CERN CMS TIER2 infrastructure deployment

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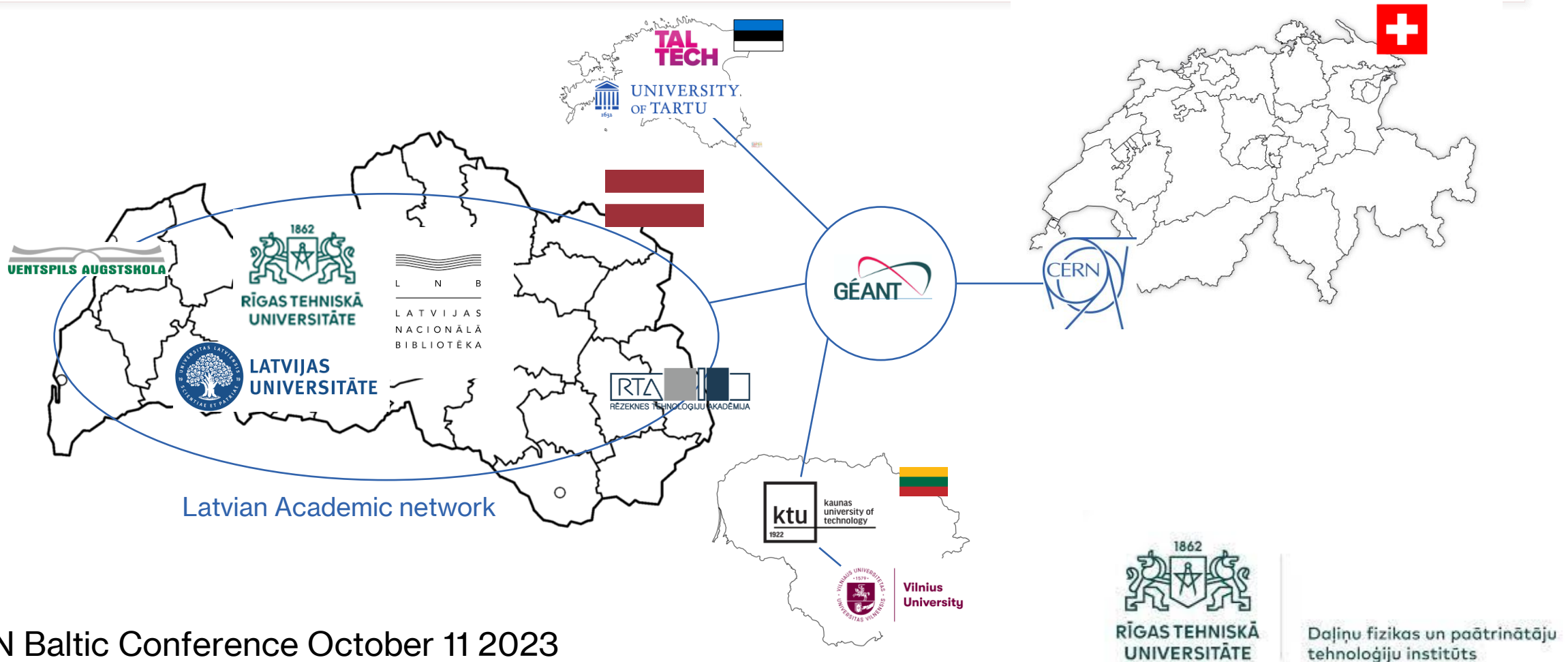Daļiņu fizikas un paātrinātāju tehnoloģiju institūts

CERN CMS TIER2 project goals

- Cooperation between partners and CERN in high energy physics and HPC

- Project member education about CMS and HPC technologies at CERN

- Involvement of CERN PhD students in TIER2 activities

- Joint participation among partbers in EU cross-border HPC projects

- Development of Latvia's HPC infrastructure and its promotion for scientific applications

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Project funding and partners

- Funded by Latvia's government via Ministry of Education and Science

- Led by Riga Technical University

- Partners in Latvia:
  - University of Latvia
  - National Library of Latvia
  - Ventspils International Radio Astronomy Centre
  - Rezekne Academy of Technologies

- Baltic partners
  - Kaunas University of Technology (Lithuania)
  - KBFI (Estonia) - consultancy

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A federated cloud:
Pooling high-performance distributed computing resources as TIER2 site

Latvian Academic network

CERN Baltic Conference October 11 2023

Summary of activities (2022-2023)

- CERN Baltic Group meetings held in Latvia, Lithuania and Estonia

- A TIER2 feasibility study with Kaunas Technical University

- 9 TIER2 HPC hyper-converged computing nodes procured and deployed for TIER2 site in RTU managed datacenter

- HPC private cloud infrastructure tenant (OpenStack)

- Deployed scaleable Software Defined Storage (Ceph)

- Configuration of TIER2 middleware

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Deployed TIER2 resources in the Main site @RTU

- 9 worker nodes with:
  - Total of 550+ CPU cores, 2.3TB total RAM
  - Total of 1.5PB of CEPH Software Defined Storage
  - nVME pool + HDDs pool
  - 4x25Gb/s LAN connections
  - 100Gb/s gateway to GEANT network
  - One node has nVidia Ampere A40 high-performance GPU for hybrid CPU/GPU processing
- Compact deployment in just half-rack

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Software stack in the Main site @RTU

- Ceph-FS filesystem

- Cent OS 7

- Kubernetes w. CERN VMFS

- ARC-CE (v.6.17)

- A-REX (ARC Resource-coupled EXecution service)

- ARC Information System, Grid Monitor

- Gridftpd service w. Certificates

- SLURM for workload distribution

Challenges we faced during 2023

- New server hardware failure with necessary full replacement delayed the software stack deployment

- Some issues with networking

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Cybersecurity concerns

CERN Baltic Conference October 11 2023

Planned activities for Q4 2023 / Q1 2024

- Participation in O&C Fall event at CERN, Geneva

- Preparation tests and first run of CMS TIER2 workloads at the Main site

- Implementation of monitoring and technical support processes

- Deployment and tests of federated cloud member resources

- GPU workload-processing tests

- Promotion of CERN information stand in the National Library of Latvia

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