



HALO AP® Integrations Facilitate Diverse Digital Pathology Workflows

Introduction

The digital transformation of pathology marks a pivotal advancement in diagnostic and research workflows. While digital pathology platforms offer significant benefits, the integration of these platforms into existing laboratory infrastructures presents unique challenges. To harness the full potential of digital pathology, laboratories require

a solution that offers robust interoperability and seamless integration across a variety of software, hardware, and data systems.

This white paper explores the critical importance of interoperability and integration in digital pathology. Using **HALO AP®** from Indica Labs as a case study, it demonstrates how flexible solutions can enhance

workflow efficiency and diagnostic accuracy. Through real-world examples, the paper illustrates how HALO AP® has been successfully implemented in a wide variety of laboratories and institutions, showcasing its integration capabilities and the resulting benefits for pathologists and other laboratory staff.

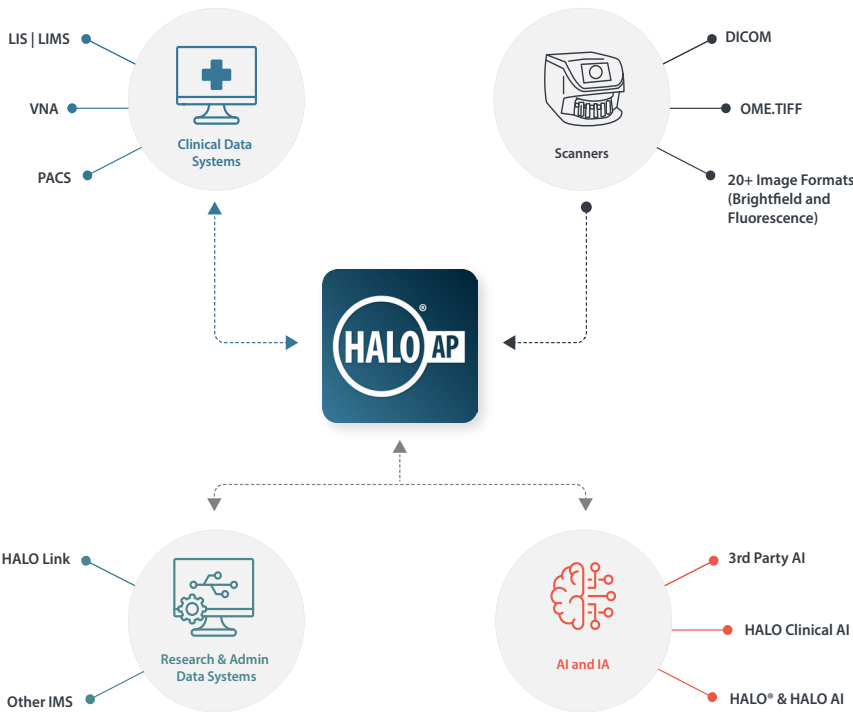


Figure 1. HALO AP® is compatible with a wide range of brightfield and fluorescent image file formats, including DICOM and OME.TIFF. It supports slide deidentification for research and algorithm development workflows, ensuring data privacy and security. Bidirectional connectivity via API enables seamless integration with existing laboratory systems.

The Value of Interoperability

Interoperability is the cornerstone of a successful digital pathology system, enabling the integration of diverse instruments, scanners, and software tools. This capability allows pathologists to streamline workflows, collaborate remotely, and reduce turnaround times. It also enables laboratories to adopt new technologies like AI and image analysis algorithms without disrupting existing processes or causing service interruptions.

A focus on interoperability is foundational to all of Indica Labs' platforms, including HALO AP®. HALO AP® is a flexible and interoperable platform that is compatible with a wide array of scanners, is interoperable with clinical data systems including laboratory information systems (LIS) and laboratory information management systems (LIMS), vendor neutral archives (VNA) and picture archiving and communication systems (PACS), image management systems (IMS) for research, and is compatible with a wide range of AI and image analysis solutions (Figure 1).

Enhancing Diagnostics with Remote Sign-Out at a Multi-Center Pathology Practice

HALO AP® was implemented at a large pathology practice in the UK as part of their digitization effort. Prior to bringing in HALO AP®, physical slides were couriered between locations for review, significantly delaying diagnosis and treatment. With HALO AP®, digital slides are immediately available for review, allowing pathologists to access and sign out cases from any location. The integration between HALO AP® and the LIS | LIMS ensures that all relevant

clinical information is available at the pathologists' fingertips, further enhancing workflow efficiency (Figure 2). Consultations can easily be requested from collaborators across the globe via a secure link, further expediting the diagnostic process.

Key Benefits:

- + **Immediate access to cases and faster diagnoses:** Eliminates delays associated with physical slide transport and with slides available immediately upon uploading, patients receive diagnoses faster and can start treatment sooner.
- + **Integrates clinical data:** Provides a comprehensive view of the patient and their history.
- + **Improves collaboration:** Facilitates second opinions and consultations with ease.

Integrating with LIS | LIMS for Optimized Workflows

The integration of HALO AP® with LIS | LIMS is critical to optimizing day-to-day operations in pathology laboratories. This integration allows for

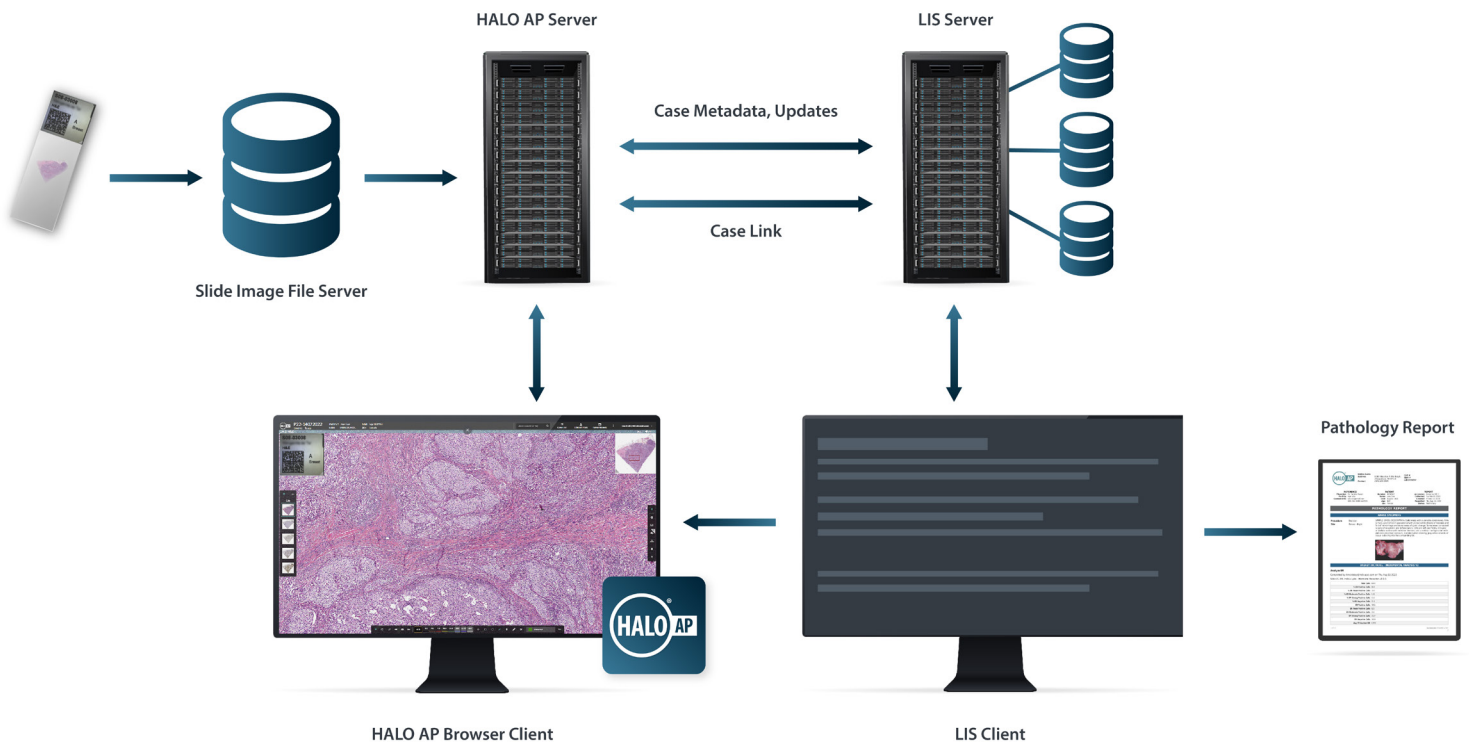


Figure 2. Workflow diagram of remote sign-out using HALO AP® showing the digital slide upload, pathologist review, and integration with LIS | LIMS.

the automation of routine tasks, ensures accurate data transfer, and supports regulatory compliance. HALO AP® was customized to integrate with the existing LIS at a large pathology practice in North America. The LIS supported HL7 messaging for sharing patient, case, and slide information, which was easily connected via the flexible integration engine built into HALO AP® (Figure 3).

The integration engine also supports HTTP-based communication, or direct integration via the GraphQL API of HALO AP®. During development, desired work and dataflows were carefully mapped in collaboration with the pathology practice resulting in a customized, bidirectional integration designed to synchronize patient, case, and status information between systems, thus increasing efficiency, reducing errors, and eliminating the need for manual data entry. The customized integration workflow also included automatic ingestion and display of gross specimen and electron microscopy (EM) images. For renal pathology cases, this supported simultaneous display of EM, immunofluorescent, and brightfield images.

Key Benefits:

- + **Customizable integration:** Adapts to each laboratory's unique requirements, compatible with most existing LIS | LIMS, software, and hardware platforms.
- + **Facilitates seamless workflows:** By automating data transfer, a properly integrated LIS and digital pathology system reduces manual errors and ensures data integrity.

Integration of AI Tools for Enhanced Diagnostic Accuracy

Artificial intelligence (AI) is advancing pathology by automating complex tasks and providing decision support for pathologists. The seamless integration of AI tools into HALO AP® enables pathologists to leverage AI-driven insights directly within their workflow, improving diagnostic accuracy and efficiency.

At a multi-center pathology practice in Europe, [Breast IHC AI](#) has been deployed with HALO AP® as an in-house validated test to assist in the quantification of breast cancer IHC expression in

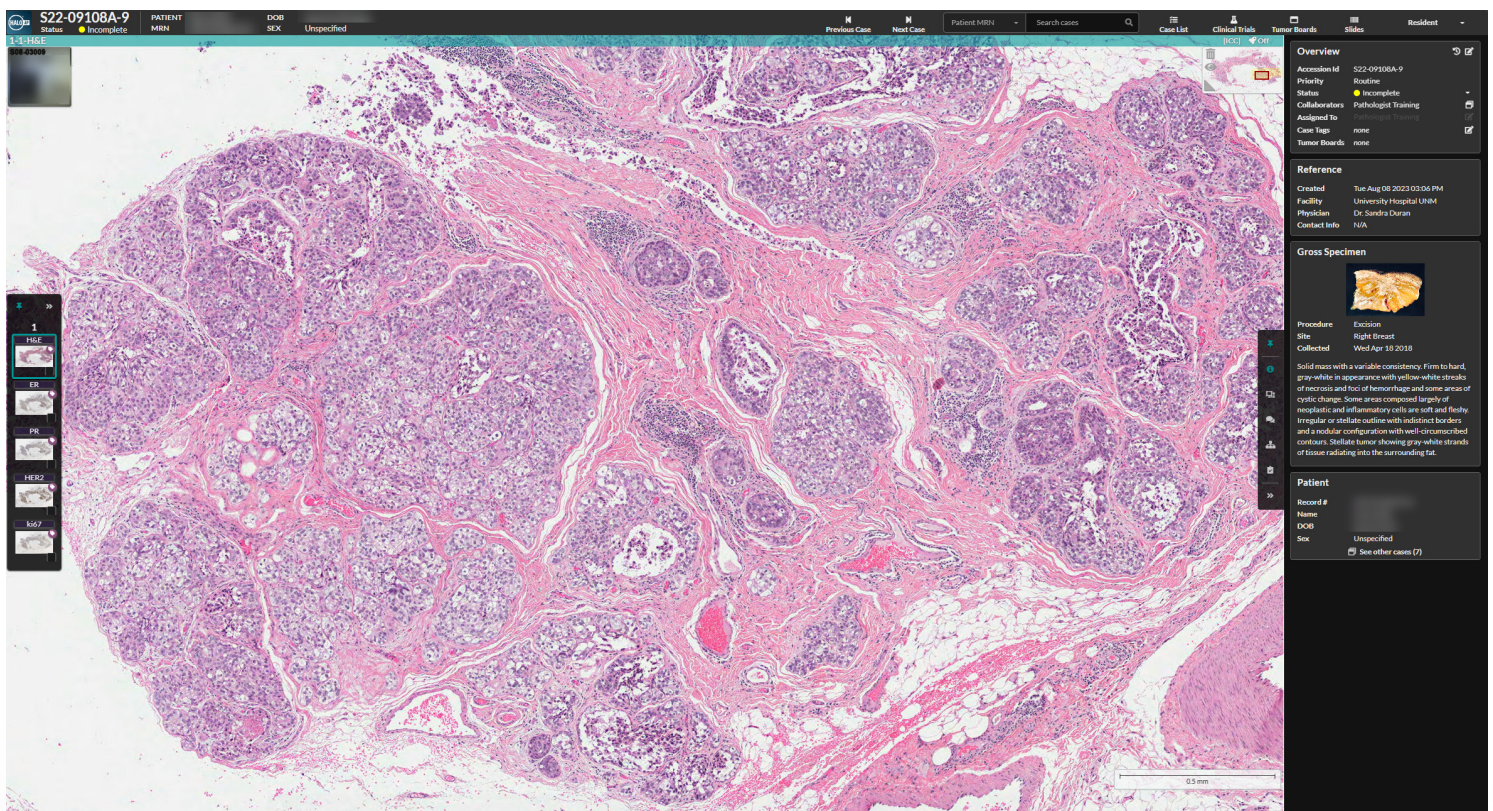


Figure 3. HALO AP® interface with patient data, gross and slide images automatically populated from LIS | LIMS data.

cases of invasive primary breast cancer. The tool quantifies the expression of HER2, ER, PR, and Ki67 and automatically calculates the percentage of positive cells by degree of expression, an Allred score, and an intensity score. All this information can be generated before the pathologist receives the case, expediting the review process. The AI analysis is presented within the HALO AP® interface, allowing pathologists to review and approve the results before sign-out (**Figure 4**).

Results can be sent from HALO AP® to the LIS | LIMS for incorporation into the final synoptic report.

Key Benefits:

- + **Standardizes biomarker evaluation:** Reduces interobserver variability and improves consistency
- + **Increases workflow efficiency:** Automates repetitive tasks, allowing pathologists to focus on complex cases
- + **Highlights regions of interest:** Alerts pathologists to regions of interest for further examination

Third-Party Integrations: Expanding Capabilities

In addition to AI tools from Indica Labs, HALO AP® supports third-party AI and software integrations, enabling laboratories to incorporate a wide range of AI algorithms and image analysis tools. This open architecture ensures that laboratories stay at the cutting edge of pathology without being locked into a single vendor's platform. Current third-party AI integrations include products from Paige¹, Ibex, Lunit², Deep Bio³, and more.

HALO AP® also offers hardware integrations for ancillary workflows to streamline laboratory operations.

For example, integration with the Tissector automated macrodissection platform from Xyall streamlines the macrodissection process by enabling the transfer of annotations generated within HALO AP® to the Tissector to direct the removal of annotated tissue for analysis⁴.

At a leading precision medicine laboratory in the United States, Lunit SCOPE PD-L1 was integrated into HALO AP® and validated as a laboratory

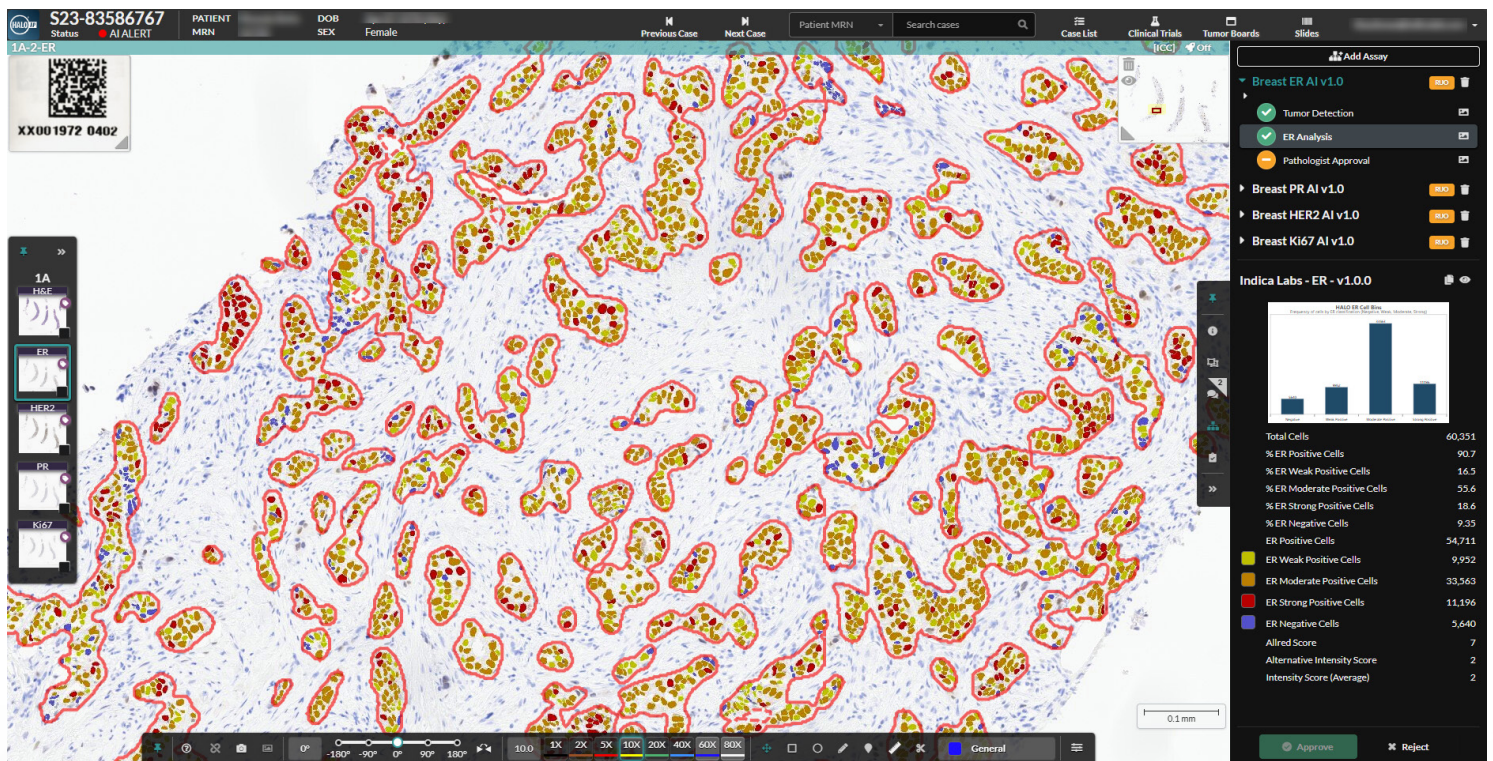


Figure 4. Breast IHC AI case showing IHC expression analysis markup and summary results for ER.

developed test to streamline the analysis of PD-L1 IHC expression and scoring for tumor proportion score (TPS) analysis in non-small cell lung cancer and combined positive score (CPS) analysis for breast, bladder, and pan-cancer applications. The three-way integration between Lunit SCOPE PD-L1, HALO AP®, and the client LIMS allows pathologists to automatically quantify PD-L1 IHC expression, significantly decreasing the time required to analyze slides and collect data, especially for large cases and studies with many slides (Figure 5).

Key Benefits:

- + **Power of Choice:** Customers can select from a wide array of AI tools to pick the best tools for their workflows.
- + **Workflow Unification:** Work with third-party AI natively within HALO AP®.
- + **Streamlines Laboratory Operations:** Hardware integration enables automated macrodissection workflows

Bridging the AI Gap

At a leading academic medical center in the EU, researchers have leveraged the power of HALO® and HALO AI to develop custom AI algorithms tailored to their specific pathology needs. Recognizing this potential, the institution has implemented a seamless

workflow to transition these custom algorithms from the research environment of HALO into the clinical setting using HALO AP®. This process involves rigorous validation and a careful lockdown procedure to ensure the algorithms meet all necessary regulatory requirements for clinical use.

This innovative approach allows the institution to bridge the gap between cutting-edge research and clinical practice, bringing custom-developed AI tools directly into the diagnostic workflow in a controlled, secure manner. It exemplifies how HALO and HALO AP® can work in tandem to advance both research and clinical care in pathology.

Key Benefits:

- + **Tailored AI solutions:** Enables development of custom algorithms specific to unique institutional needs.
- + **Seamless bench-to-bedside transition:** Facilitates the deployment of algorithms created in a research lab into the clinic.
- + **Accelerated innovation:** Encourages continuous adaptation and improvement of AI algorithms to meet evolving clinical needs.



Figure 5. Workflow of Lunit SCOPE PD-L1 integration with HALO AP®.

Summary

The adoption of digital pathology platforms like HALO AP® is transforming the practice of pathology by enhancing workflow efficiency, improving diagnostic accuracy, and enabling the integration of advanced AI tools. In the rapidly evolving digital pathology landscape, choosing a platform that maximizes digital pathology and AI capabilities is crucial. The flexibility and interoperability of HALO AP® future-proofs laboratories, ensuring adaptability to technological advancements and integration with new diagnostic tools. HALO AP® empowers modern pathology laboratories with unparalleled integration, flexibility, and precision, ensuring they are equipped for both current needs and future advancements.

References

1. [Indica Labs and Paige Forge Strategic Partnership to Expand Integrated AI for Anatomic Pathology Labs](#)
2. [HALO AP® and Lunit Application Note: Deployment of Lunit SCOPE PD-L1 in HALO AP® at Guardant Health](#)
3. [HALO AP® Third-Party Integrations Case Study: HALO AP® Enables Seamless Integration of Third-Party Image Analysis Algorithms](#)
4. [HALO AP® and Xyall Press Release: Molecular and Digital Pathology Innovators Xyall and Indica Labs Forge Global Collaboration to Transform Precision Oncology Workflows](#)

HALO AP® is CE-IVDR marked for in-vitro diagnostic use in Europe, the UK, and Switzerland. HALO AP® is For Research Use Only in the USA and is not FDA cleared for clinical diagnostic use. In addition, HALO AP® provides built-in compliance with FDA 21 CFR Part 11, HIPAA, and GDPR.

HALO AI Prostate is CE-marked for in-vitro diagnostic use in Europe, the UK, and Switzerland. HALO AI Prostate is For Research Use Only in the USA and is not FDA cleared for clinical diagnostic use. HALO AI Prostate is accessed via the HALO AP® enterprise digital pathology platform.

Breast IHC AI is For Research Use Only and not intended for clinical diagnostic use. Breast IHC AI is accessed via the HALO AP® enterprise digital pathology platform.

Lung PD-L1 AI is For Research Use Only and not intended for clinical diagnostic use. Lung PD-L1 AI is accessed via the HALO AP® enterprise digital pathology platform.

SlideQC BF is intended to be used as a quality control tool for whole slide images and is not regulated as a medical device in the EU/UK. SlideQC BF is for Research Use Only in the USA and is not FDA cleared for clinical diagnostic use. SlideQC BF is accessed via the HALO AP® enterprise digital pathology platform.

HALO Macrodissection Solutions are for Research Use Only and not intended for clinical diagnostic use. HALO Macrodissection Solutions are accessed via the HALO AP® enterprise digital pathology platform.

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