NACIONĀLAIS ATTĪSTĪBAS PLĀNS 2020
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Cloud Infrastructure for Skin Cancer Scalable Detection System

Pavel Osipov, Dmitrijs Bliznuks, Alexey Lihachev

Faculty Of Computer Science And Information Technology, Riga Technical University, Riga, Latvia;
Biophotonics Laboratory, Institute Of Atomic Physics And Spectroscopy, University Of Latvia, Riga, Latvia.

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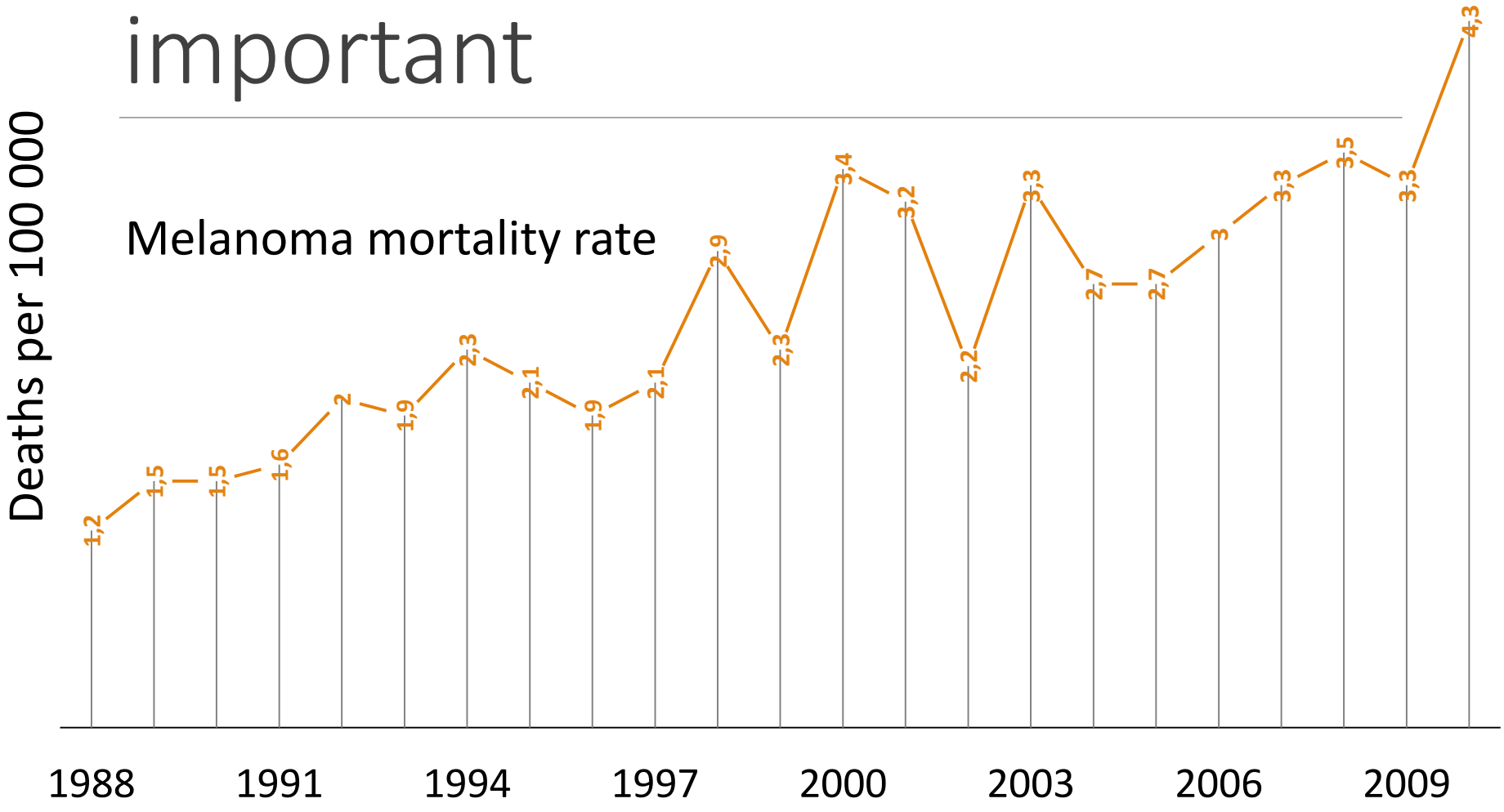
Early skin cancer detection is important



K. Azarjana, A. Ozola, D. Ruklisa, I. Cema, A. Rivosh, A. Azaryan, and D. Pjanova, "Melanoma epidemiology, prognosis and trends in Latvia," J. Eur. Acad. Dermatol. Venereol. 27(11), pp. 1352-1359, November 2013

Simple, but productive scanning device

Approach / Criteria	AQ	DP	SAP	AT	AU	Result
SDS	2,5	1	3	3	1	10,5
SDOE	3	3	2	1	1,5	10,5
SDRES	3	3	2,5	2,5	1,5	12,5
SDAA	2,5	3	3	3	3	**14,5**

Alternative systems

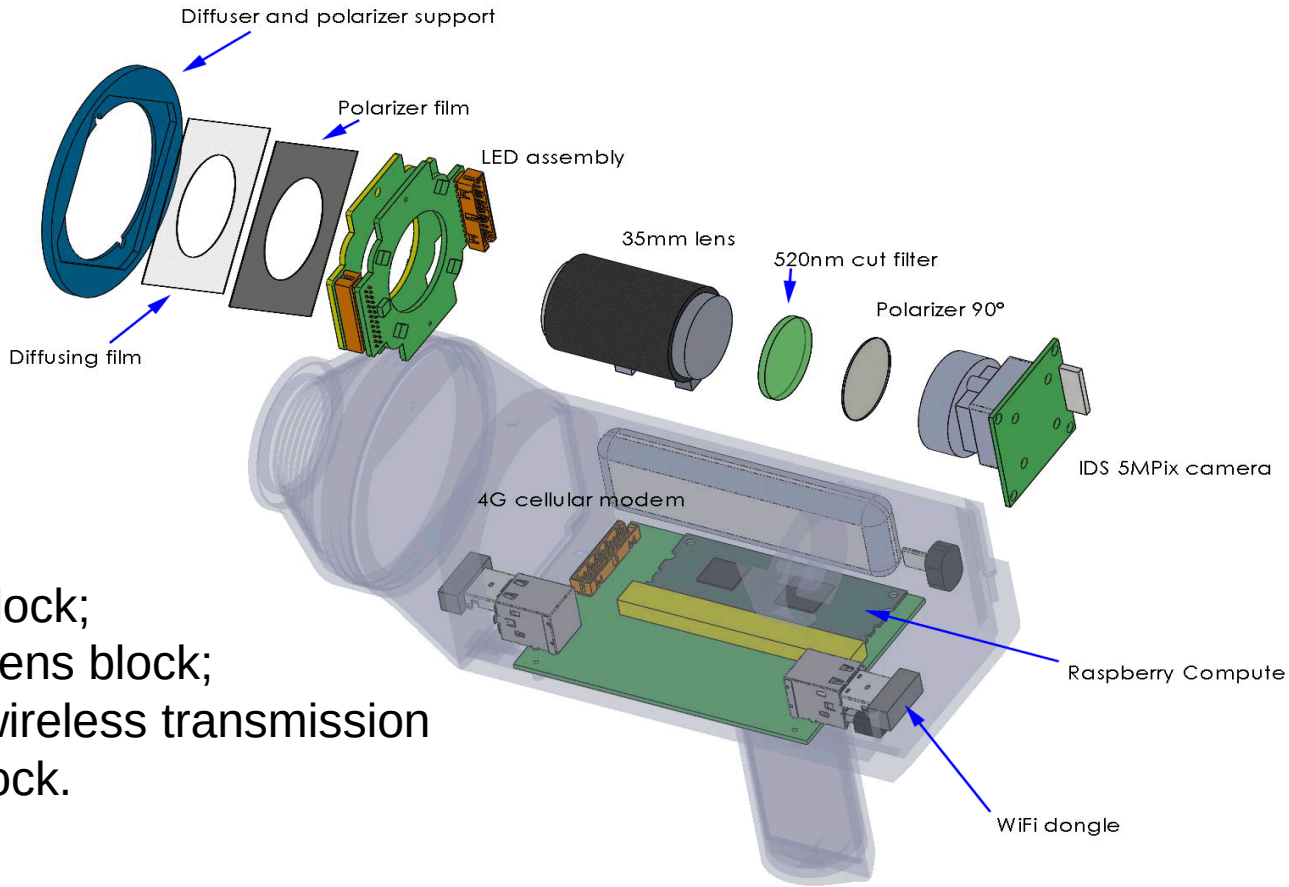
Service name	Realization specific
www.skinofmine.com, www.directderm.com, www.skinvision.com	Uses only smartphone camera without additional multispectral illumination that without doubts decreases detection quality.
www.fotofinder.de, HandyScope app	Use additional illumination, nevertheless they do not have multispectral illumination.

Advantages of cloud infrastructure

SDAA (Simple Device with Automatic Analyzing system) approach means moving most of the system into cloud infrastructure. It's set of advantages for doctors, scientists and system developers:

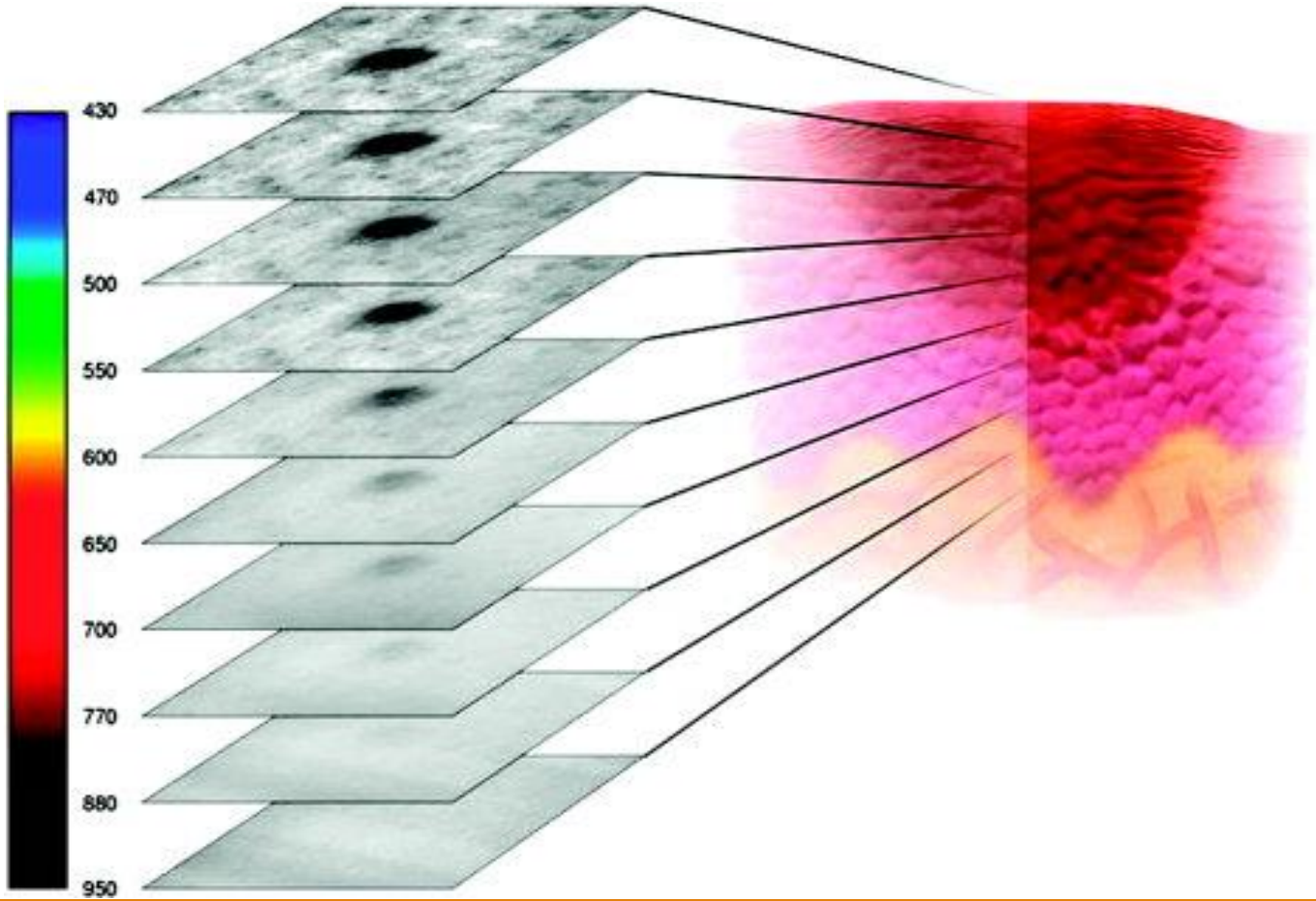
- Different located and skilled doctors;
- Easy to update algorithms used;
- Easy to see patient's scanning history;
- Easy to test new algorithms.

Our skin scanning device



- Illumination block;
- Camera and lens block;
- Processing, wireless transmission and power block.

Wavelengths’ penetration depth

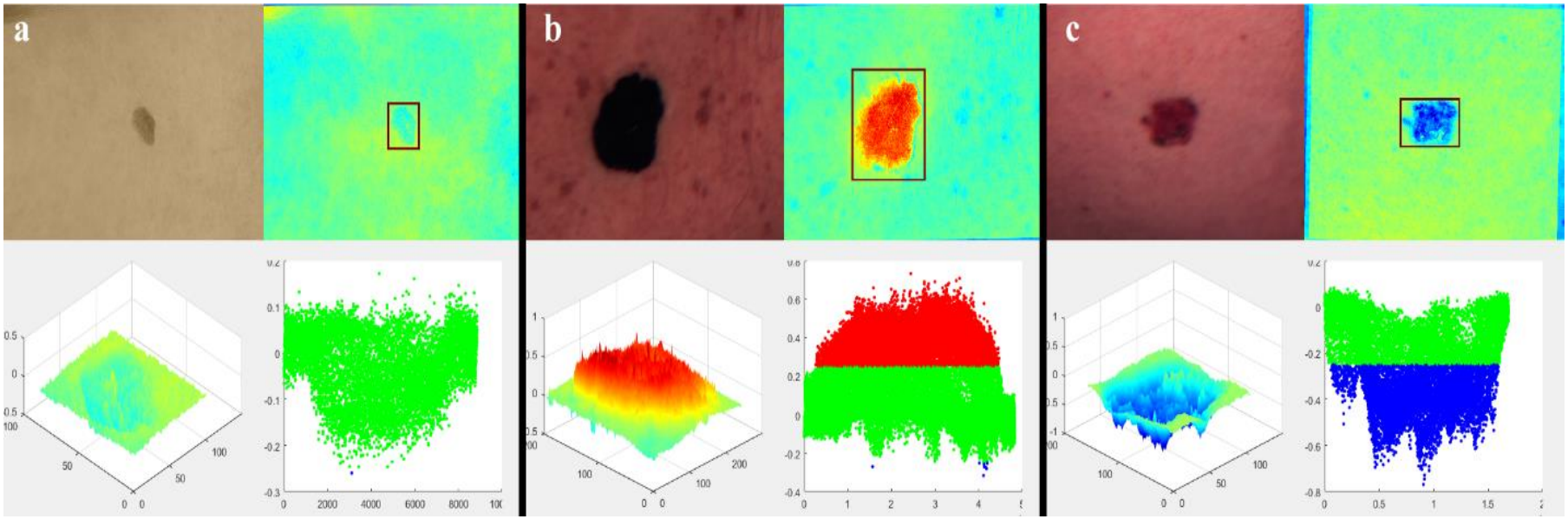


Scanning results

Nevus

Melanoma

Oxy

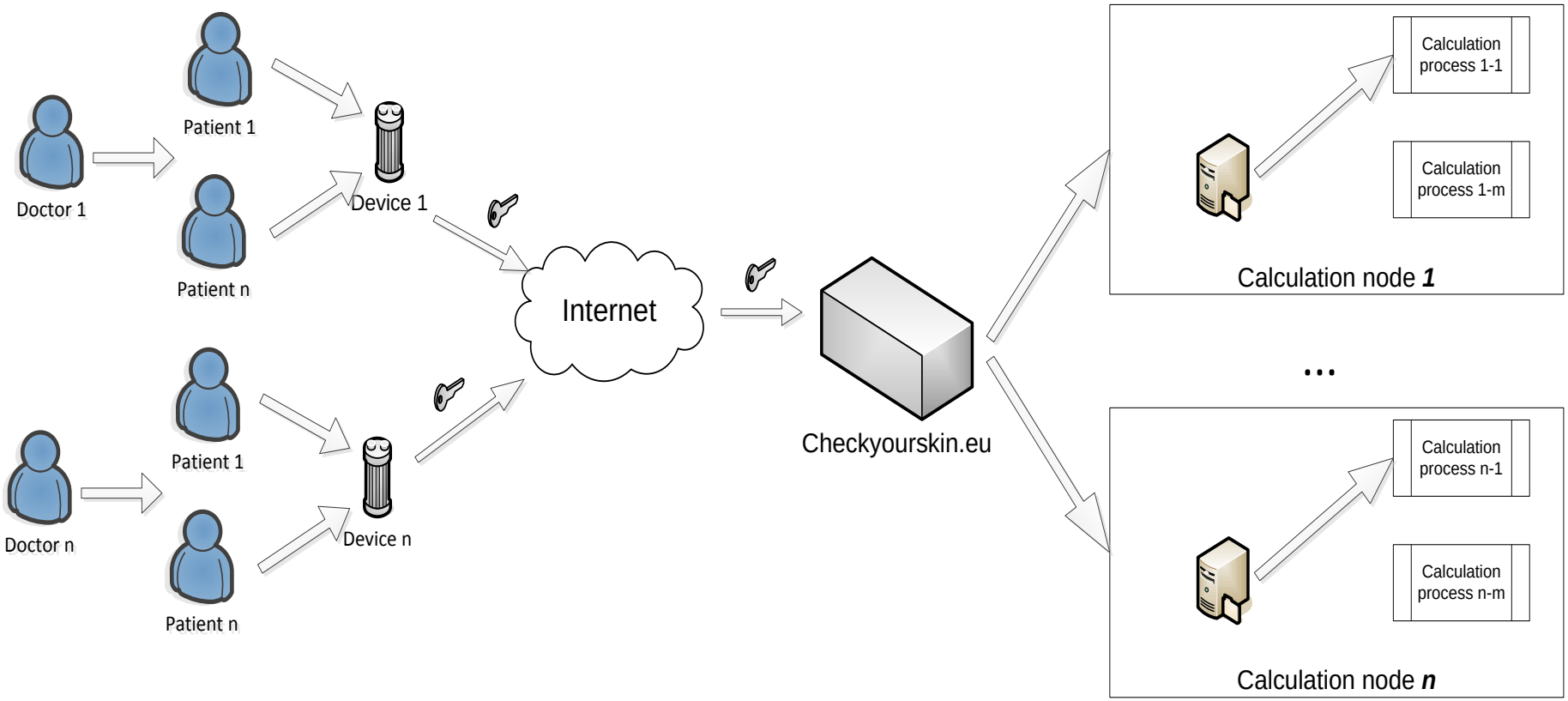


Analysis results representation

Files received from analyze

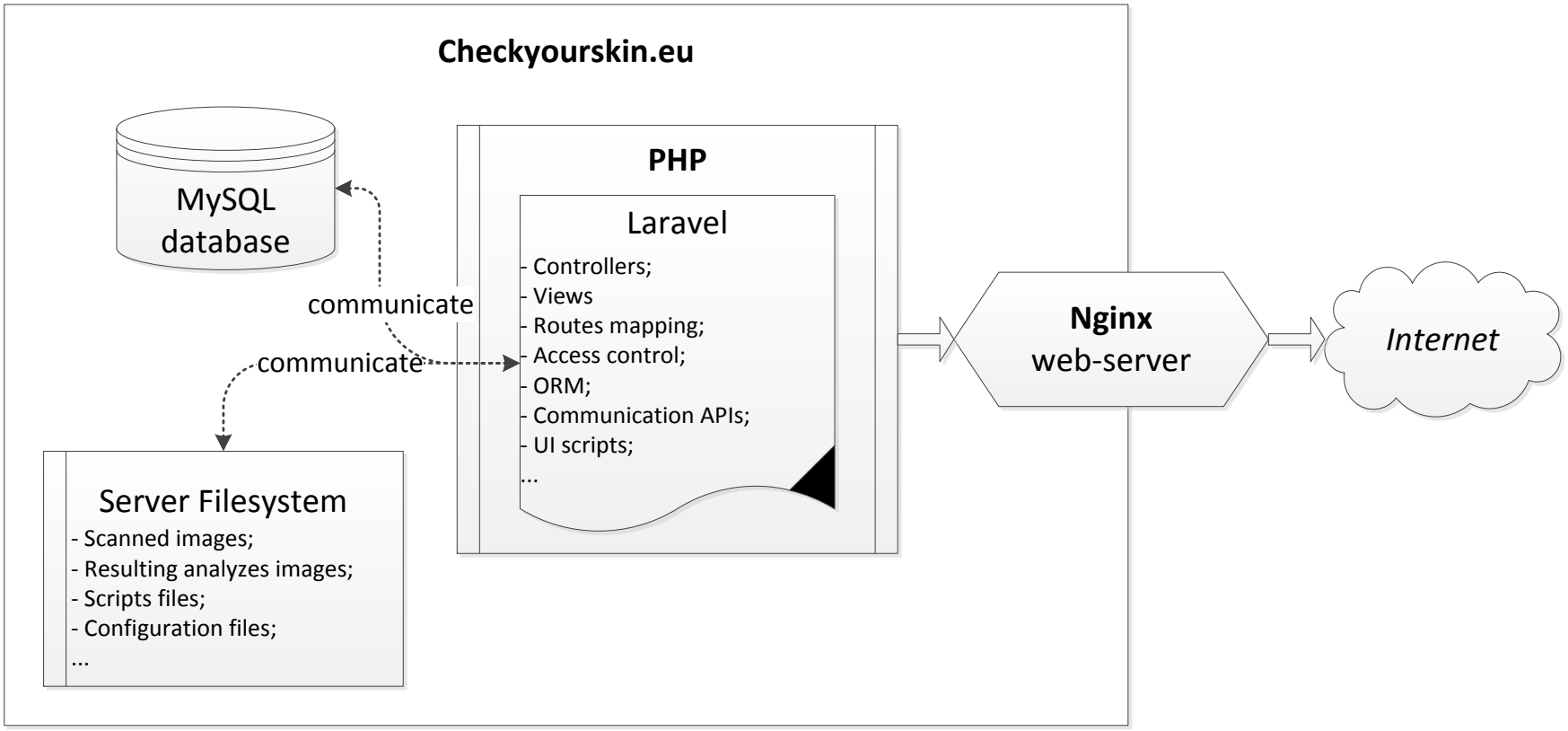
Original filename	File
result_parameter_map_jet.png	Download
result_Image_graph_2Dxz_3col.png	Download
aligned_images.png	Download
result_Image_graph_2Dyz_3col.png	Download
result_Image_graph_2Dyz_jet.png	Download
resulting_parameter_map.mat	Download
output.txt	Download
result_Image_graph_2Dxz_jet.png	Download

General structure of the system created



Main system node structure

Common modules used to build main system node.



Doctor's profile

Main menu for doctor

My patients

New patient

New measurements (7)

My profile

Active patients | Inactivepatients

Find by personal code

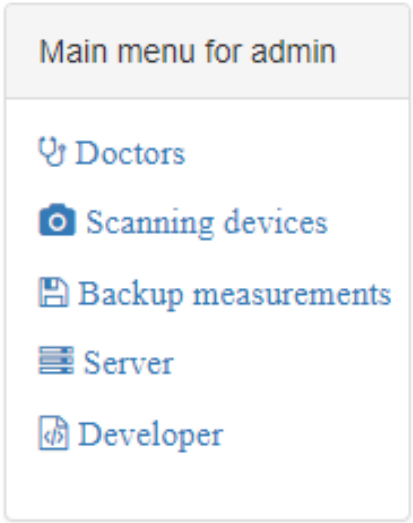
XXXXXX-XXXXX

Search

ID	Patient name	Last visit date
1	ID: #1	2017-05-27
4	ID: #4	2017-09-25
9	ID: #9	2018-03-05
13	ID: #13	2018-04-01

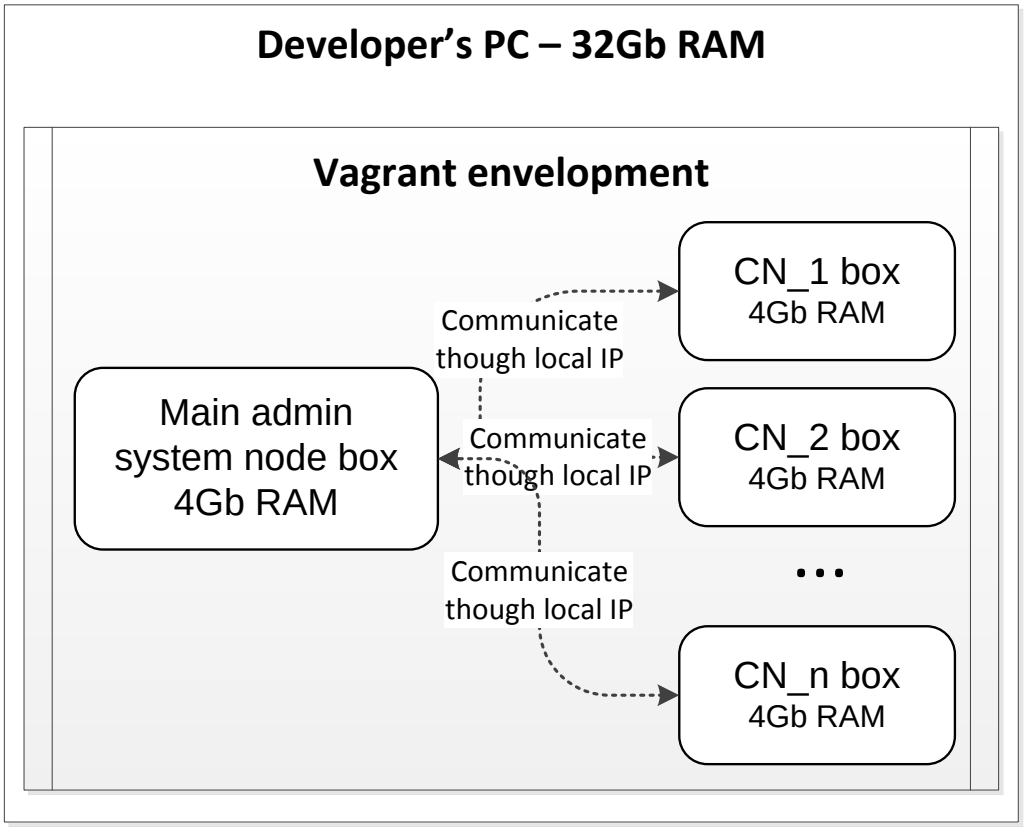
Profile of system administration

Report of server's CPU and memory usage statistic for last hour.

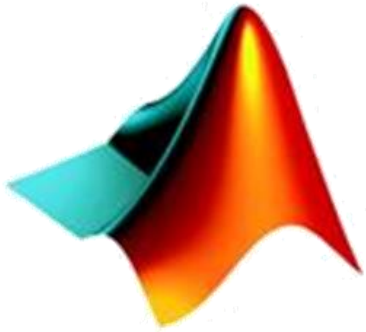


Vagrant for the environments isolation

Local PC virtual Vagrant nodes interaction envelopment.



Matlab performance



MATLAB

When used on server in command line mode, Matlab not give us any limitations comparing with GUI-based usage. However, since server not have hardware video-card, it's not possible to use GPU-based optimizations.

But we believe, what MATLAB Distributed Computing Server may help us with it in future.

Results and future work I

For now we have created cloud infrastructure what is support SDAA system for distributed skin cancer scanning devices using.

Cloud-based approach allow us to have centralized, scanning images analyze algorithms available by all scanning devices.

Additionally it allowed us to create system what unites lot of doctors what may use modern methods for patient's skin analyze.

Results and future work II

In future it's planned to increase Matlab performance to reduce count of calculation nodes and time of analyze results waiting by doctor.

Also, planned to give limited public access to system created, to allow to use system for more wide amount of people interested, first mostly scientists from another universities.

Thank you for attention!

Acknowledgment

This work has been supported by European Regional Development Fund project '*Portable Device for Non-contact Early Diagnostics of Skin Cancer*' under grant agreement # 1.1.1.1/16/A/197

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