an Academic Network at São Paulo
uma Rede Acadêmica em São Paulo

2013 ANSP YEARBOOK

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2014
The research and education network of São Paulo (ANSP project - an Academic Network at São Paulo), approved in 1988, and officially inaugurated in 1989, has always been an example of vision of the future. From 2011, it added to its range of activities a refinement in its means of communication with the production of its own publications, the organization of biannual meetings and the implementation of its presence in electronic media.

This yearbook is the third, with the aim of presenting to the academic community of the State of São Paulo, the developments during the year 2013, of the ANSP Project, funded by FAPESP (São Paulo Research Foundation).

This **ANSP 2013 Yearbook** is organized in four chapters:

- The first - *History* - offers an historical introduction to the ANSP project and a roadmap of the activities of the teams that ensure its operation: NARA (Center for Applications in Advanced Networks), at FMUSP (University of São Paulo School of Medicine), based in São Paulo, SP, Brazil; and CIARA (the Center for Internet Augmented Research and Assessment) at FIU (Florida International University), in Miami, FL, United States.

- In chapter two - *Project* - the services provided today by ANSP to the education and research community in the State of São Paulo and the means and methods with which ANSP manages and operates these services are presented.

- The third chapter – *Physical Network* – provides up to date information on the connectivity, architecture and topology of the network.

- The fourth chapter - *Social Network* – is about the ANSP Ecosystem. Its current members are introduced, along with the activities promoted by ANSP during 2013 and the ANSP communication tools which generate a constant flow of interaction between all members and those responsible for the operation of the network.

With this yearbook, we seek to provide more information about the excellent services provided by ANSP to the São Paulo scientific community.

Prof. Dr. Luis Fernández Lopez
Principal Investigator - ANSP project
The ANSP project is a means found by FAPESP to support and meet the needs of integration, in the international context of the science and technology community of the State of São Paulo.

(Sala, Oscar. 26/12/1988.)
On 19 April, 1989, *Veja* magazine, in its issue No. 1076, in the “Computers” section, devoted two pages to the matter “A channel for knowledge: São Paulo Universities gain momentum connecting to the Bitnet, the global scientific information network”, which highlights the importance of the inauguration of the ANSP network.

In 1988, when ANSP was created, it did not have its own team, but was just another set of important tasks that the FAPESP-CPD (FAPESP Data Processing Center), under the command of Prof. Demi Getschko, had in its charge. In the following years, as ANSP continued to grow, its activities and composition went through several phases, described in this chapter.

Between 1988 and 1996, ANSP went from being a Bitnet connection to becoming a network of universities connected to the Internet. It continued within the FAPESP-CPD, but began to take shape as the ANSP Team. Since 1991, with the accession of ANSP network to the Internet, the team became responsible for the registration of domains of the then nascent Brazilian Internet. During those five years, the initially academic network grew and effectively became the core of the Brazilian Internet. In 1995, ANSP was responsible for registering all Brazilian commercial and non-commercial domains and became the single point of exchange of neutral traffic in the country.

The story of ANSP’s initial phase is documented in ANSP Yearbooks 2011 and 2012.
ADVANCED ANSP (AANSP)

During the 1990s, ANSP was mainly focused on the commercial Internet. During the first half of the decade it built a statewide academic network (connecting, either by private telephone line or radio, virtually all the research institutions in the State), helped to create the RNP (National Research Network, today the National Education and Research Network) and by the end of the decade, evolved into AANSP (a high-speed network now based on the new 2, 34, 45 and 155 Mbps connections offered by Telefonica after the purchase of Telesp). However, most of the work has always been to manage Brazil’s nascent Internet.

Since 1991, when it connected to the nascent Internet in the USA, ANSP has registered Internet domain names in Brazil (in fact, it had already been managing the precursor of .br, since 1989, when it was accepted in Bitnet). From 1994-95, it came to be the only international access of the Brazilian Internet. Until 1998-99, it was the only PTT (Internet Exchange Point) in Brazil and, until 2004, was the only neutral PTT in the country. In 1998, the Brazilian Internet Steering Committee asked FAPESP in Brazil to continue administering the registration of domains until it had the structure to do it. ANSP thus continued to take care of registration until 2002, when a project was created specifically designed for this purpose. This project continued until 2006, when the Brazilian Network Information Center - NIC.br came into operation.

With the explosion of the Brazilian Internet, in the second half of the 1990s, the network users were not only academics, and domain registrations expanded into other areas such as government and non-governmental organizations, and, primarily and mostly, for private companies.

In 1996, given the size and importance of the network, ANSP could no longer remain an internal project of FAPESP, and there was no longer room for it in the CPD. That was when Project 1996/07000-9 was approved - “Integrated information in science and technology for the State of São Paulo and ANSP network” - coordinated by Prof. Hartmut Richard Glaser, POLI-USP (University of São Paulo Engineering School).

In the following years, still based on the 3rd floor of the FAPESP building, but now independent of the CPD, the project continued until 2002 developing a new phase of São Paulo Academic Network, Advanced ANSP, managing and consolidating the registration of Brazilian internet domains and supporting logistically the Brazilian Internet Steering Committee.

The final years of the 1990s and early 2000s were very difficult for ANSP: a project to support research, funded by a research-funding agency, trying to deal with the typical problems of a regulatory state agency. It was clear that the ANSP network needed to find a way to regain its profile as a scientific network, as announced in 1989 by Prof. Oscar Sala. The solution was to pass the PTT to a neutral private company and to create a specific project to handle the transition of domain registration to the future NIC.br. Thus, from 2003, Professor Hartmut Richard Glaser was charged with project 2002/13598-7 - “Development and maintenance of a computerized system for managing the registrations of Internet domains in Brazil.” Prof. Luis Fernandez Lopez was charged with project 2001/14500-8 - “Developing and bringing into operation the advanced information system for science and technology of the State of São Paulo and the development of prototypes for the academic network (ANSP Project)”, this now being dedicated one hundred per cent to the academic network.

| Period: | 1996 - 2002 |
| Coordinators: | Scientific: Hartmut R. Glaser  
| Head Office: | FAPESP - Rua Pio XI, 1500, 3º andar  
CEP 05468-901 - Alto da Lapa -  
São Paulo - SP - Brasil |
| Name: | ANSP team |

NARA AND CIARA

During 2002, operations and teams were gradually separated and in 2003, ANSP began a new phase in search of his own identity that led to a change of internal management teams and even physical space.
The current phase (2002-2013) represents twelve years of change and growth of the service to users. The ANSP teams today act to maintain the academic network of São Paulo working efficiently, speedily and in a transparent manner in resolving problems and challenges that arise daily. Forty-eight São Paulo networks are interconnected and linked to the RNP, to other academic networks worldwide and to national and international commercial networks. (See Chapter 3 - Physical Network.)

There are two teams: NARA-USP (Center for Applications in Advanced Networks, University of São Paulo School of Medicine) and CIARA-FIU (Center for Internet Augmented Research and Assessment, Florida International University), which have a history of activities in harmony with each other. (See Chapter 4 - Social Network.)

| NARA (SUPPORT CENTER FOR THE ACADEMIC NETWORK) |

Still with the name of ANSP Team in 2002, the project was being coordinated by Prof. Luis Fernandez Lopez, at the University of São Paulo School of Medicine. It had engineers and network analysts, support and systems analysts and cabling technicians. Services to users continued to be run by the operators of FAPESP-CPD. The task of administrative reorganization of the project was begun with the aim of resuming its original profile, announced by Prof. Oscar Sala, in 1988: service to the scientific community of the State of São Paulo.

Period: 2003 - 2005

Coordinators:
Scientific: Luis Fernandez Lopez
Technical: Jorge Yamamoto

Head Office:
FAPESP - Rua Pio XI, 1500, 3º andar
CEP 05468-901 - Alto da Lapa - São Paulo - SP - Brasil

Name: ANSP team

The future role of NARA (Support Center for the Academic Network) began to take shape, namely to support the academic networks of São Paulo, working together with other project groups from FAPESP, particularly the TIDIA program (Information Technology in Advanced Internet Development), in force between 2001 and 2012. TIDIA projects such as the KyoTera Network (coordinated by Hugo Luis Fragnito), Electronic Learning (coordinated by Wilson Vicente Ruggiero) and Virtual Incubator (coordinated by Imre Simon), had the support of the ANSP team. During this period, the TIDIA workshops (2003-2005) were organized, for example.

In parallel, negotiations began with CIARA, for the establishment of a high-capacity link in a manner sufficient to meet the needs of researchers from São Paulo. This procedure brought the participation in the AMPATH (Pathway of the Americas) project and the approval by the NSF (National Science Foundation), of the USA, of the WHREN-LILA (Western-Hemisphere Research and Education Networks - Links Interconnecting Latin America), and AmLight (Americas Lightpaths) projects.

2005 was a year of enormous physical, operational and project management changes. During this second period of Prof. Lopez’s leadership, ANSP and the FAPESP-CPD effectively separated, now that the functions of each group were better defined.

FAPESP-CPD retained its attributes exclusively geared to the foundation to which it belongs, and the former ANSP team, proceeded to support only projects of an academic nature such as the ANSP Project.

It was necessary to give an identity to the team, and therefore, it was given its own name: NARA (Support Center for the Academic Network). It changed its address: removing itself from FAPESP’s headquarters to the Hospital das Clínicas, USP School of Medicine, (HC-FMUSP), in the Prodesp building.

Period: 2005 - 2012

Coordinators:
Scientific: Luis Fernandez Lopez
Technical: Jorge Yamamoto

Head Office:
HC-FMUSP
Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo
Edifício PRODESP (Processamento de Dados do Estado de São Paulo)
Rua Dr. Ovidio Pires de Campos,
215 - 2º andar
CEP 05403-010 - Cerqueira César - São Paulo - SP - Brasil

Name: NARA (Support Center for the Academic Network)
The configuration of the team did not change radically, but it was necessary to strengthen the areas of planning, development and management since the Center started to manage directly the resources of the ANSP project, which until then had been managed by the FAPESP administration.

These were moments of challenge and daily learning until a controlled and stable administrative and technical situation had been achieved. NARA was looking to come of age.

<table>
<thead>
<tr>
<th>Period:</th>
<th>2012 -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinator:</td>
<td>Scientific: Luis Fernandez Lopez</td>
</tr>
<tr>
<td>Head Office:</td>
<td>IOF-FMUSP, Instituto Oscar Freire, na Faculdade de Medicina da Universidade de São Paulo, Rua Teodoro Sampaio, 455 - CEP 01246-903 - São Paulo - SP - Brasil</td>
</tr>
<tr>
<td>Name:</td>
<td>NARA (Center for Applications in Advanced Networks)</td>
</tr>
</tbody>
</table>

Its role has expanded: being no longer restricted to technical, operational and network maintenance, it began to offer support and training for the staff of electronic computing centers of teaching and research institutions, through biannual meetings, courses and workshops, and to promote its activities to all participants of the ANSP project - called the ANSP Ecosystem, through its own means of communication: website, social media and print publications.

In addition, from 2011, the ANSP project, with the support of NARA, began to publish the present yearbook, which is designed as a public annual report summarizing all its activities.

The team currently has ten professionals working in four main areas: Administration; Planning and Development; Projects and User Relations; and Networks.

**Box 1.1**

*NARA - 2013*

<table>
<thead>
<tr>
<th>Luis Fernandez Lopez - Scientific Coordination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amanda A. Nogueira - User Relations</td>
</tr>
<tr>
<td>Anna Paula A. Costa - Planning and Development</td>
</tr>
<tr>
<td>Antonio Francisco - Development</td>
</tr>
<tr>
<td>Carlos Mauricio Tejeda - Networks</td>
</tr>
<tr>
<td>Jorge Marcos de Almeida - Networks</td>
</tr>
<tr>
<td>Manuel Correia - Projects and Relations with Users</td>
</tr>
<tr>
<td>Marco A. Bandeira - Projects and Relations with Users</td>
</tr>
<tr>
<td>Maria Auxiliadora Chagas - Administration</td>
</tr>
<tr>
<td>Rogério Motitsuki - Development</td>
</tr>
<tr>
<td>Stefanie Marks - Administration</td>
</tr>
</tbody>
</table>

In 2012, a new phase began in which the NARA team was able to look outwards. The new NARA, from 2011 known as the Center for Applications in Advanced Networks, changed its headquarters. It started to operate from the Oscar Freire Institute, in the University of São Paulo School of Medicine, (IOF-USP). Its staff was reduced and the processes of activities and functions of the professionals were more clearly defined.
CIARA-FIU
(CENTER FOR INTERNET AUGMENTED RESEARCH AND ASSESSMENT - FLORIDA INTERNATIONAL UNIVERSITY)

Division of Information Technology
11200 S.W. 8th Street Charles Perry (PC) Bldg
- Suite 312 - Miami, FL 33199 - EUA

CIARA and NARA are centers of research and development in Internet geared to supporting researchers from the research and education community who use or may use advanced networks to develop their projects.

It was this common focus, to serve researchers in research and education, which brought the two teams together - one linked to a Brazilian university - USP, and the other linked to an American university - FIU.

CIARA, under the scientific coordination of Prof. Julio E. Ibarra, intends to be a bridge between researchers in academia and the field of Information Technology, in order to provide assistance in instrumentation and training for the implementation of their projects. To make this possible, CIARA maintains ties with various projects, programs and Internet networks, such as those in Box 1.2:

Box 1.2
Projects which CIARA led or participated in 2013

<table>
<thead>
<tr>
<th>Project Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AmLight (Americas Lightpaths)</td>
</tr>
<tr>
<td>AMPATH IXP (American Pathway for Research and Education Networking)</td>
</tr>
<tr>
<td>ATLANTICWAVE (international peering)</td>
</tr>
<tr>
<td>GENI (Global Environment for Network Innovations)</td>
</tr>
<tr>
<td>OSDC (Open Science Data Cloud) project</td>
</tr>
<tr>
<td>OpenWave - AmLight FlowSurge</td>
</tr>
<tr>
<td>ULTRALIGHT (collaboration)</td>
</tr>
</tbody>
</table>

ciara.fiu.edu
| COLLABORATION BETWEEN FIU AND FAPESP - the MoU |

On 20 December, 2001, the FIU and FAPESP signed a “Memorandum of Understanding - MoU” which set out the terms of cooperation between the American AMPATH network maintained by the FIU, and ANSP, the Brazilian network, State of São Paulo.

In the same memorandum, it is explicit that the FIU developed the AMPATH project in collaboration with American Global Crossing, to interconnect the networks of education and research in South America, Central America, Caribbean, Mexico and other international networks to the North American and non-North American networks of education and research, through the Abilene network, of Internet 2.

In this MoU, FIU and FAPESP set the terms that would allow the ANSP network to have access to international academic connections.

"THIS MEMORANDUM OF UNDERSTANDING (hereinafter MOU) is made and entered into this 20 day of DECEMBER, 2001, by and between the Florida International University Board of Trustees (hereinafter, “FIU”) with its principle offices located at Florida International University in Miami, Florida and Fundação de Amparo à Pesquisa do Estado de São Paulo (hereinafter “FAPESP”) which oversees the Academic Network at São Paulo – ANSP, an official Regional Research Network (RRN), representative of the state of São Paulo, in the country of Brazil, with principle Office in Rua Pio XI, 1500, Alto da Lapa, 05468-901, São Paulo - SP - Brazil (hereinafter, “Project Participant”), also referred to herein as the “Parties.”"
In the document, it is established that ANSP is responsible for national connections between Brazilian educational and research networks, particularly those in São Paulo, and to AMPATH through the ANSP connection to networks outside of Brazil (North America, South America, Central America, Mexico, the Caribbean and others).

In paragraph 3, the following may be read:

“FIU shall coordinate and assist Project Participant [ANSP] in establishing connectivity with AMPATH, provide 24-hour per day, 7 day per week, 365-day per year Network Operations Center services, provide leadership and coordination to ensure Project Participant can reach desired U.S. and non-U.S. NRNs, including connectivity to Abilene or other essential transit networks.”

The ANSP project was, therefore, the link that allowed the two teams to begin to operate together, from 2002. In 2003, NARA and CIARA were officially created, which were already part of a joint operation: the ANSP Network.

In paragraph 7:

“Project Participant is responsible for connecting its R&E networks to a designated GC POP. Project Participant shall provide, on their account, an ATM DS3 or SDH DS3 line as the local loop to the GC POP GC, to include all required active equipment (i.e. router and appropriate interface module) between their R&E network(s) and the ADM at the designated GC POP and establish connectivity to the AMPATH POP in Miami, using ATM or IP.”

Julio E. Ibarra, Scientific Coordinator of CIARA, at BMA4, in São Paulo, Brazil - Oct/2013
Box 1.3
CIARA 2013

Julio E. Ibarra - Scientific Coordinator
Heidi L. Alvarez - Manager
Donald A. "Chip" Cox III - Head of Operations
Luis Fernandez Lopez - Visiting researcher
Aurisabel Fereira - Network Engineer
Eric S. Johnson - Network Engineer
James H. Grace III - Network Engineer
Jeronimo Aguiar Bezerra - Network Engineer
Vasilka Chergarova - Coordinator of the OSDC-PIRE
Ileana Gonzalez - Administrative Assistant
Douglas Pitt - Administrative Auxiliary
Andrea Candal Da Corte - Intern - OSDC-PIRE
Boris Mizrahi - Intern - Accounts
Dwayne McNab - Intern - Network Engineering
Marcelo Marin - Intern - Network Engineering

WHREN AND AMLIGHT PROJECTS

The activity of NARA ensures the operation and connections of the São Paulo networks between themselves and with the United States, while CIARA ensures the flow from the U.S.A. and the two, together with the RNP, administer the international links between São Paulo and Miami, through the AmLight project (Americas Lightpaths). This is the architecture that keeps the members of the scientific community of the State of São Paulo permanently connected among themselves and with science partners and scientists from Brazil and other countries, with the connectivity they need.

CIARA participates in the IRNC program (International Research Network Connections), of American NSF, with the AmLight project. The NSF IRNC-ProNet projects provide network connections linking American research networks with their peers in other parts of the world.

The first CIARA project approved in this program, with support from NARA, was WHREN-LILA (Western-Hemisphere Research and Education Networks - Links Interconnecting Latin America), NSF award No. 0441095, in 2004, effective from 2004 to 2009. In 2009, the same collaboration won approval for the AmLight project, NSF award No. OCI-0963053, effective from 2009 to 2014, an evolution of the WHREN-LILA project and confirmation of its success. The WHREN-LILA and AmLight projects are fundamentally collaborative, enjoying the financial support of “U.S. National Science Foundation” and of the Brazilian RNP and ANSP networks.

Box 1.4
Chronology of ANSP

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>apr.: SPAN project</td>
</tr>
<tr>
<td></td>
<td>jun.: ANSP-Fermilab agreement</td>
</tr>
<tr>
<td></td>
<td>jul.: FAPESP-Embratel contract</td>
</tr>
<tr>
<td></td>
<td>oct.: ANSP-Bitnet agreement</td>
</tr>
<tr>
<td></td>
<td>nov.: FAPESP-Fermilab link</td>
</tr>
<tr>
<td></td>
<td>dec.: Prof. Oscar Sala's letter</td>
</tr>
<tr>
<td>1989</td>
<td>Official inauguration of the ANSP network</td>
</tr>
<tr>
<td>1991</td>
<td>ANSP on the Internet</td>
</tr>
<tr>
<td>1992</td>
<td>RNP operational</td>
</tr>
<tr>
<td>1995</td>
<td>The Brazilian Internet Steering Committee</td>
</tr>
<tr>
<td>1997</td>
<td>Advanced ANSP</td>
</tr>
<tr>
<td>2001</td>
<td>MoU FAPESP-FIU</td>
</tr>
<tr>
<td>2002</td>
<td>AMPATH</td>
</tr>
<tr>
<td>2003</td>
<td>NARA and CIARA</td>
</tr>
<tr>
<td>2004</td>
<td>WHREN-LILA</td>
</tr>
<tr>
<td>2009</td>
<td>AmLight</td>
</tr>
<tr>
<td>2011</td>
<td>New NARA</td>
</tr>
<tr>
<td>2012</td>
<td>1st Biannual Meeting of ANSP</td>
</tr>
</tbody>
</table>
Scientific development is ongoing, daily, dynamic and ANSP should understand this process and be part of it. Therefore, it will always be a project.

NEEDS AND SOLUTIONS

Researchers from universities and research centers in the State of São Paulo form a community that needs services and products that ensure their projects are developed with quality and are up to date. Many of their projects are still in the pre-commercial stage, not yet part of the road map of companies in the commercial circuit that provide services linked to the Internet and computer networks in general.

How is it then that ANSP is able to fulfill the mission of meeting the needs of the São Paulo researchers in the area of research and education? Because it is a project that monitors the development of scientific projects around the world and in the Americas and has the ability to “see”, “hear”, “feel” and “act” to meet this scientific demand, in order to provide the infrastructure of network connectivity to universities and research centers in the State of São Paulo.

At the same time, ANSP monitors the area of R&D (Research and Development) in IT (Information Technology) of suppliers of services and equipment for computer networks, in search of new technologies and new work tools, to ensure researchers from São Paulo network, a connectivity provider to provide them with an exceptional, high standard of service, on the frontiers of knowledge.

SERVICES

As a project, ANSP has the ability to support a process of mutual collaboration between research centers and companies. The academic teams of teachers and students, present models of products and services from the cutting-edge research of companies, which for their part, have the chance to develop test beds and demonstrations with their production and to better assess the demand in the scientific market.
To ensure the flow of communication within this dynamic process, ANSP produces white papers on topical issues such as OpenFlow, Smart Networks, and SDN, available on their website. In addition to offering services directly related to the networks, such as consulting and technical support, it supports and conducts workshops, courses and demonstrations and publicizes national and international events of interest to the scientific community of the State of São Paulo.

In practice, with the continuous development of network technologies and the expansion of local, national and international cooperation of the São Paulo scientific community, ANSP offers a range of different services, some offered to the entire research community in general and others to a number of other projects in particular.

In 2013, ANSP provided five different types of service.

**Services regularly provided:**
1. connectivity (physical and logical);
2. professional data center and
3. digital certification for scientific grids (GridCA).

**Services provided on demand:**
4. consultancy on network projects
5. training and development of staff.

### CONNECTIVITY

As a provider of connectivity, ANSP offers various services to its participants. From assistance in the acquisition of dark fibers or Ethernet band for optical or virtual circuits for research, ANSP provides a wide range of services in Layers 0, 1 and 2 of the network, which meet the needs of production and research and development of universities and research centers in the State of São Paulo. Since it does not operate in Layers 3 and above, ANSP is transparent to its users, so that they have complete independence to define their network and connectivity policies, including routing, traffic exchange agreements and transit purchase.

### TRAFFIC EXCHANGE

Researchers who only use the Internet, without any specific need, are completely unaware that ANSP or PTTA (the Academic Traffic Exchange Point) exist. They merely note that Internet access at their university or research center internet is generally much faster and crashes less than in their home or in other private or business environments.

Through ANSP, researchers, teachers, students and staff from universities and research centers in the State of São Paulo are able to access the Internet around the world from their server, desktop or laptop, without any restriction. To ensure this, ANSP maintains PTTA.

PTTA is located in the Network Access Point NAP do Brasil, in Barueri, a town close to the capital of the State of São Paulo. It is an infrastructure environment for datacenters and network interconnections, of high
reliability and availability, in which the participants are able to exchange traffic amongst themselves, exchange traffic with or purchase transit from other organizations or companies present in the data center and may access the Internet through ANSP, RNP (Rede Nacional de Ensino e Pesquisa) or a commercial provider.

PTTA accepts a wide variety of links, utilizing every technology on the market, from 2 Mbps serial links up to 10 Gbps optical waves. Once connected to PTTA, the institution has only to inform the technical team of their routing policy so that the equipment is configured. ANSP does not interfere in those policies. In 2013, 48 institutions participated in PTTA: 26 connected directly and 22 connected through INPE (National Institute for Space Research), the State University of Campinas (Unicamp) and the University of São Paulo (USP).

PTTA is also used by ANSP to effect Internet access. Since ANSP does not interfere in the routing policy of the participants, this service is undertaken in a totally transparent manner.

## Layer 2 Services

ANSP, with its Layer 2 services, enables its participants to build, in a scalable and flexible manner, point-to-point circuits within their network and between that network and most of the research and education networks in the world. The service endeavors to meet the present needs of the research community in the State of São Paulo and constantly prepares to meet future needs. From 2012, operating with the stable network of the KyaTera project, the flexibility of Layer 2 service has increased considerably.

In 2013, ANSP maintained principally two types of Layer 2 services:

### Box 2.1

**ANSP – Layer 2 Services**

<table>
<thead>
<tr>
<th>Point to Point Virtual Circuits (VLANs in Layer 2):</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Virtual circuits through the physical network of the RNP for several federal universities located in the State of São Paulo who chose to access the Internet via ANSP. Thus, a researcher, for example, from the Federal University of São Carlos, an institution physically connected to the RNP, accessed the other São Paulo universities and the Internet through ANSP as though it was directly connected to it.</td>
</tr>
<tr>
<td>• Virtual circuits for connectivity projects with special needs, either permanently or for a particular event or experiment. Important examples were:</td>
</tr>
<tr>
<td>• the permanent virtual circuit between IFT-UNESP (Institute for Theoretical Physics, Unesp), São Paulo, SP, Brazil, and CERN (Conseil Européen pour la Recherche Nucléaire/ European Council for Nuclear Research), in Geneva, Switzerland, to serve the Sprace project (São Paulo Research and Analysis Center) of High Energy Physics and the virtual circuits set up for experiments and demonstrations performed during the events of the GENI project (Global Environment for Network Innovations) and Super Computing 2013.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metro Ethernet Circuits (of operators):</th>
</tr>
</thead>
<tbody>
<tr>
<td>• for institutions that host large projects, ANSP provides, on occasions, specific Metro Ethernet links. For example, for INPE, which is developing FAPESP’s largest project within its research program on climate change, ANSP provides a 100 Mbps Metro Ethernet link between its headquarters in São José dos Campos, SP, and CPTEC (Center for Weather Forecast and Climate Studies), Cachoeira Paulista, SP, in order to access supercomputer located there.</td>
</tr>
</tbody>
</table>

The virtual circuits do not imply costs for the project. However, the Metro Ethernet circuits incur acquisition costs with the carriers, which must be signed up to projects that will benefit from the links. From 2010, North American and European networks have been automating their Layer 2 services, allowing researchers to create their own circuits by themselves. In Brazil, the RNP also initiated a project in this direction, in 2011. However, in ANSP,
given the low demand defined by the profile of research in the State of São Paulo, the small number of universities and research groups involved and the cost of automation, these services are still being performed manually. In addition, with the advance of the concept of SDN (Software Defined Networks), it is very likely that in 2014, these services will be replaced by similar ones defined using the OpenFlow protocol.

In 2013, ANSP took over the operation and monitoring of the KyaTera network project, thereby gaining the ability to provide optical links to researchers in the form of FTTL (Fiber To The Lab). This work, in collaboration with Telefônica and Padtec companies, yielded immediate results. Important examples:

Box 2.2
ANSP – Level 1 Services

- the links between the Institute for Theoretical Physics, Unesp, São Paulo, and the Butantã campus of USP, for use on its High Energy Physics projects;

- the link between the Universidade Federal de São Carlos and Universidade Estadual de Campinas, both in the State of São Paulo, for use on the FIBRE project (Future Internet test beds / experimentation between Brazil and Europe).

The services offered by ANSP in Layer 1 naturally depend on investments that should be part of projects approved by FAPESP that will use the circuits. They must also be approved by the coordinators of the KyaTera project, when appropriate.
From 2012, as part of activities of the ANSP Ecosystem, ANSP began to collaborate with participants in the process of selection and purchase of fibers, circuits and other equipment for their institutions. This activity has the objectives indicated in Box 2.3.

**Box 2.3**  
**ANSP – Layer 0 Services - Objectives**

- to help participating institutions, especially the smaller ones, to familiarize themselves with the São Paulo circuits and fiber market, which is quite distinctive and complex;
- to provide the participants, especially the smaller institutions, with reference prices for circuits and fiber;
- to alert participating institutions and put them in contact in cases where it is possible to share circuits or fiber, in order to reduce their costs.

**DATA CENTER**

Data center services are provided by ANSP when they are essential to the network service, when there are security reasons, or when they provide services for the entire São Paulo scientific community. They can also be shared with research institutions or businesses, when this brings shared benefits. Some examples are shown in Box 2.4.

**Box 2.4**  
**Data center Services**

- hosting of the servers of the SciElo project (Scientific Electronic Library), which maintains the library of Brazilian (and recently also international) electronic scientific journals;
- hosting of servers that distribute the electronic content of almost all the scientific journals on the Periódicos Capes portal (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior);
- hosting of the central South American node of the Latin American research and education network, RedCLARA (Cooperación Latino Americana de Redes Avanzadas);
- hosting the South American switching point of virtual circuits of Gilf/Sol (Global Lambda Integrated Facility/SouthernLight), a joint ANSP/ RNP project;
- hosting of one of the instances of USP’s cloud computing.
| DIGITAL CERTIFICATION FOR SCIENTIFIC GRIDS |

In December 2013, the ANSP network and the NCC-UNESP (Center for Scientific Computing, Universidade Estadual Paulista “Júlio de Mesquita Filho) officially deployed the service for issuing digital certificates for scientific computational grids.

The creation of a Certification Authority in the State of São Paulo has been a longstanding demand of the scientists engaged in grid computing, who until now were obliged to obtain their certificates from authorities in the United States or Europe, via a lengthy administrative process.

The ANSPGridCA (ANSP Grid Certification Authority) was recognized by TAGPMA (The Americas Grid Policy Management Authority) in the first half of 2012, and by TACAR (TERENA Academic Certification Authority Repository) in the second half of the same year, and began to issue certificates in March 2013, initially only for GridUNESP. After nine months of testing and learning, the certificate production regime has now been opened up to the entire academic community of São Paulo.

| CONSULTANCY |

The ANSP team offers consultancy to any researcher or research group in the State of São Paulo that requires some specialized service and does not have sufficient expertise or staff in information and communication technologies. The services offered range from advice on which technologies to use on a given project to the design of entire networks.

Perhaps the most interesting example of consultancy already provided by ANSP concerns Intragov, the network of the Government of the State of São Paulo. ANSP collaborated with Prodesp (the Data Processing Company of the State of São Paulo) to develop the entire project of internal and external connectivity of the IP networks of the Government of the State of São Paulo and trained its networks team to manage the network, especially in respect of routing protocols.

Today, most institutions have skilled human resources and adequate equipment, so that ANSP provides consultancy primarily to research groups which have special needs in the area of networking.

| TRAINING AND DEVELOPMENT OF STAFF |

| RETROSPECTIVE |

The main focus of the ANSP is not on the training of personnel. However, the perception is that the scientific community which it serves depends on keeping the professionals in the area of networks trained and up to date in order to develop their projects with greater promptness and efficiency. Being aware of this demand, ANSP has historically promoted and supported training initiatives of personnel in electronic computing centers, the CCEs, as can be seen in Box 2.5.

Box 2.5

ANSP Collaboration in personnel training - Retrospective

<table>
<thead>
<tr>
<th>years 1990:</th>
<th>Collaboration with Telefônica: training of engineers for the creation of the network division of the company.</th>
</tr>
</thead>
<tbody>
<tr>
<td>years 2000:</td>
<td>Training of Prodesp (Processamento de Dados do Estado de São Paulo) personnel for the administration of Intragov, the network of the Government of the State of São Paulo.</td>
</tr>
<tr>
<td>years 2010:</td>
<td>Training of personnel of the CCEs (Electronic Computing Centers) and research groups from the participating institutions, by means of projects, courses and workshops geared to using the new technologies in SDN (Software Defined Networks).</td>
</tr>
</tbody>
</table>

| COLLABORATION OF ANSP ON PROJECTS OF STAFF TRAINING - 2013 |

From the 2010s, professionals in the field of IT (Information Technology) and researchers from institutions linked to the ANSP Ecosystem began to express the need to be brought up to date in the new technologies. Thus, ANSP continued its activities to promote technological innovation, supporting, at the same time, training initiatives in SDN, OpenFlow,
OpenStack and DWDM networks, through courses, workshops and hands-on demonstrations.

These activities were conducted both within the programs of the Biannual Meetings of ANSP, the BMAs, as well as in-company when offered to smaller groups according to specific demand of those concerned. (See Chapter 4, Social Networks.)

Box 2.6
ANSP Collaboration in personnel training - 2013

ANS/ NCC-Unesp (São Paulo - SP)
Practical, hands-on workshop on OpenFlow Protocol, with the use of Datacom switches.
Participants: professionals from NCC-Unesp (Center for Scientific Computing, Universidade Estadual Paulista “Júlio de Mesquita Filho)

ANS/ Datacom (Curitiba - PR)
Workshop with lectures, discussions and demonstrations with the aim of providing interaction among researchers, users, and suppliers of equipment for SDN.
Participants: 15 representatives from academic, governmental and non-governmental institutions

ANS/ ITA (São José dos Campos - SP)
Workshop on OpenFlow-SDN at the Instituto Tecnológico de Aeronáutica, taught by faculty members from UFSCar (Universidade Federal de São Carlos) with DataCOM equipment.
Participants: IT professionals from the ITA

ANS/ Datacom/ Telebras (Brasília - DF)
Workshop on OpenFlow-SDN at the Instituto Tecnológico de Aeronáutica, taught by faculty members from UFSCar (Universidade Federal de São Carlos) with DataCOM equipment.
Participants: professionals from the areas of planning and operations of Telebras

FUNDING

Since the approval of the original project, in 1988, until the end of 2002, ANSP was funded exclusively with resources from FAPESP, through successive projects.

In 2002, a cooperation agreement was signed with the FIU (Florida International University) in conjunction with CIARA (Center for Internet Augmented Research and Assessment), which made it possible to ask the North American NSF (National Science Foundation) for resources to finance the costs of ANSP’s activities in the United States of America. This agreement also played a key role in the dissemination of ANSP within the heart of the North American scientific community, which greatly facilitated the relationship with the international research and education networks, as can be seen below:

- from 2003, the agreement allowed the accession of ANSP to the AMPATH project (NSF Award No. STI-0231844), which had already been approved in 2001;
- in 2004, ANSP and FIU presented the WHREN-Lila Project (Western-Hemisphere Research and Education Networks - Links Interconnecting Latin America), NSF Award No. OCI-0441095;
• in 2009, the AmLight project was presented (NSF Award No. OCI-0963053), with the participation also of the RNP and other North American organizations.

The aforementioned cooperation agreement also represented a substantial increase in the project budget. Table 2.1 shows the costs of maintaining the network, split into the principal items of materials and services.

**Table 2.1**

*Distribution of ANSP’s costs in 2013*

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>VALUE (REAI$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rental of optic fibers and Internet bandwidth</td>
<td>14,780,171,76</td>
</tr>
<tr>
<td>Data Center rental</td>
<td>2,751,453,82</td>
</tr>
<tr>
<td>Acquisition of equipment</td>
<td>271,466,08</td>
</tr>
<tr>
<td>Operation and maintenance</td>
<td>4,162,371,52</td>
</tr>
<tr>
<td>Total</td>
<td>21,965,463,18</td>
</tr>
</tbody>
</table>

In 2013, ANSP received funds in the order of twenty-two million reais, twenty million reais through Project No. 2013/11711-5, from FAPESP, and a million dollars through Project No. OCI-0963053 from the NSF, as shown in the data in Table 2.2.

**Table 2.2**

*Distribution of ANSP funding in 2013*

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>VALUE (REAI$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>São Paulo Research Foundation (Project ANSP 2013)</td>
<td>19,526,809,98</td>
</tr>
<tr>
<td>National Science Foundation (US$ 1,055,947.00 @ 2.00) (AmLight Project)</td>
<td>2,438,653,20</td>
</tr>
<tr>
<td>Total</td>
<td>21,965,463,18</td>
</tr>
</tbody>
</table>

**OPERATION**

ANSP is operated in São Paulo, Brazil, by NARA-FMUSP staff (Center for Applications in Advanced Networks, the USP School of Medicine), and in Miami, United States of America, by the staff of the CIARA-FIU (Center for Internet Augmented Research and Assessment - Florida International University). Since 2002, the NARA team has dedicated itself entirely and exclusively to the activities of planning, projects, management and operation of ANSP. Since 2004, CIARA has dedicated itself to the operation of the ANSP point of presence in the USA and the execution of various side projects, which guarantee the access of ANSP and other academic networks in Latin America and the Caribbean to the major networks for research and education throughout the world. (See Chapter 1 - History.)

Due to the characteristics of the network, described in the chapter Physical Network, the operation of ANSP, although complex, can be managed with a small, albeit highly qualified and competent team. This is the model toward which ANSP has been driving since 2004 and which today allows us to manage the network with a team of just ten employees fully dedicated to the project at NARA, in São Paulo, and fourteen others partially dedicated to the project in CIARA in Miami (the latter including some trainees, through projects funded by NSF), maintaining the same standard of excellence as the most important academic networks in the world.

Given the architecture and technology chosen, the operation of ANSP is handled remotely, with all equipment allocated in the data centers of NAP do Brasil (Barueri - SP) and the NAP of the Americas (Miami - FL) and in the points of concentration of Unicamp (Campinas - SP), INPE (São José dos Campos - SP) and USP (São Paulo - SP). Teams from NARA and CIARA are responsible for projects, network monitoring and decision making on all aspects of the operation of the ANSP network, and now also of the KyaTera network. Work related to transportation, installation, connection and the physical care of the equipment in the NAPs of São Paulo and Miami are outsourced in the form of hiring smart “remote hands” and “expert hands”, directly from these companies. At the concentration points at Unicamp, USP and INPE, all work is carried out in collaboration with the respective teams of these institutions.
In addition, for the purpose of responding with maximum speed and efficiency to its participants, ANSP maintains, through the hiring of specialized companies, a call center service that provides support twenty-four hours per day, seven days per week.

Since 2010, ANSP has been developing an internal project of documentation of the network and its operational processes in order to provide the necessary support to maintain the current uptime of 99.9% per year, with ever-increasing services and lower costs. The gains from this project can already be felt in the new ticketing system, implemented in the second half of 2012, the new system of monitoring, and in the project’s own page, which is now much clearer and informative.

In 2012, with the staging of the first two BMAs (Biannual Meetings of ANSP), the collaboration of the teams of the participating institutions and the efficiency of the operation increased considerably and this should leverage the quality of the network in the coming years. In particular, discussions during the BMAs have enriched the operation process by allowing the staff at NARA to get to know even better the networks of the participating institutions, their network teams, their needs and aspirations.

ANSP was born as a project of international cooperation. After all, its primary goal was to connect the São Paulo scientific community to Fermilab in the United States of America, which became a reality with the signing of a cooperation agreement with the laboratory and the Bitnet network. Thereafter, ANSP continued to expand partnerships at national and international level, always guided by fulfilling its goal of providing the São Paulo research community with the best possible network connectivity.

In 2013, ANSP maintained direct or indirect cooperation agreements with all academic networks in the world. In particular, those established with the networks listed in Box 2.7 are ongoing:

Box 2.7
Cooperation agreements between ANSP and other academic networks - 2013

AtlanticWave - distributed international traffic exchange point on the east coast of the Americas, with interconnection points in São Paulo, Miami, Atlanta, Washington and New York

Cenic (Corporation for Education Network Initiatives in California) - the network of the state of California, USA, ANSP’s “sister” network

GLIF (Global Lambda Integrated Facility) - informal consortium of the principal research and education networks and businesses that possess research networks, which aim to provide scientists throughout the world with a structure capable of supporting research on a global scale

Internet2 - the North American academic network most widely known in Brazil

NLR (National LambdaRail) - another North American academic

RedCLARA (Cooperación Latino Americana de Redes Avanzadas) - the Latin American academic network

RNP (Rede Nacional de Ensino e Pesquisa) - the Brazilian national network
In addition to cooperation with other networks, ANSP has maintained, since the 1990s, cooperation agreements with companies, government agencies and other organizations whose activities bring synergy to the project as can be seen in Box 2.8.

### Box 2.8
Cooperation between ANSP and other organizations - 2013

- **1998** - Telefônica
  - Training and development of personnel

- **2001** - FIU (Florida International University)
  - Cooperation agreement for the installation of international research links between São Paulo and Miami

- **2001** - Akamai Technologies e Exceda
  - Distribution in Brazil, based on the ANSP data center, of the majority of electronic publications in the *Periódicas Capes* portal

- **2001** - Instituto UNIEMP
  - (Permanent Forum of university-business relations)
  - Administration of the ANSP project

- **2006** - Intragov
  - Connectivity with the Internet in case of the failure of the network of the Government of the State of São Paulo

- **2011** - CAIDA
  - (Cooperative Association for Internet Data Analysis)
  - Project of the University of California in San Diego, dedicated to monitoring the Internet

- **2011** - Highwinds Brasil
  - Agreement to share dark fiber optical networks

- **2012** - Datacom
  - Development of OpenFlow switches

- **2013** - Telebras
  - Technical and Scientific Cooperation Agreement

Since ANSP’s profile is to be a project, its relentless pursuit is to innovate and upgrade its operational process. Thus, the interaction with national and international research communities occurs not only through cooperation with the networks, but also by participation in scientific events in Brazil and abroad.

### Box 2.9
Participation of ANSP in national and international meetings - 2013

- **April 22-14** - Washington - DC - EUA
  - 2013 Internet2 Annual Meeting

- **May 06-10** - Brasília, DF, Brasil
  - 31º SPRC - Brazilian Symposium of Computer Networks and Distributed Systems - 2013

- **June 03-06** - Maastricht, Holanda
  - TERENA Networking Conference 2013

- **July 21-23** - Madison, WI, EUA
  - 17th GENI Engineering Conference

- **August 19-20** - Santiago, Chile
  - The Mid-2013 SAACC Meeting - AmLight’s South American Astronomy Coordination Committee and REUNA (Red Universitaria Nacional)

- **November 03-08** - Toronto, Canadá
  - 13th BIOMAT International Symposium on Mathematical and Computational Biology - 2013

- **December 09-11** - La Jolla, CA, EUA
  - CineGrid International Workshop 2013

**STATE OF THE ART AND PERSPECTIVES**

Between 1995, when it became commercial, and 2010, the Internet has grown from a few hundred thousand university participants in a dozen countries to two billion users in 233 countries, that is, almost one third of the world population. In the education and research community, the evolution was not much different. The Internet which in 1992, served only major universities and research centers in the United States, Europe and a few other countries in the world, has expanded to virtually all teaching or research institutions around the globe.

Today, after twenty-eight years, the Internet is approaching a tipping point, perhaps a radical paradigm shift. In the coming years, the commercial Internet will have to deal with the process of universalizing the use of cloud computing, now attached to the concept of virtual slices that include network, processing and data storage. The slices will be further complicated by the universalization of IoT (Internet of Things), with the inclusion of connections of all kinds of devices to the Internet. And commercial companies will not be able to pass up the opportunity
to study their business through the new phenomenon of big data, the analysis of huge amounts of data produced daily by their customers in order to bring them tailored products.

The academic Internet, together with governments, in addition, will have to meet very similar demands, coming from mega-studies in health or economics (more big data), projects such as the LHC (Large Hadron Collider) at CERN, or the new SOAR and LSST telescopes, which will produce together, every day, quantities of data in the order of Petabytes (10^15 Bytes), which will be distributed to several laboratories throughout the world to be processed. And those laboratories wishing to use slices of the network to optimally meet their computing, storage and communication needs.

Faced with this evolution of the use and capacity of communication, everything indicates that the academic Internet, as well as continuing to be the main communication service of the scientific community around the world, and the Americas in particular, will have to return to its original role of developer of the next generation of itself. ANSP is aware of these trends and has been studying and working to provide services to the academic community that every researcher needs, with ever improved performance and quality.

- **Regarding performance**, ANSP has studied networks with transmission capacity of 40 and 100 Gbps per channel since 2012, in cooperation with the Padtec company (ANSP already benefits from the program of funding of projects in the field of optical communications launched by FAPESP and Padtec in 2007). In 2013, the capacity of international communication has increased from 10 to 40 Gbps and in the biennium 2014/15, links of 100 Gbps will begin to be deployed, including in the submarine cable between São Paulo and Miami.

- **With regard to quality**, ANSP follows the global trend and has been studying the new technologies proposed and their consequences, treating them now as a near future. Among the new technological proposals, the idea of SDN (Software Defined Networks), as opposed to the current networks based on hardware configurations and equipment such as switches and routers, is the most promising. In 2014 ANSP should have an SDN version of the PTTA.

Thus from 2012, ANSP resumed two traditional activities to support research projects:

- **Training and development of staff**: it signed an Agreement on Technical and Scientific Cooperation with the Datacom company, a 100% Brazilian manufacturer of networking equipment, for the joint development of the new OpenFlow switches. In 2012 and 2013, several teams of CCEs from São Paulo universities joined the project and will remain there in 2014.

- **Dissemination of knowledge**: from the second Biannual Meeting of ANSP, in October-November 2012, a process began of dissemination and evangelization of new technologies, initially selecting them as the theme of the meeting, including an introductory course on OpenFlow, taught by Prof. Dr. Cesar Marcondes from the Universidade Federal de São Carlos, and open to all those participating in the ANSP community. This process continued throughout 2013 and will be expanded in 2014.

In 2014, ANSP should sign agreements similar to the Datacom agreement with other companies and organizations and expand the number and variety of courses and workshops on new technologies. An important consequence of the introduction of these new technologies is that the additional complexity introduced by them in the network, especially in the beginning, requires the development of monitoring systems and efficiency measures that go beyond those used by the industry today. There are several projects being developed and many references. Since the start of 2011, ANSP has had a cooperation agreement with the CAIDA Project (Cooperative Association for Internet Data Analysis), in the area of Internet monitoring, and follows the development of the perfSONAR project (Performance Service Oriented Network monitoring Architecture), in the area of monitoring network performance. This work is at an early stage of its foundations and will continue over the coming years.
PHYSICAL NETWORK

Simplicity and focus on the research community needs: that is how ANSP works

To ensure the administrative and operational independence of its participants, ANSP adheres to the following two inviolable principles:

- minimum interference: ANSP should impose minimum restrictions and requirements on the education and research institutions that use it. Ideally, none;
- transparency: ANSP should be as transparent as possible. Ideally the end users (researchers, teachers, students and employees of educational and research institutions in the State of São Paulo) who do not have special needs, should not even notice its existence.

To simultaneously meet its objectives and adhere to its principles, ANSP, from the early 2000s, invested heavily to expand its connectivity to every commercial and academic network in the world, with increasingly simple architectures from the topological point of view and the most innovative from the technological point of view.

CONNECTIVITY

The ANSP project provides its participants with the necessary infrastructure for them to exchange among themselves and with all the Brazilian or foreign academic and commercial networks every kind of traffic (data, voice, video, etc.). The project also provides the infrastructure for connectivity between its users and these networks.

PTTA - ACADEMIC TRAFFIC EXCHANGE POINT

To perform traffic exchange between its participants and between them and other networks, the ANSP project maintains an infrastructure which, from the logical point of view, works for the users and their data in the same way as an airport works for the airlines and their planes: as a hub. The logical structure of the hub is shown in Figure 3.1.
The PTTA is hosted in the NAP do Brasil, in Barueri, Greater São Paulo. Its location was conveniently chosen based on the quality of the data center, one of the most secure and reliable in the country, and the fact that all the telecommunications companies operating within and adjacent to the metropolitan area of São Paulo are there.

Every institution participating in the ANSP network connects to the PTTA, always on its own initiative, directly or through another participating institution. The federal institutions in the State of São Paulo use, for this purpose, the RNP (Rede Nacional de Ensino e Pesquisa) links. Other institutions request resources from FAPESP (Fundação de Amparo à Pesquisa do Estado de São Paulo), through the “Technical reserve for connectivity to the ANSP Network”, or use their own resources. ANSP does not act in the so-called “last mile.”

As can be seen in Figure 3.1, the PTTA is the nerve center of the ANSP network. In addition to the ANSP users, the PTTA connects to the RNP, to the RedCLARA (Cooperación Latino Americana de Redes Avanzadas), to Internet2 and other research and education networks abroad and to other partners. Although it is not its primary mission, the PTTA also connects to the commercial Internet in Brazil and abroad.

I NATIONAL AND INTERNATIONAL CONNECTIVITY

ANSP is a member of the RNP and a participant in the Atlantic Wave and GLIF (Global Lambda Integrated Facility) consortia. It is a partner of the North American networks, Internet2 and NLR (National Lambda Rail) and co-finances the AmLight project (Americas Lightpaths) that connects Brazilian networks to the North American networks. In addition, it hosts the point of presence of RedCLARA in São Paulo. These alliances allow it to give its users connectivity to virtually every educational institution in the world.

By being a member of the RNP, the ANSP network provides its users with connectivity to the Brazilian academic networks in a natural way. In 2013, the RNP, with its IPÊ network, gave ANSP users access to virtually every Brazilian teaching and research institution outside the State of São Paulo.
In 2013, ANSP users also had access to the Brazilian commercial Internet by direct exchange of traffic. The ANSP network exchanges traffic with the Brazilian commercial Internet in two locations. The first is the traffic exchange point (PTT) in NAP do Brasil, where the PTTA is physically located. The second is the PTT-Metro, distributed network exchange point maintained by NIC.br (Núcleo de Informação e Coordenação do Ponto BR). ANSP also receives transit from some commercial networks through RNP.

For international access, ANSP maintains a point of presence in Miami, in the Internet Exchange Point NAP of the Americas. There, a connection is made with the international academic networks and the international commercial Internet. This point is maintained in collaboration with the RNP and CIARA/FIU (Center for Internet Augmented Research and Assessment, at Florida International University), since 2004, through the WHREN project, and from 2009 on through the AmLight project.

Furthermore, RedCLARA interconnects the advanced national academic networks in Latin America and connects those with networks in Europe (GÉANT2), the United States of America (Internet2), Asia (APAN - Asia Pacific Advanced Network) and the rest of the world, offering ANSP a second alternative path to the international academic networks. Figure 3.2 summarizes the logic of ANSP’s connections with other networks.

Finally, to cater for those projects that require special connectivity, point to point or even temporary, ANSP participates in the GLIF consortium.

GLIF (Global Lambda Integrated Facility) is a virtual organization of academic networks, aiming to provide temporary or permanent, dedicated international connectivity, for the research projects that require it. GLIF has no infrastructure of its own, being an agreement between academic networks which wish to work together, in a coordinated and efficient manner. Its current mode of operation is quite simple:

- the networks that have lines for research announce to their peers which lines are available;
- the lines are interconnected in the Virtual Circuits Exchange Points - GOLE (GLIF Open Lightpath Exchanges) maintained by some of the participating networks;
- the other networks connect to the closest or most convenient GOLE;
- the consortium is structured in working groups that meet annually.

ANSP and the RNP maintain in São Paulo the regional GOLE of Latin America, called SouthernLight (Sol).
Box 3.1 shows the list of countries, with their respective networks, reached by ANSP around the world. Figure 3.3 shows the evolution of ANSP international access bandwidth, from its foundation to 2013.

**Box 3.1**  
The international reach of the ANSP network

### AMERICAS
- **Argentina** (INNOVA|RED)  
- **Brazil** (RNP/RedeRo/Rede Tchê)  
- **Canada** (CANARIE)  
- **Chile** (REUNA)  
- **Colombia** (RENA)  
- **Costa Rica** (CR2Net)  
- **Ecuador** (CEDIA)  
- **El Salvador** (RAICES)  
- **Guatemala** (RAGIE)  
- **Mexico** (CUDI)  
- **Panama** (RedCyT)  
- **Peru** (RAAP)  
- **Trinidad** (Univ. of the West Indies)  
- **Uruguay** (RAU2)  
- **Venezuela** (Reacciun2)

### EUROPE
- **Albania** (ASA/INIMA)  
- **Andorra** (Univ. of Andorra)  
- **Austria** (ACOnet)  
- **Belarus** (BASNET, UNIBEL)  
- **Belgium** (BELNET)  
- **Bosnia-Herzegovina** (BIHARNET)  
- **Bulgaria** (ISTF)  
- **Croatia** (CARNet)  
- **Cyprus** (CyNET)  
- **Czech Republic** (CESnet)  
- **Denmark** (Forskningsnettet)  
- **Estonia** (EENet)  
- **Finland** (Funet)  
- **France** (RENATER)  
- **Germany** (X-WING)  
- **Greece** (GRNET)  
- **Hungary** (NIIF/HUNGARNET)  
- **Iceland** (RHnet)  
- **Ireland** (HEAnet)  
- **Italy** (GARR)  
- **Latvia** (LATNET)  
- **Lithuania** (LITNET)  
- **Luxembourg** (RESTENA)  
- **Malta** (UofM/RicerkaNet)  
- **Moldova** (RENA)  
- **Montenegro** (MREN)  
- **Netherlands** (SURFnet)  
- **Norway** (UNINETT)  
- **Poland** (PIONIER)  
- **Portugal** (FCCN)  
- **Romania** (RoEduNet)  
- **Russian federation** (RBnet, RUNNET)  
- **Serbia** (AMRES)  
- **Slovakia** (SANET)  
- **Spain** (redIRIS)  
- **Sweden** (SUNET)  
- **Switzerland** (SWITCH)  
- **Ukraine** (URAN)  
- **United Kingdom** (JANET)

### ASIA AND OCEANIA
- **Armenia** (ASNET-AM)  
- **Australia** (AARNET)  
- **Azerbaijan** (AzRENA)  
- **China** (CERNET, CSTNET, NSFCNET)  
- **Fiji** (ISP-SUVA)  
- **Georgia** (GRENA)  
- **Hong Kong** (HARNET)  
- **India** (ERNET)  
- **Indonesia** (GRNET)  
- **Japan** (SINET, WIDE, JGN2)  
- **Kazakhstan** (KazRENA)  
- **Korea** (KOREN, KORENET2)  
- **Kyrgyz Republic** (KREN)  
- **Malaysia** (MYREN)  
- **New Zealand** (KAREN)  
- **Pakistan** (PERN)  
- **Philippines** (PREGINET)  
- **Singapore** (SingAREN)  
- **Taiwan** (TANet2, ASNet)  
- **Tajikistan** (TARENA)  
- **Thailand** (UniNet, ThaiSARN)  
- **Turkey** (ULAKBIM)  
- **Turkmenistan** (TuRENA)  
- **Uzbekistan** (UzSciNet)  
- **Vietnam** (VinaREN)

### AFRICA
- **Algeria** (ARN)  
- **Kenya** (KENET)  
- **Morocco** (MARWAN)  
- **South Africa** (TENET)  
- **Tanzania** (TERNET)  
- **Tunisia** (CCK)  
- **Uganda** (RENU)

### MIDDLE EAST
- **Egypt** (EUN/ENSTINET)  
- **Israel** (IUC)  
- **Jordan** (JUNet)  
- **Palestinian Territories** (Birzeit Univ./Al-Quds Open Univ.)  
- **Qatar** (Qatar FN)  
- **Syria** (HIAST)  
- **United Arab Emirates** (ANKABUT)

### MULTINATIONAL NETWORKS
- **Africa** (UbuntuNet)  
- **Asia and Pacific** (APAN)  
- **Europe** (GÉANT2)  
- **Latin America** (RedCLARA)  
- **Northern Europe** (NORDUnet)
TOPOLOGY

The IP network (Internet Protocol) of ANSP has a star topology. Its logical structure has been illustrated in Figure 3.1. In the PTTA there is no hierarchy among networks. Every institution and project that is part of ANSP and every network with which it directly exchanges traffic is treated in the same way, as an independent and autonomous network. For this, it is used the BGP (Border Gateway Protocol), which allows each participant to have complete freedom of choice of their topologies, internal protocols and network policies. ANSP members are free also to exchange traffic directly with other networks, just as USP (Universidade de São Paulo) and Unesp (Universidade Estadual Paulista “Júlio de Mesquita Filho”) do, independently of ANSP.

Naturally, the physical structure is quite different. Figure 3.4 shows the complete topology of the PTTA, with all its components. It can be seen that, to achieve the logical simplicity presented in Figure 3.1, in addition to the PTTA, to which twenty-six institutions are directly connected, ANSP maintains four points of concentration. In Campinas, where Unicamp (Universidade Estadual de Campinas) and ten other institutions are connected; in São José dos Campos, where INPE (Instituto Nacional de Pesquisas Espaciais) and three more institutions are connected; in São Paulo, where USP, the RNP PoP in São Paulo, and another six institutions, are connected; and in São Carlos, where UFSCar (Universidade Federal de São Carlos) e another two institutions are connected.

The simple star logic is created by enabling the links between each concentration point and the PTTA to carry as many virtual circuits as the number of institutions connected to it. Finally, in order for this simple logic to be also robust, all the equipment and links between concentration points are duplicated so as to provide a minimum availability of 99.9% per year, one of the network’s strengths. Furthermore, ongoing monitoring and assistance to participants, on a 7x24x365 basis, ensure the integrity of the network and the data that travels over it.

The physical map of the IPÊ network of the RNP, used by ANSP to provide its users with access to educational and research institutions throughout the country, can be seen on the RNP’s web page: http://www.rnp.br/backbone/index.php

Similarly, the physical map of RedCLARA, which allows ANSP users to have direct access to the Latin American networks, is available on the web page: http://www.redclara.net/index.php?option=com_content&view=article&id=51&Itemid=422&lang=en
Access to the academic networks around the world and to the commercial internet is a little more complex. Figure 3.5 shows schematically how it works. It can be seen that:

- Physical access to the Brazilian commercial Internet is handled directly by ANSP in the PTT of NAP do Brasil, in the PTT-Metro of NIC.br, and indirectly through RNP.

- Physical access to other countries’ networks is handled by four 10 Gbps lambdas, shared by ANSP and RNP, connecting São Paulo to Miami, and one 2.5 Gbps link provided by RedCLARA, connecting São Paulo to Madri.

- In the United States, the access to the international commercial Internet is handled at two points. In the NAP of the Americas in Miami, through the MRS service (Managed Routing Services) of the Terremark World Wide company, and in the PoP of Internet2 in Atlanta, through its TR-CPS (Transit Rail-Commercial Peering Service).

- ANSP reaches international academic networks via the AtlanticWave consortium, Distributed Traffic Exchange Point with points of presence in São Paulo (PTTA), Miami (AMPATH), Atlanta (SoX), Washington, DC (MAX / NGIX) and New York (MAN LAN).

- Through AtlanticWave, ANSP exchanges traffic with Internet2, with the NLR (National Lambda Rail), with the network of Canada (CANET), with the TRANSLIGHT project and the European GÉANT2 network. Through these last two, ANSP has access to networks in Europe, Asia, the Middle East and Africa.

- Through Internet2, ANSP has access to other American networks (ESnet, NISN, NREN and DREN) and to the STARLIGHT traffic exchange points in Chicago and Pacific Wave on the U.S. west coast. Through these last two and the GLORIAD and TransPAC projects, ANSP has access to networks in Asia and Oceania.

- Through RedCLARA, ANSP accesses the European network GÉANT2, that acts as second way out to other networks world wide.
ARCHITECTURE

ANSP’s PTTA comprises a virtual switch-router, configured within the peering matrix (an actual switch-router, dedicated to the exchange of traffic) of NAP do Brasil. This matrix is the principal private PTT (Traffic Exchange Point) in the country, to which the major Brazilian networks are connected, including those of the largest national and international telecommunications operators. As earlier mentioned in the section on network topology, the PTTA works with the BGP protocol and, were it not the inter-domain part of the TCP/IP, we could classify ANSP as a BGP network rather than an IP network. The PTTA is ANSP’s logical center, and that is where everything decisive on the network occurs.

The use of virtual switch-routers is supported under the BGP protocol and, although little used in the world, it is a resource that is easy to use and with surprising results. ANSP began using it in 2005. Its construction consists entirely of the manipulation of the properties of the BGP protocol and does not need any extra resources (neither software nor hardware) from the peering matrix used. It begins by defining all network participants as autonomous networks (AS - Autonomous System, in BGP jargon) and each one is assigned an address (ASN - Autonomous System Number). BGP provides for the use of public and private ASNs. Networks maintained by telecommunications companies and Internet providers have their own ASNs. Large academic networks such as the RNP, ANSP, USP and Unesp, also. The networks of the institutions connected to ANSP that do not have public ASNs, are given private ASNs.

To set up the virtual switch-router, a default route to the outside is defined and each participant announces its ASN only to its ANSP peers, and to the rest of the peering matrix it announces ANSP’s public ASN. Thus, the internal traffic is isolated from the external traffic by the ANSP ASN. The result is that ANSP participants exchange traffic among themselves without interference from networks external to ANSP, as if they were connected to a router, and exchange traffic with the external networks as if they were connected to a gateway. And they do so independently!

The same applies to the relationship of ANSP with the commercial Internet and with Brazilian and foreign academic networks. Every traffic exchange is performed by BGP. Therefore, perhaps the best definition for ANSP today would be to classify it not as a network, but as a point of Distributed Traffic Exchange!
ANSP is, primarily, a network formed by people who work with people for people.

ANSP Ecosystem

ANSP is a network specifically organized to meet the needs of researchers from universities and research centers in São Paulo. In addition to those already registered on the network, other institutions and companies that intend to participate in it are welcome. The ANSP Ecosystem is a community formed by members of organizations that have common or complementary interests in the area of computer networks and continually interact. There are two main groups of network users who rely on the permanent assistance and cooperation of ANSP teams: (1) members of educational and public or private research institutions, and (2) suppliers of Information and Communications Technology equipment and services.

The main objective of the ANSP Ecosystem is to promote closer relationships and the interaction between all members who are part of it, in order to:

- promote mutual knowledge;
- develop qualified networking;
- enable the exchange of ideas and experiences;
- disseminate technological concepts;
- promote testing and validation activities of common interest;
- to facilitate improvements in the quality of business conducted between its constituents.

The immediate benefit to an institution in the ANSP Ecosystem is to be connected to all the members in São Paulo who, directly or indirectly, are engaged in common activities or in related areas of research and development in computer networking activities.
At the end of 2013, the ANSP Ecosystem had 62 institutions, with the opportunity to express themselves through the ANSP channels regarding services received, partnerships undertaken and training offered. See Table 4.1.

### Table 4.1

**Participants in ANSP Ecosystem - 2013**

<table>
<thead>
<tr>
<th>ACRONYM OR ABBREVIATION</th>
<th>INSTITUTION</th>
<th>CITY / STATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ABDL</td>
<td>Associação Brasileira para o Desenvolvimento de Lideranças</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>2. Akamai (*)</td>
<td>Akamai Technologies</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>3. Bireme</td>
<td>Centro Latino-Americano e do Caribe de Informação em Ciências da Saúde</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>4. Boldrini</td>
<td>Centro Infantil Boldrini</td>
<td>Campinas/ SP</td>
</tr>
<tr>
<td>5. BROCADE (*)</td>
<td>Brocade</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>6. Butantan</td>
<td>Instituto Butantan</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>7. Centro APTA Citros</td>
<td>Centro Avançado de Pesquisa Tecnológica do Agronegócio de Citros Sylvio Moreira</td>
<td>Cordeirópolis/ SP</td>
</tr>
<tr>
<td>8. CIARA-FIU (*)</td>
<td>Center for Internet Augmented Research and Assessment Florida International University</td>
<td>Miami/ Flórida</td>
</tr>
<tr>
<td>9. CNPEM</td>
<td>Centro Nacional de Pesquisa em Energia e Materiais</td>
<td>Campinas/ SP</td>
</tr>
<tr>
<td>10. CRIA</td>
<td>Centro de Referência em Informação Ambiental</td>
<td>Campinas/ SP</td>
</tr>
<tr>
<td>11. DATACOM (*)</td>
<td>Datacom</td>
<td>Porto Alegre/ RS</td>
</tr>
<tr>
<td>12. DCTA-ITA</td>
<td>Departamento de Ciência e Tecnologia Aeroespacial (antigo Centro Técnico de Aeronáutica - CTA)</td>
<td>São José dos Campos/ SP</td>
</tr>
<tr>
<td>13. Embrapa-CNPDIA</td>
<td>Empresa Brasileira de Pesquisa Agropecuária - Instrumentação</td>
<td>São Carlos/ SP</td>
</tr>
<tr>
<td>14. Embrapa-CNPM</td>
<td>Empresa Brasileira de Pesquisa Agropecuária Monitoramento por Satélite</td>
<td>Campinas/ SP</td>
</tr>
<tr>
<td>15. Embrapa-CNPMMA</td>
<td>Empresa Brasileira de Pesquisa Agropecuária Meio Ambiente</td>
<td>Jaguariúna/ SP</td>
</tr>
<tr>
<td>16. Embrapa-CNPTIA</td>
<td>Empresa Brasileira de Pesquisa Agropecuária Informática Agropecuária</td>
<td>Campinas/ SP</td>
</tr>
<tr>
<td>17. Embrapa-CPPSE</td>
<td>Empresa Brasileira de Pesquisa Agropecuária Pecuária Sudeste</td>
<td>São Carlos/ SP</td>
</tr>
<tr>
<td>18. Exceda</td>
<td>Exceda</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>19. FACAMP</td>
<td>Faculdades de Campinas</td>
<td>Campinas/ SP</td>
</tr>
<tr>
<td>20. FAMERP</td>
<td>Faculdade de Medicina de São José do Rio Preto</td>
<td>São José do Rio Preto/ SP</td>
</tr>
<tr>
<td>21. FAPESP</td>
<td>Fundação de Amparo à Pesquisa do Estado de São Paulo</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>22. FECAP</td>
<td>Fundação Escola de Comércio Álvares Penteado</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>23. FGV-SP</td>
<td>Fundação Getúlio Vargas - São Paulo</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>24. FUNCATE</td>
<td>Fundação de Ciências, Aplicações e Tecnologia Espaciais</td>
<td>São José dos Campos/ SP</td>
</tr>
<tr>
<td>ACRONYM OR ABBREVIATION</td>
<td>INSTITUTION</td>
<td>CITY / STATE</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------</td>
<td>--------------</td>
</tr>
<tr>
<td>25. Fundação Zerbini - INCOR</td>
<td>Fundação Zerbini - Instituto do Coração Hospital das Clínicas Faculdade de Medicina da Universidade de São Paulo</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>26. Fundacentro</td>
<td>Fundação Jorge Duprat Figueiredo de Segurança e Medicina do Trabalho</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>27. FUVEST</td>
<td>Fundação Universitária para o Vestibular</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>28. Highwinds (*)</td>
<td>Highwinds do Brasil Telecomunicações Ltda</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>29. Hospital A. C. Camargo</td>
<td>Hospital Antônio Cândido de Camargo Fundação Antônio Prudente</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>30. INOVAX (*)</td>
<td>Inovax Engenharia de Sistemas</td>
<td>Rio de Janeiro/ RJ</td>
</tr>
<tr>
<td>31. INPE</td>
<td>Instituto Nacional de Pesquisas Espaciais</td>
<td>São José dos Campos/ SP</td>
</tr>
<tr>
<td>32. Intragov</td>
<td>Rede IP de Multiserviços do Governo do Estado de São Paulo</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>33. IPEF</td>
<td>Instituto de Pesquisas e Estudos Florestais</td>
<td>Piracicaba/ SP</td>
</tr>
<tr>
<td>34. Ipen</td>
<td>Instituto de Pesquisas Energéticas e Nucleares</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>35. IPT</td>
<td>Instituto de Pesquisas Tecnológicas</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>36. Level 3 (*)</td>
<td>Level 3 Comunicações do Brasil Ltda.</td>
<td>Cotia/ SP</td>
</tr>
<tr>
<td>37. Megatelecom (*)</td>
<td>Megatelecom Telecomunicações S/A</td>
<td>Santana de Parnaíba/ SP</td>
</tr>
<tr>
<td>38. Mackenzie</td>
<td>Universidade Presbiteriana Mackenzie</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>39. Metodista</td>
<td>Universidade Metodista de São Paulo</td>
<td>São Bernardo do Campo/ SP</td>
</tr>
<tr>
<td>40. NARA-FMUSP</td>
<td>Núcleo de Aplicações em Redes Avançadas Faculdade de Medicina da Universidade de São Paulo</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>41. Padtec (*)</td>
<td>Padtec S/A</td>
<td>Campinas/ SP</td>
</tr>
<tr>
<td>42. PUC-Camp</td>
<td>Pontifícia Universidade Católica de Campinas</td>
<td>Campinas/ SP</td>
</tr>
<tr>
<td>43. PUC-SP</td>
<td>Pontifícia Universidade Católica de São Paulo</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>44. Rário e TV Cultura</td>
<td>Fundação Padre Anchieta</td>
<td>São Paulo/ SP</td>
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<tr>
<td>45. RNP CAIS</td>
<td>Centro de Atendimento a Incidentes de Segurança Rede Nacional de Ensino e Pesquisa</td>
<td>Campinas/ SP</td>
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<tr>
<td>46. Santa Casa</td>
<td>Irmandade da Santa Casa de Misericórdia de São Paulo</td>
<td>São Paulo/ SP</td>
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<td>47. SciELO</td>
<td>Scientific Electronic Library Online</td>
<td>São Paulo/ SP</td>
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<td>48. Softex</td>
<td>Softex Núcleo Campinas</td>
<td>Campinas/ SP</td>
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<td>49. Telebras (*)</td>
<td>Telecomunicações Brasileiras S/A</td>
<td>Brasília/ DF</td>
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<tr>
<td>50. Telefônica/ VIVO (*)</td>
<td>Telefônica - Vivo</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>51. Terremark (*)</td>
<td>Terremark/ Verizon</td>
<td>São Paulo/ SP</td>
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<tr>
<td>52. UFABC (*)</td>
<td>Universidade Federal do ABC</td>
<td>Santo André/ SP</td>
</tr>
<tr>
<td>53. UFSCar</td>
<td>Universidade Federal de São Carlos</td>
<td>São Carlos/ SP</td>
</tr>
<tr>
<td>54. Unesp</td>
<td>Universidade Estadual Paulista &quot;Júlio de Mesquita Filho&quot;</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>55. Unicamp</td>
<td>Universidade Estadual de Campinas</td>
<td>Campinas/ SP</td>
</tr>
<tr>
<td>56. Unicsul</td>
<td>Universidade Cruzeiro do Sul</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>57. Unifesp</td>
<td>Universidade Federal de São Paulo</td>
<td>São Paulo/ SP</td>
</tr>
<tr>
<td>58. UNINOVE</td>
<td>Universidade Nove de Julho</td>
<td>São Paulo/ SP</td>
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<td>59. UNIP</td>
<td>Universidade Paulista</td>
<td>São Paulo/ SP</td>
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<tr>
<td>60. UniVap</td>
<td>Universidade do Vale do Paraíba</td>
<td>São José dos Campos/ SP</td>
</tr>
<tr>
<td>61. USCS</td>
<td>Universidade Municipal de São Caetano do Sul</td>
<td>São Caetano do Sul/ SP</td>
</tr>
<tr>
<td>62. USP</td>
<td>Universidade de São Paulo</td>
<td>São Paulo</td>
</tr>
</tbody>
</table>

(*) Are part of the ecosystem and exchange traffic with ANSP but do not transit through it.
PARTICIPATION IN THE ANSP ECOSYSTEM

**Box 4.1**
Composition of ANSP Ecosystem

- **users of the network**: education and research institutions whose researchers develop projects in the State of São Paulo;

- **suppliers**: those who develop or offer equipment, systems and Information and Communications Technology services to the research community;

- **ANSP support and research teams**: NARA (Center for Applications in Advanced Networks), School of Medicine, University of São Paulo, São Paulo, SP, Brazil, and CIARA (Center for Internet Augmented Research and Assessment), the Florida International University in Miami, FL, USA;

- all research groups and companies interested in participating in the network.

**Box 4.2**
Typical activities of ANSP Ecosystem

- construction and maintenance of a networking site with general information about the ecosystem and its activities, links to participating organizations and enterprises, blogs and discussion forums;

- creation, maintenance and systematic distribution of a qualified mailing covering professionals from participating organizations and companies;

- staging of open or closed events and thematic meetings;

- planning and execution of tests and validations of systems, equipment, protocols, or innovative technologies;

- exchange of experiences;

- targeted promotion of products and services;

- development of technological research in the area of computer networks;

- benchmarks and performance evaluation of products and services;

- technological training and up-skilling programs and training.

**Box 4.3**
Requirements for participation in ANSP

The institution must:

- be located within the boundaries of the State of São Paulo;

- present a program on scientific or technological research;

- include within its teams one or more professors or researchers with a proven doctorate;

- be a university, a university Center, faculty or a public or private center for research and development.

**Box 4.4**
How to participate in ANSP

1. the interested institution must send an and-mail to noc@ansp.br, requesting its participation

2. Documentation should be attached to the email proving that the institution meets the requirements (see Box 4.3).

3. The case will be considered by the ANSP Steering Committee at the first meeting following receipt of the request. (In general, the committee meets every month or two).

White paper on ANSP Ecosystem, on the ANSP site: http://www.ansp.br/index.php/us/white-papers
EVENTS

| BMA – BIANNUAL MEETINGS OF ANSP |

From 2012, ANSP realized the need to become more actively involved in promoting the integration of the members of its ecosystem, thus enabling its members to exchange experiences more closely. This led to the concept of the ANSP Biannual Meeting (BMA), an event that now occurs twice a year, in the State of São Paulo. For each biannual meeting, the coordinating body indicates a guiding theme and offers activities in line with the interests and needs of members of the ANSP Ecosystem, such as Courses and workshops.

Tables 4.2 and 4.4 show the overall record of all meetings and training activities in each of them, up to the end of 2013.

Table 4.2
Biannual Meetings of ANSP (2012-2013)
Coordinator: Prof. Dr. Luis Fernandez Lopez - NARA/FMUSP

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>EVENT</th>
<th>THEME</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>BMA1</td>
<td>1st Biannual meeting of ANSP</td>
<td>USP School of Medicine - São Paulo - SP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Building together the next generation of Internet”</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>BMA2</td>
<td>2nd Biannual meeting of ANSP</td>
<td>Unesp - São Paulo Universidade Estadual Paulista “Júlio de Mesquita Filho” - São Paulo - SP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“OpenFlow - the next generation of the Internet?”</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>BMA3</td>
<td>3rd Biannual meeting of ANSP</td>
<td>USP School of Medicine - São Paulo - SP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Smart Networks - Coming soon to a laboratory near you!”</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>BMA4</td>
<td>4th Biannual meeting of ANSP</td>
<td>USP School of Medicine - São Paulo - SP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“SDN - Network-Cloud Convergence”</td>
<td></td>
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</tbody>
</table>

PARTICIPATION IN THE ANSP BIANNUAL MEETINGS

During the biannual meetings, data was collected on the participation of those enrolled in the BMAs (attendance) and of those responsible for conducting the activities (institutions and their representatives). In Tables 4.3, 4.5 and 4.6, it is possible to gain an overview of participation in the ANSP Biannual Meetings:

Table 4.3
Participation in the BMAs (2012-2013)

<table>
<thead>
<tr>
<th>BMA</th>
<th>ON-LINE</th>
<th>AT THE LOCATION</th>
<th>TOTAL</th>
<th>PRESENT</th>
</tr>
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<tbody>
<tr>
<td>BMA1</td>
<td>90</td>
<td>10</td>
<td>100</td>
<td>79</td>
</tr>
<tr>
<td>BMA2</td>
<td>139</td>
<td>16</td>
<td>155</td>
<td>126</td>
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<tr>
<td>BMA3</td>
<td>107</td>
<td>17</td>
<td>124</td>
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<tr>
<td>BMA4</td>
<td>156</td>
<td>02</td>
<td>158</td>
<td>127</td>
</tr>
</tbody>
</table>
### Table 4.4

Courses and workshops offered by ANSP (2012-2013)

(*) Training activities, complementary to the BMAs

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>COURSE/ WORKSHOP</th>
<th>WORKLOAD</th>
<th>LOCATION</th>
<th>INSTRUCTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>Course: Introduction to OpenFlow protocol</td>
<td>12 h</td>
<td>BMA2 Unesp - São Paulo Universidade Estadual Paulista “Júlio de Mesquita Filho”</td>
<td>Prof. Dr. Cesar Marcondes UFSCar Federal University of São Carlos</td>
</tr>
<tr>
<td>2012</td>
<td>Workshop: ANSP routing policy</td>
<td>8 h</td>
<td>BMA2 Unesp - São Paulo Universidade Estadual Paulista “Júlio de Mesquita Filho”</td>
<td>Engineer Jorge Marcos de Almeida - NARA/FMUSP Center for Applications in Advanced Networks of USP School of Medicine</td>
</tr>
<tr>
<td>2012</td>
<td>Workshop: (?) Hands-on in OpenFlow Technology</td>
<td>16 h</td>
<td>NCC-Unesp - São Paulo Center for Scientific Computing, Universidade Estadual Paulista “Júlio de Mesquita Filho”</td>
<td>Prof. Dr. Cesar Marcondes UFSCar Federal University of São Carlos</td>
</tr>
<tr>
<td>2013</td>
<td>Workshop: SDN (Software Defined Networks) – a path for programmable networks</td>
<td>4 h</td>
<td>BMA3 USP School of Medicine São Paulo - SP</td>
<td>Marcelo Molinari</td>
</tr>
<tr>
<td>2013</td>
<td>Workshop: Big Data</td>
<td>4 h</td>
<td>BMA3 USP School of Medicine São Paulo - SP</td>
<td>Wilian Rodrigues</td>
</tr>
<tr>
<td>2013</td>
<td>Workshop: OpenFlow Marathon (OpenFlow Hackathon)</td>
<td>12 h</td>
<td>BMA3 USP School of Medicine São Paulo - SP</td>
<td>Prof. Dr. Cesar Marcondes UFSCar Federal University of São Carlos</td>
</tr>
<tr>
<td>2013</td>
<td>Course: DWDM - Dense Wavelength Division Multiplexing</td>
<td>12 h</td>
<td>BMA3 USP School of Medicine São Paulo - SP</td>
<td>Julio César Magro</td>
</tr>
<tr>
<td>2013</td>
<td>Workshop: (?) SDN - Software Defined Networking: sharing visions for the future</td>
<td>16 h</td>
<td>Ambassador Residence Hotel - Curitiba - PR</td>
<td>Org: DATACOM - ANSP ANSP; Copel; CPqD; Equatorial; DATACOM; NIC.br; RNP; Serpro; Telebras; UEC; UFES; UFPR; UFSCar; Unesp</td>
</tr>
<tr>
<td>2013</td>
<td>Workshop: (?) SDN - OpenFlow</td>
<td>16 h</td>
<td>ITA - Instituto Tecnológico de Aeronáutica São José do Rio Preto - SP</td>
<td>Prof. Dr. Cesar Marcondes UFSCar Federal University of São Carlos</td>
</tr>
<tr>
<td>2013</td>
<td>Course: Introduction to OpenFlow protocol</td>
<td>6 h</td>
<td>BMA4 USP School of Medicine São Paulo - SP</td>
<td>Prof. Dr. Cesar Marcondes UFSCar Federal University of São Carlos</td>
</tr>
<tr>
<td>2013</td>
<td>Workshop: Status of the OpenFlow project in São Paulo universities</td>
<td>4 h</td>
<td>BMA4 USP School of Medicine São Paulo - SP</td>
<td>Prof. Dr. Cesar Marcondes UFSCar Federal University of São Carlos</td>
</tr>
<tr>
<td>2013</td>
<td>Workshop: SDN Thematic Project</td>
<td>4 h</td>
<td>BMA4 USP School of Medicine São Paulo - SP</td>
<td>Prof. Dr. Nelson Fonseca Umicamp State University of Campinas</td>
</tr>
</tbody>
</table>
Table 4.5
Participation in the Courses and workshops of the BMAs (2012-2013)

<table>
<thead>
<tr>
<th>COURSE/ WORKSHOP</th>
<th>BMA</th>
<th>ENROLLED</th>
<th>PRESENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course: Management and Monitoring of DWDM networks</td>
<td>BMA2</td>
<td>46</td>
<td>52</td>
</tr>
<tr>
<td>Workshop: OPENFLOW protocol</td>
<td>BMA2</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Workshop: ANSP routing policy</td>
<td>BMA2</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Workshop: SDN</td>
<td>BMA3</td>
<td>34</td>
<td>23</td>
</tr>
<tr>
<td>Workshop: BigData</td>
<td>BMA3</td>
<td>27</td>
<td>17</td>
</tr>
<tr>
<td>Workshop: OPENFLOW Marathon</td>
<td>BMA3</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>Course: DWDM - Dense Wavelength Division Multiplexing</td>
<td>BMA3</td>
<td>20</td>
<td>09</td>
</tr>
<tr>
<td>Course: Introduction to OPENFLOW protocol</td>
<td>BMA4</td>
<td>43</td>
<td>40</td>
</tr>
<tr>
<td>Course: Introduction to OpenStack</td>
<td>BMA4</td>
<td>44</td>
<td>30</td>
</tr>
<tr>
<td>Course: Management and Monitoring of DWDM networks</td>
<td>BMA4</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Workshop: Status of the OPENFLOW project in São Paulo universities</td>
<td>n/a</td>
<td>n/a</td>
<td>27</td>
</tr>
<tr>
<td>Workshop: SDN Thematic Project</td>
<td>BMA4</td>
<td>n/a</td>
<td>25</td>
</tr>
</tbody>
</table>

Table 4.6
Number of institutions and speakers/ instructors in the activities in the BMAs (2012-2013)

<table>
<thead>
<tr>
<th>BMA</th>
<th>BMA1 May/ 2012</th>
<th>BMA2 Oct-Nov/ 2012</th>
<th>BMA3 May/ 2013</th>
<th>BMA4 Oct/ 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>speakers/ instructors</td>
<td>15</td>
<td>17</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>institutions</td>
<td>09</td>
<td>13</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>academic institutions, ONGs and Government</td>
<td>05</td>
<td>07</td>
<td>06</td>
<td>11</td>
</tr>
<tr>
<td>business institutions</td>
<td>04</td>
<td>06</td>
<td>06</td>
<td>07</td>
</tr>
<tr>
<td>lectures (2 symposiums included)</td>
<td>16</td>
<td>16</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>courses</td>
<td>0</td>
<td>01</td>
<td>01</td>
<td>03</td>
</tr>
<tr>
<td>workshops</td>
<td>0</td>
<td>01</td>
<td>03</td>
<td>02</td>
</tr>
</tbody>
</table>
In 2013, two meetings were held, BMA3 and the BMA4. During BMA3 from 21 to 24 May 2013, at the USP School of Medicine (FMUSP), in São Paulo, those enrolled participated in various activities on the main theme “Smart Networks”, with presentations, demonstrations, Courses and workshops.

In BMA4, 29 to 31 October, 2013, in addition to the lectures related to the main theme “SDN – Cloud-Network Convergence”, three short courses, two thematic symposiums and two workshops were organized in the FMUSP premises of USP, and a demonstration in the “Armando de Salles Oliveira” University City, on USP’s Butantã campus.

It is also important to note that in BMA3 more human resources training activities were offered than at previous editions of the meeting. While in BMA2 1 Course and 1 workshop were offered, in BMA3 the amount of training activities doubled (1 course and 3 workshops).

The full program for BMA3 can be seen in Box 4.5. Another differential to BMA3 was that ANSP supported the event “IoT World Meets in Brazil”, organized by the IoT Brazil Forum of Competitiveness and the European Union, the activities of which occurred in parallel to those of BMA3, also held at the USP School of Medicine, São Paulo, SP, Brazil, with the presentation of slides and interaction with questions and answers in real time.

 Speakers, coordinators of courses and workshops and directors of research, development and innovation prepared and developed activities that were very well received by those attending the meetings, according to the feedback forms collected and analyzed at the end of each activity.

It can be seen in Table 4.6 that there was an increase in the number of activities offered and institutions responsible for conducting these activities. The number of institutions doubled (from 9 to 18). Also notable is the increase in the number of speakers and leaders of the activities during the year 2013. From 15 speakers/instructors in BMA1 (May/2012), it went to 50 at BMA4 (October/2013).

**BMA3 – 3RD BIENNIAL MEETING OF ANSP (21-24/05/2013)**

The audience, comprising mostly professionals, students, researchers and teachers from institutions affiliated to ANSP’s Ecosystem, had the opportunity to attend lectures in the morning and participate in the afternoons in interactive activities, taught by media representatives from academia and business, such as CPqD (Centro de Pesquisa e Desenvolvimento), NIC.br (Núcleo de Informação e Coordenação do Ponto BR), RNP, UFSCar, Unesp, USP, Black It, Brocade, Datacom, Hitachi, HP, Level 3, Padtec and PSG Telecom.

One of the novelties of this BMA3 was the presentation “Big Physics, Big Data: the São Paulo Research & Analysis Center”, by Prof. Rogério L. Iope, from NCC-Unesp (Center for Scientific Computing, Universidade Estadual Paulista “Júlio de Mesquita Filho”), which was conducted via web conferencing, between CERN (Conseil Européen pour la Recherche Nucléaire/ European Council for Nuclear Research) in Geneva, Switzerland, and the USP School of Medicine, São Paulo, SP, Brazil, with the presentation of slides and interaction with questions and answers in real time.

Another differential to BMA3 was that ANSP supported the event “IoT World Meets in Brazil”, organized by the IoT Brazil Forum of Competitiveness and the European Union, the activities of which occurred in parallel to those of BMA3, also held at the USP School of Medicine. Prof. Luis Fernandez Lopez, coordinator of the ANSP project, was the keynote speaker at this event with the presentation “Brazilian IoT in a Nutshell”, on 23 May, 2013.
Box 4.5

BMA3 Program (3rd Biannual Meeting of ANSP) from 21 to 24/05/2013

“SMART NETWORKS - “Coming soon, to a laboratory near you!”

Presentations - 1st day - 21/05/2013 - morning session

- Activity and evolution of ANSP in 2013 - Luis Fernandez Lopez (FMUSP-NARA)
- SDN Strategies for Real Challenges of Cloud Computing - Marcelo Molinari (Brocade)
- FIBRE: from concept to reality - Michael Stanton (RNP)
- FIBRE Demonstration - view of the researcher - Cesar Marcondes - UFSCar
- Openflow: Supporting the Development of SDN in Brazil - Adriano Favaro (Datacom)
- Update on RNP - Eduardo Grizendi (RNP)

Presentations - 2nd day - 22/05/2013 - morning session

- Big Physics, BigData at LHC/CERN (video conference) - Rogério L. Iope (Unesp/ NCC)
- Cyber Threats - Adriano Cansian (Unesp/ São José do Rio Preto)
- IPv6 in the Universities and Academic Networks - Antonio Marcos Moreiras (NIC.br)
- OpenFlow at home - Valdinei Rodrigues dos Reis (Unesp/ São Paulo)
- Operation and maintenance in research networks - Bruno Hecht and Reginaldo da Silva (PSG Telecom)
- Project Status OpenFlow ANSP-Datacom: how to troubleshoot networks in São Paulo universities using OpenFlow - Cesar Marcondes (UFSCar)

Presentations - 3rd day - 23/05/2013 - morning session

- SDN and OpenFlow no CPqD - Marcos Rogério Salvador (CPqD)
- USP Cloud - Adriano Paterlini (USP)
- SDN, Openflow and Openstack - Fabio de Paula Souza (HP)
- Unesp and the new Internet Challenges - Carlos Coletti (Unesp/ São Paulo)
- Initiatives in Future Internet/DMZ SCIENCE SDN (and 100G) - Fernando Frota Redigolo (USP/ LARC)
- Level 3 Presentation - Geraldo Amorim (Level 3)

Courses and workshops - 21-22-23/05/2013 - afternoon session

- 21/05/2013 - Workshop SDN - Marcelo Molinari (Brocade)
- 22/05/2013 - Workshop - BigData - Wilian Rodrigues (Hitachi)
- 21-22-23/05/2013 - OpenFlow Marathon - Cesar Marcondes (UFSCar)
- 21-22/05/2013 - Course DWDM - Julio Magro (PSG-Padtec)

“IoT meets in Brazil” - IoT Brazil Competitiveness Forum and PROBE-IPT Project for the European Union 23-24/05/2013

- Opening Session - Keynote Speech - Brazilian IoT in a Nutshell - Prof. Luis Fernandez Lopez (FMUSP-NARA)
- Benchmark Framework & Benchmarks - Sophie Vallet Chevillard (inno Tsd - France)
- IoT Benchmarks and Roadmaps for South America - José Roberto A. Amazons (USP - Brazil)
- IBM’s Approach to Build a Smarter Planet: Pervasive Instrumentation & Analytics - Fernando Siqueira (Sales Team) & Luis von Glehn (Client Center Team) (IBM - Brazil)
- IoT Roadmaps - Pedro Maió - Uninova/FCT-UNl - Portugal
- Butler 2020, User Story - (Bertrand Copigneaux - inno Tsd - France)
- Big Data - Roberto Marcondes Cesar Junior - USP - Brazil
- Future Perspectives Brazil - Fernando Claro - SEAL - Brazil
- IoT International Forum - Alex Bassi - Alessandro Bassi Consulting - Italy
- IoT Council - Rob van Kranenburg - Waag Fellow - Netherlands
- Worldwide Standardization - John Falk - ETSI ERM TG34 - Chairman UK
- IoT Interop: RFID Case, Outcomes - Tania Regina Tronco - CPqD - Brazil
- Closing Panel
- IoT-A Explained
- IoT-A Models
- Discussion & Practice

All the presentations are available on the BMA site, in BMA3:
The fourth edition of the Biannual Meeting of ANSP - BMA4 - was held in São Paulo, at the USP School of Medicine (FMUSP), from 29 to 31 October 2013, on the guiding theme “SDN – Cloud-Network Convergence” and its implications for education and research institutions of the State of São Paulo.

Each new semester, the meeting’s coordinating body offers something new in line with the interests of the members of the ANSP Ecosystem. Thus, in BMA4, 19 lectures, 3 courses, 2 workshops and 1 demonstration were offered.

Two innovations marked BMA4: (1) the “Demonstration of 100G on the KyaTera Network” between USP and Unicamp, performed by ANSP and Padtec at USP’s Electronic Computer Center (CCE-USP), at the University City, Butantã campus, and (2) the organization of lectures in the “Thematic Symposia” format, when the presentations were divided into two thematic groups of interest to the community - “Security in Academic Networks” and “Academic Cloud - problems and solutions”.

BMA4 enjoyed the collaboration of 50 speakers, supervisors and instructors of activities, all representatives from academic institutions, government and companies linked to the research and development of products and technology in the area of networks.

The full program for BMA4 can be seen in Box 4.6.
Symposium 2: Academic Cloud - problems and solutions
- 3rd day - 31/10/2013 - morning session
Organizer: Luis Fernandez Lopez (FMUSP - NARA)
  • Architecture of communication and contingency in Cloud environment - Manoel Alberto Rodrigues Neto (Inovax)
  • Evolution of the USP cloud - Adriano Paterlini e Fábio Carneiro de Castro (STI-USP)
  • Software Defined converged Networking (SDcN): WAN Use Cases - Marcos Rogerio Salvador (CPqD)
  • SDN – An architecture for software programmable - Adalberto Lins (Brocade)
  • Evolution of virtualization in processors - Roberto N. Mattos (Intel)
  • Data Center Container - Mackenzie Case - José Augusto Pereira Brito (Mackenzie)
  • Level 3 Cloud Computing - Paulo Santos and Cristiano Tavani (Level 3)

Demonstration, Courses and workshops - 29-30-31/10/2013 – afternoon session
  • 29/10/2013 - Demonstration: 100G DWDM - Padtec - Alexandre Martins (LLC) and Sergio de Paula Moreno Timoteo (Padtec)
  • 29-30/10/2013 - Course 1: Introduction to OpenFlow protocol - Instructor: Cesar Marcondes (UFSCar)
  • 30-31/10/2013 - Course 2: Introduction to OpenStack - Instructor: Hermes Senger (UFSCar)
  • 30-31/10/2013 - Course 3: Management and Monitoring of DWDM networks - Instructor: Reginaldo da Silva (P5GTelecom)
  • 30/10/2013 - Workshop 1: Status of the OpenFlow project in São Paulo universities - Instructor: Cesar Marcondes (UFSCar)
  • 31/10/2013 - Workshop 2: SDN Thematic Project - Instructor: Nelson Fonseca (Unicamp)

All the presentations are available on the BMA site, in BMA4:
http://rsa.ansp.br/index.php?option=com_content&view=article&id=99&Itemid=748&lang=us

PROMOTING ITS ACTIVITIES

In order to ensure transparency of its actions, the promotion of its networking activities and professional training and greater rapprochement between the members of its ecosystem, in 2013 ANSP enhanced its existing media presence (websites and printed publications) by entering the realm of the new social media.

By the end of 2013, ANSP had at its disposal the traditional means of communication (telephone and email) and the new media, as seen in Box 4.7.

Box 4.7
ANSP means of communication

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSP site</td>
<td><a href="http://www.ansp.br">http://www.ansp.br</a></td>
</tr>
<tr>
<td>BMA site</td>
<td><a href="http://BMA.ansp.br">http://BMA.ansp.br</a></td>
</tr>
<tr>
<td>Fanpage</td>
<td><a href="http://www.facebook.com/redeansp">www.facebook.com/redeansp</a></td>
</tr>
<tr>
<td>Twitter</td>
<td>@redeansp</td>
</tr>
<tr>
<td>LinkedIn</td>
<td>ANSP - an Academic Network at São Paulo</td>
</tr>
<tr>
<td>YouTube Channel</td>
<td><a href="http://www.youtube.com/redeansp">http://www.youtube.com/redeansp</a></td>
</tr>
<tr>
<td>ANSP email</td>
<td><a href="mailto:noc@ansp.br">noc@ansp.br</a></td>
</tr>
<tr>
<td>BMA email</td>
<td><a href="mailto:rsa@ansp.br">rsa@ansp.br</a></td>
</tr>
<tr>
<td>Telephone</td>
<td>(11) 3061-8600</td>
</tr>
</tbody>
</table>
The ANSP Newsletter is published by NARA-USP (Center for Applications in Advanced Networks), School of Medicine, University of São Paulo), which is part of the ANSP Ecosystem, giving support to all its members.

Four newsletters are published each year with the purpose of conveying information about the activities of ANSP, developments in the research of the groups that make up its ecosystem and events that it organizes or supports.

In 2013, ANSP Newsletters introduced some new features. From number 7, a section called “Tech Corner” was created which publicizes experiences or topics related to the latest technological events. The first “Tech Corner” dealt with the implementation and significance of the “Padtec Demonstration of 100 Gbps in the KyaTera project’s USP-Unicamp link during BMA4”.

Also from issue 7, the ANSP Newsletters have been edited in two languages (Portuguese and English).
### Box 4.10

**Chronology of ANSP’s social media**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>Creation of FAPESP’s site with a page about ANSP</td>
</tr>
<tr>
<td>1997</td>
<td>Creation of the domain names registration page within the FAPESP site</td>
</tr>
<tr>
<td>1998</td>
<td>Creation of dedicated domain names registration site, still at <a href="http://www.registro.fapesp.br">www.registro.fapesp.br</a></td>
</tr>
<tr>
<td>2000</td>
<td>Separation of domain registration from FAPESP site with “registro.br” address</td>
</tr>
<tr>
<td>2002</td>
<td>Creation of ANSP’s own site</td>
</tr>
<tr>
<td>2005</td>
<td>Creation of joint NARA/ANSP site</td>
</tr>
<tr>
<td>2009</td>
<td>Creation of the ANSP YouTube channel</td>
</tr>
<tr>
<td>2012</td>
<td>Creation of BMA site</td>
</tr>
<tr>
<td>2013 - May</td>
<td>Creation of ANSP’s Fan Page (Facebook)</td>
</tr>
<tr>
<td></td>
<td>Creation of ANSP profile on Twitter</td>
</tr>
<tr>
<td>2013 - June</td>
<td>Redesign of BMA site</td>
</tr>
<tr>
<td></td>
<td>Creation of new exclusive ANSP site</td>
</tr>
<tr>
<td></td>
<td>Creation of ANSP profile on LinkedIn</td>
</tr>
<tr>
<td>2013 - July</td>
<td>Redesign of the ANSP YouTube channel</td>
</tr>
<tr>
<td>2013 - October</td>
<td>English version of ANSP site</td>
</tr>
<tr>
<td></td>
<td>English version of BMA site</td>
</tr>
</tbody>
</table>

### ANSP ON THE WEB

Observing Box 4.10, it can be seen that until the year 2000, ANSP and FAPESP shared the same web site (www.fapesp.br), which also hosted the domain registry (registro.br) page. From 2002, ANSP gained its own website (www.ansp.br) and, in 2005, ANSP teamed up with NARA (Center for Applications in Advanced Networks, then called the Support Center for the Academic Network). In 2013, ANSP created its own website, with a new graphic design offering fresh online content, and greater agility and interaction with members of the ANSP Ecosystem.

2012 was the catalyst for reshaping ANSP’s profile on the web. That year the first two biannual meetings occurred: BMA1, in May, and BMA2 in October-November. In September 2012, a website had already been created to promote the Biannual Meetings of ANSP (BMA.ansp.br) handling registrations, as well as the dissemination of information and the publication of material derived from the activities such as slides, photos and videos of the lectures, Courses and workshops. This new dynamic led, in June 2013, to the creation of the current ANSP site (www.ansp.br). Both sites (BMA and ANSP) are interconnected, that is, reciprocal links in their menu items point from one site to another.

Naturally, this new type of connection led to the redesign of the content of the ANSP site. The information for those interested in the ANSP project needed to be faster and up to date. Thus, some innovations were introduced such as the inclusion of a “News” section to report on the latest ANSP activities and other related events, with reliable links.

### Table 4.7

**ANSP site - Popular items**

<table>
<thead>
<tr>
<th>CREATED ON</th>
<th>ITEM</th>
<th>HITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-08-30 - 16:33</td>
<td>NIC.br creates a discussion list specifically for OpenFlow (news)</td>
<td>2399</td>
</tr>
<tr>
<td>2013-06-11 - 22:14</td>
<td>ANSP Project (institutional)</td>
<td>2381</td>
</tr>
<tr>
<td>2013-06-10 - 23:52</td>
<td>ANSP Ecosystem (white paper)</td>
<td>1988</td>
</tr>
<tr>
<td>2013-06-09 - 16:08</td>
<td>Support (provided by NARA)</td>
<td>1838</td>
</tr>
<tr>
<td>2013-07-05 - 20:04</td>
<td>2013 IEEE Software Defined Networks for Future Networks and Services (news)</td>
<td>1246</td>
</tr>
</tbody>
</table>

The main purpose of the Fan Page and Twitter is to promote ANSP’s activities in a broad and flexible way. So not only do they provide timely information, for example, “Warnings of network maintenance”, but they also point users to other social and print media, (newsletters, websites and YouTube). Table 4.9 provides a sample of the dynamic connection between ANSP media.

Table 4.8

<table>
<thead>
<tr>
<th>CREATED ON</th>
<th>ITEM</th>
<th>HITS (ANSP site)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-08-30</td>
<td>NIC.br creates a discussion list specifically for OpenFlow</td>
<td>2399</td>
</tr>
<tr>
<td>2013-07-05</td>
<td>2013 IEEE Software Defined Networks for Future Networks and Services</td>
<td>1246</td>
</tr>
<tr>
<td>2013-12-09</td>
<td>Launch of ANSP Newsletter nº 7</td>
<td>1246</td>
</tr>
<tr>
<td>2013-10-29</td>
<td>Demonstration of 100 G on the KyaTera network is carried out by ANSP and Padtec during BMA4</td>
<td>1226</td>
</tr>
<tr>
<td>2013-09-05</td>
<td>Upgrade of the academic network between Brazil and USA will expand innovation and international collaboration</td>
<td>1031</td>
</tr>
</tbody>
</table>


What has proved to be most effective and interesting has been the interaction between all the ANSP media, the aim of which is to keep members of the community permanently connected and able to participate in the process of network communication.

Thus, 2013 saw the creation of ANSP’s Fan Page / Facebook (May), its Twitter (May) and Linkedin (June) profiles, in addition to the updating of the ANSP YouTube channel (July).

The increased flow of content inserted in the ANSP media, which work in sync, the precise choice of subjects of interest to the community and the extreme care with which it is released has led to an improvement in the quality of the process of communication between all members of the ANSP Ecosystem.

![Figure 4.5 - Post on ANSP Fan Page on 19/12/2013](http://www.facebook.com/redeansp)


![Figure 4.6 - Tag cloud of the keywords of the top 10 most accessed videos on the ANSP YouTube Channel](http://www.youtube.com/redeansp)

### Table 4.9

**Comparison between posts on Fan Page and Twitter and hits on ANSP’s sites and YouTube channel**

<table>
<thead>
<tr>
<th>MONTH</th>
<th>FACEBOOK AND TWITTER POSTINGS</th>
<th>SITE HITS (ANSP and BMA) AND ON THE YOUTUBE CHANNEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>Post on Fan Page pointing to the ANSP YouTube channel: 04/07/2013 - See the videos of BMA3 on our YouTube channel: <a href="http://youtube.com/redeansp">http://youtube.com/redeansp</a></td>
<td>119 views (*) (**)(*<a href="http://www.youtube.com/redeansp">http://www.youtube.com/redeansp</a>)</td>
</tr>
<tr>
<td>October</td>
<td>Posts on Twitter and Fan Page pointing to the BMA site: 04/10/2013 - Open now Registration for the BMA4! (October 2013) Register at: <a href="http://bit.ly/1aSFp4X">http://bit.ly/1aSFp4X</a> 11/10/2013 - More activities confirmed for BMA4. See the BMA website at: <a href="http://bit.ly/1v6i0jN">http://bit.ly/1v6i0jN</a> 16/10/2013 - Countdown 13 days to BMA4! See updated program and register: <a href="https://BMA.ansp.br/">https://BMA.ansp.br/</a> 18/10/2013 - Enrolment for Courses of BMA4! To sign up, log in and visit the meeting site: <a href="http://rsa.ansp.br/">http://rsa.ansp.br/</a> 21/10/2013 - Just 8 days till the beginning of BMA4! Join us at the meeting and Courses: <a href="http://rsa.ansp.br/">http://rsa.ansp.br/</a> 23/10/2013 - Just 6 days to the start of the 4th Biannual meeting of ANSP - BMA4! Follow the latest updates on the program and do not forget your registration for the meeting and Courses. <a href="http://rsa.ansp.br/">http://rsa.ansp.br/</a> 28/10/2013 - BMA4 starts tomorrow! See the summary of each activity by clicking on the items of the program: <a href="http://bit.ly/1eZtXXr">http://bit.ly/1eZtXXr</a> 29/10/2013 - BMA4! View the slides from the first day the items in the Program items at: <a href="http://bit.ly/1eZtXXr">http://bit.ly/1eZtXXr</a></td>
<td>11,806 views* (<a href="http://rsa.ansp.br">http://rsa.ansp.br</a>)</td>
</tr>
<tr>
<td>December</td>
<td>Post on the Fan Page and on Twitter about printed publication available on the ANSP site: 10/12/2013 - Newsletter No. 7 now available on the ANSP and the BMA sites, which, in addition to recording the activities of BMA4, and announcing RSA5, carries information on Courses, workshops and other events held by the ANSP in recent years. Check out <a href="http://bit.ly/1kv0Bbz">http://bit.ly/1kv0Bbz</a> 16/12/2013 - ANSPGridCA - The ANSP network, in collaboration with the NCC-UNESP, officially deploys the service of issuing digital certificates to the scientific area. Read more: <a href="http://bit.ly/1vWH3sF">http://bit.ly/1vWH3sF</a> 19/12/2013 - The ANSP Office will be closed from 21.12.13 to 05.01.14, due to end of year recess of the USP School of Medicine. In case of emergency, please contact the staff on duty by Email: <a href="mailto:noc@ansp.br">noc@ansp.br</a> (technical issues/support) or <a href="mailto:stefanie@ansp.br">stefanie@ansp.br</a> (financial/administrative/matters) For more information: <a href="http://www.ansp.br/index.php/br/suporte">http://www.ansp.br/index.php/br/suporte</a></td>
<td>2,134 views (*) (<a href="http://www.ansp.br">http://www.ansp.br</a>)</td>
</tr>
</tbody>
</table>

Accessed on: 19.02.2014 (Sample: posts that led to most hits in 5 months in 2013 with redirections to ANSP websites)

(*) The views were calculated per month, always counting from the date of the posting on Fan Page/Twitter. The number represents the total number of hits and not single hits.

(**) July was the first month of the new ANSP YouTube channel. There were only videos from BMA3 online.
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From left to right, behind: Manuel, Lopez, Mauricio, Antonio, Amanda, Stefanie and Jorge Marcos. In front: Auxiliadora, Marco, Anna Paula and Rogério.
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