

Building and deploying digital pathology infrastructure for a heterogeneous user base

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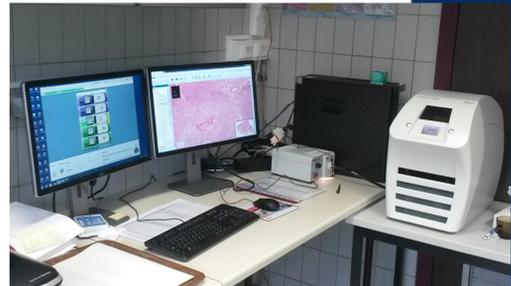
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Abstract

At Brussels Free University (VUB), we wanted to build a core digital pathology infrastructure to support a range of different use cases. Various images platforms needed to be accessible through a single access point, while still supporting different user profiles. We wanted a scalable solution that would allow interaction between equipment from different research groups intra and extramuros. A combination of commercial hardware, commercial software, and open source software was used to get this accomplished. Custom coding to connect interfaces was used where needed. We built a centralized infrastructure that integrates a variety of imaging platforms (brightfield, fluorescence, zstacking), and we now have an interconnected network of heterogeneous and scalable information silos. Image analysis and data/image mining projects can remain stuck in micro-environments due to limits artificially imposed by vendor-specific solutions. We have shown this need not be the case, and have integrated five different imaging platforms onto one architecture. We are storing data from all modalities in a single storage facility, and can manage it through a single access point. We support 40+ users, working on different use cases, including education, biobanking, and telepathology.

Overview of the imaging platforms and web interfaces



Enhanced network and local cloud infrastructure

Viewing software

PMA.view Viewer

Slide hosting

PMA.core Server

Student website

Custom built

Whole slide image repository

Education

Zeiss Axioskop 40

Snapshot with mounted-on camera

Cell-counting in ImageJ

Aperio CS2 scanner

PATHOMATION

Cell-counting in ImageJ

Willy Gepts Collection - the disease process in type 1 diabetes discovered

Custom ASP.net website
<http://histosrv.vub.ac.be/dbb>

ADO.Net Data Abstraction Layer (DAL)

Pathomation PMA.zui WSI visualization component

Pathomation Histol plugin for ImageJ component

Pathomation PMA core slide hosting software

Leica eSM database (slide meta-data)

Leica Slide Repository

Nikon Slide Repository

Zeiss Slide Repository

Aperio eSlide Manager

Nikon NIS-Elements

Zeiss Zen Studio

Research

API Authentication Query collection

Biobank WSI repo (Set #1, Set #2, Set #3)

User management File management PMA.core

/thumbnail PMA.forms PMA.zui viewport

<div> Integration PATHOMATION

Without digital histopathology:

I'm looking for breast tumor tissue → Sure; glad to help

Does the sample contain cancer cells → Just trust us

Is it in situ or invasive? → Just trust us

Is it hormone-responsive? → We don't have that information

With digital histopathology:

I'm looking for breast tumor tissue → Sure; glad to help

Does the sample contain cancer cells → Have a look at the HE

Is it in situ or invasive? → Have a look at the HE and the immunostains (p63 – calponine)

Is it hormone-responsive? → Have a look at the immunostains and the fluo data (FISH)

Fidelity increases, confident about requests, investments pay off

<http://www.diabetesbiobank.org>

Biobanking

Discussion & conclusion

Digital pathology involves much more than the acquisition of a slide scanner. At the VUB, we have engaged five different imaging platforms onto a single architecture. We are now storing data from all modalities in a single storage facility, and can manage it through a single access point. Furthermore, the Pathomation software platform for digital microscopy assists in rendering content to any type of display device, without the need for extra software or background information concerning the content's origin. The resulting ecosystem presents web-accessible interfaces to the right end-users at the right time. A single access portal is provided through <http://www.diabetesbiobank.org>.