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Service



Veterinary
Services

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Information Technology Roadmap

A New Direction: Paving the Way for the Future

An Information Collaboration Initiative

Executive Overview

Executive Summary

The dynamic nature of information is more strategic than ever. Recent events have highlighted the importance of information in the 21st century for protecting American lives, property and carrying out the fundamental purpose of Government. The United States Department of Agriculture (USDA) Veterinary Services (VS) is committed to ensuring that information relevant to animal disease management and surveillance is gathered, protected, and shared appropriately. The expectation that information technology (IT) benefits VS and its customers continues to grow. VS' IT has historically developed business software solutions that aided in the management of animal disease events within the United States and has played a critical role in supporting the mission of the Animal and Plant Health Inspection Service (APHIS).

VS protects and improves the health, quality, and marketability of our nation's animals, animal products, and veterinary biologics by preventing, controlling, and/or eliminating animal diseases, and by monitoring and promoting animal health and productivity. VS strives to serve animal producers as well as the consumers of animal products and citizens concerned about public health and environmental safety. Achieving program goals cannot take place in a vacuum. Success requires cooperation with others. To enhance cooperation, VS fosters continuous communication among foreign and U.S. animal health professionals, Governments, and industry organizations.

VS is responsible for detecting and responding to outbreaks of animal diseases that occur within the United States. As a result, VS must manage large amounts of data related to such outbreaks. Because animal disease outbreaks are many and varied, VS requires a system that is available nationwide and that provides flexibility to support numerous data requirements. VS' internal and external stakeholders/partners can support these requirements by contributing and automating the collection, management, and analysis of data from animal disease surveillance, management, investigations, and disease outbreak incidents.

VS' infrastructure is nationally distributed with VS headquarters facilities located in the Washington, D.C., metropolitan area. The headquarters office develops the agency's program and regulatory policy.

VS carries out animal health programs with a field force of approximately 250 veterinarians and 360 animal health technicians working under the direction of area offices (typically located in State capitals). APHIS and the National Veterinary Services Laboratories in Ames, Iowa, and Plum Island, New York, provide laboratory support for these programs. Numerous State and university laboratories also participate in the National Animal Health Laboratory Network (NAHLN). State animal health authorities are responsible for animal disease issues at the State level, delivery of the Federal programs, the administration of interstate certificates of veterinary inspection, and overseeing State-specific disease control activities and regulations.

VS regulates veterinary biologics (vaccines, bacterins, antisera, diagnostic kits, and other products of biological origin) to ensure that the veterinary biologics available for the diagnosis, prevention, and

treatment of animal diseases are pure, safe, potent, and effective. This work is done by the APHIS Center for Veterinary Biologics (CVB) and is centered on enforcement of the Virus Serum Toxin Act.

The National Centers for Animal Health Emergency Management and Animal Health Programs located at Riverdale, Maryland, provide program guidance, budget planning, and animal disease expertise to the extended APHIS VS structure. VS area offices are located strategically within the States to serve APHIS VS stakeholders, while some area offices serve multiple States. These field locations implement APHIS VS disease surveillance, export certification, disease eradication, and disease control activities. Regional offices located in Raleigh, North Carolina, and Fort Collins, Colorado, provide oversight of these area field offices.

The Centers for Epidemiology and Animal Health (CEAH) in Fort Collins, Colorado, sets standards for the national surveillance program and administers the National Animal Health Monitoring System. CEAH conducts epidemiological, economic, and spatial analysis and trade risk assessments. They do the statistical and analytical work to model disease vectors and identify emerging trends.

VS is challenged with the monitoring of animal movements and surveillance of livestock diseases, which have become increasingly difficult to implement with the changing global economy and the demands of international trade agreements. At present, information on animal and animal products tracking is collected in different formats from numerous data sources. Since this information is diverse in format, location, and accuracy, VS is developing a system that will enhance the ability to analyze and track animal and animal product import/export tracking and domestic movements. This initiative is intended to create a platform that will make data readily accessible to CEAH for advanced analysis, enabling VS to make informed program decisions to improve the safeguarding of U.S. livestock from the occurrence of accidental or intentional adverse animal health events.

The key challenges for VS are:

- ❖ Prepare to respond to a wider range of emergencies
- ❖ Effectively and efficiently manage program information
- ❖ Maintain a safeguard of the national animal health system
- ❖ Increase collaboration
- ❖ Be more transparent to partners and stakeholders
- ❖ Set priorities on the use of available resources

Executive Mission

The primary mission of VS is to safeguard animal health in the United States. In this respect, the National Animal Health Surveillance System and national disease program data systems were created to better protect U.S. animal populations from endemic, emerging, and foreign animal diseases, primarily, through improved access of information that is made available to the Veterinary Services Management Team (VSMT). Data standards are the foundation of building a solid surveillance and disease management system that will facilitate VSMT and State decision making as well as day-to-day program management. An urgent need exists to develop a system that adheres to clearly defined data standards within VS that will ultimately become a management tool for effective decision making for the national animal health surveillance system. Data standards also include *informatics*, which is the study of the application of computer and statistical techniques to the management of information and methods to facilitate faster database searches. Data standards will provide guidelines for the construction and operation of the VS animal health surveillance/management system; guidelines for epidemiologists and database developers on the type and format of data gathered; and provide proper data entry and structuring of data systems to integrate with existing and future databases.

The VS Office of the Chief Information officer (CIO) is responsible for developing, deploying, and supporting automated information systems that support the data management requirements of VS' national animal health program activities. VS currently maintains the following independent IT systems:

- ❖ Animal Health and Surveillance Management (AHSM) System, which will ultimately replace the Generic Database (GDB)
- ❖ Veterinary Services Process Streamlining (VSPS) System
- ❖ National Animal Identification System (NAIS)
- ❖ National Animal Health Laboratory Network (NAHLN)
- ❖ Emergency Management Response System (EMRS)
- ❖ National Veterinary Logistics system (NVLS)
- ❖ Licensing, Serial Release, and Testing Information System (LSRTIS)
- ❖ Laboratory Information Management System (LIMS)

The mission of VS IT includes identifying, gathering, protecting, and sharing specific information that is currently stored in multiple databases at different locations. The main task is to develop a VS data repository that contains animal event records loaded from other VS data sources including but not limited to State partner databases, industry partner databases, foreign government databases, other Federal agency databases, NVLS, LSRTIS, Laboratory Information Management System (LIMS), NAIS, AHSM, EMRS, NAHLN, and VSPS. This would mean the development of a repository that will eventually contain hundreds of millions of records, and must be capable of delivering information quickly. The proposed database will replicate data from multiple diverse systems into a single, consistent repository that is preconfigured to deliver requests. Because of the diversity of data sources,

the primary driver for this design will be the target data design, and the extract, transform, and load (ETL) jobs for delivery of data that are consistent with that design.

The VS mission priorities are threefold:

- ❖ Strengthen the safeguarding system domestically and in other countries:
 - Improve domestic animal disease surveillance and management systems
 - Expand partnerships
 - Set and follow priorities for international technical and regulatory capacity building projects to enhance protection of U.S. resources
 - Update regulations and regulatory framework to address advances and risks associated with biotechnology
- ❖ Strengthen emergency response preparedness:
 - Increasing involvement in all-hazards emergencies
 - Strengthening network of responders
 - Improving internal coordination
 - Improving capability to trace origins of animal disease outbreaks quickly
- ❖ Manage existing programs effectively and efficiently:
 - Develop and implement consistent and shared administrative processes and information management systems
 - Collaborate and communicate more effectively internally and externally

This document is intended as a roadmap for future efforts at integrating national animal events records. The roadmap is written for VS' internal and external stakeholders, and partners who would be participating in the data integration and collaboration for a common VS' data repository. This document describes:

- ❖ Objectives for the development of centralized repository in VS' IT system for database sharing among VS' stakeholders and partners
- ❖ Efforts for the design and status of data system integration
- ❖ Development of a standardized data entry system and data exchange protocols that will reduce vulnerability to a variety of threats, both internal and external
- ❖ A roadmap for collecting and using data elements that will support the VS' objectives for data system integration
- ❖ Recommended "next steps" for data system integration

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Section

1 Introduction**1.1** Introduction

This information technology (IT) roadmap document describes the current state of disease surveillance management IT systems within the United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Veterinary Services (VS) and presents a future path toward a national disease and surveillance management data repository that will facilitate database sharing and collaboration between VS and its stakeholders and partners.

The intended audience for the IT roadmap includes executives, program managers, field personnel, IT personnel, internal and external stakeholders, and industry partners.

1.1.1 Veterinary Services IT Goal

This document is intended to provide (1) an understanding of VS' current disease and surveillance management IT system architecture; (2) the rationale for data integration from multiple sources into a single relational database; and (3) a single enterprise solution for Veterinary Services import, export, and veterinary accreditation functions.

The document also contains strategic initiatives for building or acquiring new IT systems and the technical references necessary for data delivery to VS, as well as provides IT solutions that support the animal disease surveillance and management program.

1.1.2 IT Roadmap Purpose

The Veterinary Services IT Roadmap provides:

- ❖ Tools to determine the current technical state of the VS IT system
- ❖ A technical framework for developing future system architectures and data standards that enhance collaboration, sharing, and research
- ❖ Guidelines on how organizations and information technology resources can communicate mission-critical electronic data or information to and from VS information systems
- ❖ Technological alternatives that support moving information and technical systems from their current state to a desired future state

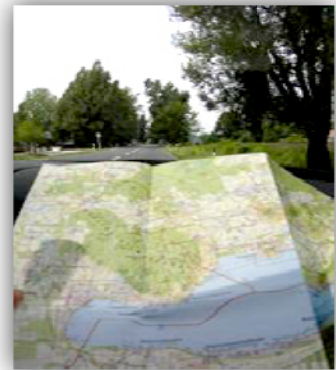
This document is intended to support future IT data integration initiatives including the establishment of a unified database. Under this unified database, the systems applications address many initiatives in which the value and need for integrated data have been previously identified. In addition, the database will establish standardized data entry systems to enhance animal disease surveillance and management programs.

1.2 IT Roadmap

This section introduces the roadmap and discusses the purpose and objectives of the roadmap, the technical details of the system (both current and future), and the data design. It also provides a summary of the approach.

1.2.1 Veterinary Services Information Technology Roadmap Purpose

The VS IT Roadmap provides executives, industry partners, State-cooperators, field personnel, and IT personnel with the ability to ascertain quickly the current technical posture of the VS IT status and plans. Additionally, the roadmap will provide a technical framework for a future architecture, and define processes and methods that describe how organizations and information technology resources can collaborate to deliver mission-critical electronic data or information to enable VS to deliver their mission-critical functions. Finally, this roadmap describes technology alternatives in moving information and technical systems from a current state to the planned future state.



This report provides a single document that can be used by partners and stakeholders to understand more clearly the current architecture of VS IT systems, the planned strategy for building or acquiring new IT systems, and the technical references necessary for data delivery to VS.

With the divergent animal health management needs across the United States this report outlines VS' vision for its partners and stakeholders to contribute data directly into the VS data repositories. Once captured, data and targeted information are shared within the VS community, which includes APHIS personnel, accredited veterinarians, State animal health officials, other Federal agencies importers, exporters, brokers, and agents. Each member of the VS community will be able to utilize and analyze data for their particular needs in a protected, secure environment.

The VS' IT Roadmap vision includes:

- ❖ Developing an IT system capable of sharing or linking databases within and across agencies while ensuring that networks and systems are secure and available
- ❖ Connecting additional data or data sources with respect to animal health issues to a centralized repository
- ❖ Providing a one-stop source of information for individuals and businesses participating in the international movement of animals and animal products
- ❖ Enhancing or replacing manual forms with electronic means for capturing and storing data into VS data repositories
- ❖ Minimizing duplication and formation of data silos and developing a comprehensive integrated enterprise architecture
- ❖ Supporting the automation and better management of the various core processes
- ❖ Facilitating rapid response to meet the demands of changing business and mission needs

- ❖ Promoting easy and effective recapitalization of IT components to leverage the latest commercial technology capabilities and reuse standard Government and industry solutions and services

The development of this report takes into consideration the use of technology to serve the needs of the many VS partners and stakeholders. Using a common enterprise architecture framework, IT portfolios can be managed better and leveraged across various agencies. Voluminous amounts of data are currently stored on different servers using different interfaces. This report presents a framework that will facilitate cross-agency analysis, identification of duplicative information and gaps, as well as highlight opportunities for collaboration within and across agencies.

1.2.2 Information Technology Technical Description

The systems introduced in section 1.1.2 are related as shown in Figure 1-1 the current VS systems architecture.

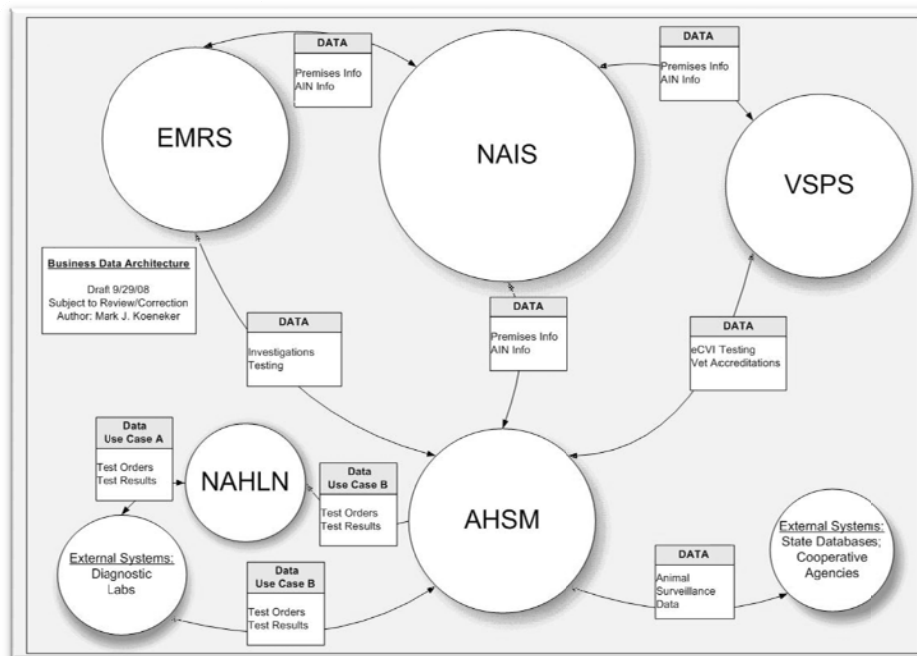


Figure 1-1. Database Interaction

Business dependencies among systems lead to the effective cycle of new technology and business innovations created by new methods of business process flow (Figure 1-2).

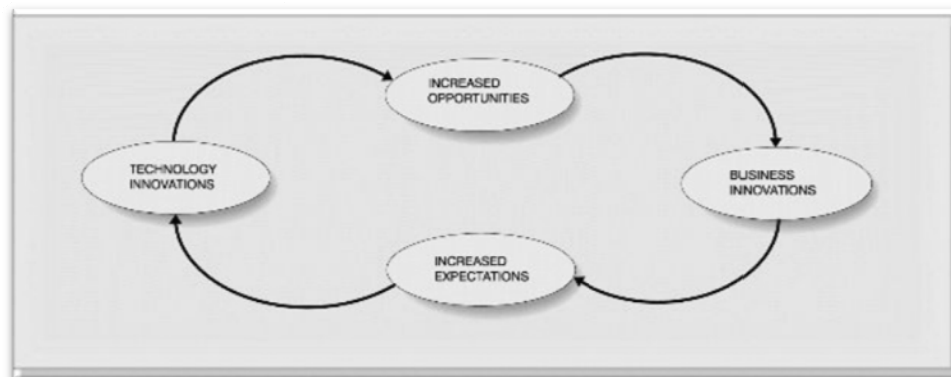


Figure 1-2. Virtuous Cycle

By applying the concepts of the virtuous cycle to the current architecture and taking into account the VS executive objectives, we have derived the driving concepts for our strategic plan (shown in Table 1-1).

Table 1-1. Veterinary Services IT Strategic Plan

Purpose	Development of a centralized repository in VS’ IT system for database sharing among VS’ stakeholders and partners Development of a standardized data entry system and data exchange protocols
VS’ IT Governance Plan	Reduction of vulnerability to a variety of threats, both internal and external Preparation for changing technology and business practices Provision of adequate security and continuity assurance
Planning Cycle	Periodic change capture jobs to keep the repository complete, current, and free of duplication
Impact	Provides continuous input to IT operating plans, governance, and portfolio management

1.2.3 Data Requirements Driving the Design

Data in the individual State databases vary due to nonstandardized data requirements. Often, State-level data cannot be effectively aggregated and analyzed nationally due to local (State-level) variations in data standards, data entry, and quality control. This lack of standardized national data hinders presentation of information required for trade negotiations and protection of animal and human health. VS’ proposal for the collaboration in sharing/storing data in a centralized repository within the VS IT systems requires more stringent standards.

A standardized VS data repository Animal Health Event Repository (AHER) is being designed to have animal event records loaded from all VS data sources including AHSM, EMRS, NAHLN, and VSPS. This system requires a repository that will eventually contain hundreds of millions of records and must be capable of quickly delivering a small subset of the data to the partners. The centralized data repository will provide animal/event/credential information to VS’ stakeholders and partners. This collaboration of data into the VS repository will constitute an operational data store. This data store will have replicated data from multiple diverse systems in a single consistent repository that is preconfigured to deliver the stakeholders’ and partners’ requests. Two data objectives are to enhance the communication methods currently in place by standardizing the flow of information regarding animal surveillance programs and define terminology standards for all IT databases systems and other related VS animal health databases including the VS laboratory network.

Once all the data from VS’ participating internal and external stakeholders have been copied into the AHER, periodic automated searches of the databases will be done to capture changes, thereby keeping the repository complete and current. The focus of this collective effort will be to populate the AHER exclusively. Figure 1-3 summarizes the VS IT Roadmap.

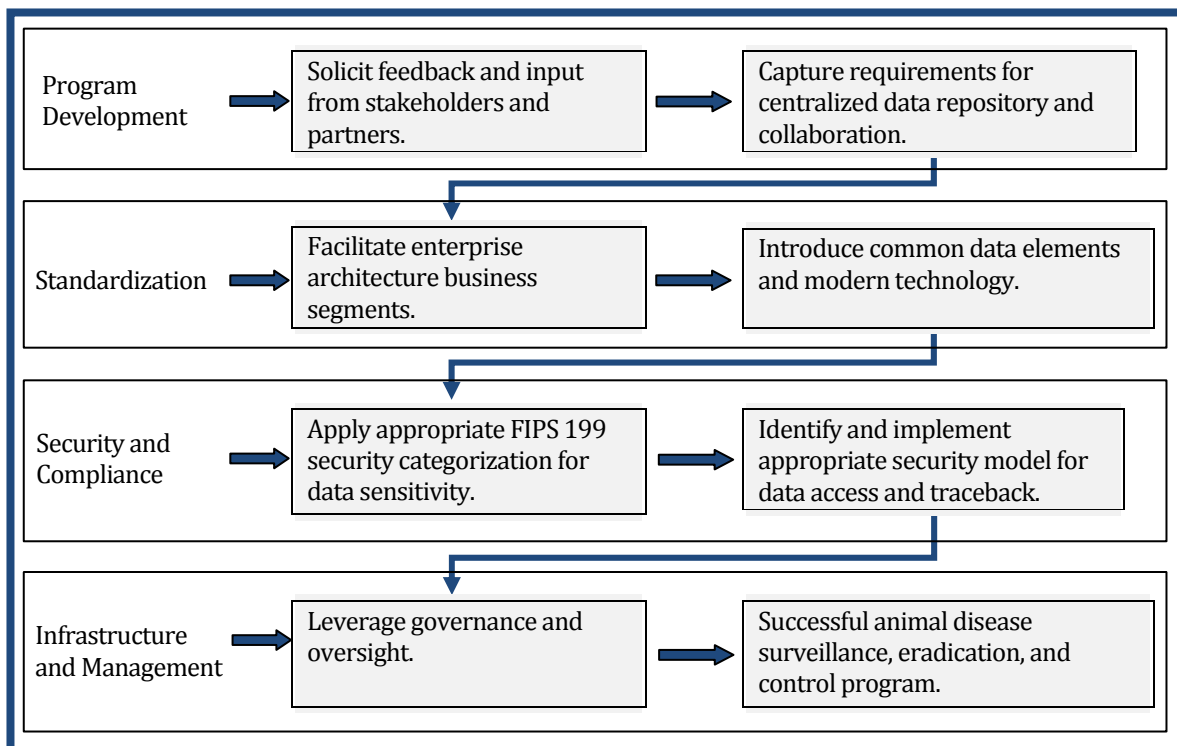


Figure 1-3. Veterinary Services Information Technology Roadmap

Section

2

Stakeholder, Field, and Program Overview

2.1

Stakeholder Overview

2.1.1 Stakeholder Summary

The VS' stakeholders include both accredited veterinarians and animal health officials (external stakeholders and State partners).

Accredited veterinarians perform regulatory functions on behalf of the VS in a manner that is consistent with international trade requirements and safeguarding animal health. In addition to working to ensure that exported animals do not introduce disease into other countries, accredited veterinarians also provide the first line of surveillance for reportable domestic and foreign animal diseases. These duties help provide safeguarding to prevent U.S. animal agriculture from becoming a bioterrorism target. When large-scale animal disease or other emergency events occur, accredited veterinarians often assist with APHIS' containment and eradication efforts.

Animal health officials perform epidemiological investigations, develop plans to eradicate disease in infected herds, and monitor and test animals. Animal health investigators conduct disease traceouts with systems already in place, such as records related to program diseases, on-farm recordkeeping, required interstate movement certificates, and breed registries.

2.1.2 External Stakeholders

Designated State veterinarians and diagnostic laboratory directors from Alabama, California, Colorado State University, Florida, Georgia, Iowa, Maine, Michigan, Minnesota, Mississippi, Montana, New Mexico, New York, North Carolina, North Dakota, Ohio, Pennsylvania, Texas, Washington, and Wisconsin were selected to participate in an information collaboration initiative survey.

Each State division of animal industry is responsible for enforcing animal health regulations and protecting their State from animal pests and diseases, which could have major economic and public health consequences. The State division combines a Bureau of Diagnostic Laboratories and Bureau of Animal Disease Control, carrying out active animal disease prevention, surveillance, and control programs. District veterinarians and animal health inspectors throughout the State work with producers, animal owners, and private veterinarians in monitoring and enhancing the health and welfare of animals.

The State animal health officials are responsible for administering programs to prevent, eradicate, and control diseases of livestock and poultry, as well as assuring that all meat and meat food products offered for sale to consumers are not adulterated, are wholesome, and are properly marked, labeled, and packaged.

2.1.3 Stakeholder Information Technology System Integration

The ability to address food safety disaster and other events that may affect the health of animals or the public regularly exceeds the scope and capacity of individual entities. By recognizing this, VS works

with an extensive array of partners to carry out its mission. VS' partnerships include State animal health agencies; animal agriculture industries; homeland security, public health, and wildlife agencies; academia; and national and international organizations. VS and its partners have defined the timing, scope, and depth of their engagement in animal and public health events including cost-sharing arrangements. In addition, VS has established protocols with its partners that establish roles and guide involvement during natural disasters and other emergencies.

During an animal disease outbreak, State animal health officials have jurisdiction in their localities. VS also has jurisdiction as localized animal health events often impact interstate or international trade. During animal disease responses, the VS' personnel co-manage incidents with State partners as well as participate, as needed, in carrying out response operations; VS makes its assets (in terms of laboratory networks, emergency response corps, national incident management teams and veterinary stockpiles) available to its partners. During disease events, VS provides national coordination with other agencies, international organizations, and trading partners.

To execute the plan of database sharing and modernization, VS will continue in collaboration with stakeholders and partners within and across agencies, to encourage the opportunity to contribute to and strengthen the VS' database repository.

The proposed system will enable all VS' animal health databases, and those maintained separately by the States and industry to share traceability-related information.

2.1.4 Stakeholder Survey Background

A 15-item quantitative survey instrument (see Appendix A.1) was developed to support the VS IT Roadmap initiative. Multi-level questions were included in the survey. Additionally, the survey provided some free text fields so that participants could elaborate on their response or address issues that might not have been captured by the questionnaire.

The survey was disseminated via e-mail to 20 senior State animal health officials (external stakeholders/State partners). Additional guidance was provided in the e-mail for those stakeholders/State partners who preferred to conduct a structured telephone interview. While several States had content-related questions or needed clarification, none requested the structured telephone interview format.

The issues covered in this survey included:

- ❖ Sensitivity of the processed information as it relates to confidentiality, integrity, and availability
- ❖ Current state of database development or use in relation to animal health activities
- ❖ Best method of integration with or contribution to VS' proposed central data repository
- ❖ The importance of a seamless integration of stakeholders' database into the VS' database architecture for data collaboration and exchange
- ❖ Impediments, if any, that may affect data integration, exchange, and collaboration
- ❖ Current database ownership and responsibility for upgrades, maintenance, and modernization

- ❖ Security initiatives that ensure security of data are addressed throughout the database System Development Life Cycle (SDLC)
- ❖ Hardware and software policies

2.1.5 Survey Findings

Twelve completed (or partially completed) surveys were returned of the 20 surveys that were disseminated for a survey-response rate of 60 percent. Assuming that respondents and nonrespondents are more similar than dissimilar, the acceptable response rate ranges anywhere between 50 and 70 percent; therefore, at 60 percent, the response rate is acceptable. While it is unclear why several respondents only partially completed a number of the survey questions, a clear pattern seems to have emerged in terms of the items that were not answered or that respondents were less than clear on. The validity of survey items 8.3, 13, 14, and 15 require further analysis (due to partial completion by several survey respondents) to determine suitability for inclusion in the final survey results. Construct validity is a very important consideration in sampling, conducting surveys, and ultimately drawing conclusions (i.e., inferences or generalizations). While reasonable inferences (or generalization) can be drawn from this survey given relative size of the sample population to the whole population, it should be noted that no specific methods of statistical analysis were employed.

The typical respondent identified the sensitivity of information process on their systems as moderate to high as it relates to confidentiality, integrity, and availability.

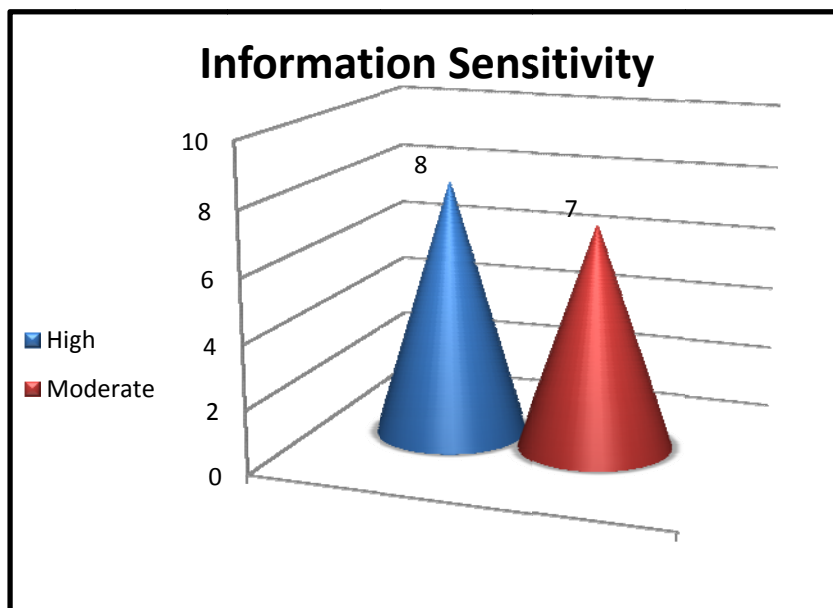


Figure 2-1. Survey Question 1, Data Sensitivity Categorization

All respondents indicated the use of several different databases and a general desire to streamline the systems. Additionally, several of the respondents indicated the need for improvements in the current system and are supportive of database improvement.

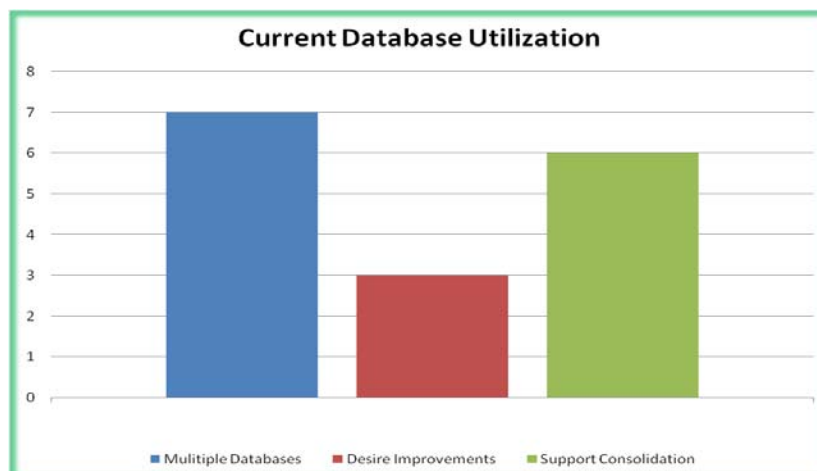


Figure 2-2. Survey Question 2, Database Utilization

The GDB emerged as the database that is widely used by the typical respondent, however these same respondents did not classify the GDB as a legacy system (or they did not know). The majority of respondents (70 percent) indicated a willingness to contribute local data to a national data repository.

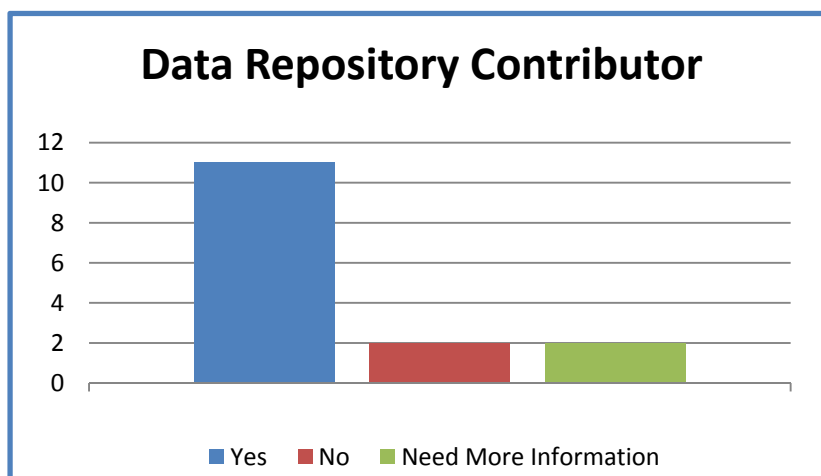


Figure 2-3. Survey Question 3.2, Data Repository Participation

The remaining respondents were either unwilling or requested additional information to collaborate on the data sharing. Respondents provided a wide range of response to the rank order of the most important features of their database systems to accomplish their daily animal health work. Mobile, Web-based, and Geographic Information System (GIS) capabilities were viewed as the most important capabilities. Software extensibility, data integration between animal health management and laboratory diagnostic information, and output of regulatory forms occupied a secondary to tertiary tier of importance. An overwhelming majority (80 percent) of respondents indicated their agency had a current database modernization initiative.

The response to whether there was a corresponding security strategy throughout the database SDLC was far more varied with several respondents indicating they did not know. All respondents indicated the importance for their database architecture to be seamlessly integrated into the VS' database

architecture for data collaboration and exchange. The majority (80 percent) of respondents did not know if any agency-specific policies or procedures were required to be implemented within the VS’ infrastructure before participating in the proposed data sharing. All participants identified a governing person, department, or agency that determines hardware and software policies in their organization.

Respondents identified all eight choices (i.e., access control, business rules in agency databases, incompatible databases, incompatible data formats, integrity of stored information, reliability of data, data management, and local laws) as the greatest hindrance to data integration, exchange, and collaboration. The majority of respondents (90 percent) indicated their agencies have database ownership responsibility for upgrades, patches, and maintenance. The number of respondents that either do or do not gather statistics and historical data for capacity planning was evenly divided. Respondents did not clearly distinguish the impact of secure information sharing, cost effectiveness, efficiency, flexible application-interfaces, or return on investment (ROI) in terms of the impact of their decision to participate in data collaboration and data exchange.

Respondents characterized the impact of each of these factors as high. While most indicated that there were no organizational and/or functional impediments that would preclude them from contributing and/or participating in the data collaboration and data exchange/collection with the VS’ IT systems. It should be noted that several respondents indicated that they did not know whether there were any impediments, which could suggest a need to reevaluate this question for clarity or validity. Finally, in terms of their readiness for implementation; the majority of respondents indicated they are ready now and waiting for the VS to begin data integration and collaboration.

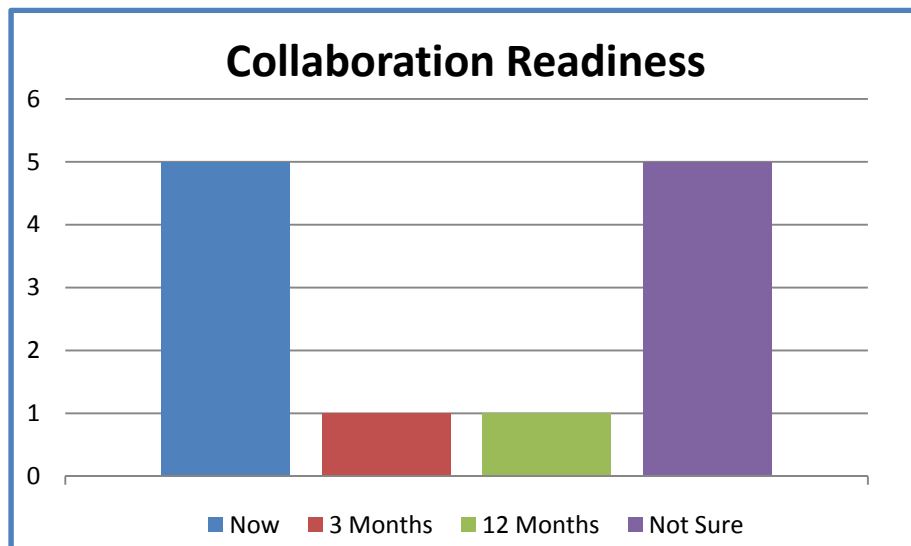


Figure 2-4. Survey Question 7, Data Collaboration Implementation

It was also immediately clear that VS’ external stakeholders and State partners are using several different databases, but desire to streamline to one standardized database architecture and associated system. Furthermore, the integrated database architecture must provide seamless integration between VS and its external stakeholders and State partners.

There is a decided willingness to collaborate and move toward a standardized enterprise database unified (or universal) system. The diagram below provides a conceptual representation of a service-oriented architecture.

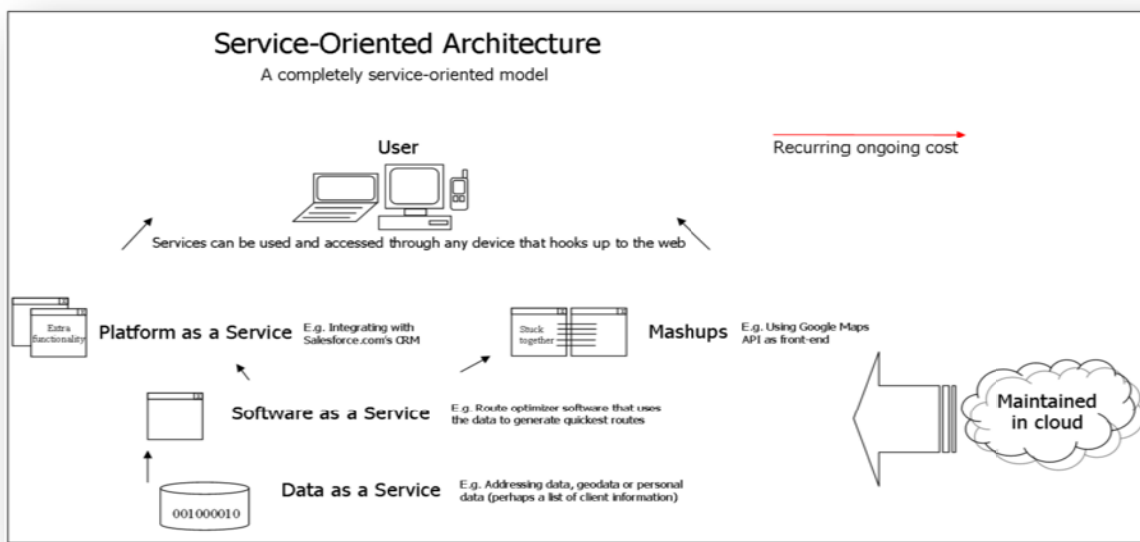


Figure 2-5. Conceptual Service-Oriented Architecture

2.1.6 Survey Conclusions

Relative to the desired outcomes stated in section 2.1.5, twenty external stakeholders/partners were surveyed to ascertain stakeholders’ interest and concerns regarding data sharing and collaboration within the VS’ IT system national data repository. The overarching goal and desired future state for the VS’ IT is the development and implementation of one national animal health and surveillance system. The survey indicated an expressed willingness for data sharing and collaboration initiative between the VS and the external stakeholders/State partners. Significant total cost of ownership benefits (i.e., operational, cost, data integrity, economies of scale) would likely be attained by the current state to a desired future state inclusive of a unified (or universal) database and standardize data schemas (network, application, programming). A detailed cost-benefit (economic) analysis should occur early in the planning process. The goal of such an analysis would be to provide support to decision makers in terms of alternative courses of action.

2.2 Field Overview

2.2.1 Field Summary

The mission of the VS Office of the Chief Information Officer (OCIO) is providing IT solutions that support animal disease surveillance and management programs. The IT specialists in VS are responsible for developing, deploying, and supporting automated information systems that support the data management requirements of APHIS and VS’ national animal health program activities.

VS OCIO intends to work with State field veterinarians and their supporting staff to meet the evolving data needs of the programs and the proposed centralized data repository. Data from the field can be recorded and submitted, such as test results and herd inventory directly into the repository; however,

in most cases, it will be routed to the AHSM system and forwarded to the repository to avoid duplication of records. Mobile information management (MIM) tools provide the capability to securely acquire and accurately store animal health data in the field with mobile devices and then upload this data electronically to the appropriate VS system. MIM provides increased data integrity and data quality, the ability to scan and store radio-frequency identification (RFID) tag numbers, improved efficiency of field processes, reduction in the time spent performing redundant data-entry, and faster availability of data for analysis. MIM applications are designed to increase the efficiency and accuracy of disease testing using personal digital assistants (PDAs) or tables that have been loaded with herd and premises information. MIM currently works in concert with Veterinary Services Laboratory Submission (VLS) to upload test submission data, thus eliminating the need to enter submission data through the VLS Website.

The MIM manager performs several functions, including loading data onto or removing data from the PDA, managing data from the PDA, merging data from multiple PDAs, and editing data. MIM applications produce a data file that can be exchanged with other databases. MIM application tools have proved to be useful in saving many person-hours and in assisting incident response personnel with planning, animal management, data integrity, and the production of necessary forms. The application supports the uploading of data to a variety of databases, including the GDB, EMRS, and State databases through disease-specific MIM Web services component.

2.2.2 Field Data Collection Mission

The primary mission of the field data collection is to develop a comprehensive information system infrastructure utilizing existing tools and technology to create an end-to-end solution for the collection of field samples and their associated data and to share that data among all information systems involved in disease surveillance and management related efforts.

Collectors in the field are urged to use the tools and infrastructures developed from pilot studies such as the California Pilot Project (CAPP) as part of their day-to-day management and field collection activities. CAPP is intended to be a reference point for future projects that utilize the tools and technologies developed as part of this project and as a guide for project managers working on cross-organizational projects involving USDA, California Department of Food and Agriculture (CDFA), and/or other organizations.

VS utilized mobile devices to assist at a 2007 New Mexico tuberculosis (TB) incident by supplying the TB MIM application and working directly with the field and command staff to meet the evolving data needs throughout the incident. The TB MIM is a PDA-based application that supports the use of both RFID and barcode technologies. The TB MIM application is designed to increase the efficiency and accuracy of bovine tuberculosis testing using PDAs that have been loaded with herd and premises information. TB MIM proved to be a useful tool that helped save many person-hours and assisted incident commanders with planning, animal management, data integrity, and the production of necessary forms. Figure 2-6 depicts typical data flow in MIM application.

In addition, several USDA projects are currently in various stages of development and are using all or portions of the tools and infrastructure developed and deployed as part of field-related projects. The USDA field projects include classical swine fever, scrapie, avian influenza, and others. A field project in collaboration with NAIS and brucellosis programs is also intended to develop a mobile application that will collect vaccination and testing data.

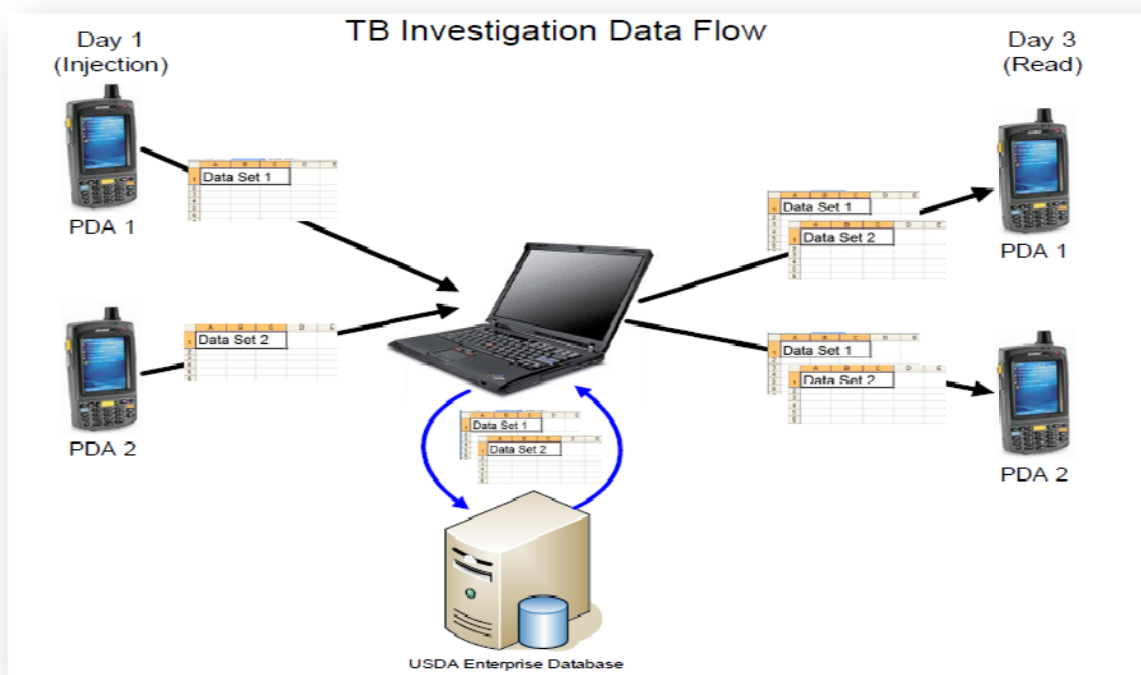


Figure 2-6. MIM Communication Schema

2.3 Program Overview

2.3.1 Program Summary

VS and its stakeholders currently do not have global and platform-independent data standards. These standards are essential components for data integrity and exchange. A major goal of VS is to develop and support global platform-independent data standards that will enable information system interoperability and improve the availability of animal health data for decision making. Data standards are the foundation of integrated and coordinated animal health information management systems and are needed to integrate major IT systems.

A survey questionnaire to identify the information that is pertinent to VS' IT system has been conducted, including VS' partners and stakeholders. The results of this survey will assist in the development of programs that will facilitate data sharing and help bridge any gap that may exist from having multiple database storage systems that are at different locations.

Knowledge obtained from this survey will enable improved collaboration between VS and its partners and stakeholders who are faced with divergent needs across the United States in regards to animal health management issues. An important mission of VS' IT is the ever-increasing need to maximize utilization of both digital and physical assets to ensure that collaboration and data sharing among all parties function smoothly.

Many VS' partners and stakeholders rely on the existing repository data collection system operated by VS. The IT architecture of the proposed VS central repository will be designed to allow both partners and stakeholders to leverage consistent, accurate, and timely information from a single data source to make better and faster decisions.

2.3.2 Program Mission

Essential to the effective implementation and monitoring of a national animal health surveillance and management system as discussed in this IT roadmap is the collaborative interaction of State, Federal, university, and industry partners. Data gathered by such a system will be critical not only to ensure and affirm the health of the nation's livestock, but to provide decision makers with information required for an effective, timely response in case of an accidental or intentional introduction of a foreign animal disease. As VS continues its mission to safeguard animal health, comprehensive and integrated surveillance systems will expand to include the next diseases of priority set by partners and stakeholders. This includes the common goals of maintaining an economically viable animal agriculture industry that improves the confidence of our trading partners and boosts consumer confidence by ensuring a safe, disease-free food supply.

The VS IT strategy is based on the premise that the key to accurate surveillance is an identification system that precisely links an animal to its farm of origin, to animal concentration points it may have transited (livestock markets), and to post-harvest facilities. Technological advances in disease diagnostics, animal identification, and database management will improve the ability of animal disease surveillance systems to supply information to decision makers. Additionally, planned VS' system upgrades will improve data integrity and improve the capabilities to conduct research and analysis on captured data. The VS' CIO believes that to make the data collaboration and exchange initiatives described in this roadmap truly successful, it is necessary to include the input of stakeholders in system design efforts.

Section

3 IT Strategy Technical Overview**3.1** Architectural Evolution**3.1.1 Technical Summary**

The VS' vision is to provide an enterprise architecture model with defined processes and methods that describe how a variety of organizations and information technology resources can obtain and/or deliver mission-critical electronic data and/or information to the VS' data repository.

The technical architecture will be capable of capturing data in a routine manner and utilizing technologies that can assist in identifying key locations of data sources necessary to populate internal systems. These data sources may be other Federal agencies, State agencies, private-sector companies, and complimentary or necessary industries, which can support national efforts in protecting the health of U.S. livestock and affiliated populations.

Technology alternatives in moving information and technical systems from a current state to a planned future state will be developed with set standards and following priorities for technical and regulatory capacity building in accordance with defined enterprise architecture standards and frameworks.

3.1.2 Current Information Technology (As-Is) Systems

The Animal Health and Surveillance Management System functions as an enterprise-level (business-wide) animal health and surveillance electronic information management system that is linked to animal disease management and surveillance programs through five key steps: (1) collecting animal specimens for disease testing, (2) testing the specimens for disease, (3) reporting the results, (4) analyzing the results, and (5) taking action. AHSM provides an electronic means of data input, data storage, and data reporting. This system enables VS to take a comprehensive and integrated approach to collecting and managing animal health data for disease management and surveillance programs.

The VS Process Streamlining System serves as comprehensible analysis tool for animal tracking and disease analysis. The system provides a consistent standard method of data capture at all levels and provides data dissemination to the appropriate existing databases and is a single point of access to VS' electronic forms, applications, and certification processes required for interstate and international movement of animals and animal products.

The National Animal Health Laboratory Network manages registry of laboratory information useful for supporting rapid response to animal health emergency incidents. The system provides tools for early testing and routine Web-based searches for all veterinary diagnostic laboratories that are able to test for specific disease agents and evaluate the laboratories surge capacity.

The Emergency Management Response System supports timely and effective responses to manage animal health emergencies by automating the collection, management, and analysis of data from animal disease investigations and animal disease outbreak incidents. EMRS is used by the VS to manage and investigate animal disease outbreaks in the United States.

The National Animal Identification System is a modern, streamlined information system that assists in the timely response to animal disease emergency situations. The system is facilitated by premises registration, animal identification, and animal-movement tracing. NAIS has a 48-hour traceback objective to minimize the scope and expense of a disease event.

The Laboratory Information Management System is currently under development at the National Veterinary Services Laboratory (NVSL). It will be used to document all incoming laboratory submissions and test results, as well as to generate test reports for stakeholders. The system is being developed using VS data standards so that it can support Health Level 7 (HL7) and other VS messaging protocols. The goal is to have test requests and testing data that can be accepted or delivered electronically to other VS database systems, such as the EMRS and the AHSM.

The Licensing, Serial Release, and Testing Information System (LSRTIS) is the CVB portion of the VS Ames LIMS. This system coordinates the release of more than 80 billion doses of product and maintenance of more than 2,000 licenses in this \$850 million industry.

The National Veterinary Logistics System operates the nation's repository of vaccines, personal protective equipment (PPE), and other critical veterinary items. It augments State and local resources in the fight against dangerous animal disease outbreaks that could potentially devastate American agriculture, seriously affect the nation's economy, and threaten public health. Also, NVLS is the source for all animal identification tags used in the nation's animal husbandry industry. NVLS is implemented by the National Veterinary Stockpile (NVS), which is designed to deploy within 24 hours sufficient amounts of critical veterinary supplies such as animal vaccine, antiviral, or therapeutic products to appropriately respond to an emergency situation in animal disease affecting human health and the economy.

3.1.2.1 Animal Health Surveillance System

AHSM is the system designed to replace the GDB. The GDB was developed as a system to be distributed to all the VS areas, with the potential to hold data from most VS programs. The GDB had a universal interface to which the VS programs needed to adapt. The GDB was developed with a high degree of flexibility and, over time, the data collected in many areas could not be combined into national data sets without extensive manipulation. Despite its limitations, the GDB system has proven to be a valuable tool for collecting VS program data. However, changes in Government security requirements and the need for standard data sets for analysis prompted VS to develop the next generation of data system.

At its core, AHSM is an Oracle database based on the GDB design, enhanced to meet the latest surveillance program requirements and standardized to a strict set of data requirements. This allows for accurate analysis of the data entering the system. The AHSM system will be more than just a database. AHSM refers to the complex interaction of specialized program interface designs, geographic information technology, mobile information management, and data flow management, creating an integration of technologies and not just a simple database structure.

AHSM is a suite of enterprise-level information management tools that provides a comprehensive, integrated approach to collecting and managing animal health data. These tools are used by the VS and State animal health partners, thereby linking AHSM to animal disease management and surveillance programs through five key steps: (1) collecting animal specimens for disease testing, (2)

testing the specimens for disease, (3) reporting the results, (4) analyzing the results, and (5) taking action.

The chain of animal health surveillance begins with animal health practitioners in the field collecting data and specimens from animals on farms and other facilities to test for the presence of animal diseases. AHSM will provide field data collection capabilities through the use of MIM. Devices such as PDAs, Tablet PCs, and Smartphones increase the speed, accuracy, and efficiency of data collection while providing an improved benefit to cost ratio. Testing data collected by VSPS and EMRS will be transferred to the universal database (UDB). Specimens are sent to Federal, State, and university diagnostic laboratories for testing. Information about the specimens will be transmitted electronically to the laboratories via AHSM.

Rapid reporting of laboratory results is critical in animal health surveillance and control to prevent disease spread. AHSM provides electronic transmission of test results, including generation of e-mail alerts to appropriate animal health officials. Results of testing requests from VSPS and EMRS will be returned to those systems also.

AHSM's reporting capabilities provide data for analysis by animal disease program managers and by animal health analysts at the VS, CEAH, and other USDA organizations. Analyses includes evaluating patterns, rate of spread, and emerging threats to the animal health population, providing assurance to our trading partners that U.S. animal and animal products are safe for export.

VS will take immediate action when detection of a regulated animal disease occurs. The AHSM system will provide critical data support for investigation, response and recovery following an endemic disease. If a foreign disease outbreak is detected or if an Incident Command System (ICS) task force is need to address an occurrence of an endemic disease, EMRS is activated to manage the VS' response to the disease outbreak. Animal health data collected by EMRS is transferred to AHSM.

VS' responses may include:

- ❖ Further investigation and testing
- ❖ Tracing of potentially exposed animals
- ❖ Quarantine and/or euthanasia of infected or exposed animals
- ❖ Vaccination, genotyping, or other responses when appropriate based on the epidemiology of the disease

AHSM has several functional tools that move beyond those previously available in the GDB; the most notable are:

- ❖ The Veterinary Services Laboratory Submission (VSLS) tool provides animal and sample/specimen data through a Web-site to diagnostic testing laboratories, which in turn provide test and result data through the Web-site or electronic messaging to the VSLS/AHSM.
- ❖ MIM provides the capability to securely acquire and accurately store animal health data in the field with mobile devices and then upload the data electronically to the AHSM, EMRS, and VSPS systems. Currently, MIM software is available for testing of scrapie, tuberculosis, and chronic wasting disease.

- ❖ Internet-based or Web-based mapping applications disseminate spatial data on animal health and populations at variable geographic resolutions to animal health-officials nationwide. The first example of a Web-based mapping application for surveillance is a mapping module for the scrapie program. The scrapie mapping module provides a map overlay that can be used to map sheep and goat premises by scrapie program status.

3.1.2.2 Veterinary Services Process Streamlining

VSPPS provides a single point of access to the electronic forms, applications, and certification processes required to regulate interstate and international movement of animals and animal products. This system is designed for accredited veterinarians, import and export brokers, and State and Federal animal health officials. VSPPS provides a consistent and standard method of data capture at all levels and provides data dissemination to the appropriate existing databases. In addition, VSPPS provides accredited veterinarians the ability to collect and disseminate animal information into health certificates, related test records, and permits via functional electronic documents.

The VSPPS system is a suite of integrated modules that provide data-management capabilities for national programs that regulate international animal and animal product movement, veterinary accreditation, and interstate animal movement. Production modules include electronic Veterinary Accreditation Program (eVAP) and the electronic interstate module and related test modules. Legacy systems continue to support import, export, and animal quarantine center activities. These legacy systems are scheduled for redevelopment and will become additional VSPPS modules in the future.

VSPPS offers four modules: Veterinarian Accreditation, Interstate Animal Movement, Animal Export, and Import. These modules will provide data to assist with the capability to monitor animal/product movement into and out of the United States. VSPPS will interface with the ePermits and Information Trade Data System (ITDS).

- ❖ **Veterinary Accreditation Module.** Accredited Veterinarians are relied upon by the USDA to attest to the health at the time of inspection of animals being exported to foreign countries or being moved between States. This certification is important for the prevention of an introduction of animal disease. Veterinarians must be accredited in the States where they perform Federal work. This module automates the submission of accreditation applications, streamlines the approval process via electronic distribution of information, and records administrative actions taken against accredited veterinarians. These features facilitate the accreditation application process, printing accreditation certificates, contact information validation, checking veterinarian accreditation status, finding accredited veterinarians, updating qualification status, processing accreditation applications (tracking, approving, and adding to the database), changing accreditation status, reinstating a short-term suspended veterinarian, reinstating a revoked veterinarian, updating Area Veterinarian in Charge (AVIC) offices and generating detailed reports.
- ❖ **Interstate Animal Movement Module.** The VSPPS interstate module enables veterinarians to create electronic Certificates of Veterinary Inspection (eCVI) and associated diagnostic test documents. All animals being moved between States are required to go through an interstate movement certification process. Each animal must be inspected by an accredited veterinarian and is subject to the target State's entry regulations. This module facilitates the way accredited veterinarians process animal health information including laboratory test results and the submission of final health

certificates required for entry into the target State. This component will facilitate viewing interstate movement requests, adding interstate movement requests, importing data from veterinary practice address books, viewing State protocols, processing interstate movement certificates, updating laboratory results, viewing interstate movement certificates, deleting inactive pending requests, generating NAIS activity movement files, and generating interstate movement reports.

- ❖ **Export Module.** All animal/products leaving the United States are required to go through an export process. Each animal must be inspected by an accredited veterinarian and is subject to the target country import regulations. This module will automate the way accredited veterinarians enter animal health information including the laboratory test results, VS' processing of final health certificates and final inspections. This component will facilitate the viewing of export requests, requesting health certificates, selecting export protocols, viewing export requests, processing health certificates, performing final inspections, maintaining International Animal Product Export Regulations (IREGS), and updating export database.
- ❖ **Import Module.** All animals entering the United States must go through an import process. There are numerous routes of entry depending on the mode of entry and the location. This module will automate the collection of information and submission of information online. It will also facilitate the tracking of importer information. As VSPS will interface with the APHIS ePermits system and ITDS, it will facilitate viewing import requests, adding import requests, amending import permits, viewing State imports, viewing Federal imports, editing import requests, processing import release forms, tracking the arrival and release of animals, generating import reports, and updating the import database.

3.1.2.3 National Animal Health Laboratory Network

NAHLN supports the exchange of electronic standardized data between VS and veterinary diagnostic laboratories. This data exchange system both minimizes manual data entry work and enables the automated analysis of information trends. A critical aspect of the NAHLN is the effort to standardize data, improve data quality, and maximize the efficiency of data transfer via the IT infrastructure and data repository. NAHLN forms part of a nationwide strategy to coordinate the work of all organizations providing animal disease surveillance and testing services. The NAHLN IT system is used to report laboratory results quickly and accurately in the event of an animal disease outbreak, to enhance surveillance programs, and to recognize emerging issues. It is also designed to provide automated alerts on defined animal health events to authorized personnel who support disease prevention and response. The system allows NAHLN labs to transmit and store data securely using nationally recognized health information standards that improve data quality and data reuse in systems such as VS' AHSM and EMRS, VSLS, and the U.S. Department of Homeland Security's National Biosurveillance Integration System (NBIS). The NAHLN IT system is being integrated with numerous existing animal health and veterinary diagnostic data networks. The standardized data-centric approach allows seamless electronic transfer of information from the time diagnostic samples are collected in the field to the addition of appropriate diagnostic test information from the NAHLN veterinary diagnostic laboratories.

The NAHLN IT system incorporates well-defined terminology (Systemized Nomenclature of Medicine [SNOMED] and Logical Observation Identifiers, Names, and Codes [LOINC] standards) with the diagnostic electronic message structure (HL7 standards) that is currently used for human health informatics systems. Standardization of data helps ensure that information is accurately transferred from one system to another and allows comparison of similar data sets from various NAHLN laboratories.

The NAHLN works closely with the USDA APHIS, VS' National Center for Animal Health Programs, and CEAH to ensure that the data collected from diagnostic sample submissions include appropriate detail for further epidemiologic study and modeling of disease transmission. In the event of an outbreak, rapid assimilation of this information is vital to managing an emergency response.

NAHLN has three components:

- ❖ **Laboratory Registry.** Veterinary diagnostic laboratories are registered in the system as part of NAHLN. Information stored for each registered laboratory includes capacity and capability levels that support testing plans and strategies during both routine animal health surveillance and emergency outbreak responses.
- ❖ **Laboratory Reporting.** Laboratories registered in the system can submit laboratory reports with test results as electronic messages sent directly from their own LIMS. The messages transmitted are based on data exchange (HL7) and terminology standards (LOINC and SNOMED). The NAHLN IT system both (1) routes the laboratory results to appropriate APHIS program surveillance systems and (2) stores the results in an integrated national data repository. Personnel who have the appropriate user role-based security access rights can view the laboratory results online over the Internet.
- ❖ **Monitoring of Laboratory Findings.** Laboratory findings stored in the central data repository will be monitored for quality, aberrant patterns, and unexpected trends that may serve as early signals for animal diseases outbreaks or uncharacteristic testing performance. This monitoring process can be configured to trigger automated notification alerts that are distributed to appropriate parties.

Historically, foreign animal disease (FAD) and other highly contagious disease samples were tested and confirmed at Federal research facilities. Lessons learned by observing the response of other countries to disease outbreaks and the threat of bioterrorism form compelling arguments to extend surveillance, detection, and response capabilities throughout the United States to other authorized laboratories in order to detect, contain, and eradicate animal-borne diseases as early as possible.

NAHLN is a system by which Federal, State and other public health agencies rapidly share veterinary diagnostic information using a common information network and data standards. At the Federal level, the USDA's NVSL serves as the national veterinary diagnostic reference and confirmatory laboratory. The State/university laboratories in the NAHLN perform routine diagnostic tests for endemic animal diseases as well as targeted surveillance and response testing for foreign animal diseases. Networking these resources provides an extensive infrastructure of facilities, equipment, and personnel that are geographically accessible no matter where disease strikes. The laboratories have the capability and capacity to conduct nationwide surveillance testing for the early detection of an animal disease outbreak. They are able to test large numbers of samples rapidly during an outbreak and to demonstrate freedom from disease after eradication.

Key elements of the NAHLN system include increased and more flexible capacity for laboratory support of routine and emergency animal-disease diagnosis and official responses to bioterrorism events; standardized, rapid diagnostic techniques used at the State, regional, and national levels; secure systems for communication, issuance of alerts, and reporting; and modern equipment and experienced personnel.

Information technology systems support the NAHLN vision by providing electronic interconnectivity between diagnostic-sample collectors, NAHLN laboratories, and national databases. By utilizing data and messaging standards established by veterinary medical and public-health agencies, accurate and consistent diagnostic information is quickly and securely transmitted, aggregated, and available for decision makers and analysts.

Table 3-1 highlights the three specific problems that NAHLN addresses.

Table 3-1. NAHLN Solutions

PROBLEM 1	Reporting test results through systems that require manual data entry which affects laboratories.
IMPACT	Costly use of resources and higher likelihood of data entry errors.
SOLUTION	Provide an electronic means to report test results using a common structure and language that supports data integrity and is acceptable by other parties also expecting a copy of the test results.
PROBLEM 2	Relying on manual entry of an order for testing prior to reporting the result to the APHIS VS IT system which affects laboratories.
IMPACT	Slowing down the timeliness of reporting available results.
SOLUTION	Provide the capability to rapidly report test results as they become available. The receiver would link the results to the order.
PROBLEM 3	Aggregating test results reported across a network of Federal, State, and university laboratories that provide testing services previously offered from the Federal laboratory system.
AFFECTS	Outbreak response decision makers and epidemiologic data analysts.
IMPACT	The need to perform time consuming manual data standardization. This standardization effort is required in order to create comparable data that can be aggregated.
SOLUTION	Enable more timely decision making and data analyses.

3.1.2.4 Emergency Management Response System

EMRS is a Web-based task management system accessed by approved users of Microsoft Internet Explorer, and includes GIS support for easy visualization of work areas. Primary users of EMRS are Federal and State veterinary medical officers, animal health technicians, and various disease specialists and epidemiologists from APHIS and from State cooperators. In an emergency, VS can enlist the assistance of more than 40,000 federally accredited private veterinary practitioners who assist with disease exclusion, detection, and control.

VS is responsible for detecting and responding to outbreaks of animal diseases that occur within the U.S. VS must manage large amounts of data related to such outbreaks. Because animal disease outbreaks are many and varied, VS requires a system that is available nationwide and provides flexibility to support numerous data requirements. EMRS supports these requirements by promoting timely and effective responses to and management of animal health emergencies by automating the collection, management, and analysis of data from animal disease investigations and animal disease outbreak incidents.

First deployed in 2001, EMRS continues to satisfy its mission goals. EMRS provides electronic management and records organization for the following:

- ❖ VS responses to animal disease outbreaks
- ❖ Documenting the routine surveillance of FAD
- ❖ Documenting investigations of emerging disease incidents (EDI) in the United States

EMRS primarily provides electronic records organization that document APHIS' responses to animal disease outbreaks in the United States including the surveillance of FAD and for investigations of emerging animal diseases in the United States. EMRS is a Web-based task management system that can be accessed by USDA-approved users with approved Web browsers, among which are State and contract cooperators as well as APHIS' veterinary medical personnel.

The number of animals moved in short time periods today necessitates faster identification, reporting, and management of problem herds. Additionally, information needs to be centralized, but readily available locally to minimize misunderstandings at the national and local levels. Examples of EMRS use include State-specific disease outbreaks and/or control programs, classic national ICS responses, and natural disasters involving animals. Planning, logistics, scheduling of operational activities are all handled by EMRS during disease outbreaks. Eradication efforts are supported using information about infected farms, auction markets, processing plants, and other premises locations. EMRS also supports the collection of spatial data for modeling, spatial simulation, analysis, and reporting of animal disease outbreaks.

In the event that a foreign animal disease is introduced into the domestic livestock or poultry populations, APHIS responds by activating its ICS. Six VS ICS teams deal with animal disease outbreaks. ICS team members responding to current animal disease outbreaks, as well as outbreaks in the past several years have all been supported by EMRS. The improved management provided by EMRS has increased the effectiveness of the ICS team response to disease outbreaks substantially.

EMRS aligns with the Disaster Management Interoperability Initiative (DMIS). The modifications necessary to link its emergency response capabilities to the national disaster response system are currently under consideration by the APHIS DMIS representative. As needed, EMRS data will be made available, through DisasterHelp.Gov, to the network of Emergency Operations Centers involved in the management of national-level disasters. Future efforts may include methods to generate data from EMRS using Common Alerting Protocol (CAP) format and to support Emergency Data Exchange Language (EDXL).

EMRS will utilize the Department's eAuthentication utility for user verification where possible. Currently, EMRS is using eAuthentication with a Web-services component of EMRS. The core EMRS modules are tied to APHIS Lotus Notes General Support System (GSS), which does not use eAuthentication. However, the current Lotus Notes user interface used by EMRS employs the same high-level security as the Agency Lotus Notes e-mail application.

EMRS uses the USDA AgLearn application. AgLearn training records are imported into the EMRS Employee Profile Module (EPM) in order to support the process of certifying employees as qualified for specific emergency response positions. Certain AgLearn training is required to meet the qualifications for a position. Having AgLearn training data along with other skill and assignment history information all in one place facilitates the review and certification process.

VS IT roadmap is strategically linked to USDA and APHIS strategic goals and the objectives are highlighted in Table 3-2.

Table 3-2. Strategic Alignment and Partnership

Planning Document	Alignment
USDA Strategic Plan	Strategic Goal 4: Enhance protection of the nation’s agriculture and food supply Strategic Goal 6: Protect and enhance the nation’s natural resource base and environment
USDA IT Strategic Plan	Goal 4: Technology and Architecture—Define and operate the technology solutions, underlying architecture and processes for IT long-term support of business capabilities
APHIS Strategic Plan	Goal 2: Strengthen emergency response preparedness
APHIS IT Strategic Plan	Goal 4: Technology & Architecture—APHIS’ mobile work force is able to collect, disperse and use information at any time and any place in a user-friendly, reliable, secure manner

In addition to the current requirements tasked to EMRS, a critical need exists for emergency management software and network tools that facilitate incident coordination and incident management. These tools need to provide the situation awareness for the basic veterinary functions such as surveillance, diagnostic testing, tracing, and quarantine and movement controls. These tools also need to provide the operational picture and status of basic emergency management functions such as command and control, incident action plans, resource requirements, and resource commitments. Furthermore, the tools must employ features and functionality that promote rapid but fluid compilation of information and data from disparate sources, ranging from small scale incidents to multi-State incidents that potentially involve high-consequence animal diseases. These tools currently exist at the private industry, State, local, and Federal level, and need to be incorporated into the VS and APHIS’ emergency preparedness and response mission.

3.1.2.5 National Animal Identification System

NAIS was developed to provide the data formats and system functionality needed to link VS databases and the databases maintained separately by the States and private sector. This achieves common data standards required to close traceability gaps.

NAIS is a modern, streamlined information system that helps producers and animal health officials respond quickly and effectively to animal disease events in the United States. The NAIS, achieved through State-Federal-industry partnerships, is beneficial because it helps VS protect U.S. livestock and poultry from disease spread, maintain consumer confidence in the food supply, and retain access to domestic and foreign markets. Animal health officials across the country agree that premises registration is a necessary first step to achieving these goals. Premises information ensures that producers will be notified quickly when a disease event might impact their area or the species of animals they have. It would be impossible for VS to help producers in an animal health emergency if the existence of the animals is not known. By voluntarily registering their premises and providing contact information, producers will ensure that they receive the information they need to protect their animals and their investments. In an emergency, animal health officials will be able to locate at-risk animals quickly and take precise

actions to address the situation, minimize hardships, and speed disease eradication efforts as much as possible.

The USDA defines retrieval of traceback data within a 48-hour window as optimal for efficient, effective disease containment. Within this timeframe, animal health officials must have the data required to trace a disease back to its source and limit potential harm to animal agriculture, such as loss of producer income. The sooner reliable data are available, the sooner affected animals can be located, appropriate response measures can be established, and disease spread can be halted. The NAIS provides the common data standards required to close traceability gaps. Although the optimal 48-hour window remains the vision of NAIS and its long-term goal, the industry organizations can make immediate progress toward meeting the needs of animal health officials, in addition to maintaining the confidence of consumers and trading partners.

VS' strategies discussed in this report support progress to the long-term goal of 48-hour traceback with continued focus on increasing the number of premises registered and initiating efforts to increase the number of animals identified to the premises of origin. VS is prioritizing its efforts by species/sectors where an increase in the traceability infrastructure can have the greatest return on investment. Traceability objectives, action timelines, and participation benchmarks are provided for the priority species.

Collaboration among the animal production industry, State animal health authorities, and USDA remains the catalyst for continued traceability progress. VS' collaborators are crucial to the success of the actions identified in this plan, as well as future strategies (including more detailed actions related to the collection of data on animal movements) as progress is made toward the long-term goal. Industry organizations and the NAIS system working groups and subcommittee will take an active role in the review of these strategies and provide feedback and additional recommendations as USDA moves forward to facilitate animal disease traceability.

The VS Animal Health Information System (Table 3-3) has evolved over time using distinct herd and flock identification protocols. NAIS now provides a standardized source for key data elements. This standardization enables the various animal health databases to communicate with one another by using the same fundamental epidemiological information regarding animal, place, event, and time across multiple programs and systems.

Databases are not new to VS' animal health programs. The AHSM, VSPS, and EMRS databases and information systems were in place prior to NAIS and continue to provide critical infrastructure that supports the VS' animal disease programs.

These systems now use the National Premises Information Repository (NPIR) and the Animal Identification Number Management System (AINMS) to obtain centralized and standardized premises and animal identification information. These databases are now integrated with the Animal Trace Processing System (ATPS), which enables animal health officials to obtain necessary information from all systems when responding to a disease event.

Table 3-3. Animal Disease Program Legacy Databases

Database	Purpose	Dates	NAIS Link
Animal Health and Surveillance Management (AHSM)	Maintains test and/or vaccination data from herds and flocks in disease programs such as brucellosis, tuberculosis, and pseudorabies, etc.	1977 (initially know as the Animal Disease Generic Database)	NPIR AINMS ATPS*
VS Process Streamlining (VSPS)	Administration of permits and certificates for import/export, interstate commerce, and veterinary accreditation.	1996	NPIR AINMS ATPS*
Emergency Management Response System (EMRS)	Records information resulting from all foreign animal disease investigations and provides incident management.	2002	NPIR AINMS ATPS*

*The ATPS will be integrated with these databases in the future as the animal tracking databases (ATDs) come online.

NAIS was developed to provide the data formats and system functionality needed to link VS’ databases and those maintained separately by the States and private sector. NAIS is comprised of three elements:

- ❖ **Premises Registration.** Registration of locations that manage livestock or poultry (farms, feedlots, veterinary clinics, and livestock markets) in a system that prevents the assignment of more than one identifier to a given location.
- ❖ **Animal Identification.** Officially identifying animals (either individually or as groups) using an approved method prior to their commingling with animals from other premises.
- ❖ **Animal Tracing/Recording.** Collects animal movement records from private and VS databases and displays them to facilitate tracing each animal to its birth premises and the cohorts of that animal.

Through NAIS, States, tribes, and territories use established standards to register premises within respective geographic regions and maintain Premises Registration Systems. Industry organizations and States provide the Animal Tracking Database (ATD) that maintains animal movement records.

The USDA provides the ATPS that allows State and Federal animal health officials to have a single point of access to the information needed to begin an investigation. Figure 3-1 illustrates one of the most significant outcomes of NAIS—the capability for databases to “talk” when information is needed to support responses to animal disease events.

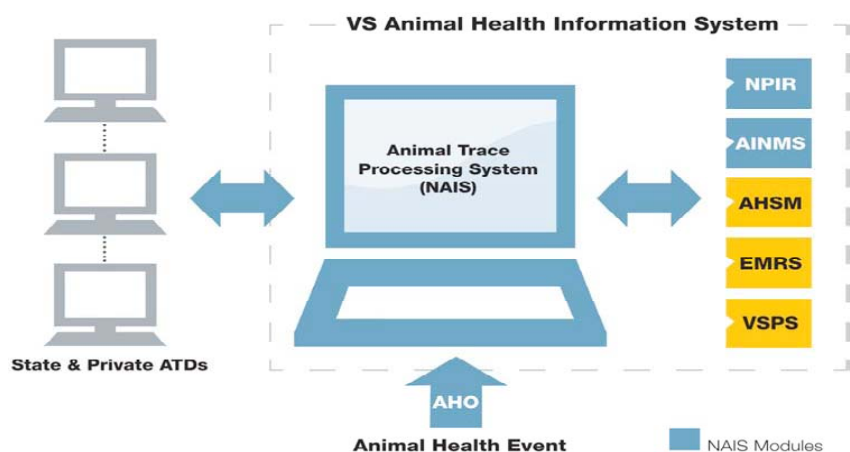


Figure 3-1. Animal Trace Processing Systems

3.1.2.5 LabWare Laboratory Information Management System

NVSL is continuing an effort to implement LabWare LIMS in its laboratories. The services and deliverables that LabWare will provide to NVSL consist of continued mentoring and assistance with LIMS configuration. The objective of these services is to enable NVSL staff to become proficient in configuring LabWare LIMS and to enable NVSL to complete the LIMS implementation in a timely manner.

The project will implement the LabWare LIMS solution for the following NVSL requirements:

- ❖ Diagnostic and surveillance testing (including electronic submission of test requests and results reporting)
- ❖ Integration of NVSL testing processes with EMRS, AHSM, and NAHLN
- ❖ Laboratory proficiency testing program
- ❖ Integration with existing user fee management systems and processes
- ❖ Integration with existing inventory and item tracking systems and reagent ordering processes at NVSL

Requirements and implementation will be considered for the following NVSL laboratories/sites:

- ❖ Diagnostic Virology Laboratory (DVL)
- ❖ Diagnostic Bacteriology Laboratory (DBL)
- ❖ Pathobiology Laboratory (PL)
- ❖ Foreign Animal Disease Diagnostics Laboratory (FADDL)
- ❖ NVSL Administration and National Animal Centers for Health (NCAH), which are impacted by the project scope
- ❖ Center for Veterinary Biologics (CVB) Laboratories for Inventory and Item Tracking systems

NVSL will deploy LabWare LIMS in multiple phases as follows:

- ❖ All Ames, Iowa, sites

- ❖ Plum Island, New York

The following systems will be considered for replacement by new system:

- ❖ Computer Automated Laboratory System (CALs)
- ❖ User Fees
- ❖ Test Results Reporting System (in Lotus Notes)
- ❖ FADDL Laboratory Information Management System in HP3000
- ❖ Avian System in HP3000
- ❖ Proficiency Testing System in HP3000
- ❖ Complete retirement of HP9000 and HP3000 technical environment

3.1.2.6 Licensing, Serial Release, and Testing Information System

The CVB is a part of the USDA APHIS VS. The CVB is responsible for implementing the provisions of the Virus-Serum-Toxin Act to ensure that veterinary biologics available for the diagnosis, prevention, and treatment of animal diseases are pure, safe, potent, and effective.

The CVB is comprised of two sections:

- ❖ CVB Policy, Evaluation, and Licensing (CVB-PEL)
- ❖ CVB Inspection and Compliance (CVB-IC)

Both sections are primarily located in Ames, Iowa, with a small portion of the CVB-PEL office in Riverdale, Maryland. The directorate for CVB consists of two section directors responsible for the direction of all CVB program activities.

CVB primary activities include:

- ❖ Biologics licensing and permitting
- ❖ Biologics inspection and compliance of licensed products
- ❖ Confirmatory assays on new biologics products prior to licensure
- ❖ Reference and reagent production, evaluation, and distribution
- ❖ Developmental activity and training

USDA APHIS VS CVB requires a secure computer system to support and manage the biological products licensing, serial release and testing processes. The system needs to allow CVB to manage information related to the three processes above and needs to allow for exchange of information with other Government agencies, stakeholders, and end users of veterinary biologics to ensure purity, safety, potency, and efficacy and/or to support of CVB mission and VS strategies. The system must be cost effective and reliable, using the most appropriate technology. It must also support accreditation efforts either mandated or internally driven.

Currently there are multiple information systems in use at the CVB that support some of CVB's operational needs. These systems are not in sync with the APHIS platform. They lack key functionality and are costly and inefficient to operate. These standalone systems don't communicate well with each other, and the lack of integration and transparency hinders the ability to streamline

processes and information flow within CVB, VS, and APHIS. The diversity of computer platforms utilized creates weak links and makes it difficult and costly to provide IT support. Because the systems are implemented using outdated technology, IT expertise in these systems (both external and internal) is dwindling. There are many growing and changing business needs/mandates (such as GPEA and ISO 17025) that these systems are unable to address, and the flexibility for expansion is nonexistent.

The objective of the LSRTIS Management System Implementation Project is to develop an integrated system that is flexible, reliable, supportable, efficient, adaptable, accessible, secure, cost effective, affordable, and tailored to the information management needs of the licensing, serial release, and testing processes at the CVB.

It is expected that the new system will enable CVB to:

- ❖ Improve customer services
- ❖ Improve communications (internal and external)
- ❖ Improve regulatory decisions
- ❖ Improve the ability to adapt our systems to changing business needs
- ❖ Decrease redundancy of information capture and management
- ❖ Decrease the number of IT systems and technologies currently in use at CVB
- ❖ Increase the ability to integrate our systems with agency systems and to partake on agencywide resource pools

Based on the current IT system situation at the CVB, failure to achieve the AIMS project goals and objectives would adversely impact customer service, accreditation efforts, ability to comply with the Government Paperwork Elimination Act (GPEA) mandates, and IT resource overhead.

3.1.2.7 National Veterinary Logistics System

The National Veterinary Stockpile is the nation's repository of vaccines, personal protective equipment, and other critical veterinary items. It augments State and local resources in the fight against dangerous animal disease outbreaks that could potentially devastate American agriculture, seriously affect the nation's economy, and threaten public health. In addition, NVLS is the source for all animal identification tags used in the nation's animal husbandry industry.

Homeland Security Presidential Directive 9 (HSPD-9) established the NVS in 2004. It required that the NVS be capable of deploying within 24 hours "sufficient amounts of animal vaccine, antiviral, or therapeutic products to appropriately respond to the most damaging animal disease outbreaks affecting human health, agriculture, and the economy..." HSPD-9 reflects the nation's concern that terrorists could simultaneously, in multiple locations, release animal diseases of an unprecedented magnitude, thus requiring an NVS response that could efficiently and quickly deliver large quantities of critical veterinary supplies and equipment to the right place at the right time for as long as necessary.

The NVS has the following primary goals:

- ❖ Deploy countermeasures against the worst animal diseases such as, but not limited to, highly pathogenic avian influenza, foot-and-mouth disease, Rift Valley fever, exotic Newcastle disease, and classical swine fever

- ❖ Ensure States are ready to request, process, and use the stockpile

The NVS has three types of inventory:

- ❖ Stockpile-managed inventory (SMI), which is owned and managed by the NVS in its warehouse
- ❖ Vendor-managed inventory (VMI), which contractors hold and manage for the NVS
- ❖ Contingency support items (CSI), which contractors own, hold, and manage but provide during emergencies on a promissory basis

The NVLS requires a reusable supply chain management (SCM) system that incorporates the three types of inventory used by APHIS. The software needs to be designed, configured, and installed (deployed) to provide accountability and visibility within the three types of inventory—SMI, VMI, and CSI. For SMI, the NVLS should provide full inventory and warehouse management functionality. For VMI, the system should provide inventory visibility and accountability that may include interfaces to contractor systems, which will allow visibility of contractor managed/owned NVS assets. For CSI items, NVLS will rely on manual data input from the appropriate NVS item managers since the number of lines and quantities are primarily static. Appendix A lists the vendors that store and maintain VMI and CSI and the types of items for which the NVLS systems integrator must establish asset visibility.

The systems integration contractor will be responsible for setup and configuration of the software and hardware hosted at the National Information Technology Center (NITC), migrating historical information from the Consolidated Logistics System (CLS) at the National Logistics Support Center (NLSC) to the NVLS. The contractor will configure the NVLS IT system to meet business process functional requirements (workflow), development of add-on software (if applicable) to fully meet NVLS business processes, provide functional user training during implementation, provide Sterling Commerce software licenses, and Tier III help desk supports/operations during and after the “Go-Live” implementation period

NVLS must be able to support both routine day-to-day customer ordering, inventory management, and warehouse management requirements as well as support 24-hour emergency response operations. A high-level list of the requirements for the system is as follows:

- ❖ Provide a “Bolt-On Application” to provide uninterrupted support to the animal tagging system currently supported by the CLS
- ❖ Provide kit building and management support, reconstitution, and reporting system
- ❖ Provide a barcode label-friendly supply chain management solution for warehouse management
- ❖ Provide for an asset-tracking system to identify what items are manifested on each deploying trailer
- ❖ Provide real-time visibility to kit order fill status by project and work order for “make to order” and “make to stock”
- ❖ Provide a user friendly ad hoc reporting capability
- ❖ Provide a capability to manage multiple inventory types (SMI, VMI, and CSI)

- ❖ Provide Web-based remote access support
- ❖ Provide for veterinary material inventory, warehouse, and distribution management support for the NVS
- ❖ Meet NITC information assurance requirements to include providing role-based security
- ❖ Create a system with the following:
 - A highly configurable solution for all order and inventory-management types and processes
 - The capability to manage and view inventory across an extended supply chain
 - A global multi-site inventory visibility application
 - The ability to reconcile purchase orders versus product receipts
 - A monitoring capability to validate supplier performance

3.1.3 Information Technology Systems Future (To-Be) State

3.1.3.1 Animal Health and Surveillance Management Future State

The AHSM future state will:

- ❖ Design a modular Web-based system to assist animal health officials in managing their animal health programs more easily, with a focus on data integrity and strict data standards so that information from external systems can be easily imported into the UDB, and UDB data can be easily merged with cooperating State and Federal systems.
- ❖ Integrate additional programs such as pseudorabies, avian influenza, bovine spongiform encephalitis, and Johne's disease into the system.
- ❖ Provide software support for PIN for all disease programs. Currently, MIM software is available for testing of scrapie, tuberculosis, and chronic wasting disease.

3.1.3.2 Veterinary Services Process Streamlining Future State

The VSPS future state will:

- ❖ Integrate data from multiple sources into a single relational database and provide a single enterprise solution for all VS import, export, and veterinary accreditation stakeholders
- ❖ Aggregate or link additional data or data sources that are needed to analyze animal/animal product flow with respect to risk of disease
- ❖ Integrate with GPEA and IDs e-Government initiatives
- ❖ Provide a one-stop, 24x7 source of information for individuals and businesses participating in the international movement of animals and animal products
- ❖ Provide individuals and companies involved in the international trade of animal and animal products an electronic format to secure necessary certifications/endorsements, complete required forms that are not in the APHIS ePermits System, and provide information about the requirements and regulations relevant to the commodity of interest

- ❖ Enhance or replace currently used forms with electronic means of capturing and storing the same data
- ❖ Minimize duplication of efforts through elimination of stovepipe systems

The VSPS system architecture is designed to ensure that the infrastructure conforms to the principles and standards of the most current USDA enterprise architecture (EA). These USDA EA requirements are included in the technical standards for the implementation of the VSPS system. The VSPS system interfaces with a number of external systems either directly or through a staging area. Figure 3-2 provides a high-level view of the data flow within VSPS system. In this figure, VSPS is optimized to function as a repository for information pertaining to animal import and export and for the accredited veterinarian's data. The VSPS system interfaces with a number of external systems either directly or through a staging area.

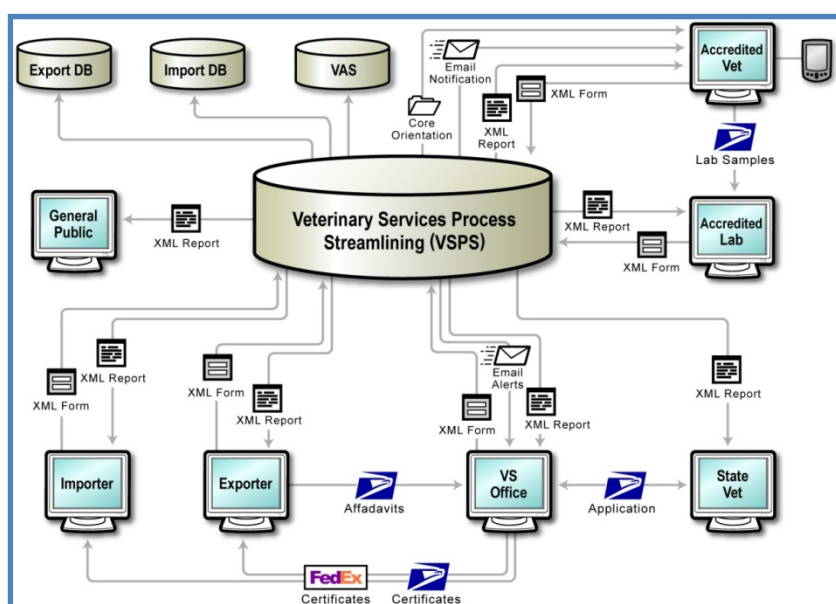


Figure 3-2. Data Flow within VSPS

NOTE: A more detailed discussion of VSPS proposed hardware architecture, with specific information provided on processor capabilities, storage requirements, communication line speeds, and middleware platforms or other hardware needed to integrate the proposed system into an existing network can be found in the *High-Level System Architecture Design*, Version 6.0, dated January 29, 2007.

3.1.3.3 National Animal Health Laboratory Network Future State

The NAHLN future state will:

- ❖ Make the program national and comprehensive across populations—providing accessible, timely, accurate, and consistent animal-disease laboratory services nationwide
- ❖ Introduce standardized terminology and methods of data entry
- ❖ Provide laboratory data to meet epidemiologic and disease-reporting needs
- ❖ Maintain the capacity and capability to provide laboratory services in support of responses to foreign animal-disease outbreaks or other adverse animal-health events

- ❖ Focus on diseases of livestock (exotic, zoonotic, and emerging diseases), while including diseases of nonlivestock species

3.1.3.4 Emergency Management Response System Future State

The EMRS future state will:

- ❖ Integrate with NAIS to avoid building a duplicative mapping function in the respective applications
- ❖ Function as the user interface for requesting data from the National Premises Information Repository and/or the Animal ID Number Management System (AINMS) based on a positive test result returned
- ❖ Promulgate the use of its modeling and analysis modules that consist of (1) North American Animal Disease Spread Model (NAADSM), (2) Farm Location and Population Simulator (FLAPS), (3) EMRS Saturation Model application, and (4) Emerging Veterinary Events (eVe) application
- ❖ Support nonanimal APHIS-level emergency responses through the Employee Profile Module (EPM)
- ❖ Generate data using CAP format and support EDXL in the Emergency Operations Centers involved in the management of national-level disasters
- ❖ Incorporate emergency management software and network tools for incident coordination and management awareness for the basic veterinary functions of surveillance, diagnostic testing, tracing, and quarantine and movement controls
- ❖ Introduce a vital utility tool of a VS Comprehensive Emergency Management Program (CEMP) with defined processes for mitigating threats, and preparing for, responding to, and recovering from animal disease and nonanimal disease emergencies

3.1.3.5 National Animal Identification System Future State

The NAIS future state will:

- ❖ Integrate with EMRS to avoid building a duplicative mapping function in the respective applications
- ❖ Facilitate full integration with VSPS system
- ❖ Be capable of identification of all animals and premises through Federal, State, and or industry partnership within 48 hours after discovery of a disease outbreak
- ❖ Implement common data-sharing standards to advance and accelerate a low-cost implementation strategy by creating a technical solution that meets the USDA's needs while also protecting producer privacy concerns

3.1.4 Future Strategies

3.1.4.1 Veterinary Services Business Intelligence Strategy

VS' business intelligence (BI) vision strategy shall be documented in a BI Strategy Plan to ensure that implementation of specific technology or a data structure remains focused on the BI objectives disease surveillance and management.

VS' BI Strategy Plan will start with high-level diagrams, broad policy statements, and general definitions. As the BI environment grows, details will be added to the strategy document. The plan will offer insight into VS BI environment, with the focus on communicating:

- ❖ What is to be built
- ❖ How it will be built
- ❖ When it will be ready to meet user requirements

VS' BI Strategy Plan at a minimum will include four core components. Each of these components will provide VS' partners and stakeholders with a unique perspective of VS BI environment being planned.

- ❖ Conceptual View
- ❖ Data Architecture
- ❖ Technical Architecture
- ❖ Implementation View

VS' conceptual BI architecture shall be used as a road map for the enterprise initiative and guide for architects and project planners to define and describe individual components. The VS conceptual BI technical diagram in Figure 3-3 provides a broad overview of the entire BI vision that is useful for illustrating how all the BI technology fits together and assists with both the strategy definition and subsequent implementation planning.

BI enables VS to get more valuable, insightful, and actionable business intelligence information from its database systems by generating the ability to extract meaningful (actionable) information from VS' business applications—in a way that enables VS and its partners to make better informed, intelligent business decisions.

VS' strategy for BI reporting consists of two preliminary steps: (1) Properly design and structure VS' business databases (capture and define the semantics, relationships, and dependencies among the discrete bits of information); and (2) properly design associated reports, so that the database information can be viewed in ways that support the disease surveillance and management process. Figure 3-4 shows information flow in BI custom report design.

3.1.4.2 Data Architecture View

VS data architecture will provide an understanding as to what data structures are to be implemented, how the data are stored in each and how the data will propagate throughout the warehouse environment.

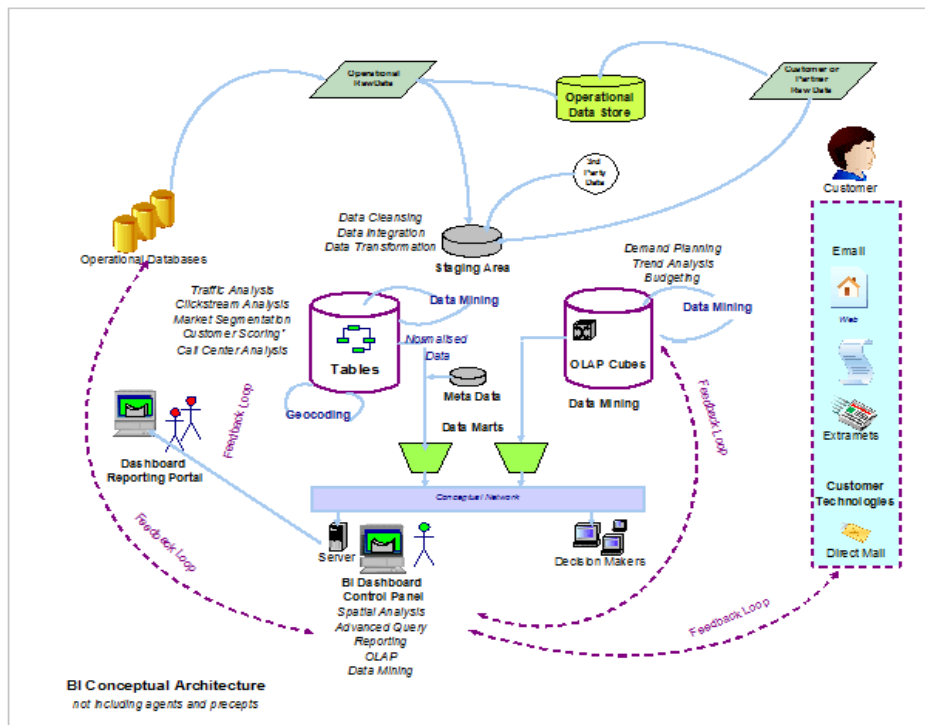


Figure 3-3. Conceptual Business Intelligence Architecture

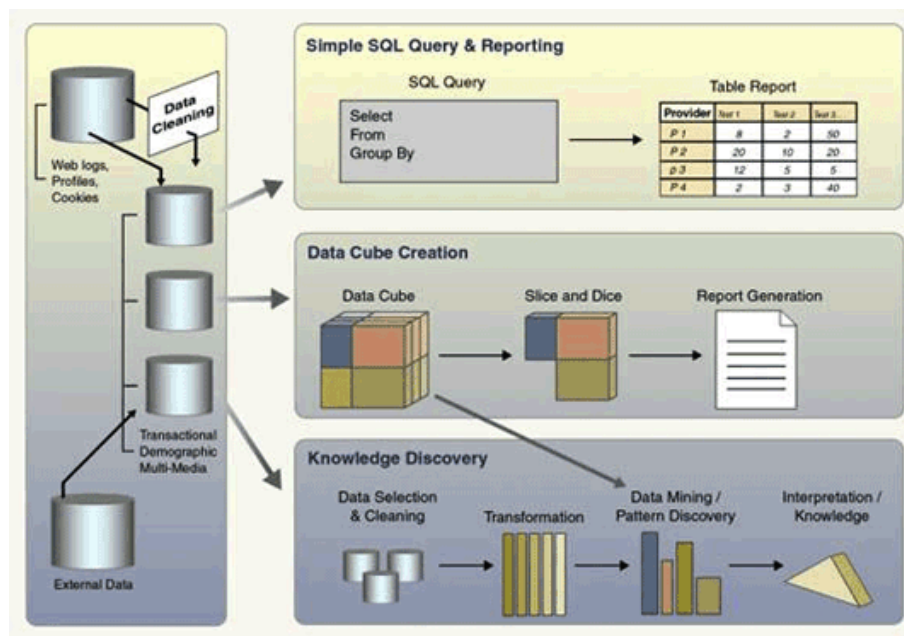


Figure 3-4. Business Intelligence Custom Report Design

Creation of a single repository is a significant effort to amass a huge amount of data. The volume of the data determines the amount of resources required to do the query, which can become expensive. Therefore, there should be a plan to limit searchable credentials within the repository. This will curtail the query maintenance cost yet still provide the most valuable search returns possible.

This performance optimization will be accomplished by avoiding credentials that are only minimally identifying. Many animal identifiers are really only useful within a single grouping (such as herd, flock, gaggle) and could appear in many groupings with the exact same values. This can be useful in the data as “confirming” identifiers, when there are multiple rows based on “highly identifying” credentials returned. These secondary identifiers will then serve to locate the correct records for the animal that is being traced and separate out the similar records that are clearly for another animal. However, if these secondary-level identifiers are allowed to be in the main search, they could return dozens, or even hundreds of animal records that are almost all animals of no interest. This illustrates the need to promote methods to maximize the number of “highly identifying” credentials that are in the search, while minimizing the number of “secondary identifiers” in the search. A secondary benefit of this filtering is keeping the total size of the repository down. Research into GDB credentials, indicates that there are at least as many secondary identifiers in the data as there are highly identifying ones. Therefore, there is a need to filter the credentials that are being stored, to avoid a table size that will probably exceed 400 million on the initial load.

Initial proposals to accomplish this task have centered on recognizing certain credential formats that are sufficiently unique, but a more generic approach should be considered. The challenge for using specific formats to identify the acceptable credentials is twofold. The processing time to match any particular ID against a set of formats will be quite expensive. Additionally, this technique will be prone to missing potentially qualifying identifiers that are not in an identifiable format and coded for. As new formats need to be added, reprocessing the whole load is essential to look for those “missed” credentials that could have been loaded in the initial load, but were not identifiable. A more generic approach could yield more complete results with minimal missed credentials on the initial load.

This generic mechanism would look at credentials in a statistical manner. That is, how many letters and numbers does it take to be a combination that would be statistically unlikely to duplicate very often? A credential that has a few duplicates is still a unique enough identifier that would get returned data that can be filtered down to the exact matches with minimal work. Two or three matches of a unique credential would give data about the animal being traced without getting a null return because the credential in place is not unique. On the other hand, two or three-dozen matches might obscure the desired data in the small flood of secondary qualifiers. Based on this concept, there is a need to look at the combinatorial magnitude of the allowed patterns and determine if any specific patterns need to be excluded because they cannot be unique enough.

3.1.5 Technical Architecture View

VS BI technical architecture will focus on tangible components of the BI environment. Components will be described sufficiently, with technical diagrams and related textual detail. Furthermore, VS’ technical architecture diagram will provide a general understanding of the current architecture as well as future architecture as details are confirmed. The technical architecture will evolve as updated versions as necessary.

3.1.6 Implementation View

VS' implementation view will start as a high-level perspective, with detail added as it becomes known. This view will be compiled by designers and project planners to:

- ❖ Establish the guidelines necessary for building and maintaining the purposed warehouse structures and related technologies
- ❖ Detail the implementation of core processes
- ❖ Outline the sequence of establishing data structures
- ❖ Display three distinct perspectives in the implementation view: the overall strategy, architecture, and process

3.1.6.1 Strategy

The strategy subsection includes:

- ❖ Timelines and resource availability schedules to help planning and prioritizing of BI iterations, using process flows.
- ❖ Funding

3.1.6.2 Architecture

The technical architecture includes details such as:

- ❖ Size and performance requirements
- ❖ Data quality issues
- ❖ Metadata control and retention policies

The purpose is to indicate potential areas of impact, such as, retention policies that will impact both data architecture (partitioning) as well as technical architecture (disk storage).

3.1.6.3 Process

Outlines high-level process issues such as:

- ❖ Refresh rates
- ❖ Backup/recovery
- ❖ Archive
- ❖ Workflow
- ❖ Security

3.2 Protecting Sensitive Data

VS is required to adapt and develop systems proven to be secure and reliable by established industry standards. With many high-profile cases of data corruption and sensitive data falling into inappropriate

hands, data security is a major concern throughout Federal IT systems. VS will also focus on data integrity and strict data standards so that information from external systems can be easily imported into the VS' database repository.

VS and its stakeholders and partners must protect sensitive data in its many forms such as electronic, printed, and voice. It would be considered negligent if a bank has its outer doors locked and left the vault's doors open at night. Likewise, it will not be acceptable for an enterprise to lock down the network and leave databases vulnerable. Selectively protecting the most sensitive data that is in databases from unauthorized access is critical.

As more and more of the world's critical animal disease information, commerce, and transport communications exist in digital form, the door will open to a new world of connected experiences. Increasingly, VS' stakeholders, partners, and field agents envision a world of anywhere access—a world in which the information and the content that they value is available instantly and easily, no matter their geographical location. Ultimately, anywhere access depends on whether one can create and share information without fear that it will be compromised, stolen, or exploited.

3.3 Federal IT Architecture Governance

VS and the national animal State health officials are committed to work together on enhancing their IT systems and streamlining the exchange of data flow between their respective systems.

Through collaboration and more transparency surrounding information technology software development, both at the Federal and State levels, a direction is being established for the future on how animal health surveillance and monitoring information can be more efficiently, effectively, and securely shared to safeguard our nation's livestock and poultry through surveillance and monitoring activities.

VS is undergoing an enterprise architecture review to identify processes and methods concerning collection or delivery of mission-critical electronic data or information to its systems. In preparation to facilitate a collaborative data repository environment within its enterprise architecture, VS' vision takes into account strategic and agency guidance for implementing an enterprise architecture framework in support of this initiative. These include the Federal Enterprise Architecture Framework (FEAF), Practical Guide to Federal Service Oriented Architecture (PGFSOA), and the USDA Enterprise Architecture Transition Plan.

3.3.1 Federal Enterprise Architecture Framework

The U.S. Federal CIO council published *A Practical Guide to Federal Enterprise Architecture* (Version 1.0) in February 2001 in a cooperative venture with the General Accounting Office (GAO) and the Office of Management and Budget (OMB). The purpose of that document is to provide guidance to U.S. Federal agencies in initiating, developing, using, and maintaining their enterprise architectures. The guide offers an end-to-end process to initiate, implement, and sustain an enterprise architecture program and describes the necessary roles and responsibilities for a successful enterprise architecture program. The guidance presented in the practical guide should be tailored by each Federal agency according to its needs.

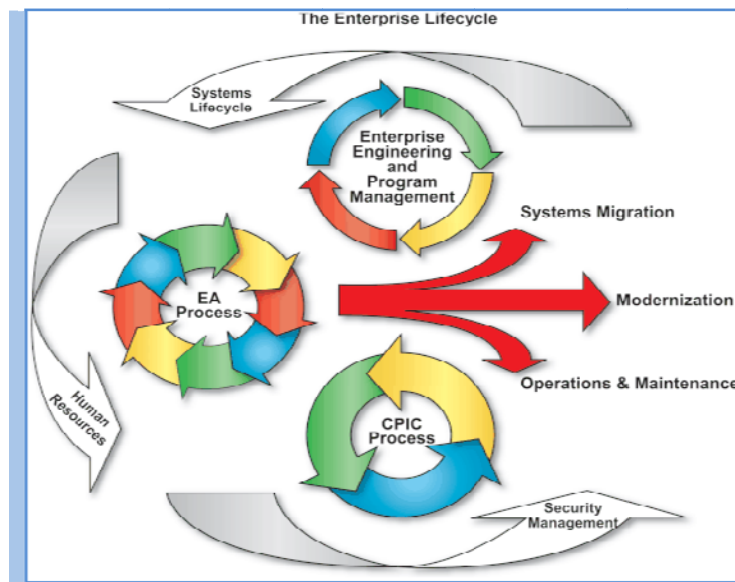


Figure 3-5. FEAF Enterprise Lifecycle

The guide focuses on enterprise architecture processes, products, and roles and responsibilities. The guide addresses how enterprise architecture processes fit within an overall enterprise lifecycle; namely, by describing in detail how the enterprise architecture processes relate to enterprise engineering, program management, and Capital Planning and Investment Control (CPIC) processes.



Figure 3-6. FEAF Control and Oversight

At the initiation of its enterprise architecture program, each agency should establish the scope of its enterprise architecture and formulate a strategy that includes the definition of a vision, objectives, and principles.

Executive buy-in and support should be established and an architectural team formed within the organization. The team defines an approach and process tailored to agency needs. The architecture team implements the process to build both the baseline and target architectures. The architecture team also prepares a sequencing plan for transitioning systems, applications, and associated business practices, based on gap analyses and business drivers. Projects are selected and controlled in the CPIC and the enterprise engineering and program management processes and are guided by, and compliant with, the enterprise architecture. Lastly, the architecture is maintained through a continuous modification to reflect the agency's baseline and target business practices, organizational goals, visions, technology, and infrastructure. The FEAF provides direction and guidance to Federal agencies for structuring enterprise architecture.

The FEAF describes eight components of enterprise architecture: Architecture Drivers, Baseline Architecture, Transitional Processes, Architectural Models, Strategic Direction, Target Architecture, Architectural Segments, and Standards.

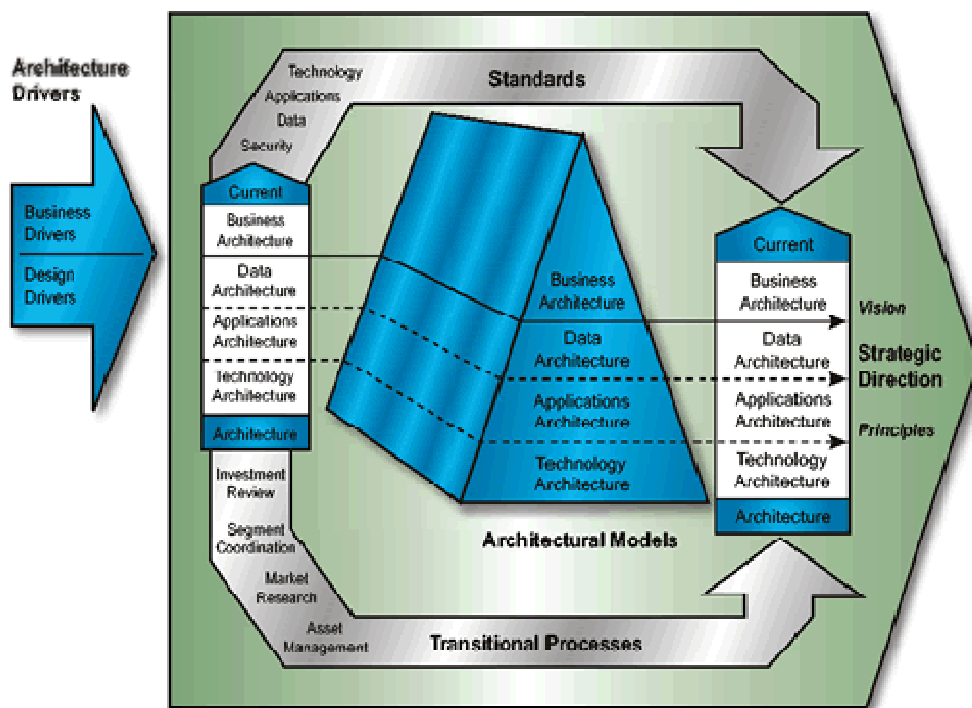


Figure 3-7. FEAF Components

The FEAF also provides direction for establishing “Federal segments”, which are cross-agency business areas (such as international trade, grants, and common patient records) that transcend Federal agency boundaries. Collectively, these Federal architectural segments constitute the Federal Enterprise Architecture. The FEAF partitions a given architecture into business, data, applications, and technology architectures.

3.3.2 Practical Guide to Federal Service Oriented Architecture (PGSOA)

Because of increased need for the effective delivery of Government services, and requirements for increased information sharing and collaboration within constrained budget, agencies are under tremendous pressure to deliver through their IT investments.

In particular, Federal CIOs and chief architects who are responsible for a broad set of goals defined by the Federal Enterprise Architecture Program can realize the following spectrum of benefits for pursuing service oriented business, data sharing, and technology infrastructure transformations.

Implementation of a service-oriented architecture (SOA) provides agency benefits that are outlined below.

- ❖ Improved Government Responsiveness. SOA can enable agencies to better respond to the challenges they face. By employing services to isolate business functionality within architectures, the impact of changes can be mitigated, parallelism can be introduced to allow more change initiatives to proceed concurrently with shorter lifecycles, and IT investments can be better managed and measured to deliver mission/business value more effectively. Additional features include:
 - Increasing speed at which critical mission capabilities are added
 - Improving agencies' ability to respond to changing demands rapidly
 - Implementing more effective service and information discovery and reuse capabilities
 - Offering new functionality for end users/citizens and produce better communication between citizenry and Government
- ❖ Simplify delivery of enhanced Government services
 - Enable broader and more consistent access to data and information
 - Enhance the ability of agencies to modernize their business processes and systems more rapidly and effectively
 - Implement more effective models for the specification, procurement, and operating effectiveness of services
 - Manage shared value streams across Government organizational boundaries to facilitate the delivery of common services to citizens
- ❖ Contribute to a more efficient Government
 - Find ways to leverage public and private sector investments collaboratively to innovate IT architecture and drive business and mission improvements
 - More effectively use the agency IT budget through the reuse of existing capabilities; more effective staff utilization through common training and modernization of skill sets
 - Foster consistency, discipline, and control through cross-domain governance of IT
 - Develop infrastructure and bridge the gap between business and IT stakeholders

- Create cross-domain/cross-agency trust, data access, and semantic interoperability to enable an increased use of shared services
- ❖ Promote information sharing
 - Provide an effective, efficient, and reproducible approach to implementing reusable data exchanges
 - Take logical interoperability coming from collaborative data modeling and architecture activities and turn it into physical, on-the-wire interoperability
- ❖ Increased transparency and resilience
 - Provide a shared, standards-based infrastructure
 - Enable consolidation, simplification, and optimization of IT infrastructure for audit ability and continuity of operations, while maintaining appropriate levels of security
 - Support an effective integration approach to deal with the rationalization of the enterprise applications and diverse technology infrastructures

To meet today's challenges, Federal CIOs and chief architects must find new and more effective ways to develop, deploy, and apply their IT assets. Implementation of SOA can provide Federal CIOs and chief architects the environment and tools to deploy IT resources more effectively. There are many reasons Federal organizations should embrace SOA today. Some of the reasons are technological and others are driven by recent changes in the Federal IT environment, but the primary reason is that SOA has the potential to substantially improve the ability of Federal organizations to execute their mission.

3.3.3 USDA Enterprise Architecture Transition Plan

Over the past few decades, IT has changed dramatically and continues to rapidly change the way in which the USDA conducts its business. It is for this reason that attention to enterprise architecture becomes critical to the achievement of an organization's mission, in terms of both business performance and management. As agencies' IT become increasingly complex, processes must be put into place to increase efficiency and reduce the cost of maintaining IT.

The USDA's EA Transition Plan is a high-level strategic roadmap for IT modernization. It is a plan for supporting the recently approved iteration of the target EA, which depicts the desired future state of USDA's performance goals, business, applications and services, technology, data, and security.

The primary purpose of the USDA EA Transition Plan is to define and sequence the activities needed to yield to the desired future state according to priorities, dependencies, and constraints. It is this path for IT modernization, driving both investment in and implementation of systems and technologies, which will transform USDA's business. The transition activities defined within this plan will become the program USDA executes to achieve IT modernization.

This EA Transition Plan is comprehensive, addressing all of USDA's organizational units and business operations. It prescribes a high-level roadmap for USDA to modernize its operations and computer systems. The EA Transition Plan is the result of:

- ❖ Architectural drivers, such as USDA's strategic plans and priorities, milestone commitments to the OMB, and audit/report findings

- ❖ USDA's target enterprise architecture and other EA artifacts
- ❖ Improvement opportunities, such as potential opportunities for reuse and sharing of common services, business collaboration, and technology refresh
- ❖ Transition/implementation plans and other EA artifacts from across the Federal Government

The EA Transition Plan is applicable to all USDA component agencies and staff offices. USDA executives, managers and staff are encouraged to read, discuss and comment on this document. While the plan represents a complex and intensive modernization effort, it can be accomplished by dividing the overall plan into manageable increments.

As USDA continues to move forward, it must seek and commit resources to modernization. There will be many decision points along the way and the EA Transition Plan will serve as a guide. The first steps will likely be the most challenging, as USDA establishes new ways to examine and manage its operations and supporting computer systems. To succeed, USDA must fully engage in proven management practices to achieve its IT modernization objectives.

3.4 Data Standardization

Data standards are the foundation of building a solid surveillance system and data management systems that will ease the VS decision making. Presently, the current database systems in place do not fully meet standards requirements. The lack of standardization of data elements and integration within U.S. animal health data systems is the most significant challenge today in conducting successful animal traceback and controlling animal disease. To overcome this challenge, common data elements and modern technology must be applied so that separate databases can communicate with each other. This standardization will enable animal health officials to access accurate and complete traceback information, which is maintained by multiple sources. When an outbreak occurs, animal health officials must identify the specific animals involved or exposed including where they have been, when they were there, and in some cases, why they were there. Obtaining this information quickly significantly reduces the scope and magnitude of an animal disease investigation and minimizes the time and costs involved in these efforts.

Significant progress has been made within the VS in formulating standards that establish a foundation for building surveillance and data management systems that will better ensure integration and aggregation of surveillance data to facilitate accurate estimates, address pertinent issues and inform decision makers. Current data standardization approaches within the VS are discussed below.

3.4.1 Current Veterinary Services Data Standards

The NAHLN information technology system is a standards-based solution for electronic messaging and coding laboratory diagnostic data for both test orders and results. The value that a standards-based solution provides is a common language for all participants. This means that participants can translate data from their system to a well-defined and agreed-upon message structure to transfer and share data. This is important to VS and other animal health entities because, in many cases, diagnostic data are missing from surveillance systems due to the traditional requirement of duplicate data entry once at the laboratory and again at the area or State offices. The NAHLN increases the potential that vital

diagnostic data will be included in surveillance data sets. The standards that the NAHLN uses are HL7, LOINC, and SNOMED. These three programs create the data standards foundation for animal disease management systems.

3.4.1.1 Health Level Seven

HL7 reaches far beyond the needs of laboratory data exchange for veterinary medicine. It is one of several American National Standards Institute (ANSI)-accredited Standards Developing Organizations (SDO) operating in healthcare arena. The HL7 Version 2 Messaging Standard Application Protocol for Electronic Data Exchange in Healthcare Environments is considered to be the workhorse of data exchange in healthcare and is the most widely implemented standard for healthcare information in the world. Part of the mission of HL7 is to provide standards, guidelines, methodologies, and related services for interoperability among healthcare information systems. The NAHLN utilizes segments of HL7 related to the creation of messages for laboratory orders and observations. The segments are highly organized message structures that define data standards and rules for data exchange. Items such as security, identification and system negotiations can also be formulated into the messaging standard, allowing systems to become more interoperable. "Health Level Seven" refers to the highest application level of the International Organization for Standardization (ISO) communications model for Open Systems Interconnection (OSI). The application level addresses definition of the data to be exchanged, the timing of the interchange, and the communication of certain errors to the application. The seventh level supports such functions as security checks, participant identification, availability checks, exchange mechanism negotiations and, most importantly, data exchange structuring. The current version of HL7 uses Extensible Markup Language (XML) encoding and the initial release of Version 3 of HL7 will also be based on XML encoding.

3.4.1.2 Logical Observations, Identifiers, Names and Codes

LOINC provides a set of codes that resolves idiosyncratic values in coding. LOINC is a formulation of coding standards for laboratory and clinical observations. Including approximately 32,000 observation terms, each record in the LOINC database identifies a clinical observation containing a six-part name, a unique name for tests identifying code with check digit, synonyms, and other useful information. In addition, there are LOINC records that apply to all tests with equivalent clinical results. LOINC has been endorsed by many large industry, commercial and Government entities. There are comprehensive coding standards for clinical observations in the following subjects:

- ❖ Surgical Pathology
- ❖ Immunology/Serology
- ❖ Toxicology
- ❖ Microbiology
- ❖ Molecular Genetics

3.4.1.3 Systemized Nomenclature of Medicine

SNOMED is a second important set of codes used by the NAHLN. SNOMED provides a scientifically validated clinical reference terminology that offers a common language to enable consistent methods of capturing, sharing, and aggregating human and animal health data across many

medical specialties. The terminology and coding contained in SNOMED includes over 357,000 health care concepts with unique meanings and formal logic-based definitions, which are organized into hierarchies with a fully populated table containing over 957,000 unique descriptions for each concept. Subject taxonomy concepts represented by Linnaean classification, groups, breeds, and strains are organized within the SNOMED CT® Veterinary Adaptation hierarchy. This hierarchy can be used to navigate from a high granularity (e.g., bovine) to a lower granularity (e.g., Black Angus) for promoting data entry efficiency. This is supported by pull-down, data entry selection lists specialized for the type of subject observed. The hierarchy can also be used to group lower granularity animals (e.g., cattle and bison) into higher granularity groups (e.g., bovine). Full utilization of this hierarchy is maximized if the information model used to store this data represents the generic concept “taxonomy,” and this data element is able to store either the Linnaean classification, group, breed, or strain. Rather than model and store each of the above data elements separately (e.g., breeds are stored separately from species) and requiring all or a subset for each animal recorded in the database (e.g., “bovine” group, “Bos Taurus” species, and “Black Angus” breed are all stored), only a single taxonomy data element will be required (e.g., “Bos Taurus” breed).

This single data element will capture the animal taxonomy classification specified to a reasonable level of confidence. For example, if an individual that observes a sheep is not confident that they know the breed, but are confident that the animal is a domestic sheep, the subject species “Ovis aries” will be stored. Information systems that are able to model and process this taxonomy information using the SNOMED CT hierarchy will be able to group or aggregate this animal accurately as part of the “Sheep” animal group. Data entry personnel can be provided guidance to select the breed (or Linnaean taxonomy) level of detail appropriate to their level of confidence. Data retrieval personnel may be provided a system that supports navigation through the various levels of hierarchy in order to identify the level of detail useful for performing accurate aggregation of comparable animals based on species, animal group, or breed.

A standards-based solution for the communication of diagnostic data provides the necessary common language for electronic sharing of laboratory orders and observations. The NAHLN affords opportunities for system interoperability, increased data quality and comparability. The NAHLN is certain to be instrumental in helping to build an integrated approach for laboratory diagnostic and surveillance related applications.

3.4.1.4 Surveillance and Data Standards for USDA APHIS Veterinary Services

The *Surveillance and Data Standards for USDA APHIS VS* manual was created as a foundation for building information management systems and surveillance systems. These standards ensure that VS surveillance supports confident decision making through a standardized and methodical manner to collect the most appropriate information and make it available to address the pertinent issues at the minimum cost. The *Surveillance and Data Standards for USDA APHIS VS* manual was completed by the CEAH. The project was coordinated by the National Surveillance Unit (NSU) and represents a collaborative effort by multiple units within CEAH.

The manual, which provides standards and guidelines for the construction and operation of a surveillance system, represents an essential element of the National Animal Health Surveillance System (NAHSS). A primary objective of the NAHSS is to provide greater protection from endemic, emerging, and foreign animal diseases through enhanced information made available to decision makers. Timely and useful animal health information depends on the collection and accessibility of

accurate, valid, and representative surveillance data. Standardization introduces consistency in the way data are collected, stored, and made available, and streamlines the integration of a vast number of data sources from multiple entities and locations.

The standards establish a foundation for building surveillance and data management systems that better ensure integration and aggregation of surveillance data to facilitate accurate estimates, address pertinent issues, and inform decision makers.

The *Surveillance and Data Standards for USDA APHIS VS* manual includes three chapters plus Appendices.

Chapter 1 includes standards for the key components of a surveillance system, is intended to assist planners and managers in considering specific purposes, objectives, design strategies, reporting systems, implementation methods, expected outcomes, and long-term system maintenance. The guidelines ensure that the collection, organization, and analysis of appropriate data are considered before surveillance is implemented. In addition, the manual offers guidelines for review and evaluation to make certain that the surveillance system is achieving its objectives and meeting the standards.

Chapter 2 includes standards for data categories and classes, provides guidelines for epidemiologists and database developers on the type and format of data to be gathered. This chapter identifies the commonly used data classes in animal health surveillance systems and provides standard specifications for recording these fields. While the data categories and classes described do not include all fields necessary to address the specific needs of a particular surveillance system, they are intended to provide a helpful starting point for a data dictionary.

Chapter 3 includes standards for the VS' animal health surveillance database systems. These standards ensure the proper structuring of data systems for easy integration with new and existing databases, as well as proper data entry and storage. This chapter also addresses data confidentiality, security, and quality, and describes expectations for designing, implementing, and managing the VS data systems developed for national animal health surveillance.

3.5 Interfaces

The need to use or develop fully integrated (i.e., functional, secure, and interoperable) IT systems is a critical component of the VS IT Roadmap.

To have an increased effectiveness in acquiring and administering resources by promoting compatibility and interconnectivity of hardware and applications, the VS' OCIO ensures that standards are aligned with VS' enterprise architecture business goals and processes.

USDA and States incorporate electronic data capture and reporting into existing programs and information systems. Incorporation of electronic data capture and reporting technologies into existing disease programs will improve the overall integrated communications strategy. Industry efforts are encouraged to integrate automated data capture technologies with disease programs and establish necessary interfaces with VS' information systems. Strategic integration of technologies will improve efficiency and accuracy of data collection.

3.5.1 Veterinary Services' Database Interfaces

The Automated Web-based Data Submission (AWBDS) module of the GDB system is the current VS reporting mechanism used to store and report on the national status of various diseases surveillance programs including brucellosis for cattle and swine, tuberculosis, pseudorabies, Johne's disease, and equine infectious anemia. AWBDS is a process by which States use to submit, review, and approve their monthly/quarterly animal disease program data for the VS national disease surveillance status reports.

3.5.1.1 Current AHSM Interface

AHSM interface architecture consists of a combination of Java 2 Platform, Enterprise Edition (J2EE) and Oracle Web forms. As new databases have been created for new disease programs, database structures have been upgraded. The AWBDS is the current method that States use to enter their detailed surveillance data entry submission work to the original legacy GDB. The Legacy GDB User Interface is Client Server Oracle based. The Scrapie program uses an upgraded version of the GDB Legacy system that is of a web based Oracle design and utilizes Synchronous XML messaging.

Newer disease program developments, including BSE, classic swine fever, and avian influenza, have been created around VSLS and provide no direct data-management interface of the repository of record. Data entry is accomplished in the VSLS modules. Data correction, which is solely based around the original laboratory submissions, is also done in the VSLS, using the Data Correction Interface. Reporting is all canned reports provided through the VSLS interface. Web Java Server Pages is the user interface, with messaging employing synchronous XML.

VSLS is the frontend for many recent VS surveillance systems dependant on laboratory testing data alone. VSLS collects and buffers data in a frontend Web data buffer (WDB). It then electronically submits the data to the laboratories to match up with the samples that have been received for testing. The results from this testing, combined with the data keys provided by VSLS become the results message that the laboratory sends back to VSLS. From the message, results are posted to the WDB frontend for the submitter to review and to the repository of record for the program to analyze. The VSLS user interface is Web Java Server Page based and messaging is asynchronous HL7 or asynchronous XML. Application interfaces include Rhapsody and HL7 or Rhapsody and XML.

AHSM also includes mobile information management systems. Tablet devices employ Micro Forms as the user interface and PDAs use NET Forms as the user interface.

3.5.1.2 Current VSPS Interface

VSPS data are originally saved in an Oracle database but can be transmitted as XML-formatted data and schema that can be shared or exchanged using Web services and other technologies. Data can also be saved as flat files that can be dropped by batch jobs and picked during predefined times.

For users that have direct access to the APHIS intranet, the PC clients (Internet Explorer browsers) will access the Web/application server using secure socket layers (SSL) on the intranet. For users that do not have direct access to the APHIS intranet, entry points are provided

by dial-up, through a virtual private network (VPN), which is connected to the APHIS wide-area network (WAN) through a firewall.

VSPS interfaces with the following external systems, either directly or through a staging area: accredited veterinarians and laboratories, State and Federal animal health officials, Export Health Certificate System, Import Tracking System, premises allocator, pay.gov, eAuthentication server, User Fee System, and the general public.

3.5.1.3 Future VSPS Interface

The VSPS system is being designed within the framework of the existing USDA telecommunication infrastructure. The network architecture for the VSPS system will use the existing USDA/APHIS network architecture to communicate among all three tiers. The database and Web/application production servers at Fort Collins will communicate within the local area network (LAN).

3.5.1.4 Current NAHLN Interface

The NAHLN Information System includes laboratory registry, laboratory reporting, and document library modules. In the laboratory registry module, laboratories are registered in the system as part of the NAHLN. Information stored for each registered laboratory includes capacity and capability levels that support testing plans and strategies during both routine animal health surveillance and emergency outbreak response. In the laboratory reporting module, laboratories registered in the system can submit laboratory reports with test results as HL7 electronic messages sent directly from their laboratory information systems (LIMS). The NAHLN IT system both (1) routes the laboratory results to appropriate USDA VS program surveillance systems and (2) stores the laboratory result in an integrated national data repository. The laboratory results can be viewed online over the Internet with appropriate user role-based security access rights. The document library module is available for posting documents such as Laboratory Response Plans (associated with a laboratory's registry profile) and accessing a shared library for downloading posted documents.

The VSLS application is an Internet/Intranet Web-based application for inputting sample-related data from any Web-accessible location. Laboratories registered in the system can submit reports with test results as electronic messages sent directly from their LIMS. Laboratory results are routed through the Center for Animal Disease Information and Analysis (CADIA) message router, which performs NAHLN data validation (e.g., checking against data requirements and formatting rules) and data processing (e.g., grouping, mapping, aggregation). It also includes automatically linking results to the original order. Human review for assessment of level of standards compliance and proper meaning (semantic validation) is also performed for new data-exchange interfaces.

3.5.1.5 Current EMRS Interface

The EMRS has been designed so that it can be accessed by any authorized person using Internet Explorer version 5.5 or greater from any computer having Internet access. A user does not need to have Lotus Notes installed on the computer or have a Lotus Notes ID. The user also does not need remote LAN dial (RLD) or to be on a secure network. This is very different from the previous version of EMRS that required the use of Lotus Notes on the user's computer to access the system through the client side interface. RLD provides remote node connections to LAN environments. With RLD, a

customer's remote users connect to their enterprise network and access applications from their remote PCs as if they were attached to the LAN back at the office.

Only personnel in a specific State or with a definite need-to-know are given access to a specific EMRS database. A link is provided in EMRS, on the Investigations Database Welcome Page to NAIS, to validate premises addresses and retrieve a unique Premises ID. All VS' program database systems handling data from activities performed on premises are using the same Premises ID system in NAIS.

3.5.1.6 Future EMRS Interface

In the future, EMRS may transition to a J2EE-based system.

3.5.1.7 Current NAIS Interface

The National Animal Identification System consists of a set of modules that perform registration, validation, issue National Premises IDs and perform animal trace processing. URL is the primary interface method for NAIS. A command and the data for that command are sent to the Allocator. XML is returned after the command has been processed.

There are two ways to enter data into the National Premises Information Repository (NPIR) module of NAIS. The first is through the NAIS Data Management Center (DMC) Web application, which is limited to use by exception administrators. The second is through the NAIS Premises Number Allocator Web service interface, which is used to eliminate the allocation of multiple National Premises IDs to the same location.

A username and password are needed to access NAIS functions. Valid applications include a list of functions that a user is authorized to perform. The scope of data that can be accessed is limited according to need to know. There is limited access to all data.

The Standard Premises Registration System (SPRS) is a Web-based application that allows registration of premises and assigns a nationally unique number to each registered premise. The SPRS interfaces with the NPIR through the Premises Allocator, using Application Program Interface (API) calls. Data concerning a premise are only accessible to the registrant of the premise.

The DMC is a Web-based application that is used to streamline research of nonstandard premise addresses, called *exceptions* and to grant National Premises IDs for premises that do not validate through normal procedures.

AINMS is a Web-based application used to track the manufacturer and issuance of the Animal Identification Numbers (AINs) under NAIS.

The Animal Trace Processing System (ATPS) is the application that supports the animal tracing function of NAIS. ATPS is a J2EE application. ATPS submits requests for information to private and State ATDs, and receives responses containing animal events that satisfy the request parameters. All interaction is done via Web services. The J2EE platform simplifies enterprise applications by basing them on standardized, modular components, by providing a complete set of services to those components, and by handling many details of application behavior automatically, without complex programming.

3.5.2 File Transfer Interfaces for State Partner Systems and Individual Users

AHSM – File Transfer Protocol (FTP) based local GDB loaders

NAIS – Batch Premises Process: Data management Center (DMC), SPRS

- ❖ User interfaces by document type:
 - Client Server Oracle
 - Oracle*Forms screens
 - Oracle*Reports canned reports
 - Runs on clients PC with direct access to Oracle databases
- ❖ Web-based Oracle types:
 - Oracle*Forms -screens
 - Oracle*Reports -canned reports
 - Runs on clients PC with direct access to Oracle databases
 - Oracle Discover Ad-Hoc Reporting
- ❖ Web-Java server page types:
 - HTML+Javascript+J2EEE Pages
 - HTML+Jasper dynamic reports
 - Runs in Web Server (Oracle Application Server(OAS)) with database access only from the server
- ❖ Lotus Notes types:
 - Lotus Documents screens
 - Lotus Reports canned reports
 - Runs on a Notes server with background access to a Domino database

3.5.3 Application Interfaces

The application interfaces as follows:

- ❖ **FTP+SQL*Loader.** Files (commonly CSV format) are received by user-specific logins and are processed into databases by direct loading using the Oracle SQL*Loader into the Oracle tables of the permanent repository. This interface method requires monitoring to identify and resolve file and process errors.
- ❖ **FTP+PL/SQL.** Files (commonly CSV format) are received by user-specific logins and are processed into databases by direct loading using Oracle SQL*Loader into temporary tables. PL/SQL routines then reformat and insert the data into Oracle tables of the permanent repository. This interface method is more robust than the direct load technique but still requires monitoring to identify and resolve file and process errors.

- ❖ **Rhapsody+XML.** Files with a well-defined self-documenting format (XML) are received by the Rhapsody Data Integration engine and are processed directly into Oracle tables of the permanent repository. This interface method is quite robust but still needs at least minimal supervision.
- ❖ **Rhapsody+HL7.** Files with an extremely well-defined self-documenting format (HL7) are received by the Rhapsody Data Integration engine and are processed directly into Oracle tables of the permanent repository. This interface method is quite robust but still needs at least minimal supervision.
- ❖ **Custom HTML+XML.** Files with a well-defined self-documenting format (XML) are received by the Custom Java Interfaces running under a Web Server and are processed directly into Oracle tables of the permanent repository by using Java Database Connectivity (JDBC) calls. This interface method is customizable and quite robust but still needs at least minimal supervision.

3.5.4 Messaging Interfaces

Messaging interfaces are as follows:

- ❖ **Synchronous XML.** Well-defined self-documenting data structures (message formats) are exchanged in a “wait-for-an-answer” mode. The providing service handles the message as soon as possible while the client waits for the answer. This interface method makes error reporting straight forward but can hold up the client application for long periods if the providing service is too busy.
- ❖ **Asynchronous XML.** Well-defined self-documenting data structures (message formats) are exchanged in a “mailbox” mode. The providing service handles the message when it has time and replies in a like manner to the requester. This interface method makes error reporting difficult but will not hold up the client application for long periods if the providing service is too busy.
- ❖ **Asynchronous HL7.** Extremely well-defined self-documenting data structure (message formats) are exchanged in a “mailbox” mode. The providing service handles the message when it has time, and replies in a like manner to the requester. This interface method makes error reporting difficult but will not hold up the client application for long periods if the providing service is too busy.

Section

4 IT Roadmap Conclusion Statements

VS continues its mission to increase visibility and be recognized as the national veterinary authority in the U.S. One path that supports this mission is designing and implementing a Comprehensive Emergency Management Program (CEMP) that facilitates a national animal health surveillance system capable of providing early warning of foreign, emerging, and other diseases/conditions that affects animal health and safety.

The IT Roadmap provides VS' stakeholders and State partners an inside view of the processes and systems currently employed with the VS' disease management and surveillance program. Furthermore, it outlines the future desired state of information technology within VS that will facilitate the creation of a national data repository for collaboration and sharing of animal disease management data with stakeholders and State partners.

VS next steps to facilitate successful progress down the road of data consolidation/integration into a national repository within the VS information system consist of:

- ❖ Developing the VS CEMP with defined processes for mitigating threats, and preparing for, responding to, and recovering from animal disease and nonanimal disease emergencies.
- ❖ Implementation of the five key initiatives of the execution strategy designed to facilitate the VS' efforts in migrating from the current state to a future state. The strategy constitutes a national data repository that will facilitate cross-agency data integration and sharing by VS' partners and stakeholders.

Section

5 IT Execution Strategy

The VS' IT Roadmap helps to convey the organization's vision for redefining IT systems and/or applications within VS from the current (As-Is) state to a future (To-Be) state. The modernization of VS' IT systems is needed to create a national repository for animal disease surveillance, management, and traceability data.

Although departments, agencies, and State programs each have some unique technology needs, by aligning technology at the enterprise level, and focusing investments on initiatives that promote collaboration across agencies and States, VS can maximize the value that its technology investments deliver to the organization, its partners, and stakeholders.

VS' IT vision is to maintain a single national animal health and surveillance management system that combines the functionality of applications currently in place, which support surveillance strategies for animal health management, emergency management, and process streamlining.

VS IT Roadmap execution strategy comprises five key initiatives, all of which directly support the migration from the current state to an integrated national data repository, while complying with applicable governing policies. Even with the divergent needs across the United States concerning animal disease surveillance and animal health management, these initiatives, when completed, will ultimately provide our partners and stakeholders timely access to critical data for national animal health management. The five key initiatives are:

- ❖ Initiative 1, Data Acquisition and Exchange, establishes the ability to routinely collect, exchange, and deliver pertinent animal health data from a variety of Federal, State, and private repositories.
- ❖ Initiative 2, Security, details data security requirements and practices that further the protecting of data, equipment, and associated processes.
- ❖ Initiative 3, Software Services and Delivery, identifies and develops new processes that will assist partners, stakeholders, industry, and companies in delivering critical information to the VS' data repository.
- ❖ Initiative 4, Governance, ensures compliance with information technology governance policies and procedures to guarantee continuity in planning, deploying, and maintaining technology solutions.
- ❖ Initiative 5, Modernize Legacy Information Technology Applications, provides for modernization of existing applications to satisfy current and future animal health management requirements.

5.1 Initiative 1: Data Acquisition and Exchange

As VS continues to develop key information technology systems, populating these systems becomes paramount in effective animal disease management. These systems will rely on information sources

located across the United States and will have a continued requirement to collect international data as well. It will be critical that such systems be architected to acquire data from multiple repositories across many locations for a wide variety of needs. Sound animal health management is a crucial feature in supporting animal disease management profiles, and the collection, exchange, and immediate delivery of information is the first step in safeguarding efforts.

Today, VS continues to build upon a technical architecture that will be capable of capturing these data in a routine manner, utilizing technologies that can assist in identifying key locations of data sources necessary to populate internal systems. These data sources may be other Federal agencies, State agencies, private-sector companies, and complimentary or necessary industries that can support national efforts in protecting the health of the U.S. livestock and affiliated populations.

Technologies, which have become standard within VS, include the use of thin-client software and hardware, which provide data collection at the production level. Examples of this hardware include PDAs, tablet laptops, and Smartphones. These devices, with Bluetooth-enabled technology, have enabled VS to collect a wide variety of information, in real time, to populate internal surveillance, traceability, and risk analysis systems.

5.1.1 Objective 1: Veterinary Services Will Continue to Research, Develop and Implement Mobile Information Management Solutions

VS will continue to develop new mobile information management data collection tools and solutions that support market-leading technologies, both in the hardware and software spheres.

Actions to Achieve Objective 1:

In FY 2009, the VS Office of the Chief Information Officer will:

- ❖ During the third quarter of 2009, in conjunction with National Animal Health Program staff, the VS OCIO will formulate an implementation strategy for current MIM solutions to enable State and Federal animal health officials to perform field testing and surveillance for VS animal health programs.
- ❖ Upon completion of the implementation strategy, the VS OCIO will continue to research, develop or purchase, implement, and train end users on VS MIM solutions used in field operations.
- ❖ During the fourth quarter of 2009, a MIM inventory module will be made available.
- ❖ During 2009, VS will continue to enhance MIM solutions for integration with third-party and State-based solutions by accepting files for upload and providing output files using common file-sharing formats.

In FY 2010, the VS OCIO will:

- ❖ Continue to build and make additional MIM solutions available for animal health programs.
- ❖ Enhance the design of the enterprise-reporting capabilities for MIM solutions to just-in-time reporting features.
- ❖ Determine a strategy for integration of MIM solutions with the VSPS application, making it possible for solutions to be deployed to accredited veterinarians.

5.1.2 Objective 2: Veterinary Services Will Continue To Develop and Implement an Enterprise Messaging Solution

VS will continue to develop new data exchange tools and solutions that simplify exchanging animal health data with key stakeholders and partners.

Actions to Achieve Objective 2

In FY 2009, the VS OCIO will:

- ❖ Create and publish standardized surveillance message schemas, including header information, core surveillance data elements, and primary data elements for several animal disease programs, such as tuberculosis, classical swine fever, wildlife avian influenza, bovine spongiform encephalopathy, and live bird markets.
- ❖ Create and publish terminology standards
- ❖ Design Web services for implementation terminology standards within VS systems.
- ❖ Create a secure-message invocation architecture with the ability to receive and validate a VS-published message, authenticate users, perform simple validation, and route data to VS repository for parking.

In FY 2010, the VS OCIO will:

- ❖ Create a data message distribution solution for routing messages stored in the data park to VS transactional, analytical, and external systems.
- ❖ Evaluate and select business process management (BPM) tools and solutions that will allow the delegation and control of simple messaging rules to VS system business owners.
- ❖ Evaluate and select enterprise service bus (ESB) tools and solutions.

In FY 2011, the VS OCIO will:

- ❖ Implement enterprise technologies for BPM and ESB.
- ❖ In the first quarter of 2009, the VS OCIO will publish several standards to assist partners, stakeholders, industry, and companies in delivering critical information to the VS' data repository. The Subject Matter Expert (SME) Office will lead this effort.
- ❖ In the second quarter of 2009, both the Technology and Applications Development Offices will create a secure data repository to continue the exchange of standardized data sent to the VS' data repository.

5.2 Initiative 2: Security

Data security is a common concern of VS, producers, and private animal owners. By respecting and protecting individual client privacy and sharing VS' privacy principles, our stakeholders, producers, and private animal owners will better understand how we keep client information private and secure.

Cooperative collaboration is vital to our business and surveillance programs, and for disease management, response, and eradication.

It is important to note that establishing an Information Security Program (ISP) is not a one-time event, but an ongoing venture that follows a cyclical process. The implementation phases (see below) are not cleanly separated processes, but instead represent a flow of activities that yield an ever-maturing program. The implementation cycle involves establishing information security requirements, educating people about their responsibilities under those requirements, building governance structures to ensure program compliance, and monitoring and reporting progress.

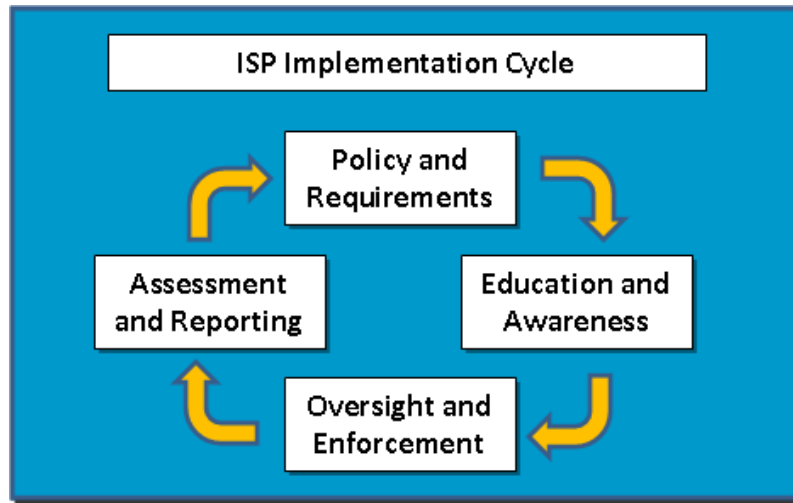


Figure 5-1. Security Program Implementation Phases

5.2.1 Objective 1: Continue To Support, Educate, and Implement the APHIS Information Security Program with Employees, Cooperators, and Stakeholders.

Actions to Achieve Objective 1:

- ❖ By October 2009, the VS OCIO will prepare verbiage to be entered into all cooperative agreements outlining the requirement of all APHIS employees, cooperators, and stakeholders to complete the APHIS mandatory annual security awareness and privacy training prior to being allowed access to any VS application. In addition, all APHIS employees, cooperators, and stakeholders will be required to sign “APHIS Rules of Behavior” prior to being granted access to VS applications.
- ❖ By October 2009, the VS OCIO will develop and implement for all cooperators and stakeholders an access control policy. The policy will require an APHIS 513, “APHIS User Account Control Form,” to be completed and approved by an APHIS Area Veterinarian in Charge (AVIC) prior to access being granted to VS Applications.
- ❖ On an ongoing basis, the VS OCIO will provide guidance, clarification, and direction on policies being delivered by USDA and APHIS security program officers and potential impacts to VS employees, cooperators, and stakeholders.

5.2.2 Objective 2: Develop and Employ Security Models that Enforce Security of Data Collected by the VS' IT Systems and Contained within the Data Repository

Data security is a critical element of business operations. VS is committed to protecting all data received from cooperators and stakeholders by adhering to industry best practices. As part of this adherence, VS requires certification of all VS application users on a quarterly basis. VS annually tests security controls within information systems to verify controls are performing as intended by Federal Information Security Management Act (FISMA) regulations. Also, any identified weaknesses are investigated, remediated, and retested as part of the annual security assessment process.

Actions to Achieve Objective 2:

- ❖ During 2009, the VS OCIO, in collaboration with State partners, stakeholders, and companies, will continue to implement information security policies and institute industry best practices which support information security program initiatives provided by USDA and APHIS.
- ❖ By May 2009, the VS' CIO, in collaboration with State partners, stakeholders, and companies, will establish a process for regular progress reporting to the National Animal Health Information Technology Board (NAHITB).
- ❖ On an ongoing basis, the VS OCIO will inform employees, stakeholders, and cooperators of the importance of protecting the equipment that collects the data being transmitted to the VS applications. As a condition of protection, lost or stolen equipment must be reported immediately to assist in eliminating unauthorized access to not only data on the device, but also penetration of the VS applications.

5.2.3 Objective 3: Expand the Current Web Security Model that Enforces Role-Based Security Across All VS Applications

Actions to achieve Objective 3:

- ❖ During FY 2009 through early FY 2010, the VS OCIO will begin researching and redefining the current database structure for implementation of a more comprehensive role-based security strategy to align with e-Authentication action identified in the Software Services and Delivery initiative.

5.3 Initiative 3: Software Services and Delivery

The VS will examine current services and delivery. Upon completion, VS will look at best practice approaches to provide on-demand services (training, customer support, frequently asked questions, etc.) to the customer while looking at already-leveraged commodities outlined and implemented at USDA and APHIS levels.

5.3.1 Objective 1: Veterinary Services Will Research and Implement an Enterprise Reporting Strategy

Actions to Achieve Objective 1:

- ❖ By December 2009, the VS OCIO and partners will identify requirements across investments to support an enterprise reporting strategy.
- ❖ By June 30, 2010, the VS OCIO staff will research, review, and purchase an Enterprise Reporting Tool.
- ❖ Beginning in July 2010, the VS OCIO staff will begin integrating the Enterprise Reporting Tool into the existing and current development applications.
- ❖ Beginning in August 2010, the VS OCIO staff will begin training and implementing the Enterprise Reporting Tool across VS.

5.3.2 Objective 2: Veterinary Services Will Leverage USDA and APHIS Common/Shared Services

USDA and APHIS support many common services that are of value to VS. As VS moves toward 2015, many of the services have a direct result on how VS responds in the future to everyday events, as well as animal health emergencies. Services being supported by USDA and APHIS include:

- ❖ Document Management (Stellent)
- ❖ ROSS
- ❖ Employee Qualification System (EQS)
- ❖ E-Authentication
- ❖ Global Information Systems (GIS)

Actions to achieve Objective 2:

- ❖ During FY 2009, the VS OCIO will mandate all systems require an E-Authentication account in order to access all VS Applications.
- ❖ Beginning in FY 2009, the VS OCIO will work with the proponents of ROSS and EQS to ensure the information being collected about employees' abilities and skills is sufficient and accurate in both systems.
- ❖ Beginning June 2009, the VS OCIO will work with the GIS Steering Committee to identify a VS GIS Enterprise Strategy for using GIS technology. As a result of identifying a VS Enterprise GIS Strategy, the VS OCIO will provide mapping layer management and table data services for all of its mission-critical delivery systems.

5.3.3 Objective 3: Veterinary Services Will Improve Training, Customer Service Practices, and Documentation Delivery

Today, the VS OCIO delivers training, customer service, and documentation in several different methods, some of which are not necessarily effective for the customer. In the future, the VS

OCIO staff will begin reviewing, researching, and developing new methods for delivering these services to the customer.

Actions to Achieve Objective 3:

- ❖ Beginning in January 2009, the VS OCIO will begin developing a new Web page for delivery of information to the customer.
- ❖ Beginning in March 2009, the VS OCIO will begin analyzing using AgLearn to deliver training on demand to the customer.
- ❖ Beginning in June 2009, the VS OCIO will begin using the Customer Relationship Management Tool to post frequently asked questions about application functionality and resolving issues.

5.3.4 Objective 4: Veterinary Services Will Begin Hosting Mission-Critical Systems at the USDA Enterprise Data Centers

Today, VS mission-critical systems are hosted within the APHIS computer centers. The four APHIS computer centers are aging and, in addition, are only supported 8 hours a day, 5 days a week. The VS mission-critical systems require 24x7 coverage, which is not currently supported by APHIS. In addition, recent outages at the APHIS computer centers have resulted in loss of service to our stakeholders. As a result of the recent events and direction from the USDA OCIO, all VS mission-critical systems and data stores will be migrated into USDA-operated data centers for both primary and backup capabilities.

Actions to Achieve Objective 4:

- ❖ Beginning FY09 through FY11, the VS OCIO staff will begin to transition mission-critical systems to USDA Enterprise Data Centers.
 - By June 2009, the VS OCIO staff will identify a plan to begin the transition of mission-critical systems to the USDA Enterprise Data Centers.
 - By December 2009, the VS OCIO staff will coordinate with USDA Enterprise Data Center staff the identification and purchase of hardware/software to support the transition.
 - By June 2010, the VS OCIO staff will transition one of the mission-critical systems to a USDA Enterprise Data Center.
 - From December 2010 to December 2011, the VS OCIO staff will transition the remaining mission-critical systems to a USDA Enterprise Data Center.

5.3.5 Objective 5: Veterinary Services Will Develop and Implement an Access Control Strategy for All Veterinary Services Applications

Actions to achieve Objective 5:

- ❖ Beginning February 2009, the VS OCIO will develop an access control strategy to be used across all VS Applications.
- ❖ In May 2009, the VS OCIO will implement the access control strategy across all VS applications.

5.4 Initiative 4: Governance

For VS' IT applications to be initiated and remain viable following implementation, they must be in constant compliance with a variety of demands placed upon them by VS' governing agencies. These requirements are independent of the functional needs that prompted the development of the applications and, specifically, do not include the security-related constraints addressed previously in Initiative 3.

Because of the significant investment in IT and the resulting impact on the success of the overall mission of the parent organization, OMB and GAO have provided guidance to all Government departments on ensuring their investments are cost effective and support the business goals of the organization. USDA and APHIS have turned this guidance into a series of directives and policies for IT investments that VS must comply with to initiate and maintain its business applications.

Initiative 4 for the VS OCIO is to understand and comply with all applicable directives addressing the ongoing operation of IT investments within USDA APHIS VS.

5.4.1 Objective 1: Ensure All Private Information Contained in All Applications Is Being Obtained and Used in Accordance with Applicable Directives

Actions to achieve Objective 1:

- ❖ Verify that the respective data owners for each application have created and published System of Records Notice (SORNs) detailing their authority for soliciting the information contained within them and their routine uses of that information. Systematically enable the gathering and storage of only the data for which the data owner has created a SORN detailing the authority for soliciting the information and their routine uses of it.
- ❖ Verify that the respective data owners annually, and as modifications are made, assess the handling of private data by preparing/updating privacy impact assessments (PIAs). Systematically enable the gathering and storage of only the data for which the data owner has already assessed the privacy concerns by preparing/updating the associated PIAs.

5.4.2 Objective 2: Manage All VS IT Investments, as Directed by APHIS, in Accordance with the USDA Capital Planning and Investment Control Guide

Both major and nonmajor IT investments have ongoing requirements as they progress from initiation to retirement. To ensure uninterrupted availability of the applications, and therefore equally uninterrupted satisfaction of the business need, each investment needs to operate consistently within USDA Capital Planning and Investment Control (CPIC) guidelines and periodically report the status of that compliance to the agency.

Actions to achieve Objective 2:

- ❖ By the end of the second quarter of FY 2009, establish an extensible method for investment compliance with the ANSI/EIA Standard 748 guidelines for performance measurement.

- ❖ By the end of the second quarter of FY 2009 and subsequent years, prepare, and gain approval of, acquisition approval requests for all investments with anticipated purchases within the given fiscal year.
- ❖ Maintain current, consistent, estimated life-cycle costs, out to at least Budget Year +2, in all mandated department/agency repositories.
- ❖ Prior to the end of each fiscal year, submit and obtain a passing score on Exhibit 300s for all existing major investments.

5.4.3 Objective 3: Develop, Enhance, Modify, and Support VS IT Applications Only as Directed and Funded by the VSMT

VS IT has historically been influenced by a variety of factors, both internal and external to the organization, potentially resulting in a skewed representation or prioritization of requirements. Simply to realize optimum return on both the funding available and the customers' ongoing efforts to corroborate their needs, VS IT resources will be strictly aligned with documented VS management priorities.

Actions to achieve Objective 3:

- ❖ By the end of the first quarter of FY 2009, develop a standard operating procedure for the initiation and delivery of IT solutions, to include the implementation of integrated project teams (IPTs) designed to oversee the gathering of business requirements and the implementation and maintenance of the associated IT applications.
- ❖ By the end of the third quarter of FY 2009, create, and assign members to IPTs for all existing applications.

5.4.4 Objective 4: Put into Operation a National Animal Health Information Technology Board Consisting of State and VS Representatives and Chaired by the VS CIO

The NAHITB will provide a discussion forum for identifying critical and strategic control points needed in VS IT infrastructure, databases, and reporting systems. Currently, representatives from California, Michigan, Minnesota, Montana, New York, Ohio, Pennsylvania, Texas, and Colorado State University comprise this board. The output of this board will be provided to the VSMT for discussion and decision point analysis.

Actions to achieve Objective 4:

- ❖ By December 31, 2008, the VS CIO, in cooperation with external and internal stakeholders will identify NAHITB board participants.
- ❖ By the end of the second quarter of FY 2009, the VS CIO, in cooperation with identified NAHITB board participants, will have drafted and instituted a NAHITB charter.
- ❖ By the end of the second quarter of FY 2009, the VS CIO, in cooperation with identified NAHITB board participants, will have defined and documented roles and responsibilities.

5.5 Initiative 5: Modernize Legacy IT Applications

VS continues to administer several important automated data management systems that were developed for program requirements and are using IT technologies and security standards, that are 10 to 15 years old. These legacy applications were designed primarily for local program management using client-server technology and separate data stores. Program requirements, IT technologies, security standards, and user expectations have significantly advanced since the development and deployment of these legacy applications. Today, program delivery and management require more standardized and granular data that can be aggregated at regional and national levels for planning, analysis, and reporting, while continuing to support local program management. The current situation of VS legacy systems—minimal data standards, minimal business rules, distributed databases, outdated security and auditing tools—fails to meet either today’s expanded program requirements or the data processing requirements that will be dictated by the VS 2015 vision.

VS legacy applications need to be modernized in order to meet the animal health data management requirements of today and tomorrow. Legacy applications must be modernized in compliance with the following principals:

- ❖ Provide VS with standardized and quality-controlled program data that can be effectively and efficiently used to manage, evaluate, and improve VS’ programs
- ❖ Provide VS with an accurate and timely national animal health data that can be used to make confident decisions in emergency situations and respond to emerging issues, assess risks, and facilitate trade
- ❖ Use national data standards for all animal health data
- ❖ Integrate information and exchange data seamlessly with other VS, Federal, and State IT systems; laboratory information management systems; and private sector systems as needed to meet VS’ information needs
- ❖ Allow rapid development of new components to support new animal health monitoring and surveillance programs
- ❖ Ensure security and confidentiality of information related to VS’ programs
- ❖ Provide authorized individuals who are directly and indirectly involved in VS programs with reliable and straightforward access to the program-related data needed to perform their official duties

Modernization of VS legacy applications can be achieved by closing functional and technical requirement gaps, implementing formal data standards, applying more rigorous business rules, streamlining data capture processes, providing modern standard user interfaces and workflow processes, defining standard processes for data exchange, and consolidating databases.

VS legacy applications are administered within three of VS’ IT investments: AHSM, VSPS, and EMRS. The GDB, administered under the AHSM investment, is the most significant (with respect to modernization need) of the legacy applications. The Import Tracking and the Export Health Certification applications are administered under the VSPS investment. The EMRS investment is a

Lotus Notes-based information system that supports disease investigation, disease management, and resource management activities.

VS' IT is always faced with the decision of whether to buy a commercial off-the-shelf (COTS) software product or to create an in-house software application. For some program requirements, the decision is obvious because the requirements are so unique that they simply can't be reasonably met by a commercial product.

A given software application can range from being an unmodified COTS software package to being a completely custom, internally developed program. Between those two extremes, one can find customized and/or configured COTS software, custom software built using commercial software frameworks and libraries, and complex application systems comprising all of the above. The question always is, which solution is best, given the environmental constraints in place at initiation?

As shown Figure 5-2, the customization level correlates directly to three other aspects: cost, suitability, and time to deployment.

Cost. Acquisition and deployment of COTS software is usually cheaper than development and deployment of equivalent custom software. Similarly, it can take a significant investment in labor to maintain and update custom software, whereas the vendor will generally maintain COTS software at a fairly predictable rate through the life cycle of the product.

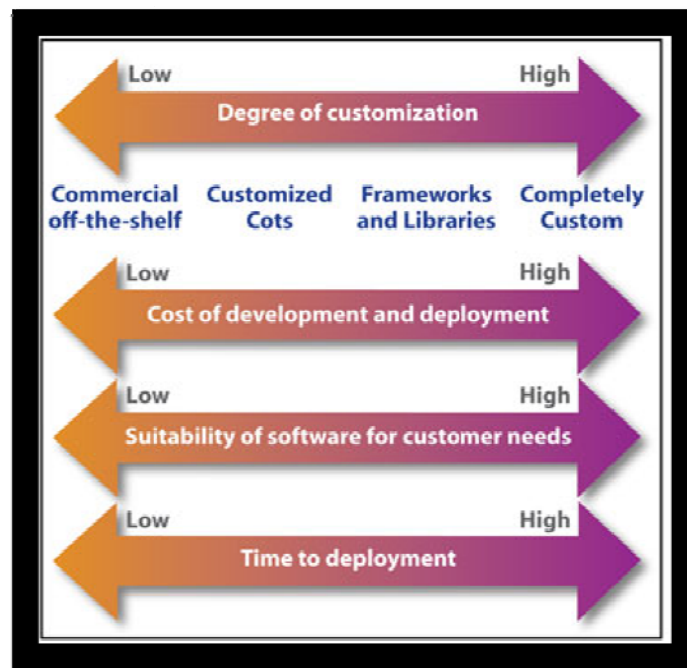


Figure 5-2. Software Customization

Suitability. A given COTS software package, even customized, will likely be less suited to a firm's specific needs and challenges than a custom program designed and developed internally. Assuming that a COTS package even exists that can be reasonably customized to meet business needs, the organization may still have to adapt its business processes to gain sufficient value from it. Conversely,

given sufficient resources, an organization can theoretically develop software that precisely matches its existing business practices.

Time to Deployment. A given COTS software package can usually be acquired and implemented within a relatively short period of time. If customization of the COTS package is required, the degree of customization required will obviously impact the time to implement. Regardless of the degree of customization of a COTS product, its time to market can be exponentially shorter than that of any product developed in house.

Beginning in 2009, VS OCIO, its State partners, stakeholders (working with NAHITB), will collaborate in identifying required functionality and data standards associated with the creation of a national standardized disease surveillance and management data repository maintained by the VS' IT organization.

Upon creation of the requirements and data standards, the VS OCIO will, prior to initiating a software development effort, conduct an analysis of available commercial products to determine applicability to the given business requirement, utilizing the three primary criteria identified previously.

5.5.1 Objective 1: Conduct a Build-Versus-Buy Assessment To Determine Course of Action for Modernizing the GDB.

These decisions must be guided by the AHSM Business Plan.

Actions to achieve Objective 1:

- ❖ Conduct a discovery and analysis of animal disease program and surveillance data management systems currently in the market.
- ❖ Define, vet, and finalize all data standards (for those not yet in place) that are necessary for the specific project. (This is also an action item for the data exchange initiative.)
- ❖ Analyze, vet, and finalize/approve functional requirements for the specific project.
- ❖ Perform preliminary analysis of available COTS products for applicability to identified requirements.
- ❖ If tools are available, establish criteria for alternatives analysis.
- ❖ Perform full-scale life-cycle analysis of all applicable COTS products, versus internal development using the agreed-upon evaluation criteria.
- ❖ Select specific product or initiate internal development.

5.5.2 Objective 2: Modernize the GDB Application

Actions to achieve Objective 2:

- ❖ Conduct the Build vs. Buy assessment (Objective 1)
- ❖ Develop (build) a new system or customize (buy) a COTS system
- ❖ Migrate the legacy system data
- ❖ Deploy the new system

5.5.3 Objective 3: Modernize the EMRS

Actions to achieve Objective 3:

- ❖ Integrate the EMRS with the APHIS Employee Qualification System
- ❖ Leverage NAHLN processes for ordering diagnostic tests and reporting results
- ❖ Conduct a discovery and analysis of incident-management information systems currently in the market
- ❖ Assess feasibility of redeveloping EMRS into an incident management module that is integrated with, and administered under, the AHSM investment using standard processes and platforms
- ❖ Develop (build) a new system or customize (buy) a COTS system
- ❖ Deploy the new system

5.5.4 Objective 4: Modernize the Import Tracking and Export Health Certification Applications using VSPS Processes and Platforms

Actions to achieve Objective 4:

- ❖ Complete development and deploy the VSPS Animal Import module, which will replace the ITS
- ❖ Define requirements for the Animal Export module and execute a contract for development, which will replace the EHC
- ❖ Complete development and deploy the VSPS Animal Export module

Appendix

A Appendix

A.1 Data Collaboration Questionnaire

Note: All survey questions pertain to national animal health/eradication and control programs. The purpose of the survey is to serve as a data collection tool for ascertaining stakeholders' interest and concerns regarding data sharing and collaboration within VS' IT system national data repository.

1. What is the sensitivity of the information processed on these systems or by these applications as it relates to confidentiality, integrity, and availability?
 - High -- *The loss of confidentiality, integrity, or availability could be expected to have a severe or catastrophic adverse effect on organizational operations, organizational assets, or individuals*
 - Moderate -- *The loss of confidentiality, integrity, or availability could be expected to have a serious adverse effect on organizational operations, organizational assets, or individuals*
 - Low -- *The loss of confidentiality, integrity, or availability could be expected to have a limited adverse effect on organizational operations, organizational assets, or individuals*
 - Don't know

2. What is your agency's current state of database development/use? Check all that apply.
 - No database in place
 - Limited database in use
 - Have several different databases in use but desire to streamline the system
 - Desire improvements in current system
 - Agency is currently supportive of database improvement

3. What databases and/or applications systems are you using in your day-to-day job related to animal health activities?
 - 3.1 Are any of these legacy systems (i.e. older systems where support or updates may no longer be available or may be cost prohibitive)?
 - Yes. What systems are they?
 - No
 - Don't know

3.2 Are you willing to contribute local data to a national data repository within VS IT System?

- Yes. What method do you have available to transfer data to the national data repository?
- No. Is there a reason why you are not willing to contribute to the data repository or would you like more information?

Reason:

More Information: Yes No

3.3 On a scale of 1 – 8 (1 representing most important) what are the most important features of your database systems to accomplish your daily animal health work?

- _____ Web-based
- _____ Mobile solutions
- _____ GIS enabled
- _____ Data integration between animal health management and laboratory diagnostics information
- _____ Output of regulatory Government forms
- _____ Software extensibility (customize the SW for non VS programs.)
- _____ Pre-established profile to re-populate data as needed
- _____ Work flow or task management

4. Does your agency have a current database modernization initiative?

- Yes. Is there a transition and implementation strategy?
 - Yes No
- No
- Don't know

4.1 Has a security strategy been defined that ensures security is addressed throughout the database System Development Life Cycle (SDLC)?

- Yes
- No
- Don't know

4.2 Does your legacy systems have inherent or add on security features for data protection?

- Yes
 No
 Don't know

5. Is it important for your database architecture to be seamlessly integrated into the VS database architecture for data collaboration and exchange?

- Yes
 No
 Don't know

6. Are there agency specific database policies and procedures you require to be implemented within the VS infrastructure before participating in the proposed data sharing?

- Yes
 No
 State or Local Law
 Don't know

6.1 Would you share the policy and procedures with VS IT?

- Yes
 No

7. Is there a governing person, department, or agency that determines hardware and software policies in your organization?

- Yes. Can you share the contact information of the individual/s with VS IT?
 Yes. _____
 No
 No
 Don't know

8. How can data collaboration and exchange with VS best be facilitated?

8.1 How would you propose we eliminate data duplication?

8.2 Do you currently have standardized data sets for collection of information?

Yes. Can you share the standardized data sets with VS IT?

Yes No

No

Don't know

8.3 What transfer methods do you currently use?

Web-services

XML

FTP

HTTP

Other

9. Are you currently participating in data sharing and collaboration with any other agencies and/or organizations?

Yes Who are they? _____

If outside the U.S., where are they located? _____

No

10. In terms of data integration, exchange and collaboration what impediments would you classify as the greatest hindrance? Check all that apply.

Access Control (Data Security)

Business Rules in Agency Database

Incompatible databases

Incompatible data format

Integrity of stored information

Reliability of data

Data Management (Lack of Ownership)

Local Laws

11. Does your agency currently have database ownership responsibility for upgrades, patches, and maintenance?
- Yes
- No. Who performs database maintenance?
- Don't Know
12. Do you currently gather statistics and historical data for capacity planning?
- Yes
- No.
- Don't Know
13. On a scale of 1-5 (5 being the highest) how would you rate the following features impact to your decision to participate in data collaboration and data exchange?
- _____ Secure Information Sharing
- _____ Cost Effectiveness
- _____ Efficiency
- _____ Flexible Application-Interfaces
- _____ Return on Investment (ROI)
14. Are there any organizational and/or functional impediments that would preclude you from contributing and/or participating in the data collaboration and data exchange/collection within the VS IT system(s)?
- Yes. What are the impediments?
- No
- Don't Know
15. When will you be ready for implementation
- Ready now, waiting for VS
- 0-3 months
- 3-12 months
- 12 + months
16. Do you have any additional comments or questions?

A.2 Survey Responses

	Q1. Information sensitivity	Q3.1 Legacy systems	Q3.2 Willingness to contribute	Q4. Modernization initiative	Q.4.1 SDLC security strategy	Q4.2 Inherent/add-on security features	Q5. Seamless data integration
State 1	Moderate	No	Yes	Yes	Yes	Unknown	Yes
State 2	High	No	Yes	Yes	Unknown	Yes	Yes
State 3	Moderate	No	Yes	No	Yes	Yes	No
State 4	Moderate	Unknown	Need more info	No	Unknown	Unknown	Yes
State 5	Moderate	No	No	Yes	Unknown	Unknown	Yes
State 6	High	Yes	Need more info	Yes	Unknown	Unknown	Yes
State 7	High	Yes	Yes	Yes	Yes	Yes	Yes
State 8	High	No	Yes	Yes	Yes	Yes	Yes
State 9	High	Yes	Yes	Yes	Yes	Yes	-
State 10	High	No	Yes	Yes	Yes	Unknown	Yes
State 11	High	No	Yes	Yes	Yes	-	No
State 12	Moderate	No	Yes	Yes	Unknown	No	No
State 13	Moderate	Yes	Yes	Yes	Yes	Yes	Yes
State 14	High	No	No	Yes	Yes	Yes	Yes
State 15	Moderate	No	Yes	Yes	Yes	-	No

	Q6. Agency specific policy	Q6.1 Willingness to sharing	Q7 Policy governing body	Q8.2 Standardized data-sets	Q.9. Existing data sharing	Q11. Maintenance ownership	Q12. Statistical/historical capacity planning
State 1	Unknown	Yes	Yes	Yes	Yes	Yes	Yes
State 2	Yes	Yes	No	Yes	Yes	Yes	Yes
State 3	Yes	Yes	Yes	Yes	Yes	Yes	No
State 4	Unknown	-	Yes	-	-	-	-
State 5	Unknown	-	Yes	Yes	Yes	Yes	Yes
State 6	Unknown	Yes	Yes	Unknown	No	No	No
State 7	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State 8	Yes	Yes	Yes	Yes	No	Yes	No
State 9	-	-	-	-	-	-	-
State 10	Unknown	Yes	Yes	Yes	Yes	Yes	Unknown
State 11	State/local	Yes	Yes	Yes	No	Yes	Yes
State 12	Unknown	No	Yes	Unknown	-	Yes	Unknown
State 13	Unknown	Yes	No	Yes	Yes	Yes	No
State 14	Unknown	Yes	Yes	Yes	Yes	Yes	Yes
State 15	State/local	Yes	Yes	Yes	No	Yes	Yes

	Web-services	XML	FTP	HTTP	Other Systems/Databases
State 1	X	X	X	X	XML HL7
State 2	X	-	-	-	In house systems, changing to STARLIMS, HL7 capacity
State 3	-	X	X	-	XML export
State 4	-	-	-	-	GDB, EMERS
State 5					
State 6	-	-	-	-	Microsoft Access, Lotus approach
State 7	-	-	X	-	Holstein/FAIR, AISS
State 8	-	-	-	-	Database triggers
State 9	X	X	-	-	FileMaker, MS SQL, CSV, ODBC, Excel exports. In-house database system matching the specs of the NAIS Program Standards and Technical Reference with a goal of becoming an official Animal Tracking Database.
State 10	-	X	-	-	GDB, HL7
State 11	X	X	-	-	Developed a web-based system named AGTRAQ
State 12	-	-	-	-	-
State 13	X	X	X	-	GDB, EMERS, Permit Tracker in Omnis, Fox Pro applications
State 14	X	X	X	X	UDB
State 15	Under development	X	X	X	SFTP

Comments concerning data sharing and data duplication	
State 1	Need standards for data collection and transfer, and make export/import easy between the State and VS systems. The Sample Collection Project (bar-coding pilot project) an example of data being acquired only once and shared with and stored by multiple entities as needed.
State 2	Noted the importance of uniform data standards and appeal for the elimination of the use of different systems for each disease program.
State 3	Strategic planning and adapting the DOACS/USDA ITLC methodology can facilitate data sharing/collaboration. Planning/development methodology should cover elimination of data duplication.
State 4	Not Provided
State 5	Not Provided
State 6	Not Provided
State 7	Define data needs for VS-types, formats, etc.; define data that VS has that could be shared; identify vehicle for conducting data exchanges. To eliminate data duplication, identify authoritative sources of data for merging into a collaborative metadata environment
State 8	Establish a national, normalized, relational database with individual States having local copies which only contain individual States data. Use web services to upload individual States data to a national database. A normalized, relational database would minimize data duplication.
State 9	Not Provided
State 10	If VS would provide the technical specifications for the transfer protocol, the integration of databases could be accomplished. Data definitions in GDB are not stable, and may lead to incorrect data relationships. Also noted that Federal databases change frequently and that there were no clear means of sharing data between State databases and the Federal systems. Individual States should be responsible for maintaining their own data.
State 11	Not Provided
State 12	Need to know what connectivity is required. System compatibility might be an issue.
State 13	VS and State agencies have compatible systems. For those States that have the ability to protect data from public disclosure VS must assure the protection of those data. VS needs to collaborate with States which already have functional systems and purchase rather than develop a database.
State 14	Hindered by Stakeholders' requirements and State legislations from contributing local data to a national data repository within VS IT. Identified the implementation of SQL database, XML, and delimited flat files to facilitate data collaboration and exchange. Putting all State information one time in a State database will eliminate data duplication.
State 15	Would like to know what data will be shared? What are the security and IT business requirements from VS? What database will be used? Proposes to identify areas where duplication may exist and eliminate as many as possible.

	General Comments
State 1	Launched a multi-year project to migrate all Animal Health and Food Safety information systems into a single database application. Future phases to develop several State-specific programs (Trichomonosis, West Nile Virus, etc.) and additional Federal-State cooperative modules (PRV, Food Waste inspections, etc.). This project includes a requirement to electronically exchange data with USDA VS.
State 2	Glad to see the effort started but cautions that USDA does not do this in isolation. Stakeholder input is imperative and that communication at this level must be of a continuous and reiterative nature.
State 3	Not provided
State 4	Not provided
State 5	Not provided
State 6	Not provided
State 7	An initiative is underway to roll out a new application that will be eliminating some database redundancies but will not affect our current use of GDB and SPRS. Project will be completed and rolled out to in-State customers within the next 3-12 months.
State 8	Not Provided
State 9	Not Provided
State 10	Recommends purchasing an animal health information system and deploying it on a national level for use by all 50 States. Such a system should be web accessible, include mobile tools for data entry, produce regulatory forms, integrate NAHLN laboratory, etc. The use of established data standards and definitions, and common architecture inherent in such a solution would obviate the need for extensive accommodation required to incorporate 50 potentially different database solutions.
State 11	The most important thing to consider is the data model of the software. A faulty data model will have a negative impact on data collection, data integrity and data sharing. A solid data model allows you the flexibility to handle any unique conditions for any of the disease programs currently being tracked by State and Federal agencies. The second most important thing is to avoid duplication. It is not efficient to have to enter data a second time. New software must have ways to collect data that minimizes the need to enter the same data a second or third time.
State 12	State economic situation may impact continued development of databases. If additional development would be needed to interface with VS, connectivity may not be possible. Spent money in the past to develop connectivity to APHIS databases which never materialized. Wonders if this time will be any different?
State 13	Those States which have the resources and expertise have already developed (or are developing) their own systems. Concerned that USDA's failure to upgrade its system will result in a non-functional system and many State databases that will not interface with the national system. The USDA should purchase a database that can provide for the immediate needs for our programs and either modify the system as needed or at least utilize it while continuing development of an in-house system.
State 14	The State recognizes the importance of animal identification and traceability is recognized, however, this State will not allow contact information that has not been requested by a stakeholder to be provided to a national database. Requests that NAIS system be provided to States with a standard set of requirements for a data base. This would allow certain information to be kept secure at the State level so all traceability information could be utilized and allow a National Animal Identification System to move forward.
State 15	Not provided

Abbreviations and Acronyms

ADSP	Animal Disease and Surveillance Programs
AHER	Animal Health Event Repository
AHSM	Animal Health and Surveillance Management System
AI	avian influenza
AIN	animal identification number
AINMS	Animal Identification Number Management System
ANSI	American National Standards Institute
APHIS	Animal and Plant Health Inspection Services
API	application program interface
ASTM	American Society for Testing and Materials
ATD	animal tracking databases
ATPS	Animal Trace Processing System
AVIC	Area Veterinarian in Charge
AWBDS	automated web-based data submission
BI	business intelligence
BPM	business process management
BSE	bovine spongiform encephalitis
CADIA	Center for Animal Disease Information and Analysis
CALS	Computer Automated Laboratory System
CAP	common alerting protocol
CAPP	California Pilot Project
CDFA	California Department of Food and Agriculture
CEAH	Centers for Epidemiology and Animal Health
CEMP	Comprehensive Emergency Management Program
CFR	Code of Federal Regulations
CIO	chief information officer
CLS	Consolidated Logistics System
COTS	commercial off-the-shelf
CPIC	Capital Planning and Investment Control
CSI	contingency support item
CSV	comma separated values
CVB	Center for Veterinary Biologics
CVB-IC	CVB Inspection and Compliance
CVB-PEL	CVB Policy, Evaluation, and Licensing

CWD	chronic wasting disease
DBL	Diagnostic Bacteriology Laboratory
DMC	Data Management Center
DMIS	Disaster Management Interoperability Initiative
DMS	disease management surveillance
DVL	Diagnostic Virology Laboratory
EA	enterprise architecture
eCVI	electronic Certificates of Veterinary Inspection
EDI	emerging disease incidents
EDXL	emergency data exchange language
eEIA	electronic Equine Infectious Anemia
EHC	export health certificates
EM	Emergency Management
EMRS	Emergency Management Response System
EPM	Employee Profile Module
EQS	Employee Qualification System
ESB	enterprise service bus
ESRI	Environmental System Research Institute
ETL	extract, transform, and load
EULA	end-user license agreement
eVAP	Electronic Veterinary Accreditation Program
eVe	emerging veterinary event
FAD	foreign animal disease
FADD	foreign animal disease diagnosticians
FADDL	Foreign Animal Disease Diagnostics Laboratory
FEA	Federal Enterprise Architecture
FEAF	Federal Enterprise Architecture Framework
FIPS	Federal Information Processing Standards
FISMA	Federal Information Management Security Act
FLAPS	Farm Location and Population Simulator
FTP	file transfer protocol
GAO	General Accounting Office
GDB	generic database
GIN	group/lot identification number
GIS	Geographic Information System
GPEA	Government Paperwork Elimination Act
GSS	General Support System
HL7	health level seven

HSPD	Homeland Security Presidential Directive
HTML	hypertext markup language
ICS	Incident Command System
ICVI	interstate certificate of veterinary inspection
IPT	integrated project team
IREGS	International Animal Product Export Regulations
ISO	International Organization for Standardization
ISP	information security program
IT	information technology
ITDS	Information Trade Data System
ITS	Import Tracking System
J2EE	Java 2 Enterprise Edition
JDBC	java database connectivity
LAN	local area network
LIMS	Laboratory Information Management System
LOINC	logical observations, identifiers, names, and codes
LSRTIS	Licensing, Serial Release, and Testing Information System
MIM	mobile information management
MOU	memorandum of understanding
NAADSM	North American Animal Disease Spread Model
NAHEMS	National Animal Health Emergency Management System
NAHITB	National Animal Health Information Technology Board
NAHLN	National Animal Health Laboratory Network
NAHSS	National Animal Health Surveillance System
NAIS	National Animal Identification System
NASS	National Agricultural Statistics Service
NBIS	National Biosurveillance Integration System
NCAH	National Center for Animal Health
NIST	National Institute of Standards and Technology
NITC	National Information Technology Center
NLSC	National Logistics Support Center
NPIR	National Premises Information Repository
NSU	National Surveillance Unit
NVAP	National Veterinary Accreditation Program
NVLS	National Veterinary Logistics System
NVS	National Veterinary Stockpile
NVSL	National Veterinary Services Laboratory
OCIO	Office of the Chief Information Officer

OMB	Office of Management Office
OSI	open systems interconnection
PDA	personal digital assistant
PGSOA	Practical Guide to Federal Service Oriented Architecture
PIA	privacy impact assessment
PIN	premises identification number
PKI	public key infrastructure
PL	pathology laboratory
PPE	personal protective equipment
PremID	premises identification
RAC	real application cluster
RBAC	role-based access control
RFID	radio-frequency identification
RLD	remote LAN dial
ROI	return on investment
SAN	storage area network
SCM	supply chain management
SDLC	system development life cycle
SDO	standards developing organization
SMI	Stockpile Managed Inventory
SNOMED	Systemized Nomenclature of Medicine
SOA	service-oriented architecture
SORN	System of Records Notice
SPRS	Standardized Premises Registration System
SQL	structured query language
SSL	secure socket layer
UDB	universal database
UFS	User Fee System
USDA	United States Department of Agriculture
VMI	Vendor Managed Inventory
VPN	virtual private network
VS	Veterinary Services
VSLs	Veterinary Services Laboratory Submission
VSMT	Veterinary Services Management Team
VSPS	Veterinary Services Process Streamlining System
WAN	wide area network
WBB	Web data buffer
XML	extensible markup language