Integrating and scaling up SLING
Perspectives for Scientific Computing in Slovenia

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SLING - Slovenian National Supercomputing Network

http://www.ijs.si/
http://www.sling.si/
Consortium in 2020

Jožef Stefan Institute

Engineering, Informatics, Mathematics, Medicine
SLING  Slovenian National Supercomputing Network

- DataGrid  2002-2004
- EGEE I-III, NorduGrid  2004-2010
- NorduGrid  2004/2011
- EGI  2010
- PRACE  2018
Some High Points and interesting moments

- Early parallel support in compilers
  Convex, 1996

- First production 64-bit cluster
  AMD + SUSE, 2003

- Chrooted HPC user software
  2003-2015

- First national EGI OC
  2008

- aCT – the massive HTC task manager
  2010

- Early HPC containers with IB and GPGPU
  Singularity HPC, -nv option, ATLAS deploy
Domains and Communities

- High energy physics
- Theoretical physics
- Computational chemistry
- Astrophysics
- AI / Machine learning
- Biochemistry
- Genomics
- Earth observation data
- Bioinformatics
- Cryo microscopy
- Medical image processing
- Robotics
- Meteorology
- Climate research
Current Set-Up

- Multiple combined grid/HPC sites
  - Login, CPU, GPGPU, adding FPGA
- Singularity containers
- HPC courses at universities + CC
- Central services:
  - LDAP, ICINGA, dCache
  - CVMFS for modules & images
  - NextCloud, GitLab, MkDocs
Current Projects
HPC RIVR

• Research Infrastructure in the Eastern Region
• April 2018 – March 2021
• 20 Mio EUR budget
• National, regional international collaborations
HPC RIVR

- Invested: 20+ 6 Mio
- Eastern region consortium
- Contracted to SLING
- EGI, PRACE, NorduGrid
- EuroHPC PetaScale Vega Q1 2021

Atos BullSequana XH2000 6.8 Rmax 10PF peak
130k Rome 7H12 cores ~1k nodes
256 GB/node, 256 x 512 GB/node
60 GPU nodes with 4 x A100 GPU
HDRI00 + 1000Gbps Ethernet + 500 Gbps WAN
23 GB CEPH + 1 PB NVMe Lustre
SI & EuroHPC

- Integrated effort:
  - with national SLING support
  - with EuroHPC VEGA PetaScale
  - with Leonardo consortium
  - Access, high-level support and docs with EuroCC
Not only Vega

Distributed effort:
- +2 HPC RIVR machines
- NREN massive upgrade
- JSI and KI upgrading
- Project infrastructure: Clarin, Elixir
Scaling Up?

- Resources
- Allocation
- Accessibility
- Interoperability
- Reporting
Distribution and Allocation

- But how to scale in time?
- What access and accounting?
- Reservations and immediate use?
- Storage and service partition?
Accessibility

• SLING:
  - Users
  - **Projects**
  - Organizations

• EGI, PRACE, EuroHPC

• Projects and infrastructures:
  - ATLAS, PierreAuger, CTA, HBA
  - ELIXIR, CLARIN, CERN, CECAM

SLING clusters
Login node: SLURM/ARC
NorduGrid ARC:
  client, API, aCT
dCache, CEPH
OpenScience storage
EUDAT B2suite
Goals
member-oriented

- Unified access
  (EduGain AAI + attributes/x509 + VOMS)

- Unified interfaces
  (SLURM Login, ARC + aCT ...)

- Flexible environment
  (HPC modules / ARC RTE → Singularity)
    OpenMP, OpenCL, CUDA, interactive ...

- Flexible infrastructure
  experimental environment, flexible network

- High-Level Support
  integrated with user communities
Goals
future-proof

- Modern Architecture
  parallel, data-intensive, network connected

- Advanced Software Support
  hyperconverging architectures, service+storage+compute, high-level support

- International Integration
  PRACE, EuroHPC, EGI, EUDAT, projects
  bi-lateral projects (as Hosting Entity)
SLING model: compute + storage + service

- Containerized software
- Managed services + compute
- Consistent Environment
  - Persistent and Managed
  - Tested and Documented
  - Validated and Peer-Reviewed
  - Portable and Accessible
  - Open Container & Scientific File-system

→ combined workflows
SLING model
compute + storage + service
↓
federation of distributed resources
national + international
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Dejan Valh (IZUM)
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