This work was supported by the READEX project The Implementation Phase of PRACE receives funding from the EU’s Seventh Framework Programme (FP7/2007-2013) through its Work Programme under grant agreement No. 671657 and by the EXA2CT project funded from the Horizon 2020 programme of the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 680778.

Martin Čermák, Václav Hapla*, David Horák, Jakub Kružík, Alexandros Markopoulos, Marek Pechá, Lukáš Pospíšil, Radim Sojka, Alena Vašatová

**PermonQP**
- framework and concrete solvers for quadratic programming (QP)
- QP problems, transforms, solvers
- easy-to-use / HPC-oriented
- workflow
  1. QP problem specification
  2. QP transforms
  3. automatic/manual choice of an appropriate solver
  4. the solver is called
- benchmark generated by Tomáš Brožovský (IT4Innovations)

**PermonFLOP**
- extends PermonQP with domain decomposition methods of the FETI type
- problems without / with contacts
- scalability up to tens of thousands of CPU cores, billions of unknowns
- assembly of FETI-specific objects

**PermonCube**
- benchmark generation - mesh with billion of unknowns in parallel over the cubical or membrane domain
- FEM assembly
- deformable body, contacts
- realistic linear elasticity problem
- displacement computed
- gluing and non-penetration constraints
- METIS mesh decomposition
- benchmark prepared by Tomáš Brožovský (IT4Innovations)

**PermonMembrane**
- Membrane problems

---

**Numerical experiments**
- realistic linear elasticity problem
- problem generated using PermonCube
- computed on HERCULES (SPPC)

---

**Coercive membrane problem**

---

**Semicoversive membrane problem**

---

**Elastic cube in potential contact with obstacle**

- computed on Archer (SPPC)