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Health Standards and the Nationwide Health Information Network (NHIN) Prototype

Brian J. Kelly, M.D.

brian.j.kelly@accenture.com

September 16, 2007

This presentation discusses a NHIN Architecture Prototype project made possible by a contract from the Office of the National Coordinator for Health Information Technology (ONC), DHHS. The content is solely the responsibility of the authors and does not necessarily represent the official view of ONC.

Our Distinct Health Care Markets



Characteristics of our distinct health care markets:

- RHIOs exist, but do not have regional information infrastructures for sharing health data
- Hospital and provider systems are widely diverse
- Few systems based on federal health standards
- Very representative of the US health care market
- Required rapidly building RHIO capabilities, leveraging existing IT systems

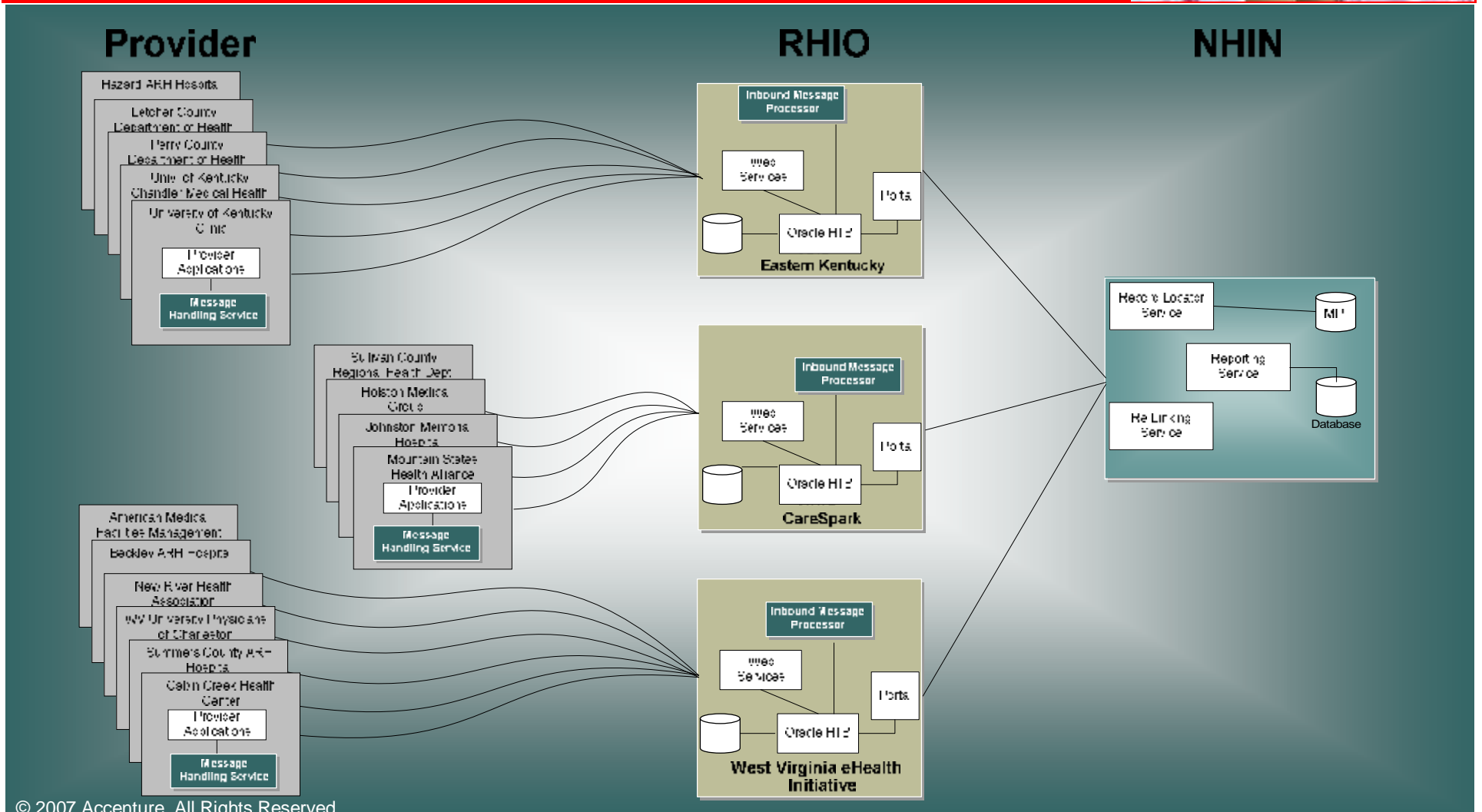


West Virginia Provider Organizations

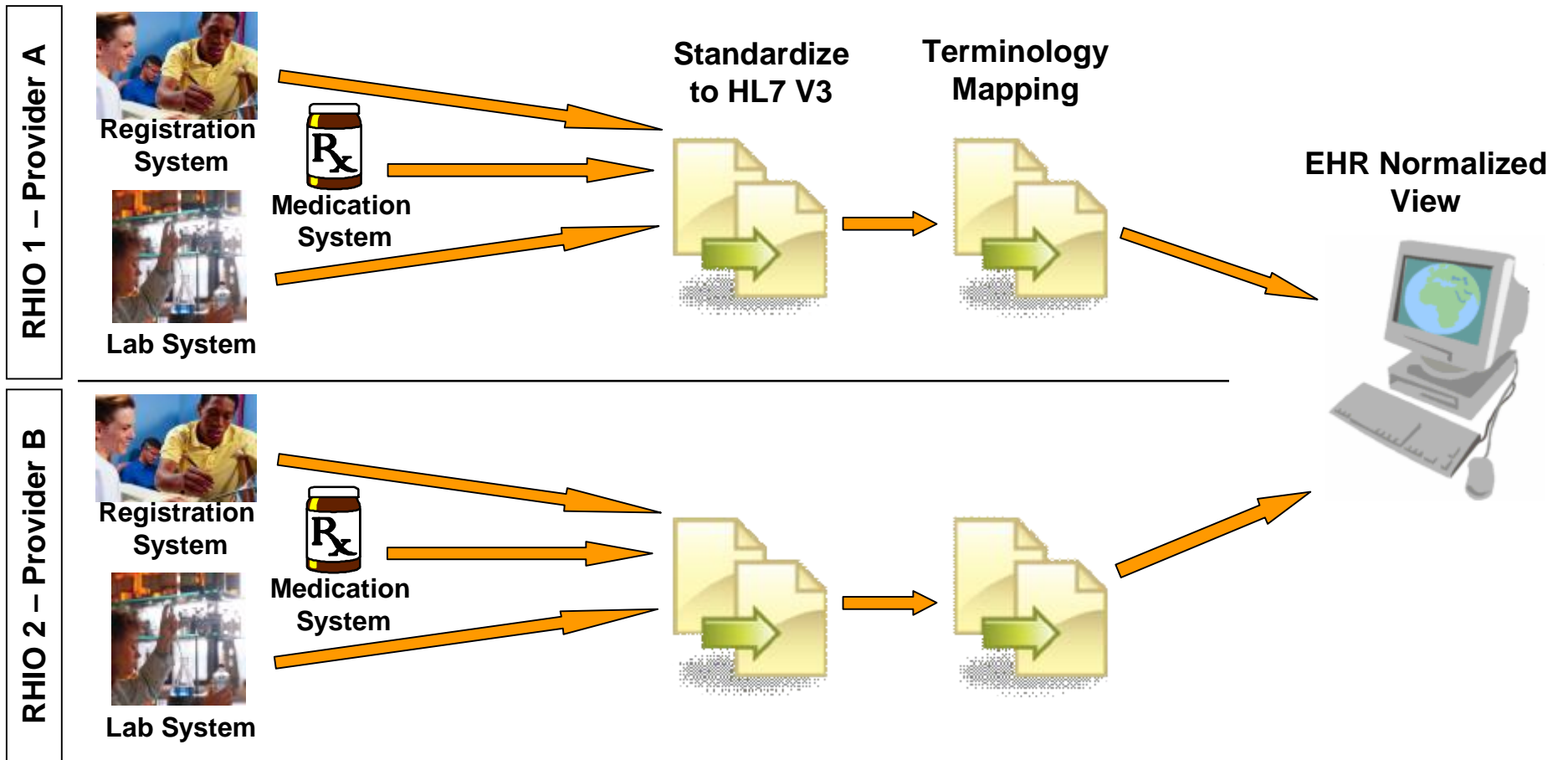


Provider	Platforms Supported	# Interfaces Built	Interface Types	Messages Supported	Solution
New River Health Association	EHS Practice Management, Medcom Lab	2	HL7	ADT, ORU (3 sub-message types)	Messaging
American Medical Facilities Management	QuickCare	1	Custom	NON – Demographics, Clinical (1 sub-type)	File
West Virginia University Physicians of Charleston	GE IDX, Siemens Invision, SCC Lab, Cerner Pathology, KBT E*Scripton	5	HL7	ADT, ORU (11 sub-message types)	Messaging
Cabin Creek Health Systems	CDEMS	1	Custom	NON – Demographics, Lab (2 sub-types)	Extraction/File
Appalachian Regional Healthcare (Beckley, Summers County)	McKesson STAR HIS, McKesson Horizon Lab	2	HL7	ADT, ORU (6 sub-message types)	Messaging

Accenture's Solution Overview



Data and Semantic Normalization



Data Standardization



Local Message (e.g HL7 V2.3.1)

```
TextPad - [C:\Documents and Settings\thomas.f.howard\Desktop\10-1
File Edit Search View Tools Macros Configure Window Help
MSH|^~\&|LAB|JCMC|SMS|JCMC|200609081457||ORU^R01|10520
PID|1||000463418^^^JCMC^MR^32203199^^^JCMC^AN||TEST^AF
OBR|1|000625100013|LAB7260466A^UA|||200609081439|||
OBX|1|ST|3500160^APPEARANCE||BLOODY||CLEAR|R|||F|||200
OBX|2|ST|3500140^COLOR||YELLOW||YELLOW|||F|||20060908
OBX|3|ST|3500180^PH||6.5||< 6.0|||F|||200609081439||
OBX|4|ST|3500260^PROTEIN||30 MG%||NEGATIVE|R|||F|||200
OBX|5|ST|3500120^GLUCOSE||NEGATIVE||NEGATIVE|||F|||20
OBX|6|ST|3500240^KETONES||40 MG/DL||NEGATIVE|||F|||20
OBX|7|ST|3500100^U BILIRUBIN||MODERATE||NEGATIVE|R|||F
OBX|8|ST|3500220^BLOOD||LARGE||NEGATIVE|R|||F|||200609
OBX|9|ST|3500660^NITRITE||NEGATIVE||NEGATIVE|||F|||20
OBX|10|ST|3500280^UROBILINOGEN||.1 EU/DL||<1.0|||F||
OBX|11|ST|3500200^SPEC GRAVITY||1.015||1.015-25|||F||
OBX|12|ST|3500300^WBC/HPF||5-10||0-2||A|||F|||200609081
OBX|13|ST|3500320^RBC/HPF||TNTC||0-2||A|||F|||200609081
OBX|14|ST|3500340^BACTERIA||NEGATIVE||NEGATIVE|||F|||200
OBX|15|ST|3500460^SQUAMOUS EPITH||2-5||0-2||A|||F|||200
OBX|16|ST|3500225^U LEUKOCYTE EST||SMALL||NEGATIVE|R||
```

Standard Message (HL7 V3 - HTB)

```
[2-MSHA ORU HL7_3 TEST.xml]
Project XML QTD/Schema Schema design XSL Authentic Convert View Browser WSDL SOAP Tools Win
<high inclusive="true" value="200609081439-0500"/>
</activityTime>
<interpretationCode code="R" codeSystem="2.16.840.1.113883.3.74.20.1.12.4.1.78"/>
<recordTarget htb:association="participation" type="Participation" typeCode="RCT">
  <Patient htb:association="role" type="Patient" classCode="PAT">
    <id root="2.16.840.1.1.112883.6.4.1" extension="123444444"/>
    <id root="2.16.840.1.113883.3.74.20.1.12.1" extension="000000032203199"/>
    <Person htb:association="player" type="Person" classCode="PSN" determinerCode="INSTANCE">
      <name htb:dataType="PN" use="L">
        <family encoding="TXT" mediaType="text/plain" partType="FAM">TEST</family>
        <given encoding="TXT" mediaType="text/plain" partType="GIV">APRIL</given>
        <suffix encoding="TXT" mediaType="text/plain" partType="SFX">TEST</suffix>
      </name>
      <administrativeGenderCode code="F" codeSystem="2.16.840.1.113883.3.74.20.1.12.4.1.1"/>
      <birthTime value="19710401"/>
    </Person>
    <Organization htb:association="scoper" type="Organization" classCode="ORG" determinerCode="INSTANCE">
      <id root="2.16.840.1.113883.3.74.20.1.12" extension="LABCER"/>
    </Organization>
  </Patient>
</recordTarget>
<component htb:association="outboundRelationship" type="ActRelationship" typeCode="COMP">
  <contextConductionInd value="true"/>
</component>
U HL7_3 TEST.xml
Ln 3 U, Col 3 Registered to Tom (HL7 Control Query TC) ©1998-2003 Altova GmbH & Altova, Inc. Ln 71, Col 69
```

(or Local Flat File)



HL7v3 Implementation Guide



The screenshots show the following content:

- Navigation Menu (Left):** COVER, HL7v3, Contributors and Acknowledgements, Version Table, EXECUTIVE SUMMARY, INTRODUCTION, Purpose and Background, Audience, Scope, Document Assumptions, Related Documents, Conventions, VOLUME I - SUB-7, LAYERS, VOL I MF II - MESSAGING, Overview, Messaging Infrastructure, Wrappers, Data Types, OIDs, Encounter Messaging, Storyboards, Use Cases, Transactions, Interactions, RIM, Schema, Example, Common Message Element Types (CMTs).
- Main Content Area (Bottom Screenshot):**
 - 1.1.1. Attributes
 - 1.1.1.1. **Condition Problem Class Code** (classCode)

Conformance	BL	Boolean (values are 'true' or 'false')
Conformance	Mandatory	Value must always be supplied (no nulls)
Repetition	1	Does not repeat
 - 1.1.1.2. **Condition Problem Class Code** (classCode)

DataType	CS	Simple Code (mnemonic only)
Conformance	Mandatory	Value must always be supplied (no nulls)
Repetition	1	Does not repeat
Code Strength	CNE	Must be coded using 'official' codeset (no un-coded text or local codes)
Code Domain	COM (under ActClass)	
Description	A code specifying the major type of Act that this Act-instance represents.	
Used by	Unspecified	
 - 1.1.1.3. **Condition Problem Code** (code)

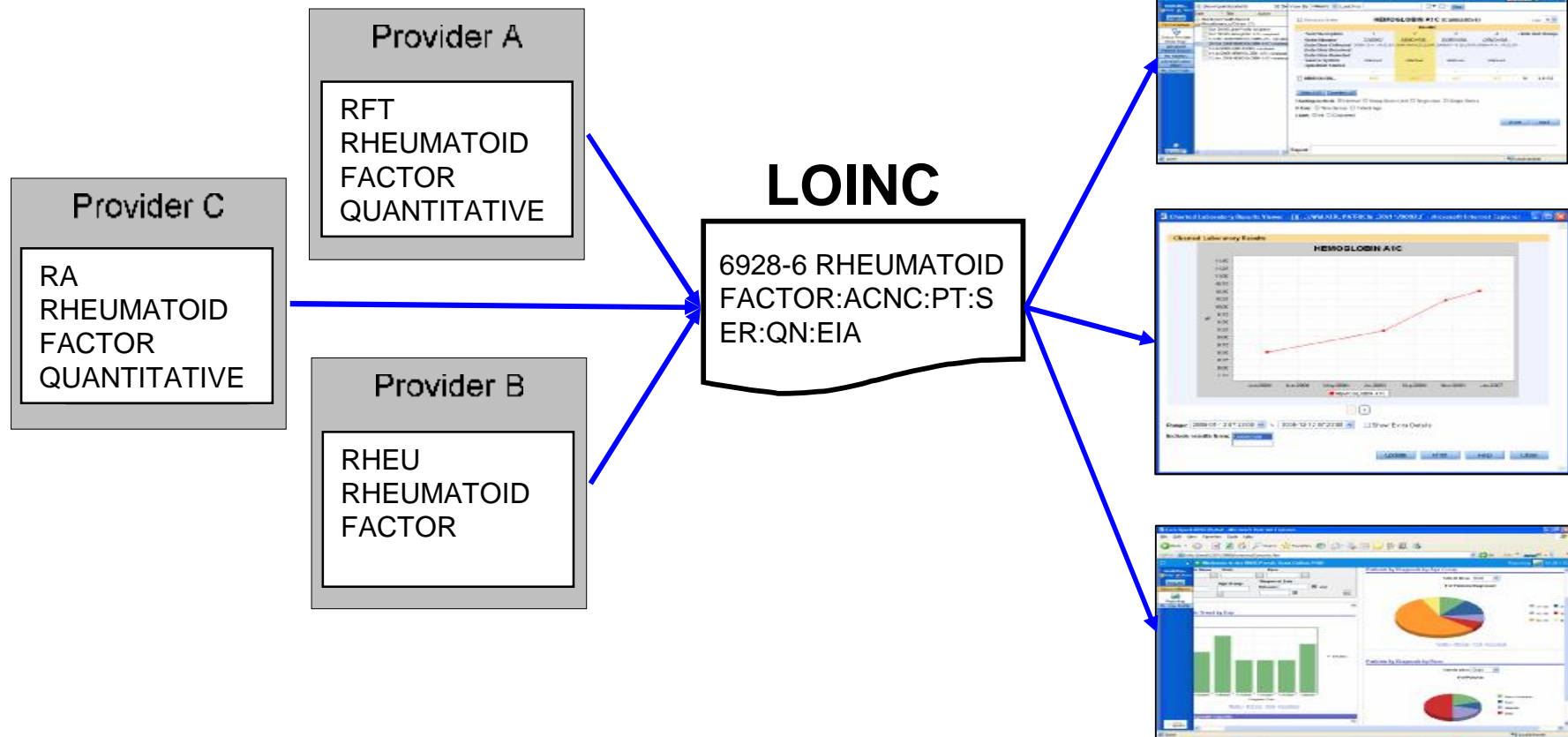
DataType	CD	Complex Code (includes mnemonic, code-system,
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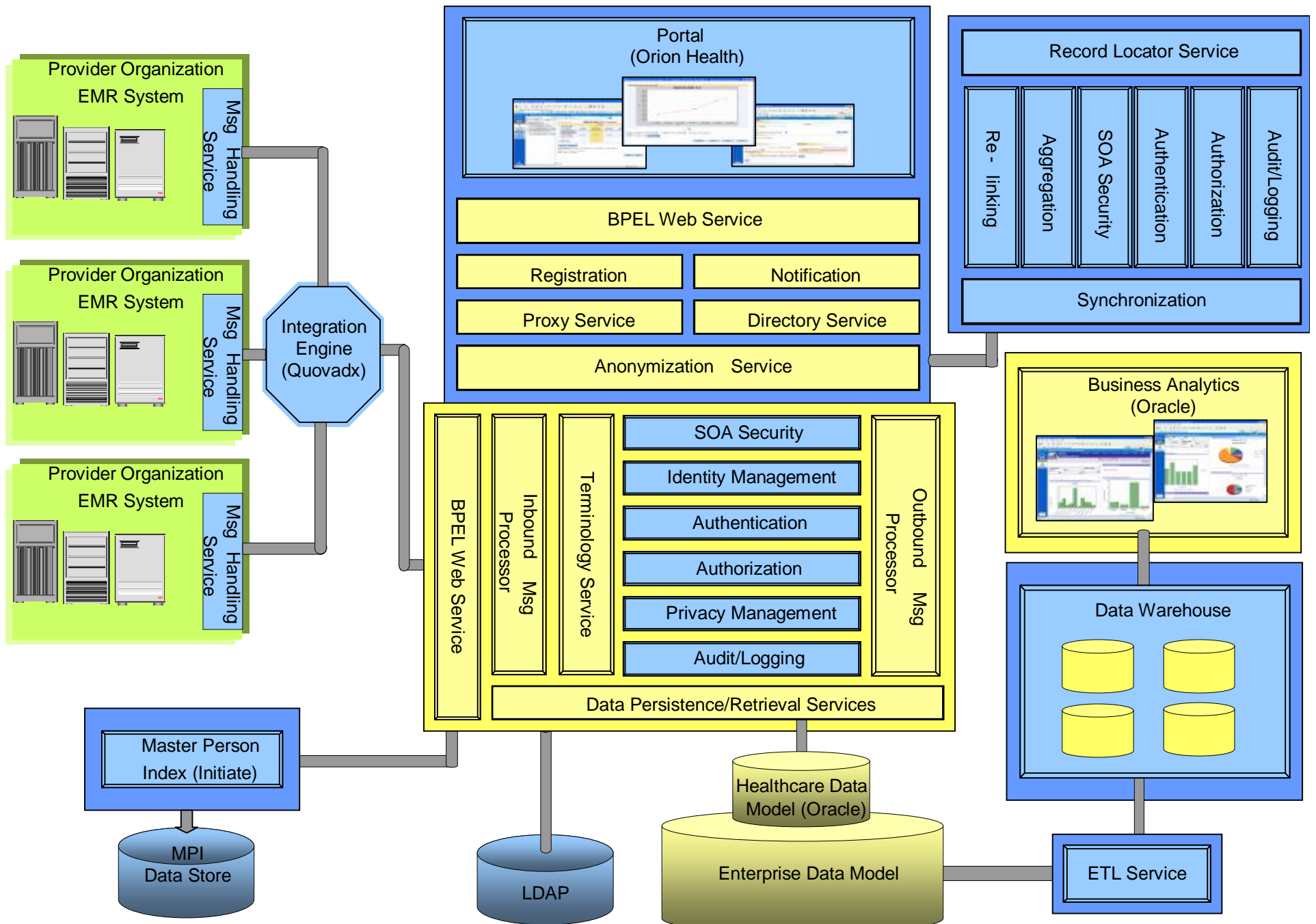
Dynamic model generated from same source that builds interaction schemas for consistency and correctness.

Diagrammatic message representation directly harvested from core HL7 tooling.

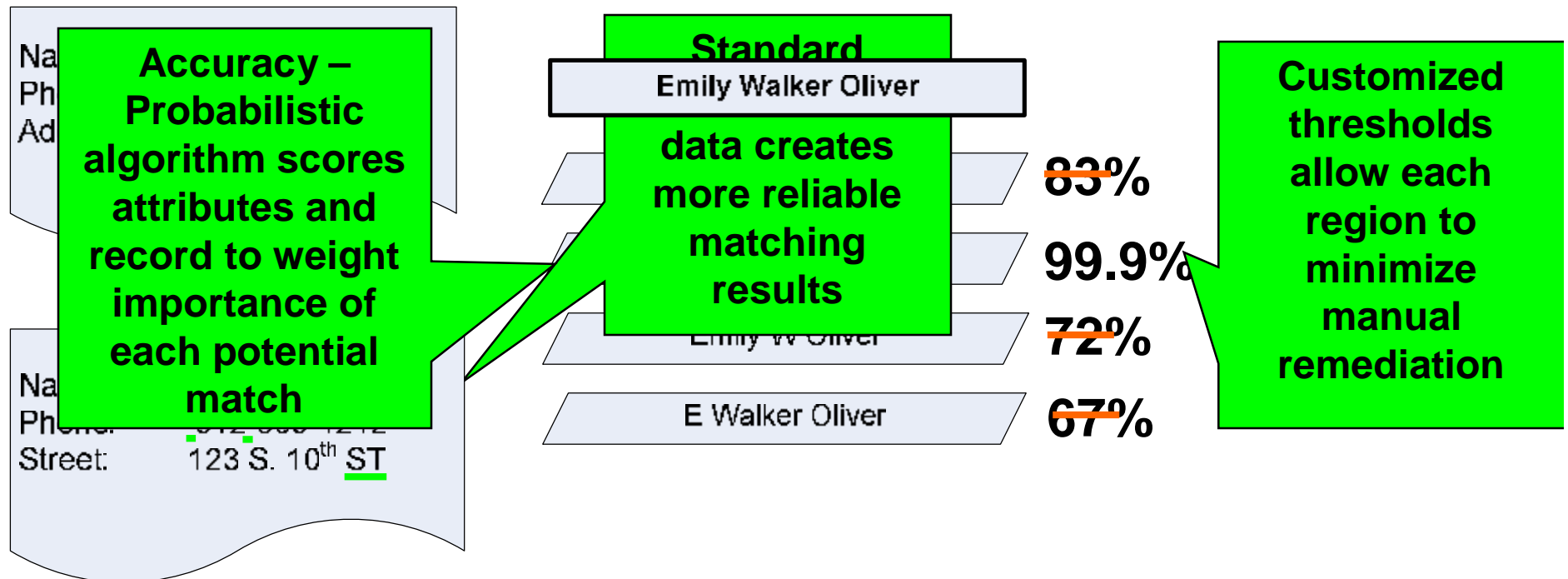
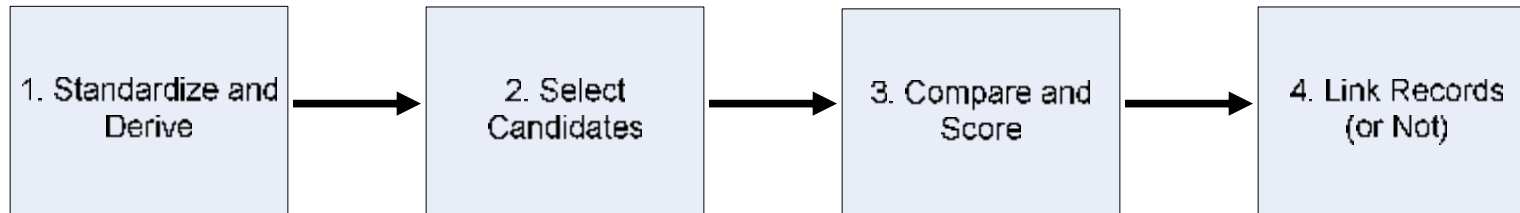
Detailed attribute documentation harvested directly (no double entry!) from formal specification for accuracy and completeness.

Terminology Normalization

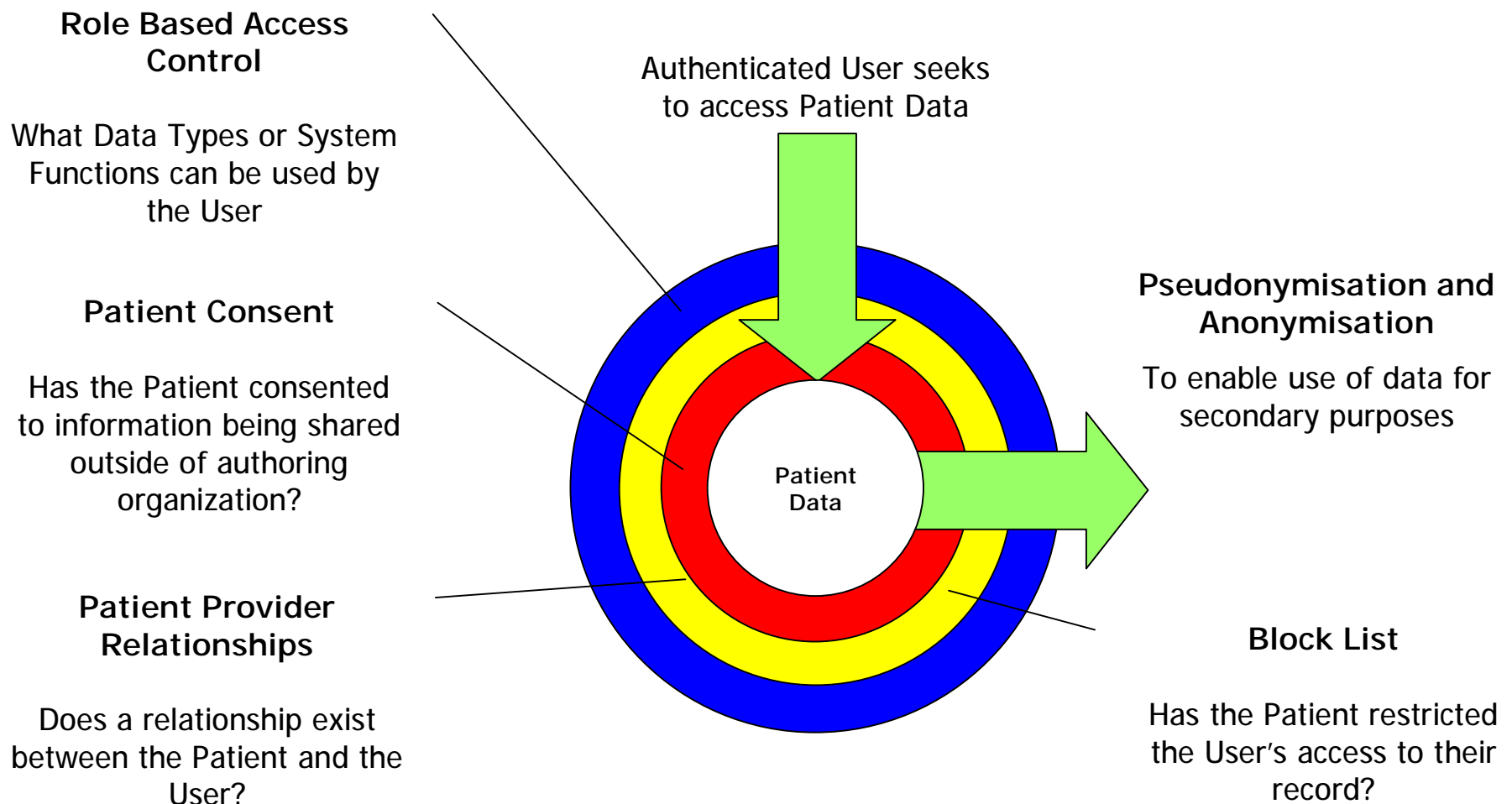




Enterprise Master Person Index (EMPI)



Security Architecture - Authorization



What We Proved



- Data can be extracted from a wide variety of clinical systems
- Working with NLM, HL7, Gordan Point Informatics, ASPE and Quovadx we were able to develop a target implementation guide for the most common HL7v3 messages
- We were able to map terminologies from 15 different provider organizations to FHA approved terminologies

Lessons Learned



- Data can be extracted from a wide variety of provider systems and converted into semantically normalized data
- In addition to standards, implementation guides are critical to achieving semantic interoperability
- However, building a NHIN that exchanges semantically normalized data is complex and requires teamwork between a large number of stakeholders
- The total cost of ownership of a data standardization in a world where source systems are still not standardized is high
- Standards regarding patient matching and security frameworks will greatly reduce long-term maintenance costs of National health infrastructures