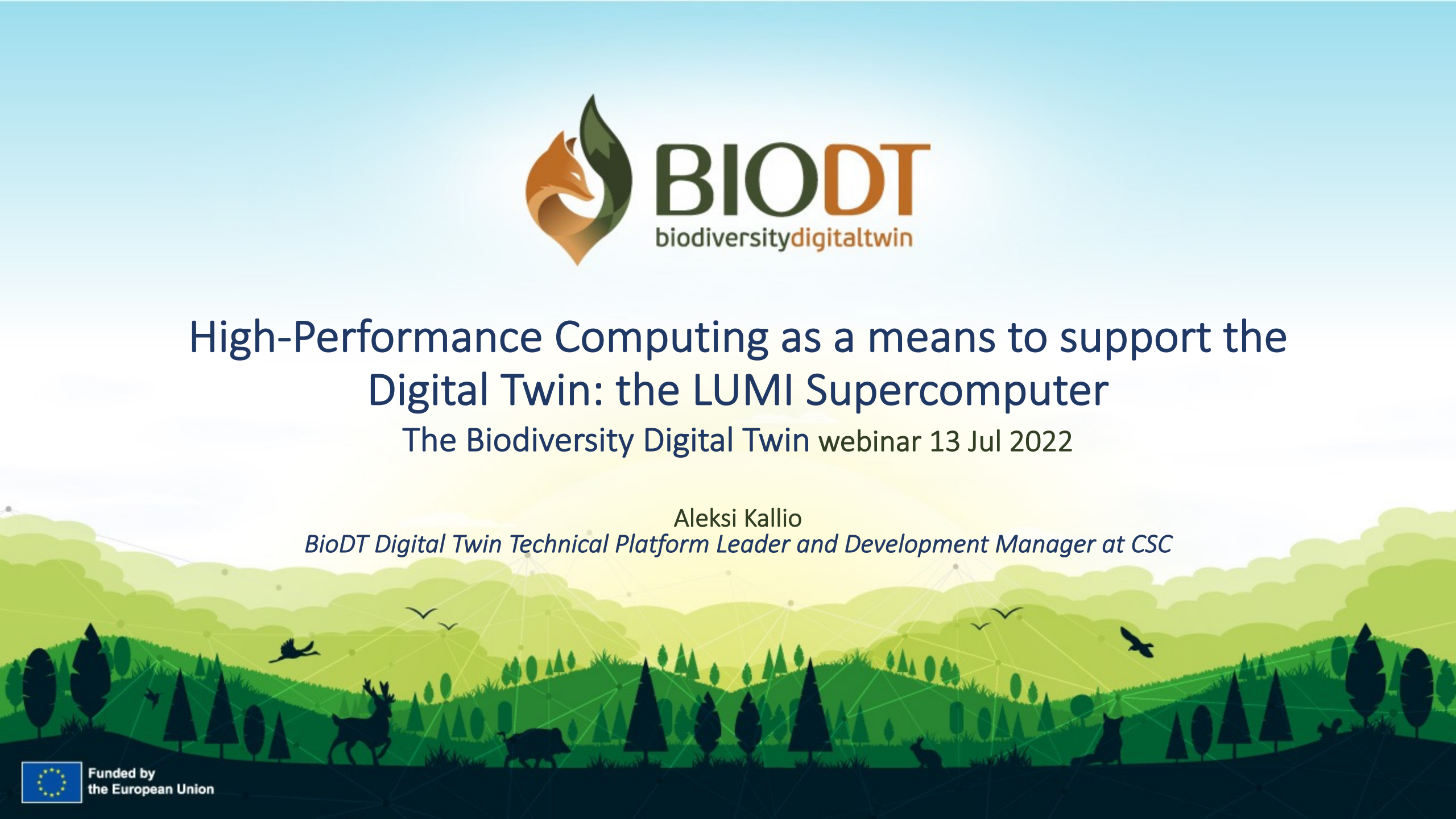

High-Performance Computing as a means to support the Digital Twin: the LUMI Supercomputer

The Biodiversity Digital Twin webinar 13 Jul 2022

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BioDT Digital Twin Technical Platform Leader and Development Manager at CSC

Funded by
the European Union

- WP3 - Digital Twin Advanced Technical Platform
  - *"Set up, develop and operate the advanced technical platform required by the digital twins; provide world-class HPC resources from the LUMI EuroHPC computing facility; ensure portability of digital twins across HPC sites and cloud environments; maintain service catalogue of shared services for integration with EOSC Core services."*
- Digital twins require platforms for **computational simulation**
  - Detailed and realistic simulations require large amounts of computing time
  - You cannot just throw in more computers to speed up complex computing
- Container technology has improved portability of scientific software code

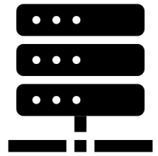
Computing environments for simulation

Laptop

Cloud and web services

private / public
IaaS / PaaS / SaaS

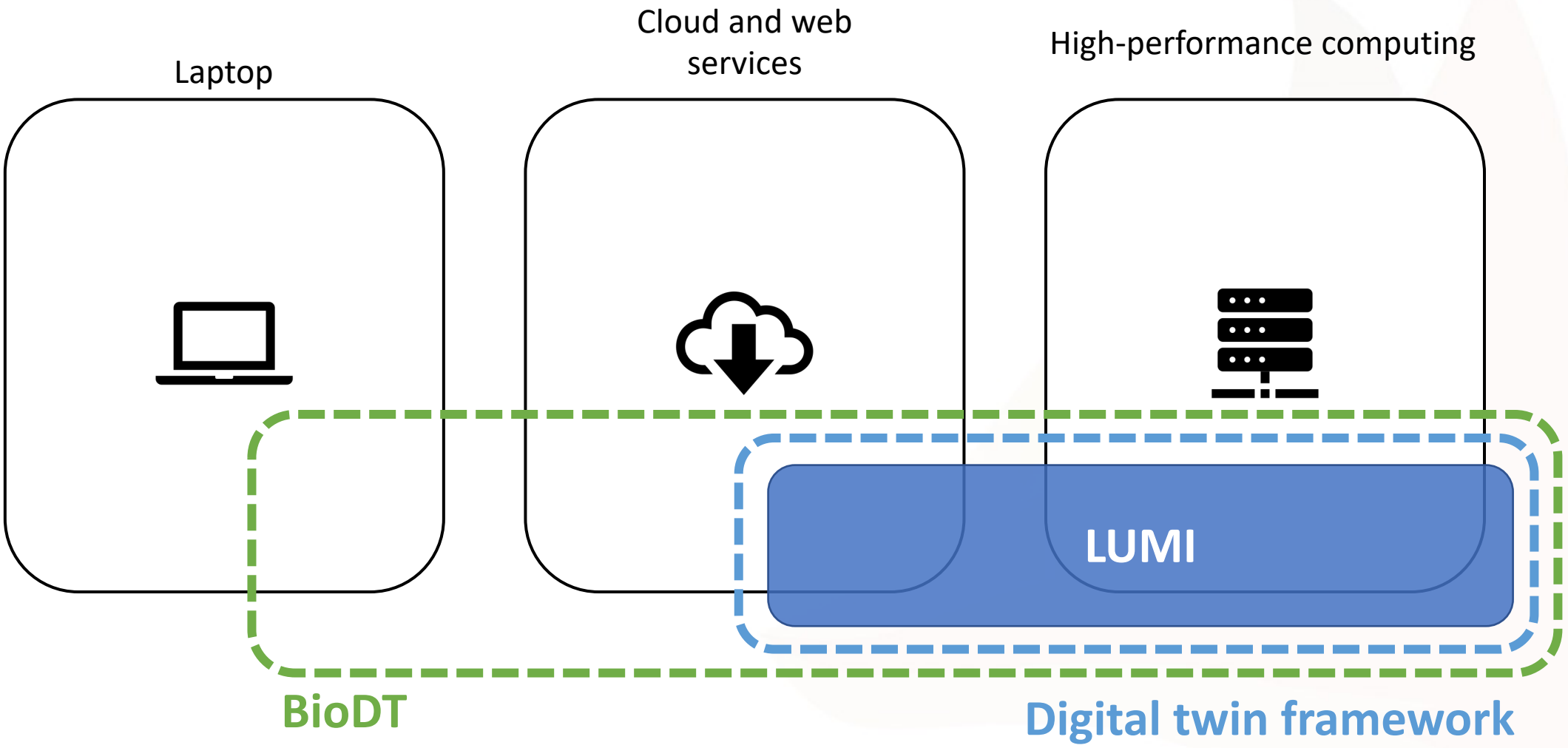
High-performance computing



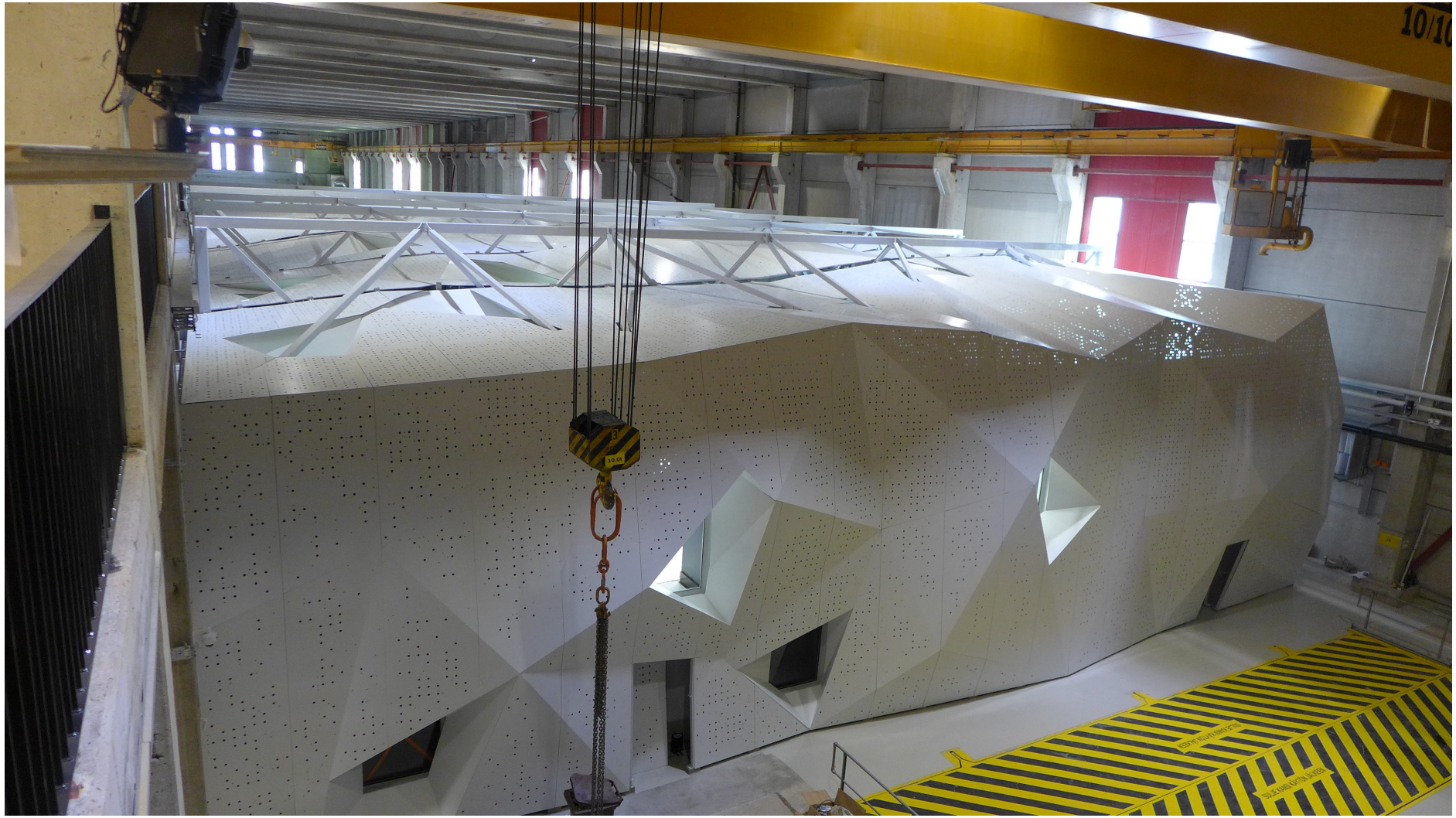
cluster / supercomputer
acceleration (GPU)

Complexity of simulation

Computing environments for simulation



LUMI data center



LUMI supercomputer

LUMI is a Tier-0 ***GPU-accelerated supercomputer*** *that enables the convergence of* ***high-performance computing***, ***artificial intelligence***, *and* ***high-performance data analytics.***

Tier-0 GPU partition:

over **550** Pflop/s

powered by AMD Radeon Instinct™ MI250X GPUs

LUMI-G: GPU Partition

LUMI-D: Data Analytics Partition

Interactive partition with

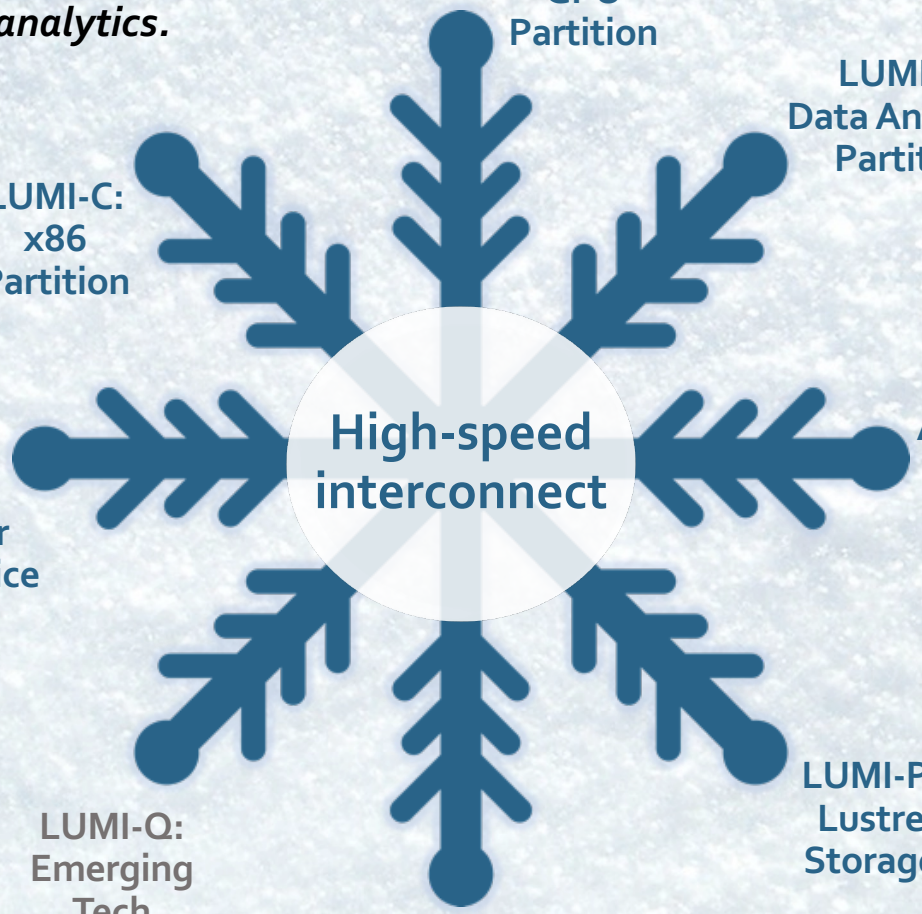
32 TB of memory and graphics GPUs for data analytics and visualization.

Supplementary CPU partition

~200,000

AMD EPYC CPU cores

LUMI-C: x86 Partition



LUMI-F: Accelerated Storage

7 PB Flash-based storage layer with extreme I/O bandwidth of 2 TB/s and IOPS capability.

LUMI-K: Container Cloud Service

Possibility for combining different resources within a single run. HPE Slingshot technology.

LUMI-Q: Emerging Tech

LUMI-P: Lustre Storage

80 PB parallel file system

30 PB encrypted object storage (Ceph) for storing, sharing and staging data.

LUMI-O: Object Storage Service

Summary and next steps

- We set up, develop and operate technical platform for digital twins
- Support adoption of digital twins from HPC to cloud and, to a certain extent, personal computers
- Building collaboration with Destination Earth initiative on digital twin runtime environments (engine)
- The computing environment will be tightly connected to data layer (WP5)
- Currently working on collecting platform requirements from use cases and computational modellers

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