



## Laboratory of Parallel and Distributed Systems

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### INTRODUCTION

Since 1998 the research laboratory has been playing a key role in the application-oriented research of distributed, computational grid and cloud technologies. The laboratory coordinated several international e-Infrastructure projects in the EU 7th Framework Programme. A cloud platform, elaborated in one of these coordinated consortia, ranked as No. 1 regarding its innovation potential among more than 500 evaluated outputs of various European research projects.

### MAIN R&D TOPICS

#### Our mission is twofold in research:

- On the one to provide efficient software development tools and high-level services together with customizable Platform-as-a-Service environment (Occopus & WS-PGRADE/gUSE) based on workflows.
- On the other hand we are developing easy-to-maintain middleware solutions (SZTAKI Desktop Grid) and technologies for interoperability (Data Avenue & DCI Bridge) that enables cost-efficient cloud and alternative distributed and parallel infrastructures, such as clusters, supercomputers, grid systems for scientific and business applications taking into consideration of Big Data challenges.

Our laboratory manages the development of the SZTAKI Cloud, in a close cooperation with the departments ILAB, ITAK and DSD. Now we are working on the development and set up of the MTA Cloud, in cooperation with HBIT, and the Wigner Data Center.

Other important research area of the laboratory is volunteer computing and its platforms, such as the SZTAKI Desktop Grid (SZDG). The goal of SZDG is to provide a solution to exploit the spare capacities of home PCs, or computers located at different sites of a company or an institute. A volunteer computing system can interconnect a large number of distributed resources to solve very complex scientific tasks in a reasonable time and with a reasonable price.

#### Main R&D areas:

- cloud systems
- interoperability between cloud and (volunteer) grid systems
- resource brokering
- Big Data platforms
- scientific gateways for e-infrastructures
- workflow based IT solutions

The EU FP7 SCI-BUS project (coordinated by the laboratory) creates application specific portals for the different fields of science that let the users to access different cloud and grid systems in a transparent way. This technology was further extended in the EU FP7 CloudSME project, where a PaaS cloud environment was developed for companies using simulations for manufacturing. In the Hungarian AgroDat project our laboratory pursues research in the field of Big Data and IoT (Internet of Things) to combine with clouds, especially the usability analysis of Big Data solutions (e.g. SPARK) for precision agriculture. Our newest research product is Occopus that enables to easily set up complex virtual infra-structures even in a heterogeneous, multi-cloud environment.

- MIMOS
- ETH Zürich
- KBTU
- CloudBroker
- CloudSigma
- ScaleTools
- Simula8
- ATOS Origin
- INRIA
- Sony CSL
- Panasonic Europe
- Hewlett Packard Enterprise
- 4D Soft
- E-Group
- Magyar Telekom
- ComGenex
- Silicon Computers

#### As project coordinator:

- SCI-BUS: Scientific gateway based user support (EU FP7)
- IDGF-SP: International Desktop Grid Federation - Support Project (EU FP7)
- EDGI: European Desktop Grid Initiative (EU FP7)
- DEGISCO: Desktop Grids for International Scientific Collaboration (EU FP7)
- SHIWA: Sharing interoperable workflows for large-scale scientific simulations on DCIs (EU FP7)
- EDGeS: Enabling Desktop Grids for e-Science (EU FP7)
- SZTAKI Cloud, and MTA Cloud (as vice coordinator)

#### As partner:

- CloudSME: Cloud Simulation for Manufacturing & Engineering (EU FP7)
- AgroDat.hu: Agricultural knowledge centre and decision support system (VKSZ12)
- EGI Engage: Engaging the Research Community towards an Open Science Commons (EU FP7)
- ENTICE: Decentralised repositories for transparent and efficient virtual machine operations (H2020)
- agINFRA: Promoting data sharing and development of trust in agricultural sciences (EU FP7)
- EGI-InSPIRE: European Grid Initiative: Integrated Sustainable Pan-European Infrastructure for Researchers in Europe (EU FP7)

