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Enabling eScience

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By today, especially in the natural sciences, computers have become indispensable tools and instruments for research. Recently, due to progress in digital measurement technology, researchers acquire vast amounts of data in ALL domains of science. Not only the amount of data, but also its complexity is continuously increasing. And to top it off, the data needs to be shared within large scientific collaborations among many people located at various research institutions all across the globe. The term eScience has been coined in the early 2000s to describe research that heavily relies on computational technologies - today it is applicable to almost all sciences.

However, the new organisational and engineering tasks to deal with the new complexity cannot be expected to be managed by the researchers alone. There is the need for a new kind of IT, engineering and research support that focuses on the methods and technologies enabling eScience. This includes large-scale data management, data storage, data policies and data lifecycle considerations, as well as automated validation, processing and analysis of data. It also includes the creation and usage of large-scale infrastructures for eScience, like distributed Grid or Cloud infrastructures. And it requires domain-specific know-how, for example in bioinformatics, chemoinformatics, medical informatics, etc. Ultimately it is all about integration of several layers of infrastructure and software so that the scientists can extract the necessary information from large amounts of raw data, to be used by to propose new insights and theories, and to plan the next round of experimentation and observation.

I will show based on the example of the SystemsX.ch SyBIT project and the Sloan Digital Sky Survey how modern eScience operates, what kinds of problems already have reasonable solutions and where the current challenges are.

Author: Dr KUNSZT, Peter (ETH Zürich)

Presenter: Dr KUNSZT, Peter (ETH Zürich)

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