

Towards the generation of real-time Digital Twins with the press of a button

AR/VR for Space Programmes 2023

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Agenda

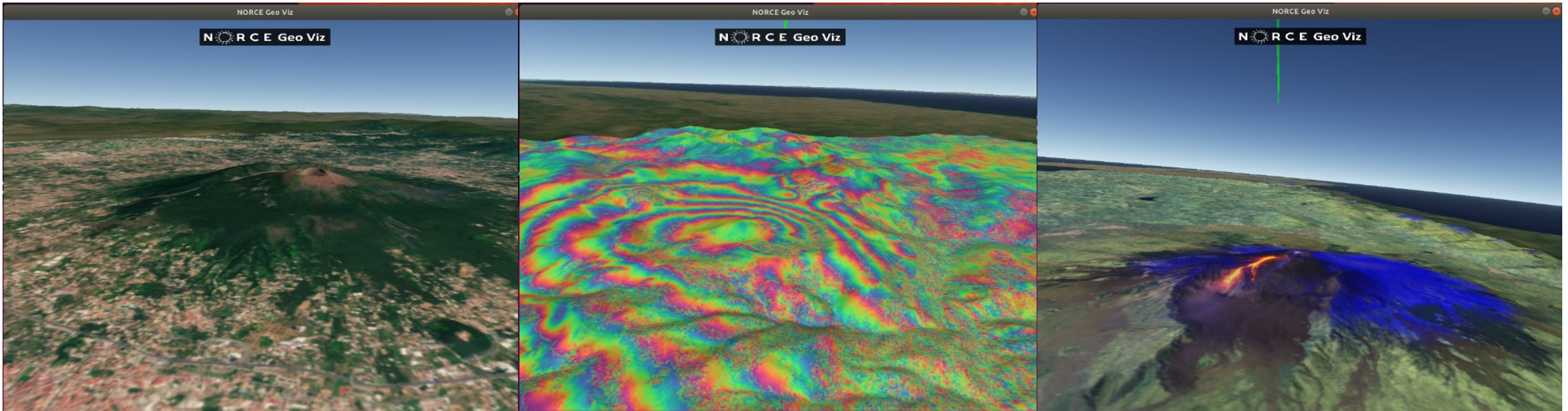
- Current Assets at ϕ -Lab
- Reduction of the AR/VR scenarios preparation time
- From a drone scan to XR experience
- From event to EO scan to XR experience
- AR/VR Visualizations Journey
- Future plans and 2024 activities

Current Assets at ϕ -Lab

As of end of 2023, the ϕ -Lab XR (including VR, AR) portfolio consisted of:

- **The NORCE (Norway) VR installation (development 2018-2019)**
 - Software: Linux Ubuntu, SteamVR, NORCE GeoVIZ proprietary software - Hardware: HTC VIVE PRO Hardware
 - Content: complete 3D globe of the Earth with base satellite imagery, real DEMs, multiple EO scenes (S1, S2, S3, hyper, etc.)

NORCE (Norway) VR installation



Vesuvius fires 2017

Central Italy Earthquake 2016

Etna Eruption 2017

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- **Multiple relevant assets from Digital Twin Urban Pilot (DTUP, MindHeart) project (datasets, 3D models, prototype web, VR and AR applications)**

DTUP – Digital Twin Urban Pilot



Digital Twin Frascati

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- **The DT ESRIN (Digital Twin ESRIN) prototype (developed 2021 by Anatole Deligant)**
 - Software: Windows, Unity, open C# application, integrated with in-situ data sources using respective APIs
 - Hardware: Oculus Quest 2 (but works with HTC VIVE PRO as well – tested -, thanks to the use of openXR technology)
 - Content: external 3D models of the whole ESRIN campus (2018 – done in-house from WFP data; 2021 – output of DTUP project)

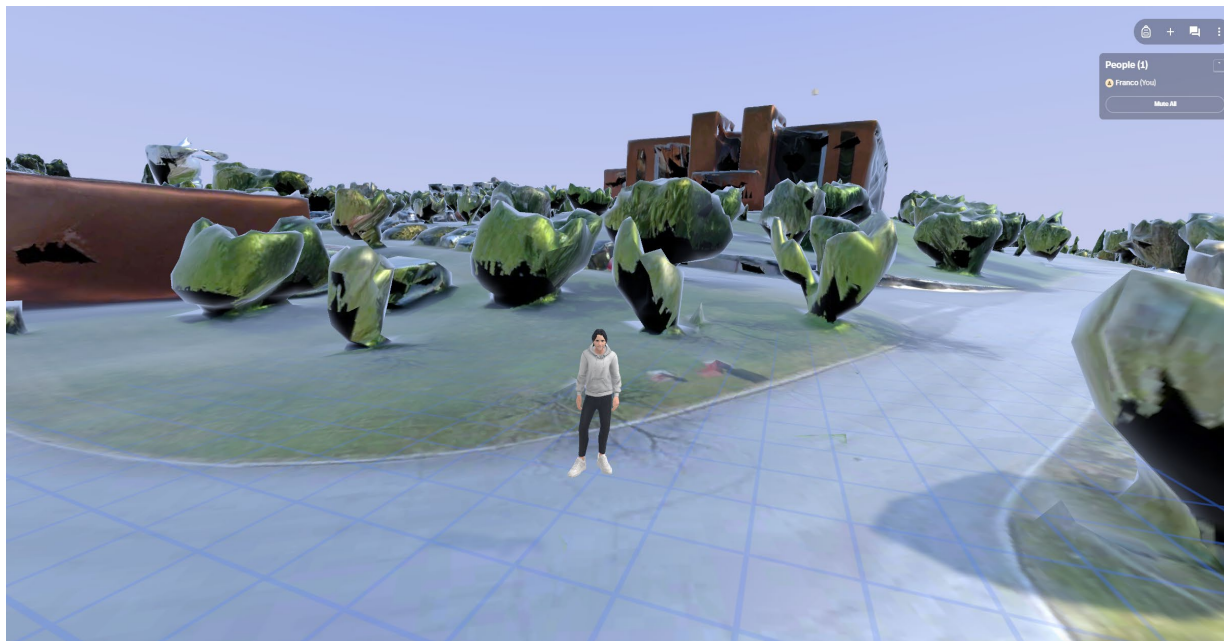
Digital Twin ESRIN



Digital Twin Esrin

Additional activity with DT ESRIN

- Explored loading Φ -lab/Esrin model onto spatial.io:
 - <https://www.spatial.io/Space>
 - Metaverse concept, to use in virtual events, expand VR interactivity



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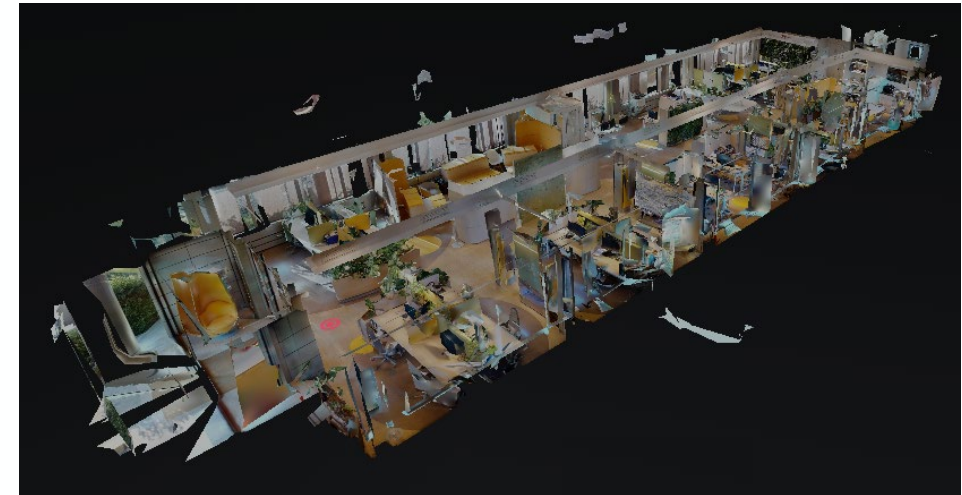
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φ-Lab Digital Twin



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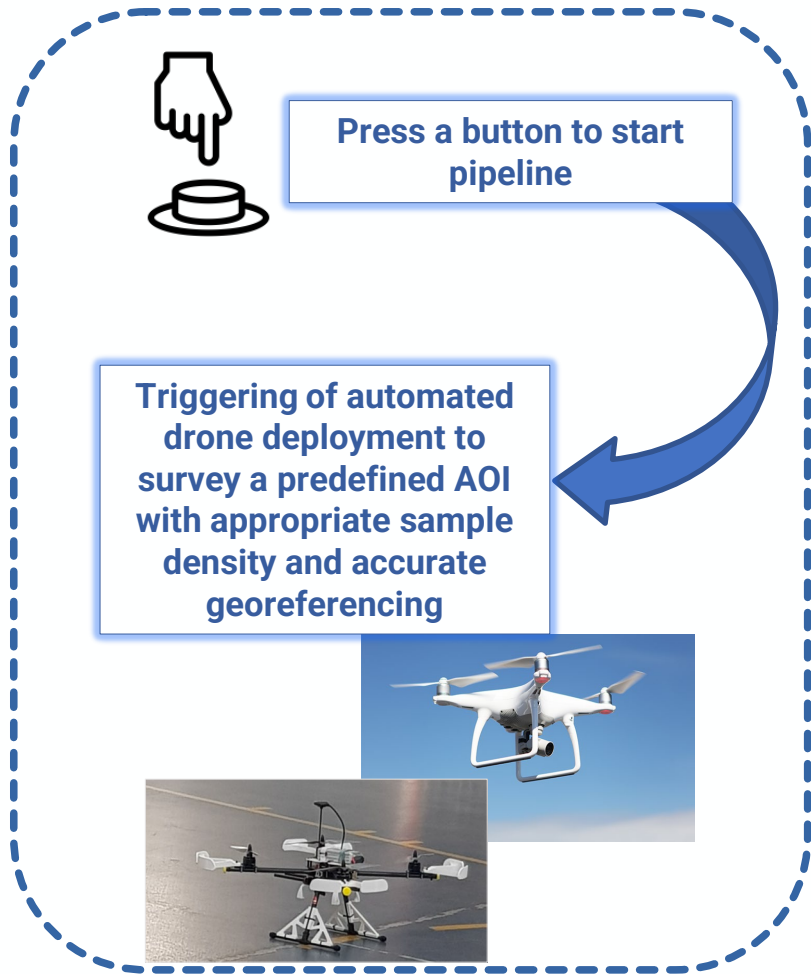
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- **VR space for events and virtual meetings (development 2023, BIT)**
 - Philab in the metaverse concept, merge ϕ -Lab DT with a virtual building/gallery for ESA projects showcase
 - Avatar personalization and scan of the user, selection of the project of interest and follow different talks

Reduction of the AR/VR scenarios preparation time

- Digital Twins are like a snapshot of a place at a certain time
- No standard interfaces between AR/VR and other systems
- The future vision is to build a pipeline for semi-automated digital twin generation in near real-time.
- The system would deliver a full drone to XR experience with minimal human interaction
- This pipeline could be automated to repeat itself without direct human interaction, triggered for example by changes in IoT sensors (e.g. fire, flood detection sensors).
- Usage of open source software (e.g. OpenDroneMap, Blender, Unity, O3DE) where possible.

From a drone scan to XR experience



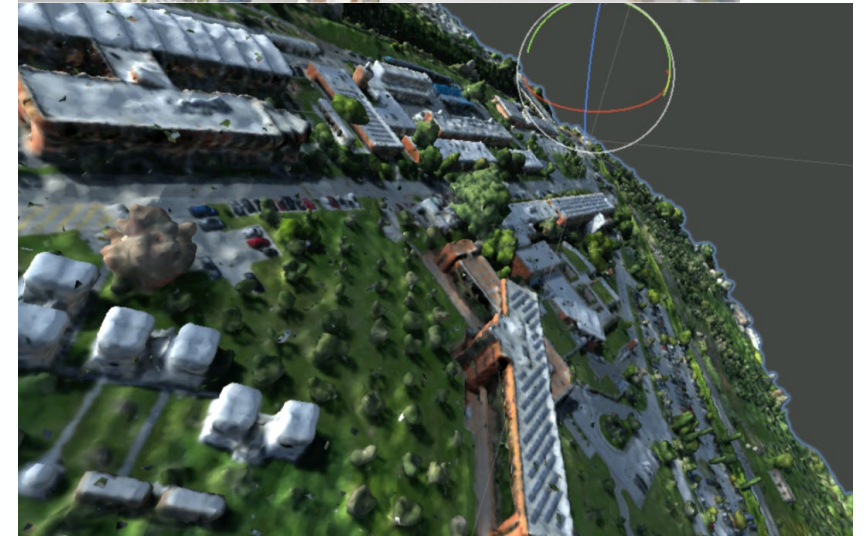
From a drone scan to XR experience



From a drone scan to XR experience

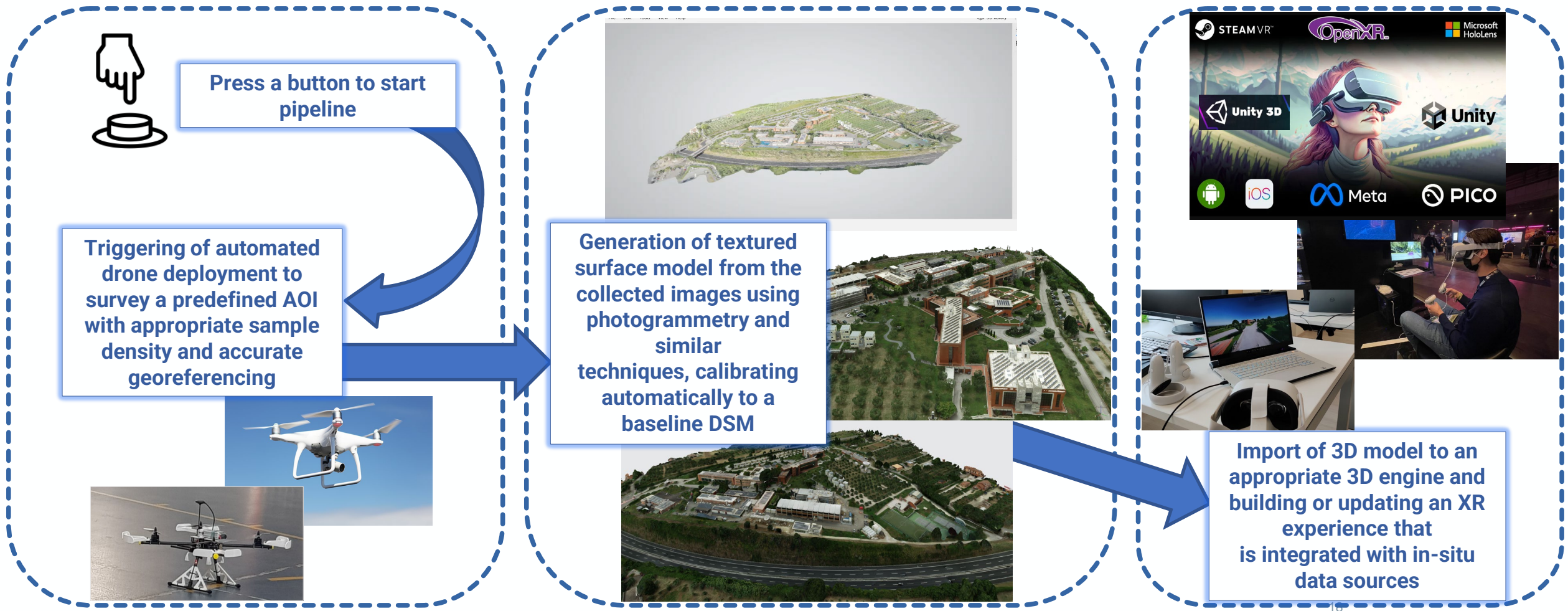


From a drone scan to XR experience

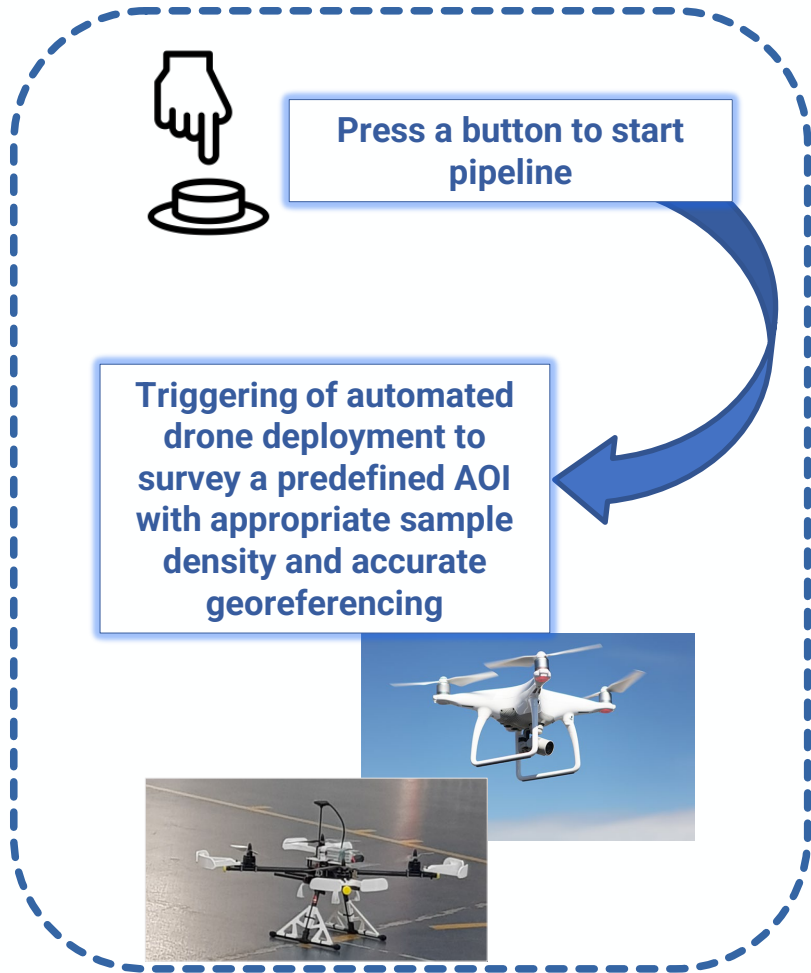


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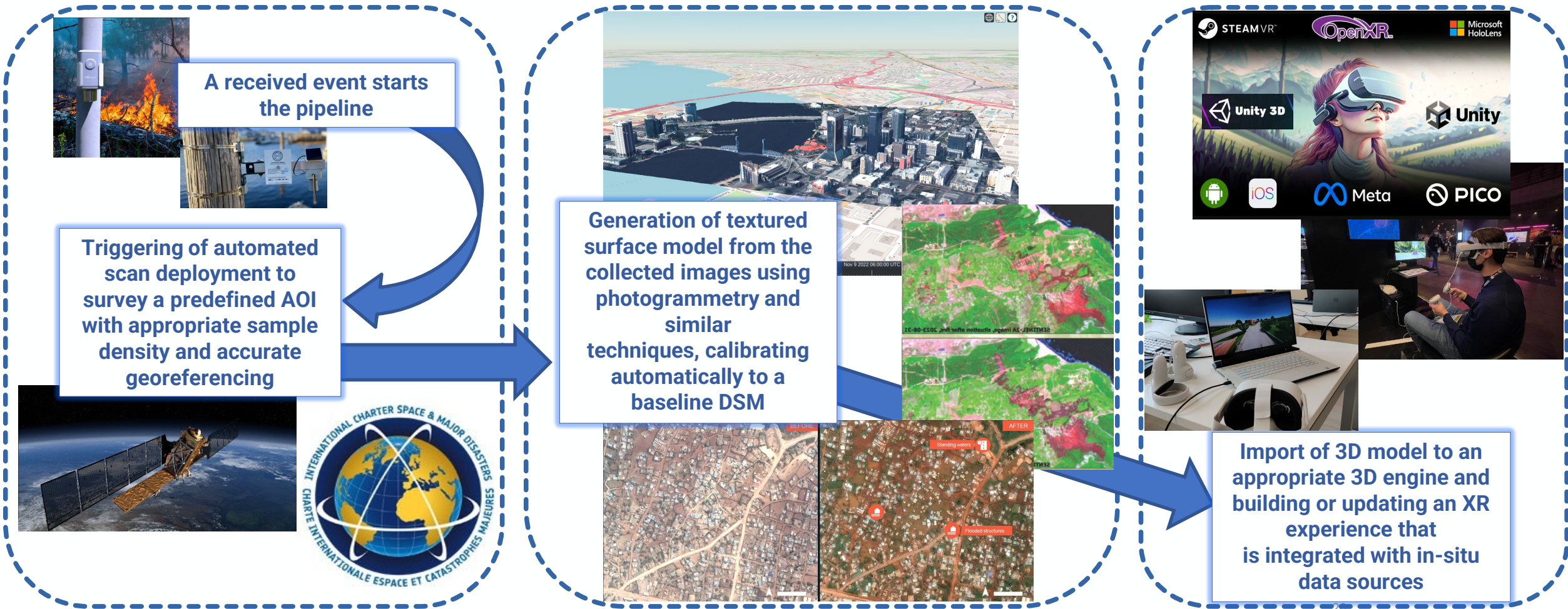
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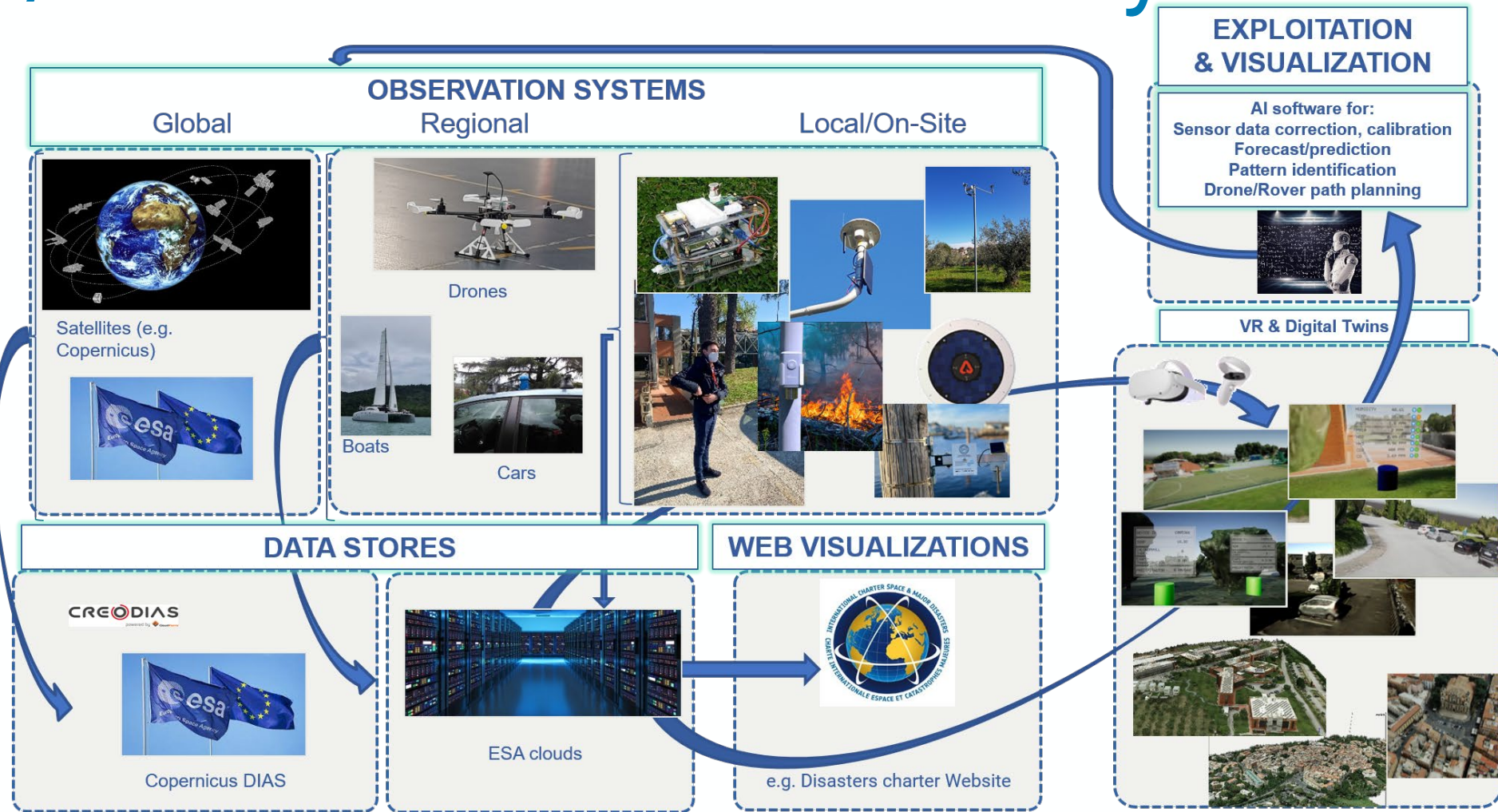
From a drone scan to XR experience



From event to EO scan to XR experience



AR/VR Visualizations Journey



Future plans and 2024 activities

- Continue working on existing EO models (DT Frascati, DT ESRIN) improving existing experiences (both in-house and/or with partners)
- Continue building up know-how in team (3D models/photogrammetry from drone images)
- Add EO-derived DSM/model capability from e.g. Sentinel 1/2 or Very High Resolution (VHR) TPM data to our assets
- Possible prototype-pipeline preparation using VHR sensors to both generate standalone textured DSMs as well as adding information to existing baseline models
- Follow-up this paper, check available technologies and technical means that can help in this project
- Experiment and test (e.g. AI automation, super resolution algorithm, new VR/AR equipment)

Thank you for your attention

Any Questions?

Do you want to try some demos?
Come to our stand

