Digital Pathology &
The Open Platform

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Digital Pathology Solutions
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technology revolutions enabling the true "virtual" clinical pathology lab

Availability of Global Collaboration Suites
(Google Docs, Office365)

The Rise of Practical Artificial Intelligence
(Deep Learning for images)

The Digitization of the Clinical Pathology Lab
Our vision: foster a Digital Pathology Eco-System around an Open Platform

Digital Pathology needs to bring **mobility** and **flexibility** to the pathologist, so that he or she can work from **anywhere**, and **present**, **share** and **participate** fully in multidisciplinary team meetings, tumor-boards, and conferences. All without any concessions to **patient safety** and **privacy**.

An Open Pathology Platform is needed to **enable** the pathology applications of the future, by establishing an **eco-system** around an **open pathology platform**, with **shared applications**, **data** and **know-how** contributed by industry, academia and the open source community.
Our Inspiration: collaborative suites on the modern day "Web 2.0"
Where we are Today: Philips Intellisite Pathology Solution – Collaboration

The Portal IMS virtual or physical, central or on one of the sites. Gives high availability & scalability.

Site A

Local IMS

Images are stored locally. View from anywhere, with image streaming.

Portal IMS

Secure Network

https

Portal IMS: single worklist for all sites

For seamlessly networked lab

Single sign-on (SSO) support

Users sign in once for all sites

Site B

Local IMS

Images

Cases

Secure Network

https

Images

https

https

Images

https

Images
Where we are Today: Philips Intellisite Pathology Solution – a Scalable Solution

<table>
<thead>
<tr>
<th></th>
<th>Minimum Configuration</th>
<th>Maximum Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scanners</strong></td>
<td>1</td>
<td>+1</td>
</tr>
<tr>
<td><strong>Sites</strong></td>
<td>1</td>
<td>+1</td>
</tr>
<tr>
<td><strong>Pathologist</strong></td>
<td>1</td>
<td>+1</td>
</tr>
<tr>
<td><strong>Workstations</strong></td>
<td></td>
<td>+1</td>
</tr>
<tr>
<td><strong>Storage (performance)</strong></td>
<td>20 TB</td>
<td>+20TB</td>
</tr>
<tr>
<td><strong>Storage (economic)</strong></td>
<td>33 TB</td>
<td>+33TB</td>
</tr>
<tr>
<td><strong>Archive</strong></td>
<td>200 TB</td>
<td>+200TB</td>
</tr>
</tbody>
</table>

- **Scanners**: 1 scanner, options to add +1 or +2 scanners.
- **Sites**: 1 site, options to add +1 sites.
- **Pathologist Workstations**: 1 workstation, options to add +1 workstations.
- **Storage (performance)**: 20 TB, options to add +20TB.
- **Storage (economic)**: 33 TB, options to add +33TB.
- **Archive**: 200 TB, options to add +200TB.
Evolution: Future direction of the Philips IntelliSite Pathology Solution

To build the Pathology applications of the future, we need a platform that allows for:

1. **Interoperability**: allow 3rd party slide scanners and whole slide image viewers to seamlessly work with the platform, by providing secure and simple open interfaces.*

2. **Flexibility**: allow migration of the data in the platform to or from alternative platforms using standards such as DICOM and HL7.

3. **Extensibility**: allow adding functionality to the platform by the customer or any other 3rd party to enable a pathology ecosystem.

4. **Mobility**: allow working on, sharing and presenting content from any location, on any device.

*FDA on interoperability: Ability of medical devices, clinical systems, or their components to communicate in order to safely fulfill an intended purpose.
Requirements for An Open Pathology Platform

- **Security, privacy and patient consent** must be guaranteed at all times.
- **Mobile workers** require data that can be accessed from anywhere.
- **The size of digital images** require smart sending of only required data

No Files! & No Multiple Software Suites!
High Level Concept of An Open Pathology Platform

**Pathologist Suite**
- Viewer
- Case list

**Lab Manager Suite**
- Dispatch
- Dashboard

- List Assigned Cases
- Assign Cases
- View Slide Region

Open Pathology Platform

- Whole Slide Images
- Clinical Data
- Pathology Services

https://PathologyServices

Clinical Data

Pathology Services
A case study for the open pathology platform: computational pathology apps

Why is Computational Pathology not aiding pathologists in the clinical practice today?

Most of today’s Computational Pathology products:
• Require **context switching**: for pathologist attention, and data to a different software application.

• Require **significant interaction**: to select the relevant area, to configure the algorithm, to tune the thresholds

• **Are time consuming**: they take tens of seconds to minutes *while the pathologist is waiting.*
Seamless Computational Pathology – applications that are seamlessly integrated into the lab workflow

- Slide production
- Scanning
- Analysis
- Review
- Signout

Intelligent

Find & annotate
Measure / count
Digital Tests
Enhanced Reporting

Order extra slides / tests

Analyze, Influence & Inform to:
- Increase quality
- Increase efficiency
- Increase transparency
An Open Pathology Platform for Computational Pathology Apps

Pathologist Suite
- Viewer
- Case list
- Analytics cockpit

Scanner
- Analytics Engine
- Workflow Program: how & when to run
- Algorithm Program: model & settings
- Visualization Program: result visualization

Analytics App
- Install Algorithm on Analytics Engine
- Assign algorithms to slides based on LIS information
- Display and interact with Algorithm results

Workflow Program:
- how & when to run

Algorithm Program:
- model & settings

Visualization Program:
- result visualization

Pathology Platform
- Scan Engine
- Pixel Engine
- Analytics Engine
- Workflow Engine
The Open Pathology Platform needs Open (Web) Standards

- **Pixels**: bits & bytes to pixels
- **Physics**: pixels to physical quantities
- **Connected Workflow**: interoperability

- DICOM Store/Retrieve
- DICOM WADO-RS
- ICC Medical Imaging Workgroup
- IHE, FHIR, HL7
Digital Pathology – the cloud versus on-site – Hybrid Open Platform

Small amount of “hot” data
Benefits from relatively cheap bandwidth on the premise.

Huge amount of “cold” data
Benefits from relatively cheap elastic storage and compute in the cloud
We aim to improve diagnostic efficiency and quality of the pathology lab, by enabling a Networked Virtual Pathology lab, fully decoupled from the wet lab by automated 1st time right slide digitization. Pathologists will work, share data and collaborate anytime and from anywhere on an open, extensible Digital Pathology Platform.

Myriad digital pathology and computational pathology “apps” can be imagined and indeed are needed to create this virtual pathology lab, and no single party can aim to provide all of them, or even enough of them to give it the critical mass it needs to deliver it's full promise.