2012 NASCIO RECOGNITION AWARD NOMINATION

Nomination Category: Data, Information and Knowledge Management

Surveillance of Animal Diseases through an Emerging Threats Identification System

State of California
California Department of Food and Agriculture (CDFA)
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2. Executive Summary

When a highly contagious animal disease strikes, it must be immediately identified to reduce the impact to the food supply and minimize the potential to impact human health. Animal disease can require the destruction of millions of animals, threaten the nation’s food supply, and endanger human health.

A 2002-2003 outbreak of Exotic Newcastle Disease (END) in Southern California triggered the largest multi-agency animal health emergency response mounted in this country. State and federal agencies spent more than $160 million to eradicate the highly contagious and deadly poultry virus, resulting in the death of more than three million birds and caused industry losses estimated at $5 billion.

A 2006 outbreak of a new Avian Flu resulted in 79 human deaths and the destruction of hundreds of millions of birds in Asia and Europe, demonstrating a continuing security vulnerability. Following the outbreak, California reviewed its IT systems responsible for tracking and managing animal diseases and food safety and found them siloed and old, lacking GIS integration and connectivity to the field. This made it difficult to effectively track animal health events or to conduct surveillance of animal disease.

Between 2009 and December 2011, the California Department of Food and Agriculture (CDFA) developed the Emerging Threats Project (ET) to provide a single, integrated, comprehensive system to collect and report on millions animal health events, such as vaccinations. ET’s cross-correlative databases provide detailed information on premises where agriculture takes place, licensed equipment, agricultural operators, and veterinarians.

ET’s web-based, GIS-enabled features provide CDFA and its partners with accurate animal population information and milk safety surveillance information at all times. With ET’s remote connectivity to the field, users have rapid correlation of animal test results, and local incident commanders and emergency operations center managers have accurate, complete, and current demographic information. ET’s business results include:

- Surveillance of and ensuring that the 112 million pounds of milk products daily from farm to table are wholesome and safe to consume.
- Tracking millions of animal health events such as vaccinations and tests.
- Efficiencies that improve CDFA’s animal disease tracking and prevention despite a thirty person reduction in staff.
- Real time information between the field and partners through ruggedized tablets.

California is the world’s fifth largest supplier of food and agricultural commodities. The dairy industry alone contributes $63 billion to the state’s economy. With ET, Californians can feel safe that potential animal disease threats are tracked and addressed efficiently to ensure the safety of California’s people and its agricultural industry.
3. Description

Problem: Inefficient animal tracking systems put California’s agriculture at risk

Food safety is critical to California’s $36.6 billion agricultural industry, the world’s fifth largest supplier of food and agricultural commodities. The California Department of Food and Agriculture (CDFA) is responsible to ensure the safety of the state’s food supply and to identify and address potential outbreaks. CDFA has a limited resource pool of 75 people to conduct surveillance activities over 1.7 million dairy cows across 1,800 operations, 1 million sheep, 140,000 goats, 270 million chickens, 15 million turkeys and 220,000 swine. CDFA also monitors over 35,000 contacts and 29,000 premises across California’s 160,000 square miles. CDFA is hard-pressed in response to California’s ongoing budget crisis; CDFA’s workforce has been reduced, cutting the number of inspectors, lab technicians, and staff in the Animal Health and Food Safety Division (AHFSD) by 15 percent between the 2005-6 and 2009-10 fiscal years.

In 2006 CDFA reviewed its seven legacy systems and found that information required for animal epidemiologic investigation, disease containment strategy development, and surveillance implementation were not sufficiently accurate, complete, or accessible to quickly respond to emerging animal disease threats. CDFA found the following issues:

- Disparate, siloed systems and databases did not work together, causing duplication of effort, and reduced response to potential animal health threats.
- Antiquated processes and systems, some 50 years old, meant much work was done by hand, leading to slower, less efficient and less accurate results.
- Lack of web connectivity meant inspectors could not receive or send test information from the field, slowing data gathering and response to disease.
- Lack of integrated GIS features in applications slowed epidemiological prediction.

To address surveillance of animal diseases, CDFA needed an integrated system to monitor potential outbreaks, and assess the severity of threats across millions of livestock animals in California’s vast agricultural industry while connecting the field, labs, headquarters, and partner agencies. The system also needed to be extensible to address future animal health threats.

Solution: ET Project Overview: securing California’s agriculture through surveillance information systems.

CDFA and its partners considered several alternatives such as adapting USAHerds, or waiting for a national system. CDFA determined that an internally-developed custom system was needed to bring all pertinent electronic information used by CDFA’s animal health programs under a single centralized umbrella system. CDFA developed Emerging Threats (ET), in collaboration with 200 stakeholders across California that crossed boundaries among California Animal Health and Food Safety Laboratories, U.S. Department of Agriculture, California Department of Public Health, and California’s veterinarians. The ET System:

- Provides a single unified platform to tie together surveillance needed to address multiple animal disease threats. Key data elements include:
Emerging Threats Application – Surveillance of Animal Diseases

- Premises: geographic locations where animal agriculture takes place
- Operations: agriculture-based activities at premises e.g. milk processing plants, feed lots, poultry farms
- People: individuals that have a role with premises, operations and organizations, including veterinarians, herdsmen and owners.

- Includes tracking records for millions of agricultural events, such as animal vaccinations, tests, and permits for agricultural equipment e.g. milk tanker trucks
- Is extensible to address organizational needs and new animal threats

The ET Project innovatively integrates disparate systems, collects and transmits critical field data in real time, rapidly integrates and correlates field and lab testing data, and manages epidemiological response across the most critical animal diseases. Diseases tracked in ET include Brucellosis, Bovine Tuberculosis, foreign animal diseases, such as Exotic Newcastle Disease, and swine diseases including Swine Fever. ET provides incident commanders and emergency operations managers with accurate, complete, and current demographic data that enable better field-disease control strategies.

Features include:

- A consolidated system to seamlessly share, analyze, and act on animal data in a central interface with individual program modules and CDFA partners.
- Effective tracking and association of millions of animal health events across 30,000 premises, 31,000 processing operations, and in communications with 35,000 individual contacts. ET ties veterinarians, vaccine distribution, tests, and certifications to individual animals, premises, and herds. ET's TB module automatically accepts and transfers USDA data. Tracked events include disease surveillance and diagnostic testing and monitoring for Brucellosis and TB and tests among herds.
- A data model that allows a business and its animals and their records to be examined and documented despite movement to another location.
- Databases of animal facilities, laboratories in a GIS-enabled application to tie locations together for epidemiological overlaying.
- Ruggedized tablet devices and Windows 7 applications allow Dairy Foods Specialist's secure wireless connectivity to acquire real time data and reporting from milk product sampling activities.
- Handheld devices and a bar coding application to submit, track, and report on milk product testing.

Deployed between 2009 and 2011 in a phased approach, ET’s strengths include providing a single, expandable platform to address new functions and animal disease threats. As a holistic solution, ET consolidates CDFA’s siloed systems and provides a best of breed solution to track and manage over sixteen animal disease threats, inspections and licensing across California’s vast agricultural industry.

**ET is implemented through the following technology components:** Secure three tier server architecture of web, application and SQL Server database servers installed at CDFA’s secure data center. CDFA migrated the data center to a virtualized server and
storage environment as part of the ET Project in alignment with California’s green IT and consolidation initiatives.

- ET applications use Microsoft SQL Server for data storage and Microsoft C#, .Net for server-based programming.
- Ruggedized laptops allow field personnel to enter and exchange data such as pictures, GIS information, reports in addition to surveillance information from anywhere in extreme field operating environments such as food processing plants and farms. The Milk Dairy Food Safety bar coding component can capture live GIS data that can be sent into the ET system through sample information that is gathered from the field and then submitted to the laboratory or other party.
- All end-user data is encrypted and applications are accessed through a web browser using Secure Socket Layer (SSL). Network access from remote locations is provided through cellular and satellite technology. Authorized CDFA and USDA personnel can securely access ET from any web browser.
- Provides a consolidated Kardex intelligence report which collects and reports all activities on a premises or operation over a time period by using data from all ET activities traceable to the premises on a single report.

ET Project Costs and Management: The ET Project primarily used CDFA application developers. Total project costs were under $5 million and within budgeted amounts. The project was managed by a PMP-certified Project Manager from CDFA, who applied PMI methodologies to the project. The ET solution met all of its original objectives and was approved for project closure by the state’s oversight agency.

ET Project Communications Plan: The ET Project required collaboration among five distinct sets of stakeholder groups that totaled more than 200 individuals across local, state and federal government, and California’s veterinarians. The project’s robust communication plan employed active communication, personal contact, and web-based announcements that quickly and uniformly put information into the hands of experts. To reach stakeholders and gain adoption across the state, project staff maintained email contact and conducted meetings during every stage of the project to get feedback.

Accessibility and Usability: ET follows CDFA’s accessibility policy, ensuring accessible, usable, and aesthetically pleasing Web pages and applications that meet Section 508 and related accessibility requirements. Accessibility and usability were ensured through end-user feedback during joint application development sessions.

Information Security: The CDFA Information Security Officer reviewed and approved the security aspects of the proposed solution and was part of the project oversight team. ET is consistent with the security standards, policies, and practices of the CDFA and the state’s Office of Information Security. CDFA has appropriate security policies and protocols in place, including 128-bit Secure Socket Layer (SSL) technology to ensure that data is secure from inappropriate access and use.
4. Significance of the project
In today’s severely resource-constrained environment, the ET project demonstrates how government can combine security and technology to protect citizens and produce more effective results with fewer resources. Key areas of significance to government include:

- Allows sharing of information across the CDFA AHFSS division.
- Provides a robust Animal Disease Investigation module repository and reporting system.
- Innovative server virtualization yielded a 30:1 ratio of virtual server to server CPU.
- Innovation through using XML Web Services to communicate with external parties such as the UC Davis California Animal Health and Food Safety laboratory, California’s official state diagnostic laboratory.
- Connectivity between the field, labs, and partners through ruggedized tablet devices.
- Live field sample data collection including the location intelligence, GIS map, temperature measurement and printed bar codes for the samples.

Direct project beneficiaries include California’s farmers and veterinarians, UC Davis health departments, and USDA. 37 million Californians ultimately benefit through a secure food supply and reduced risk of threats. The project has improved government operations through coordination and exchange of information.

The ET project objectives directly align with Governor Brown’s priorities of improving state efficiency, avoiding costs, and protecting the public. The ET Project:

- Improves how California uses animal health information as an asset to protect the public, consistent with Goal 4 of California’s Statewide IT Strategic Plan.
- Improves mobile access consistent with Goal 1 of California’s 2012 IT Strategic Plan.

The ET project directly supports NASCIO’s 2012 priorities of consolidation, mobility, and security and electronic records management by using data to improve efficiency and significantly enhance the surveillance of animal diseases.

5. Benefits of the project
The ET project provides data management and integration capacity for large-scale or high-consequence events. ET was used in the identification and response to an April 2012 incident of mad cow disease. ET significantly reduces costs associated with disease eradication and helps eliminate contaminants from the food supply and to protect human health. ET benefits include:

Efficiency
- ET helps CDFA’s limited resource pool of 75 experts to efficiently conduct surveillance activities of over 1.7 million dairy cows across 1,800 operations, 1 million sheep, 140,000 goats, 270 million chickens, 15 million turkeys and 220,000 swine. In total, CDFA have over 35,000 contacts across 29,000 premises to monitor across 160,000 square miles.
- ET’s tracking and surveillance includes intricate animal health details including which RFID vaccination tag was assigned by which veterinarian to each animal.
When this information is tied to premises, owners, and operations where activities take place, ET provides a unique window into animal health and movement, enabling fast action for any identified anomalies.

- ET’s TB module accepts USDA data, ties to identified premises, and transfers data automatically.
- GIS integration allows creation of epidemiological maps to predict an epidemic’s movement to speed response.
- Using ruggedized tablets and Windows 7 applications, Dairy Foods Specialists can connect to the ET database to submit and review sampling data relating to milk and dairy product testing. The rapid submittal and retrieval of field data allows Dairy Foods Specialists to respond faster and more efficiently to incidents of dairy foods contamination across California’s 112 million pound milk output.
- Coupled with real time GPS capabilities, incident management staff can collect field data submitted into ET to better track, model and predict the spread of food safety emergencies. ET expedites Milk Product sampling and testing using ruggedized tablets and a Windows 7 bar coding application. Dairy Foods Specialists can rapidly collect and submit up to 500 samples per day using the ET database. ET transmits sample submission information to the laboratory, allowing the lab to adequately staff and plan for surges in sampling. This allows both field staff and lab managers to more efficiently use personnel, resources and time during incidents such as food borne pathogen outbreaks.
- An expandable platform to incorporate new functions or animal disease threats.

Financial
- While ET’s primary function is the preservation of animal and human life, ET’s efficiencies helped CDFA absorb a cumulative budget reduction of 13.9 positions and $3,350,223 to animal health and milk dairy programs over the span of the project period. With the cost of the project, the reduction represents a 12% project ROI, 8.4% simple annualized ROI with a 3.75 year project pay-back period.

Collaboration and Transferability
- ET improved communication and collaboration among California’s animal agriculture community including CDFA, UC Davis, USDA and Veterinarians. ET’s single platform helps link the community together on an ongoing basis.
- The ET solution is transferrable to other government entities to improve the tracking, monitoring, and response to animal diseases and food safety issues.

In summary, the ET Project developed a comprehensive solution to the problem of animal disease and dairy food safety surveillance for threats that can cause huge economic losses, the death of millions of animals and disease in humans. While ET’s primary purpose is the tracking and prevention of disease, the project has developed other beneficial outcomes including cost avoidance, increased collaboration and technical innovation. Other states with similar agricultural issues could take an approach similar to ET to track disease and manage surveillance programs.

Emerging Threats Application – Surveillance of Animal Diseases