Superračunalništvo v Sloveniji

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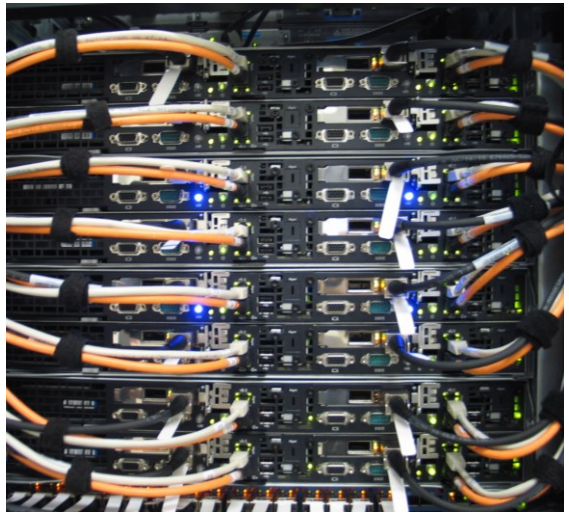
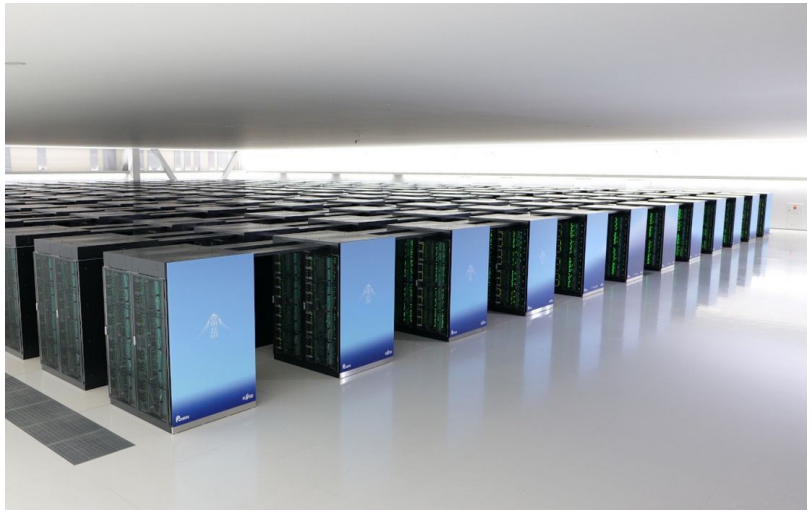
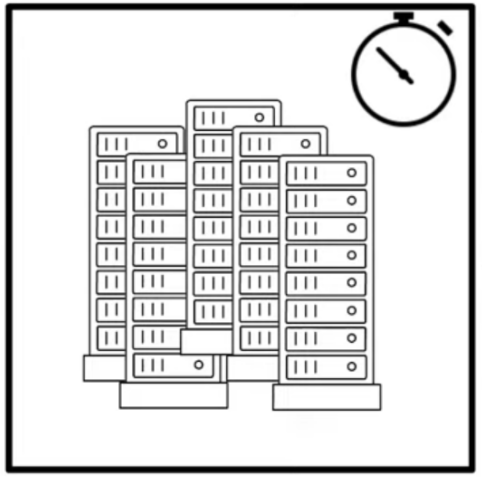
04 April 2023

Kaj je HPC

- Sistem medsebojno povezanih računalnikov
- Dosega boljše rezultate skozi paralelizacijo
- Ni pameten … ne bo napisal kodo za vas







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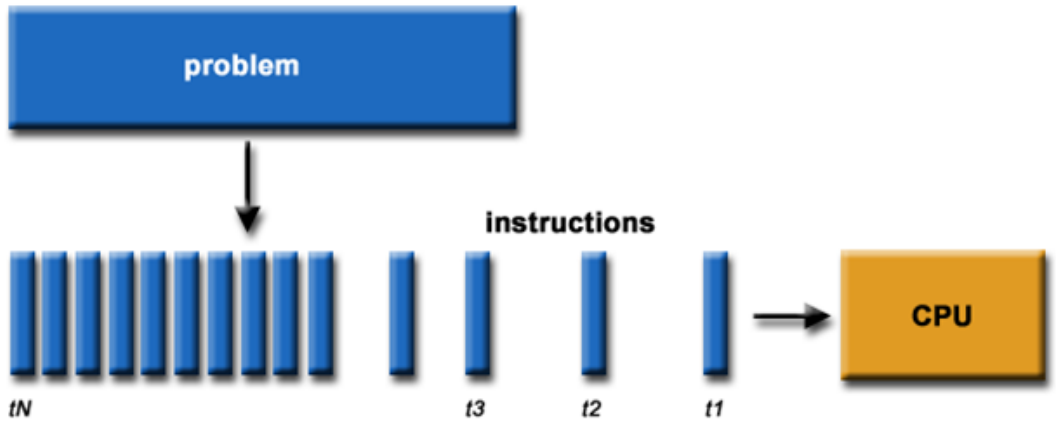
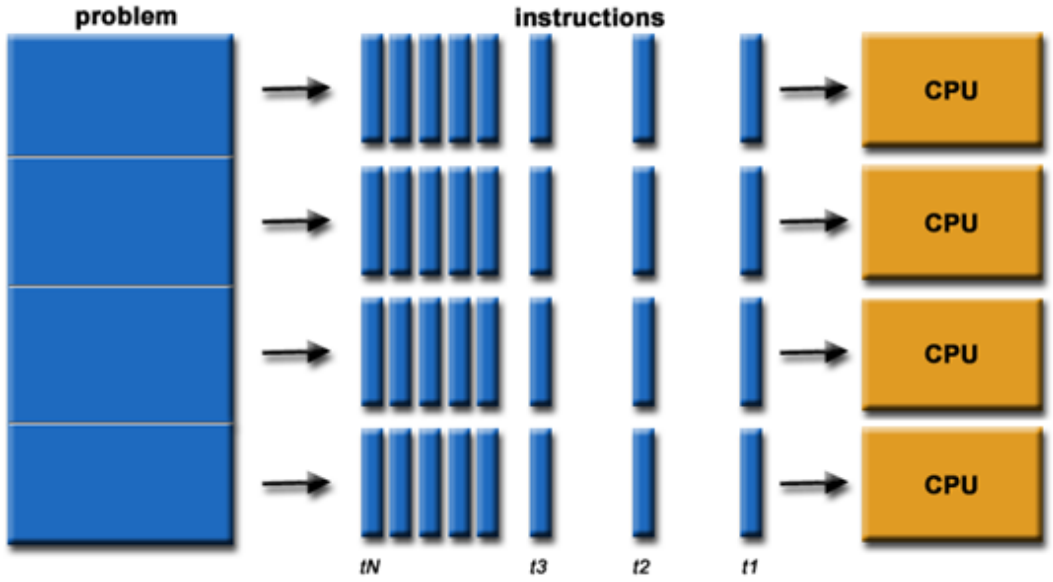
Kako deluje HPC

Proces paralelizacije

Zaporedno računanje



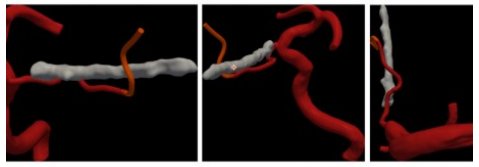
Prarelizacija problema

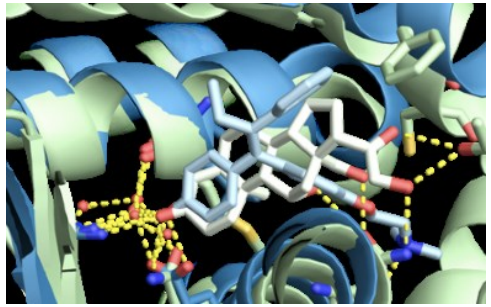


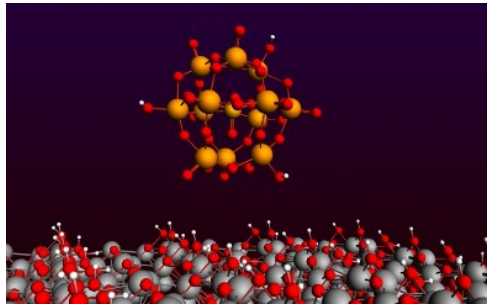
Področja uporabe HPC

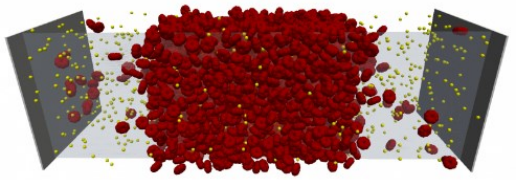
Področja:

- Simulacije fluidov (CFD); tok vode okoli telesa ladje; zračni tok okoli letalskega krila, …
- Strukturne analize (FEM); deformacije, pomiki, preračun nosilnosti, …
- Analiza podatkov; prepoznava vzorcev, predikcije, …
- Strojno učenje
- 3D modeli in digitalin dvojčki; fotogametrija, vizualizacija, …
- Več primerov najdete na: https://www.ff4eurohpc.eu/en/multimedia/booklet/

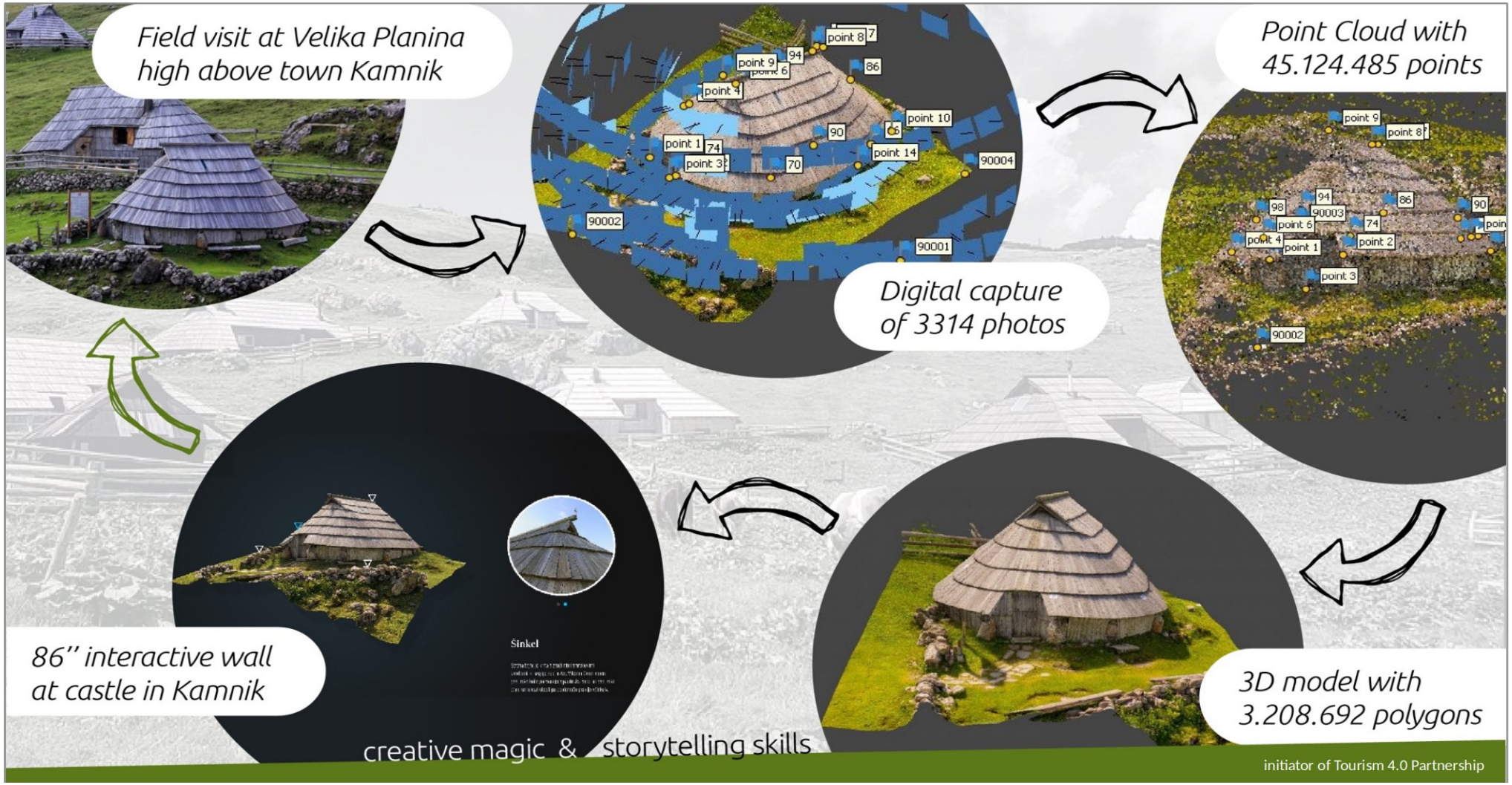








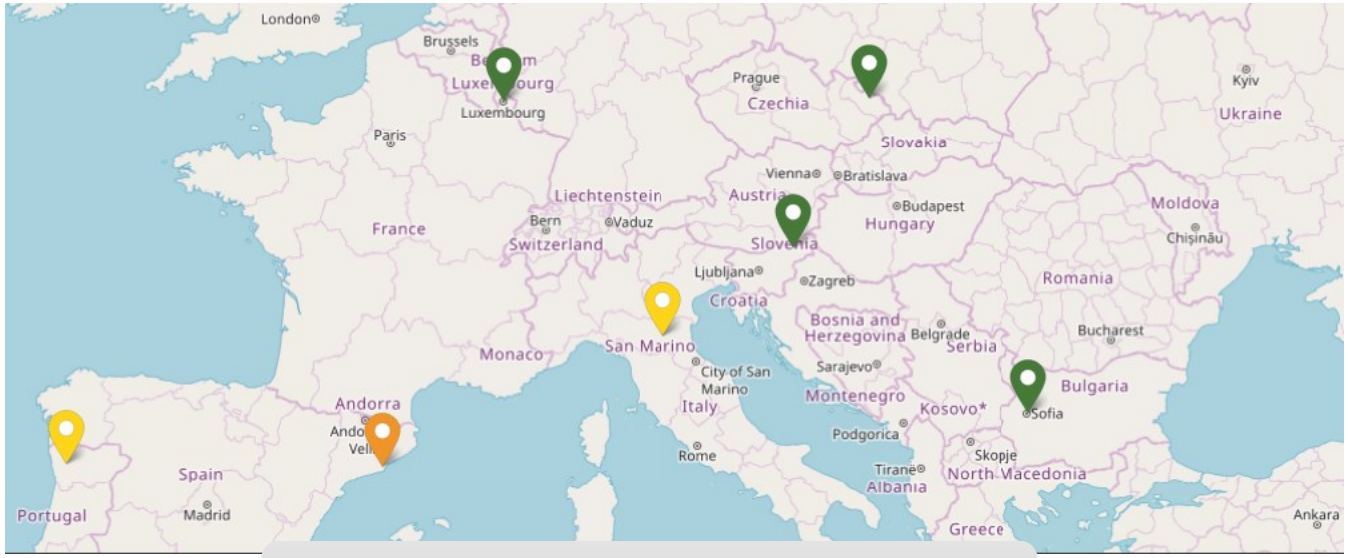
Primer uporabe: turizem 4.0



HPC infrastuktura v Evropi

#EuroHPC (high performance computing) **Joint Undertaking**

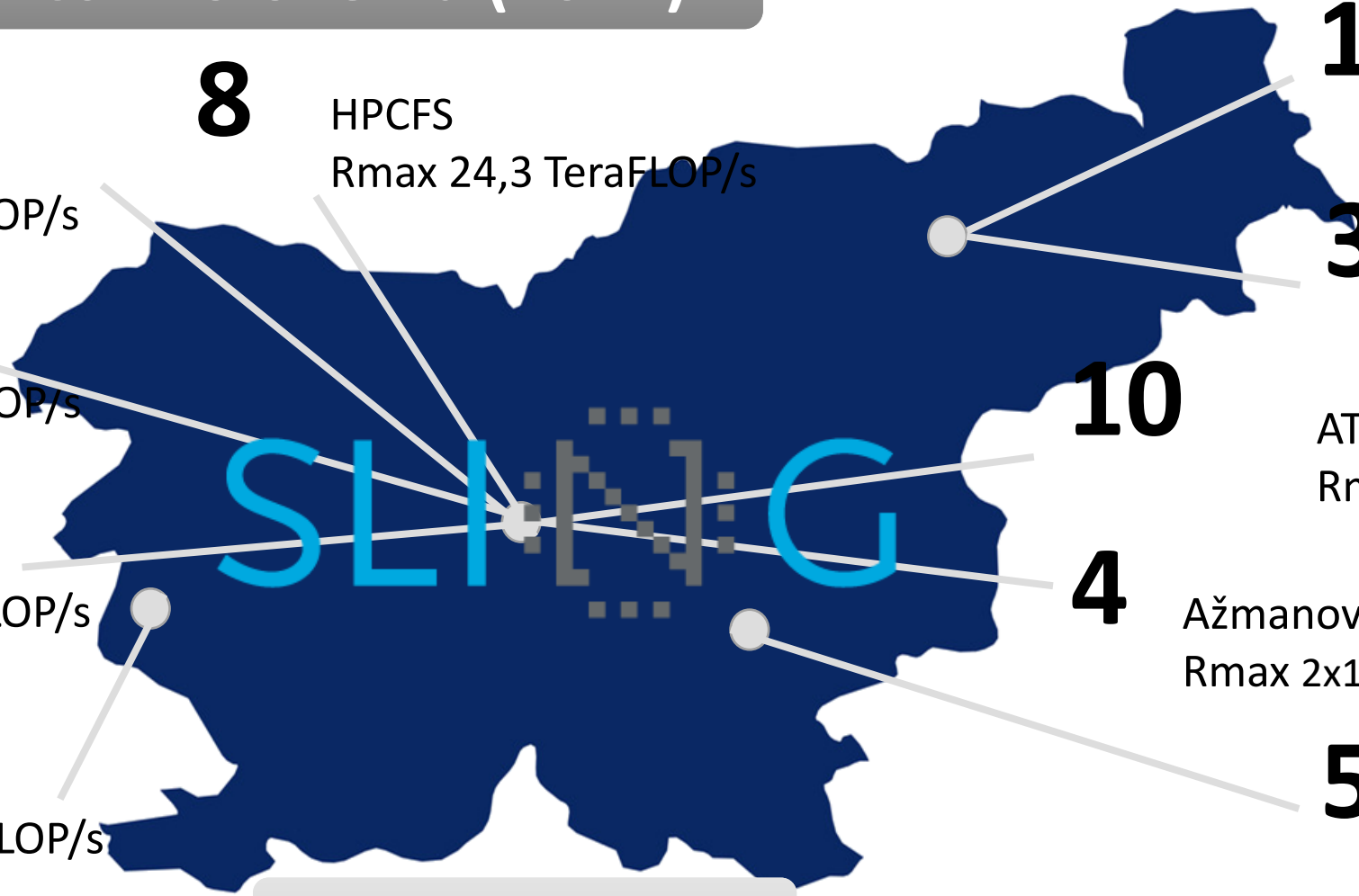
- 3 pre-exascale supercomputers:
  - LUMI – Finland (375 Petaflops),
  - LEONARDO – Italy (248 Petaflops),
  - MARENOSTRUM 5 – Spain (200 Petaflops),
- 5 petascale supercomputers:
  - **VEGA – Slovenia (6.8 Petaflops),**
  - MELUXINA – Luxembourg (10 Petaflops),
  - KAROLINA – Czech Republic (15.2 Petaflops),
  - DISCOVERER – Bulgaria (4.4 Petaflops),
  - DEUCALION – Portugal (10 Petaflops).



https://eurohpc-ju.europa.eu/

HPC infrastuktura v Sloveniji

Top 10 HPCs in Slovenia (2021)



1 HPC Vega
Rmax 6,8 PetaFLOP/s

3 HPC Maister
Rmax 244 TeraFLOP/s

10 ATOS
Rmax 19 TeraFLOP/s

4 Ažmanov računski center
Rmax 2x15 + ~ 120 GPU TeraFLOP/s

5 HPC Trdina
Rmax ? TeraFLOP/s

8 HPCFS
Rmax 24,3 TeraFLOP/s

6 SiGNET
Rmax 43 TeraFLOP/s

7 ARNES
Rmax 30 TeraFLOP/s

9 SGI ICE-X
Rmax 20 TeraFLOP/s

2 Arctur-2
Rmax 340 TeraFLOP/s

https://www.sling.si/

HPC infrastuktura v Sloveniji

HPC RIVR @ UM (working name MAISTER)

computing capacity up to 244 TeraFLOPS.
76 dual-processor compute nodes with a total of 4,256 cores.
6 dual-processor compute nodes, each with 4 GPUs; a total of 122,952 cores.
In total 40 TB of system memory and 158 TB of fast storage space.
Additional fast disk array with a capacity of 138 TB.

HPC RIVR @ FIŠ (working name TRDINA)

Dual-processor compute node with increased system memory.
Dual-processor compute node with 4 additional graphics processing units with a total of 14,348 cores.
Additional fast disk array with a capacity of 138 TB.

HPC RIVR @ IZUM (working name VEGA)

planned computing capacity 10 PetaFLOPS.
Dual-processor compute nodes with more than 100,000 processor cores.
Dual-processor compute nodes with GPUs with more than 600,000 cores.
Disk array with at least 4 PB of fast and at least 30 PB of permanent storage space.

TOP500 LIST - JUNE 2021

R_{max} and R_{peak} values are in TFlops. For more details about other fields, check the TOP500 description.

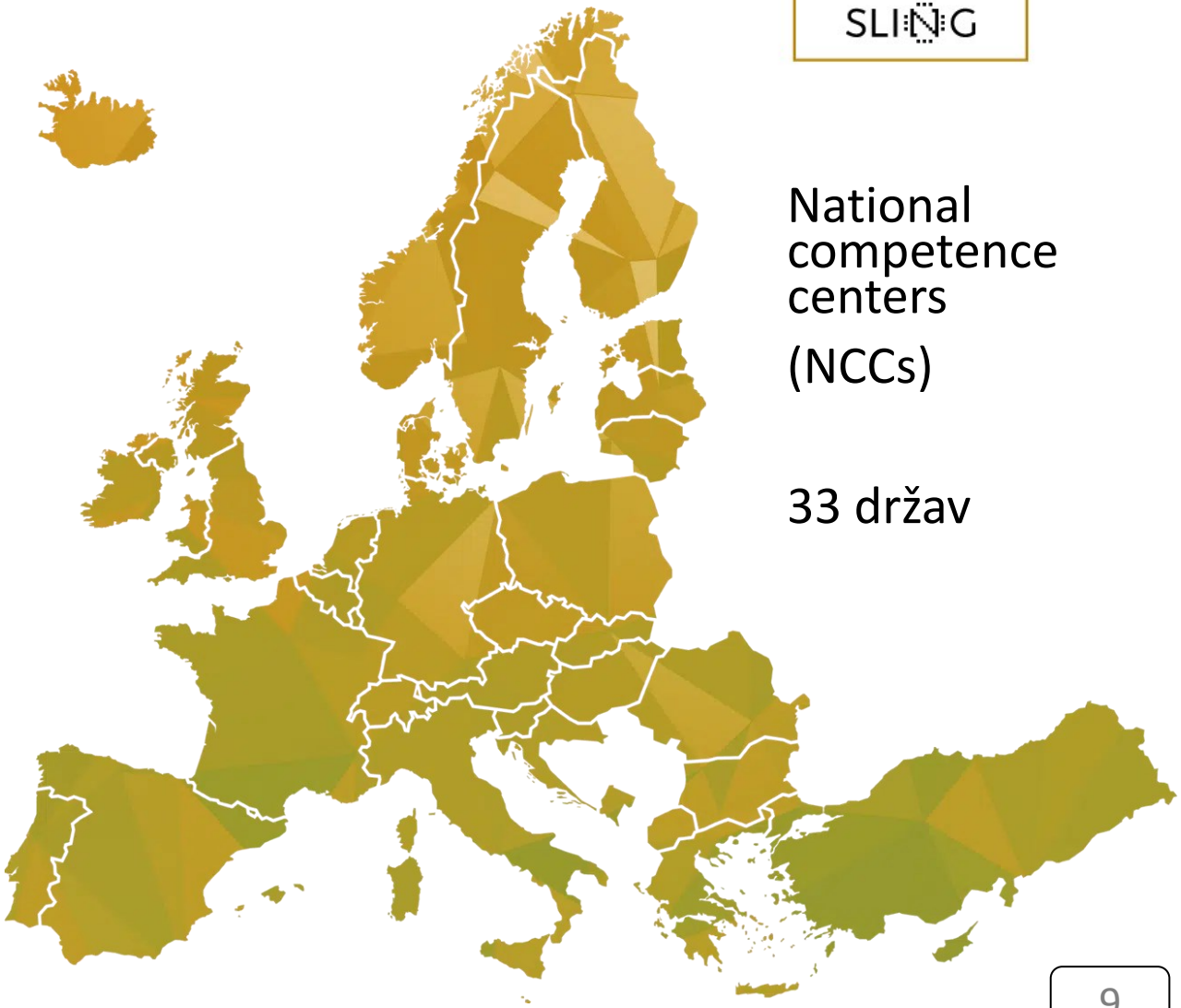
R_{peak} values are calculated using the advertised clock rate of the CPU. For the efficiency of the systems you should take into account the Turbo CPU clock rate where it applies.

106	**VEGA HPC CPU** - BullSequana XH2000, AMD EPYC 7H12 64C 2.6GHz, Mellanox InfiniBand HDR100, Atos IZUM Slovenia	122,880	3,822.0	5,367.0
134	**VEGA HPC GPU** - BullSequana XH2000, AMD EPYC 7H12 64C 2.6GHz, NVIDIA A100, Infiniband HDR, Atos IZUM Slovenia	33,600	3,096.0	4,680.0

https://www.hpc-rivr.si/

EuroCC kompetenčni centri

EuroCC Spain	NCC Austria	NCC Belgium
NCC Bulgaria	NCC Croatia	NCC Cyprus
NCC Czech Republic	NCC Denmark	NCC Estonia
NCC Finland	NCC France	NCC Germany
NCC Greece	NCC Hungary	NCC Iceland
NCC Ireland	NCC Italy	NCC Latvia
NCC Lithuania	NCC Luxembourg	NCC Montenegro
NCC Netherlands	NCC North Macedonia	NCC Norway
NCC Poland	NCC Portugal	NCC Romania
NCC Slovakia	NCC Slovenia	NCC Sweden
NCC Switzerland	NCC Turkey	NCC UK



National competence centers (NCCs)

33 držav

NCC Slovenija partnerji

EURO SLING

arnes

ARCTUR

IJS

Univerza v Mariboru

Univerza v Ljubljani

FS
FRI
FMF
FE

https://www.sling.si/

NCC Slovenija - izobraževanje

Delavnice

Seminarji

Osnovni nivo

- HPC opismenjevanje
- splošno HPC orientirane tematike
- kratke delavnice (1-4h)

Napredni nivo

- osredotočanje na STEM področje
- odeleženci imajo osnovno znanje programiranja
- Udeleženci znajo dostopati do HPC
- kratke – srednje dolge delavnice (4-8h) – (1-3 dni)

Ekspertni nivo

- udeleženci imajo predhodno znanje na področju HPC
- tematika iz specifičnega (ozkega) področja
- zviševanje kompetenc in konkurenčnosti
- srednje do dolge delavnice (4-8h) – (3-5 dni)

NCC Slovenija – izobraževanja

Računalništvo	Strojništvo	Matematika	Fizika	Podatkovna znanost	Varnost	Uporaba HPC

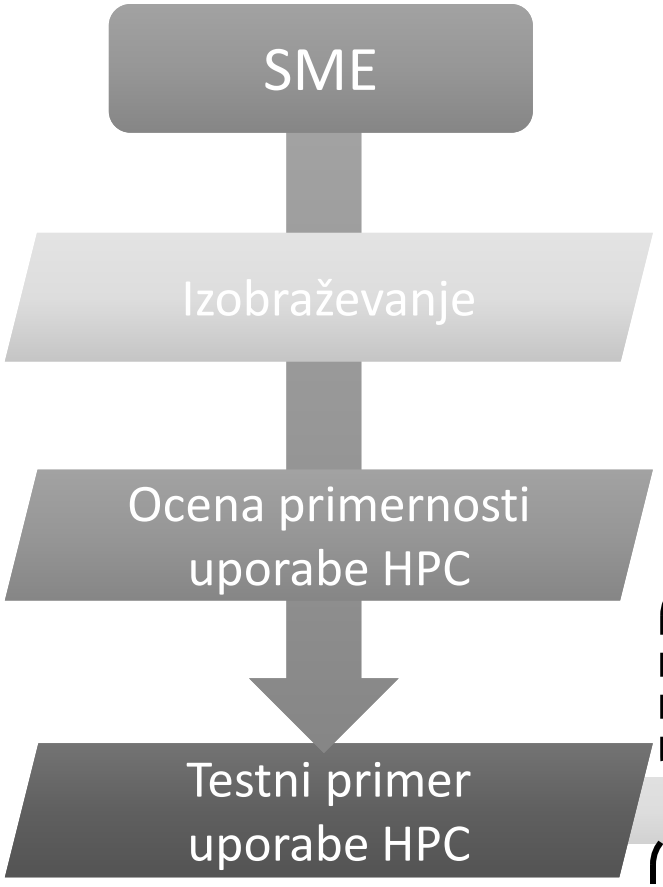
Seminarji

Tematika	Področje
Incorporated support for graphics processing units into the Stan statistical toolbox	matematika
Source control managment with Git at Gitlab, Github and Bitbucket	računalništvo
Biological superproblems require supercomputing	kemija
Kinetic-fluid coupling of plasma simulations	fizika
High-performance computing and artificial intelligence in public administration	HPC
Parallel branch and bound algorithm in C using MPI	računalništvo
pen source programs for FVM and FEM running on HPC	strojništvo
Virtualizacija in kontejnerji pod pokrovom	računalništvo

Delavnice

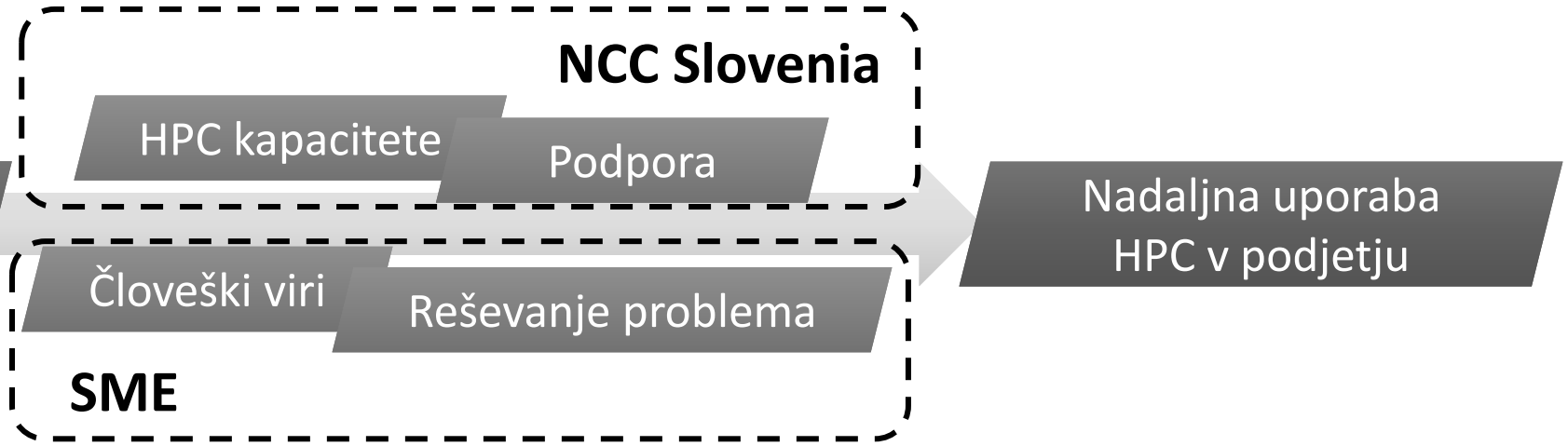
Tematika	Nivo
Osnove superračunalništva	Osnovni
Napredno vzporedno programiranje	Napredni
Uvod v Linux za HPC	Osnovni
Jupyter in Galaxy za analizo podatkov v odprti znanosti	Napredni
CFD on HPC: OpenFOAM	Ekspertni
Programiranje grafičnih procesnih enot	Ekspertni
Superračunalništvo malo bolj zares	Napredni
Deep learning with Keras	Napredni
Računajmo na vsa jedra	Napredni
Računske in statistične metode v Kemiji	Ekspertni
HPC in FEM: Odprtokodna programska oprema	Ekspertni

NCC Slovenija – podpora industriji



Kaj nudimo:

- Svetovalne storitve za industrijo
- Pomoč razvojnim dejavnostim; učinkovita uporabo virov HPC; npr. prenos in prilagoditev programske opreme, uvedba naprednih algoritmov za simulacijo in modeliranje, metod in orodij itd.
- Omogočanje dostopa do superračunalništva in upravljanja podatkov; za raziskovanje inovativnih rešitev
- Zagotavljanje ocen novih tehnologij, eksperimentiranje, potrditev koncepta ter omogočanje validacije in demonstracije tehnologij HPC, programskih kod, orodij in algoritmov v ustreznih okoljih.



HPC4SME orodje

https://hpc4sme.eu/

First approach to the SME and motivation

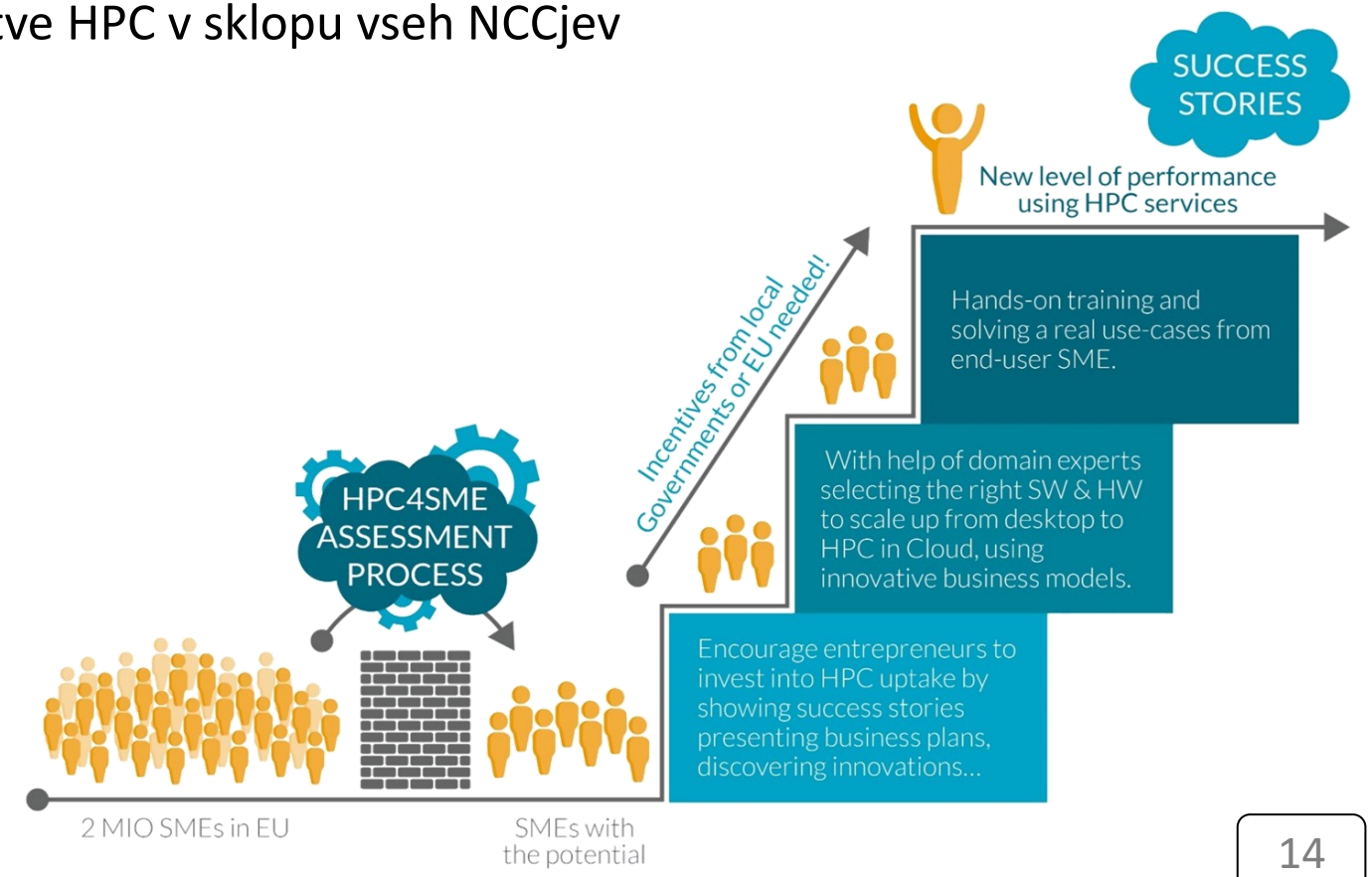
Online Questionare with online tutorials (F1)

Help from HPC experts (online, F2F)

HPC4SME assesment tool

Assesment report with recommendation for SME

Uporaba orodja za analizo pripravljenosti malih in srednje velikih podjetij na storitve HPC v sklopu vseh NCCjev



kontakt: eurocc@sling.si

Hvala za pozornost!

Mesečni novičnik:

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