SOA in the pan-Canadian EHR

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Outline

- Infoway
- EHR Solution
- EHRS Blueprint Overview
- Services Oriented Architecture
- Business Case
- Key Messages
Mission
To foster and accelerate the development and adoption of electronic health information systems with compatible standards and communications technologies on a pan-Canadian basis with tangible benefits to Canadians.

Vision
A high-quality, sustainable and effective Canadian healthcare system supported by an infostructure that provides residents of Canada and their healthcare providers timely, appropriate and secure access to the right information when and where they enter into the healthcare system. Respect for privacy is fundamental to this vision.

Goal
By 2010, every province and territory and the populations they serve will benefit from new health information systems that will help transform their healthcare system. Further, by 2010, 50 per cent of Canadians and by 2016, 100% of Canadians will have their electronic health record available to their authorized professionals who provide their healthcare services.

Shared Governance Facilitates Collaboration
Canada Health Infoway is an independent not-for-profit organization, whose Members are Canada’s 14 federal, provincial and territorial deputy ministers of health.
Electronic Health Record

An electronic health record (EHR) provides each individual in Canada with a secure and private lifetime record of their key health history and care within the healthcare system.

The record is available electronically to authorized healthcare providers and the individual anywhere, anytime in support of high quality care.

This record is designed to facilitate the sharing of data across the continuum of care, across healthcare delivery organizations and across geographies.
Integrating Health IT Systems: Key Challenges

• Protecting Privacy
  • Governance, accountability & data custodianship
  • Controlling access
  • Managing & applying consent directives
  • Controlling feeds and queries to the data
  • Trust relationships & contracts

• Discovery & availability of data
  • Discovery capability
  • Availability in electronic format
  • Timeliness

• Harmonization
  • Data structures (format)
  • Vocabularies (encoding, normalization)
  • Semantics

• Heterogeneous technology environments
• Number of organizations, connection points & systems
• Costs inherent to integration

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EHR Infostructure

The **EHR Infostructure** is a collection of common and reusable components in the support of a diverse set of health information management applications. It consists of software solutions for the EHR, data definitions for the EHR, and messaging standards for the EHR.
Standards-based EHR Solutions

- Standardized Architecture
- Standardized Interfaces
- Standardized Data Structures
- Standardized Data Vocabularies
- Standardized Functional Behavior
Pan-Canadian Privacy Forum on EHR Information Governance

JURISDICTIONAL INFOSTRUCTURE

Registries Data & Services
- Client Registry
- Provider Registry
- Location Registry

Ancillary Data & Services
- Immunization Management
- PHS Reporting

EHR Data & Services
- Shared Health Record
- Drug Information
- Diagnostic Imaging
- Laboratory

Data Warehouse
- Health Information

Longitudinal Record Services
- Business Rules
- EHR Index
- Message Structures
- Normalization Rules
- Terminology Repository

Common Services
- Security Mgmt Data
- Privacy Data
- Configuration

Communication Bus

HIAL

POINT OF SERVICE

Public Health Services
- Public Health Provider

Pharmacy System
- Pharmacist

Radiology Center PACS/RIS
- Radiologist

Lab System (LIS)
- Lab Clinician

Hospital, LTC, CCC, EPR
- Physician/Provider

Physician Office EMR
- Physician/Provider

EHR Viewer
- Physician/Provider
EHR Infostructure: Longitudinal Record Services

JURISDICTIONAL INFOSTRUCTURE

Registries Data & Services

Ancillary Data & Services

EHR Data & Services

Data Warehouse

Longitudinal Record Services

HIAL

POINT OF SERVICE

LONGITUDINAL RECORD SERVICES

DATA

Key Mgmt Services

Data Services

ETL Services

Replication Services

BUSINESS

Data Quality Services

Normalization Services

Domain Business Components

Terminology Services

EHR Index Services

Business Rules Services

Orchestration Services

Assembly Services

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EHR Infostructure: Communication Bus

JURISDICTIONAL INFOSTRUCTURE

Registries Data & Services
Ancillary Data & Services
EHR Data & Services
Data Warehouse

COMMUNICATION BUS

MESSAGING
- Transformation Services
- Encrypt/Decrypt Services
- Parser Services
- Routing Services
- En/Decoding Services
- Serialization Services

PROTOCOL
- App Protocol Services
- Network Protocol Services

POINT OF SERVICE

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## EHR Infrastructure: Common Services

### Interoperability Services
- Interoperability Services
- Search/Resolution Services

### Integration Services
- Service Catalogue Services
- Broker Services
- Mapping Services
- Queuing Services

### Subscription Services
- Alert/Notification Services
- Pub/Sub Services

### Privacy & Security
- Anonymization Services
- Consent Directives Management Services
- Identity Management Services
- User Authentication Services
- Encryption Services
- Secure Auditing Services
- Digital Signature Services
- General Security Services

### Management Services
- Management Services
- Configuration Services
- Policy Management Services

### General Services
- Auditing Services
- Log Management Services
- Exception/Error Handling Services

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Pan-Canadian EHR Infostructures as Peers
Distributed, Federated, Message Based
Business Case for SOA
Service Oriented Architecture as an Enabler

Application of SOA in EHR Infostructure Solutions

• Repurpose legacy applications to offer services as part of SOA-based EHR Infostructure
• New breed of services to enable coordinated transactions in an EHR Infostructure (e.g. Longitudinal Record Services)
• Use of commercially available solutions to enable components of EHR Infostructure
Service Oriented Architecture as an Enabler

The HIAL as an Application Abstract Layer

- Each jurisdictional HIAL deployed will have different
  - Physical deployment model
  - Some interfaces which are unique to that implementation
- HIAL acts as an abstraction of the EHR such that applications see the EHR in a consistent way across EHR implementations
- Services within an EHR Infostructure to optimize scalability, maintainability and functional flexibility
- Not all SOA Services are exposed and standardized
First Type of Abstraction: The EHR as Services

JURISDICTIONAL INFOSTRUCTURE

EHR SERVICES

- Get Client ID Resolution
- Put Immunization Data
- List CD Report Events
- List DI Results
- Get DI Report
- Get Provider Information
- List Encounter Events
- Get Laboratory Results
- Stream DI Image
- List Service Delivery Locations
- Get Encounter Summary
- List Laboratory Orders
- Put Laboratory Result
- List Medications
- Get Clinical Dashboard
- Get Client Demographic
- Get Prescription

POINT OF SERVICE

- Public Health Services
- Pharmacy System
- Radiology Center PACS/RIS
- Lab System (LIS)
- Hospital, LTC, CCC, EPR
- Physician Office EMR
- EHR Viewer

Public Health Provider
Pharmacist
Radiologist
Lab Clinician
Physician/Provider
Physician/Provider
Physician/Provider

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Second Type of Abstraction: Generic Application

JURISDICTIONAL INFOSTRUCTURE

- CR Services
- Outbreak Services
- Detection & Reporting Services
- Shared Health Record Services
- Drug Services
- DI Services
- Lab Services
- PR Services
- LR Services
- Terminology Services
- Rules Services
- A & A Services
- Brokering Services
- Consent Services
- Session Services
- Logging Services
- Orchestration Services
- EHR Index Services
- Assembly Services
- Normalization Services

POINT OF SERVICE

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Number of Systems to Integrate

Canada could have as many as **40,000** systems
Point-to-Point Connectivity

Costs basis
- Cost of one integration
  - Simple = $32K;
  - Medium = $95K;
  - Complex = $190K

Futile approach
- 38,783 systems in Canada
- Simple = 4,527; Medium = 20,081; Complex = 14,175
- 1.5 B integration points
- 183.9 T $CDN

We needed a different approach
**Hospital Networks Approach**

**Costs basis**
- Cost of one integration
  - Simple = $32K; Medium = $95K; Complex = $190K

**Hypothesis**
- 1,126 Hospital networks, each includes 71 systems to integrate and group (EAI) in 44 points of integration
- 1,892 (44 x 43) integrations per network totalling 2.1 M (1,126 x 1,892) integrations in Canada
- Assuming existence of standardized protocol for interfaces
- 68.2 B $CDN (if Simple – 32K)
- 202.3 B $CDN (if Medium – 95K)

**We needed a different approach**
EHRS Blueprint Approach

**Costs basis**
- Cost of one integration
  - Simple = $32K; Medium = $95K; Complex = $190K

**Hypothesis**
- All hospitals/long term care organizations use an integration engine and count as 1 integration point
  - Simple = 4,575; Medium = 8,134; Complex = 6,597
  - 19,306 integration points
- Assuming existence of standardized interface and protocols
  - 2.2 B $CDN
In Conclusion
Key Messages and Lessons Learned

• Separate the business problem from the solution
  • Define the business architecture first
  • Conceptual, logical, technical and deployment architectures must support the business
• Find the patterns
• Our ESB creates an Application Abstraction Layer
  • Some of the internal services can be hidden
  • We did not identify and specify well those that needed to publicly exposed and what detailed services they would support
• Evolve your SOA deployment over time
  • No monolithic footprint
  • Maturity path
  • Migration path
  • Govern, maintain and enhance
Key Messages and Lessons Learned

- It is about *Systems Interoperability* not *Systems Integration*
- Only cost effective scenario to handle degree of application integration required
- Maximized ability to deliver proper response time and consistent access to data across thousands of source systems
- Maximized ability to apply privacy and security policies in a harmonized and consistent fashion
- Enables evolutionary path to semantic harmonization of health information across service delivery points
- Enables high degree of scalability from local health services integration, to regional, provincial or territorial and cross-jurisdictional
- Enables high degree of flexibility in reconfiguration of health services delivery networks
Thank you!

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