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PHOSPHORUS

Lambda User Controlled Infrastructure for European Research

Integrated Project

Strategic objective:
Research Networking Testbeds

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Abstract

The PHOSPHORUS project aims to co-operate with European partners, however, the full success can be achieved only by global collaboration of all interested partners working on dynamic grid and network service provisioning. Partnership with them make opportunity of share the experience and technical knowledge, achieve synergy between all similar projects by collaboration in the common areas of interest. This document is a detailed report on all liaison activities during the first year of the project.

This is the first release of an evolving deliverable document. Subsequent releases are planned at M18 and M30.

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0 Executive Summary

This document describes co-operation between PHOSPHORUS projects and other European and non-European organisations. From the beginning, collaboration activities were an important part of the PHOSPHORUS project. Some partners in the Consortium were specially chosen to enable easy and effective cooperation. During the first year the PHOSPHORUS project established collaboration with seven international projects and several NRENs. Most of the collaborations were very helpful to take choices during PHOSHORUS architecture and its particular layers design. These choices enabled the implementation cooperation with other projects and some standardization efforts. A lot of interest has been generated for the PHOSPHOROUS first version prototypes, and it is anticipated that as more mature versions become available, this interest will be transformed into strong and focused collaboration.

Section 1 contains description of collaboration with European NRENs and projects.

Section 2 contains information about cooperation with non-European organizations.

1 Collaborations with EU Partners

1.1 Collaboration with EU NRENs

During the first year of PHOSPHORUS project contacts with European NRENs were established. Information about objectives and progress of the project was disseminated among European NRENs during numerous international events (workshops, meetings and conferences, please see [1]). PHOSPHORUS project was presented during major events like TERENA's European Future Networking Initiatives Workshop 2007, ECOC 2007, Global LamdaGrid Workshop (GLIF'07), Customer Empowered Networks Workshop (CEF 2007).

In the first year the PHOSPHORUS project was primarily focused on implementation of the software, which subsequently could be used also by the NRENs. Two questionnaires were prepared and sent to the NRENs and supercomputing centers:

- G^2MPLS/NRPS NREN Questionnaire - to evaluate the requirements and possible plans of the NRENs towards GMPLS adoption in their infrastructures,
- G^2MPLS/NRPS Questionnaire for Super-computing Centers to poll further requirements and willingness towards the one-step co-allocation of Grids and Network Resources through Network Control Plane solutions.

The NREN questionnaire was circulated to the wider NREN community during the TERENA European Future Networking Initiative Workshop, held on February 22nd 2007 in Amsterdam (http://www.terena.org/activities/efniw/programme.html). Two internal consortium partners (CESNET and PSNC) and four external partners (FCCN, DFN, GARR and HEAnet) provided the answers.

Two answers (from Barcelona Supercomputing Center and CINECA) were received to questionnaire for supercomputing centers.

The low answering rate was assessed to be mainly due to the lack of running and public demonstrations of the PHOSPHORUS concept, which are planned for a later phase with respect to the ongoing design and implementation processes. It is expected that after several public demonstrations interest in project results should increase. Template of questionnaire can be found on PHOSPHORUS website (http://www.phosphorus.pl/files/press/phosphorus-questionnaire.doc). More information and copy of filled questionnaires can be found in Appendix B and Appendix C of the D.2.6 deliverable [2].

To facilitate cooperation between PHOSPHORUS, NRENs and other projects templates of Cooperation Agreements were prepared. Unfortunately, NRENs prefer more unofficial cooperation and more information about collaboration with European NRENs can be found also in deliverable D.7.3.1 [3]. Cooperation Agreement with NRENs template and Cooperation Agreement with Projects template are available at PHOSPHORUS website in documents section (http://www.phosphorus.pl/documents.php).

1.2 Collaboration with GN2 project

The PHOSPHORUS project intends to closely cooperate with GÉANT2 activities in order to achieve a synergy effect and improve future network services. Due to PHOSPHORUS objectives the JRA3 Bandwidth on Demand (BoD) activity was selected as the liaison point and common benefits are expected to be visible before projects ends. The AutoBAHN system designed and developed by JRA3 activity is aimed to be fully automatic bandwidth provisioning system for heterogeneous multi-domain environments. Its objectives involve possible deployment of the BoD service over various network technologies, depending on NRENs requirements. The main stress was placed on most common technologies used as data planes in Europe, which currently are Ethernet and SDH. Network equipment can be managed directly by AutoBAHN, indirectly through vendor's NMS, or even with applications developed internally for particular NREN needs.

AutoBAHN architecture is comparable with PHOSPHORUS. There are some similarities that may by pointed out. According to figure 1.1 AutoBAHN is built of Inter-Domain Manager (IDM) and Domain Manager (DM) modules, which control complementary responsibility areas. Both IDM and DM must be deployed in a domain, which is expected to operate under AutoBAHN control. The IDM performs activities affecting inter-domain aspects of bandwidth reservation, which includes:

- inter-domain communication – only IDM modules are allowed to communicate each other at multi-domain level; DM modules are not contacting each other and are focused on single domain activities,
- common network configuration negotiation – some attributes (e.g. common VLAN identifiers) must be agreed for inter-domain circuit creation; this process requires a common agreement between all domains, and this negotiation process is managed by the IDMs,
- user access to the system – the IDM is equipped with sub-module for user/application access, which allows to submit reservation, cancel it, or check its current state.

The responsibility range of IDM is similar to Network Service Plane (NSP) module of PHOSPHORUS. Initially, at the beginning of the PHOSPHORUS project, it was considered to use full AutoBAHN IDM module or reuse most of the source code, instead of starting whole design and implementation process from scratch. The representatives of both projects had declared a cooperation in such activity, however further PHOSPHORUS work discovered some important differences in assumptions and requirements between NSP and IDM. Reuse of the IDM source code became more complicated than starting new implementation. Moreover, the IDM

maturity was not at the production level and both requirements and architecture were continuously the subject of changes.

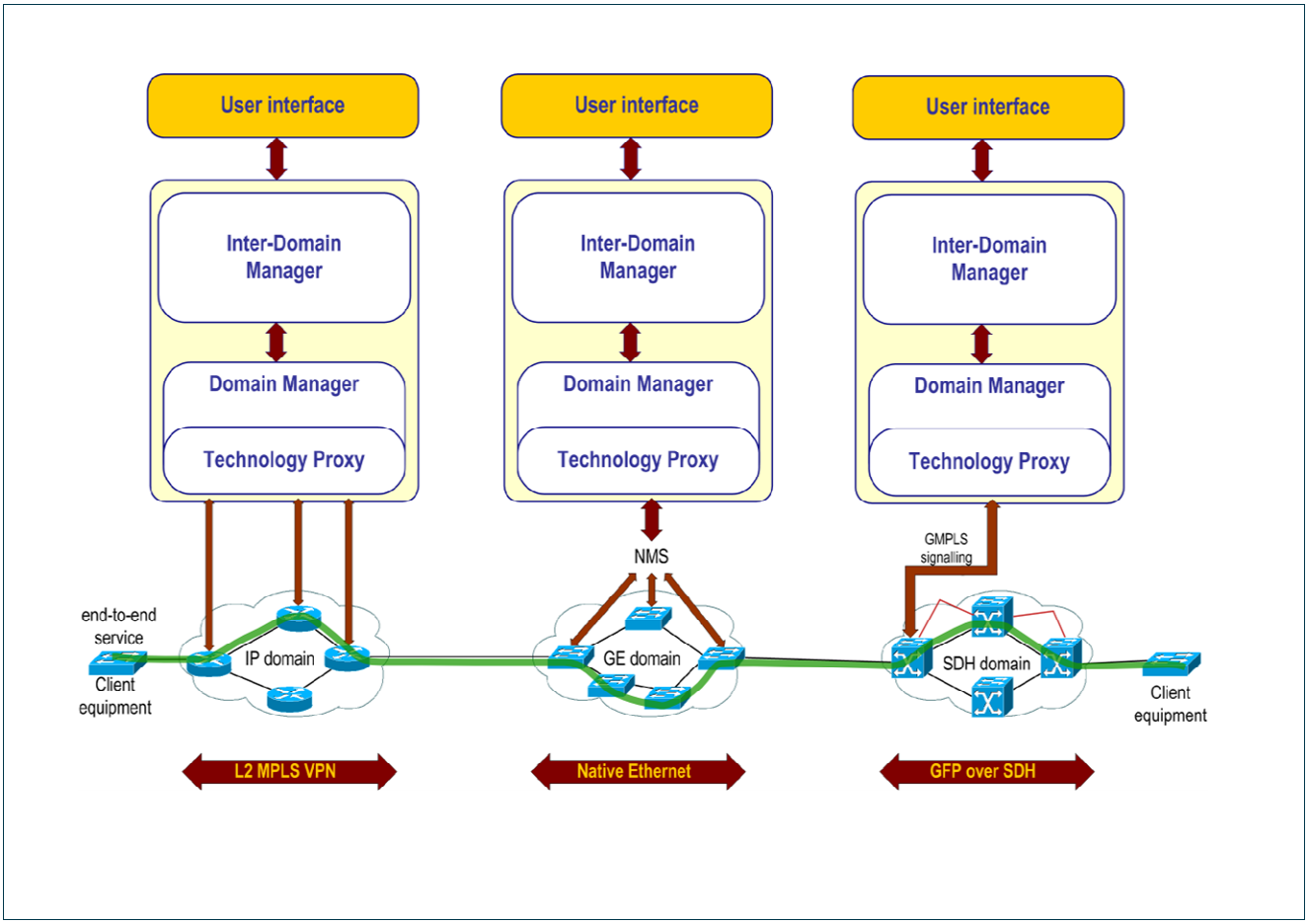

Figure 1.1 AutoBAHN architecture

The decision of not using IDM source code was inevitable and thus lead to the concept of AutoBAHN-PHOSPHORUS peering. Despite of differences in the design, priorities and objectives, both systems are designed as BoD services, which are able to operate within multi-domain environment. It is just a matter of time when two neighbour domains will be controlled by AutoBAHN on one side and PHOSPHORUS on the other side. Having in mind users satisfaction and effectiveness of network services, the best option to follow was to create an interface between both systems, so that reservations can be realized in collaborative environment. In order to make AutoBAHN PHOSPHORUS-friendly a several conditions must be meet:

- a common way of topology advertisement must be agreed and implemented,
- a common way of reservation management messages mechanism must be agreed and implemented,

- a common way of signalling must be agreed and implemented ("signalling" in the meaning of network equipment configuration).

It is agreed that both systems will create a proxy box, which enable messaging translation. The work plan to implement full collaboration was established during the PHOSPHORUS meeting in Zakopane, Poland in June 2007. The plan was based on on-going cooperation between AutoBAHN and DRAGON/OSCARS BoD system developed by Internet2 and ESNet organizations. It consists of 3 steps, which represents 3 stages of reservation process (exchange topology, book resources, create circuit):

1. exchange, analyze, and agree protocols for network topology advertisement,

2. exchange, analyze, and agree protocols for reservations,

3. exchange, analyze, and agree protocols for signalling.

At the moment this text is written, the topology exchange protocol of AutoBAHN were mature, validated and tested in practice during the system demonstrations (including trans-Atlantic collaboration with Internet2 and ESNet domains). It was already provided to the PHOSPHORUS NSP design group for further discussion. As a response, AutoBAHN is allowed to investigate current state of the adequate protocol used in PHOSPHORUS. The work with the protocol is still in progress and thus the protocol evolves however the final results are closing and it is possible to initialize discussion on common topology exchange proxy.

In the contrary the AutoBAHN IDM, the DM module performs operations within single domain, using a physical network topology. The functionality provided here may be compared to the Network Resource Provisioning Module of PHOSPHORUS. The DM controls the domain resources and through the Technology Proxy is able to configure equipment and create intra-domain circuit. Although the functionality of the DM is similar in each AutoBAHN domain, this module must be adjusted to exact domain conditions in the aspects of data plane technology, existing network management software, security policy, and administrative policy. During experience exchange with PHOSPHORUS project, the conclusion was made that similar issues will rise for NRPS, and thus a inter-project knowledge exchange bridge should be created.

The DM and AutoBAHN as a whole is now incapable of GMPLS domain support, due to limited presence of GMPLS enabled equipment in European NRENs. The GMPLS is also not expected to be faced during GÉANT2 project in the meaning of implementation, however some preparation works and guidance for future work shall be defined. In this context, the cooperation with PHOSPHORUS project is twofold:

1. it will enable AutoBAHN systems to perform reservation in PHOSPHORUS managed domains, and thus it will be able to indirectly operate in GMPLS enabled domains,

2. the experience of PHOSPHORUS project in the area of GMPLS research will be priceless, and potentially allows to avoid already faced issues.

Additionally, in PHOSPHORUS project GÉANT2 infrastructure is used to connect local test-beds. In particular, GÉANT2 network is used to connect:

- PSNC and SURFNet
- PSNC and i2CAT
- PSNC and CRC
- VIOLA and SURFNet
- UEssex and PSNC
- UEssex and SURFNet
- CESNET and SURFNet

1.3 Collaboration with RINGrid project

Remote Instrumentation in Next-generation Grids is a 18 months project co-funded by the EC under FP6. The main objectives of the RINGrid project include: the systematic identification of instruments and corresponding user communities, a definition of their requirements as well as careful analysis of the synergy between Remote Instrumentation and next-generation high speed communications networks and grid infrastructure as a basis for the definition of recommendations for designing next-generation Remote Instrumentation Services. The dissemination of project results among scientific, industrial and business groups of users will promote egalitarian access to the European e-Infrastructure and increase awareness of benefits from using next-generation Remote Instrumentation Systems [6].

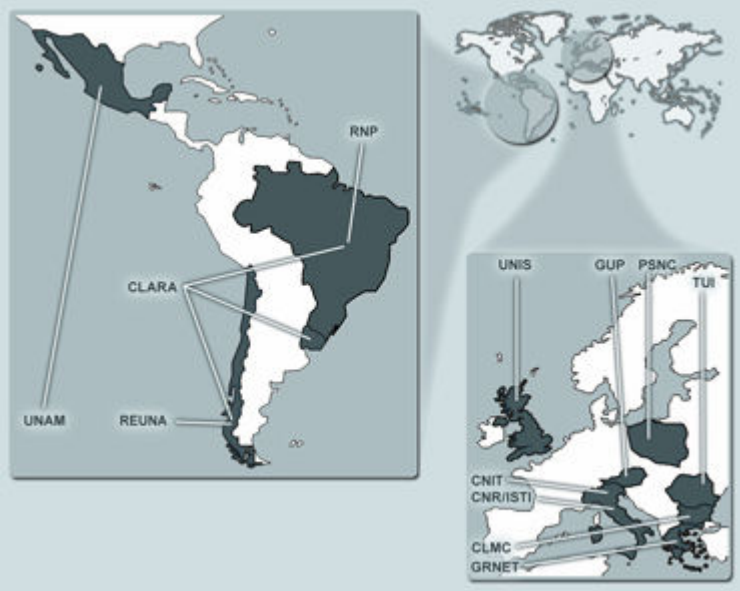

Figure 1.2: RINGrid participants [6]

PHOSPHORUS project and its objectives were presented during "3rd Technical Meeting on Remote Instrumentation in Next−generation" Grids organized in frames of IMEKO'07 on 20-21 September 2007 in Iasi, Romania. Participants of the meeting expressed interest in PHOSPHORUS activities, especially in usability of PHOSPHORUS' G^{2}MPLS implementation in Grids.

More information on RINGrid project can be obtained online at http://www.ringrid.eu

1.4 Collaboration with EGEE

The Enabling Grids for E-sciencE (EGEE) project is funded by the European Commission and aims to build on recent advances in grid technology and develop a service grid infrastructure which is available to scientists 24 hours-a-day. The project aims to provide researchers in academia and industry with access to major computing resources, independent of their geographic location. The EGEE project will also focus on attracting a wide range of new users to the Grid. The project will primarily concentrate on three core areas:

- The first area is to build a consistent, robust and secure Grid network that will attract additional computing resources,

- The second area is to continuously improve and maintain the middleware in order to deliver a reliable service to users,
- The third area is to attract new users from industry as well as science and ensure they receive the high standard of training and support they need.

The EGEE Grid will be built on the EU Research Network GÉANT and exploit Grid expertise generated by many EU, national and international Grid projects to date [5].

PHOSPHORUS' WP3 recently started to explore the possibilities of a cooperation with the EGEE SA2 activity. Some years ago EGEE had an own activity on interaction of the Grid middleware and the network layer, including research on co-allocation issues. However, this activity was stopped due to other activities considered more important. Thus, as a first approach for the exploration of possible topics for a cooperation with EGEE we selected Grid middleware and network interoperation as the environment for the current discussions on potential topics. Moreover, we started exchanging the objectives and the state of the respective activities in PHOSPHORUS and EGEE.

2 Collaborations with non-EU Partners

The main aim of the PHOSPHORUS project is related to European partners co-operation however the full success can be achieved only by global collaboration of all interested partners. To fulfil this idea some non-European partners participate in the PHOSPHORUS project: MCNC(USA), Nortel(USA), CRC(Canada). However, there are many others organisations working on dynamic service provisioning using network and computing resources. Partnership with them make opportunity of share the experience and technical knowledge, achieve synergy between all similar projects by collaboration in the common areas of interest. There is also the possibility to run some set of services between networks and solutions developed by different projects which is a very practical kind of co-operation. Common meetings and workshops give a great possibility to promotion of the projects results in research communities.

The PHOSPHORUS project collaborates with the following organizations/projects:

- CANARIE,
- Internet2/Dragon,
- ESnet/OSCARS,
- National LambdaRail/Enlightened Computing,
- Japan Gigabit Network/G-Lambda.

2.1 CANARIE Inc.

2.1.1 About CANARIE

It is Canada's advanced Internet development organization - is a not-for-profit corporation supported by its members, project partners and the Canada Federal Government. CANARIE's mission is to accelerate Canada's advanced Internet development and use by facilitating the widespread adoption of faster, more efficient networks and by enabling the next generation of advanced products, applications and services to run on them. More information on CANARIE organization can be obtained online at http://www.canarie.ca/.

2.1.2 UCLP project

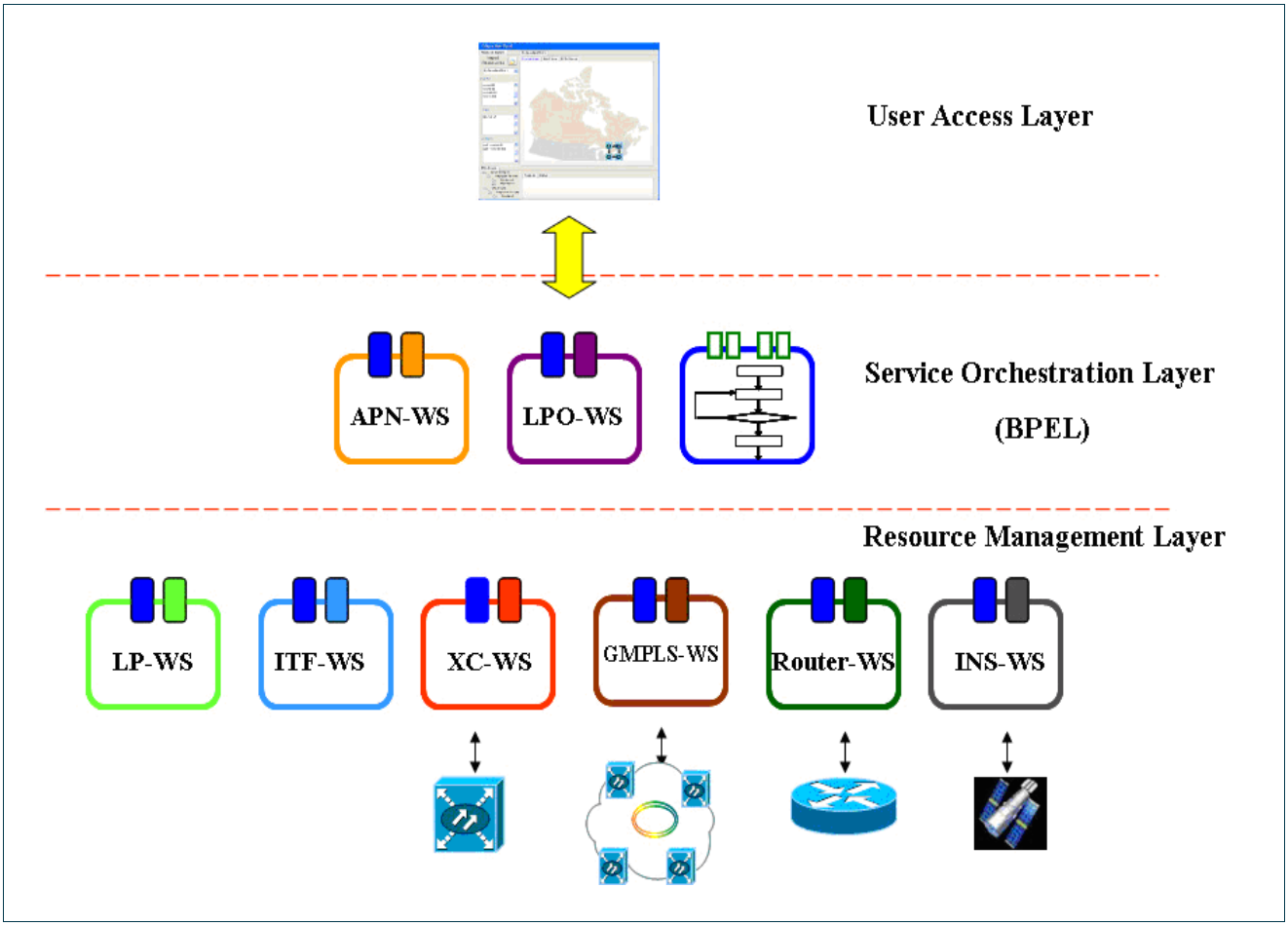

Figure 2.1: UCLPv2 System Architecture

One of the CANARIE projects is User Controlled LightPath (UCLP) which allows end-users, either people or sophisticated applications, to treat network resources as software objects and provision and reconfigure lightpaths within a single domain or across multiple, independently managed, domains. The UCLP architecture is presented on **Figure 2.1**. Users can also join or divide lightpaths and hand off control and management of these larger or smaller private sub-networks to other users. The UCLPv2 project is funded under CANARIE's Directed Research Program and is being performed in collaboration with the Communications Research Centre, the i2CAT Foundation in Barcelona, Spain, Inocybe Technologies Inc., and the University of Ottawa. The goal of the project it to create a set of virtualized network resources that can be orchestrated into BPEL workflows to create Articulated Private Networks as described above. End users will be able to control and managed their APNs using a Graphical User Interface built on Eclipse RCP technology that is both familiar and

very easy to use and will never have to see or write any BPEL workflow source code. More information on UCLP project can be obtained online at http://www.canarie.ca/canet4/uclp/uclp_software.html.

2.1.3 PHOSPHORUS and CANARIE co-operation

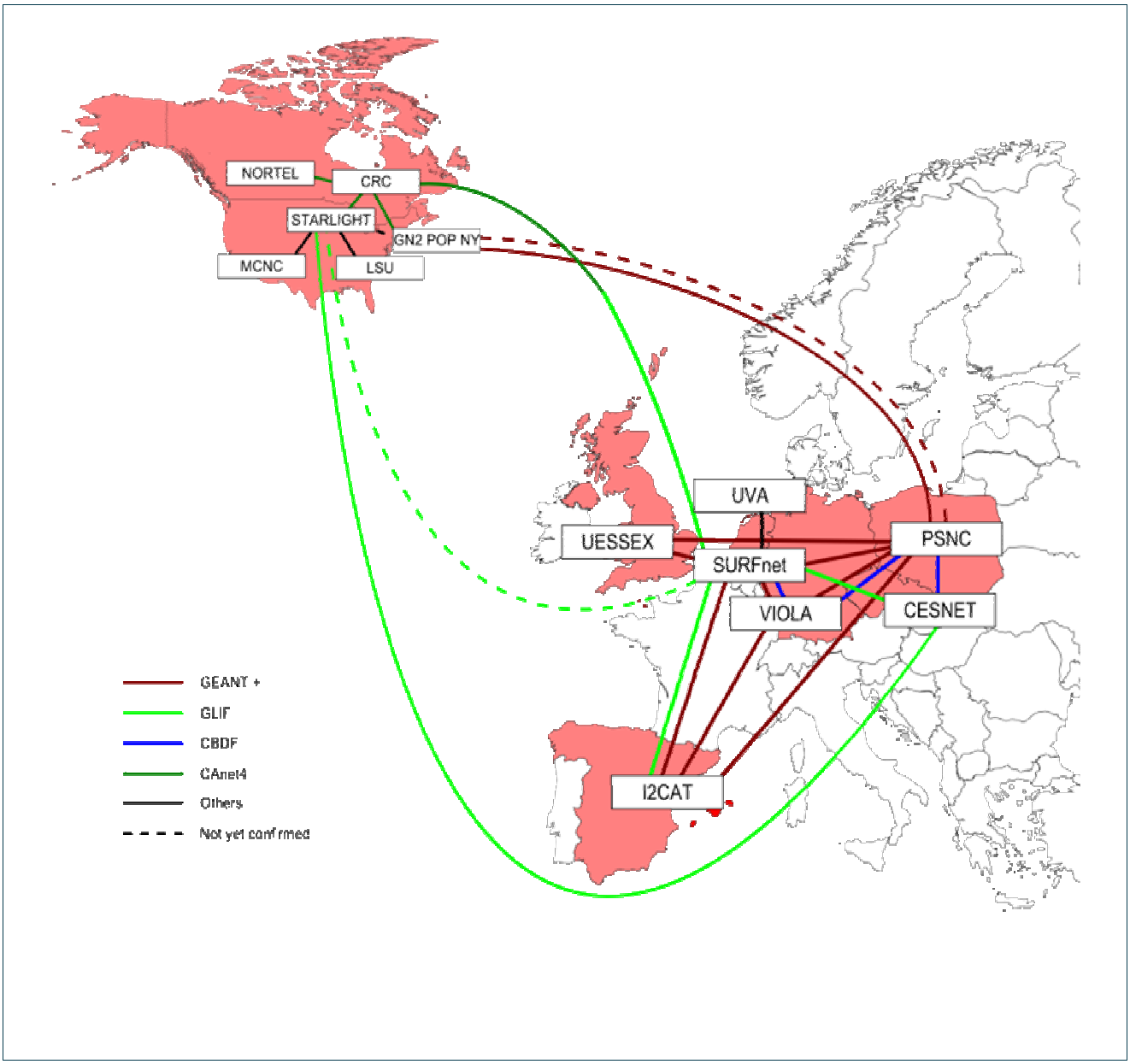

Figure 2.2: The PHOSPHORUS test-bed

Communications Research Centre(CRC) and i2CAT are participating in the PHOSPHORUS Project and they are working on the UCLPv2 interaction to PHOSPHORUS architecture aspects within PHOSPHORUS WP1 activity. This work aims to create seamless interoperability between UCLP, DRAC, ARGON and GMPLS Control Plane. CRC and i2CAT are enhancing of UCLPv2 to achieve the required PHOSPHORUS functionality. To enable UCLP integration with other PHOSPHORUS BoD solutions, the PHOSPHORUS WP6 implemented proper test-bed structure and installed UCLPv2 in PHOSPHORUS partners local test-beds: CRC, UESSEX, I2CAT [4]. There were appointed and configured connections between all these test-beds, where the most important are between Europe and Canada. PHOSPHORUS test-bed links are presented on **Figure 2.2**.

2.2 Internet2/Dragon and ESnet/OSCARS

2.2.1 About Internet2

Internet2 (University Corporation for Advanced Internet Development) is a non-profit consortium which develops and deploys advanced network applications and technologies, for education and high-speed data transfer purposes. Its goal is accelerating the creation of tomorrow's Internet. It is led by 208 U.S. universities and partners with 60 companies in areas from the networking (Cisco Systems), publishing (Prous Science) and technology industries such as Comcast, Intel and Sun Microsystems. Internet2 network is presented on **Figure 2.3**. More information on Internet2 organization can be obtained online at http://www.internet2.org.

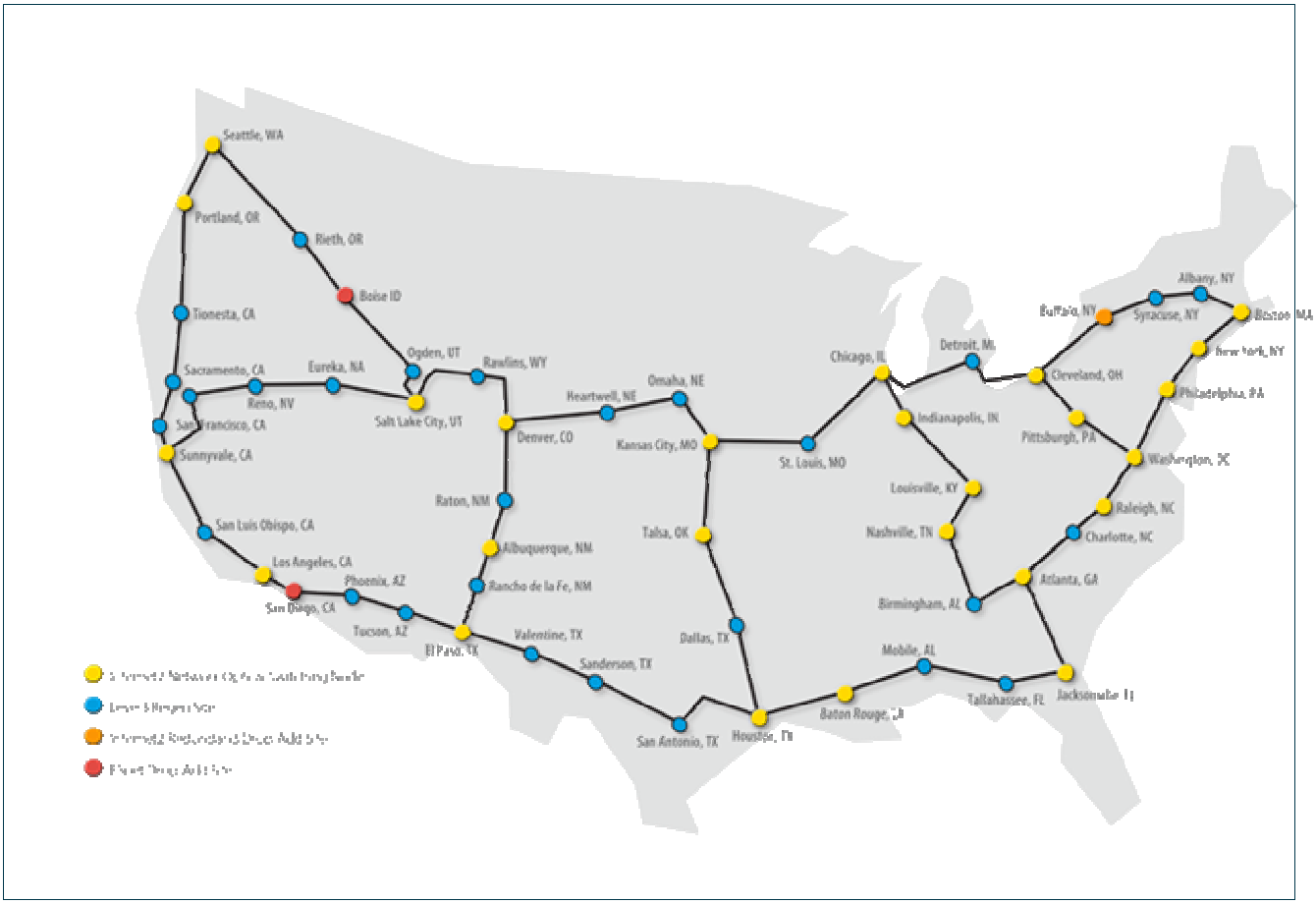

Figure 2.3: Internet2 network map

2.2.2 Dragon project

The DRAGON (Dynamic Resource Allocation via GMPLS Optical Networks) project, funded by USA National Science Foundation (NSF), is conducting research and developing technologies to enable dynamic provisioning of network resources on an interdoman basis across heterogeneous network technologies. A DRAGON network architecture and control plane is defined which aims to leverage the maturing of network technologies (such as WDM, Ethernet, and Next-Generation SONET) to demonstrate the power and flexibility of a "hybrid" packet and circuit switched network infrastructure. A key element is the extension of the GMPLS IP control plane to enable multi-domain, multi-layer, multi-service provisioning with robust levels of authentication, authorization, and accounting. DRAGON's architecture is presented on **Figure 2.4**. More information on DRAGON project can be obtained online at http://dragon.maxgigapop.net/twiki/bin/view/DRAGON/WebHome.

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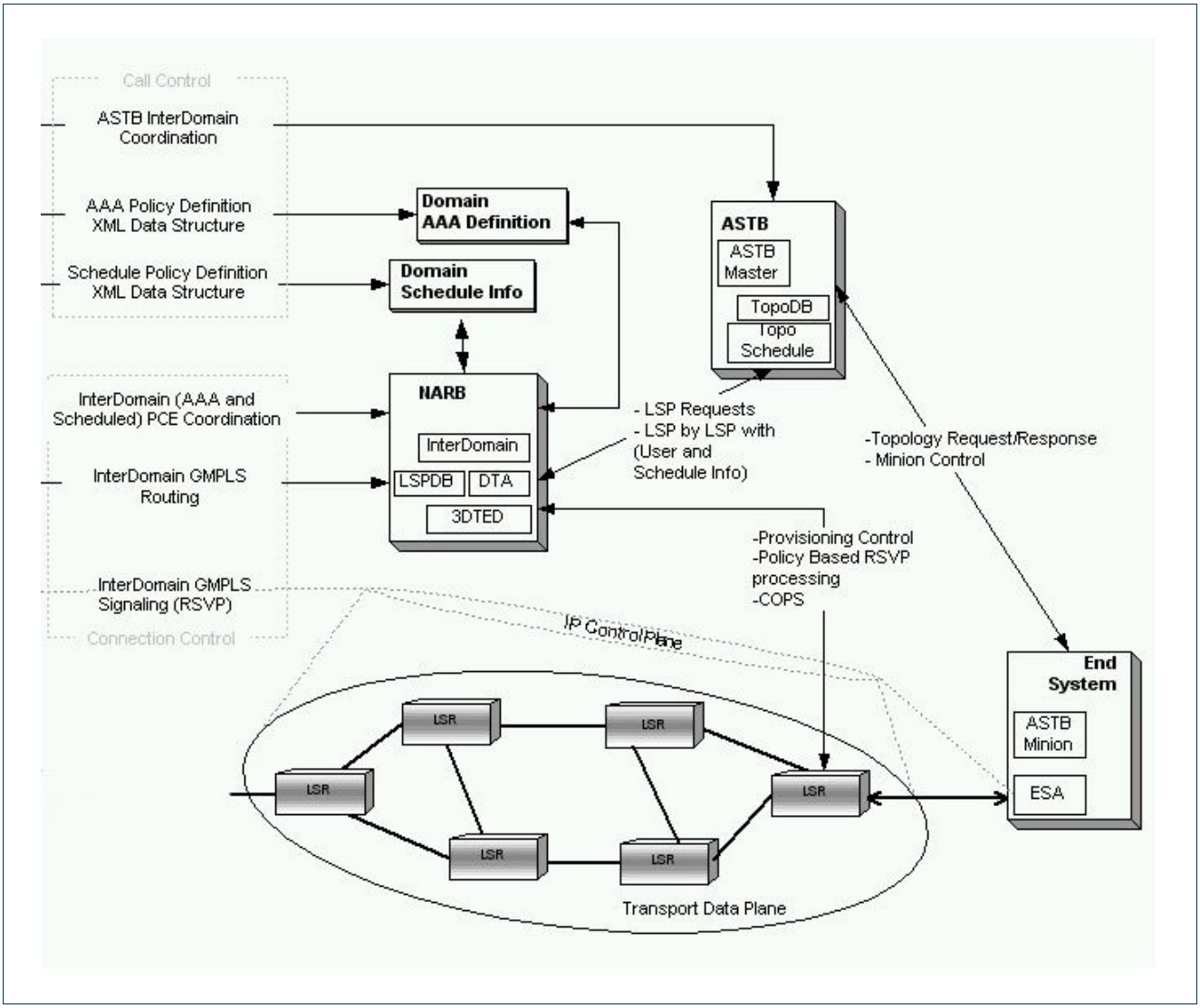

Figure 2.4: Dragon's architecture

2.2.3 About ESnet

Energy Sciences Network is a high-speed network serving thousands of Department of Energy scientists and collaborators worldwide. A pioneer in providing high-bandwidth, reliable connections, ESnet enables researchers at national laboratories, universities and other institutions to communicate with each other using the collaborative capabilities needed to address some of the world's most important scientific challenges.

Managed and operated by the ESnet staff at Lawrence Berkeley National Laboratory, ESnet provides direct connections to all major DOE sites (site list) with high performance speeds, as well as fast interconnections to more than 100 other networks. Funded principally by DOE's Office of Science, ESnet services allow scientists to make effective use of unique DOE research facilities and computing resources, independent of time and geographic location. More information on ESnet organization can be obtained online at http://www.es.net/.

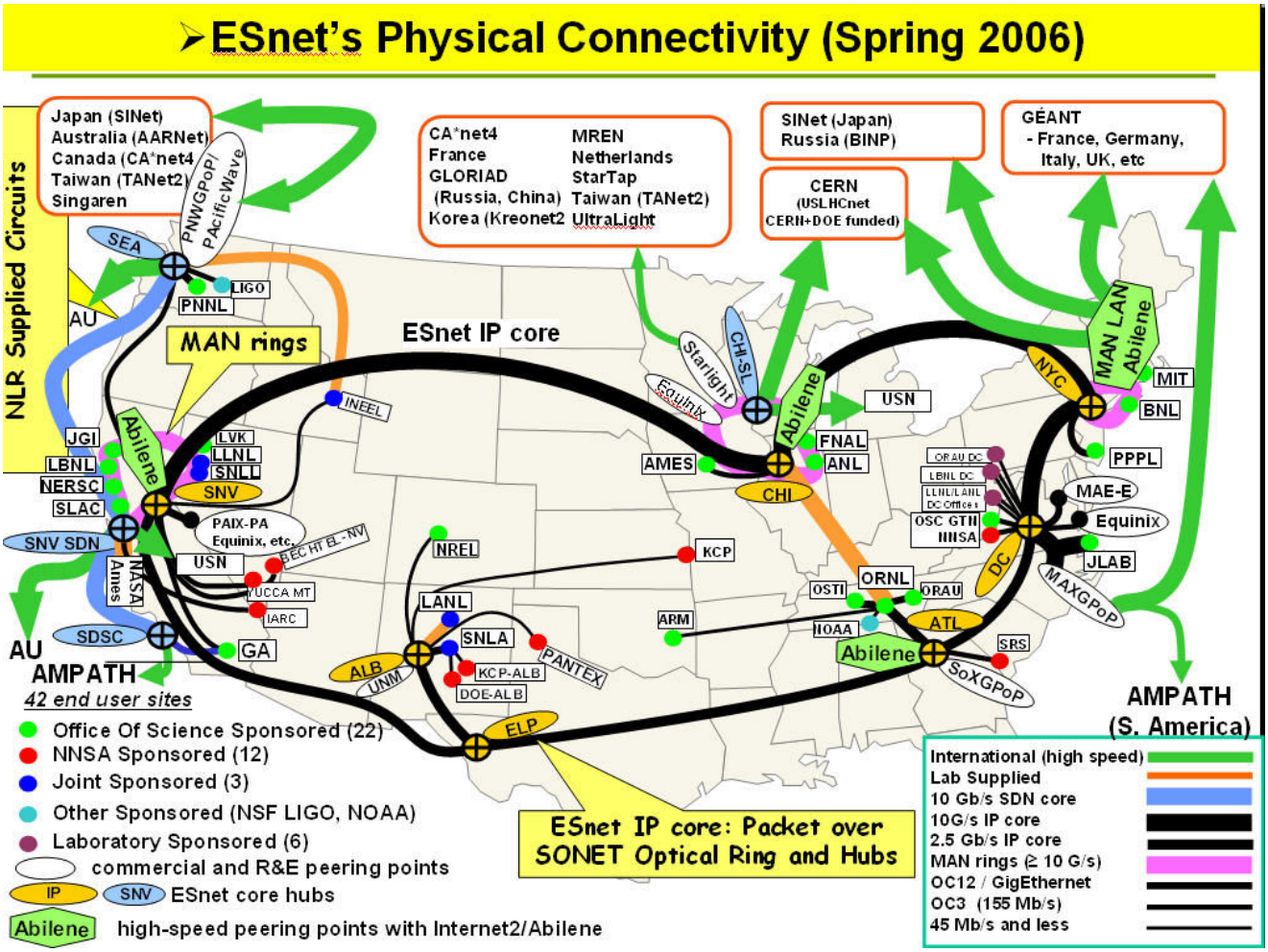

Figure 2.5: ESnet's physical connectivity network map

2.2.4 OSCARS Project

The focus of the ESnet On-Demand Secure Circuits and Advance Reservation System (OSCARS) is to develop and deploy a prototype service that enables on-demand provisioning of guaranteed bandwidth secure circuits within ESnet. OSCARS will leverage existing (or in development) products, services, and code (both

from the industry and academia) to accomplish its goals. OSCARS will utilize the existing DOEGrids certificate infrastructure and modify Virtual Organization Membership Services (VOMS) software to implement its authentication and authorization schemes. The management and operation of end-to-end circuits (using Label Switched Paths (LSPs)) within the network will be supported using Multi-Protocol Label Switching (MPLS) and Resource Reservation Protocol (RSVP). Quality of Service (QoS) will be used to provide bandwidth guarantees. OSCARS is implementing a multi-domain control plane implementing functions such as path finding and path reservations. More information on OSCARS project can be obtained online at http://www.es.net/OSCARS/.

2.2.5 PHOSPHORUS, Internet2 and ESnet co-operation

The Internet2 consortium is working together with ESnet (Energy Sciences Network) on the implementation of a Control- and Data- plane architecture for multi-domain, multi-layer hybrid networks. Awaiting the output of PHOSPHORUS WP1, WP2 and WP3, WP4 decided to become actively involved in testing its Authorization concepts (based on the RFC2904 push model) by integrating its code into the GMPLS based Control- and Dataplane of the Internet2/ESnet collaboration. More specifically, Internet2 coordinates the integration of output of the DRAGON project and the output of the ESnets OSCARS project. PHOSPHORUS has provided the OSCARS/DRAGON effort with code that implements an important Authorization aspect by means of a Token Validation Service (TVS). The TVS is now part of the OSCARS/DRAGON release and is jointly being tested by connecting the PHOSPHORUS AAA test-bed in Amsterdam and the Internet2 HOPI testbed interconnected via Netherlight and MANLAN. A joint demo has been planned for SuperComputing 2007 in Reno.

Co-operation is focused on creation common Authorization, Authentication and Accounting mechanism with collaboration of Cees de Laat (University of Amsterdam) who is developing a Generic AAA Toolkit. The Generic AAA Toolkit components are applied to drive the authorization necessary to perform end-to-end provisioning of network connections across multiple administrative domains. Generic AAA components can be driven by grid middleware components via various interfaces including web services style interfaces that adhere to the Open Grid Service Architecture (OGSA). This is work of PHOSPHORUS WP4.

There was also a PHOSPHORUS presentation during Internet2 Day Event on 23rd-25th April 2007.

The differences between PHOSPHORUS and DRAGON were pointed out by I. Monga (Nortel), B. Peeters (Surfnet) in GLIF'07 presentation: "PHOSPHORUS and Dragon methods of interdomain path setup".

2.3 National LambdaRail/Enlightened Computing and Japan Gigabit Network/G-Lambda

2.3.1 About National LambdaRail network

National LambdaRail (NLR) is a high-speed national computer network (see **Figure 2.6**) in the United States that runs over fiber-optic lines, and is the first transcontinental Ethernet network. The name is shared by the organization of research institutions that developed the network, and, to date, plans to continue developing it. More information on NLR organization can be obtained online at http://www.nlr.net.

Figure 2.6: The NLR network map

2.3.2 Enlightened Computing project

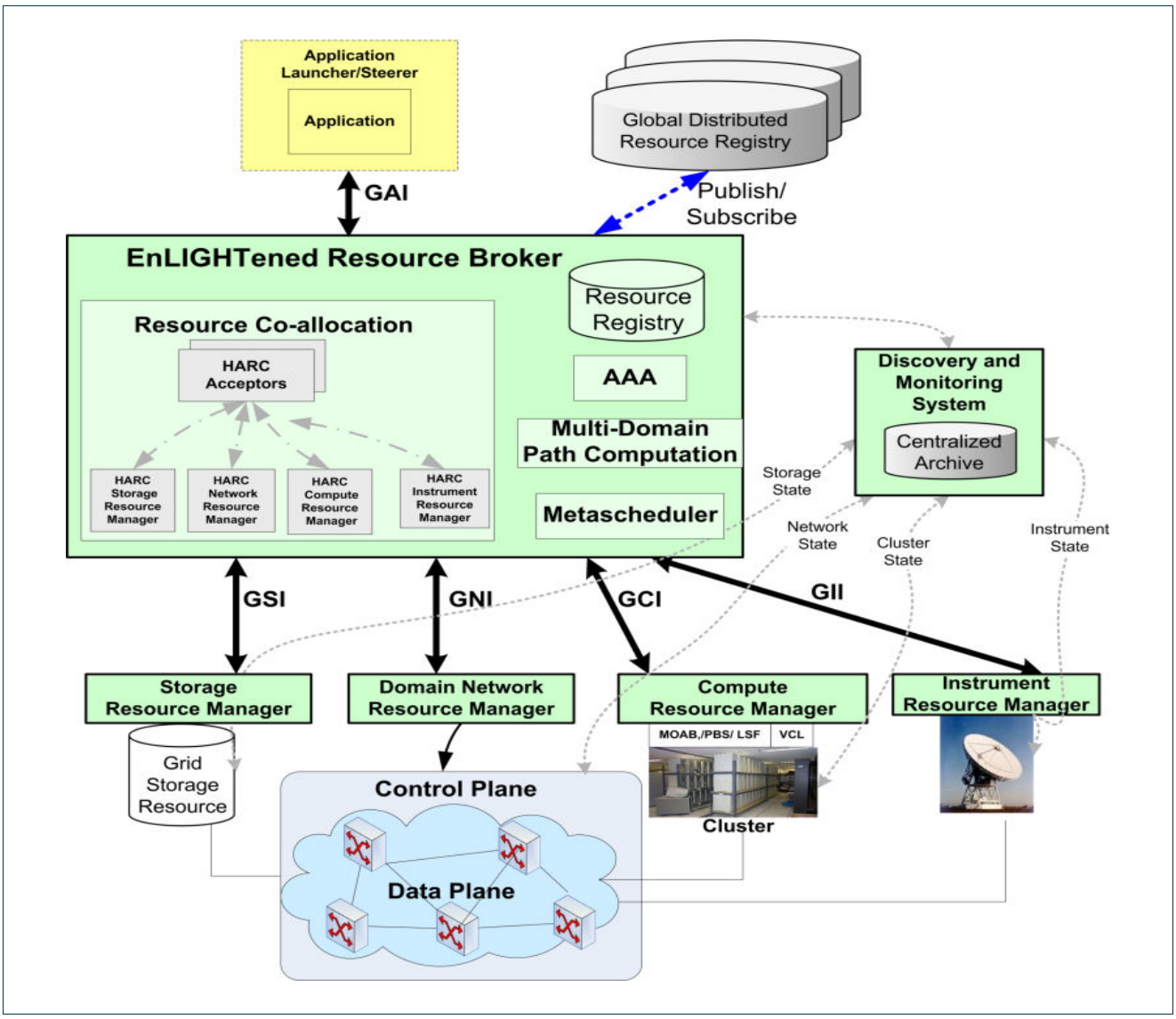

Figure 2.7: Enlightened Computing Architecture

The focus of the Enlightened Computing project is on developing dynamic, adaptive, coordinated and optimized use of networks connecting geographically distributed high-end computing resources and scientific instrumentation. A critical feedback-loop consists of resource monitoring for discovery, performance, and SLA compliance, and feed back to co-schedulers for coordinated adaptive resource allocation and co-scheduling (see **Figure 2.7**). Enlightened Computing network research is driven by concrete application projects in

astrophysics, coastal modeling, and atmospheric research, currently underway, all of which critically require progress in network technologies and tools that utilize them. The research carried out, the developed tools, and the applications that use them will be deployed across regional and nationwide 10Gbps bandwidth test-beds running over National LambdaRail(NRL) and Louisiana Optical Network Initiative(LONI), connected via four all-photonic Calient switches, all using GMPLS control plane technologies. More information on Enlightened Computing project can be obtained online at http://www.enlightenedcomputing.org.

2.3.3 About Japan Gigabit Network

Japan Gigabit Network (JGN) is a nationwide, next generation, high-speed telecommunications network that is made widely available for use at Japan universities, research institutions, venture businesses, local governments. The JGN is expected to be widely used for research and development of very high-speed networking and high-performance application technologies. The JGN is also expected to create business opportunities and telecommunications services. More information on JGN organization can be obtained online at http://www.jgn.nict.go.jp/english/index.html.

2.3.4 G-Lambda project

The goal of G-lambda is to establish a standard web services interface to network resource manager provided by network operators (Telecom operators). This interface should be used by application service providers (Grid resource managers / Grid brokers) or by end users to make the most of network operators service available. Define a standard web service interface, which is acceptable for both ASP and commercial network operators (see **Figure 2.8**). G-Lambda optical test-bed was established using JNG network. More information on G-Lambda project can be obtained online at http://www.g-lambda.net.

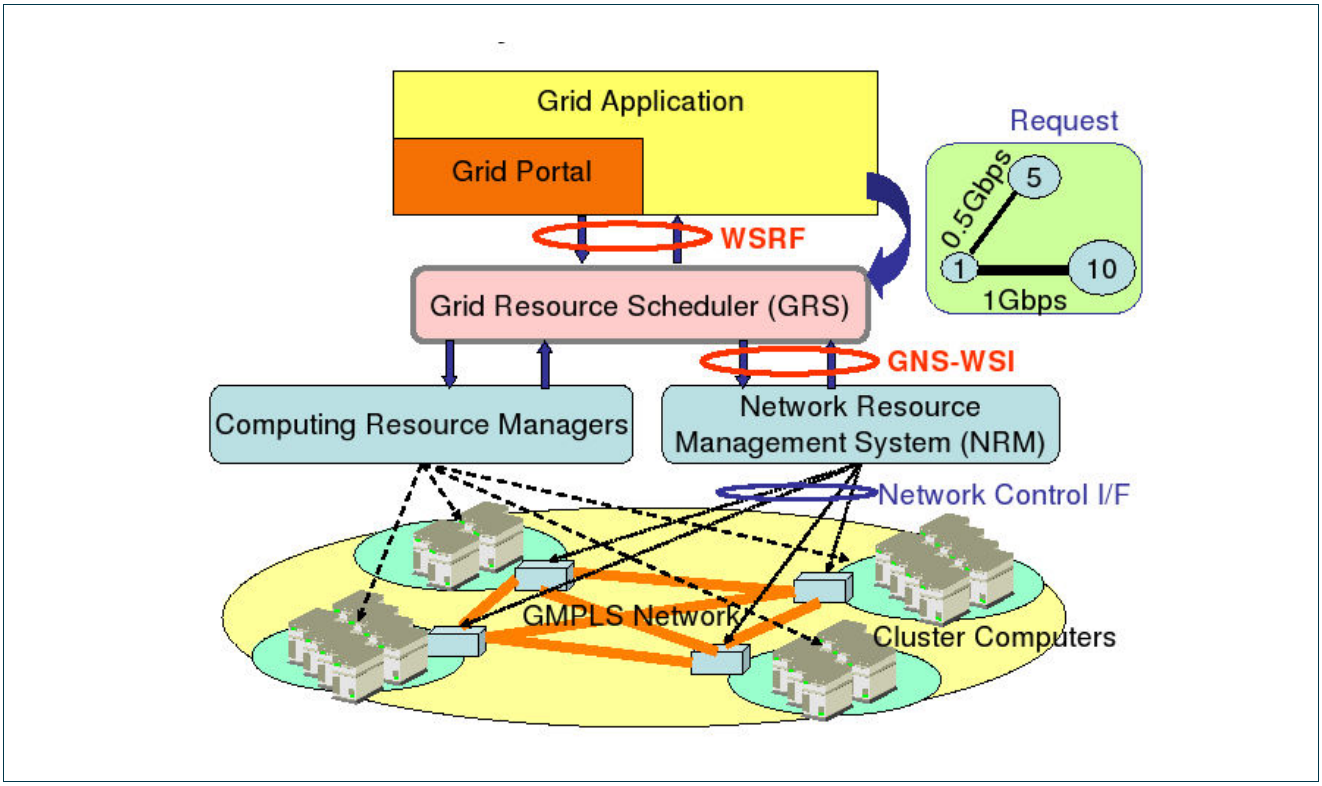

Figure 2.8: G-lambda's system overview

2.3.5 PHOSPHORUS, Enlightened Computing and G-Lambda co-operation

The one of the main participants of Enlightened Computing is MCNC which also is participated in the PHOSPHORUS project and National LambdaRail organisation. MCNC (represented by Gigi Karmous Edwards) in the PHOSPHORUS project is participating in testing and demonstration activities in order to extend the EU test-bed to the USA for international demonstrations for the PHOSPHORUS project. MCNC increases the global awareness of the PHOSPHORUS project and its developments.

First cooperation planes between these three projects began during Supercomputing 2006 (Tampa, Florida, USA from the 11th – 17th November 2006) where University of Essex organised a BOF session: “Delivery of Network Services across Heterogeneous Optical Domains”. All three projects were concerned with interoperability issues between heterogeneous network domains. The BOF targeted wider community awareness and participation in the main common technical challenges concerning these projects.

Next very important event was Collaboration Across Three Continents Meeting (from January 31st to February 2nd 2007). It was organized by MCNC where G-Lambda, PHOSPHORUS and Enlightened Computing research teams discussed in face-to-face meeting about collaboration plans (see **Figure 2.9**). During this meeting all participants gained an understanding of the three research project, established a work plan for 3-way collaboration. The objectives of the meeting were threefold to provide an update on the on-going concentration efforts on networks and grids and to discuss the trends and critical issues related to the future of research networking test-beds and to explore creation of synergies between projects, to explore plans for future actions (in particular, within the context of the upcoming FP7) and to pursue efforts to maximize synergy with other similar concentration initiatives.

Figure 2.9: G-Lambda, PHOSPHORUS and Enlightened Computing research teams during Collaboration Across Three Continents Meeting

During the meeting, the three teams formulated an action technical plan for collaboration of optical networks and grid middleware across three continents:

- Develop two common interfaces to request resources:
    - An API for all grid resources,

    - An API to request Lightpaths from domain network managers,

- Interconnect all test-beds.

One of the co-operation effects is providing the OGF Grid User Network Interface (GUNI) draft which defines, describes and provides extensions to existing UNI standardization documents required to support Grid service requirements and functionalities over GMPLS or Network Resource Provisioning Systems. This document describes an interface for Grid Users, Applications and Resources which could be used in G-lambda, enlightened, PHOSPHORUS or any other Grid middleware in the future. GUNI draft contribution are PHOSPHORUS (EU), Enlightened (USA), G-Lambda (JAPAN), 3TNET (CHINA), e-Photon/One+ (EU) and GLIF.

The last PHOSPHORUS, Enlightened Computing and G-Lambda project meeting were hold during 7th LambdaGrid Workshop, 17-18 September 2007 in Prague where Control Plane Working Group discussions were placed.

The main goal of the PHOSPHORUS, Enlightened Computing and G-Lambda is collaboration of optical networks and grid middleware across three continents. All three projects are currently working on establishing standard and open interfaces which can be used for connecting different Bandwidth on Demand system components especially preparing a connection between G-Lambda, Enlightened Computing and PHOSPHORUS test-beds and demonstrating together an advance network and computing service delivery demonstrations.

3 Acronyms

AAA	Authentication, Authorisation, Accounting
APN	Access Point Name
ASP	Application Service Providers
ARGON	Allocation and Reservation in Grid-enabled Optic Networks
BoD	Bandwidth on Demand
BPEL	Business Process Execution Language
DM	Domain Manager
DOE	Department of Energy
DRAC	Dynamic Resource Application Controller
DRAGON	Dynamic Resource Allocation via GMPLS Optical Networks
IDM	Inter-Domain Manager
JNG	Japan Gigabit Network
GEANT2	Pan-European Gigabit Research Network
GEANT+	the point-to-point service in GEANT2
GMPLS	Generalized MultiProtocol Label Switching
G^{2}MPLS	Grid-GMPLS (enhancements to GMPLS for Grid support)
GHPN-RG	Grid High Performance Networking Research Group
NREN	National Research and Education Network
NRL	National LambdaRail
NRPS	Network Resource Provisioning System
NSP	Network Service Plane
OGF	Open Grid Forum
OGSA	Open Grid Service Architecture
OSCARS	On-Demand Secure Circuits and Advance Reservation System
QoS	Quality of Service
RPC	Rich Client Platform
RSVP	Resource Reservation Protocol
SoA	Service-oriented Architeture
SDH	Synchronous Digital Hierarchy
TVS	Token Validation Service
UCLP	User Controlled LigthPath
UNI	User Network Interface
VLAN	Virtual Local Area Network

4 References

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[3] "PHOSPHORUS deliverable D.7.3.1: Co-operation agreements with EU NRENs and projects", European IST project PHOSPHORUS, Oct. 2007

[4] "PHOSPHORUS deliverable D.6.3: Test-bed functionality report", European IST project PHOSPHORUS, Oct. 2007

[5] http://public.eu-egee.org/

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