

Building Healthcare Integration Solutions with App Connect and IBM Transformation Extender

Ben Thompson

App Connect Enterprise Chief Architect

Steph Fetzer

IBM Transformation Extender Product Manager



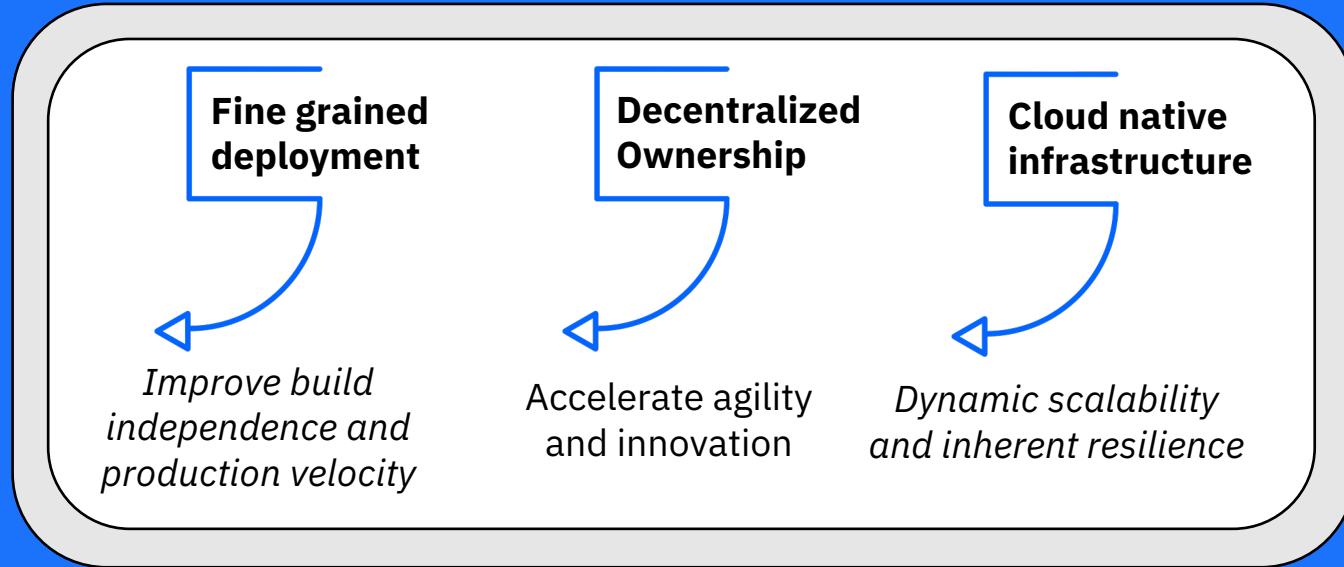
IBM Cloud

IBM

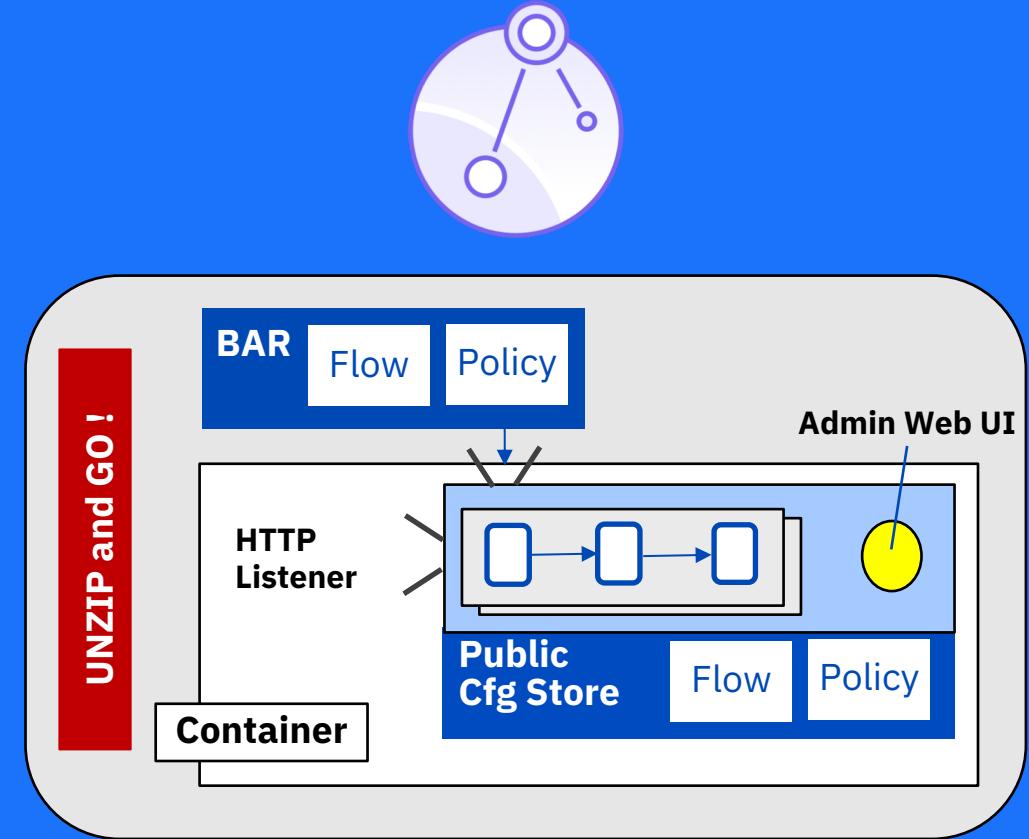
Three trends driving change in HealthCare

- 1. JUST ANOTHER MANIC MANDATE**
- 2. PAYER PROVIDER FOCUS**
- 3. SHIFT & COEXIST**

Introduction: What is App Connect Enterprise?



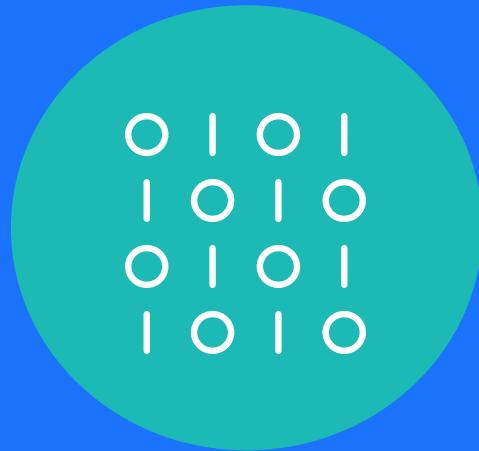
IBM App Connect Enterprise v11 combines the existing, industry-trusted IBM Integration Bus software with new cloud based composition capabilities, including connectors to a host of well-known SaaS applications.



Introduction: What is Transformation Extender?



Any data...



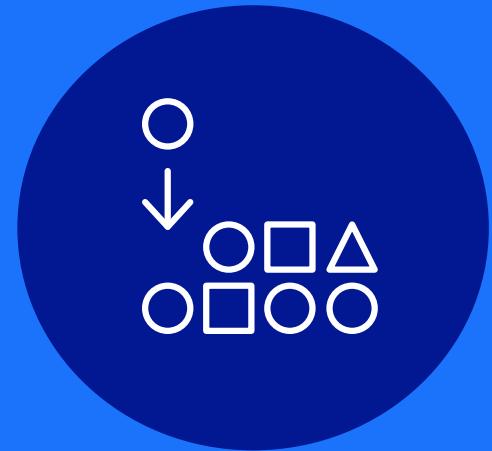
**Industry standards,
structured or unstructured
data and custom formats**

Any where...



**On premises and hybrid,
private or public cloud**

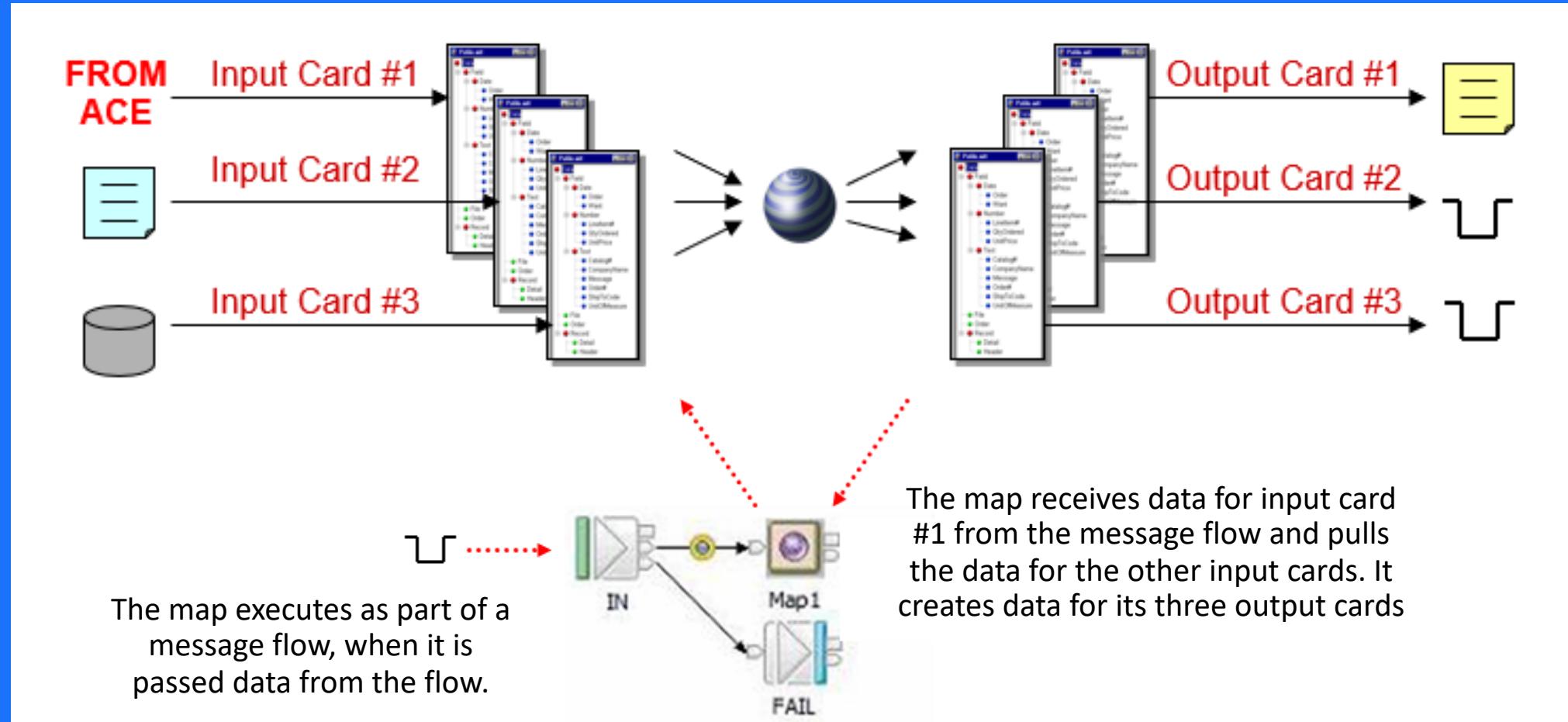
Any way...



**Robust User
Experience and
RESTful APIs**

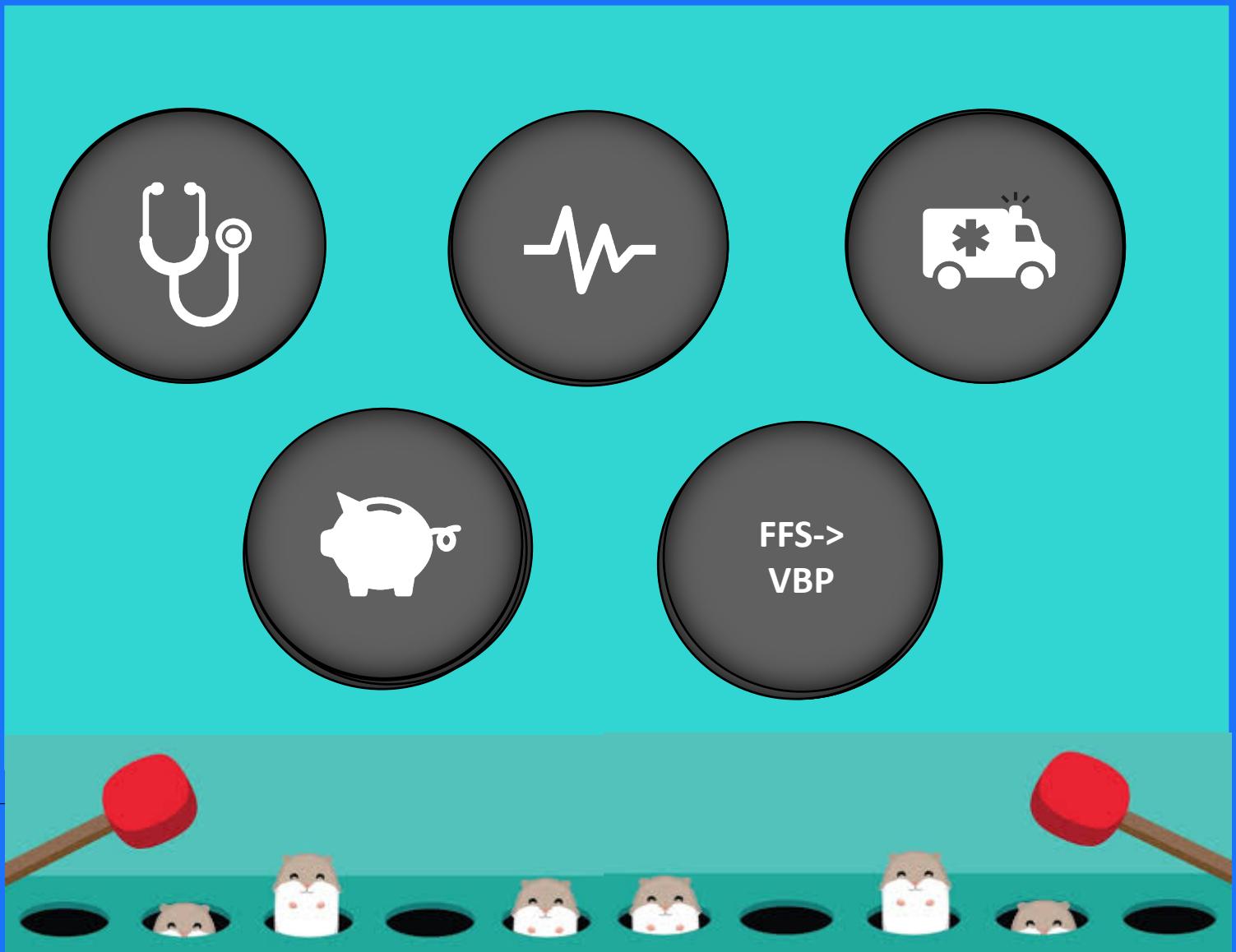
Executing an ITX Map in an ACE Integration Server

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Manic Mandate: Whack-a-mole

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Payer / Provider Profitability Focus

IBM.



More focus on opportunities
to leverage data to
streamline processing

[https://www.healthaffairs.org/
doi/full/10.1377/hlthaff.28.4.
w544](https://www.healthaffairs.org/doi/full/10.1377/hlthaff.28.4.w544)

Market Focus US Healthcare Payment Infrastructure



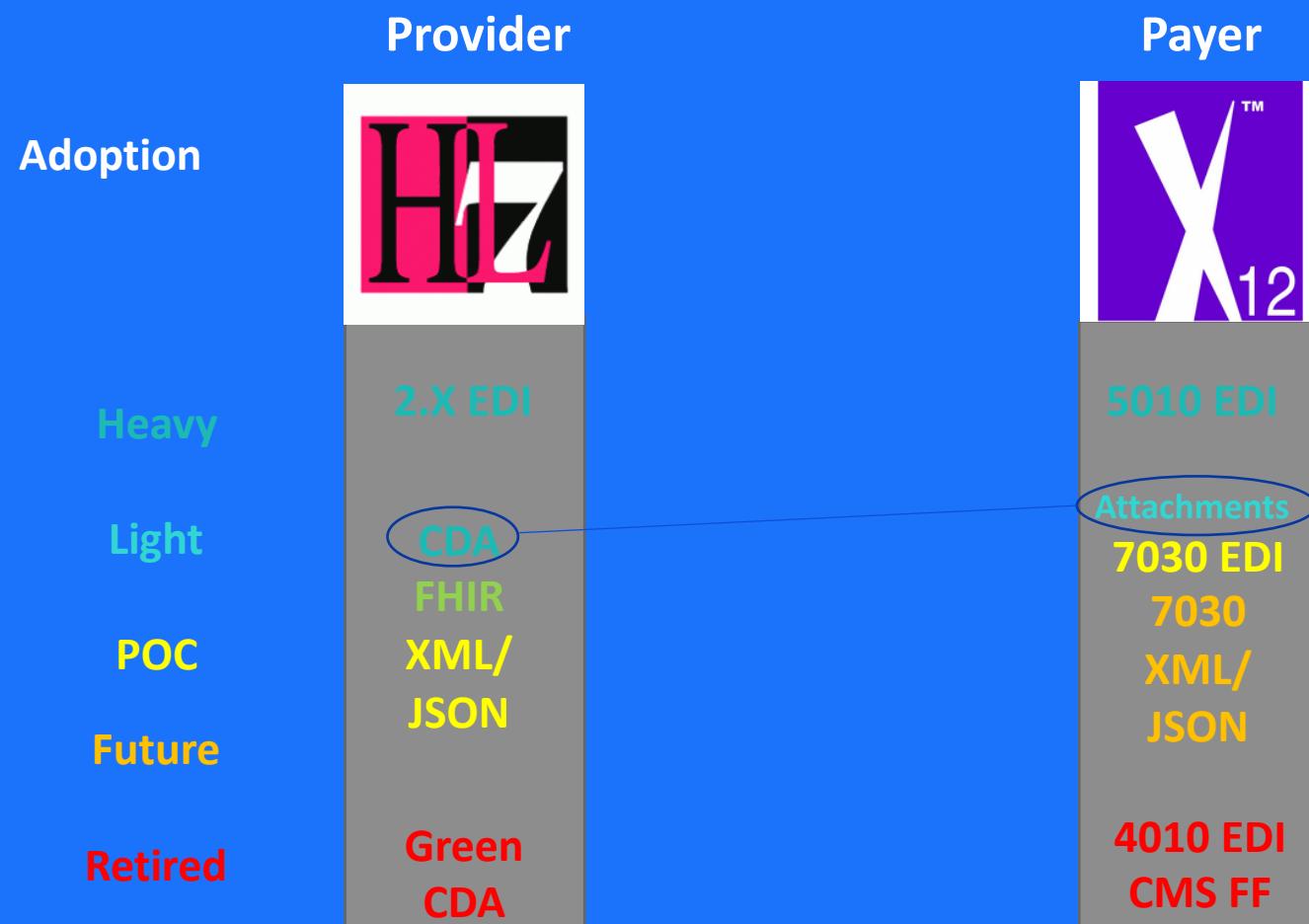
For every ten
physicians providing
care there are almost
seven additional
people in billing-
related activities

Shift & Coexist



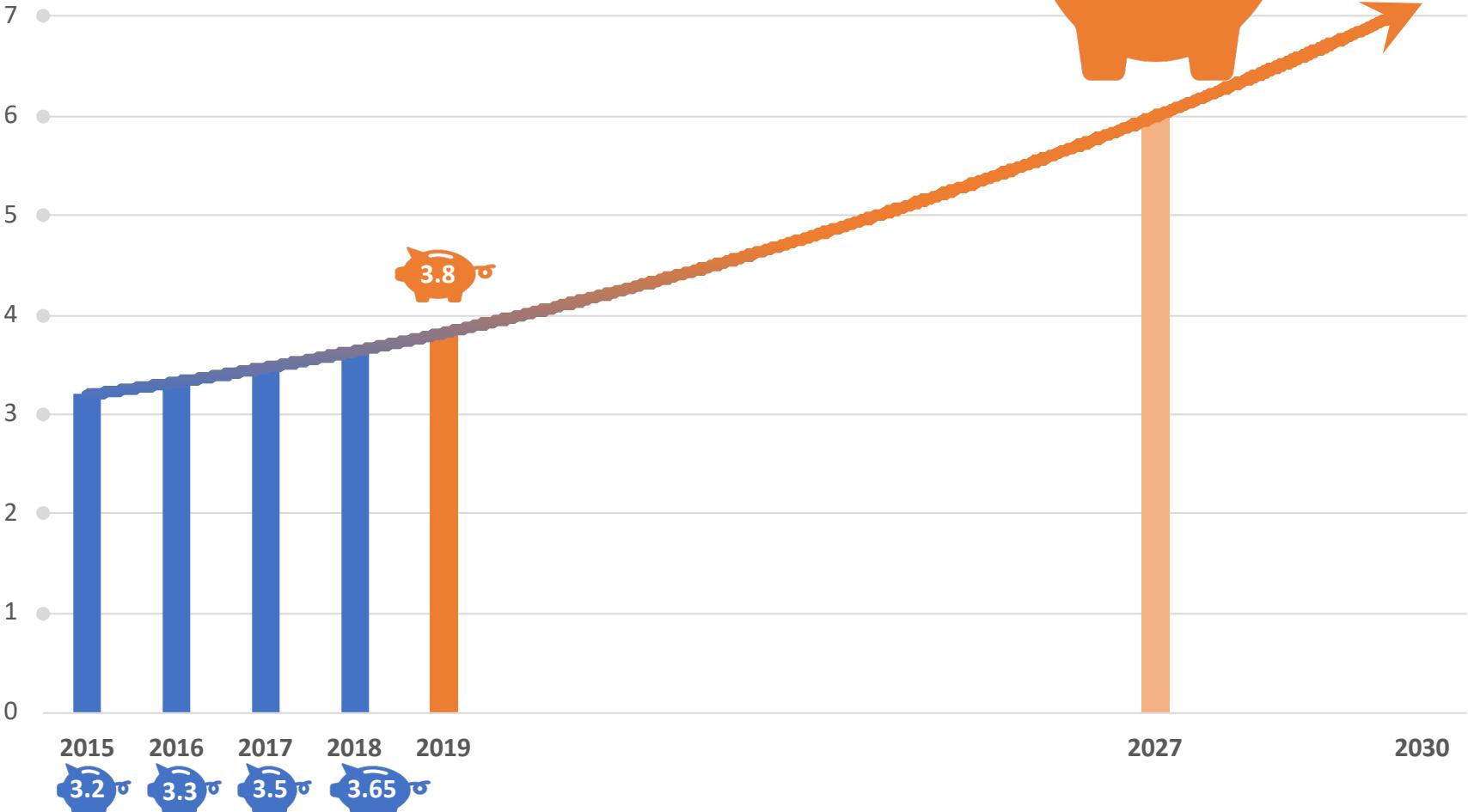
- Seeing a very slow very gradual shift from Proprietary/Industry standards to Technology/Industry Standards
- HL7 decades to get to XML with many false steps along the way.
 - Still early days for FHIR but industry seems poised to move
- US Payer Community not able/willing to move yet
- Cloud trends

**More focus on opportunities
to leverage data to
streamline processing**



BY 2027 US Health Spending

- Will grow 5.5 percent per year
- Will be nearly \$6.0 trillion
- Will grow 0.8 faster than GDP
- Will be 19.4 percent of GDP by 2027



Key Use Cases for ITX



- Complex Data Transformation
 - Nested, Semi-structured And Hierachical Data Types
 - Dependent Inputs And Outputs
 - Binary, Packed, EBCDIC, ASCII, Mixed Character Data
- Data Enhancement
 - Lookups
 - Data Logic and Routing
 - Data Validation
 - Context Based Data and Usage Rules
- Many to Many Transformation
 - Single-Transaction, interdependent data sets, conversions and logic
 - Mixed Data and Source/Target Types
 - Dependent Result Sets, Nested Structure Dependencies

ITX Industry Packs

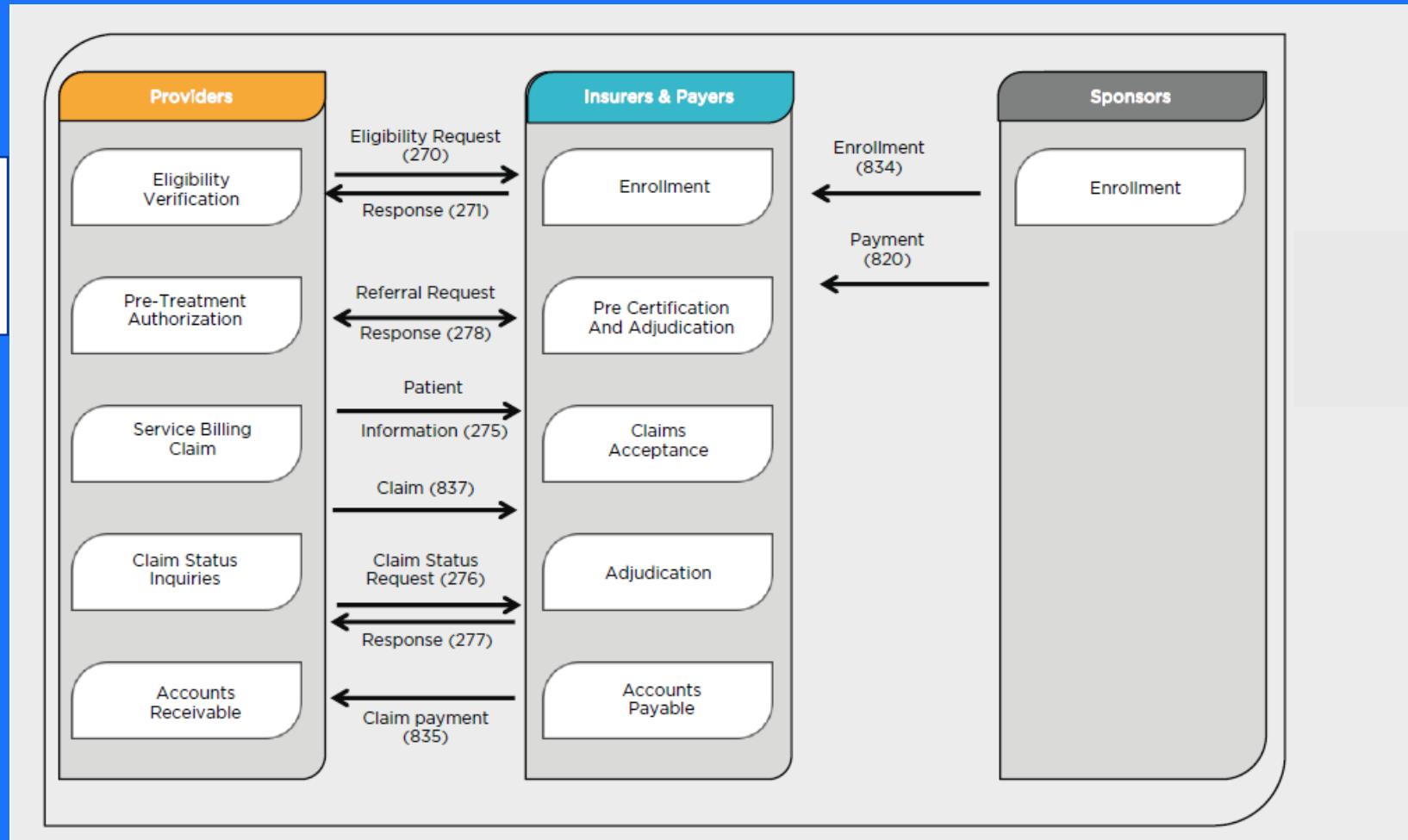
- Reliable updates -> no hand coding
- Validate correctly
- Handle bad data gracefully
- Timely compliance with regulations
- *EDI for Supply Chain, etc.*
- *Healthcare*
- *Financial Payments*

ITX - IBM's **Strategic** solution for comprehensive data transformation

	HIPAA HL7 NCPDP	<p>Health Insurance Portability and Accountability Act addresses standardization of electronic patient health, administrative, and financial data.</p> <p>Health Level 7 is an ANSI-accredited standards organization whose domain is clinical data.</p> <p>National Council for Prescription Drug Programs is a standards maintenance organization for finalized HIPAA transactions used in the retail pharmacy sector.</p>	HIPAA X12 EDI, Clinical Attachments, PACDR, CMS Flat File, NCPDP D.0, NCPDP Script, NCPDP EDI, NCPDP ScriptML, NCPDP PACDR, NCPDP BATCH, NCPDP TELECOM, ECL, NCPDP REPORT, HL7 2.x, HL7 3.x, CDA, CCD, FHIR
	SWIFT SEPA NACHA FIX ACORD	<p>Society for Worldwide Interbank Financial Telecommunication is a secure messaging interface for financial transactions.</p> <p>Single Euro Payment Area pan-European electronic payments infrastructure initiative. Includes templates, credit transfers, and direct debits.</p> <p>National Automated Clearing House Association is the North American ACH message standard for electronic payments.</p> <p>Financial Information eXchange Protocol handles message specifications for automated trading of financial instruments.</p> <p>Association for Cooperative Operations Research and Development is the insurance industry standards for life, property, and large commercial accounts.</p>	SWIFT ISO7775, SWIFT ISO15022, SWIFTMX, Minos, DTAUS, SIA RNI, ISO20022, BACS, SEPA, NACHA ACH, FIX, FIXML
	X12 EDIFACT	<p>B2B standard for inter-industry electronic exchange of business transactions; primarily in North America.</p> <p>Electronic Data Interchange For Administration, Commerce, and Transport is the Global EDI standard.</p>	ASC X12 (versions from ansi2003), TRADACOMS, EDIFACT (versions from v90), ISO9735-4

Healthcare Payer HIPAA

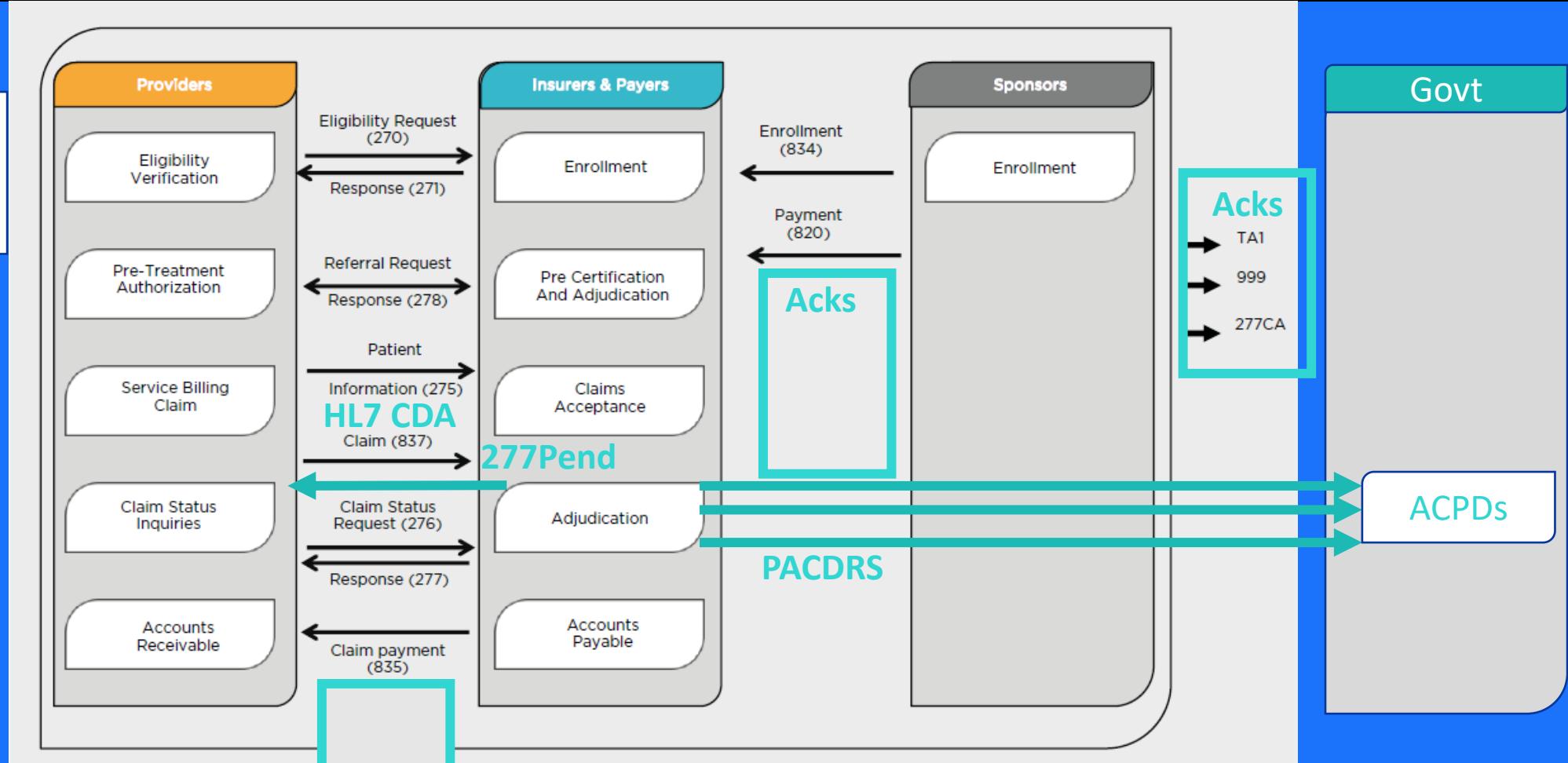
Mandate Basics



Healthcare Payer HIPAA

Beyond the mandates

Also – Examples including CMS Flat file formats



Healthcare Payer HIPAA Compliance



- In Depth Syntax, Semantic and configurable Business Rule Validation
- Validation and reporting options correspond to the various WEDI/SNIP levels
- Structured 999 and 277CA acks created as per specs
- Highly Configurable
- With ITXA can be extended to support partner-specific rule based configuration
- Navigable Human readable report
- Highly Performant

TRANSMISSION

Sequence: File="C:\HCIP_902\HIPAA\Claim_LevelX224A1_837D\Bad\5010x224a1_837d_2300_cn1_absent____t4pre_content"
TYPE 1: ACCEPT TYPE 2: ERRORS NOTED TYPE 3: ACCEPT TYPE 4: ERRORS NOTED

▫ **INTERCHANGE** Sequence: 1 Control Number: 00000008

TYPE 1: ACCEPT TYPE 2: ERRORS NOTED TYPE 3: ACCEPT TYPE 4: ERRORS NOTED

▫ **FUNCTIONAL GROUP** Sequence: 1 ID: HC Control Number: 001

TYPE 1: ACCEPT TYPE 2: ERRORS NOTED TYPE 3: ACCEPT TYPE 4: ERRORS NOTED

▫ **TRANSACTION SET** Sequence: 1 TransactionSetID: 837 Transaction Set Control Number: 0007

TYPE 1: ACCEPT TYPE 2: REJECT TYPE 3: SKIP TYPE 4: SKIP

▫ **SEGMENT** At position: 32 CN1 {Contract Information}

TYPE 2: error

Error Code: 6 {Segment Not in Defined Transaction Set}

▫ **TRANSACTION SET** Sequence: 2 TransactionSetID: 837 Transaction Set Control Number: 0009

TYPE 1: ACCEPT TYPE 2: REJECT TYPE 3: SKIP TYPE 4: SKIP

▫ **SEGMENT** At position: 36 CN1 {Contract Information}

TYPE 2: error

Error Code: 6 {Segment Not in Defined Transaction Set}

▫ **TRANSACTION SET** Sequence: 3 TransactionSetID: 837 Transaction Set Control Number: 0008

TYPE 1: ACCEPT TYPE 2: REJECT TYPE 3: SKIP TYPE 4: SKIP

▫ **SEGMENT** At position: 23 CN1 {Contract Information}

TYPE 2: error

Error Code: 6 {Segment Not in Defined Transaction Set}

▫ **TRANSACTION SET** Sequence: 4 TransactionSetID: 837 Transaction Set Control Number: 0011

TYPE 1: ACCEPT TYPE 2: REJECT TYPE 3: SKIP TYPE 4: SKIP

▫ **SEGMENT** At position: 32 CN1 {Contract Information}

TYPE 2: error

Error Code: 6 {Segment Not in Defined Transaction Set}

▫ **TRANSACTION SET** Sequence: 5 TransactionSetID: 837 Transaction Set Control Number: 0012

TYPE 1: ACCEPT TYPE 2: ACCEPT TYPE 3: ACCEPT TYPE 4: REJECT

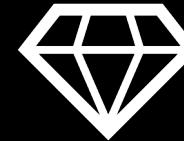
▫ **SEGMENT** At position: 65 NM1 {Individual or Organizational Name} in loop 2420B

TYPE 4: error

Error Code: 848 {Incorrect Data}

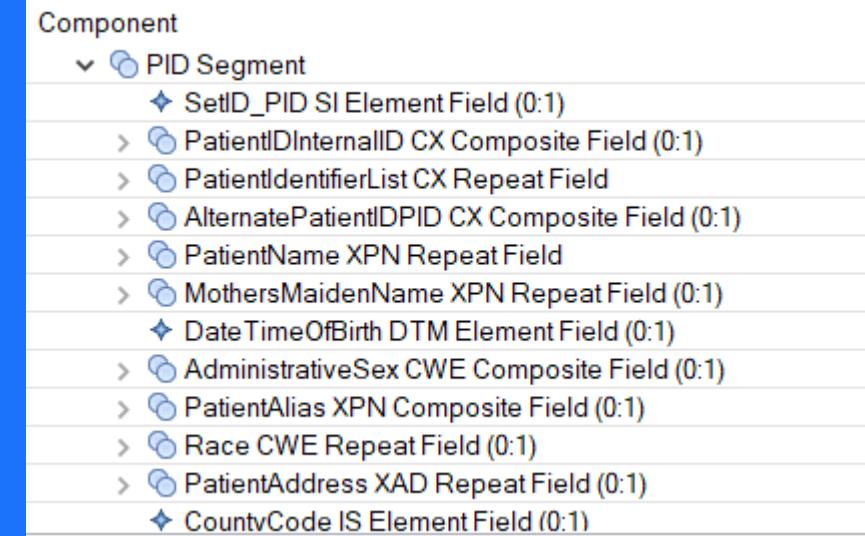
Error Description: 59013 2310D NM1 must be present when 2420B NM1 present

Healthcare Payer HL7



- Decades worth of HL7 2.x standards
- Detailed MetaData definitions using business terminology
- Easy to customize 2.x using ITX Graphical User Interface
- Validation utility for HL7 2.x error reporting
- HL7 XML (FHIR, V2, CCD, CDA) supported through ITX Core Native Schema and Native JSON capabilities

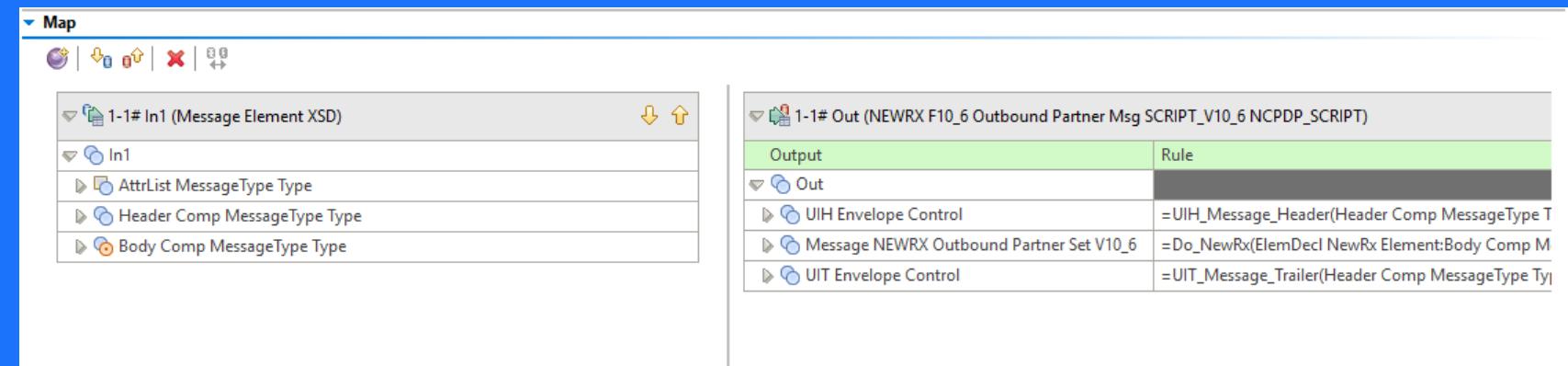
```
<hl7_v2_1.mtt  
<hl7_v2_2.mtt  
<hl7_v2_3.mtt  
<hl7_v2_3_1.mtt  
<hl7_v2_4.mtt  
<hl7_v2_5.mtt  
<hl7_v2_5_1.mtt  
<hl7_v2_5_1_grouptag.mtt  
<hl7_v2_5_grouptag.mtt  
<hl7_v2_6.mtt  
<hl7_v2_6_grouptag.mtt  
<hl7_v2_7.mtt  
<hl7_v2_7_grouptag.mtt  
<hl7_v2_8.mtt  
<hl7_v2_8_1.mtt  
<hl7_v2_8_2.mtt  
<HL7Utility.mtt  
<StatusReport.mtt
```



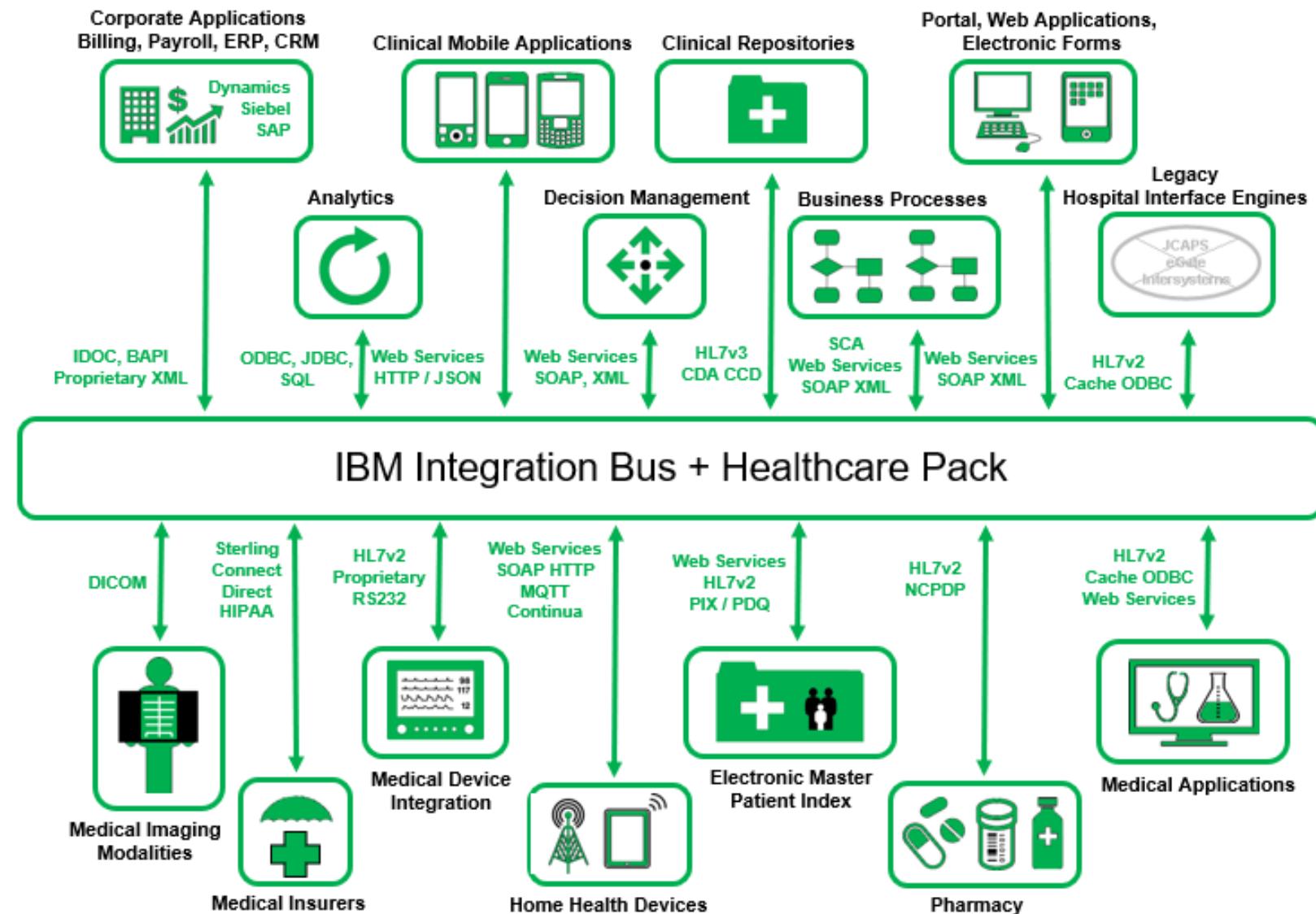
Healthcare Payer NCPDP



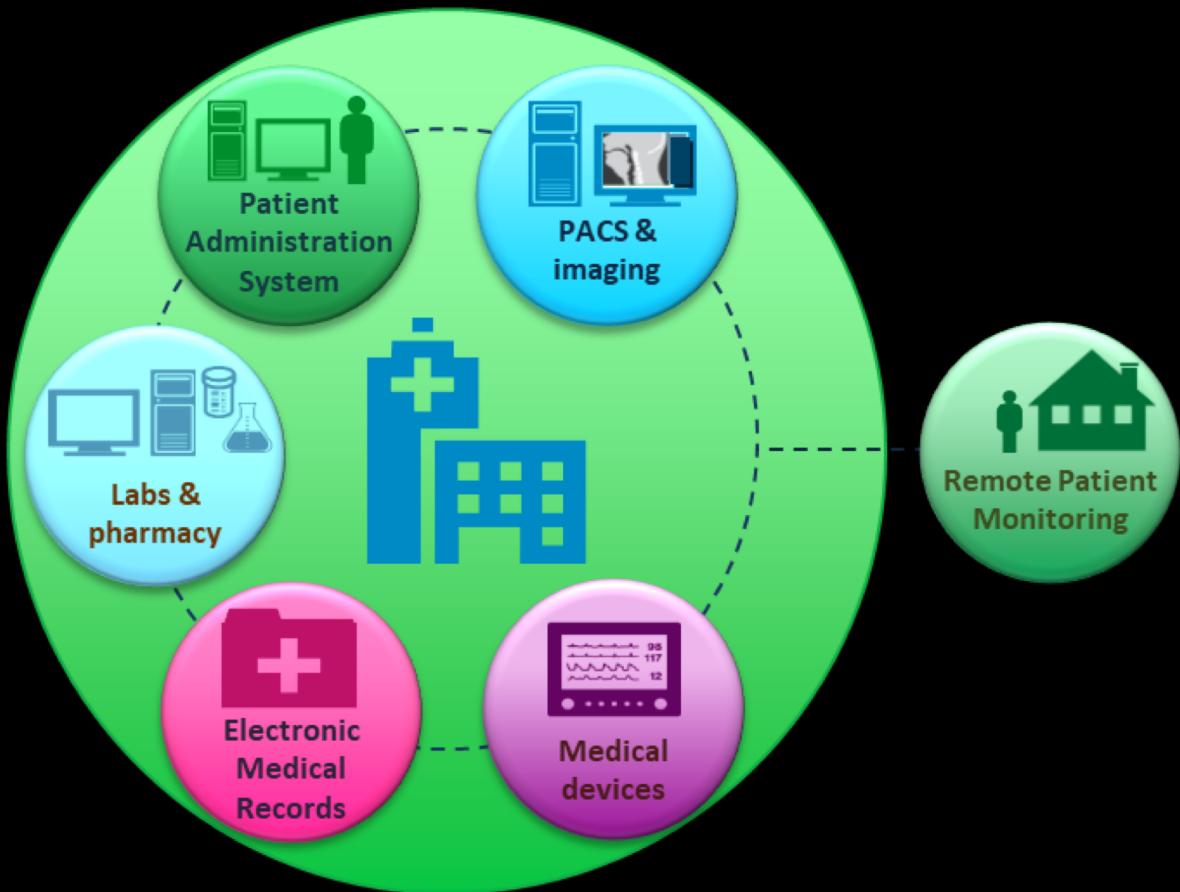
- Prescription Drug Processing is a key concern now
- HEDIS measures leveraging NCPDP D.0 claims data
- Supporting: HIPAA mandated D.0, Batch, Telecom
- NCPDP PACDR now included.
- Pack handles External Code Lists with variants
- **NEW NCPDP D.0 Validation Utility** (created in partnership with a large HC Payer)
- NCPDP Script and Script included with conversion utility



The IBM Integration Bus Healthcare Pack Landscape



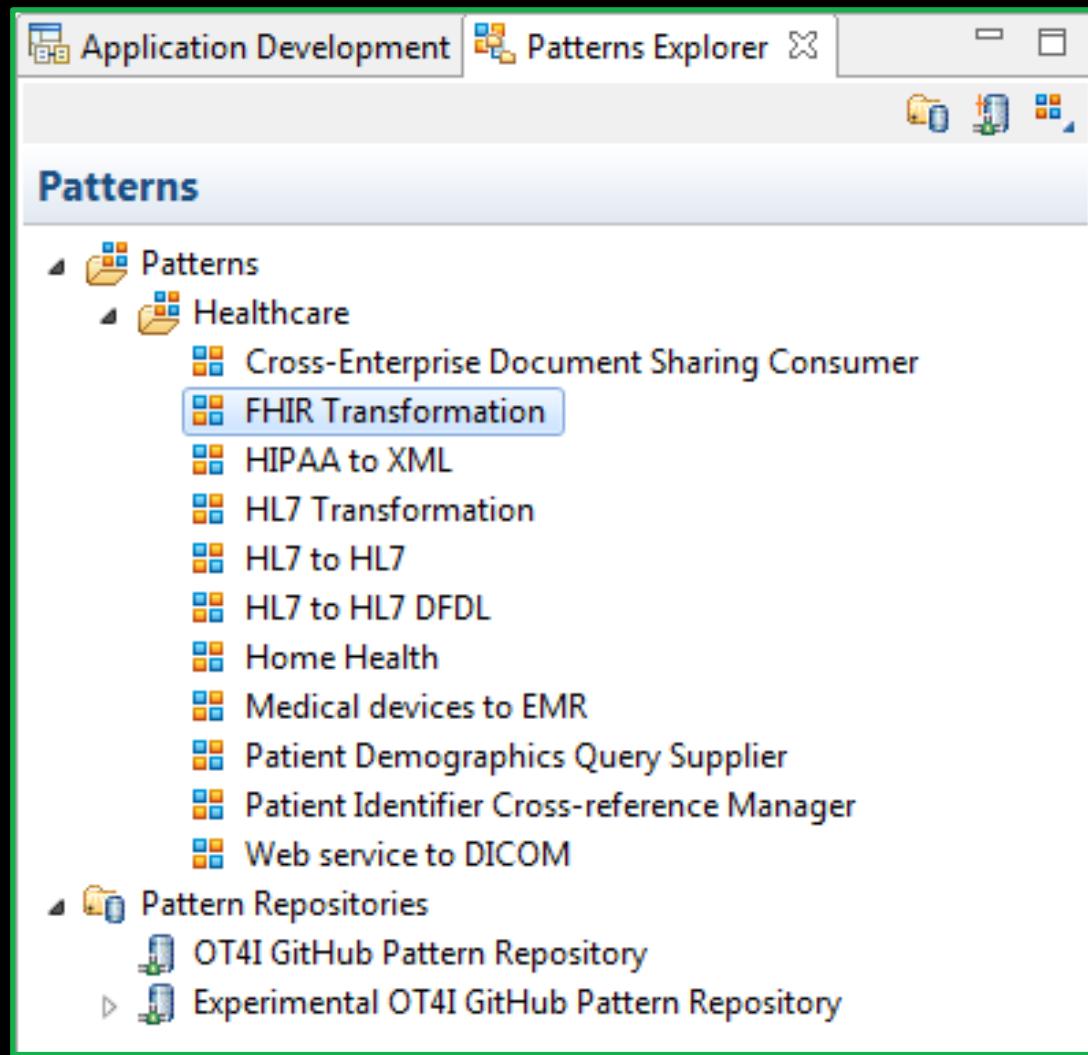
The IIB Healthcare Pack



- ✓ **Healthcare Patterns** installed into the Toolkit ready for developer use.
- ✓ Other patterns also available in Toolkit via **Github repositories**
- ✓ Baked-in **Best Practices** for common integration scenarios
- ✓ **Speed** the creation of integrations by handling the complexity of flow logic and using default values where possible
- ✓ Quickly create **production-ready** integration flows
- ✓ Fully tailorable with **points of variability & editable** after generation
- ✓ **Trusted** integration technology, with over 15 years in the market
- ✓ More than **1000 production installations**
- ✓ More than **600 installations at healthcare sites**

- ✓ **Protocols** – SOAP, HTTP/S, REST, TCP/IP, (S)FTP, SMTP, MQTT, JMS and SOAP/JMS
- ✓ **Industry Formats** – HL7 v2.x, HL7 v3, FHIR, DICOM, Continua, Continuity of Care Documents (CCDs), HIPAA X12, ISO8583, ACORD AL3, EDIFACT, FIX, SWIFT, NACHA ...
- ✓ **Industry Profiles** – IHE profiles (PIX, PDQ, ATNA)
- ✓ **Data Analysis Profiles** – CDA and HL7 v2, integrated with LOINC terminology code system
- ✓ **Data Formats** – XML, XSD, DFDL, JSON, CSV, COBOL ...
- ✓ **Web services** – WS-I, WS-Trust, WS-Security, WS-RM
- ...





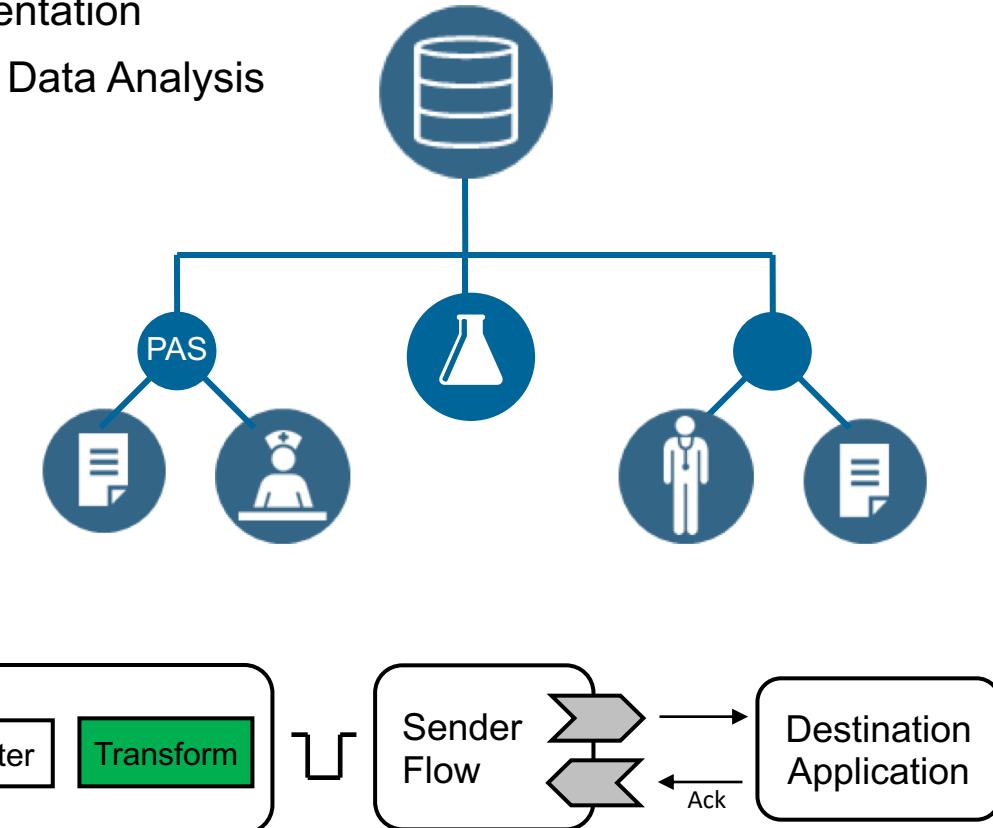
HL7: The Good, The Bad and The Ugly

- ✓ HL7v2 is over 25 years old ... and may well still exist in another 10 years! HL7v3 has not yet gathered widespread adoption.
- ✓ Both forms of HL7 have their problems ...
 - ✓ Not concise enough on the wire
 - ✓ Widespread abuse of the standard form – quirks in implementation between vendors and between 2.x versions. Z Segment structures widely used.
 - ✓ MLLP socket communication less suitable for widespread adoption than SOA or RESTful communications over HTTP
 - ✓ Increasing pressure to broaden scope of sharing across organization, disciplines and borders
 - ✓ Harder to get up and running quickly – pressure to integrate these days is measure in days or weeks not in months or years.

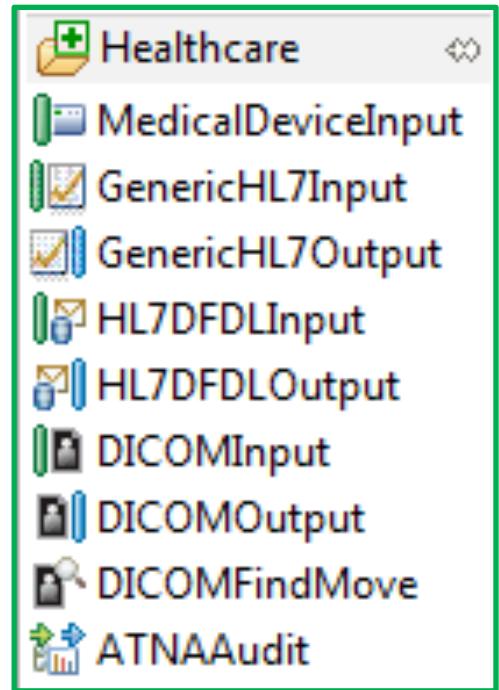
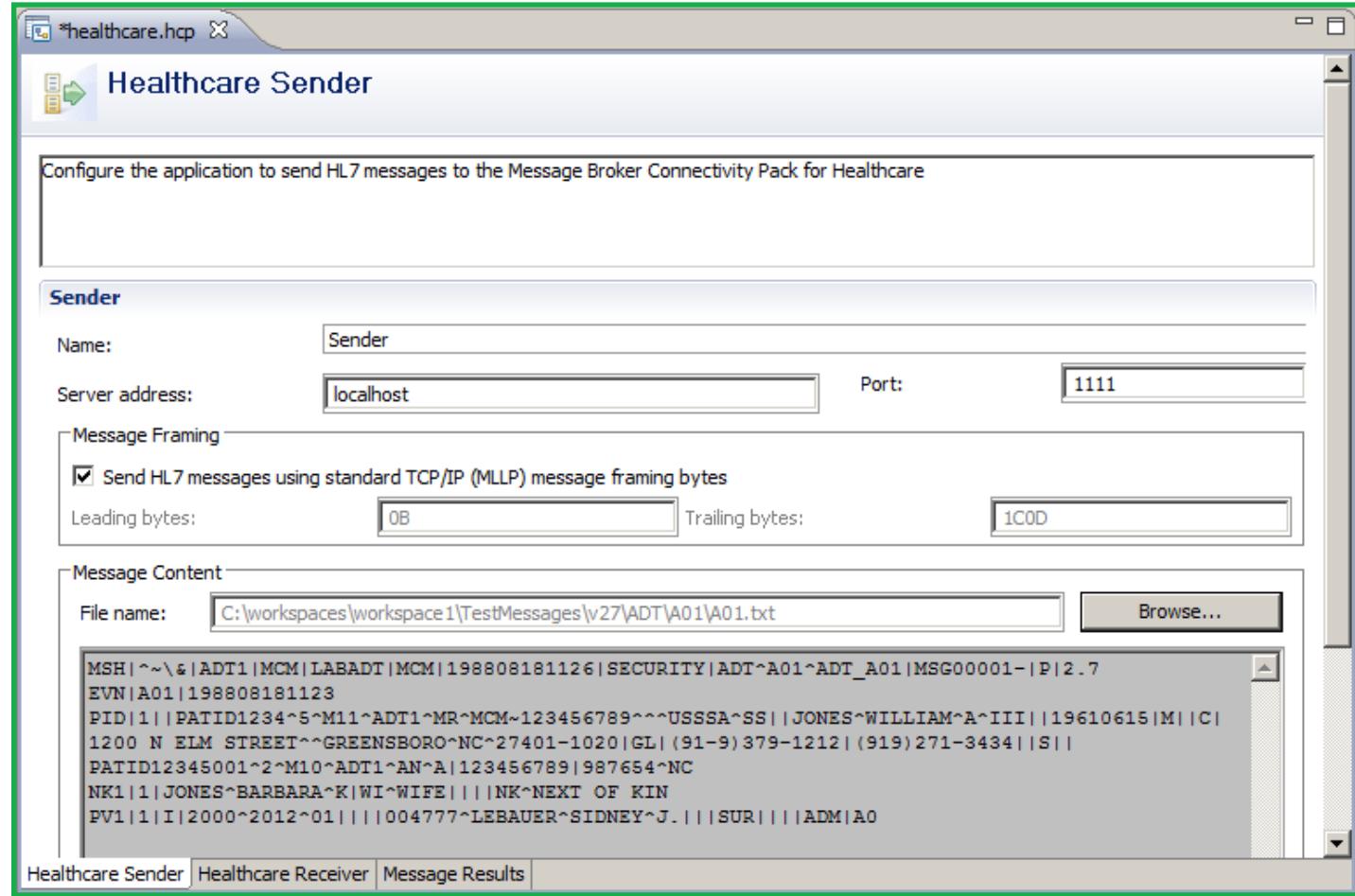
HL7 to HL7 DFDL Pattern: Clinical Application Integration



- ✓ Integrate EMR and clinical applications such as PAS, Pharmacy, Labs
- ✓ HL7 v2.x predominant standard but wide variations in application implementation
- ✓ Pack provides connectors, schemas (HL7, DICOM, ATNA, Data Devices, Data Analysis profiles for CDA and CCD) and development patterns for easy integration
- ✓ Uses many features of IIB including Graphical Mapping tools
- ✓ HL7 to HL7 DFDL Pattern
 - ✓ MLLP over TCP/IP, Message Validation and Parsing
 - ✓ Transformation to canonical XML format
 - ✓ Duplicate checking and Sequencing
 - ✓ Message & Segment Filtering
 - ✓ Transformation to canonical XML format
 - ✓ Journaling
 - ✓ Exception Handling
 - ✓ Message Distribution



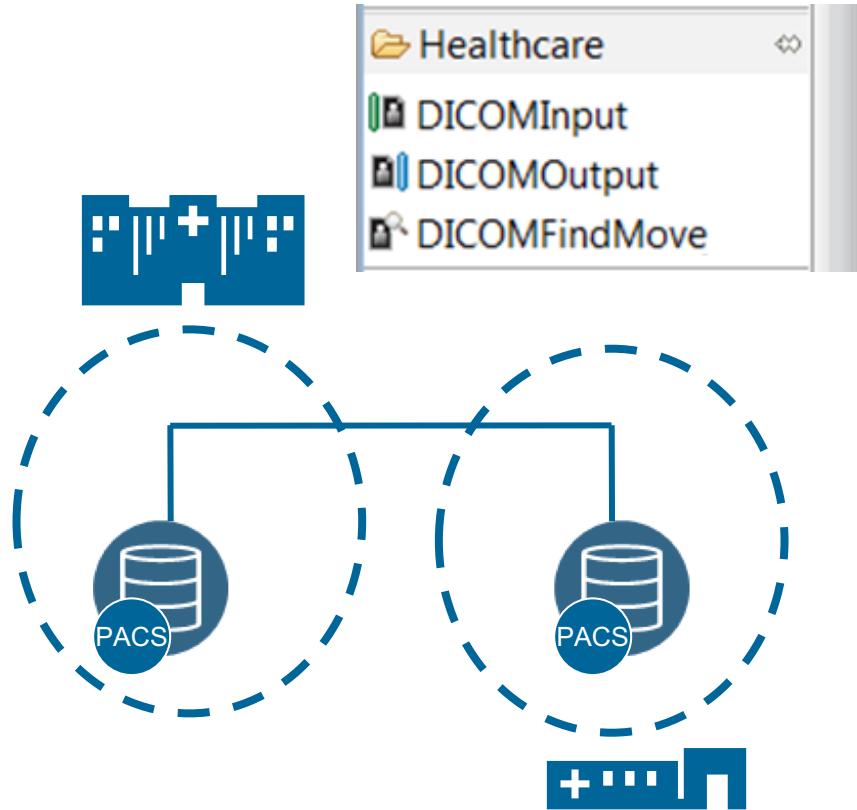
Built-in Message Flow Nodes and Testing Utilities



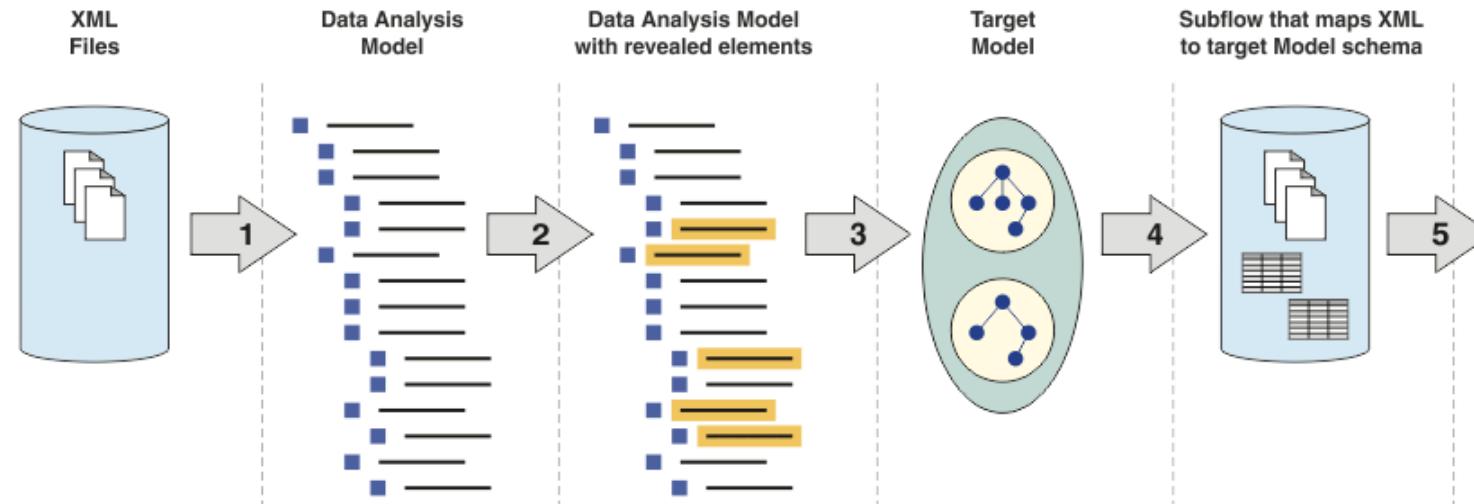
DICOM Message Flow Nodes and Testing Utility



- ✓ Provides flow of image and supporting data between medical image archives and modalities
- ✓ Both inside and between care establishments
- ✓ Support for common DICOM commands including MOVE, FIND and STORE
- ✓ Images are routed as XML messages and stored on the file system
- ✓ DICOM nodes:
 - ✓ IBM Integration Bus can act as both a client (SCU) and server (SCP)
 - ✓ Metadata for DICOM images is propagated through IBM Integration Bus as XML messages
 - ✓ Message does *not* contain the pixel data (this is stored on the file system!)
 - ✓ Shared file system locations (NFS) supported
- ✓ DICOM Pattern provided for Web Services
- ✓ DICOM Test Application



Data Analysis Tools



- ✓ Recursive nature of CDAs makes working from the schema very difficult
 - ✓ Component, section, entry and entryRelationship to mention just a few
 - ✓ Great flexibility in representing and modelling rich clinical statements
- ✓ IIB Data Analysis helps you to rapidly understand the structure of clinical documents. Analyze a set of sample documents according to their data content
- ✓ The Healthcare Connectivity Pack provides four built-in Data Analysis Profiles for HL7v2, HL7 CDA, HL7v2 (ORU), and DICOM.
- ✓ It is pre-configured with CDA, C-CDA, CCD, HITSP (C32 and C83) template IDs and set up for use with a LOINC glossary of terms to make clinical codes more readily understandable.

Basingstoke & North Hampshire NHS Foundation Trust is a 450 bed hospital facility serving 300,000 patients in North- and mid-Hampshire/West Berkshire, England.

As part of a multi phased strategy for reducing clinical risk, increasing operational efficiency and improving the patient experience, the hospital implemented IBM's integration for healthcare.



"The solution gives our clinical users the information they need on a single screen. Everything is presented via a simple, intuitive web interface, and the information is instantly available, accurate and up-to-date."

Basingstoke & North Hants NHS Foundation Trust - Client Success Story



▪ The challenge

- The Trust's initial project was a single-page patient care record summary for clinicians available without logins to multiple systems. This enabled the hospital to:
- Create portlets for patient data such as demographics, medications, co-morbidities, images and previous stays
- Create and populate electronic discharge summaries and clinical correspondence forms which can be routed to primary care physicians.

▪ Integration in Action

- Future phases will introduce healthcare analytics capabilities, enable clinical document sharing, and establish clinical pathway management, all building on the same IBM healthcare integration infrastructure.

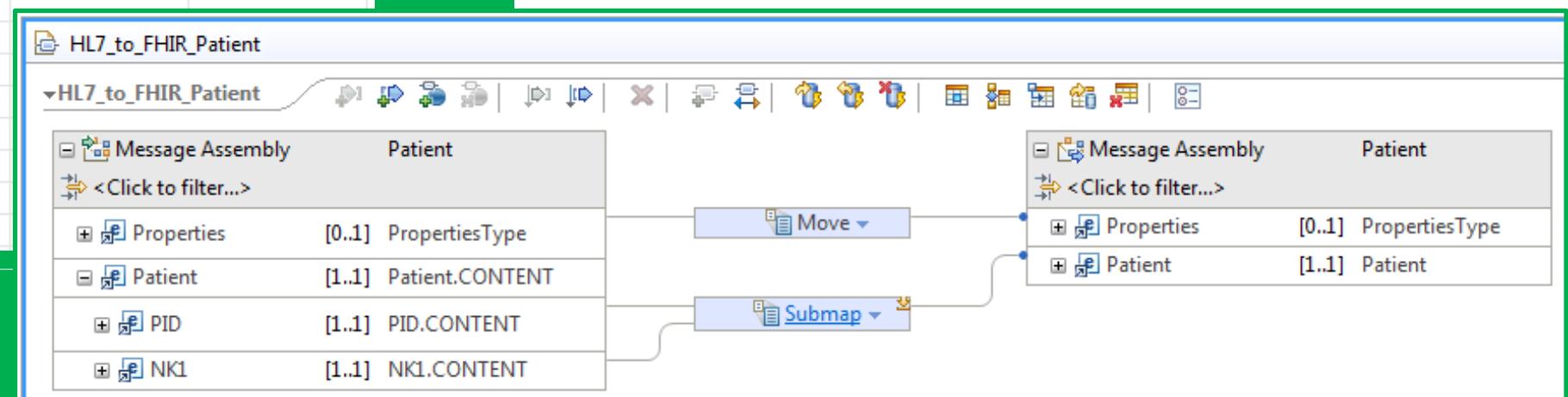
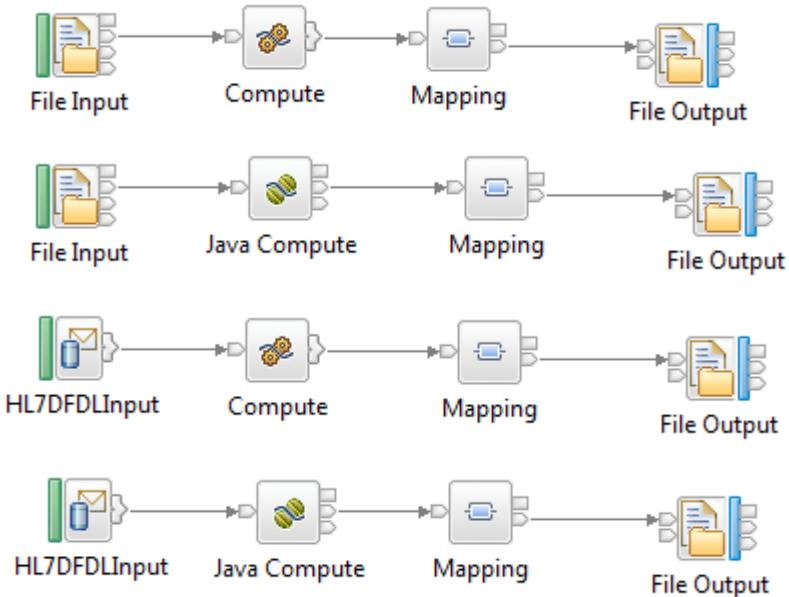
▪ Business Outcomes

- ✓ Provides the insight physicians need to make rapid diagnoses based on access to up-to-the-minute information
- ✓ Improves visibility of vital clinical information such as a patient's allergies and medical history
- ✓ Eliminates administrative delays and enhances operational efficiency as all information is available instantly and test results are published in real time

Mapping HL7 to FHIR

Tree View XML View

Name	Type	Value
HL7		
▷ MSH		
▷ anyHL7Segment		
PID		
PID.3.PatientIdentifierList		
CX.1	xs:string	555444222111
▷ CX.4		
CX.5	xs:string	MR
▷ PID.5.PatientName		
XPN.1		
FN.1	xs:string	smith
XPN.2	xs:string	john
PID.7.DateTimeOfBirth	xs:string	19600614
▷ PID.8.AdministrativeSex		
▷ PID.10.Race		
▷ PID.11.PatientAddress		
▷ PID.13.PhoneNumberHome		
▷ PID.14.PhoneNumberBusiness		
PID.19.SSNNumberPatient	xs:string	343132266
▷ PID.22.EthnicGroup		
▷ anyHL7Segment		
▷ PD1		
▷ anyHL7Segment		
▷ NTE		
▷ anyHL7Segment		
▷ NK1		
▷ anyHL7Segment		
▷ anyHL7Segment		
▷ anyHL7Segment		



Thank You

