HEALTH LEVEL 7 SGML/XML SPECIAL INTEREST GROUP

RESPONSE TO THE CORBAMED RFI 2 CLINICAL OBSERVATIONS

A PERSPECTIVE FROM THE SGML/XML SPECIAL INTEREST GROUP OF HEALTH LEVEL 7

CORBAMED RFI 2

CLINICAL OBSERVATIONS

INTRODUCTION

Much of the clinical observation data in patient records is acquired in formats that make electronic access difficult: on paper, film, audiotape, and electronically as ASCII text or in binary data structures. The functionality required of healthcare information technologies has recently extended beyond simple record-keeping requirements and formats. Clinical observation data is now widely used for legal, administrative, bedside, and research purposes. Any electronic solution must define a migration path that includes access to clinical observations in both electronic friendly and unfriendly formats.

The diverse information content and structural features of clinical observation data compound its complexity and fuel the need for a technology that can accommodate the data from multiple sources in diverse formats. These formats include:

- Numeric and textual data: transcribed notes, lab result data, letters,
- Graphics and Images: scanned documents, clinical digital and analog images such as X-rays,
- Audio formats: dictated and recorded notes, waveforms
- Video: telemedicine consultations.

Assuming that data is accessible and can be communicated, how the observation is represented (structurally) within the application and within the message are of extreme importance. The clinical observation data must be able to be used for a variety of purposes including providing a patient-centric view to the care provider or providing aggregate views for research, reporting, and analysis. These very different demands on data indicate that the original context in which observational data was created must be preserved. Ideally the structure used to represent the data would also allow for increased levels of abstraction and generalization.

It is also crucial that the clinical data and the context in which it was created can be preserved over time in an open systems environment that is resistant to technology obsolescence, so that the data itself has the potential to outlive the application or the lifespan of the vendor who was responsible for its initial generation or storage. While these data needs span both the present and the immediate future, Standard Generalized Markup Language (SGML) is the only standard today that addresses each of these issues fully, and thus has the potential to be an important representation for clinical observations.

The Health Level 7 (HL7) SGML/XML Special Interest Group (SIG) is responding to this RFI with a proposal for the KONA Architecture, an SGML-based approached to exchanging healthcare data that addresses a common point of contact between systems at varying levels of structure.

THE HL7 SGML/XML SIG AND KONA

The HL7 SGML initiative is a special interest group of HL7 formed to create the standard for the use of SGML in all domains of health care. This standard will comply with ISO: 8879 (Standard Generalized Markup Language (SGML), and will not be out of conformance with the HL7 RIM. Participation is open to all parties.

CHARTER OF THE SIG

1. To coordinate the development of a comprehensive document architecture for healthcare.
2. To create components of this comprehensive document architecture including HL7 domains.
3. To educate the healthcare community in the capabilities and utility of SGML-based information.
4. To develop, coordinate, and maintain a framework for interpretable Document Type Definitions (DTDs) for use in healthcare.
5. To coordinate and cooperate with other SGML initiatives where appropriate.
6. To enable and promote the use of this HL7 SGML standard
7. To represent this initiative in SGML standards activities/evolution.

The HL7 SGML/XML SIG manages the development of the KONA architecture. Currently work includes creation of white papers and a schedule for balloting within HL7. Additionally, a method of using SGML within HL7 version 2.x has been developed.

A SOLUTION STRATEGY- THE KONA PROPOSAL

One of the benefits to using SGML is the functionality it provides for exchanging information. A key piece of SGML is the use of a Document Type Definition (DTD). DTDs define the structure of a document in terms of the types of data elements it contains, the labels of the data elements and the order or sequence in which these data elements may appear.

For instance the following is an example of a part of an SGML document:

<ASSESSMENT>
<DIAGNOSIS SCHEME=ICD9 CODE=123>
Non-hodgkins lymphoma
</DIAGNOSIS>
</ASSESSMENT>

The DTD for this document fragment would specify the elements: ASSESSMENT and DIAGNOSIS. It would specify that a DIAGNOSIS tag only appeared within the ASSESSMENT tag and that a DIAGNOSIS tag would contain extra information or attributes for SCHEME and CODE.

One way an information exchange may be facilitated is if both partners are able to agree on one (DTD) for encoding their information. While this may be possible in some cases, more often than not individual organizations will probably encode their information using their own DTD because that DTD will best meet their needs. In this case, one option may be to use an SGML document architecture for facilitating exchange.

The Kona Proposal addresses exchange of clinical content from a document-centered perspective and assumes varying levels of exchange requirements, diverse information models and constant change. The Kona Architecture permits multiple levels of semantic encoding and supports local variation and local control. Exchange policies can change without revision of the exchange standard.

The Kona Architecture is a multi-layered schema from which individual DTDs (or other architectures) may be derived. The first of the four layers of the architecture, called *ProseDoc* is a very abstract layer for exchanging prose documents. This layer contains a minimum amount of structure and may be used to exchange information at a very high level. As long as it is accompanied by an

architecturally defined header, any structured or non-structured character data may be exchanged at this layer; non character data, such as images, may be exchanged as well at this level of the architecture.

The second layer, called *ClinicalContent*, applies to all documents used for clinical care that form part of the (Electronic Health Record) EHR, including observations. This layer is based upon a loose agreement of the types of information most likely to be exchanged in a clinical care document. What the architecture allows is for a community of users to classify, at a very high level, what sort of information they will be exchanging. This is the only level of agreement the community of interest must reach. Once this general level of agreement has been reached, an architectural form may be developed. When individual entities then create their internal DTDs, they create elements which conform to an architectural element. When the time comes for an information exchange to take place, the sending party will normalize its data against the architecture, transforming the markup to the architectural tags. When the information reaches the receiver, that entity will have the ability to process it according to the rules of their own information systems because they are aware of the architecture forms used in the data exchange. The third and fourth layers of the architecture addressing an architecture for the EHR itself and more specialized applications has not yet been specified.

The following is an example of the transformation from an application specific SGML document to the Kona clinical content level of Kona:

APPLICATION SPECIFIC SGML

```
<SUBJECTIVE>

Subjective:
<CHIEFCOMPLAINT
COMPLAINT="earache">

Chief complaint:  earache.
</CHIEFCOMPLAINT>
```

KONA COMPLIANT SGML

```
<SUBJECTIVE
CC.CLIENT.ETN="SUBJECTIVE">
Subjective:
<MENTION DOMAIN="Application"
CC.CLIENT.ETN="CHIEFCOMPLAINT">
NORMALIZED.CONTENT="earache"
Chief complaint:  earache.
</MENTION>
```

The SUBJECTIVE tag from the Application Specific SGML is transformed directly to the Clinical Content tag SUBJECTIVE. The original tag name is preserved in the Kona SGML by the use of the attribute CC.CLIENT.ETN="SUBJECTIVE". The CHIEFCOMPLAINT tag is transformed to MENTION. The originating application is preserved in the attribute DOMAIN="Application". Other information such as the tag and attribute of the Application Specific SGML is retained in the attributes of the MENTION in CC.CLIENT.ETN="CHIEFCOMPLAINT" and NORMALIZED.CONTENT="earache".

The full text of the Kona proposal is attached at the end of this document.

RECOMMENDATIONS

Based on the work of the HL7 SGML/XML SIG and the efforts deployed to design and develop the KONA proposal, there are two areas we recommend CORBAmed to include in the clinical observation request for proposal (RFP):

1. Support clinical observation data represented in SGML and XML.

2. Support for data conforming to the KONA architecture both within HL7 messages and outside of HL7 messages

3. Functional support for transformations of SGML architectures as in the example and processing that enables the transformations.

Further information on the HL7 SGML/XML SIG, KONA, SGML and XML may be found at: http://www.mcis.duke.edu/standards/HL7/committees/sgml/.

ATTACHMENT

THE KONA PROPOSAL

ALSO AVAILABLE AT HTTP://WWW.MCIS.DUKE.EDU/STANDARDS/HL7/COMMITTEES/SGML/KONA.HTM

INTRODUCTION

The Kona Proposal describes a method in which electronic healthcare records (EHR) can be created, exchanged, and processed using SGML, Standard Generalized Markup Language, ISO 8879:1986.
The project of bringing participants together to review this problem was called Operation Jumpstart and the result is the Kona Proposal. Operation Jumpstart has no further role in the enhancement and development of this Proposal. Further work on this proposal is the province of open standards bodies, specifically the HL7 SGML SIG, if it chooses to do so.
The individuals who participated in Operation Jumpstart invite and encourage all interested parties to become active in the HL7 SGML SIG to which we have given the copyright to this Kona Proposal and to all of the documents, files, and scripts associated with it.

DISCLAIMER

This proposal is an expression of the group that met at Kona Mansion on Lake Winnipesaukee New Hampshire the week of July 7, 1997, and does not represent the opinion of any other individual, corporation, or organization. Explicitly, this is a suggestion being put before the HL7 SGML SIG and as such has no more standing as an official document of the SIG than any item brought to the group for discussion.

SUMMARY

The Kona Architecture is a new approach to exchange of electronic health records and documents. Exchange requires a prior agreement on content and information definitions. However, total agreement within a domain as large as Medical Informatics is not feasible. Using SGML, the metalanguage from which HTML was created and on which XML, the new standard for Web documents, is based, the Kona Architecture resolves these two opposing forces by establishing scaleable levels of exchange so that partners can determine the degree of conformity in the documents they send one another. The architecture:

- allows amendment or extension of the exchange standard to include new data or narrative or new combinations of data and narrative
- allows partners to identify and encode highly granular (atomic) concepts such as billing codes or controlled vocabulary terms at all levels

- contains document headers (metadata) derived from the current HL7 standard for exchange of healthcare data

The levels differ in their degree of structural and semantic specificity and in the scale of the community for which they are intended. The lowest level of the architecture requires no structural definition beyond the header and can be satisfied with imaged data. The highest level requires structural and semantic specificity, such as might exist within a single enterprise or within a tightly bound professional community.

This proposal does not envision or advocate a single prescription for the electronic health record or for associated documents such as claims forms and summaries. Instead, this proposal sets up conventions that allow exchange partners to agree on content without waiting for the action of a standards body and without upgrading technical capability. Thus, if adopted, an insurer will be able to define a new submission form and require that providers submit these forms as Kona-compliant SGML documents without amendment to the exchange standard or upgrades to the technical infrastructure of either party. New documents will require a definition of the document content and expression of that content in a Kona-compliant document.

There may also be other documents that are part of the EHR, such as an aggregated view or report formatted and built as an SGML document for viewing, transport, archiving or other purposes. These SGML documents fall outside of the scope of the collection of attested documents which make up the patient health record. These documents have not been described in detail in this proposal, although provision is made for their inclusion.

At Kona Mansion, we demonstrated feasibility using diverse technology and a wide-ranging approach to document content.

After reaching consensus on our goals and designing the basic Kona Architecture, we produced over 30 documents covering patient encounters and pathology reports using several different DTDs and several systems for document creation: two specialized EHR systems, several SGML editors, and one ASCII editor. Some documents were created from alternate forms of SGML (non-Kona-compliant), some from proprietary data formats, some from paper legacy documents, and some as native, Kona SGML. We imported the Kona-compliant documents from these diverse systems into one document repository. We queried the repository across all documents according to indexed markup and text-in-context. The repository assembled an electronic health record composed of multiple encounters, each with multiple entries (documents) generated by different EHR systems and different Kona-compliant DTDs. A single script translated the SGML documents into HTML.

OBJECTIVES

The role of any exchange standard is to enable a flow of information (equivalent or better than that which exists in the paper world) without constraining the technology or the content on either end of the exchange. An exchange standard should render technical requirements transparent to exchange policy. In other words, policy changes that affect the content of an exchange should not require changes in the standards and technology that supports that exchange.

Current standards for exchange of information between clinical systems cover messaging of fielded data, but do not meet the need for reliable exchange and semantic processing of hierarchical, structured, clinical narrative. A comprehensive healthcare information exchange standard must include this narrative and the full electronic health record. The constituencies for such a standard include caregivers, managers, insurers, regulators, researchers, and the courts. Everyone wants maximum data flow without loss or constraint.

This Kona Proposal is intended to:

- satisfy a range of technical sophistication and a range of markup complexity
- ensure that the cost of entry can be low and yet scale to all sizes of enterprise

- be persistent, extensible, and simple to implement
- allow policy-makers to set and to change information exchange requirements without extension to this technical specification

The Kona Proposal embodies the Mission and Design Principles of the HL7 SGML SIG by making no assumptions about application processing which explicitly proscribes imposition of local application processing requirements.

RELATIONSHIP BETWEEN KONA, SGML AND HL7

Portions of the HL7 2.x specification (and the parts of Version 3 that are equivalent in scope) express information that is useful and required in the *clinical content* of the EHR. This information has been expressed in SGML syntax and incorporated into the Kona Proposal. The object modeling of the RIM presents an additional area of information that may be added to the Kona Architecture as it is extended and filled out.

In several areas, we have applied the data models of HL7 2.x message syntax and the Reference Information Model (RIM). A full standard based on this architecture would integrate all relevant portions of existing and future HL7 data models. (Portions of the data model do not pertain to clinical content and fall outside the scope of this proposal.)

The HL7 V.2.x syntax is a messaging syntax. The scope of the Kona architecture is not messaging, but persistent clinical content and as such, can stand on its own independent of an HL7 message. The Kona Proposal describes an SGML architecture, which allows exchange of health records either independently or within an HL7 version 2.x message segment.

Thus, an entry transmitted within an HL7 message would contain information in its header that is redundant with the HL7 message "wrapper". An entry exchanged without an HL7 message would include header information derived from HL7. We call this the "inside-outside" model of SGML and HL7 messaging.

The Kona Proposal lays the groundwork for a standard document architecture for healthcare. Conformance with the architecture can be validated, but the architecture itself does not define the content of healthcare documents. To some extent, existing HL7 standards already define clinical content (e.g., section headers for various documents are included in HL7 V2.x). As the work of other committees and SIGs progresses, as concensus is reached on industry-wide forms of clinical content, this model can be expressed in the Kona architecture. Furthermore, it is our hope that, should this approach to document architecture be embraced by HL7, the HL7 Technical Committees and Special Interest Groups of HL7 will extend the document architecture into their domains.

DEFINITIONS

Standards:

SGML	Standard Generalized Markup Language, ISO 8879:1986
HL7	Health Level 7, an ANSI-recognized standards writing organization; HL7 also refers to the messaging syntax created by the organization.

Medical:

EHR	Electronic Health Record - an electronic version of a Health record
Health Record	Multiple entries for one individual
Entry	An entry is an attested SGML document.
Attestation	Includes a date, time, signature, and staff ID number

Health Record View	Summary or extraction from entries. A view is not attested and may change over time.

Kona:

Document	SGML document which consists of the document element and the prolog
Schema	A declaration set, documentation of the schema, and optional supporting specifications such as style sheets and supporting processes such as transforms or standard queries.
DTD	SGML Document Type Definition; a schema for a single document (more than one document can use the same DTD).
SGML Architecture	A schema for a class of documents
Kona Architecture	The architecture described by this proposal.
Level of Architecture	Consistent degree of specialization represented in a set of one or more document architectures identified with a community of interest
ProseDoc	The lowest, least granular level in the Kona architecture
ClinicalContent	The second level of the Kona architecture.
Conformance	Adherence to the syntactic requirements of a level of the architecture expressed in the declarations (DTD) for that level (a conformant document is a valid SGML document). (Usage and community of interest for each level of conformance is defined below.)
Compliance	Conformance to a level of architecture and to specific policies on document content. For example, a community of interest can specify that compliance requires conformance with the Clinical Content level of the architecture and inclusion of markup for specified billing and diagnostic procedures.
Derivation	A conceptual and semantic expression of the relationship between schemas at different levels of specialization in an SGML architecture.

THE KONA ARCHITECTURE

The Kona Architecture is a multilevel SGML architecture. This meta-schema definition creates a framework within which individual schemas can conform at various levels of exchange. The exact definition of the most useful degrees of specificity will be developed over time within an open standards environment. The working assumption is that exchange standards such as this architecture cannot and should not control document schemas.

Specification of the architecture does not obviate the need for DTD design to meet the needs of individual organizations and constituencies at each level of the architecture. In other words, the exchange architecture and specific declaration sets (DTDs) within the architecture are not intended to be "authoring" DTDs or templates suitable for collecting and entering information. The exact requirements for exchange will always be, and should remain, a matter of policy between exchange partners.

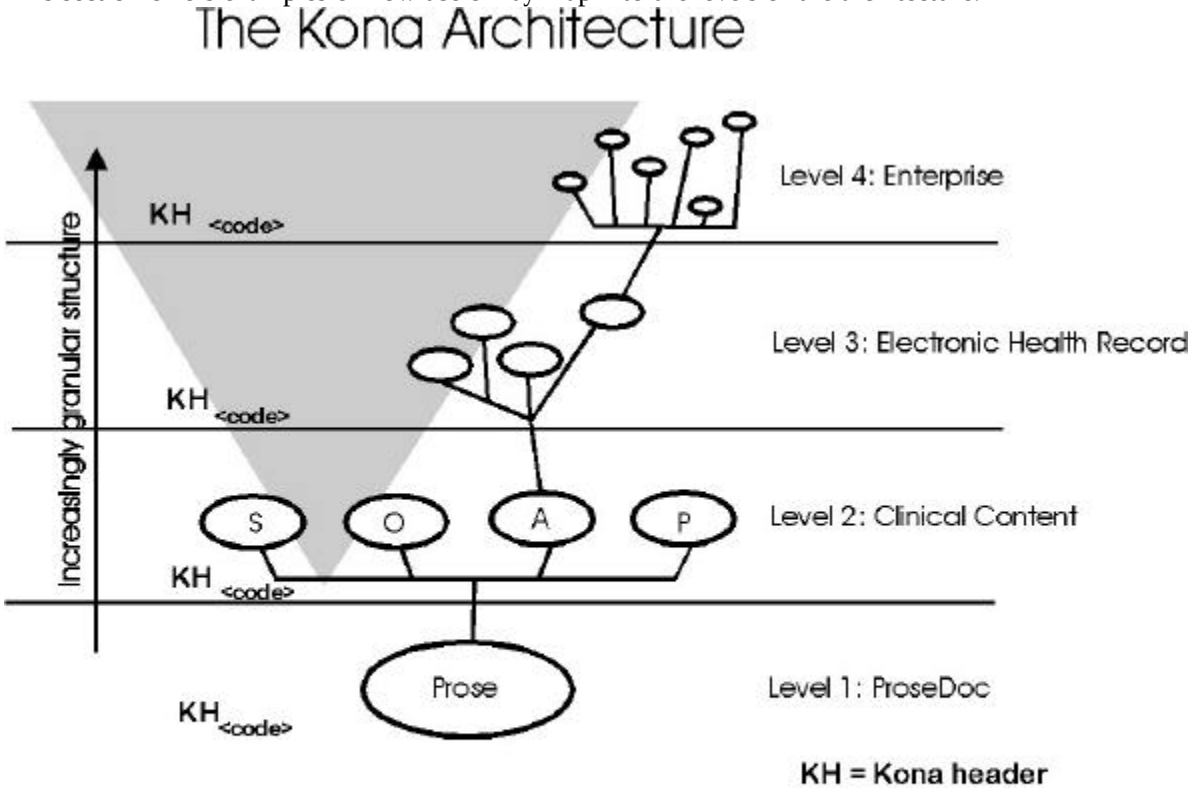
To demonstrate the usage of HL7 data models, portions of the HL7 2.3 patient identification segment formed the basis of the patient information Clinical Content header.

Conformance and Compliance

Exchange partners can declare *conformance* to higher or lower levels of the architecture by declaring that a DTD derives from a certain level of the architecture. Exchange partners can declare *compliance* to levels of the architecture by conforming with that level and with content agreed upon as a matter of policy between the exchange partners. For example, an insurer can require conformance with the ClinicalContent level of the architecture which can be validated by an SGML parser. The insurer can require compliance by setting a policy that specifies the billing, diagnostic, and treatment codes that must be identified within the document. Thus compliance is a policy that can be met and expressed in the applicable Kona-conformant schema. Institutions can set information requirements as a matter of policy without changing technical specifications, thus making the technology transparent to policy-makers in the same manner as existed when information was exchanged on paper.

Kona Level

The Kona Architecture provides multiple levels of markup specificity and thus multiple levels of conformance options. All levels require an SGML header and all levels allow the insertion of domain specific taxonomies. Any party interested in utilizing this architecture can do so, at some level. This section offers examples of how users may map into the levels of the architecture.



Highly-defined structures map to lower levels of the architecture.
All levels carry a Kona header.
All levels can markup codes and terms.
The lowest level can be ASCII or imaged pages.

Level 1 - ProseDoc

The architecture across all levels derives from this level, so documents at a higher may link to or store scanned images using markup defined at level 1. prosedoc.mdt is a reference, level 1 DTD.

Compliance:

The SGML header can link to other medical records stored outside of the SGML document and identify the document in a repository. Markup is minimal covering basic underlying language constructs (Prose) and embedding of image, audio, and non-textual material.

Communities of Interest:

The widest possible community within healthcare with an interest in exchanging information. Example: Exchange of imaged documents or unstructured, character-based documents with an SGML header.

Usage:

This level allows users of higher level systems to incorporate images from and exchange records with document management-oriented medical records systems.

Level 2 - ClinicalContent

The second level is called ClinicalContent and applies to all documents used for clinical care. This level requires loose agreement on content and structure such as that which would apply across institutional boundaries but within an interest group such as all insurers. clincont.mdt is a reference, level 2 DTD.

Compliance:

Requires minimal mark-up of the content and provides markup for fundamental semantic types (SOAP - subjective, objective, assessment, plan) used in clinical documents.

Communities of Interest:

Healthcare insurance carriers, government regulatory agencies, and broad national constituencies with minimal specification of common data requirements. All parties with any level of structured markup exchange requirements. Further utility is possible at this level, but that must be set by policy decision. Example: Submission of records supporting an insurance claim where the insertion of billing and diagnostic codes is specified and required by the insurer.

Usage:

Healthcare providers interested in data for the treatment of patients probably would find much (if not all) treatment data at this level. Likewise, interchangeable insurance data may be provided at this level. Along with patient treatment data, this level can accommodate policies that specify the data required for insurance claims processing. Many Practice Management and Billing System vendors may elect level 2 compliance.

Level 3 - EHR

The third level is called Electronic Health Record (EHR) and is intended to meet the requirements of those creating, managing, and processing EHRs. We encourage the SGML-HL7 SIG to develop reference level 3 DTDs.

Compliance:

Requires markup and semantics from many components of the HL7 standard, including the Reference Information Model (RIM), the current Chapter 7 document classifications, and others sources yet to be determined.

Communities of Interest:

Those who wish to exchange electronic health records. Example: Transfer of patients information in an outpatient setting for admission to a hospital.

Usage:

Clearly, many Electronic Health Record systems capture data at this level of granularity. Traditionally, these systems store codified data in some persistent data store (i.e. RDBMS or OO storage). These systems, then, may exchange data by exporting out from their internal representations into a Kona level 3 or higher SGML document(s). This exchange would be valuable in the transfer of medical records between systems and locations.

Level 4
The fourth level is called Enterprise and should meet the requirements of a tightly bound community of interest. We encourage the SGML-HL7 SIG to develop reference level 4 DTDs.
Compliance:
Requires additional, site-specific or enterprise-specific SGML mark-up. It addresses a granularity of data traditionally reserved for use in specific domains, outside the general interest of healthcare. These systems store and manipulate very specific data elements for use within the enterprise.
Communities of Interest:
A tight community of interest within an enterprise such as an integrated health system or independent practice association.

RELATIONSHIP TO XML

XML, eXtensible Markup Language, is a new standard proposed and sponsored by the W3C to make possible standard exchange of richly encoded documents on the World Wide Web. XML is a subset of SGML, simplified for use on the Internet. XML is widely supported and is expected to become a common feature of Web browsers and therefore of desktops and operating systems.
This proposal is congruent with the emerging XML standard in several ways:

- Users can exchange Kona SGML documents without sending a DTD because they can validate the document against the architecture.
- Users can translate Kona documents into XML for distribution and browsing.
- Users can create documents in XML editors to be transformed into Kona-compliant SGML in a hands-off process. This transformation should be no more demanding than that which we have demonstrated for non-Kona SGML and proprietary format documents.
- XML-Link can be used with Kona documents. (This proposal contains no linking specification.)

AREAS NOT COVERED OR ADDRESSED

Following, in no particular order, is a list of areas we did not address in this proposal. Doubtless more will surface in the future:

- Technical areas:
- Annotations
- Inclusion of non-character images within HL7 messages
- Linking
- Other applicable standards
- Records created for groups of individuals
- Insertion by external reference
- Complete RIM mapping
- Specifications for folders of entries
- CORBAmed interface
- Architecture for views (unattested set of records or summary record)
- Revision required to conform to future and past versions of HL7 messaging specifications.
- Other areas:
    - Creation of draft standard
    - Management policies for the architecture standard
    - Training issues

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PARTICIPANTS

Liora Alschuler	liora@the-word-electric.com	The Word Electric
Ron Capwell	ron@sequoiasw.cm	Sequoia Software Corporation
Bob Dolin	Robert.H.Dolin@kp.org	Kaiser Permanente, Southern California
Dan Essin	essin@hsc.usc.edu	LAC+USC Medical Center
Jasen Fici	jasen@sequoiasw.com	Sequoia Software Corporation
Lloyd Harding	lloyd@bonsai.infoauto.com	Information Assembly Automation Inc.
Eliot Kimber	eliot@isogen.com	Isogen Consulting
Anil Sethi	anil@sequoiasw.com	Sequoia Software Corporation
Rachael Sokolowski	rachaels@kurzweil.com	Kurzweil Applied Intelligence
John Spinosa	spinosaj@scripps.edu	Pathology Medical Group
Michael Toback	mtoback@Oceania.com	Oceania Incorporated
Jason Williams	jwilliams@oceania.com	Oceania Incorporated

Kona Brand: Strong Enough for an Engineer, Doctors Like It Too!

PROSEDOC ARCHITECTURE

AVAIBALE AT: http://www.mcis.duke.edu/standards/HL7/committees/sgml/prosedoc.mdt

```
<![IGNORE[
==========================================================================
                    Prose Document Architecture
Author: Kona Project
Version: 0.0
```

```
Copyright (c) 1997 HL7 SGML SIG
For a more complete definition of this architecture see the formal documentation.
$Log: prosedoc.mdt $
Revision 1.4  1997/07/11 08:21:10  kimber
Added sect.title to section content
Revision 1.3  1997/07/11 03:31:52  kimber
Fixed bug in section content model--now allows paragraph
============================================================================
Use the following declarations to declare derivation of documents or architectures from
the prosedoc architecture.

<!NOTATION SGML PUBLIC "ISO 8879:1986//NOTATION Standard Generalized Markup Language//EN"
>
<?ArcBase prosedoc >
<!NOTATION prosedoc
  PUBLIC "-//HL7::SGMLSIG::Kona//NOTATION Prose Document//EN"
>
<!ENTITY prosedoc.meta-DTD
  PUBLIC "-//HL7::SGMLSIG::Kona//DTD Prose Document//EN"
 "prosedoc.mdt"
 CDATA SGML
>
<!ATTLIST #NOTATION prosedoc
   ArcDTD  CDATA #FIXED "prosedoc.meta-DTD"
   ArcNameA NAME #FIXED "prosedoc"
   ArcNamrA NAME #FIXED "prosedoc.names"
>
]]>
<!entity % common-atts -- Common attributes --
  "PD.client.ETN  -- Element type name of client element --
    CDATA #IMPLIED
   ID            -- Unique ID --
    ID   #IMPLIED
  "
>
<!entity % header.content -- Common content for headers --
   "patient.info |
    care.provider |
    attestor |
    metadata.item
   "
>
<!entity % metadata.items -- Metadata items --
 "organization.name |
 liscense.identifier |
 primary.care.indicator |
 confidentiality.constraint.code |
 primary.person.name |
 identification.text |
 identifier.check.digit.text |
 identifier
 "
>
<!entity % data.content -- Common data content --
```

```
  "#PCDATA |
  arch.bridge |
  crossreference |
  mention"
>
<!entity % para.content -- Paragraph-level content --
  "paragraph |
   list |
   media"
>
<!entity % section.content -- Common content for sections --
  "(sect.title?,
   (header? |
    (%metadata.items; |
     %header.content; |
     name |
     address)*),
   (content |
    (section |
     (%para.content;) |
     (%data.content;))*))"
>
<!element prosedoc -- Architectural document element --
  - - ((header |
        (%metadata.items; |
         %header.content; |
         name |
         address)+),
       Section*)
>
<!attlist prosedoc
  %common-atts;
>
<!--=========================================================
                      Header
   ========================================================-->
<!element header -- Generic document/section header --
  O O (%header.content;|
       name|
       address)*
>
<!attlist header
  %common-atts;
>
<!ELEMENT Care.Provider  -- Provider of Care --
  - O (#PCDATA |
       organization.name |
       liscense.identifier |
       primary.care.indicator|
       metadata.item |
       crossreference)*
>
```

```
<!element MetaData.Item  -- Generic metadata item --
- O (#PCDATA |
      %metadata.items;|
      crossreference)*
>
<!attlist MetaData.Item
 %common-atts;
>
<!element (%metadata.items;)
  - O (#PCDATA |
      arch.bridge|
      crossreference)*
>
<!attlist (%metadata.items;)
 %common-atts;
 prosedoc.base NAME #FIXED "metadata.item"
>
<!ELEMENT Location  -- Real place location --
  - O (address |
      name |
      identifier)*
>
<!ELEMENT Attestor  -- The person who attests to the entry --
 - O (identification.text |
     identifier.check.digit.text)*
>
<!entity % name.content -- Substructure for names of people --
 "#PCDATA |
  title|
  givenname|
  mi |
  familyname|
  suffix |
  alias|
  honorific|
  maiden |
  arch.bridge"
>
<!entity % address.content -- Substructure for names of people --
 "#PCDATA |
  arch.bridge"
>
<!element name -- Generic structured name --
 - - (%name.content;)*
>
<!attlist name
 %common-atts;
>
<!element address -- Generic structured address --
 - - (%address.content;)*
>
<!attlist address
 %common-atts;
>
```

```
<!element patient.info -- Patient identification information --
 - - (patient.name |
      patient.id |
      patient.sex |
      patient.employer |
      patient.contact |
      patient.occupation |
      location |
      confidentiality.constraint.code |
      primary.person.name |
      identification.text |
      identifier.check.digit.text |
      metadata.item |
      crossreference |
      arch.bridge)*
>
<!attlist patient.info
 %common-atts;
>
<!element patient.name -- Name of patient --
 - - (%name.content;)*
>
<!attlist patient.name
 %common-atts;
 prosedoc.base NAME #FIXED "name"
>
<!element patient.ID -- ID of patient --
 - - (%data.content;)*
>
<!attlist patient.ID
 %common-atts;
>
<!element patient.sex -- sex of patient --
 - - (%data.content;)*
>
<!attlist patient.sex
 %common-atts;
>
<!element patient.employer -- employer of patient --
 - - (%data.content;)*
>
<!attlist patient.employer
 %common-atts;
>
<!element patient.contact -- contact of patient --
 - - (%data.content;)*
>
<!attlist patient.contact
 %common-atts;
>
<!element patient.occupation -- occupation of patient --
 - - (%data.content;)*
```

```
>
<!attlist patient.occupation
 %common-atts;
>
<!element givenname  -- ID of patient --
 - - (#PCDATA)
>
<!attlist givenname
 %common-atts;
>
<!ELEMENT MI -- ID of patient --
 - - (#PCDATA)
>
<!attlist MI
 %common-atts;
>
<!ELEMENT FAMILYNAME  -- ID of patient --
 - - (#PCDATA)
>
<!attlist FAMILYNAME
 %common-atts;
>
<!ELEMENT TITLE  -- ID of patient --
 - - (#PCDATA)
>
<!attlist TITLE
 %common-atts;
>
<!ELEMENT ALIAS  -- ID of patient --
 - - (#PCDATA)*
>
<!attlist ALIAS
 %common-atts;
>
<!ELEMENT MAIDEN -- ID of patient --
 - - (#PCDATA)*
>
<!attlist MAIDEN
 %common-atts;
>
<!ELEMENT SUFFIX  - - (#PCDATA) --<Title>SUFFIX--
          --Jr, III, etc.--
           >
<!ATTLIST SUFFIX
 %common-atts;
           >
<!ELEMENT HONORIFIC  - - (#PCDATA) --<Title>Honorific--
          --MD, PhD, DVM, Esq., etc.--
           >
<!ATTLIST HONORIFIC
 %common-atts;
>
<!--=========================================================
                  Sections
```

```
   ============================================================-->
<!element Section
 - - (%section.content;)*
>
<!attlist Section
 %common-atts;
>
<!element Sect.Title -- Arbitrary section title --
 - - (%data.content;)*
>
<!attlist Sect.Title
 %common-atts;
>
<!element content -- Content of a section --
 O O (paragraph |
      list |
      (%data.content;))*
>
<!attlist content
 %common-atts;
>
<!--============================================================
                Paragraph-level content
   ============================================================-->
<!element paragraph -- Generic text block paragraph --
 - O (%data.content;)*
>
<!attlist paragraph
 %common-atts;
>
<!element list  -- Generic list element --
 - - (list |
     item)+
>
<!attlist list
 %common-atts;
>
<!element item -- List item --
 - - (paragraph |
      list |
      (%data.content;))
>
<!attlist item
 %common-atts;
>
<!element media -- Reference to media object --
 - - (media.object |
      text.alternative)*
>
<!attlist media
 %common-atts;
 prosedoc NAME #FIXED "media"
```

```
>
<!element media.object -- Reference to a media object --
 - O EMPTY
>
<!attlist media.object
  object   -- Reference to media object entity --
    ENTITY #REQUIRED
  %common-atts;
>
<!element text.alternative -- Text alternative or description of media object --
 - - (%section.content;)*
>
<!attlist text.alternative
  text.object   -- Reference to separate storage object that contains the
                   text alternative (e.g., OCRed ASCII from TIFF image) --
    ENTITY #CONREF
  %common-atts;
>
<!element arch.bridge -- Clinical Content bridging element --
 - - ANY
>
<!attlist arch.bridge
  %common-atts;
>
<!--============================================================
                    Data content
    ============================================================-->
<!element mention -- Mention of domain-specific object --
  - - (%data.content;)*
>
<!attlist mention
  domain   -- Mention's domain hierarchy specification --
    CDATA
    #IMPLIED -- Default: inherent in mention content or
                client attributes. --
  normalized.content -- Normalized form of the mention content --
    CDATA  #IMPLIED
  %common-atts;
>
<!element crossreference -- Generic cross reference --
  - O (%data.content;)*
>
<!attlist crossreference
   refsub    -- Reference subject: Pointer to subject of the cross reference --
     CDATA #IMPLIED
   autogen   -- When given the value "autogen" the reference has no syntactic
                content and the referent text is generated automatically by
                some process (e.g., in a style sheet). --
     (autogen) #CONREF
   -- HyTime attributes go here --
>
```

CLINICAL CONTENT ARCHITECTURE

AVAILABLE AT: http://www.mcis.duke.edu/standards/HL7/committees/sgml/clincont.mdt

```
<![IGNORE[
================================================================
                    Clinical Content Architecture
```

This architecture expresses the fundamental semantic information types for clinical content documents. This is a very general architecture intended to be further specialized into more detailed and use-specific architectures or document types.

The ClinicalContent architecture is derived from the Prose Document architecture, which defines the fundamental structural components for documents whose content is primarily prose (as opposed to documents that are essentially database tables or collections of records).

```
Author: Kona Project
Version: 0.0
Copyright (c) 1997 HL7 SGML Special Interest Group
For a more complete definition of this architecture, see the formal documentation.
$Log: clincont.mdt $
Revision 1.5  1997/07/11 17:52:36  kimber Added normalized.content to code, code.id is now distinct
Revision 1.4  1997/07/11 17:09:57  kimber Added sect.title to section content
Revision 1.3  1997/07/11 03:32:27  kimber Fixed bug in section content model--now allows paragraph
================================================================
  <!-- Use the following declarations to declare
       derivation from the clinical content architecture -->
<!NOTATION SGML PUBLIC "ISO 8879:1986//NOTATION Standard Generalized Markup Language//EN"
>
<?ArcBase clinicalcontent >
<!NOTATION clinicalcontent
  PUBLIC "-//HL7::SGMLSIG::Kona//NOTATION Clinical Content//EN"
>
<!ENTITY clinicalcontent.meta-DTD
  PUBLIC "-//HL7::SGMLSIG::Kona//DTD Clinical Content//EN"
 "clincont.mdt"
 CDATA SGML
>
<!ATTLIST #NOTATION clinicalcontent
   ArcDTD  CDATA #FIXED "clinicalcontent.meta-DTD"
   ArcNameA NAME #FIXED "clinicalcontent"
   ArcNamrA NAME #FIXED "cc.names"
>
]]>
```