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 six 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:
- Conducting research on parallel and distributed systems in order to support the highly parallel and/or distributed execution of grand challenge applications processing very large data sets.
- Elaborating new methods and tools for closing the gap between the abstraction level of current parallel and distributed platforms (like supercomputers, clusters, clouds and grids) and the grand challenge applications.

Our laboratory coordinated the development of the SZTAKI Cloud, in a close cooperation with the departments ILAB, ITAK and DSD. Now we work on the development of the MTA Cloud, in cooperation with HBIT, and the Wigner Data Center, as well as supporting the user community of MTA Cloud. Other important research area of the laboratory is the creation of parallel and distributed frameworks running on hybrid multi-cloud systems in order to support artificial intelligence (machine learning, deep learning, etc.) and big data applications.

Development roadmap
- On one hand to provide efficient software development tools and high-level services together with customizable Platform-as-a-Service environment (Flowbster & WS-PGRADE/gUSE) based on workflows.
- On the other hand we are developing cloud and data management tools (Occopus, Data Avenue) by which complex infrastructures and services can easily be deployed and managed on hybrid multi-cloud systems in order to support the cost-efficient execution of research and business applications with special attention on Big Data challenges (e.g. Docker, Hadoop and Spark clusters).

Main R&D areas:
- cloud systems
- interoperability between clouds and other platforms
- resource brokering
- scientific gateways for e-infrastructures
- workflow based IT solutions
- big data platforms
- artificial intelligence (machine learning, deep neural network, etc.) platforms

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.

- CloudBroker
- CloudSigma
- CloudSME UG
- ScaleTools
- Simula8
- Machineering
- Trevalli Cooperlat
- Saker Solutions
- Outlandish
- AgroKnow

- Balasys
- DSS Consulting
- InnoMine
- Bakony Elektronika
- Hewlett Packard Enterprise
- eNET
- 4D Soft
- E-Group
- 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:

- CloudiFacturing: Cloudification of Production Engineering for Predictive Digital Manufacturing (H2020)
- COLA: Cloud Orchestration at the Level of Application (H2020)
- EOSC-hub: Integrating and managing services for the European Open Science Cloud (H2020)
- CloudSME: Cloud Simulation for Manufacturing & Engineering (EU FP7)
- AgroDat.hu: Agricultural knowledge centre and decision support system (VKSZ12)
- ENTICE: Decentralised repositories for transparent and efficient virtual machine operations (H2020)
- agINFRA: Promoting data sharing and development of trust in agricultural sciences (EU FP7)