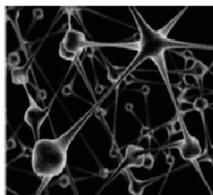


HPC-Cloud-based microscopy

Fortissimo Experiment Facts:

- Segment: Health
- Application Domain: Microscopy
- Application: In house code



The Company

Clinical laboratories and R&D departments produce and analyse huge amounts of microscopic image data. This is used in medical diagnosis, to accelerate drug discovery and for biomedical research. To support the analysis of this data, there is a significant SME-based industry for the manufacturing of microscopes and spectrometers serving the biotech and material science industries. In many cases the analysis of this data can be computationally intensive requiring the use of powerful computers.

UZH is a University laboratory making significant use of microscopic data. In this experiment UZH provided a test case in the area of fluorescent microscopy. MicroscopeIT is a Polish technology-based SME company, founded in 2012, which has introduced an internet service called VIRTUM. VIRTUM provides computations in a Software-as-a-Service (SaaS) model for use in microscopy. Before this experiment, VIRTUM comprised a client-server architecture using in-house computer resources. OpTecBB, founded in 2000, is the competence network for optical technologies and micro-system technology in the region of Berlin-Brandenburg. Currently, this association has approximately 100 employees. In this experiment, the expertise and software of MicroscopeIT has been complemented by the end-user requirements of UZH and OpTecBB and the HPC expertise of ARCTUR. This has enabled the development of a Cloud-based HPC implementation of VIRTUM available as a service. This has greatly enhanced VIRTUM's availability, capabilities and affordability, particularly to SMEs.



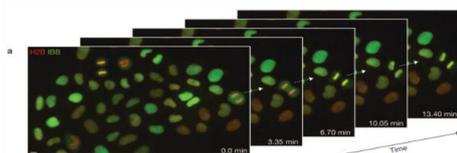
The Challenge

The challenge addressed in this experiment was to adapt VIRTUM to an HPC-Cloud-based infrastructure and to test if the enhanced VIRTUM could be applied beneficially in four test cases. The test cases comprised: the analysis of the images from remotely controlled fluorescence microscopy; the processing of the data from super-resolution microscopy; the management and visualization of spectroscopic data; and whole slide imaging and analysis in digital pathology and high-throughput screening. These test cases are numerically intensive each taking around a full day on a PC.

The Solution

The VIRTUM service has been adapted to work with an external Cloud-based HPC infrastructure. Modules have been developed to support the implementation of the test cases described above. Through the use of HPC, the time taken to process test cases has been reduced from one day to a few hours, a typical reduction of 5 times. A cross-platform, simple user-interface has also been developed. This supports the visualisation of data and its management from almost any device. Furthermore, the VIRTUM service provides flexible licensing models allowing end-users to optimize their costs.

A spin off from the enhancement of VIRTUM has been a generic platform, which can be applied to many various computational tasks in such areas as medicine, biotechnology, material engineering and optical inspection.



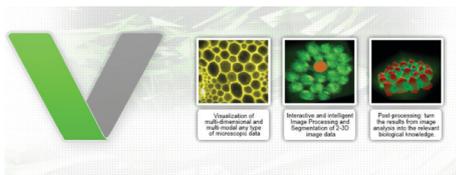
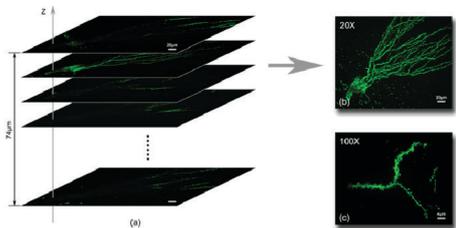
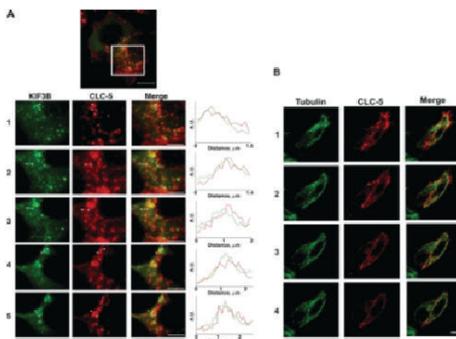
Fortissimo Experiment Partners:

- OpTecBB, UZH, NIKON (End-user)
- MicroscopeIT (ISV)
- ARCTUR (HPC Provider and Expert)
- Opta-tech (Hardware vendor)

More Information:

www.fortissimo-project.eu

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The Benefits

VIRTUM-DP has the potential to remove obstacles and bottlenecks in current oncological diagnostics. Its main benefits are a significant improvement in clinical diagnosis due to an increased speed of diagnosis, an increased quality of diagnosis, an increased throughput of diagnoses and more accessible storage of samples. VIRTUM-DP can result in a reduction in staff costs by 50% through increased efficiency. Extrapolating this to the USA alone results in an overall saving per annum of \$1.7 billion.

Furthermore, there is a significant cost saving in IT infrastructure through the use of Cloud-based processing. In most cases, computer resources available via the Cloud are more cost-effective. As a result of the development of VIRTUM-DP, ARCTUR will see an increase in its sales of cycles of approximately €20K per annum.

The Fortissimo Project

Fortissimo is a collaborative project that enables European SMEs to be more competitive globally through the use of simulation services running on a High Performance Computing cloud infrastructure. The project is coordinated by the University of Edinburgh and involves 123 partners including Manufacturing Companies, Application Developers, Domain Experts, IT Solution Providers and HPC Cloud Service Providers from 14 countries. These partners are engaged in 53 experiments (case studies) where business relevant simulations of industrial processes are implemented and evaluated. The project is funded by the European Commission within the 7th Framework Programme and is part of the I4MS Initiative.

I4MS Fortissimo is part of I4MS ICT Innovation for Manufacturing SMEs: www.i4ms.eu



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