PHIN Support for Outbreak Management: Requirements Definition & Architectural Approach

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Topics Addressed

- PHIN Outbreak Management Architecture Definition Task Overview
- Requirements and Architecture for Outbreak Management
- PHIN Architectural Convergence

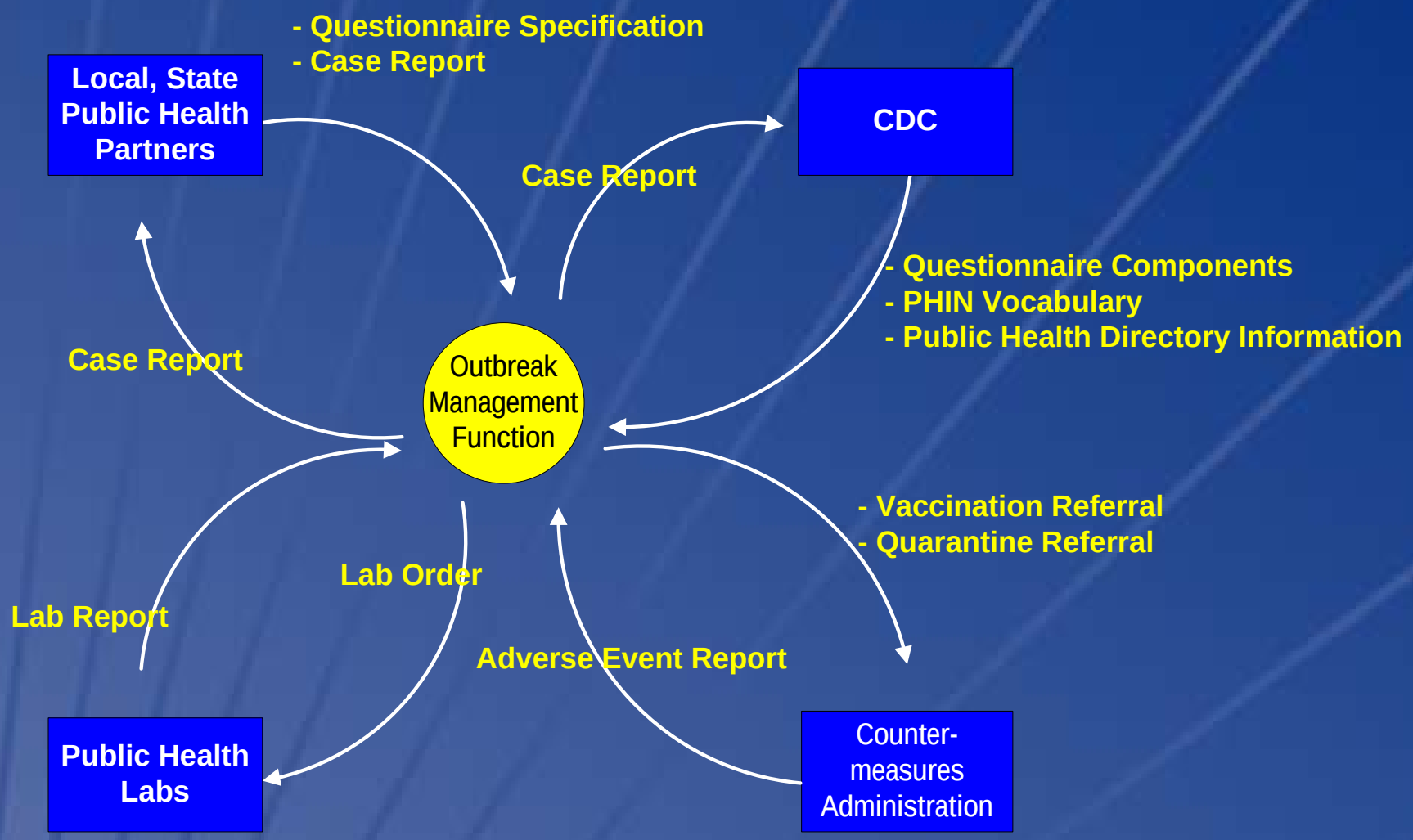
PHIN OM Architecture Definition Task Overview

- CDC initiative to define a standards-based architecture that will enable local, state, and federal public health partners to effectively respond to and manage outbreaks
- "Outbreak" defined broadly as disease or health event manifested as a combination of symptoms observed in one or more cases
  - Includes biological, chemical, radiological, nuclear, and environmental events
  - Includes routine and outbreak-specific surveillance activities
- Approach
  - Identify and document functional requirements and core data exchanges
  - Develop architectural roadmap for integrating systems in accordance with PHIN principals, including the OMS, the NBS, and state and local systems

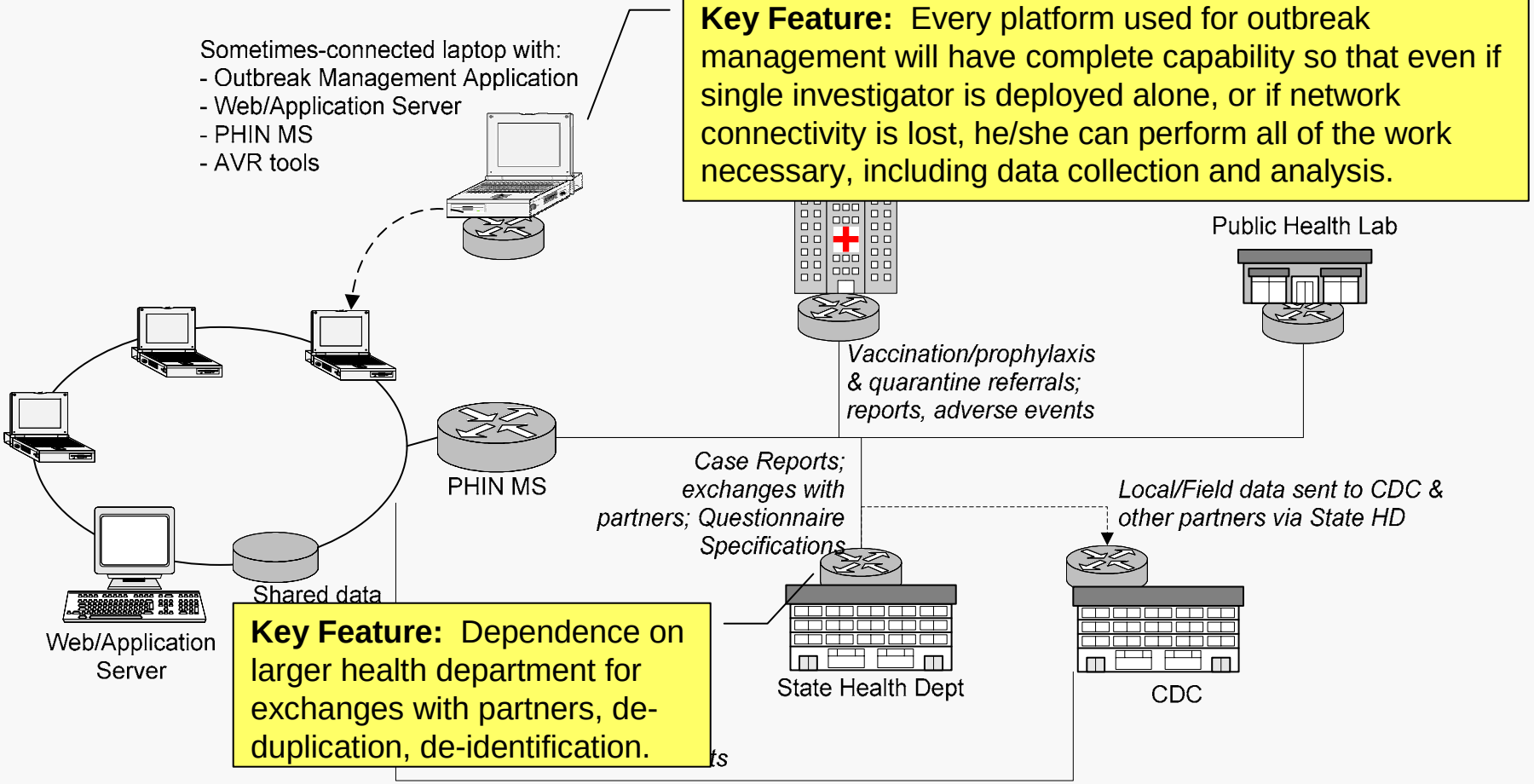
Outbreak Management Top-Level Functions

- Case Investigation and Contact Tracing
- Data-Collection Instrument Management
- Exchanges with Lab Information Management Systems
- Exchanges with Countermeasure and Response Administration Systems
- Data Sharing
- Data Analysis

Outbreak Management Core Data Exchanges



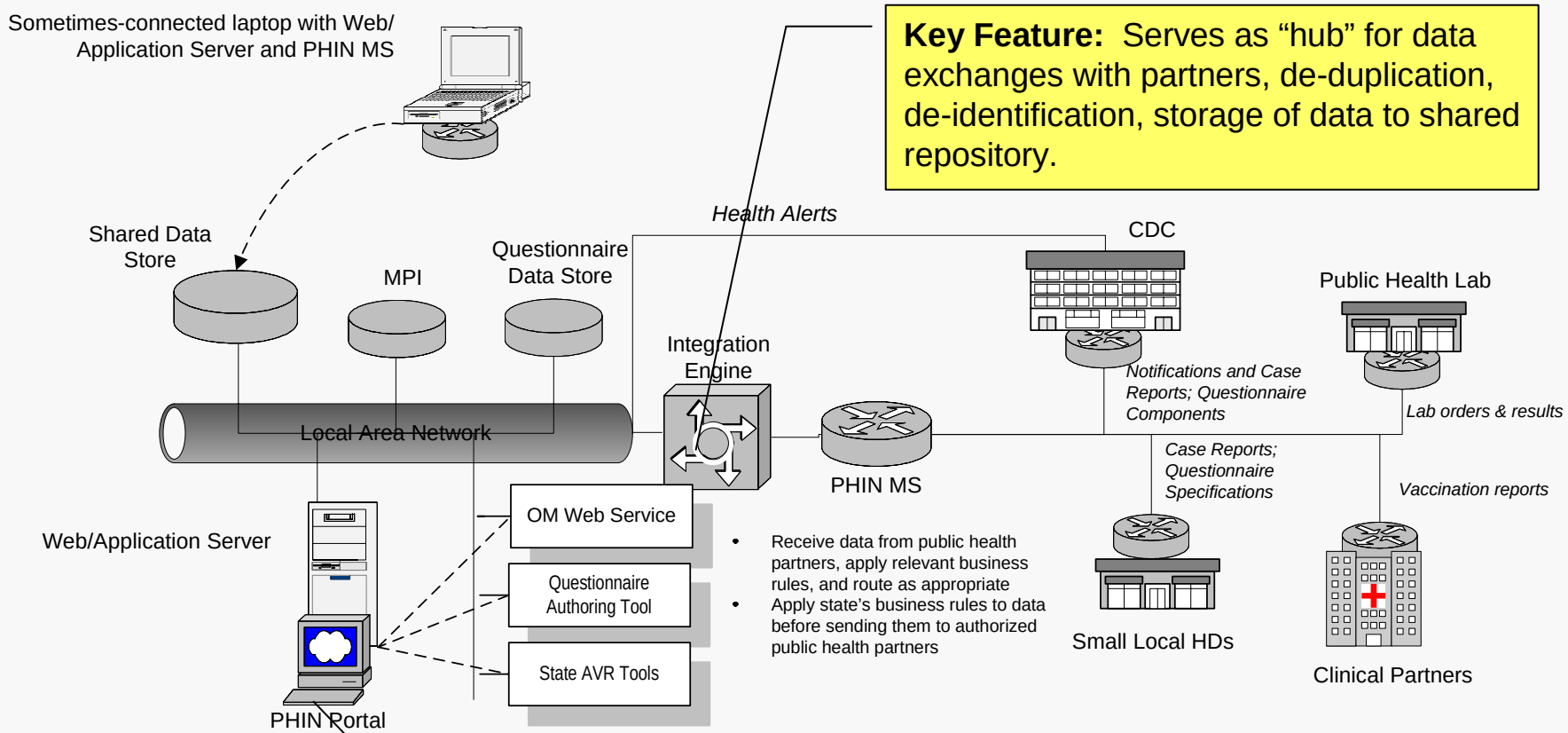
PHIN Outbreak Management Notional Architecture for Local Health Department or Field Investigation Team



Key Feature: Every platform used for outbreak management will have complete capability so that even if single investigator is deployed alone, or if network connectivity is lost, he/she can perform all of the work necessary, including data collection and analysis.

Key Feature: Dependence on larger health department for exchanges with partners, de-duplication, de-identification.

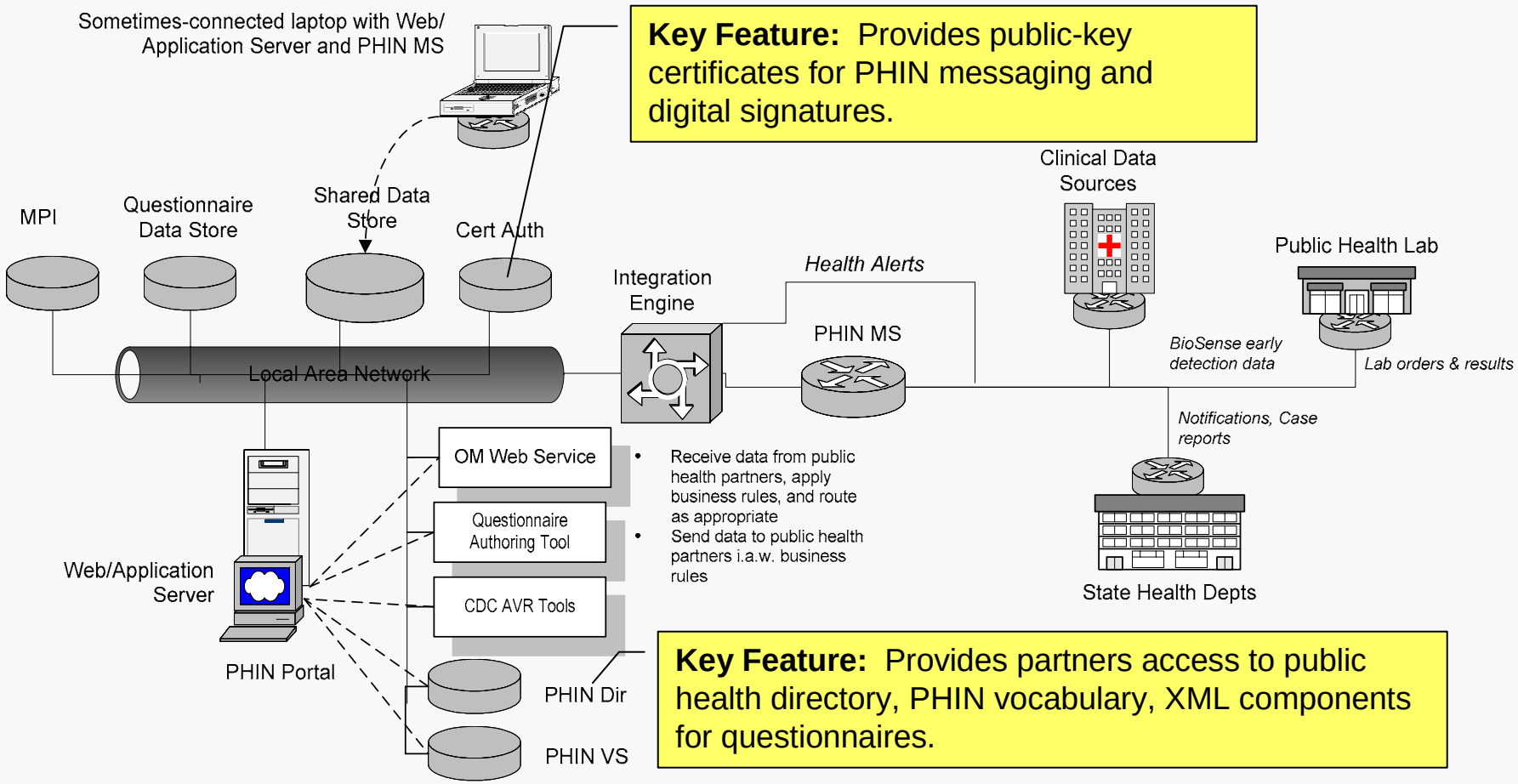
PHIN Outbreak Management Notional Architecture for State or Large Local Health Department



Key Feature: Serves as "hub" for data exchanges with partners, de-duplication, de-identification, storage of data to shared repository.

Key Feature: PHIN Portal provides convenient Web access to OM support services through a single view.

PHIN Outbreak Management Notional Architecture for CDC Director's Emergency Operations Center



Key Feature: Provides public-key certificates for PHIN messaging and digital signatures.

Key Feature: Provides partners access to public health directory, PHIN vocabulary, XML components for questionnaires.

Architectural Considerations for Data-Collection Instruments

- How can we achieve consistency?
  - Questions asked
  - Acceptable responses
  - Vocabulary
  - Messaging
- How can we efficiently distribute instruments in the event of an outbreak?
- How can we modify instruments during an investigation?
  - Maintain associations between data and instrument used
  - Maintaining configuration control
- How can we produce instruments that can be consumed by a broad range of platforms, including fielded laptops and tablet PCs, NBS, and proprietary solutions?

Common Approach to Data Collection: Concept of Operations

Authoring Environment

- Provide XML editors for creating standard XML schemas
- Produce sharable, consumable XML schemas for collecting data for specific investigations
- Publish schemas and implementation guides
- Maintain knowledge repository of standards-based templates, reusable XML schemas, executable rules
- Maintain configuration control

XML Schema

```
1  <?xml version="1.0"?>
2  <!DOCTYPE levelone PUBLIC "-//HL7//DTD CDA Level One 1.
3  <levelone>
4    <clinical_document_header>
5      <id EX="a123" RT="2.16.840.1.113883.3.933"/>
6      <set_id EX="B" RT="2.16.840.1.113883.3.933"/>
7      <version_nbr V="2"/>
8      <document_type_cd V="11488-4" S="LOINC"
9        DN="Consultation note"/>
10     <origination_dttm V="2000-04-07"/>
11     <confidentiality_cd ID="CONF1" V="N" S="HL7_Confide
12     <confidentiality_cd ID="CONF2" V="R" S="HL7_Confide
13     <document_relationship>
14       <document_relationship.type_cd V="RPLC"/>
15       <related_document>
16         <id EX="a234" RT="2.16.840.1.113883.3.933"/>
17         <set_id EX="B" RT="2.16.840.1.113883.3.933"/>
18         <version_nbr V="1"/>
19       </related_document>
20     </document_relationship>
21     <fulfills_order>
22       <fulfills_order.type_cd V="FLFS"/>
```

State and Local Investigation Environments

- Retrieve investigation-specific XML schemas and implementation guides
- Provide application capable of consuming XML input
- Use PHIN Vocabulary Service to retrieve vocabularies referenced by XML schemas
- Capture routine surveillance and outbreak data as XML name-value pairs
- Store surveillance data in local data store and/or shared repository
- Send and receive investigation information in HL7 messages

HL7 Message

PHIN Standard (required)

CDC-Specified & Available

CDA as a PHIN Standard?

- What is CDA?
  - Document markup standard that specifies structure and semantics of clinical documents
  - First certified XML specification for health care (ANSI/HL7 CDA R1.0-2000)
  - "CDA document" is a defined and complete information object that can include text, images, sounds, and other multimedia content
- What attributes make it attractive as a possible structure for specifying surveillance data-collection instruments?
  - Supports sharing of documents, while imposing minimal constraints on local policies and practices
  - Can include multimedia content
  - Basis for health care's Electronic Health Record standard
  - Assumes heterogeneous processing environment
  - Provides for vertical "levels" of granularity and horizontal specialization of document types
  - Based on HL7 Reference Information Model (RIM)
  - HL7 message-compatible

Converging PHIN Activities into a Common PHIN Architecture

Standard Interchanges

(1) Capability to produce and consume PHIN-standard messages.

Standard Inputs

(2) Capability to consume common data-collection instrument content.

Standard Inputs & Outputs

(3) Common set of functions and capabilities.

Standard Methods

(4) Common application architecture.

Key Points

1. CDC is using an iterative approach to define the PHIN architecture.
2. The PHIN architecture for outbreak management is designed to facilitate data exchange among partners.
3. An approach for creating, distributing, and consuming XML-based standard data-collection instruments at local, state, and national levels is being defined.
4. A goal is to converge PHIN systems toward a common architecture.