



034115

PHOSPHORUS

Lambda User Controlled Infrastructure for European Research

Integrated Project

Strategic objective:
Research Networking Testbeds



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Report on Outcomes of the Targeted Collaborations

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RE	Restricted to a group specified by the consortium (including the Commission)	
CO	Confidential, only for members of the consortium (including the Commission Services)	



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Abstract

This report is providing an assessment on the established liaisons with commercial companies and scopes the second phase liaison activities.

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1 Targeted collaboration outcomes

The partnership with European Industrials and achievement of the commercial exploitation of the PHOSPHORUS technologies is one of the goals of the PHOSPHORUS project. The collaborations with industry companies confirm the real value of Phosphorus project results and related software products. The leading telecommunication companies are very interested in testing the dynamic provisioning systems combined with great support for grid computing and storage. In future we should expect the economy growth of this sector. PHOSPHORUS project is one of the most important partner for such kind of cooperation because of well research activities result which confirms “know-how” of the project partners.

1.1 Collaboration with ADVA AG Optical Networking

ADVA Optical Networking is a leading global provider of optical networking solutions for rapid and cost-effective provisioning of high-speed data, storage, voice, and video services in the metropolitan area. Leveraging core competencies in optical and Ethernet technologies together with expertise in enterprise applications, ADVA focuses on delivering end-to-end solutions from enterprise sites to carrier regional infrastructure.

PHOSPHORUS project has a very good collaboration with ADVA AG Optical Networking. During the course of the project ADVA expressed interested in PHOSPHORUS products deployment on their devices. In project local testbed in Poznan Supercomputing and Networking Center ADVA FSP 3000RE-II ROADM devices are used and PHOSPHORUS G²MPLS software is developed for ADVA’s devices which allows to test G²MPLS LSC path provisioning in Wavelength Switched Optical Networks. Additionally, the company has opened the office in Poland which one of the purposes is supporting the PHOSPHORUS project. Michael Roth, ADVA Optical Networking Engineering Director has been invited to participate in PHOSPHORUS Advisory Board meeting in Barcelona in April.

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Figure 1 – ADVA FSP 3000RE-II device has Lambda Switching Capability (LSC).

For detail evaluation of the ADVA devices features in context of PHOSPHORUS project requirements, there will be prepared some tests. These tests will verify 40Gbps and 100Gbps transmission system capabilities, measure the add/drop and pass-through setup time with automatic laser equalization and also evaluate the management/configuration devices interfaces. These tests are very important for PHOSPHORUS WP2 and WP6 activities which will be preparing TNRC SP controller (detail requirements of TNRC SP controller are available in PHOSPHORUS-D2.3) for ADVA device.

1.2 Collaboration with Alcatel-Lucent and France Telecom

Alcatel-Lucent is one of the largest research, technology and innovation organizations in the telecommunications industry. It provides solutions that enable service providers, enterprises and governments worldwide, to deliver voice, data and video communication services to end-users. **France Telecom** is the main telecommunication company in Europe and one of the largest in the world. Currently it is very interested in Bandwidth on demand services.

The main scope of collaboration with Alcatel-Lucent and France Telecom will concentrate in the following topics:

- End-to-End on demand service delivery
- Development and deployment of Grid enabled network control planes
- Building the European-wide test-beds and facilities

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- Evaluation of the applicability of the concept of a combined grid/network control plane for the commercial sector

The cooperation with Alcatel-Lucent started during ECOC'07 workshop: "*Networks for IT: A new Opportunity for Optical Network Technologies*", prepared by Phosphorus project, where Dominique Verchere (Alcatel-Lucent Research & Innovation) had a presentation: "*Orchestrating optimally IT and network resource allocations for stringent distributed applications over ultrahigh bit rate transmission networks*" (the presentation available here: http://www.ist-phosphorus.eu/files/ECOC2007-Orchestrating_optimally_IT_and_network_resource_allocations.pdf)

The collaboration will involve active exchange of researchers and relevant know-how. A set of common workshops with panel discussions and live demonstrations is foreseen in order to allow the knowledge exchange and open the discussion on relevant subjects.

The rationale for the collaboration is to demonstrate the viability of the end-to-end on demand service delivery in multi-domain environment, involving different provisioning technology and heterogeneous network equipment integrated with Grid middleware. The collaboration brings also extra benefits to the project. Through the industrial partners the PHOSPHORUS consortium will have a possibility to cooperate with the CARRIOCAS project (<http://www.carriocas.org>), in which both, France Telecom and Alcatel-Lucent, play a major role. The CARRIOCAS has started on January 23rd, 2007 and has 3 years duration, thus the PHOSPHORUS and CARRIOCAS projects have almost the same timeframes. The CARRIOCAS main subject is distributed computation over ultra high optical internet network. A similar background of PHOSPHORUS and CARRIOCAS, the same rationales and similar approaches to the Grid enabled network control planes may have a strong influence not only on the project achievements. It is expected that the results of the cooperation may have a strong impact on the research activities in Europe and even beyond it.

PHOSPHORUS and France Telecom agreed to start the collaboration with extending the PHOSPHORUS test-bed with the resources provided by Telekomunikacja Polska S.A., a Polish branch of France Telecom. In a set of teleconferences the PHOSPHORUS concepts have been presented to FT partners and possible deployment scenarios have been identified. Since the decision about final topology of the test-bed has not been taken yet by FT, it is impossible to present it in this deliverable. It is expected to finalize the design work by the end of May, to make the first tests possible in late June 2008.

1.3 eStrategies

In order to disseminate information about Phosphorus activities to a wider audience publication in eStrategies magazine has been prepared. In April a special section with a focus on Advanced Grid Technologies and Research Networking Testbeds will be prepared. Over 39000 copies of eStrategies magazine will reach a dedicated European audience in over 30 countries. Previous issues of eStrategies also covered a variety of European focused Research and Innovation topics. For example, in November of 2006 eStrategies Europe was the only publication to be distributed in the attendee visitor packs at the IST Helsinki event. The magazine will

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be distributed to Public & Academic Sector (EC, European Parliament, local government departments and agencies, national government departments and agencies, universities, public research centers / institutes etc.), Private Sector Industry, High Technology & SME areas, Media and web portals. There is also a planned distribution during 3 events in 2008.

Copy of the article is available in Appendix A.

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Appendix A **eStrategies** article

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★ The Phosphorus project focuses on delivering advanced network services to Grid users and applications interconnected by heterogeneous infrastructures. The project is addressing some of the key technical challenges to enable on-demand end-to-end services across multiple domains

Empowering Grid users with improved services

Grid infrastructure – comprising of dedicated optical bandwidth, shared data services, shared instruments and widely distributed computing resources, has enabled vast processing power and data sharing capabilities, not only across Europe but across the globe.

Phosphorus is a European project to essentially create software tools (and associated developments) to make users/applications acutely 'resource-aware' in the vast Grid environments, which will in turn make the best and optimal use of these powerful networks.

end-to-end, on-demand provisioning of network services in this field, need to be developed, in coordination with other resources (CPU and storage) and will also need to span multiple administrative and network technology domains.

The developments and achievements of the project will also be verified in a real environment with real applications.

This is being achieved by means of distributed test-bed demonstrations in major conferences and on a global scale involving European and international

of authentication, authorization and accounting (AAA) across all planes.

See below for a breakdown of aims within each of these planes.

Service plane

- The creation of middleware extensions and APIs to expose network and Grid resources and make reservations of those resources for users.
- The implementation of policy mechanisms for networks participating in a global hybrid network infrastructure, allowing both network resource owners and applications to have a stake in the decision to allocate specific network resources.

Network Resource Provisioning plane

- The Adaptation of existing Network Resource Provisioning Systems (NRPS) to support the framework of the project.
- The implementation of interfaces between different NRPS to allow multi-domain interoperability with the Phosphorus resource reservation system.

Control plane

- Work on enhancements of the GMPLS Control Plane (G²MPLS) to provide optical network resources as first-class Grid resource.
- The inter-working of GMPLS-controlled network domains with NRPS-based domains, i.e. interoperability between G²MPLS and UCLP, DRAC and ARGON Being in its crucial test-bed design

The Phosphorus project is gathering information and analysis to create the first user tested platform for experimentation and development

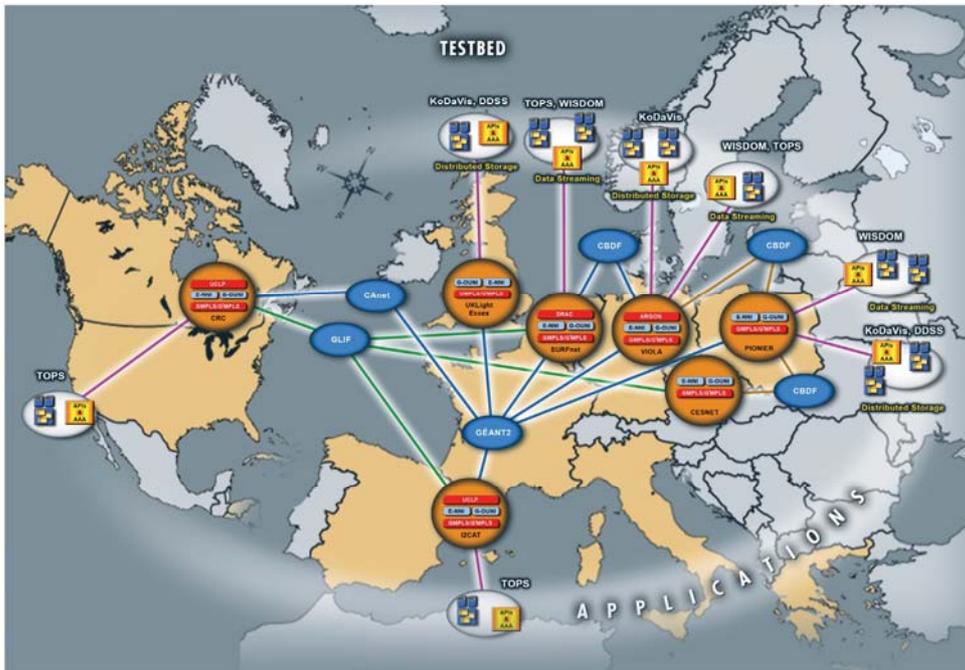
The Phosphorus project is endeavoring to make applications aware of their complete computational and networking resources.

This will make applications more adaptive, by making dynamic use of various connected high-end resources. The development of appropriate middleware to enhance interoperability between various sites and maximise the scope and level of available facilities for a project undertaken will enhance the usage of Grids that offer great opportunities for largescale international research initiatives.

Software tools and frameworks for

resources and test-beds. The most recent of this was at the largest IT conference, the SuperComputing conference, held in Reno, USA where high end scientific and Grid applications were set on Phosphorus testbed interconnecting domains across Europe (Spain, the Netherlands, Germany and Poland), USA and Canada to demonstrate Phosphorus achievement to date.

The technical goal is to develop smooth integration between applications, middleware and transport networks, based on three planes which consist of the service plane, NRPS plane and control plane and policy related issues



The Phosphorus test-bed components and applications

phase, the Phosphorus project is gathering information and analysis to create the first user tested platform for experimentation and development.

The project is continually evaluating the outcomes of these implemented changes within the relatively risk free environment of the test-bed, and will be

multiple optical international networks. These will include GÉANT2, CBDF, GLIF connections and NRENs. E-Science applications with extreme communication demands will be put in particular test-beds to demonstrate services delivery. The test-bed infrastructure will be available for all interested NRENs, End-Users and

which network and Grid-specific resources are controlled and set-up at the same time, Phosphorus is poised to reshape the network infrastructure. It provides a set of seamlessly integrated procedures that reorganise deployment of on-demand and in-advance Grid and network services. From the resource operator's perspective, it provides an efficient all-round resource provisioning and utilization. From the user's perspective, it results in a real, node-to-node deployment of on-demand Grid services.

The final global test-bed in Phosphorus project will be composed of a number of local test-beds interconnected using multiple optical international networks

closely studying resource management within this context in order to create effective job scheduling algorithms, incorporating network awareness, constraint based routing and highly advanced reservation techniques.

The final global test-bed in Phosphorus project will be composed of a number of local test-beds interconnected using

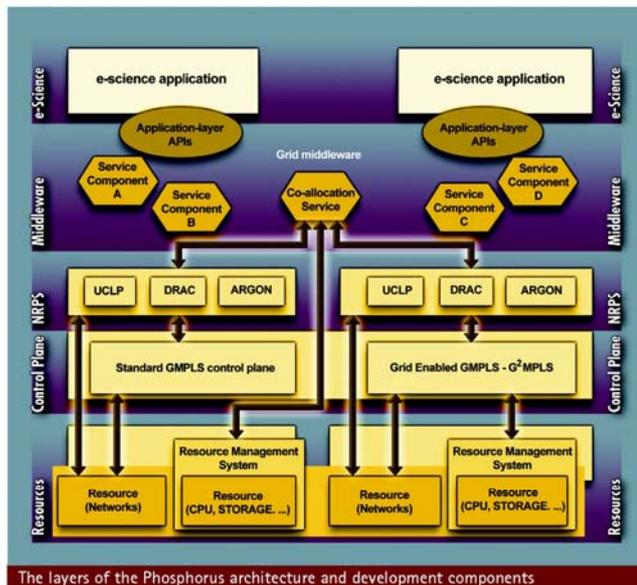
Research and Development projects. Partnership with NRENs and End Users with highly demanding applications is very welcome. NRENs and their research end users from all over the world are invited in order to share the knowledge and results of the Phosphorus project. With its service-centric, single-step approach to resource provisioning in

Distributed computing
By means of simulations, real test-bed demonstrations, third-party initiative applications, and numerous scientific publications, Phosphorus is to date, proving its concepts by practical results that demonstrate interoperability in a heterogeneous environment across inter-domain infrastructures and technologies. Several initiatives have become the focus for the testing stage of the Phosphorus' project, including

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applications such as WISDOM, KoDaVis, TOPS and DDSS. All these initiatives need to rely on the power of distributed computing so would benefit from the most efficient and effective approach to accessing Grid resources on-demand, that is possible.

The initiatives are varied in scope. For instance, the WISDOM initiative seeks to demonstrate the impact of the Grid approach to address drug discovery for neglected and emergent diseases.

Heterogeneous infrastructures

KoDaVis also requires serious computing power, relying on collaborative computing to generate an atmospheric simulation based on a huge amount of data describing the transport of chemical tracers in the troposphere. TOPS – Technology for Optical Pixel Streaming involves the streaming of ultra high resolution data sets over Lambda Networks; and then there is DDSS which stands for Distributed Data Storage System, a high performance, secure, reliable data transfer protocol optimised for high bandwidth wide area-area IP networks.

The potential difference that the improvements to Grid access could make through Phosphorus' studies may ultimately refine the way organisations

approach these heterogeneous infrastructures.

As the project continues, Phosphorus will continue to disseminate procedures, toolkits and middleware to the EU NRENs and their users, such as Supercomputing centres and the wider European and worldwide scientific users.

Paving the way with its innovative single-step approach to resource provisioning, Phosphorus realises an infrastructure that supports the deployment of mission-critical applications on a global scale.

Its vision of the network as a Grid resource coupled with its perspective of service-centric resources and infrastructure allows Phosphorus to significantly enhance the capability of Grid and e-science applications and provides a unified network/Grid infrastructure that can flexibly adapt to application's demands, regardless of the diversity of resource requirements.

In this way the Phosphorus project pioneers a new approach in communications, in which applications rely on a network infrastructure that adapts to the application, rather than having the application to adapt to the network as per the status-quo in research. ★

At a glance

PHOSPHORUS – Lambda User Controlled Infrastructure for European Research

Objective:

Phosphorus is demonstrating on-demand end-to-end network services across multiple heterogeneous network and Grid domains.

Project partners:

PSNC, Poland
 ADVA, Germany
 CESNET, Czech Republic
 Nextworks, Italy
 Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung eV., Germany
 i2CAT, Spain
 Forschungszentrum Jülich GmbH, Germany
 HITACHI, France
 IBBT, Belgium
 RACTI, Greece
 AIT, Greece
 SARA, Netherlands
 SURFnet, Netherlands
 Universität Bonn, Germany
 Universiteit van Amsterdam, Netherlands
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