

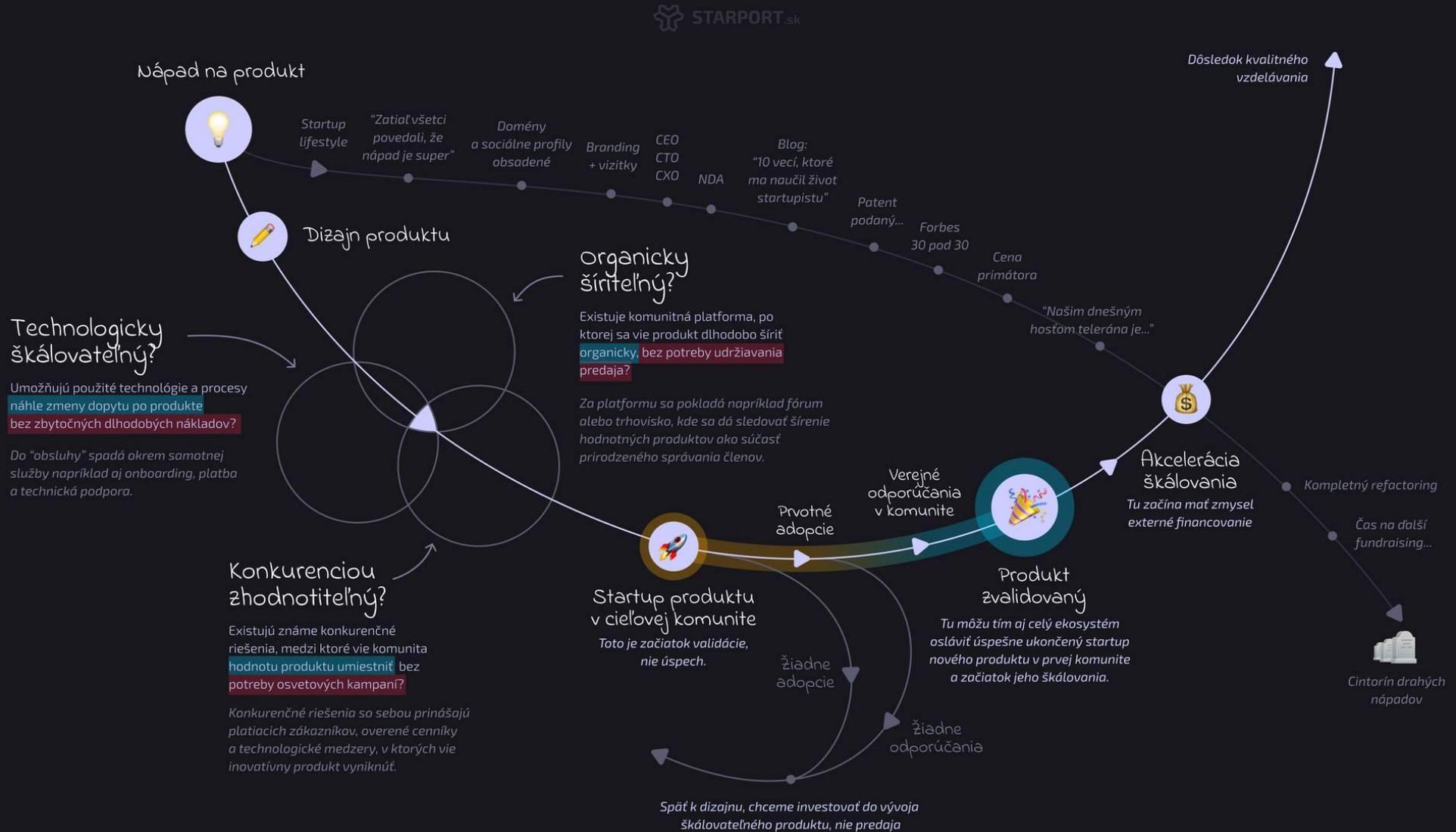


**Ako (a prečo) si
založiť vesmírny
startup?**

Čo sa dnes dozviete?

- Na čo myslieť v prvotnej fáze?
- Ako začať?
- Ako to vidia investori?
- Príležitosti v sektore
- Prečo si založiť vesmírny startup?

(ne)Startupové správanie/na čo myslieť ako prototypovať?



Ako budovať MVP?

HOW NOT TO BUILD A MINIMUM VIABLE PRODUCT



1



2



3



4

ALSO HOW NOT TO BUILD A MINIMUM VIABLE PRODUCT



1



2

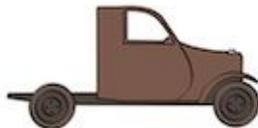


3

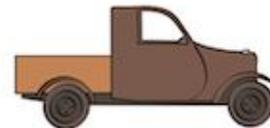


4

HOW TO BUILD A MINIMUM VIABLE PRODUCT



1



2



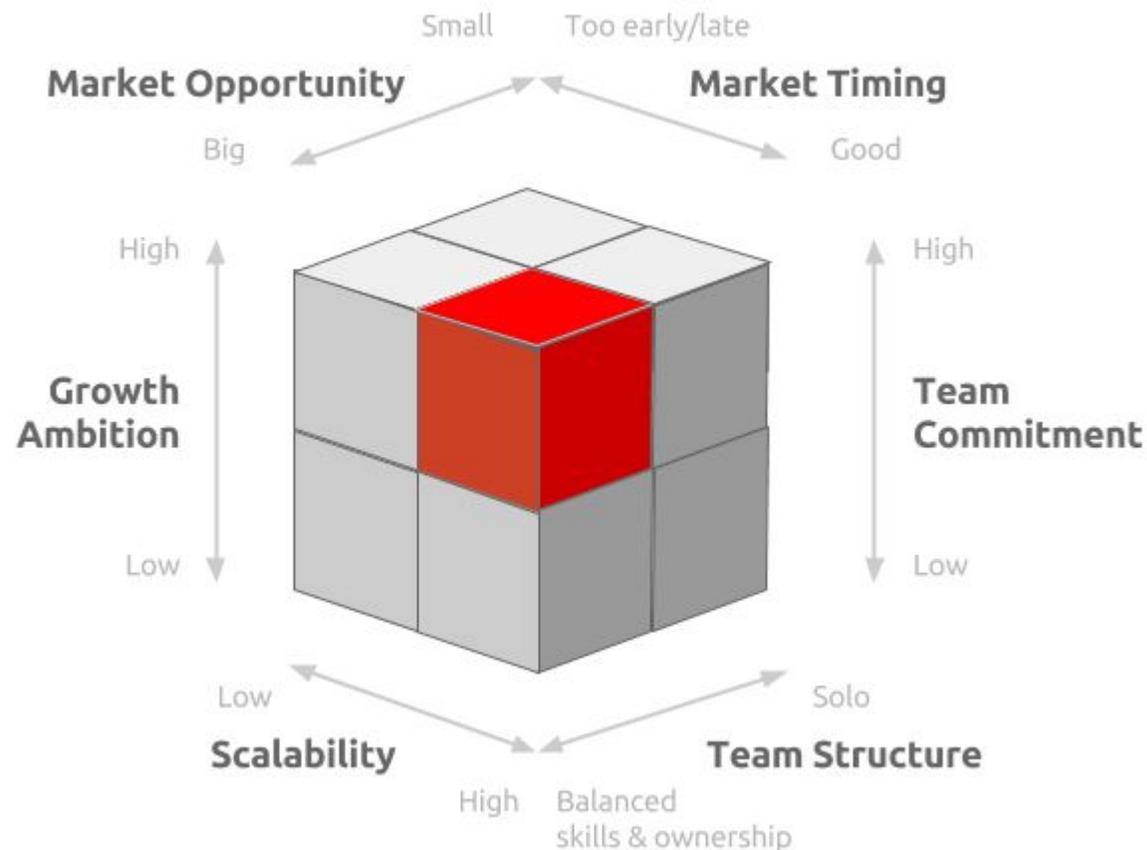
3



4

Čo na to investori?

Evaluating Startup Potential



Vesmírne startupy a možnosti ktoré ponúka sektor

WHAT ALIENS DO ON EARTH

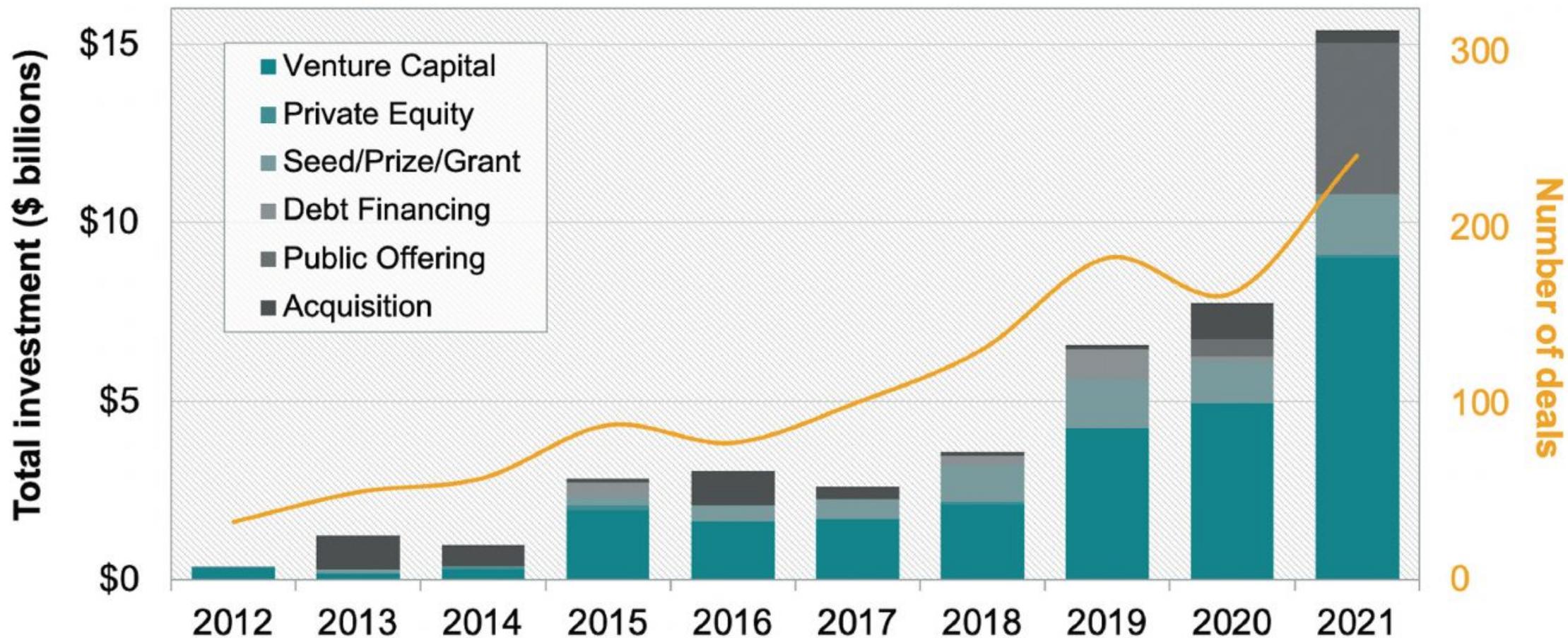


WHAT HUMANS DO ON MARS



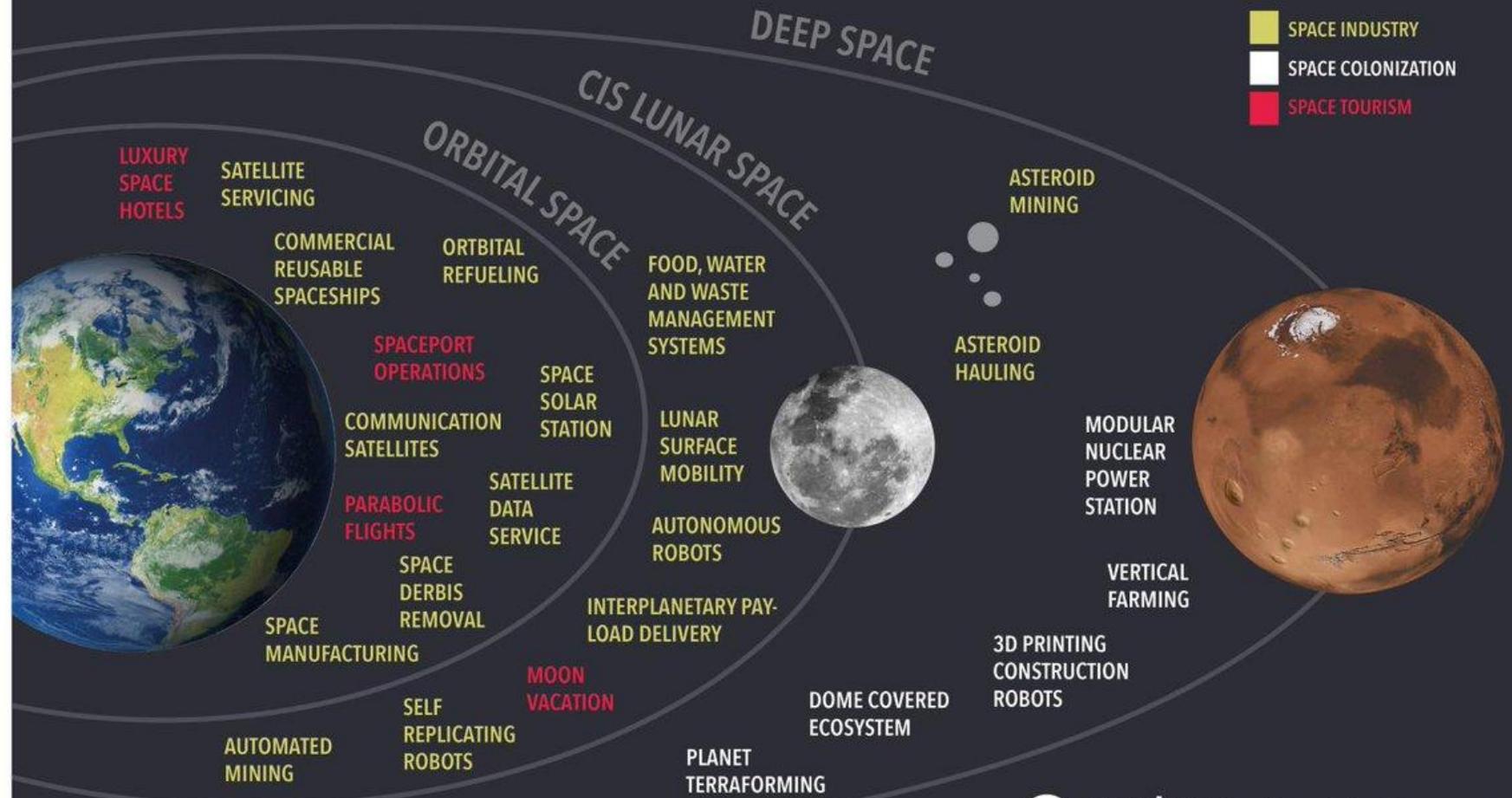
Prečo vesmír ako biznis vertikála?

Investment in Start-Up Space Companies 2012 to 2021, by Investment Type



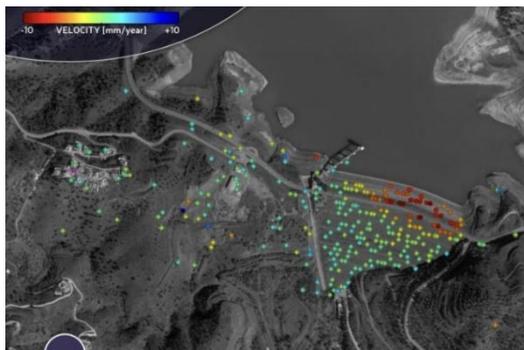
Vesmír otvorený privátnemu sektoru

EMERGING MARKETS IN THE NEW SPACE ECONOMY



Downstream ako jednoduchšia cesta pre SK startupy

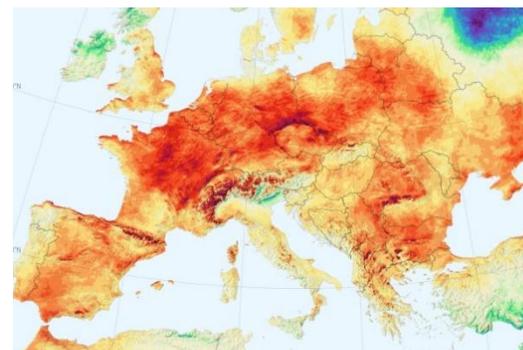
SHOWCASE OF SLOVAK BUSINESS-LED EO PROJECTS



Infrastructure and land deformation monitoring Insar.sk



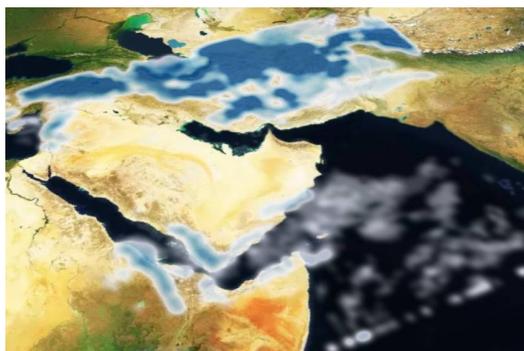
Mining monitoring Photomap



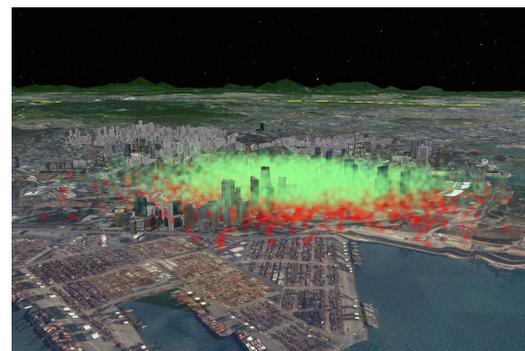
Solar radiation monitoring Solargis



Forest disturbance mapping and monitoring YMS



Meteorological forecasting & modeling Microstep MIS & IBL Software Engineering



Radiation monitoring ABmerit



Early warning systems KAJO Services



Habitat monitoring Algoritmy SK

Nie ste v tom sami

SLOVAK SPACE ECONOMY OVERVIEW

Slovakia has **more than 40 companies actively involved** in the space economy. On top of that, there are **more than 50 other companies** with a strong potential of entering space - working in relevant areas of sectors such as **electronics, high precision machinery, industry 4.0 and ICT**. Several of them already have initial experience with space projects.



KEY FIGURES

40

Companies directly involved in the space economy with 50+ more active in related areas

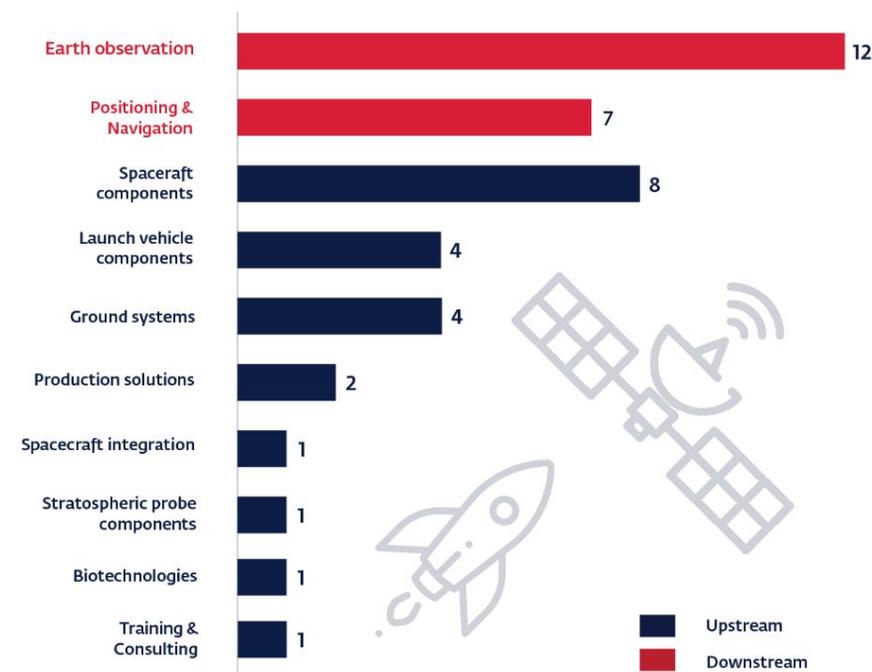
550

People employed by companies directly involved in the space economy

€
120
M+

Revenue generated by companies directly involved in the space economy

Number of Companies Directly Involved in Space Sector



Naše podporné mechanizmy



Entita	názov podpory?
Slovak investment holding	Private investície
Venture to future fund	VC fond
Slovak business agency	Startup Sharks
Fond inovácií a technológií	Private investície
Výskumná agentúra	Spoločnosť orientovaná
Zero gravity Capital/EURO Ventures	VC fond
Vision Ventures	VC fond
AirVentures	VC fond
Zakre Ventures	VC fond
IBB	Mikrospolníka
European Innovation Council	Seal of excellence
Crowdberry	VC fond
Crowdberry	Crowdfunding platforma
Credo Ventures	VC fond
Cassini	Organizátor Hackathon
ISA	Q Equity Funding
European Innovation Council	IC Pathfinder
European defence fund	Space topic
European Innovation Council	IC Accelerator
IBB	Venture Debt
European defence agency	Súťaž: Innovative solution
EUSPA	Experts call
Tamberg Capital	Investičný fond
Status Capital	Investičný fond
Slovak Business Agency	Mikrospolníka

Rozvoj sektora

- 230+ a stále rozširujúca sa tabuľka aktívnych a potenciálne zaujímavých hráčov pre ekosystém
- Networking s Univerzitami, Inkubátormi, VC fondmi a partnermi
- Geografické pokrytie celého Slovenska (BA,ZA,KE)
- 10 + diverzifikačných callov
- Matchmaking SK firiem s Airbus, TAS, SAB Aerospace (Advisory board inkubátora)
- Pozitívne odozvy od partnerov z privátneho sektora



New member, new opportunities...

#SpaceCare

→ THE EUROPEAN SPACE AGENCY

JOIN US



INTERNATIONAL SPACE HACKATHON

ACTINSPACE 2022

DON'T MISS THE INTERNATIONAL HACKATHON
WITH CONTESTANTS FROM ALL OVER THE GLOBE
TO BECOME TOMORROW'S NEW SPACE ENTREPRENEUR!

THE PARTICIPANT'S GUIDE

START



TIMETABLE

Friday November 18th



Saturday November 19th





INNOVATION ECOSYSTEM



innovlab
startup centre of T



SPACE::LAB

KEY MESSAGE



WE NEED TO MAKE A BOLDER STEP TOWARDS SUPPORTING INNOVATION...

...AND DO IT IN COLLABORATION BETWEEN PLAYERS
RATHER THAN COMPETITION



innovlab
startup centre of T



SPACE::LAB

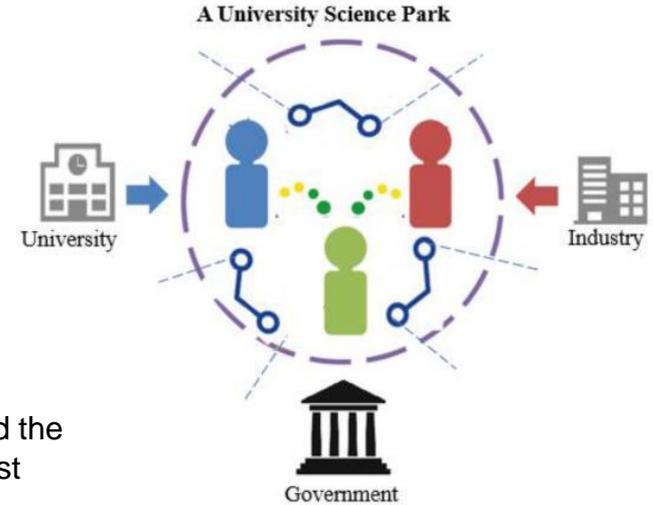
INNOVATION ECOSYSTEM - INTRO

Innovation Ecosystem

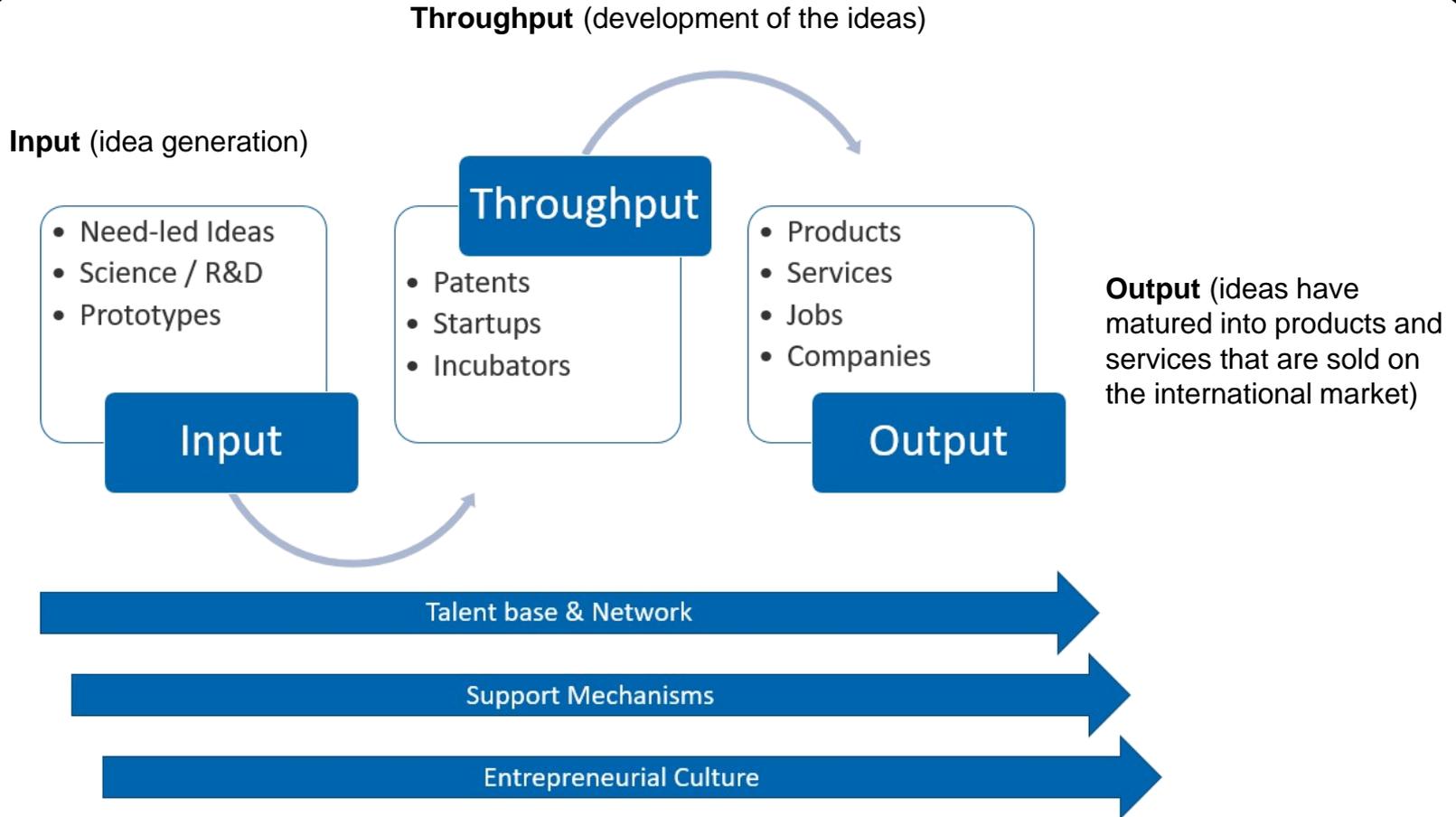
Refers to a loosely interconnected network of companies and other entities that coevolve capabilities around a shared set of technologies, knowledge, or skills, and work cooperatively and competitively to develop new products and services (Moore, 1993).

Key Elements are:

1. **The Talents** that will need to form the development or **Startup teams** and the **Network** that will need to support them with advice, customer insights, first investments, launching costumer ship etc.
2. **The Support Mechanisms** that are in place within **Universities**, **Companies**, launching **Customers** or at regional **Government** level to support the swift development of the teams and their products & services.
3. **The Culture** that either favors or discourages **Risk taking**, **Collaboration** with other network partners, **exploring new** opportunities etc.



MAKING UP A LIVING INNOVATION ECOSYSTEMS

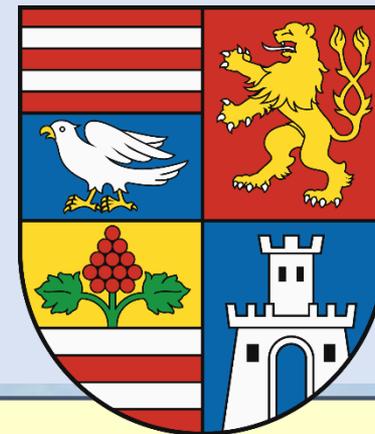


OUR POTENTIAL & VISION

INTRODUCTION OF THE KOSICE CITY REGION

Kosice 2nd largest city in Slovakia
The average age of the population - 35 years
3 important Slovak universities (key are Technical and Medical)

Inhabitants in the region:	238 757
Total student base:	16544
Total ERC grants in all domains for the region since 2010:	500+
Total patents filed in the region:	156
Nr. of health related start ups created by the Universities 2014-2019:	60



OUR JOINED 2025 VISION AND AMBITION FOR THE REGION

- Create a high impact entrepreneurial ecosystem focused on telco, health & space innovation
- Enabled by access to facilities and know-how in emerging technologies
- Establish best practice knowledge transfer from foreign countries Tech clusters to Kosice
- Supported by the formation of a corporate and educational collaboration platform to stimulate innovation entrepreneurship
- Supported by new sources of funding and programs for regional economic benefit

NETWORK - SIZE OF COMMUNITIES

STUDENT BASE STEM	TOTAL
# of students in STEM disciplines (incl. Life Sciences)	9354
Following BSc program	
Following MSc program	8677
Following a PhD program	677
STUDENT BASE MEDICINE	TOTAL
# of students in STEM disciplines (incl. Life Sciences)	3175
Following BSc program	
Following MSc program	2975
Following a PhD program	200
STUDENT BASE BUSINESS & ECONOMICS	TOTAL
# of students in STEM disciplines (incl. Life Sciences)	985
Following BSc program	
Following MSc program	935
Following a PhD program	50
STUDENT BASE OTHER	TOTAL
# of students in STEM disciplines (incl. Life Sciences)	3030
Following BSc program	
Following MSc program	2697
Following a PhD program	333

Possible challenges to approach the communities

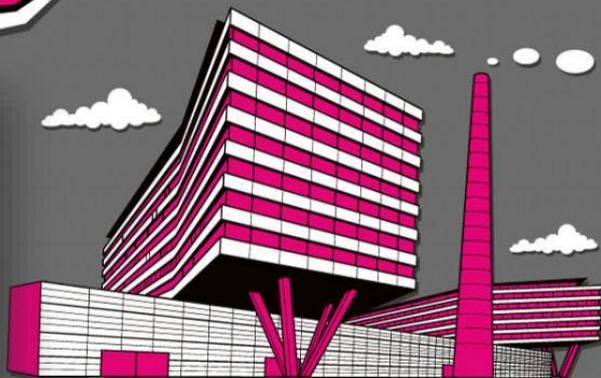
Networking and engagement - Due pandemic and restrictions students and innovators have changed their behavior. No in person meetings, they are studying & working from home and online...

Planned actions to mitigate the listed challenges

We need use existing structures like university courses & classes, business clusters and student organizations to organize together info sessions, workshops and meetups with students and young entrepreneurs to get them involved.

INNOVLAB STARTUP CENTRUM

Košice – Head Office



1. TELCO

5G, IoT, VR / AR, Ux

2. HEALTH

Digital Health, Biotech,
Medtech, LifeTech

3. SPACE

Commercial Upstream
& Downstream



We are the start-up center of Deutsche Telekom, based in Košice. Our goal is to support the development of the innovation ecosystem in the region of east Slovakia. To achieve this, we work with young people, students and start-ups and continue with schools, universities and local government.

SUPPORT & CULTURE - KOSICE STARTUP PLATFORM (*17.04.2019)

REGULAR
MEETUPS

TECHNOLOGY
&
INNOVATION
TRANSFER

PARTNER
SEARCH IN
KOSICE

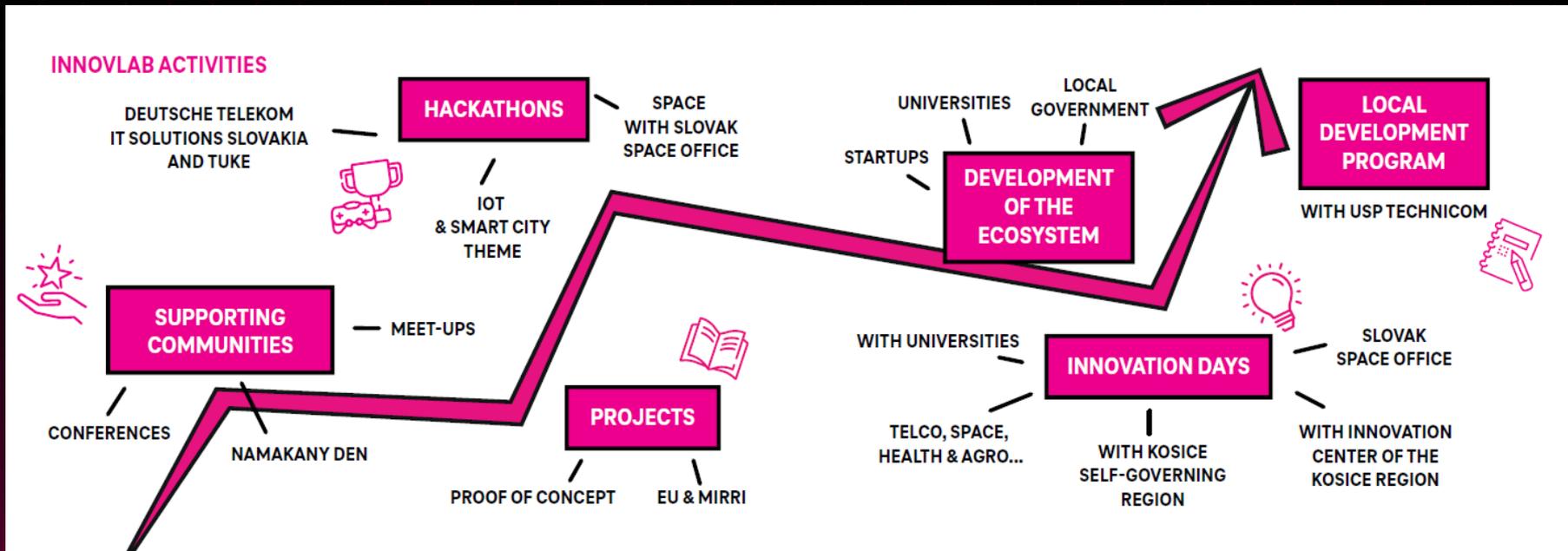
EXCHANGE
TRAINING
PROGRAMS



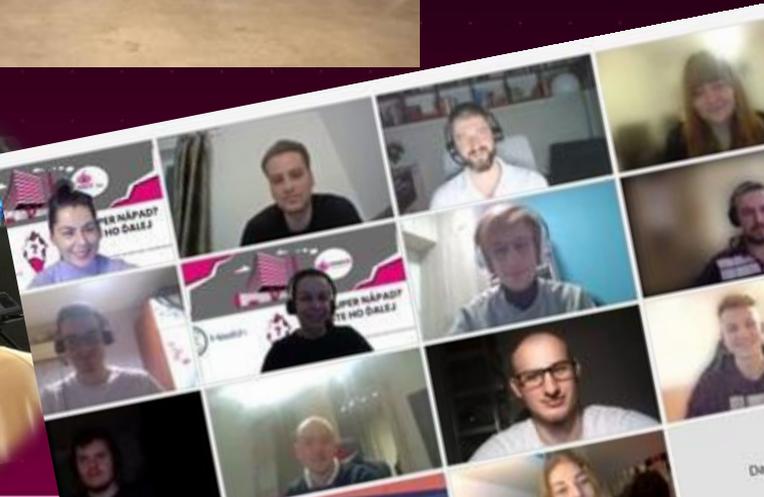
KOSICE STARTUP PLATFORM



INNOVLAB ACTIVITIES TO SUPPORT ECOSYSTEM DEVELOPMENT



INNOVATION DAYS, DEMO DAYS, HACKATHONS, MEETUPS



VEDECKÝ KURIÉR - KOZMICKÝ STRÁŽCA

arrived at schools, students learned more about space debris existence, dangers monitoring and removal

Oct 26: The cosmic guardian landed in 113 primary and secondary schools.



Credits



UNIVERZITA
KOMENSKÉHO
V BRATISLAVE



SPACE::LAB



innovlab
startup centre of

NÖC VÝSKUMNÍKOV

SUMMARY

- ✓ STARTED NEW COOPERATION WITH SLOVAK SPACE OFFICE - SARIO, INNOVATION CENTER OF THE KOSICE REGION, KOSICE IT VALLEY, DIGITALNA JESEN
- ✓ INNOVLAB HAS BECOME A PART OF THE SLOVAK SPACE INCUBATOR WITH THE SLOVAK ACADEMY OF SCIENCES, WE CREATED THE KOSICE HUB
- ✓ 5 EVENTS ORGANIZED TO SUPPORT STARTUPS ECOSYSTEM IN THE EAST SLOVAKIA REGION - MEETUPS, WORKSHOPS, INNOVATION DAY 2021, HACKATHON 2021
- ✓ +251 ATTENDEES ON OUR ONLINE EVENTS
- ✓ 206 ACTIVE NEW MEMBERS IN OUR ONLINE COMMUNITY PLATFORM
- ✓ 2185 ONLINE ATTENDEES IN THE LOCAL DEVELOPMENT PROGRAM FOR START-UPS AND ENTREPRENEURS 2021, COOPERATION WITH OUR LONG -TERM PARTNER USP TECHNICOM
- ✓ CSR - THERMAL CAMERAS INSTALLATIONS FOR POPROC NURSERY & PRIMARY SCHOOL - HELPING TO FIND PANDEMIC
- ✓ TOP STUDENTS FINAL THESIS COMPETITION WITH TUKE - 3 STUDENTS AWARDED WITH THEIR FINAL THESIS
- ✓ 638 FOLLOWERS ON INNOVLAB FACEBOOK, 287 + LINKED IN
- ✓ 30 WRITTEN ARTICLES ABOUT INNOVLAB

2021
IN INNOVLAB

THANK
YOU



THANK YOU

Whether you are looking for the way how to launch your startup, or achieve specific innovation goals, or you just need to increase the speed and scope of your existing programs, we should definitely talk to each other.

Do not hesitate to contact us on
FMB_innovlab@t-systems.com



 innovlab.sk



 [Innovlab_Kosice](https://www.linkedin.com/company/Innovlab_Kosice)



 [@innovlabkosice](https://www.facebook.com/innovlabkosice)



 [@innovlab_kosice](https://www.instagram.com/innovlab_kosice)



The background is a vibrant space scene. It features a dark purple and red gradient. In the top right, there's a large orange and red planet with a smaller yellow and red striped planet below it. In the bottom left, there's a blue and green planet with a yellow and red striped planet below it. The scene is filled with white stars, small blue and purple celestial bodies, and large, light-colored, cratered moons or planets in the corners.

KOZMICKÝ STRÁŽČA

MONITOROVANIE KOZMICKÉHO ODPADU

NÁŠ DEV TÍM

ZOSTAVA TÍMU



Štefan Hadbavný - frontend



Gabriel Urban - testing



Ádám Tamáš - backend



Motivácia

Prečo sme vyrobili appku

Na základe našej skúsenosti, keďže pracujeme v startup centre a aj v našej spoločnosti často s mladými ľuďmi alebo školami je dôležité začať čo najskôr a už možno aj v predškolskom veku budovať pozitívnu skúsenosť s vedou a modernými technológiami a snažiť sa o to hlavne hravou nenásilnou formou.

Cielom by malo byť ukázať že nejde o vec, ktorú môže robiť len vybraná skupina ľudí a motivovať ich cez pozitívnu skúsenosť k tomu, aby neskôr si zvolili pracovať v STEM oblasti a že im k tomu stačí sa postupne naučiť chápať problém a analyzovať ho a kriticky myslieť a pracovať s informáciami, programovať a potom sa da ľahko budovať špecializácia na vedecký alebo inžiniersky smer napríklad zameraný na vesmír.

Preto sme sa aj zapojili do aktivity noc vyskumníkov a vyvinuli náučnú aplikáciu o kozmickom odpade, ktorá by mala mala k tomu mladých ľudí nadchnúť a motivovať, dozvedieť sa o probléme kozmického odpadu viac.





Problém

KOZMICKÝ ODPAD:

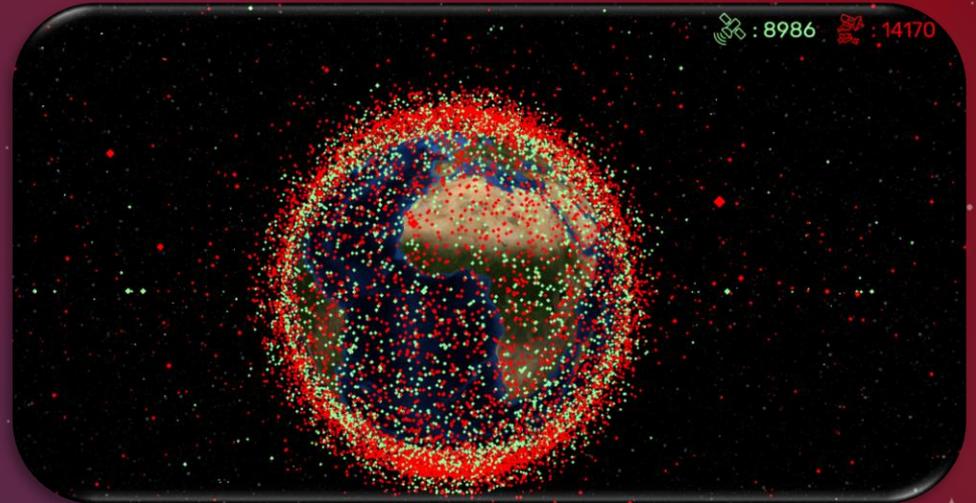
- objekty na obežnej dráhe našej planéty,
- už nemajú žiaden účel,
- vytvorené človekom,
- prevažne: vyhorené stupne nosných rakiet, nefunkčné satelity, trosky,
- ohrozujú družice i kozmické lety.

KOĽKO ODPADU JE V KOZME?

- viac ako 36 000 objektov s priemerom >10 cm,
- viac ako 1 000 000 objektov s priemerom 1-10 cm
- viac ako 130 000 000 objektov s priemerom 0.1 - 1 cm

Celková váha kozmického odpadu sa odhaduje na 10 100 ton. Tolko váži napríklad Eiffelova veža v Paríži.

Priblíženie problematiky kozmického odpadu



DEMO

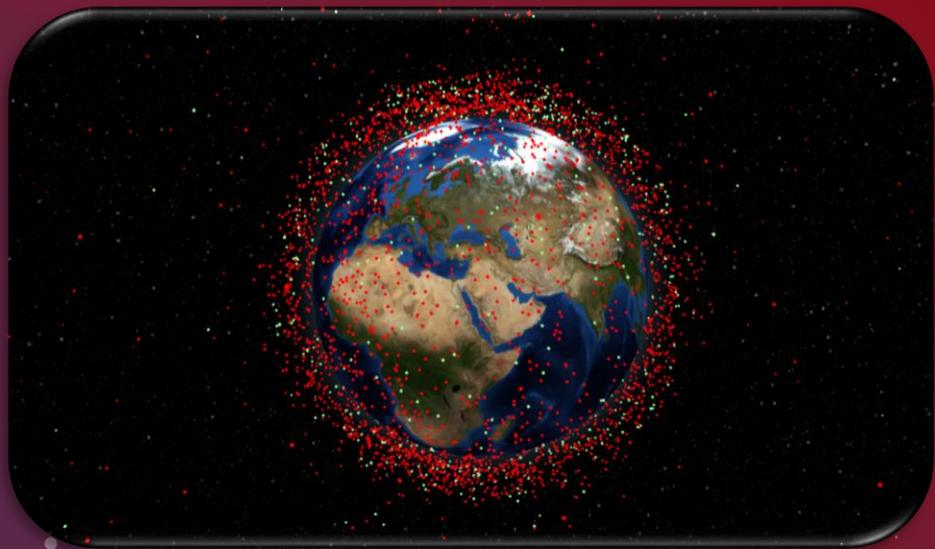
UKÁŽKA STÚPANIA POČTU OBJEKTŮ OKOLO ZEME



Prostredníctvom našej aplikácie je možné sledovať zvyšovanie počtu objektov za uplynulé roky.

Webová aplikácia

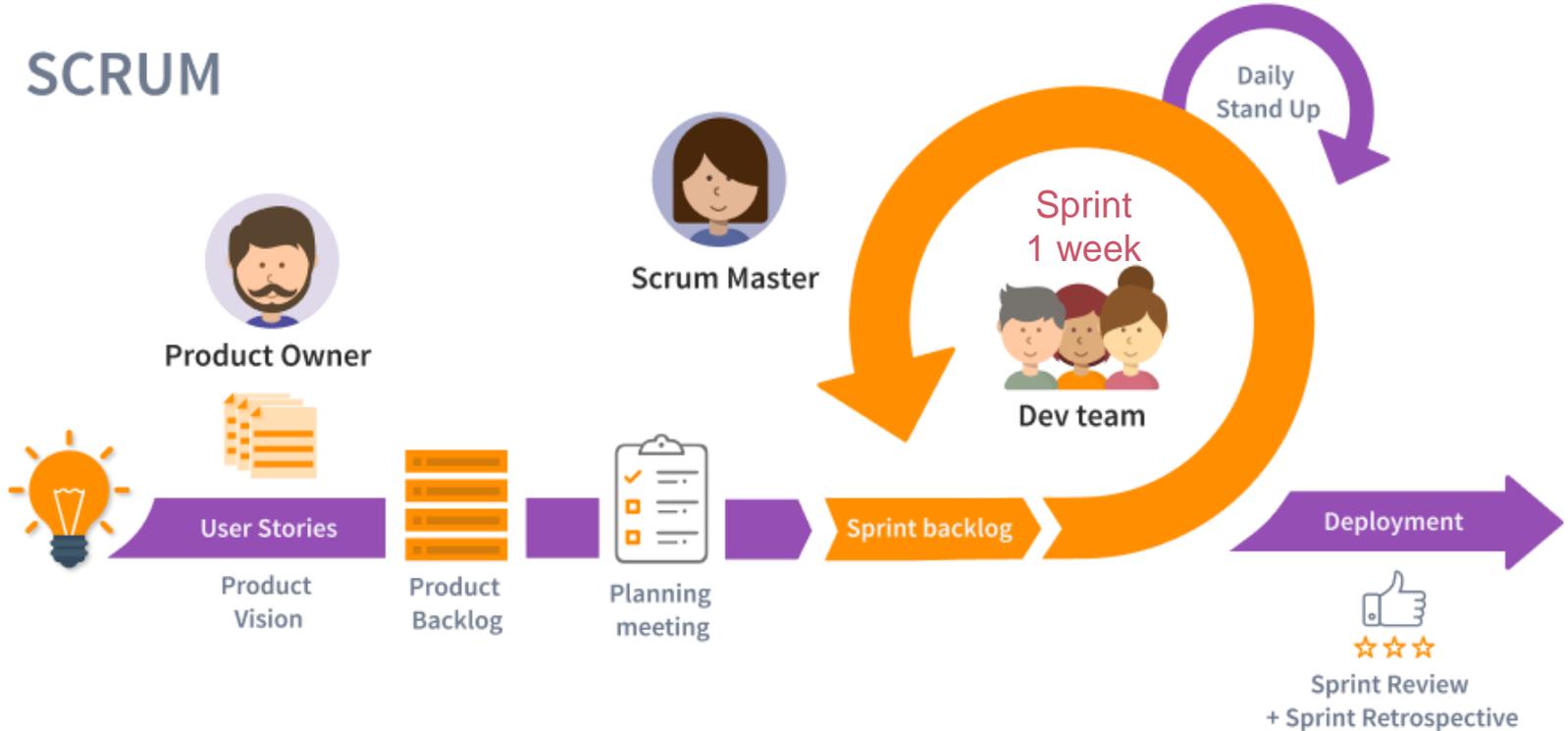
Virtualizácia kozmického odpadu



DEV PROCES

Ako sme pracovali

SCRUM



Frontend

ReactJS - FRONT-END JAVASCRIPT LIBRARY

- Three.js - JavaScript 3D library
- Satellite.js - satellite propagation via TLEs



The screenshot shows the Visual Studio Code editor interface. The Explorer sidebar on the left displays a project structure for "SPACE-DEBRIS-PROJECT" with various files and folders like "util", "Virtualization.js", and "Slider.js". The main editor area shows the code for "Virtualization.js", which includes functions for handling satellite information and calculating positions. The code uses the `satellite` library for geodetic and propagation calculations. The terminal at the bottom shows the output of the development server, indicating that the application is running successfully on `localhost:3000`.

```
React-project > kozmicka-strazca-2 > src > components > Virtualization.js > Virtualization > <-function>
29
30
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59
60
61
satObjectInfoOnClick,
handleOpenModalSatInfo,
time,
earthRadiusKm,
satWakeUpZoom,
isCheckedFilter,
setZoomNum,
} = props;

//update objects locations
const objectsData = useMemo(() => {
  if (!satData) return [];
  const gmst = satellite.gstime(time);
  const data = satData.map(d => {
    const eci = satellite.propagate(d.satrec, time);
    if (eci.position) {
      const gdPos = satellite.eciToGeodetic(eci.position, gmst);
      const lat = satellite.radiansToDegrees(gdPos.latitude);
      const lng = satellite.radiansToDegrees(gdPos.longitude);
      const alt = gdPos.height / earthRadiusKm;
      return { ...d, lat, lng, alt };
    }
  });
  return d;
});

if (isOpenModalSatInfo && objectInfoOnClick) {
  const position = data.filter((x) => x.ID === objectInfoOnClick.object.ID);
  if (position.length === 1) {
    no.current.pointOfView(
      {
        lat: position[0].lat,
        lng: position[0].lng,
        altitude: position[0].alt * 1
      }
    );
  }
}

OUTPUT  DEBUG CONSOLE  JUPYTER  PROBLEMS  14  TERMINAL

You can now view earth in the browser.

Local: http://localhost:3000/kozmiczydopad
On Your Network: http://172.31.96.1:3000/kozmiczydopad

Note that the development build is not optimized.
To create a production build, use yarn build.

webpack compiled successfully
```

```
"info":{
  "OBJECT_NAME": "VANGUARD 1",
  "OBJECT_ID": "1958-002B",
  "NORAD_CAT_ID": 5,
  "OBJECT_TYPE": "PAY",
  "OPS_STATUS_CODE": "",
  "OWNER": "US",
  "LAUNCH_DATE": "1958-03-17",
  "LAUNCH_SITE": "AFETR",
  "DECAY_DATE": "",
  "PERIOD": 132.72,
  "INCLINATION": 34.25,
  "APOGEE": 3833,
  "PERIGEE": 649,
  "RCS": 0.122,
  "DATA_STATUS_CODE": "",
  "ORBIT_CENTER": "EA",
  "ORBIT_TYPE": "ORB",
  "ORBIT_ALTITUDE_TYPE": "MEO"
},
"tle":{
  "line1": "1 00005U 58002B 22237.43319354 .00000174 00000-0 22372-3 0 9999",
  "line2": "2 00005 34.2496 286.8512 1847288 347.9860 167.1844 10.84997181292031"
}
```



```
"name": "VANGUARD 1",
"id": 5,
"satellite": true,
"year": 1958,
"orbit": "MEO",
"optTier": 1,
"line1": "1 00005U 58002B 22237.43319354 .00000174 00000-0 22372-3 0 9999",
"line2": "2 00005 34.2496 286.8512 1847288 347.9860 167.1844 10.84997181292031"
```

ZDROJE:

- TLE – v textovom forme – space-track.org,
- NORAD Satcat – vo forme CSV – celestrak.org,

SPÔSOB RIEŠENIA:

- Prepracovanie a modifikovanie TLE a CSV dát,
- Pridanie vlastné výpočty
- Zlúčenie dát do JSON formátu,
- Zjednodušenie datasetov pre animáciu,
- Vytvorenie REST API – Express.js

Quality assurance

TEST MANAGEMENT TOOL – Tuskr

- custom test suite,
- tracking testov a performance,
- reporty

UNIT TESTY - Selenium WebDriver

- automatizované testy,
- Python



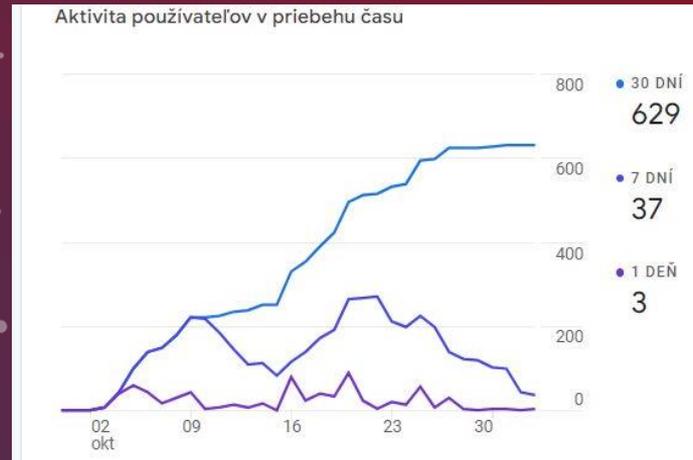
```
File Edit Selection View Go Run Terminal Help
unit-testing
functions.py x test_altitude_filter.py test_controls.py test_object_filter.py test_optimization.py test_re
functions.py > functions.py > is_checked
287     time.sleep(2)
288
289
290     # check whether checkbox is checked or not
291     # parameter: id of a checkbox
292     def is_checked(test_name, id):
293
294         open_menu(test_name)
295
296         is_checked = False
297
298     try:
299         is_checked = driver.execute_script(
300             f"return document.getElementById('{id}').checked")
301
302         if (is_checked):
303             logging.info(test_name + ": checkbox with ID: " +
304                           str(id) + " is CHECKED")
305         else:
306             logging.info(test_name + ": checkbox with ID: " +
307                           str(id) + " is UNCHECKED")
308     except WebDriverException:
309         logging.error(test_name + ": checkbox with ID: " + str(id) +
310                       " cannot return value! Check given ID parameter")
311
312     close_menu(test_name)
313
314     return is_checked
315
316
317     # switch checkbox for optimization (less objects)
318     def switch_optimization(test_name):
```

Zhodnotenie

Štatistiky a výsledky

ZÁVER:

- Aplikácia splnila a naďalej plní svoj edukačný účel
- Čísla nám hovoria, že je živá a odhadujeme $631 \text{ tried} \times 30 = \sim 18000$ žiakov
- Počas noci vyskumníkov = EURÓPSKA NOC VÝSKUMNÍKOV 2022 bolo 145 077 účastníkov z toho 80 265 žiakov

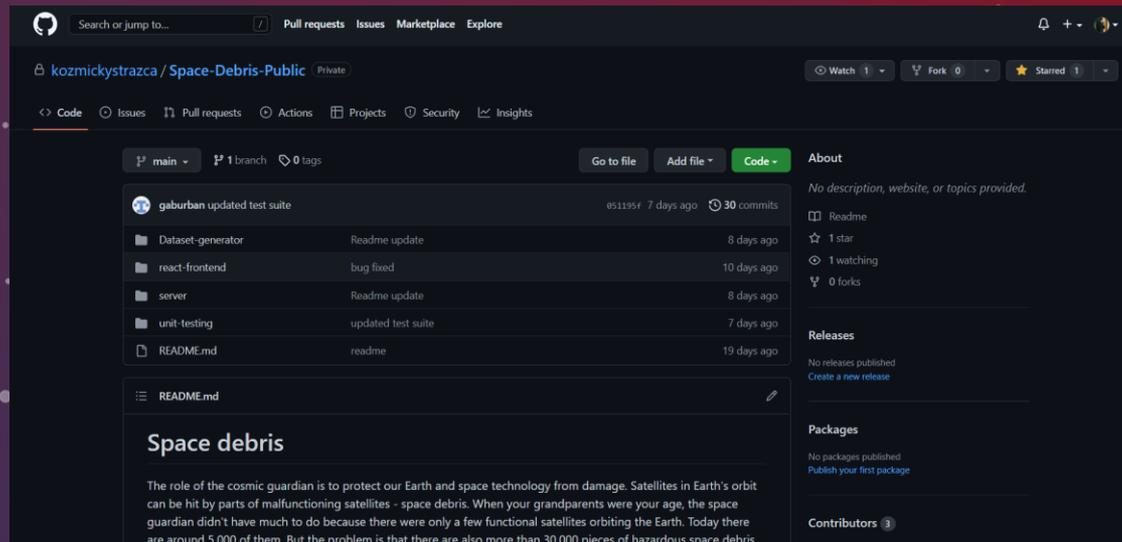


Next steps

Publikovanie kódu

PODPORÍME SPACE DEV KOMUNITU OTVORENÍM KÓDU PRE VEREJNOSŤ

- Verejný repozitár Github: Kozmickystrazca / Space-Debris-Public



The screenshot shows the GitHub interface for the repository `kozmickestrazca / Space-Debris-Public`. The repository is public and has 1 star, 0 forks, and 1 watch. The main branch is `main` with 1 branch and 0 tags. The repository contains several files and folders:

File/Folder	Last Update	Time Ago
gaburban updated test suite	051195f	7 days ago
Dataset-generator	Readme update	8 days ago
react-frontend	bug fixed	10 days ago
server	Readme update	8 days ago
unit-testing	updated test suite	7 days ago
README.md	readme	19 days ago

The `README.md` file is expanded, showing the title `Space debris` and the following text:

The role of the cosmic guardian is to protect our Earth and space technology from damage. Satellites in Earth's orbit can be hit by parts of malfunctioning satellites - space debris. When your grandparents were your age, the space guardian didn't have much to do because there were only a few functional satellites orbiting the Earth. Today there are around 5,000 of them. But the problem is that there are also more than 30,000 pieces of hazardous space debris.

The right sidebar shows the repository's statistics and sections for `About`, `Releases`, `Packages`, and `Contributors`.

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POZORNOSŤ!



Credits



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