



On Flexibility of HPC

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Agenda

- Background and Context
- SMEs and HPC in EU
- The recent changes in requirements
- Response
- Conclusions



Bridge between academia and industry

Slovenian Research

Largest non-university ICT Research Group

Research Quality

Continuously among top 5 in Slovenia

FOUNDED
2003

EMPLOYEES
40+

EU RESEARCH
Top 50

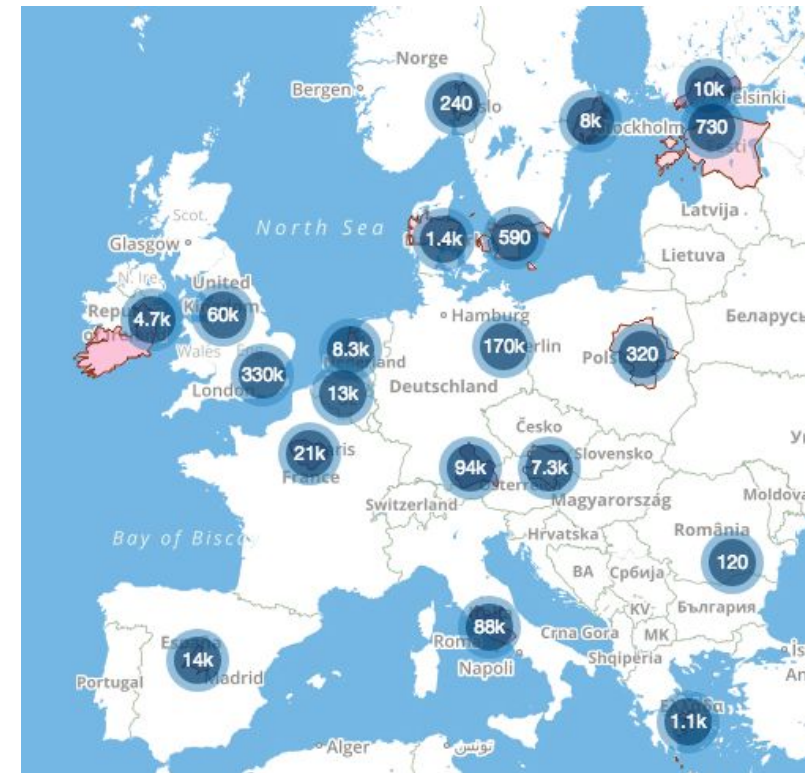


MY Background and Context

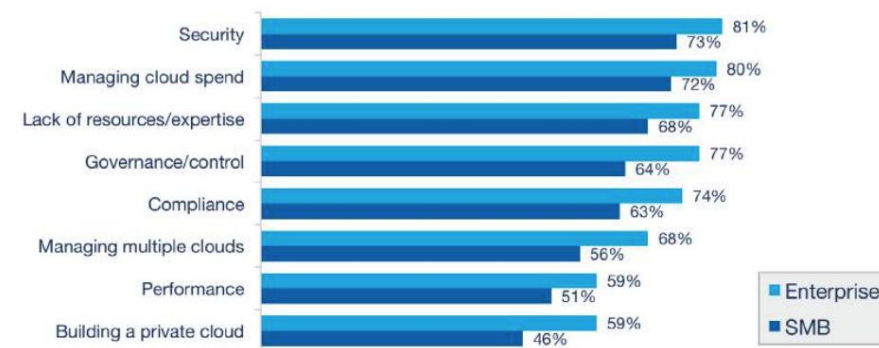
- **Working in different EU projects** (XtreemOS, Contrail, Fortissimo, M2DC, Fortissimo2, MIKELANGELO)
- **SME perspective**
 - Onboarding (SMEs to HPC): help with software or simulations
 - Technical improvements of software running on HPC (porting, deployment, performance improvement)
 - Exploitation in projects (being and SME)

SMEs/Startups in EU and HPC

- SMEs 99.8% of the enterprises in EU.
- EU Startup Culture (#828,982, 4.52m employees, 426mlrd EUR total revenue)
- **Talent and Technology Problem:**
 - HPC expertise in SMEs.
 - HPC software stack in SMEs.
 - Scaling up to HPC.



Cloud Challenges by Company Size



Growth predictions

- **Fuelled by AI, IoT, Factory 4.0 trends.**
- The global HPC will grow significantly faster than other ICT sectors - 33 B\$ by 2022 (Market Research Future, July 2017).
- The total HPC market to grow to 43.9 B\$ in 2021 (4.3% CAGR).
- The expected growth rate of the deep learning market in 2017-2018 to be very high and close to 100% year-on-year (Intersect360 Research).

Have we recognised the problem?

- PRACE, SHAPE (SME HPC Adoption Programme in Europe)
- ETP4HPC/SME-WG, onboarding of SMEs.
- Projects: sesamenet.eu, Fortissimo project, EXDCI, etc.
- WP 2018-2020 EU research infrastructures & e-Infrastructures:
 - 28 mentions of SMEs with cumulative budget of 1.2 mlrd EUR.
 - Challenges and scope: “Proposals are expected to propose an outreach approach for identifying and attracting SMEs whose innovation potential could be increased as users of advanced HPC services”

The assumptions for HPC have changed

Not just simulation and modelling (traditional HPC), but also:

- Analytics backends
- Machine learning
- Different use models (on-demand, automated)

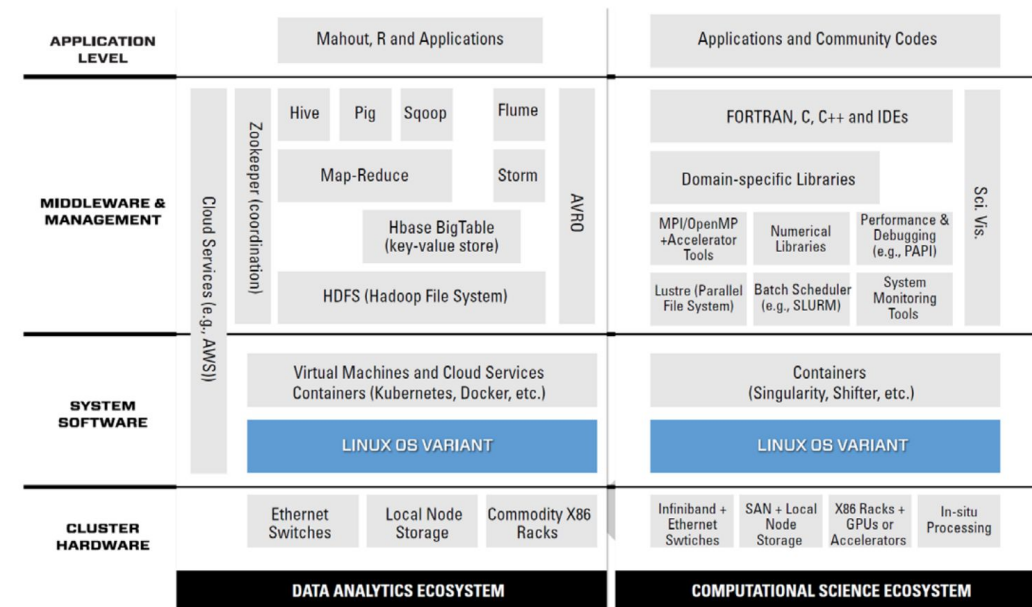
New assumption: User can use their own software stack and not be bound by the provider.

Main Needs

Main difference for users with HPC vs Cloud:

- On-demand, Self-service, Automation, Software stack freedom, etc.
- **Need a cloud-like experience, with similar/same APIs.**

Today 2 approaches for BD and HPC



Slide from ETP4HPC presentation on March 27th, 2017, showing discrepancy between different stacks.

Recent moves towards flexibility

- UberCloud
- RESCALE
- ATOS / BULL ExtremeFactory
- Fortissimo Marketplace
- NERSC Shifter/Berkeley Singularity
- Sabalcore
- IBM HPC
- Microsoft Azure
- CPU 24/7
- GridMachine

A large majority still follows the traditional models of gaining access, data delivery, software stack independence.

Recent (technical) moves towards flexibility

- Virtualisation of HPC:
 - Containers,
 - Full VMs,
 - LightVM approach,
 - Unikernel,
 - vTorque
- Virtualisation of typical HPC resources (e.g. Infiniband, GPUs)

Conclusions

- This talk is a call to a more widespread action of HPC centres to improve flexibility towards the end-user.
- HPC, if it counts on diversification of clientele & onboard SMEs, must use virtualisation, simplify access, introduce self-provisioning, automation, and make it closer to the existing talent pool.
- **EU based HPC centres have legislation, research, industry on their side. Now it is time to put them into good use for SMEs.**



Thanks!

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