The NEXPReS project

Submission for the Terena TNC2011 conference

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November 30, 2010

Title

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Keywords

Radio Astronomy, Very Long Baseline Interferometry (VLBI), e-VLBI, Dynamic Lightpaths, Bandwidth-on-Demand

Extended Abstract

VLBI is a technique in radio astronomy in which observations are carried out using a distributed set of radio telescopes. Working together, these telescopes constitute a virtual radio telescope of truly global size with a resolution that far surpasses that of each individual contributing radio telescope. A VLBI observation generates terabytes of data at each of the participating telescopes. This data was traditionally recorded on magnetic tapes and more recently on large numbers of hard disks, to be shipped to a correlator facility such as JIVE (Joint Institute for VLBI in Europe) in Dwingeloo, the Netherlands.

In the EC funded EXPReS project, which ran from 2006 to 2009, we successfully demonstrated the use of high speed networks for transporting the VLBI data streams in real time to a correlator. Receiving and processing the data in real-time greatly increases the flexibility of VLBI and makes it possible to quickly respond to transient events in the universe, enabling novel kinds of astronomical research.

With the support of several NRENs, GÉANT and GLIF, we now have dedicated layer 2 connections to radio telescopes around the world. These connections (lightpaths, MPLS paths and dedicated VLANs) are static, and therefore a somewhat inefficient use of scarce international

networking resources. On the other hand, the nature of e-VLBI networking traffic (constant bit-rate UDP, currently 1Gb/s per telescope, increasing to 4Gb/s and more in the next few years) is such that it is best transported over dedicated paths.

The popularity of dedicated networking paths (lightpaths etc.) for data-intensive e-science has prompted NRENs and vendors to develop automated provisioning tools for lightpaths (e.g. OpenDRAC, Oscars). By allowing end-users themselves to provision these paths, a new networking service, 'Bandwidth on Demand' (BoD) has been created. Initially bandwidth on demand was only available within a single administrative domain, but there is a clear demand (especially for international virtual instruments like e-VLBI) for BoD on an international scale, and this is a topic of active research and experimentation. Current international BoD systems include GÉANT's AutoBahn project, and the Automated GOLE project in GLIF.

NEXPReS, an EC funded project which is an international collaboration of both NRENs and radio astronomical institutes, will pioneer the use of these emerging BoD systems to provide on-demand connectivity between radio telescopes, correlators and archives. With BoD we can create a more flexible network, while at the same time making more efficient use of networking resources in terms of ports and international bandwidth. We are planning to demonstrate our first international BoD trials in the first months of 2011.

Author Biography

Paul Boven was born in 1971 and grew up in Germany and the Netherlands. He studied applied physics at the University of Twente. He previously worked as a systems expert at SARA, the Dutch center for high performance computing and networking. In December 2006 he started at JIVE as a unix/linux/networking specialist, responsible amongst others for the networking resources for e-VLBI. He is activity leader for Workpackage 6, 'High Bandwidth on Demand' in the NEXPReS project.