

# Public Health Information Network; Information Technology, Bioterrorism and Public Health: Unprecedented Challenges and Opportunities

John W. Loonsk, M.D.  
Associate Director for Informatics  
Centers for Disease Control and  
Prevention

# Public Health Information Network

- Ongoing public health information technology activities
- What happened last fall – re information technology and anthrax
- Some of what has been learned
- Role of Public Health Information Network in what still needs to be done

# Ongoing Public Health IT Activities

## Connectivity and Alerting

Connectivity: connectivity meeting Health Alert Network (HAN) standards (high speed continuous Internet access, ability to receive emergency broadcast health alert messages)

- 50 states and Guam
- 2,142 counties (68% of US counties)
- 13 states have 100% of counties connected
- 42 states have plans to include private providers; currently 2500 hospitals & 6000 physician offices

Alerting:

- 9/11 alert sent via HAN within 4 hours of WTC attack, advising on need for heightened surveillance
- Since 9/11 60 alerts, updates, and advisories sent

# Ongoing Public Health IT Activities

## Interactive Communications

EPI-X: Secure public health information, discussion

- Nationally delivered threaded discussion and edited report system
- Epidemic Information Exchange (Epi-X) posted 95 reports since 9/11
- provided secure discussion forum among state epidemiologists, local CDC investigative teams

# Ongoing Public Health IT Activities Information Dissemination – Web Site and Other Modalities

- CDC Bioterrorism web page >12,000,000 downloaded info, >5,000,000 only visited
- MMWR to >500,000 clinicians via e-mail & web
- CDC's Distance Learning network hosted 10 programs with audiences of >1,300,000
- 23 phone press briefings—1,909 journalists, >12,000 mentions
- 306 TV interviews: audience >370,000,000
- 2 TV, 3 radio news packages rebroadcast 216 to 798 times
- 2,583 phone inquiries to Emergency Operations Center from health professionals

# Ongoing Public Health IT Activities Surveillance - NEDSS

- In process of redeveloping surveillance infrastructure -> National Electronic Disease Surveillance System (NEDSS)
- Not “a software system,” but an initiative and a process to:
  1. Integrate diverse PH systems – many program stovepipes
  2. Connect to clinical data systems
  3. Use and promote national standards for data and systems
- Funding for 50 states and several large municipalities

# Ongoing Public Health IT Activities

## Diagnostic Capacity

### Laboratory Response Network (CDC & APHL)

- Support for group of laboratories for the testing of possible BT agents
- Website for state public health labs and other labs
- Protocols for BT agent testing, isolation, identification
- BT reagent ordering
- Communication between laboratorians

# Prior to 9/11

## Bioterrorism surveillance approaches:

- Informed alert health care provider notifies local or state health department
- IT contribution to detection vs. clinician alone is being investigated
- BT infrastructure should not be separate from non-BT
- Investigation of Bioterrorism detection methodologies
  - Multi-data source - clinical, drug, OTC, absenteeism, 911 calls, etc.
  - Some syndromic data (with follow-up) in emergency departments in the context of major events

# Prior to 9/11

Clear examples of the benefits of secondary public health use of clinical system data:

- Electronic Laboratory Reporting
  - more data, better data, more timely data
  - Hawaii – 2.3x the number of reports
- Clinical databases
  - Boston – via HMO data -> increase in 20% in number of TB cases reported
- Lack of clinical data standardization

Manual data entry for BT event detection

- Provider burden will limit compliance
- Focuses on questionable data types (i.e. syndromic data)

# 9/11-ish

- Anthrax attacks were not executed as many expected, many lessons learned
  - Started with a single case
  - Focal, not disseminated
  - Astute clinician
  - Identification was not syndromic
- Major CDC, state, local response
  - Investigation of possible cases, threats
  - Management of prophylaxis, treatment
  - Information development and dissemination
    - mail handling protocols. etc.
  - Human and environmental samples, samples, samples...

# 9/11-ish

- Major CDC, state, local response
  - Reacting to press reports
  - Traditional data flow and reporting in public health
  - Response decisions
    - Based on limited and imperfect information
    - Use limited and imperfect response tools
    - Response implemented across multiple organizations
    - Communicated to non-technical, highly energized audiences
    - New information points to “mistakes” or to “response improvement”?

# Some Major Anthrax Response IT Issues

1. Need to have as much in place as possible (software, hardware and processes) before an emergency
2. Majority of data needs were not about initial detection of a BT event or about alerting: were about threats, calls, cases, contacts, samples, results, sites, who to prophylax...
3. Ongoing issues exchanging data in #2 among partners: clinical, local, state and federal – need a standing network and data standards
4. Data (and hence systems) need to be linked across functions: Detection, possible threats -> possible cases, contacts, facility and geospatial data (maps) -> analysis and presentation to decision makers -> alerts and policies, prophylaxis and vaccination
5. Many knowledge management and communication issues – with teams, partners, public – getting specific information to point of need

# Interoperability Across Public Health - Example Functions and Organizations

Clinical Care System	“Possible case” data - fever and rash
Public Health Lab	Positive lab test result
Local Health Department	Case contact tracing data
Vaccine Clinic	Accelerated vaccination of contacts
State and Federal Agencies	Disease progression / response coordination resource deployment
Law Enforcement / First Responders	Criminal investigation / site management
All	Information and knowledge management
All	Communications to public and public health participants

# Interoperability Across Public Health

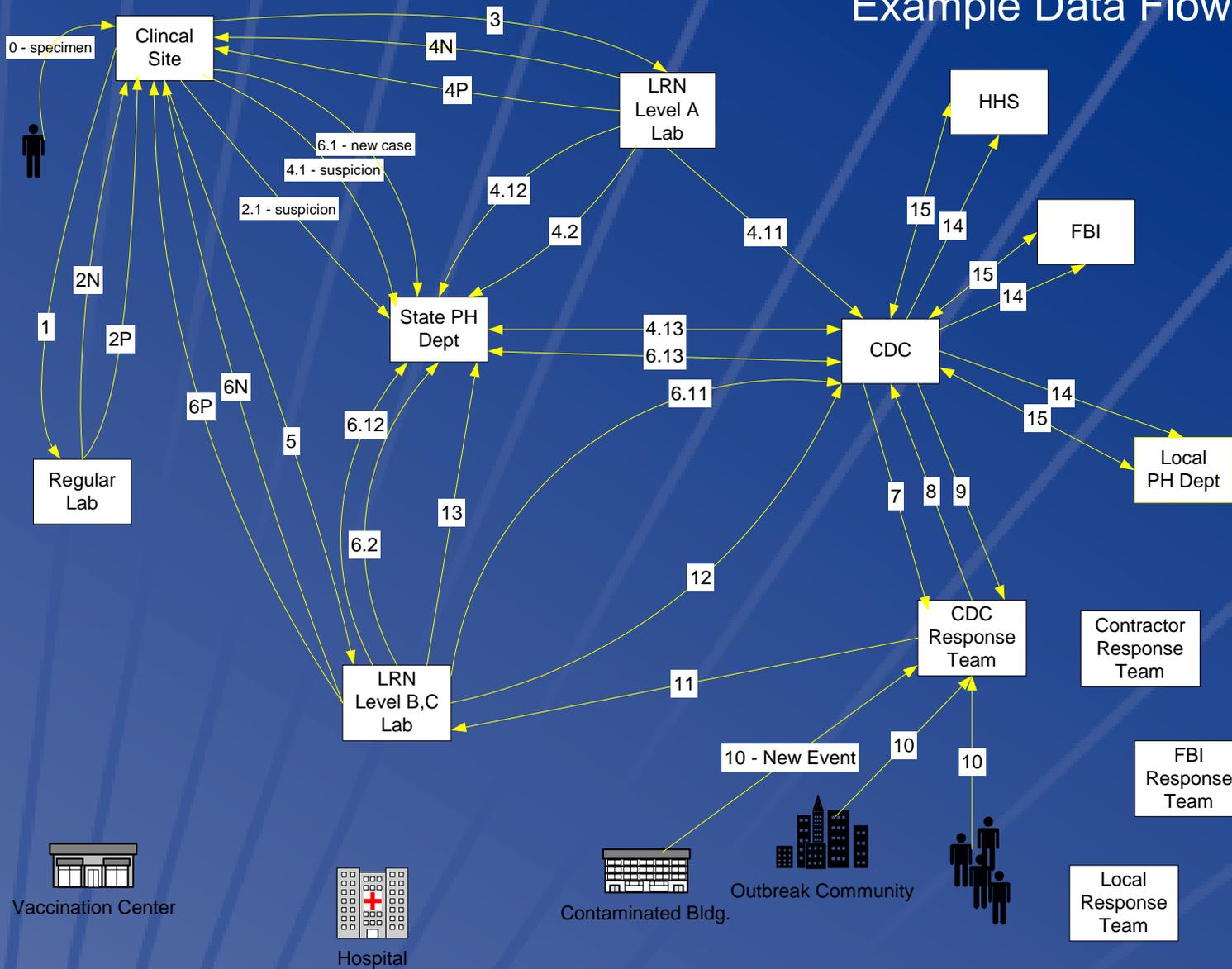
## Public Health Needs

Clinical Care System	Deliver industry standard data to public health, continue to investigate BT detection
Public Health Lab	Manage and exchange standard lab result data, implement LIMS systems
Local Health Department	Implement interoperable point of service systems that support local, state and national data needs, use deployable systems
Vaccine Clinic	
State and Federal Agencies	Disease tracking, analysis, and response and resource management systems
Law Enforcement / First Responders	Integratable emergency operations systems
All	Information dissemination and communications systems, standard directories
All	“Live network” for specific data exchange

# Vaccination Related Information Technology Needs

1. The support of vaccine administration
  - integrated with clinic workflow, operations, and ancillary process considerations (vaccine cards, labels, bar code readers, etc.)
2. Tracking vaccine use
  - Vaccine batch usage information
  - Lot and diluent information
3. “Take” recording management
  - Matching against vaccinated individual
4. Active and passive adverse event surveillance
5. Storage of data on vaccinated individuals
6. Storage and management of possible and conformed cases with appropriate epi data
7. Matching of possible exposures and of case contacts against the vaccinated individuals list
8. Real-time exchange of confirmed case, possible case, lab results, number of vaccinated individuals and vaccine lot data with the state and federal authorities
9. If IND vaccine is used, there are a series of additional process, data and information exchange requirements

# Example Data Flow



# Information Technology and Public Health

Specific initiatives have shown the potential of public health information technology:

- Health Alert Network (HAN) – Internet connectivity, alerting and distance learning
- National Electronic Disease Surveillance System (NEDSS) – disease surveillance, electronic laboratory reporting
- Laboratory Response Network (LRN) – diagnostic capacity and information delivery
- Epidemiology Information Exchange (EPI-X) – Secure, interactive communications
- CDC and other web sites – Public information access
- National Health Care Safety Network (NHSN) – Patient safety data

Now that public health is being tested by new needs for preparedness and response, it is time to advance a public health information network that brings together the functions and organizations that are public health.

# Public Health Information Network Functions

- **Detection and monitoring** – support of disease and threat surveillance, national health status indicators
- **Analysis** – facilitating real-time evaluation of live data feeds, turning data into information for people at all levels of public health
- **Information resources and knowledge management** - reference information, distance learning, decision support
- **Alerting and communications** – transmission of emergency alerts, routine professional discussions, collaborative activities
- **Response** – management support of recommendations, prophylaxis, vaccination, etc.

# Public Health Information Network - Characteristics

- An interoperable network – supporting diverse electronic public health functions and needs
- Industry standards based – interoperable with other partner data systems
- Live data – continuous monitoring of nations health, continuous detection and evaluation of possible threats
- Dual use – meets BT preparedness needs and a major advance for routine public health practice
- Builds on existing investments – natural progression from HAN, NEDSS, EPI-X, LRN, CDC Web

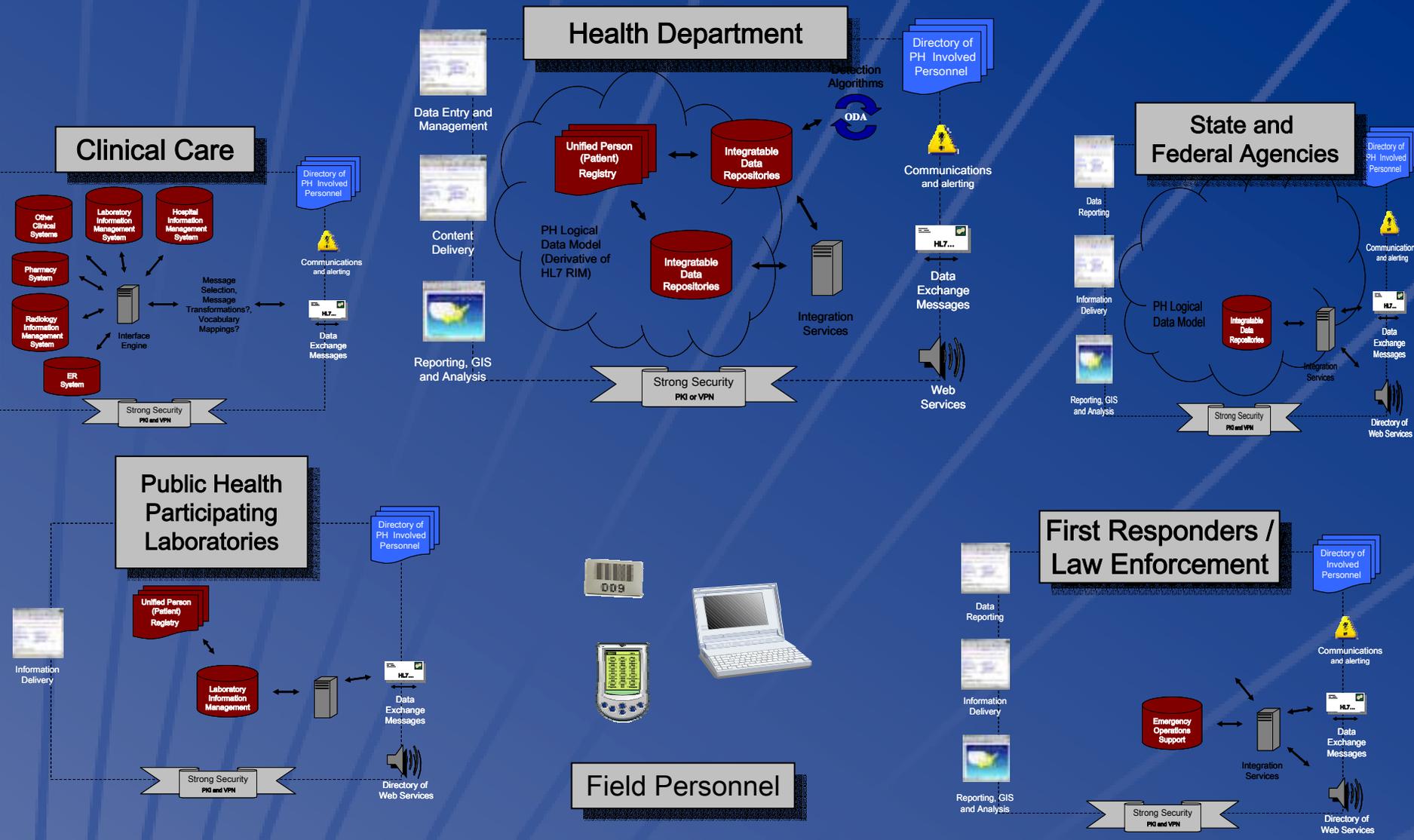
# Integrated Network Functions and Specifications - Bioterrorism Funds

- An “always on,” interoperable system for exchanging all relevant critical information types
- Event detection and surveillance
- Public health response data management capabilities
- Analysis and visualization - getting information to decision makers
- Laboratory information management integration
- The reliable identification of the participants in preparedness and response with identification of roles and responsibilities
- Efficient information dissemination, communications, and alerting
- Secure systems that are reliably available even in crisis situations

# Public Health Information Network Interoperability Strategies

- Systems architecture
- Shared data model and vocabularies
- Live network for the exchange of specific data

# Public Health Information Network – Systems Architecture



# Health Department

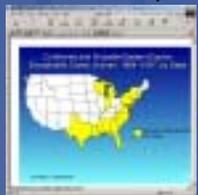
Directory of PH Involved Personnel



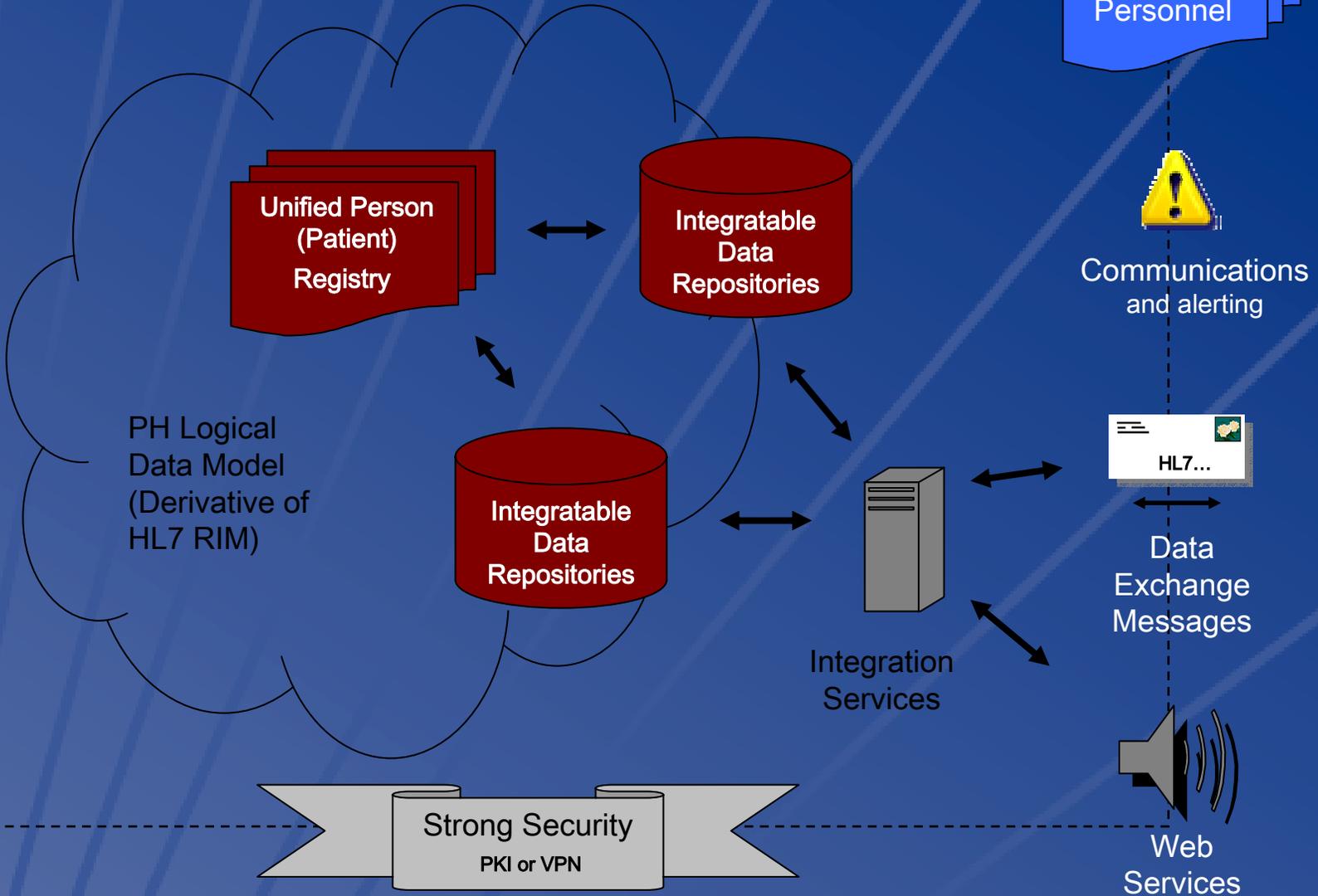
Data Reporting



Content Delivery



Reporting, GIS and Analysis



Data

HL7 RIM

PH Domain  
Information  
Model

Other Industry  
Data Models

Specificity

Environmental  
Health Tracking,  
BT, etc.

PH  
Logical  
Data Model

Physical Database Implementations

Messages

# Public Health Information Network – “Live Network”

“Live” Exchange of and Access to Specific Data  
for Interoperable Systems – Messages and Storage

Specific Data Content – Vocabulary Terms

Data Structure – Data Models

Transport / “Handshake Between Information Systems” - ebXML

Encryption / Security – HTTPS, ebXML

Connectivity – Continuous Internet Connectivity



# Public Health Information Network Messages

## Routine Public Health and Investigation of BT Detection Messages

### Clinical

- Microbiology results
- Orders
- Chief complaints
- Lab results
- Discharge diagnosis

### Public Health

- Nationally Notifiable Diseases
- Hepatitis
- Meningitis
- Electronic Lab Reporting

## Response Messages

- Lab test request
- Lab result
- Case report
- Test result available notification
- Specimen container shipment
- Specimen context
- Intervention request
- Intervention result report
- Contact list report
- LDIF directory exchange
- Alerts and public health information dissemination

# Current Status of Public Health Information Network

## Public Health and Social Services Emergency Fund

- \$1 billion for state and local public health capacity (estimate that 30% of funding is going to IT)
- CDC and HRSA stipulate use of standards for IT investments

## CDC approves naming of IT Functions and Specifications as Public Health Information Network Standards

- Apply to all CDC - public health information technology initiatives

## All 50 states have received funding for HAN (starting in fy1999) and NEDSS (starting in fy 2000)

- 16 implementing NEDSS compatible state-developed systems, 20 proposed use of NEDSS Base System (NBS)

# Current Status of Public Health Information Network

## Laptop deployable systems

- Case management, contact tracing, specimen and results management, vaccination and prophylaxis management

## Software for industry standards based inter-institutional messaging available from CDC

- HL7 messages, ebXML “handshake,” PKI encryption and security

## Technical assistance and direct assistance available for public health partners