FRAMEWORK CAREGIVER 4.0 & CHECKUP – COGNITIVE HEALHCARE PLATFORM

Katedra kybernetiky a umelej inteligencie, FEI, TUKE, Slovenská republika

CHECkuP

Cognitive HEalthCare Platform

EDGE-ENABLED FRAMEWORK

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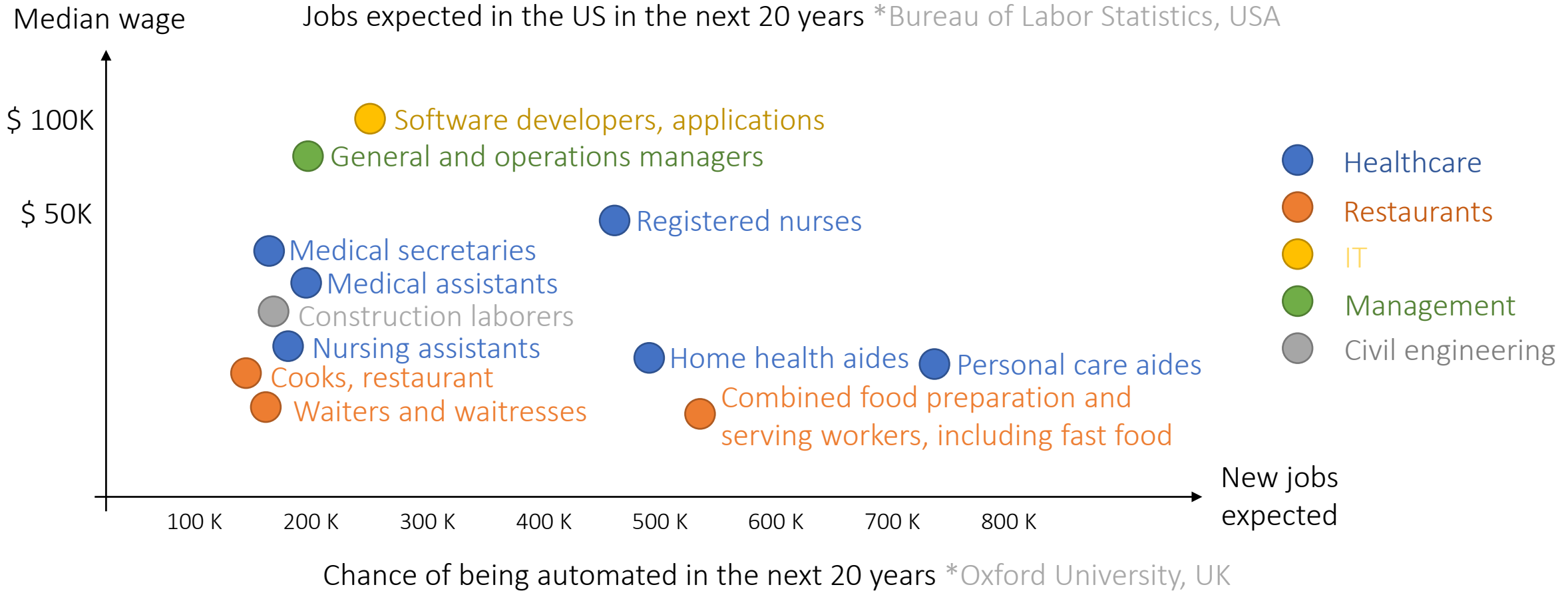
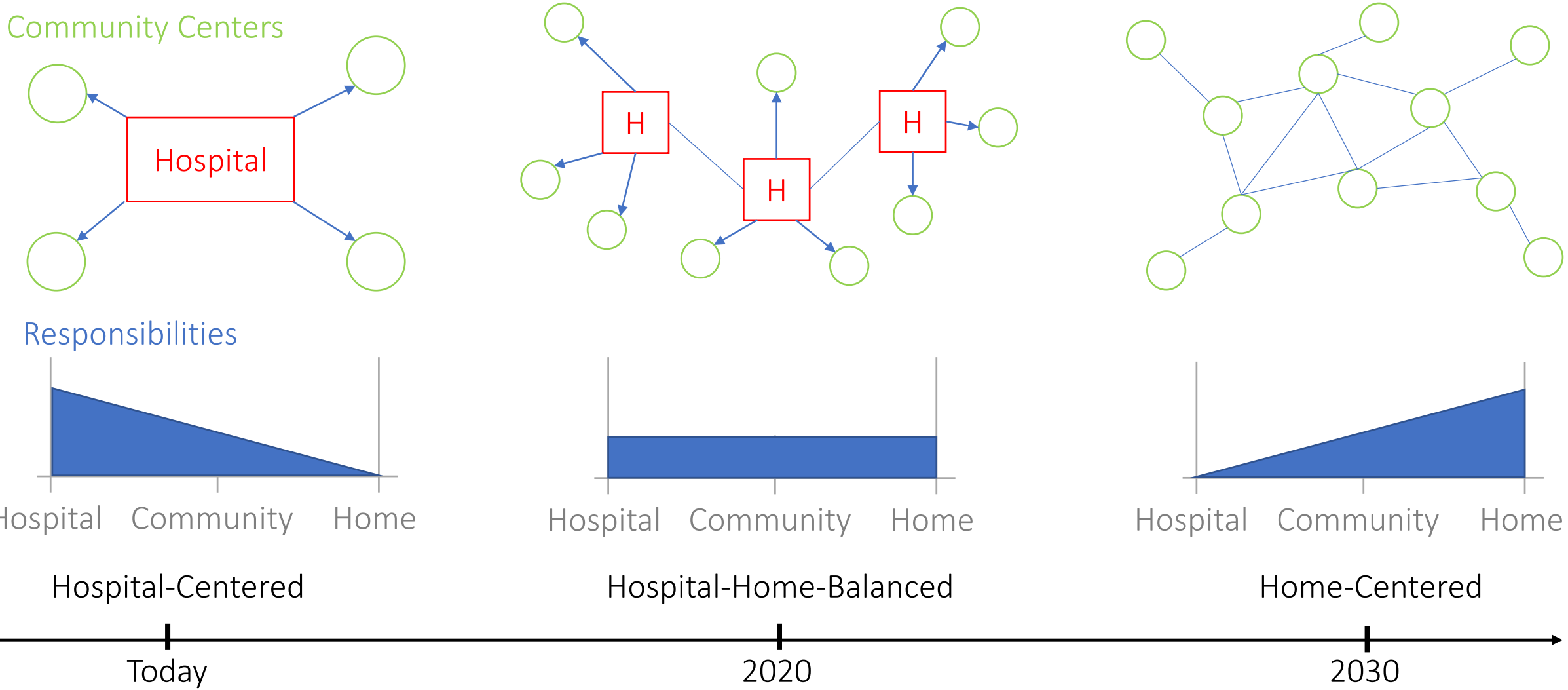
Motivácia - Zdravotníctvo a IoT technológie



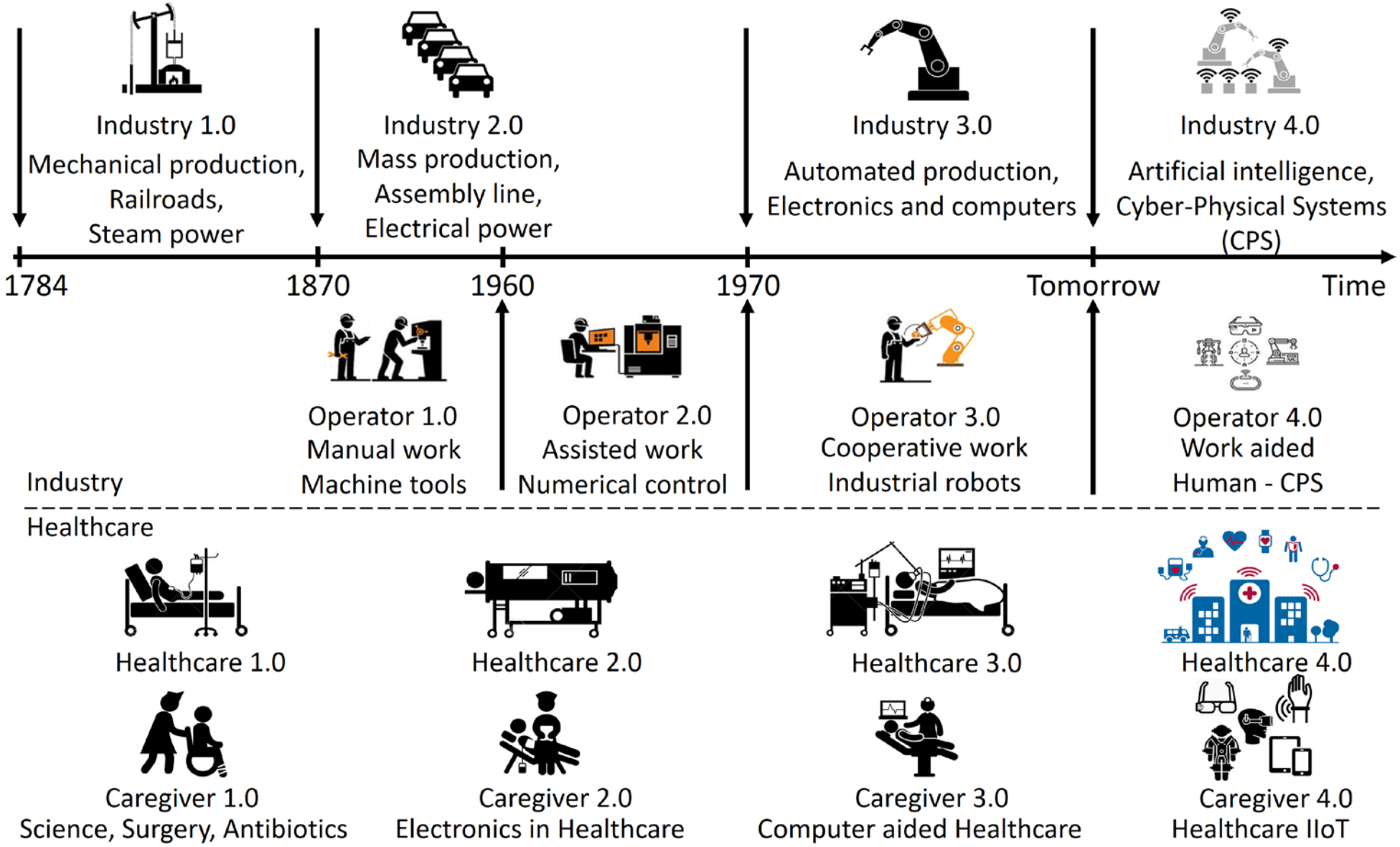
Chance of being automated in the next 20 years *Oxford University, UK

Motivácia - Zdravotníctvo a IoT technológie

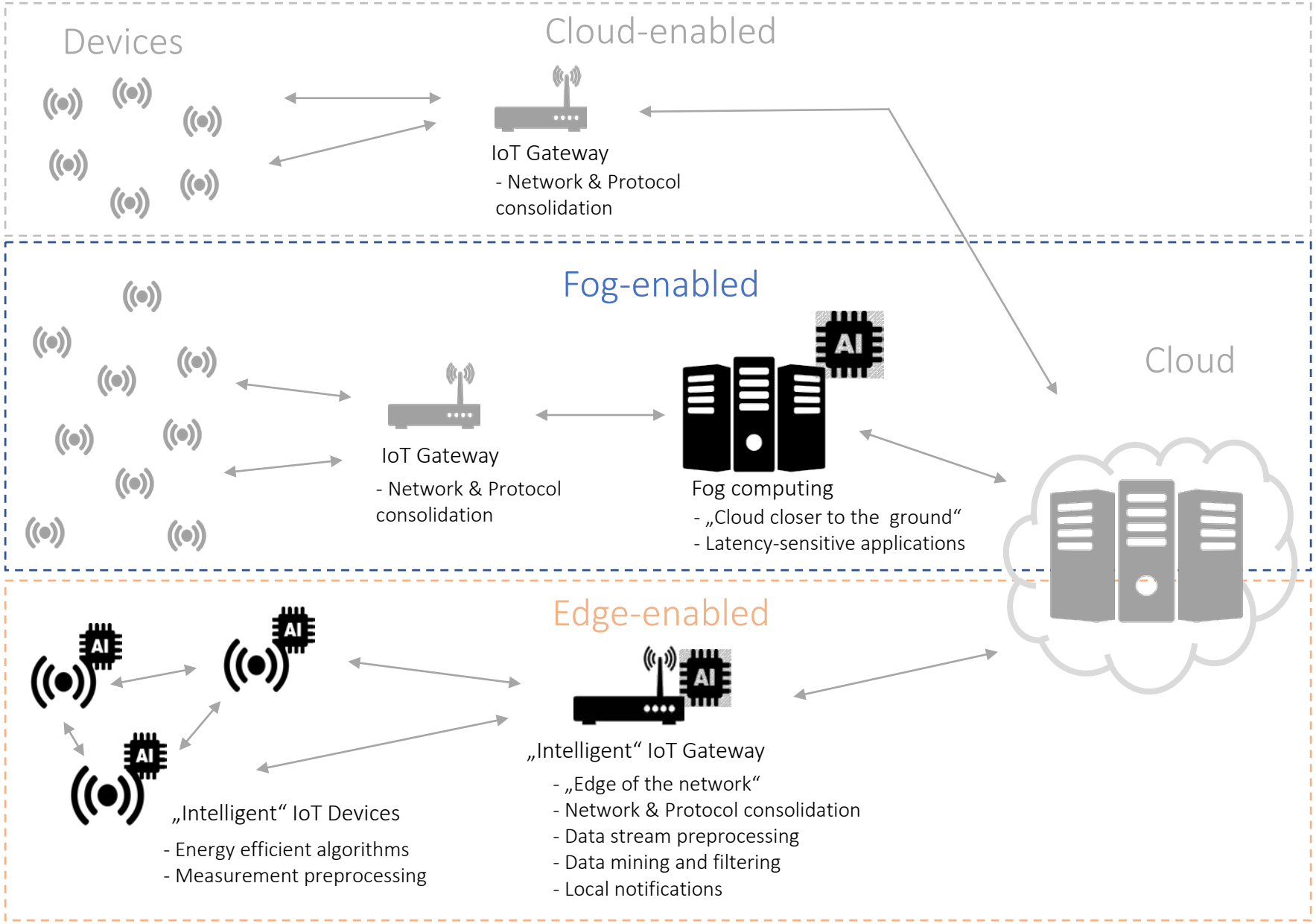
[* Future Delivery of Health Care: Cybercare]



Zdravotníctvo a 4. priemyselná revolúcia



Moderné spôsoby implementácie IoT riešení

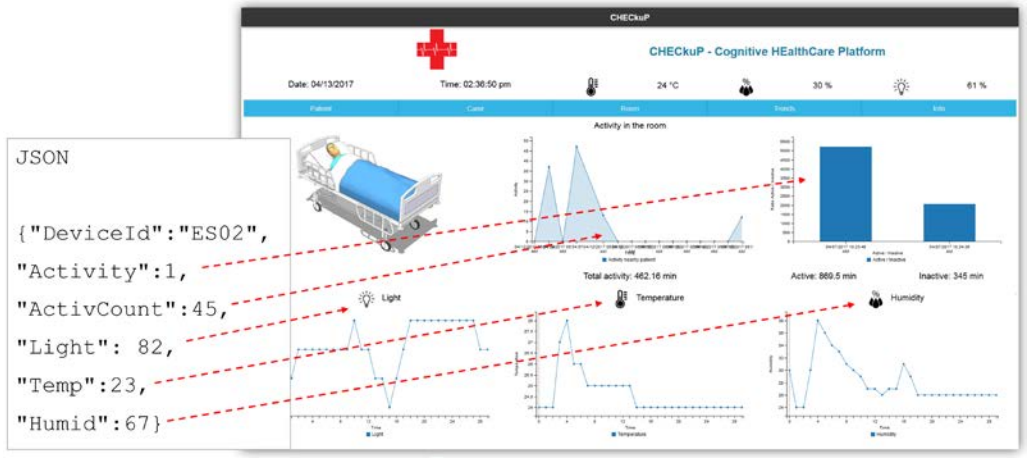


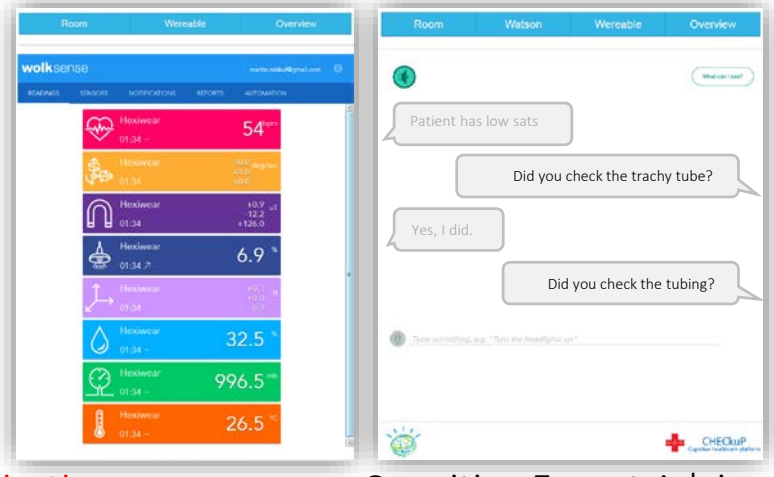
Distribúcia inteligencie v rámci IoT riešenia

- Cloud-enabled
  - Škálovateľnosť
- Fog-enabled
  - „Mrak (Cloud) pri zemi“
  - Pojem - Cisco 2015
  - Private / Hybrid cloud
  - Väčšie IoT riešenia
- Edge-enabled
  - Koncové zariadenia „hrana siete“
  - Pojem – 90. roky
  - Menšie IoT riešenia

CHECkuP
Cognitive HEalthCare Platform

Prípadová štúdia CHECkuP – Cognitive HEalthCare Platform





Cognitive Expert Advisor

Important data

Most of the data, communication & computations

Real-time visualizations & analytics

Advanced data analytics
healthcare data classification
anomaly detection

Edge-enabled IoT Gateway

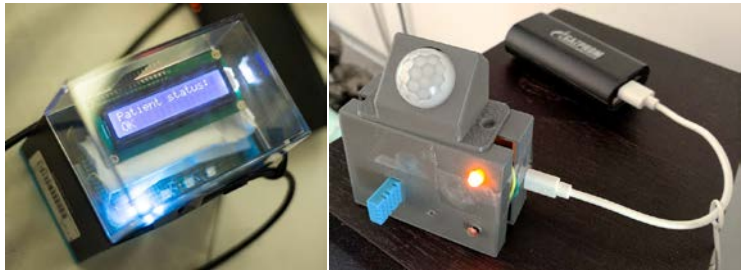
Cognitive services

Wi Fi

EMG & Gyroscope data
(Patient Fall Simulation)

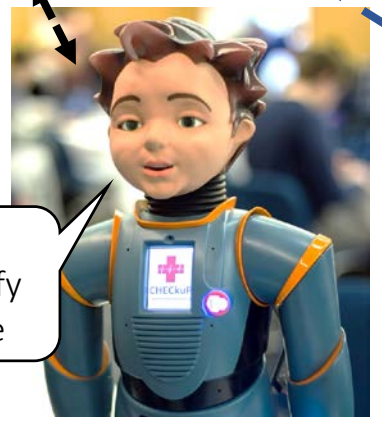
BLE

Hold on, I will notify someone



CHECkuP Devices

Myo Armband

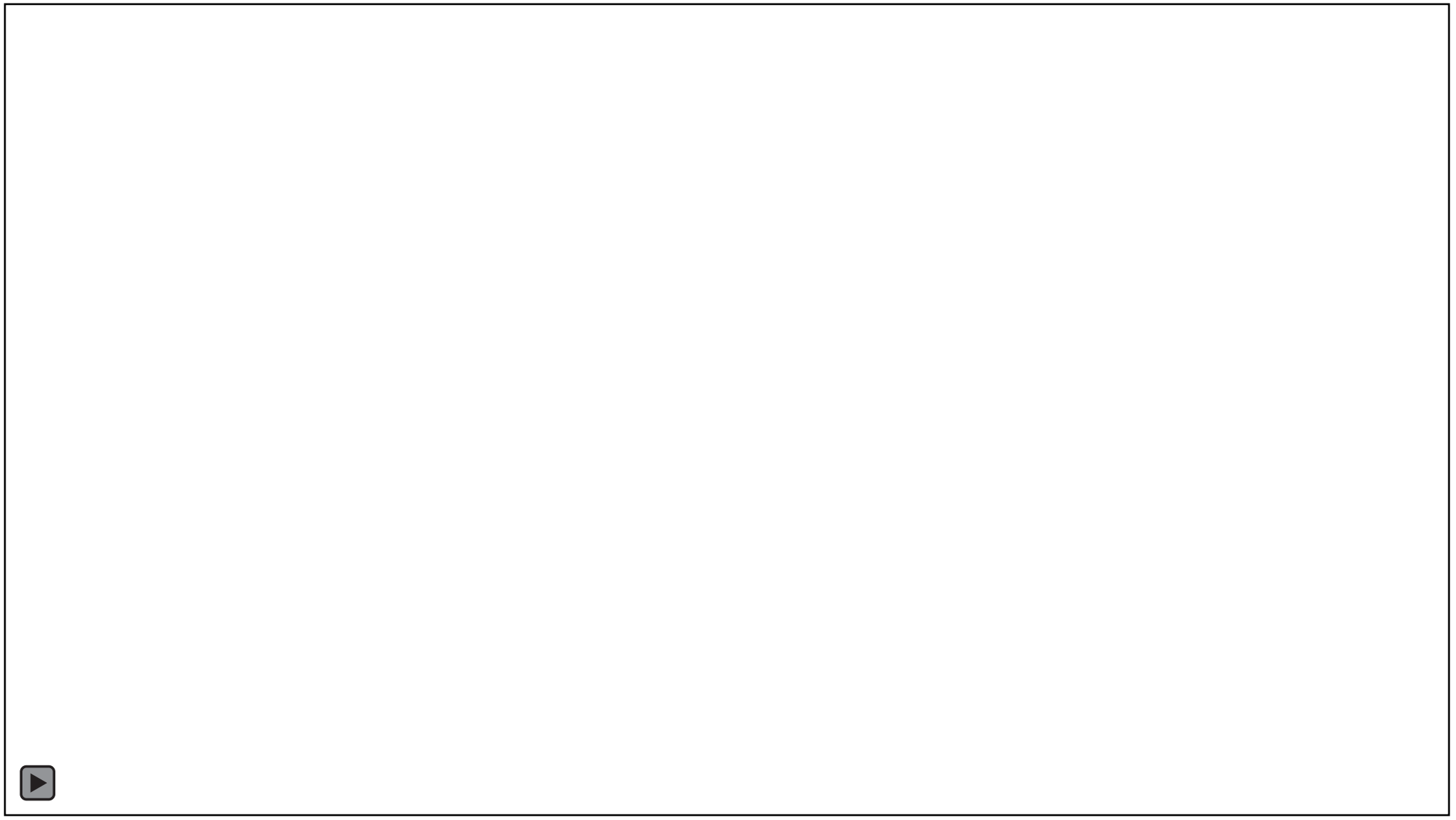


Robokind

Wearables

Caregiver 4.0

Prípadová štúdia CHECkuP – Cognitive HEalthCare Platform



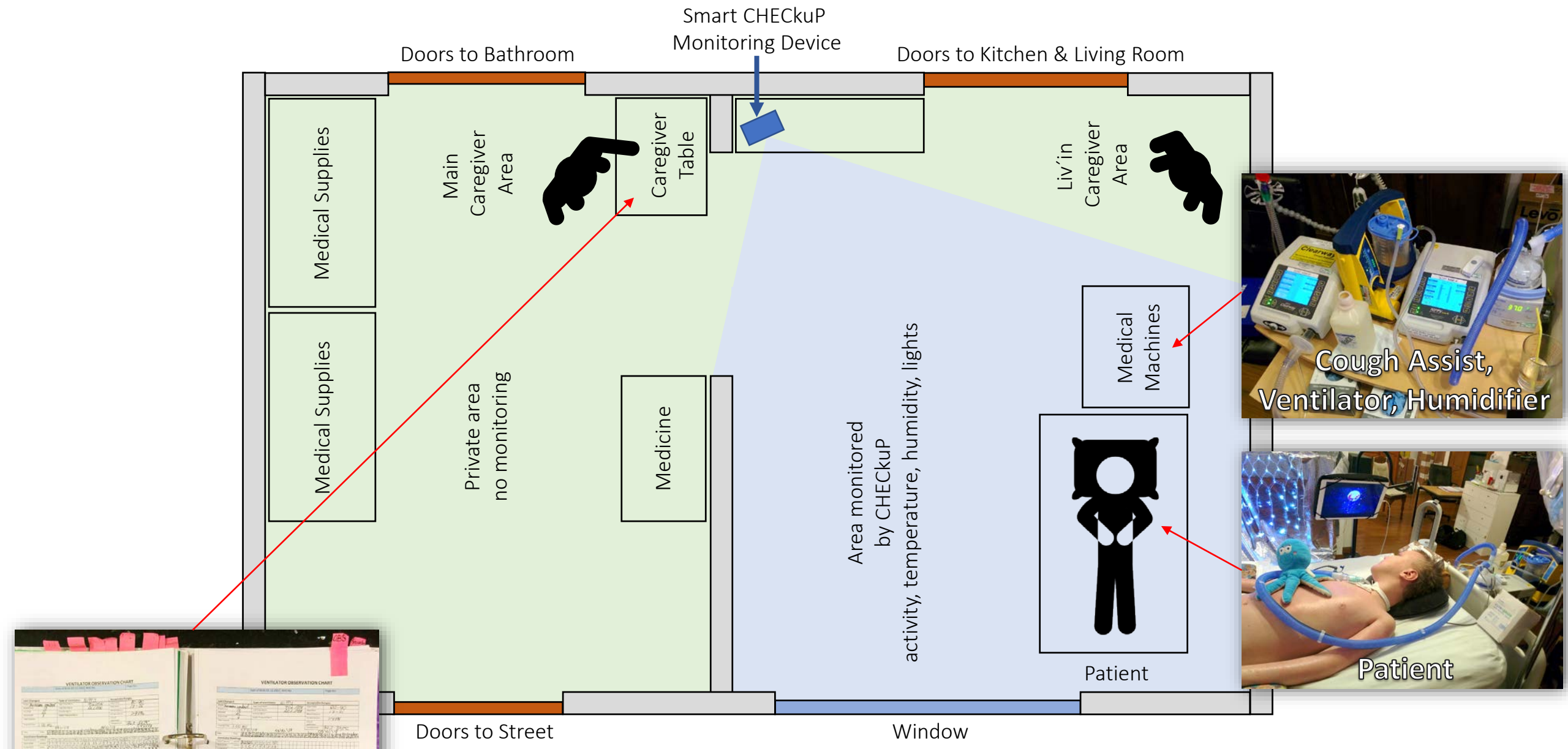
CHECkuP
Cognitive HEalthCare Platform

YouTube

Edge-enabled IoT riešenie pre monitorovanie kvality zdravotnej starostlivosti

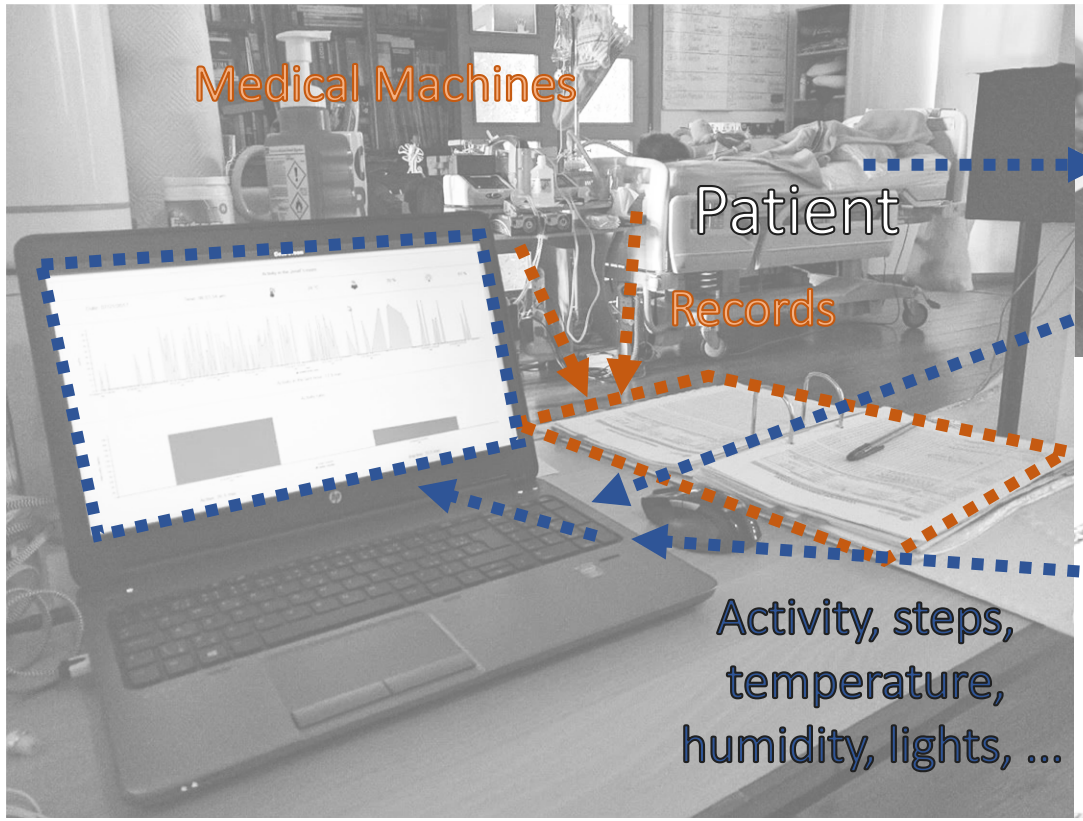
- IoT zariadenia
- Cognitive služby
- Pokročilá dátová analytika

Testovanie CHECkuP v reálnych podmienkach



CHECkuP
Cognitive HEalthCare Platform

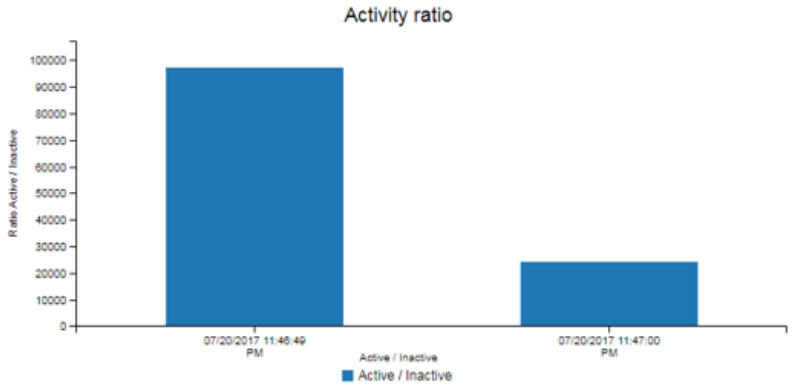
Testovanie CHECkuP v reálnych podmienkach



CHECkuP IoT Portal

CHECkuP Devices
Monitoring activity

Activity ratio after 2 weeks



Inactive: 16219.83min Active: 4052.33min

KOGNITÍVNY PRÍSTUP ZBERU DÁT A REDUKOVANIE FINANČNÝCH NÁKLADOV NA CLOUDOVÉ SLUŽBY

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Cena riešení z tejto oblasti

ENTERPRISE IoTNET

IBM Bluemix™

amazon web services

Cloud

Microsoft Azure

MS Azure Pricing

Azure App Service

INSTANCE	CORES	RAM	STORAGE	PRICES
P1 Premium	1	1.75 GB	500 GB	$0.30/hr (~$223/mo)
P2 Premium	2	3.50 GB	500 GB	$0.60/hr (~$446/mo)
P3 Premium	4	7 GB	500 GB	$1.20/hr (~$893/mo)
P4 Premium[1]	8	14 GB	500 GB[1]	$2.40/hr (~$1,786/mo)

Azure Machine Learning

	DEV/TEST*	STANDARD S1	STANDARD S2	STANDARD S3
Tier Price per month	€0	€84.33	€843.30	€8,433
Features				
Included Transactions (per month)	1,000	100,000	2,000,000	50,000,000
Included Compute Hours (per month)	2	25	500	12,500
Total number of Web Services[1]	2	10	100	500
Overage Rates	N/A	€0.4217 per 1,000 transactions €1.6866 per API Compute Hour	€0.2108 per 1,000 transactions €1.265 per API Compute Hour	€0.0843 per 1,000 transactions €0.8433 per API Compute Hour

Azure IoT Hub

EDITION TYPE	PRICE (PER MONTH)	TOTAL NUMBER OF MESSAGES/DAY	MESSAGE METER SIZE
Free	Free	8,000	0.5 KB
S1	€42.17	400,000	4 KB
S2	€421.65	6,000,000	4 KB
S3	€4,216.50	300,000,000	4 KB

+ 850 €

Industrial router od 1 000 €

Náklady na pripojenie

+ 15 €

+ 40 €

+ 100 €

+ 500 €

...

Plug&Play

Štandardizovaná M2M sieť

Kognitívny prístup

Náklady na cloudové služby

+ 89.99 €

+ 342.17 €

+ 1 350.44 €

+ 5 562.44 €

....

Status & konkurencia

ENTERPRISE IoTNET

Prototyp

	eWON	Intel® IoT Gateway	MULTITECH	IoT NET Julia
Priemyselné protokoly	✓	✗	✗	✓
Plug&Play	✗	✗	✓	✓
Kognitívny prístup	✗	✗	✗	✓
Grafický vývoj	✗	✗	✗	✓
Jednoduchá dátová analytika	✓	✓	✗	✓

Príležitosti

Neexistencia zariadenia na trhu, aplikovanie štandardizovaných komunikácii

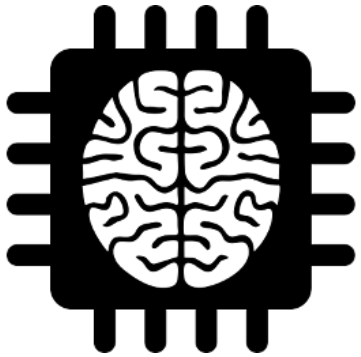
Riziká

Konkurencia má distribučné kanály a priestor na rýchlejší vývoj

ENTERPRISE IoTNET

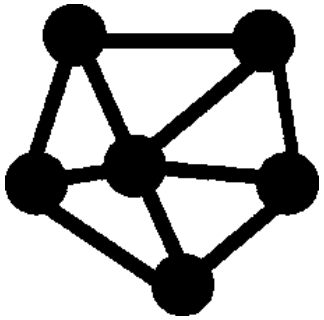
Výhody riešenia

Šetrenie nákladov



Machine learning

Bezpečnosť



Štandardizácia

IBM Hackathon

Cisco Creathon

BEST + IBM
Winter course

AT&T Hackathon

Projekty

- Nadácia Tatrabanky
  - E-talent, IoT Net Take your knowledge to the Edge, 2017
  - Business Idea, Enterprise IoT Net, 2017
  - Študenti do sveta, Výskumný pobyt University of Auckland, 2017
- FEI grant, TUKE, CHECkuP, 2016
- 2x IBM Country Project Innovation Award
- 2x Microsoft Azure Research Award

StartUp súťaže

- ✓ IBM Hackathon, 2017, Bratislava
- AT&T Hackathon, 2017, Brno, Česká Republika
- ✓ Startup Centrum TUKE, 2017, Košice
- ✓ BEST a IBM - Smart future course, 2017, Košice
- ✓ CISCO Creathon, 2016, Bratislava

Ďakujem za pozornosť

EDGE-ENABLED FRAMEWORK PRE MONITOROVANIE KVALITY ZDRAVOTNEJ STAROSTLIVOSTI

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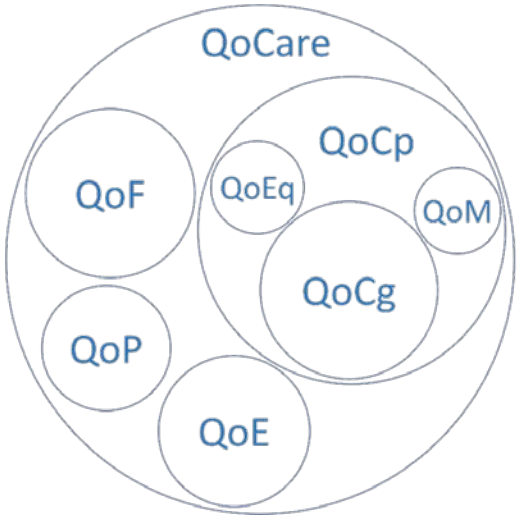
Koncept monitorovania Quality of HealthCare (QoC)



QoCare – Quality of HealhCare

QoCp – Quality of Care Provider

- QoCg – Quality of Caregiver
- QoM – Quality of Medicines
- QoEq – Quality of Equipment

QoE – Quality of Environment

QoP – Quality of Patient

QoF – Quality of Family

Systém QoC

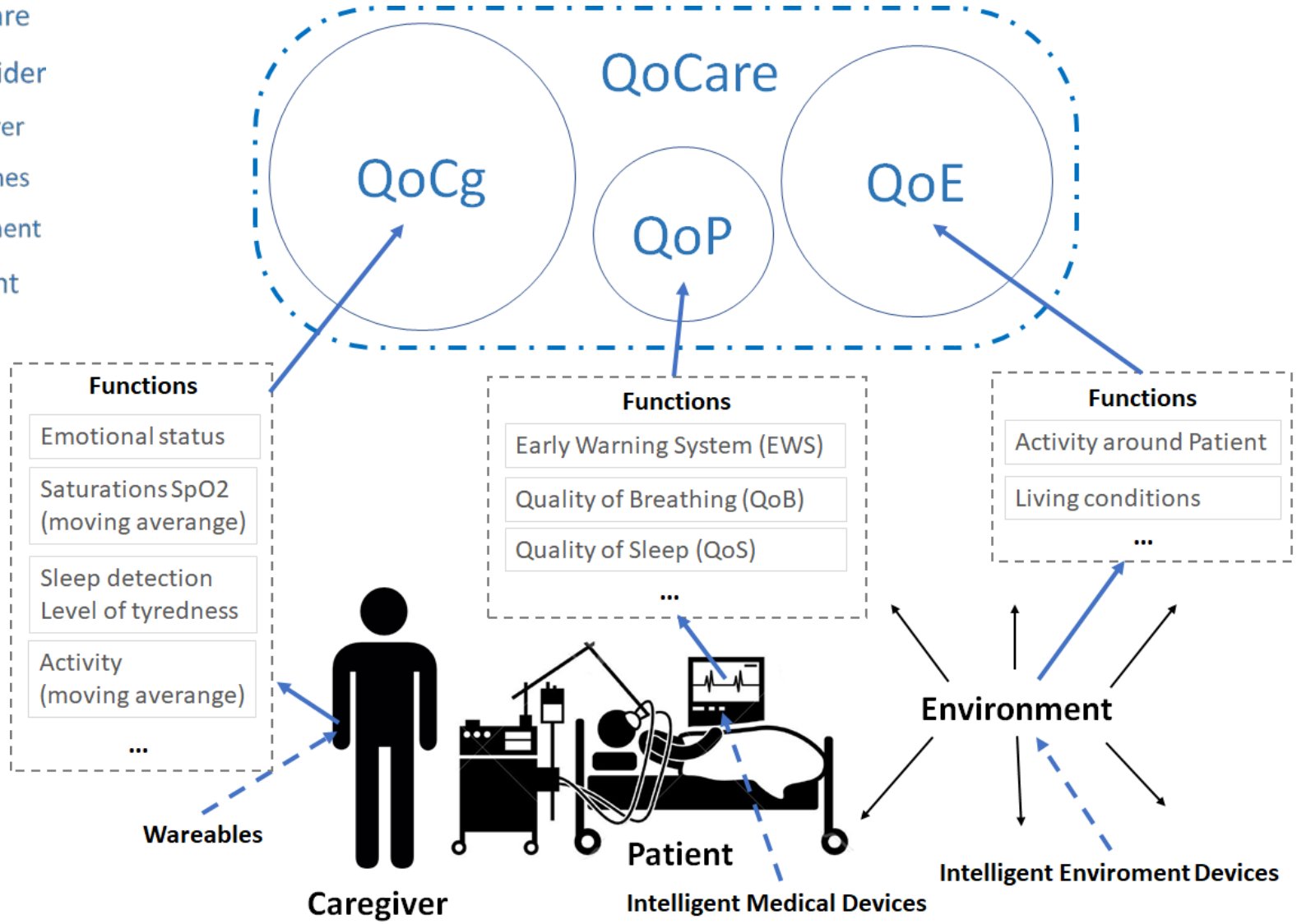
$$\boldsymbol{QoC} \in < 0,1 >$$

$$\boldsymbol{QoC} = \frac{\sum_{i=1}^{m} \propto_i * \boldsymbol{QoService_i}}{\boldsymbol{m}}$$

$$\forall \boldsymbol{QoService_i} \in < 0,1 >$$

$$\sum_{i=1}^{m} \propto_i = \boldsymbol{m}$$

Vypočítavanie QoC



Koncepčná architektúra QoC