NATIONAL DEVELOPMENT PLAN 2020

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Cloud Infrastructure for Skin Cancer Scalable Detection System

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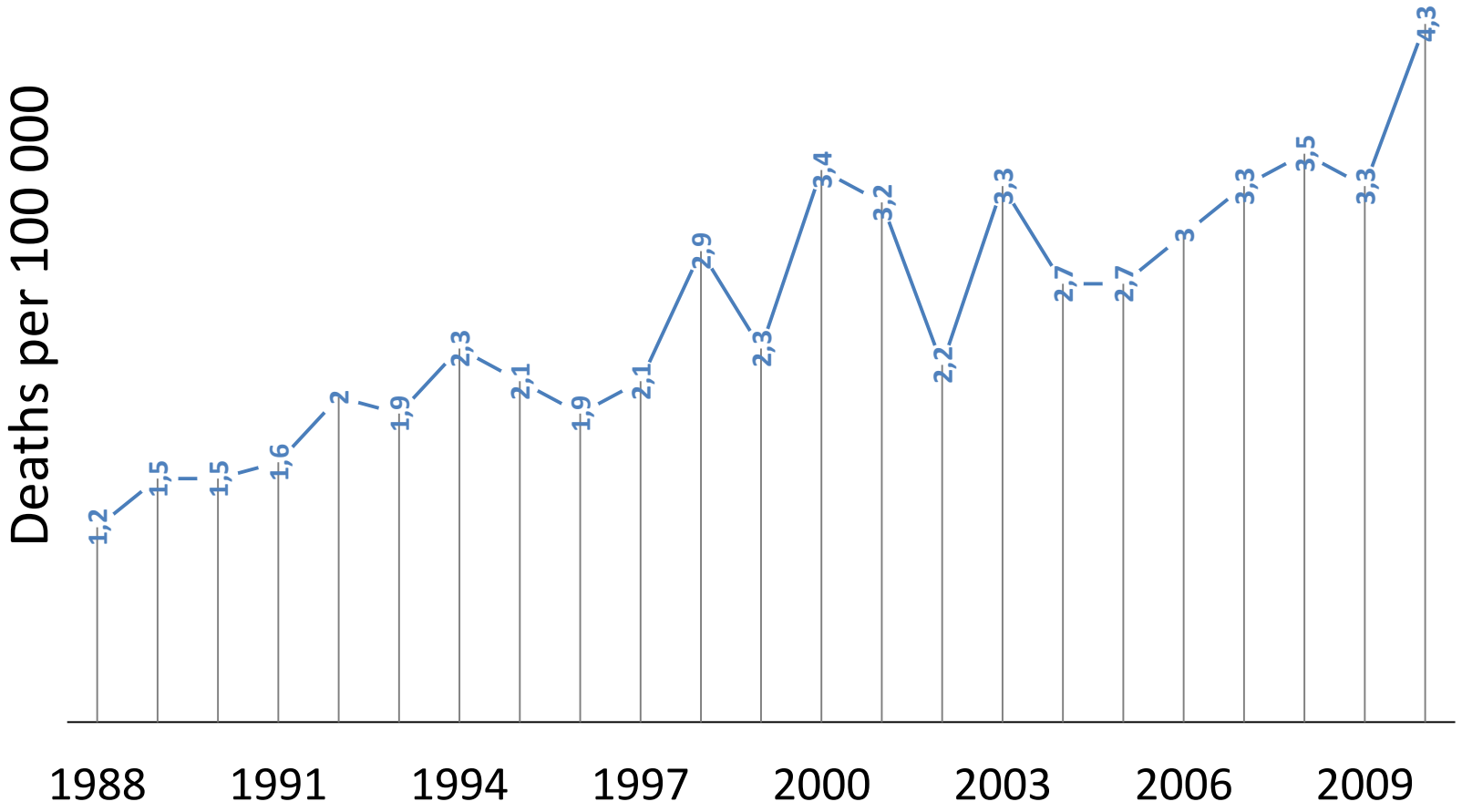
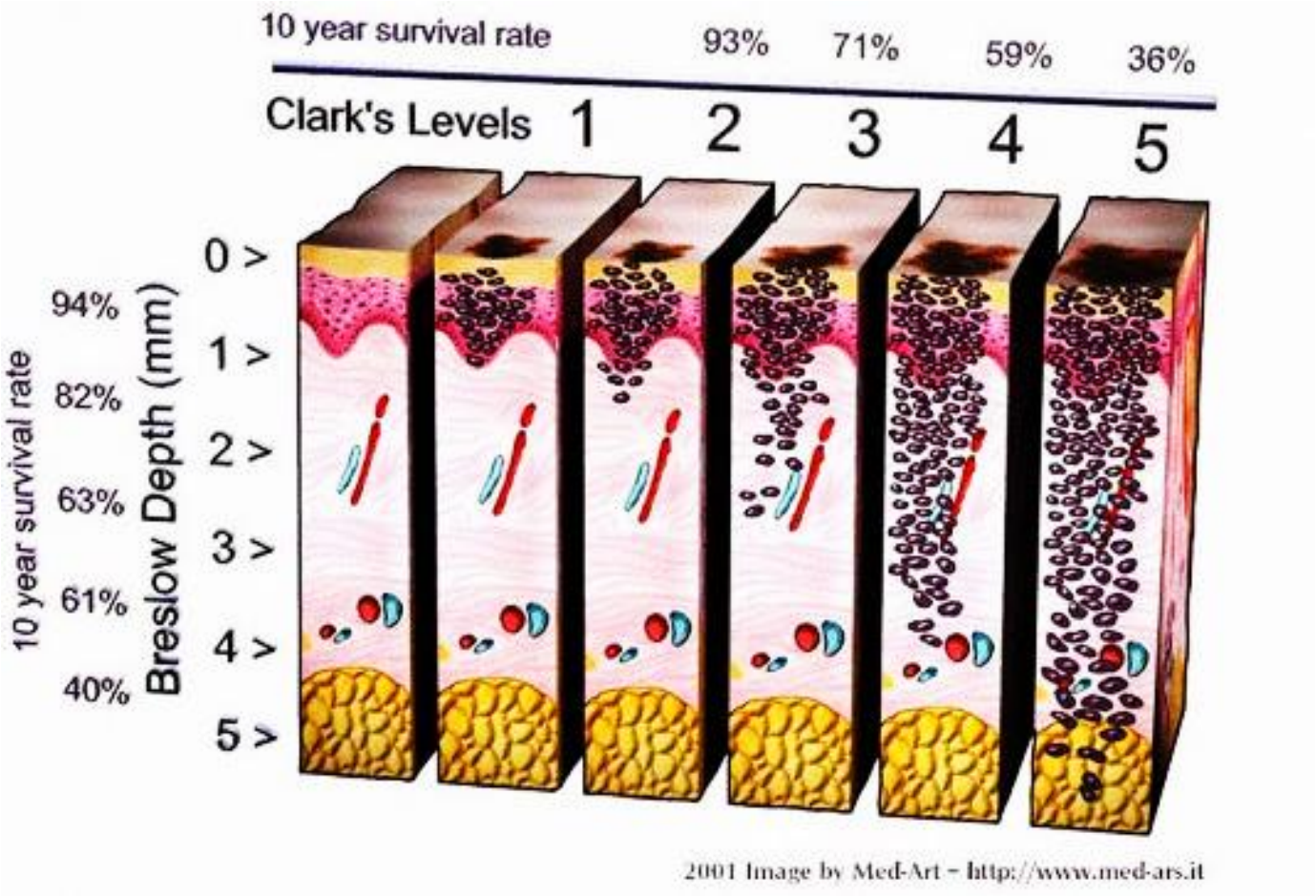
Skin cancer mortality rate



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

Early skin cancer detection is important



Possible approaches for scanning system architecture

1. *SD-S*: Smart diagnostics device.
2. *SD-OE*: Simple device with offline human expert.
3. *SD-RE*: Simple device with remote human expert.
4. *SD-AA*: Simple device with remote automatic analyze system.

Quality characteristics of the system architecture

1. Diagnostic quality (DQ).
2. Cost of the device (DP).
3. Cost of one analysis (SAP).
4. Time of obtaining the results of the analysis (processing speed) (AT).
5. Ability to make changes (adjustments) in the analysis process (AU).

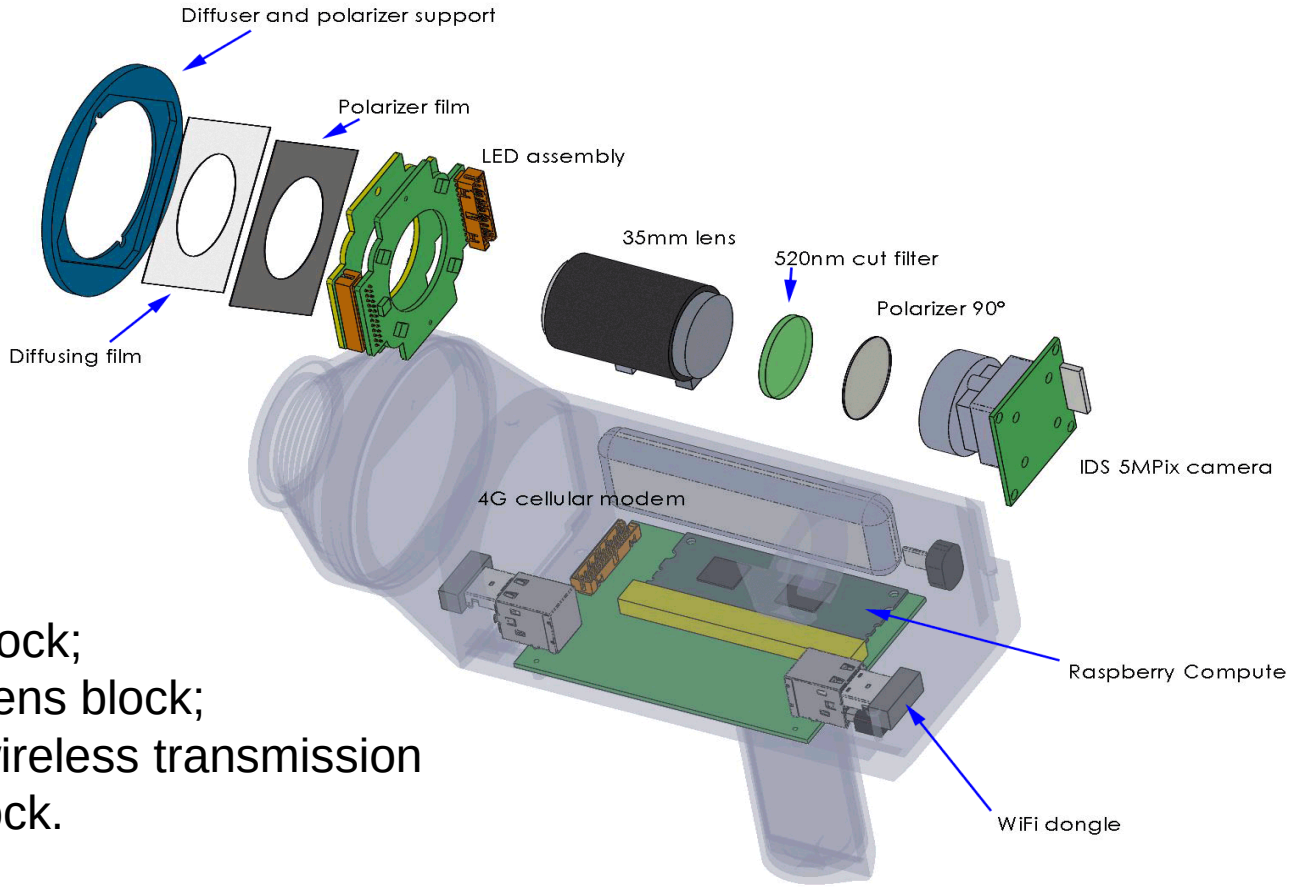
Criteria / Approach	DQ[1]	DP[2]	SAP[3]	AT[4]	AU[5]	Total
SD-S	2,5	1	3	3	1	10,5
SD-OE	3	3	2	1	1,5	10,5
SD-RE	3	3	2,5	2,5	1,5	12,5
SD-AA	2,5	3	3	3	3	**14,5**

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:

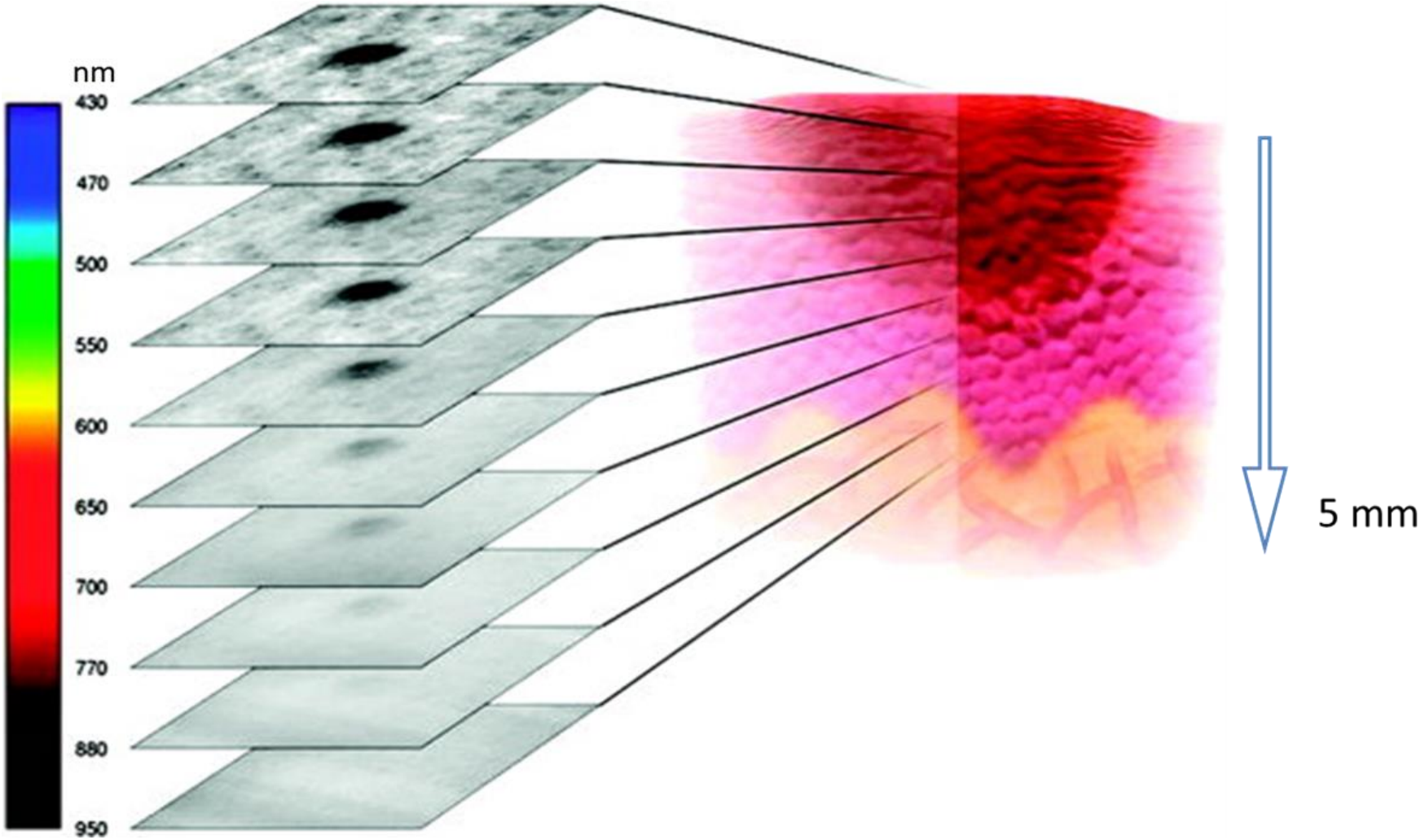
- Different located and skilled doctors;
- Easy to update algorithms used;
- Easy to see patient's scanning history;
- Easy to test new algorithms.

Our skin scanning device



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

Wavelengths' penetration depth

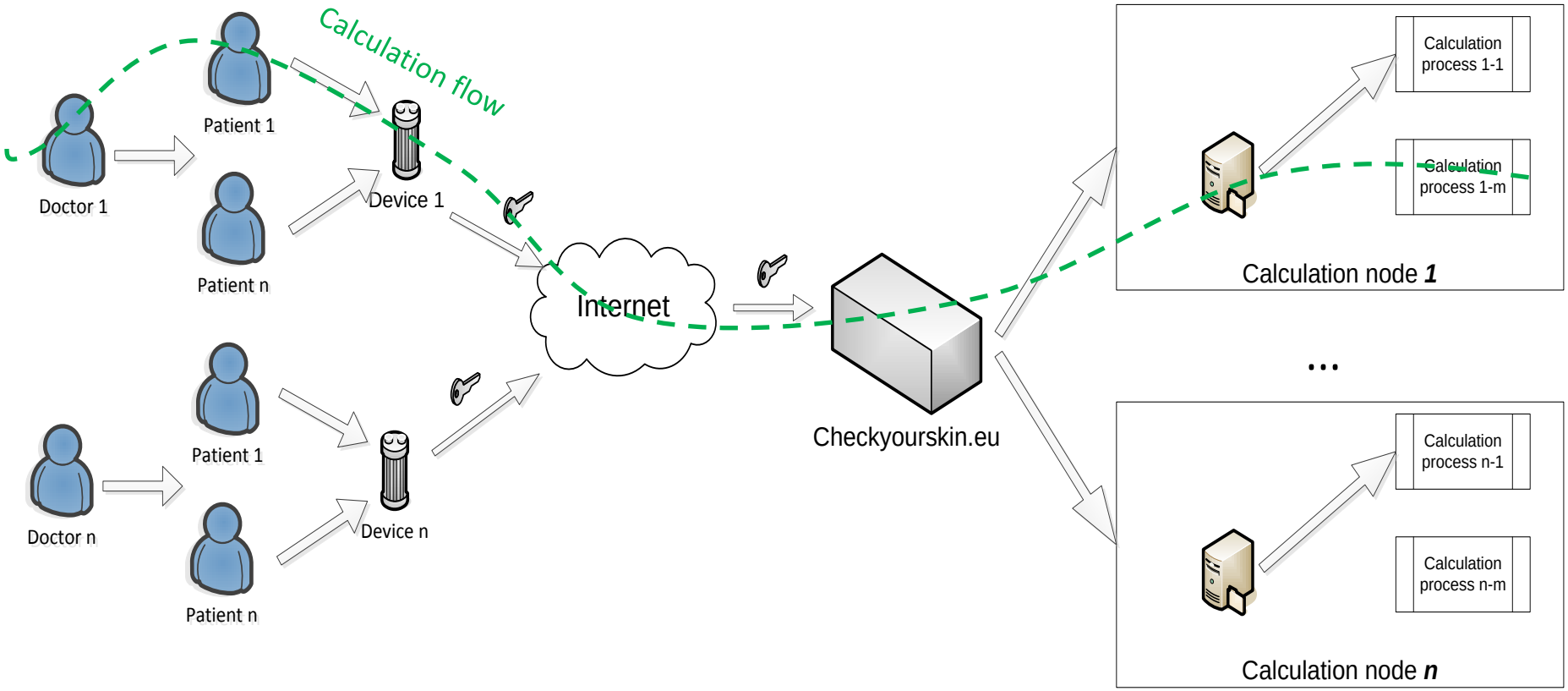


Effectivity of algorithm used

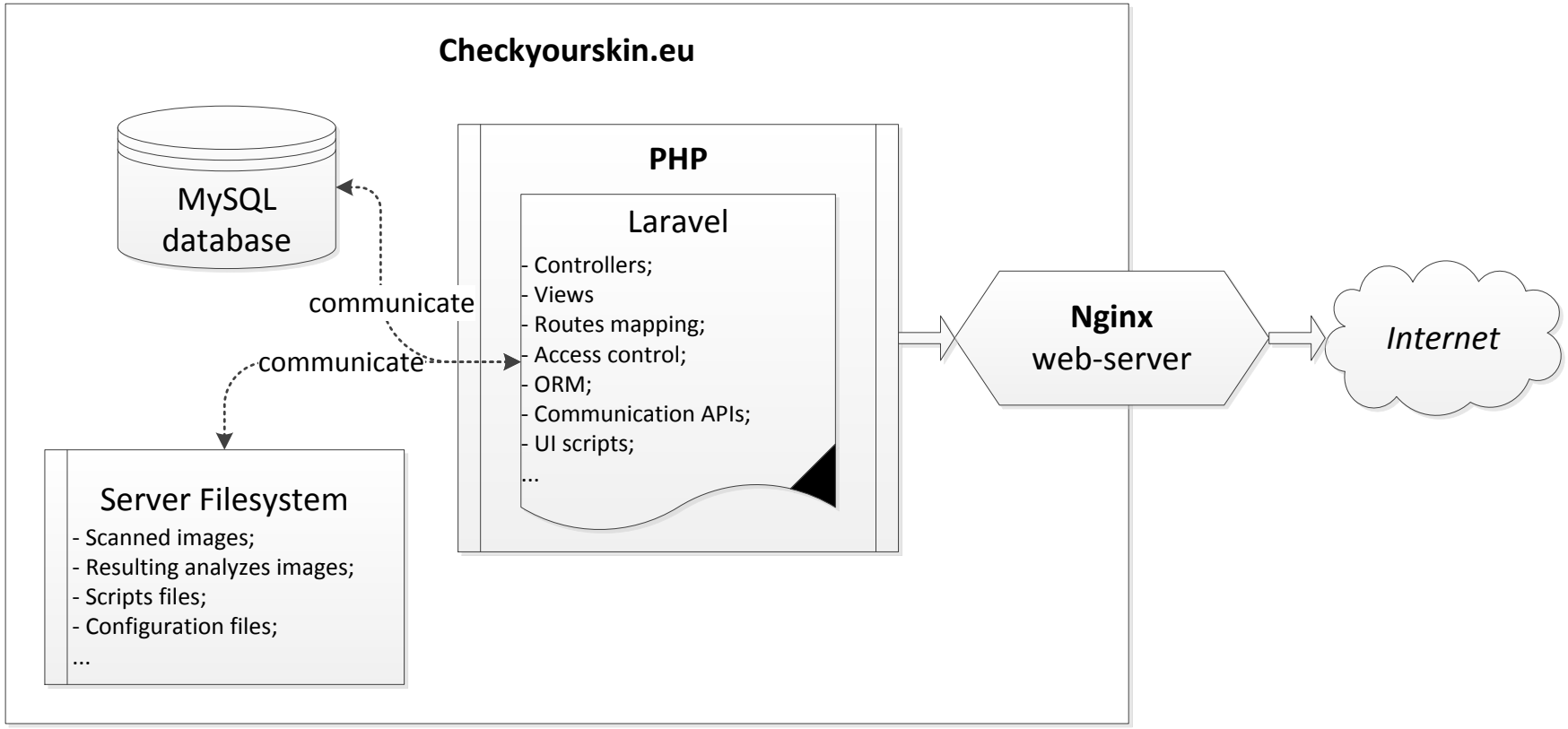
Diagnosis	Amount
Malignant	92
Melanoma (approved)	8
Melanoma (suspected)	10
BCC (approved)	50
BCC (suspected)	12
Bening	455
Pigmented	138
Hyperkeratosis	51
Seborrheic keratosis	64
Hemangioma	18
Others	184
Total	**792**

Results are based on official research organized on biggest Latvian oncological clinic center - “Gailezers”.

General structure of the system created



Main system node structure



Effectivity per cost

MPC	MPC_1	MPC_2	MPC_3	MPC_4	MPC_5
Price	€ 100	€ 150	€ 210	€ 273	€ 327
PW	5	12	19	29	55

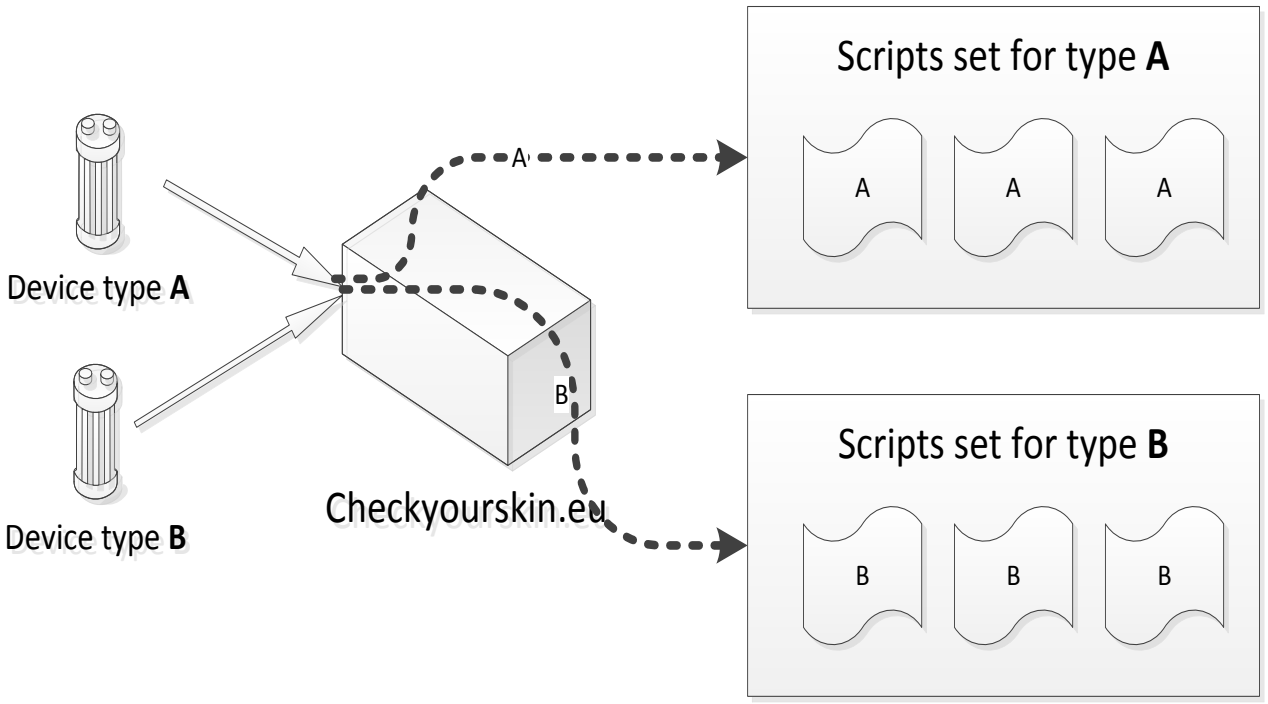
MPC – Hardware configuration of calculation node.
PW – Calculation power of calculation node.

MPCs count	MPC_1	MPC_2	MPC_3	MPC_4	MPC_5
1	€ 100.00	€ 150.00	€ 210.00	€ 273.00	€ 327.60
2	€ 200.00	€ 300.00	€ 420.00	€ 546.00	€ 655.20
3	€ 300.00	€ 450.00	€ 630.00	€ 819.00	€ 982.80
4	€ 400.00	€ 600.00	€ 840.00	€ 1,092.00	€ 1,310.40
5	€ 500.00	€ 750.00	€ 1,050.00	€ 1,365.00	€ 1,638.00

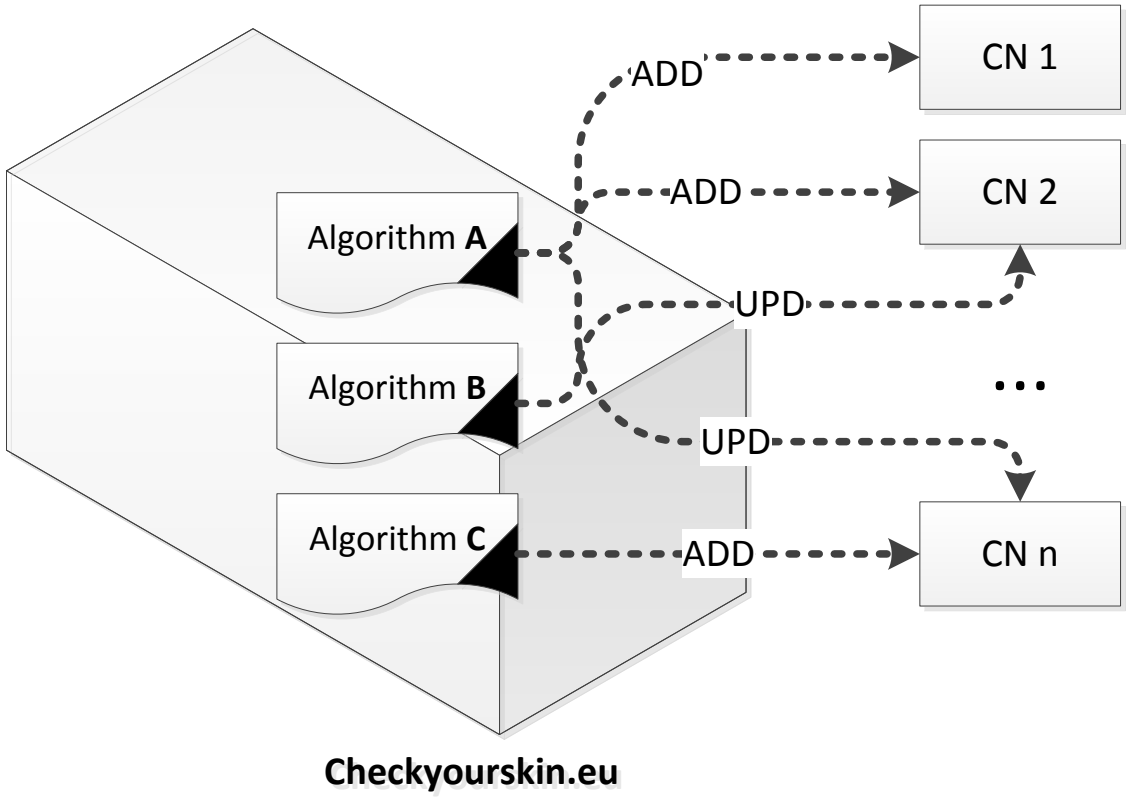
MPCs count	MPC_1	MPC_2	MPC_3	MPC_4	MPC_5
1	0.05	0.08	0.09	0.11	0.17
2	0.10	0.16	0.18	0.21	0.34
3	0.15	0.24	0.27	0.32	**0.50**
4	0.20	0.32	0.36	0.42	0.67
5	0.25	0.40	0.45	0.53	0.84

Configuration	Effectivity
5 x MPC_3	0.45
4 x MPC_4	0.42
3 x MPC_5	**0.5**

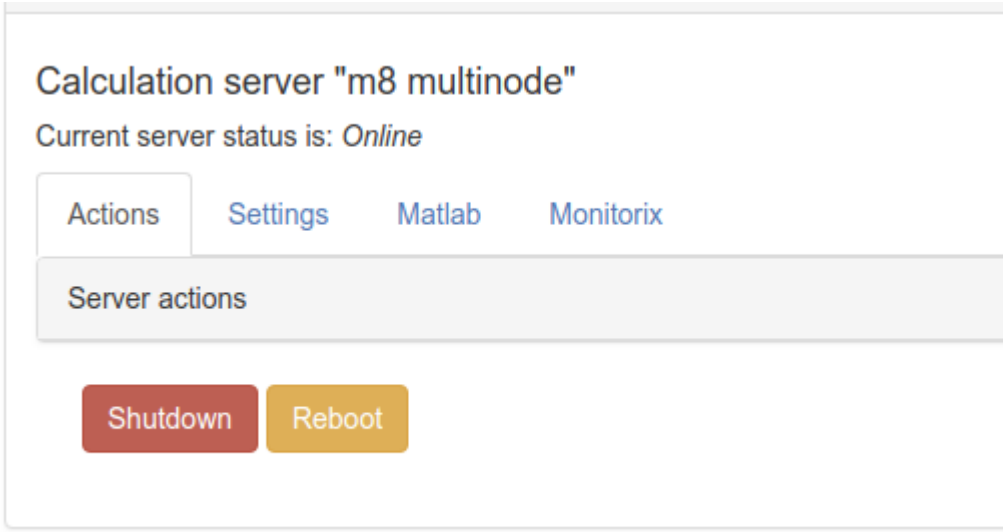
Extendibility for new types of devices



Extendibility for new types of analyse algorithms



Checkyourskin.eu



Doctor’s menu

New scans received

ID	Scanned at	Images count	Manage
122	2018-10-09 11:11:58	2	View and assign to patient Delete
121	2018-10-09 11:10:45	2	View and assign to patient Delete
120	2018-10-09 11:10:17	2	View and assign to patient Delete
119	2018-10-09 11:09:09	2	View and assign to patient Delete
23	2018-04-07 22:16:47	6	View and assign to patient Delete
19	2018-03-04 21:47:38	3	View and assign to patient Delete

Acknowledgment

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Thank you for attention!

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