Best Practice

Proteomics project winner of EYR2

Proteomics faster with grids and lightpaths

SURFnet and its e-Science partners organise the annual Enlighten Your Research competition. Held for the second time in 2009, this international lightpath competition produced a series of interesting proposals, representing a whole range of scientific disciplines. From these, the jury selected three winners, including the Proteomics research project.

More efficient research process

Dr Peter Horvatovich, an assistant professor at the University of Groningen's Faculty of Mathematics and Natural Sciences, submitted the project proposal. Dr Horvatovich's work involves bio-informatics and developing software to process large quantities of data generated during proteomics research. Lightpaths can speed up the research process because the data can be transmitted faster to researchers at other locations, and processed and stored on supercomputers, which are only available in a few places in the Netherlands.

Essential contribution

With the Enlighten Your Research competition, SURFnet challenges researchers to speed up their research by utilising lightpaths and additional infrastructure. This enables them to become familiar with this technology and can give a boost to their research. The researchers taking part in this project submitted a pioneering proposal that makes innovative use of dynamic lightpaths, which make an essential contribution to the project.

Proteins in an organism

Peter Horvatovich is an expert in the field of proteomics, the study of the proteome. He explains: “The proteome is the collective term for all the proteins in an organism that are produced on the basis of the genome, the genetic information present. These proteins differ from cell to cell and they are constantly changing over the course of life due to all kinds of biochemical interactions, for example with the environment.”

New insights

In many medical conditions, an important role is played by defects in and between proteins. “Proteomics research can contribute to new medical insights, for example in the form of new therapies,” says Dr Horvatovich. “The research focuses, for example, on what proteins occur in a cell and in what quantities (the protein profile), what changes proteins undergo, and what interactions occur between them. We aim to be able to identify cancer cells, for example, with the aid of biomarkers, which are proteins that function as indicators.”

”Processing the information generated during our research requires a lot of computing capacity. That computing capacity and the associated storage capacity are available in Groningen, at the SARA computer centre in Amsterdam, and also in Utrecht, Rotterdam, and Delft. Those locations are now connected by lightpaths. That creates opportunities for our research.”

Peter Horvatovich (RUG, Groningen)

A hundred thousand results

The studies are intensive. “Using a mass spectrometer produces a particularly large amount of information,” says Dr Horvatovich. “It generates between ten and a hundred thousand results from just a single sample. Bio-informatics is the discipline that brings together biology and IT. We use IT to store data in databases, to analyse information, and to convert data into useful knowledge.”

Dealing with bottlenecks

Distributing these growing quantities of information to computer centres and storage locations was causing a great deal of delay. “Using SURFnet’s dynamic lightpaths has alleviated those bottlenecks,” says Dr Horvatovich. “We can now share data between the various computer centres. And we can also process it significantly faster and more cheaply.”

Massive computing capacity

The researcher is using the Life Science Grid (LSG), one of the infrastructures rolled out by BiG Grid. The aim of BiG Grid is to promote scientific research by making large-scale computing and data storage facilities available. Coen Schrijvers is the coordinator of the LSG and works at the SARA computer centre in Amsterdam.

Some facts about SURFnet lightpaths

- A lightpath is a direct data connection via optical fibre, with a guaranteed bandwidth and only a slight delay.
- Lightpaths provide a safe and superfast connection for data traffic because they are entirely separate from the Internet.
- This setup means that users are not hampered by other data traffic, and do not themselves hamper others, for example by utilising the whole of the available bandwidth.
- A fixed lightpath is a permanent connection.
- A dynamic lightpath is a flexible connection set up by the user himself or by a research application. This is a particularly valuable solution in situations when such a data connection is not required all the time, or when a number of different destinations need to be connected one after the other.

What are the benefits?

- A lightpath can be connected to an organisation’s own network;
- It can be created in a relatively short time (just a few weeks);
- High capacity is guaranteed;
- It provides a stable connection with high availability;
- It involves only a slight network delay (latency);
- It is a secure solution.

All about lightpaths

- **SURFnet lightpaths:**
  > http://www.surfnet.nl/surflichtpaden
- **Enlighten your research:**
  > http://www.surfnet.nl/Documents/SURF03_2009_EYR.pdf
  > http://www.surfnet.nl/eyr
- **Proteomics:**
  > http://www.rug.nl/
  > http://www.proteomics.nl/
  > http://www.netherlandsproteomicscentre.nl/
- **Bioinformatics:**
  > http://www.nbic.nl/
- **Life Science Grid SARA:**
  > http://www.sara.nl/project/life-science-grid

“A small variant of the big grid clusters has been set up at a dozen research locations especially for the life sciences, with two to three hundred processors and 180 terabytes of storage capacity. This gives researchers access not only to their own local LSG cluster but also to other LSG clusters. If necessary, they can also easily scale up to the big BiG Grid clusters, which have many thousands of processors and several petabytes of storage capacity.”

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