

CzechRad - a new detector with GPS for citizen mapping of radiation



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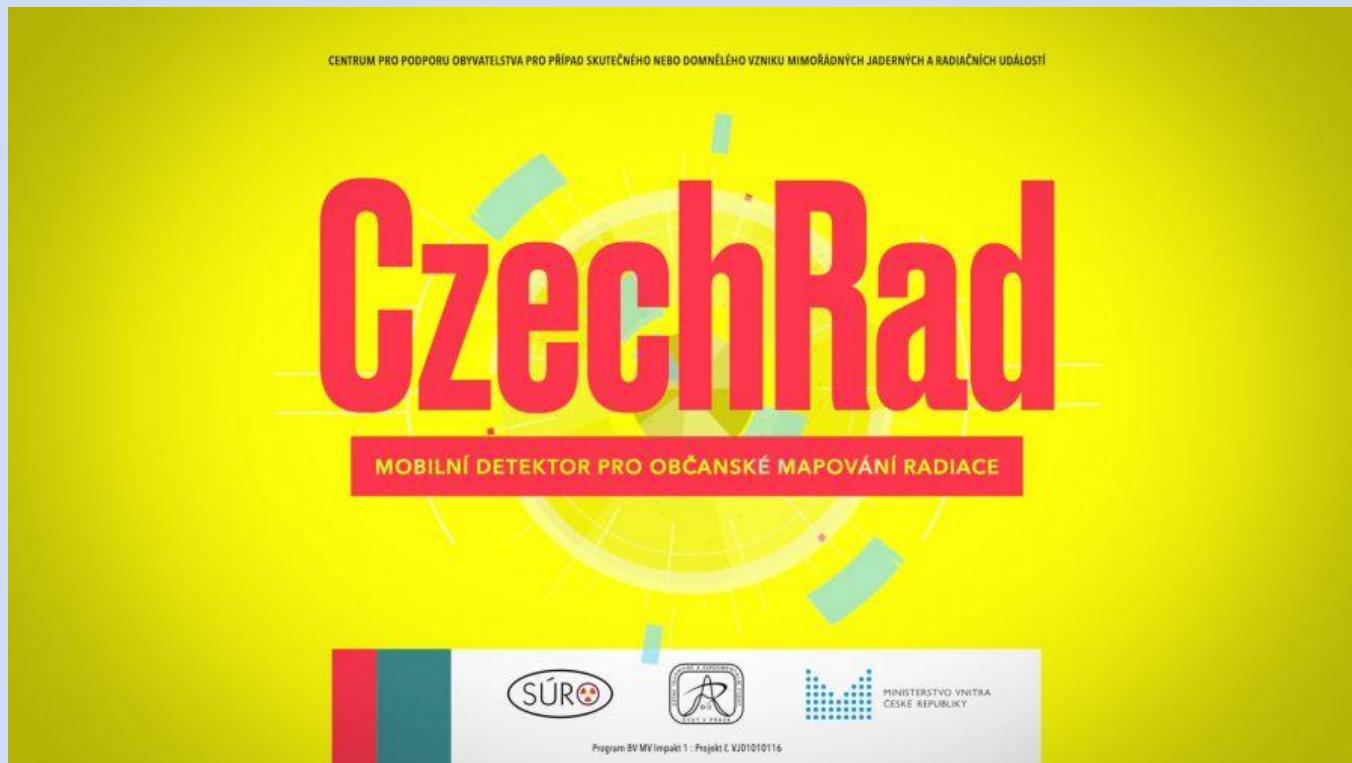


MINISTERSTVO VNITRA
ČESKÉ REPUBLIKY

Centrum pro podporu obyvatelstva pro případ
skutečného nebo domnělého vzniku mimořádných
jaderných a radiačních událostí (VJ01010116)

This is a quick English translation (just the text, figures remained in Czech) of a presentation given at the “[Dny radiační ochrany 2023 \(Days of Radiation Protection 2023\)](#)” conference in November 2023.

From 2024, a promotional video about CzechRad is also available on Youtube:



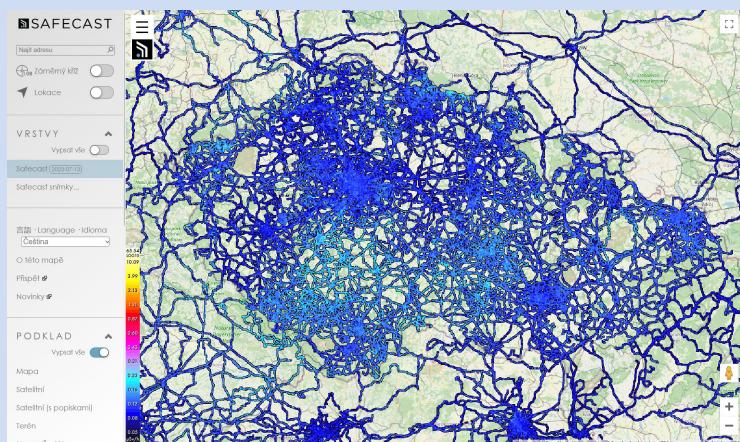
Introduction

- the CzechRad device is conceptually based on the [SAFECAST bGeigie Nano](#) detector developed by the non-profit organization SAFECAST in Japan after the Fukushima nuclear power plant accident



Fukushima Daiichi NPP, Digital Globe, CC BY-SA

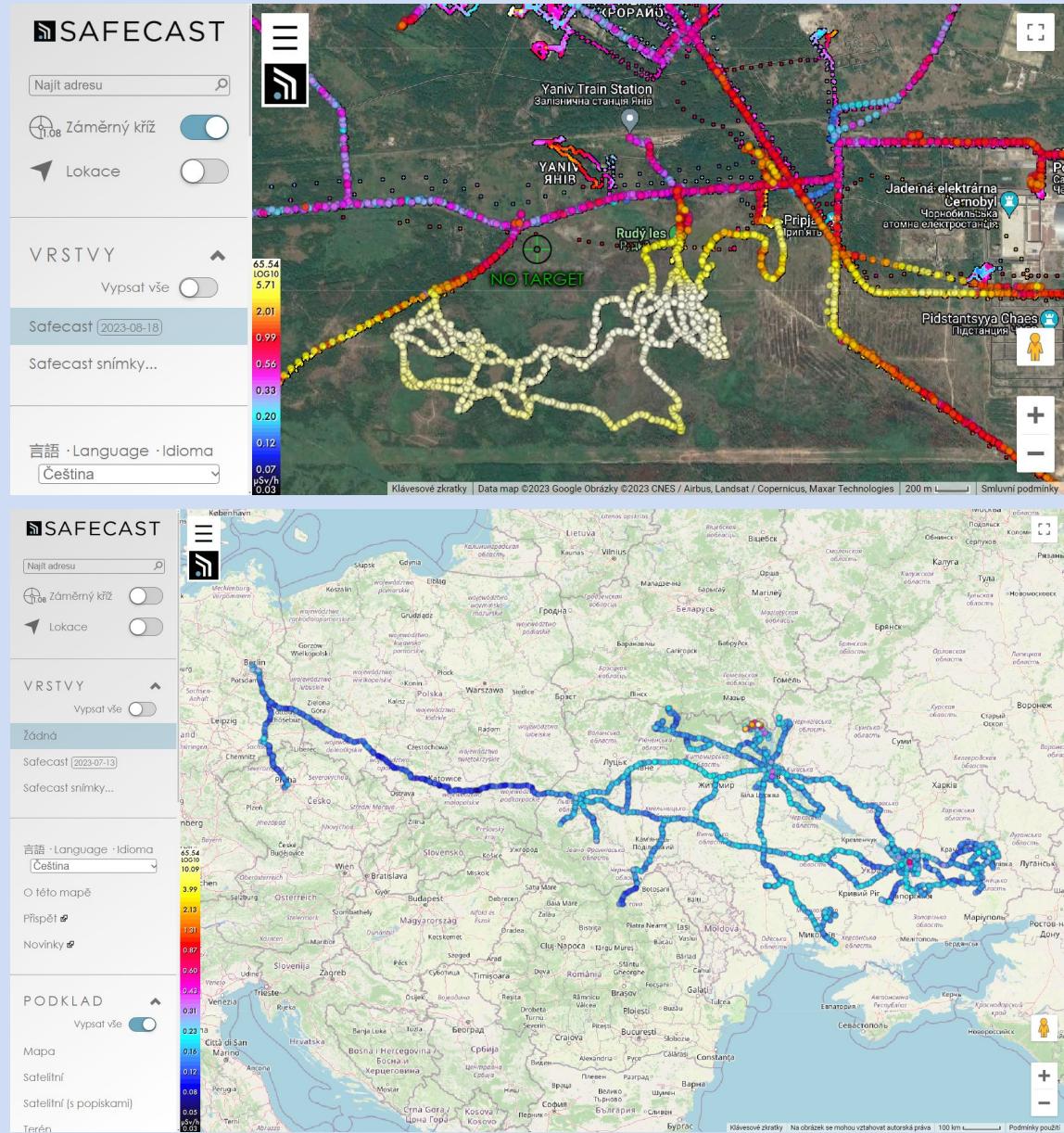
- SÚRO has been operating SAFECAST bGeigie Nano devices since 2015, their number gradually increased to 60 pieces
- experience from operation (and related maintenance/service/repair needs) gradually led to an effort to develop our own compatible alternative, and production was then implemented as part of the IMPAKT project ([VJ01010116](#)), whose provider is the Ministry of the Interior of the Czech Republic

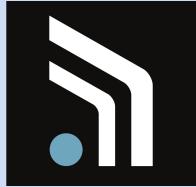


- 10 SAFecast devices were lent by SÚRO to Ukraine, and significantly helped with radiation mapping in the Chernobyl region after the withdrawal of Russian troops
- >300,000 new data points were measured within the [#bgeigies4ukraine](#) project

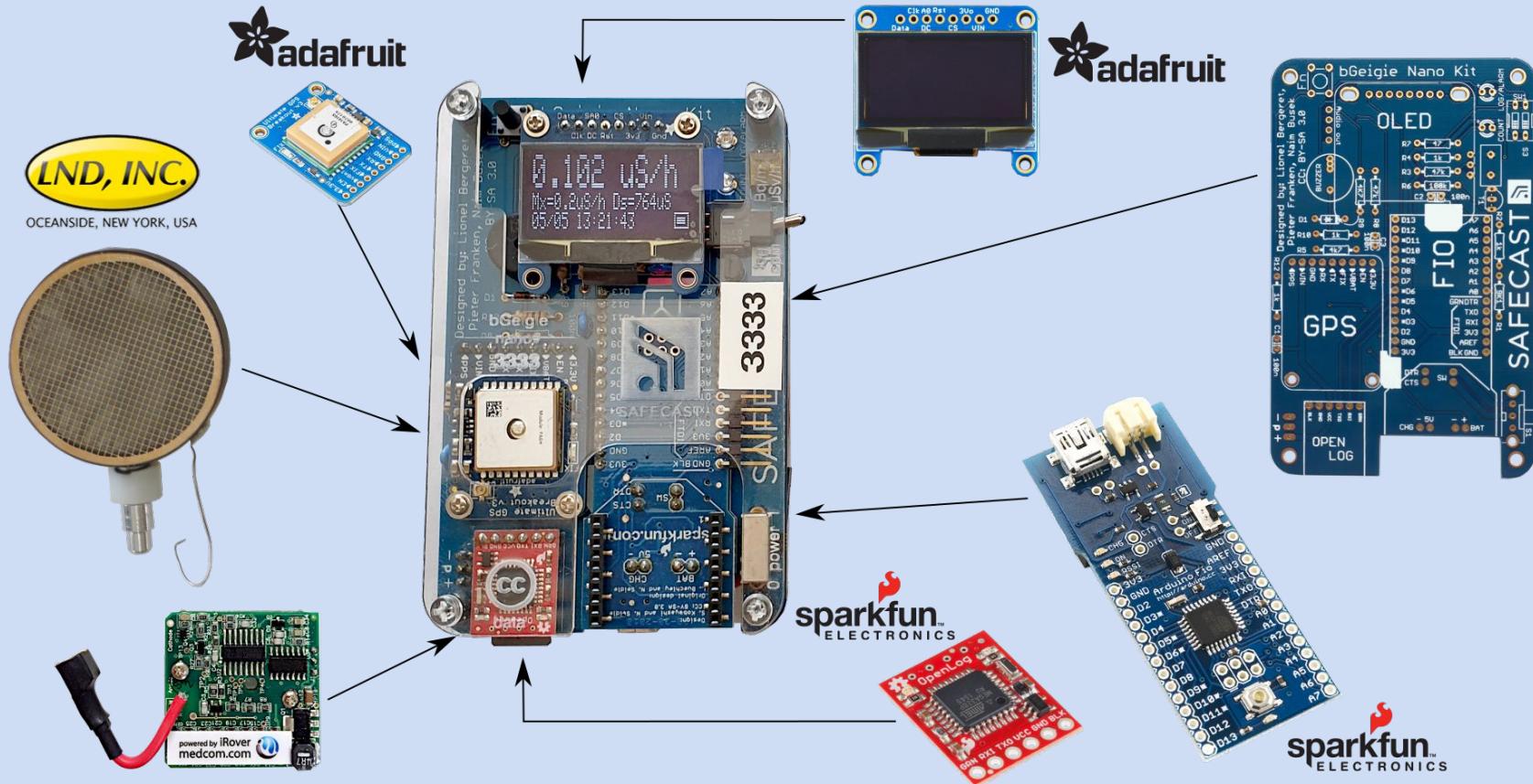


foto SaveDnipro





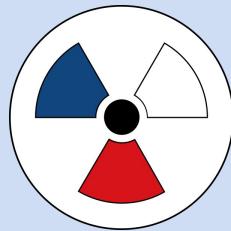
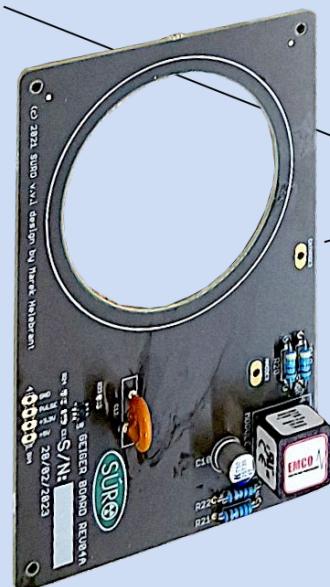
SAFECAST bGeigie Nano



- assembly kit, various commercial modules from various foreign suppliers
- some modules are now difficult to obtain, service is difficult
- soldering ability required for device assembly

LND, INC.

OCEANSIDE, NEW YORK, USA

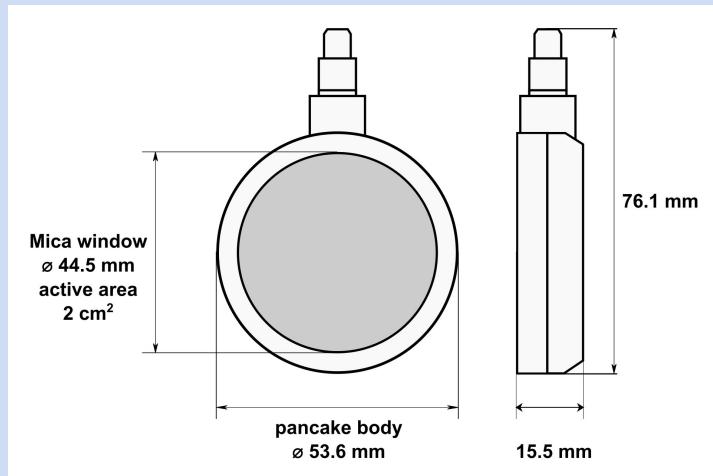


CzechRad



- import dependence limited to basic electronic components only
- electronic boards (PCBs) are manufactured in the Czech Republic

What do the devices have in common?



- same detector - pancake GM ([LND 7317](#), USA)
- same housing - Pelican 1010 Micro Case (polycarbonate, water/dust resistant, IP67 protection)
- offline operation = privacy protection, cyber security ensured
- same data format - text files *.LOG

CzechRad_data.LOG — Kate

Soubor Úpravy Pohled Projekty Záložky Sezení Nástroje Nastavení Nápověda

Nový Otevřít... Uložit Uložit jako... Zavřít Zpět Znovu Přejít zpět Přejít vpřed

CzechRad_data.LOG

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Rádek 1, sloupec 1 VLOŽIT cs_CZ Soft Tabs: 4 UTF-8 Normální

Výstup Hledat a nahradit Současný projekt

bGeigie_Nano_data.LOG — Kate

Soubor Úpravy Pohled Projekty Záložky Sezení Nástroje Nastavení Nápověda

Nový Otevřít... Uložit Uložit jako... Zavřít Zpět Znovu Přejít zpět Přejít vpřed

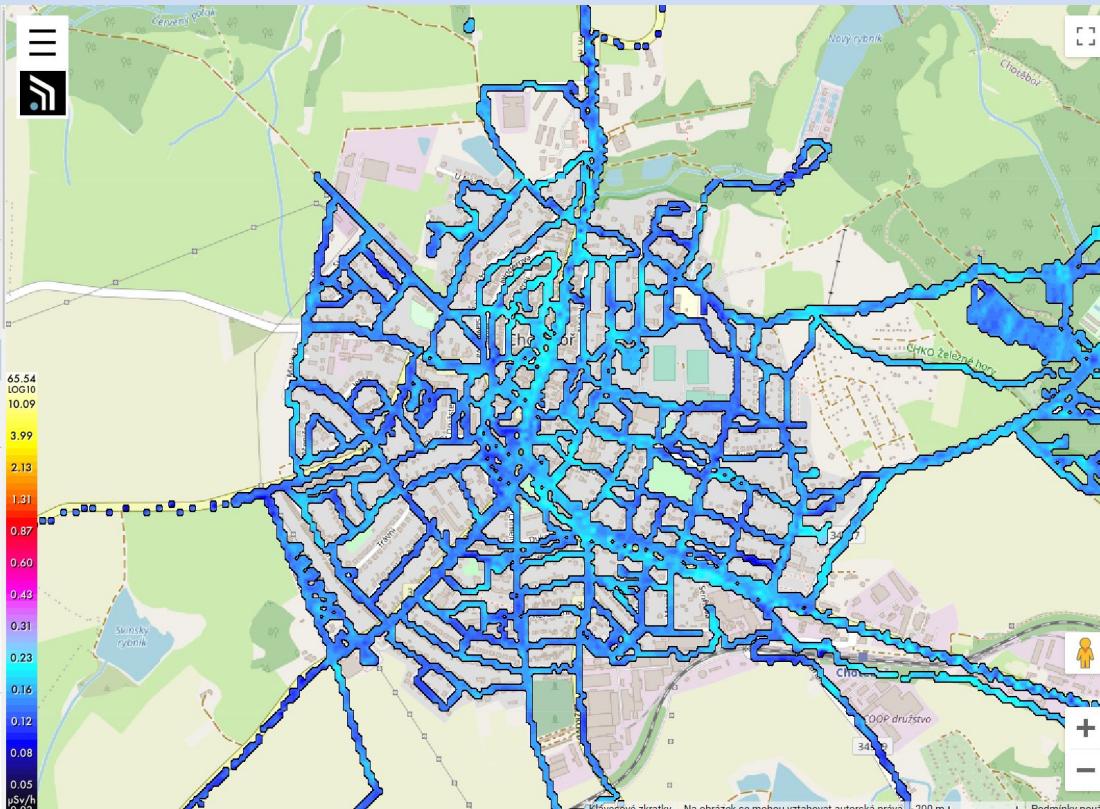
bGeigie_Nano_data.LOG

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```

Rádek 1, sloupec 1 VLOŽIT cs_CZ Soft Tabs: 4 UTF-8 Normální

Výstup Hledat a nahradit Současný projekt

CzechRad is compatible with SAFECAST online tools



SAFECAST MAP

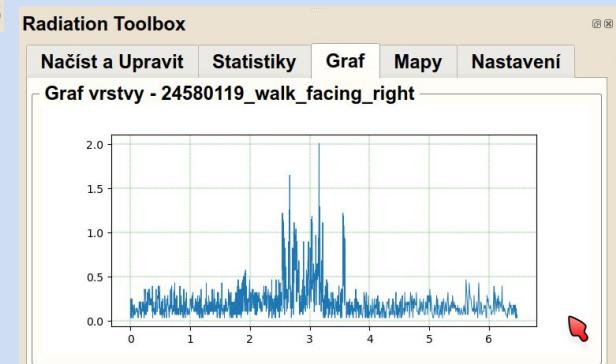
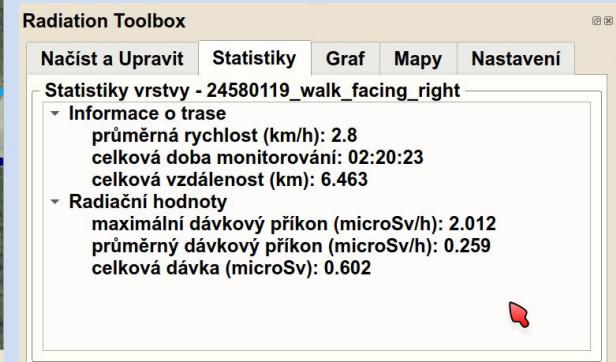
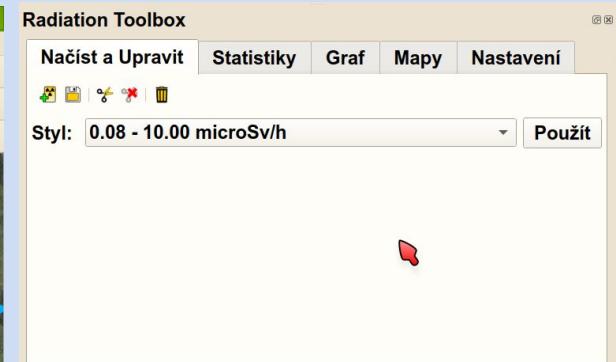
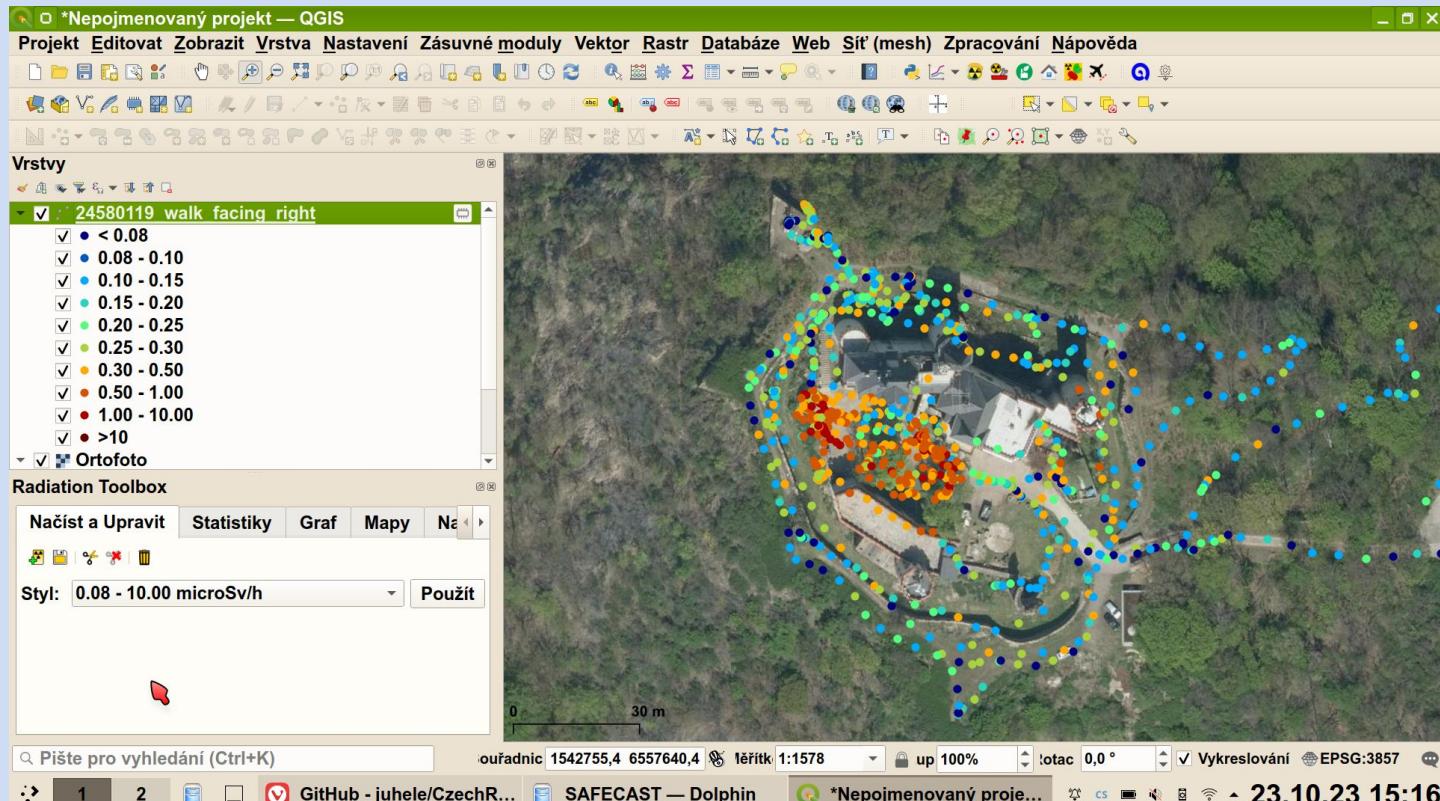
- interactive map

SAFECAST API

- uploading and managing data

| User | File Name | # of Measurements (maximum_cpm) | Status | Comment |
|---|--------------------------|---------------------------------|--------------------------|---------|
| National Radiation Protection Institute, Prague, Czech Republic | 24060719_upload_walk.LOG | 290 maximum cpm: 57 | Approved | |
| National Radiation Protection Institute, Prague, Czech Republic | 24060716_upload_walk.LOG | 1,755 maximum cpm: 109 | Submitted (Not Approved) | |
| National Radiation Protection Institute, Prague, Czech Republic | 24060715_upload_walk.LOG | 2,469 maximum cpm: 89 | Approved | |
| National Radiation Protection Institute, Prague, Czech Republic | 24060712_upload_car.LOG | 3,020 maximum cpm: 83 | Approved | |

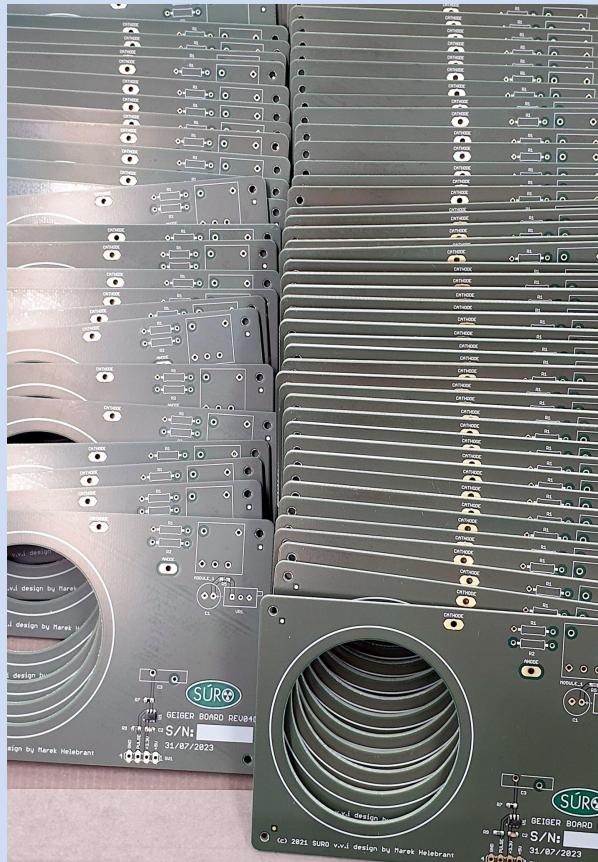
CzechRad is compatible with QGIS plugin RadiationToolbox



- the plugin has undergone a complete update, some parts of the code completely rewritten
- loading and editing** - Safecast / CzechRad files *.LOG
- loading** - [PEI](#) (MobDose ap.), [ERS](#) files
- besides Czech, other languages: EN, DE, FR, IT, RU, UK

We will produce 1000 CzechRad devices!

- in the framework of the project “*Center for the support of the population in case of actual or suspected occurrence of extraordinary nuclear and radiation events*” ([VJ01010116](#)) 1000 CzechRad devices will be produced
- they will again be loaned free of charge to selected volunteers / organizations



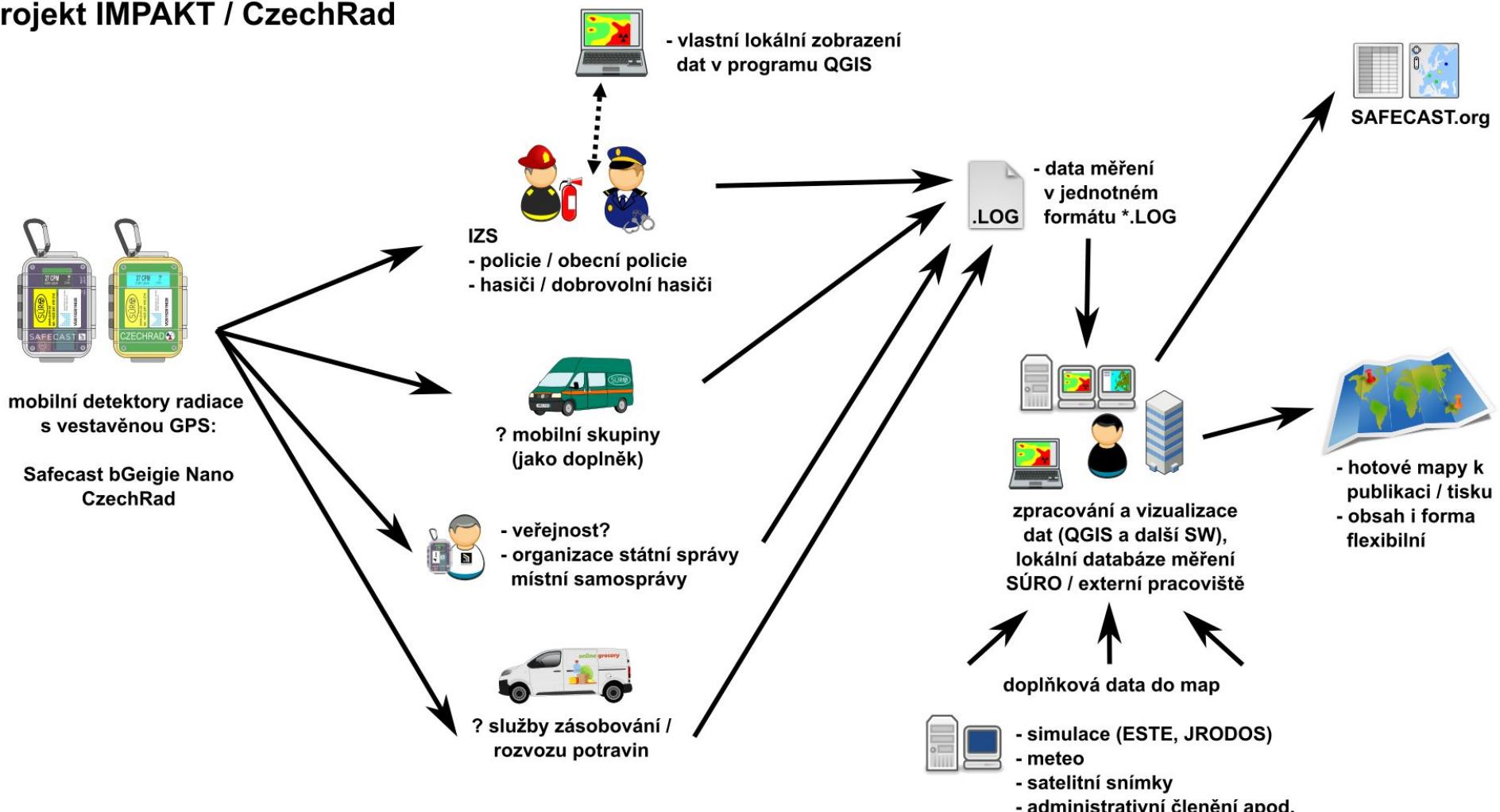
How will the CzechRad be tested?

- SÚRO testing and calibration laboratory with normalized x-ray (Isovolt Titan) and gamma radiation beams (OG-8 irradiator: ^{137}Cs , ^{60}Co) - energy and direction dependence, temperature dependence of the response (climate chamber)
- comparison with the Safecast bGeigie Nano device
- field testing
- the first devices could be loaned to users at the beginning of 2024



Who is going to get the CzechRad device?

Projekt IMPAKT / CzechRad

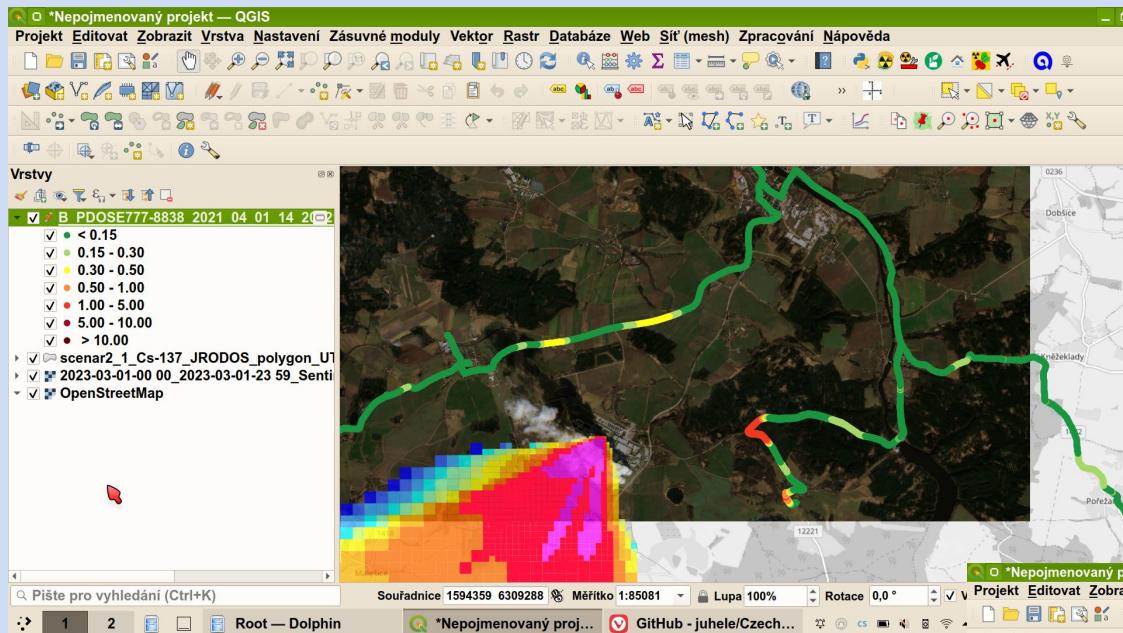


Centrum pro podporu obyvatelstva pro případ skutečného nebo domnělého vzniku mimořádných jaderných a radiačních událostí (VJ01010116)

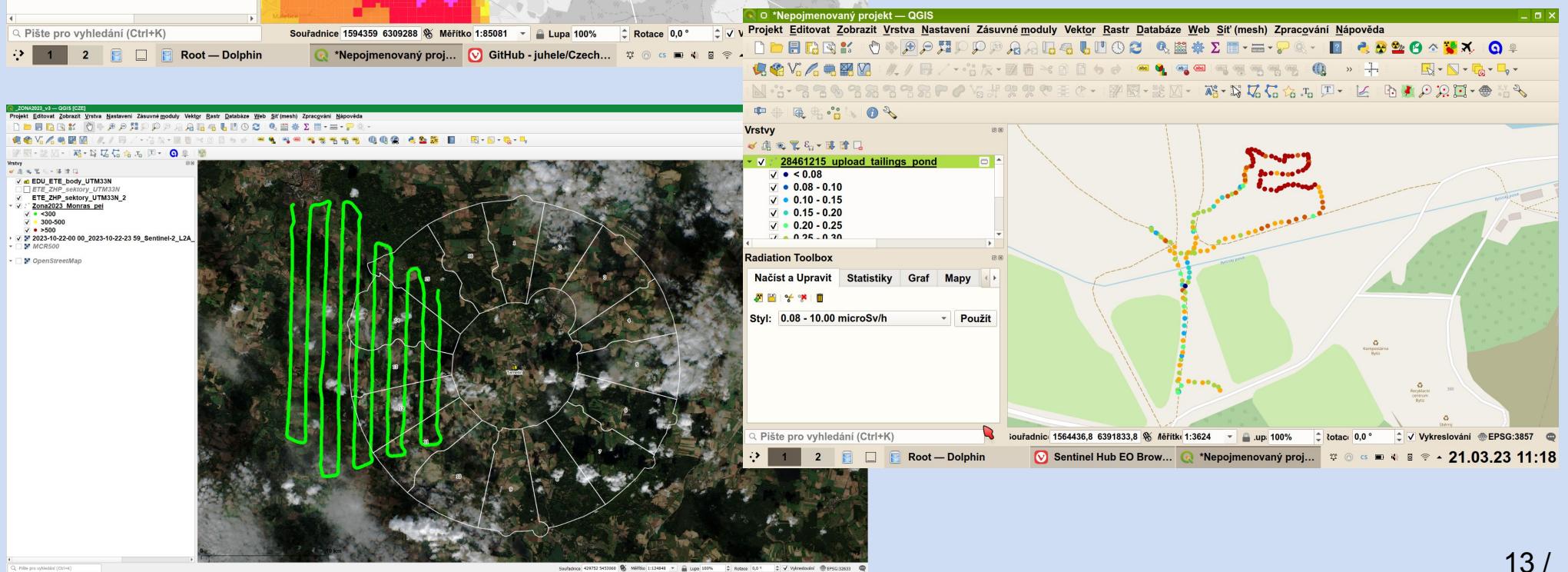


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A practical example of working with data



- [QGIS](#) application (open-source)
+ custom developed plugin
RadiationToolbox
(data *.LOG, experimentally *.PEI)
- can be combined with other data
(measurements from instruments,
outputs of model calculations, etc.)



1000 devices? That's a lot of data, right?

Estimated data volumes

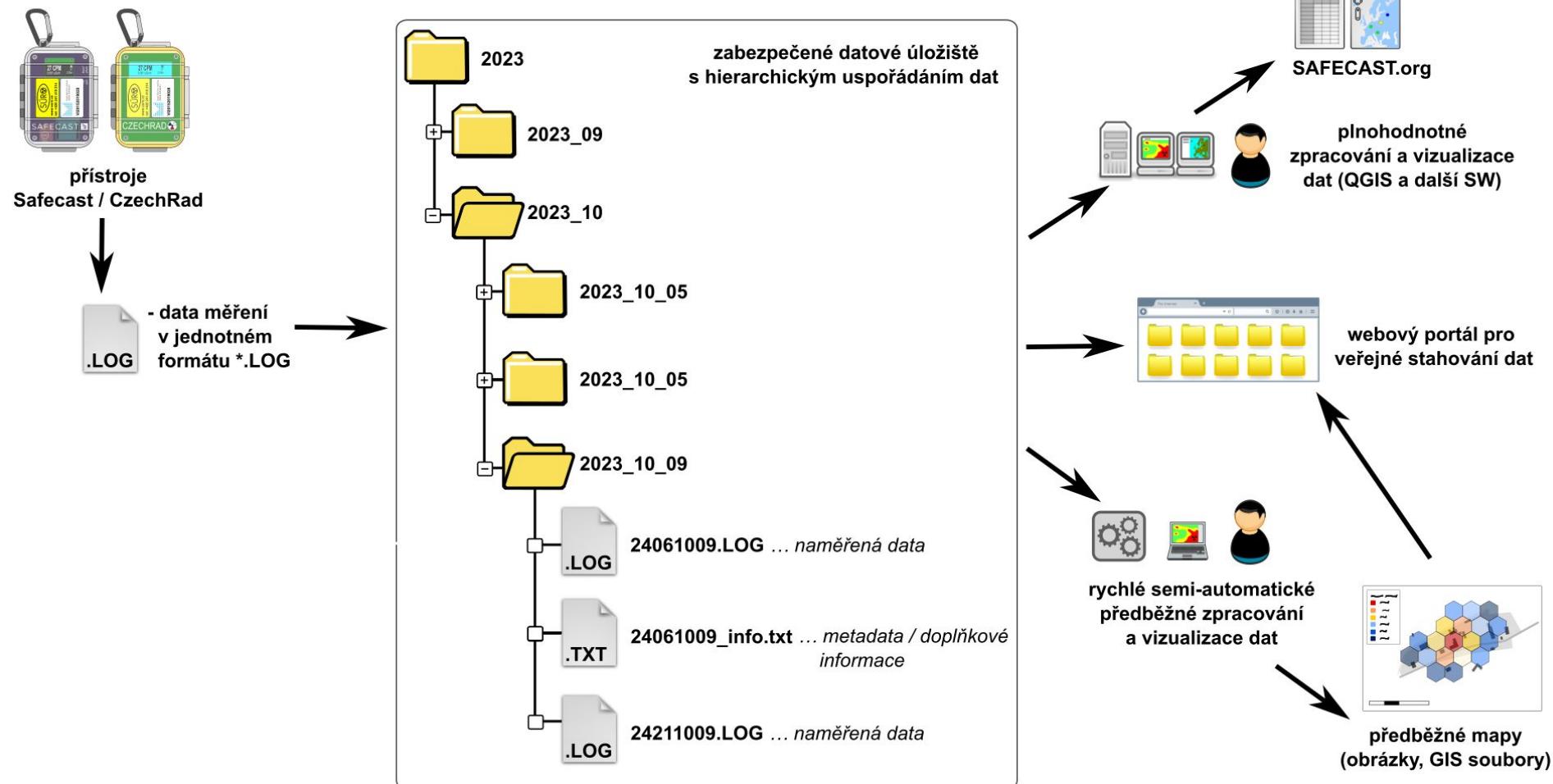
- in 24 hours with 5 sec measurements, 7280 measurements/lines are created by 1 device = approx. 1.6 MB
- 1 day / 1000 devices = 17,280,000 results
- 1 year / 1000 devices = 6.31 billion measurement results - up to 584 GB of data!
(data is in text format, can be compressed for archiving
reduce data volume by 100x)

Necessary to solve

- processing such large volumes of data in normal situation
- data processing in emergency situation - a request for fast processing and visualization of data on the map can be expected
- making the measured data available to the public

1000 devices? That's a lot of data, right?

Projekt IMPAKT / CzechRad - koncepce správy a zpracování dat



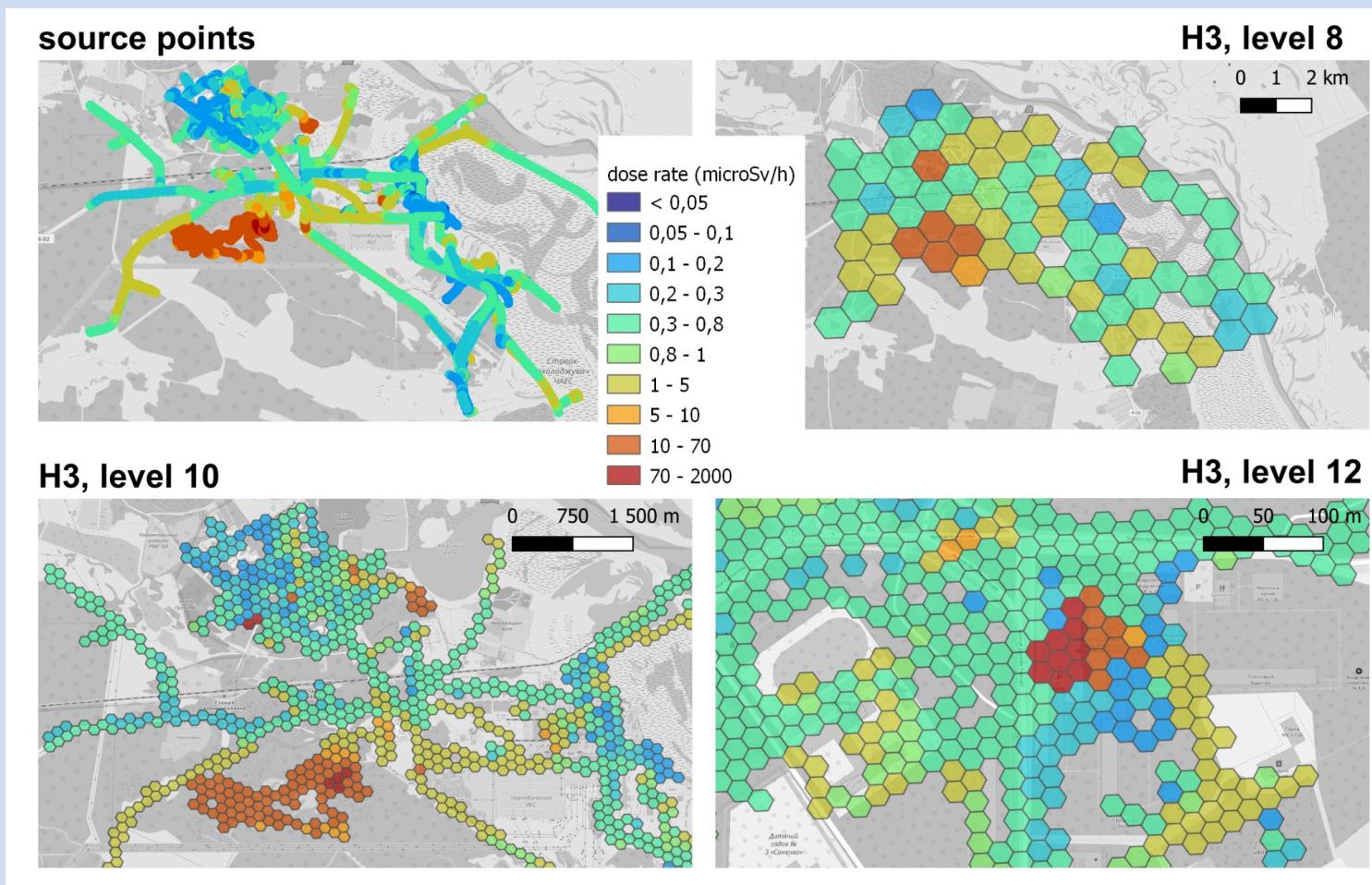
Centrum pro podporu obyvatelstva pro případ skutečného nebo domnělého vzniku mimořádných jaderných a radiačních událostí (VJ01010116)



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Testing new data visualization possibilities

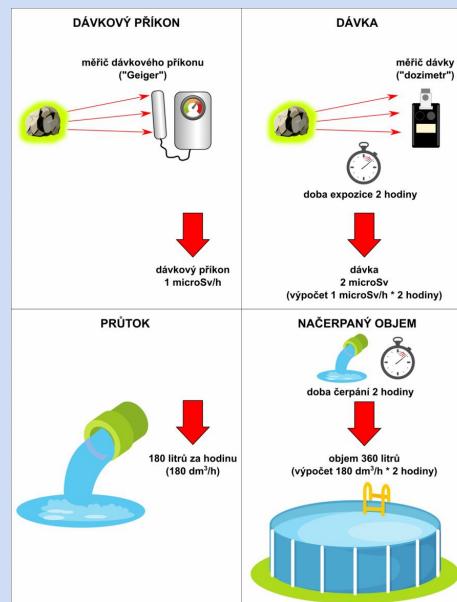
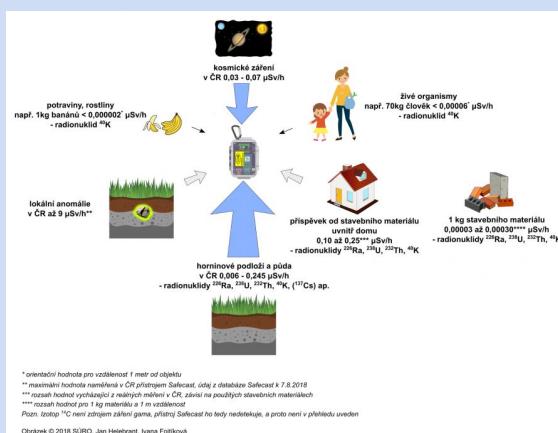
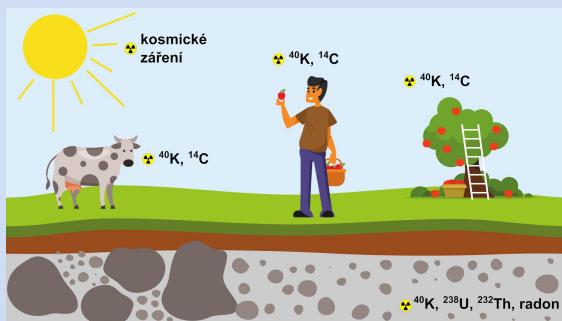
- it is not possible to work reasonably quickly with such a large amount of point data, nor to display it on the map, therefore, based on pilot tests, it is assumed (at least for emergency situations) use of the "data binning" method - grouping data into hexagonal cells of the [H3 Grid](#) system at different scale levels



*example of
conversion of
SAFECAST
point data
(Pripjat, UA) to
vector GIS layers
of H3 Grid with
different scale
levels*

Educational activities, information portal

- attention will continue to be paid to educational activities - expanding and updating the existing [Ramesis Wiki](#) information portal
- a video for the [SÚRO YouTube channel](#) is also ready



SÚRO RAMESIS Wiki

Hlavní strana
Poslední změny
Náhodná stránka
Nápověda k MediaWiki

Nástroje
Odkazujeme sem
Související změny
Speciální stránky
Verze k tisku
Trvalý odkaz
Informace o stránce

Přihlášení

Stránka Diskuse Čist Zobrazit zdroj Zobrazit historii Hledat na Ramesis

Vítejte na informačním portálu projektu RAMESIS

MINISTERSTVO VNITRA ČESKÉ REPUBLIKY

Radiační měřicí síť pro instituce a školy, kteří se zabývají včasné informovaností a zvýšenou bezpečností občanů měst a obcí (RAMESIS) (VI/2015/2019028)

je projekt Bezpečnostního výzkumu České republiky 2015-2022 podporovaného Ministerstvem vnitra České republiky.

Schéma sítě RAMESIS

Obsah [skryt]

- 1 Projekt RAMESIS
- 2 Online aplikace RAMESIS
- 3 Mobilní měření - detektory SAFECAST
- 4 Stacionární měření - fixní stanici, pixelové detektory
- 5 Obecné informace
- 6 QGIS - práce s programem, souhrn dostupných informací
- 7 Ostatní spolupráce
- 8 Reference, zdroje informací

www.suro.cz/aplikace/ramesis-wiki/

Conclusion

The CzechRad device has successfully transitioned from the development phase to the production phase. The devices are currently being assembled at the SÚRO in Prague and tests are being prepared in the SÚRO Prague test and calibration laboratory.

In parallel, the firmware of the device is being improved, which primarily takes into account user feedback from testing prototypes and pre-production samples.

The plan is also to develop a software for downloading data via a USB cable, which eliminates the need to remove the SD card and use the card reader.

Thank you for your attention

