



Shaping Healthcare Possibilities

# Modernizing digital pathology with cloud native Interoperability & AI driven workflows

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CASE STUDY

## About the Client

A large integrated health system serving a major metropolitan region sought to transform its digital pathology operations. With multiple hospitals, extensive care locations, and a rapidly expanding patient population, the organization aimed to elevate diagnostic workflows through modernization, standardization, and intelligent automation. Their goal: build a scalable, interoperable foundation capable of supporting next generation pathology, research, and AI powered clinical decision

## Business

The client's pathology environment had evolved inconsistently across five hospitals and multiple specialty labs, each operating its own legacy scanners, viewers, and LIS workflows. This created real, day-to-day operational friction for pathologists, lab techs, and clinical teams

## Key challenges included:

### Fragmented image formats and non-standardized workflows across sites



Different hospitals used different whole-slide scanners producing proprietary formats, forcing pathologists to manually convert or request re-scans when collaborating across locations



This inconsistency often delayed tumor board preparation and cross-site consultations

### Limited visibility across specimen lifecycle



The LIS was not consistently integrated with scanners and viewers, leading to missing or incomplete metadata



Pathologists often spent additional time validating case IDs, stain types, or block

### Inefficient remote and consult workflows



External consultations required physical slide shipment between hospitals



Urgent cases sometimes experienced 12–24 hour delays because the digital system could not seamlessly route images to remote subspecialty reviewers

## AI adoption blocked by non-standard data pipeline



Each lab stored images differently, preventing the organization from training AI models or running vendor tools consistently



Even simple tasks like retrieving annotated images for research required heavy manual effort

## Operational strain from rising case volumes and workforce shortages



With case volumes rising 8–12% annually, and only minor staffing increases, turnaround times for routine cases began to drift



Supervisors lacked real-time dashboards to balance workloads across hospitals, resulting in uneven distribution and

These issues were not only technical but operational, impacting efficiency, consistency, and diagnostic agility.

The health system needed a unified, cloud-native digital pathology backbone to eliminate fragmentation and prepare for AI-powered diagnostics.

## The Solution

To address these challenges, a comprehensive digital pathology modernization initiative was designed using a **cloud native, standards driven architecture**.

## The solution incorporated:

### Standards-Based Interoperability



Adoption of **DICOM** and **HL7 standards** to ensure consistent, cross platform compatibility



Development of a **metadata enrichment tool** to integrate LIS–EMR information into DICOM files for seamless downstream utilization

### Cloud-Native Architecture

Built on modern cloud services including:



**Healthcare APIs, DICOM Store, DICOM Web Adapter** for secure, scalable image ingestion and retrieval



**Pub/Sub, Big Query, and serverless components** for event-driven processing, data enrichment, and workflow automation



**IAM-based security** to ensure robust governance and controlled access across clinical and research domains

### Integrated Application Ecosystem



Streamlined image acquisition workflows compatible with leading whole slide scanners



Secure, compliant remote viewing capabilities



Multi-environment interoperability across PACS, AI platforms, and research tools

### Application and Infrastructure Modernization



React based frontend; Node.js, Go, and Java services based frontend; Node.js, Go, and Java services



Centralized logging via **CloudWatch**



Automated security and vulnerability management



Multitenancy support with isolation of environments across the enterprise

### Tech Stack



**Google Cloud Technologies:** Healthcare APIs, DICOM Store, DICOM Web Adapter, Pub/Sub, Big Query, IAM



**Standards:** DICOM, HL7



**Other Tools:** Metadata enrichment tool, LIS-EMR integration

This cohesive framework created a future-ready digital pathology backbone that supports clinical care, research, and AI innovation.

## Value Delivered

The modernization effort transformed how the health system manages, shares, and analyzes pathology images across its enterprise



## For Physicians and Pathology Teams



**Cross site reads now happen in minutes instead of hours**

because standardized DICOM images flow seamlessly into a unified cloud viewer



**Pathologists can perform remote sign-out securely**, improving flexibility and extending subspecialty coverage to smaller hospitals



**Less administrative overhead:** Automatic metadata enrichment eliminates manual case verification and reduces error rates



**Improved workload balancing:** Leaders now have real-time insight into case queues, enabling dynamic redistribution and faster turnaround times

## For Patient Experience



**Faster diagnosis and reduced wait times**, especially for oncology cases requiring subspecialty review



**Improved accuracy and consistency of reads** through standardized image capture, structured metadata, and AI ready infrastructure



**Reduced need for repeat biopsies** since missing or unreadable scans have significantly decreased

## For the Health System



**A single enterprise-wide digital pathology platform** replaced fragmented legacy systems, reducing operational overhead



**AI readiness established:** Images are now stored in consistent DICOM format, enabling integration with multiple AI vendors and research programs



**Scalable, cloud native foundation** supports future expansion to dermatopathology, cytology, and computational pathology initiatives



**Secure, governed data sharing** allows clinical teams, researchers, and external partners to collaborate faster and more safely

This modernization created a future ready digital pathology ecosystem—one that accelerates diagnosis, improves clinician experience, enhances patient outcomes, and establishes a scalable platform for next generation AI innovation



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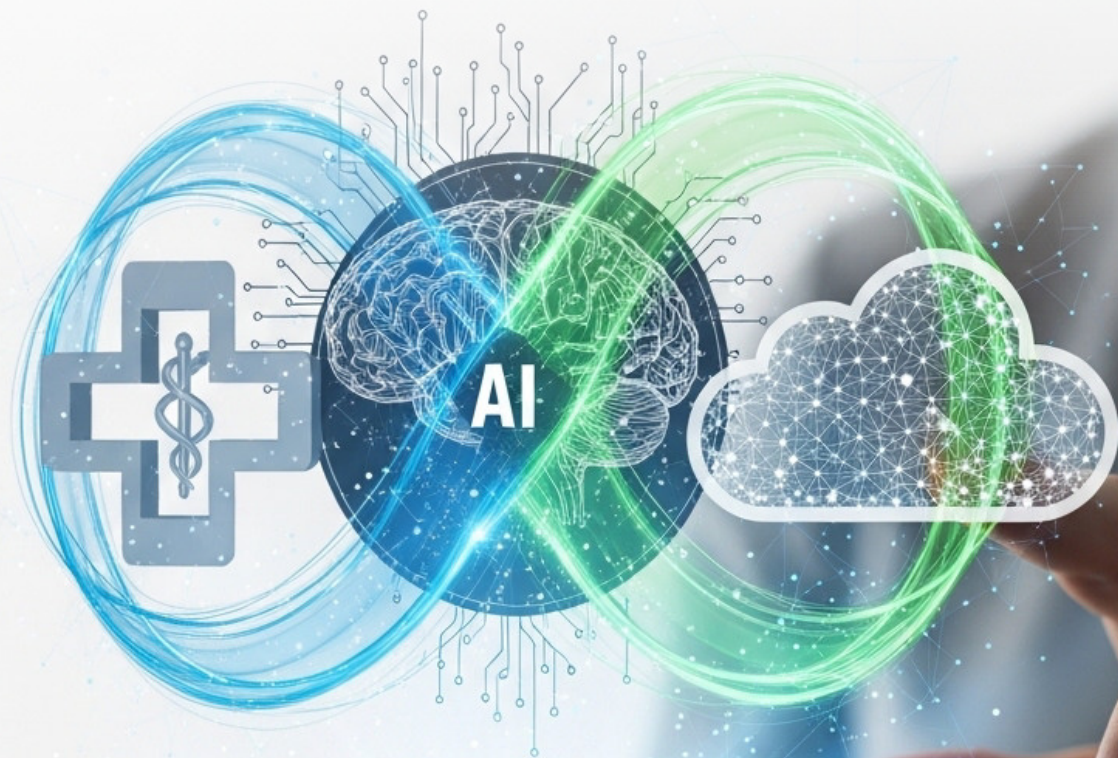


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### About CitiusTech

CitiusTech is a global technology services, consulting, and business solutions enterprise 100% focused on the healthcare and life sciences industry. We enable 140+ enterprises to build a human-first ecosystem that is efficient, effective, and equitable. Leveraging deep domain expertise and next-generation technologies including AI, Cloud, Data, and Intelligent Automation, we assist our clients in realizing their vision, accelerate transformation, and achieve business outcomes. With 7,700+ healthcare technology professionals worldwide, CitiusTech powers digital innovation, business transformation, and industry-wide convergence through next-generation technologies, solutions, and products. Follow CitiusTech on Twitter or LinkedIn.

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