

National Electronic Disease Surveillance System (NEDSS)

[ELC Supplement A - NEDSS 2001: New Activities]

ATTACHMENT A - BACKGROUND

Public health surveillance is a cornerstone of public health decision-making and practice at local, state, and national levels. Surveillance provides information crucial to monitoring the health of the public, identifying public health problems and priorities, taking public health action to prevent further illness, and evaluating the effectiveness of these actions. At the time of its founding in 1946, CDC's primary emphasis was on malaria and other tropical diseases. Since then, CDC's responsibilities have broadened, and today it focuses on prevention of infectious diseases, chronic diseases, injuries, workplace hazards, birth defects and disabilities, and environmental hazards. CDC also pursues an improved quality of life for all by promoting healthy behavior and life-style choices and by fostering healthful environments. Today, through essential collaboration with its public health partners (e.g., Association of Public Health Laboratories, Association of State and Territorial Health Officials, Council of State and Territorial Epidemiologists, National Association of County and City Health Officials, National Association of Local Boards of Health, National Association for Public Health Statistics and Information Systems), CDC maintains over 100 surveillance and health information systems in support of its expanded responsibilities. Sources of data for public health surveillance are nearly as varied as the diseases or conditions of concern. Because there are multiple data sources, different information requirements, multiple, distinct users and different partners with whom CDC collaborates to obtain data for specific program areas, no single surveillance system captures all the information required to monitor the health of the public. Moreover, in addition

to surveillance, public health agencies at all governmental levels operate information systems for a variety of purposes, including case management, and public health laboratory testing and results tracking.

Public health agencies clearly have a variety of information *needs*. However, the multiplicity of information *systems* that have evolved to meet these needs are in general not integrated, which does not serve public health efforts well. Modern information technology, if applied in a standards-based, coordinated way, offers the opportunity to do public health work more efficiently and with improved outcomes.

To better integrate, modernize, and enhance public health surveillance and information systems, CDC and its public health partners are implementing the National Electronic Disease Surveillance System (NEDSS). When completed, NEDSS will electronically link and integrate a wide variety of surveillance activities - meeting necessary confidentiality and security requirements - and will facilitate more accurate and timely reporting as well as enhanced public health use of disease information. (For more information see www.cdc.gov/od/hissb/act_int.htm)

During FY 2000, CDC initiated an extramural program to assist states with development of surveillance information systems according to the NEDSS systems architecture (www.cdc.gov/od/hissb/docs/NEDSSSysArch2.0.pdf). Cooperative agreement awards for NEDSS went to 42 jurisdictions for Assessment and Planning, 12 for Element Development, and 2 for the development of NEDSS Charter sites. During the past year, work has also continued on

the development and application of the Public Health Conceptual Data Model and enhancement of the Secure Data Network (SDN). Further, CDC coordinating development of the NEDSS Base System for health departments who choose this software option (see Attachment C below). These 2001 NEDSS awards will continue to provide support for the development of surveillance systems according to the NEDSS architecture, will extend support to additional jurisdictions, and will provide support for those jurisdictions that choose to use the NEDSS Base System.

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ATTACHMENT B - NEDSS SYSTEMS ARCHITECTURE

Version 2.0, April 15, 2001

The NEDSS Systems Architecture is built around recognized national standards, de facto commercial standards that are not tied to particular vendors, and the use of Internet technologies for information interchange. Standardized modular elements are being emphasized in order to facilitate the use of commercial software platforms, to minimize proprietary commercial applications that cross element boundaries, to prepare for module by module element exchange as new technologies are developed, to facilitate technology sharing, and to strive for the rapid exchange of high quality, comparable data.

Fully developed systems will have all of the NEDSS systems elements, and in addition, will have the elements functioning well as an integrated whole.

NEDSS Systems Elements:

- a. Conduct and support web browser based data entry and data management

Functional description: This element will involve developing secure, web browser based data entry and management capacity for use inside and outside of health departments. Browser based

data entry will be used for data input and results reporting inside of health departments, between local health departments and state health departments, for reporting from and to other sources (e.g., infection control practitioners, small laboratories) and for case management. Sites will have the ability to develop and refine their own systems, but will also be able to incorporate into their web systems web forms and application server code representing public health reports developed by the CDC and others as part of coordinated surveillance systems (e.g., national notifiable diseases reporting, selected EIP activities, and others). Case management tools will be used across categorical program data to develop an integrated, patient centered design.

Technical description: Web browser based data entry will be developed using commercial application server technology as part of a multitiered web development system using open platform web servers (e.g., Apache, Microsoft's IIS, Netscape) running on Windows NT / 2000, LINUX or UNIX and supporting generic web browsers (HTML 3.0+ / Java). The web server, the application server and the database server will be separate tiers of this system. Web application servers (e.g. those made by Silver Stream, BEA, IBM and Microsoft) can speed the development and upkeep of web input and management systems. JavaScript for field based data validation in the browser and EJB, CORBA, or DNA (DCOM) components on the server can be implemented for application logic (please see element #e). Application servers, regardless of physical platform will be able to run shared JAVA code. Data delivery to an associated database will use ANSI standard SQL and ODBC or JDBC connectivity. Security over the Internet will be implemented using a Secure Sockets Layer (SSL) capable server and industry standard client certificates or

token based for authentication and selective authorizations. Firewalls will be necessary to protect accumulated data (please see element #h).

b. Accept, route and process electronic HL7 messages containing laboratory, clinical and public health content.

Functional description: This element involves developing the capacity to dynamically accept, import, route to other recipients, and process incoming electronic messages in HL7 format which use the LOINC and SNOMED coding standards. These messages will come, for example, as result reports from local clinical laboratories or emergency departments, from HMO's, from CDC laboratories, or as pertinent information from other public health jurisdictions (e.g., in the setting of multijurisdictional outbreaks). Efforts to initiate public health electronic laboratory reporting with clinical care sites and labs will be encouraged. NEDSS Charter sites and some NEDSS Element Development sites will also develop infrastructure to support XML data exchange, which will provide the message infrastructure for HL7 Reference Information Model (RIM) content.

Technical description: Many laboratory and clinical systems now transmit HL7 version messages. Messages will be dynamically received, processed and, as appropriate, routed to other organizations or stored with either a dedicated interface engine or HL7 message and translation software components running on Windows NT / 2000, LINUX or UNIX servers. The ability to translate and manipulate LOINC and SNOMED codes and to map local lab codes into these

standards will be important. Application logic to perform data validation, to queue data reports for completion and to initiate the completion and submission of full case reports will be performed using EJB, CORBA, or DNA (DCOM) components (please see element #e).

c. Implement an integrated data repository.

Functional description: The developed data repository will be integrated (i.e., contain data from multiple state based and CDC categorical programs), patient centered where appropriate (i.e., where reporting information is about a person, such as in surveillance case reports), will implement the Public Health Conceptual Data Model / HL7 Reference Information Model structure as appropriate, will include the ability to associate incoming data with appropriate existing data (e.g., a report of a disease in a person who had another condition previously reported), will have the capacity to support data accumulated through various means (e.g., through web based and thick client systems as well as electronic messages), and will function so that data can be accessed by standards based interaction with commercial products for reporting, statistical analysis, geographic mapping and automated outbreak detection algorithms as well as the processing of queued data from and for electronic messages.

Technical description: The integrated data repository will implement common database technology (e.g., Sybase, Oracle or SQL Server) running on servers using Windows NT / 2000, LINUX or UNIX and supporting ODBC, ANSI standard SQL and JDBC access for data input from web based systems, reporting and analysis tools. The repository will also be able to house

stored procedures that can initiate EJB, CORBA and DNA (DCOM) objects. Appropriate security for the repository will include firewall protection, restricted access, selective authorizations and the encryption of some sensitive patient data (please see element #h).

d. Develop active data translation and exchange (integration broker) functionality.

Functional description: This element supports data translation, data import and export, queuing and messaging for the dynamic bi-directional interchange of data using Extensible Markup Language (XML) to and from the integrated data repository, other associated databases and, in some cases, the within health departments and with other public health agencies. Data integration functionality will be deployed with the ability to rapidly develop ad hoc data exchange interfaces without programming. XML messaging will also provide the messaging infrastructure for future versions of HL7 and X12 content and for some environments may be best achieved with interface engine technology such as in element #b.

Technical description: Integration broker functionality may be fulfilled by an integration broker server, by software components running on shared servers or by some application server technologies. Bi-directional data transmission will occur using XML transfer over HTTP or HTTPS as appropriate. Secure communication with recipient servers will be performed with virtual private network capacity or certificate based SSL server-to-server communication. Application logic to perform data validation, to queue data reports for completion or to initiate the completion and submission of full messages will be performed using EJB, CORBA, or DNA

(DCOM) components (please see element #e). XML messages and associated application logic for program specific reporting will be derived from the Public Health Data Model / HL7 Reference Information Model and will be jointly developed by the CDC and the funding recipients.

e. Contemporary application programming practices component based, object oriented and cross platform where possible. (formerly Develop transportable business logic capability).

Functional description: Data validation, business rules for data accumulation, data processing, workflow implementation, data coding and decoding, registry mapping, and case management capabilities will be developed on the application server around the data repository using contemporary programming practices including one of several component development approaches, object oriented code development and, where possible, a cross platform implementation. Application logic for data accumulated via the web, via thick client software, via messaged XML and HL7 will need to be consistently applied to ensure that data quality is good and shared data is comparable.

Technical description: Component development will involve EJB, CORBA or DNA (DCOM). Database access will use SQL and ODBC or JDBC connectivity. Application server development surrounding the data repository will apply business rules and initiate integration broker activity. Data repository stored procedures will need to initiate application server functions.

f. Develop data reporting and visualization capability.

Functional description: Selective data reporting according to user need-to-know, statistical analysis, Geographic Information Systems (GIS) use and other visualization, display and mapping functions will be implemented using COTS (commercial off of the shelf software) solutions through industry standards for access to the data repository.

Technical description: Commercial reporting systems (e.g., Crystal Reports or Actuate, statistical analyses software such as SAS, SPSS or EPI Info 2000 and GIS software (e.g., ArcView or MapInfo) will be integrated using ODBC and JDBC data access. Security and access control will be applied for remote access over public networks using SSL and Certificate or Token based authentication with appropriate authentication and authorization.

g. Implement a shareable directory of public health personnel.

Functional description: Select information about pertinent public health personnel within state health departments and select local health jurisdictions will be listed in a standards based information directory. The directory will be shareable and mergeable with directories from other state and local health departments and the CDC to create a directory of public health personnel. The directory will capture information about the roles and expertise of personnel for the use by public health communication and notification systems. Eventual use for authentication and

authorization to resources is also anticipated. The directory of public health personnel will be used to guide the flow of information within and among public health agencies for emergent and nonemergent purposes.

Technical description: Directories will be maintained using the Light Weight Directory Access Protocol (LDAP) services. Data fields in the directory will use X.500 standards for field type and length. Public and nonpublic field division, standard Object Classes and their attributes and definitions as well as methodologies for replication will be defined in conjunction with CDC and DHHS directories.

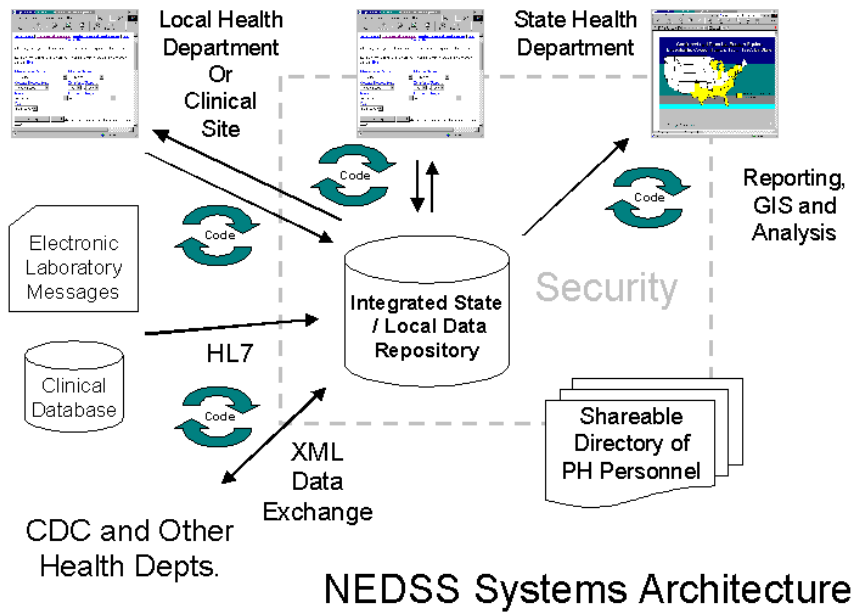
h. Implement a security system and appropriate security policies.

Functional description: To develop standards, operating procedures and infrastructure for the secure transmission, processing and storage of sensitive or critical data and the support of sensitive or critical systems. This will include the secure Internet exchange of information based on the creation and operation of a secure Internet connection and gateway facility that can work in concert with the CDC's Secure Data Network (SDN).

Technical description: Security policies will be implemented with authentication based on industry standard X.509 certificates, secure tokens, and other applicable means as identified; access and control of data via selective integrated repository authorization; an encryption engine

and appropriate use of encrypted data; and access control through a firewall by data routing to programs and other organizations.

NEDSS Systems Architecture for State and Large Local Health Departments



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ATTACHMENT C - NEDSS BASE SYSTEM PACKAGE

The NEDSS Base System represents a series of specific design standards that will allow states to accumulate and share more comparable data, a platform for systems implementation in the NEDSS architecture, and a software option for supporting public health surveillance in an integrated, secure environment. Many states have received Assessment and Planning funds to evaluate current systems and develop plans for implementation of NEDSS-compatible systems. Some states are choosing to develop their own systems using specified NEDSS standards, while other states have expressed interest in using all or parts of CDC developed systems. The first release of the NEDSS Base System will support the electronic processes involved in core demographic data maintenance and notifiable disease surveillance and analysis, succeeding the functionality currently supported by the National Electronic Telecommunications System for Surveillance (NETSS). Shortly thereafter several other systems will be available that build upon Base System standards, services and modules. More information on the base system can be obtained at www.cdc.gov/od/hissb/docs/NEDSSBaseSysDescription.pdf and www.cdc.gov/od/hissb/docs/NEDSSBaseSysFactSheet/pdf.

NEDSS Base System Support

States that are interested in the base system should request each of the following components of the base system package or should demonstrate how they are available through existing resources.

1. Direct Assistance for Software Integration and Training

The CDC will contract with a software systems integrator to help provide time-limited on site integration support and training for the implementation of the base system. Software integration tasks will include the implementation of the base system under existing state or local web, security and database management systems. Recipient can expect several days of on-site work from these contractors as part of an on-site integration team.

2. Integrated Data Repository Manager

This position will be responsible for operational maintenance and security of the Integrated Data Repository. He or she will ensure that the database management system is operational and secure, supervise at least weekly full back-ups with daily incremental back-ups, apply and maintain appropriate personnel access and authorizations, and oversee importing legacy and ongoing data into the IDR. He or she will also be responsible for maintaining some controlled vocabularies

that will be downloaded to the IDR. This position may also support systems management functions for the site web and application server as appropriate.

3. Base System Registry Manager

This position will be responsible for maintaining data and functions in the Integrated Data Repository. He or she will maintain a person registry that will be shared by multiple programs, maintain an up-to-date person list, support the de-duplication of person records, facilitate the evaluation of incoming data, triage data according to program needs, and direct data and reports to appropriate personnel.

4. Hardware and Software Systems and Support

To include all of the following:

The following are current projections for the technical environment necessary to run the base system. More detailed specifications will be available at a later date and we recommend consulting with CDC technical staff before committing to any new hardware or software implementations on the basis of these specifications.

Recipient will provide access to a network connected web server with managed system security and operations support running Microsoft's IIS version 4.0 or higher or Netscape Enterprise Server Version 3.0 or higher (at version 4.0 this became iPlanet Web Server, Enterprise Edition).

Recipient will provide access to a network connected database management server running Microsoft SQL Server version 7.0 or higher or Oracle RDBMS version 8.0 or higher.

Recipient will provide an otherwise unused, network connected server. This machine will be used as an application server, an LDAP server and will support other CDC provided functionality. The system should be running Windows NT, Windows 2000 Advanced Server, or one of several current versions of UNIX. Recipient should confer with CDC technical personnel prior to the purchase of this machine to ensure compatibility and adequate functionality.

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ATTACHMENT D - GLOSSARY OF SELECTED TERMS

ANSI (American National Standards Institute)

A voluntary standards organization that serves as the coordinator for national standards in the United States and the U.S. member body to the International Organization for Standards. ANSI accredits standards committees and provides an open forum for interested parties to identify, plan, and agree on standards; it does not itself develop standards. Standards are developed by Standards Development Organizations (SDOs). URL: www.ansi.org

Application Server

Server based software that provides specific services and capabilities for hosting applications that may be remotely called.

Certificate (and Digital Certificate)

An electronic file used for security purposes. Certificates are used to verify a user or computer is who they claim to be and to encode data exchange

CIPHER (Common Information for Public Health Electronic Reporting)

A set of standards and guidelines for data representation and code values, which includes specifications for representing concepts as well as standard code, lists for coded elements. The

CIPHER standards can be linked directly to attributes in the PHCDM. URL:

www.cdc.gov/od/hissb/docs/cipher.htm

**Note: The CIPHER document was developed early in the NEDSS process and was oriented toward a preliminary architecture. The data variable specifications for the core demographic variables in the Base System will supersede the CIPHER document.

COM (Component Object Model)

A Microsoft approach for that allows programmers to share and reuse pieces of software by specifying the way that pieces of code can be called. URL:

www.microsoft.com/com/tech/com.asp

CORBA (Common Object Request Broker Architecture)

A standard that allows programmers to share and reuse pieces of software by specifying the way that pieces of code can be called. URL: cgi.omg.org/corba/whatiscorba.html

COTS

Commercial off of the shelf software

DCOM (Distributed Component Object Model)

A Microsoft approach for that allows programmers to share and reuse pieces of software by specifying the way that pieces of distributed code can be called. DCOM components are like

COM components, but they can be called from other computers. URL:

www.microsoft.com/com/tech/DCOM.asp

DNA (Distributed interNet Applications Architecture)

A Microsoft name for a collection of technologies comprised of ActiveX, Dynamic HTML (DHTML) and COM

DTD (Document type definition)

A type of file used by XML documents that describes how applications should interpret data

EDI (Electronic Data Interchange)

A standard format for exchanging business data. An EDI message contains a string of data elements, each of which represents a singular fact, such as a price, product model number, and so forth, separated by delimiters (a character that identifies the beginning and end of a character string). The entire string is called a data segment. EDI is one form of e-commerce, which also includes e-mail and fax.

EJB (Enterprise Java Beans)

A server component standard developed by Sun Microsystems that allows programmers to share and reuse pieces of software by specifying the way that pieces of code can be called

ELR (Electronic Laboratory-based Reporting)

Electronic Laboratory-Based Reporting (ELR) is the transmission of data of public health importance from clinical laboratories to public health agencies in electronic format. Ideally, data transmitted by ELR would be automated and would use standardized codes for tests and results allowing for more timely and complete reporting.

Firewall

Software and / or hardware that protects systems from access by unauthorized users and programs.

GIS (Geographic Information Systems)

Software used to relate data to geographic location for the purposes of mapping, analysis and manipulation

HIPAA (Health Insurance Portability and Accountability Act)

The Administrative Simplification provisions of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) are intended to reduce the costs and administrative burdens of health care by making possible the standardized, electronic transmission of many administrative and financial transactions that are currently carried out manually on paper. URL: aspe.os.dhhs.gov/admnsimp/index.htm

HL7 (Health Level 7)

A standards development organization formed in 1987 to produce a standard for hospital information systems. HL7 received ANSI accreditation as an Accredited Standards Developing

Organization in 1994. The HL7 standard is an American National Standard for electronic data exchange in health care that enables disparate computer applications to exchange key sets of clinical and administrative information. HL7 is primarily concerned with movement within institutions of orders; clinical observations and data, including test results, admission, transfer and discharge records, and charge and billing information (coordinating here with X12). HL7 is the selected standard for the interfacing of clinical data for most health care institutions. URL: www.hl7.org

HTML (HyperText Markup Language)

An authoring language for the creation of World Wide Web documents.

ISO (International Organization for Standardization)

A worldwide federation of national standards bodies from some 100 countries, one from each country. Among the standards it fosters is Open Systems Interconnection (OSI), a universal reference model for communication protocols. Many countries have national standards organizations, such as the U.S. American National Standards Institute (ANSI), that participate in and contribute to ISO standards development. URL: www.iso.ch

Java

An object oriented programming language developed by Sun Microsystems.

JavaScript

A scripting language for Web pages developed by the Netscape Corporation.

JDBC (Java Data Base Connectivity)

A standard that allows Java programs to interact with any SQL compliant database.

LDAP (Lightweight Directory Access Protocol)

A standard for computer directory services

LINUX

A free version of the UNIX operating systems that runs on a number of different computer types including those based on Intel microprocessors

LOINC (Logical Observations, Identifiers, Names, and Codes)

The LOINC database provides a set of universal names and ID codes for identifying laboratory and clinical observations. The purpose is to facilitate the exchange and pooling of clinical laboratory results, such as blood hemoglobin or serum potassium, for clinical care, outcomes management, and research. URL: www.regenstrief.org/loinc

NCVHS (National Committee on Vital and Health Statistics)

External Advisory Committee to the Secretary of the Department of Health and Human Services (DHHS), and to the DHHS Data Council. Consists of 16 members with overlapping four-year terms. The National Center for Health Statistics (NCHS) serves as Executive Secretary. The

NCVHS was established in 1949 in response to a recommendation by the World Health Organization (WHO). The committee was re-chartered in January 1996 to include a more direct focus on data standardization and privacy activities. URL: ncvhs.hhs.gov/intro.htm

NEDSS

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ODBC (Open Data Base Connectivity)

A standard database access method developed by Microsoft Corporation

PHCDM (Public Health Conceptual Data Model)

A high level conceptual model, developed as part of the CDC NEDSS initiative, which provides the foundation for standardization of public health data collection, management, transmission, analysis and dissemination.

SDN (Secure Data Network Standards and Procedure)

Agency standards and operating procedures for the use of CDC/ATSDR Internet resources in the secure transmission and processing of sensitive or critical data and the support of sensitive or critical systems. URL: www.cdc.gov/od/hissb/docs/sdn3.pdf

SNOMED (Systematized Nomenclature of Medicine)

A structured nomenclature and classification of the terminology used in human and veterinary medicine developed by the College of Pathologists and American Veterinary Medical Association. Terms are applied to one of eleven independent systematized modules. URL: www.snomed.org

SQL (Structured Query Language)

A standard language for requesting information from a database.

SSL (Secure Sockets Layer)

A method for the encrypted transmission of data across TCP/IP.

TCP/IP (Transmission Control Protocol/Internet Protocol)

Standards that are the basis for data transmission on the Internet and over LANs (local area networks) and WANS (wide area networks)

Tokens

A security device that displays a code for network login.

UML (Unified Modeling Language)

A graphical language for visualizing, specifying, constructing, and documenting the artifacts of a software-intensive system. URL: www.omg.org/uml

UMLS (Unified Medical Language System)

Developed by the National Library of Medicine as a standard health vocabulary that enables cross-referencing to other terminology and classification systems. Includes a metathesaurus, a semantic network, and an information sources map. Purpose is to help health professionals and researchers retrieve and integrate electronic biomedical information from a variety of sources, irrespective of the variations in the way similar concepts are expressed in different sources and classification systems. Has incorporated most source vocabularies.

URL: www.nlm.nih.gov/research/umls

W3C (World Wide Web Consortium)

An industry consortium that seeks to promote standards for the evolution of the Web and interoperability between WWW products by producing specifications and reference software.

URL: www.w3.org

X12

A standards development organization that develops uniform standards for inter-industry electronic interchange of business transactions - electronic data interchange (EDI). X12N, a subcommittee of X12, develops standards for healthcare insurance and claims processing. URL:

www.X12.org

X.500

A standard for computer based directories.

X.509

A standard for defining digital certificates URL: www.ietf.org/html.charters/pkix-charter.html

XML (eXtensible Markup Language)

A specification developed by the World Wide Web Consortium. XML is designed especially for Web documents. It allows designers to create their own customized tags, enabling the definition, transmission, validation, and interpretation of data between applications and between organizations. XML provides a file format for representing data, a schema for describing data structure, and a mechanism for extending and annotating HTML with semantic information.

URL: www.w3.org/XML

Some websites with information technology glossaries that may be of use:

www-rohan.sdsu.edu/glossary.html

www.state.ia.us/government/iitt/glossary.htm

www1.umn.edu/enterprise/glossary.html

www.instantweb.com/foldoc

www.webopaedia.com

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ATTACHMENT E

Table of NEDSS Element Stages

Development and support of information systems can be described in terms of these three stages:

- 1) Acquisition (through purchase or development);
- 2) Deployment/Implementation;
- 3) Providing Ongoing support

NEDSS Architecture Elements	Acquisition (through purchase or development)	Deployment/ Implementation	Providing Ongoing Support
a. Conduct and support web browser-based data entry and data management			
b. Accept, route and process electronic HL7 messages containing laboratory and clinical content			
c. Implement an integrated data repository			

d. Develop active data translation and exchange (integration broker) functionality			
e. Contemporary application programming practices component based, object oriented and cross platform where possible. (formerly Develop transportable business logic capability).			
f. Develop data analysis, visualization and reporting capability			
g. Implement a directory of public health personnel			
h. Implement a security system and appropriate security policies			

Instructions for completing table: Complete table by indicating the status (i.e., not underway, in progress, or completed) of each stage for each element. Further, indicate which activities are being proposed in this application. Also, indicate if support for an element comes from other sources instead of or in addition to NEDSS Element Development.

