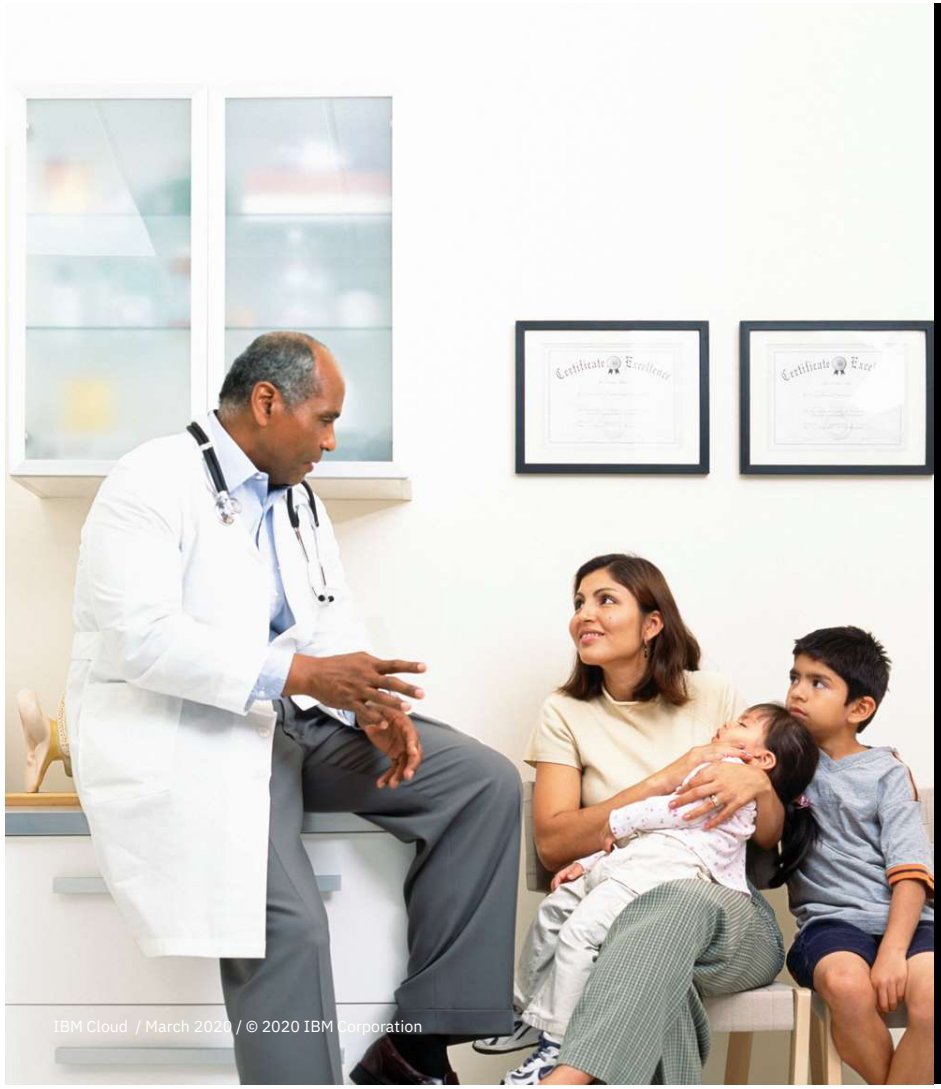
HEALTHCARE INTEGRATION

IBM App Connect for Healthcare v5

IBM | Red Hat



Our customers' challenges:

- **Cost pressures** on traditional models
- Shift to **prevention and wellbeing**
- Consumers' heightened demand for transparency, convenience, access, and **personalized products and services**
- Consumers' increased access to and **control over personal health data**
- Constantly shifting **regulatory landscape**
- **Securing increasing amounts of data** at rest and in-transit

“Business application experiences and architectures — as well as the entire business software landscape — will change drastically in the next five years. The ability of application leaders to realize their application visions for the future depends on the plans they put in place today.”

Gartner Predicts 2020: Application Leaders
14 January 2020, ID G00464148

The number of new applications and the cost of maintaining existing applications is skyrocketing...

500m

New digital apps and services by 2023 (IDC)[1]

40%

Technical debt. (Gartner)[2]

By 2025, technical debt will continue to compound on top of existing technical debt consuming more than 40% of the current IT budget.

[1] Source: IDC FutureScape: Worldwide IT Industry 2020 Predictions, Doc #US45599219, Oct 2019

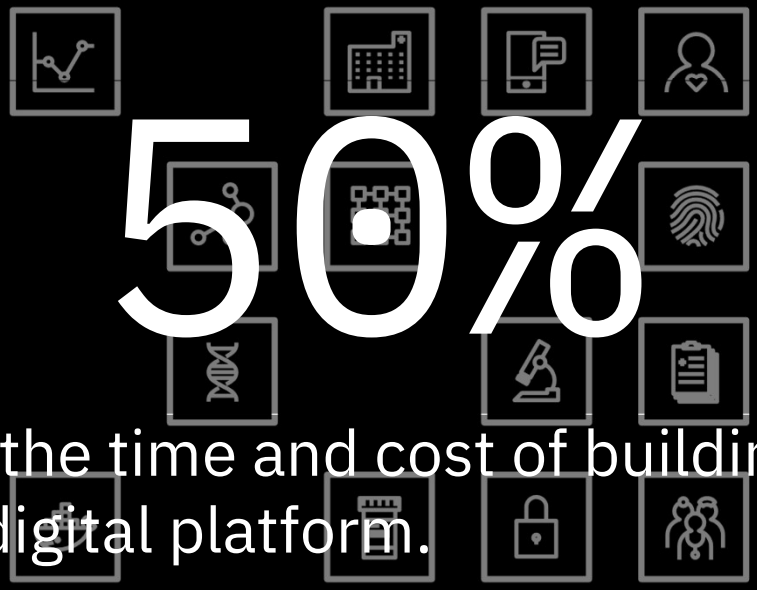
[2] Source: Gartner: Application Modernization Should Be Business-Centric, Continuous and Multiplatform 15 August 2019, ID G00430084

...Leading to an increased focus on integration to support the digital health platform

Why?

- SaaS adoption
- AI
- Business Automation
- Blockchain
- IoT
- Partner ecosystems
- Microservices
- Hybrid, multicloud architecture

Through 2020, integration work will account for

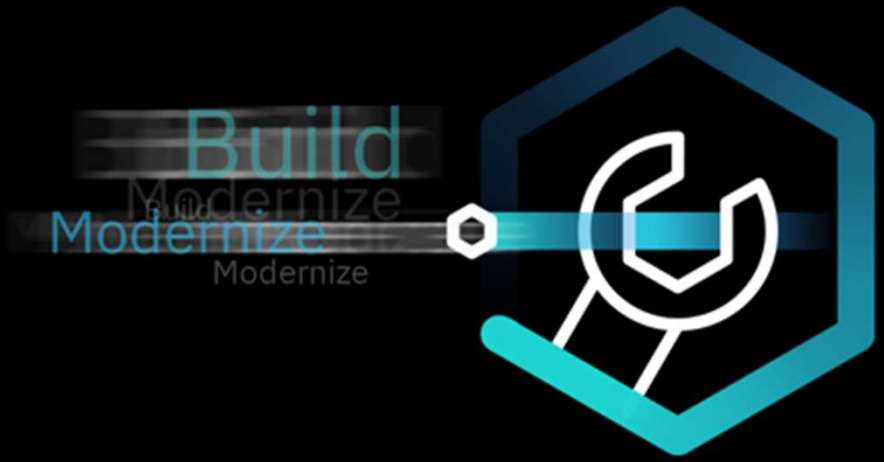


50%

of the time and cost of building a digital platform.

Cloud native is key

Whether modernizing existing application architecture or building new business platform and applications, cloud-native principles provide greater speed, flexibility, and digital readiness.



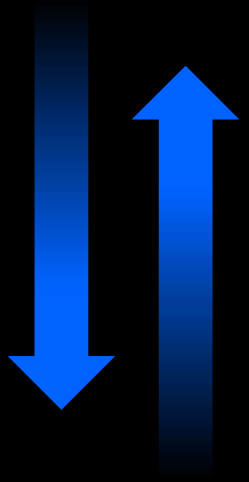
Successful enterprises are leveraging these techniques...

Today		Tomorrow
Centralized integration team Siloed, specialized, difficult to scale skills	→	Culture and skill transformation Decentralized ownership
Monolithic architecture Centralized deployment	→	Build once, deploy anywhere Optimized data and workload placement
Multiple clouds and vendors Hard to connect across clouds, point products	→	Hybrid Integration Platform Multiple integration styles, secure data access

...lowering costs while meeting demand

1/3

reduction in
integration cost



3X

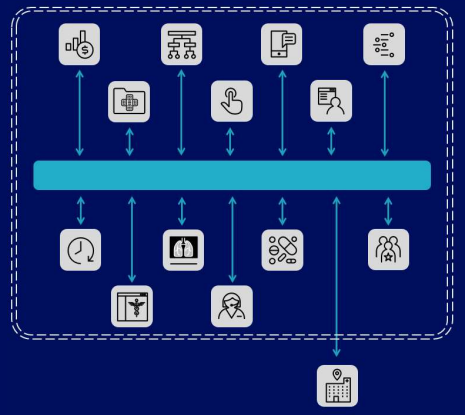
faster in creation &
deployment of integrations

Base: Varies; based on client experiences.

Integration enables higher value initiatives

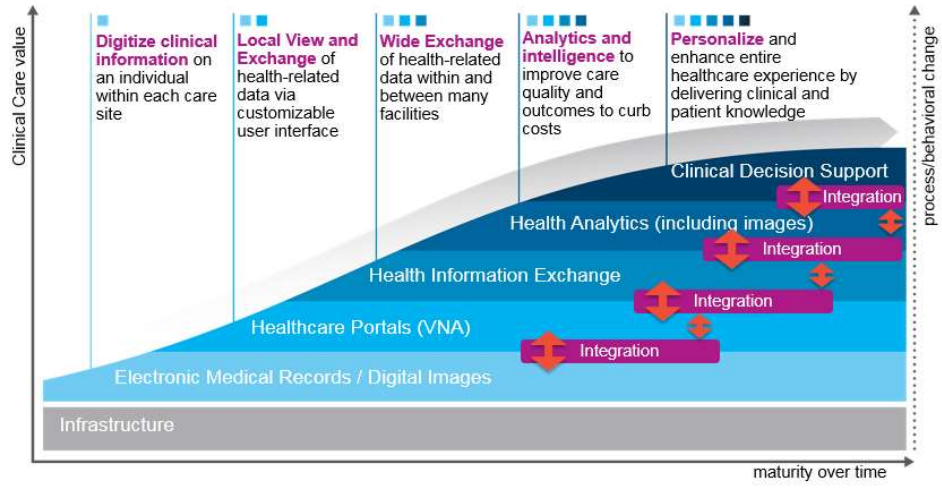
IBM can help you connect endpoints in meaningful ways.

- ✓ **Avoid rewrites** in response to new integration requirements
- ✓ **Simplify maintenance** by reducing expensive coupling
- ✓ **Add flexibility** introducing anonymity between producers and consumers of data
- ✓ **Provide insight** into applications and business value they bring

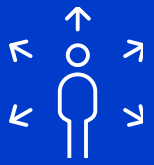


A strategic approach to interoperability can help:

- Organizations achieve the best outcomes at a lower cost.
- Patients have increased financial independence and improved interaction with their healthcare systems.
- Staff rapidly find relevant data and add new applications as needed.
- Organizations gain a competitive edge through insights

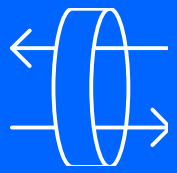


IBM can help you build and modernize with Agile Integration



People & Process

- Decentralized ownership
- Empowering teams
- Agile methods



Architecture

- Fine-grained deployment
- API led
- Event-driven
- Microservices aligned

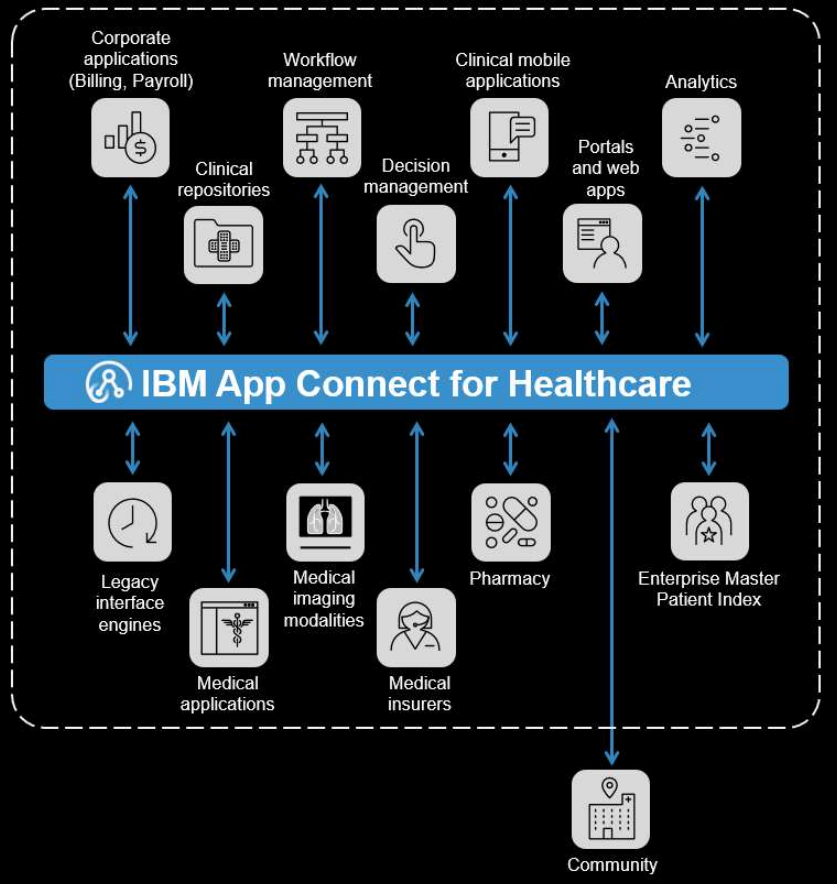
Technology

- Cloud-native infrastructure
- Essential integration capabilities
- Unified security, governance, and operations

IBM App Connect for Healthcare

App Connect for Healthcare V5.0 provides a set of development accelerators for healthcare integrators enabling rapid integration without detailed knowledge of integration technologies

- ✓ Pattern-based, healthcare-focused development tooling, including built-in testing tools enables you to rapidly create integrations between clinical and enterprise systems, customize patterns and re-use them as best practices across your enterprise
- ✓ Independent integration runtimes for customers wishing to run container-based and microservice aligned architectures
- ✓ Well suited to handling high message volumes in complex environments
- ✓ Best practices from years of proven industry experience
- ✓ Supports a range of developer skills and tools, including citizen (Line of Business) integrators
- ✓ Fully customizable for an individual organization
- ✓ Fully supported software product



IBM App Connect for Healthcare

Routes and transforms messages FROM anywhere, TO anywhere

- Supports a wide range of protocols: MQ, JMS 1.1, HTTP(S), Web Services, File, EIS (Oracle, Siebel…), TCP/IP, MLLP, User Defined
- Interactions and Operations: Route, Filter, Aggregate, Transform, Enrich, Monitor, Distribute, Decompose, Correlate, Detect…

Supports a broad range of message formats:

- HL7 FHIR v4.0.1, HL7 v2.7 / v2.6 / v2.5.1
- Digital Imaging and Communications in Medicine (DICOM)
- Clinical Document Architecture (CDA) & Continuity of Care Document (CCD)
- XML, CSV, Custom text or Binary, COBOL structure, SAP, Siebel, PeopleSoft, Database, JSON, and many more…

Patient and provider identity resolution

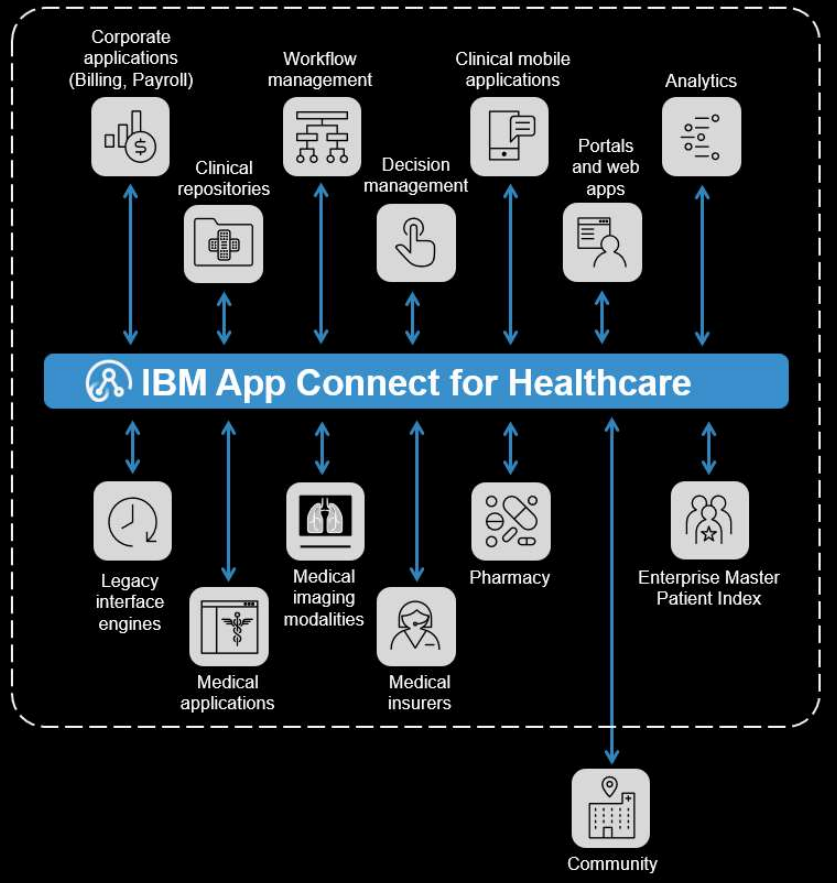
- Embedded connectivity to IBM Electronic Master Patient Index (with InfoSphere Master Data Management)
- IHE Patient Identity Cross-Referencing (PIX) & Patient Demographic Query (PDQ)

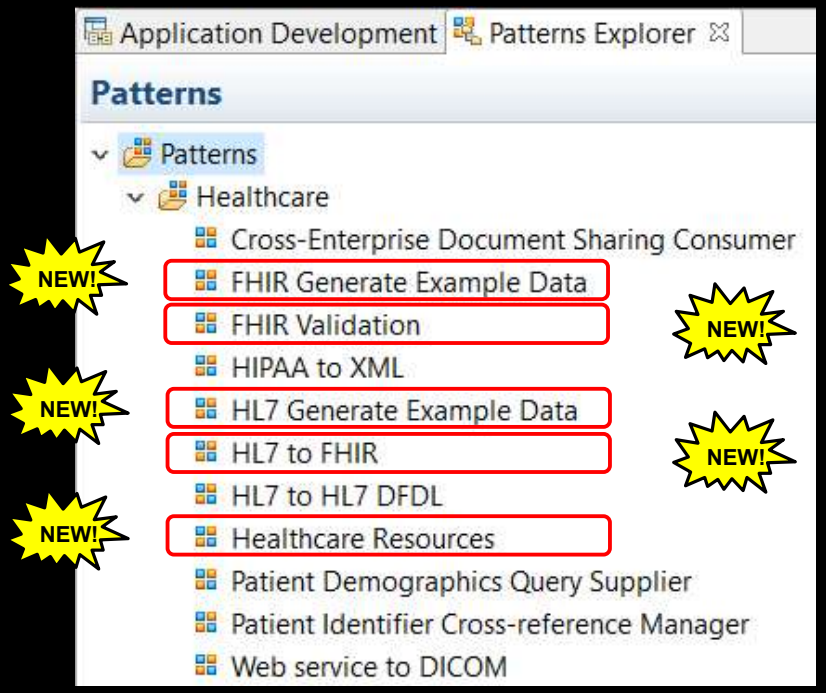
Connectivity beyond the hospital walls

- IHE Health Information Exchange capabilities
- Healthcare 'Internet of Things' connectivity

Compliance in a regulated world

- Support for creation and parsing of HIPAA X12 claims messages
- IHE Audit Trail & Node Authentication profile support

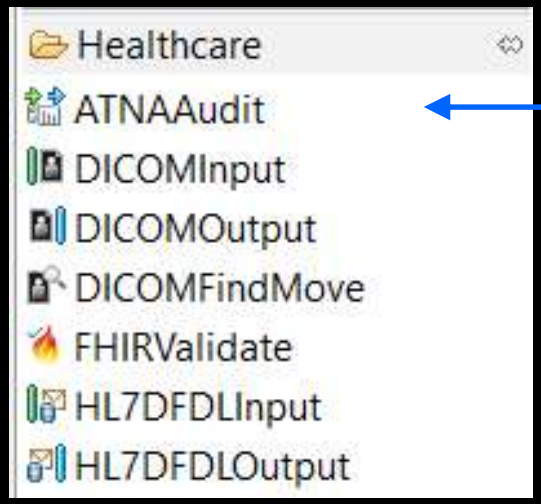




HL7

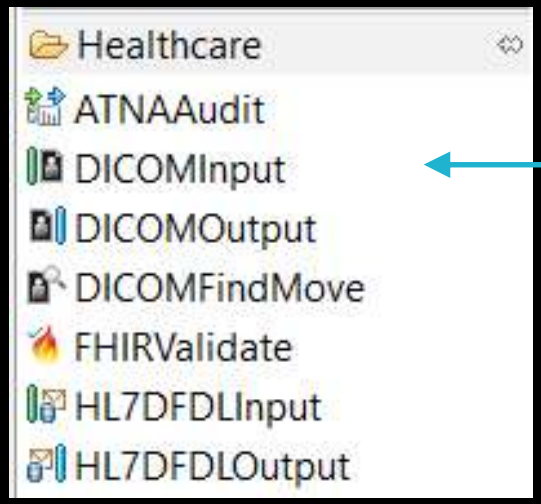
- HL7v2 is over 25 years old … and may well still exist in another 10 years!
- HL7v3 has not yet gathered widespread adoption.
- Both forms of HL7 have their problems:
  - Not concise enough on the wire
  - Widespread abuse of the standard form – quirks in implementation between vendors and between 2.x 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 hours or days and not not in months or years.
- With this context, many healthcare installations are turning towards **FHIR**

Built-in Message Flow Nodes



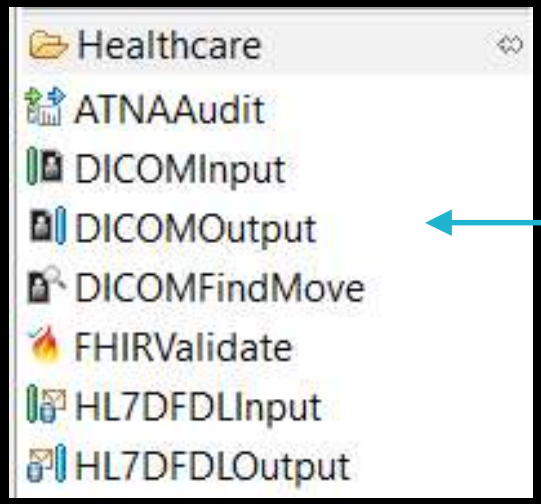
Use the ATNA Audit node to receive an XML audit message from a message flow. Use the elements from the XML audit message to create an ATNA audit message, and then route the ATNA audit message to the configured ATNA audit repository.

Built-in Message Flow Nodes



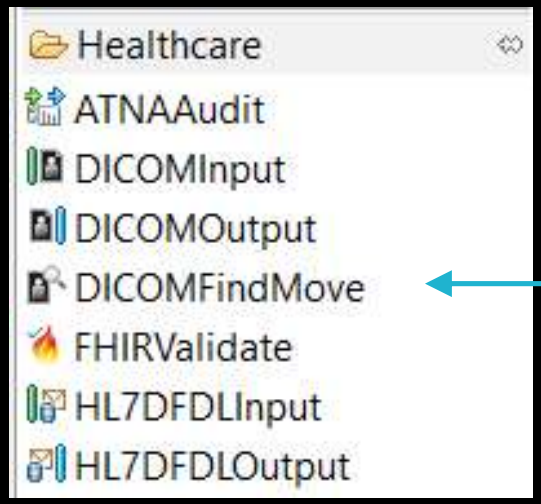
Use a DICOM Input node to receive DICOM images from an SCU, store the DICOM images on the file system, and propagate metadata from the DICOM images into the message flow as XML messages.

Built-in Message Flow Nodes



Use a DICOM Output node to receive DICOM XML messages, combine the metadata from DICOM XML messages with the pixel data that is stored in the file system by the DICOM Input node, and send the resulting DICOM image to an SCP.

Built-in Message Flow Nodes



Use a DICOM FindMove node to query a remote Service Class Provider (SCP) for patients, studies, series, and images, and to move the results of a query to an application entity such as a DICOM Input node.

DICOM

External Expert / Second Opinion

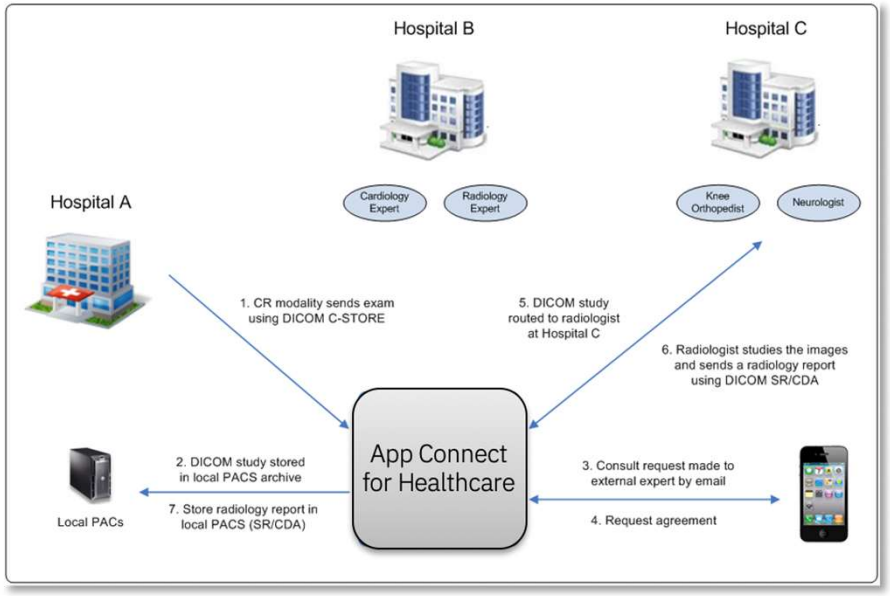
In many geographies radiology skills are in critically short supply

- App Connect can be used to route DICOM images to external experts
- Routing based on data in the DICOM image (for example, a SNOMED code)
- Solves the larger integration picture such as email notification to physicians

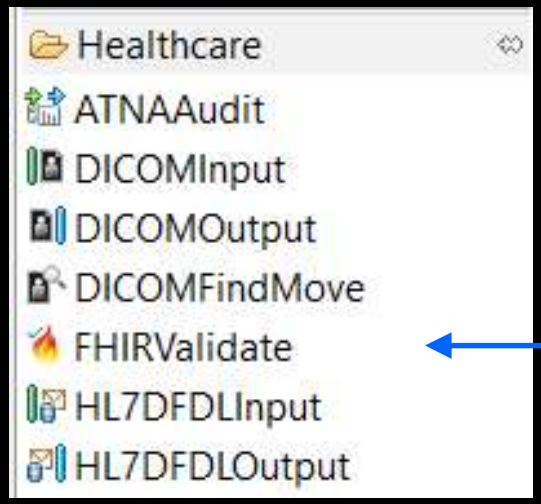
Pre-Fetch on Admissions

Preparing studies in advance when patients are admitted to hospital

- Flexible routing options to retrieve studies and send them to the right specialists
- Routing based on data in the DICOM image (for example, a SNOMED code)
- Requires a mixture of DICOM commands including C-FIND, C-MOVE and C-STORE

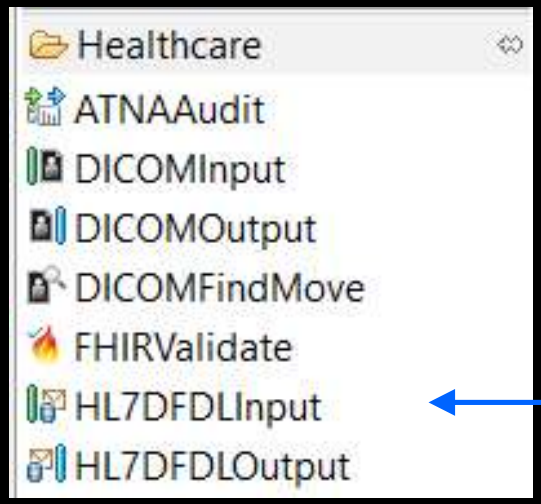


Built-in Message Flow Nodes

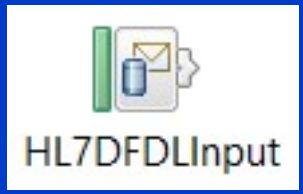


Use a FHIR Validate node to validate that an incoming message is a valid FHIR resource. You can also use this node to convert valid FHIR resources between XML and JSON.

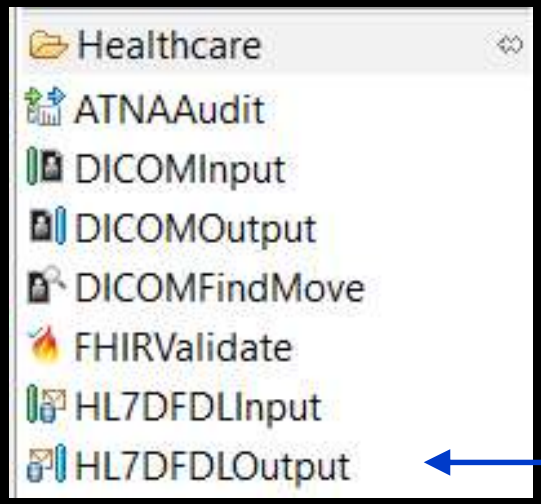
Built-in Message Flow Nodes



Use an HL7DFDLInput node to receive messages from clients that connect to the integration node by using the MLLP protocol over TCP/IP.



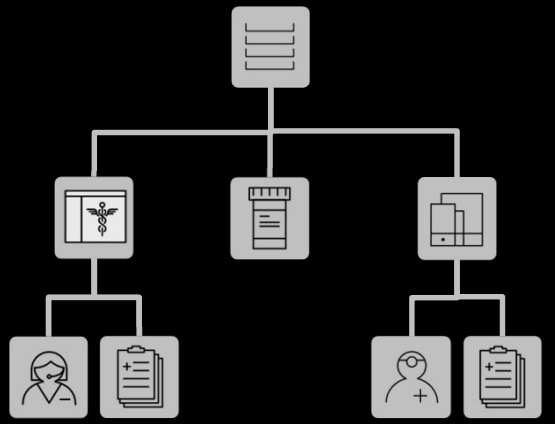
Built-in Message Flow Nodes

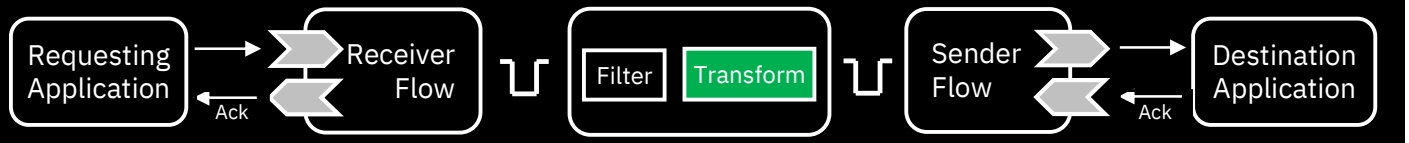


Use an HL7DFDLOutput node to prepare a message for the destination application. The HL7DFDLOutput node receives an HL7 message in the DFDL domain and opens connections to a destination application that is listening on a TCP/IP port.

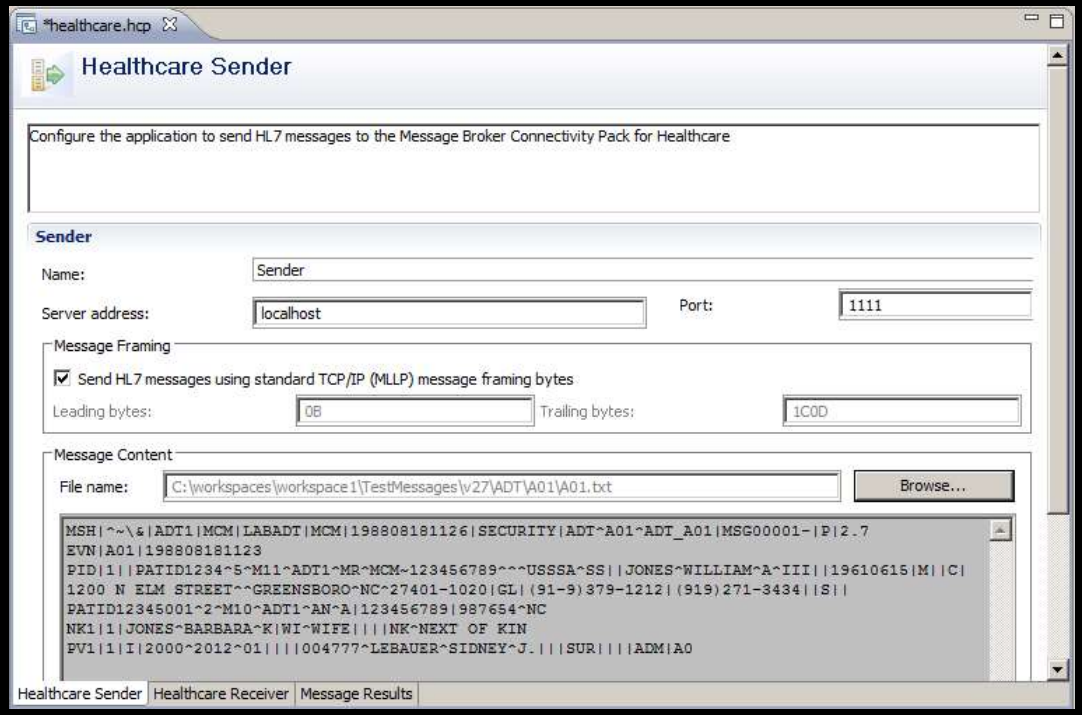
HL7 to HL7 DFDL Pattern: Clinical Application Integration

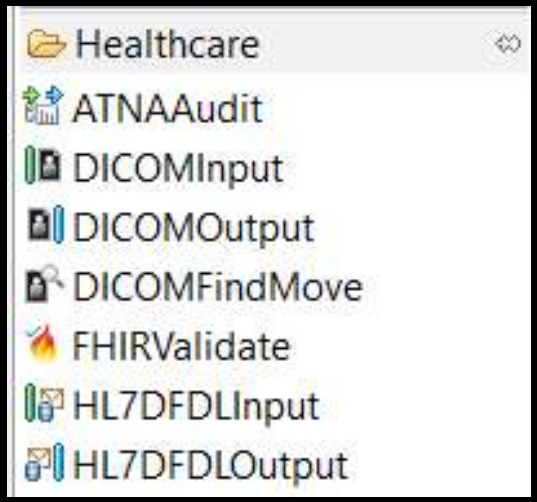
- Integrate EMR and clinical applications such as PAS, Pharmacy, Labs
- HL7 v2.x predominant standard but wide variations in application implementation
- Pack provides connectors, schemas (HL7, DICOM, ATNA, Data Devices, Data Analysis profiles for CDA and CCD) and development patterns for easy integration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





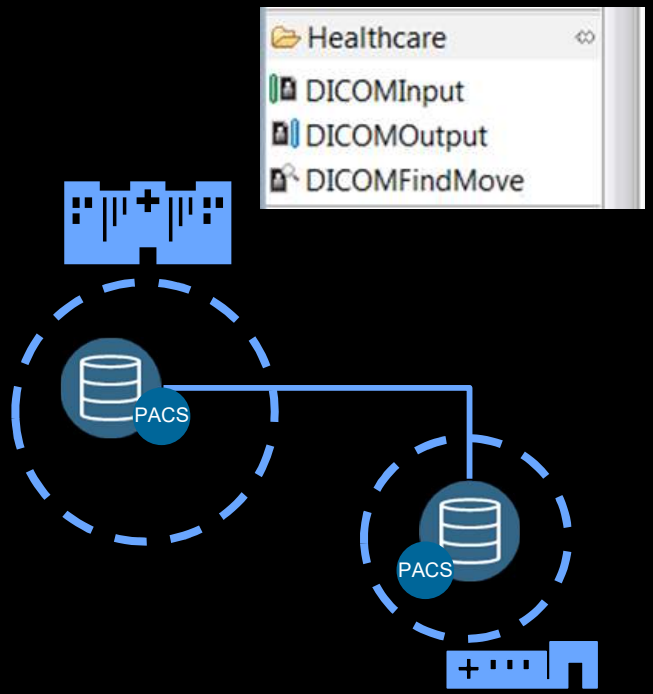
Built-in Message Flow Nodes and Testing Utilities



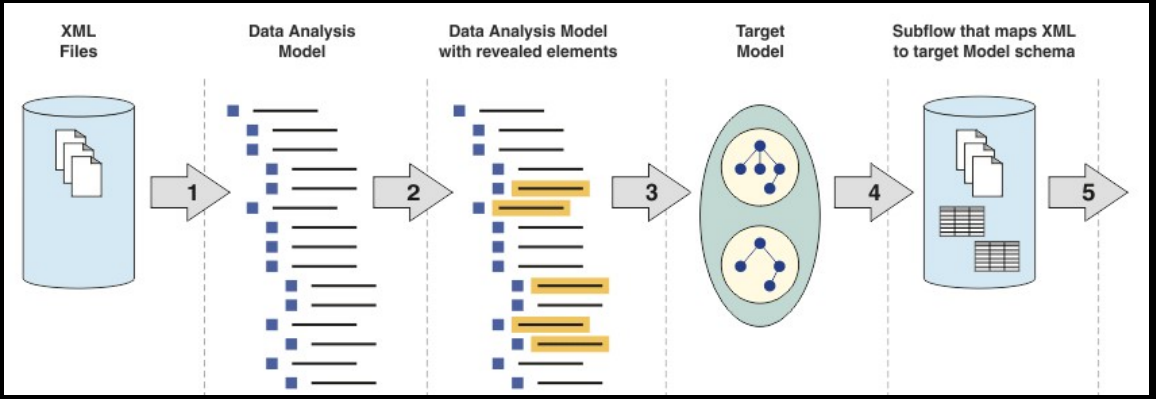


DICOM Message Flow Nodes and Testing Utility

- ✓ 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:
  - ✓ App Connect can act as both a client (SCU) and server (SCP)
  - ✓ Metadata for DICOM images is propagated through App Connect 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

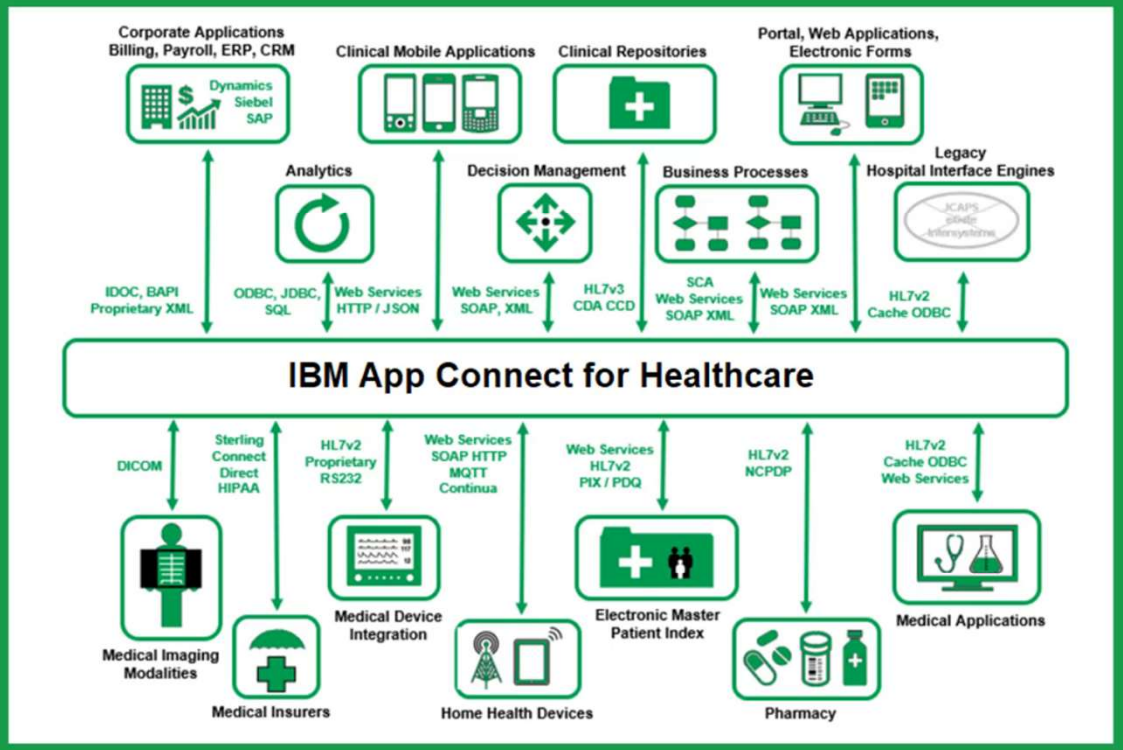


Data Analysis Tools



- ✓ 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
- ✓ App Connect Data Analysis helps you to rapidly understanding the structure of clinical documents. Analyze a set of sample documents according to their data content
- ✓ App Connect 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.

Demo
Linking App Connect for Healthcare and App Connect Enterprise

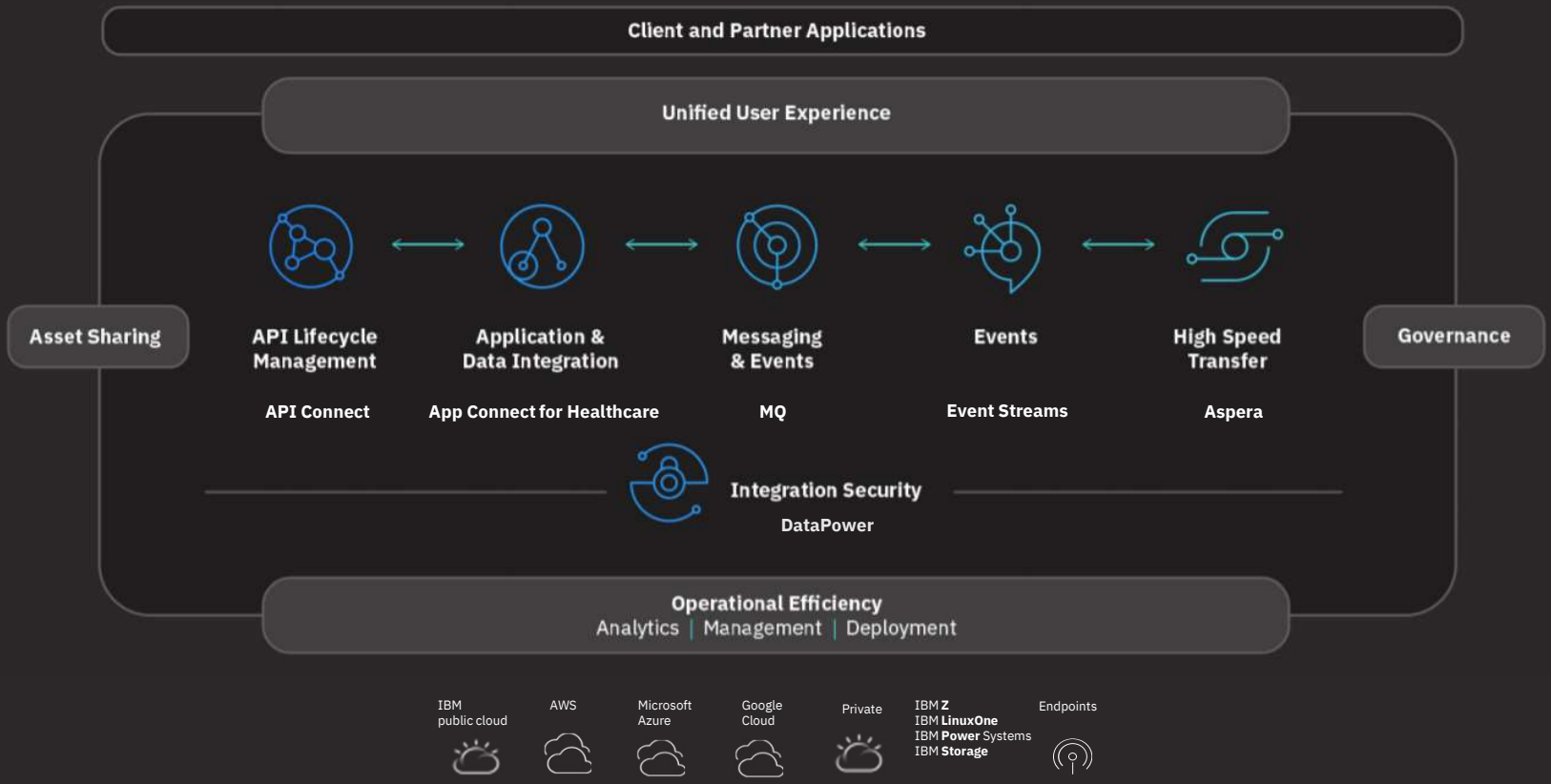


Demo
Exploring the ACH Toolkit Features

Demo

Exploring the Healthcare Resources Pattern HL7 Test Data and HL7 Message Model

IBM Cloud Pak for Integration



Cloud Pak for Integration

Broadest integration capabilities

Unified experience, operational efficiency & reuse

–

Deploy where needed

Container-based architecture with common enterprise services

–

Enterprise-grade

Secure, scalable

API Lifecycle

Application & Data Integration

Enterprise Messaging

Events

High Speed Transfer

Integration Security

IBM hybrid multicloud platform
Build once. Deploy anywhere

Expertise

- Strategy
- Migration
- Development
- Management
- AI Skills

ISV Applications/Solutions

Advanced Technologies

- Blockchain
- IoT
- Quantum
- Supply Chain
- Watson
- Weather

Capabilities

- Cloud Pak for Applications
- Cloud Pak for Data
- Cloud Pak for Integration
- Cloud Pak for Automation
- Cloud Pak for Multicloud Management
- Cloud Pak for Security

Foundation

Red Hat

Open Hybrid Multicloud Platform

- Red Hat OpenShift
- Red Hat Enterprise Linux
- Common Services
- Multicluster Management

Infrastructure

- IBM public cloud
- AWS
- Microsoft Azure
- Google Cloud
- Edge
- Private
- IBM **Z**
- IBM **LinuxOne**
- IBM **Power** Systems

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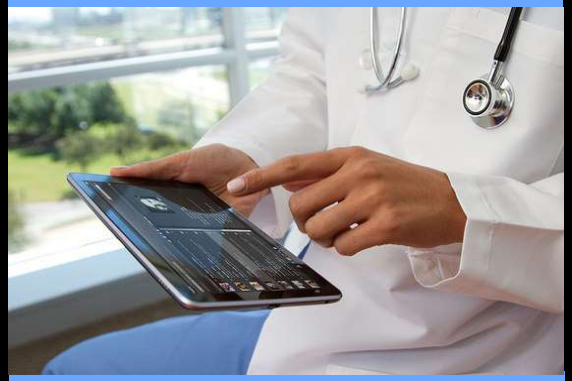
Cloud Pak for Integration accelerates your access to data and services

Patient Care: Respond to events in real time



App Connect for Healthcare + Event Streams + MQ

Mobile: Deliver responsive customer experiences

App Connect for Healthcare + API Connect + Event Streams

Finance: Supply chain finance with blockchain

App Connect for Healthcare + API Connect + DataPower

A leading healthcare company in the US

Modernizing the IT landscape to provide improved healthcare services and outcomes

Learn more

Business Challenge:

This leading healthcare company is transforming the way healthcare services are provided to its consumers. As part of this modernization effort, the organization is bringing together data, microservices, and an agile framework to offer unique solutions and healthcare services to its customers.

This multi-year digital transformation is focused on changing the marketplace and providing consumers with a path to better health. The goal is to create unique and new services offered in a multichannel, digital way. First, the company needed a new hybrid cloud IT architecture and more agile processes.

Solution:

The client is working with IBM® to evolve its legacy integration and data platform to a cloud ready, hybrid architecture. Using IBM Cloud Pak™ solutions, the company will improve end-to-end integration, shift to microservice architectures, and create a data platform layer to support a unified fabric for governance and accessibility.

Outcome:

- Cost-savings
- Flexibility through hybrid cloud strategy
- Agile development

"We can literally build integration capabilities at about a third of the cost that we could four years ago."

Client Technology Officer

Solution Components:

- IBM Cloud Pak for Integration
- IBM Cloud Pak for Applications
- IBM Cloud Pak for Automation
- IBM Cloud Pak for Data

A US state government

Using enhanced data integration as a new tool in fighting the opioid crisis

Learn more

Business Challenge:

A state government in the US sought a way to securely share opioid abuse information with partner agencies.

Solution:

The state and IBM® Cloud Integration Expert Labs applied IBM Cloud Pak™ for Integration and IBM DataPower Gateway technology to rapidly create APIs and event streams and to conduct usage governance that meets strict security requirements.

Outcome:

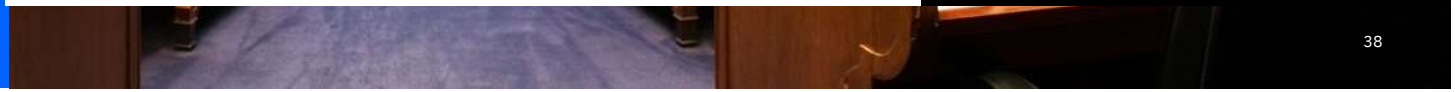
- Faster delivery of new features: from four weeks to ten days
- Faster exposure of critical information for managing state's opioid crisis
- Real-time predictive and crisis outcome information via integration of IBM analytics with multiple back-end systems

"For a small feature to be implemented in our legacy application, it used to take a minimum of four weeks. Now, we can achieve that in roughly ten days and we're targeting one week."

Head of Information Technology

Solution Components:

- IBM Cloud
- IBM Cloud Integration Expert Labs
- IBM Cloud Pak for Integration:
  - IBM API Connect
  - IBM App Connect Enterprise



Only IBM provides investment protection

Leverage existing integration investments:

- Integration assets, skills, licenses

Employ open standards and the latest frameworks:

- As new integration patterns emerge (e.g., Istio, GraphQL)

Grow with us:

- Purchase only the integration capabilities you need
- Flexibility within entitlement

IBM Integration

a trusted partner in enterprise integration around the world and across all industries

1000+

installations in production

600

Healthcare & Life Sciences companies

21	of the top 25 insurance companies
23	of the top 25 US Retailers
90%	of global credit card transactions
50	of the top 50 global banks
20	of top 20 global comm service providers
80%	of all worldwide airline reservations

Cloud Pak for Integration Solution Initiation Workshop

Deploy IBM Cloud Pak for Integration for initial use case in just 2 weeks!

Benefits

- Learn how IBM Integration provides the capabilities required for your new Integration Platform
- Experience comprehensive platform installation and good working practices
- Define scope and design for first use case to be deployed
- Factor security, operations requirements and business continuity needs into the overall solution
- For more information, contact your local sales representative

Thank you!

HEALTHCARE INTEGRATION

IBM App Connect for Healthcare v5

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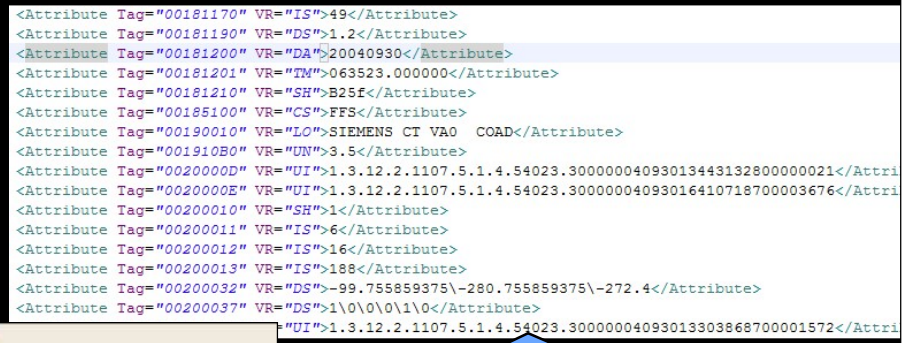
Back up

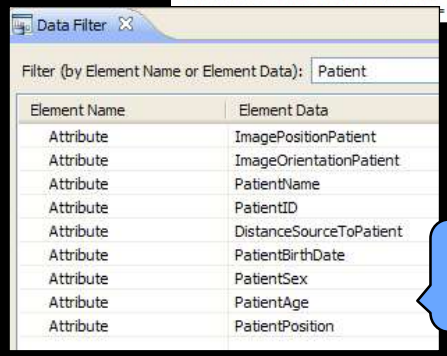
DICOM Analysis

The DICOM Data Analysis profile *understands* DICOM messages

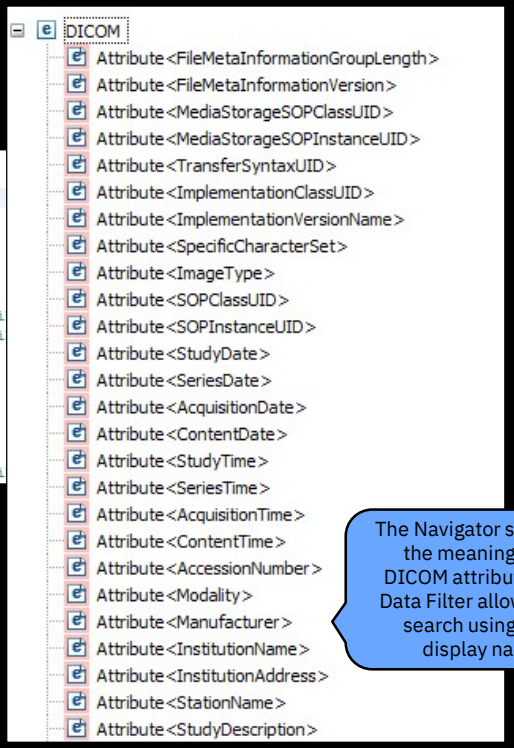
- Data Analysis Profile includes a glossary with 2K+ standard DICOM tags
- Vendor specific DICOM tags are common and are handled by the profile
- Search for DICOM attributes and understand what modalities are *actually* sending



This is an example DICOM message which flows through App Connect - the message contains codes that specify the meaning of each element



Search for particular pieces of information across all DICOM messages using the display names

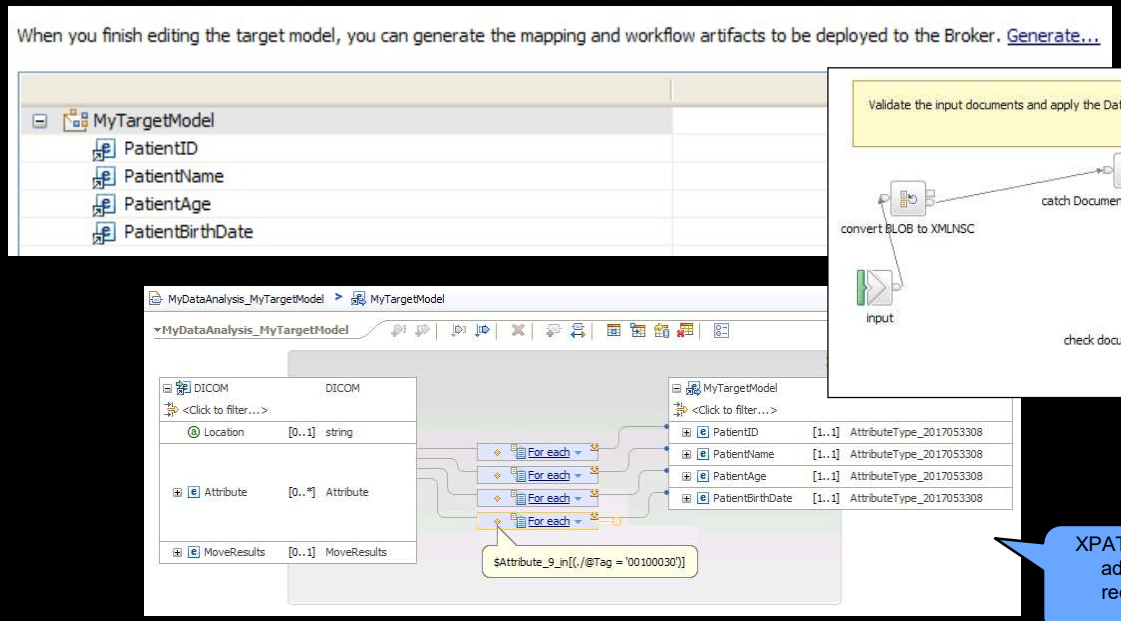


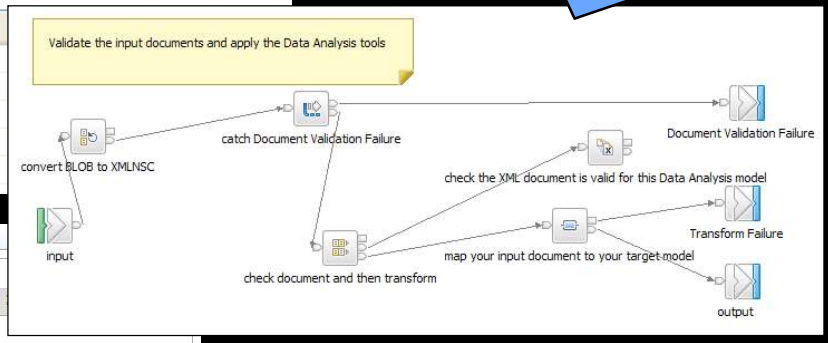
The Navigator shows you the meaning of the DICOM attributes – the Data Filter allows you to search using these display names

DICOM Analysis - Target Model

Creating the target model is the same sequence of steps as before!

- Simply drag-and-drop your DICOM attributes onto the target model
- By default all attributes and elements are assumed to be required
- Refine the target model by removing unnecessary data and renaming elements
- Generate the App Connect artefacts including map, subflow and library





The tooling generates an App Connect subflow which extracts the information from DICOM messages into the target model – the extraction is implemented as a graphical map

XPATH predicates are automatically added to the map to locate the required data from the DICOM messages