Co-funded by the Horizon 2020
Framework Programme of the European Union
Grant Agreement Number 825532

Large-scale EXecution for Industry & Society

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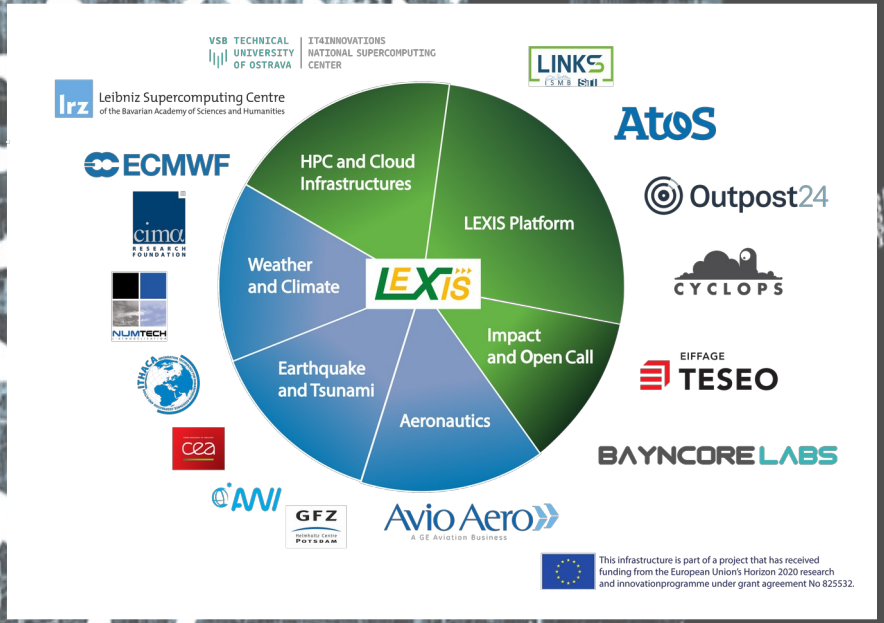
LEXIS EARTHQUAKE AND TSUNAMI LARGE SCALE PILOT

Deeper Understanding of Natural Disasters: Joint DMCC, UMD & Environmental Computing

2021 / 03 / 25

THIERRY GOUBIER

CEA



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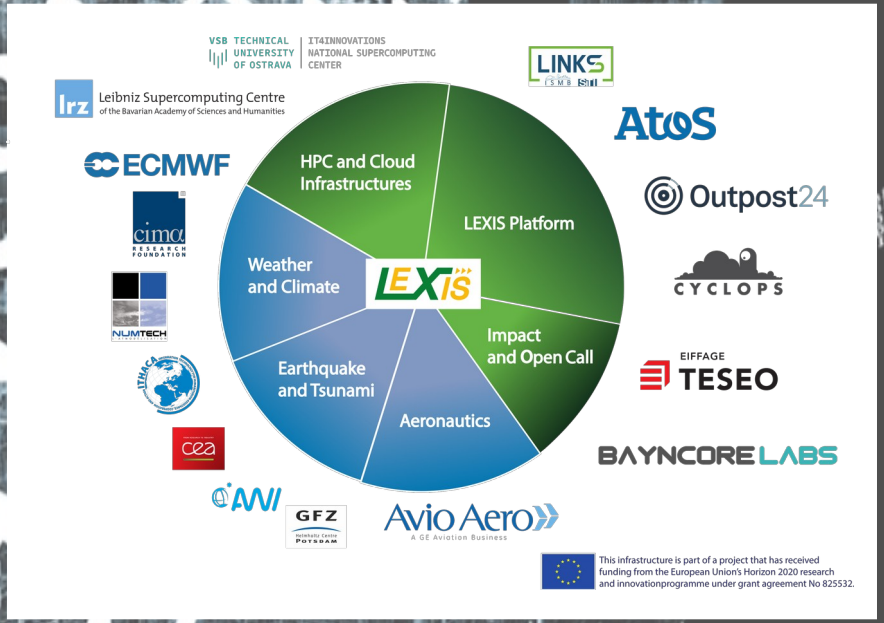
- LEXIS itself
- The pilot
- Its components
- Key points



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THE EARTHQUAKE AND TSUNAMI PILOT

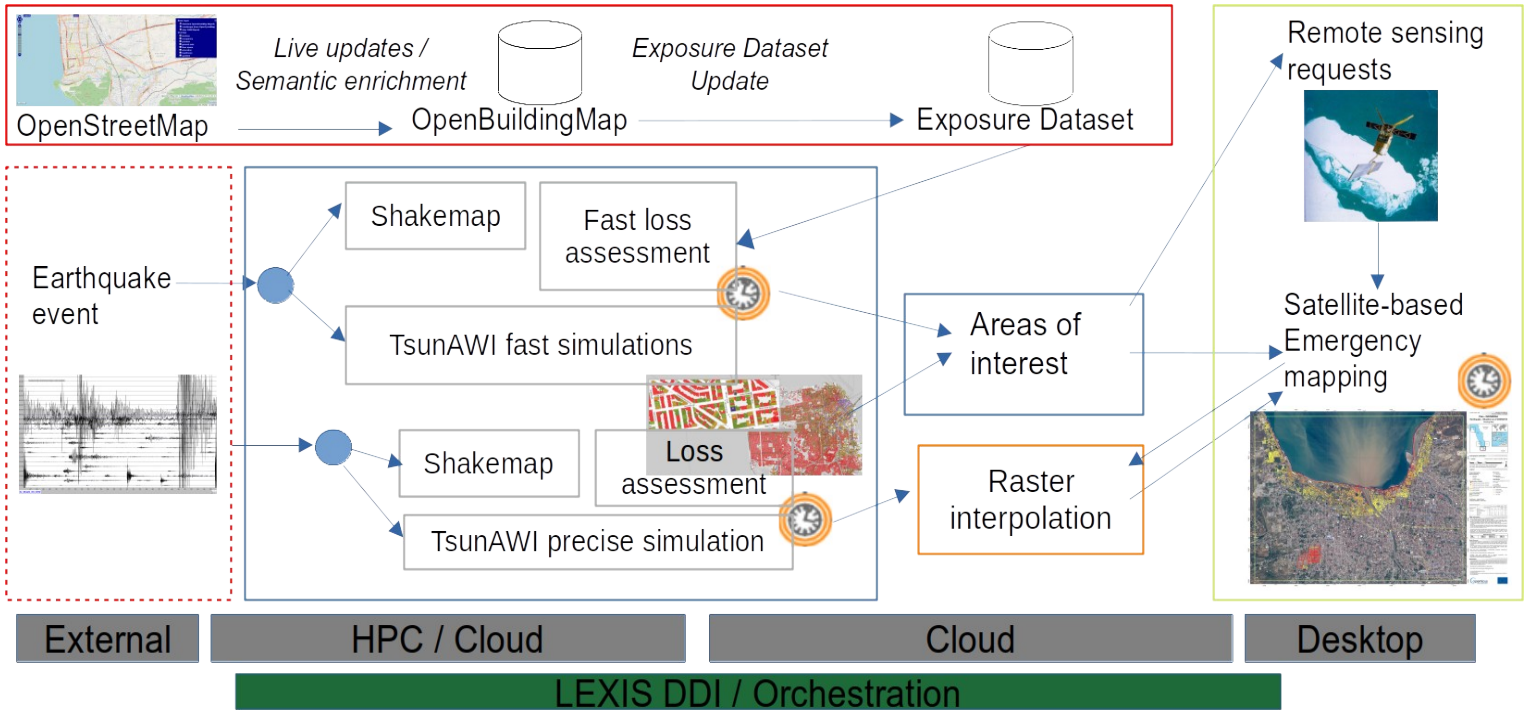
Core differentiator of the pilot: a real-time workflow with codes that are too heavy for on-line processing

Compute tsunami inundations and earthquake damage estimates fast enough to match warning and response needs

- First results in within 60 seconds, more precise 30 minutes later
- Gain 24h on production of emergency maps
- Use as much as possible available compute time for best results
- Exploit LEXIS unification of Cloud and HPC resources
  - Including ATOS burst buffer

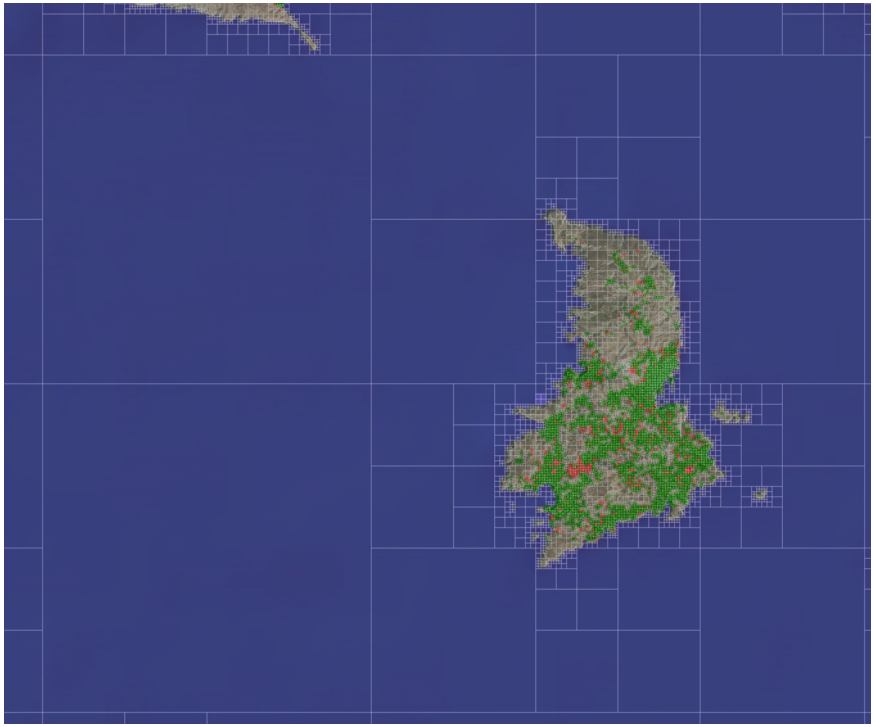
THE PILOT

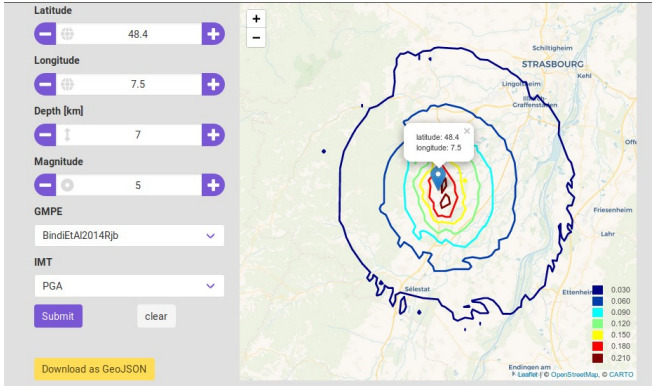
The pilot workflow and ...

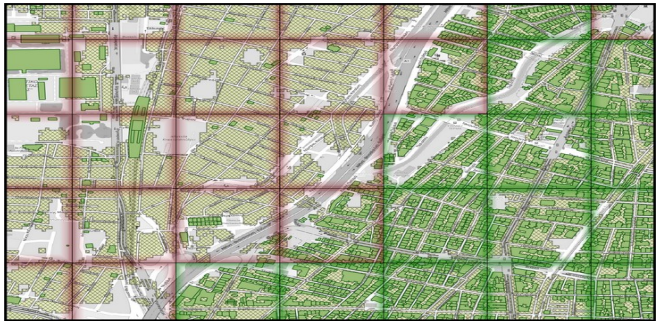


SHAKEMAP AND EXPOSURE DATASET

Shakemapi and the Quadtree exposure dataset – Large dataset, cloud-oriented, PostGIS, massively parallel







GFZ Helmholtz Centre Potsdam

TSUNAMI SIMULATIONS

TsunAWI: tsunami inundation simulations, performance

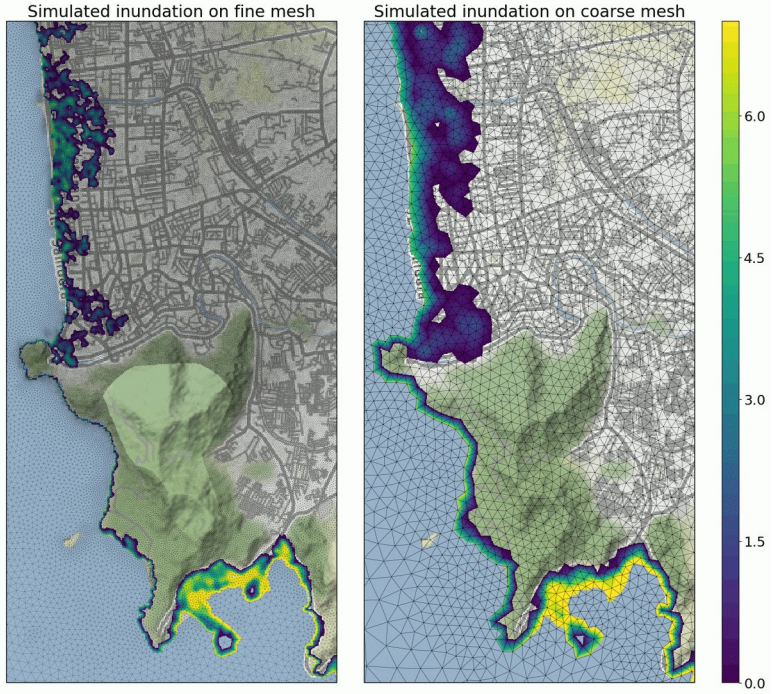
TsunAWI : Tsunami simulation from AWI

- Unstructured mesh
- Hybrid MPI/OpenMP
- From 10km to 20m edges

- Target scenarios:
  - Padang, West Sumatra, Indonesia, M8.8 (hypothetical)
  - Coquimbo, Chile, 2015, M8.3 (historical)

- Two meshes: coarse and fine
- Coarse for the fast path
  - 460k triangles, 5 seconds runtime

- Fine for the precise path
  - 2.5M triangles, 6 minutes runtime (now down to 1 minute)

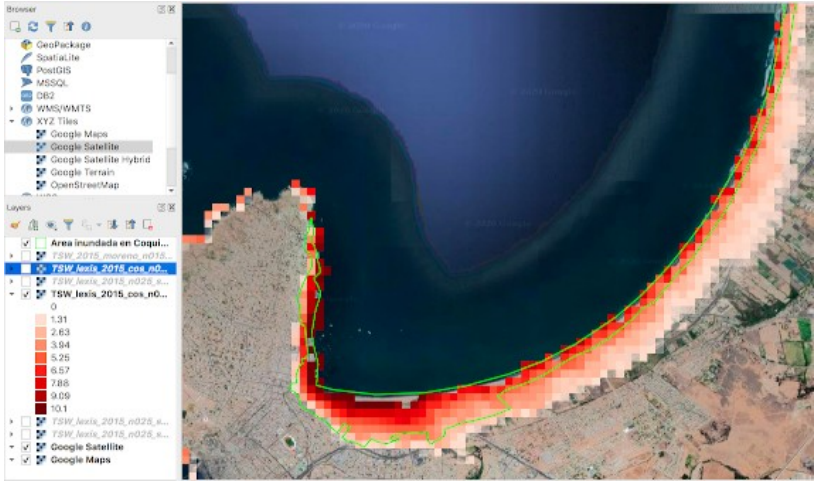


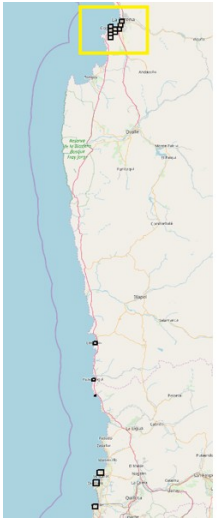
SATELLITE-BASED EMERGENCY MAPPING

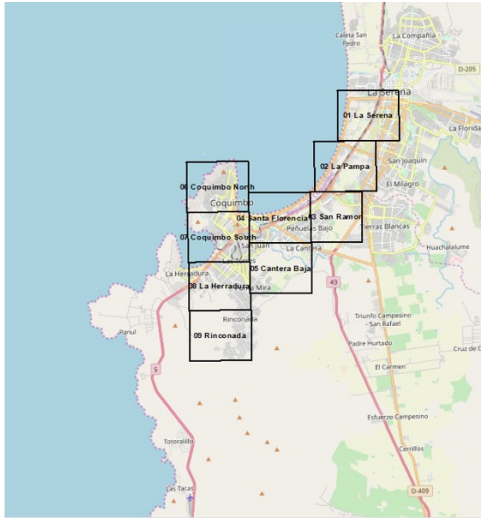
Upon an event, photo-interpretation of remote sensing products

Activations (maps) for the EU Copernicus emergency mapping services.

- Target: reduce the delay to order remote sensing products by 24h
- Secondary target: avoid activations on area with little to no damage
  - For example, Palu 2018, M7.5, damage 200 km south of epicenter

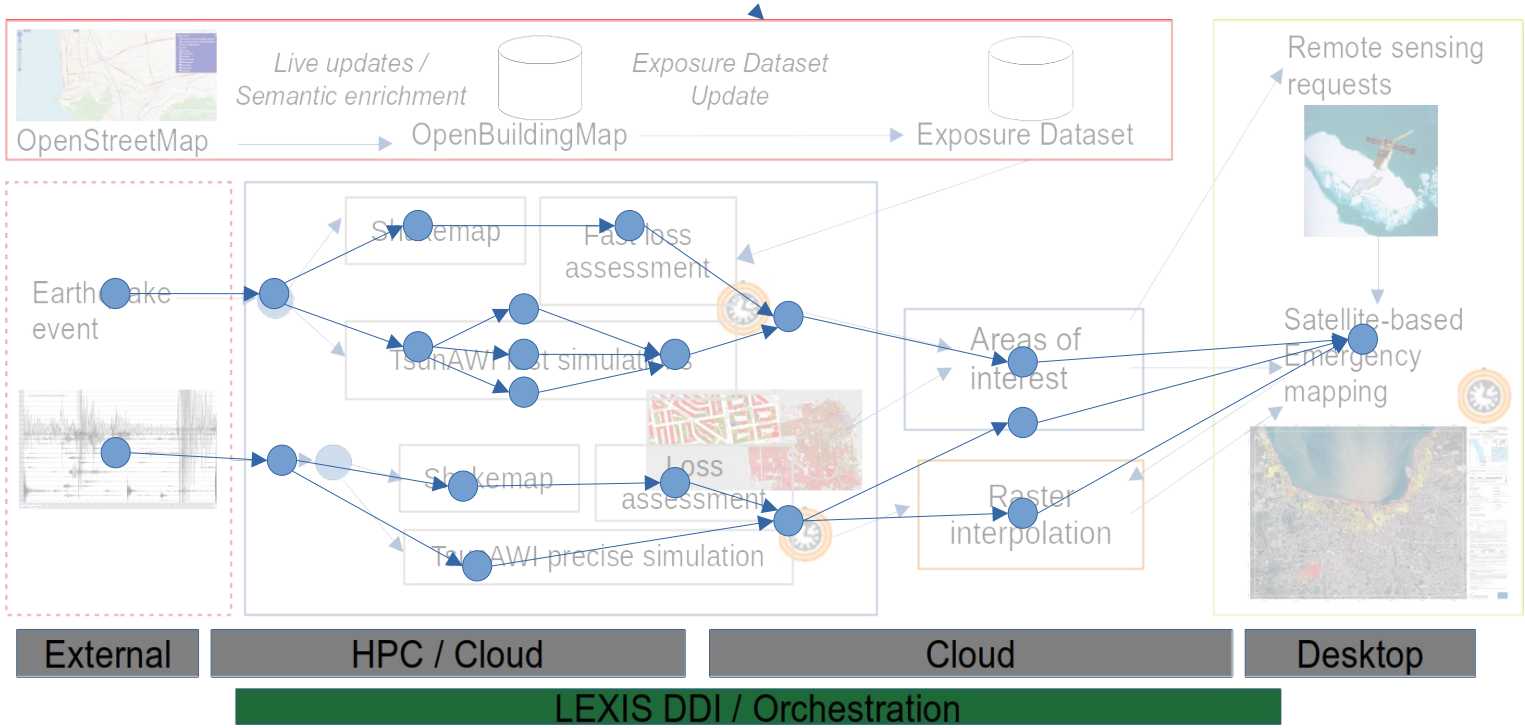






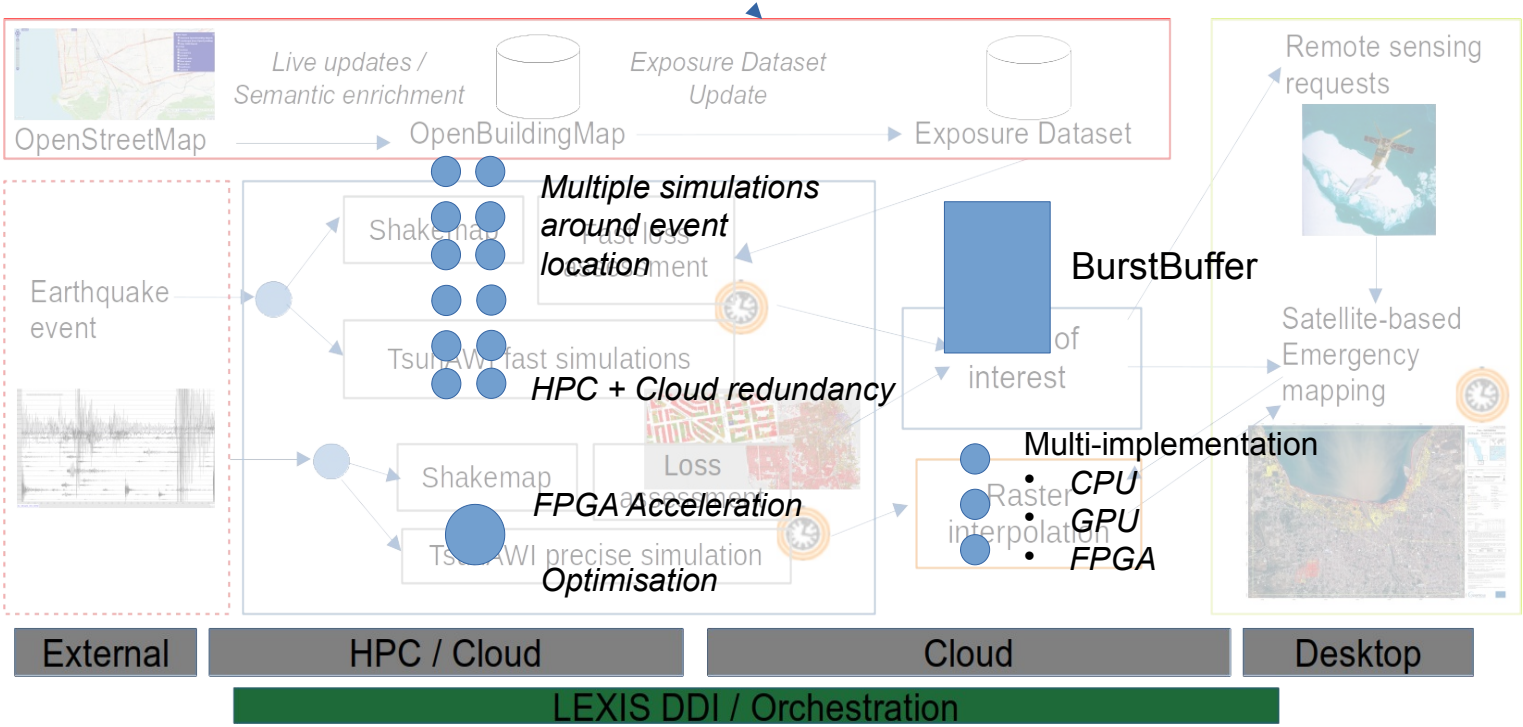
TECHNOLOGY LAYER 1 - ORCHESTRATION

A Model of Computation with Time over ATOS YSTIA and LEXIS heterogeneous resources



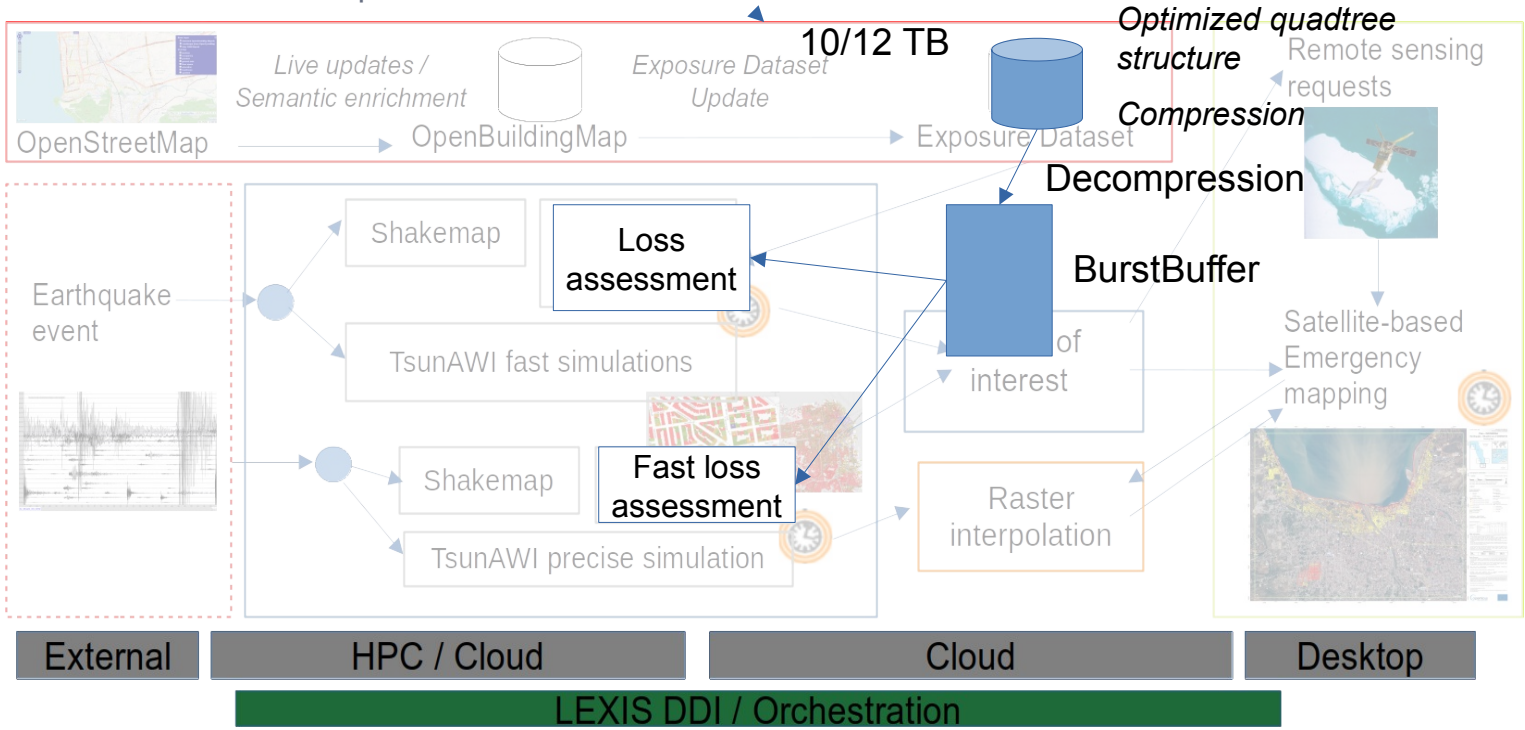
TECHNOLOGY LAYER 2 – HETEROGENEOUS COMPUTE

Use the unified, heterogeneous compute resources to accelerate and make redundant



TECHNOLOGY LAYER 3 – DATA

Make data localisation transparent and accelerate data access at the same time (with ATOS burst buffers)



CHALLENGES & FUTURE PLAN

End of project: 12/2021

- Challenges
  - Acceleration opportunities for the workflow by the LEXIS infrastructure
  - Deploy the quadtree exposure dataset
- Future plan
  - Keep improving the workflow components
  - Keep deploying the workflow on the project infrastructure (tasks, datasets)
  - Run and measure
  - Disseminate

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