



Connecting for Health: Common Framework

CONNECTING FOR HEALTHSM
MARKLE FOUNDATION *A Public-Private Collaborative*

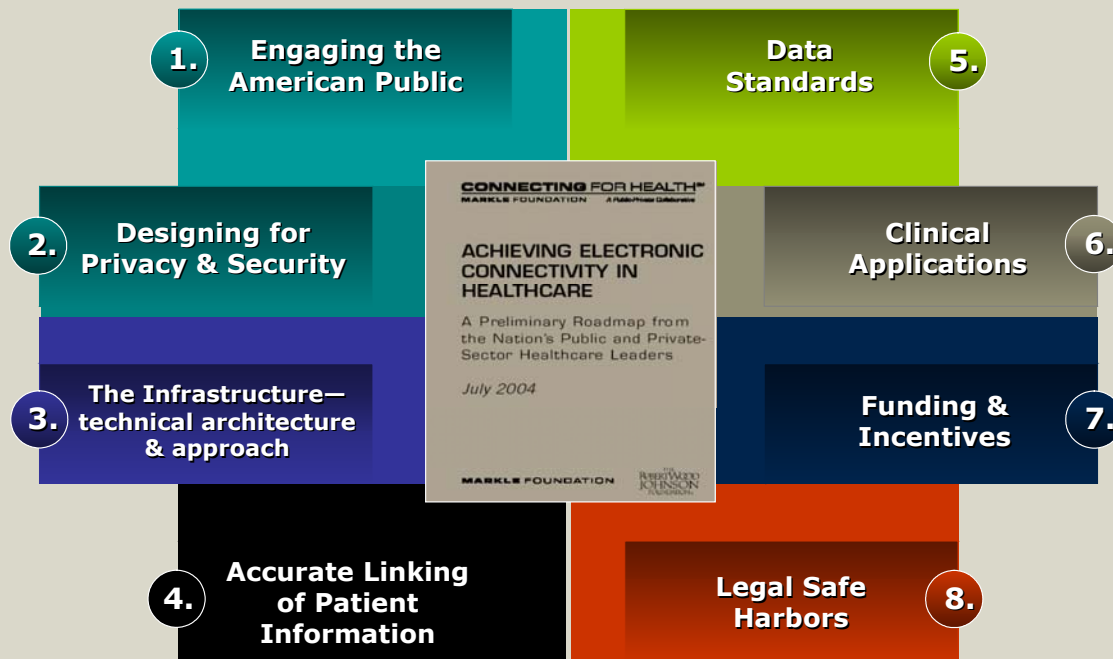
What is Connecting for Health?

- Broad-based, public-private coalition
- More than 100 collaborators
 - Providers
 - Patients
 - Payers
 - Accreditors
 - Government agencies
 - Researchers
 - IT systems manufacturers
- Founded and supported by **Markle Foundation**, with additional support from **Robert Wood Johnson Foundation**

Purpose of Connecting for Health

Catalyze changes on a national basis to create an interconnected, electronic health information infrastructure to support better health and healthcare

Our architecture is rooted in the Connecting for Health Common Framework and principles



Connecting for Health principles

- Builds on existing systems (“incremental”) and creates early value for doctors and patients
- Designed to safeguard privacy – imposed the requirements and then designed the solution
- Consists of an interoperable, open standards-based “network of networks” built on the Internet
- Leverages both “bottom-up” and “top-down” strategies

Design Principles

- Decentralized
- Federated
- No “Health ID”
- Bottom up *and* top down
- Decoupled development
- Scalable and evolvable
- No 'rip and replace'
- Auditable

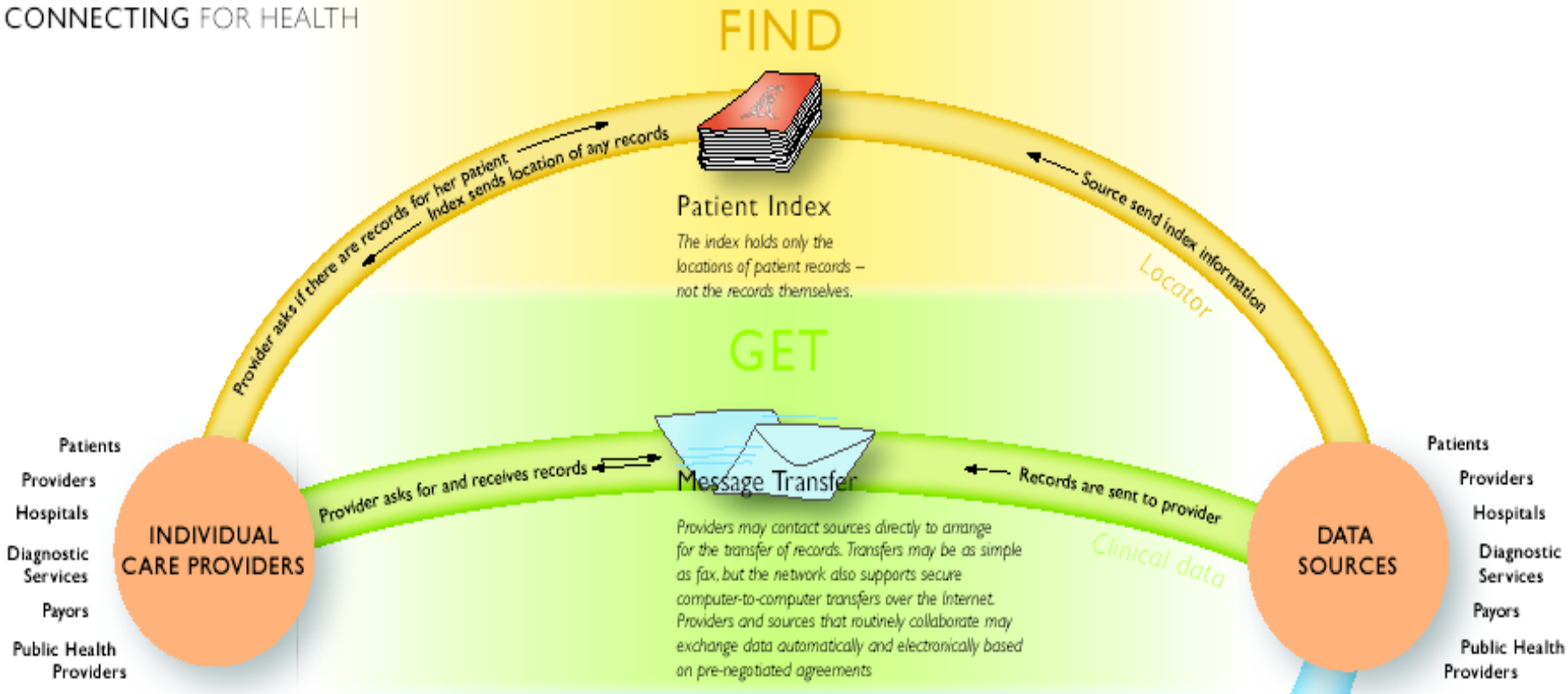
Two Questions:

**“Where are records for Patient X,
and how can I get them?”**

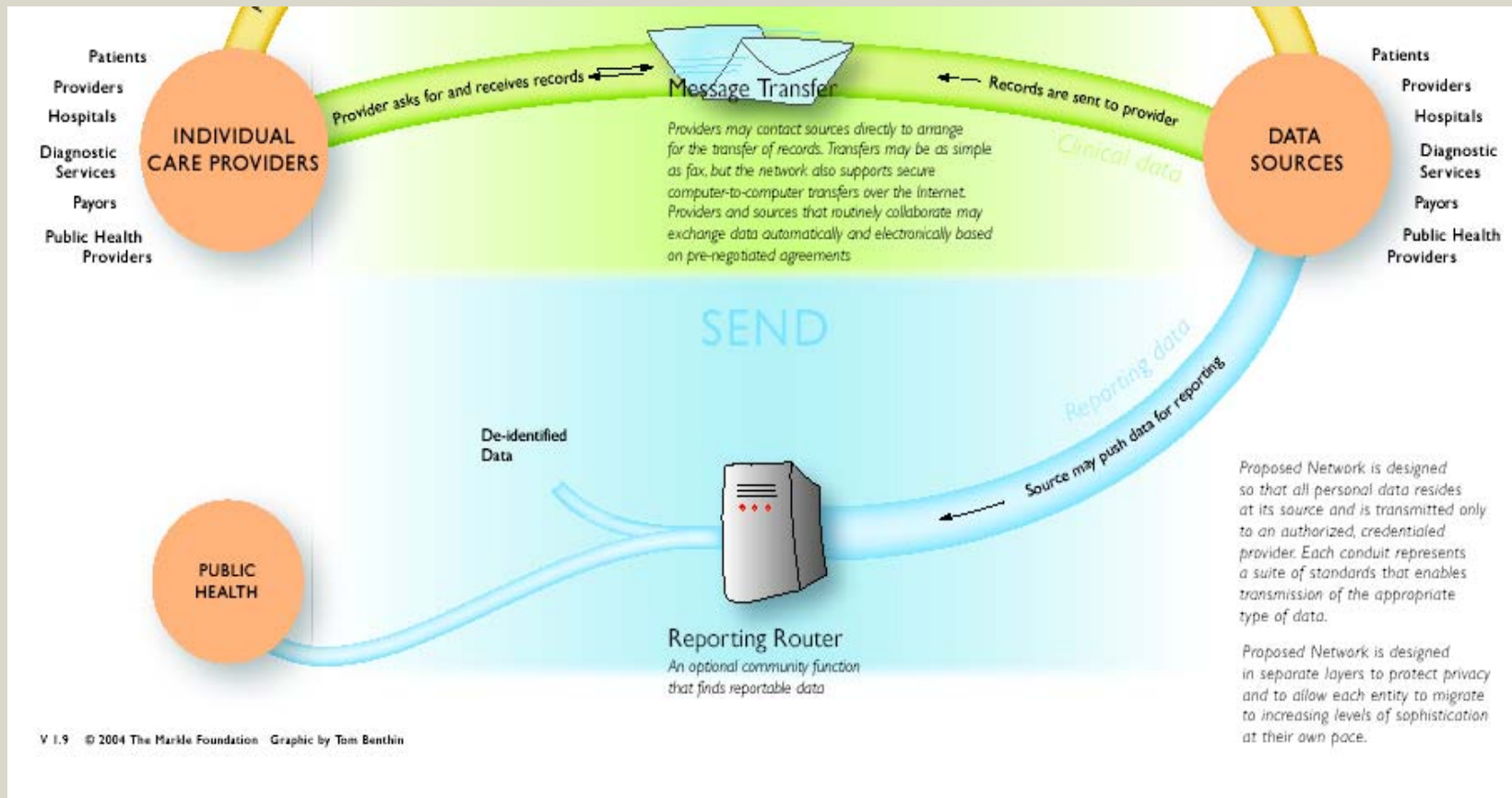
**How Can *Connecting For Health*
Standardize Among Various
Actors, So Queries Will Be
Interoperable?**

Architecture is Federated and Decentralized: Once records are located, the health information flows peer-to-peer – with patient’s authorization

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The architecture supports point of care information sharing and population-based reporting

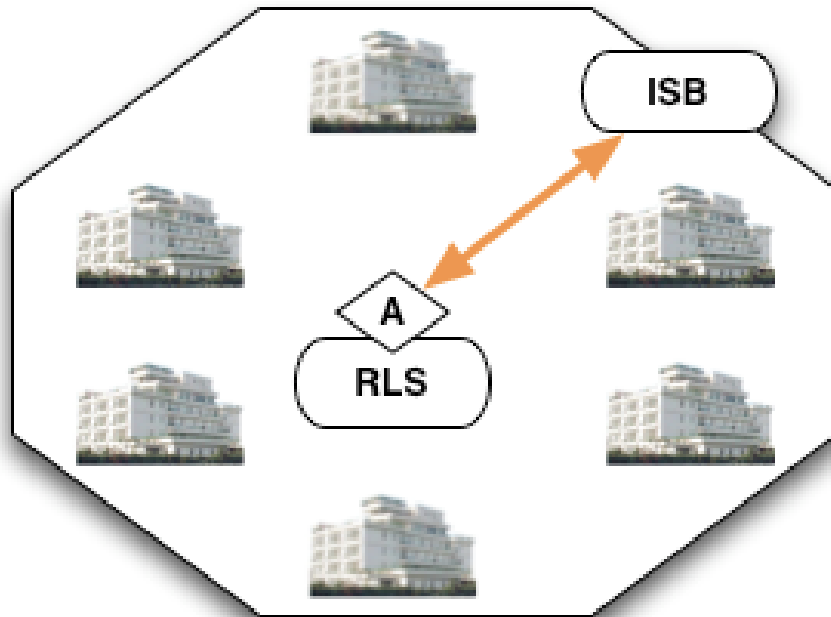


Common Framework: Standards *and* Policies Together

- Protect Privacy
- Availability of data
- Local control of data
- Patient access to data
- Federated Governance
- 3-5 Year Deployment
- Decentralized
- Interoperable
- Little 'Rip and Replace'
- Use Internet/No new wires
- Decoupled development
- Secured
- Authenticated
- Audited

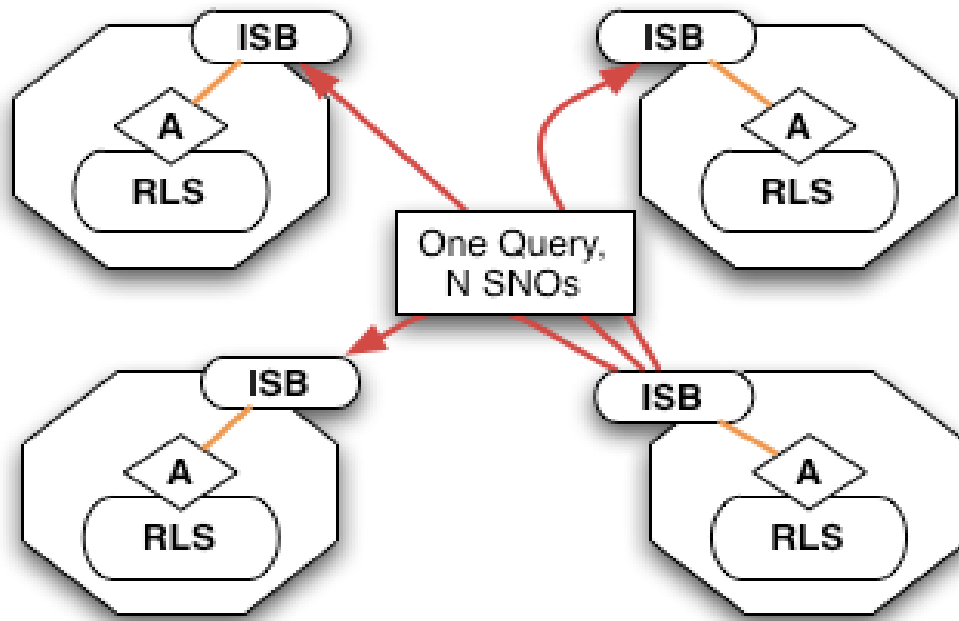
NHIN: Network of Networks

- A Sub-Network Organization (SNO):
 - Implements the Common Framework
 - Runs an RLS Internally
 - Provides an Inter-SNO Bridge for All External Traffic



NHIN: Network of Networks

- A SNO Queries Other SNOs When It Knows:
 - An Institution Where The Patient Received Care
 - A Region Where The Patient Received Care
- Same Query Formatted For All Remote SNOs
- Only Need Location of ISBs



NHIN: Network of Networks

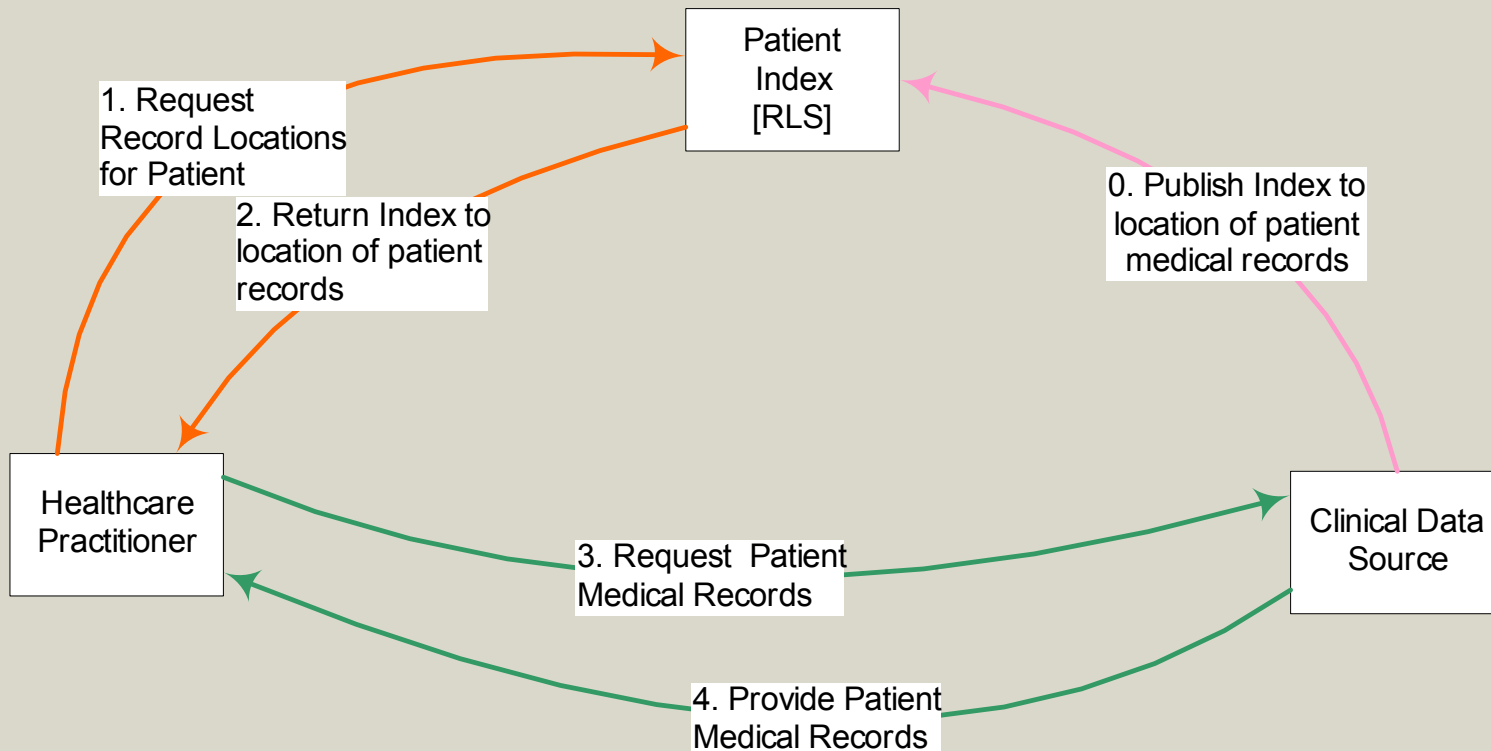
- National Health Information *Network*, not National Health Information *Database*
- Bad Tradeoff: 1000x Searches for 0.1 to 0.01 increase
- No “Top Level” Query
 - Privacy
 - Security
 - Patient Trust
 - Source of Truth
 - Data Cleanliness
- Queries Must Be Targeted/No Fishing
- Built On Lines of Actual Human Trust

Break the Problem Down

1. Location of Records
2. Disambiguation of Identity<>Record
3. Transport of Records
4. Aggregation of Records

Three Standard Interfaces

- Centralize record *locations*
- Publish local record locations to RLS (Pink)
- Query institution+MRN from RLS (Orange)
- Retrieve clinical data directly from sources (Green)
- Working Test Among Three Networks (MA, IN, CA)



1. Location: Namespaces

Problem of Global Uniqueness

Globally Unique Institutions IDs +
Locally Unique Record Numbers =
Globally Unique Record IDs

Examples:

John.Smith@IBM.com

HHS.gov/help.html

GeneralHospital/MRN:457398457

2. Disambiguation: Probabilistic Match on Demographics

- Assume No National Health ID
- Use Only Demographics / No Clinical Data
- Design Standard Patient ID Form
 - Name/DOB/Gender/Zip/SSN/etc
 - HL7 2.4/3.0
 - Extensible and Customizable
- Pluggable Matching Algorithm
- Optimized To Minimize False Positives



Records for Elizabeth Smith, DoB 3/4/54, Zip 23441 ?

Record Locator Service



Patient Match

- Incoming PID Fields Matched Against DB
- Algorithm Tuned to Local Conditions
- False Positives Tuned to < 1 in 100,000

First	Last	DoB	ZIP	SSN	Gn	Record
Elizabeth	Smith	3/4/54	23441	591-82-0065	F	B:458374
Liz	Smith			591-82-0065	F	E:668475
Elizabeth	Smit	3/4/44	23414	591-28-0065	F	B:875456
E	Smith	4/3/54			F	A:5698
Elizabeth	Sharon	6/1/66	23441	591-82-0065		C:45458
Jane	Public	5/7/75	23449	165-44-1332	F	D:387453



B: 875456, 458374
E: 668475

Record Locator Service



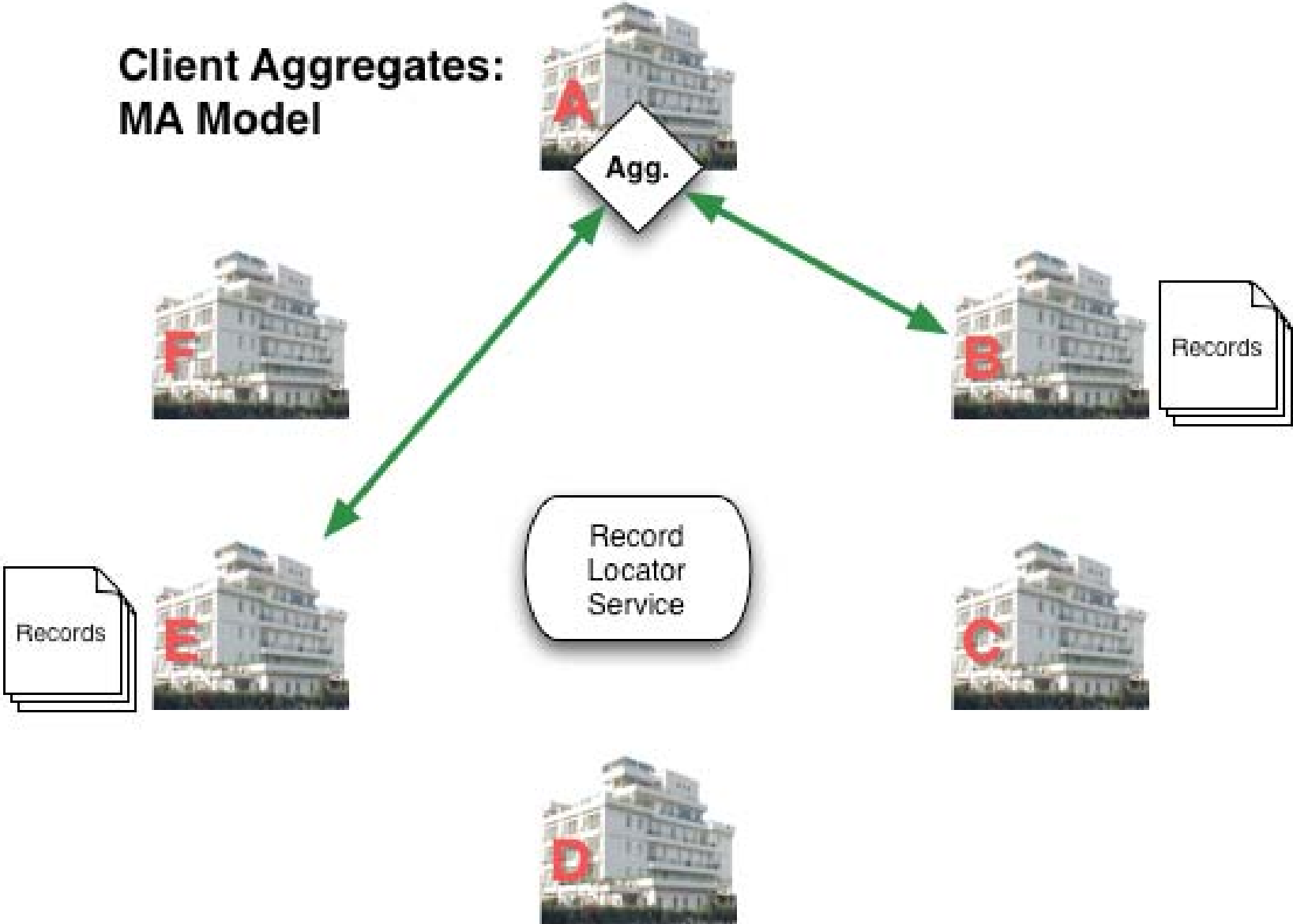
4. Aggregation: Architectural Flexibility

MA Model Aggregation at the Client

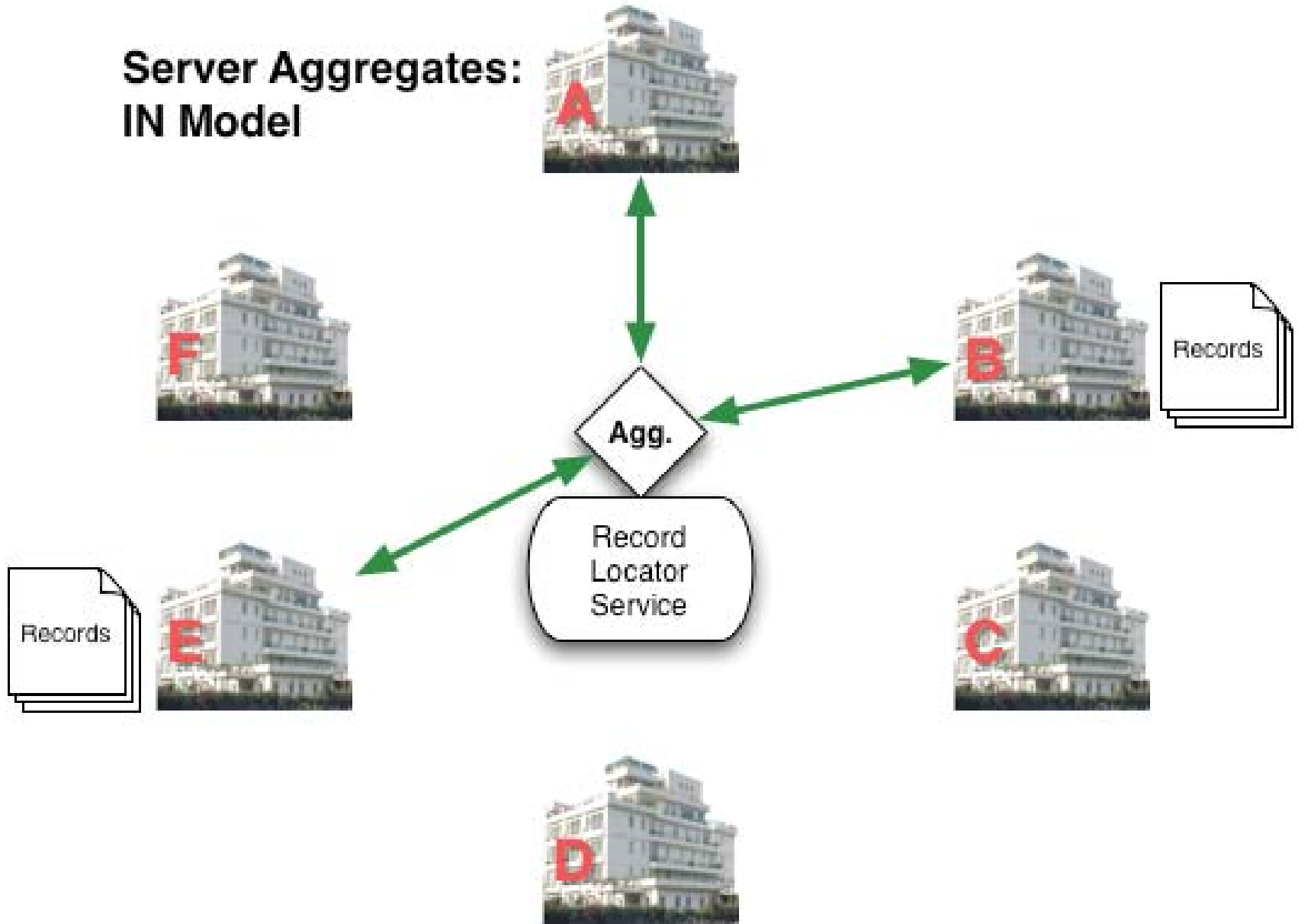
IN Model Aggregation at the Server

CA Model Aggregation in the Network

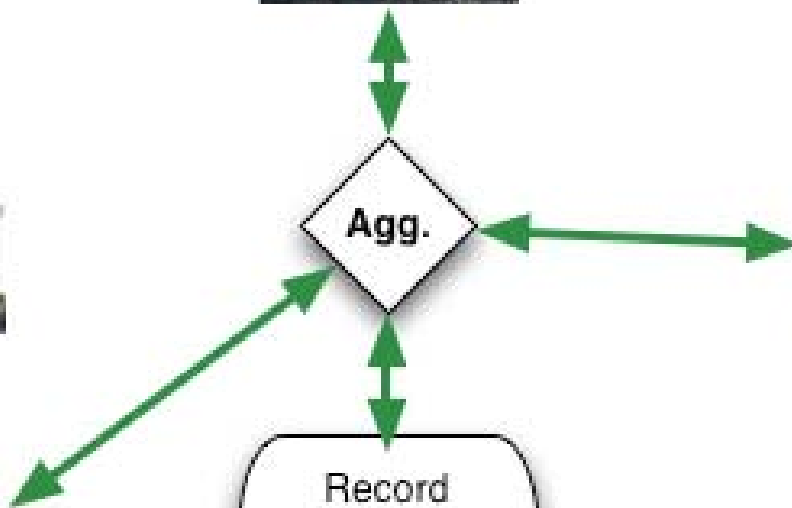
Client Aggregates: MA Model



Server Aggregates: IN Model



Proxy Aggregates: CA Model





A technical sojourn

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What does it mean?

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Viewer

- Demonstrate that the architecture allows users without an EMR can access data

Authentication against specific entity



A screenshot of a login dialog box titled "Connecting for Health Login". The dialog has a blue header bar with the title. Below the header, there are four input fields: "URL" with the value "https://connectingforhealth.regenstrief.org:8443", "Institution" with a dropdown menu showing "ST ELSEWHERE HOSPITAL", "Username" with the value "amartin-3", and "Password" with a masked field of ten dots. At the bottom of the dialog are two buttons: "Login" and "Cancel".

Field	Value
URL	https://connectingforhealth.regenstrief.org:8443
Institution	ST ELSEWHERE HOSPITAL
Username	amartin-3
Password	••••••••••

Connecting for Health - MARTIN, ANDREW

File View Windows Help

Silver, Stephannie

Last Name First Name Middle Name

silver stephannie

Street City State Zip

Gender F Birthdate 4/14/1923 SSN MRN MADEUP-4 Institution st elsewhere hospital

Red fields are required.

Advanced Querying Submit Query

Connected to: <https://connectingforhealth.regenstrief.org:8443>

Connecting for Health - MARTIN, ANDREW

File View Windows Help

Silver, Stephannie

Last Name: silver First Name: stephannie Middle Name:

Street: City: State: Zip:

Gender: F Birthdate: 4/14/1923 SSN: MRN: MADEUP-4 Institution: st elsewhere hospital

Red fields are required. Advanced Querying Submit Query

Advanced Query

- Return no records before start date.
Start Date: Wednesday, November 09, 2005
- Return no records after end date.
End Date: Wednesday, November 09, 2005
- Return a maximum number of records.
Number of Records: 5

Cancel OK

Connected to: <https://connectingforhealth.regenstrief.org:8443>

Last Name: silver
 First Name: stephannie
 Middle Name:
 Street:
 City:
 State:
 Zip:
 Gender: F Birthdate: 4/14/1923 SSN: MRN: MADEUP-4 Institution: st elsewhere hospital
 Red fields are required. Advanced Querying Submit Query

QUERY PARAMETERS:

NAME: silver, stephannie
SEX: F
DOB: 1923-04-14T00:00:00
MRN: MADEUP-4 **HOSPITAL:** st elsewhere hospital
Query Maximum Number of Records: 5

QUERY RESULTS:

Date	Description	Elapsed	Results	Patient/Normals
21-Oct-03 11:02		-2.05 Years	VISIT HISTORY	Silver, Stephannie {a} (MADEUP-101680, St Elsewhere Hospital)
		Total Clinic Charge 819	DOLLARS	
06-Feb-00 03:44		-5.76 Years	VISIT HISTORY	Silver, Stephannie {a} (MADEUP-101680, St Elsewhere Hospital)
		Total Clinic Charge 279		
10-Jul-87 05:19		-18.35 Years	Wnd Routine Cult	Silver, Stephannie {b} (MADEUP-4, St Elsewhere Hospital)
		Gram Stn Wnd negative		
		MIC ORGANISM Proteus mirabilis		
		MIC ORGANISM Klebsiella pneumoniae		
19-Jan-87 09:16		-18.82 Years	MIC-GNR-Ur1	Silver, Stephannie {b} (MADEUP-4, St Elsewhere Hospital)
		MIC ORGANISM Escherichia coli		
		AMPICILLIN UR 2.00000		

NAME: fabrizio, ki
 SEX: M
 DOB: 28-Aug-53
 MRN: fake030702 HOSPITAL: st elsewhere hospital

QUERY RESULTS:

Date	Description	Elapsed	Results	Patient/Normals
26-Feb-06 12:00		-2 Days	DPC Panel 1	Fabrizio, Ki B (fake030702, St Elsewhere Hospital) (a)
	AFP Ser-QN		5.3	(0.0-14.9)
26-Feb-06 12:00		-2 Days	ECI PANEL	Fabrizio, Ki B (fake030702, St Elsewhere Hospital) (a)
	Hep B Surf Ab Ser QI		neg	
26-Feb-06 12:00		-2 Days	ROUTINE CHEM	Fabrizio, Ki B (fake030702, St Elsewhere Hospital) (a)
	Glucose SerPl Qn		100	(75-110)
	BUN SerPl Qn		15	(9-20)
	Bilirubin Conj SerPl Qn		0.3	(0.0-0.3)
	Bilirubin Unconj SerPl Qn		0.3	(0.0-1.1)
	Creatinine SerPl Qn		0.3	(0.8-1.5)
	ALT SerPl Qn		40	(21-72)
	Bilirubin SerPl Qn		1.6 *H	(0.2-1.3)
	Alk Phos SerPl Qn		63	(38-126)
	Protein SerPl Qn		8.3 *H	(6.3-8.2)
	Albumin SerPl Qn		4.6	(3.4-5.0)
	Calcium SerPl Qn		9.7	(8.4-10.2)
	AST SerPl Qn		59	(17-59)
	Sodium SerPl Qn		141	(135-145)
	Potassium SerPl Qn		5.9 *H	(3.6-5.0)
	Chloride SerPl Qn		108 *H	(98-107)
	CO2-Tot SerPl Qn		16 *L	(20-30)
29-Sep-05 12:00		-152 Days	Hip XR	Fabrizio, Ki B (fake030702, St Elsewhere Hospital) (a)
	RADIOLOGY IMPRESSION		1. Right hip disarticulation. Without radiographic evidence of complication. 2. Obliteration of the left ankle joint space and the left subtalar joint space.	
25-Aug-05 12:00		-187 Days	Prot Ser Elp ¹	Fabrizio, Ki B (fake030702, St Elsewhere Hospital) (a)
	Albumin SerPl Qn Elp		4.09	(3.40-5.00)
	A1 Glob Ser Qn Elp		0.34	(0.20-0.80)
	A2 Glob Ser Qn Elp		1.25 *H	(0.50-1.00)
	Beta Glob Ser Qn Elp		1.48 *H	(0.50-1.00)
	Gamma Glob Ser Qn Elp		2.03 *H	(0.50-1.60)
	Tot Prot (SPE)		8.5 *H	(6.4-8.2)
14-Sep-04 12:00		-1.46 Years	Discharge Summary Gopher-Brief	Fabrizio, Ki B (fake030702, St Elsewhere Hospital) (a)
	Discharge Diet		Regular Diet	
	Discharge Actvty		other activities	
	Hosp Stay		discharge	
	DISCHARGE PLAN		D/C all IV'S	
	Code Status		FULL CODE	
	DISCHARGE PRESCRIPTIONS		Acetaminophen Aspirin Buffered Atenolol Docusate NA	



What is available?

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Technical Documentation: 3 Categories

- Background on Record Locator Service Design
- Background on Data “Cleanliness”

- NHIN Message Implementation Guide
 - Record Locator Service/Inter-SNO Bridge
- Standards Guides
 - Medication History: Adapted NCPDP SCRIPT
 - Laboratory Results: ELINCS 2.0, with modifications

- Test Interfaces: CA, IN, MA
- Code base: CA, IN, MA