Service-Oriented Architecture: Enabling Data Sharing Between Immunization Information Systems and Clinical Care

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Problem Statement

- IIS are focus of Stage 1 Meaningful Use objective: "Submit data to Immunization Registries"
- IIS *could* also support an additional objective: "Implement one clinical decision support rule"
- IIS are complex systems; so are EHR systems
- New functionality often required due to regulatory changes (*e.g.,* algorithm) or healthcare environment (*e.g.,* records exchange)
- Not all technical implementations inherently compatible

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Learning Objectives

- Define the functions of an IIS best enabled by SOA
- Identify the ways in which IIS can support clinical needs
- Describe the technical standards used by IIS to enable information exchange with clinical systems

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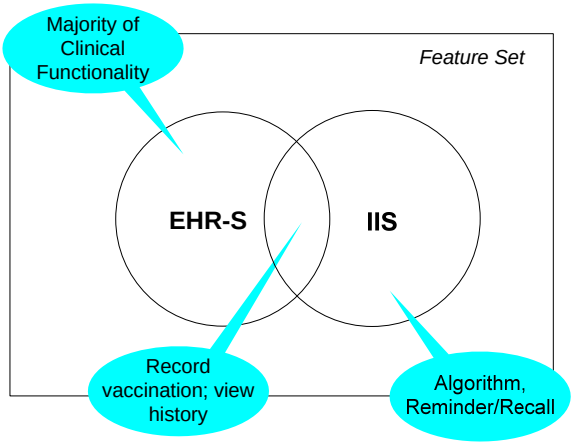
IIS – EHR-S Tension



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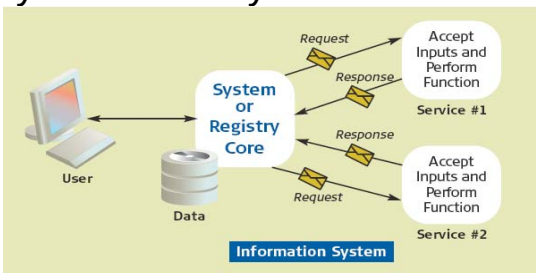
SOA Defined

Service-oriented Architecture (SOA): a building block approach to systems design that allows discreet functions to be accessed by any authorized system



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SOA Benefits

- Increased scalability through increased modularity
- Lower cost through software component reuse
- Applicable either to entire systems or just to parts of systems, making it a flexible approach with no single “right answer” in the context of a particular application
- Components tend to be more platform independent than other strategies
- Offers increased flexibility as services can be re-written and/or replaced as needs change with less impact on the overall system than other methods.
- Offers the potential for more agile and speedy system modification and improvement through its modular design.

SOA Limitations

- Implementations may run slower or require more processing power as data flows between loosely coupled components that may not be optimized for these data flows.
- There is a lot of hype in the marketplace over SOA, and it may be difficult to discern when components that are acquired are well-tested and operating properly.
- Just because a system is developed using SOA it does not mean it will be developed using good practices or appropriate methods.

Case Study #1

New York City

Citywide Immunization Registry (CIR)

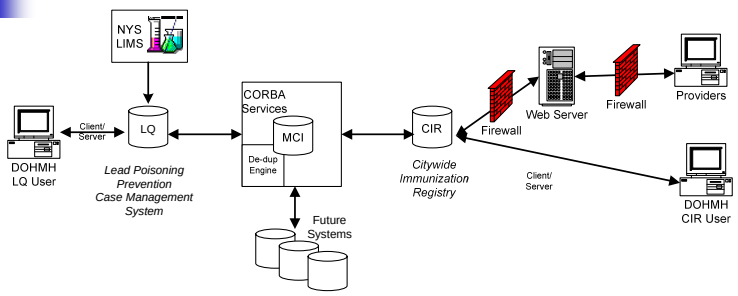
Mission of CIR

"To improve the immunization status of all NYC children and adolescents by consolidating immunization information and sharing it with health care providers, families, and agencies concerned with children's health."

Benefits of the CIR to Clinicians

- Consolidated Immunization Histories
  - 4.3+ million patient records
  - 47+ million immunization records
- Clinical Decision Support
  - For 14 routinely administered vaccine series
  - Evaluations (e.g., was the immunization valid?)
  - Recommendations (e.g., when is next dose due?)
  - Implementation of 50+ pages of rules
  - Updated for new vaccines, changing guidelines

Current CIR System Architecture



- CIR and LeadQuest developed independently
- Integrated by sharing a Master Patient Index
- System evolved incrementally over 10+ years

Service #1: Report New Immunizations

- Parses standard HL7 VXU message and retrieves patient identifying information
- Performs deterministic search for the patient
- If necessary, performs probabilistic search for the patient using AI search engine
- Validates all of the demographic and immunization data
- If necessary, creates a new patient record in the CIR, otherwise updates patient demographic data in the CIR
- Inserts into the CIR any immunizations for which there is not already a record
- Constructs HL7 acknowledgement or error message

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Service #2: Get Immunization History and Clinical Decision Support

- Parses standard HL7 VXQ message and retrieves patient identifying information
- Performs deterministic search for the patient
- If necessary, performs probabilistic search for the patient using AI search engine
- Gets patient's immunization history and calculates the evaluations of those immunizations
- Calculates patient's recommendations for all 14 routinely administered vaccine series
- Constructs standard HL7 message based on CDC implementation guide

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Benefits to CIR

- Allows standards-based submission of new immunizations and histories
- Allows access to immunization schedule through system-to-system query
- New functionality added
  - Without disruption to current operations
  - Compliant with national standards
  - Without re-architecting the entire system

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Case Study #2

Rhode Island KIDSNET

Mission of KIDSNET

"KIDSNET facilitates the collection and appropriate sharing of health data with healthcare providers, parents, maternal and child health programs, and other child service providers for the provision of timely and appropriate preventive health services and follow up."

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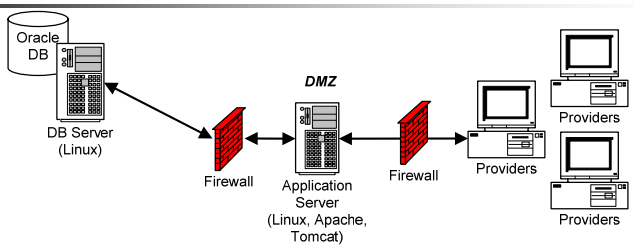
KIDSNET System Architecture



- 10+ public health programs share system
- 325,000+ patient records, 3.9+ million immunization records
- Primary system for some; others submit data via electronic interfaces from other systems
- Unified provider interface (terminal-based → WWW)

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Need for an Immunization Algorithm Service

- KIDSNET did not initially have a robust immunization predictor algorithm
- Decided to use a version of the algorithm developed in another state (with permission)
- Deployed algorithm as a web service rather than absorbed into KIDSNET
- Other applications could now easily make use of the service

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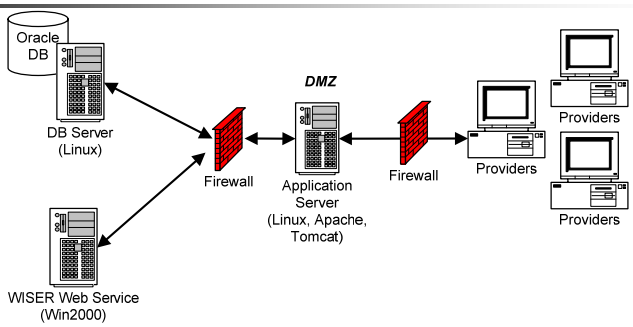
Updated KIDSNET Architecture



- Web service is called in real time from KIDSNET application when needed.
- Core KIDSNET system (Linux/Oracle) interoperates with Microsoft-based Web Immunization Service Evaluation and Recommendation (WISER) without issue.

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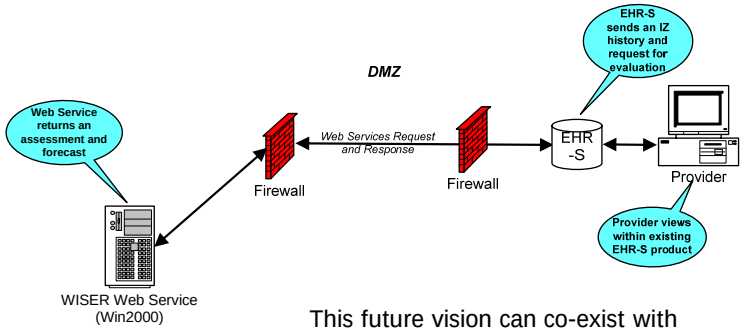
A Possible Future



This future vision can co-exist with the previous model: Web service can interact with IIS *and* provider EHR systems

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Benefits to KIDSNET

- New, robust algorithm with no software acquisition cost
- Integration into existing KIDSNET system with minimal interruption and minimal system modification
- Position KIDSNET to provide algorithm service to other applications

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Questions and Comments

Thank you!