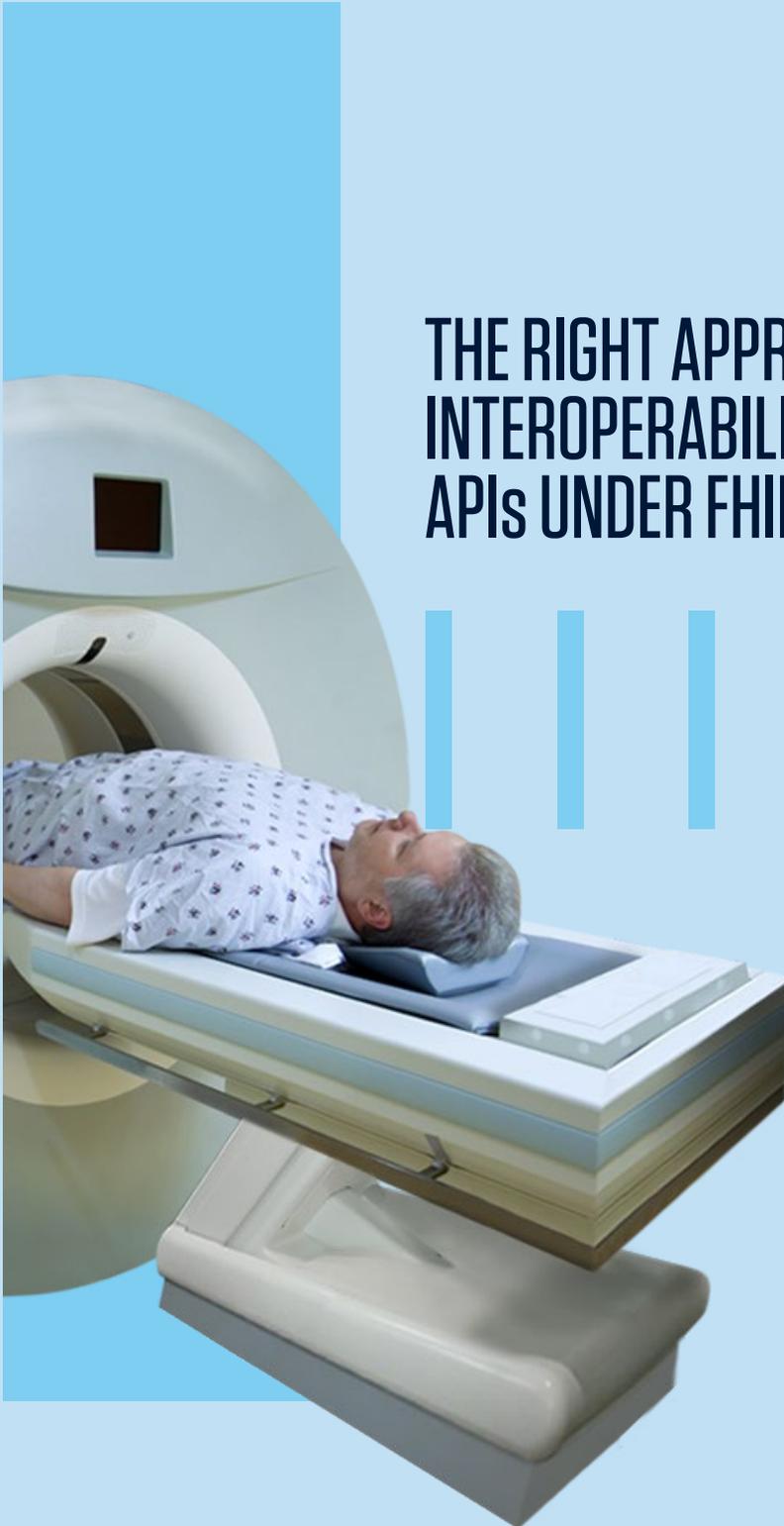


THE RIGHT APPROACH TO TESTING INTEROPERABILITY OF HEALTHCARE APIs UNDER FHIR





Abstract

Historically, the lack of mutual data exchange on patient health between entities in the healthcare industry has impaired the quality of patient care. This has led to poor health outcomes and increased costs for patients. The Trump administration's MyHealthEDData initiative has the stated objective of placing the patient at the center of the US healthcare system. The initiative aims to promote interoperability of patient health data between entities using latest technologies such as cloud and APIs.

This paper outlines the test approach to ensure compliance with the CMS (Centers for Medicare and Medicaid Services) payor policies mandate effective July 2021. The paper explains 3 simple steps for interoperability of cloud/on-premises healthcare APIs between payors and providers as per Fast Healthcare Interoperability Resources (FHIR) guidelines using the Infosys FHIR testing solution. This solution has been built on the proven Infosys Interoperability Test Automation Framework that leverages open-source tools, cloud components, and test servers.



Introduction

All healthcare payors, providers, and stakeholders need to ensure that their systems are truly interoperable based on Fast Healthcare Interoperability Resources (FHIR) guidelines. Organizations are seeking to minimize the manual effort involved in ensuring data integrity and real-world testing as per these guidelines. The need of the hour is test accelerators that can seamlessly integrate with FHIR cloud/on-premises servers to run automated conformance and data validation tests.

Key challenges



Fragmented data consolidation

Currently, organizations have non-standard data consolidation architecture due to the nature of their source systems. To be CMS (Centers for Medicare and Medicaid Services) certified, organizations must implement FHIR-compliant microservices-based architecture for API enablement including authentication and security policies. This adds additional complexities for testers to validate data accuracy and performance at the FHIR layer (cloud/on-premise) in addition to specification conformance validation.

Adoption and interpretation of FHIR standards

FHIR standards have base rules, constraints, and other metadata that make them complex to interpret and derive conformance scenarios. FHIR regulated payors and providers will be required to implement FHIR compatible cloud/on-premises based healthcare APIs considering different market segments like Medicare, Medicaid, and any other state-specific inclusions. They also need to enable various FHIR resources such as diagnostics, medication, care provision, billing, payments, and coverage to be accurate and accessible as per the standard SLAs for patient and provider.

Real world testing

This is a gray area at this initial stage because of the lack of a SMART application (a user-facing application that connects to payors or providers for a patient's health records). This limits the process of simulating and validating complete end-to-end testing for FHIR conformance. A payor or provider must qualify themselves as FHIR compliant both internally and externally through acceptance from consumers. To achieve acceptance, a payor needs to conduct multiple tests to cover data integrity, conformance, and consumer registration and consent as per FHIR guidelines. Tests need to be conducted between peer-to-peer servers, client to server, and from a standalone server to a proven FHIR-compatible test framework.

Infosys 3-step process for interoperability testing

Any test strategy to achieve FHIR compliance must be carefully structured to mitigate all known challenges. To begin with, organizations must finalize their API end-to-end operating model, cloud/on-premises implementation strategy, consent management, and intermediate data aggregation strategy so that we understand the various stages that need FHIR testing.

Infosys recommends these 3 simple steps to achieve interoperability of cloud/on-premises healthcare APIs between payors and providers as per FHIR guidelines

Step 1 – Functional/non-functional testing

The primary focus areas of functional testing are:

- Conformance (structure and behavior) validation based on FHIR specifications
- Data validation of cloud/on-premise-

based healthcare APIs through the original source or from intermediate data aggregation or virtualization. If an organization considers any data aggregation before FHIR mapping, then additional testing around data quality should be done to ensure source data is aggregated correctly at the FHIR layer

Non-functional testing such as performance and security testing are equally important given that APIs are exposed externally using OAuth2.0 or OpenID connect protocols.

Step 2 – Regulatory compliance testing

This validation should ensure payor or provider complies with the guidelines defined by CMS and FHIR. The primary focus of regulatory compliance testing is on features mandated by HealthIT standards which includes self-discoverability, capability statement, authentication/authorization, FHIR conformance and so on. Every payor must undergo this testing so that they can pass the CMS certification within the given deadline.



Step 3 – End-user beta testing

There are several third-party healthcare applications (cloud/on-premises) that are under development by Apple, Amazon, Google, and other payor/vendors that are registered in their respective developer portals. Our strategy involves partnering

with these vendors and using their beta applications to integrate with payor FHIR servers. This will provide payors early confidence in terms of usability and conformance with regulation.

Figure 1 below depicts an end-to-end automated test-driven development flow

of Infosys Interoperability Test Automation Framework covering the 3-step testing procedure. The framework leverages Infosys FHIR Testing Solution, open-source tools, cloud components, and test servers to achieve FHIR compliance seamlessly across various healthcare entities within a short time to market.

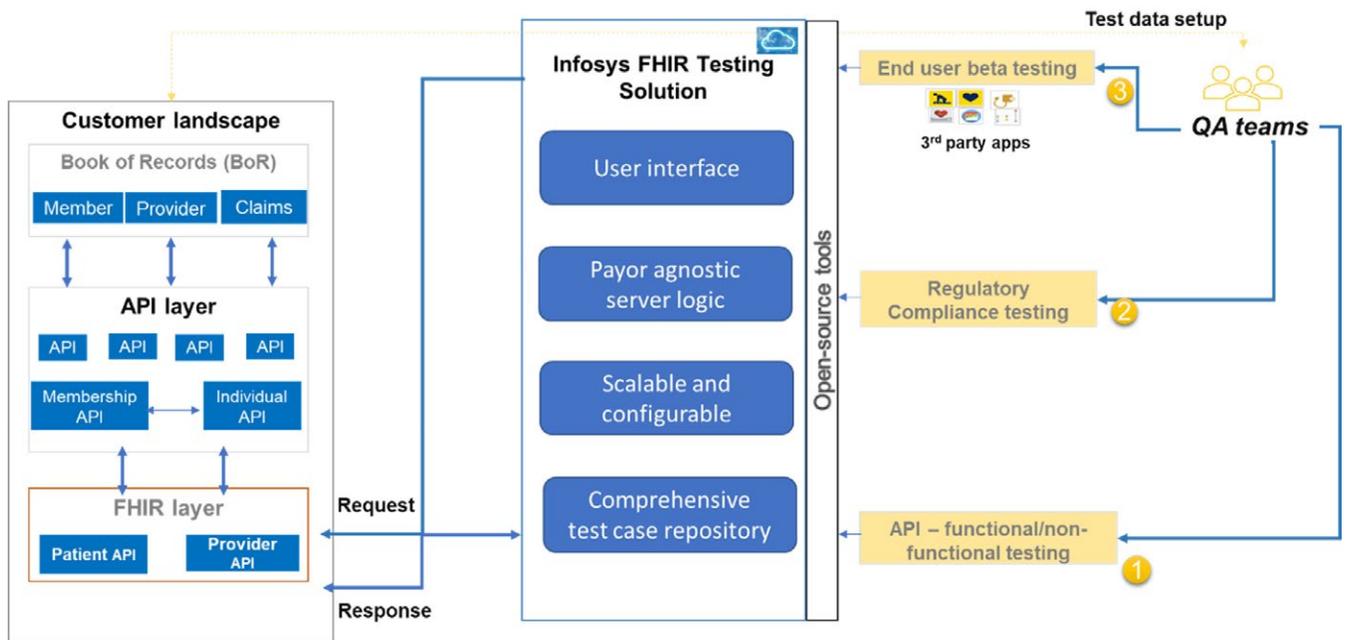
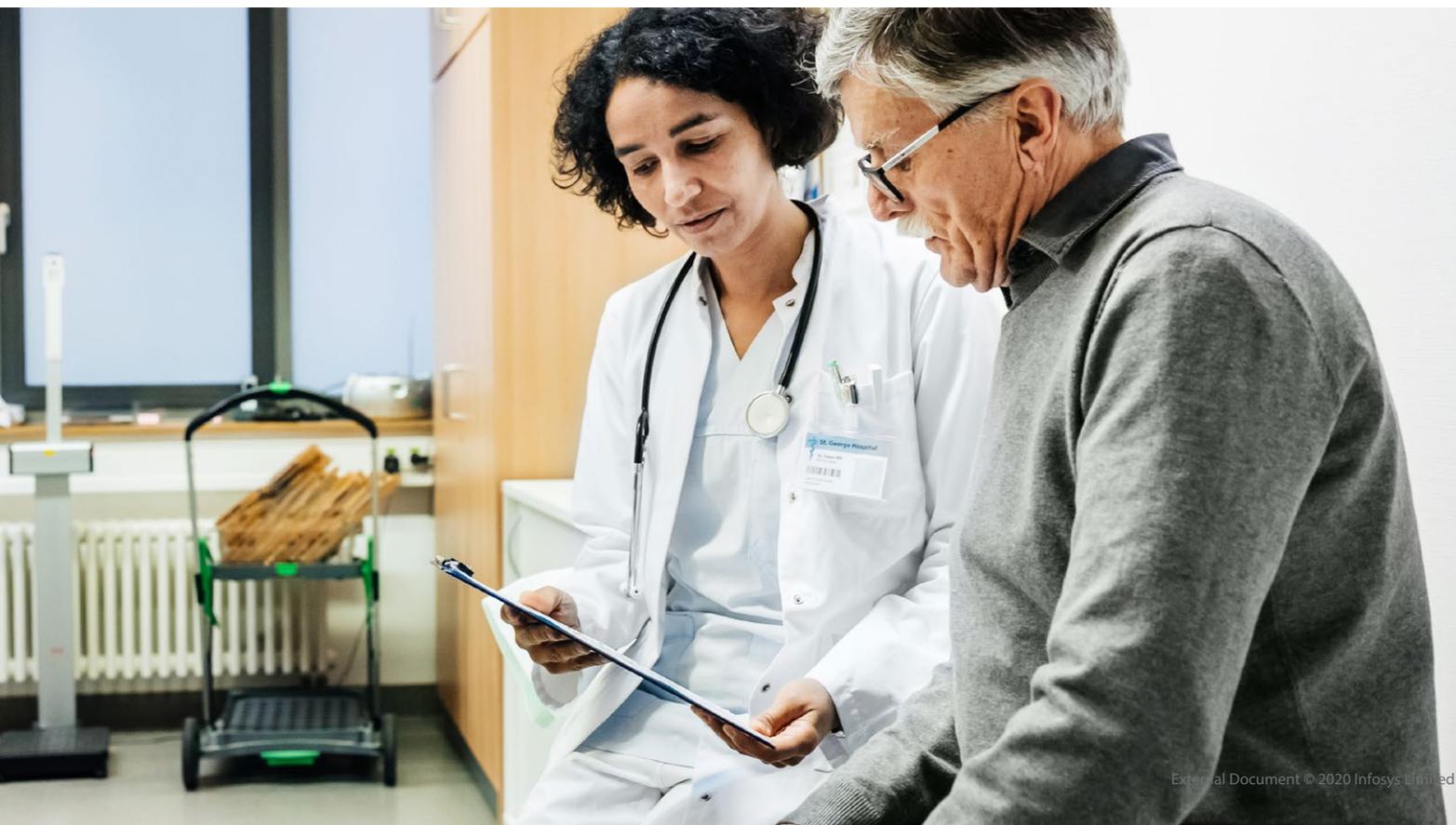


Figure 1: Infosys Interoperability Test Automation Framework





The road ahead

Today, organizations are focused on getting their FHIR-compliant cloud/on-premises based patient access API and provider directory API up and running. However, organizations must also think

of other policies specified in the CMS final rules. These include payor to payor data sharing, improving user experience for the beneficiary, and admission/discharge/transfer event notifications. With such requirements in mind, payors and vendors need to think about developing a scalable

test automation framework that not only works between payors and consumers but also across payors.

Infosys is enhancing the capabilities of its FHIR testing solution so that it is future ready.



Conclusion

Establishing end-to-end testing for FHIR guidelines compliance across healthcare payors and third-party vendors comes with its own challenges and complexities. The only way forward is based on the final CMS interoperability rule.

A solution that ensures fast and effective delivery of FHIR rules to consumers should focus on two key aspects:

- *Building configurable FHIR accelerators with the ability to support cloud/on-premises FHIR servers*
- *Identifying FHIR-compliant consumers for continuous testing practices*

The end goal is to build a test approach that can be scaled rapidly based on the rate of increase in FHIR adoption by payors, providers and consumers.

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