

A15: Best Practices for using ITX Maps in App Connect

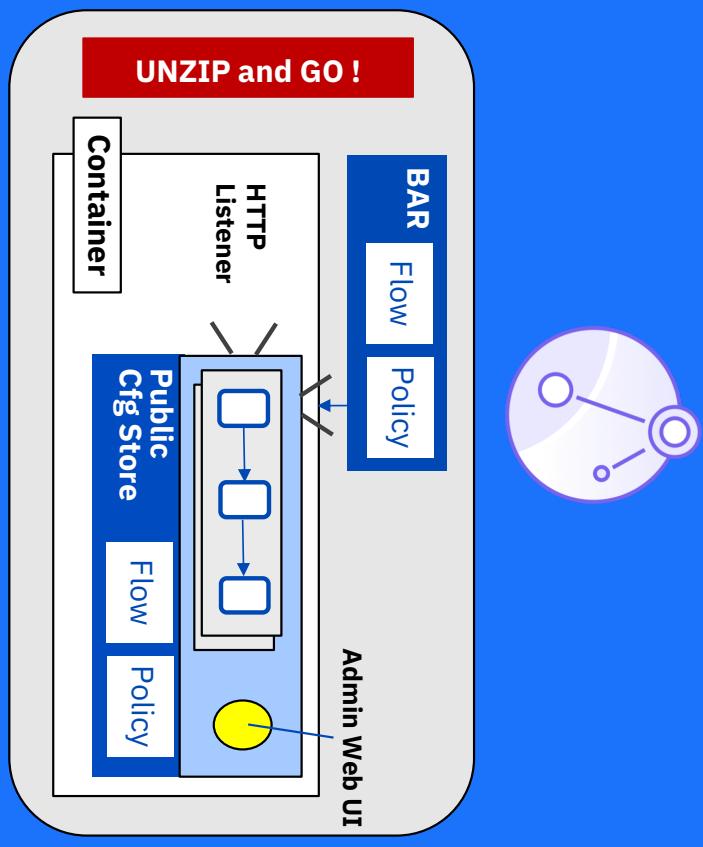
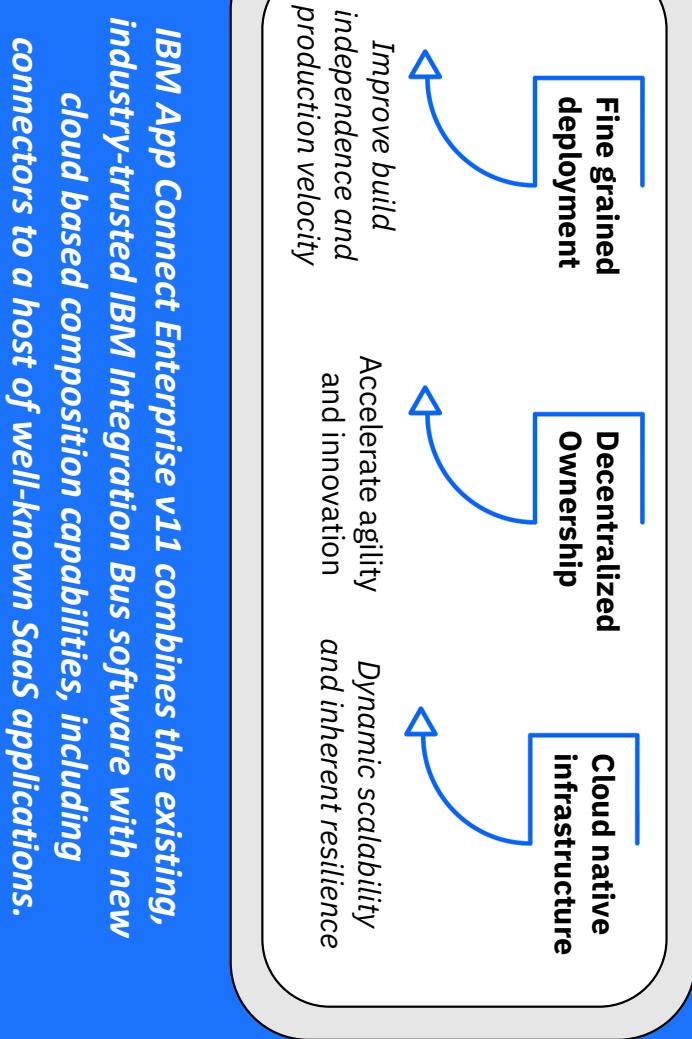
Paul Stanley
David Coles



IBM Cloud



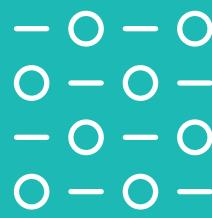
Introduction: What is App Connect Enterprise?



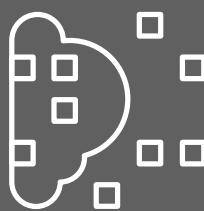
Introduction: What is Transformation Extender?



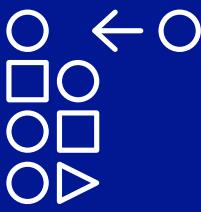
Any data...



Any where...



Any way...

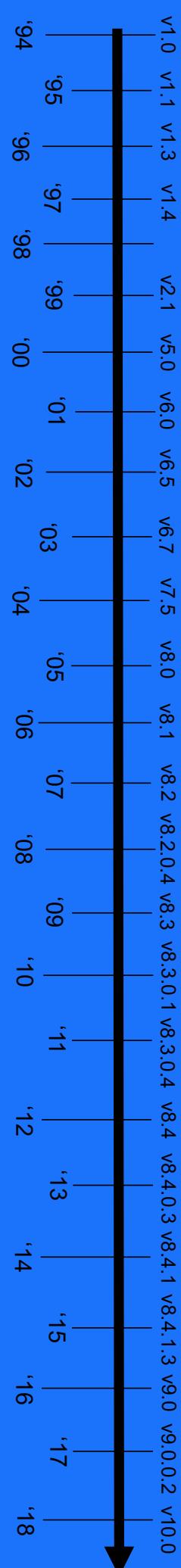


**Industry standards,
structured or unstructured
data and custom formats**

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

**Robust User
Experience and
RESTful APIs**

A Little Bit of History Repeating ...



ISI^{soft}



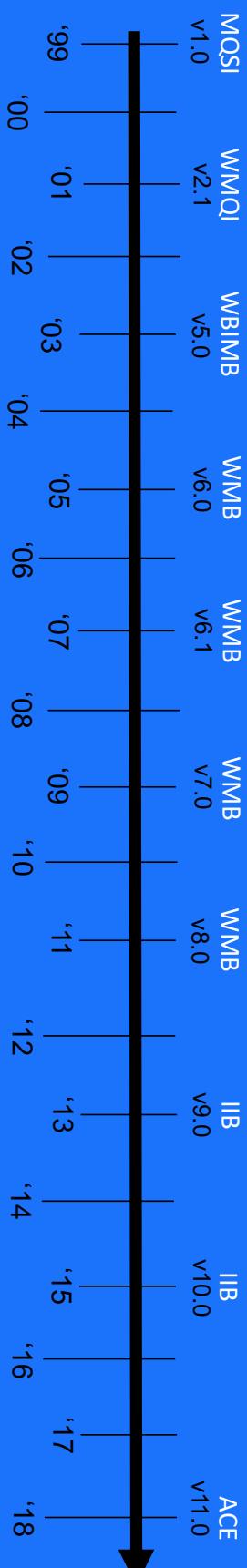
mercator.

AscentialSM DataStage TX

IBM WebSphere Transformation Extender

IBM Transformation Extender

PRODUCTS
by HCL Technologies



ACE and ITX - Integration Solution Features



- “ITX Map” node provided in Flow palette
- Integrated Tooling capabilities (Type Tree & Map creation, build, deploy, debug)
- ITX Message Flow Node uses the C DTXPI to call ITX engine
- Integrates the ACE Toolkit with the ITX Design Studio
- Map & card settings can be changed
- Maps can be automatically compiled when the message flow is compiled
- Maps can be deployed in Broker Archive (BAR) file to your target integration node or standalone integration server
- Multiple output cards can propagate data into the message flow
- Multiple input cards can receive data (via the Collector Message Flow Node)
- ITX Map caching enabled in the ACE runtime
- ITX Map server location can be specified dynamically at runtime
- ITX Map can use the ACE message tree instead of a bit-stream
- Integrated error handling



Collector ITX Map

master

Rule:

Enter the rule for this output.

Map

1-1# USData (UnitedStates Input Data)

Output Rule

USData

Region (S)

1-1# Stats (Stats Output Data)

Output Rule

Stats

Region (S)

StatePop (S) = MapState(Sta

WebSphere MQ

MQTT

Kafka

IMS

HTTP

REST

Web Services

Websphere Adapters

.NET

Transformation

Cloud Connectors

Construction

Callable Flow

LoopBack Connectors

Database

File

CICS

IMS

Email

TCP/IP

CORBA

File

Security

Timer

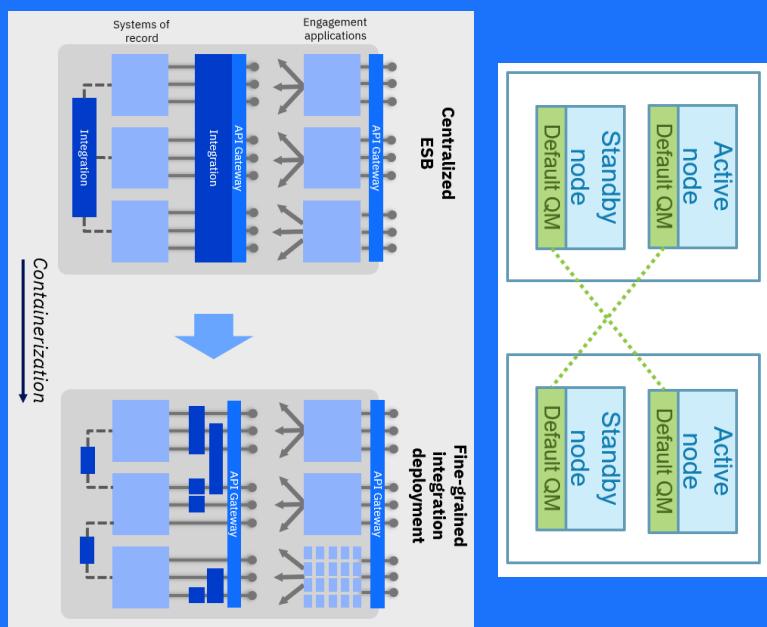
WebSphere TX

WITX Map

What does ACE add for an ITX user?

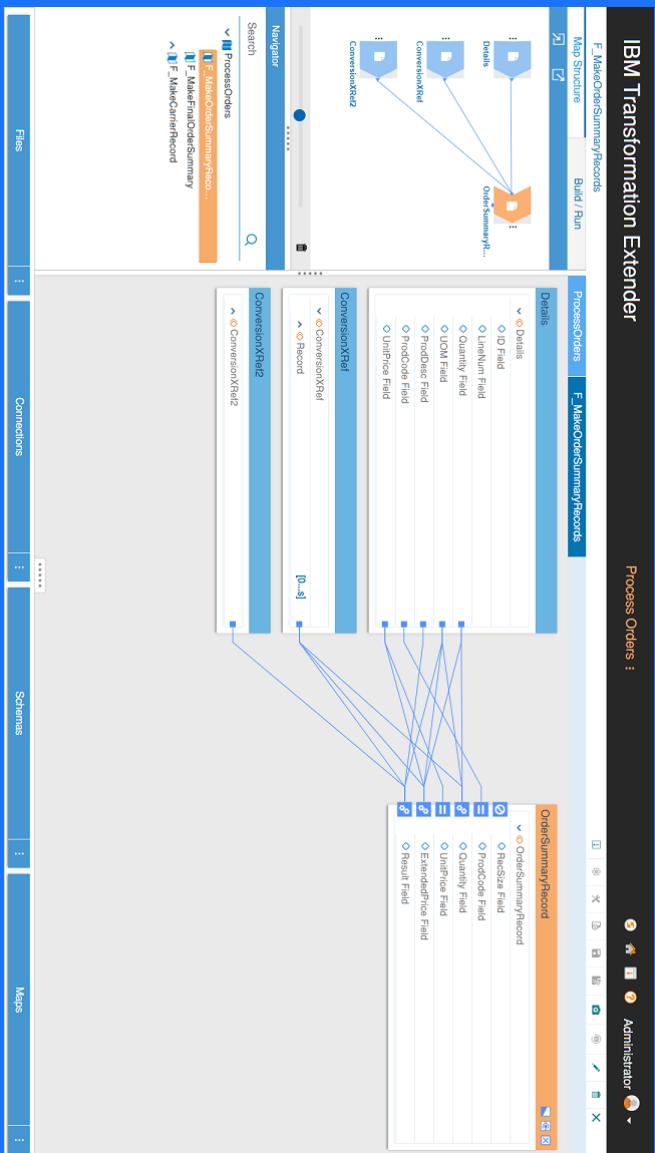


- A robust and scalable architecture for running maps
- High-availability and failover
- Message routing, including publish/subscribe
- Event-driven processing, such as aggregation and fan-in/fan-out
- Web Services stack including WS-Addressing and WS-Security
- Implementation of a complete application integration solution
- Integrated runtime security model
- Built-in accounting, statistics, and monitoring
- Ancillary capabilities such as Record & Replay and Global Cache



What does ITX add for an ACE user?

- Complex any-to-any, many-to-many mapping
- Blazing fast transformation
- Out-of-the-box support for industry standards
 - Healthcare, Financial Payments, EDI for Supply Chain
- Validation
- Transformation/Conversion
- Reliable updates -> no hand-coding
- Timely compliance with regulations
- Define data with ITX type trees, XML Schema or JSON templates
 - Nested, semi-structured and hierarchical data
- Many adapters to connect to data sources
- Transactional control across inputs and outputs of a map



10.0 Web-UI

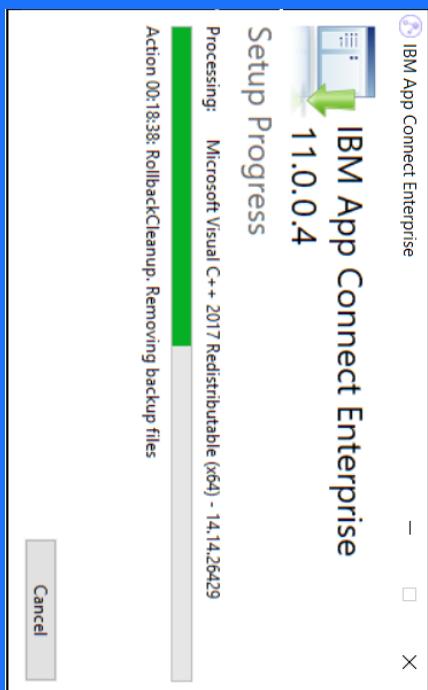
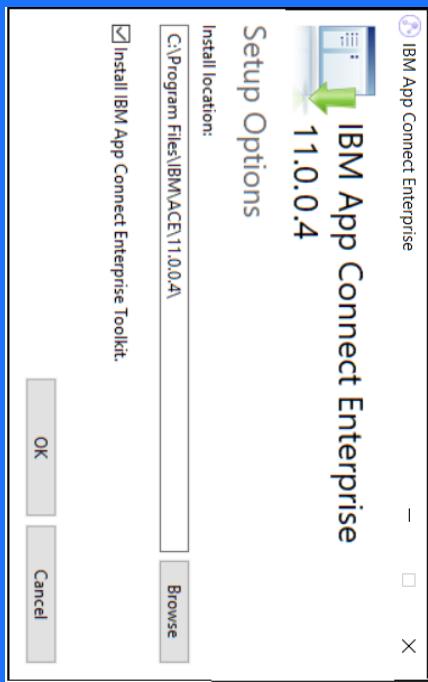
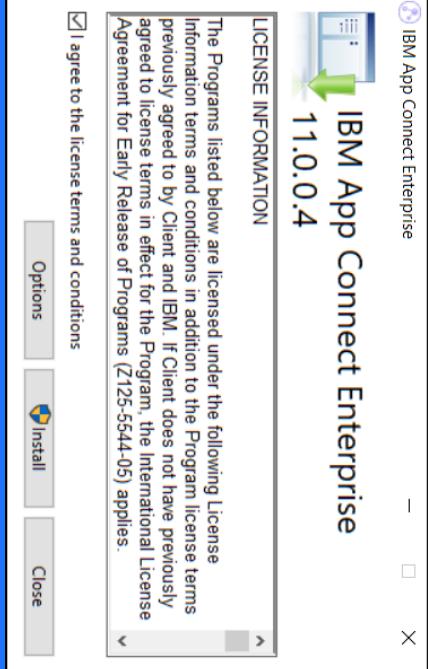
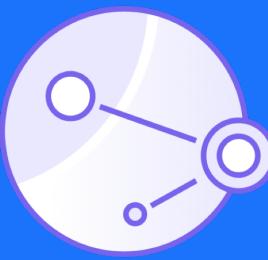
ITX - IBM's Strategic solution for comprehensive data transformation

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

Installing ACE (Toolkit and Runtime)



- **Radically Simple Packaging and Installation**
 - Full function, simple, single package install
 - Developer Operating Systems contain Toolkit and Server
 - Total size approx. 1.3 GB
 - Server Operating Systems contain only server
 - Full entitlement to MQ remains (but no longer packaged)
 - Built-in Unit Test Environment
 - Test and deploy to manually created local and remote servers



Installing ITX v10.0.0.0 Design Studio



IBM Transformation Extender Design Studio 10.0.0.0(51)

IBM Transformation Extender Design Studio Setup



Installation completed successfully

The InstallShield Wizard has finished installing IBM Transformation Extender Design Studio on your computer.

View readme file

Installation has completed successfully

< Back

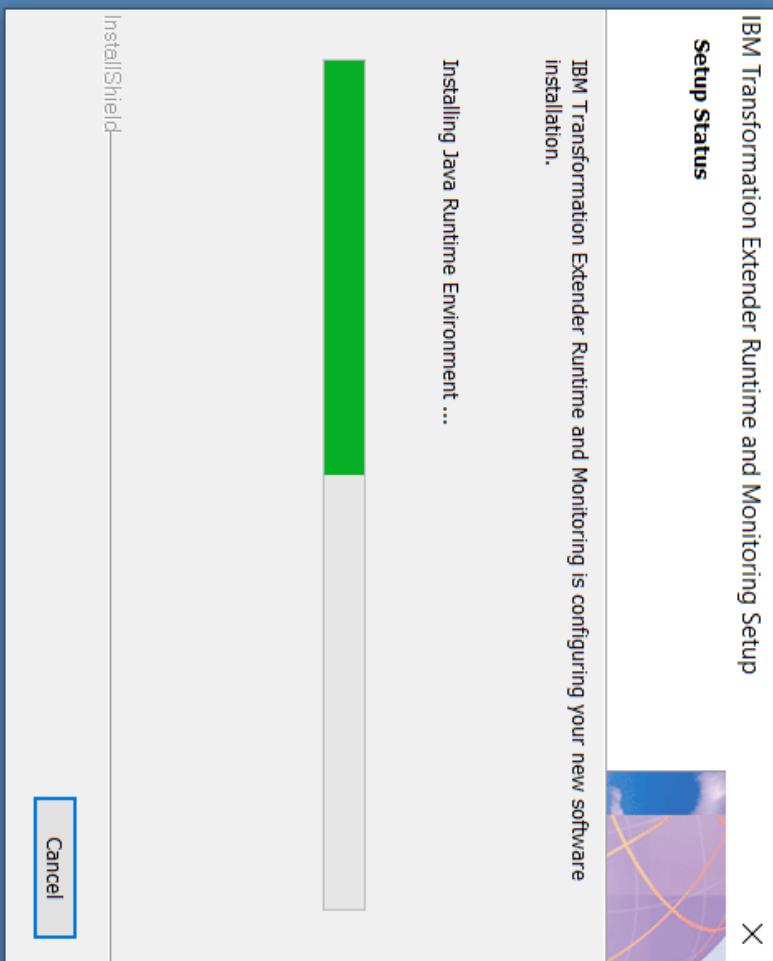
Finish

Cancel

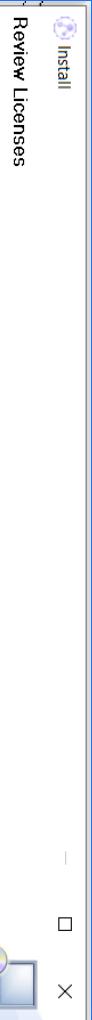
Installing ITX v10.0.0.0 Runtime



IBM Transformation Extender Runtime and Monitoring 10.0.0.0(51)

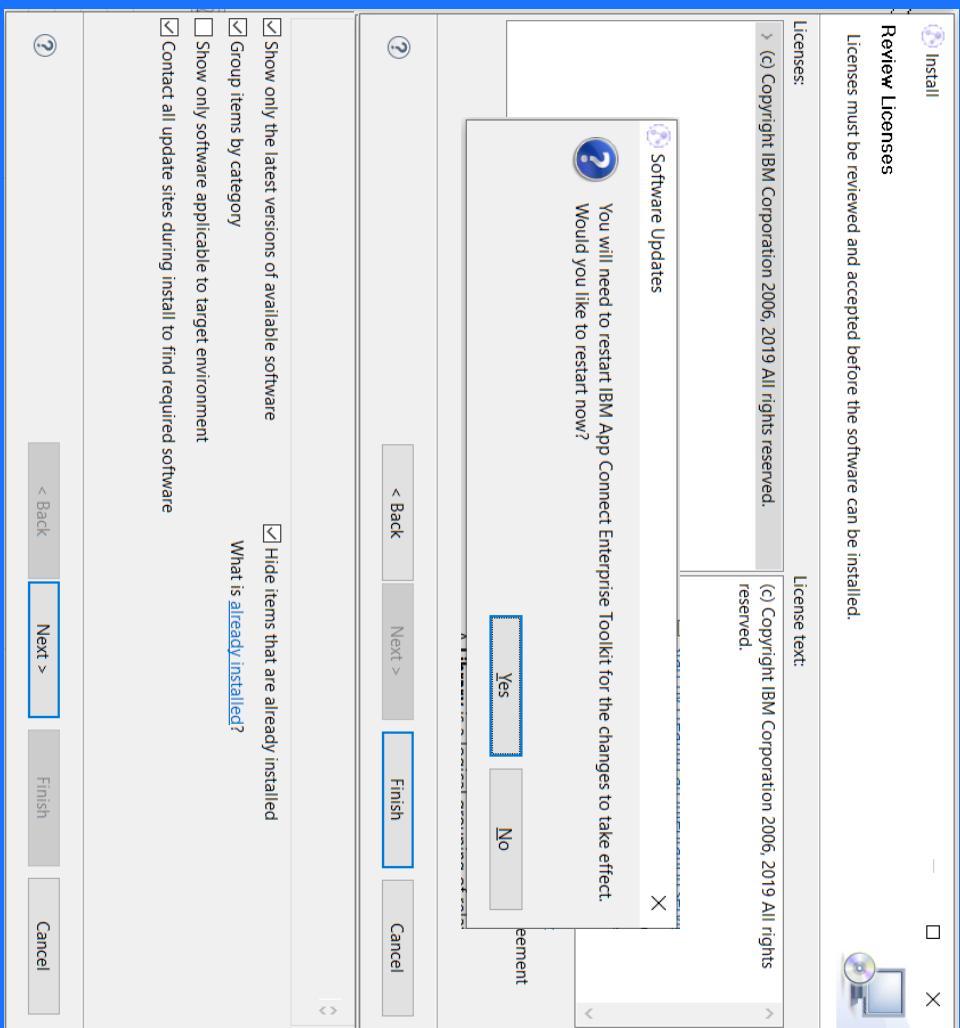


Installing the TX Perspective in ACE Toolkit



Follow these steps to integrate the IBM Transformation Extender perspective with the IBM ACE Toolkit:

- Open IBM App Connect Enterprise, V11.0.0.4.
- Click **Help > Install New Software** Click **Add**. Click **Local**.
- Browse to *<install_dir>\Design Studio\wtx_repo* Click **OK**.
- Select **Group items by category**.
- Select **ITX for IBM App Connect Enterprise** from the list of categories. Click **Next**.
- Accept the new license, then click **Finish**.

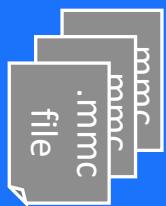


Executing an ITX Map

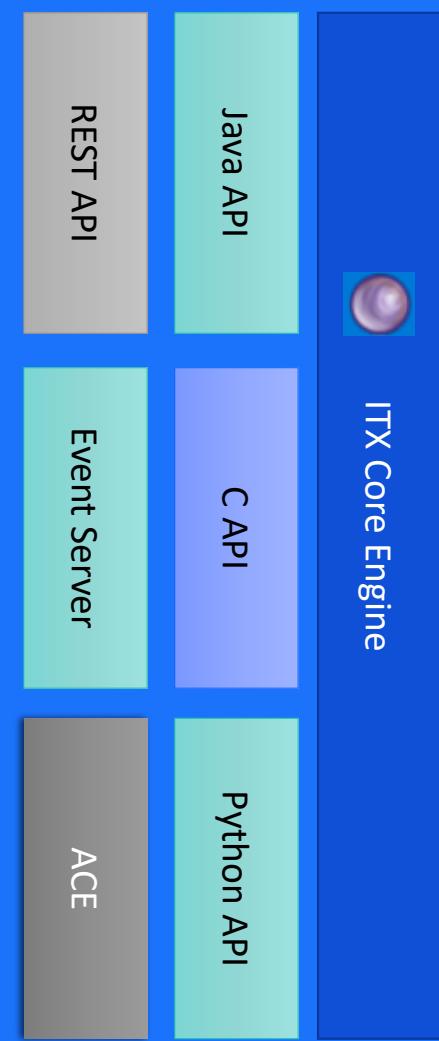


Multiple ways to invoke maps:

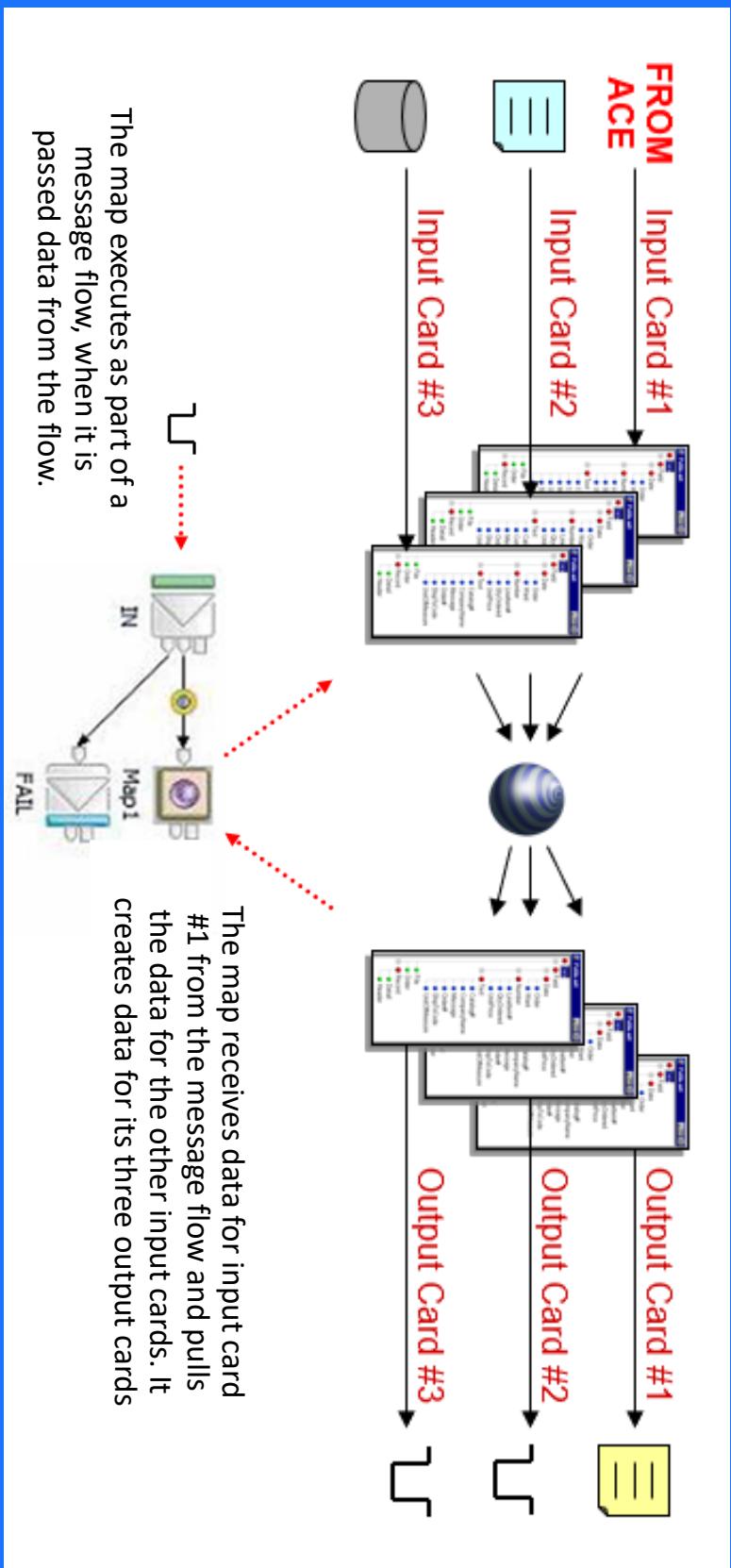
- REST API
- C, Java, Python APIs
- Event Server
- Command line
- From a map!
- ACE



ITX Core Engine



Executing an ITX Map in an ACE Integration Server

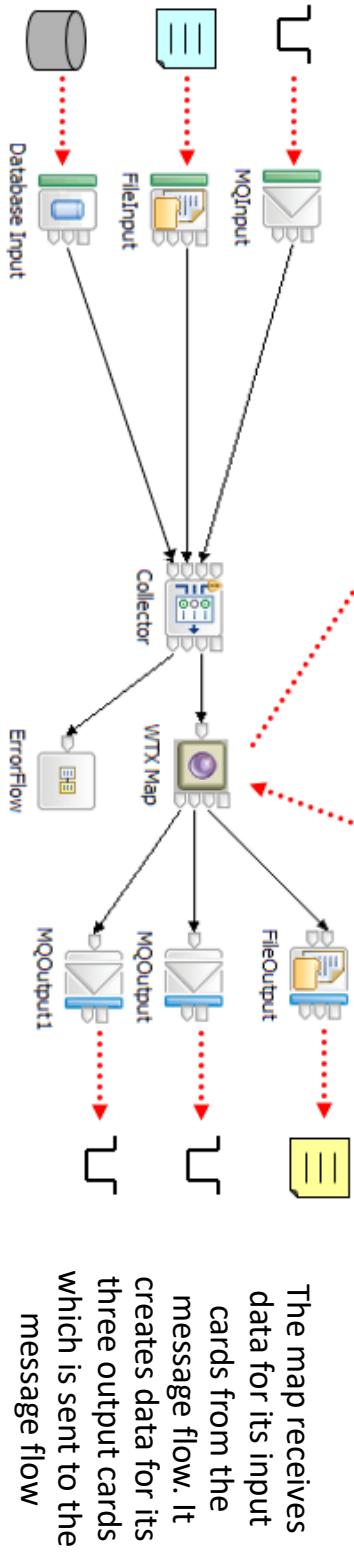
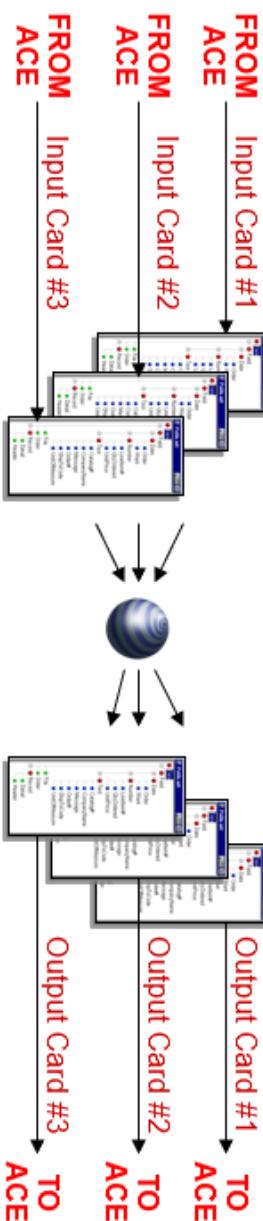


The map executes as part of a message flow, when it is passed data from the flow.

Fully Integrating an ITX Map into an ACE Flow



The map executes as part of a message flow, when it is passed data from the flow. A special "Collector" node gathers multiple inputs

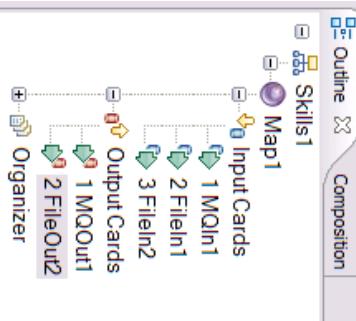
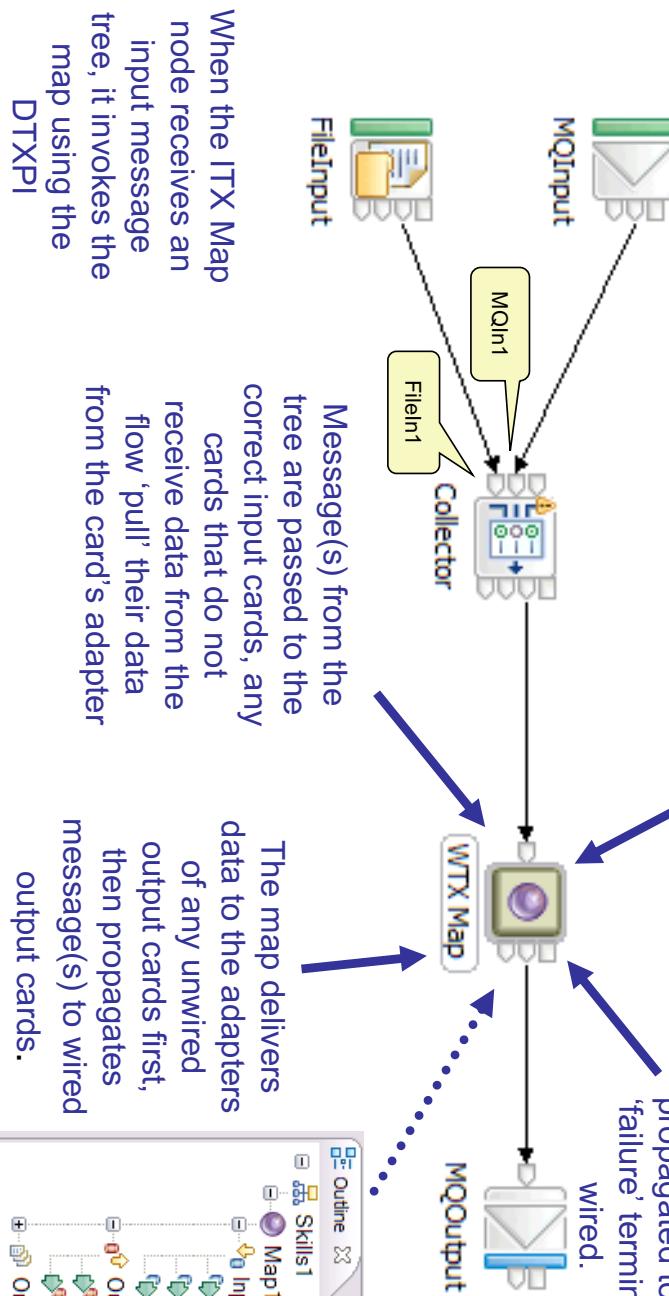


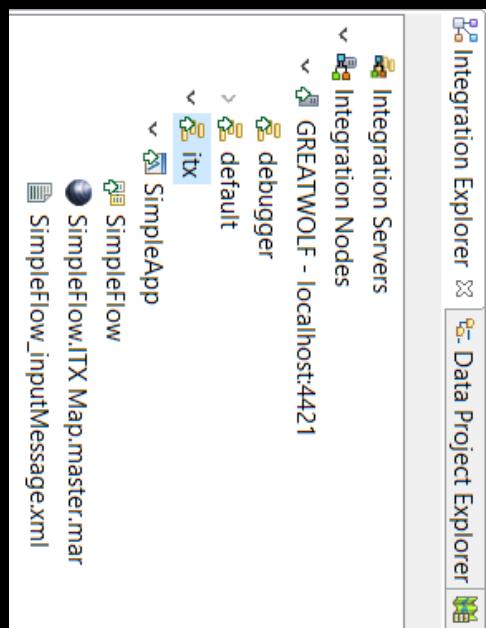
Flow Authoring

The map executes and transforms the data from input to output

If a failure occurs in the map, a broker exception is raised.

The input message is propagated to the 'failure' terminal if wired.





TO DO: Chart showing
deploy process or
combine in a demo and
remove this one.

Thank You



Integration Technical Conference 2019

Building Healthcare Integration Solutions with App Connect and IBM Transformation Extender

Ben Thompson

App Connect Enterprise Chief Architect

Steph Fetter

IBM Transformation Extender Product Manager

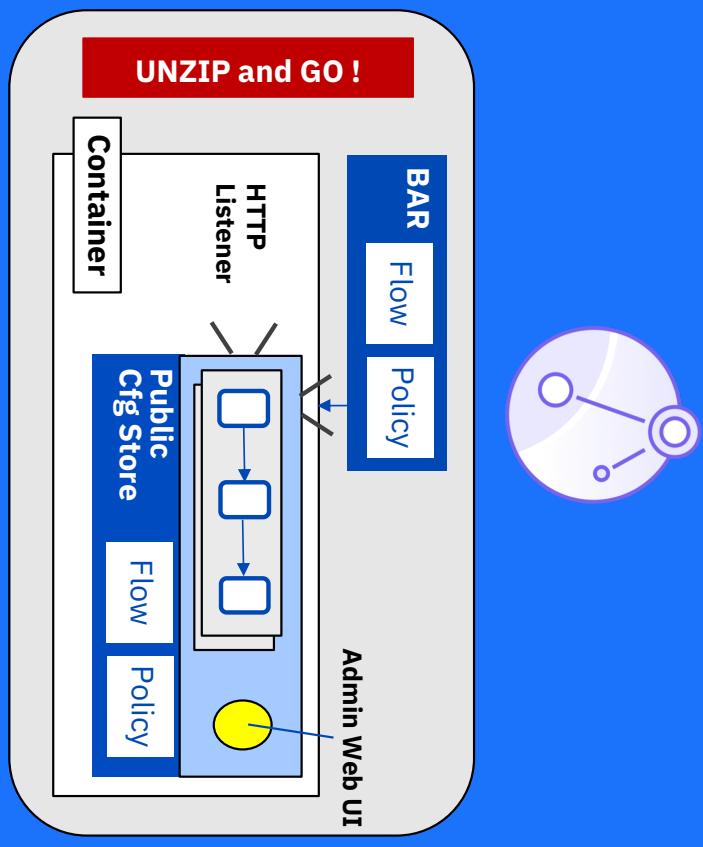
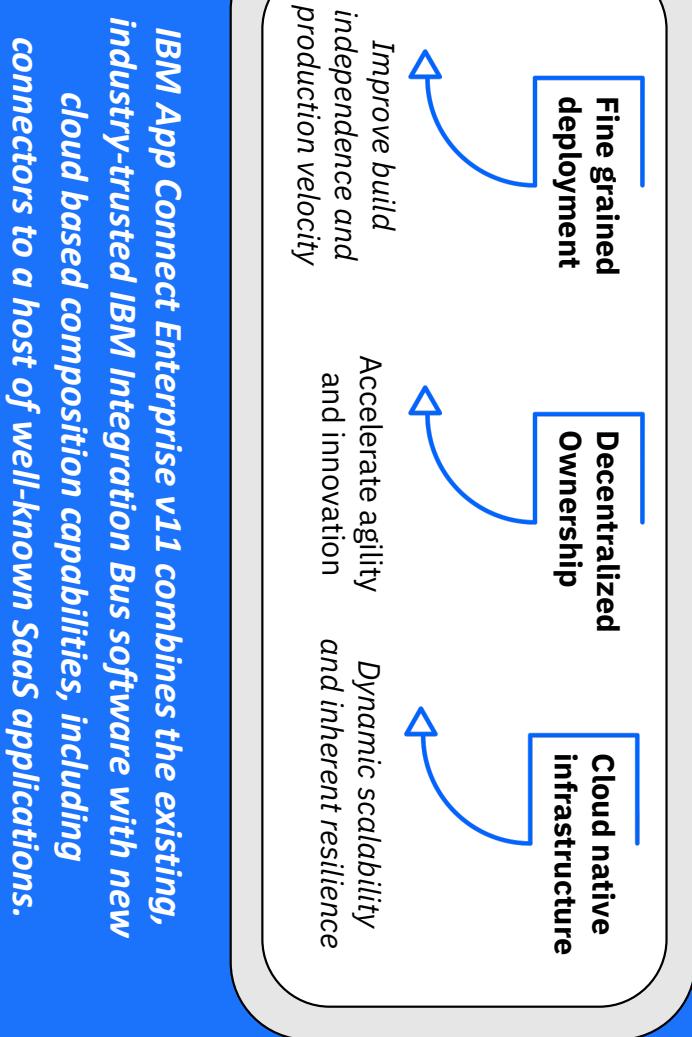
IBM Cloud





- Three trends driving
change in HealthCare**
- 1. JUST ANOTHER MANIC MANDATE**
 - 2. PAYER PROVIDER FOCUS**
 - 3. SHIFT & COEXIST**

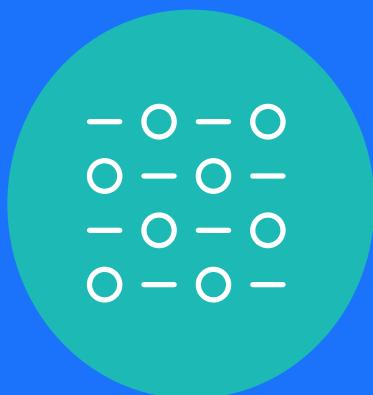
Introduction: What is App Connect Enterprise?



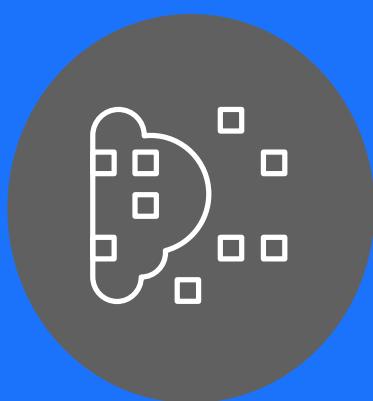
Introduction: What is Transformation Extender?



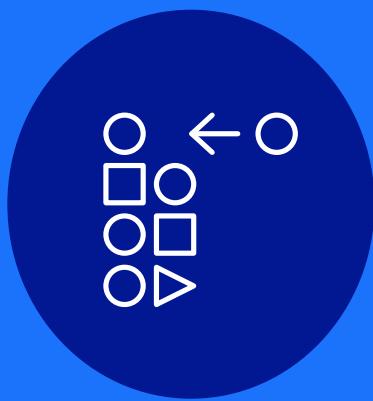
Any data...



Any where...



Any way...

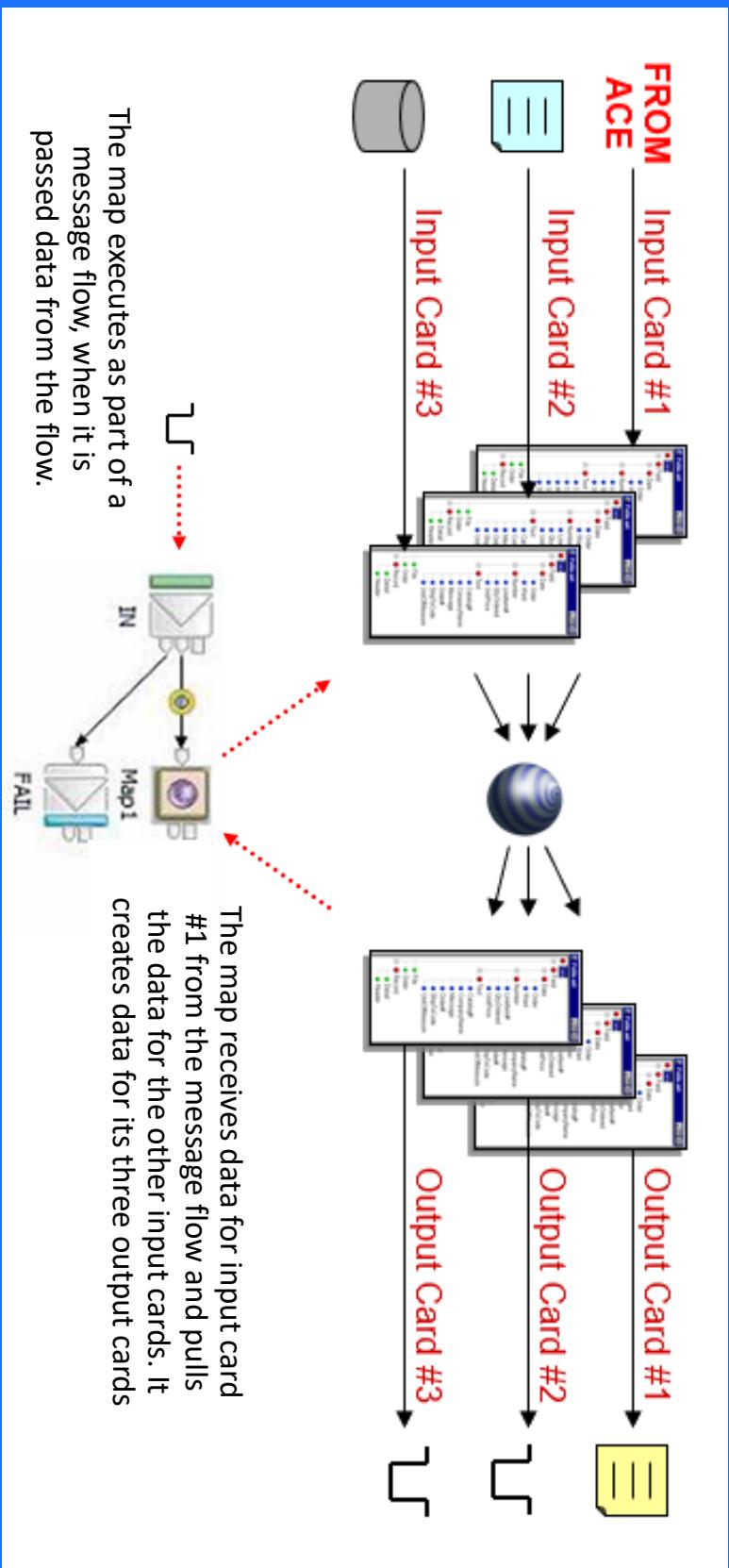


**Industry standards,
structured or unstructured
data and custom formats**

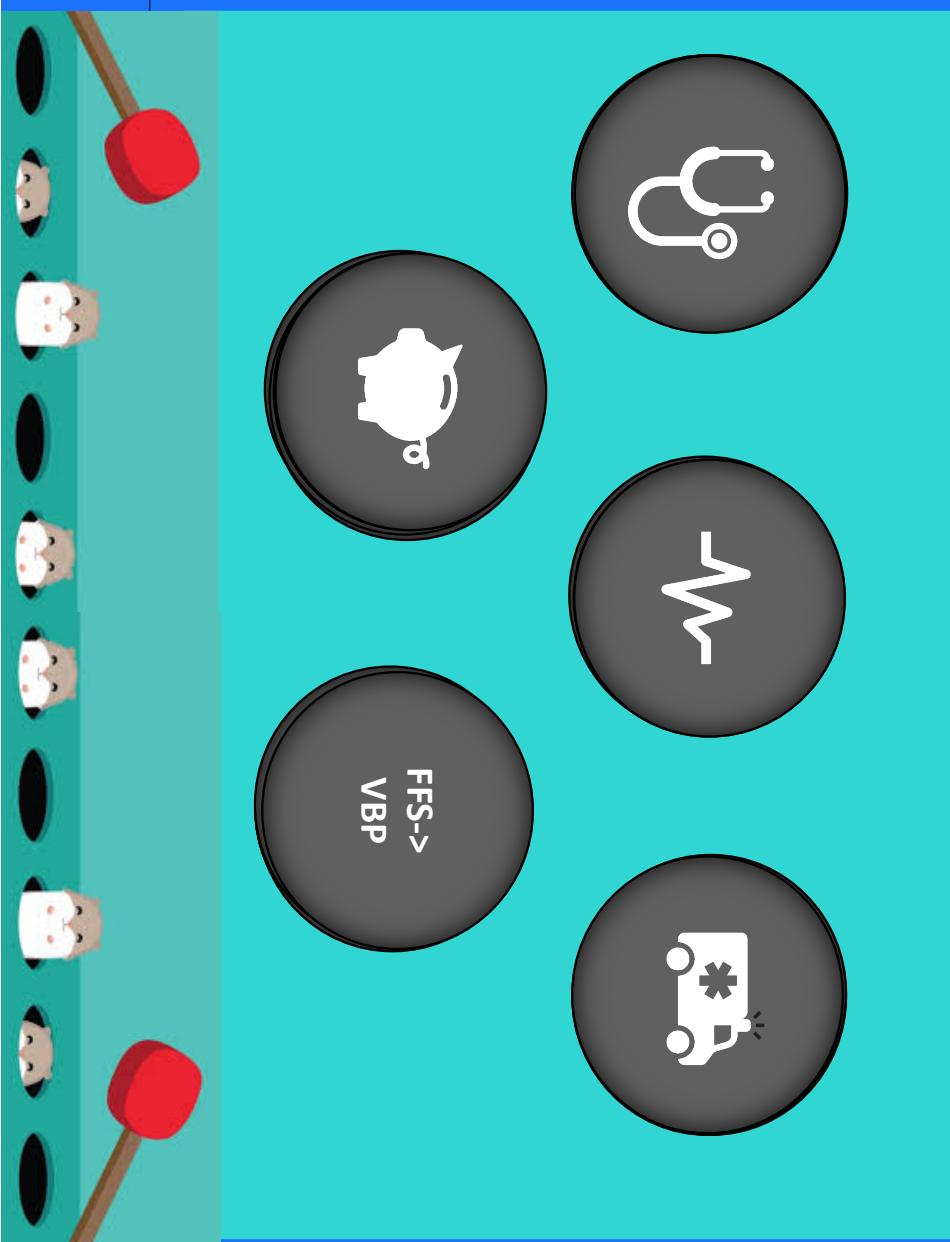
**On premises and hybrid,
private or public cloud**

**Robust User
Experience and
RESTful APIs**

Executing an ITX Map in an ACE Integration Server



Manic Mandate: Whack-a-mole



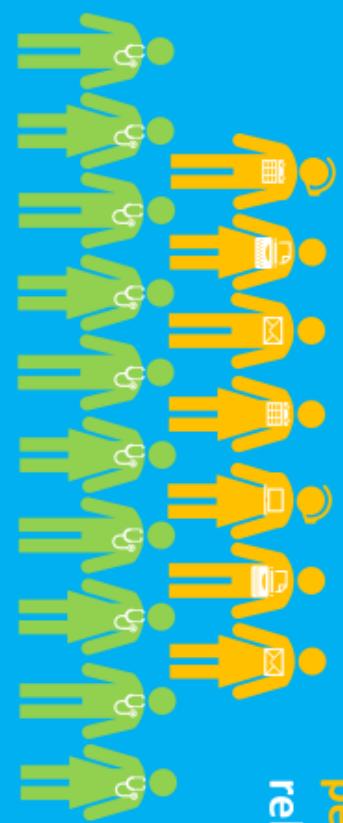
Payer / Provider Profitability Focus



Market Focus US Healthcare Payment Infrastructure



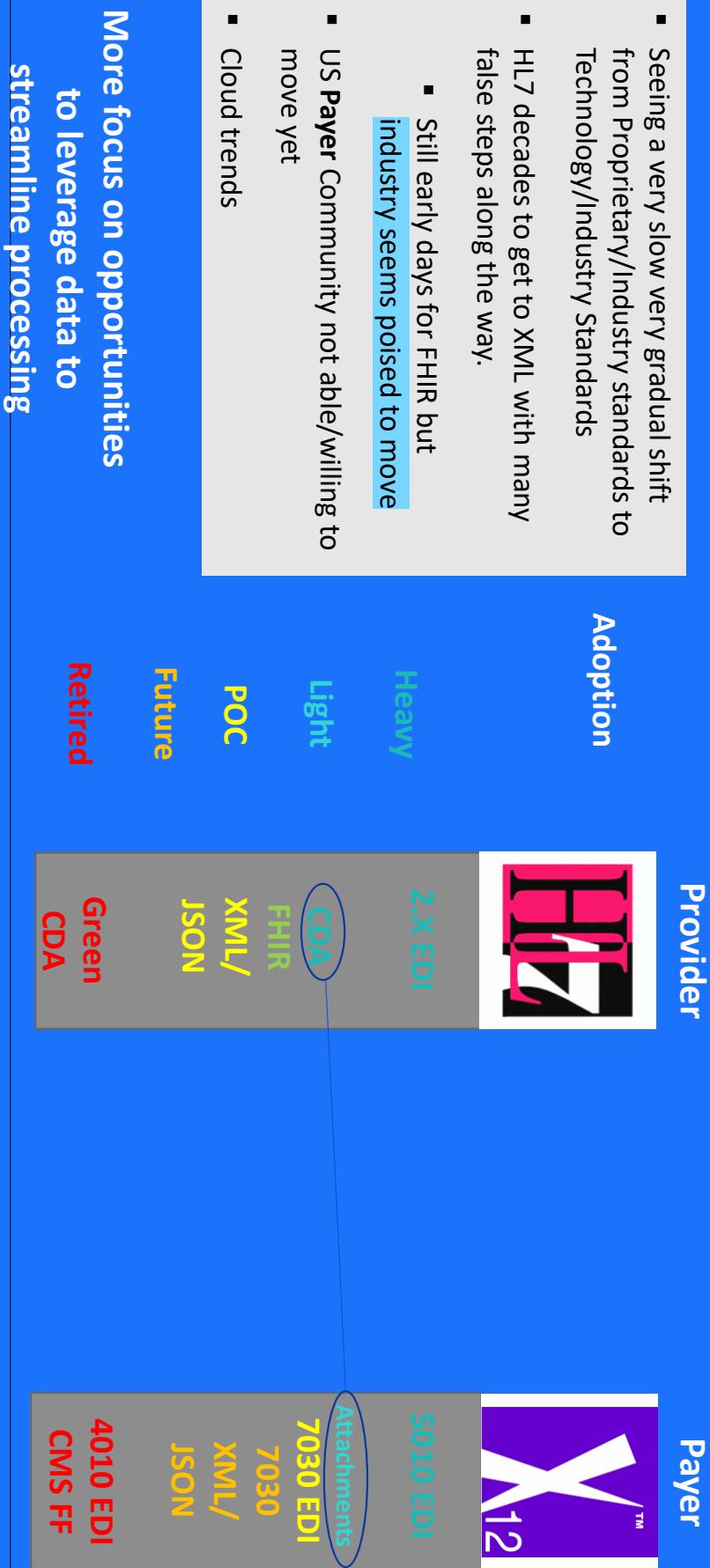
For every **ten** physicians providing care there are almost **seven additional** people in billing-related activities



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)

Shift & Coexist

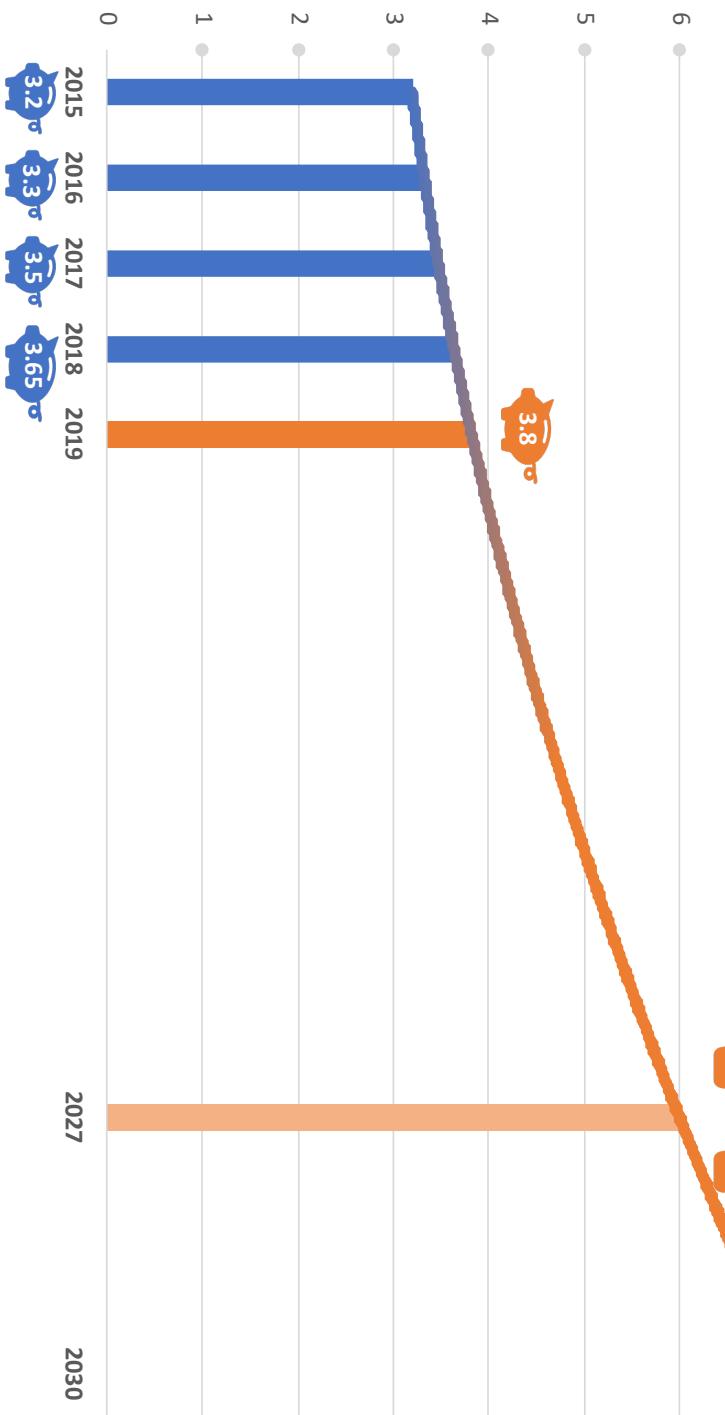


- Will grow 5.5 percent per year
- Will be nearly \$6.0 trillion
- Will grow 0.8 faster than GDP
- Will be 19.4 percent of GDP by 2027



3.8%

CMS US Healthcare Payment Projection



Key Use Cases for ITX

- Complex Data Transformation
 - Nested, Semi-structured And Hierarchical 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*

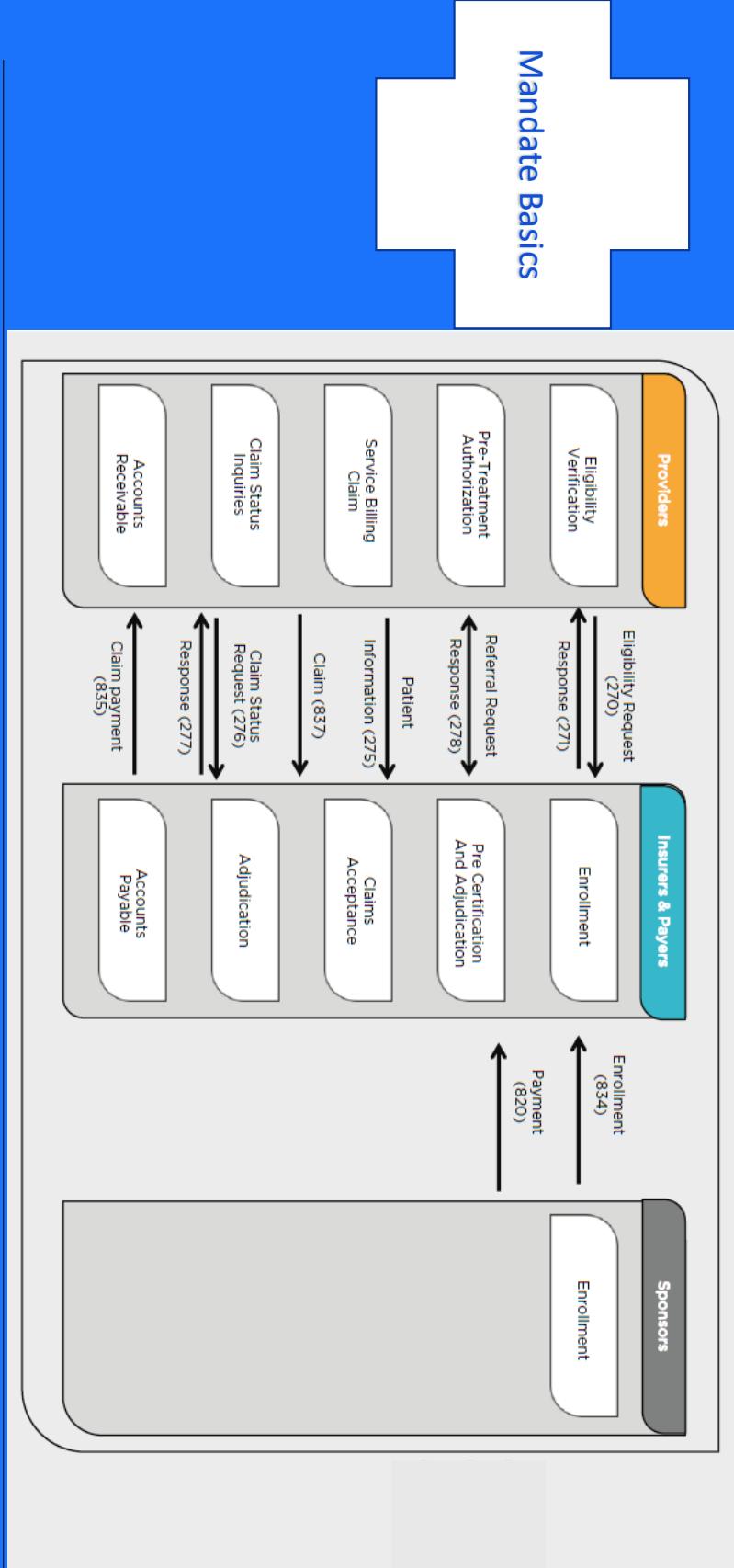
ITX - IBM's Strategic solution for comprehensive data transformation

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

Healthcare Payer HIPAA

ASC X12
The Accredited Standards Committee

IBM
®



Healthcare Payer HIPAA

ASC X12
The Accredited Standards Committee

IBM
®

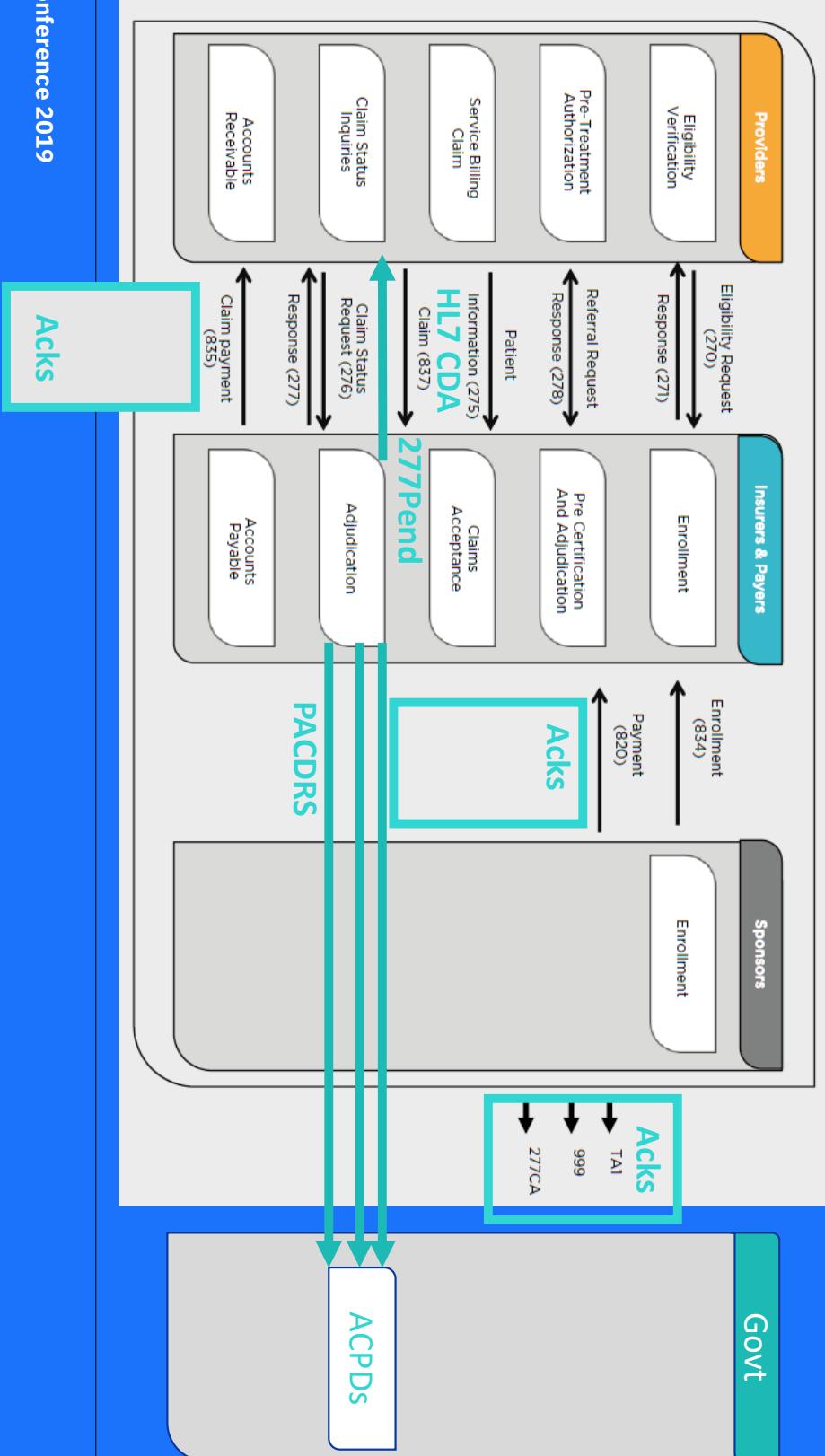
Beyond the
mandates

Also – Examples
including CMS
Flat file formats

Acks

31

Integration Technical Conference 2019



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

Integration Technical Conference 2019

TRANSMISSION
Sequence: File=C:\HCIP_902\HIPAA\Claim_Level0\X224A1_837DBad5010\X224A1_837D_2300_cn1_asent_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 23100 NM1 must be present when 2420B NM1 present

Healthcare Payer HL7

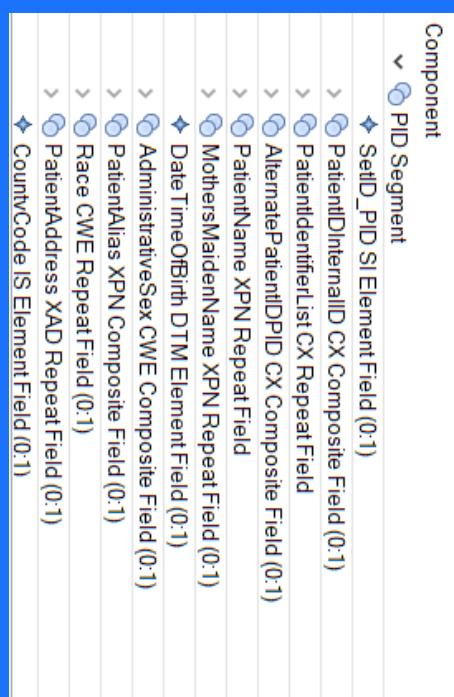


HL7
INTERNATIONAL®



- 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

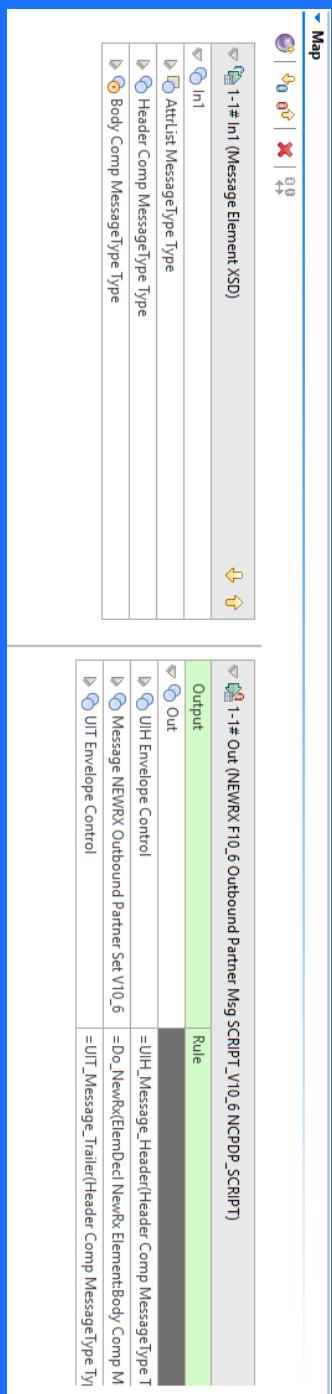
- ↳ hl7_v2_1.mtt
- ↳ hl7_v2_2.mtt
- ↳ hl7_v2_3.mtt
- ↳ hl7_v2_3_1.mtt
- ↳ hl7_v2_4.mtt
- ↳ hl7_v2_5.mtt
- ↳ hl7_v2_5_1.mtt
- ↳ hl7_v2_5_1_grouptag.mtt
- ↳ hl7_v2_5_grouptag.mtt
- ↳ hl7_v2_6.mtt
- ↳ hl7_v2_6_grouptag.mtt
- ↳ hl7_v2_7.mtt
- ↳ hl7_v2_7_grouptag.mtt
- ↳ hl7_v2_8.mtt
- ↳ hl7_v2_8_1.mtt
-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



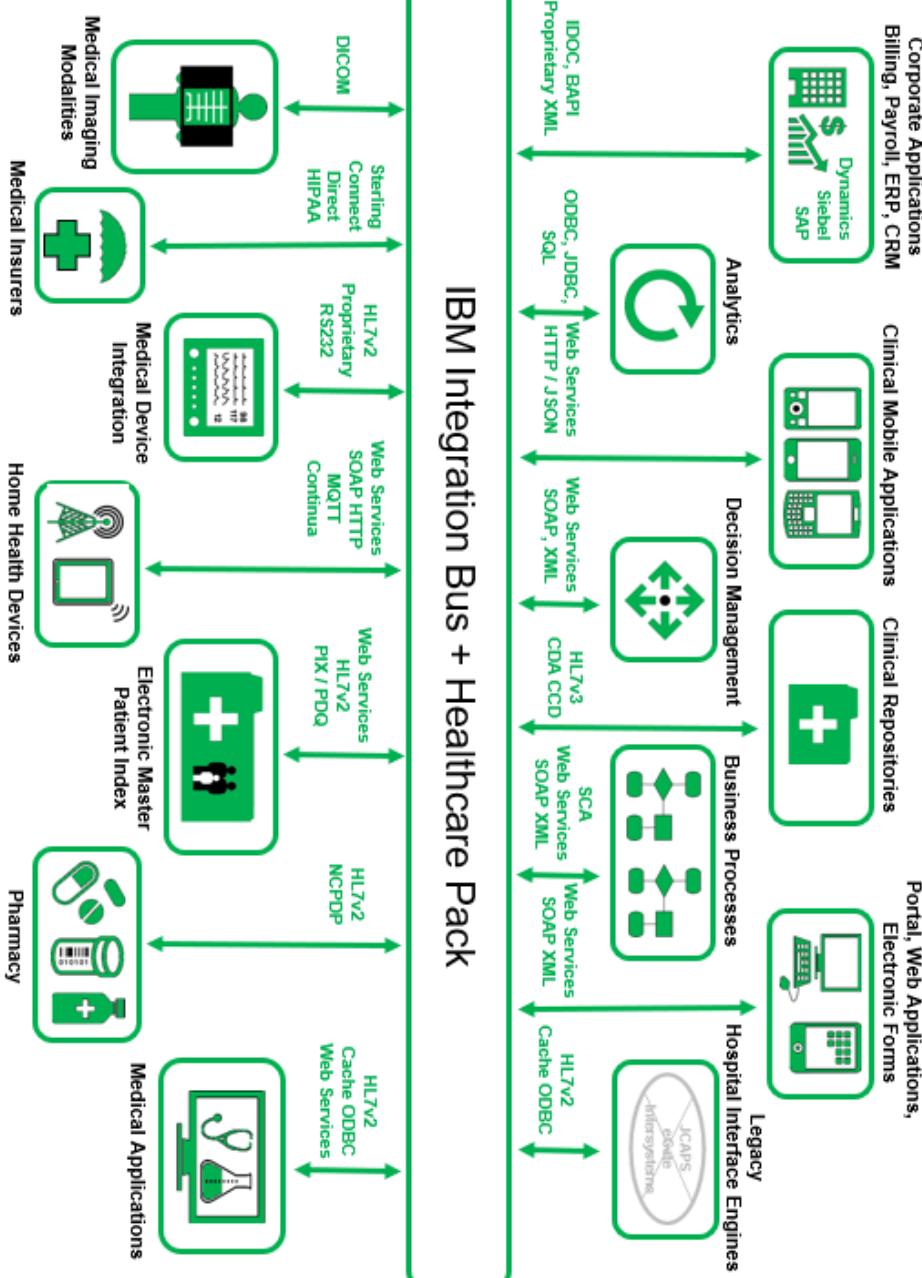
Healthcare Payer NCPDP



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



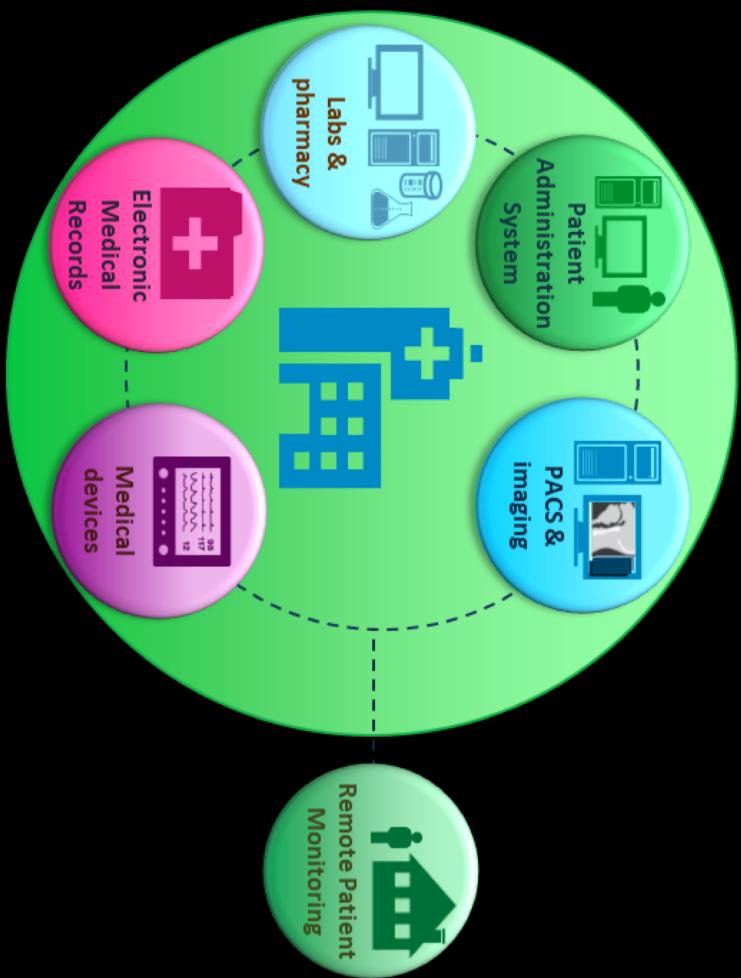
The IBM Integration Bus Healthcare Pack Landscape



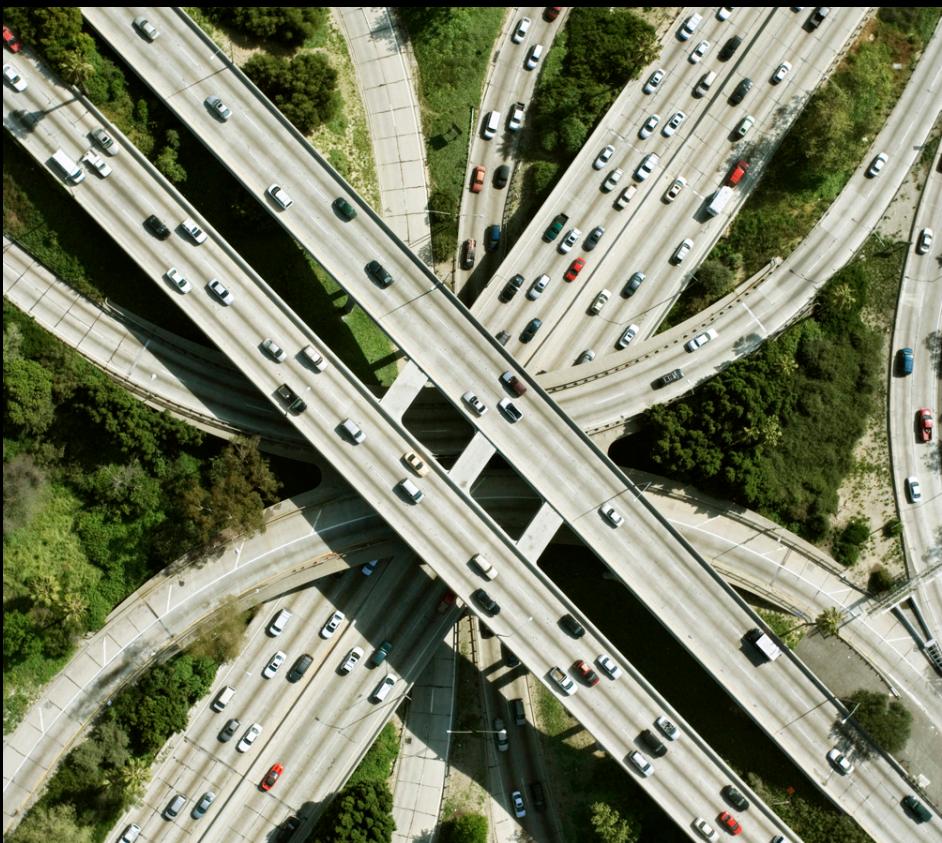
The IIB Healthcare Pack



- ✓ **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, HTTPS, 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 measured in days or weeks not in months or years.

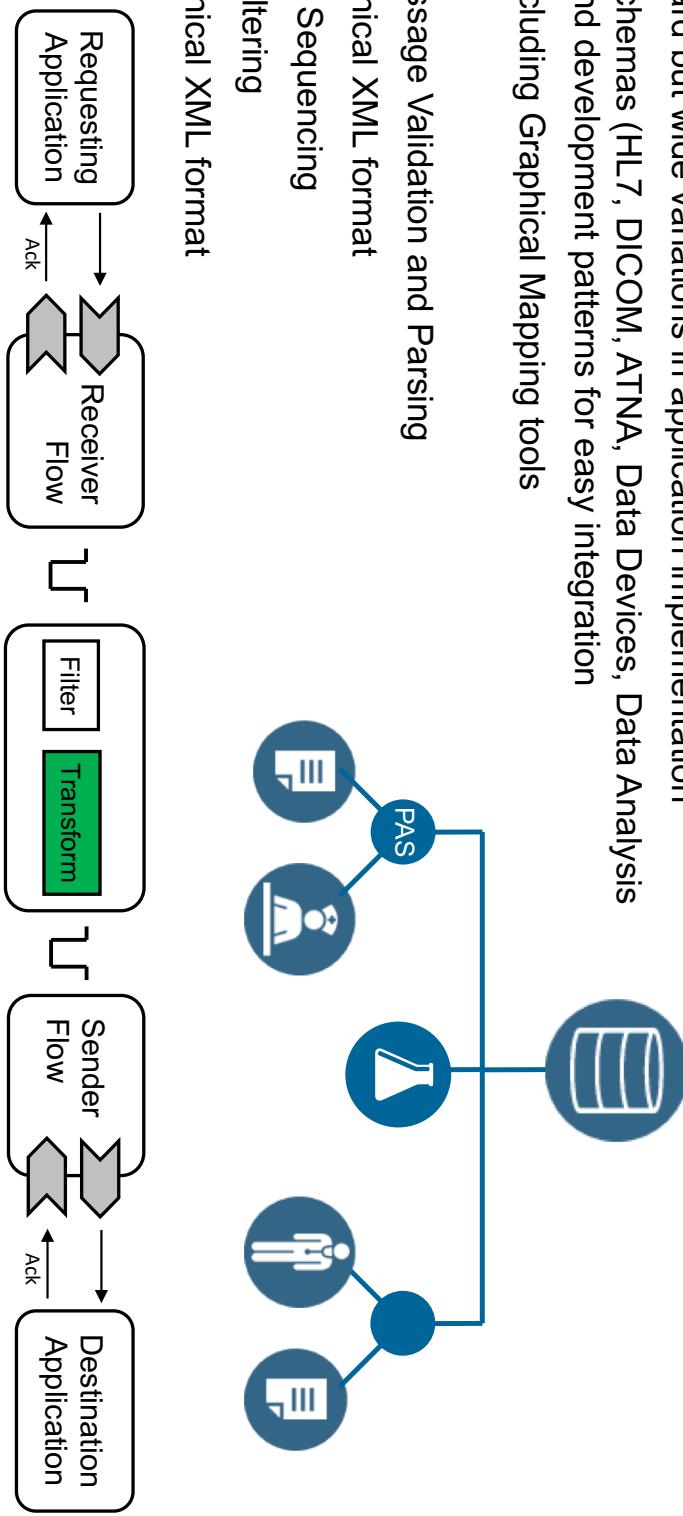
The screenshot shows the 'Patterns Explorer' view of the Application Development interface. The left sidebar lists categories: Patterns, Healthcare, Cross-Enterprise Document Sharing Consumer, FHIR Transformation, HIPAA to XML, HL7 Transformation, HL7 to HL7, HL7 to HL7 DFDL, Home Health, Medical devices to EMR, Patient Demographics Query Supplier, Patient Identifier Cross-reference Manager, Web service to DICOM, and Pattern Repositories. Under 'Pattern Repositories', two items are listed: OT4I GitHub Pattern Repository and Experimental OT4I GitHub Pattern Repository. The main pane displays a grid of icons representing different patterns, such as a person icon for 'Patient Identifier Cross-reference Manager' and a document icon for 'Cross-Enterprise Document Sharing Consumer'.

HL7 to HL7 DFDL Pattern: Clinical Application Integration

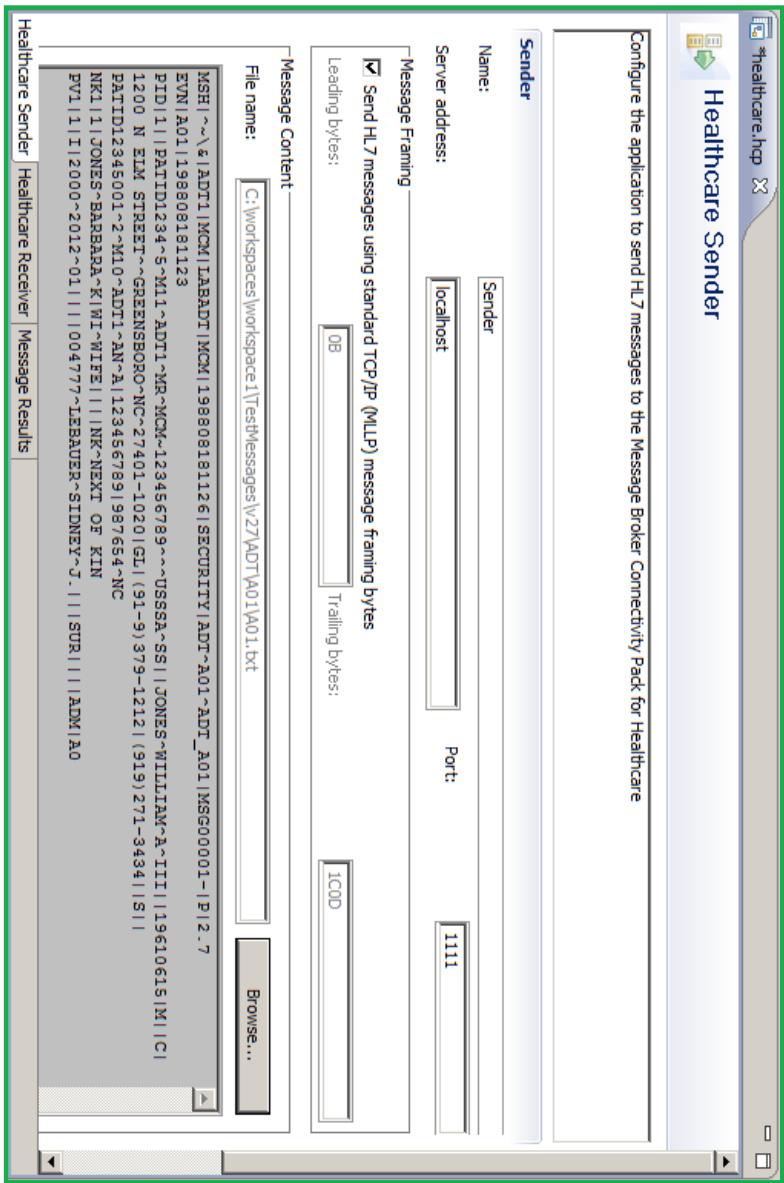


- ✓ Integrate EMR and clinical applications such as PAS, Pharmacy, Labs
- ✓ HL7 v2.x predominant standard but wide variations in application implementation
- ✓ Pack provides connectors, schemas (HL7, DICOM, ATNA, Data Devices, Data Analysis profiles for CDA and CCD) and development patterns for easy 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

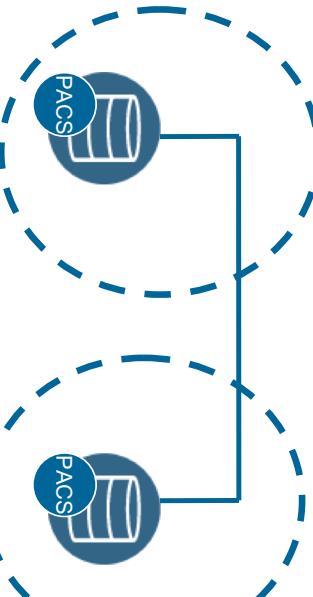


DICOM Message Flow Nodes and Testing Utility

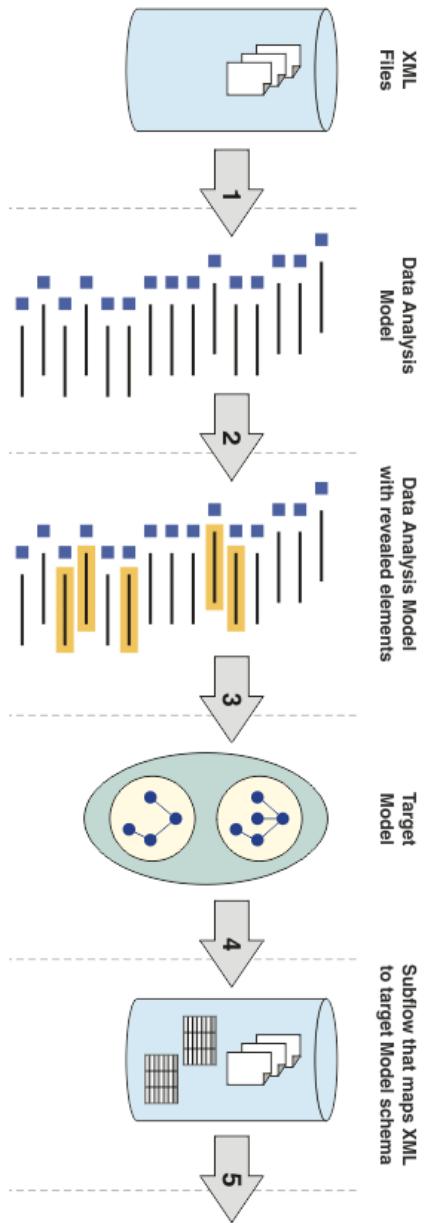


- ✓ Provides flow of image and supporting data between medical image archives and modalities
- ✓ Both inside and between care establishments
- ✓ Support for common DICOM commands including MOVE, FIND and STORE
- ✓ Images are routed as XML messages and stored on the file system
- ✓ DICOM nodes:

- ✓ 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 understanding 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

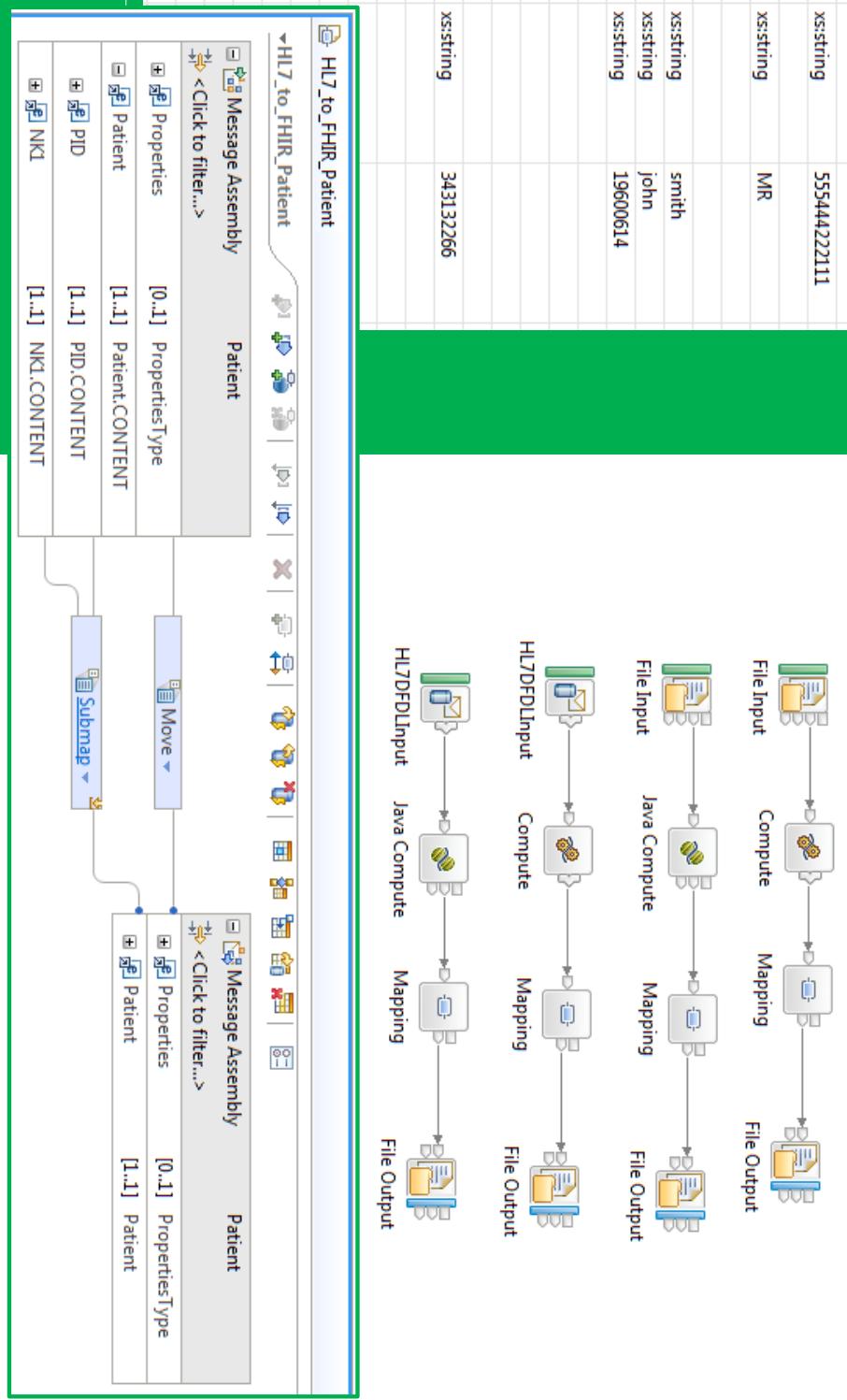
- Future phases will introduce healthcare analytics capabilities, enable clinical document sharing, and establish clinical pathway management, all building on the same IBM healthcare integration infrastructure.

■ 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



Thank You

