Data-Centric Computing

The focus of the group is to accelerate the processing of data-driven workloads, including large analytics as well as stream processing, in heterogeneous execution frameworks; also explore the future of computing through critical challenges in areas such as Artificial Intelligence, Big Data, Cloud Computing, High Performance Computing and Sustainable Computing.

Objectives

The goal of the group is to advance in the field of methods, mechanisms and algorithms for the management of heterogeneous data-centre workloads. In particular, the group aims to achieve the following objectives:

- Advance research frontiers in the management of Software Defined Infrastructures, providing holistic optimisation solutions for the optimisation of Data Centres. A critical angle of this objective is the development of advanced Task Placement and Scheduling techniques, and extending unifying performance models for heterogeneous infrastructures and workloads.
- Advance research frontiers in the development of technologies for developing mechanisms for an automated characterisation of cost-effectiveness of Big Data deployments, such as Hadoop, to explore how runtime performance, and therefore its price, are critically affected by relatively simple software and hardware configuration choices. The group architected and maintains the Aloja portal.
- Advance research frontiers in the design and exploitation of Active Storage technologies by conducting evaluation of NVM technologies for workload acceleration, either through memory extensions for in-Memory computing (scale-up) or creating abstractions to access global address spaces (scale-out).
- Explore novel architectures of the emerging IoT stream processing platforms, that provide the capabilities of data stream composition, transformation and filtering in real time. The group architected and maintains the servIoTicy platform.
- Advance research frontiers in Learning Algorithms for guiding task and data placement algorithms for Data Center optimization, through intelligent resource management policies and mixes our extended experience in High Performance Computing with Advanced Analytics fields. The effort includes modelling workloads with learning technologies, from classical Machine Learning to Deep Learning aproaches.
- Build hardware prototypes for accelerating data-centric workloads, exploring how to accelerate IO bound applications by leveraing most advanced technologies available in the market (NVM, GPUs, FGPAs).

- Develop management algorithms for virtualised Data Centres in a large-scale distributed ecosystem running heterogeneous workloads that optimize their operation with respect to energy and ecological efficiency.

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