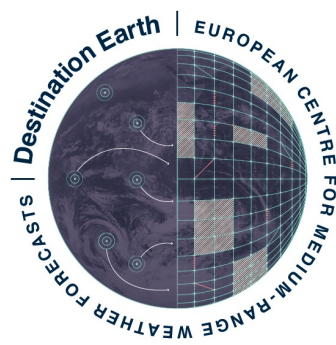


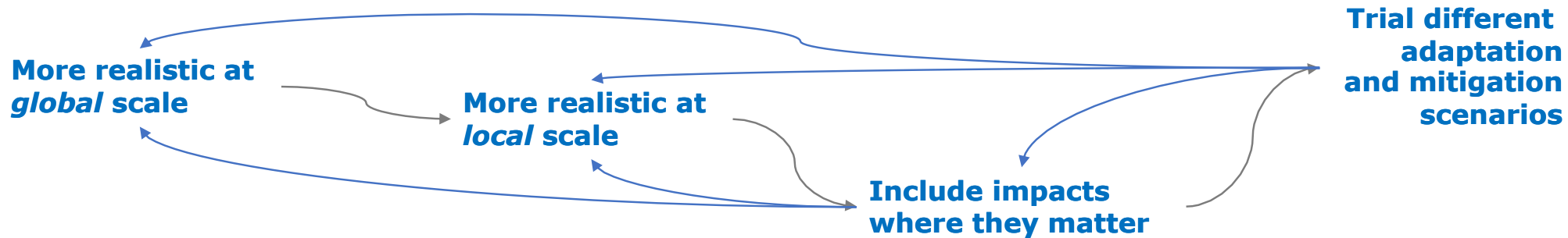
Digital Twins are much more than models



1. **Better simulations** based on **more realistic models**
2. **Better ways of combining all observed and simulated information** from entire Earth system = physical + food/water/energy/health **supporting action scenarios**
3. **Interactive and configurable access to all data, models and workflows**

.AND.

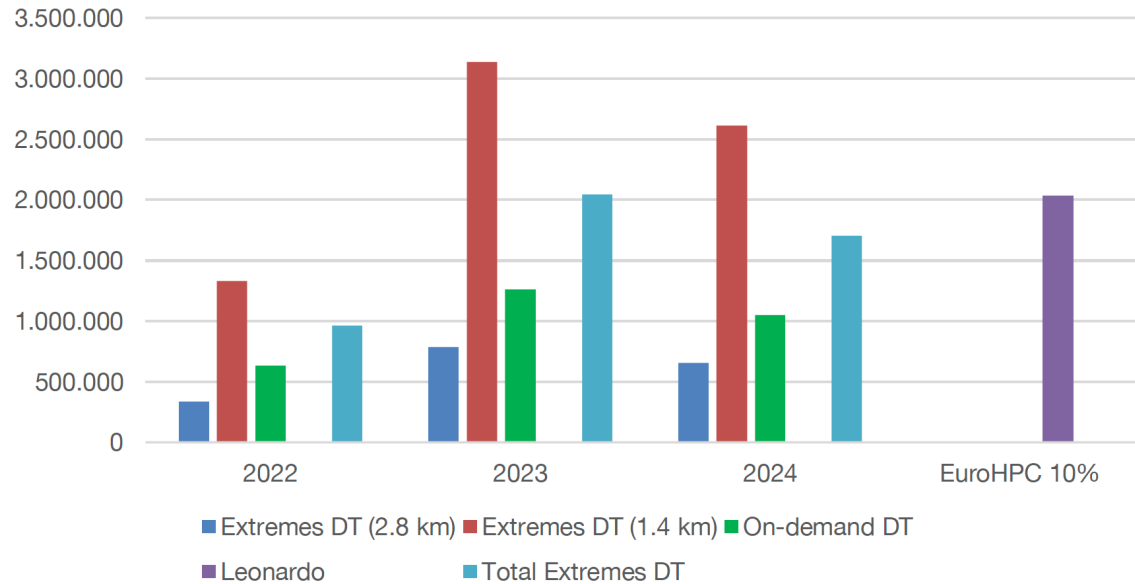
.AND.



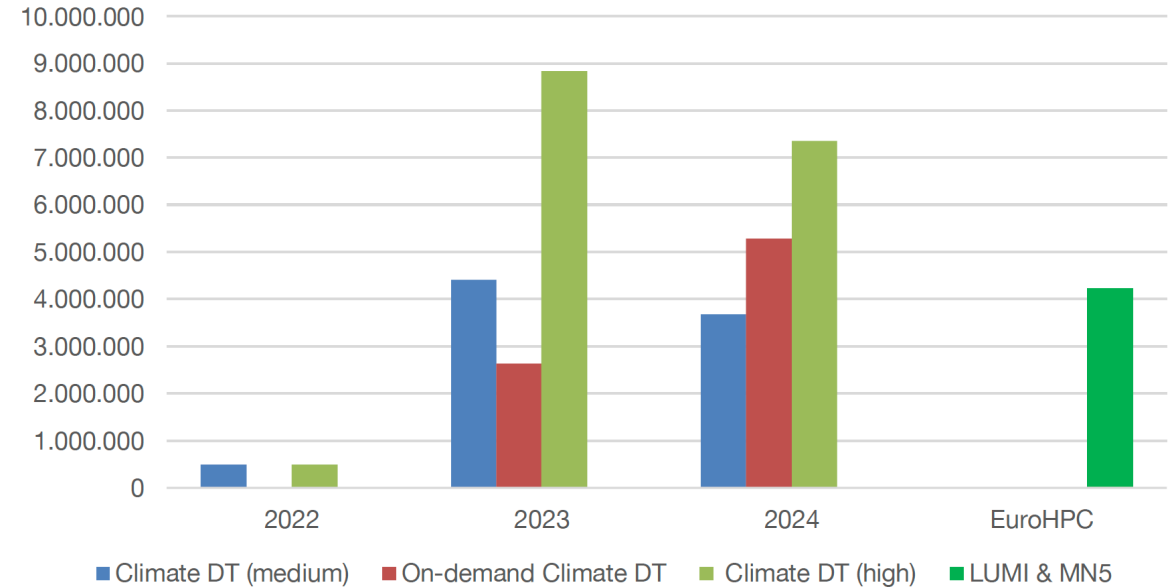
The implications of achieving all 3 goals on digital technology are different!

Estimated HPC footprints

Node hour allocations per year: Extremes DT



Node hour allocations per year: Climate DT

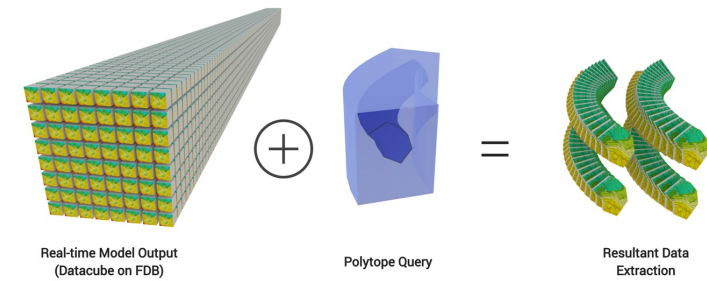


Estimates based on:

- existing ICON/IFS runs on Summit and Jewels being scaled to estimated EuroHPC performance
- hypothetical production suite configurations
- assumptions on suite placement on LUMI, Leonardo and MareNostrum5

TBC once contracts have been established, HPC centre implementation schedules are confirmed, final code performance has been verified

Envisaged data handling functionalities



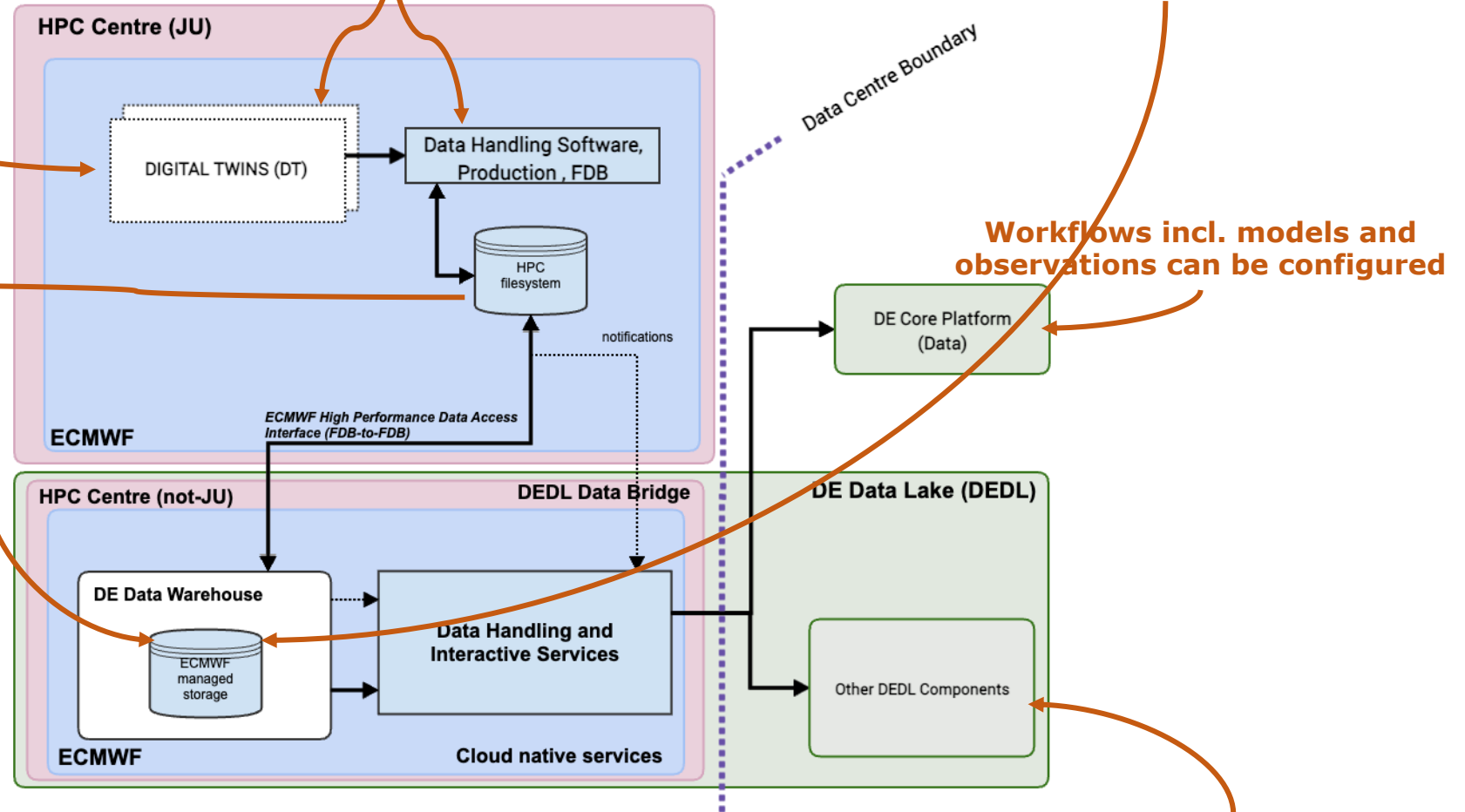
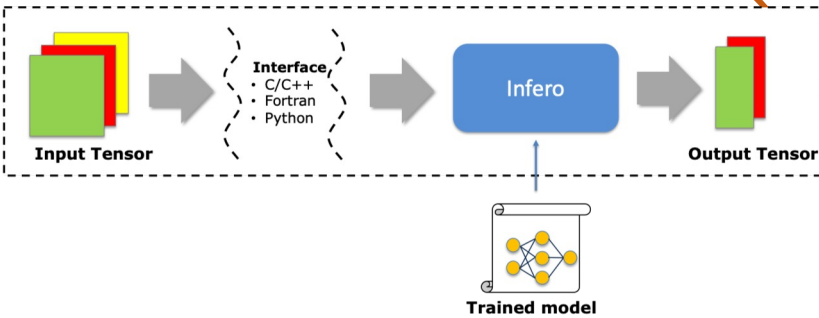
simulation-observation production can be run in continuous or on-demand modes (and deployed across distributed HPC)

data is streamed at full 4D-resolution and coupled with applications (water, food, energy) on the fly

applications can operate in fully immersive data spaces

machine learning models are trained and applied on the fly

Workflows incl. models and observations can be configured



Data handling architecture becomes scalable

Key challenges

Science:

- Very high-resolution, coupled model performance from days to decades to be confirmed.
- Links between physical and impact science in model and workflow design are new.

Technology:

- Focus for simulation models on CPU-GPU architectures with different adaptation needs for LUMI vs Leonardo vs MareNostrum5, but also on different time scales.
- Data handling based on hybrid HPC centre – DestinE data bridge approach (which is new).
- On-demand/interactive/configurable features need new work/dataflow concepts.

Governance:

- EuroHPC access falls under category 'projects of strategic importance' with max. 10% of total EuroHPC & individual system allocation; the same category applies to other projects incl. CoEs!
- Distributed HPC and data handling approach requires complex set-up between DG CNECT, EuroHPC JU, individual HPC centres and ECMWF/ESA/EUMETSAT.
- DestinE evolution complicated between DG CNECT, RTD, DEFIS and ESA's Digital Twin Earth project.

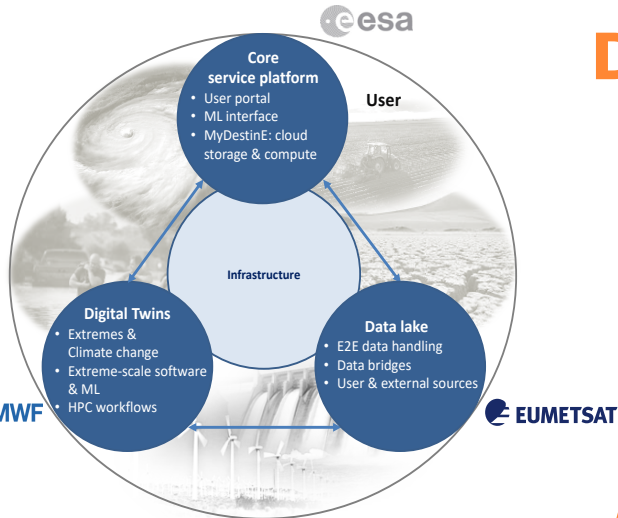
Funding:

- DestinE is funded for the period 12/2021-06/2024 and needs to be extended through further phases (unlike Copernicus).
- Non-EU countries like UK and CH are not eligible for DestinE funding (at present).

Need for synergies across programmes



European Environment Agency



Services



Technology & infrastructures



EuroHPC
Joint Undertaking



EUROPEAN OPEN SCIENCE CLOUD

SIMPL

Earth-system & impact science

Grand Challenge

Mission

Areas of interest & cross-sector

R&I Projects

CLIMATE CHANGE

100 CARBON NEUTRAL CITIES BY 2030

Reach net zero greenhouse gas emissions balance of 100 European cities by 2030

