Enabling Interoperability in Healthcare to Drive Value and Growth

How healthcare organizations can take advantage of an API-first middleware approach

As healthcare lags other industries in digital transformation, interoperability has become an important part of all conversations around technological interventions in healthcare[1]. Healthcare leaders across the globe have started to identify the lack of interoperability as one of the major barriers to transformation operations and processes. In this white paper, we explore the factors contributing to this current problem and demonstrate how an API-first middleware layer can be the key to enabling greater value, growth, and efficiency within healthcare organizations.

What is interoperability?

Interoperability, in the realm of software, means the ability of different software systems to seamlessly connect and communicate with each other in an automated and secure manner. Therefore, simply put, a lack of interoperability means that data cannot seamlessly flow across different systems. This leads to the formation of data silos which prevent the creation of SSoT (Single Source of Truth), impeding the realization of the true potential of data.

In the context of healthcare industry, a lack of interoperability leads to a host of fragmented experiences resulting in sub-optimal results for all stakeholders. For instance, it results in scattered patient data across siloed systems, preventing patient data consolidation, thereby restricting access to valuable information for healthcare providers, payers, and other stakeholders. Interoperability can connect data in ways that lead to better outcomes for healthcare stakeholders in multiple ways, such as more accurate disease diagnosis, better decision making on insurance premiums, better contribution to ongoing research and development activities, and fully automated workflows in healthcare administration.

/ Improve patient care by enabling seamless data exchange between healthcare IT systems

/ Reduces costs and increases efficiency by streamlining data sharing

/ Enables rapid development of new applications and services by providing a standardized interface

/ Enhances flexibility and scalability by supporting different data formats and protocols

Figure 1: Benefits Of Interoperability For Healthcare Organizations (Source: Persistent)

Factors contributing to the lack of interoperability in healthcare

Legacy systems and processes: the healthcare industry is still dominated by legacy systems that in most cases were first installed decades ago. For instance, fax machines still play a crucial role in the healthcare processes — according to **Bloomberg**, more than 70% of healthcare offices still share the documents via Fax[2]. These documents culminate into a large unstructured data set, meaning it's a morass of information in assorted styles and formats, covering different types of information. Similarly, manual processes such as handwritten notes for recording and sharing information is still prevalent in the industry. Combine all these datasets with medical reports, lab images and data from other systems and the result is a gigantic amount of unstructured data, which according to most of the **industry estimates**, is 80% of all healthcare data[3]. As unstructured data has its own challenges in processing, given the diverse types of data and information involved, it is a huge deterrent to enabling healthcare interoperability.

Disparate IT systems: A typical healthcare institution such as a hospital has multiple IT systems. The most common ones are EHR (Electronic Health Record) and EMR (Electronic Medical Record) systems to electronically store the patient data, practice management systems, patient portals, clinical decision support systems, and multiple SaaS systems for a host of administration-related tasks. Such as massive number of systems pose a significant integration challenge to healthcare organisations. External integration becomes even more complicated as the same set of systems can be provided by various vendors — for example, EMR systems can be deployed from vendors such as Epic, Oracle Cerner, etc., with little to no interoperability options.

Proliferation of digital healthcare products: Adoption of wearables and remote health monitoring systems have spiked during the last few years. From basic fitness bands to sophisticated products meant for advanced tracking of ailments, wearable technology is fast becoming an essential utility. While the technology is truly promising, its true potential lies in its integration with the mainstream healthcare systems. Integrating such data requires highly scalable and reliable integration systems that can manage high data volumes at a high velocity.

Data regulations: Data security and privacy in healthcare are paramount, as is ensuring that healthcare systems follow ethical processes. However, if the regulatory compliance is not managed the right way, it could introduce additional layers of complexity. Adherence to the best practices is essential while ensuring compliance. The easiest way to achieve this goal is by leveraging industry standards-based integration platforms that provide out-of-box capabilities for compliance.

An API-first approach spearheads interoperability

An API-first, three-layered middleware architecture enables interoperability in a way that can greatly enhance healthcare organizations' overall effectiveness and efficiency. The three-layered architecture creates a dedicated middleware layer that decouples system end points and renders extensive re-usability across the middleware layer. Let's explore each layer below.

System Layer: The architecture starts with the System API layer to create robust connections with other healthcare systems, including EHR systems such as Epic and Oracle Cerner, patient portals, claims databases, hospital systems such as RCM (Revenue Cycle Management) and others. In addition, the System API layer also builds interfaces to sources of unstructured data such as the fax systems, Lab reports, etc.

Process Layer: This layer creates services for implementing business / functional processes, orchestrations, and data transformations. Processes and orchestrations can be used to implement functionalities such as creating a patient 360-degree view, and automating workflows such as appointment scheduling and pre-authorizations. With regards to data, healthcare systems typically follow multiple standards, with the prominent ones being X12, HL7, CCDA, and FHIR. Frequently, there is a need to convert data from one format to another, which the Process Layer achieves

by using canonical data structures and a low code / no code tool for mapping (DataWeave in case of MuleSoft, or Map in case of Boomi).

The Process Layer further contains an Extraction Layer, which contains advanced document processing capabilities powered by the latest and greatest technologies in the IDP (Intelligent Document Processing) space. It employs LLMs-powered (Large Language Models) Document AI by Google to read and parse unstructured data.

Experience Layer: The Experience Layer exposes APIs to be consumed by external systems such a web portal, mobile app, or a partner application.

The three-layered architecture can be coupled with an enterprise-grade API Management layer to add advanced security features while exposing APIs, as well as tracking API usage to gather insights into consumption patterns.
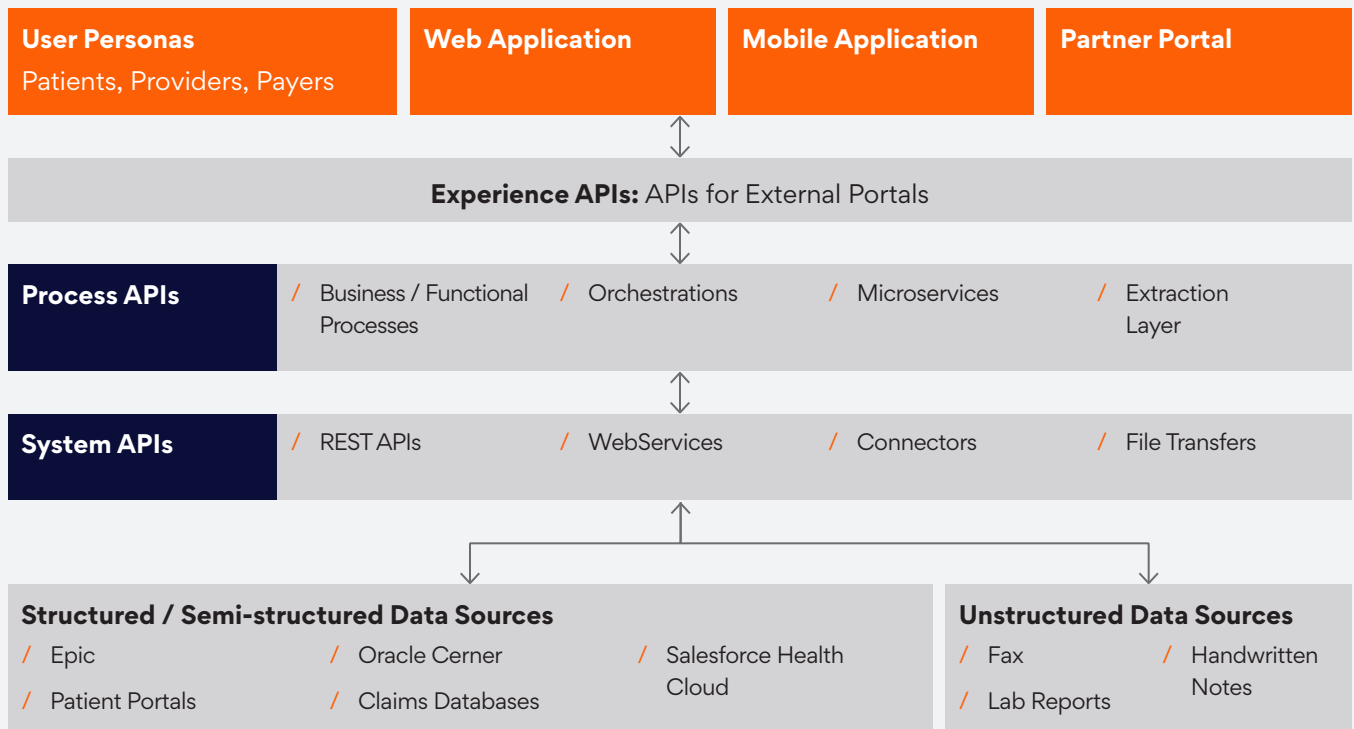
User Personas Patients, Providers, Payers	Web Application	Mobile Application	Partner Portal

Experience APIs: APIs for External Portals

Process APIs	/ Business / Functional Processes	/ Orchestrations	/ Microservices	/ Extraction Layer

System APIs	/ REST APIs	/ WebServices	/ Connectors	/ File Transfers

Structured / Semi-structured Data Sources

/ Epic / Oracle Cerner / Salesforce Health Cloud
/ Patient Portals / Claims Databases

Unstructured Data Sources

/ Fax / Handwritten Notes
/ Lab Reports

Figure 2: Overview Of Api-First Middleware Architecture (Source: Persistent)

Select the right partner for your path to interoperability

Enabling interoperability within healthcare organizations is a massive undertaking, yet it's critical to accelerate transformation, promote efficiency, and generate positive patient outcomes. While connected digital experiences are ubiquitous in other industries, healthcare continues to lag, a result of decades of legacy systems and integration that hinder high degrees of flexibility and agility. With technology advancements and the evolution of integration patterns to weave disruptive technologies together, achieving interoperability is no longer an unsurmountable proposition. An API-based, three-layered architecture represents a critical next step in integration that can handle complex integration problems and enable interoperability, delivering benefits for providers, insurers, patients, and caregivers. However, healthcare organizations will need to be diligent in selecting the right partner to bring next-level interoperability to fruition.

At Persistent, we have extensive experience in developing solutions for major healthcare and life science organizations across the globe. We work with:

3 of top 5 Healthcare Payers	**5 of top 10** Healthcare Providers	**50+** Health Tech / Med Tech / ISV Providers
3 of top 10 Pharma / CRO / CDMO	**3 of top 5** Medical Device Manufacturers	**4 of top 5** Analytical Instruments Companies

Persistent collaborates with clients to break down data silos and realize the true potential of data by leveraging an API-first middleware design. Our Integration capabilities span across all major enterprise Integration tools and open-source technologies. We also possess our own Solution Accelerators for enabling faster time to market for our clients.

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Learn more about our Integration practice and start your journey to interoperability for value, growth and efficiency

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