

# System for exascale supercomputer modeling based on thousands of FPGAs

**Motivation** Exaflop supercomputers are expected in 2018-20. It changes the programming paradigm dramatically. But, how it will look like? Nobody knows the exact answer because we have no exascale experience. Let's make reconfigurable system that will represent a part of future supercomputer and begin the programming today!

**Project mission** is to create huge heterogeneous FPGA based system for modeling of exascale computer consisting of  $10^6$ - $10^7$  cores and managing up to  $10^8$ - $10^9$  threads. Modern FPGA technology will make it very flexible for representing a wide range of existing and developing supercomputer architectures including light/heavy cores, CPU/GPU modules, DSM/PGAS memory, Infiniband/Ethernet/custom interconnects etc. Modeling system will help to test and optimize user programs for real exascale systems before they will be ready to use.

## Specifications

- Up to 512 Intel x86 processors
- Up to 72 TB Shared memory
- Up to 8192 Xilinx Virtex UltraScale FPGAs
- Up to 36 billions Virtex7 logic cells
- Up to 8 TB Shared memory on FPGAs
- Up to 1.5 MW power consumption
- Up to 64 19' cabinets

## Main customer

Russian Academy of Sciences  
<http://www.ras.ru>

## Contractors

Keldysh Institute of Applied Mathematics  
<http://www.keldysh.ru>



Scientific-Research Institute "Kvant"  
<http://www.rdi-quant.ru>



Lomonosov Moscow State University  
<http://www.msu.ru>



## Subcontractors



Engineering Physics Laboratory  
MSU Faculty of Physics