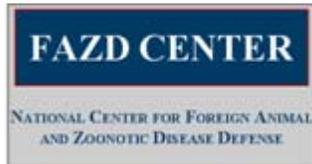


# FASTRANS: Modeling the Interstate Movement of Animals and Commodities

## A Necessary Step in Disease Spread Modeling



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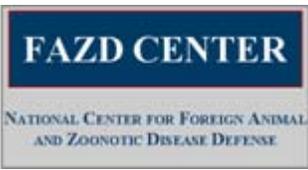
19 March 2008



# Outline

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- **Why FASTERANS?**
  - Need for a national FAS transportation model
- **Project Overview**
  - Research Questions
  - Project objectives
  - Year 1 deliverables
  - Project status



# Need for an Interstate FAS Transportation and Movement Model

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- The FAS commodity transportation and movement infrastructure is not well documented
- Disease and contamination spread models can't be employed to their full potential without such information

# The FAS Transportation/Movement Infrastructure is a Complex System

- The FAS infrastructure is an interlinked network of systems with multiple critical nodes
  - Large number of businesses/operations
  - Thousands of commodities
  - Each system/node exhibits unique vulnerabilities to attack
- The FAS infrastructure is ***dynamic*** and is influenced by many factors
  - Transportation network
  - Environment
  - Markets
  - International/global issues

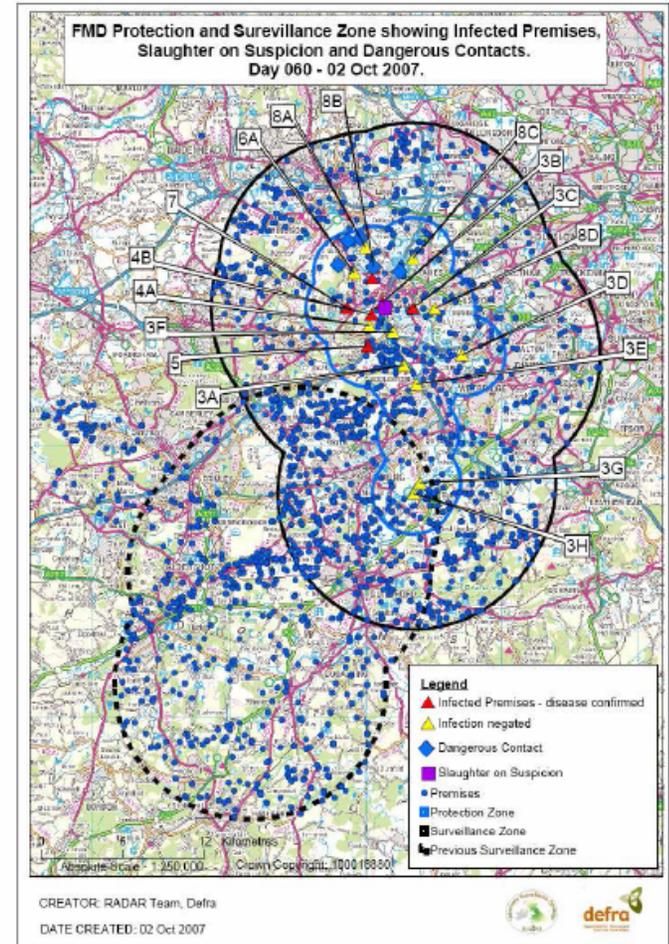


 Chicago Board of Trade



# Disease Models Need Accurate Movement Data

- In many cases, the spread of diseases will follow the movement of commodities – which is *dynamic*
- Control strategies depend on the movement of commodities (e.g., get feed to infected cattle, etc.,)
- Current movement information stored in disease models is a snapshot of history



# Example: Cattle Movement

## **Some** of the **factors** behind the movement of cattle

- Type of cattle (beef, dairy, breeders, show cattle, etc.)
- Weight/age
- Market conditions (price/lb, price of feed, price of fuel, etc.)
- Environment (seasons, droughts, etc.)
- Transportation (grid availability, trucking companies, etc.)
- Special circumstances
  - Disease outbreaks and quarantines

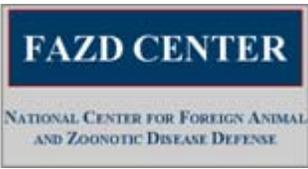


*The US cattle industry is horizontal in structure*



# What is the Research Question?

- How to accurately model the interstate movement of commodities without exposing sensitive data
  - Business sensitive: Data (premises, business rules/decisions, etc.)
  - Homeland Security: In some cases, data exposes vulnerabilities of the infrastructure to attack
- How to represent movement and business rules
  - Potentially large number of movement and business rules
  - A data management problem
  - Modeling movement at the approx. county level (many epidemic models operate at this level)
    - Example:
      - Approximately 3400 counties in CONUS
      - Assume 30 different animal types (e.g., breed, age, weight, etc.,)
      - $3400 \times 3400 \times 30 = 3.4\text{M}$  possible movement rules



# Objective – Long Term

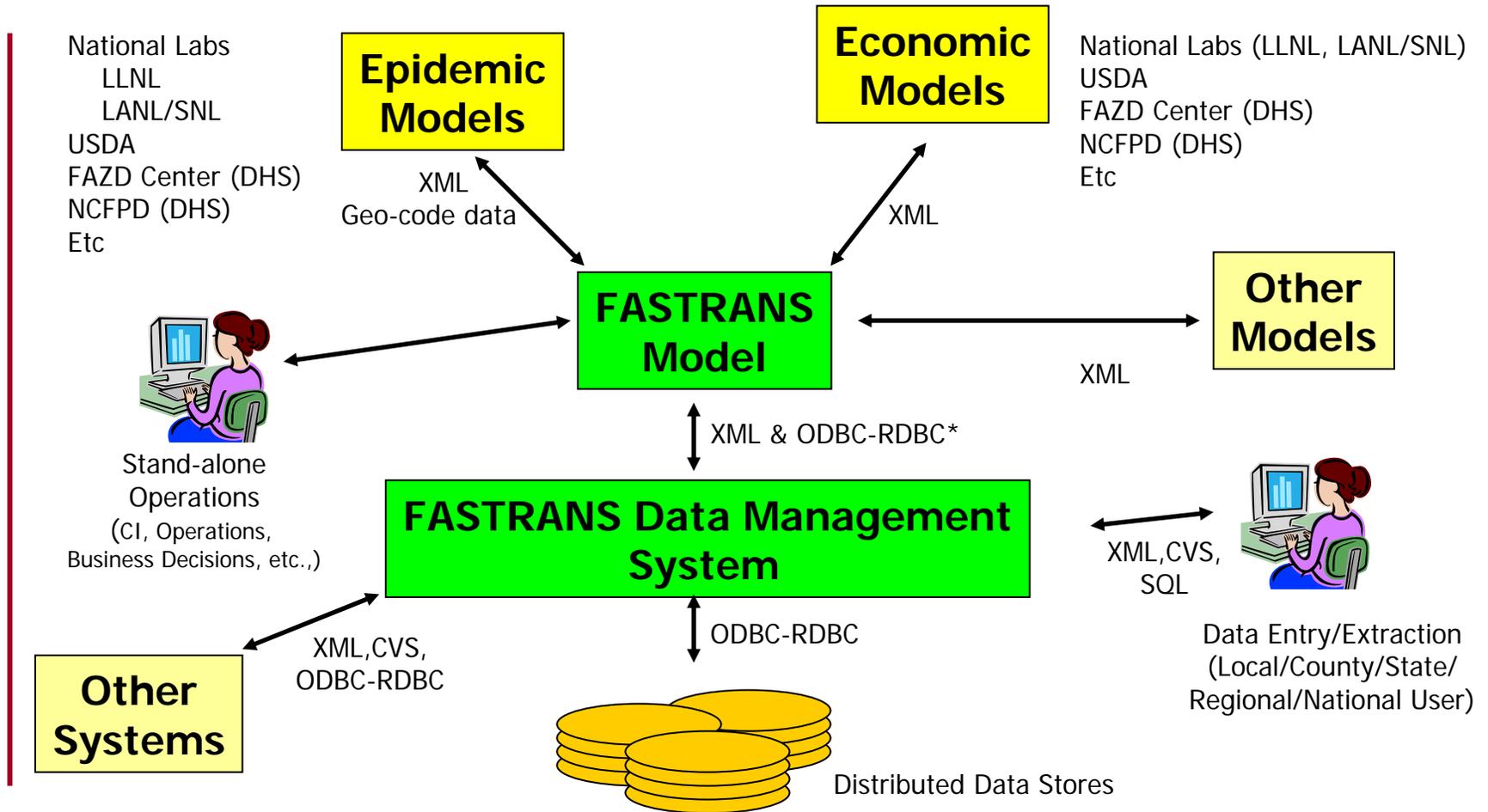
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- Development and deployment of an interstate FAS transportation and movement model (FASTRANS)
  - Linked to existing epidemic, economic, and environmental models
  - Support new models that come on line
  - Can also be used in stand-alone operations
- Development and deployment of a FASTRANS Transportation Data Management System
  - Populated with captured transportation and movement data
  - Templates to allow local, state, regional, and national level users to enter information
  - Provides data to the interstate FAS transportation model
  - Data available for analysis and additional model development

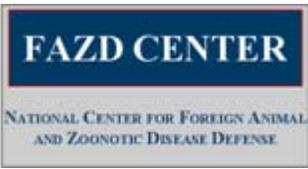
***Provide “insight” into the FAS movement infrastructure***

# FASTRANS



\* Both XML and ODBC-RDBC supported: allows model to interface to systems other than the FASTRANS data mgmt system

# Objective – Short Term FY08



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Development and deployment of an interstate cattle (beef and dairy) and swine transportation and movement model

- Largest gaps in knowledge exist in this sector
- Focus on providing movement data to enhance the epidemic and economic models for exotic disease
  - FMD modeling (DADS, MESA, NAADSM)
  - RVF modeling (FAZD/RVF)



**Foot-and-Mouth  
Disease**

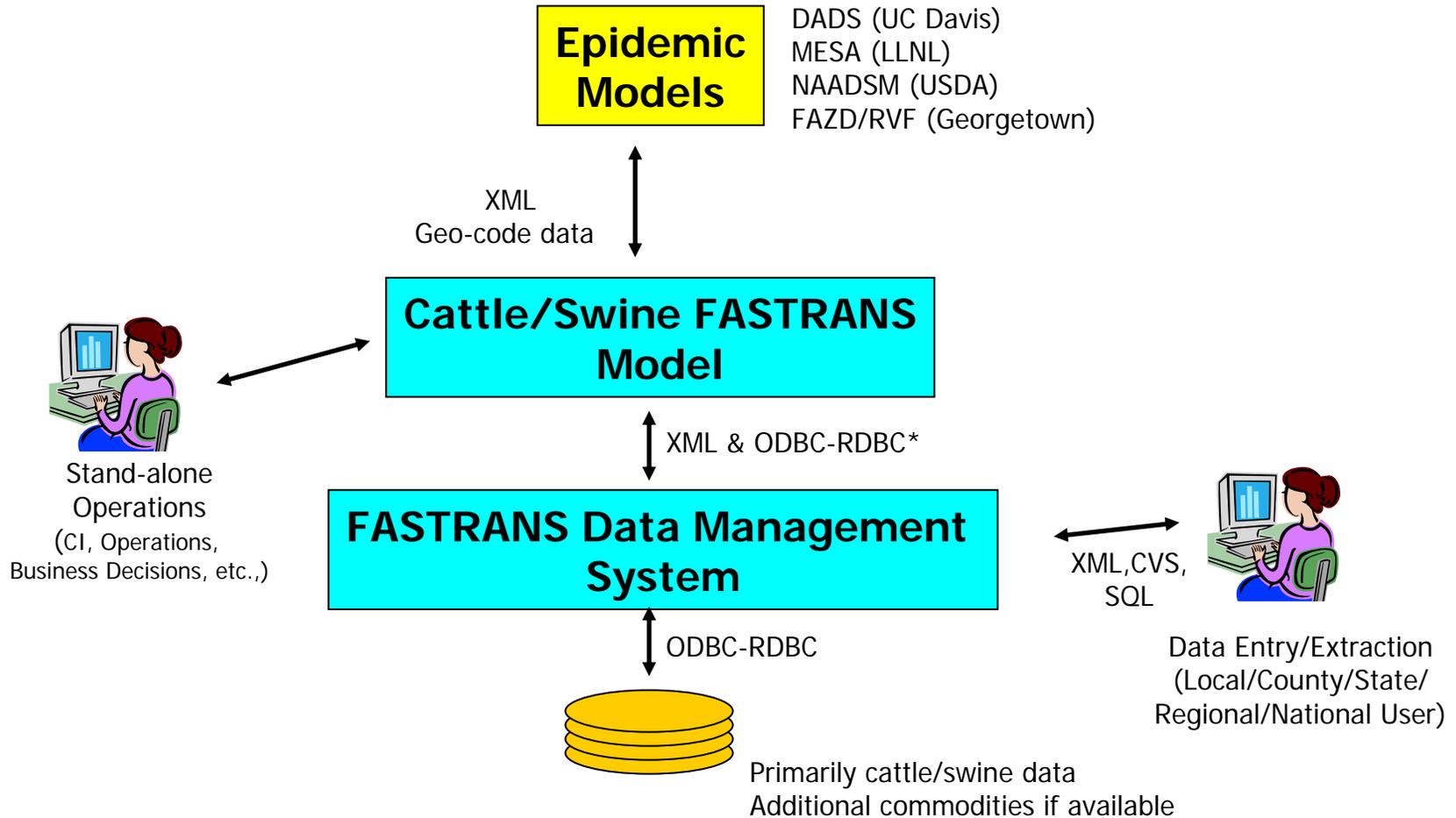


**Rift Valley Fever**

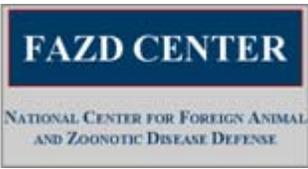


# Cattle/Swine FASTRANS

## Phase 1 Deliverable



\* Both XML and ODBC-RDBC supported: allows model to interface to systems other than FASTRANS data mgmt system



# Current Status

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- Initial FASTRANS model design completed
  - Core infrastructure completed
  - Initial movement/business rule representation
- Prototype FASTRANS data management system operational
  - Populating with data collected
- Collecting movement data from government agencies and the private sector
- Working with disease modeling teams to develop interface requirements
- On target to deliver working prototype FASTRANS model on 30 Sept 2008

# Next Steps

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- Continue collection of cattle and swine movement/business data
  - Continue to refine movement/business rules in FASTRANS
- Expand to include other commodities
  - Livestock
  - Commodities
- Expand model to link to other models/systems
- Develop methods to assess vulnerabilities in the FAS infrastructure

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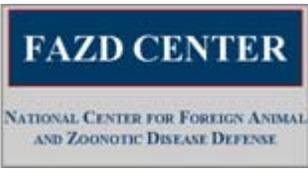
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Thank You



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# Backup

# Example of Simplified Model Function

