

Best Practice

Pulsar Surveys project winner of EYR2

Astronomical databases via SURFnet 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 Pulsar Surveys research project.

Connecting supercomputers

The lead applicant for the Pulsar Surveys project was astronomer Joeri van Leeuwen, who works at the ASTRON radio-astronomy research institute in Dwingeloo. Dynamic lightpaths enable him to connect a number of supercomputers in different locations so as to analyse enormous quantities of data.

More flexible

SURFnet's dynamic lightpaths enable researchers to work more flexibly. They are the same as a fixed lightpath except that they are temporary and set up by the user himself or automatically by a research

application. A supercomputer in Amsterdam can open up a lightpath to Groningen when it needs to utilise data that is stored there, for example, and close down the lightpath when processing has been completed.

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.

Better understanding

The Pulsar Surveys research project involves enormous quantities of data from space. Astronomer Joeri van Leeuwen explains: "Radio telescopes in the United States collect data from space. Stars mainly emit light, but radio pulsars – burnt-out stars – emit primarily radio waves. Information from pulsars helps us understand the nature of material and of gravity, thus helping us to study the evolution and existence of those extreme stars. It's extremely interesting information for researchers."

"The lightpath infrastructure creates a superfast connection that allows researchers at the various locations to utilise data without any delay."

Joeri van Leeuwen (ASTRON, Dwingeloo)

Distilling information

Gigantic quantities of data are produced in the United States. "In the Netherlands," says Joeri Van Leeuwen, "we store that raw data and use it to distil valuable information. That information is then processed and visualised, but doing so requires enormous computing capacity and storage capacity. For this project, ASTRON has been working with the University of Groningen and the SARA university computer centre in Amsterdam. Like ASTRON, they each have a supercomputer. The supercomputers store that data and process it so as to derive all the information as quickly and flexibly as possible."

Sole option

SURFnet's dynamic lightpaths connect the supercomputers and the associated work locations with one another as and when necessary. "A normal IP connection would never be able to guarantee the capacity and speed that we now get with this private 'computing superhighway'," says Joeri van Leeuwen. "In fact, using a lightpath is the sole option. We also occupy the connection only when it's actually necessary, so the optical fibre connection remains available the rest of the time for other users."

Cutting edge

Joeri van Leeuwen believes that cutting edge lightpath technology will come to be indispensable, certainly for astronomers. "In 2020, we will be building a gigantic new radio telescope in the southern hemisphere. By then, we want to be able to transport data at a speed of 10 terabits per second. That is no less than one hundred times faster than at present. It's therefore extremely important that we already experiment with this technology and take it further. SURFnet, with all its know-how, is an important partner in this process."

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>
- **ASTRON/Pulsar Surveys:**
 - > <http://www.pulsars.nl/>
 - > <http://www.astron.nl/>

"Lightpaths are superfast. They can contribute to research in bio-informatics, physics, astronomy, and meteorology – in fact in all research where enormous quantities of data need to be processed."

Joeri van Leeuwen (ASTRON, Dwingeloo)