# HIGH PERFORMANCE NETWORKING IN EUROPE

An overview of SURFnet's European lightpath collaborations

About Lightpaths In case you have large amounts of data that need to be transported back and forth between different locations, or if your software profits from a low latency network connection, you might consider the use of lightpaths in your e-infrastructure. 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 theyare entirely separate from the Internet. A fixed lightpath is a permanent connection. An on-demand lightpath (also known as 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.
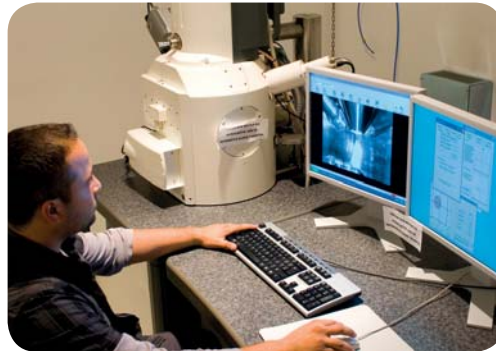
About NetherLight NetherLight is an Open Exchange, providing policy-free connectivity between the connected parties. NetherLight itself does not provide transit capacities. GLIF & GÉANT offer this transit capacity for the research and education community.

NL Light

PROJECT	LOCATION _ Bandwidth	INFORMATION	
LHC-OPN	**Vancouver** Canada (TRIUMF) − 1 Gbit/s **Amsterdam** the Netherlands (NL-T1 (SARA + Nikhef)) − 10 Gbit/s **Geneva** Switzerland (CERN) − 10 Gbit/s **Chicago** USA (Fermilab) − 1 Gbit/s **Brookhaven** USA (BNL) − 150 Mbit/s **Taipei** Taiwan (ASCG) − 10 Gbit/s	**Large Hadron Collider - Optical Private Network (LHC-OPN)** is a dedicated high-bandwidth network performs data distribution from CERN to all of the 11 major Tier 1 centres around the world.	lhcopn.web.cern.ch LHCOPN
LHC-ONE	**Geneva** Switzerland (CERN) − 10 Gbit/s **New York** USA (MANLAN) − 2 Gbit/s **Amsterdam** the Netherlands (NL-T1 (SARA + Nikhef)) − 1 Gbit/s	**Large Hadron Collider - Open Network Environment (LHC-ONE)** provides a collection of access locations that are effectively entry points into a network that is private to the LHC T1/2/3 sites.	lhcone.web.cern.ch
NEXPReS	**Sheshan** China (radio telescope) − 1 Gbit/s **Medicina** Italy (radio telescope) − 1 Gbit/s **Onsala** Sweden (radio telescope) − 1,5 Gbit/s **Jodrell Bank** United Kingdom (radio telescope) − 2 Gbit/s **Sydney** Australia (radio telescope) − 150 Mbit/s **Effelsberg** Germany (radio telescope) − 10 Gbit/s **Torun** Poland (radio telescope) − 1 Gbit/s **Hartebeesthoek** South Africa (radio telescope) − 2 Gbit/s **Dwingeloo** the Netherlands (correlation) − 10 Gbit/s **Westerbork** the Netherlands (radio telescope) − 10 Gbit/s	**Novel Explorations Pushing Robust e-VLBI Services** (**NEXPReS**, www.nexpres.eu) is a three-year project with the goal of implementing real-time, electronic VLBI (e-VLBI) into all observations conducted by the European VLBI Network. This will be achieved through development of a variety of technologies including: cloud correlation; high-bandwidth on demand; distributed correlation; and high-bandwidth, high-capacity networked storage on demand. NEXPReS is comprised of 15 partner institutes in eleven countries and is coordinated by JIVE.	www.jive.nl/nexpres NEXPReS
DEISA	**Amsterdam** the Netherlands (SARA) − 10 Gbit/s **Frankfurt** Gemany - 10 Gbit/s	**DEISA**, the Distributed European Infrastructure for Supercomputing Applications, is a consortium of leading national Supercomputing centres that aims at fostering the pan-European world-leading computational science research.	www.deisa.eu DEISA
LOFAR	**Manchester** United Kingdom (real time streaming data) **Groningen** the Netherlands (Long Term Archive sites (Tier 1), real time streaming data) − 10 Gbit/s **Garching** Germany (real time streaming data) − 3 Gbit/s **Tautenburg** Germany (real time streaming data) − 3 Gbit/s **Postdam** Germany (real time streaming data) − 3 Gbit/s **Effelsberg** Germany (real time streaming data) **Juelich** Germany (Long Term Archive sites (Tier 1), real time streaming data) **Onsala** Sweden (real time streaming data) **Nançay** France (real time streaming data) − 3 Gbit/s **Chibolton** United Kingdom (real time streaming data) − 3 Gbit/s **Amsterdam** the Netherlands (Long Term Archive sites (Tier 1)) − 1 Gbit/s	**The Low Frequency Array (LOFAR)** is a telescope that opens up a new window on the Universe by observing at very low radio frequencies (10-240 MHz). The radio interferometric array of LOFAR consists of 48 stations spread over the north of Europe. Each station has a number of fields with many low-cost antennas. The core stations are distributed over an area of about 100 kilometres in diameter in the North-East of the Netherlands. LOFAR generates several petabytes of data each year.	www.astron.nl/about-astron/press-public/pictures/ictures#Pictures_LOFAR LOFAR
CineGrid	**Poznan** Poland − 10 Gbit/s **Prague** Czech Republic − 10 Gbit/s **Amsterdam** the Netherlands − 10 Gbit/s **San Diego** USA − 10 Gbit/s **Chicago** USA − 10 Gbit/s	**CineGrid**'s mission is to build an interdisciplinary community that is focused on the research, development, and demonstration of networked collaborative tools to enable the production, use, preservation, and exchange of very-high-quality digital media over photonic networks.	www.cinegrid.org CINEGRID AMSTERDAM
PALFA/GBT	**2 locations in the USA** (telescopes) − 1 Gbit/s **Manchester** United Kingdom (compute cluster) − 1 Gbit/s **Dwingeloo** the Netherlands (compute, storage, visualisation) − 1 Gbit/s **Amsterdam** the Netherlands (On-demand computing (Huygens, SARA) − 1 Gbit/s **Groningen** the Netherlands (raw data storage) − 1 Gbit/s	**The PALFA/GBT** pulsar survey project studies extreme physics laboratories. The objective is to find new pulsars. Pulsars are highly magnetized, rotating neutron stars that emit a beam of electromagnetic radiation.	
CONCLUDE	**Oxford** United Kingdom (BADC, data) − 1 Gbit/s **De Bilt** the Netherlands (KNMI, compute cluster) − 1 Gbit/s	**CONCLUDE** is a project that connects climate model data for scientific users and decision makers. Climate centers around the world use high-performance computing systems to compute new scenarios of future climate change with their respective numerical climate models.	www.badc.nerc.ac.uk www.knmi.nl

SURFnet ensures that researchers, instructors, and students can work together simply and effectively with the aid of ICT. It links ICT services, scientific instruments, and people with reliable ICT infrastructures. SURFnet also demonstrates what is possible by developing and testing innovative ICT services. SURFnet is part of SURF, the Dutch higher education and research partnership for ICT, which is celebrating its 25th anniversary in 2012.

More information about SURFnet: www.surfnet.nl/en

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