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.
Patient Receives Care Across Care Providers & Settings

- Clinic
- Homecare
- Emergency Services
- Pharmacy
- Laboratory
- Specialist Clinic
- Community Care Center
- Hospital Emergency
- Diagnostic

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Patient Clinical Information is “Shared” Among Care Providers & Settings

INTEGRATED VIEW
Clinician systems “put” relevant data for sharing into interoperable EHR.
Clinician systems “list” and “get” desired data from interoperable EHR for display and use
Integrating Health IT Systems: Key Challenges

• Protecting Privacy
  • Governance, accountability & data custodianship
  • Controlling access
  • Managing & applying consent directives
  • Trust relationships & contracts
• Discovery & availability of data
  • Discovery capability
  • Availability in electronic format
  • Timeliness
• Harmonization
  • Data structures (format)
  • Vocabularies (encoding, normalization)
  • Semantics
  • Behaviours
• Heterogeneous technology environments
• Number of organizations, connection points & systems
  • National interoperability
• Costs inherent to integration
EHR Architecture

Jurisdictional 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.
EHR Infrastructure: Longitudinal Record Services

JURISDICTIONAL INFOSTRUCTURE

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

LONGITUDINAL RECORD SERVICES

DATA
- Key Mgmt Services
- ETL Services
- Replication Services
- Data Services

BUSINESS
- Data Quality Services
- Domain Business Components
- EHR Index Services
- Orchestration Services
- Normalization Services
- Terminology Services
- Business Rules Services
- Assembly Services

POINT OF SERVICE
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

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EHR Infostructure: Common Services

JURISDICTIONAL INFOSTRUCTURE

COMMON SERVICES

INTEROP
- Interoperability Services
- Search/Resolution Services

PRIVACY & SECURITY
- Identity Protection Services
- Anonymization Services
- Consent Directives Mgmt Services

INTEGRATION
- Service Catalogue Services
- Broker Services
- Access Control Services
- User Authentication Services
- Encryption Services
- Identity Mgmt Services
- Secure Auditing Services
- Digital Signature Services

SUBSCRIPTION
- Alert/Notification Services
- Pub/Sub Services
- Alert/Notification Services

MANAGEMENT
- Management Services
- Configuration Services
- Policy Mgmt Services
- Auditing Services

CONTEXT
- Caching Services
- Session Mgmt Services
- Pub/Sub Services

GENERAL
- Encrypt/Decrypt Services
- Exception/Error Handling Services
- Log Mgmt 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 ESB 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
- List Laboratory Orders
- Put Laboratory Result
- List Medications

- Get Encounter Summary
- 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
PR Services
LR Services
Terminology Services
Rules Services
A & A Services
Brokering Services
Consent Services
Session Services
Logging Services
EHR Index Services
Assembly Services
Normalization Services
Orchestration Services
Detection & Reporting Services
Shared Health Record Services
Drug Services
DI Services
Lab Services
EHR IP
Any Point-of-Service Application

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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
- A theoretical upper limit of the number of integration points but still an exponential challenge

Potential Interfaces = $N (N-1) = 1.5B

183.9 T $CDN
We need a more cost effective 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

- 68.2 B $CDN (if Simple – 32K)
- 202.3 B $CDN (if Medium – 95K)

- Significant reduction in interfaces and cost, but we still need a more practical approach

Potential Interfaces = 2.1M
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
- The most cost effective approach!

Potential Interfaces = 19k
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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