

NEDSS AND NEDSS PAMs
BUSINESS DISCOVERY STATEMENT
VERSION 1.2 -- 021202

BUSINESS DISCOVERY STATEMENT
NEDSS Base System and Program Area Modules

Purpose of a Discovery Statement: the Business Discovery Statement guides decisions regarding project scope, scheduling, processes supported, and functionality for a project. The program area public health processes and the overall NEDSS vision provide the context for the Business Discovery Statement.

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1.0 PROJECT OVERVIEW

1.1 NEDSS Program

The National Electronic Disease Surveillance System (NEDSS) program is a public health initiative of the Department of Health and Human Services (DHHS) to provide an integrated, standards-based approach to public health surveillance. NEDSS will connect surveillance systems to the burgeoning clinical information systems infrastructure. By providing a single, consistent approach to the collection and provision of health data, NEDSS will improve the nation's ability to identify and track emerging infectious diseases, monitor disease trends, and respond to the threat of bioterrorism.

The Centers for Disease Control and Prevention (CDC) has lead responsibility for the NEDSS program within DHHS. CDC and its public health partners are developing NEDSS in collaboration. The stakeholders include CDC, other agencies within DHHS, state and local public health departments, healthcare providers, laboratories, health-care standards organizations, health care product vendors, and healthcare professional services organizations.

The NEDSS program articulates an architecture that will enable public health information systems to communicate electronically, thereby decreasing the burden on respondents and promoting timeliness and accuracy. States have received funds to assess their current systems and develop plans for acquiring systems compatible with the NEDSS architecture. Some states are choosing to develop their own systems using NEDSS standards, while other states are looking to CDC to provide a NEDSS implementation that they can build on. For those states that choose to use the CDC-provided option, the **NEDSS Base System** is being developed as a platform upon which public health surveillance systems, processes, and data can be integrated in a secure environment.

1.2 NEDSS Base System

The NEDSS Base System (NBS) is a specific implementation of NEDSS standards for use by state and local health departments and other organizations. The NBS provides basic disease surveillance functionality and a set of enterprise, or framework, services that support that functionality and enable its extension.

The NBS supports functions common to most surveillance systems and is not specific to any disease category or program area. NBS capabilities are identified as modules or subsystems that represent groupings of data, user interface capabilities, and associated business logic. Modules provided by the base system include:

- Core Demographics Module (CDM)
- National Notifiable Disease Module (NNDM)
- Observation Management
- Investigation Management
- Messaging Subsystem

The CDM tracks information about parties (people, groups, organisms, etc.) associated with observed conditions and diseases. The NNDM enables the reporting to appropriate authorities of cases of diseases subject to such reporting requirements. The observation management capabilities provide for the collection and storage of observations (clinical or laboratory reports). The investigation management capability supports the basic disease investigation capabilities needed to determine reportable cases.

The messaging subsystem, which can be deployed either as part of the NBS or in a standalone mode, enables the secure transmittal and receipt of public health messages. It gives state health departments an initial capability for receiving laboratory and clinical observations and for transmitting notifications to the CDC and to other state and local public health departments. The messaging subsystem will route messages from national laboratories to states via an interface broker at CDC.

The NEDSS program has defined architecture concepts that will support goals of usability, information access and security, and system extension and integration. A key concept is the use of web and Internet technologies for user access and information exchange. Also central to the NBS architecture is the concept of the Integrated Data Repository (IDR). The development of the NBS will detail these concepts to the level of implementation standards and will provide the associated services and functionality.

The NBS will enable systems from different CDC program areas to be integrated, and will also allow state and local health departments to build their own integrated systems to meet local public health needs. Program areas, states, and others can develop domain specific modules called ***Program Area Modules*** that rely on and extend the modules of the NBS.

1.3 Program Area Modules

To incorporate disease specific data and processes, Program Area Modules (PAMs) will be created and integrated with the NBS. This modular approach will allow the sharing of common data and processes while incorporating disease-specific data and processes. The Figure 1-1 illustrates the concept. While initially focusing on disease surveillance functionality, it is anticipated that in time NEDSS PAMs will address a wide variety of public health needs.

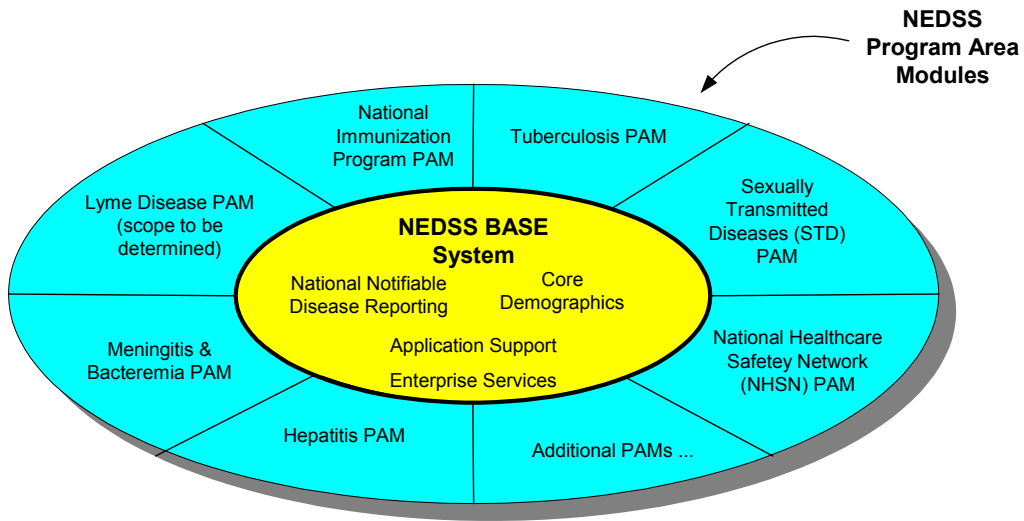


Figure 1-1. Conceptual Picture of the NEDSS Base System and Program Area Modules

1.4 Deployment Concepts

NEDSS will not be a single, monolithic application, but rather a collection of complementary information systems deployed by a variety of public health organizations, all exchanging information. When the vision for NEDSS is realized, the deployment could include multiple installations of the NBS, numerous PAMs developed by the CDC and its public health partners and running at many sites, and other NEDSS application and architecture elements developed and operated by states. The NEDSS architecture will ultimately allow the adoption of mixed solutions that include some components developed by CDC and others developed locally.

To support this vision the NBS and CDC-developed PAMs must be able to be deployed in several different deployment models. To support disease surveillance the NBS and PAMs will typically be deployed at a state health department at a central site. In the case of large states or states with large metropolitan areas, the NBS and PAMs may be deployed at more than one site across the state. For some applications, the NBS will be deployed at CDC and accessed by partners directly. There may also be circumstances in which an organization such as a hospital or university could choose to deploy the NBS, a PAM, or a component locally.

Organizations deploying the NBS and the PAMs are responsible for maintaining the security perimeter within which the system is deployed. The NBS provides an authorization security system that will interface with the partner’s authentication security system. The NBS security system includes a security model that can be configured to control access to the data and functionality of the system. However, the state or other organization deploying the NBS must provide the security infrastructure and must enforce user authentication.

2.0 GOALS & OBJECTIVES

This section first identifies the overall goals of the NEDSS program and then lists the specific objectives of the NBS Project.

2.1 NEDSS Program Goals

The NEDSS program is intended to serve public health agencies at the local, state, and national levels, and also to foster the integration of CDC coordinated surveillance systems. The NEDSS program addresses the DHHS Healthy People 2010 priority areas of Public Health Infrastructure; Immunization and Infectious Diseases; Food Safety; Sexually Transmitted Diseases (STDs); and Tuberculosis (TB).

The goals of NEDSS are to enhance public health surveillance through approaches that

- 1) emphasize, adopt, and promote national standards for electronic exchange of information
- 2) foster integration of surveillance and health information systems;
- 3) support the development of surveillance systems according to a defined information systems architecture;
- 4) develop direct electronic communications between sources of data (such as health care providers or laboratories) and public health agencies
- 5) facilitate ready exchange of data, as appropriate, between local and state health departments, among states, and between states and CDC;
- 6) ensure security and confidentiality of public health surveillance information in accordance with Health Insurance Portability and Accountability Act (HIPAA) and state regulations.

2.2 NBS Project Objectives

The project objective is to develop the NBS and to achieve its adoption by state health departments and program areas. To do this, the NBS must meet a set of business requirements that provide benefit to the public health community and must provide an architectural framework that adopting organizations can build upon to extend that benefit.

In support of NEDSS program goals, it is also critical that the NBS be affordable to public health partners in terms of the human and financial resources required for implementation and maintenance. This implies that the system must provide for easy customization and extension by the adopting organizations, and use industry standard approaches that minimize support costs. Finally, the NBS needs to have an architecture that can connect surveillance systems to the clinical information systems infrastructure, ultimately including interfaces to non-public health provider systems and business systems.

Business Objectives

Provide a system that supports public health workers' primary functions:

- Surveillance and Intervention Program Management
- Person Surveillance
- Person Intervention
- Population Surveillance
- Population Intervention
- Analysis, Visualization, and Reporting
- Notification
- Information Request

It is important that the NBS provide these capabilities (and enable PAMs to expand on their scope) in such a way that the reporting of surveillance data becomes as an automatic side effect of the surveillance and intervention processes. This will promote more accurate, complete, efficient, and timely reporting.

Supportability Objectives

Provide a system development and operations platform that meets NEDSS goals for adoption by the CDC's public health partners, and can be utilized and supported by the organizations that adopt it. Supportability objectives will be addressed through:

- A modular NBS structure that supports extensions to functionality and data
- Integration of the NBS with other public health information systems
- Deployment of the NBS under a range of options
- Configuration of NBS features to meet state and local needs

Usability Objectives

Provide the public health community with a system that

- Eases the reporting burden to the public health partner organizations
- Promotes efficient and accurate information entry and retrieval
- Conforms to the way the public health workers view the information and processes with which they work
- Minimizes training times
- Encourages adoption in the public health community.

Technical Objectives

Adopt a modular architecture that promotes technology update. Build the architecture around recognized national standards, de facto commercial standards that are not tied to particular vendors, and the use of Internet technologies for information interchange.

The elements of the technical architecture are:

- Web browser based data entry and data management
- Electronic Health Level 7 (HL7) message processing
- Integrated Data Repository
- Data translation and exchange
- Transportable business logic
- Analysis, visualization, and reporting (AVR)
- Shareable directory of public health personnel
- Security system

System Replacement Objectives

A key objective is replacing current legacy systems in use by the CDC and its public health partners with NEDSS-compatible systems of greater capability. The NBS and accompanying PAMs are to incrementally replace current CDC-provided systems. These systems are often characterized as “stove-piped” within program areas. The NEDSS objective is to replace these with systems that meet program needs but with the ability to share data through the use of NEDSS standards. A release plan will be defined to identify priority areas for support and timelines for availability.

2.3 Critical Success Factors

The NEDSS program will be able to achieve its goals only when a significant number of public health organizations have adopted the concepts and tools of the program. To this end, the most important factor in the success of the NBS and the PAMs is to achieve adoption. Public health partners must choose to use NBS and PAMs, they are not required to do so. Critical success factors may be stated at a high level as:

- Win adoption across a wide spectrum of public health partner organizations. Early failure, even if corrected later, may be prejudicial.
- Provide clear benefit to users through meeting business requirements and usability features
- Provide clear benefit to adopting organizations through the ability to integrate and consolidate current “stovepiped” systems and to automate current manual reporting processes
- Use technologies and information system components that are available to and affordable by public health organizations, and that are easy to administer and maintain.

CDC must provide the national leadership to bring users of current systems into the NEDSS era, through implementation grants, and through communication and training.

3.0 BUSINESS CONTEXT

The NBS is intended to support the business requirements identified in Section 2.1, and to enable the development and operation of PAMs that will support those requirements. The basic pattern of public health surveillance information flow is depicted in Figure 3-1. This information flow represents the context within which the NBS and most PAMs will be fielded.

The **reporting organization** is one of any number of healthcare providers or laboratories. It is the point of origin of the observations that are reported in the person surveillance business processes. The reporting organization sends the observations to the **local health department** in their jurisdiction, where caseworkers collect the observations and organize, analyze, and judge the completeness of these reports. The observations generally include patient identification, condition, and results of tests, though often the caseworker will need to make an information request of the reporting organization or of a public health department in another jurisdiction.

If the local health department concludes that the observations indicate a notifiable condition, the notification process begins. The local health department notifies the **state health department**, which receives information from health departments across the state and carries out epidemiological analysis on the data. Epidemiologists at the state level rely extensively on analysis, visualization, and reporting capabilities to perform this function. The state health department notifies the **CDC** of any cases of nationally notifiable diseases. In some cases reporting organizations send observations directly to the state health department, and the same types of activities that occur at the local level occur at the state level.

The CDC assists the state and local health departments by providing advice and consultation (including information systems) and by analyzing public health trends across the country. CDC makes epidemiological data available to the public health community and to the general public, most notably through reports such as the *Morbidity and Mortality Weekly Report* (MMWR).

Between them the state and local health departments manage any public health issues associated with the reported conditions, with help from CDC as requested. They carry out the processes of surveillance and intervention program management, which provide policies and procedures, including case definition standards, to be used by the caseworkers to collect and analyze data associated with a condition. They also define any population intervention activities to protect the general populace or a group within the populace. The healthcare providers generally carry out the processes of person intervention to treat the individual patients, but within the framework established by the state and local health departments.

Most surveillance systems are passive, in which the reporting organizations voluntarily send the data upon the detection of a condition. In active surveillance systems, the local or state health department or the CDC actively solicits reports for particular conditions.

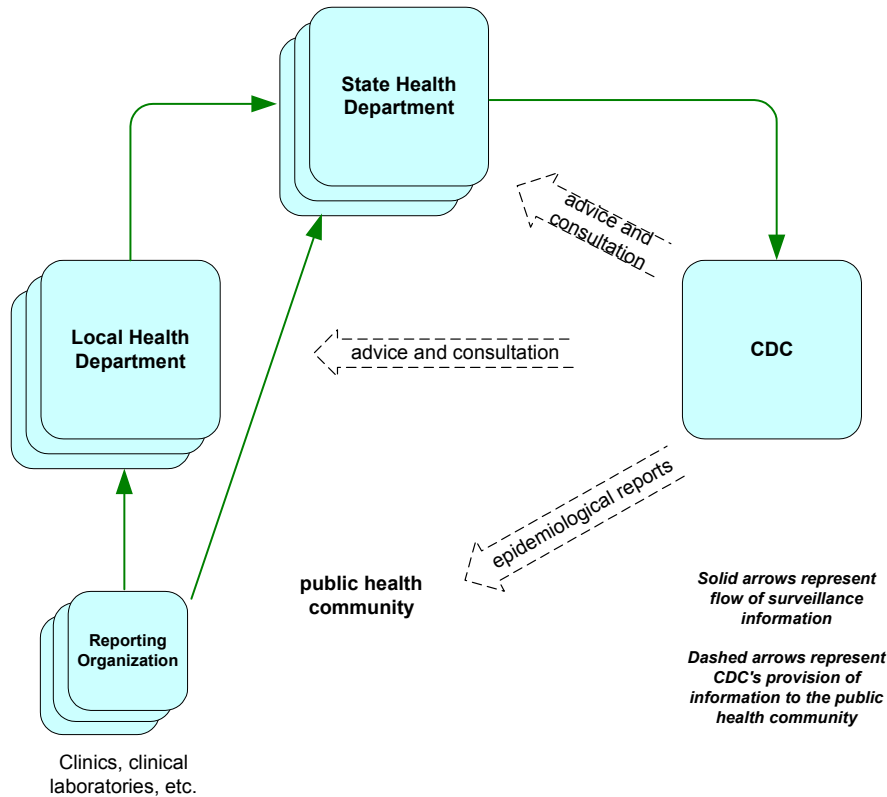


Figure 3-1. Business Context Diagram for public health surveillance

With current public health information systems, public health workers usually receive the data on paper forms and determine whether a set of related observations constitutes a reportable case and whether that intervention is warranted. A major reason for incomplete reporting is the time and effort required to complete reports, so the reporting of public health observations must be as efficient as possible. The NBS and the PAMs will provide tools to automate reporting. The NBS will also provide for electronic interfaces to the sources of data at the reporting organizations.

The NBS and the PAMs should reduce the burden on the reporting organizations by reducing the number of different types of forms and the paperwork associated with them. Ultimately the NEDSS initiative should enable the public health community to move toward a clinical condition processor that will capture potential public health events as they are communicated between clinical systems.

Table 3-1 summarized the motivation of the groups within the public health community for using the NBS and PAMs.

User Group	Motivation for use of NEDSS Base System and PAMs
State & Local Public Health Professionals	<ul style="list-style-type: none"> ➤ allows public health workers and other public health care professional to use one type of system with a consistent user interface and , an integrated database to record and manage their surveillance data. ➤ provides significantly enhanced capabilities to support the user in collecting and organizing the many types of observation reports used in an investigation (here referred to more generally as a ‘work-up’) ➤ provides the capability to receive observations as electronic messages that can be reviewed and converted into observation reports semi-automatically ➤ provides support for the consistent use of the standard codes defined by several standardization bodies and provides the ability to define local codes that can be cross-mapped to these national standards (such as, for example, local ethnicity codes that vary from the OMB standards) ➤ supports a patient focus rather than an event or episode focus
State & Local Data Entry Specialists	<ul style="list-style-type: none"> ➤ provides extensive data entry help to increase both the speed of data entry as well as the completeness and accuracy of the data entered. ➤ Provides for the electronic capture of event information from many sources in many formats rather than having to rely on the manual entry all data.
State & Local Surveillance Program Directors	<ul style="list-style-type: none"> ➤ provides support for the maintenance of case definitions and work-up guidelines that can be used by public health workers as they enter and analyze data ➤ provides tools to analyze the quality of the data in the surveillance database
State & Local Epidemiologists	<ul style="list-style-type: none"> ➤ provides the ability to view and analyze all surveillance data across all program areas ➤ provides advanced support for integrating both COTS and custom analysis and reporting tools while minimizing the need for the users to know the specific details of how to use each ➤ provides a library of sharable pre-defined reports (created either by CDC or other local and state NEDSS users) based on a standard data model across all diseases and program area.
State & Local System Developers	<ul style="list-style-type: none"> ➤ provides a fast and simple mechanism for tailoring NBS modules without necessarily having to change or add program code. ➤ provides a detailed NBS Design and Programming Guide along with skeleton code to guide developers in creating new modules and integrating them with the NBS ➤ provides a standard and consistent technical infrastructure and architecture across all CDC provided applications ➤ allows for the reuse and integration of industry standard business logic objects (e.g., Enterprise Java Beans) from any source to expedite local custom development
CDC Program Area Directors	<ul style="list-style-type: none"> ➤ provides reduced development costs for program area specific functionality since the services of the NBS are made available for reuse
CDC Epidemiologists	<ul style="list-style-type: none"> ➤ allows the analysis of data across all conditions and from a patient rather than episodic basis
CDC Program Area System Developers	<ul style="list-style-type: none"> ➤ allows program area developers to focus on the functionality that is unique to their domain without having to worry about infrastructure services such as security, logging, messaging, etc.
Public Health Partners	<ul style="list-style-type: none"> ➤ provides for the sending and receiving of data in electronic format ➤ provides for the direct entry of observation data into the NBS without having to fill out and send paper-based forms

Table 3-1. NEDSS Motivation Table

4.0 BUSINESS AREA SCOPE

4.1 CDC Organizations

The CDC is the lead federal agency for protecting the health and safety of people at home and abroad, providing credible information to enhance health decisions, and promoting health through strong partnerships. CDC, located in Atlanta, Georgia, is an agency of the DHHS. Within the CDC, NEDSS stakeholders represent various program areas that have responsibility for a specific class of diseases or a specific public health function such as epidemiology or immunization.

The CDC is composed of twelve centers, institutes, and offices: National Center on Birth Defects & Developmental Disabilities; National Center for Chronic Disease prevention & Health Promotion; National Center for Environmental Health Office of Genetics & Disease Prevention; National Center for Health Statistics; National Center for HIV, STD, & TB Prevention; National Center for Infectious Diseases; National Center for Injury Prevention & Control; National Immunization Program; National Institute for Occupational Safety & Health; Epidemiology Program Office; Public Health Practice Program Office; and the Office of the Director.

Those CDC organizations that have participated the most in the definition of NEDSS are described below. Since the NEDSS architecture is not program specific, in the future more CDC organizations will be using the NEDSS approach to build information systems. The business discovery statement will be updated and supplemented to address those needs as they are identified.

4.1.1 Epidemiology Program Office

The Epidemiology Program Office (EPO) coordinates public health surveillance at CDC and provides domestic and international support through scientific communications, statistical and epidemiologic consultation, and training. The EPO provides public health partners with information systems that support this mission. These include the National Electronic Telecommunications System for Surveillance (NETSS), through which state public health departments provide surveillance data to EPO. The EPO collects this information, makes it available to the other programs at CDC, and publishes the results of surveillance in the *Morbidity and Mortality Weekly Report* (MMWR). The EPO will rely on NEDSS as a successor to NETSS for the provision of surveillance information.

4.1.2 National Center for HIV, STD, & TB Prevention

The National Center for HIV, STD, and TB Prevention (NCHSTP) is responsible for public health surveillance, prevention research, and programs to prevent and control human immunodeficiency virus (HIV) infection and acquired immunodeficiency syndrome (AIDS), other sexually transmitted diseases (STDs), and tuberculosis (TB). Center staff work in collaboration with governmental and nongovernmental partners at

community, State, national, and international levels, applying well-integrated multidisciplinary programs of research, surveillance, technical assistance, and evaluation.

The NCHSTP receives NETSS surveillance data from EPO and also fields several major surveillance systems used by state and local partners. These systems are candidates for replacement by NEDSS PAMs:

- Sexually Transmitted Diseases Management Information System (STD*MIS) – software for STD surveillance and case management
- Tuberculosis Information Management System (TIMS) – software for TB surveillance and case management
- HIV AIDS Reporting System (HARS) – software for entry and editing of HIV AIDS data and generation of reports by state and local health departments

4.1.3 National Center for Infectious Diseases (NCID)

The mission of the National Center for Infectious Diseases (NCID) is to prevent illness, disability, and death caused by infectious diseases in the United States and around the world. To accomplish this goal, NCID staff work in partnership with local and state public health officials, other federal agencies, medical and public health professional associations, infectious disease experts from academic and clinical practice, and international and public service organizations. They conduct surveillance, epidemic investigations, epidemiologic and laboratory research, training, and public education programs to develop, evaluate, and promote prevention and control strategies for infectious diseases.

Like the NCHSTP, the NCID receives NETSS surveillance data from EPO, and also fields additional surveillance systems, both active and passive, targeted toward particular diseases or conditions. Some of these systems are paper-based (data is collected on forms and mailed to CDC) while others are automated information systems. A chief goal of NETSS for the NCID is to replace this collection of existing systems with the NEDSS base system and an integrated set of PAMS addressing specific program needs.

One NCID program of special interest to NEDSS is the National Healthcare Safety Network (NHSN), an initiative of the NCID Department of Healthcare Quality Practice (DHQP). NHSN will be an early NEDSS PAM implementation, but unlike the other PAMs associated with infectious disease surveillance, the NHSN will be operated in hospitals and clinics rather than in local and state health departments. It will monitor the safety of patients with regard to nosocomial infections and healthcare worker injuries and infections.

4.1.4 National Immunization Program (NIP)

The National Immunization Program (NIP) provides leadership for the planning, coordinating, and conducting of immunization activities nationwide. The NIP's surveillance activities involve collecting Vaccine Preventable Disease (VPD) information and using this information to monitor and support VPD eradication. Diseases tracked by

the NIP include both childhood and adult VPDs. The NIP receives NETSS surveillance data from the EPO, but collects data from other sources such as vaccine registries and informal consultation with its partners. The NIP also provides consultation services to state and local partners.

The NIP will gather disease-specific information through NEDSS as it currently does through NETSS, with special attention to vaccination data collected. In some instances the diseases of interest to NIP overlap those of interest to another program, for example, the Hepatitis and Meningitis/Bacteremia programs of the NCID.

4.1.5 Office of the Director

The Office of the Director (OD) leads the implementation of the NEDSS program. The NEDSS program is organized as a collection of overlapping working groups from the various centers, institutes, and offices. These in turn collaborate with public health partners across the country. The OD staff provides program guidance and administrative support for both the internal and external aspects of NEDSS coordination. The development of the NBS and related information system components of NEDSS is delegates to the CDC Information Resources Management Office (IRMO), a part of the OD.

4.2 Public Health Partner Organizations

Public Health Partner Organizations that are stakeholders in NEDSS are located across the country. These organizations include many jurisdictions and associations such as the Council of State and Territorial Epidemiologists among others. These organizations are the users of the information systems provided by CDC; many also have a substantial investment in their own locally developed public health systems:

- State Public Health Jurisdictions
- Local Public Health
 - Regional Public Health Agencies
 - County Public Health Agencies
 - City Public Health Agencies
- Laboratories
 - National laboratories
 - State public health laboratories
 - CDC laboratories
- Clinical Providers (Hospitals, Clinics, Doctors, etc.)
 - Public
 - Private

There are many organizational and program models used in the various states and localities for public health agencies and it is not possible to briefly summarize them all. The important lesson is that the NBS and the PAMs must be capable of being widely accessed and configured to meet particular local and programmatic needs.

5.0 BUSINESS PROCESS, CONTENT, AND PRESENTATION SCOPE

This section identifies the scope of the NBS and the currently identified PAMs in terms of business process, content, and presentation. Business process refers to the activities carried out by system users to meet business requirements. Content refers to the information handled by the system. Presentation refers to the ways in which the system allows users to view, add, modify, and otherwise act upon the content.

5.1 Process Scope

The high-level business requirements will be met through a series of releases of the NBS and designated PAMs. The first releases will address processes supporting person surveillance. These processes will enable collecting information about patient clinical visits and laboratory tests and investigating the public health cases that these data may reveal. Early releases will also support the notification process, so that an authorized user can send a health related event report to any registered user authorized to receive it (including the CDC for nationally notifiable diseases).

The initial releases will support a limited messaging capability in support of requests for information and exchange of information by public health professionals. The NBS will take advantage of maturing industry capabilities to provide more extensive and sophisticated information exchange capabilities in the future. Other capabilities that will be built up over a series of releases include those for analysis, visualization, and reporting. The capabilities to be deployed will include tabular and graphical reporting, statistical analysis, and geographical information analysis and display.

Later releases of the NBS and PAMS will address public health processes such as person intervention (the monitoring and treatment of exposed and infected persons), population surveillance (collecting of information about populations), and population intervention (management and control of disease prevention activities targeted to protect the general populace a demographic group).

Specific business requirements within the processes described above will be identified and analyzed for each release of the NBS or a PAM. The business requirements will be diagrammed as business process flows and published in a requirements summary document issued for the release. These process flows will identify processes for which use cases will be described to capture lower level workflow and business rules.

The business requirements for the first release of the NBS and the PAMs for notifiable diseases are presented in the *NBS Business Requirements Summary*, the *NBS Business Requirements Summary for the NIP*, the *NBS Business Requirements Summary for BMIRD*, and the *NBS Business Requirements Summary for Hepatitis*. Detailed requirements are maintained in supporting tables in the NBS/PAM Rational Requisite Pro library.

The CDC is currently defining a Public Health Conceptual Process Model (PHCPM). When it is available, the NEDSS business requirements will be defined in terms of it.

5.2 Content scope

The content of the information managed by managed by the NBS and PAMs is a function of the supported program areas and disease conditions. The intention of the NEDSS program is for the NBS and the PAMs accompanying it to be comprehensive, that is, not limited to infectious disease surveillance. However, this goal will be approached incrementally. Currently scope has been defined only for those diseases conditions associated with the notifiable conditions and related program areas managed by NCID, NCHSTP, and the NIP. The content is discussed below in terms of disease area and applicability the NBS and to identified PAMs.

NBS

Nationally Notifiable Diseases (NND): The NBS will replace the data capture currently performed through NETSS for nationally notifiable diseases. The information to be collected through the NBS will cover all conditions reported through the NETSS core record. For some diseases additional disease-specific information must be captured (the NETSS extended records). In situations for which this information goes beyond what can be accommodated in the NBS, a PAM will be developed (see below). There is also disease-specific information collected through other surveillance systems (paper forms) used by program areas at CDC and not currently captured through NETSS. A goal of the NBS is to replace paper-based systems, so these data collection activities will ultimately be folded into the NBS or PAMs as well.

Other Notifiable Diseases: States and local health departments require notification on conditions of public health importance in addition to those collected for the NND. The NBS will provide the capability to collect this information through extensions of data capture screens and tables. The necessary extensions will be identified on a state-by-state basis during NBS deployment. The NBS will then be configured for each state to collect the required information.

PAMs

Hepatitis: A hepatitis PAM will replace the current surveillance functionality provided by the NETSS hepatitis extended record.

Bacterial Meningitis and Invasive Respiratory Diseases (BMIRD): A BMIRD PAM will address the surveillance of six bacterial pathogens that cause Meningitis, Bacteremia, and Pneumonia. This information is currently collected NETSS extended records, the Active Bacterial Core Surveillance (ABCS) Emerging Infections Program (EIP) Network, and the National Bacterial Meningitis and Bacteremia Reporting System (NBMRS).

National Immunization Program (NIP): A NIP PAM will address disease specific surveillance information required for vaccine-preventable diseases, most of which is currently collected through NETSS extended records. In addition, the capability to interface with state-maintained information specific to NIP needs, such as vaccine registry information, may ultimately be incorporated into the PAM (scope to be determined).

Lyme Disease / Tickborne Diseases: A PAM for Lyme Disease and other tickborne diseases may be required to provide disease-specific surveillance information currently provide through the NETSS extended record and paper-based systems. The scope is to be determined.

National Healthcare Safety Network (NHSN): The NHSN will be NEDSS PAM that will cover patient safety monitoring and healthcare worker safety monitoring. These are activities performed by hospitals and clinics participating in CDC Health Quality Practice programs. Information content includes nosocomial infections (infections acquired in a healthcare setting), kidney dialysis adverse events, and healthcare worker safety adverse events. The NHSN PAM will replace the surveillance functions currently performed by the National Nosocomial Infections Surveillance System (NNIS), the National Surveillance System for Hospital Healthcare Workers (NASH), and the Dialysis Surveillance Network (DSN).

Sexually Transmitted Diseases (STD): An STD PAM will replace the current STD*MIS, currently STD*MIS is used to collect STD disease-specific surveillance data which is appended as an extended record to the NETSS core record. The STD PAM will collect this data and will replace this surveillance mechanism. In addition, it will address functional areas beyond surveillance now handled by STD*MIS. These are disease investigation, staff management and evaluation, and potentially clinic visit management. These map to the functional areas of Person Intervention and Surveillance and Intervention Program Management.

Tuberculosis: A Tuberculosis PAM will replace the current TMIS. The content scope is the tuberculosis-specific information currently collected by TMIS and reported to CDC as a NETSS extended record. Additional PAM scope is to be specified.

HIV: An HIV PAM will replace the current HARS. Currently HARS is used to collect all basic and disease-specific HIV/AIDS surveillance data (NETSS is not used for this purpose). The PAM scope is to be specified.

There are many other potential applications of the NEDSS architecture. Some may involve the creation of additional PAMs that will work with the NEDSS Base System. Among the types of public health surveillance systems for which use of the NEDSS architecture has been proposed are

- ❑ Surveillance of chronic disease conditions
- ❑ Tracking exposure to environmental toxins and hazardous substances
- ❑ Vital statistics (birth and death) registration

- ❑ Maternal / child care health monitoring
- ❑ Electronic laboratory reporting for newborn blood screening

5.3 Presentation Scope

The user interface for the NBS will address the presentation need of users in the following roles:

State

- Registry Manager
- Epidemiologist
- Program Coordinator
- Case Worker
- Clerical Worker

Local

- Health Officer
- Disease Supervisor
- Case Worker
- Clerical Worker

Other

- Remote Laboratory Technician
- Public Health Laboratory Worker

A user will be assigned to one or more roles. The NBS will control visibility of data in the system on the basis of the user's roles. Furthermore the NBS will use the roles to determine the functions that the user is allowed to take upon the data.

Roles will be configurable by the organization using the base system. The NBS will provide a default set of roles and user profiles that define them, but the roles and profiles can be modified to conform to the needs of the organization. Profiles can also be tailored to the unique needs of a given user, who may in some cases need to be given access to specific information or functionality beyond that normally conveyed by the role.

6.0 ENABLING TECHNOLOGIES

Enabling technologies are emerging or established industry capabilities, commercial products, or design and implementation approaches that form the technical context within which the NBS and PAMs will be developed and operated. Table 6-1 identifies the high level requirements associated with the enabling technologies for each element of the NEDSS technical architecture. Detailed requirements are maintained in supporting tables in the NBS/PAM Rational Requisite Pro library.

Architecture Element	High Level Requirement
Web browser based data entry and data management	<p>The NBS shall provide secure, web browser based data entry and management capacity for:</p> <ul style="list-style-type: none"> • use inside of health departments • use between local health departments and state health departments, • reporting from and to other sources (e.g., infection control practitioners, small laboratories) • case management
Electronic Health Level 7 (HL7) message processing	<p>The NBS shall provide messaging functionality that will accept, import, route to other recipients, and process incoming electronic messages in HL7 format that use the LOINC and SNOMED coding standards.</p>
Integrated Data Repository (IDR)	<p>The NBS shall utilize a data repository that will</p> <ul style="list-style-type: none"> • integrate data from multiple state-based and CDC categorical programs • be patient centered where appropriate • implement the Public Health Conceptual Data Model / HL7 Reference Information Model structure as appropriate • associate incoming data with appropriate existing data • support data accumulated through various means (e.g., web based systems, electronic messages) • implement standards permitting interaction with commercial products.
Data translation & exchange (Integration Broker)	<p>The NBS shall provide integration broker functionality to support data translation, data import and export, queuing and messaging for the dynamic bi-directional interchange of data using Extensible Markup Language (XML).</p>
Application programming practices (Transportable business logic)	<p>The NBS shall be developed using contemporary application programming practices that are component based, object oriented and cross platform where possible.</p>
Analysis,	<p>The NBS shall enable users to employ commercial off the shelf</p>

Visualization, and Reporting (AVR)	software (COTS) solutions to provide selective data reporting according to user need-to-know, statistical analysis, Geographic Information Systems (GIS) use and other visualization, display and mapping functions. The interface to these tools will rely on industry standards for access to the data repository.
Shareable directory for authorization (Public Health Directory, PHDIR)	The NBS shall be able to access and use a standards based information directory that will provide select information about pertinent public health personnel (state and local). 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.
Security System	<p>The NBS shall provide a security system that will</p> <ul style="list-style-type: none"> • Protect the confidentiality of patient information and other sensitive or critical data during processing and storage • Provide for secure transmission (Internet exchange) of information

Table 6-1. Technical Requirements Associated with the Elements of the NEDSS Architecture

The NBS will operate on NEDSS-compliant platforms, which are combinations of the following categories and products:

<u>Operating System</u>	<u>Data Base</u>	<u>Web Server</u>	<u>Application Server</u>
Windows NT/2000	MS SQL/Server	MS/IIS	SilverStream
Unix	Oracle RDBMS	iPlanet	BEA
Linux	Sybase	Apache	IBM
			MS

The initial release of the NBS will be compatible with a subset of this environment. The relevant technical standards and conventions applicable to each architecture element for the NBS Release 1 are:

Web browser:

- HTML 3.0 or higher
- Netscape 4.0 or higher
- MS Internet Explorer (IE) 4.0 or higher
- Java
- JavaScript
- Web server:
 - MS IIS 4.0 or higher
 - Netscape Enterprise Server 3.0 or higher (at version 4.0 this became iPlanet Web Server, Enterprise Edition).

Electronic message processing:

- ❑ Logical Observations International Nomenclature Classifications (LOINC)
- ❑ Systemized Nomenclature of Medicine (SNOMED)

Integrated Data Repository:

- ❑ American National Standards Institute (ANSI) Structured Query Language (SQL)
- ❑ Open Data Base Connectivity (ODBC)
- ❑ Java Data Base Connectivity (JDBC)
- ❑ Health Level 7 Reference Information Model (HL7-RIM)
- ❑ Public Health Conceptual Data Model (PHCDM)
- ❑ Data Base Management System:
 - MS SQL/Server 7.0 or higher
 - Oracle RDBMS 8.0 or higher

Data translation and exchange:

- ❑ HL7 2.X delimited format messages
- ❑ HL7 version 2.3.1 XML format messages
- ❑ Version 3 Extensible Markup Language (XML) schemas
- ❑ Clinical Document Architecture (CDA)
- ❑ Commercial integration broker selected by CDC to interface with NBS messaging subsystem for Release 1: eWebIt eLink

Application programming practices:

- ❑ Java 2 Platform, Enterprise Edition (J2EE) standards
- ❑ XML
- ❑ Extensible Stylesheet Language (XSL)
- ❑ Application Server: SilverStream
- ❑ Operating System:
 - Windows NT/2000
 - Unix
 - Linux

Analysis, Visualization, and Reporting:

- ❑ Commercial reporting tools compliant with ODBC and JDBC
- ❑ Commercial reporting tools selected by CDC to provide AVR capabilities for NBS Release 1: SAS product line

Public Health Directory:

- ❑ Lightweight Directory Access Protocol (LDAP)
- ❑ X.500 directory standard

Security System

- ❑ LDAP
- ❑ X.509 certificate standard
- ❑ Secure Data Network (SDN)
- ❑ Transport over Secure Socket Layer (SSL)

7.0 SECURITY NEEDS

Detailed security requirements are identified in the technical requirements tables maintained in Rational Requisite Pro. This section presents an overview of security needs at a state health department that provides the context for those requirements.

Public health data are subject to federal privacy regulations as required by the Health Insurance Portability and Accountability Act (HIPPA). In addition, states and localities may impose their own regulations. The responsibility for enforcing compliance rests with the state and local agencies for any information systems within their jurisdictions. States vary in their capacities to field secure web-based systems. The most fundamental variation is in the ability to provide for authentication of users accessing the system. A system that enforces strong authentication utilizes methods that guarantee the identity of the person, such as PKI certificates or tokens. Weak methods of authentication rely only on means such as user ID and password.

The NBS must be able to accommodate two interface scenarios for state security systems:

- (1) The state has the capacity to enforce strong authentication over the web. In this case the NBS must be able to receive the authentication information provided by the state security system for the user and must enable state-authenticated users to go directly to NBS features without requiring additional log-on steps. Provision of the strong authentication method (e.g., the issuance of certificates) is the responsibility of the state.
- (2) The state lacks the capacity to enforce strong authentication over the web. In this case the NBS will be deployed along with the state web systems on a state intranet. Provision of physical security to ensure that only proper users access the system is the responsibility of the state. The NBS will provide weak authentication mechanisms within the intranet environment.

In both cases the NBS will provide a security system that defines and enforces user roles. These roles will define the activities the user can perform and the type of information the user can access. The security system must allow states to configure these roles to conform to their organizations and to assign particular users to roles. The details are recorded in the security requirements.

Security is also essential to the messaging subsystem, which must be able to handle encryption and decryption on three distinct levels. First, the message itself will be encrypted at the transport level (HTTPS). Second, the state or locality at which the NBS is installed must be able to use certificate-based encryption for the message content. Third, specific programs or jurisdictions may choose to use their own keys to encrypt designated fields within the message, for use only by those programs or jurisdictions. In the initial release of NBS field-level encryption will not be provided within the ODS, but this feature is a candidate for provision in a future release.

8.0 PRINCIPLES, CONSTRAINTS, AND ASSUMPTIONS

This section summarizes the key principles, constraints, and assumptions that affect the development of the NBS and PAMs. Principles are rules that guide decision-making. Constraints are restrictions stemming from factors beyond the control of the program. Assumptions are conditions expected to be true, which if shown to be false would have a major impact on program success.

Principles

- The NBS/PAMs must integrate with the state-provided web environment, security environment, and data base environment, in each state that adopts the system.
- The NBS/PAMs must provide and promote common standards for information sharing pertinent across program areas and jurisdictions
- Users must be able to access the NBS/PAMs from the state web pages as both a user application and as a data entry service that is invoked when the user is entering data (e.g., an NBS person data entry form can be invoked from a another application when the user needs to enter information).
- COTS products should be used within a given element of the technical architecture, and preferentially should not cross the boundaries between architectural elements

Constraints

- The CDC-provided PAMs must build upon the technology and standards established for the NBS.
- Resources for training at the state and local health department levels will be limited and could be an impediment to the adoption of the NBS/PAMs, and must be anticipated for NEDSS through the provision of adequate help facilities, support documentation, and training provided by CDC.
- Electronic messaging capabilities for NBS/PAMs will be provided through interface to the CDC-provided NEDSS Messaging System

Assumptions:

- States adopting NEDSS and interfacing with the NBS/PAMs will build their system elements according to the technical architecture specified by the NEDSS program.
- States receiving the NBS/PAMs will provide the technical infrastructure of firewalls, web servers, and data base servers.
- States will handle the registering of NBS/PAM users and will provide and enforce user authentication.
- States will extend the NBS/PAM data collection and reporting capabilities to meet their disease-specific local surveillance needs, in consultation with CDC.
- States will be responsible for converting legacy data to NBS/PAM format, in consultation with CDC.