDG">
      <PrmsgIdTyp T="ID">D</PrmsgIdTyp>
    </procID>
    <vrnsID T="VID">
      <ID T="ID">3.0P1</ID>
    </vrnsID>
    <acptAckTyp T="ID">AL</acptAckTyp>
    <applAckTyp T="ID">NE</applAckTyp>
  </Regv3P00.MSGH>
  <Regv3P00.MSGEVNT T="MSGEVNT">
    <RecrDtm T="DTM">199901042335</RecrDtm>
  </Regv3P00.MSGEVNT>
  <Regv3P00.PTP T="PTP">
    <PTP.birthDtm T="DTM">19560412</PTP.birthDtm>
    <PTP.gndr T="CNE">M</PTP.gndr>
    <PTP.martlStats T="CNE">M</PTP.martlStats>
    <PTP.primrNamType T="CNE">L</PTP.primrNamType>
    <PTP.primrPrsnm T="PN">
      <fmn T="ST">Newman</fmn>
      <gvn T="ST">Alfred</gvn>
      <mdn T="ST">E</mdn>
    </PTP.primrPrsnm>
    <PTP.race T="CNE">XXX</PTP.race>
    <PTP.addr T="XAD">
      <strtAdrs T="ST">25 Centscheap Ave</strtAdrs>
      <city T="ST">Whatmeworry</city>
      <sttPrvnc T="ST">UT</sttPrvnc>
      <zipPstlCd T="ST">89651</zipPstlCd>
      <addrType T="ID">L</addrType>
    </PTP.addr>
    <PTP.PhonNmbr_L T="PhonNmbr_LL">
      <PhonNmbr_LL.item T="XTN">
        <tlcmnUse T="ID">WPN</tlcmnUse>
        <tlcmnEqpTyp T="ID">PH</tlcmnEqpTyp>
      </PhonNmbr_LL.item>
    </PTP.PhonNmbr_L>
  </Regv3P00.PTP>
</Regv3P00>
```

```
        <areaCityCode T="NM">777</areaCityCode>
        <phonNmbr T="NM">7777777</phonNmbr>
    </PhonNmbr_LL.item>
    <PhonNmbr_LL.item T="XTN">
        <tlcmnUse T="ID">PRN</tlcmnUse>
        <tlcmnEqpTyp T="ID">PH</tlcmnEqpTyp>
        <areaCityCode T="NM">777</areaCityCode>
        <phonNmbr T="NM">6665432</phonNmbr>
    </PhonNmbr_LL.item>
</PTP.PhonNmbr_L>
<PTP.StkID T="StkID">
    <StkID.id T="ST">X12457</StkID.id>
    <StkID.idType T="ID">MRN</StkID.idType>
</PTP.StkID>
</Regv3P00.PTP>
</Regv3P00>
```

5. HIMSS Demo V3 XML Lab Result MTL

the clinical observation transition code is serving as the trigger event
 # for this message. It is available in MSGH.msgTyp.intrId; the value will be: R01

The MOD path for this message is shown below. Recursive links are marked with
 # **.



```

MESSAGE TYPE Lab_results_message [Labrs3P00] CONTAINS
{
  Message_header [MSGH] MANDATORY OF TYPE MSGH
  Patient_person [PTP] MANDATORY OF TYPE PTP
  Service_intent_or_order_list [SI00_L] MANDATORY OF TYPE SI00_L
}

```

```

=====
# Response Message to Lab Query is RLabrv3P00
=====

```

```

MESSAGE TYPE Rspns_HL7_Lab_Query [RLabrv3P00] CONTAINS
{
  Message_header [MSGH] MANDATORY OF TYPE MSGH
  Message_ack [MSGA] MANDATORY OF TYPE MSGA
  Patient_person [PTP] MANDATORY OF TYPE PTP
  Service_intent_or_order_list [SI00_L] OPTIONAL OF TYPE SI00_L
}

```

LIST TYPE Service_intent_or_order_list [SI00_L] INCLUDES 1..N OF TYPE SI00

```

COMPOSITE TYPE Service_intent_or_order [SI00] CONTAINS
{
  filler_order_id [filrOrdId]          OPTIONAL OF TYPE IID    # also element of order_id
  placer_order_id [placrOrdId]         OPTIONAL OF TYPE IID    # also element of order_id
  intent_or_order_cd [int0r0rd]        MANDATORY OF TYPE ID   # always "0" for demo
  order_placed_dttm [ordPlcdDtm]       OPTIONAL OF TYPE DTM
  order_quantity_timing_qty           [OrdQtyTimg]          OPTIONAL OF TYPE TQ
  placer_txt [placrTxt]                 OPTIONAL OF TYPE TX
  filler_txt [filrTxt]                  OPTIONAL OF TYPE TX
  report_results_to_phone              [rprtRsltsToPhon]    OPTIONAL OF TYPE XTN
  is_an_instance_of [InsncOf]           OPTIONAL OF TYPE MSRV
  is_entered_at [entrdAt]               OPTIONAL OF TYPE MPSLOC
  has_as_target_sample [SAMP]           MANDATORY OF TYPE SAMP
  has_as_active_participant_order_list [actPrtcptOrd_L] MANDATORY OF TYPE ACTP_L # at least one list entry
# must have the value 'ORD'
# for ordering provider
# in participation_type_cd
# use 'PI' for principle
# interpreter
# no other values for demo
}
Service_event_list [SRVE_L]           MANDATORY OF TYPE SRVE_L
}

```

```

COMPOSITE TYPE Master_service [MSRV] CONTAINS
{
  universal_service_id [unvSvcId]       MANDATORY OF TYPE CE # Orderable items, no code
  service_desc [svcDesc]                OPTIONAL OF TYPE TX
  target_anatomic_site_cd [targAntmcSite] OPTIONAL OF TYPE CE # HL7 v2.3 Table 0163
  method_cd [mthdCd]                   OPTIONAL OF TYPE CE # there's no standard code
  method_descr [mthdDesc]               OPTIONAL OF TYPE TX
}

```

```

COMPOSITE TYPE Master_patient_service_location [MPSLOC] CONTAINS
{
  id [id] MANDATORY OF TYPE IID
  nm [name] OPTIONAL OF TYPE ST
  addr [addr] OPTIONAL OF TYPE XAD
  phon [phon] OPTIONAL OF TYPE XTN
  email_address [emlAdr] OPTIONAL OF TYPE XTN
  is_included_in [inclIn] OPTIONAL OF TYPE MPSLOC

# recursion note:
# -----
# include all parents up to the organization level;
# it is only necessary to include phon, addr, and emlAdr
# for one MPSLOC, the lowest one for which this info
# is available
}

```

```

COMPOSITE TYPE Collected_specimen_sample [SAMP] CONTAINS
{
  participation_type_cd [partpnTyp] MANDATORY OF TYPE CE # This is actually in
# Target_participation
# Always should have the code "S"
  id [id] MANDATORY OF TYPE IID #
  specimen_source_cd [spcmnSrc] OPTIONAL OF TYPE CE # optional, because specmn
# source frequently implicit
# in test name
  collection_start_dttm [colctnStrtDtm] OPTIONAL OF TYPE DTM # ... or
  collection_end_dttm [colctnEndDtm] OPTIONAL OF TYPE DTM #
  method_of_collection_desc
}

```

```

    body_site_cd [mthdColctnDesc] OPTIONAL OF TYPE TX
    collection_volume_amt [bodySite] OPTIONAL OF TYPE CE # use HL7 v2.3 table 163
    mass collection_volume_amt [colctnVolm] OPTIONAL OF TYPE CQ # need not be volume, can be
specimen_additive_txt [spcmmAdtv] OPTIONAL OF TYPE ST # tbl: specimen_additive needs
elaborate code table!
    handling_cd [handlg] OPTIONAL OF TYPE ID # tbl: specimen_handling
    specimen_danger_cd [spcmDngr] OPTIONAL OF TYPE ID # tbl: danger_code
}

```

LIST TYPE Active_participation_list [ACTP_L] INCLUDES 1..N OF TYPE ACTP

COMPOSITE TYPE Active_participation [ACTP] CONTAINS

```

{
    participation_type_cd
    [partcpnTyp] MANDATORY OF TYPE ID # unordered, tbl:
active_participation_type,
    submitted # all applicable qualifiers must be
    participant [partcptnt] MANDATORY OF TYPE PSNI
    # eliminating organization as possibility
    # for the demo
}

```

```

#
# as used in this HMD, Service_event is at the level of a reportable observation
# (i.e.) is is not a battery or other multi-component orderable entity
#
# we have elected not to include information from the congruent Master_service entry
# when reporting the service event
#

```

LIST TYPE Service_event_list [SRVE_L] INCLUDES 1..N OF TYPE SRVE

COMPOSITE TYPE Service_event [SRVE] CONTAINS

```

{
    name [name] MANDATORY OF TYPE CE # LOINC code; not a "master
service"
    service_event_desc [svcEvtDesc]
instance OPTIONAL OF TYPE ST # only specifics for this
    Clinical_observation [CLOB] OPTIONAL OF TYPE CLOB # this is optional because
    # not all of the ordered components
    # may have results yet
specimen_received_dttm [spcmRcvdDtm] OPTIONAL OF TYPE DTM
has_as_active_participant_list
    [hasActvPartnts_L] MANDATORY OF TYPE ACTP_L
    # unordered at least
    # one with SRC in type
}

```

revised 12/20 to be more consistent with species of Master_observation_service

COMPOSITE TYPE Clinical_observation [CLOB] CONTAINS

```

{
    observation_value_choice [obsValu_C] MANDATORY OF TYPE obsValu_C
    probability_number [prblty] OPTIONAL OF TYPE NM
    abnormal_result_ind [abnrmlRslt] OPTIONAL OF TYPE ID # use HL7 v2.3 tbl 576
7.3.2.8
    references_range_text [refsRng] OPTIONAL OF TYPE ST
    nature_of_abnormal_testing_cd
    [naturAbnTstg] OPTIONAL OF TYPE CE # use HL7 v2.3 tbl 80
    last_observed_normal_values_dttm
    [lastObsvNormValuDtm] OPTIONAL OF TYPE DTM #
    clinically_relevant_begin_dttm [clnRl vnBgnDtm]
    OPTIONAL OF TYPE DTM
    clinically_relevant_end_dttm
    [clnRl vnEndtm] OPTIONAL OF TYPE DTM # (rarely known)
}

```

```

CHOICE TYPE observation_value_choice [obsValu_C] SELECTS
{
N: observation_value_continuous [obsValuCnt] OF TYPE obsValuNm
C: observation_value_categorical [obsValuCd] OF TYPE CE
S: observation_value_calculated [obsValuSt] OF TYPE ST
}

```

```

COMPOSITE TYPE observation_value_nm [obsValuNm] CONTAINS
{
observation_value [obsvnValu] MANDATORY OF TYPE NM
value_units_code [valUnits] OPTIONAL OF TYPE CE # only for numeric values
# (TY="NM # float ")
}

```

```

LIST TYPE Code_list [ID_L] INCLUDES 1..N OF TYPE ID

```

```

<INCLUDE ..\HL7_public.mtl>

```

6. HIMSS Demo V3 XML Lab Result DTD

```
<!--=====
      HL7 Version 3 Prototype Messages: Lab_results_message [Labrs3P00]
                                     Rspns_HL7_Lab_Query [RLabrv3P00]
      =====>

<!ENTITY % DT_MSGH          "sndApp?, sndFacIt?, rcvgApp?, rcvgFacIt?, msgDt?,
                             scrty?, msgTyp, msgCntID, procID, vrsnID, sqncNbr?,
                             contPtr?, acptAckTyp?, applAckTyp?, cntryCd?,
                             charSet?, msgPrimLang?, altCharSetSchm?">
<!ENTITY % DT_HD            "nsid, uid?, uidtyp?">
<!ENTITY % DT_PTP           "PTP.birthDtm, PTP.gndr, PTP.martlStats,
                             PTP.primrNamRprsntn?, PTP.primrNamType,
                             PTP.primrPrsnm, PTP.race?, PTP.addr,
                             PTP.PhonNmbr_L?, PTP.StkID">
<!ENTITY % DT_PN            "fmn, gvn?, mdn?, sfx?, pfx?, dgr?">
<!ENTITY % DT_XAD           "strtAdrs?, othrDsgn?, city?, sttPrvnc?, zipPstlCd?,
                             cntry?, addrType, othrGgrphDsgn?, cntyPrsh?,
                             cnssTract?">
<!ENTITY % DT_XTN           "tlcmnUse, tlcmnEqpTyp, emailAddr?, cntryCode?,
                             areaCityCode?, phonNmbr, xtnsn?, anytxt?">
<!ENTITY % DT_StkID         "StkID.id, StkID.idType">
<!ENTITY % DT_SIOO_L        "SIOO_L.item">
<!ENTITY % DT_MPSLOC        "MPSLOC.id, MPSLOC.name?, MPSLOC.addr?,
                             MPSLOC.phon?, MPSLOC.emlAdr?, MPSLOC.inclIn?">
<!ENTITY % DT_ACTP_L        "ACTP_L.item">
<!ELEMENT Labrs3P00         (Labrs3P00.MSGH, Labrs3P00.PTP, Labrs3P00.SIOO_L)>
<!ELEMENT Labrs3P00.MSGH   (%DT_MSGH;)>
<!ELEMENT Labrs3P00.PTP    (%DT_PTP;)>
<!ELEMENT Labrs3P00.SIOO_L (SIOO_L.item+)>
<!ELEMENT RLabrv3P00       (RLabrv3P00.MSGH, RLabrv3P00.MSGA, RLabrv3P00.PTP,
                             RLabrv3P00.SIOO_L?)>
<!ELEMENT RLabrv3P00.MSGH (%DT_MSGH;)>
<!ELEMENT RLabrv3P00.MSGA (MSGA.ackCd, MSGA.msgCntID, MSGA.txtmsg?,
                             MSGA.expctdSeqNbr?, MSGA.dlydAckTyp?,
                             MSGA.errCond?)>
<!ELEMENT RLabrv3P00.PTP  (%DT_PTP;)>
<!ELEMENT RLabrv3P00.SIOO_L (SIOO_L.item+)>
<!ELEMENT SIOO_L.item      (SIOO.filrOrdId?, SIOO.placrOrdId?, SIOO.intOrOrd,
                             SIOO.ordPlcdDtm?, SIOO.OrdQtyTimng?,
                             SIOO.placrTxt?, SIOO.filrTxt?,
                             SIOO.rprtrsltsToPhon?, SIOO.InsncOf?,
                             SIOO.entrdAt?, SIOO.SAMP, SIOO.actPrtcptntOrd_L,
                             SIOO.SRVE_L)>
<!ELEMENT SIOO.filrOrdId  (#PCDATA)>
<!ELEMENT SIOO.placrOrdId (#PCDATA)>
<!ELEMENT SIOO.intOrOrd   (#PCDATA)>
<!ELEMENT SIOO.ordPlcdDtm (#PCDATA)>
<!ELEMENT SIOO.OrdQtyTimng (TQ.text?)>
<!ELEMENT SIOO.placrTxt   (#PCDATA)>
<!ELEMENT SIOO.filrTxt    (#PCDATA)>
<!ELEMENT SIOO.rprtrsltsToPhon (%DT_XTN;)>
<!ELEMENT SIOO.InsncOf    (MSRV.unvSvcId, MSRV.svcDesc?, MSRV.targAntmcSite?,
                             MSRV.mthdCd?, MSRV.mthdDesc?)>
<!ELEMENT SIOO.entrdAt    (%DT_MPSLOC;)>
```

```

<!ELEMENT SIOO.SAMP      (SAMP.partpnTyp, SAMP.id, SAMP.spcmnSrc?,
                          SAMP.colctnStrtDtm?, SAMP.colctnEndDtm?,
                          SAMP.mthdColctnDesc?, SAMP.bodySite?,
                          SAMP.colctnVolm?, SAMP.spcmnAdtv?, SAMP.handlg?,
                          SAMP.spcmnDngr?)>
<!ELEMENT SIOO.actPrtcptOrd_L (ACTP_L.item+)>
<!ELEMENT SIOO.SRVE_L      (SRVE_L.item+)>
<!ELEMENT MSRV.unvSvcId    (#PCDATA)>
<!ELEMENT MSRV.svcDesc    (#PCDATA)>
<!ELEMENT MSRV.targAntmcSite (#PCDATA)>
<!ELEMENT MSRV.mthdCd     (#PCDATA)>
<!ELEMENT MSRV.mthdDesc   (#PCDATA)>
<!ELEMENT MPSLOC.id       (#PCDATA)>
<!ELEMENT MPSLOC.name     (#PCDATA)>
<!ELEMENT MPSLOC.addr     (%DT_XAD;)>
<!ELEMENT MPSLOC.phon     (%DT_XTN;)>
<!ELEMENT MPSLOC.emlAdr   (%DT_XTN;)>
<!ELEMENT MPSLOC.inclIn   (%DT_MPSLOC;)>
<!ELEMENT SAMP.partpnTyp  (#PCDATA)>
<!ELEMENT SAMP.id        (#PCDATA)>
<!ELEMENT SAMP.spcmnSrc   (#PCDATA)>
<!ELEMENT SAMP.colctnStrtDtm (#PCDATA)>
<!ELEMENT SAMP.colctnEndDtm (#PCDATA)>
<!ELEMENT SAMP.mthdColctnDesc (#PCDATA)>
<!ELEMENT SAMP.bodySite   (#PCDATA)>
<!ELEMENT SAMP.colctnVolm (qty, unts?)>
<!ELEMENT SAMP.spcmnAdtv  (#PCDATA)>
<!ELEMENT SAMP.handlg     (#PCDATA)>
<!ELEMENT SAMP.spcmnDngr  (#PCDATA)>
<!ELEMENT ACTP_L.item     (ACTP.partcpnTyp, ACTP.partcpnt)>
<!ELEMENT ACTP.partcpnTyp (#PCDATA)>
<!ELEMENT ACTP.partcpnt   (PSNI.primrNamType, PSNI.primrPrsnm, PSNI.StkID)>
<!ELEMENT SRVE_L.item     (SRVE.name, SRVE.svcEvtDesc?, SRVE.CLOB?,
                          SRVE.spcmRcvdDtm?, SRVE.hasActvPartnts_L)>
<!ELEMENT SRVE.name       (#PCDATA)>
<!ELEMENT SRVE.svcEvtDesc (#PCDATA)>
<!ELEMENT SRVE.CLOB       (CLOB.obsValu_C, CLOB.prblty?, CLOB.abnrmlRslt?,
                          CLOB.refsrng?, CLOB.naturAbnTstg?,
                          CLOB.lastObsvNormValuDtm?, CLOB.clnRlvnBgnDtm?,
                          CLOB.clnRlvnEndtm?)>
<!ELEMENT SRVE.spcmRcvdDtm (#PCDATA)>
<!ELEMENT SRVE.hasActvPartnts_L (ACTP_L.item+)>
<!ELEMENT CLOB.obsValu_C  (obsValu_C.obsValuCnt| obsValu_C.obsValuCd|
                          obsValu_C.obsValuSt)>
<!ELEMENT CLOB.prblty     (#PCDATA)>
<!ELEMENT CLOB.abnrmlRslt (#PCDATA)>
<!ELEMENT CLOB.refsrng    (#PCDATA)>
<!ELEMENT CLOB.naturAbnTstg (#PCDATA)>
<!ELEMENT CLOB.lastObsvNormValuDtm (#PCDATA)>
<!ELEMENT CLOB.clnRlvnBgnDtm (#PCDATA)>
<!ELEMENT CLOB.clnRlvnEndtm (#PCDATA)>
<!ELEMENT obsValu_C.obsValuCnt (obsValuNm.obsvalValu, obsValuNm.valUnits?)>
<!ELEMENT obsValu_C.obsValuCd (#PCDATA)>
<!ELEMENT obsValu_C.obsValuSt (#PCDATA)>
<!ELEMENT obsValuNm.obsvalValu (#PCDATA)>
<!ELEMENT obsValuNm.valUnits (#PCDATA)>

```

```

<!ELEMENT sndApp          (%DT_HD;)>
<!ELEMENT sndFacIt       (%DT_HD;)>
<!ELEMENT rcvgApp        (%DT_HD;)>
<!ELEMENT rcvgFacIt     (%DT_HD;)>
<!ELEMENT msgDt          (#PCDATA)>
<!ELEMENT scrty          (#PCDATA)>
<!ELEMENT msgTyp         (msgID, intrId?)>
<!ELEMENT msgCntID       (#PCDATA)>
<!ELEMENT procID         (PrmsgIdTyp, PrmsgMod?)>
<!ELEMENT vrsnID         (ID, intCd?, intVID?)>
<!ELEMENT sqncNbr        (#PCDATA)>
<!ELEMENT contPtr        (#PCDATA)>
<!ELEMENT acptAckTyp     (#PCDATA)>
<!ELEMENT applAckTyp     (#PCDATA)>
<!ELEMENT cntryCd        (#PCDATA)>
<!ELEMENT charSet        (#PCDATA)>
<!ELEMENT msgPrimLang    (#PCDATA)>
<!ELEMENT altCharSetSchm (#PCDATA)>
<!ELEMENT msgID          (#PCDATA)>
<!ELEMENT intrId         (#PCDATA)>
<!ELEMENT MSGA.ackCd     (#PCDATA)>
<!ELEMENT MSGA.msgCntID  (#PCDATA)>
<!ELEMENT MSGA.txtmsg    (#PCDATA)>
<!ELEMENT MSGA.expctdSeqNbr (#PCDATA)>
<!ELEMENT MSGA.dlydAckTyp (#PCDATA)>
<!ELEMENT MSGA.errCond   (#PCDATA)>
<!ELEMENT PTP.birthDtm   (#PCDATA)>
<!ELEMENT PTP.gndr       (#PCDATA)>
<!ELEMENT PTP.martlStats (#PCDATA)>
<!ELEMENT PTP.primrNamRprsntn (#PCDATA)>
<!ELEMENT PTP.primrNamType (#PCDATA)>
<!ELEMENT PTP.primrPrsnm (%DT_PN;)>
<!ELEMENT PTP.race       (#PCDATA)>
<!ELEMENT PTP.addr       (%DT_XAD;)>
<!ELEMENT PTP.PhonNmbr_L (PhonNmbr_LL.item+)>
<!ELEMENT PTP.StkID      (%DT_StkID;)>
<!ELEMENT StkID.id       (#PCDATA)>
<!ELEMENT StkID.idType   (#PCDATA)>
<!ELEMENT PSNI.primrNamType (#PCDATA)>
<!ELEMENT PSNI.primrPrsnm (%DT_PN;)>
<!ELEMENT PSNI.StkID     (%DT_StkID;)>
<!ELEMENT TQ.text        (#PCDATA)>
<!ELEMENT nsid           (#PCDATA)>
<!ELEMENT uid            (#PCDATA)>
<!ELEMENT uidtyp         (#PCDATA)>
<!ELEMENT PrmsgIdTyp     (#PCDATA)>
<!ELEMENT PrmsgMod       (#PCDATA)>
<!ELEMENT ID             (#PCDATA)>
<!ELEMENT intCd          (#PCDATA)>
<!ELEMENT intVID         (#PCDATA)>
<!ELEMENT fmn            (#PCDATA)>
<!ELEMENT gvn            (#PCDATA)>
<!ELEMENT mdn            (#PCDATA)>
<!ELEMENT sfx            (#PCDATA)>
<!ELEMENT pfx            (#PCDATA)>
<!ELEMENT dgr            (#PCDATA)>

```

```

<!ELEMENT strtAdrs      (#PCDATA)>
<!ELEMENT othrDsgn      (#PCDATA)>
<!ELEMENT city          (#PCDATA)>
<!ELEMENT sttPrvnc      (#PCDATA)>
<!ELEMENT zipPstlCd     (#PCDATA)>
<!ELEMENT cntry         (#PCDATA)>
<!ELEMENT addrType      (#PCDATA)>
<!ELEMENT othrGgrphDsgn (#PCDATA)>
<!ELEMENT cntyPrsh      (#PCDATA)>
<!ELEMENT cnssTract     (#PCDATA)>
<!ELEMENT PhonNmbr_LL.item (%DT_XTN;)>
<!ELEMENT tlcmmUse      (#PCDATA)>
<!ELEMENT tlcmmEqpTyp   (#PCDATA)>
<!ELEMENT emailAddr     (#PCDATA)>
<!ELEMENT cntryCode     (#PCDATA)>
<!ELEMENT areaCityCode  (#PCDATA)>
<!ELEMENT phonNmbr      (#PCDATA)>
<!ELEMENT xtnsn         (#PCDATA)>
<!ELEMENT anytxt        (#PCDATA)>
<!ELEMENT qty           (#PCDATA)>
<!ELEMENT unts          (#PCDATA)>
<!ATTLIST ACTP.partcpnTyp
HL7_name CDATA #FIXED "Active_participation.participation_type_cd"
T        CDATA "ID">
<!ATTLIST ACTP.partcpnt
HL7_name CDATA #FIXED "Active_participation.participant"
T        CDATA "PSNI">
<!ATTLIST ACTP_L.item
HL7_name CDATA #FIXED "Active_participation_list.item"
T        CDATA "ACTP">
<!ATTLIST CLOB.abnrmlRslt
HL7_name CDATA #FIXED "Clinical_observation.abnormal_result_ind"
T        CDATA "ID">
<!ATTLIST CLOB.clnRlvnBgnDtm
HL7_name CDATA #FIXED "Clinical_observation.clinically_relevant_begin_dttm"
T        CDATA "DTM">
<!ATTLIST CLOB.clnRlvnEndtm
HL7_name CDATA #FIXED "Clinical_observation.clinically_relevant_end_dttm"
T        CDATA "DTM">
<!ATTLIST CLOB.lastObsvNormValuDtm
HL7_name CDATA #FIXED "Clinical_observation.last_observed_normal_values_dttm"
T        CDATA "DTM">
<!ATTLIST CLOB.naturAbnTstg
HL7_name CDATA #FIXED "Clinical_observation.nature_of_abnormal_testing_cd"
T        CDATA "CE">
<!ATTLIST CLOB.obsValu_C
HL7_name CDATA #FIXED "Clinical_observation.observation_value_choice"
T        CDATA "obsValu_C">
<!ATTLIST CLOB.prblty
HL7_name CDATA #FIXED "Clinical_observation.probability_number"
T        CDATA "NM">
<!ATTLIST CLOB.refsRng
HL7_name CDATA #FIXED "Clinical_observation.references_range_text"
T        CDATA "ST">
<!ATTLIST ID
HL7_name CDATA #FIXED "Version_id"
T        CDATA "ID">

```

```

<!ATTLIST Labrs3P00
    HL7_name CDATA #FIXED "Lab_results_message"
    T CDATA "Labrs3P00">
<!ATTLIST Labrs3P00.MSGH
    HL7_name CDATA #FIXED "Lab_results_message.Message_header"
    T CDATA "MSGH">
<!ATTLIST Labrs3P00.PTP
    HL7_name CDATA #FIXED "Lab_results_message.Patient_person"
    T CDATA "PTP">
<!ATTLIST Labrs3P00.SIOO_L
    HL7_name CDATA #FIXED "Lab_results_message.Service_intent_or_order_list"
    T CDATA "SIOO_L">
<!ATTLIST MPSLOC.addr
    HL7_name CDATA #FIXED "Master_patient_service_location.addr"
    T CDATA "XAD">
<!ATTLIST MPSLOC.emlAdr
    HL7_name CDATA #FIXED "Master_patient_service_location.email_address"
    T CDATA "XTN">
<!ATTLIST MPSLOC.id
    HL7_name CDATA #FIXED "Master_patient_service_location.id"
    T CDATA "IID">
<!ATTLIST MPSLOC.inclIn
    HL7_name CDATA #FIXED "Master_patient_service_location.is_included_in"
    T CDATA "MPSLOC">
<!ATTLIST MPSLOC.name
    HL7_name CDATA #FIXED "Master_patient_service_location.nm"
    T CDATA "ST">
<!ATTLIST MPSLOC.phon
    HL7_name CDATA #FIXED "Master_patient_service_location.phon"
    T CDATA "XTN">
<!ATTLIST MSGA.ackCd
    HL7_name CDATA #FIXED "Message_ack.acknowledgement_code"
    T CDATA "ID">
<!ATTLIST MSGA.dlydAckTyp
    HL7_name CDATA #FIXED "Message_ack.delayed_ack_type"
    T CDATA "ID">
<!ATTLIST MSGA.errCond
    HL7_name CDATA #FIXED "Message_ack.error_condition"
    T CDATA "CNE">
<!ATTLIST MSGA.expctdSeqNbr
    HL7_name CDATA #FIXED "Message_ack.expected_seq_number"
    T CDATA "NM">
<!ATTLIST MSGA.msgCntID
    HL7_name CDATA #FIXED "Message_ack.message_control_id"
    T CDATA "ST">
<!ATTLIST MSGA.txtmsg
    HL7_name CDATA #FIXED "Message_ack.text_message"
    T CDATA "ST">
<!ATTLIST MSRV.mthdCd
    HL7_name CDATA #FIXED "Master_service.method_cd"
    T CDATA "CE">
<!ATTLIST MSRV.mthdDesc
    HL7_name CDATA #FIXED "Master_service.method_descr"
    T CDATA "TX">
<!ATTLIST MSRV.svcDesc
    HL7_name CDATA #FIXED "Master_service.service_desc"
    T CDATA "TX">

```

```

<!ATTLIST MSRV.targAntmcSite
  HL7_name CDATA #FIXED "Master_service.target_anatomic_site_cd"
  T CDATA "CE">
<!ATTLIST MSRV.unvSvcId
  HL7_name CDATA #FIXED "Master_service.universal_service_id"
  T CDATA "CE">
<!ATTLIST PSNI.StkID
  HL7_name CDATA #FIXED "Person_ID.Stakeholder_ID"
  T CDATA "StkID">
<!ATTLIST PSNI.primrNamType
  HL7_name CDATA #FIXED "Person_ID.primary_name_type_cd"
  T CDATA "CNE">
<!ATTLIST PSNI.primrPrsnm
  HL7_name CDATA #FIXED "Person_ID.primary_prsnm"
  T CDATA "PN">
<!ATTLIST PTP.PhonNmbr_L
  HL7_name CDATA #FIXED "Patient_person.phone_number_list"
  T CDATA "PhonNmbr_LL">
<!ATTLIST PTP.StkID
  HL7_name CDATA #FIXED "Patient_person.Stakeholder_ID"
  T CDATA "StkID">
<!ATTLIST PTP.addr
  HL7_name CDATA #FIXED "Patient_person.addr"
  T CDATA "XAD">
<!ATTLIST PTP.birthDtm
  HL7_name CDATA #FIXED "Patient_person.birth_dttm"
  T CDATA "DTM">
<!ATTLIST PTP.gndr
  HL7_name CDATA #FIXED "Patient_person.gender_cd"
  T CDATA "CNE">
<!ATTLIST PTP.martlStats
  HL7_name CDATA #FIXED "Patient_person.marital_status_cd"
  T CDATA "CNE">
<!ATTLIST PTP.primrNamRprsntn
  HL7_name CDATA #FIXED "Patient_person.primary_name_representation_cd"
  T CDATA "CNE">
<!ATTLIST PTP.primrNamType
  HL7_name CDATA #FIXED "Patient_person.primary_name_type_cd"
  T CDATA "CNE">
<!ATTLIST PTP.primrPrsnm
  HL7_name CDATA #FIXED "Patient_person.primary_prsnm"
  T CDATA "PN">
<!ATTLIST PTP.race
  HL7_name CDATA #FIXED "Patient_person.race_cd"
  T CDATA "CNE">
<!ATTLIST PhonNmbr_LL.item
  HL7_name CDATA #FIXED "Patient_Phone_Number_List.item"
  T CDATA "XTN">
<!ATTLIST PrcsgIdTyp
  HL7_name CDATA #FIXED "processing_id_type"
  T CDATA "ID">
<!ATTLIST PrcsgMod
  HL7_name CDATA #FIXED "processing_mode"
  T CDATA "ID">
<!ATTLIST RLabrv3P00
  HL7_name CDATA #FIXED "Rspns_HL7_Lab_Query"
  T CDATA "RLabrv3P00">

```

```

<!ATTLIST RLabrv3P00.MSGA
  HL7_name CDATA #FIXED "Rspns_HL7_Lab_Query.Message_ack"
  T CDATA "MSGA">
<!ATTLIST RLabrv3P00.MSGH
  HL7_name CDATA #FIXED "Rspns_HL7_Lab_Query.Message_header"
  T CDATA "MSGH">
<!ATTLIST RLabrv3P00.PTP
  HL7_name CDATA #FIXED "Rspns_HL7_Lab_Query.Patient_person"
  T CDATA "PTP">
<!ATTLIST RLabrv3P00.SIOO_L
  HL7_name CDATA #FIXED "Rspns_HL7_Lab_Query.Service_intent_or_order_list"
  T CDATA "SIOO_L">
<!ATTLIST SAMP.bodySite
  HL7_name CDATA #FIXED "Collected_specimen_sample.body_site_cd"
  T CDATA "CE">
<!ATTLIST SAMP.colctnEndDtm
  HL7_name CDATA #FIXED "Collected_specimen_sample.collection_end_dttm"
  T CDATA "DTM">
<!ATTLIST SAMP.colctnStrtDtm
  HL7_name CDATA #FIXED "Collected_specimen_sample.collection_start_dttm"
  T CDATA "DTM">
<!ATTLIST SAMP.colctnVolm
  HL7_name CDATA #FIXED "Collected_specimen_sample.collection_volume_amt"
  T CDATA "CQ">
<!ATTLIST SAMP.handlg
  HL7_name CDATA #FIXED "Collected_specimen_sample.handling_cd"
  T CDATA "ID">
<!ATTLIST SAMP.id
  HL7_name CDATA #FIXED "Collected_specimen_sample.id"
  T CDATA "IID">
<!ATTLIST SAMP.mthdColctnDesc
  HL7_name CDATA #FIXED "Collected_specimen_sample.method_of_collection_desc"
  T CDATA "TX">
<!ATTLIST SAMP.partpnTyp
  HL7_name CDATA #FIXED "Collected_specimen_sample.participation_type_cd"
  T CDATA "CE">
<!ATTLIST SAMP.spcmnAdtv
  HL7_name CDATA #FIXED "Collected_specimen_sample.specimen_additive_txt"
  T CDATA "ST">
<!ATTLIST SAMP.spcmnDngr
  HL7_name CDATA #FIXED "Collected_specimen_sample.specimen_danger_cd"
  T CDATA "ID">
<!ATTLIST SAMP.spcmnSrc
  HL7_name CDATA #FIXED "Collected_specimen_sample.specimen_source_cd"
  T CDATA "CE">
<!ATTLIST SIOO.InsncOf
  HL7_name CDATA #FIXED "Service_intent_or_order.is_an_instance_of"
  T CDATA "MSRV">
<!ATTLIST SIOO.OrdQtyTimng
  HL7_name CDATA #FIXED "Service_intent_or_order.order_quantity_timing_qty"
  T CDATA "TQ">
<!ATTLIST SIOO.SAMP
  HL7_name CDATA #FIXED "Service_intent_or_order.has_as_target_sample"
  T CDATA "SAMP">
<!ATTLIST SIOO.SRVE_L
  HL7_name CDATA #FIXED "Service_intent_or_order.Service_event_list"
  T CDATA "SRVE_L">

```

```

<!ATTLIST SIOO.actPrtcptntOrd_L
HL7_name CDATA #FIXED
"Service_intent_or_order.has_as_active_participant_order_list"
T CDATA "ACTP_L">
<!ATTLIST SIOO.entrdAt
HL7_name CDATA #FIXED "Service_intent_or_order.is_entered_at"
T CDATA "MPSLOC">
<!ATTLIST SIOO.filrOrdId
HL7_name CDATA #FIXED "Service_intent_or_order.filler_order_id"
T CDATA "IID">
<!ATTLIST SIOO.filrTxt
HL7_name CDATA #FIXED "Service_intent_or_order.filler_txt"
T CDATA "TX">
<!ATTLIST SIOO.intOrOrd
HL7_name CDATA #FIXED "Service_intent_or_order.intent_or_order_cd"
T CDATA "ID">
<!ATTLIST SIOO.ordPlcdDtm
HL7_name CDATA #FIXED "Service_intent_or_order.order_placed_dttm"
T CDATA "DTM">
<!ATTLIST SIOO.placrOrdId
HL7_name CDATA #FIXED "Service_intent_or_order.placer_order_id"
T CDATA "IID">
<!ATTLIST SIOO.placrTxt
HL7_name CDATA #FIXED "Service_intent_or_order.placer_txt"
T CDATA "TX">
<!ATTLIST SIOO.rprtrSltsToPhon
HL7_name CDATA #FIXED "Service_intent_or_order.report_results_to_phone"
T CDATA "XTN">
<!ATTLIST SIOO_L.item
HL7_name CDATA #FIXED "Service_intent_or_order_list.item"
T CDATA "SIOO">
<!ATTLIST SRVE.CLOB
HL7_name CDATA #FIXED "Service_event.Clinical_observation"
T CDATA "CLOB">
<!ATTLIST SRVE.hasActvPartnts_L
HL7_name CDATA #FIXED "Service_event.has_as_active_participant_list"
T CDATA "ACTP_L">
<!ATTLIST SRVE.name
HL7_name CDATA #FIXED "Service_event.name"
T CDATA "CE">
<!ATTLIST SRVE.spcmRcvdDtm
HL7_name CDATA #FIXED "Service_event.specimen_received_dttm"
T CDATA "DTM">
<!ATTLIST SRVE.svcEvtDesc
HL7_name CDATA #FIXED "Service_event.service_event_desc"
T CDATA "ST">
<!ATTLIST SRVE_L.item
HL7_name CDATA #FIXED "Service_event_list.item"
T CDATA "SRVE">
<!ATTLIST StkID.id
HL7_name CDATA #FIXED "Stakeholder_ID.id"
T CDATA "ST">
<!ATTLIST StkID.idType
HL7_name CDATA #FIXED "Stakeholder_ID.identifier_type_cd"
T CDATA "ID">
<!ATTLIST TQ.text
HL7_name CDATA #FIXED "Service_delivery_time_quantity.text"

```

```

T          CDATA    "TX">
<!ATTLIST acptAckTyp
  HL7_name CDATA    #FIXED "accept_ack_type"
  T        CDATA    "ID">
<!ATTLIST addrType
  HL7_name CDATA    #FIXED "address_type"
  T        CDATA    "ID">
<!ATTLIST altCharSetSchm
  HL7_name CDATA    #FIXED "alt_char_set_scheme"
  T        CDATA    "ID">
<!ATTLIST anytxt
  HL7_name CDATA    #FIXED "any_text"
  T        CDATA    "TX">
<!ATTLIST applAckTyp
  HL7_name CDATA    #FIXED "application_ack_type"
  T        CDATA    "ID">
<!ATTLIST areaCityCode
  HL7_name CDATA    #FIXED "area_city_code"
  T        CDATA    "NM">
<!ATTLIST charSet
  HL7_name CDATA    #FIXED "character_set"
  T        CDATA    "ID">
<!ATTLIST city
  HL7_name CDATA    #FIXED "city"
  T        CDATA    "ST">
<!ATTLIST cnssTract
  HL7_name CDATA    #FIXED "census_tract"
  T        CDATA    "IS">
<!ATTLIST cntry
  HL7_name CDATA    #FIXED "country"
  T        CDATA    "ID">
<!ATTLIST cntryCd
  HL7_name CDATA    #FIXED "country_code"
  T        CDATA    "ID">
<!ATTLIST cntryCode
  HL7_name CDATA    #FIXED "country_code"
  T        CDATA    "NM">
<!ATTLIST cntyPrsh
  HL7_name CDATA    #FIXED "county_or_parish_code"
  T        CDATA    "IS">
<!ATTLIST contPtr
  HL7_name CDATA    #FIXED "continuation_pointer"
  T        CDATA    "ST">
<!ATTLIST dgr
  HL7_name CDATA    #FIXED "degree"
  T        CDATA    "ST">
<!ATTLIST emailAddr
  HL7_name CDATA    #FIXED "email_address"
  T        CDATA    "ST">
<!ATTLIST fmn
  HL7_name CDATA    #FIXED "family_name"
  T        CDATA    "ST">
<!ATTLIST gvn
  HL7_name CDATA    #FIXED "given_name"
  T        CDATA    "ST">
<!ATTLIST intCd
  HL7_name CDATA    #FIXED "internationalization_code"

```

```

T          CDATA    "CNE">
<!ATTLIST intVID
  HL7_name CDATA    #FIXED "international_version_id"
  T        CDATA    "CNE">
<!ATTLIST intrId
  HL7_name CDATA    #FIXED "interaction_id"
  T        CDATA    "ID">
<!ATTLIST mdn
  HL7_name CDATA    #FIXED "middle_initial_or_name"
  T        CDATA    "ST">
<!ATTLIST msgCntID
  HL7_name CDATA    #FIXED "message_control_id"
  T        CDATA    "ST">
<!ATTLIST msgDt
  HL7_name CDATA    #FIXED "date_time_message"
  T        CDATA    "DTM">
<!ATTLIST msgID
  HL7_name CDATA    #FIXED "message_id"
  T        CDATA    "ID">
<!ATTLIST msgPrimLang
  HL7_name CDATA    #FIXED "msg_primary_lang"
  T        CDATA    "CNE">
<!ATTLIST msgTyp
  HL7_name CDATA    #FIXED "message_type"
  T        CDATA    "MSGT">
<!ATTLIST nsid
  HL7_name CDATA    #FIXED "name_space_id"
  T        CDATA    "ST">
<!ATTLIST obsValuNm.obsvnmValu
  HL7_name CDATA    #FIXED "observation_value_nm.observation_value"
  T        CDATA    "NM">
<!ATTLIST obsValuNm.valUnits
  HL7_name CDATA    #FIXED "observation_value_nm.value_units_code"
  T        CDATA    "CE">
<!ATTLIST obsValu_C.obsValuCd
HL7_name CDATA    #FIXED "observation_value_choice.observation_value_categorical"
  T        CDATA    "CE"
  Choice   CDATA    "C">
<!ATTLIST obsValu_C.obsValuCnt
HL7_name CDATA    #FIXED "observation_value_choice.observation_value_continuous"
  T        CDATA    "obsValuNm"
  Choice   CDATA    "N">
<!ATTLIST obsValu_C.obsValuSt
HL7_name CDATA    #FIXED "observation_value_choice.observation_value_calculated"
  T        CDATA    "ST"
  Choice   CDATA    "S">
<!ATTLIST othrDsgn
  HL7_name CDATA    #FIXED "other_designation"
  T        CDATA    "ST">
<!ATTLIST othrGgrphDsgn
  HL7_name CDATA    #FIXED "other_geographic_designation"
  T        CDATA    "ST">
<!ATTLIST pfx
  HL7_name CDATA    #FIXED "prefix"
  T        CDATA    "ST">
<!ATTLIST phonNmbr
  HL7_name CDATA    #FIXED "phone_number"

```

```

T          CDATA    "NM">
<!ATTLIST procID
  HL7_name CDATA    #FIXED "processing_id"
  T        CDATA    "PDG">
<!ATTLIST qty
  HL7_name CDATA    #FIXED "quantity"
  T        CDATA    "NM">
<!ATTLIST rcvgApp
  HL7_name CDATA    #FIXED "receiving_application"
  T        CDATA    "HD">
<!ATTLIST rcvgFaclt
  HL7_name CDATA    #FIXED "receiving_facility"
  T        CDATA    "HD">
<!ATTLIST scrty
  HL7_name CDATA    #FIXED "security"
  T        CDATA    "ST">
<!ATTLIST sfx
  HL7_name CDATA    #FIXED "suffix"
  T        CDATA    "ST">
<!ATTLIST sndApp
  HL7_name CDATA    #FIXED "sending_application"
  T        CDATA    "HD">
<!ATTLIST sndFaclt
  HL7_name CDATA    #FIXED "sending_facility"
  T        CDATA    "HD">
<!ATTLIST sqncNbr
  HL7_name CDATA    #FIXED "sequence_number"
  T        CDATA    "NM">
<!ATTLIST strtAdrs
  HL7_name CDATA    #FIXED "street_address"
  T        CDATA    "ST">
<!ATTLIST sttPrvnc
  HL7_name CDATA    #FIXED "state_or_province"
  T        CDATA    "ST">
<!ATTLIST tlcmmEqpTyp
  HL7_name CDATA    #FIXED "telecommunication_equipment_type"
  T        CDATA    "ID">
<!ATTLIST tlcmmUse
  HL7_name CDATA    #FIXED "telecommunication_use_code"
  T        CDATA    "ID">
<!ATTLIST uid
  HL7_name CDATA    #FIXED "universal_id"
  T        CDATA    "ST">
<!ATTLIST uidtyp
  HL7_name CDATA    #FIXED "universal_id_type"
  T        CDATA    "ID">
<!ATTLIST unts
  HL7_name CDATA    #FIXED "units"
  T        CDATA    "CE">
<!ATTLIST vrsnID
  HL7_name CDATA    #FIXED "version_id"
  T        CDATA    "VID">
<!ATTLIST xtnsn
  HL7_name CDATA    #FIXED "extension"
  T        CDATA    "NM">
<!ATTLIST zipPstlCd
  HL7_name CDATA    #FIXED "zip_or_postal_code"

```

T CDATA "ST" >

7. HIMSS Demo V3 XML Lab Result Message

```
<?xml version = "1.0" encoding="US-ASCII"?>
<!DOCTYPE Labrs3P00 SYSTEM "Labrs3P00.dtd" [ ]>
<Labrs3P00 T="Labrs3P00">
  <Labrs3P00.MSGH T="MSGH">
    <sndApp T="HD">
      <nsid T="ST">LABGL1</nsid>
    </sndApp>
    <rcvgApp T="HD">
      <nsid T="ST">DMCRES</nsid>
    </rcvgApp>
    <msgDt T="DTM">19951022183800</msgDt>
    <msgTyp T="MSGT">
      <msgID T="ID">Labrs3P00</msgID>
      <intrId T="ID">R01</intrId>
    </msgTyp>
    <msgCntID T="ST">LABGL1199510221838581</msgCntID>
    <procID T="PDG">
      <PrmsgIdTyp T="ID">P</PrmsgIdTyp>
    </procID>
    <vrsnID T="VID">
      <ID T="ID">3P00</ID>
    </vrsnID>
    <acptAckTyp T="ID">NE</acptAckTyp>
    <applAckTyp T="ID">NE</applAckTyp>
  </Labrs3P00.MSGH>
  <Labrs3P00.PTP T="PTP">
    <PTP.birthDtm T="DTM">19720812</PTP.birthDtm>
    <PTP.gndr T="CNE">M</PTP.gndr>
    <PTP.martlStats T="CNE">M</PTP.martlStats>
    <PTP.primrNamType T="CNE">L</PTP.primrNamType>
    <PTP.primrPrsnm T="PN">
      <fmn T="ST">Sample</fmn>
      <gvn T="ST">George</gvn>
      <mdn T="ST">H</mdn>
    </PTP.primrPrsnm>
    <PTP.race T="CNE">C</PTP.race>
    <PTP.addr T="XAD">
      <strtAdrs T="ST">25 Centscheap Ave</strtAdrs>
      <city T="ST">Whatmeworry</city>
      <sttPrvnc T="ST">UT</sttPrvnc>
      <zipPstlCd T="ST">85201</zipPstlCd>
      <addrType T="ID">P</addrType>
    </PTP.addr>
    <PTP.PhonNmbr_LL T="PhonNmbr_LL">
      <PhonNmbr_LL.item T="XTN">
        <tlcmnUse T="ID">PRN</tlcmnUse>
        <tlcmnEqpTyp T="ID">PH</tlcmnEqpTyp>
        <areaCityCode T="NM">555</areaCityCode>
        <phonNmbr T="NM">7776666</phonNmbr>
      </PhonNmbr_LL.item>
      <PhonNmbr_LL.item T="XTN">
        <tlcmnUse T="ID">WPN</tlcmnUse>
        <tlcmnEqpTyp T="ID">PH</tlcmnEqpTyp>
        <areaCityCode T="NM">444</areaCityCode>
        <phonNmbr T="NM">6777777</phonNmbr>
      </PhonNmbr_LL.item>
    </PTP.PhonNmbr_LL>
  </Labrs3P00.PTP>
</Labrs3P00>
```

```

    </PhonNmbr_LL.item>
  </PTP.PhonNmbr_L>
  <PTP.StkID T="StkID">
    <StkID.id T="ST">6910828</StkID.id>
    <StkID.idType T="ID">MRN</StkID.idType>
  </PTP.StkID>
</Labrs3P00.PTP>
<Labrs3P00.SIOO_L T="SIOO_L">
  <SIOO_L.item T="SIOO">
    <SIOO.filrOrdId T="IID">LABGL110751</SIOO.filrOrdId>
    <SIOO.placrOrdId T="IID">DMCRES387209372</SIOO.placrOrdId>
    <SIOO.intOrOrd T="ID">O</SIOO.intOrOrd>
    <SIOO.ordPlcdDtm T="DTM">199812190830</SIOO.ordPlcdDtm>
    <SIOO.OrdQtyTimng T="TQ">
      <TQ.text T="S">Once</TQ.text>
    </SIOO.OrdQtyTimng>
    <SIOO.InsncOf T="MSRV">
      <MSRV.unvSvcId T="CE">18729-4</MSRV.unvSvcId>
      <MSRV.svcDesc T="TX">URINALYSIS TESTS (COMPOSITE)</MSRV.svcDesc>
    </SIOO.InsncOf>
    <SIOO.SAMP T="SAMP">
      <SAMP.partpnTyp T="CE">S</SAMP.partpnTyp>
      <SAMP.id T="IID">S19234</SAMP.id>
      <SAMP.colctnStrtDtm T="DTM">199812292128</SAMP.colctnStrtDtm>
      <SAMP.colctnVolm T="CQ">
        <qty T="NM">200</qty>
        <unts T="CE">ML</unts>
      </SAMP.colctnVolm>
    </SIOO.SAMP>
    <SIOO.actPrtcptOrd_L T="ACTP_L">
      <ACTP_L.item T="ACTP">
        <ACTP.partcpnTyp T="ID">ORD</ACTP.partcpnTyp>
        <ACTP.partcpt T="PSNI">
          <PSNI.primrNamType T="CNE">L</PSNI.primrNamType>
          <PSNI.primrPrsnm T="PN">
            <fmn T="ST">Schadow</fmn>
            <gvn T="ST">Gunther</gvn>
            <dgr T="ST">MD</dgr>
          </PSNI.primrPrsnm>
          <PSNI.StkID T="StkID">
            <StkID.id T="ST">IN2973</StkID.id>
            <StkID.idType T="ID">UPIN</StkID.idType>
          </PSNI.StkID>
        </ACTP.partcpt>
      </ACTP_L.item>
      <ACTP_L.item T="ACTP">
        <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
        <ACTP.partcpt T="PSNI">
          <PSNI.primrNamType T="CNE">L</PSNI.primrNamType>
          <PSNI.primrPrsnm T="PN">
            <fmn T="ST">Spinosa</fmn>
            <gvn T="ST">John</gvn>
            <dgr T="ST">MD</dgr>
          </PSNI.primrPrsnm>
          <PSNI.StkID T="StkID">
            <StkID.id T="ST">CA20837</StkID.id>
            <StkID.idType T="ID">UPIN</StkID.idType>
          </PSNI.StkID>
        </ACTP_L.item>
      </ACTP_L.item>
    </SIOO.actPrtcptOrd_L>
  </SIOO_L.item>
</Labrs3P00.SIOO_L>
</Labrs3P00>

```

```

        </PSNI.StkID>
    </ACTP.partcpnt>
</ACTP_L.item>
</SIOO.actPrtcptOrd_L>
<SIOO.SRVE_L T="SRVE_L">
    <SRVE_L.item T="SRVE">
        <SRVE.name T="CE">5778-6</SRVE.name>
        <SRVE.svcEvntDesc T="ST">URINE COLOR</SRVE.svcEvntDesc>
        <SRVE.CLOB T="CLOB">
            <CLOB.obsValu_C T="obsValu_C">
                <obsValu_C.obsValuSt T="ST"
Choice="S">STRAW</obsValu_C.obsValuSt>
            </CLOB.obsValu_C>
            <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
            <ACTP_L.item T="ACTP">
                <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                <ACTP.partcpnt T="PSNI">
                    <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                        <PSNI.primrPrsnm T="PN">
                            <fmn T="ST">Spinosa</fmn>
                            <gvn T="ST">John</gvn>
                            <dgr T="ST">MD</dgr>
                        </PSNI.primrPrsnm>
                        <PSNI.StkID T="StkID">
                            <StkID.id T="ST">CA20837</StkID.id>
                            <StkID.idType T="ID">UPIN</StkID.idType>
                        </PSNI.StkID>
                    </ACTP.partcpnt>
                </ACTP_L.item>
            </SRVE.hasActvPartnts_L>
        </SRVE_L.item>
    <SRVE_L.item T="SRVE">
        <SRVE.name T="CE">5767-9</SRVE.name>
        <SRVE.svcEvntDesc T="ST">URINE APPEARANCE</SRVE.svcEvntDesc>
        <SRVE.CLOB T="CLOB">
            <CLOB.obsValu_C T="obsValu_C">
                <obsValu_C.obsValuSt T="ST"
Choice="S">CLEAR</obsValu_C.obsValuSt>
            </CLOB.obsValu_C>
            <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
            <ACTP_L.item T="ACTP">
                <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                <ACTP.partcpnt T="PSNI">
                    <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                        <PSNI.primrPrsnm T="PN">
                            <fmn T="ST">Spinosa</fmn>
                            <gvn T="ST">John</gvn>

```

```

                <dgr T="ST">MD</dgr>
            </PSNI.primrPrsnm>
            <PSNI.StkID T="StkID">
                <StkID.id T="ST">CA20837</StkID.id>
                <StkID.idType T="ID">UPIN</StkID.idType>
            </PSNI.StkID>
        </ACTP.partcptnt>
    </ACTP_L.item>
</SRVE.hasActvPartnts_L>
</SRVE_L.item>
<SRVE_L.item T="SRVE">
    <SRVE.name T="CE">2349-9</SRVE.name>
    <SRVE.svcEvntDesc T="ST">URINE GLUCOSE</SRVE.svcEvntDesc>
    <SRVE.CLOB T="CLOB">
        <CLOB.obsValu_C T="obsValu_C">
            <obsValu_C.obsValuSt T="ST"
Choice="S">1+</obsValu_C.obsValuSt>
        </CLOB.obsValu_C>
        <CLOB.abnrmlRslt T="ST">A</CLOB.abnrmlRslt>
        <CLOB.refsrng T="ST">NEG</CLOB.refsrng>
        <CLOB.clnRlrvnBgnDtm
T="DTM">199812292128</CLOB.clnRlrvnBgnDtm>
    </SRVE.CLOB>
    <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
    <SRVE.hasActvPartnts_L T="ACTP_L">
        <ACTP_L.item T="ACTP">
            <ACTP.partcptntyp T="ID">PI</ACTP.partcptntyp>
            <ACTP.partcptnt T="PSNI">
                <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                <PSNI.primrPrsnm T="PN">
                    <fmn T="ST">Spinosa</fmn>
                    <gvn T="ST">John</gvn>
                    <dgr T="ST">MD</dgr>
                </PSNI.primrPrsnm>
                <PSNI.StkID T="StkID">
                    <StkID.id T="ST">CA20837</StkID.id>
                    <StkID.idType T="ID">UPIN</StkID.idType>
                </PSNI.StkID>
            </ACTP.partcptnt>
        </ACTP_L.item>
    </SRVE.hasActvPartnts_L>
</SRVE_L.item>
<SRVE_L.item T="SRVE">
    <SRVE.name T="CE">1977-8</SRVE.name>
    <SRVE.svcEvntDesc T="ST">URINE BILIRUBIN</SRVE.svcEvntDesc>
    <SRVE.CLOB T="CLOB">
        <CLOB.obsValu_C T="obsValu_C">
            <obsValu_C.obsValuSt T="ST"
Choice="S">NEG</obsValu_C.obsValuSt>
        </CLOB.obsValu_C>
        <CLOB.refsrng T="ST">NEG</CLOB.refsrng>
        <CLOB.clnRlrvnBgnDtm
T="DTM">199812292128</CLOB.clnRlrvnBgnDtm>
    </SRVE.CLOB>
    <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
    <SRVE.hasActvPartnts_L T="ACTP_L">

```

```

        <ACTP_L.item T="ACTP">
            <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
            <ACTP.partcpnt T="PSNI">
                <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                    <PSNI.primrPrsnm T="PN">
                        <fmn T="ST">Spinosa</fmn>
                        <gvn T="ST">John</gvn>
                        <dgr T="ST">MD</dgr>
                    </PSNI.primrPrsnm>
                    <PSNI.StkID T="StkID">
                        <StkID.id T="ST">CA20837</StkID.id>
                        <StkID.idType T="ID">UPIN</StkID.idType>
                    </PSNI.StkID>
                </ACTP.partcpnt>
            </ACTP_L.item>
        </SRVE.hasActvPartnts_L>
    </SRVE_L.item>
    <SRVE_L.item T="SRVE">
        <SRVE.name T="CE">2514-8</SRVE.name>
        <SRVE.svcEvntDesc T="ST">URINE KETONES TEST
STRIP</SRVE.svcEvntDesc>
        <SRVE.CLOB T="CLOB">
            <CLOB.obsValu_C T="obsValu_C">
                <obsValu_C.obsValuSt T="ST"
Choice="S">NEG</obsValu_C.obsValuSt>
            </CLOB.obsValu_C>
            <CLOB.refsRng T="ST">NEG</CLOB.refsRng>
            <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
            <ACTP_L.item T="ACTP">
                <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                <ACTP.partcpnt T="PSNI">
                    <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                        <PSNI.primrPrsnm T="PN">
                            <fmn T="ST">Spinosa</fmn>
                            <gvn T="ST">John</gvn>
                            <dgr T="ST">MD</dgr>
                        </PSNI.primrPrsnm>
                        <PSNI.StkID T="StkID">
                            <StkID.id T="ST">CA20837</StkID.id>
                            <StkID.idType T="ID">UPIN</StkID.idType>
                        </PSNI.StkID>
                    </ACTP.partcpnt>
                </ACTP_L.item>
            </SRVE.hasActvPartnts_L>
        </SRVE_L.item>
        <SRVE_L.item T="SRVE">
            <SRVE.name T="CE">5810-7</SRVE.name>
            <SRVE.svcEvntDesc T="ST">URINE SPECIFIC GRAVITY
(REFRACTOMETRY)</SRVE.svcEvntDesc>
            <SRVE.CLOB T="CLOB">
                <CLOB.obsValu_C T="obsValu_C">

```

```

        <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
            <obsValuNm.obsVnValu
T="NM">1.007</obsValuNm.obsVnValu>
            </obsValu_C.obsValuCnt>
        </CLOB.obsValu_C>
        <CLOB.refsRng T="ST">1.005-1.030</CLOB.refsRng>
        <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
            <ACTP_L.item T="ACTP">
                <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                <ACTP.partcpt T="PSNI">
                    <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                    <PSNI.primrPrsnm T="PN">
                        <fmn T="ST">Spinosa</fmn>
                        <gvn T="ST">John</gvn>
                        <dgr T="ST">MD</dgr>
                    </PSNI.primrPrsnm>
                    <PSNI.StkID T="StkID">
                        <StkID.id T="ST">CA20837</StkID.id>
                        <StkID.idType T="ID">UPIN</StkID.idType>
                    </PSNI.StkID>
                </ACTP.partcpt>
            </ACTP_L.item>
        </SRVE.hasActvPartnts_L>
    </SRVE_L.item>
    <SRVE_L.item T="SRVE">
        <SRVE.name T="CE">2756-5</SRVE.name>
        <SRVE.svcEvntDesc T="ST">URINE PH</SRVE.svcEvntDesc>
        <SRVE.CLOB T="CLOB">
            <CLOB.obsValu_C T="obsValu_C">
                <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                    <obsValuNm.obsVnValu
T="NM">5.5</obsValuNm.obsVnValu>
                </obsValu_C.obsValuCnt>
            </CLOB.obsValu_C>
            <CLOB.refsRng T="ST">5.0-8.0</CLOB.refsRng>
            <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
            </SRVE.CLOB>
            <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
            <SRVE.hasActvPartnts_L T="ACTP_L">
                <ACTP_L.item T="ACTP">
                    <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                    <ACTP.partcpt T="PSNI">
                        <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                        <PSNI.primrPrsnm T="PN">
                            <fmn T="ST">Spinosa</fmn>
                            <gvn T="ST">John</gvn>
                            <dgr T="ST">MD</dgr>
                        </PSNI.primrPrsnm>
                        <PSNI.StkID T="StkID">
                            <StkID.id T="ST">CA20837</StkID.id>

```

```

                <StkID.idType T="ID">UPIN</StkID.idType>
            </PSNI.StkID>
        </ACTP.partcpt>
    </ACTP_L.item>
</SRVE.hasActvPartnts_L>
</SRVE_L.item>
<SRVE_L.item T="SRVE">
    <SRVE.name T="CE">3107-0</SRVE.name>
    <SRVE.svcEvntDesc T="ST">URINE UROBILINOGEN</SRVE.svcEvntDesc>
    <SRVE.CLOB T="CLOB">
        <CLOB.obsValu_C T="obsValu_C">
            <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                <obsValuNm.obsvNValu
T="NM">0.2</obsValuNm.obsvNValu>
                    <obsValuNm.valUnits
T="CE">mg/dL</obsValuNm.valUnits>
                        </obsValu_C.obsValuCnt>
                    </CLOB.obsValu_C>
                <CLOB.refsrng T="ST">0.2 - 1.0</CLOB.refsrng>
                <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
                    </SRVE.CLOB>
                <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
                <SRVE.hasActvPartnts_L T="ACTP_L">
                    <ACTP_L.item T="ACTP">
                        <ACTP.partcptTyp T="ID">PI</ACTP.partcptTyp>
                        <ACTP.partcpt T="PSNI">
                            <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                                <PSNI.primrPrsnm T="PN">
                                    <fmn T="ST">Spinosa</fmn>
                                    <gvn T="ST">John</gvn>
                                    <dgr T="ST">MD</dgr>
                                </PSNI.primrPrsnm>
                                <PSNI.StkID T="StkID">
                                    <StkID.id T="ST">CA20837</StkID.id>
                                    <StkID.idType T="ID">UPIN</StkID.idType>
                                </PSNI.StkID>
                            </ACTP.partcpt>
                        </ACTP_L.item>
                    </SRVE.hasActvPartnts_L>
                </SRVE_L.item>
            <SRVE_L.item T="SRVE">
                <SRVE.name T="CE">798-9</SRVE.name>
                <SRVE.svcEvntDesc T="ST">URINE ERYTHROCYTES (AUTOMATED
COUNT)</SRVE.svcEvntDesc>
                <SRVE.CLOB T="CLOB">
                    <CLOB.obsValu_C T="obsValu_C">
                        <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                            <obsValuNm.obsvNValu T="NM">1</obsValuNm.obsvNValu>
                            <obsValuNm.valUnits
T="CE">/(hpf)</obsValuNm.valUnits>
                                </obsValu_C.obsValuCnt>
                            </CLOB.obsValu_C>
                        <CLOB.abnrmlRslt T="ST">./.</CLOB.abnrmlRslt>
                        <CLOB.refsrng T="ST">0-3</CLOB.refsrng>

```

```

        <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
            <ACTP_L.item T="ACTP">
                <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                <ACTP.partcpnt T="PSNI">
                    <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                    <PSNI.primrPrsnm T="PN">
                        <fmn T="ST">Spinosa</fmn>
                        <gvn T="ST">John</gvn>
                        <dgr T="ST">MD</dgr>
                    </PSNI.primrPrsnm>
                    <PSNI.StkID T="StkID">
                        <StkID.id T="ST">CA20837</StkID.id>
                        <StkID.idType T="ID">UPIN</StkID.idType>
                    </PSNI.StkID>
                </ACTP.partcpnt>
            </ACTP_L.item>
        </SRVE.hasActvPartnts_L>
    </SRVE_L.item>
</SIOO.SRVE_L>
</SIOO_L.item>
<SIOO_L.item T="SIOO">
    <SIOO.filrOrdId T="IID">LABGL110801</SIOO.filrOrdId>
    <SIOO.placrOrdId T="IID">DMCRES387209373</SIOO.placrOrdId>
    <SIOO.intOrOrd T="ID">O</SIOO.intOrOrd>
    <SIOO.ordPlcdDtm T="DTM">199812190830</SIOO.ordPlcdDtm>
    <SIOO.OrdQtyTimng T="TQ">
        <TQ.text T="S">Once</TQ.text>
    </SIOO.OrdQtyTimng>
    <SIOO.InsncOf T="MSRV">
        <MSRV.unvSvcId T="CE">18768-2</MSRV.unvSvcId>
        <MSRV.svcDesc T="TX">CELL COUNTS+DIFFERENTIAL TESTS
(COMPOSITE)</MSRV.svcDesc>
    </SIOO.InsncOf>
    <SIOO.SAMP T="SAMP">
        <SAMP.partpnTyp T="CE">S</SAMP.partpnTyp>
        <SAMP.id T="IID">S19235</SAMP.id>
        <SAMP.colctnStrtDtm T="DTM">199812292128</SAMP.colctnStrtDtm>
        <SAMP.colctnVolm T="CQ">
            <qty T="NM">35</qty>
            <unts T="CE">ML</unts>
        </SAMP.colctnVolm>
    </SIOO.SAMP>
    <SIOO.actPrtcptntOrd_L T="ACTP_L">
        <ACTP_L.item T="ACTP">
            <ACTP.partcpnTyp T="ID">ORD</ACTP.partcpnTyp>
            <ACTP.partcpnt T="PSNI">
                <PSNI.primrNamType T="CNE">L</PSNI.primrNamType>
                <PSNI.primrPrsnm T="PN">
                    <fmn T="ST">Schadow</fmn>
                    <gvn T="ST">Gunther</gvn>
                    <dgr T="ST">MD</dgr>
                </PSNI.primrPrsnm>
            </PSNI.primrPrsnm>
        </ACTP_L.item>
    </SIOO.actPrtcptntOrd_L>
</SIOO.actPrtcptntOrd_L>

```

```

        <PSNI.StkID T="StkID">
            <StkID.id T="ST">IN2973</StkID.id>
            <StkID.idType T="ID">UPIN</StkID.idType>
        </PSNI.StkID>
    </ACTP.partcpnt>
</ACTP_L.item>
<ACTP_L.item T="ACTP">
    <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
    <ACTP.partcpnt T="PSNI">
        <PSNI.primrNamType T="CNE">L</PSNI.primrNamType>
        <PSNI.primrPrsnm T="PN">
            <fmn T="ST">Spinosa</fmn>
            <gvn T="ST">John</gvn>
            <dgr T="ST">MD</dgr>
        </PSNI.primrPrsnm>
        <PSNI.StkID T="StkID">
            <StkID.id T="ST">CA20837</StkID.id>
            <StkID.idType T="ID">UPIN</StkID.idType>
        </PSNI.StkID>
    </ACTP.partcpnt>
</ACTP_L.item>
</SIOO.actPrtcpntOrd_L>
<SIOO.SRVE_L T="SRVE_L">
    <SRVE_L.item T="SRVE">
        <SRVE.name T="CE">4544-3</SRVE.name>
        <SRVE.svcEvntDesc T="ST">HEMATOCRIT
(AUTOMATED)</SRVE.svcEvntDesc>
        <SRVE.CLOB T="CLOB">
            <CLOB.obsValu_C T="obsValu_C">
                <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                    <obsValuNm.obsValu
T="NM">45</obsValuNm.obsValu>
                </obsValu_C.obsValuCnt>
            </CLOB.obsValu_C>
            <CLOB.refsrng T="ST">39-49</CLOB.refsrng>
            <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
            <ACTP_L.item T="ACTP">
                <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                <ACTP.partcpnt T="PSNI">
                    <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                    <PSNI.primrPrsnm T="PN">
                        <fmn T="ST">Spinosa</fmn>
                        <gvn T="ST">John</gvn>
                        <dgr T="ST">MD</dgr>
                    </PSNI.primrPrsnm>
                    <PSNI.StkID T="StkID">
                        <StkID.id T="ST">CA20837</StkID.id>
                        <StkID.idType T="ID">UPIN</StkID.idType>
                    </PSNI.StkID>
                </ACTP.partcpnt>
            </ACTP_L.item>
        </SRVE.hasActvPartnts_L>

```

```

    </SRVE_L.item>
    <SRVE_L.item T="SRVE">
      <SRVE.name T="CE">789-8</SRVE.name>
      <SRVE.svcEvntDesc T="ST">ERYTHROCYTES COUNT
(AUTOMATED)</SRVE.svcEvntDesc>
      <SRVE.CLOB T="CLOB">
        <CLOB.obsValu_C T="obsValu_C">
          <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
            <obsValuNm.obsvsvValu
T="NM">4.94</obsValuNm.obsvsvValu>
            <obsValuNm.valUnits
T="CE">10*12/mm3</obsValuNm.valUnits>
          </obsValu_C.obsValuCnt>
        </CLOB.obsValu_C>
        <CLOB.refsRng T="ST">4.30-5.90</CLOB.refsRng>
        <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
      </SRVE.CLOB>
      <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
      <SRVE.hasActvPartnts_L T="ACTP_L">
        <ACTP_L.item T="ACTP">
          <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
          <ACTP.partcpnt T="PSNI">
            <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
            <PSNI.primrPrsnm T="PN">
              <fmn T="ST">Spinosa</fmn>
              <gvn T="ST">John</gvn>
              <dgr T="ST">MD</dgr>
            </PSNI.primrPrsnm>
            <PSNI.StkID T="StkID">
              <StkID.id T="ST">CA20837</StkID.id>
              <StkID.idType T="ID">UPIN</StkID.idType>
            </PSNI.StkID>
          </ACTP.partcpnt>
        </ACTP_L.item>
      </SRVE.hasActvPartnts_L>
    </SRVE_L.item>
    <SRVE_L.item T="SRVE">
      <SRVE.name T="CE">787-2</SRVE.name>
      <SRVE.svcEvntDesc T="ST">ERYTHROCYTE MEAN CORPUSCULAR VOLUME
(AUTOMATED COUNT)</SRVE.svcEvntDesc>
      <SRVE.CLOB T="CLOB">
        <CLOB.obsValu_C T="obsValu_C">
          <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
            <obsValuNm.obsvsvValu
T="NM">91</obsValuNm.obsvsvValu>
            <obsValuNm.valUnits T="CE">fL</obsValuNm.valUnits>
          </obsValu_C.obsValuCnt>
        </CLOB.obsValu_C>
        <CLOB.refsRng T="ST">90-98</CLOB.refsRng>
        <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
      </SRVE.CLOB>
      <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
      <SRVE.hasActvPartnts_L T="ACTP_L">
        <ACTP_L.item T="ACTP">

```

```

    <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
    <ACTP.partcpnt T="PSNI">
      <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
        <PSNI.primrPrsnm T="PN">
          <fmn T="ST">Spinosa</fmn>
          <gvn T="ST">John</gvn>
          <dgr T="ST">MD</dgr>
        </PSNI.primrPrsnm>
        <PSNI.StkID T="StkID">
          <StkID.id T="ST">CA20837</StkID.id>
          <StkID.idType T="ID">UPIN</StkID.idType>
        </PSNI.StkID>
      </ACTP.partcpnt>
    </ACTP_L.item>
  </SRVE.hasActvPartnts_L>
</SRVE_L.item>
<SRVE_L.item T="SRVE">
  <SRVE.name T="CE">5907-1</SRVE.name>
  <SRVE.svcEvntDesc T="ST">PLATELETS COUNT
(AUTOMATED)</SRVE.svcEvntDesc>
  <SRVE.CLOB T="CLOB">
    <CLOB.obsValu_C T="obsValu_C">
      <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
        <obsValuNm.obsvNValu
T="NM">233</obsValuNm.obsvNValu>
          <obsValuNm.valUnits
T="CE">10*9/mm3</obsValuNm.valUnits>
            </obsValu_C.obsValuCnt>
          </CLOB.obsValu_C>
          <CLOB.refsrng T="ST">150-450</CLOB.refsrng>
          <CLOB.clnRlrvBgnDtm
T="DTM">199812292128</CLOB.clnRlrvBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
          <ACTP_L.item T="ACTP">
            <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
            <ACTP.partcpnt T="PSNI">
              <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                <PSNI.primrPrsnm T="PN">
                  <fmn T="ST">Spinosa</fmn>
                  <gvn T="ST">John</gvn>
                  <dgr T="ST">MD</dgr>
                </PSNI.primrPrsnm>
                <PSNI.StkID T="StkID">
                  <StkID.id T="ST">CA20837</StkID.id>
                  <StkID.idType T="ID">UPIN</StkID.idType>
                </PSNI.StkID>
              </ACTP.partcpnt>
            </ACTP_L.item>
          </SRVE.hasActvPartnts_L>
        </SRVE_L.item>
      <SRVE_L.item T="SRVE">
        <SRVE.name T="CE">6690-2</SRVE.name>

```

```

        <SRVE.svcEvntDesc T="ST">LEUKOCYTES COUNT
(AUTOMATED)</SRVE.svcEvntDesc>
        <SRVE.CLOB T="CLOB">
            <CLOB.obsValu_C T="obsValu_C">
                <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                    <obsValuNm.obsvsvValu
T="NM">25</obsValuNm.obsvsvValu>
                    <obsValuNm.valUnits
T="CE">10*9/mm3</obsValuNm.valUnits>
                </obsValu_C.obsValuCnt>
            </CLOB.obsValu_C>
            <CLOB.abnrmlRslt T="ST">H</CLOB.abnrmlRslt>
            <CLOB.refsrng T="ST">3.2-9.8</CLOB.refsrng>
            <CLOB.clnRlsvBgnDtm
T="DTM">199812292128</CLOB.clnRlsvBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
            <ACTP_L.item T="ACTP">
                <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                <ACTP.partcpnt T="PSNI">
                    <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                    <PSNI.primrPrsvnm T="PN">
                        <fmn T="ST">Spinosa</fmn>
                        <gvn T="ST">John</gvn>
                        <dgr T="ST">MD</dgr>
                    </PSNI.primrPrsvnm>
                    <PSNI.StkID T="StkID">
                        <StkID.id T="ST">CA20837</StkID.id>
                        <StkID.idType T="ID">UPIN</StkID.idType>
                    </PSNI.StkID>
                </ACTP.partcpnt>
            </ACTP_L.item>
        </SRVE.hasActvPartnts_L>
    </SRVE_L.item>
    <SRVE_L.item T="SRVE">
        <SRVE.name T="CE">770-8</SRVE.name>
        <SRVE.svcEvntDesc T="ST">NEUTROPHILS/100 LEUKOCYTES
(AUTOMATED)</SRVE.svcEvntDesc>
        <SRVE.CLOB T="CLOB">
            <CLOB.obsValu_C T="obsValu_C">
                <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                    <obsValuNm.obsvsvValu
T="NM">83.1</obsValuNm.obsvsvValu>
                    <obsValuNm.valUnits T="CE">%</obsValuNm.valUnits>
                </obsValu_C.obsValuCnt>
            </CLOB.obsValu_C>
            <CLOB.abnrmlRslt T="ST">H</CLOB.abnrmlRslt>
            <CLOB.refsrng T="ST">37.0-80.0</CLOB.refsrng>
            <CLOB.clnRlsvBgnDtm
T="DTM">199812292128</CLOB.clnRlsvBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
            <ACTP_L.item T="ACTP">
                <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>

```

```

                                <ACTP.partcpnt T="PSNI">
                                    <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                                        <PSNI.primrPrsnm T="PN">
                                            <fmn T="ST">Spinosa</fmn>
                                            <gvn T="ST">John</gvn>
                                            <dgr T="ST">MD</dgr>
                                        </PSNI.primrPrsnm>
                                        <PSNI.StkID T="StkID">
                                            <StkID.id T="ST">CA20837</StkID.id>
                                            <StkID.idType T="ID">UPIN</StkID.idType>
                                        </PSNI.StkID>
                                    </ACTP.partcpnt>
                                </ACTP_L.item>
                            </SRVE.hasActvPartnts_L>
                        </SRVE_L.item>
                    <SRVE_L.item T="SRVE">
                        <SRVE.name T="CE">706-2</SRVE.name>
                        <SRVE.svcEvntDesc T="ST">BASOPHILS/100 LEUKOCYTES
(AUTOMATED)</SRVE.svcEvntDesc>
                        <SRVE.CLOB T="CLOB">
                            <CLOB.obsValu_C T="obsValu_C">
                                <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                                    <obsValuNm.obsvNValu
T="NM">10.1</obsValuNm.obsvNValu>
                                        <obsValuNm.valUnits T="CE">%</obsValuNm.valUnits>
                                    </obsValu_C.obsValuCnt>
                                </CLOB.obsValu_C>
                                <CLOB.refsrng T="ST">10.0-50.0</CLOB.refsrng>
                                <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
                                    </SRVE.CLOB>
                                <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
                                <SRVE.hasActvPartnts_L T="ACTP_L">
                                    <ACTP_L.item T="ACTP">
                                        <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                                        <ACTP.partcpnt T="PSNI">
                                            <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                                                <PSNI.primrPrsnm T="PN">
                                                    <fmn T="ST">Spinosa</fmn>
                                                    <gvn T="ST">John</gvn>
                                                    <dgr T="ST">MD</dgr>
                                                </PSNI.primrPrsnm>
                                                <PSNI.StkID T="StkID">
                                                    <StkID.id T="ST">CA20837</StkID.id>
                                                    <StkID.idType T="ID">UPIN</StkID.idType>
                                                </PSNI.StkID>
                                            </ACTP.partcpnt>
                                        </ACTP_L.item>
                                    </SRVE.hasActvPartnts_L>
                                </SRVE_L.item>
                            <SRVE_L.item T="SRVE">
                                <SRVE.name T="CE">5905-5</SRVE.name>
                                <SRVE.svcEvntDesc T="ST">MONOCYTES/100 LEUKOCYTES
(AUTOMATED)</SRVE.svcEvntDesc>
                                <SRVE.CLOB T="CLOB">

```

```

        <CLOB.obsValu_C T="obsValu_C">
            <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                <obsValuNm.obsvsvValu
T="NM">6.3</obsValuNm.obsvsvValu>
                    <obsValuNm.valUnits T="CE">%</obsValuNm.valUnits>
                </obsValu_C.obsValuCnt>
            </CLOB.obsValu_C>
            <CLOB.refsRng T="ST">0.0-12.0</CLOB.refsRng>
            <CLOB.clnRlsvBgnDtm
T="DTM">199812292128</CLOB.clnRlsvBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
            <ACTP_L.item T="ACTP">
                <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                <ACTP.partcpnt T="PSNI">
                    <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                        <PSNI.primrPrsvnm T="PN">
                            <fmn T="ST">Spinosa</fmn>
                            <gvn T="ST">John</gvn>
                            <dgr T="ST">MD</dgr>
                        </PSNI.primrPrsvnm>
                        <PSNI.StkID T="StkID">
                            <StkID.id T="ST">CA20837</StkID.id>
                            <StkID.idType T="ID">UPIN</StkID.idType>
                        </PSNI.StkID>
                    </ACTP.partcpnt>
                </ACTP_L.item>
            </SRVE.hasActvPartnts_L>
        </SRVE_L.item>
        <SRVE_L.item T="SRVE">
            <SRVE.name T="CE">713-8</SRVE.name>
            <SRVE.svcEvntDesc T="ST">EOSINOPHILS/100 LEUKOCYTES
(AUTOMATED)</SRVE.svcEvntDesc>
            <SRVE.CLOB T="CLOB">
                <CLOB.obsValu_C T="obsValu_C">
                    <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                        <obsValuNm.obsvsvValu
T="NM">0.3</obsValuNm.obsvsvValu>
                            <obsValuNm.valUnits T="CE">%</obsValuNm.valUnits>
                        </obsValu_C.obsValuCnt>
                    </CLOB.obsValu_C>
                    <CLOB.refsRng T="ST">0.0-7.0</CLOB.refsRng>
                    <CLOB.clnRlsvBgnDtm
T="DTM">199812292128</CLOB.clnRlsvBgnDtm>
                </SRVE.CLOB>
                <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
                <SRVE.hasActvPartnts_L T="ACTP_L">
                    <ACTP_L.item T="ACTP">
                        <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                        <ACTP.partcpnt T="PSNI">
                            <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                                <PSNI.primrPrsvnm T="PN">
                                    <fmn T="ST">Spinosa</fmn>
                                    <gvn T="ST">John</gvn>
                                </PSNI.primrPrsvnm>
                            </ACTP.partcpnt>
                        </ACTP_L.item>
                    </SRVE.hasActvPartnts_L>
                </SRVE_L.item>
            </SRVE">

```

```

        <dgr T="ST">MD</dgr>
        </PSNI.primrPrsnm>
        <PSNI.StkID T="StkID">
            <StkID.id T="ST">CA20837</StkID.id>
            <StkID.idType T="ID">UPIN</StkID.idType>
        </PSNI.StkID>
        </ACTP.partcpt>
    </ACTP_L.item>
</SRVE.hasActvPartnts_L>
</SRVE_L.item>
<SRVE_L.item T="SRVE">
    <SRVE.name T="CE">706-2</SRVE.name>
    <SRVE.svcEvntDesc T="ST">BASOPHILS/100 LEUKOCYTES
(AUTOMATED)</SRVE.svcEvntDesc>
    <SRVE.CLOB T="CLOB">
        <CLOB.obsValu_C T="obsValu_C">
            <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                <obsValuNm.obsvnuValu
T="NM">0.2</obsValuNm.obsvnuValu>
                    <obsValuNm.valUnits T="CE">%</obsValuNm.valUnits>
                </obsValu_C.obsValuCnt>
            </CLOB.obsValu_C>
            <CLOB.refsRng T="ST">0.0-2.0</CLOB.refsRng>
            <CLOB.clnRlrvnBgnDtm
T="DTM">199812292128</CLOB.clnRlrvnBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
            <ACTP_L.item T="ACTP">
                <ACTP.partcptTyp T="ID">PI</ACTP.partcptTyp>
                <ACTP.partcpt T="PSNI">
                    <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                        <PSNI.primrPrsnm T="PN">
                            <fmn T="ST">Spinosa</fmn>
                            <gvn T="ST">John</gvn>
                            <dgr T="ST">MD</dgr>
                        </PSNI.primrPrsnm>
                        <PSNI.StkID T="StkID">
                            <StkID.id T="ST">CA20837</StkID.id>
                            <StkID.idType T="ID">UPIN</StkID.idType>
                        </PSNI.StkID>
                    </ACTP.partcpt>
                </ACTP_L.item>
            </SRVE.hasActvPartnts_L>
        </SRVE_L.item>
    <SRVE_L.item T="SRVE">
        <SRVE.name T="CE">752-6</SRVE.name>
        <SRVE.svcEvntDesc T="ST">NEUTROPHILS COUNT
(AUTOMATED)</SRVE.svcEvntDesc>
        <SRVE.CLOB T="CLOB">
            <CLOB.obsValu_C T="obsValu_C">
                <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                    <obsValuNm.obsvnuValu
T="NM">20.8</obsValuNm.obsvnuValu>
                        <obsValuNm.valUnits
T="CE">10*9/mm3</obsValuNm.valUnits>
                    </obsValu_C.obsValuCnt>
                </CLOB.obsValu_C>
            </SRVE.CLOB>
        </SRVE_L.item>
    </SRVE.hasActvPartnts_L>
</SRVE_L.item>

```

```

        </obsValu_C.obsValuCnt>
        </CLOB.obsValu_C>
        <CLOB.abnrmlRslt T="ST">H</CLOB.abnrmlRslt>
        <CLOB.refsRng T="ST">2.0-7.0</CLOB.refsRng>
        <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
            <ACTP_L.item T="ACTP">
                <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                <ACTP.partcpnt T="PSNI">
                    <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                        <PSNI.primrPrsnm T="PN">
                            <fmn T="ST">Spinosa</fmn>
                            <gvn T="ST">John</gvn>
                            <dgr T="ST">MD</dgr>
                        </PSNI.primrPrsnm>
                        <PSNI.StkID T="StkID">
                            <StkID.id T="ST">CA20837</StkID.id>
                            <StkID.idType T="ID">UPIN</StkID.idType>
                        </PSNI.StkID>
                    </ACTP.partcpnt>
                </ACTP_L.item>
            </SRVE.hasActvPartnts_L>
        </SRVE_L.item>
        <SRVE_L.item T="SRVE">
            <SRVE.name T="CE">731-0</SRVE.name>
            <SRVE.svcEvntDesc T="ST">LYMPHOCYTES COUNT
(AUTOMATED)</SRVE.svcEvntDesc>
            <SRVE.CLOB T="CLOB">
                <CLOB.obsValu_C T="obsValu_C">
                    <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                        <obsValuNm.obsvnuValu
T="NM">2.5</obsValuNm.obsvnuValu>
                            <obsValuNm.valUnits
T="CE">10*9/mm3</obsValuNm.valUnits>
                                </obsValu_C.obsValuCnt>
                                </CLOB.obsValu_C>
                                <CLOB.refsRng T="ST">0.6-3.5</CLOB.refsRng>
                                <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
                                    </SRVE.CLOB>
                                    <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
                                    <SRVE.hasActvPartnts_L T="ACTP_L">
                                        <ACTP_L.item T="ACTP">
                                            <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                                            <ACTP.partcpnt T="PSNI">
                                                <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                                                    <PSNI.primrPrsnm T="PN">
                                                        <fmn T="ST">Spinosa</fmn>
                                                        <gvn T="ST">John</gvn>
                                                        <dgr T="ST">MD</dgr>
                                                    </PSNI.primrPrsnm>
                                                    <PSNI.StkID T="StkID">

```

```

                <StkID.id T="ST">CA20837</StkID.id>
                <StkID.idType T="ID">UPIN</StkID.idType>
            </PSNI.StkID>
        </ACTP.partcpnt>
    </ACTP_L.item>
</SRVE.hasActvPartnts_L>
</SRVE_L.item>
<SRVE_L.item T="SRVE">
    <SRVE.name T="CE">742-7</SRVE.name>
    <SRVE.svcEvntDesc T="ST">MONOCYTES COUNT
(AUTOMATED)</SRVE.svcEvntDesc>
    <SRVE.CLOB T="CLOB">
        <CLOB.obsValu_C T="obsValu_C">
            <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                <obsValuNm.obsvNValu
T="NM">1.6</obsValuNm.obsvNValu>
                <obsValuNm.valUnits
T="CE">10*9/mm3</obsValuNm.valUnits>
            </obsValu_C.obsValuCnt>
        </CLOB.obsValu_C>
        <CLOB.abnrmlRslt T="ST">H</CLOB.abnrmlRslt>
        <CLOB.refsrng T="ST">0.0-0.9</CLOB.refsrng>
        <CLOB.clnRlrvBgnDtm
T="DTM">199812292128</CLOB.clnRlrvBgnDtm>
    </SRVE.CLOB>
    <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
    <SRVE.hasActvPartnts_L T="ACTP_L">
        <ACTP_L.item T="ACTP">
            <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
            <ACTP.partcpnt T="PSNI">
                <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                <PSNI.primrPrsnm T="PN">
                    <fmn T="ST">Spinosa</fmn>
                    <gvn T="ST">John</gvn>
                    <dgr T="ST">MD</dgr>
                </PSNI.primrPrsnm>
                <PSNI.StkID T="StkID">
                    <StkID.id T="ST">CA20837</StkID.id>
                    <StkID.idType T="ID">UPIN</StkID.idType>
                </PSNI.StkID>
            </ACTP.partcpnt>
        </ACTP_L.item>
    </SRVE.hasActvPartnts_L>
</SRVE_L.item>
<SRVE_L.item T="SRVE">
    <SRVE.name T="CE">711-2</SRVE.name>
    <SRVE.svcEvntDesc T="ST">EOSINOPHILS COUNT
(AUTOMATED)</SRVE.svcEvntDesc>
    <SRVE.CLOB T="CLOB">
        <CLOB.obsValu_C T="obsValu_C">
            <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                <obsValuNm.obsvNValu
T="NM">0.08</obsValuNm.obsvNValu>
                <obsValuNm.valUnits
T="CE">10*9/mm3</obsValuNm.valUnits>
            </obsValu_C.obsValuCnt>

```

```

        </CLOB.obsValu_C>
        <CLOB.refsRng T="ST">0.00-0.70</CLOB.refsRng>
        <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
        </SRVE.CLOB>
        <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
        <SRVE.hasActvPartnts_L T="ACTP_L">
            <ACTP_L.item T="ACTP">
                <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                <ACTP.partcpnt T="PSNI">
                    <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                        <PSNI.primrPrsnm T="PN">
                            <fmn T="ST">Spinosa</fmn>
                            <gvn T="ST">John</gvn>
                            <dgr T="ST">MD</dgr>
                        </PSNI.primrPrsnm>
                        <PSNI.StkID T="StkID">
                            <StkID.id T="ST">CA20837</StkID.id>
                            <StkID.idType T="ID">UPIN</StkID.idType>
                        </PSNI.StkID>
                    </ACTP.partcpnt>
                </ACTP_L.item>
            </SRVE.hasActvPartnts_L>
        </SRVE_L.item>
        <SRVE_L.item T="SRVE">
            <SRVE.name T="CE">704-7</SRVE.name>
            <SRVE.svcEvntDesc T="ST">BASOPHILS COUNT
(AUTOMATED)</SRVE.svcEvntDesc>
            <SRVE.CLOB T="CLOB">
                <CLOB.obsValu_C T="obsValu_C">
                    <obsValu_C.obsValuCnt T="obsValuNm" Choice="N">
                        <obsValuNm.obsvsvValu
T="NM">0.04</obsValuNm.obsvsvValu>
                            <obsValuNm.valUnits
T="CE">10*9/mm3</obsValuNm.valUnits>
                                </obsValu_C.obsValuCnt>
                            </CLOB.obsValu_C>
                            <CLOB.refsRng T="ST">0.00-0.20</CLOB.refsRng>
                            <CLOB.clnRlvnBgnDtm
T="DTM">199812292128</CLOB.clnRlvnBgnDtm>
                                </SRVE.CLOB>
                                <SRVE.spcmRcvdDtm T="DTM">199812292315</SRVE.spcmRcvdDtm>
                                <SRVE.hasActvPartnts_L T="ACTP_L">
                                    <ACTP_L.item T="ACTP">
                                        <ACTP.partcpnTyp T="ID">PI</ACTP.partcpnTyp>
                                        <ACTP.partcpnt T="PSNI">
                                            <PSNI.primrNamType
T="CNE">L</PSNI.primrNamType>
                                                <PSNI.primrPrsnm T="PN">
                                                    <fmn T="ST">Spinosa</fmn>
                                                    <gvn T="ST">John</gvn>
                                                    <dgr T="ST">MD</dgr>
                                                </PSNI.primrPrsnm>
                                                <PSNI.StkID T="StkID">
                                                    <StkID.id T="ST">CA20837</StkID.id>
                                                    <StkID.idType T="ID">UPIN</StkID.idType>

```

```
        </PSNI.StkID>
      </ACTP.partcpnt>
    </ACTP_L.item>
  </SRVE.hasActvPartnts_L>
</SRVE_L.item>
</SIOO.SRVE_L>
</SIOO_L.item>
</Labrs3P00.SIOO_L>
</Labrs3P00>
```

8. HIMSS Demo PRA LevelOne DTD

<!--

=====
=====

HL7 Document Patient Record Architecture
Level One Architectural DTD.

Drafted by the Kona Editorial Group (KEG), a group chartered by the HL7
SGML/XML SIG

Requires Header declarations version 0.01

This draft document is a work in progress. It represents the deliberations
of the Kona Editorial Group (a working group of the HL7 SGML/XML Special
Interest Group) as of the date it was issued.

The KEG has reached consensus on this draft, but other
requirements of a full Level One architectural DTD are under development and
will be posted as an Open Issues document on the SIG listserv.

We are issuing this document to solicit comments on our progress.

This document has not yet been subjected to close review by the entire HL7
SGML/XML SIG nor by HL7 at large.

The XML approach in this document will not necessarily follow the same style
being proposed for HL7 Version 3.0. While there are no purposeful
differences at this point, the V3-XML project is a moving target. Efforts
will be made to explicitly list identified differences in subsequent
versions of this draft.

Comments may be sent to HL7 SGML listserv.

This is a draft document and may be updated or replaced at any time.

=====
=====

-->

<!--

=====
=====

Change Log

Each change must reference:

- the version number
- the date of the change
- the author

=====
=====

Version 0.01:1998/12/3:harding

Changed heading comment to that supplied by Liora

Version 0.01:1998/12/3:harding

Removed link from healthcare.code and added an attribute
(original.text) to permit linking to associated text
wherever it occurs in the document.

Version 0.01:1998/11/30:harding
Added 'version' attribute to LevelOne element.

Version 0.01:1998/11/30:harding
Added 'html-like' link to the link declartion

Version 0.01:1998/11/30:harding
Some elements will be the same across all levels. These elements are those found in the entity 'content'. Added comment to indicating these elements are shared by all levels.

-->

<![IGNORE[

<!--

=====
=====

SGML Architecture Syntax

Uses constructs not available in XML.

Use this syntax in your DTD to enable processing using this meta-dtd.

For further details refer to:

ISO 10744

Structuring XML Documents by David Megginson (ISBN 0-13-642299-3)

www.megginson.com/XAF

=====
=====

-->

<!-- Architectural Base Description -->

<?IS10744 ArcBase LevelOne>

<!-- Architectural Notation Declaration -->

<!NOTATION LevelOne PUBLIC

"-//HL7 KEG//NOTATION AFDR ARCBASE HL7 Document architecture LevelOne//EN">

<!-- Architecture Support Attribute Declaration -->

<!ATTLIST #NOTATION LevelOne

ArcDtd CDATA #FIXED "LevelOne.dtd">

<!-- Architecture Entity Declaration -->

<!NOTATION SGML PUBLIC

"ISO 8879:1986//NOTATION Standard Generalized Markup Language//EN">

<!ENTITY LevelOne.dtd PUBLIC

"-//HL7 KEG//DTD LevelOne//EN" CDATA SGML>

]]>

<![IGNORE[

<!--

=====
=====

XML Architecture Syntax

Use this syntax in your DTD to enable processing using this meta-dtd.

For further details refer to:

ISO 10744

Structuring XML Documents by David Megginson (ISBN 0-13-642299-3)

www.megginson.com/XAF

=====
=====

-->

```
<?IS10744:arch name="LevelOne"
    public-id="-//HL7 KEG//NOTATION AFDR ARCBASE HL7 Document architecture
LevelOne//EN"
    dtd-system-id="LevelOne.dtd"?>
```

]]>

<!--

=====
=====

HL7 Document Patient Record Architecture

Header DTD Fragment

Drafted by the Kona Editorial Group (KEG), a group chartered by the HL7
SGML/XML SIG

Purpose

- * Enable clinical document exchange across and within institutions.
- * Facilitate clinical document management.
- * Facilitate compilation of an individual patient's HL7 Patient Record Documents into a lifetime Electronic Patient Record.

Every HL7 Patient Record Document contains a Patient Record Header.
An HL7 Patient Record Document is incomplete and invalid if the
Patient Record Header does not contain the required components.

The Patient Record Header contains information that uniquely
identifies and classifies the document, attestation details,
event, patient, and practitioner.

The Patient Record Header is not intended to replace and does
not preclude use of localized header information or local
document management information in either the source or the
interchange documents.

=====
=====

-->

<!--

=====
=====

Change Log

Each change must reference:

the version number
the date of the change
the author

=====
=====

Version 0.01:1999/1/12:pbirom
Updated table 0291 entity to include values sgml and xml
per V2.3.1, for the HIMSS demo

Version 0.01:1999/1/12:pbirom
Changed RIM mapping of practitioner.role to be
Encounter_practitioner.participation_type_cd, which
meant changing to a CE datatype, which resulted in
adding a CE param entity decl and element decls for
each component of the CE datatype

Version 0.01:1999/1/12:pbirom
Updated table 0270 entity to include value
"history.and.physical", so that so that all of the
document types that are part of the HIMSS demo scenarios
are included. This is not necessarily intended to be a
long term change

Version 0.01:1998/12/3:harding
Added header material supplied by Liora

Version 0.01:1998/12/3:harding
Changed comment on HL7 datatypes to indicate rationale for
using complete content models is to allow changes using the
internal subset and changed datatype entities to include
complete content models along with where they are used in the
DTD.

Version 0.01:1998/12/3:harding
Removed patient.alternate.id from patient.identifer.id since
it is already in XON.
Removed entity HL70203.identifier.type - no longer referenced

Version 0.01:1998/12/3:harding
Changed EN to ID.EN and IS.EN to reflect types of datatypes.

Version 0.01:1998/12/3:harding
Added 'other' attribute to HL7 tables.

Version 0.01:1998/12/3:harding
Changed 'v' attribute name to 'value'.

Version 0.01:1998/12/3:harding
Changed 'type' attribute name to 'HL7.datatype'.

Version 0.01:1998/12/3:harding
Removed content.header since not used.

Version 0.01:1998/11/30:harding
Added 'version' attribute to header element.

Version 0.01:1998/11/30:harding

Added recursion to local.header declaration.

Version 0.01:1998/11/30:harding
Changed datatype content models to include content model
parents and repetition indicators to force conformance to
HL7 datatypes and added note indicating such.

Version 0.01:1998/11/30:harding
Added comment to document.parent.id, hopefully, clarifying
the reason for only one id.

-->

<!--

=====
=====
Common Attributes

Attributes shared by many elements.

=====
=====
-->

```
<!ENTITY % common-atts
  " ID ID #IMPLIED
  "
>
```

<!--

=====
=====
Local Header Information

Local.header provides a slot for local
(non-exchange related) markup.

Examples would include items for
internal workflow issues, etc.

Descriptor describes the local header.
Render may give indication of how the
origin would render the content.

=====
=====
-->

```
<!ELEMENT local.header (#PCDATA | local.header)* >
<!ATTLIST local.header
  descriptor CDATA #IMPLIED
  render CDATA #IMPLIED
  %common-atts;
>
```

<!--

=====
=====

HL7 V2.3 table definitions

=====
=====

-->

<!ENTITY % HL7Z001.document.state

" (original
| addendum
| replacement
)

" >

<!ENTITY % HL70001.sex

" (female
| male
| other
| unknown
)

">

<!--this entity contains "history.and.physical" which
has been added to the V2.3 table values for the
purposes of the HIMSS demo-->

<!ENTITY % HL70270.document.type

" (autopsy.report
| cardiognostics
| consultation
| diagnostic.imaging
| discharge.summary
| emergency.department.report
| history.and.physical
| operative.report
| psychiatric.consultation
| psychiatric.history.and.physical.examination
| procedure.note
| progress.note
| surgical.pathology
| transfer.summary
| other
)

">

<!-- this entity reflects the state of table
0291 in V2.3.1 rather than V2.3-->

<!ENTITY % HL70291.subtype.of.referenced.data

" (tiff
| pict
| dicom
| fax
| jot
| basic
| octet.stream
| postscript
| jpeg
| gif
| html
| rtf
| sgml
| xml

```

    | other
  )
">

<!--
=====
=====
HL7 V2.3.1 data type definitions

Data type definitions represent HL7 content models to permit
alteration in the internal subset.

=====
=====
-->
<!--
*****
Coded Element
*****
-->
<!ENTITY % CE
  "(id.value,
    text?,
      name.of.coding.system?,
      alternative.id.value?,
      alternative.text?,
      name.of.alternative.coding.system?,
      local.header*
  )"
>
<!--
*****
Extended composite ID with check digit
*****
-->
<!ENTITY % CX
  "( id.value,
    check.digit?,
    check.digit.scheme?,
    assigning.authority?,
    identifier.type.code?,
    assigning.facility.id?,
    local.header*
  )"
>
<!--
*****
Entity identifier
*****
-->
<!ENTITY % EI
  "( id.value,
    namespace.id?,
    universal.id?,
    universal.id.type?,
    local.header*
  )"

```

```

>
<!--
*****
Hierarchic designator
*****
-->
<!ENTITY % HD
  "( namespace.id?,
    universal.id?,
    universal.id.type?,
    local.header*
  )"
>
<!--
*****
Coded values for HL7 tables
*****
-->
<!ENTITY % ID
  "( #PCDATA
    | local.header
  )"
">

<!--
*****
Coded value for user-defined tables
*****
-->
<!ENTITY % IS
  "( #PCDATA
    | local.header
  )"
">

<!--
*****
Numeric
*****
-->
<!ENTITY % NM
  "( #PCDATA
    | local.header
  )"
">

<!--
*****
Person location
*****
-->
<!ENTITY % PL
  "( id.value?,
    point.of.care?,
    room?,
    bed?,
    facility?,
    location.status?,

```

```

        person.location.type?,
        building?,
        floor?,
        location.description?,
        local.header*
    )"
>
<!--
*****
String
*****
-->
<!ENTITY % ST
    "( #PCDATA
      | local.header
    )"
">
<!--
*****
Time stamp
*****
-->
<!ENTITY % TS
    "( #PCDATA
      | local.header
    )"
">
<!--
*****
Extended address
*****
-->
<!ENTITY % XAD
    "( street.address?,
      other.designation?,
      city?,
      state.or.province?,
      zip.or.postal.code?,
      country?,
      address.type?,
      other.geographic.designation?,
      county.parish.code?,
      census.tract?,
      address.representation.code?,
      local.header*
    )"
>
<!--
*****
Extended composite ID number and name
*****
-->
<!ENTITY % XCN
    "( id.value,
      family.name?,
      last.name.prefix?,
      given.name?,

```

```

mi?,
suffix?,
prefix?,
degree?,
source.table?,
assigning.authority?,
name.type.code?,
check.digit?,
check.digit.scheme?,
identifier.type.code?,
assigning.facility.id?,
name.representation.code?,
local.header*
)"
>
<!--
*****
Extended composite name and ID number
for organizations
*****
-->

<!ENTITY % XON
  "( id.value,
    organization.name?,
    organization.name.type.code?,
    check.digit?,
    check.digit.scheme?,
    assigning.authority?,
    identifier.type.code?,
    assigning.facility.id?,
    name.representation.code?,
    local.header*
  )"
>
<!--
*****
Extended person name
*****
-->

<!ENTITY % XPN
  "( family.name?,
    given.name?,
    last.name.prefix?,
    mi?,
    suffix?,
    prefix?,
    degree?,
    name.type.code?,
    name.representation.code?,
    local.header*
  )"
>
<!--
*****
Extended telecommunications number
*****

```

```

-->
<!ENTITY % XTN
  "( number?,
    telecommunication.use.code?,
    telecommunication.equipment.type?,
    email.address?,
    country.code?,
    area.city.code?,
    phone.number?,
    extension?,
    any.text?,
    local.header*
  )"
>

<!--
=====
=====
Header
=====
=====
-->

<!ELEMENT header
  ( document,
    event,
    patient,
    practitioner+,
    local.header*
  )>
<!ATTLIST header
  version CDATA #FIXED "0.01"
  %common-atts;
  RIM.version CDATA #FIXED "0.86a"
>

<!ELEMENT document
  (document.attestation*,
  document.creation.date,
  document.edit.date*,
  document.format?,
  document.id,
  document.originating.system,
  document.originator.id,
  document.parent.id?,
  document.state,
  document.title?,
  document.type,
  local.header*
  )>
<!ATTLIST document
  %common-atts;
>

```

```

<!ELEMENT event
  (event.id,
   event.date,
   event.location.id?,
   event.address?,
   local.header*
 )>
<!ATTLIST event
  %common-atts;
>

<!ELEMENT patient
  (patient.id,
   patient.alternate.id*,
   patient.name,
   patient.alternate.name*,
   patient.mothers.maiden.name?,
   patient.date.of.birth?,
   patient.sex*,
   patient.address*,
   patient.phone*,
   local.header*
 )>
<!ATTLIST patient
  %common-atts;
>

<!ELEMENT practitioner
  (practitioner.id,
   practitioner.role*,
   practitioner.address*,
   practitioner.phone*,
   local.header*
 )>
<!ATTLIST practitioner
  %common-atts;
>

<!--
=====
=====
Header Elements
=====
=====
-->

<!ELEMENT document.attestation
  (document.attestation.person.id,
   document.attestation.date
 )>
<!ATTLIST document.attestation
  %common-atts;
>

<!--
*****

```

```

Date/time the document was attested to
(either manually or electronically).
*****
-->
<!ELEMENT document.attestation.date %TS;>
<!ATTLIST document.attestation.date
  %common-atts;
  HL7.datatype CDATA #FIXED "TS"
  RIM.attribute CDATA #FIXED "Clinical_document_header.authentication_dt"
>

<!--
*****
The person who has attested to the document
(either manually or electronically).
*****
-->
<!ELEMENT document.attestation.person.id %XCN;>
<!ATTLIST document.attestation.person.id
  %common-atts;
  HL7.datatype CDATA #FIXED "XCN"
  RIM.attribute CDATA #FIXED "Stakeholder_identifier.id"
>

<!--
*****
Date/time the document was created
(i.e., dictated, recorded, etc.).
*****
-->
<!ELEMENT document.creation.date %TS;>
<!ATTLIST document.creation.date
  %common-atts;
  HL7.datatype CDATA #FIXED "TS"
  RIM.attribute CDATA #FIXED "Clinical_document_header.origination_dt"
>

<!--
*****
Date/time the document was edited.
NOTE: Edits occur before attestation and do
not result in a new document.
*****
-->
<!ELEMENT document.edit.date %TS;>
<!ATTLIST document.edit.date
  %common-atts;
  HL7.datatype CDATA #FIXED "TS"
  RIM.attribute CDATA #FIXED "Clinical_document_header.last_edit_dt"
>

<!--
*****
Used to specify a non-xml format of the
document body. If format is non-xml, body must
be MIME-encoded.

```

Note: Use of other in this element is used differently than in other elements.

See HL7 Table 0291 for values.

-->

<!ELEMENT document.format EMPTY>

<!ATTLIST document.format

 %common-atts;

 HL7.datatype CDATA #FIXED "ID.EN"

 RIM.attribute CDATA #FIXED "Clinical_document_header.content_presentation_cd"

 domain CDATA #FIXED "HL70291"

 value %HL70291.subtype.of.referenced.data; #REQUIRED

>

<!--

A unique document identification assigned by the originating system.

-->

<!ELEMENT document.id %EI;>

<!ATTLIST document.id

 %common-atts;

 HL7.datatype CDATA #FIXED "EI"

 RIM.attribute CDATA #FIXED "Clinical_document_header.id"

>

<!--

The site where the document originates, and the site responsible for assigning the other identifiers occurring in the document.

There is no globally unique identifier for an originating system. The data type XON has a required first component, id.value, which for now can be null.

-->

<!ELEMENT document.originating.system %XON;>

<!ATTLIST document.originating.system

 %common-atts;

 HL7.datatype CDATA #FIXED "XON"

 RIM.attribute CDATA #FIXED "Patient_service_location.id"

>

<!--

The person (or potentially the machine) who originated (e.g., dictated) the document. The document originator may or may not be the person responsible for authenticating the document.

-->

<!ELEMENT document.originator.id %XCN;>

<!ATTLIST document.originator.id

```
%common-atts;
HL7.datatype CDATA #FIXED "XCN"
RIM.attribute CDATA #FIXED "Stakeholder_identifier.id"
>
```

```
<!--
*****
A unique document identification that
identifies the parent document to which
this document belongs (is a version of).
```

```
NOTE: This field is required
if the current document represents an
addendum or replacement document.
*****
```

```
-->
<!ELEMENT document.parent.id %EI;>
<!ATTLIST document.parent.id
  %common-atts;
  HL7.datatype CDATA #FIXED "EI"
  RIM.attribute CDATA #FIXED "Clinical_document_header.id"
>
```

```
<!--
*****
Specifies state information about the document,
including whether it is intended to append or
replace an existing document
(e.g., original, addendum, replacement).
See HL7 Table Z001 for values.
*****
```

```
-->
<!ELEMENT document.state EMPTY>
<!ATTLIST document.state
  %common-atts;
  HL7.datatype CDATA #FIXED "ID.EN"
  RIM.attribute CDATA #FIXED "Clinical_document_header.change_reason_cd"
  domain CDATA #FIXED "HL7Z001"
  value %HL7Z001.document.state; #REQUIRED
>
```

```
<!--
*****
The title given the document by the
originating institution.
*****
```

```
-->
<!ELEMENT document.title %ST;>
<!ATTLIST document.title
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
  RIM.attribute CDATA #FIXED "Clinical_document_header.file_nm"
>
```

```
<!--
*****
The category or classification type of document.
```

See HL7 Table 0270 for values.

-->

<!ELEMENT document.type EMPTY>

<!ATTLIST document.type

 %common-atts;

 HL7.datatype CDATA #FIXED "EN"

 RIM.attribute CDATA #FIXED "Clinical_document_header.type_cd"

 domain CDATA #FIXED "HL70270"

 other CDATA #IMPLIED

 value %HL70270.document.type; #REQUIRED

>

<!--

The address where the event took place.

-->

<!ELEMENT event.address %XAD;>

<!ATTLIST event.address

 %common-atts;

 HL7.datatype CDATA #FIXED "XAD"

 RIM.attribute CDATA #FIXED "Patient_service_location.addr"

>

<!--

Date/time the event took place.

-->

<!ELEMENT event.date %TS;>

<!ATTLIST event.date

 %common-atts;

 HL7.datatype CDATA #FIXED "TS"

 RIM.attribute CDATA #FIXED "Service_event.begin_dttm"

>

<!--

A unique event identification assigned
by the originating system.

-->

<!ELEMENT event.id %CX;>

<!ATTLIST event.id

 %common-atts;

 HL7.datatype CDATA #FIXED "CX"

 RIM.attribute CDATA #FIXED "Patient_encounter.id"

>

<!--

A unique event location identifier assigned
by the originating system indicating where
the event took place.

-->

```

<!ELEMENT event.location.id %PL;>
<!ATTLIST event.location.id
  %common-atts;
  HL7.datatype CDATA #FIXED "PL"
  RIM.attribute CDATA #FIXED "Patient_service_location.id"
>

```

```

<!--
*****
Patient's address. May be helpful to unambiguously
identify a particular patient.
An attribute can show which is the preferred address.
*****
-->

```

```

<!ELEMENT patient.address %XAD;>
<!ATTLIST patient.address
  %common-atts;
  HL7.datatype CDATA #FIXED "XAD"
  RIM.attribute CDATA #FIXED "Stakeholder.addr"
>

```

```

<!--
*****
Other identifiers by which the patient
may be known, and which may be used to
unambiguously identify a particular patient.
*****
-->

```

```

<!ELEMENT patient.alternate.id (%XON;)>
<!ATTLIST patient.alternate.id
  %common-atts;
  HL7.datatype CDATA #FIXED "XON"
  RIM.attribute CDATA #FIXED "Stakeholder_identifier.id"
>

```

```

<!--
*****
Other names by which the patient is or has
been known, including previous legal names.
May be helpful to unambiguously identify a
particular patient.
*****
-->

```

```

<!ELEMENT patient.alternate.name %XPN;>
<!ATTLIST patient.alternate.name
  %common-atts;
  HL7.datatype CDATA #FIXED "XPN"
  RIM.attribute CDATA #FIXED "Person_alternate_name.prsnm"
>

```

```

<!--
*****
Patient's date and time of birth.
May be helpful to unambiguously identify
a particular patient.

```

```

*****
-->
<!ELEMENT patient.date.of.birth %TS;>
<!ATTLIST patient.date.of.birth
  %common-atts;
  HL7.datatype CDATA #FIXED "TS"
  RIM.attribute CDATA #FIXED "Person.birth_dttm"
>

<!--
*****
A unique patient identifier assigned
by the originating system.
*****
-->
<!ELEMENT patient.id %XON;>
<!ATTLIST patient.id
  %common-atts;
  HL7.datatype CDATA #FIXED "XON"
  RIM.attribute CDATA #FIXED "Stakeholder_identifier.id"
>

<!--
*****
The family name under which the mother was born
(i.e., before marriage). It is used to distinguish
between patients with the same last name.
May be helpful to unambiguously identify a
particular patient.
*****
-->
<!ELEMENT patient.mothers.maiden.name %XPN;>
<!ATTLIST patient.mothers.maiden.name
  %common-atts;
  HL7.datatype CDATA #FIXED "XPN"
  RIM.attribute CDATA #FIXED "Stakeholder_identifier.id"
>

<!--
*****
The current legal name of the patient.
*****
-->
<!ELEMENT patient.name %XPN;>
<!ATTLIST patient.name
  %common-atts;
  HL7.datatype CDATA #FIXED "XPN"
  RIM.attribute CDATA #FIXED "Person.primary_prsnm"
>

<!--
*****
Patient's phone number(s).
Components of the XTN data type distinguish
home phone from work phone.
*****
-->

```

```

<!ELEMENT patient.phone %XTN;>
<!ATTLIST patient.phone
  %common-atts;
  HL7.datatype CDATA #FIXED "XTN"
  RIM.attribute CDATA #FIXED "Stakeholder.phon"
>

<!--
*****
Patient's gender. May be helpful to unambiguously
identify a particular patient.
See HL7 Table 0001 for values.
*****
-->
<!ELEMENT patient.sex EMPTY>
<!ATTLIST patient.sex
  %common-atts;
  HL7.datatype CDATA #FIXED "IS.EN"
  RIM.attribute CDATA #FIXED "Person.gender_cd"
  domain CDATA #FIXED "HL70001"
  other CDATA #IMPLIED
  value %HL70001.sex; #REQUIRED
>

<!--
*****
The unique identifier of the practitioner providing
health care services during the event.
*****
-->
<!ELEMENT practitioner.id %XCN;>
<!ATTLIST practitioner.id
  %common-atts;
  HL7.datatype CDATA #FIXED "XCN"
  RIM.attribute CDATA #FIXED "Stakeholder_identifier.id"
>

<!--
*****
The address(es) of the practitioner
*****
-->
<!ELEMENT practitioner.address %XAD;>
<!ATTLIST practitioner.address
  %common-atts;
  HL7.datatype CDATA #FIXED "XAD"
  RIM.attribute CDATA #FIXED "Person_employment.addr"
>

<!--
*****
The phone number(s) of the practitioner.
*****
-->
<!ELEMENT practitioner.phone %XTN;>
<!ATTLIST practitioner.phone
  %common-atts;

```

```

    HL7.datatype CDATA #FIXED "XTN"
    RIM.attribute CDATA #FIXED "Person_employment.phon"
>

<!--
*****
The relationship of the practitioner to the patient.
*****
-->
<!ELEMENT practitioner.role %CE;>
<!ATTLIST practitioner.role
    %common-atts;
    HL7.datatype CDATA #FIXED "CE"
    RIM.attribute CDATA #FIXED "Encounter_practitioner.participation_type_cd"
>

<!--
=====
=====
Data type components
=====
=====
-->
<!ELEMENT address.representation.code %ID;>
<!ATTLIST address.representation.code
    %common-atts;
    HL7.datatype CDATA #FIXED "ID"
>

<!ELEMENT address.type %ID;>
<!ATTLIST address.type
    %common-atts;
    HL7.datatype CDATA #FIXED "ID"
>

<!ELEMENT alternate.id.value %ST;>
<!ATTLIST alternate.id.value
    %common-atts;
    HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT alternate.text %ST;>
<!ATTLIST alternate.text
    %common-atts;
    HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT any.text %ST;>
<!ATTLIST any.text
    %common-atts;
    HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT area.city.code %NM;>
<!ATTLIST area.city.code
    %common-atts;
    HL7.datatype CDATA #FIXED "NM"

```

```

>

<!ELEMENT assigning.authority %HD;>
<!ATTLIST assigning.authority
  %common-atts;
  HL7.datatype CDATA #FIXED "HD"
>

<!ELEMENT assigning.facility.id %HD;>
<!ATTLIST assigning.facility.id
  %common-atts;
  HL7.datatype CDATA #FIXED "HD"
>

<!ELEMENT bed %IS;>
<!ATTLIST bed
  %common-atts;
  HL7.datatype CDATA #FIXED "IS"
>

<!ELEMENT building %IS;>
<!ATTLIST building
  %common-atts;
  HL7.datatype CDATA #FIXED "IS"
>

<!ELEMENT census.tract %IS;>
<!ATTLIST census.tract
  %common-atts;
  HL7.datatype CDATA #FIXED "IS"
>

<!ELEMENT check.digit %NM;>
<!ATTLIST check.digit
  %common-atts;
  HL7.datatype CDATA #FIXED "NM"
>
<!ELEMENT check.digit.scheme %ID;>
<!ATTLIST check.digit.scheme
  %common-atts;
  HL7.datatype CDATA #FIXED "ID"
>

<!ELEMENT city %ST;>
<!ATTLIST city
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT country %ID;>
<!ATTLIST country
  %common-atts;
  HL7.datatype CDATA #FIXED "ID"
>
<!ELEMENT country.code %NM;>
<!ATTLIST country.code
  %common-atts;

```

```

    HL7.datatype CDATA #FIXED "NM"
  >

<!ELEMENT county.parish.code %IS;>
<!ATTLIST county.parish.code
  %common-atts;
  HL7.datatype CDATA #FIXED "IS"
>

<!ELEMENT degree %ST;>
<!ATTLIST degree
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT email.address %ST;>
<!ATTLIST email.address
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT extension %NM;>
<!ATTLIST extension
  %common-atts;
  HL7.datatype CDATA #FIXED "NM">

<!ELEMENT facility %HD;>
<!ATTLIST facility
  %common-atts;
  HL7.datatype CDATA #FIXED "HD"
>

<!ELEMENT family.name %ST;>
<!ATTLIST family.name
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT floor %IS;>
<!ATTLIST floor
  %common-atts;
  HL7.datatype CDATA #FIXED "IS"
>

<!ELEMENT given.name %ST;>
<!ATTLIST given.name
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT id.value %ST;>
<!ATTLIST id.value
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT identifier.type.code %IS;>

```

```

<!ATTLIST identifier.type.code
  %common-atts;
  HL7.datatype CDATA #FIXED "IS"
>

<!ELEMENT last.name.prefix %ST;>
<!ATTLIST last.name.prefix
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT location.description %ST;>
<!ATTLIST location.description
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT location.status %IS;>
<!ATTLIST location.status
  %common-atts;
  HL7.datatype CDATA #FIXED "IS"
>

<!ELEMENT mi %ST;>
<!ATTLIST mi
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT name.of.alternative.coding.system %ST;>
<!ATTLIST name.of.alternative.coding.system
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT name.of.coding.system %ST;>
<!ATTLIST name.of.coding.system
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT namespace.id %IS;>
<!ATTLIST namespace.id
  %common-atts;
  HL7.datatype CDATA #FIXED "IS"
>

<!ELEMENT name.representation.code %ID;>
<!ATTLIST name.representation.code
  %common-atts;
  HL7.datatype CDATA #FIXED "ID"
>

<!ELEMENT name.type.code %ID;>
<!ATTLIST name.type.code
  %common-atts;
  HL7.datatype CDATA #FIXED "ID"

```

```

>
<!ELEMENT number %ST;>
<!ATTLIST number
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT organization.name %ST;>
<!ATTLIST organization.name
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT organization.name.type.code %ST;>
<!ATTLIST organization.name.type.code
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT other.designation %ST;>
<!ATTLIST other.designation
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT other.geographic.designation %ST;>
<!ATTLIST other.geographic.designation
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT person.location.type %IS;>
<!ATTLIST person.location.type
  %common-atts;
  HL7.datatype CDATA #FIXED "IS"
>

<!ELEMENT phone.number %NM;>
<!ATTLIST phone.number
  %common-atts;
  HL7.datatype CDATA #FIXED "NM"
>

<!ELEMENT point.of.care %IS;>
<!ATTLIST point.of.care
  %common-atts;
  HL7.datatype CDATA #FIXED "IS"
>

<!ELEMENT prefix %ST;>
<!ATTLIST prefix
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT room %IS;>
<!ATTLIST room

```

```

    %common-atts;
    HL7.datatype CDATA #FIXED "IS"
  >

<!ELEMENT source.table %IS;>
<!ATTLIST source.table
  %common-atts;
  HL7.datatype CDATA #FIXED "IS"
>

<!ELEMENT state.or.province %ST;>
<!ATTLIST state.or.province
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT street.address %ST;>
<!ATTLIST street.address
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT suffix %ST;>
<!ATTLIST suffix
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT telecommunication.equipment.type %ID;>
<!ATTLIST telecommunication.equipment.type
  %common-atts;
  HL7.datatype CDATA #FIXED "ID"
>

<!ELEMENT telecommunication.use.code %ID;>
<!ATTLIST telecommunication.use.code
  %common-atts;
  HL7.datatype CDATA #FIXED "ID"
>

<!ELEMENT text %ST;>
<!ATTLIST text
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT time.stamp %ST;>
<!ATTLIST time.stamp
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

<!ELEMENT universal.id %ST;>
<!ATTLIST universal.id
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>

```

```
<!ELEMENT universal.id.type %ID;>
<!ATTLIST universal.id.type
  %common-atts;
  HL7.datatype CDATA #FIXED "ID"
>
```

```
<!ELEMENT zip.or.postal.code %ST;>
<!ATTLIST zip.or.postal.code
  %common-atts;
  HL7.datatype CDATA #FIXED "ST"
>
```

<!--

=====
=====
Shared Entities

Content elements provide context. These elements are used at all levels.

Internal.structures provide shared structural elements.

=====
=====
-->

```
<!ENTITY % content
  " #PCDATA
  | arch.bridge
  | local.markup
  | healthcare.code
  | link
">
```

```
<!ENTITY % internal.structures
  " paragraph
  | list
  | table
">
```

<!--

=====
=====
Level One Root

This is only mixed case element or attribute. All the rest are lower case.

Contains a header followed by a body.

The header elements are defined in another entity to allow Re-use for other levels.

=====
=====
-->

```
<!ELEMENT LevelOne (header, body) >
<!ATTLIST LevelOne
  version CDATA #FIXED "0.01"
>
```

```
<!ELEMENT body (section+) >
<!ATTLIST body
  %common-atts;
>
```

```
<!--
=====
=====
```

Body Components (Section)

A section may contain a section.title.
internal structures and nested sections may be intermixed.

The healthcare.code in the section.title is NOT to be used to
identify the section. Section identification is part of Level 2.

```
=====
=====
-->
```

```
<!ELEMENT section
  ( section.title?,
    (%internal.structures; | section)*
  )
>
```

```
<!ATTLIST section
  %common-atts;
>
```

```
<!ELEMENT section.title
  ( %content;
  )*
>
```

```
<!ATTLIST section.title
  %common-atts;
>
```

```
<!--
=====
=====
```

Content Entity Elements

```
=====
=====
-->
```

```
<!--
*****
Arch.bridge
```

Arch.bridge is the trashcan for
markup that does not map to other
elements at this level.

```

*****
-->

<!ELEMENT arch.bridge ANY >
<!ATTLIST arch.bridge
  %common-atts;
>

<!--
*****
Healthcare.code

Healthcare.code should be used to derive
medically-related in line items such as
coded vocabularies.
Cannot contain another healthcare.code.

identifier - The code, that uniquely
  identifies the item being
  referenced by the text attribute.

preferred.name - The preferred name of
  the item identified by the identifier
  attribute, as determined by the coding
  system.

name.of.coding.system - Identifiesthe party
  responsible for creating the code in the
  identifier attribute.

local.coding.system - Indicates if
  name.of.coding.system is a local name or
  a unique identifier defined by HL7.

instance.id - An id assigned to the particular
  instance of the code by the originating
  institution. (A particular patient may have
  several episodes of bronchitis. Each episode
  would potentially use the healthcare.code,
  with all attributes being the same except
  that the instance.id will be different for
  each episode.)

original.text - Space delimited list of IDs used
  to indicate text within the document relevant
  to the healthcare.code.
*****
-->

<!ELEMENT healthcare.code
  ( #PCDATA
  | arch.bridge
  | local.markup
  )*
>

<!ATTLIST healthcare.code

```

```
%common-atts;
identifier CDATA #REQUIRED
preferred.name CDATA #IMPLIED
name.of.coding.system CDATA #REQUIRED
coding.system.version CDATA #IMPLIED
local.coding.system (Y|N) #REQUIRED
instance.id CDATA #IMPLIED
original.text IDREFS #IMPLIED
```

>

<!--

Local.markup

Local.markup is similar to healthcare.code except that it is not medically related and doesn't have an implied data dictionary or look up table.

Examples would include foreign terms, footnotes, emphasis, bold, italic, subscript, superscript, items for internal workflow issues, etc.

Descriptor describes the local markup. Render may give indication of how the origin would render the content.

-->

<!ELEMENT local.markup (%content;)* >

```
<!ATTLIST local.markup
  descriptor CDATA #IMPLIED
  render CDATA #IMPLIED
  %common-atts;
```

>

<!--

Link

The current declaration provides for the simple link mechanism found in HTML. This declaration will change when more detailed link requirements have been obtained. These future changes will maintain compatibility with the current declaration (html.link will remain).

```
name      named link end
href      URL for linked resource
rel       forward link types
rev       reverse link types
title     advisory title string
*****
```

-->

<!ELEMENT link (html.link) >

```
<!ELEMENT html.link (#PCDATA) >
<!ATTLIST html.link
  name      CDATA      #IMPLIED
  href      CDATA      #IMPLIED
  rel       CDATA      #IMPLIED
  rev       CDATA      #IMPLIED
  title     CDATA      #IMPLIED
  %common-atts;
>
```

```
<!--
=====
Internal Structures Entity Elements
=====
-->
```

```
<!--
*****
Paragraph
*****
-->
```

```
<!ELEMENT paragraph (%content;)* >
<!ATTLIST paragraph
  %common-atts;
>
```

```
<!--
*****
List
*****
-->
```

```
<!ELEMENT list (item*, list?) >
<!ATTLIST list
  %common-atts;
>
```

```
<!ELEMENT item (paragraph*, list?) >
<!ATTLIST item
  %common-atts;
>
```

```
<!--
=====
Table
```

Captures the structural aspects of multi-dimensional tables and the content relationships. A table is made of fields which can contain cells.

Fields and cells share common attributes (t.global).

For more details see www.infoauto.com/articles/sgml/table.htm.

```
=====
-->
```

```
<!--
=====
t.global
```

ci (contained in) is the id of the containing element. A table item (field or cell) is contained in only one field. A cell must be contained in a field. This value captures the structure of the table.

do (depends on) captures the content relationships of the table. If the element is a field, do (depends on) is a space delimited list indicating the fields which the values in this field depend on to uniquely distinguish themselves from other values in this field. If the element is a cell, do (depends on) is a space delimited list indicating the cells in other fields which this cell depends on to uniquely distinguish the cell from other cells in its containing field.

```
t.id uniquely names each item.
=====
-->
```

```
<!ENTITY % t.global
  "ci IDREF #REQUIRED
  do IDREFS #REQUIRED
  t.id NMTOKEN #REQUIRED
">
```

```
<!--
=====
Table
```

table.title labels the table. A table is made of fields.

```
=====
-->
```

```
<!ELEMENT table (table.title?, field+)>
<!ATTLIST table %t.global;>
```

```
<!ELEMENT table.title (%content;)*>
```

```

<!--
=====
Field

Field.title labels of a set of
values.
Type indicates the form of the
information in the field.
Type may be used to direct
formatting and alignment of
cells in the field.
=====
-->

<!ELEMENT field (field.title, (field*|cell*))>
<!ATTLIST field
  %t.global;
  type ( char
        | date
        | dollar
        | signed-int
        | unsigned-int
        | scientific
        | real
        | formula
        | function
        ) "char"
>

<!ELEMENT field.title (%content;)*>

<!--
=====
Cell
=====
-->

<!ELEMENT cell (%content; | paragraph | list)* >
<!ATTLIST cell %t.global; >

```

9. HIMSS Demo PRA LevelOne History and Physical Document

Produced by HIMSS Demo participant Oceania, Inc.

```
<?xml version="1.0"?>
<!DOCTYPE LevelOne SYSTEM "LevelOne.dtd"[]>
<LevelOne>
  <header>
    <document>
      <document.creation.date>
        1/11/99 2:18:32 PM
      </document.creation.date>
      <document.id>
        <id.value>
          123
        </id.value>
      </document.id>
      <document.originating.system>
        <id.value>
          Oceania
        </id.value>
      <organization.name>
        Oceania HL7 HIMSS Demonstration Clinic
      </organization.name>
      </document.originating.system>
      <document.originator.id>
        <id.value>
          1
        </id.value>
        <family.name>
          Admin
        </family.name>
        <given.name>
          Emr
        </given.name>
      </document.originator.id>
      <document.state value='original' />
      <document.type value='history.and.physical' />
    </document>
    <event>
      <event.id>
        <id.value>
          123
        </id.value>
      </event.id>
      <event.date>
        1/11/99 2:18:32 PM
      </event.date>
    </event>
    <patient>
      <patient.id>
        <id.value>
          301
        </id.value>
      <organization.name>
        Oceania HIMSS HL7 Clinic
      </organization.name>
    </patient>
  </header>
</LevelOne>
```

```

        </patient.id>
        <patient.name>
            <family.name>
                Smith
            </family.name>
            <given.name>
                Mary
            </given.name>
        </patient.name>
    </patient>
    <practitioner>
        <practitioner.id>
            <id.value>
                1
            </id.value>
            <family.name>
                Admin
            </family.name>
            <given.name>
                Emr
            </given.name>
        </practitioner.id>
    </practitioner>
</header>
<body>
    <section>
        <section.title>
            Source of Information
        </section.title>
        <paragraph>
            Accompanied by family member.
            <local.markup descriptor='Source'>
                accompanied by
                <local.markup>
                    family member
                </local.markup>
            </local.markup>
        </paragraph>
    </section>
    <section>
        <section.title>
            Chief Complaint
        </section.title>
        <paragraph>
            Abnormal appearance of urine onset gradual.
            <local.markup descriptor='Complaint'>
                abnormal appearance of urine
                <local.markup descriptor='Onset'>
                    onset
                    <local.markup>
                        gradual
                    </local.markup>
                </local.markup>
            </local.markup>
        </paragraph>
    </section>
</section>

```

```

<section.title>
  Hx of Present Illness
</section.title>
<section>
  <section.title>
    Genitourinary
  </section.title>
  <paragraph>
    Frequency trend worsening.
    <local.markup descriptor='Symptoms'>
      frequency
      <local.markup descriptor='Trend'>
        trend
        <local.markup>
          worsening
        </local.markup>
      </local.markup>
    </local.markup>
  </paragraph>
</section>
</section>
<section>
  <section.title>
    Medications
  </section.title>
  <paragraph>
    Acetaminophen.
    <local.markup descriptor='GenericName'>
      Acetaminophen
    </local.markup>
  </paragraph>
</section>
<section>
  <section.title>
    Family History
  </section.title>
  <section>
    <section.title>
      Alcohol use
    </section.title>
    <paragraph>
      Mother.
      <local.markup descriptor='relative'>
        mother
      </local.markup>
    </paragraph>
  </section>
</section>
<section>
  <section.title>
    Social History
  </section.title>
  <paragraph>
    Alcohol use amount 1 serving per day.
    <local.markup descriptor='Item'>
      alcohol use
    <local.markup descriptor='Descriptor2'>

```

```

        amount
        <local.markup>
            1 serving per day
        </local.markup>
    </local.markup>
</paragraph>
</section>
<section>
    <section.title>
        Plan of Care
    </section.title>
    <section>
        <section.title>
            Lab
        </section.title>
        <section>
            <section.title>
                Laboratory
            </section.title>
            <paragraph>
                UA (urinalysis) type spot checkdate requested
                11-jan-1999duration x 2 daysfrequency one time
                onlynowspecimen source urine.
                <local.markup descriptor='Procedure'>
                    UA (urinalysis)
                    <local.markup descriptor='Type'>
                        type
                        <local.markup>
                            spot check
                        </local.markup>
                    </local.markup>
                <local.markup descriptor='RequestDate'>
                    date requested
                    <local.markup>
                        11-jan-1999
                    </local.markup>
                </local.markup>
                <local.markup descriptor='Duration'>
                    duration
                    <local.markup>
                        x 2 days
                    </local.markup>
                </local.markup>
                <local.markup descriptor='Frequency'>
                    frequency
                    <local.markup>
                        one time only
                    </local.markup>
                </local.markup>
                <local.markup descriptor='Priority'>
                    priority
                    <local.markup>
                        now
                    </local.markup>
                </local.markup>
                <local.markup descriptor='Source'>

```

```
specimen source
<local.markup>
  urine
</local.markup>
</local.markup>
</paragraph>
</section>
</section>
</section>
</body>
</LevelOne>
```

10. HIMSS Demo PRA LevelOne Progress Note

Produced by HIMSS Demo participant, Care Flow|Net

```
<?xml version="1.0"?>
<!DOCTYPE LevelOne PUBLIC "-//HL7 KEG//DTD HL7 PRA LevelOne ver 0.01//EN"
"LevelOne.dtd">
<LevelOne>
  <header>
    <document>
      <document.creation.date>12/23/98 10:37 AM</document.creation.date>
      <document.id>
        <id.value>1001</id.value>
      </document.id>
      <document.originating.system>
        <id.value>CTS</id.value>
      </document.originating.system>
      <document.originator.id>
        <id.value>SBL</id.value>
      </document.originator.id>
      <document.state value="original"/>
      <document.title>PROGRESS NOTE</document.title>
      <document.type value="progress.note"/>
    </document>
    <event>
      <event.id>
        <id.value></id.value>
      </event.id>
      <event.date>12/23/98 10:37 AM</event.date>
      <event.location.id>
        <id.value>4444444</id.value>
        <point.of.care>Williams Memorial
          Hospital</point.of.care>
        <facility>
          <namespace.id>12345</namespace.id>
          <local.header>DEPARTMENT OF FAMILY
            PRACTICE</local.header>
          <local.header>An Affiliate of Creighton Health
            Systems</local.header>
        </facility>
      </event.location.id>
    </event>
    <patient>
      <patient.id>
        <id.value>0002628876</id.value>
      </patient.id>
      <patient.name>
        <family.name>Doe</family.name>
        <given.name>Jane</given.name>
        <mi>D.</mi>
        <suffix>null</suffix>
        <prefix>Ms.</prefix>
      </patient.name>
      <patient.address>
        <street.address>444 Fourth Street</street.address>
        <city>Myburg</city>
        <state.or.province>CA</state.or.province>
      </patient.address>
    </patient>
  </header>
</LevelOne>
```

```

        <zip.or.postal.code>55555-5555</zip.or.postal.code>
    </patient.address>
</patient>
<practitioner>
    <practitioner.id>
        <id.value>2667</id.value>
    </practitioner.id>
</practitioner>
<practitioner>
    <practitioner.id>
        <id.value>1234</id.value>
    </practitioner.id>
    <practitioner.role value="other"/>
    <local.header>Donald</local.header>
    <local.header>Kirkland</local.header>
    <local.header>MD</local.header>

</practitioner>
</header>
<body>
    <section>
        <section.title>Subjective:</section.title>
        <paragraph>
            Pt complains of the onset yesterday afternoon of a sore
            throat Mother relates she had a fever to 104 F last night.
            She has been treating with Children's Tylenol since
            then, last dose 2 hours ago. No headache, no abdominal
            pain. Nausea since yesterday evening, with vomiting after
            breakfast this morning.. No cough, no rhinorrhea, no
            hoarseness. No dysuria or diarrhea There are no sick
            contacts.
        </paragraph>
    </section>
    <section>
        <section.title>Objective:</section.title>
        <paragraph>
            T 39.2C    BP 110/60    R 20    P 114
        </paragraph>
        <section>
            <section.title>Allergies:</section.title>
            <paragraph>None</paragraph>
        </section>
        <section>
            <section.title>General:</section.title>
            <paragraph>
                ill appearing 7 year old girl, non-toxic, good eye
                contact, responsive to questions.
            </paragraph>
        </section>
        <section>
            <section.title>HEENT:</section.title>
            <section>
                <section.title>Eyes:</section.title>
                <paragraph>
                    EOMI, pupils are equal, round, reactive to
                    light, sclera are non-injected, non-icteric
                </paragraph>
            </section>
        </section>
    </section>

```

```

</section>
<section>
  <section.title>Ears:</section.title>
  <paragraph>
    tympanic membranes are pearly white
    bilaterally, with good cones of light,
    and good landmarks, no otalgia. Nares: no
    discharge, turbinates non-inflamed,
    no muco-pus..
  </paragraph>
</section>
<section>
  <section.title>Mouth:</section.title>
  <paragraph>
    There are no gingival vesicular eruptions.
    Generalized swelling and erythema of the
    pharynx. Bilateral 3+ tonsils with moderate
    exudate. Scarce palatal petechiae
  </paragraph>
</section>
</section>
</section>
<section>
  <section.title> Physical:</section.title>
  <section><section.title>Neck:</section.title>
  <paragraph>
    tender 4 mm swollen anterior nodes bilaterally
  </paragraph>
</section>
  <section>
    <section.title>Lungs:</section.title>
    <paragraph>
      clear to auscultation bilaterally
    </paragraph>
  </section>
  <section>
    <section.title>Heart:</section.title>
    <paragraph>
      tachycardic, regular rate and rhythm, no murmurs,
      rubs, or gallops.
    </paragraph>
  </section>
  <section>
    <section.title>Abdomen:</section.title>
    <paragraph>
      on-distended, non-tender, normo-active bowel sounds,
      no peritoneal signs, no organomegaly.
    </paragraph>
  </section>
  <section>
    <section.title>Back:</section.title>
    <paragraph>
      no CVA tenderness
    </paragraph>
  </section>
  <section>
    <section.title>Ext:</section.title>

```

```
        <paragraph>
            no splinter hemorrhages
        </paragraph>
    </section>
    <section>
        <section.title>Skin:</section.title>
        <paragraph>
            no petechiae or rashes.
            Rapid Streptococcal Test in the office was positive
        </paragraph>
    </section>
</section>
<section>
    <section.title>Assessment:</section.title>
    <paragraph>
        7 yr old black female, mild dehydration, Group A Beta-
        hemolytic Streptococcus
    </paragraph>
</section>
<section>
    <section.title>Plan of Care: </section.title>
    <section>
        <section.title>Labs</section.title>
        <paragraph>CBC (complete blood count)</paragraph>
        <paragraph>Urinalysis (UA)</paragraph>
    </section>
    <section>
        <section.title>Meds</section.title>
        <paragraph>
            Penicillan 250mg, po, qid x 10 days
        </paragraph>
        <paragraph>
            Tylenol prn fever
        </paragraph>
        <paragraph>
            encourage po fluid
        </paragraph>
        <paragraph>
            RTC in 7 days or soon as worsens.
        </paragraph>
    </section>
</section>
</body>
</LevelOne>
```