

Migration of Legacy Applications at Los Angeles County- Public Health to a PHIN and HL7 (V3) Architecture

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- ❖ **February 8, 2002, the Centers for Disease Control and Prevention (CDC) awarded funding to state and local jurisdictions to support public health preparedness and response to bioterrorism.**

- ❖ **Seven focus areas identified:**
 - **A: Preparedness Planning and Readiness Assessment**
 - **B: Surveillance and Epidemiology Capacity**
 - **C: Laboratory Capacity: Biologic Agents**
 - **D: Laboratory Capacity: Chemical Agents**
 - **E: Health Alert Network, Communications, and Information Technology**
 - **F: Communicating Health Risks and Health Information Dissemination**
 - **G: Education and Training**

CDC defined detailed technical specifications to assist state and local jurisdictions in the planning and deployment of public health information systems according to distinct national standards:

- **Public Health Information Network (PHIN):** National initiative that aims to establish a standards-based collaborative network for the exchange of critical health information between public health and clinical information systems
- **National Electronic Disease Surveillance System (NEDSS):** Broad, national initiative to advance the development of efficient, integrated, and interoperable disease surveillance systems at federal, state, and local levels
- **Health Alert Network (HAN):** National effort to establish an effective, rapid communications network that promotes connectivity between public health departments and emergency response agencies while facilitating the electronic exchange of information in standardized formats
- **PHIN Data standards are derived from HL7 RIM.**

PHIN Functional Capabilities Requirements

- 1. The Automated Exchange of Data between Public Health Partners**
To securely and automatically exchange information, as appropriate, between two computer systems to achieve a “live” network for data exchange between partners in public health.
- 2. The Use of Electronic Clinical Data for Event Detection**
To receive, manage and process electronic data from care systems at clinical care sites, laboratories, or their proxies.
- 3. Manual Data Entry for Event Detection and Management**
To receive, manage and process electronic data from care systems at clinical care sites, laboratories, or their proxies.
- 4. Specimen and Lab Result Information Management and Exchange**
For laboratories involved in public health testing, to receive laboratory requests, accept specimen and sample data, manage these data and immediately report electronic results to public health partners.
- 5. Management of Possible Case, Contacts and Threat Data**
To electronically manage, link and process the different types of data (possible cases from detection, possible contacts, facility, lab results, prophylaxis and/or vaccination, adverse events monitoring and follow-up).

PHIN Functional Capabilities Requirements - contd

6. **Analysis and Visualization**
To analyze, display, report and map accumulated data and share data and technologies for analysis and visualization with other public health partners.
7. **Directories of Public Health and Clinical Personnel**
To participate in and maintain directories of public health participants (including primary clinical personnel), including participant roles and contact information.
8. **Public Health Information Dissemination and Alerting**
To receive, manage and disseminate alerts, protocols, procedures and other information for public health workers, primary care providers, and public health partners in emergency response.
9. **IT Security and Critical Infrastructure Protection**
To ensure that sensitive or critical electronic information and systems are not lost, destroyed, misappropriated or corrupted.

The Role of Public Health

Initial Response to BT Induced Disease

- ❖ Early detection through surveillance/ rapid assessment of reports
- ❖ Mobilize laboratory
- ❖ Rapid confirmation of agent, site, initial at-risk population, prophylaxis and/or treatment
- ❖ Alert medical community, ERs, labs
- ❖ Implement disease specific plans (e.g. Smallpox)
- ❖ Determine resource needs and possible quarantine
- ❖ Coordinate with partner agencies (local/state/national)



BT-PHIN Functional Support

❖ Traditional Surveillance

- Improve traditional disease surveillance system through enhancements of existing reportable disease applications.
- Expand deployment of secure, web-based disease reporting, electronic linkages to the public health laboratory and laboratory partners, and improved feedback to reporting sources.
- Promote situational awareness by providing the capability to track reporting of additional public health threats from emergency response partners

❖ Enhanced Surveillance

- Enhanced surveillance through electronic interfaces with key public health partners.
- Expansion of current laboratory interface projects, hospital syndromic surveillance research, coroners death surveillance, and access to additional data sources (such as pharmaceutical data, 911 / dispatch, and hospital information systems).
- Expand accessibility to analytical and data management tools to ease burden on public health staff. Includes development of automated analytical routines and access to data mining and geographic information systems applications

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BT-PHIN Functional Support

- ❖ **Management of Strategic National Stockpile**
 - **Ensure capacity to support SNS operations through the development of tracking modules to support inventory control, resource distribution, management of the supply chain, and resource requests from various field-based operations.**

- ❖ **Public Health Laboratory Activities**
 - **Coordinate with surveillance programs to ensure rapid identification of reports submitted to the Public Health laboratory or other LRN partners in the region including requests for specimen identification, characterization, and surge capacity**

 - **Develop the capacity to track LRN specimen processing from traditional reporting sources and emergency response partners (includes intake of samples from FBI and BioWatch sampling and results reporting to agency partners including TEW, EMS, law enforcement, and Haz-Mat units)**

BT-PHIN Functional Support

BT-PHIN project will provide functional support to (contd):

❖ **Enhance case management tools**

- **Managing reported cases and contacts to improve the timeliness of data and improve ability to manage current workflows.**
- **Improve access to advanced analytical technologies (COTS statistical packages, GIS modules, and reporting tools) to support rapid investigation or other public health assessments.**

❖ **Immunization / Prophylaxis**

- **Develop capacity to track the administration of prophylaxis and immunizations within the jurisdiction via registry enhancements to support cases and contacts, scheduling and forecasting of follow-up schedules, and adverse event tracking**

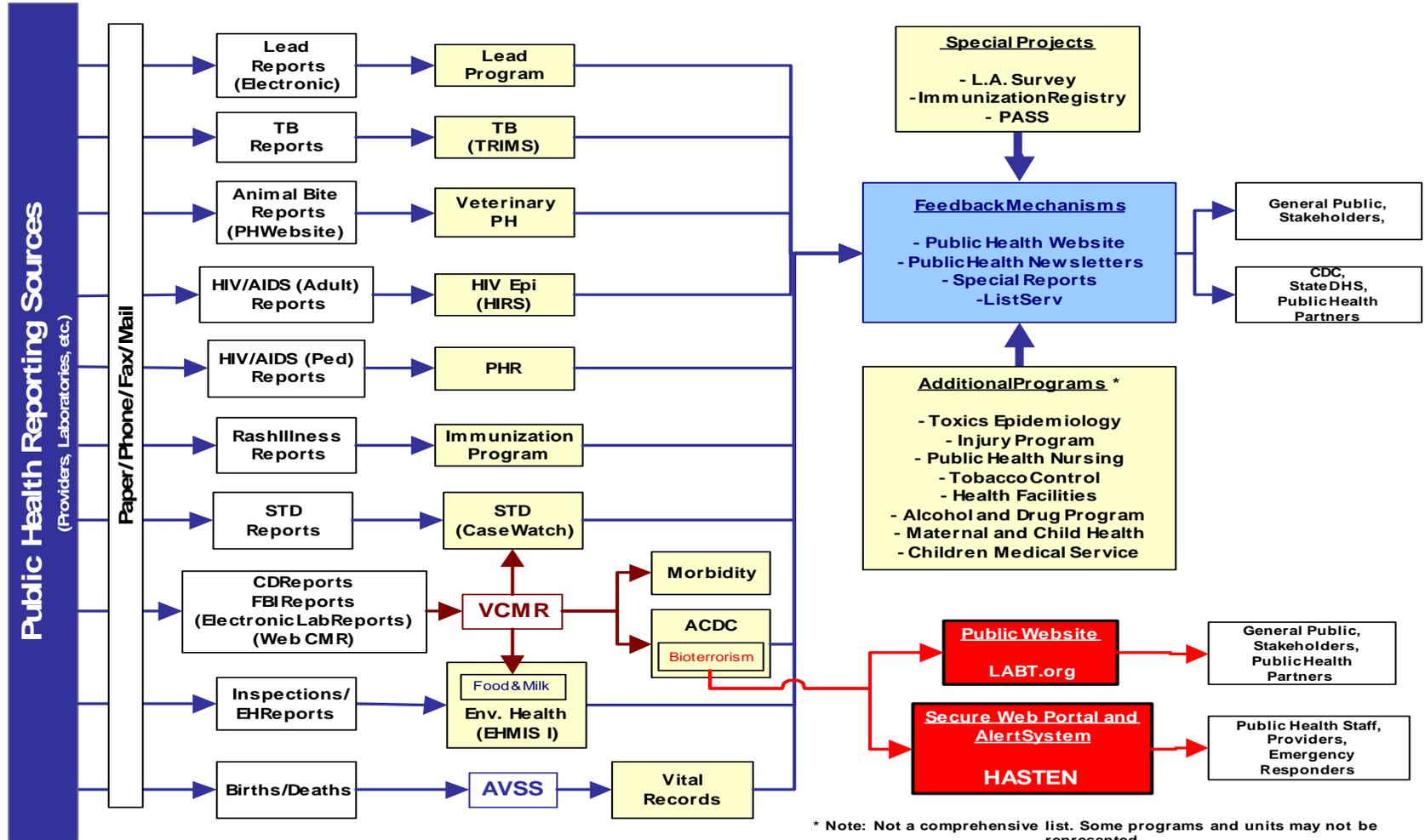
Current Problems in Public Health

- ❖ **Limited collaboration and information sharing among public health programs**
- ❖ **Unacceptable burden on reporting sources and public health partners**
- ❖ **Vast duplication of effort and incomplete, untimely data**
- ❖ **Limited access to critical community health information**
- ❖ **Protracted policy-making process and inefficient public health response**

The Challenge in L.A County

- ❖ Los Angeles County covers an area of over 4000 square miles (88 unincorporated cities)
- ❖ Largest population of any county in the country with nearly 10 million people (14 million in the Op. Area)
- ❖ 29.3 % of California's population (only eight other states exceed the population of the county)
- ❖ Second largest public health jurisdiction in the country
- ❖ 114 acute care hospitals, 81 of which have fully staffed emergency departments
- ❖ Safety net of care lacks resources
- ❖ Highly mobile population
- ❖ Highly diverse population spread across wide geographic area
- ❖ **All these factors limit L.A. County's ability to respond to public health emergencies such as bioterrorism**

Current Public Health Reporting and Alerting Structure



* Note: Not a comprehensive list. Some programs and units may not be represented

Critical Needs in Los Angeles

- ❖ **Los Angeles County Bioterrorism Preparedness and Response Unit identified the most critical operational needs:**
 - **Enhanced Surveillance**
 - **Epidemiologic Investigation and Response**
 - **Immunization / Prophylaxis**
 - **Management of Strategic National Stockpile**
 - **Public Health Laboratory Activities**
 - **Public Health Disaster Management**
 - **Emergency Communications and Health Alert Network**
 - **Information Technology: PHIN/NEDSS Standardization**
 - **Information Technology: Security and Continuity of Service (Disaster Recovery)**
 - **Risk Communication**
 - **Training**

BT-PHIN Action Plan

- ❖ **Los Angeles County Public Health (LAC-PH) engaged CAL2CAL to support the development of an Action Plan to outline a technical strategy for preparedness efforts.**
- ❖ **The Bioterrorism Preparedness and Response Program of Los Angeles County Department of Health Services - Public Health published the technical Action Plan for the Bioterrorism Preparedness and Response Initiative in early 2003.**
- ❖ **The Action Plan proposed a unified PHIN compliant architecture for integration of the multitude of independent systems within the Los Angeles County Public Health and provide a strong platform for future development activities.**

BT-PHIN Action Plan Adoption Benefits

Adoption of the Action Plan would enable LAC-PH to:

- **Enhance the ability of Public Health to conduct surveillance for bioterrorism and other communicable diseases through automated data exchange with public health partners**
- **Provide web-based applications for Public Health that will assist in the control of disease outbreaks and offer critical surge capacity for the tracking of epidemiological information during a bioterrorism event or public health emergency**
- **Broaden the communications capabilities of the public health system in Los Angeles County to enhance information sharing with critical local, state, and federal response partners during a bioterrorism event or other public health emergency**
- **Develop advanced training tools for public health staff and emergency response partners through the use of collaborative web-based tools and distance learning technologies**

BT-PHIN Program Objectives

Los Angeles BT-PHIN Program objectives defined in the Action Plan were:

- **Public Health Incident Management Systems (IMS):** A collection of web-enabled transactional database systems that integrated information sharing across a broad spectrum. This would consist of modifications to existing information systems like VCMR, LINK, and HASTEN. IMS also was proposed to integrate with County EMIS and Terrorism Early Warning Group.
- **Healthcare Electronic Data Exchange (HEDEX):** An electronic interface and data exchange hub that would collect, analyze and provide digital feedback of public health data between various healthcare partners like DHS, hospitals, labs etc using standardized HL7 data streams.

BT-PHIN Program Objectives

Los Angeles BT-PHIN Program objectives defined in the Action Plan were:

- **Los Angeles Immunization Network (LINK):** Enhancements would be made to the California Automated Immunization Registry (CAIR) software to develop a response module under LINK immunization registry under deployment throughout Los Angeles County.
- **Health Alert System Training and Education Network (HASTEN):** Provide for secure, rapid and redundant communication channels to exchange health related information between health partners and response agencies. System would also provide for communication backup in a disaster situation when normal communication channels are unavailable.
- **Public Health Data Mart:** As a component of the DHS Enterprise Data Warehouse, this would serve as the large-scale integration and analysis point for public health and clinical data under the Department of Health Services.

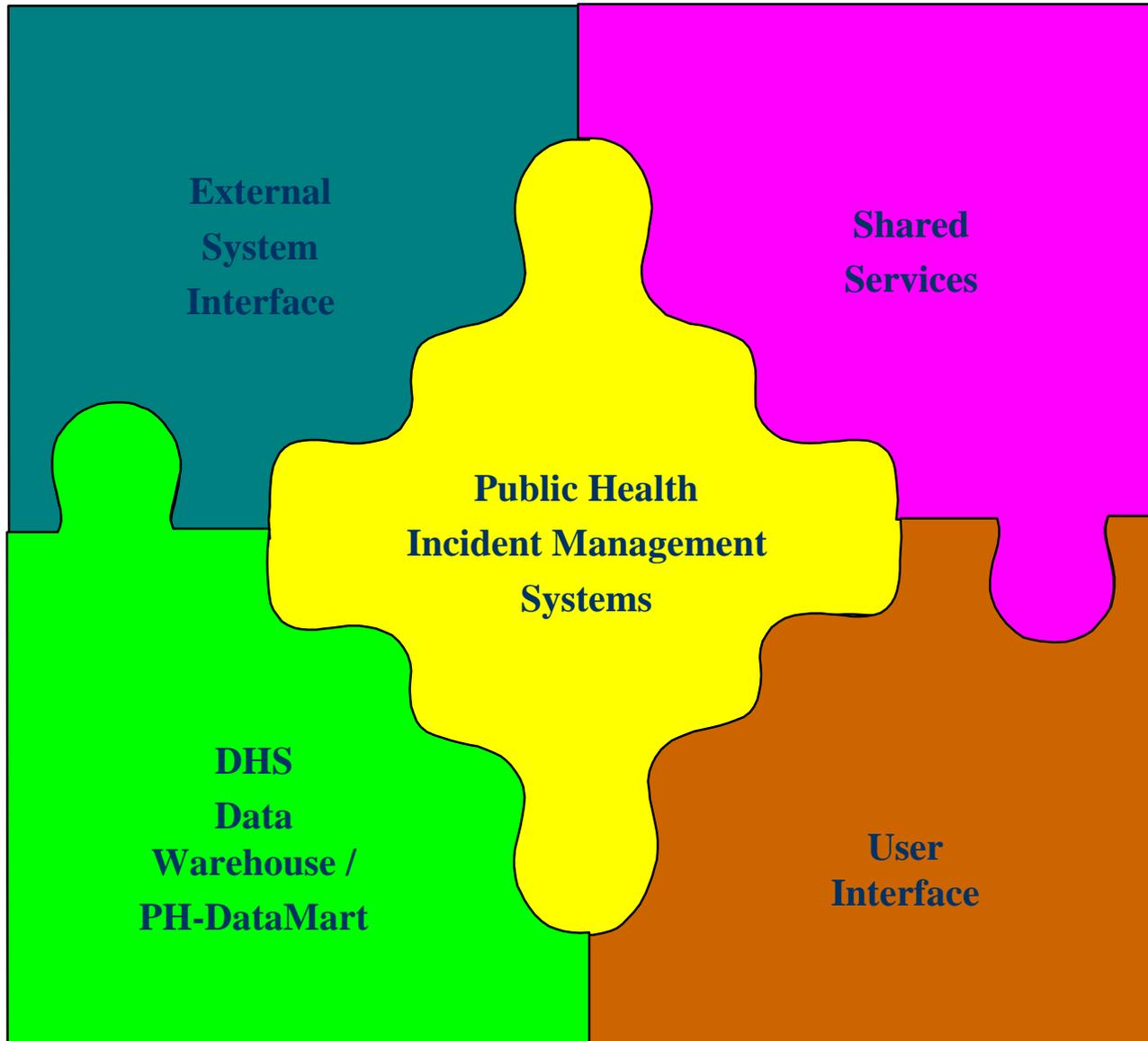
LAC BT-PHIN Project Team

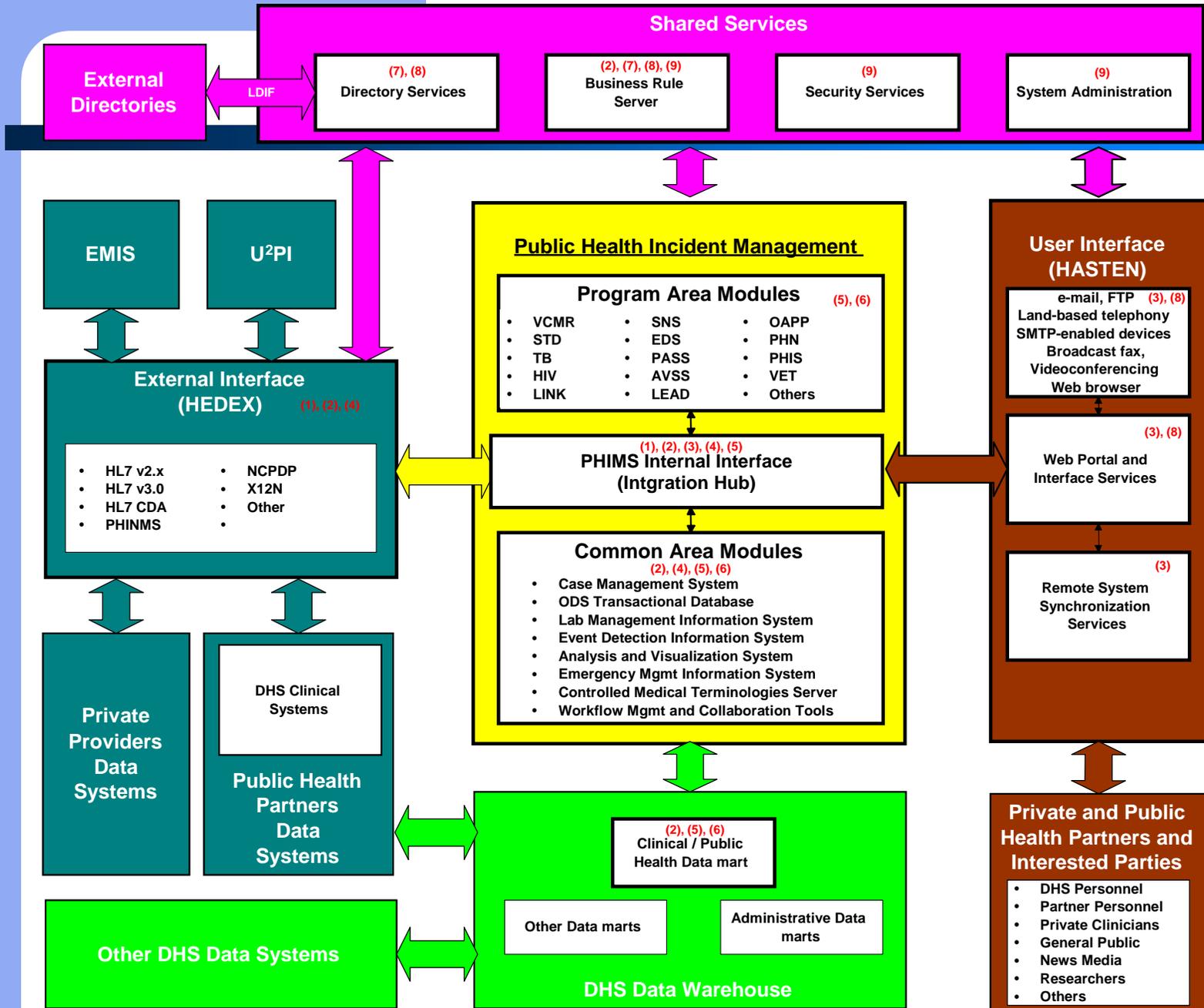
- Los Angeles County Public Health Staff
- CAL2CAL – IT Program Management (Program Manager, Business Analyst, Technical Lead, Data Modeler and Security Lead) and Core technology implementation (ODS, KMS, PH Data Mart and BI)
- PHFE – Business Program Management
- ATLAS – VCMR enhancements
- SIMI – HASTEN, HEDEX and Infrastructure
- HLN – LINK enhancements and SNS
- Various other vendor teams (LMS, EMIS, etc.)

BT-PHIN Project : ADVANTAGES

- ❖ Provide a sustainable, cost-effective strategy for the development of *integrated* public health systems through the implementation of web-based technologies and conversion away from inefficient legacy systems
- ❖ Maximize the return on existing investments by leveraging successful Public Health applications (VCMR, LINK, HASTEN) and other contractual software agreements to accelerate web-based development efforts
- ❖ Implement mechanisms to support broad CDC initiatives while complying with strategic departmental information technology (IT) requirements for integration and consolidation (EMR, U2PI, DHS-DW, etc.)
- ❖ Align the public health system in Los Angeles County with federal directives and national initiatives such as NEDSS, HAN, and PHIN to ensure competitiveness of the local public health system for future federal / state grant funding

PHIN Technical Architecture: Five Functional Areas

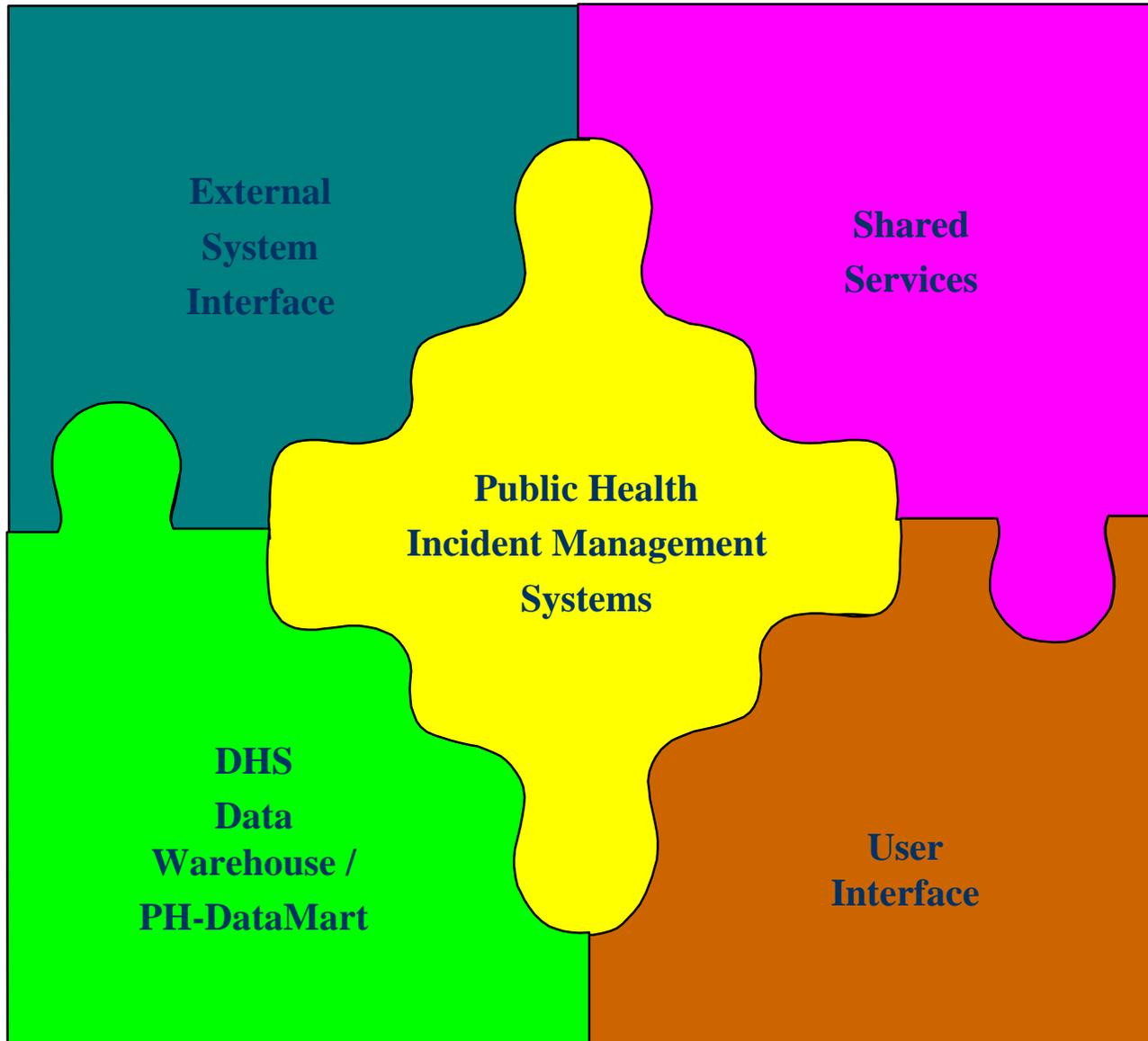




PHIN Architectural Components and Functional Requirements

- ✓ **External System Interface**
 - Information Exchange Technologies (1, 2, 4)
- ✓ **Public Health Incident Management System**
 - Program Area Modules (5, 6)
 - Common Area Modules (2, 4, 5, 6)
 - Integration Hub (1, 2, 3, 4, 5)
- ✓ **User Interface**
 - Communication Technologies (3, 8)
 - Web Portal and Interface Services (3, 8)
 - Remote System Synchronization Services (3)
- ✓ **Shared Services**
 - Directory Services (7, 9)
 - Business Rule Server (2, 8, 9)
 - Security Services (1, 3, 4, 9)
 - System Administration (1, 2, 3, 4, 7, 8, 9)
- ✓ **DHS Data Warehouse / PH-Datamart**
 - Clinical/Public health data mart (2, 5, 6)

PHIN Technical Architecture: Five Functional Areas



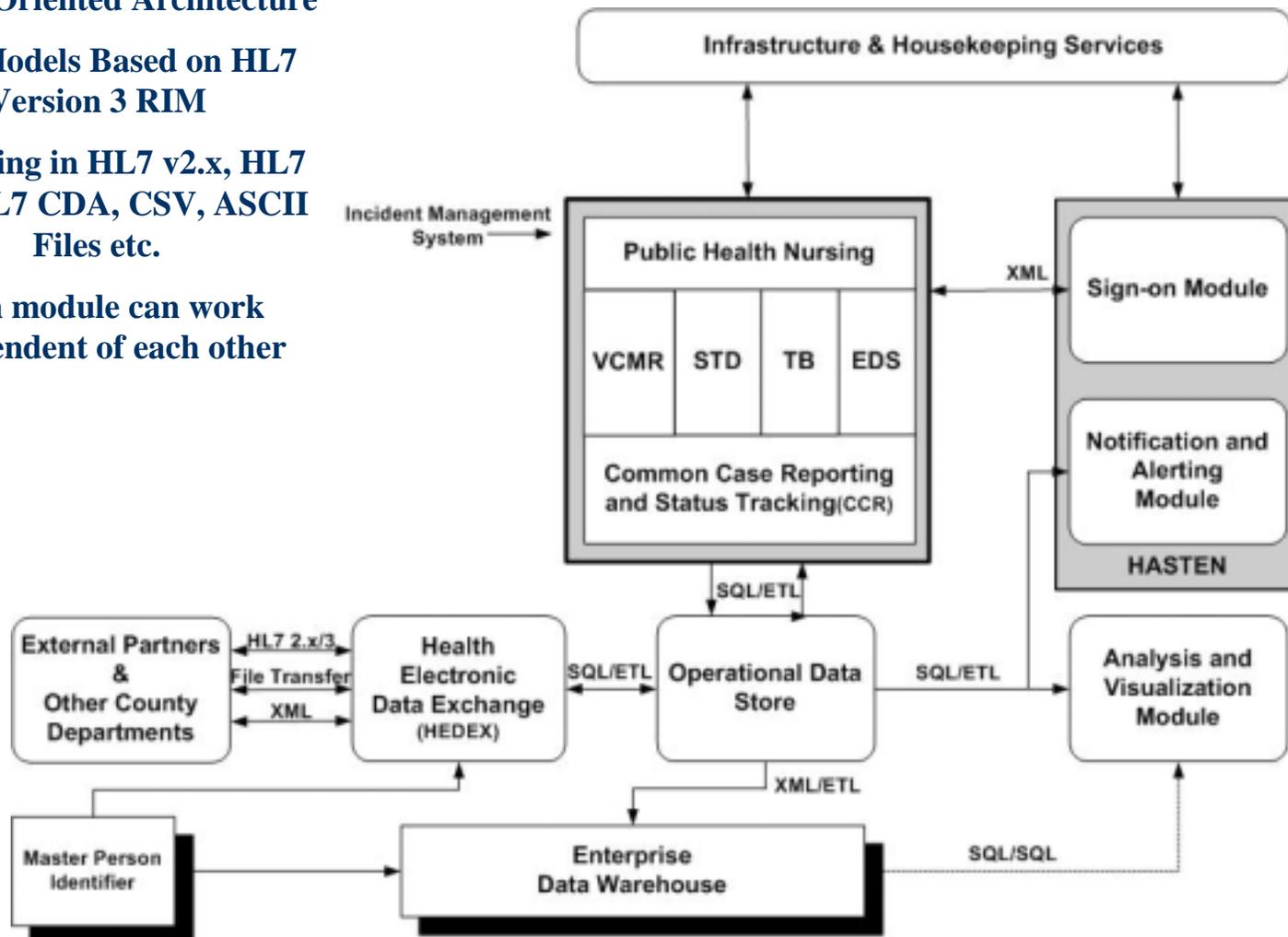
Public Health Integration Architecture

Service Oriented Architecture

Data Models Based on HL7
Version 3 RIM

Messaging in HL7 v2.x, HL7
v3.x, HL7 CDA, CSV, ASCII
Files etc.

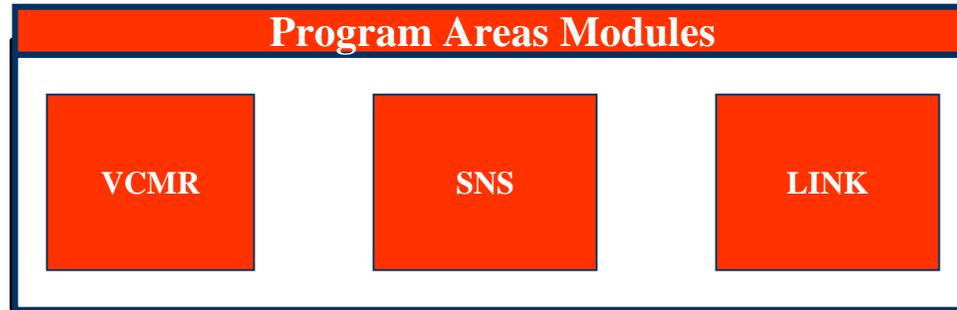
Each module can work
independent of each other



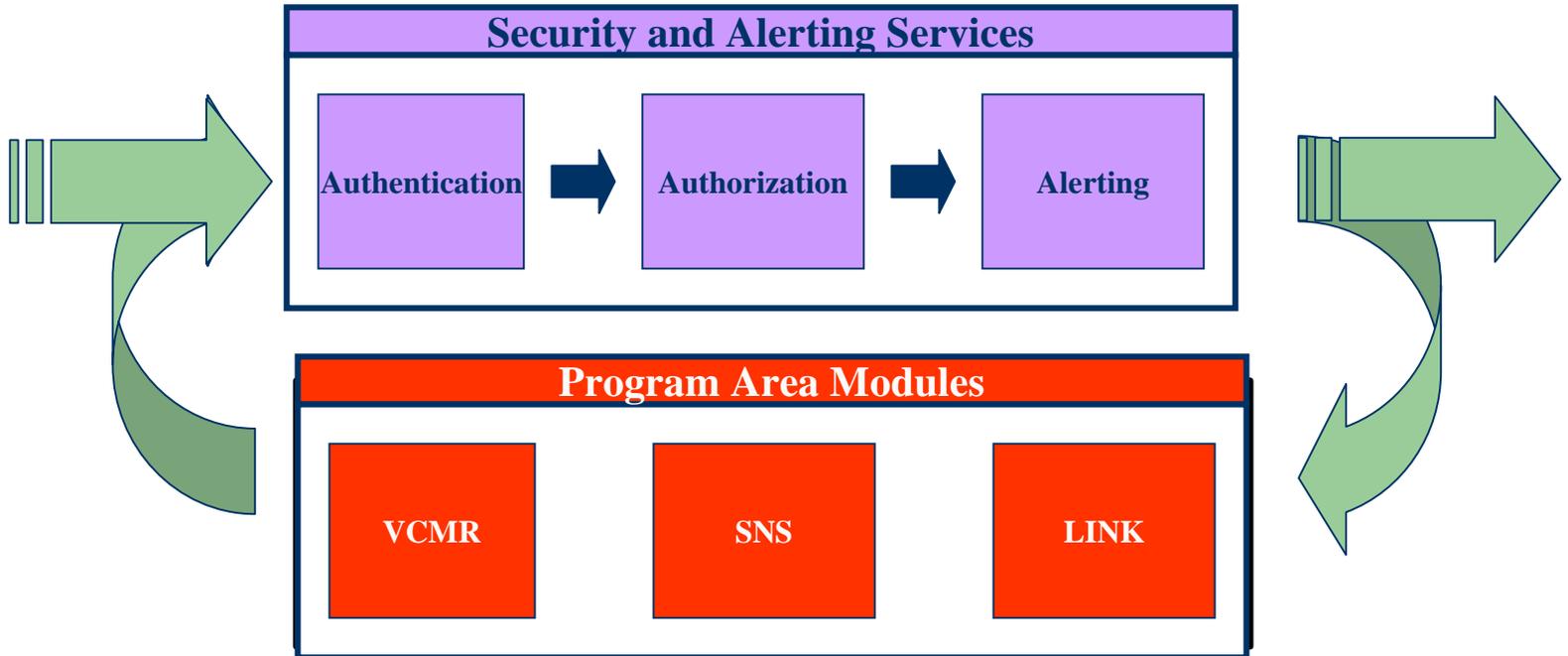
Tactical Objectives

- ❖ Security and Alerting Services
- ❖ Electronic Data Interchange
- ❖ Application Data Integration
- ❖ Architectural Alignment of Applications
- ❖ Knowledge Management Services
- ❖ Public Health Analytical Database
- ❖ Analysis, Visualization, and Reporting

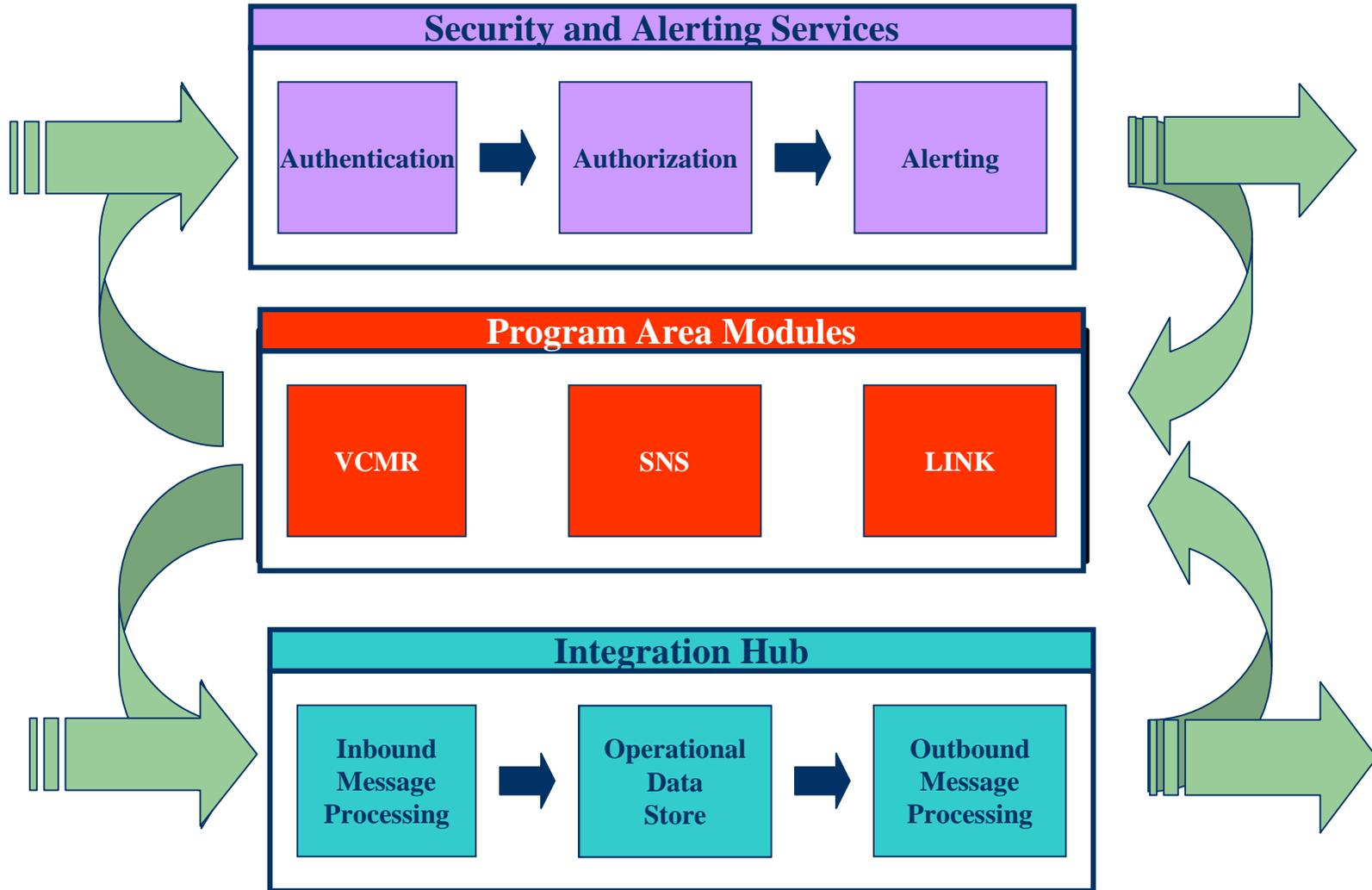
Program Area Modules



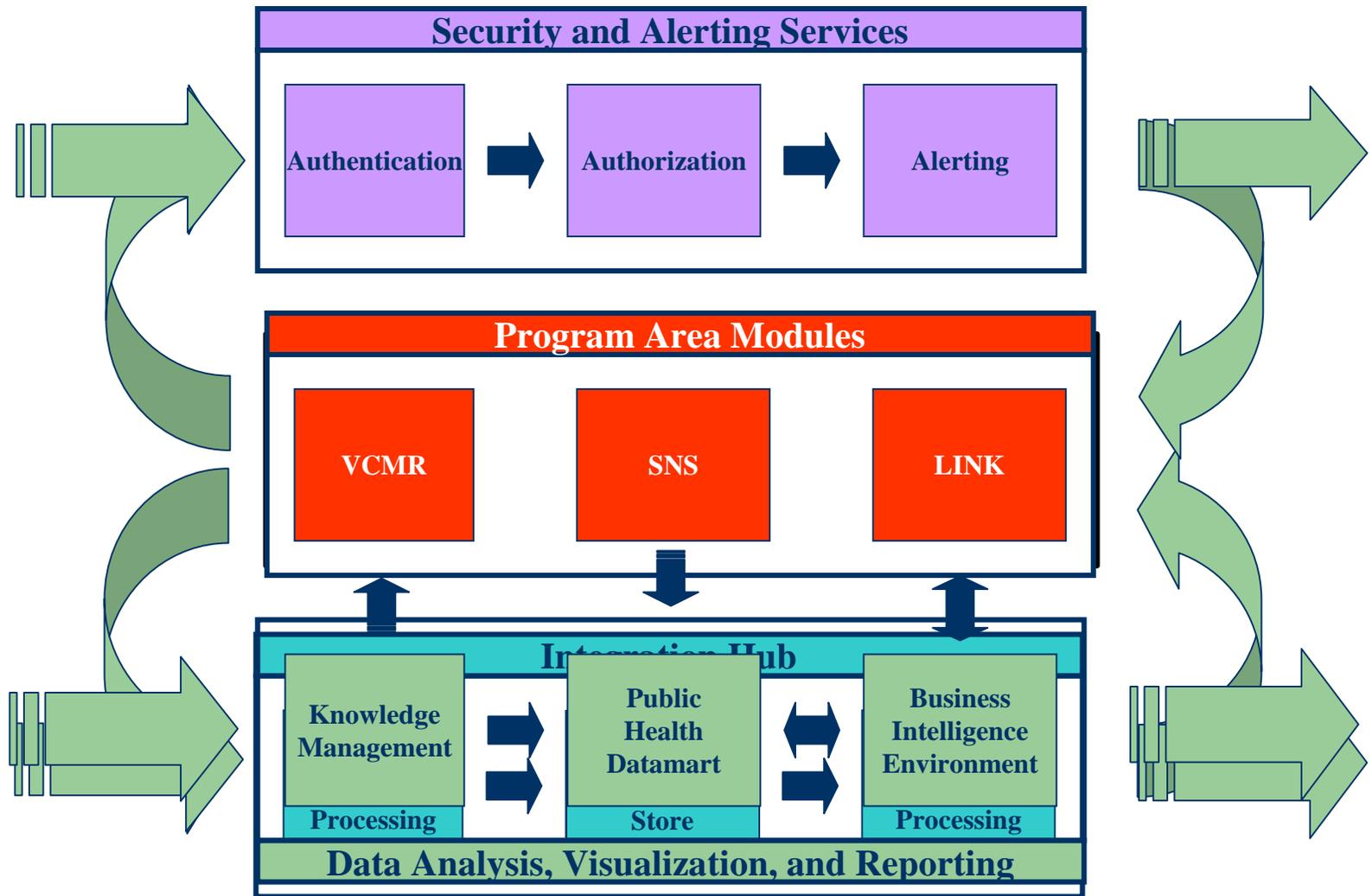
Security and Alerting Services



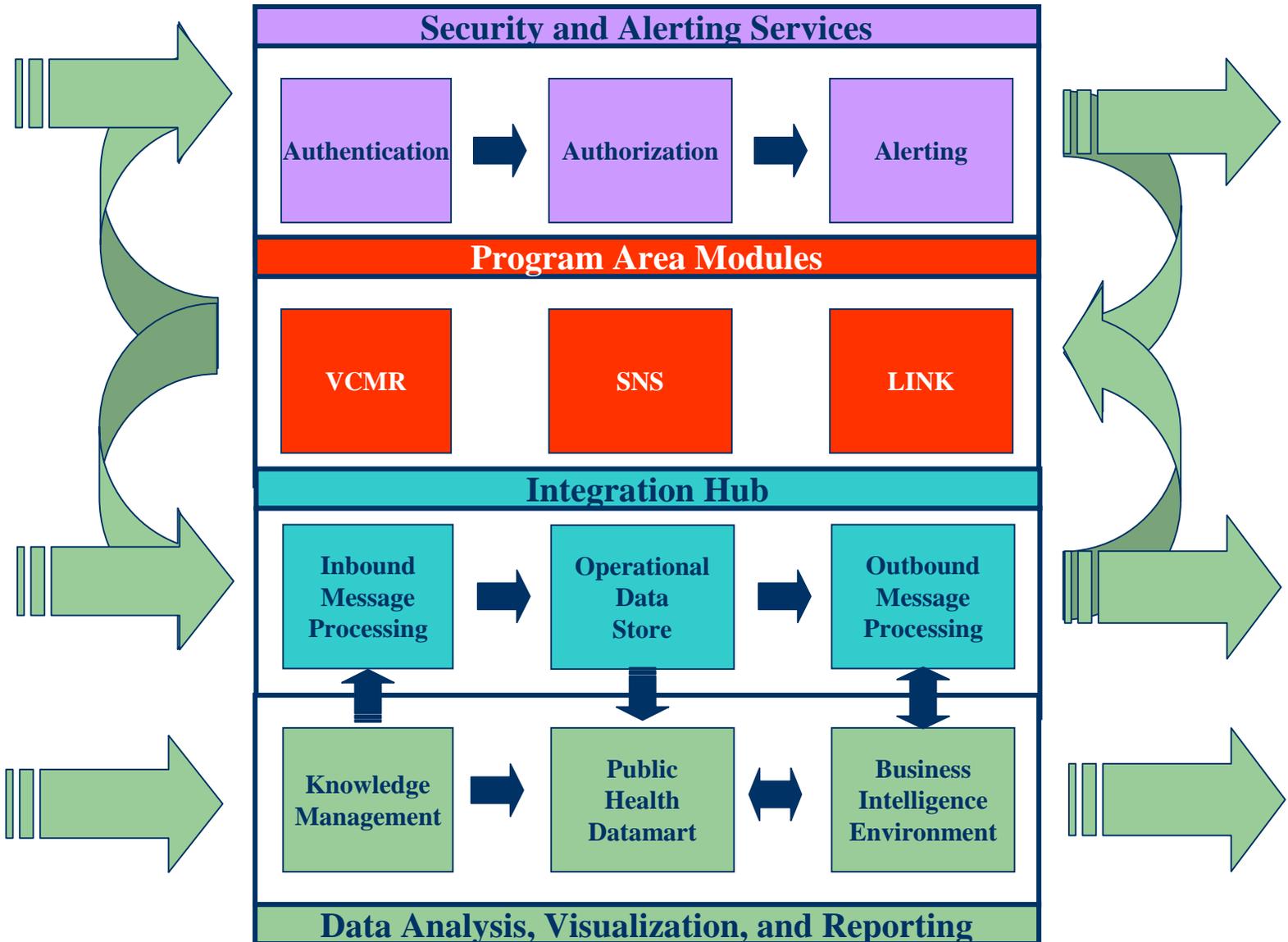
Data Exchange and Integration



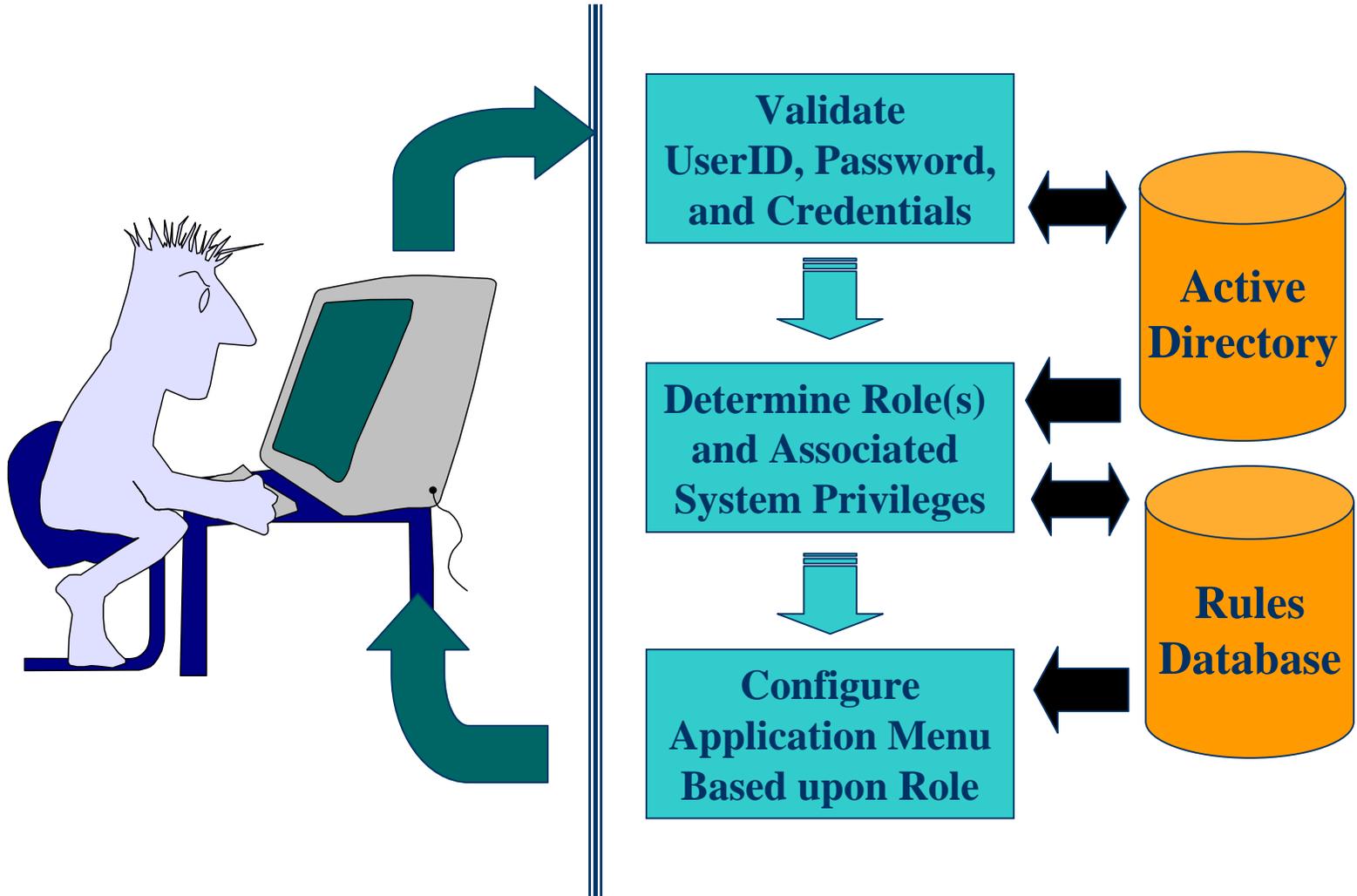
Analysis, Visualization, and Reporting



LAC BT-PHIN Architecture

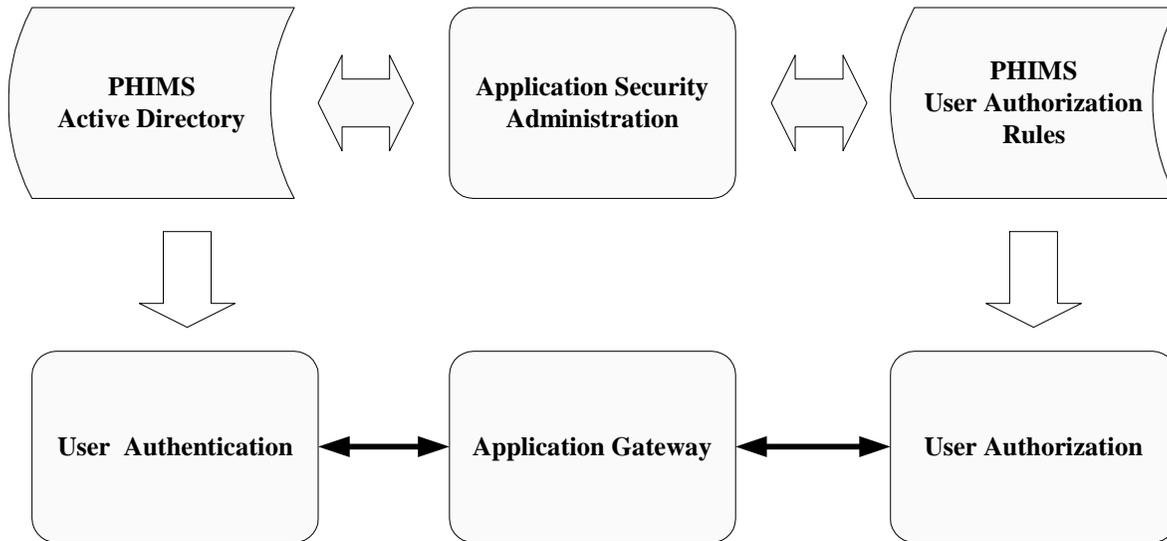


Authentication/Authorization



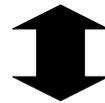
Authentication/Authorization

Microsoft Active Directory Services



Multi-Factor Authentication

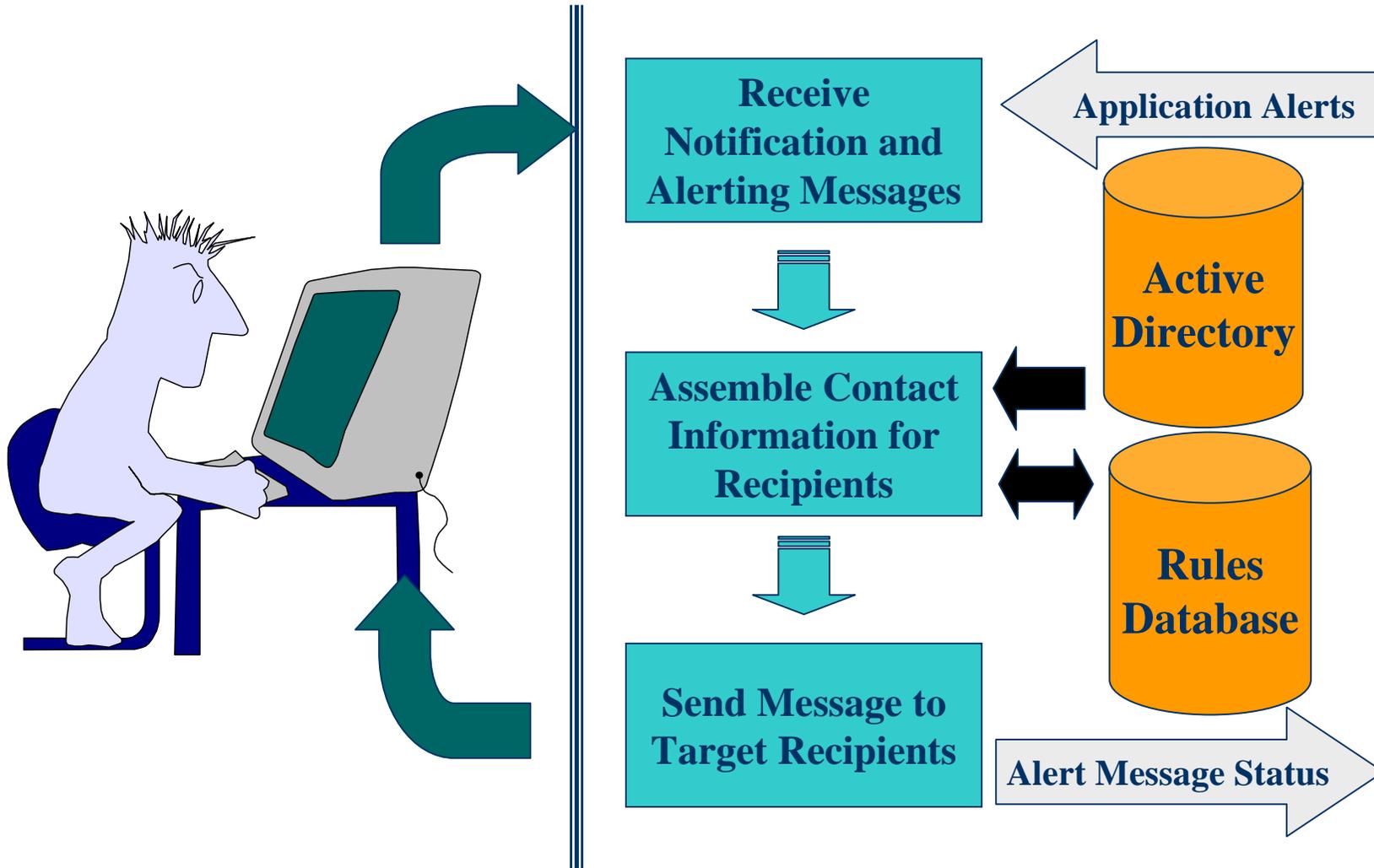
- UID/Passwords
- RSA Secure ID Tokens
- X509 Certificates



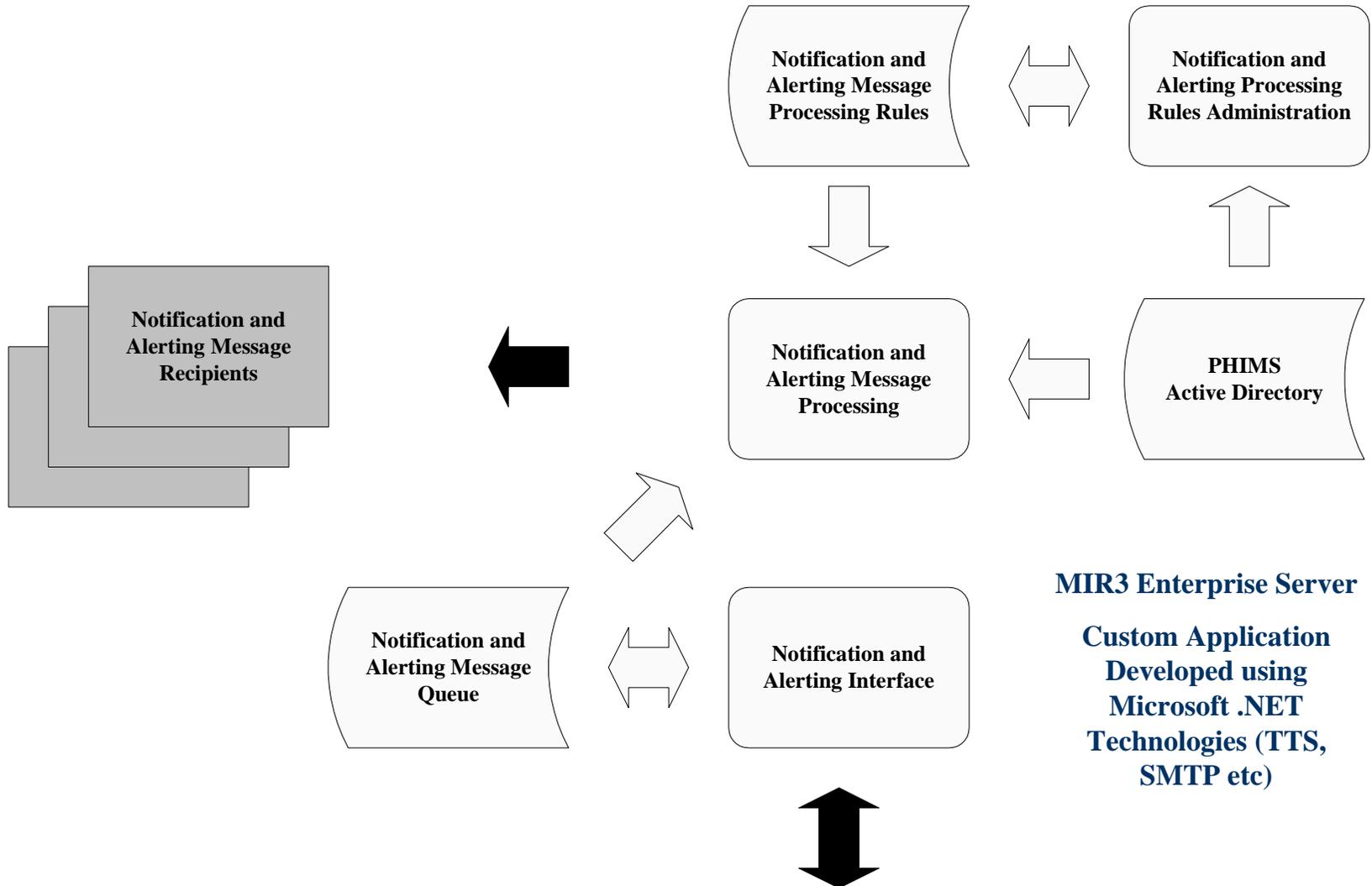
Single Sign On Service

User Roles & Access Rights

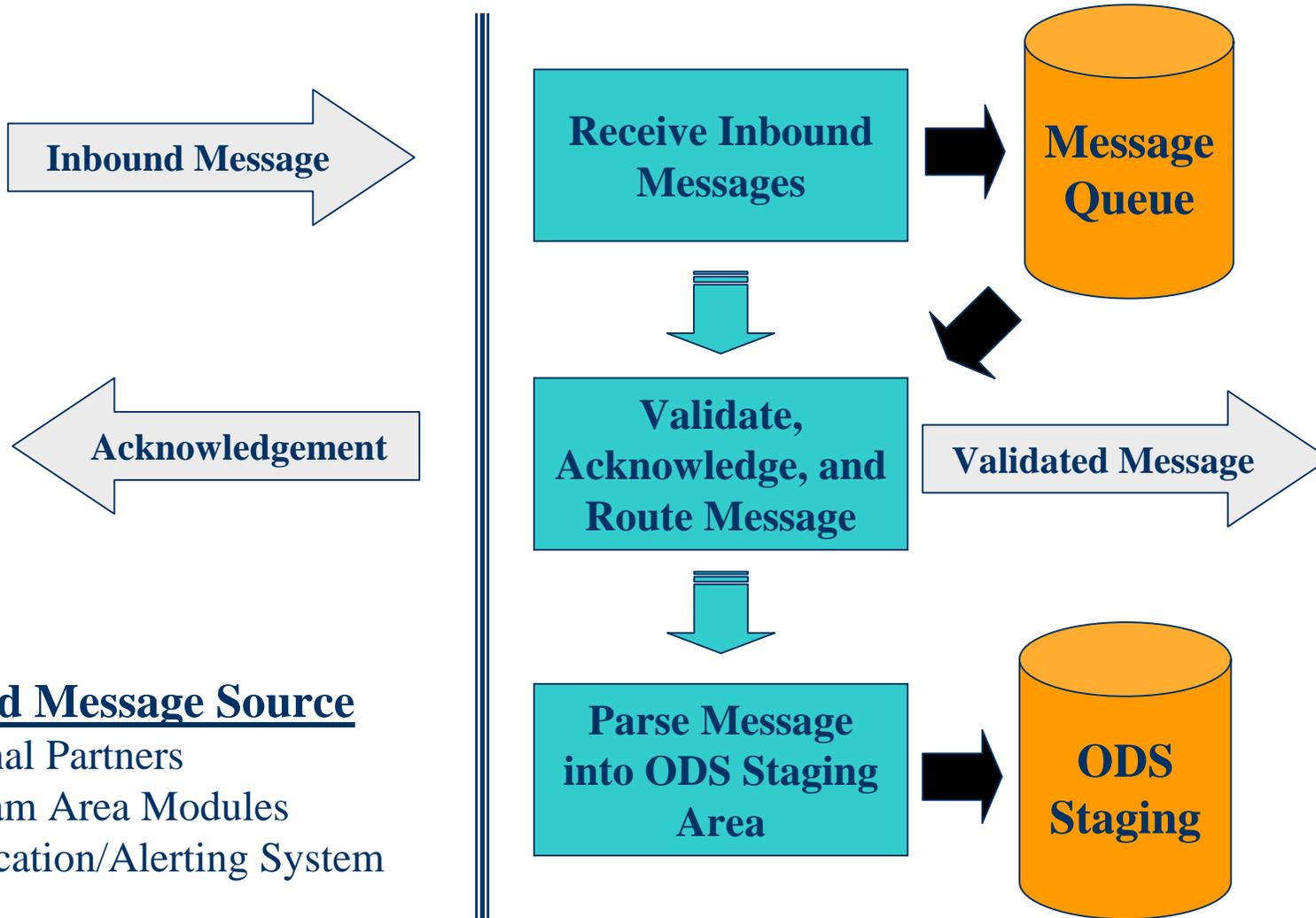
Notification and Alerting



Notification and Alerting



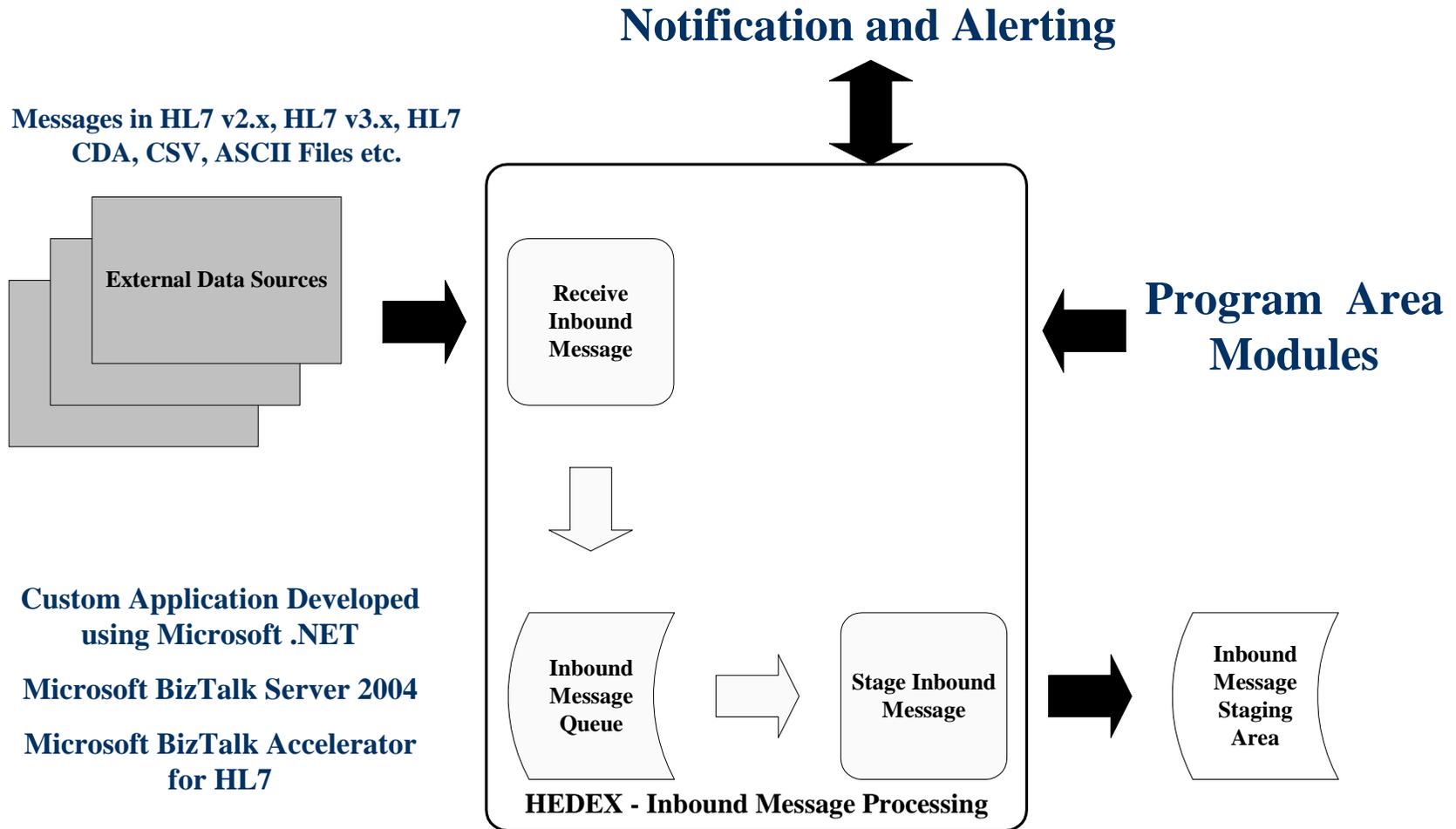
Inbound Message Processing



Inbound Message Source

- External Partners
- Program Area Modules
- Notification/Alerting System

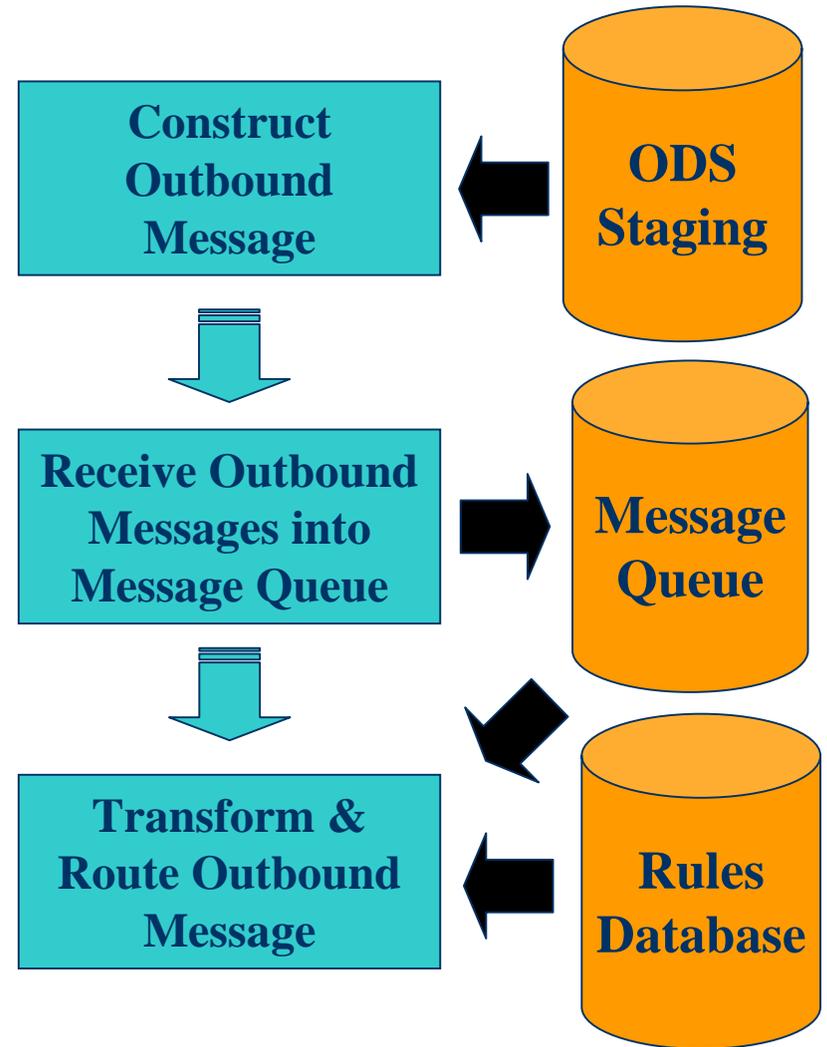
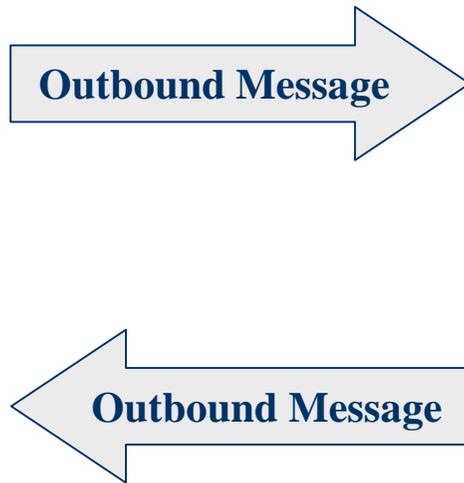
Inbound Message Processing



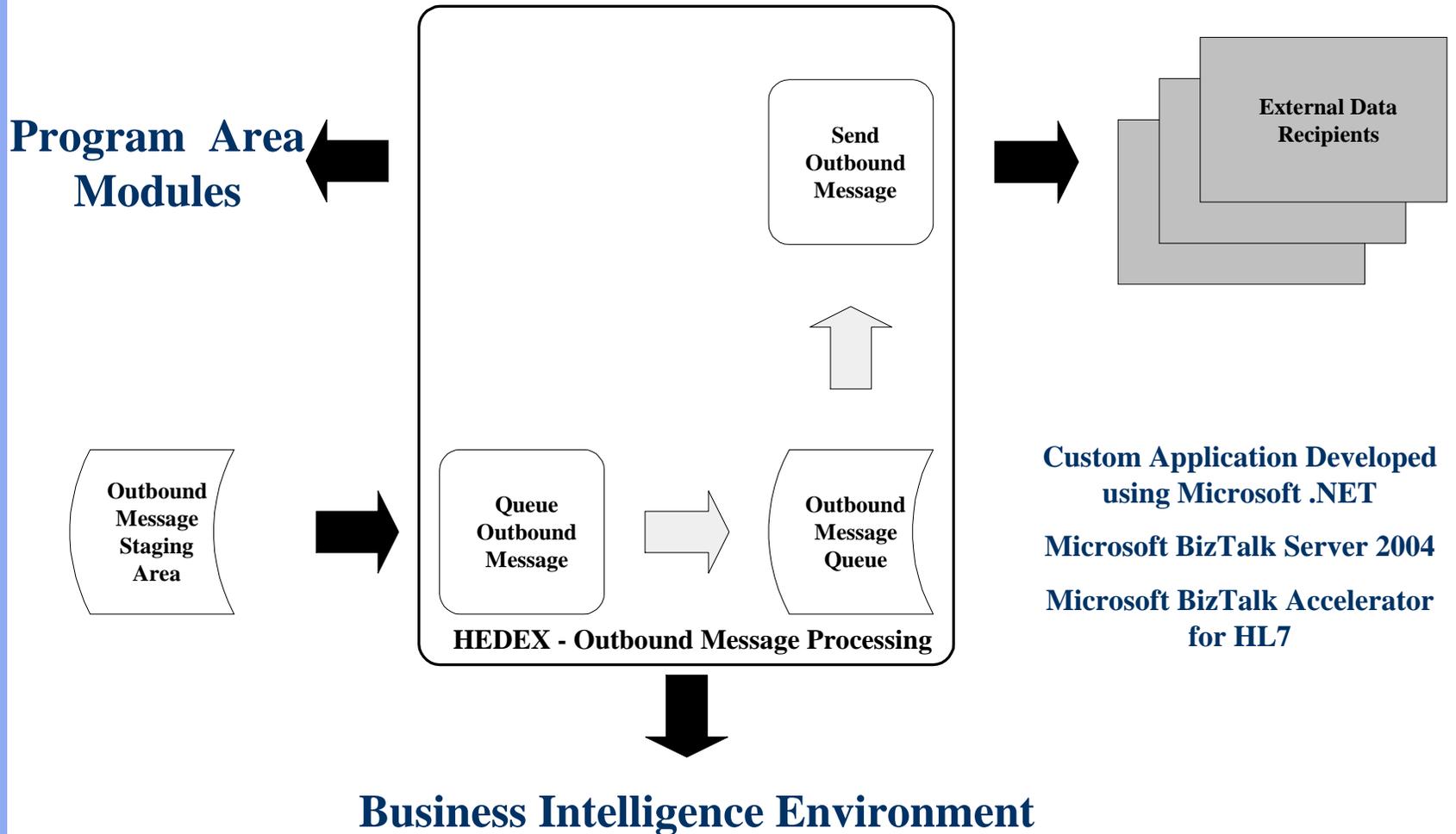
Outbound Message Processing

Message Source & Targets

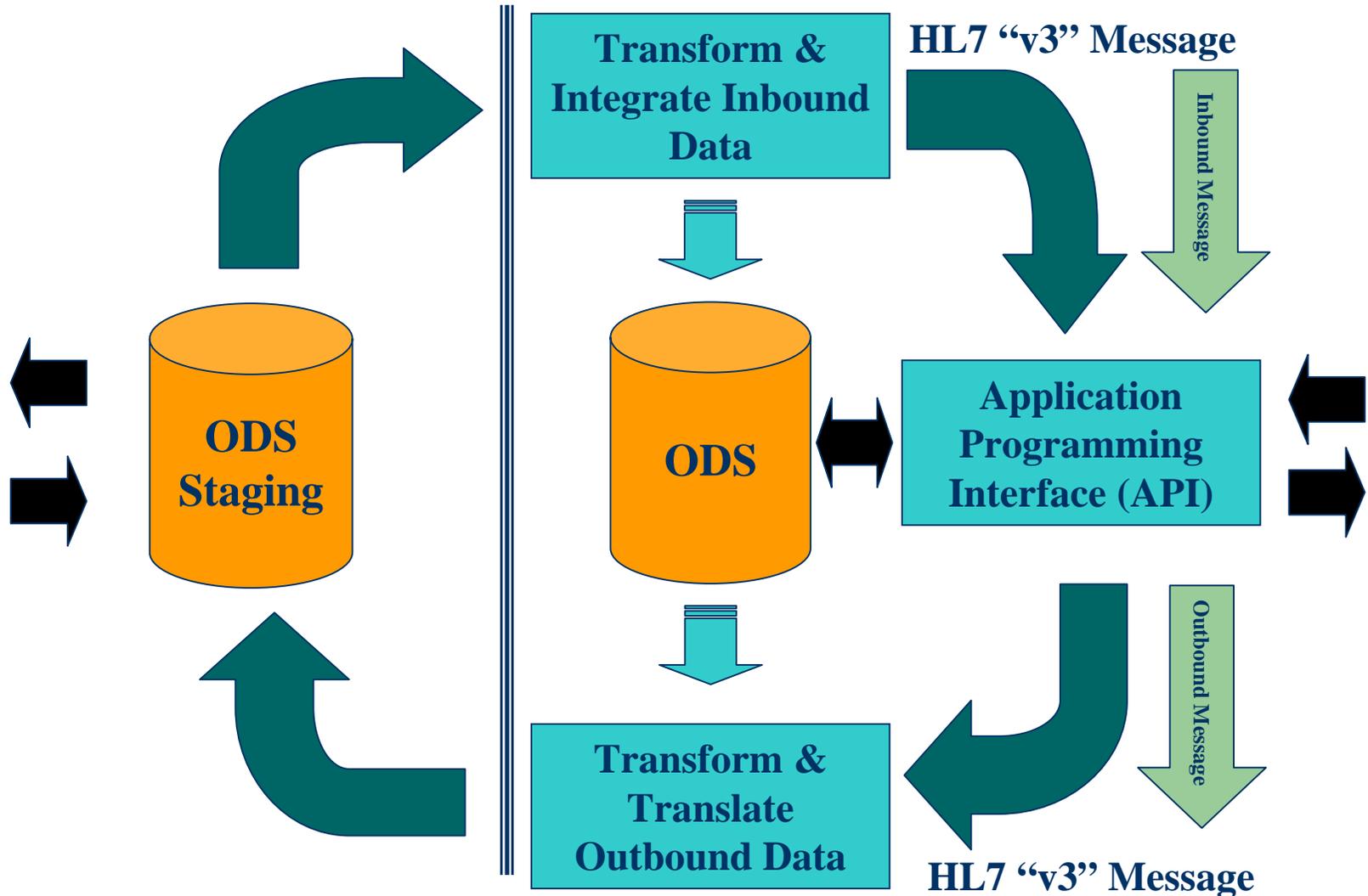
- Program Area Modules
- Notification/Alerting System
- Business Intelligence Tools
- External Partners



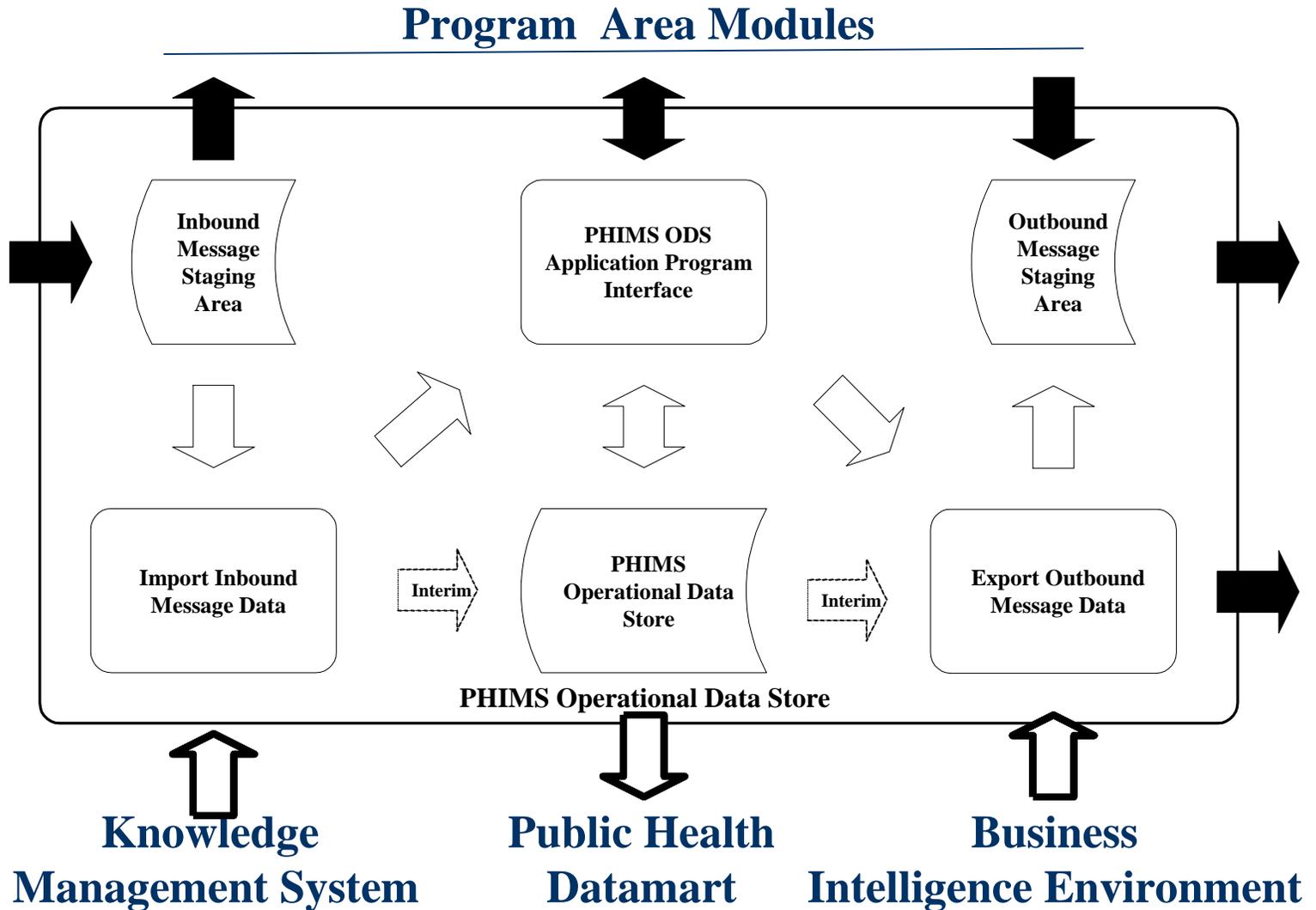
Outbound Message Processing



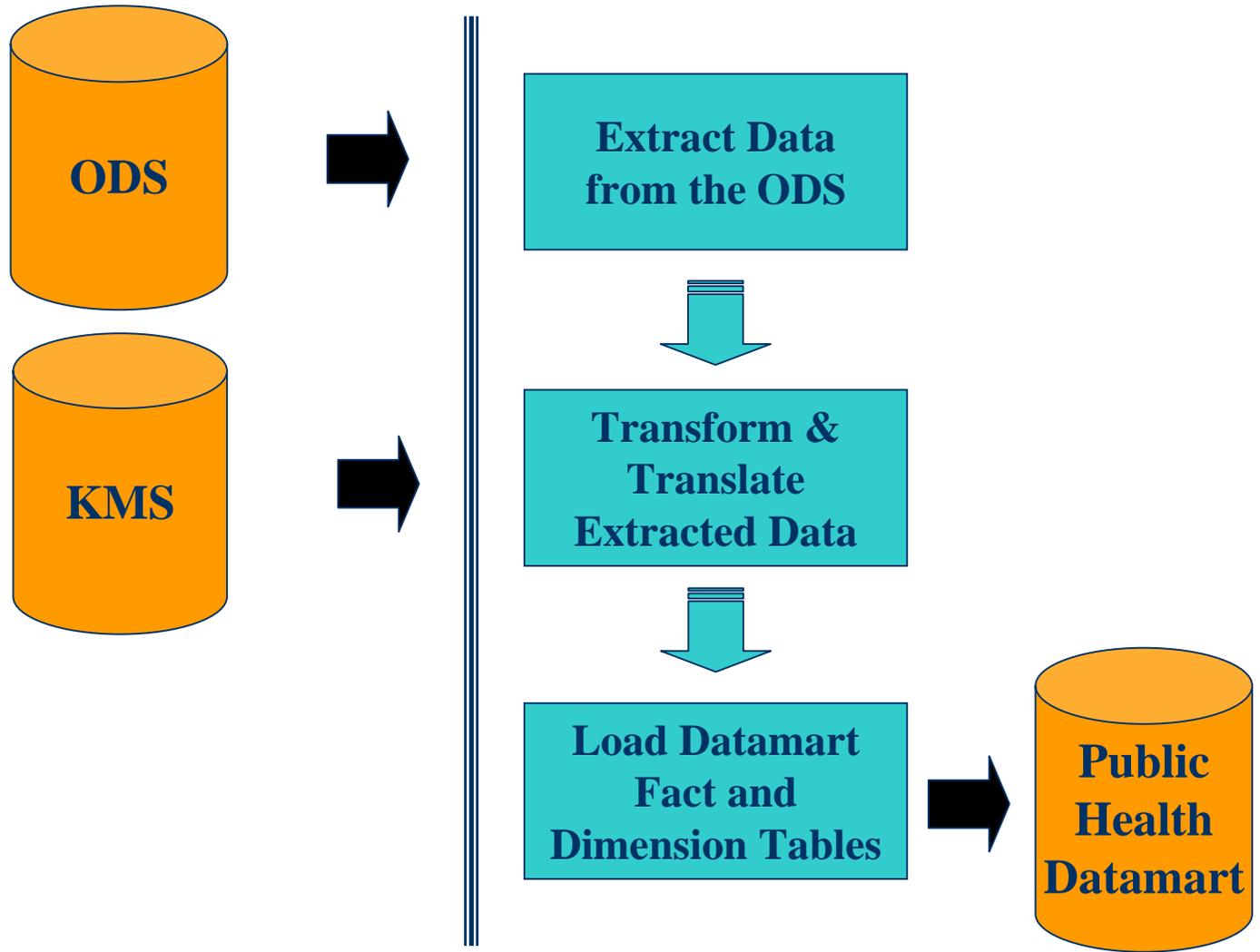
Operational Data Store (ODS)



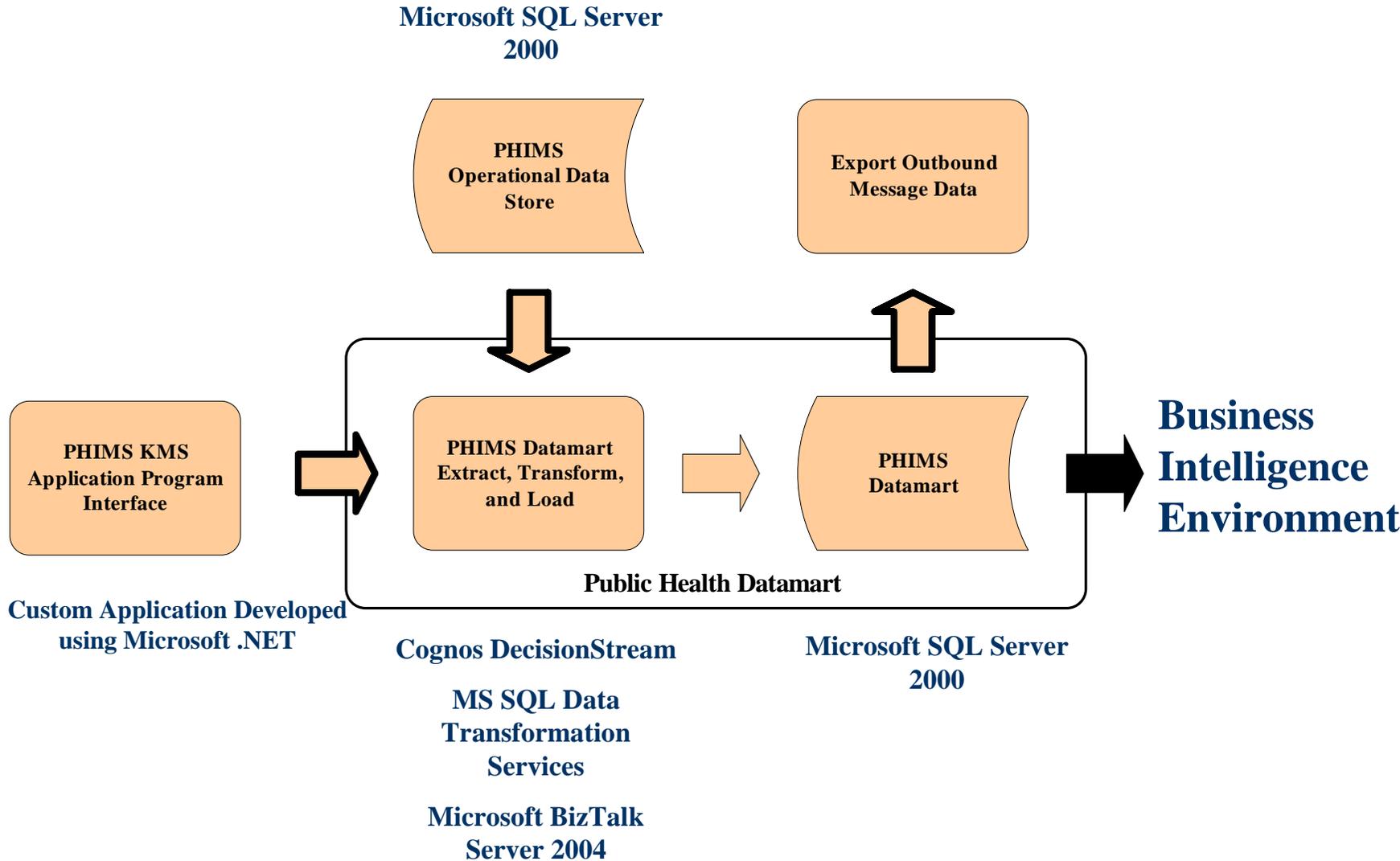
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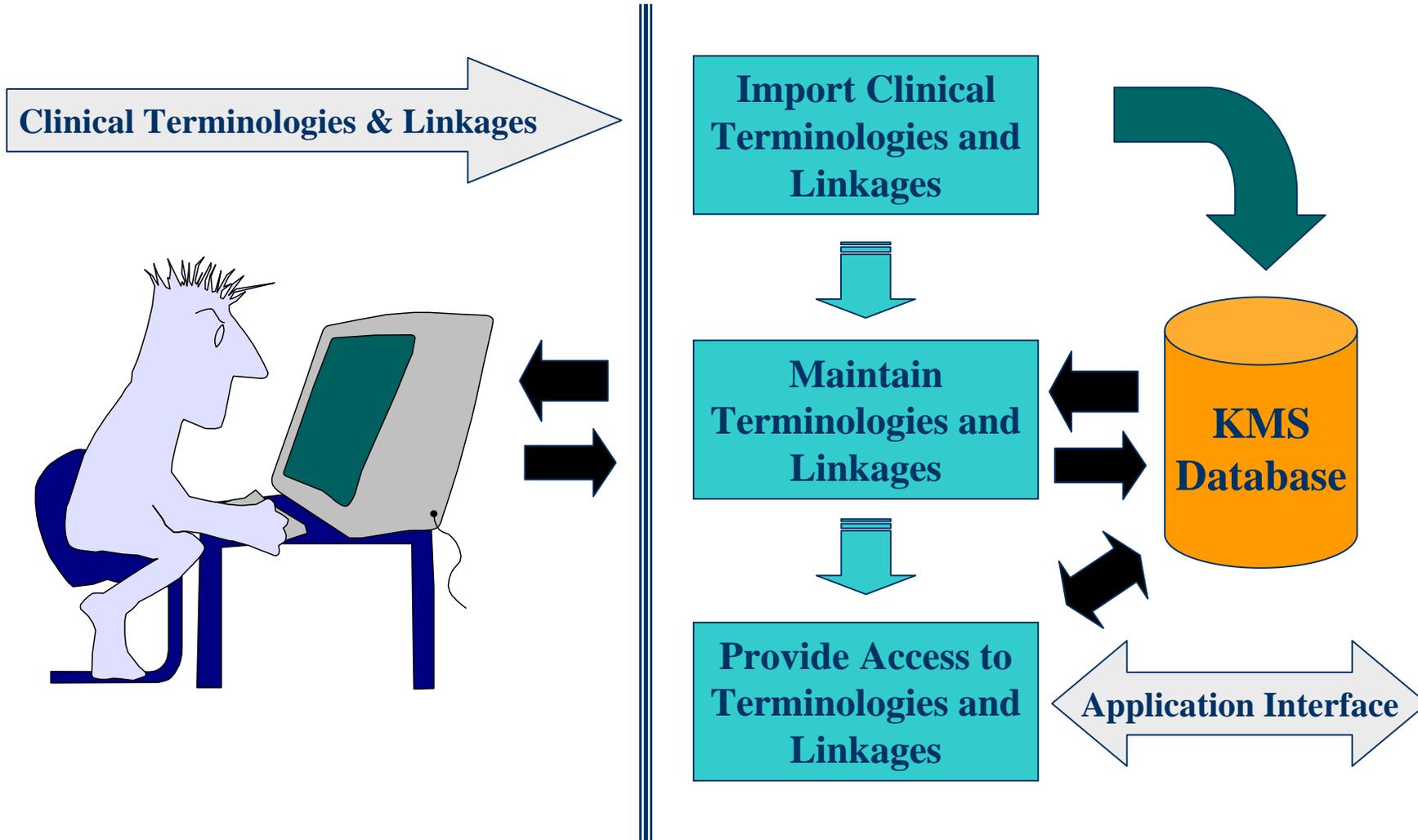
Public Health Datamart



Public Health Datamart

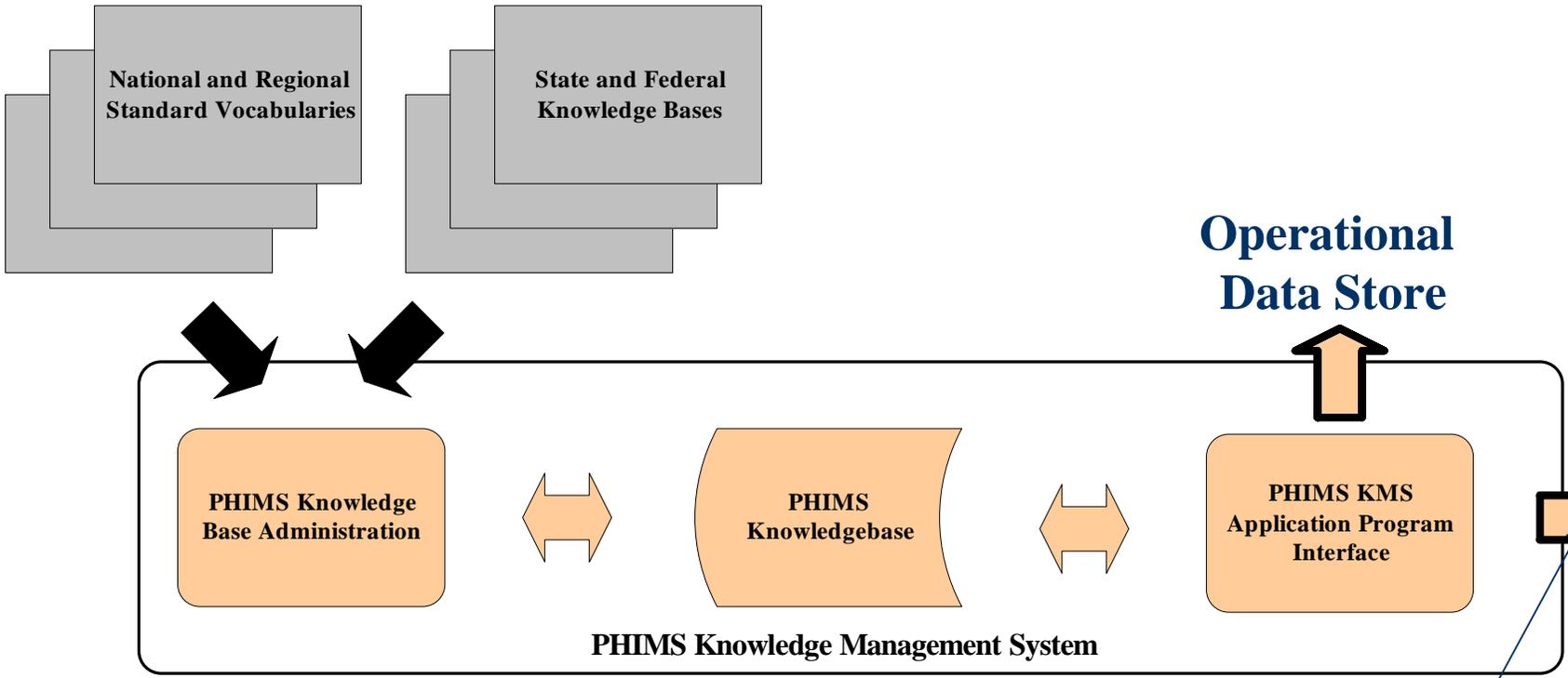


Knowledge Management System



Knowledge Management System

HL7, LOINC, SNOMED, CDC



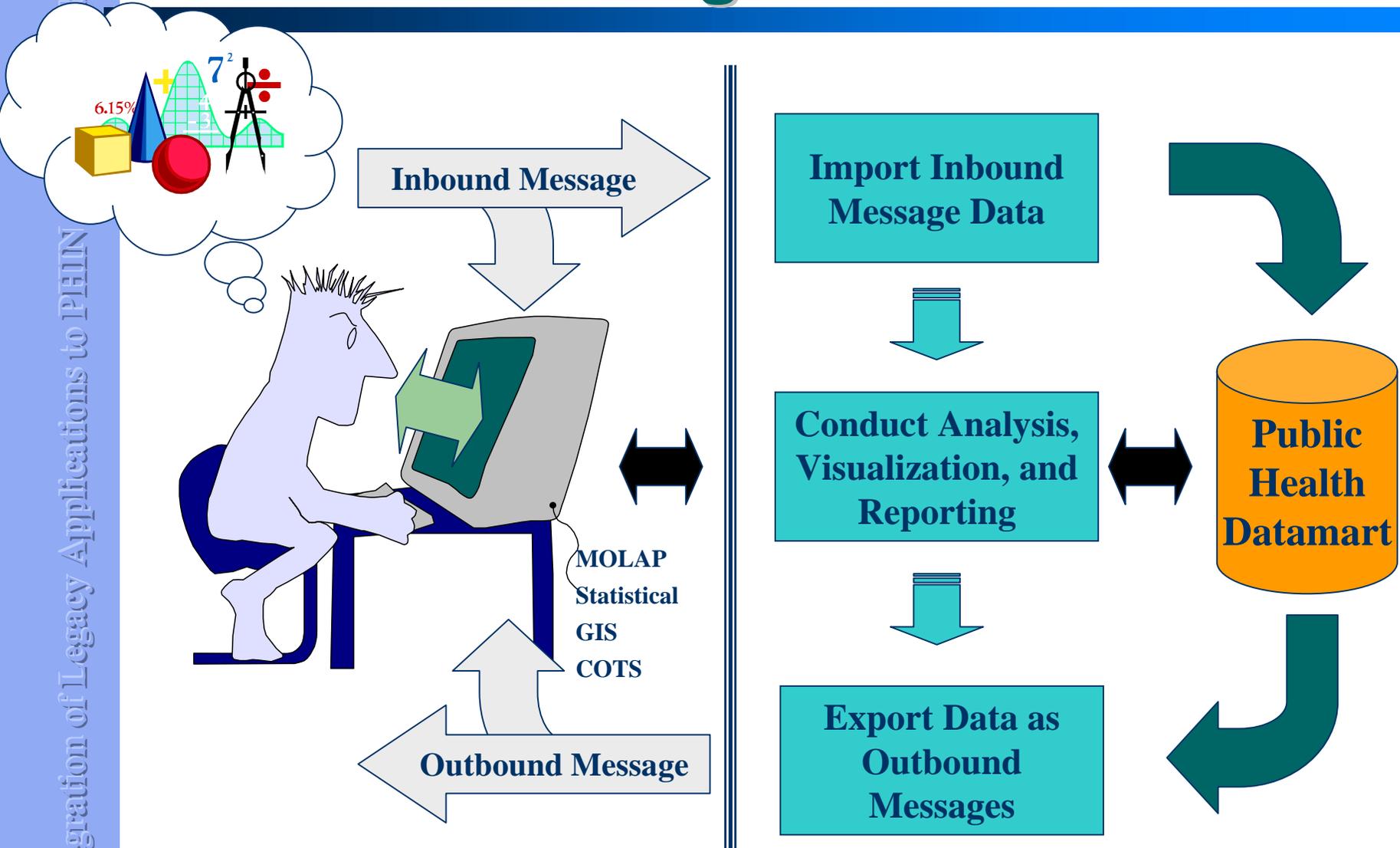
Custom Application Developed using Microsoft .NET

Microsoft SQL Server 2000

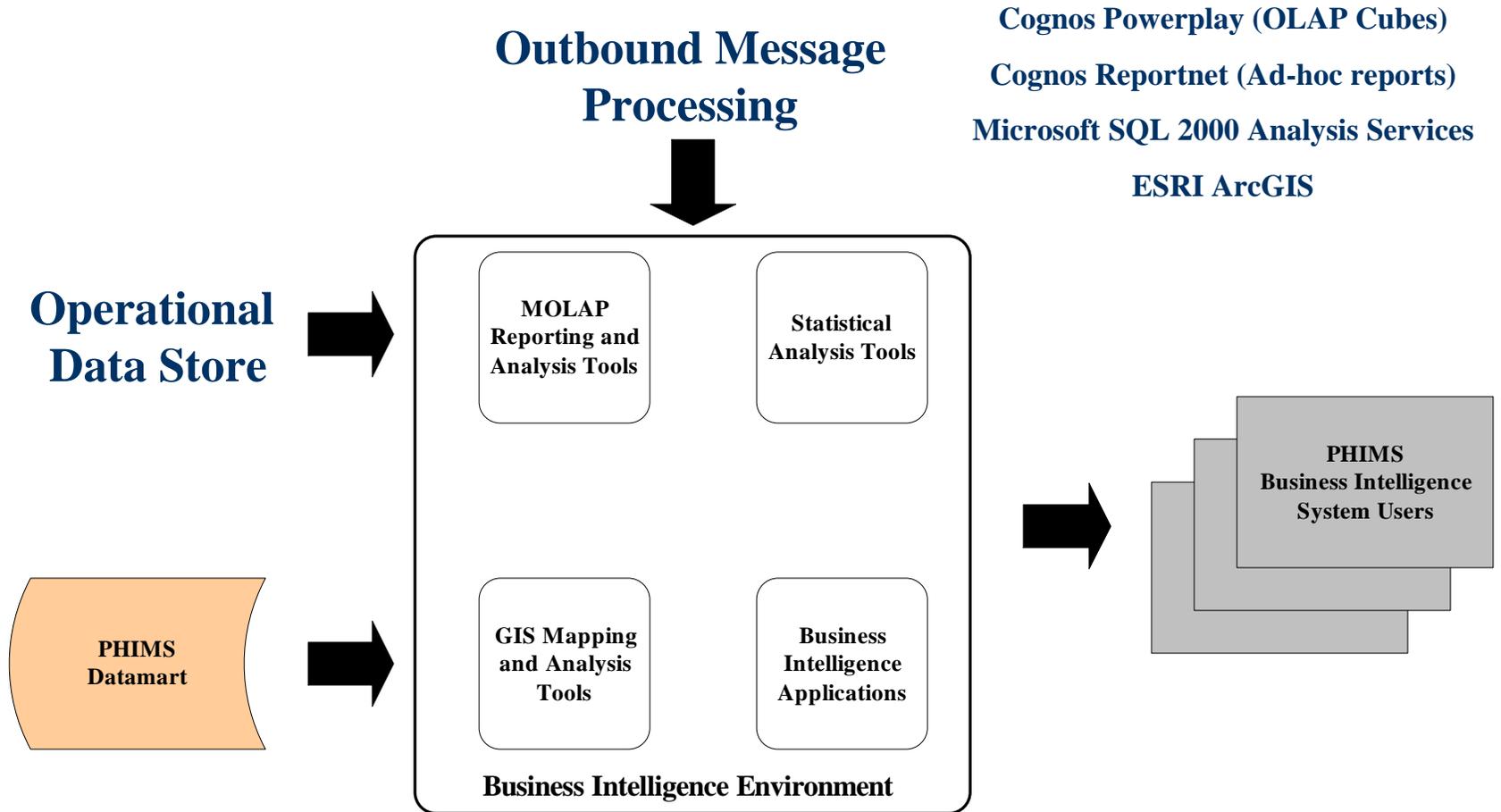
Public Health Datamart

Code translation between different data sources

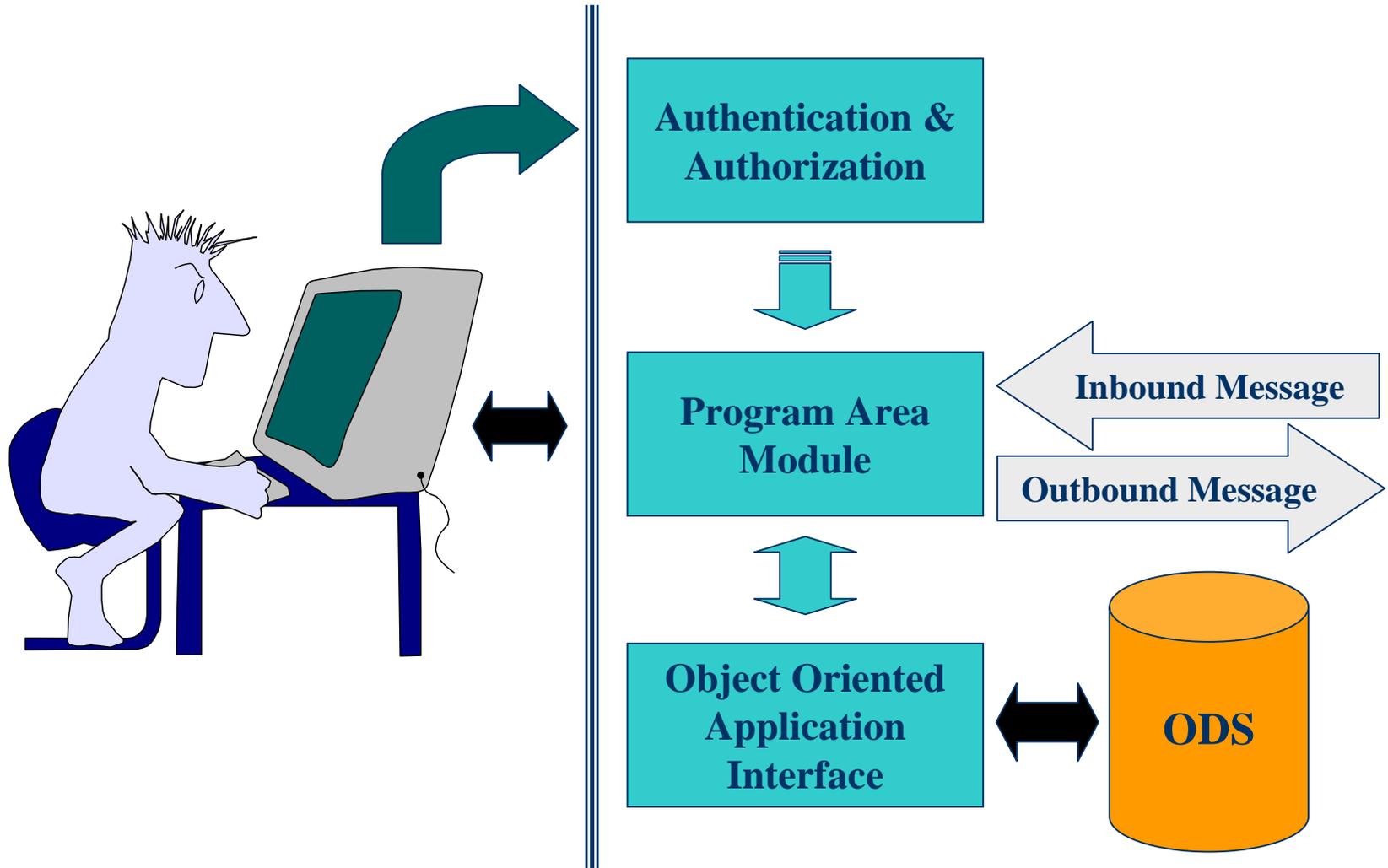
Business Intelligence Environment



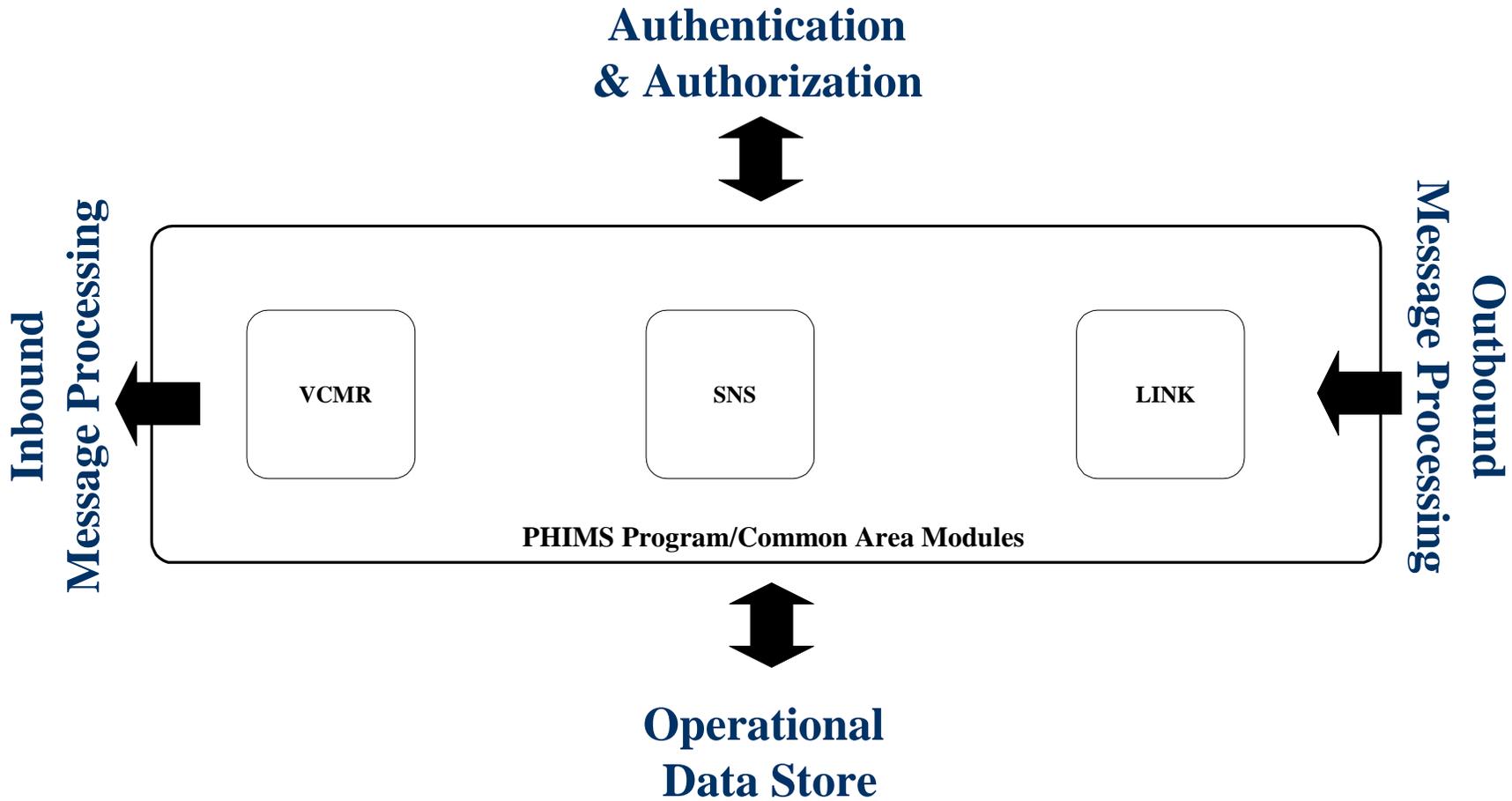
Business Intelligence Environment



Program Area Modules



Program Area Modules

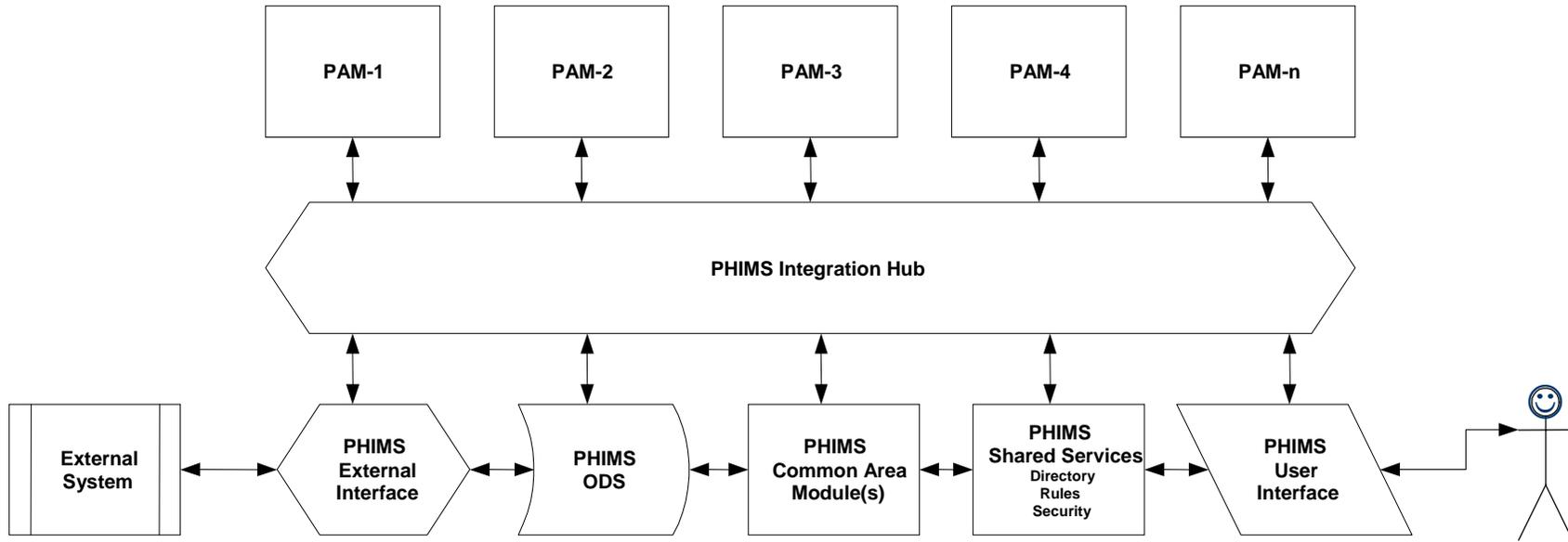


Public Health Information Integration

Current Dilemma in the Public Health Architecture

How will the stand alone applications be integrated into Standards-based Public Health Information Network (PHIN) System ?

PHIMS Integrated Collection of PAMS



Current L.A. County Deployment

Current Deployment Efforts include

- ❖ **Immunization Registry Enhancements - Enhanced system for mass dispensing/vaccination operations**
- ❖ **VCMR / WebCMR – Includes Enhanced Web-Based Disease Reporting System for Providers / Healthcare Partners**
- ❖ **HEDEX Project – Real-Time or Near Real-Time Electronic Data Exchange effort with healthcare partners such as laboratories, hospitals, pharmacies, coroner, etc.**
- ❖ **SNS Management System – Inventory Management system to support tracking of resources / assets**
- ❖ **Health Alert Network – Secure alerting and communications platform for broadcasting of health alerts**
- ❖ **E-Learning Suite – Includes deployment of a learning management system for tracking and delivery of instructor-led and web-based training to Public Health partners**
- ❖ **EMIS – Includes support for Public Health emergency management activities.**

Current Issues and Challenges

- ❖ Difficult to breakdown existing silos – Need to find ways to navigate through programmatic boundaries
- ❖ Multi-Vendor Environment – Difficult to coordinate various business and technical perspectives of each vendor and align to unified platform
- ❖ Governmental process – 14-month delay in approval of Action Plan
- ❖ Limited resources – need to adjust for continual limitations in resources and adjust priorities, when necessary
- ❖ Requires executive support – significant amount of time and investment goes into back-end infrastructure that the users never see

Final Thoughts

- ❖ L.A. County PHIN Project has been successful at moving from concept to implementation of its Service-Oriented Architecture
- ❖ Service-Oriented Architecture is beginning to show true promise for a unified framework and infrastructure for Public Health
- ❖ Support for common standards has eased transition of diverse systems to a unified framework
- ❖ Effective planning, critical investment in project governance, and responsible stewardship have been the keys to success.

THANK YOU

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