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Status report on network monitoring system

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Table of Content

Table of Content.....	3
1. Introduction.....	4
1.1 Executive Summary.....	4
1.2 References and Applicable Documents	4
1.3 Document Amendment Procedure	4
1.4 List of Acronyms and Abbreviations	5
2. A quick overview of DEISA monitoring	6
2.1 Overview of the DEISA network infrastructure	6
2.2 The DEISA network monitoring web interface.....	7
2.3 The future DEISA monitoring environment.....	8
3. Accessing the DEISA network monitoring tool	10

1. Introduction

1.1 *Executive Summary*

The DEISA [1] Service Activity 1 – Network Operation and Support is responsible for deploying the high performance network infrastructure for DEISA. In phase 1 of the project the main task has been the deployment of the infrastructure for all DEISA sites. The infrastructure is based on the tight coupling - using virtually dedicated bandwidth network interconnects (GEANT Premium IP service [2]) - of supercomputer systems at DEISA sites, to provide a distributed supercomputing platform operating in multi-cluster mode.

The network infrastructure is in most parts fully operational including services to measure performance and monitor the status.

This document describes the current status of the provisioned permanent monitoring tool (see online: [3]) for the DEISA network infrastructure. The basic functionality, the provided services and used tools of the DEISA monitoring system have been described in detail in deliverable DSA1-1.3 – “Provision of a permanent monitoring tool for the DEISA network infrastructure” in September 2005.

Beneath the status update of DSA1-1.3 this document provides an overview of tasks to be done in the near future after installation of the new 10 Gb/s “proof of concept” network infrastructure.

1.2 *References and Applicable Documents*

- [1] Distributed European Infrastructure for Supercomputer Applications, <http://www.deisa.org>
- [2] GÉANT - GÉANT/Dante description of the Premium IP service, <http://www.dante.net/server/show/nav.00700a003>
- [3] DEISA User and Network Administrator Monitoring Interface, <http://wwwnet.deisa.fz-juelich.de>
- [4] perfSONAR
- [5] ESNET – home page, the Energy Sciences Network, <http://www.es.net>
- [6] Internet2 – home page, www.internet2.edu
- [7] <http://www.perfsonar.net/>

1.3 *Document Amendment Procedure*

1.4 List of Acronyms and Abbreviations

DWDM	Dense Wavelength Division Multiplex
ISO/OSI	International Standardization Organization / Open Systems Interconnect
NREN	National Research and Education Network
X-WiN	Technical infrastructure of the German research network for Universities and research institutions

2. A quick overview of DEISA monitoring

2.1 Overview of the DEISA network infrastructure

DEISA as a consortium of leading national supercomputing centres deploys and operates a persistent, production quality, distributed supercomputing environment with continental scope. The basic service provided by DEISA service activity 1 (D-SA1) is the deployment, operation, management and monitoring of the network infrastructure, to which mostly all of the DEISA supercomputer systems are connected to. The current network infrastructure is based on virtually dedicated bandwidth network interconnects provided by GÉANT2 and the involved NRENs of the supercomputing sites. A “Premium IP service” defined by GÉANT2 is used to allow “dedicated” connections over the normal Europe wide DANTE network. Though this service has been shown reliable in the past and provided interaction of the supercomputing systems all over the last two years, it seemed reasonable to think about new infrastructures and higher bandwidths.

So in September 2005 it has been decided to initiate a so called “proof of concept” phase for a limited number of DEISA supercomputer sites to be connected with 10 Gb/s uplinks instead of the currently used 1 Gb/s “virtually “dedicated connections. A detailed description of the new infrastructure, the design principles, transition phases from an all 1 Gb/s network infrastructure to a mixed 1Gb/s and 10 Gb/s infrastructure has been described in detail in deliverable DSA1-2 “Provision of the *proof of concept* 10 Gb/s DEISA network infrastructure”.

The 1 Gb/s network infrastructure is fully operational (except EPCC and HLRS) including services to measure performance and monitor the status. Within the first technical annex the supercomputer system of EPCC had not been thought to be connected to the DEISA network. HLRS joined the DEISA consortium after the first year. Because of contractual problems of the DEISA technical annex modifications HLRS could not be connected to the network infrastructure due to budget restrictions. Though in the meantime this problem has been solved, it seemed not reasonable to connect HLRS to the network infrastructure because it was planned to have them connected with higher speeds (10 Gb/s) soon after availability of the German X-WiN. Buying equipment for 1 Gb/s connection and changing connectivity just after some months to higher capacity didn't make any sense, because the old equipment couldn't be used any longer afterwards. Unfortunately we are waiting for connectivity until now. The provision for the HLRS connectivity has been scheduled for mid of November by German NREN DFN.

The current DEISA “dedicated” network connects therefore the following sites: BSC(Barcelona, Spain), CINECA (Bologna, Italy), CSC(Espoo, Finland), ECMWF(Reading, UK), FZJ(Jülich, Germany), IDRIS(Orsay, France), LRZ(Garching, Germany), RZG(Garching, Germany) and SARA(Amsterdam, The Netherlands). The following figure illustrates the DEISA network infrastructure as of October 2006.

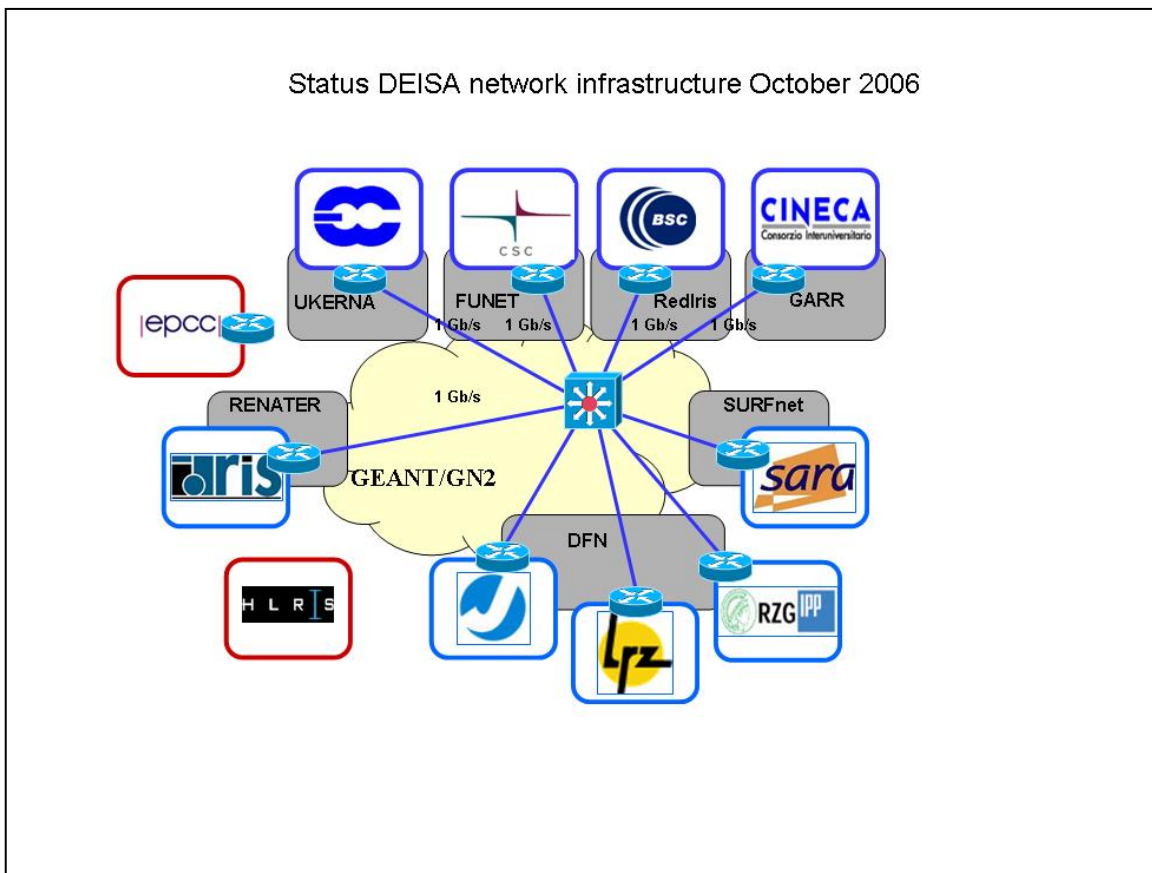


Figure 1: “Dedicated” DEISA network infrastructure (October 2006)

2.2 The DEISA network monitoring web interface

The main web page, which is accessible by authorized persons only, is divided into several independent parts. It has been updated several times since its first installation. Beneath information of link statistics, throughput measurement information and supercomputer availabilities of the new sites included in to the network infrastructure over time, additional information regarding future network layout and information about preferred network option settings have been added. Moreover the functionality and readability has been enhanced. No new monitoring features have been added yet. Also no new monitoring information for the “proof of concept” 10 Gb/s infrastructure could be included because of the delayed availability of the needed equipment and NREN and GEANT2 links (wavelengths). As soon as the first links are in production, these will be included into the monitoring service.

2.3 The future DEISA monitoring environment

The current DEISA network monitoring system has been designed in a straight forward manner. Most information as link statistics, routing information, etc has come from external resources like NRENs and GÉANT. Only local links and switches have been monitored directly by DEISA. Nevertheless the DEISA monitoring web page provided information for both kinds of network paths in an uniform and standardized manner. The whole information has been assigned to DEISA needs and provided through the DEISA monitoring web site.

This situation will change in the future. Starting the “proof of concept” phase 2 of the DEISA network there will be a “real” dedicated DEISA network, which implies that topology information, link statistics, availability information and network load have to be gathered from resources provided by DEISA itself. In the past the network design was a multi-domain approach within layers 1, 2 and 3 of the ISO/OSI reference model. Local IP networks at DEISA sites had been connected to layer 3 networks at NRENs which again where connected to the GÉANT2 backbone, also layer 3 based.

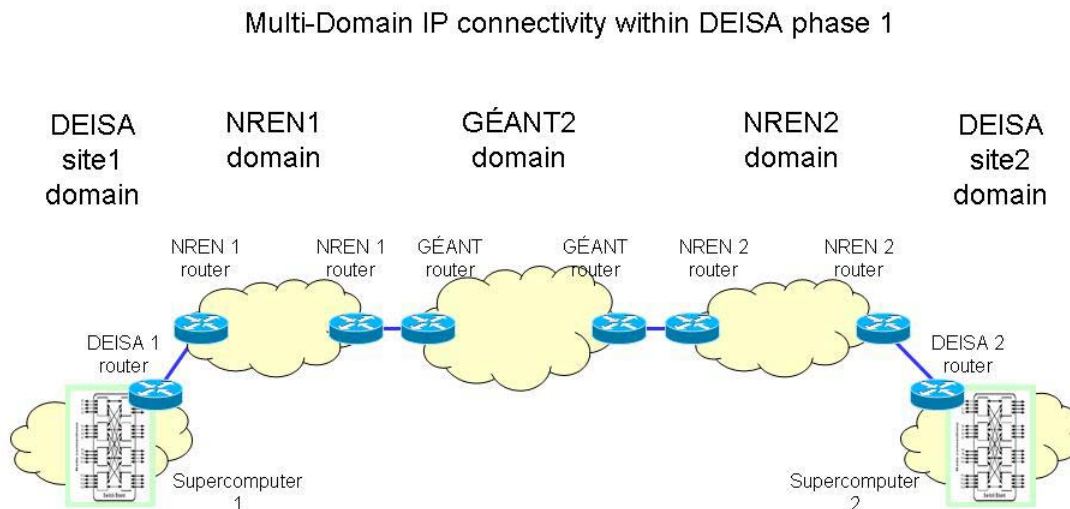


Figure 2: Multi-Domain IP connectivity within DEISA phase 1

In the future the local DEISA site layer 3 networks will be connected to a layer 3 DEISA backbone network consistent of Layer2/3 switches managed by DEISA itself. The NRENs and GÉANT2 will provide the layer 1 component only, which are in most cases DWDM systems providing a wavelength between the DEISA sites and the central DEISA backbone switch (see figures 3 and 4 on the next page).

Therefore a new approach will be investigated. We are just looking into the perfSONAR [4] activities. perfSONAR, a joint collaboration between ESNET[5], GÉANT2 and Internet2 [6], is an infrastructure for network performance monitoring, making it easier to solve end-to-end performance problems on paths crossing several networks. It provides services delivering performance measurements in a multi-domain environment and acts

as an intermediate layer, between the performance measurement tools and the diagnostic or visualization applications using well-defined protocols (IP, TCP, HTTP and SOAP).

Multi-Domain IP connectivity within DEISA phase 2

Logical view layer 2/3

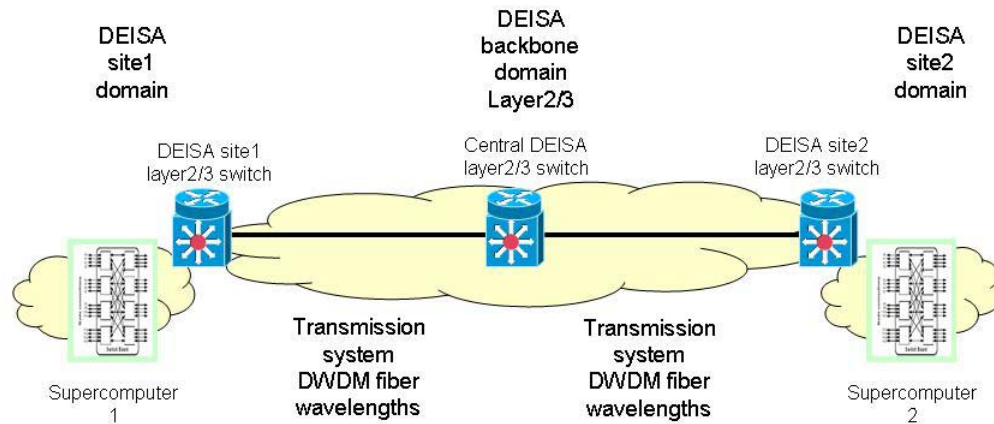


Figure 3: Logical view DEISA layers 2 and 3 managed by DEISA using the underlying transmission system (DWDM)

Multi-Domain IP connectivity within DEISA phase 2

Lower layer view

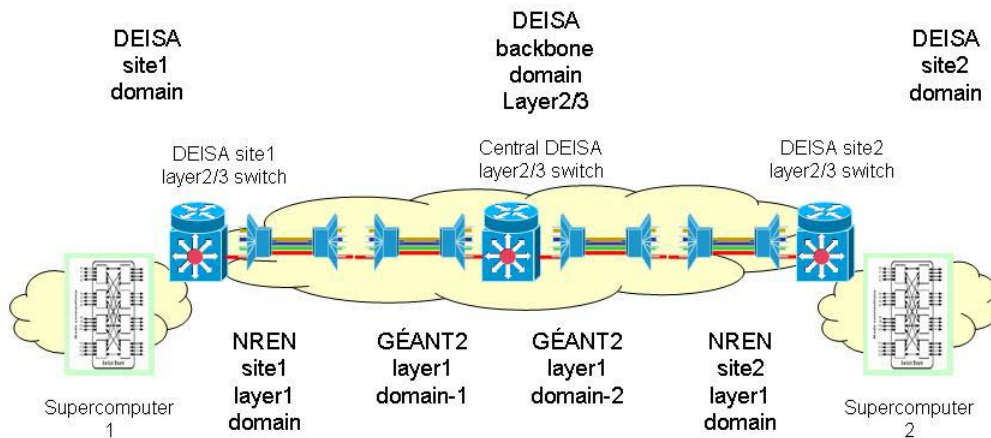


Figure 4: Lower layer physical view (DWDM system managed by NRENs and GÉANT2)

From the perfSONAR description [7]: *“The perfSONAR infrastructure is open and any tool can take advantage of it. Many perfSONAR services and monitoring applications have already been implemented as standalone measurement tools. Weathermaps, looking-glasses, IPPM measurements, and many other monitoring applications have already been implemented using the perfSONAR framework.”*

perfSONAR provides a bunch of services as there are :

- Measurement Point Service: Creates and/or publishes monitoring information related to active and passive measurements
- Measurement Archive Service: Stores and publishes monitoring information retrieved from Measurement Point Services
- Lookup Service: Registers all participating services and their capabilities
- Authentication Service: Manages domain-level access to services via tokens
- Transformation Service: Offers custom data manipulation of existing archived measurements
- Resource Protector Service: Manages granular details regarding system resource consumption
- Topology Service: Offers topological information on networks

Most of these services could be valuable for DEISA. It is assumed that the current services created, installed and provided by DEISA monitoring can be integrated into this perfSONAR services without any problems in future. Many of the NRENs providing services to DEISA are also partners in the perfSONAR activity. GEANT2 is a main collaboration partner, DFN, GARR, NorduNet, RedIRIS, RENATER, SURFnet are additional partners working within the GÉANT2 JRA1 activity.

Because of the delays in provisioning of the new 10 Gb/s links within Germany and through Europe it did not make any sense to start these activities until now. The current monitoring system is working well for the 1 Gb/s infrastructure. After redesigning the DEISA backbone and going to a star like 10 Gb/s infrastructure, new network equipment and supercomputer interfaces will be introduced. The monitoring system has to be updated or adjusted. This will be a perfect time for redesigning the DEISA monitoring system and including new features..

As soon as first sites have been connected via the new 10 Gb/s network infrastructure it will be investigated if DEISA can benefit from perfSONAR services and if these services can be included within the DEISA monitoring system easily.

3. Accessing the DEISA network monitoring tool

The current network monitoring tool (web pages) can be accessed by authorized hosts only. General access will not be provided so far. Publicly available information will be provided at a later stage of the project.