RedCLARA Compendium of Latin American National Research and Education Networks

2010

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«The European Union is constituted by 27 member states which have decided to progressively join their practical knowledge, their resources and their destinies. Over an expansion period of 50 years, together they have built a stability, democracy and sustainable development zone, and have also preserved cultural diversity, tolerance and individual liberties. The European Union is committed to sharing its achievements and values with countries and peoples which are beyond its borders».

The European Commission is the executive body of the European Union.
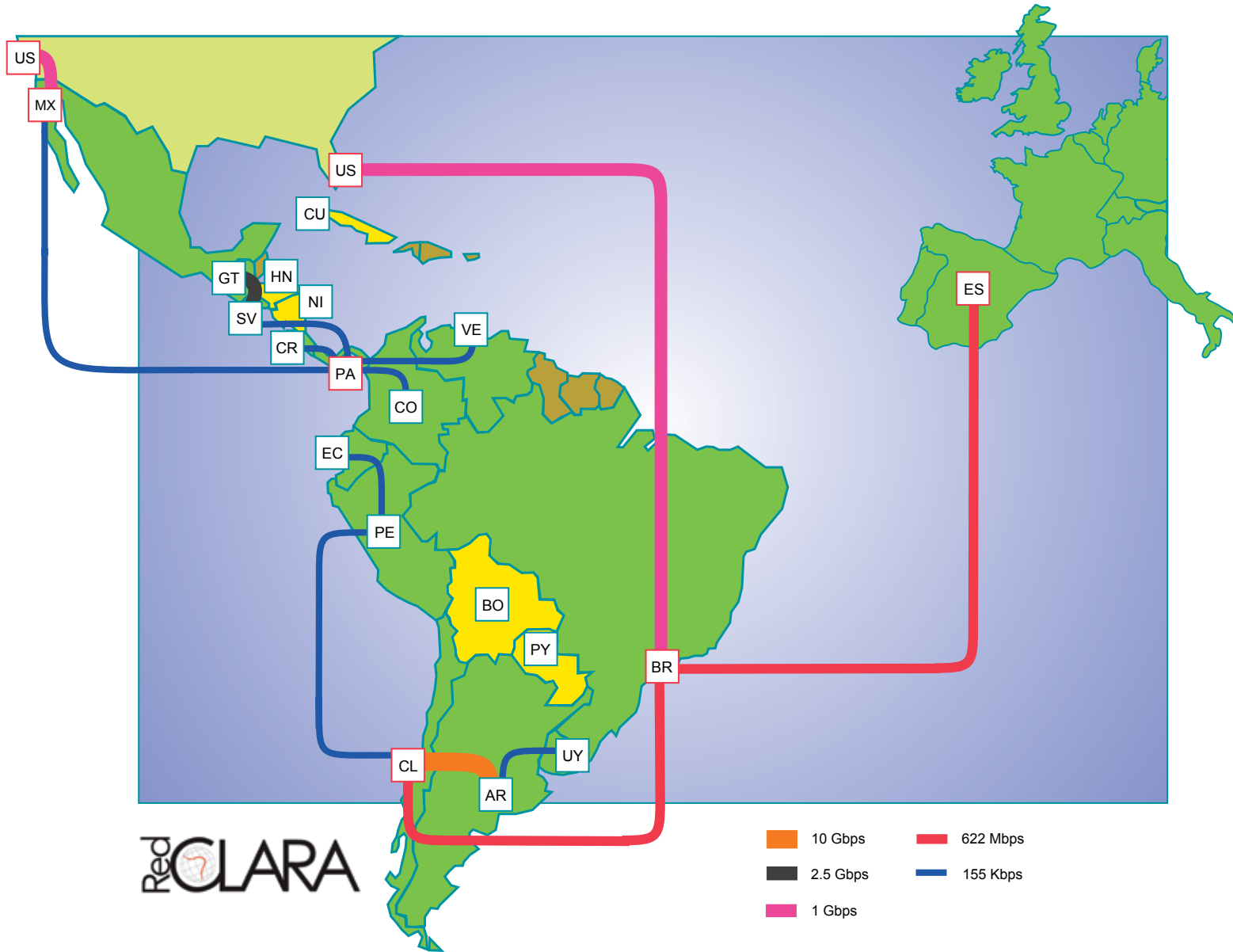
RedCLARA Compendium of Latin American National Research and Education Networks

2010

▬ 10 Gbps		▬ 622 Mbps	
▬ 2.5 Gbps		▬ 155 Kbps	
▬ 1 Gbps			

Contents

Introduction

After the publication of the first **Compendium of Latin American National Research and Education Networks, in February 2010**, which compiled information related to 2009 on the networks in the region connected to RedCLARA, what was a dream (its use as a consultation and reference material) became a reality. That first edition made it for possible for Latin American academic networks to get a deeper insight into the situation of their peers, and also helped the rest of the world to finally have access to information which can be compared to and contrasted with the reality of networks in Europe, North America and other latitudes.

In order to elaborate the 2010 Compendium, an online system to facilitate the completion of the questionnaire by the leaders of each National Research and Education Network (NREN) across the continental space covered by RedCLARA in its tracing. The questionnaire was open to be answered from November 15th, 2010 until February 3rd, 2011.

The goals were to deal in depth with subjects that were merely tangentially addressed in the first edition, open up the range of data to represent a more efficient sample of the reality of each of the networks that make up RedCLARA and the ALICE2 project.

What is the final result? A comprehensive study on the regional reality which, although wishing to enter the world of scientific and technological development with the strength of countries in Europe or North America, features realities and faces challenges which are diametrically opposed to them.

The results of the questionnaires have been shown in full in the study; the trends have been summarised in the chapter called "Key factor summary".

All the questionnaires have been published just as they were answered in:
http://200.0.206.38/prado/compendium/compendium/LoginPageV2.html.

We expect this second edition of the **Compendium of Latin American National Research and Education Networks** is useful for you and, certainly, we are open to receiving your suggestions, contributions and critiques.

María José López Pourailly
Public Relations and Communications Manager
RedCLARA

Key findings summary

Unlike the 2009 edition of the **RedCLARA Compendium of Latin American National Research and Education Networks,** which only considered the NREN (National Research and Education Networks) from those countries in the region which are members of the ALICE2 project, for the elaboration of the present edition we invited the Paraguayan network to participate, as in 2010 it had the chance to be connected to RedCLARA for a period long enough to test its benefits and some of the applications operated over it.

Twelve out of the 14 Latin American NREN that are part of ALICE2 answered the questionnaire used for the elaboration of the present Compendium, which features a sample of thirteen national networks including Paraguay's participation. Bolivia and Panama refrained from sharing the information requested on the questionnaire, which was implemented online and referred to the Directors, Technical Representatives and Communications and Public Relations Representatives from each network.

Legal structure

69% of the Latin American NRENs which participated in the present study are institutions that have been granted an independent legal status. Three of them, 23%, declare to be part of a larger organisation and do not have a separate legal status from them; two of them indicate that such larger entity is a government agency. The remaining 8% corresponds to an NREN which refrained from answering.

Organisational structure

The region's networks feature vertical hierarchical structures where their members' representativeness is ensured by a General Assembly which elects a Directing Board; the figure of Executive Director, supported directly by the Assembly's confidence, is –in general terms- the highest authority for the members of the work team constituted by the operational staff of each NREN.

Changes

Just a few scarce expansions in the data transport capacities and organisational changes are mentioned.

Connection policies and connectivity level

A small step forward in terms of connection policies is seem in relation to the information collected in the 2009 Compendium, where 46% of the NRENs in the region stated they had such policies; in the period analysed in the present document, this average increased and hit a 54%. Following the comparison with 2009, in that year six NRENs declared to have a policy for acceptable use, two more than the four which declared to have this type of regulation in 2010.

The institutions connected to the Latin American NRENs are in the field of universities, research centres and institutes of further education; there is no connection for primary schools and only one network connects secondary schools. The number of connections for national libraries, museums and/or archives, non-university hospitals and government agencies, features a significant increase in relation to 2009.

The most frequent typical connectivity level provided by NREN to their users/customers is the one that ranges from 10 Mbps to less than 100 Mbps (43%); less than 10 Mbps of typical connection reaches 29% of universities, while 21% feature an average level of less than 1 Gbps, and only a privileged 7% features a typical connection level ranging from 1 Gbps to less than 10 Gbps.

PoPs, network and connection services

A slight variation in relation to 2009 was seen in the number of PoPs, circuits and sites managed by the NREN. Argentina added four new PoP, Chile did something similar but with optical PoP with Layer 3 routing, Mexico declared an exponential increase of 21 PoPs, and Uruguay indicated they added two new points of presence to their network.

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As regards the installation of dark fibre in at least one part of the networks' backbone, only Chile and Paraguay featured a slight step forward along these lines.

Traffic

In relation to the data collected for the 2009 Compendium, the NREN do not show a significant variation as regards congestion, and it remains impossible to indentify a tendency given the type of information provided and the disparity between the networks they operate. Significant congestion can be seen in Uruguay and Venezuela, in the access network and the external connection respectively.

Most networks indicate they measure IP traffic; half of them transport Ethernet and VLAN traffic, although they do not measure it. SDH traffic is transported only by two NRENs.

In relation to 2009, in 2010 the request for IPv4 prefixes was reduced to only 10, and there were 36 requests for IPv6 prefixes. Ten NRENs state their networks provide IPv6 and support native production services for the sixth version of the Internet Protocol.

Other services

70% of NREN has a network operation centre (NOC) service and all of them attend all their users.

Just as in 2009, only Brazil, Chile and Colombia declare to offer Premium QoS in their networks, and this represents a mere 23%. The IP Best Effort is offered by 54% of the NREN in the Compendium and 38% consider it as part of their future plans.

54% of the NREN offer in an autonomous way security incident responses to their user community. 23% declare to feature this service in their future plans; 15% of the sample discards it.

Only 23% of the thirteen networks that answered the questionnaire on which the present Compendium was based have a security policy.

Brazil and Uruguay indicate they provide Authorisation and Authentication infrastructures (AAI) in an autonomous way; Colombia indicates it outsources this service from another organisation.

Only Brazil and Chile have a Certification Authority (CA); the first issues grid and AAI certificates and the second only grid certificates. Only Chile's NREN is part of TAGPMA, the region's PMA (Policy Management Authority).

76% of the NREN declare to have included the computing grid service in their future plans.

As regards housing, storage, hosting and content delivery services, in general there are very few networks which are not interested in providing them and those which already have them as part of their range of offers for their customers. The majority are the ones that expect to be able to deploy them in the future.

In terms of interaction with the user, almost all NREN offer at least one type of help in terms of direct support for user groups, organisation of national videoconferences and/or training courses; the solution of doubts and problems is mostly conducted through electronic mail.

Funding and staffing

All the NREN –except that of Ecuador- work out their budget on a calendar year basis. The information collected regarding the annual funds shows scant budget situations, which is matched by the level of participation of the region's governments in such funding; the direness of this situation allows only three networks to develop multi-annual budget plans, which implies some certainty about their future sustainability.

Most NREN identified their users and customers as their only source of funding, and three of them identified them as major partial sources. Only Costa Rica features the government (or public agencies) as its sole source of funding. The funding from international institutions represents a marginal contribution.

As regards the modality for charging their members/users, it is not possible to identify a tendency among the NREN.

Except in the case of Brazil, Chile and Venezuela, which have a significant amount of staff working directly in the NREN activities, the number of people who actually constitute the staff of the Latin American networks is very low, reaching even zero in the cases where the networks are sustained thanks to the volunteer work of some academics.

1. Basic information

1.1 NRENs that answered the questionnaire

In order to elaborate the **2010 RedCLARA Compendium of Latin American National Research and Education Networks** we invited to participate the NREN from those countries in the region which are members of the ALICE2 project, all of them currently connected to RedCLARA, plus the Paraguayan network, ARANDU, which was connected experimentally to RedCLARA from July 30th to September 30th 2010, thanks to the support from the Paraguayan Council for Science and Technology, the Mercosur Digital project and the agreement signed between ARANDU, the Paraguayan Communications Company (COPACO), the Brazilian academic network – RNP, and RedCLARA.

14 Latin American NREN are part of ALICE2, 12 of them answered the questionnaire on which the contents of the 2010 Compendium were developed; including Paraguay's participation, the Compendium brings together a total of 13 countries, 13 networks under analysis"[1].

In most tables and graphs, in order to identify each NREN we used the acronyms that abbreviate their names; furthermore, the order in which each NREN is presented in these tables follows the alphabetical order of the countries that were invited to answer the survey.

Table 1.1.1: NRENs that answered the questionnaire

Country	NREN	Website
Argentina	Innova |Red	www.innova-red.net
Brazil	RNP	www.rnp.br
Chile	REUNA	www.reuna.cl
Colombia	RENATA	www.renata.edu.co
Costa Rica	CONARE	www.redconare.ac.cr
Ecuador	CEDIA	www.cedia.org.ec
El Salvador	RAICES	www.raices.org.sv
Guatemala	RAGIE	www.ragie.org.gt
Mexico	CUDI	www.cudi.edu.mx
Paraguay	ARANDU	
Peru	RAAP	www.raap.pe
Uruguay	RAU	www.rau.edu.uy
Venezuela	CENIT	www.cenit.gob.ve

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1   In the first edition of the Compendium (2009) we featured the participation of Paraguay, whose national network refrained from participating in the 2010 study; on the contrary, Peru and Venezuela had not participated in the first Compendium, but joined the effort done for the present edition.

Table 1.1.2: Basic information about the Latin American NRENs in the Compendium

Country	Full name of the NREN in its original language	Full name of the NREN in English	Abbreviation	Website	Postal address	Telephone	Generic email
Argentina	Innova |Red	Innova |Red	I|R	www.innova-red.net	Esmeralda 339 - 2do Cuerpo y 3er piso, Buenos Aires.	(+54) 011 432 284 88	+info@innova-red.net masinfo@innova-red.net
Brazil	Rede Nacional de Ensino Pesquisa	National Education and Research Network	RNP	www.rnp.br	Rua Lauro Muller 116 sala 1103 22.290-906 Rio de Janeiro-RJ.	(+55) 21 210 296 60	comunicacao@rnp.br
Chile	Red Universitaria Nacional	National University Network	REUNA	www.reuna.cl	Canadá 239, Providencia, Santiago.	(+56) 2 337 03 40	secdirec@reuna.cl
Colombia	Red Nacional Académica de Tecnología Avanzada	National Academic Network for Advanced Technology	RENATA	www.renata.edu.co	Cr7B BIS No 132-28, Bogotá.	(+57) 1 625 84 80	migiraldo@renata.edu.co
Costa Rica	Consejo Nacional de Rectores	National Council of University Vice-Chancellors.	CONARE	www.redconare.ac.cr	CONARE, Edificio "Dr. Franklin Chang Díaz". de la Embajada de los Estados Unidos de América, 1,3 kms al Norte. Pavas, San José.	(+506) 2 519 57 99	admin@redconare.ac.cr
Ecuador	Consorcio Ecuatoriano para el Desarrollo de Internet Avanzado	Ecuadorian Consortium for the Development of Advanced Internet	CEDIA	www.cedia.org.ec	Av. 12 de Abril,y Agustín Cueva, Ciudadela Universitaria, Edf.. Laboratórios Tecnológicos 3er Piso, Cuenca.	(+593) 7 405 10 00 ext. 4220	info@cedia.org.ec
El Salvador	Red Avanzada de Investigación, Ciencia y Educación Salvadoreña	Salvadorian Advanced Research, Science and Education Network	RAICES	www.raices.org.sv	Universidad Centroamericana José Simeón Cañas, Dirección de Informática, Bulevar Los Próceres, Antiguo Cuscatlán, La Libertad, Sann Salvador.	(+503) 2 210 66 36	ribarra@di.uca.edu.sv
Guatemala	Red Avanzada Guatemalteca para la Investigación y Educación	Guatemalan Advanced Network for Research and Education	RAGIE	www.ragie.org.gt	11 Avenida 32-35, zona 5, Ciudad de Guatemala.	(+502) 2 362 06 80	info@ragie.org.gt

Mexico	Corporación Universitaria para el Desarrollo de Internet A.C.	University Corporation for Internet Development A.C.	CUDI	www.cudi.edu.mx	Parral # 32 , Colonia Condesa, Mexico D.F.	(+52) 55 521 130 60	cudi@cudi.edu.mx
Paraguay	Red Avanzada para la Educación, Investigación e Innovación	Advanced Network for Education, Research and Innovation	ARANDU				
Peru	Red Académica Peruana	Peruvian Academic Network	RAAP	www.raap.pe	Av. San Luis 1771 - San Borja, Lima.	(+51) 1 270 53 50	contacto@raap.pe
Uruguay	Red Académica Uruguaya	Uruguayan Academic Network	RAU	www.rau.edu.uy	Colonia 2066, Montevideo.	(+598) 2 408 39 01	noc@seciu.edu.uy
Venezuela	Fundación Centro Nacional de Innovación Tecnológica	National Technological Innovation Centre Foundation	CENIT	www.cenit.gob.ve/	Complejo Tecnológico "Simón Rodríguez". Base Aérea "Generalísimo Francisco de Miranda" Sector Noreste, La Carlota, Caracas.	(+58) 212 555 81 00	atencion@cenit.gob.ve

1.2   Legal form of the NRENs

The Latin American NRENs have various legal forms. However, nine out of the thirteen in the Compendium, a big majority, follows a common pattern: they are institutions with a separate legal status in their own right. Three networks declare to be part of a larger organization and do not have an independent legal status; two of these NRENs identify this larger entity as a government agency (Innova|Red – Argentina and CENIT – Venezuela). This relationship with their country's government can be seen, although indirectly, in three national networks. Only one NREN declares to depend directly on a higher education institution.

Table 1.2.1: Legal form of the NRENs

Country	NREN	Legal Form	Relationship with the Government	Comments / Organization of which depends
Argentina	Innova|Red	It is not a separate legal entity, but it is part of a larger organisation	Government agency or part of a ministry	Fundación Innova-T.
Brazil	RNP	Separate legal entity in its own right	The Government appoints at least half of the members of the Governing body	
Chile	REUNA	Separate legal entity in its own right	No formal relationship	
Colombia	RENATA	Separate legal entity in its own right	Other	The Ministry of Information and Communication Technologies (MinTIC), the Ministry of National Education (MEN) and the Science, Technology and Innovation Administration Department Colciencias, and 3 State institutions, are part of the Corporation's 11 member institutions.
Costa Rica	CONARE	Separate legal entity in its own right	Indirect relationship	
Ecuador	CEDIA	Separate legal entity in its own right	Other	Members are Universities, mostly state-owned, and it features strategic members from the government. Also the Ministry of Science and Technology is a member of CEDIA.
El Salvador	RAICES	Separate legal entity in its own right	No formal relationship	
Guatemala	RAGIE	Separate legal entity in its own right	Other	Through the National Science and Technology Council, which is a secretariat dependent on the vice-presidency of the Republic of Guatemala, RAGIE has received recognition as the organisation that leads the country's effort to establish an academic and research network. There are no formal links, however.
Mexico	CUDI	Separate legal entity in its own right	No formal relationship	
Paraguay	ARANDU			
Peru	RAAP	Separate legal entity in its own right	No formal relationship	
Uruguay	RAU	No es persona jurídica separada, pero es parte de una organización mayor	Other	It depends on the Universidad de la República. Its authorities do not depend on the Government; It has parliamentary budget approved by the executive power.
Venezuela	CENIT	No es persona jurídica separada, pero es parte de una organización mayor	Government agency or part of a ministry	CENIT.

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1.3   History of the NRENs

As regards the history of their creation and foundation, the development of Latin American academic networks is the result of a process which, in those networks created in the 1980s and 1990s (literally in the past century), was influenced by the communicational and technological revolution that some visionary researchers discovered in the road opened up by ARPANET in the USA and DFN, the German NREN, in 1984; in those NREN created at the beginning of the present century, the drive for change was the establishment of RedCLARA and the strong influence of the ALICE project.

In the research conducted to elaborate this Compendium, we asked each NREN to identify three dates:

- year in which the first research network operations started,
- year in which research networking was started as a dedicated organisational unit, and year in which the NREN was founded in its current form.

Table 1.3.1: History of the NRENs

Country	NREN	Beginning of network's operations	Beginning of the network as a dedicated organisational unit	Year in which the network was founded in its current form	URL to see the organisation's history
Argentina	Innova|Red	1990 (under the name of Retina)	1990	2006 (as Innova|Red)	http://www.innova-red.net/node/14
Brazil	RNP	1992	1999	2001	http://www.rnp.br/rnp/historico.html
Chile	REUNA	1986	1991	1991	http://reuna.cl/index.php/es/ique-es-reuna
Colombia	RENATA	2006	2006	2007	http://www.renata.edu.co/index.php/quienes-somos-identidad-y-objetivos-de-renata.html?showall=1
Costa Rica	CONARE	2009	2009	2009	http://www.redconare.ac.cr
Ecuador	CEDIA	2007	2009	2003	http://www.cedia.org.ec/index.php?option=com_content&task=view&id=17&Itemid=1
El Salvador	RAICES	2005	2005	2005	http://www.raices.org.sv/iquienes-somos/historia.html
Guatemala	RAGIE	1995	2005	2004	
Mexico	CUDI	1999	1999	1999	http://www.cudi.edu.mx/antecedentes/antece00.html
Paraguay	ARANDU				
Peru	RAAP	2005	2009	2003	http://www.raap.pe/site/historia.php
Uruguay	RAU	1991	1995	1991	http://www.rau.edu.uy/rau/historia.htm
Venezuela	CENIT	1993	1993	1994	http://portal.cenit.gob.ve/cenitcms/noticia_3_1.html

1.4   Organisational structure of the NREN

A key aspect of the functioning of each NREN is related to the ways that have been developed to govern themselves and operate. Although the organisational structure was addressed by the questionnaire developed for the elaboration of the 2009 Compendium, the fact is that very few networks answered this at that time, as opposed to what happened with the survey conducted to develop the present analysis.

In general terms, the networks in the region have vertical hierarchical structures, where their members' representativeness is ensured by a General Assembly that elects a Directing Board; the figure of Executive Director, supported directly by the Assembly's confidence, is –in general terms- the highest authority for the members of the work team constituted by the operational staff of each NREN.

Table 1.4.1 shows the answers given by the NREN which took part in the present study.

Table 1.3.1: Organisational structure of the NREN

Country	NREN	Governing structure	URL to see the organisation's governing structure
Argentina	Innova|Red		http://www.innova-red.net/node/16
Brazil	RNP		http://www.rnp.br/asrnp/
Chile	REUNA	Members of the Corporation – Directing Board (6 directors elected by the members in the Assembly) – Executive Director (carries out the tasks given by the Directing Board).	http://reuna.cl/index.php/es/ique-es-reuna/organizacion/organigrama
Colombia	RENATA	The Government and the Corporation's Administration are in charge of the Members General Assembly, the Directing Council and Executive Director.	http://www.renata.edu.co/index.php/quienes-somos-identidad-y-objetivos-de-renata.html?showall=1
Costa Rica	CONARE	The network has two sides: the CENAT (National Centre for High Technology) attached to CONARE for the area of scientific development, promotion and dissemination) and the CETIC (Information and Communication Technologies Centre), also attached to CONARE, which is in charge of the network's operational management. The Commission of Research Vice-Chancellors is on top of these two bodies, and is constituted by the heads of research development in CONARE's member universities. The applications area is articulated through the CENAT and the infrastructure and connectivity are structured through the CETIC.	
Ecuador	CEDIA	President, Executive Director, General Coordinator, Technical Coordinator, Financial Coordinator, Website and Communications, Statistics Engineering and Quality Control (The highest body will always be the Members General Assembly).	http://www.cedia.org.ec/index.php?option=com_content&task=view&id=17&Itemid=1
El Salvador	RAICES	7 members, 5 members in the Directing Board (although the 7 members attend all meetings under equal conditions).	
Guatemala	RAGIE	Our statutes indicate that any institution where research and/or education are the main component of its function can be a member of RAGIE. At present we have only have educational institutions (5), but the door is open to other types of organisation. The governing body is the Directing Council, constituted by five members elected by the General Assembly. Since the majority of RAGIE members are currently part of it decision-making is fairly straightforward. The highest authority is the General Assembly.	
Mexico	CUDI		http://www.cudi.edu.mx/organizacion/index.html
Paraguay	ARANDU		
Peru	RAAP	Highest governing body: Associates General Assembly. Executive body: Directing Board (constituted by a President, Vice-President, secretary and 2 members). Additionally, there is an Executive Director.	http://www.raap.pe/site/historia.php
Uruguay	RAU	The direction is responsibility of the central Service of the Universidad de la República and decisions are made in the consultation committee constituted by its members.	
Venezuela	CENIT	It has a Directing Council, a Presidency and an Executive Direction, as well as substantive and functional directions.	http://portal.cenit.gob.ve/cenitcms/noticia_4_1.html

1.5   Major changes in the NREN

NRENs were asked to provide a brief description of the major changes that have taken place within them during 2010 or those expected for 2011. The following table contains the answers given by the networks. It is important to point out that the fact that some NRENs have not answered does not necessarily mean there have not been any changes in them.

Only two NREN mentioned the expansion of data transport capacities as their major landmarks for the period analysed.

Table 1.5.1: Major changes in the NRENs

Country	NREN	Major changes
Argentina	Innova|Red	
Brazil	RNP	The full report on what RNP did in 2010 is published in: http://www.rnp.br/rnp/relatorio_gestao.html.
Chile	REUNA	In 2010 REUNA has worked hard on the updating of its network, GREUNA (their network's 3rd version). The backbone's physical layer is constituted by capacity transported over the DWDM / SDH network of a telecommunications provider, and by a 1xODU-1 (2,5 Gbps) through a OTU-2 lambda (10 Gbps) of the same telecommunications provider. The OTU-2 lambda has been obtained through the EVALSO project. (http://www.evalso.eu).
Colombia	RENATA	Until 2010 there was a post called Administrative Financial Coordinator which was replaced by the post of Administrative Financial Deputy Director.
Costa Rica	CONARE	
Ecuador	CEDIA	
El Salvador	RAICES	
Guatemala	RAGIE	Our link to RedCLARA was changed from a STM-1 with the Americas NAP to a 2,5 Gbps link towards El Salvador, which is in turn linked towards Panama with a STM-1 link. This is the beginning of Central American backbone base from Mexico to Panama. We have experienced the withdrawal of two members and the incorporation of a new one. This is a problem since the members fund 100% of the costs.
Mexico	CUDI	
Paraguay	ARANDU	
Peru	RAAP	At the end of February 2010, we elected the new Directing Council presided by the National Agricultural University La Molina. We also organised a Workshop aimed at the elaboration of the RAAP Strategic Plan.
Uruguay	RAU	
Venezuela	CENIT	Activation of the metroethernet circuits to access REACCIUN for some member universities. Activation of IPv6 and Multicast sessions for some national universities. Removal of dialled access (because it is outdated and has a high cost). Definition of Service Catalogues for standardisation, fees definition, promotion and dissemination.

2. Users / Customers

Identifying the existence of connection and acceptable network use policies in the NRENs, as well as the types of institutions they can actually connect to their backbones is useful to better understand the guidelines and actions which sustain the processes that each of them conducts within its country; the 2.2 and 2.1 sections look into these key issues in order to identify the target audience of the services deployed by the NREN over their backbones (main subject of chapter 3). Section 2.3 looks at the connectivity levels provided by the NREN to the institutions that are part of them.

2.1   Overview

In terms of connection policies, a slight progress is seen as compared to the information collected for the first edition of the Compendium (2009), where they appeared to exist in 46% of the NREN in the region; in 2010 this figure increased up to 54% (see Table 2.2.1). Following the comparison with 2009, in that year six NRENs declared to have a policy for acceptable use, two more than the four which declared to have this type of regulation in 2010.

Most of the institutions connected to the Latin American NREN are in the field of universities, research centres and further education institutes; none of them currently connects primary schools and only one of them declares to have a few secondary schools connected. The number of connections for national libraries, museums and/or archives and government agencies shows a substantial increase in relation to 2009 (see Table 2.2.2).

The **connectivity level provided by the NRENs to each type of institution** they connect is analysed in section 2.3, which shows the lower, upper and typical levels for their main connections.

2.2   Connection policies

In 2009 46% of the NRENs declared to have a policy for connection to the national backbone; in 2010 the same 46% represents the networks that do not have this type of policies, as the number of those networks which do amounts to a promising 54%. A little bit less promising is the meagre 31% represented by the four NREN that have a policy for the network's acceptable use (see Table 2.2.1), the same four that indicated they have not modified such policy in the last year.

Graph 2.2.1: Connection policies

Does not have a
connection policy
46%

Has a
connection policy
54%
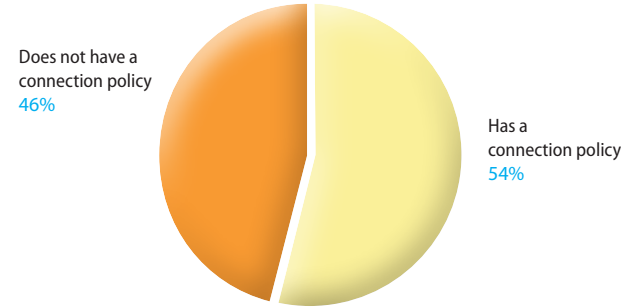
Graph 2.2.2: Acceptable use policies

No answer
8%

Has an aceptable
use policy
31%

Does not have
an acceptable
use policy
61%

27
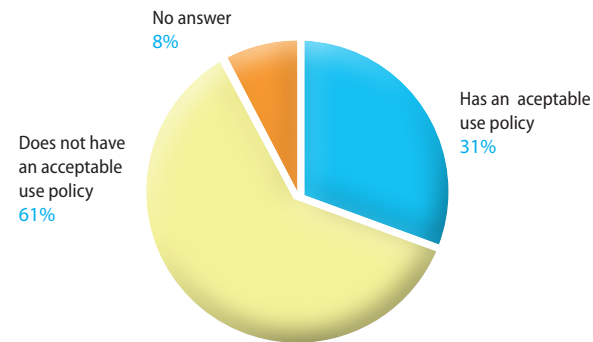
As regards the institutions that each NREN can connect, all of them allow universities in this category; only CONARE (Costa Rica) does not accept research institutes and half of them allow connectivity for further education institutes. Five national networks allow secondary schools to get connected to their backbones, but only RAAP (Peru) indicates it has (3) institutions of this type currently connected; the same five networks (RAGIE – Guatemala, CUDI – Mexico, ARANDU – Paraguay, RAAP y RAU – Uruguay), allow the connection of primary schools, but they do not declare to have active links of this kind. Only REUNA (Chile), CONARE and RAICES (El Salvador) exclude from their map possible connections for national libraries, museums and archives; eight of the NRENs that answered the questionnaire indicate they accept the connection to their networks of non-university hospitals and government agencies, but only RENATA (Colombia) and CUDI have entities of this kind connected to their backbones.

These tendencies are shown in Table 2.2.2, which also features the figures declared by each NREN like the total number of institutions connected to them. The entities connected to the NREN through a Commercial Internet provider have not been taken into account.

Table 2.2.1: Connection and aceptable use policies

Country	NREN	Connection policy	Connection policy URL	Acceptable use policy	Acceptable use policy online URL
Argentina	Innova|Red	√		_	
Brazil	RNP	√	http://www.rnp.br/_arquivo/conexao/doc0108d.pdf	√	http://www.rnp.br/_arquivo/conexao/doc0108d.pdf
Chile	REUNA	√		_	
Colombia	RENATA	√	http://www.renata.edu.co/index.php/instituciones-conectadas-a-renata.html?start=1 http://www.renata.edu.co/index.php/instituciones-conectadas-a-renata.html?start=2	NC	
Costa Rica	CONARE	_		_	
Ecuador	CEDIA	√	www.cedia.org.ec	√	
El Salvador	RAICES	_		_	
Guatemala	RAGIE	_		√	
Mexico	CUDI	√	http://www.cudi.edu.mx/index_redes.html	√	http://rfc.cudi.edu.mx/
Paraguay	ARANDU	_		_	
Peru	RAAP	_		_	
Uruguay	RAU	√	http://www.rau.edu.uy/rau/objetivos.htm	_	
Venezuela	CENIT	_		_	

Table symbol key

√ Exists

- Does not exist

NC No answer

Table 2.2.2: Categories and number of institutions that can be connected to the NRENs

Country	NREN	Universities	Further education institutes	Research institutes	Secondary schools	Primary schools	National libraries, museums and/or archives	Non-university hospitals	Government agencies (national, regional, local)
Argentina	Innova|Red	90	5	13	-	-	1	√	4
Brazil	RNP	650	√	10	-	-	10	-	15
Chile	REUNA	√	-	√	-	-	-	-	√
Colombia	RENATA	106	-	3	-	-	√	11	√
Costa Rica	CONARE	5	-	-	-	-	-	-	-
Ecuador	CEDIA	24	-	2	-	-	√	√	√
El Salvador	RAICES	6	1	√	-	-	-	-	-
Guatemala	RAGIE	5	0	0	0	0	0	0	0
Mexico	CUDI	72	86	32	0	0	1	14	0
Paraguay	ARANDU	4	√	√	√	√	√	√	√
Peru	RAAP	6	0	1	3	0	0	0	-
Uruguay	RAU	3	0	5	0	0	3	0	4
Venezuela	CENIT	21	-	7	-	-	2	-	22

Table symbol key

√   Allowed, but no connected institutions recorded

-     Not allowed

2.3   Connectivity level by type of institution

Since all the Latin American NRENs connected to RedCLARA connect universities and since that type of institution is the one that features the largest amount of links per country, we have chosen this connected entity category to evaluate the typical connection level offered by national academic networks, that is, at which speed they typically connect these institutions. As shown by Graph 2.3.1, the most frequent typical connectivity level is in the category ranging from 10 Mbps to less than 100 Mbps (43%); 29% of universities have less than 10 Mbps of typical connection, while 21% has an average level of less than 1Gbps, and only a privileged 7% features a typical connection level ranging from 1 Gbps to 10 Gbps.

Graph 2.3.1: Most frequent level of typical connectivity
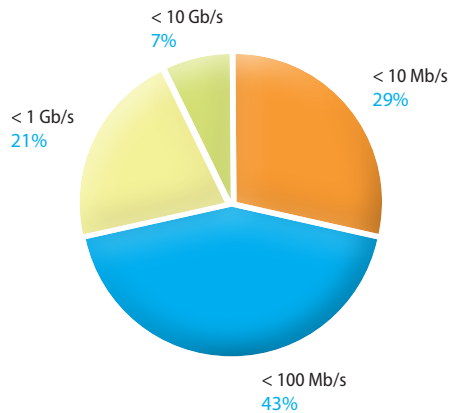
Tables 2.3.1 and 2.3.2 show the connectivity levels for each type of institution, except primary and secondary schools, since only three institutions in the latter category connected to the same NREN (RAAP, Peru) are recorded, and this has little relevance to be considered in this sample that aims at identifying tendencies.

Sppeds:
- **Lower:** The lowest speed at which an institution in this category is connected
- **Upper:** The highest speed at which an institution of this category is connected
- **Typical:** The typical speed of connection for the majority of institutions in this category of institution

As regards the way in institutions are connected to each NREN, in general terms these connections are carried out mainly through a PoP (Point of Presence) in the national network's backbone, and in the second place through a MAN (Metropolitan Area Network) or a RAN (Regional Area Network) managed by the NREN. Table 2.3.3 shows the information related to connection mode provided by the different NREN to universities, further education institutes and research institutes.

Table 2.3.1: Connectivity level by type of institution (universities, further education institutes and research institutes)

Country	NREN	Universities			Further Education Institutes			Research Institutes		
		Lower	Upper	Typical	Lower	Upper	Typical	Lower	Upper	Typical
Argentina	Innova|Red	< 10 Mb/s	< 1 Gb/s	< 100 Mb/s	< 10 Mb/s	< 10 Mb/s	< 10 Mb/s	< 10 Mb/s	< 1 Gb/s	< 100 Mb/s
Brazil	RNP	< 10 Mb/s	< 10 Gb/s	< 100 Mb/s	NC	NC	NC	< 10 Mb/s	< 10 Gb/s	< 100 Mb/s
Chile	REUNA	< 1 Gb/s	< 1 Gb/s	< 1 Gb/s	NDC	NDC	NDC	< 1 Gb/s	< 1 Gb/s	< 1 Gb/s
Colombia	RENATA	< 10 Mb/s	< 1 Gb/s	< 100 Mb/s	< 10 Mb/s	< 100 Mb/s	< 100 Mb/s	< 10 Mb/s	< 100 Mb/s	< 100 Mb/s
Costa Rica	CONARE	< 100 Mb/s	< 100 Mb/s	< 100 Mb/s	NDC	NDC	NDC	NDC	NDC	NDC
Ecuador	CEDIA	< 10 Gb/s	< 10 Gb/s	< 10 Gb/s	NDC	NDC	NDC	< 10 Gb/s	< 10 Gb/s	< 10 Gb/s
El Salvador	RAICES	< 1 Gb/s	< 1 Gb/s	< 1 Gb/s	< 1 Gb/s	< 1 Gb/s	< 1 Gb/s	NC	NC	NC
Guatemala	RAGIE	< 1 Gb/s	< 1 Gb/s	< 1 Gb/s	NC	NC	NC	NC	NC	NC
Mexico	CUDI	< 10 Mb/s	< 1 Gb/s	< 100 Mb/s	NC	NC	NC	< 10 Mb/s	< 100 Mb/s	< 10 Mb/s
Paraguay	ARANDU	NC	< 10 Mb/s	< 10 Mb/s	NC	NC	NC	NC	NC	NC
Peru	RAAP	< 10 Mb/s	< 10 Mb/s	< 10 Mb/s	NC	NC	NC	< 10 Mb/s	< 10 Mb/s	< 10 Mb/s
Uruguay	RAU	< 100 Mb/s	< 100 Mb/s	< 100 Mb/s	< 10 Mb/s	< 10 Mb/s	< 10 Mb/s	< 100 Mb/s	< 100 Mb/s	< 100 Mb/s
Venezuela	CENIT	< 10 Mb/s	< 100 Mb/s	< 10 Mb/s	NDC	NDC	NDC	< 10 Mb/s	< 100 Mb/s	< 100 Mb/s

Table symbol key

<10 Mb/s	Less than 10 Mb/s	<10 Gb/s	1 Gb/s or more, but less than 10 Gb/s
<100 Mb/s	10 Mb/s or more, but less than 100 Mb/s	NC	No answer
<1 Gb/s	100 Mb/s or more, but less than 1 Gb/s	NDC	No connectivity declared

Table 2.3.2: Connectivity level by type of institution (libraries, museums, archives and cultural institutions; non-university hospitals, government agencies)

Country	NREN	Libraries, museums, archives and cultural inst.			Non-university hospitals			Government agencies		
		Lower	Upper	Typical	Lower	Upper	Typical	Lower	Upper	Typical
Argentina	Innova|Red	< 10 Mb/s	< 10 Mb/s	< 10 Mb/s	NC	NC	NC	< 100 Mb/s	< 100 Mb/s	< 100 Mb/s
Brazil	RNP	< 10 Mb/s	< 10 Gb/s	NC	NDC	NDC	NDC	NC	< 10 Gb/s	NC
Chile	REUNA	NDC	NDC	NDC	NDC	NDC	NDC	< 100 Mb/s	< 100 Mb/s	< 100 Mb/s
Colombia	RENATA	NC	NC	NC	< 100 Mb/s	< 100 Mb/s	< 100 Mb/s	< 10 Mb/s	< 100 Mb/s	< 100 Mb/s
Costa Rica	CoNARE	NDC	NDC	NDC	NDC	NDC	NDC	NDC	NDC	NDC
Ecuador	CEDIA	NC	NC	NC	NC	NC	NC	NC	NC	NC
El Salvador	RAICES	NDC	NDC	NDC	NDC	NDC	NDC	NDC	NDC	NDC
Guatemala	RAGIE	NC	NC	NC	NC	NC	NC	NC	NC	NC
Mexico	CUDI	< 10 Mb/s	NC	NC	< 10 Mb/s	NC	NC	NC	NC	NC
Paraguay	ARANDU	NC	NC	NC	NC	NC	NC	NC	NC	NC
Peru	RAAP	NC	NC	NC	NC	NC	NC	NDC	NDC	NDC
Uruguay	RAU	< 100 Mb/s	< 100 Mb/s	< 100 Mb/s	< 10 Mb/s	< 10 Mb/s	< 10 Mb/s	< 10 Mb/s	< 100 Mb/s	< 100 Mb/s
Venezuela	CENIT	< 10 Mb/s	< 100 Mb/s	< 100 Mb/s	NDC	NDC	NDC	< 10 Mb/s	< 100 Mb/s	< 100 Mb/s

Table symbol key

<10 Mb/s	Less than 10 Mb/s	<10 Gb/s	1 Gb/s or more, but less than 10 Gb/s
<100 Mb/s	10 Mb/s or more, but less than 100 Mb/s	NC	No answer
<1 Gb/s	100 Mb/s or more, but less than 1 Gb/s	NDC	No connectivity declared

Table 2.3.3: Way in which the sites are connected to each NREN's network

Country	NREN	Universities					Further Education Institutes					Research Institutes					Quantity of institutions
		Through a PoP in the NREN's backbone	MAN or RAN managed by the NREN	MAN or RAN managed by the NREN	Connected through or behind another connected site	Other way	Through a PoP in the NREN's backbone	MAN or RAN managed by the NREN	MAN or RAN managed by the NREN	Connected through or behind another connected site	Other way	Through a PoP in the NREN's backbone	MAN or RAN managed by the NREN	MAN or RAN managed by the NREN	Connected through or behind another connected site	Other way	
Argentina	Innova|Red																None or just a few
			√														More than a half
																	Almost a half
				√													Less than a half
							√						√				All or almost all
Brazil	RNP																None or just a few
																	More than a half
		√	√									√		√			Almost a half
																	Less than a half
																	All or almost all
Chile	REUNA						√					√					None or just a few
																	More than a half
																	Almost a half
																	Less than a half
		√															All or almost all
Colombia	RENATA																None or just a few
																	More than a half
																	Almost a half
																	Less than a half
		√										√					All or almost all

Country	NREN	Universities					Further Education Institutes					Research Institutes					Quantity of institutions
		Through a PoP in the NREN's backbone	MAN or RAN managed by the NREN	MAN or RAN managed by the NREN	Connected through or behind another connected site	Other way	Through a PoP in the NREN's backbone	MAN or RAN managed by the NREN	MAN or RAN managed by the NREN	Connected through or behind another connected site	Other way	Through a PoP in the NREN's backbone	MAN or RAN managed by the NREN	MAN or RAN managed by the NREN	Connected through or behind another connected site	Other way	
Costa Rica	CONARE																None or just a few
																	More than a half
																	Almost a half
																	Less than a half
		√															All or almost all
Ecuador	CEDIA																None or just a few
																	More than a half
																	Almost a half
																	Less than a half
			√											√			All or almost all
El Salvador	RAICES																None or just a few
																	More than a half
																	Almost a half
																	Less than a half
		√					√										All or almost all
Guatemala	RAGIE																None or just a few
																	More than a half
																	Almost a half
																	Less than a half
			√														All or almost all

Country	NREN	Universities					Further Education Institutes					Research Institutes					Quantity of institutions
		Through a PoP in the NREN's backbone	MAN or RAN managed by the NREN	MAN or RAN managed by the NREN	Connected through or behind another connected site	Other way	Through a PoP in the NREN's backbone	MAN or RAN managed by the NREN	MAN or RAN managed by the NREN	Connected through or behind another connected site	Other way	Through a PoP in the NREN's backbone	MAN or RAN managed by the NREN	MAN or RAN managed by the NREN	Connected through or behind another connected site	Other way	
Mexico	CUDI						√										None or just a few
		√		√					√			√			√		More than a half
			√						√						√		Almost a half
																	Less than a half
																	All or almost all
Paraguay	ARANDU																None or just a few
																	More than a half
																	Almost a half
																	Less than a half
					√												All or almost all
Peru	RAAP																None or just a few
																	More than a half
																	Almost a half
				√											√		Less than a half
																	All or almost all
Uruguay	RAU																None or just a few
																	More than a half
																	Almost a half
																	Less than a half
		√										√					All or almost all

Country	NREN	Universities					Further Education Institutes					Research Institutes					Quantity of institutions
		Through a PoP in the NREN's backbone	MAN or RAN managed by the NREN	MAN or RAN managed by the NREN	Connected through or behind another connected site	Other way	Through a PoP in the NREN's backbone	MAN or RAN managed by the NREN	MAN or RAN managed by the NREN	Connected through or behind another connected site	Other way	Through a PoP in the NREN's backbone	MAN or RAN managed by the NREN	MAN or RAN managed by the NREN	Connected through or behind another connected site	Other way	
Venezuela	CENIT																None or just a few
												√					More than a half
																	Almost a half
														√			Less than a half
				√													All or almost all

3. Networks and Connectivity Services

Those topics which are most meaningful, considering technical terms and the connectivity service offered by Latin American NREN, are the issues addressed in the present chapter. This is the space where we look into the inside of each network.

Section 3.1 provides information related to the PoP, circuits and sited managed by each network. Section 3.2 is related to the capacities of the same networks. Section 3.3 is devoted to the changes that are planned for future implementation in the NRENs in terms of capacities and modifications to the topology. Section 3.4 aims to identify the external links owned by the Latin American national networks, while section 3.5 looks into the use and future implementation of dark fibre. In this section, just as in the Compendium's first edition –related to the situation in 2009-, the results are diametrically opposed to those obtained by TERENA in its Compendium (which collects information from the European networks connected to GÉANT), and smaller than those presented by the Latin American NREN over a year ago.

3.1   Number of PoPs, circuits and sites managed by the NREN

The quantity of Points of Presence (PoPs) in the backbone and the number of circuits and sites managed by each NREN are key indicators of the degree of complexity of each network.

A PoP, within this context, is understood as a connection aggregation point, which can connect to customer networks directly or through aggregations of metropolitan networks such as a MAN (Metropolitan Area Network), or to external networks. A PoP can be constituted basically by two technologies: IP or optical. The first is the classic way of dealing with traffic, aggregating latency and processing conditions in forwarding the information ; the second was is the tendency that is being adopted by networks which require a greater capacity in their backbones (2,5 Gbps or higher), an optical node, as well as a capacity increase, significantly reduces

the traffic processing time. This does not mean that IP nodes are going to be eliminated, since they complement each other and the tendency will be to optimise their deployment only where strictly necessary.

The number of circuits managed is the number of links for which the NRENs are responsible and which conduct transport of production traffic. The number of sites managed is the one in which the NREN manages the routing or switching equipment that the customer network uses to get connected to the PoP.

Table 3.1.1 shows the data provided by the Latin American NRENs on the subjects mentioned in the paragraphs above; when comparing them with those in the same table in the 2009 Compendium, certain changes are perceived, namely:
- Innova|Red (Argentina) increased from 2 to 6 PoPs and from 23 to 27 circuits with production traffic managed by the NREN. Furthermore, it declares to manage 2 sites (in 2009 this space was left blank).
- RNP (Brazil) increased from 39 to 34 circuits.
- REUNA (Chile) did not declare optical PoPs with layer 3 routing in the 2009 Compendium, but in the current one it marked 2; it also added 2 new circuits and 4 sites managed.
- CEDIA (Ecuador), although it does not identify the existence of any PoPs, it did add a circuit and one site managed.
- RAGIE (Guatemala), in 2009 indicated the existence of 6 PoPs, and in 2010 these were reduced to 5.
- TThe number of PoPs in CUDI (Mexico) grew from 18 to 39, and while it identified 6 backbone circuits and 15 aggregated ones, in 2010 it accomplished the management of 12 circuits and also added a site.
- RAU also increased the number of its PoPs from 3 to 5, y the number of sites it manages from 37 to 41

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Table 3.1.1: PoPs, circuits and sites managed by the NREN

Country	NREN	Number of PoPs	Number of places with optical PoPs	Number of optical PoPs with Layer-3 routing	Number of circuits (with production traffic) managed	Number of sites managed
Argentina	Innova|Red	6	2	2	27	2
Brazil	RNP	27	0	0	34	27
Chile	REUNA	10	4	2	56	23
Colombia	RENATA	8	8	8	1	8
Costa Rica	CONARE	1	1	1	1	1
Ecuador	CEDIA	0	0	0	1	1
El Salvador	RAICES	1	1	1	8	8
Guatemala	RAGIE	5	1	0	1	1
Mexico	CUDI	39	0	0	12	7
Paraguay	ARANDU	0	0	0	0	0
Peru	RAAP	1	0	0	6	6
Uruguay	RAU	5	1	1	0	41
Venezuela	CENIT	0	1	2	67	2

3.2   Network's core capacity

By the "network's backbone core capacity" we mean the capacity between two nodes (PoP) to which the member institutions of each NREN get connected. Some networks do not have a backbone since they have a star-shaped topology and in those cases the information given is related to the maximum capacity within the network's core node.

Table 3.2.1 shows the capacities of each NREN's backbone (measurements were conducted in Mbps).

Table 3.2.1: Network's backbone core capacity

Country	NREN	Backbone's typical usable core capacity
Argentina	Innova|Red	100 Mbps
Brazil	RNP	10000 Mbps
Chile	REUNA	155 to 2500 Mbps
Colombia	RENATA	200 Mbps
Costa Rica	CONARE	45 Mbps
Ecuador	CEDIA	1000 Mbps
El Salvador	RAICES	10 Mbps
Guatemala	RAGIE	100 Mbps
Mexico	CUDI	1000 Mbps and 155 Mbps
Paraguay	ARANDU	-
Peru	RAAP	10 Mbps
Uruguay	RAU	1000 Mbps
Venezuela	CENIT	1000 Mbps

3.3   Changes expected in the network

Table 3.3.1 shows a general descriptive diagram of the most important initiatives related to the development of the underlying network, which the NRENs expect to see in their networks over the next few years. It shows the answers given and it is important to mention that we required that each initiative had to be associated with an approximate level of confidence, expressed in the following terms: Quite Certain, Likely, Uncertain.

Table 3.3.1: Changes expected in the network

Country	NREN	2011	2012	2013 onwards	Comments
Argentina	Innova|Red				
Brazil	RNP	Connection of 393 new campuses of higher education institutions located in the country's provinces			
Chile	REUNA	Increase up to 1Gbps the southern portion of the network's backbone from Santiago to Osorno			
		Implement a photonic node in Santiago, lambda Exchange at 10 Gbps			
Colombia	RENATA				
Costa Rica	CONARE		Incorporation of regional campuses of the member universities	Incorporation of new users (laboratories and research centres which are not currently members of the network).	
			Bandwidth increase in the "Interinstitutional VPN ring" (ring of illuminated fibre which links the network's member universities)		
Ecuador	CEDIA	VoIP	Multicasting	Multihoming (5 years)	
			IP Mobility	Acquisition of infrastructure for the NREN (13 years)	
			IP TV		
El Salvador	RAICES	Change of provider; construction of ring between NREN members; bandwidth increase between NREN members			
		External bandwidth increase (towards RedCLARA)			
		Connection to commercial internet through RedCLARA			
Guatemala	RAGIE		Today only the campuses located in the capital city are connected. We expect to launch the process of expansion towards rural areas.		Last year a 2.5 Gbps GT-SV link was installed. This is the beginning of RedCLARA's backbone network through Central America. With this link we eliminated the direct connection to the Americas NAP in the USA.

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Country	NREN	2011	2012	2013 onwards	Comments
Mexico	CUDI	Bandwidth increase in the backbone from 155Mbps to 1Gbps	Bandwidth increase in the backbone from 1Gps to 10 Gbps		
Paraguay	ARANDU				
Peru	RAAP	Network expansion at a National Level, initially in the north of the country			
		Network expansion to the south of the country			
Uruguay	RAU		Increase in the number of nodes up to 10Mbps	Dark optical fibre urban connections (3 years)	
				Interurban connections hired by IRUs	
Venezuela	CENIT	Activation of peering circuits with most ISP in Venezuela	Capacity optimisation and expansion of institution circuits for access to REACCIUN		
			Deployment of IPv6 and Multicast REACCIUN's member institutions		
			Access to Advanced Networks form all REACCIUN's member institutions		

■ Quite Certain

■ Likely

■ Uncertain

3.4   External links

NRENs were asked to produce a list of all their external links at the end of November 2010, excluding backup links.

The connections were classified as "External Network IP Connections" in the following way:
- Direct to RedCLARA
- Direct to other research locations (e.g. other NRENs, CERN, Starlight, Abilene)

- Direct connections to Commercial Internet excluding Internet Exchanges
- Traffic exchanges with Local Commercial Internet (Peerings)

Table 3.4.1 shows the data provided by the NREN regarding their external links.

Table 3.4.1: Conexiones externas

Country	NREN	Mb/s direct to RedCLARA	Mb/s direct to other research locations	Mb/s direct to Commercial Internet	Mb/s Exchange with Commercial Internet (peerings)
Argentina	Innova|Red	256	-	90	2
Brazil	RNP	1500	2500	5000	2000
Chile	REUNA	1024	2048	1024	1024
Colombia	RENATA	130	-	10	-
Costa Rica	CONARE	10	-	-	-
Ecuador	CEDIA	45	-	2170	2170
El Salvador	RAICES	10	-	-	-
Guatemala	RAGIE	18000	-	-	-
Mexico	CUDI	45	2000	-	-
Paraguay	ARANDU	-	-	-	-
Peru	RAAP	10	-	2	-
Uruguay	RAU	155	-	100	24
Venezuela	CENIT	90	50	205	14

3.5   Dark fibre

This section was implemented in the 2009 Compendium with the aim of finding out if the tendency seen in Europe regarding the incorporation of dark fibre was replicated in Latin America. What percentage of their backbone is dark fibre, what percentage of it is on a long-term lease (IRU) and what percentage is owned by the NREN, were the questions formulated to the networks, which were also asked to refer to the situation at the time of answering the questionnaire and their projections for 2011. And although the very few answers collected showed the scarce explorations and projection of the Latin American NREN in terms of dark fibre, we decided to repeat the same questions in the questionnaire on which the elaboration of the present document was based; yes, the same questions, including the projection for early 2011. What was the result? Even more

scarce than the one obtained in the first Compendium, where Innova|Red (Argentina), REUNA (Chile), RAGIE (Guatemala) and RAU (Uruguay), at least offered a projection for 2011, and the first of them indicated that 1% of its backbone was dark fibre, of which it owned 1%. The current data are unequivocal. Expect Innova|Red, which maintained its future projection, all the other NRENs refrained from identifying the situation they expect for the beginning of the present year (2011). In terms of the current situation, only REUNA and RAU submitted new data. The first indicated that 33% of its dark fibre is under IRU modality (although it does not identify which percentage of its backbone is dark fibre), whereas the second indicated that less that 1% of its backbone is already in fibre.

Table 3.5.1: Dark fibre in the backbones of the NRENs

Country	NREN	Current situation			Situation expected in early 2011		
		% backbone in dark fibre	% of that fibre in IRU	% of that fibre owned by the NREN	% backbone in dark fibre	% of that fibre in IRU	% of that fibre owned by the NREN
Argentina	Innova|Red	1%		1%	80%	79%	1%
Brazil	RNP						
Chile	REUNA		33%				
Colombia	RENATA						
Costa Rica	CONARE						
Ecuador	CEDIA						
El Salvador	RAICES						
Guatemala	RAGIE						
Mexico	CUDI						
Paraguay	ARANDU						
Peru	RAAP						
Uruguay	RAU	< 1%					
Venezuela	CENIT						

4. Traffic

The transferring of data within the physical networks of each Latin American NREN is a crucial issue when providing services to users. The network congestion issue is analysed in section 4.1, while section 4.2 focuses on the situation of data traffic over the NRENs' optical networks and their monitoring.

IPv4 and IPv6 are covered in section 4.3.

4.1   Network congestion

In relation to the data gathered for the 2009 Compendium, the NREN do not show much variability regarding congestion, and it is still impossible to identify a tendency, given the type of information provided by the NRENs (and also for the lack of several answers), and the disparity between the networks they operate. Significant congestion is seen in RAU (Uruguay) and CENIT (Venezuela), in the access network and the external links, respectively.

Table 4.1.1: Network Congestion

Country	NREN	Campus LAN			Metropolitan / Regional Networks			Access network			NREN backbone			External links		
		☺	☐	☹	☺	☐	☹	☺	☐	☹	☺	☐	☹	☺	☐	☹
Argentina	Innova|Red															
Brazil	RNP	100%			100%			50%	40%	10%	80%	20%				
Chile	REUNA	45%	40%	15%												
Colombia	RENATA										80%	10%	10%	20%	70%	10%
Costa Rica	CONARE															
Ecuador	CEDIA															
El Salvador	RAICES	100%			100%			100%			100%			100%		
Guatemala	RAGIE	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Mexico	CUDI							70%	20%	10%						
Paraguay	ARANDU															
Peru	RAAP	86%	14%					57%	14%	29%	57%	14%	29%	71%	0%	29%
Uruguay	RAU	95%	5%		80%	10%	10%		20%	80%				20%	80%	
Venezuela	CENIT							85%	5%	10%	70%	30%		8%	12%	80%

Table symbol key

☺   % of institutions experiencing no or very little congestion

☐   % of institutions experiencing some or moderate congestion

☹   % of institutions experiencing serious congestion

4.2 Measurement

NRENs were asked which types of optical traffic are transported by their networks and how they measure it. In 2009 this question was not answered by all the networks that participated in the study, which is why it is not possible to make comparisons.

Table 4.2.1 shows information on whether or not this traffic is conducted, which type of traffic it is and whether it is measured or not. Table 4.2.2 identifies the tools with which traffics are measured.

Table 4.2.1: Types of optical traffic and measurement

Country	NREN	IP Traffic	SDH	VLAN	Ethernet	Others (known)
Argentina	Innova|Red				No measurement of usage	
Brazil	RNP					
Chile	REUNA	Measures level of usage		Measures level of usage	Measures level of usage	
Colombia	RENATA	Measures level of usage		No measurement of usage	Measures level of usage	
Costa Rica	CONARE	Measures level of usage	No measurement of usage	No measurement of usage	No measurement of usage	No measurement of usage
Ecuador	CEDIA	Measures level of usage		Measures level of usage	No measurement of usage	
El Salvador	RAICES	Measures level of usage				
Guatemala	RAGIE	Measures level of usage				
Mexico	CUDI	Measures level of usage	Measures level of usage	Measures level of usage	Measures level of usage	
Paraguay	ARANDU					
Peru	RAAP	Measures level of usage				
Uruguay	RAU	Measures level of usage		Measures level of usage	Measures level of usage	
Venezuela	CENIT					

Table symbol key

◼ Transported

◼ Not transported

Table 4.2.2: Measurement tools

Country	NREN	IP Traffic	SDH	VLAN	Ethernet	Others (known)
Argentina	Innova|Red					
Brazil	RNP					
Chile	REUNA	Traffic volume statistics (MRTG, Netflow)		Monitoring of traffic volume through interface	Monitoring of traffic volume through interface	
Colombia	RENATA	MRTG			CACTI	
Costa Rica	CONARE	Monitor SNMP, CACTI, Zenos, Scrutinazer, Nagios				
Ecuador	CEDIA	SNMP, CACTI, Weathermap		SNMP, CACTI, Weathermap		
El Salvador	RAICES	SNMP				
Guatemala	RAGIE	MRTG				
Mexico	CUDI	CACTI	CACTI	CACTI	CACTI	
Paraguay	ARANDU					
Peru	RAAP	CACTI				
Uruguay	RAU	Mrtg, CACTI, Netflow		CACTI	Mrtg, CACTI, Netflow	
Venezuela	CENIT					

Table symbol key

    Transported

    Not transported

4.3   IPv4 and IPv6

The difference between 2009 and 2010 in terms of IPv4 prefix requests is of only 10 requests (the reduction is seen in the last year with a total of 87 requests); although a slight pone, this decrease is in accordance with the worldwide tendency.

In 2009, only three NRENs stated that their networks provided IPv6. Fort the second edition of the Compendium this number has increased up to 10, the same number of networks that indicate they support IPv6 native production services. But this increase is not related, as one could think, to

an intense investment of work and efforts by national networks in the sixth version of the Internet Protocol. The reason is a lot simpler. The seven NREN counted did not answer the question in the 2009 questionnaire.

Finally, just like the allocation of IPv4 prefixes, the allocation of IPv6 also decreased, from 198 allocations in 2009 to 162 in 2010.

Table 4.3.1: Requests for IPv4 and IPv6 preffixes

Country	NREN	IPv4 Requests over the last year	Does the network currently support native IPv6 production services?	If it provides native IPv6, when was the service introduced?	If you are planning to provide native IPv6 in the future, what is the scheduled date for introduction?	IPv6 preffixes allocated
Argentina	Innova|Red	4	Yes	Before 2007		32
Brazil	RNP	40	Yes	2002		20
Chile	REUNA	4	Yes	2004		3
Colombia	RENATA	25	Yes	2008 (November)	2010 RENATA's Backbone	32
Costa Rica	CONARE	1	No		1st semester 2011	0
Ecuador	CEDIA	3	Yes	2010 (December)		1
El Salvador	RAICES	0	No		No date	8
Guatemala	RAGIE	1	Yes	2008		5
Mexico	CUDI	0	Yes	2001		5
Paraguay	ARANDU	0	-	-	-	0
Peru	RAAP	2	Yes	2008		10
Uruguay	RAU	2	Yes	2006 (January)	n/c	41
Venezuela	CENIT	5	Yes	2005	2012	5

The work of IPv6 support is not trivial. When the network equipment is acquired the ideal thing is to consider this aspect as a fundamental component in the purchasing decision. Asked about whether this support is an obligatory requirement in the conditions established to conduct the purchasing of the network equipment, 69% of the Latin American NRENs stated that it is obligatory, and 31% stated it does not.

Finally, the question that constantly haunts NRENs is why they do not conduct the migration of some part of their network to IPv6; Table 4.3.2 shows the answers given in this sense by Latin American NREN; lack of human resources and applications are the most frequent answers

Table 4.3.1: Requests for IPv4 and IPv6 preffixes

Country	NREN	Do you currently have any convincing or driving reason to mígrate part of the network to IPv6?	What are the main inhibitors for the network to migrate to IPv6?
Argentina	Innova|Red	No	The network's backbone supports IPv6 in native form
Brazil	RNP	Yes – The network is already IPv6	The inhibiting factors are among users. The basic network is already v6. Users will have the freedom to migrate their services to v6 according to their judgement
Chile	REUNA	Yes – The network supports IPv6 in its entirety. Applications (websites, DNS, etc.) cannot yet be reached by IPv6	Human resources
Colombia	RENATA	Yes – Mobility and expansion	Capacity of equipment which support IPv6 and lack of training in services over this protocol
Costa Rica	CONARE	No	There has been no demand
Ecuador	CEDIA	Yes – If we do not begin to use the IPv6 network it will be impossible to further the expansion of the Advanced network and the Internet, since this protocol is the network's future	We lack a killer app which forces the deployment of IPv6 towards the entire network
El Salvador	RAICES	No	Human resources available
Guatemala	RAGIE	Yes – The running out of IPv4 and the transition that has to be made towards IPv6. As a research entity, RAGIE is seen as the institution that naturally has to take the lead in the country.	Lack of knowledge by some members and lack of implementation by ISPs
Mexico	CUDI	Yes – Currently the CUDI servers (web, emails, repositories) are being migrated to a dual versión IPV4/IPv6.	Lack of equipment and applications which support IPv6 in universities
Paraguay	ARANDU	No	
Peru	RAAP	Yes – Lack of IPv4 numbers for allocation	Lack of applications y and native IPv6 services
Uruguay	RAU	No	The members
Venezuela	CENIT	Yes – So that services can be accessed from any of the 2 protocols and thus encourage the deployment of such technology	Qualified human resources

5. Other services

What other services Latin American NRENs are providing to their users on top of the connectivity service to the national academic network. This chapter explores such areas of the NRENs brought together by RedCLARA, and it covers the following subjects: Network Operation Centres – NOC (5.2), Quality of Service – QoS (5.3), Security Incident Responses (5.4), Security Policy (5.5), Authorisation and Authentication Infrastructures (AAI) (5.6), Certification Authority (5.7), Networked Computing Resources – Grids (5.8), Housing, Storage, Hosting and Content Delivery Services (5.9); Communication Tools (5.10) and Customer and User Support (5.11).

It is important to mention that although it is true that traffic monitoring should be mentioned here, this was covered in the previous chapter in section 4.2, along with the types of traffic.

5.1   Overview

70% of the NRENs feature the service of **network operation centres (NOC)** and all of them cater for the needs of all their users.

Just as in 2009, only Brazil, Chile and Colombia declare to offer Premium **QoS** in their networks, which barely represents 23%. The IP – Best Effort is offered by 54% of the NRENs in the Compendium and 38% of them are considers it for the future.

54% of the NREN in the Compendium offers, in an autonomous way, **security incident responses** to their user community. 23% state they have included this service in their future plans; 15% of the sample does not consider it.

Only 23% of the thirteen networks that answered the questionnaire on which the present Compendium was based have a **security policy**.

Brazil and Uruguay indicate they provide **Authorisation and Authentication Infrastructures (AAI)** in an autonomous way; Colombia states it outsources this service from another organisation.

Only Brazil and Chile have a **Certification Authority (CA)**; the first issues grid and AAI certificates and the second one only grid certificates. Only Chile's NREN is part of TAGPMA, the region's PMA (Policy Management Authority).

76% of the NREN indicate they have included the **computing grids** service within their future plans.

As regards **Housing, Storage, Hosting and Content Delivery Services**, in general very few networks are not interested in providing them, and very few networks already feature them in their offered services; the majority of NRENs expect to be able to deploy them in the future.

In terms of **interaction with the user**, almost all the NRENs offer at least one type of support in terms of direct support for user groups, the organisation of national conferences and/or training courses; the solution of doubts and problems is mostly conducted through electronic mail.

5.2   Network Operation Centres - NOC

Nine out of the eleven NRENs that answered the question about who provides the NOC service indicated that it is provided directly by the network; CEDIA (Ecuador) and RAAP (Peru) have their network operation centres managed by another institution under an outsourcing modality. 100% of the NRENs that provided information in this regard indicated that their NOC serves the needs of all their users.

Table 5.2.1: NOC

Country	NREN	The NOC is provided by…	Serves all NREN users
Argentina	Innova|Red	The NREN	Yes
Brazil	RNP	The NREN	Yes
Chile	REUNA	The NREN	Yes
Colombia	RENATA	The NREN	Yes
Costa Rica	CONARE		No
Ecuador	CEDIA	Is managed by another institution (outsourcing)	Yes
El Salvador	RAICES	The NREN	Yes
Guatemala	RAGIE	The NREN	Yes
Mexico	CUDI	The NREN	Yes
Paraguay	ARANDU		No
Peru	RAAP	Is managed by another institution (outsourcing)	Yes
Uruguay	RAU	The NREN	Yes
Venezuela	CENIT	The NREN	Yes

5.3 Quality of Service – QoS

The GN2 (GÉANT2) Project defined three levels of Quality of Service (QoS): "Premium", "IP Best Effort" and "IP Less than Best Efforts" (http://www.geant2.net/server/show/conWebDoc.1582). Just as in the first edition, such parameters were used for the objectives of this Compendium: NRENs were asked to choose the one that was closest to their individual situation.

In networks experiencing congestion, the implementation of QoS enables Premium traffic to move without any problems across those areas where traffic might be experiencing congestion problems.

Featuring the same situation as in 2009, only RNP (Brazil), REUNA (Chile) and RENATA (Colombia) indicated they offer Premium QoS in their networks, which equals 23%. The category of IP Less than the best effort features one NREN providing this level of QoS (RENATA), and four of them excluding it from their plans (only CONARE – Costa Rica, considers it for the future). The IP Best Effort is offered by 54% of the NREN in the Compendium, 38% consider it for the future and 8% is not interested in providing it. These relations, and the reasons that the NRENs have for not providing these levels QoS are presented in Table 5.3.1.

Table 5.3.1: Do you offer QoS in your network?

Country	NREN	IP Best Effort			Premium			IP Less than Best Efforts			Reasons for not providing QoS at these levels
		Yes	No	In the future	Yes	No	In the future	Yes	No	In the future	
Argentina	Innova|Red	√				√			√		Does not give details
Brazil	RNP	√			√						
Chile	REUNA	√			√						Does not give details
Colombia	RENATA	√			√			√			
Costa Rica	CONARE			√			√			√	Does not give details
Ecuador	CEDIA	√							√		Does not give details
El Salvador	RAICES			√							It is not financially feasible
Guatemala	RAGIE		√			√			√		We don't have the necessary resources; both the equipment and the human resources are volunteered
Mexico	CUDI	√				√			√		It is not physically possible unless all domains in the route participate
Paraguay	ARANDU			√							Our NREN's hardware is currently not capable of supporting these types
Peru	RAAP	√				√					In general there is overprovision, in some cases we are planning to implement it; we have already conducted tests with diffserv
Uruguay	RAU			√							Our NREN's hardware is currently not capable of supporting these types
Venezuela	CENIT			√							

5.4   Security Incident Response

Of the thirteen NRENs that answered the questionnaire used to elaborate the **RedCLARA 2010 Compendium of Latin American National Research and Education Networks**, seven of them (RNP - Brazil, REUNA - Chile, RENATA - Colombia, CONARE – Costa Rica, CUDI – Mexico, RAU – Uruguay and CENIT - Venezuela) gave a positive answer to the question about whether they offer security incident responses to their users community; they represented 54% of the NRENs in the Compendium and all of them provide the service in an autonomous way. Innova|Red (Argentina), CEDIA (Ecuador) and RAGIE (Guatemala), representing 23%, state this service is part of their future plans; it is not considered by RAICES (El Salvador) and RAAP (Peru), representing 15% of the sample. ARANDU (Paraguay) did not answer the question.

Graph 5.4.1: Computer security responses offered by the NREN

No answer
8%

No
15%

Yes
54%

Planned
23%
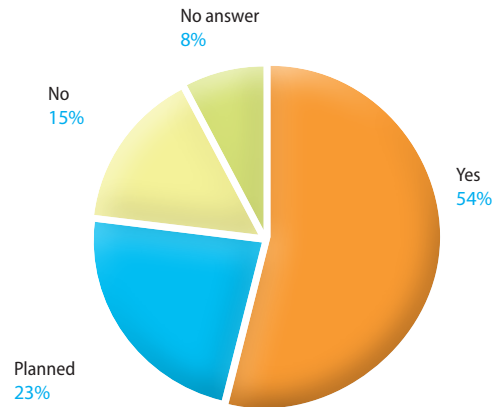
5.5   Security Policy

Within the Questionnaire applied for the elaboration of the present document, the Latin American national research and education networks were asked if they had a security policy; 23% de of the thirteen networks that answered the survey (that is, only three) gave a positive answer.

Table 5.5.1: Security Policy

Country	NREN	Security Policy	Public URL to see the policy
Argentina	Innova|Red	Yes	
Brazil	RNP	No	
Chile	REUNA	No	
Colombia	RENATA	Yes	http://www.renata.edu.co/index.php/instituciones-conectadas-a-renata.html?start=1
Costa Rica	CONARE	No	
Ecuador	CEDIA	No	
El Salvador	RAICES	No	
Guatemala	RAGIE	No	
Mexico	CUDI	Yes	http://seguridad.internet2.ulsa.mx
Paraguay	ARANDU	No	
Peru	RAAP	No	
Uruguay	RAU	No	
Venezuela	CENIT	No	

5.6   Authorisation and Authentication infrastructures (AAI)

For the elaboration of the 2009Compendium, NRENs were asked about the existence of Authorisation and Authentication infrastructures (AAI) within their organisations, but none of them gave a positive answer and the big majority simply did not answer this, which is why this subject was not included in the first edition.

One year later, in 2010, RNP (Brazil) and RAU (Uruguay) indicate that they provide this service by themselves; while RENATA (Colombia), indicates it outsources it from another organisation.

Only the Brazilian academic network reports the administration of federations (20, with 20 identity providers, 5 service provider – scientific journals portal and Microsoft systems repository for download-, approximately 200 users including students, researchers and officials from the government sector) which support SAML 1.x and SAML2, and do not have a policy.

5.7   Certification Authority

In the reports provided by the NRENs in 2009, only RNP and REUNA declared to have a Certification Authority (CA); in 2010 this situation did not change at all. Thus, the 18.18% represented by both South American academic networks having CA, versus the 81.81% represented by their peers that do not provide this service, remained unchanged.

RNP issues computing grid and Authorisation and Authentication infrastructures (AAI) certificates; it is neither part of TAGPMA nor of any other PMA (Policy Management Authority)

REUNA only issues grid certificates and it is part of TAGPMA. In 2009, REUNA accomplished the allocation of 61 server certificates (RNP did not identify the allocation of this type of certificates in 2009) and 72 in 2010, that is, more than three times the 20 certificates reported by RNP for the same period. As regards user certificates, REUNA reckoned the allocation

of 118 for the year reported, while RNP stated it does not allocate them because it thinks they have to be provided by the same user institutions of its academic network.

5.8   Networked Computing Resources – Grids

Despite the strong presence of the topic of e-Infrastructure and grids in Latin America (since 2006) and despite the participation of various institutions connected to the NRENs in Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Panama, Peru, Venezuela y Uruguay, and the participation of RedCLARA itself some of the NRENs connected to its network in RinGrid, EELA, EELA-2 and GISELA projects, only REUNA (Chile) declares to offer grid services to the community it serves, representing 8%.

76% of the NRE declare to have included this service in their future plans. Only one network is not interested in having it and another one does not give an answer, and thus each represents 8%. Table 5.8.1 shows the answers related to computing grid services.

Considering that the reality faced by countries in terms of grids is in many cases related to the participation in grid projects funded by the European Commission's Framework Programmes in which Latin America taken part, NRENs were asked about the disciplines that in each country make use of the grid infrastructures existing in the region. In order to facilitate the answering process we included a field for those who could not identify any areas or who did not have any knowledge on the subject (no / I don't know) and the following areas were identified:
  High Energy Physics
   • Other Physics
   • Computational Chemistry
   • Other Chemistries
   • Biomedicine
   • Astro-science
   • Earth Science
   • Climatology
   • Arts and Humanities
   • Other

Additionally, when identifying each area NRENs were asked to indicate if the grid was being used (running), if its use was planned (planned) or if it was not considered in future plans or if they did not have any knowledge about it (no/do not know). The answers to this question are illustrated in Table 5.8.2; the numbers included in it correspond to the total marks that resulted in each discipline according to the three evaluation categories presented, and a comparison between the data provided in 2009 and 2010 is included.

Table 5.8.1: Computing grid services

Country	NREN	Does the NREN offer grid services to the community it serves?	Grid services provided for the national community				
			Dedicated optical routes	Dedicated point-to-point IP circuits	Storage facilities managed by the NREN	Computing CPUs provided by the NREN	Other
Argentina	Innova|Red	Planned					
Brazil	RNP	Planned		Planned			
Chile	REUNA	Running	No interest	Running	Running	Running	Running
Colombia	RENATA						
Costa Rica	CONARE	Planned					
Ecuador	CEDIA	Planned			Planned	Planned	
El Salvador	RAICES	No interest					
Guatemala	RAGIE	Planned					
Mexico	CUDI	Planned					
Paraguay	ARANDU	Planned					
Peru	RAAP	Planned					
Uruguay	RAU	Planned	No interest	Planned	Planned	Planned	
Venezuela	CENIT	Planned			Planned	Planned	Planned

Table 5.8.2: Disciplines that make use of grids in Latin American countries according to the NREN's perception

Discipline	Currently running		Planned		No / don't know	
	2009	2010	2009	2010	2009	2010
High Energy Physics	3	3	1	3	2	3
Other Physics			3	4	1	1
Computational Chemistry			2	3	1	2
Other Chemistry			1	1	1	2
Biomedicine		1	4	4		1
Astroscience	1	1	2	3	1	1
Earth Science	1		2	3	1	2
Climatology	3	2	3	3		1
Arts and Humanities		1	1	2	1	2
Others			3			

5.9 Housing, Storage, Hosting and Content Delivery Services

In this subject the answers are varied. However, some of them make it possible to identify certain tendencies.

Distributed storage service for grid users: 70% of the NRENs have planned it for the future; 15% are not interested in having it and 15% did not give an answer.

Distributed storage for any kind of NREN user: 31% considers it for the future, 46% are not interested in having it and 23% did not give an answer.

Dedicated (or special) connectivity service to provide high connectivity levels for commercial content servers: 8% (Innova|Red, Argentina) already have this service; 23% intends to implement it in the future, 46% are not interested in having it, and 23% refrained from answering.

Hosting for commercial content servers in the NREN's network: Innova|Red, 8%, already does this; ARANDU – Paraguay, aims to implement it (8%), 61% are not interested in offering it and, again, 23% did not give an answer.

Video servers to be used by the NREN's sites: 31% of the national academic networks state they have this service deployed; 39% aims to do so in the future, 15% are not interested in it and 15% does not give an answer.

Mirroring (creation of replicas) of content from outside the NREN's network: 15% of the networks already have this service; 31% intends to implement it; 39% are not interested in it and 15% do not answer.

Table 5.9.1 shows all the data provided by Latin American NRENs on this subject.

**Table 5.9.1: Housing, Storage, Hosting and Content Delivery Services**

Country	NREN	Distributed Storage for grid users	Distributed Storage for any NREN users	Dedicated/special connectivity to provide high levels of connectivity to commercial content servers or commercial content	Hosting of commercial content servers or commercial content on the NREN network	Video servers for use by NREN sites	Mirroring of content from outside the NREN network
Argentina	Innova|Red	Planned	Planned	Deployed	Deployed	Deployed	Deployed
Brazil	RNP	No interest	No interest	No interest	No interest	Deployed	No interest
Chile	REUNA	Planned	No interest	No interest	No interest	Deployed	No interest
Colombia	RENATA						
Costa Rica	CONARE						
Ecuador	CEDIA	Planned				Planned	Deployed
El Salvador	RAICES	No interest	No interest	No interest	No interest	No interest	No interest
Guatemala	RAGIE	Planned	No interest	Planned	No interest	Planned	No interest
Mexico	CUDI	Planned	Planned	Planned	No interest	Planned	Planned
Paraguay	ARANDU	Planned	Planned	Planned	Planned	Planned	Planned
Peru	RAAP	Planned	No interest	No interest	No interest	Planned	Planned
Uruguay	RAU	Planned	No interest	No interest	No interest	No interest	No interest
Venezuela	CENIT	Planned	Planned	No interest	No interest	Deployed	Planned

5.10 Communication Tools

5.10.1 VoIP

The Voice over IP (VoIP) service is provided only by RNP (Brazil) and CENIT (Venezuela), where both NRENs represent 15% of the sample; 54% expect to offer it in the future and 31% do not consider a matter of their interest.

Graph 5.10.1: NREN providing the VoIP service

Planned
54%

No interest
31%

Deployed
15%
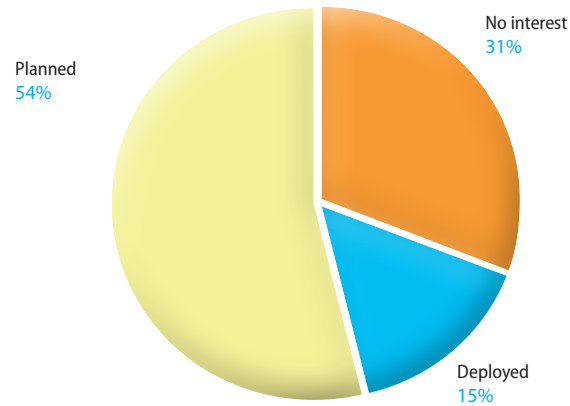
5.10.2 Video streaming and Videoconference

54% of the NRENs provide a centrally managed videoconference service; 15% have included this service in their plans; and the remaining 31% are not interested in offering this type of service. Exactly the same percentages can be seen in the distribution of Standard Definition (SD) Services MCU channels.

Graph 5.10.2: Videoconference service centrally managed and Standard Definition (SD) Services MCU channels
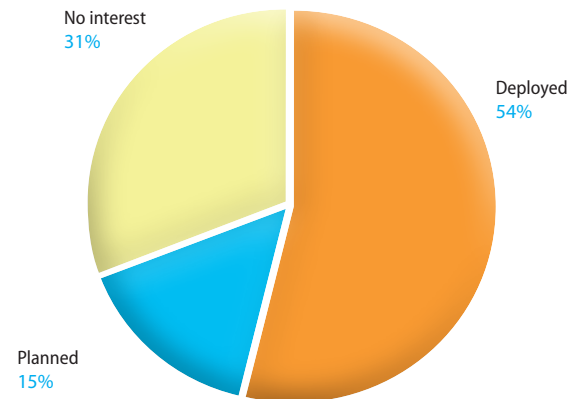
No interest
31%

Deployed
54%

Planned
15%

Table 5.10.2 gives further details on the provision of additional services apart from Videoconferencing.

Table 5.10.2: Additional services apart from the Videoconference service

Country	NREN	Do you provide a centrally managed videoconference service?	Do you provide Standard Definition (SD) Service MCU channels?	Do you provide High Definition (HD) Service MCU channels?	Can members from other communities outside your NREN book channels in your MCUs?	Do you offer centrally provided conference archiving / streaming?	Do you have an online booking system?	Is there centrally provided support for users?	Is GDS supported?
Argentina	Innova|Red	Planned	Planned	Planned	Planned	Deployed	No interest	No interest	No interest
Brazil	RNP	Deployed	Deployed	Planned	No interest	Deployed	Deployed	Deployed	No interest
Chile	REUNA	Deployed	Deployed	Deployed	Planned	Deployed	Deployed	Deployed	No interest
Colombia	RENATA	Deployed	Deployed	Deployed	Deployed	Deployed	Planned	Deployed	Planned
Costa Rica	CONARE	No interest							
Ecuador	CEDIA	Deployed	Deployed	Deployed	Planned	Deployed	Planned	Deployed	Planned
El Salvador	RAICES	No interest							
Guatemala	RAGIE	No interest	Deployed	Planned	Planned	Planned	Planned	Planned	Planned
Mexico	CUDI	Deployed	Deployed	Planned	Deployed	Deployed	Deployed	Deployed	
Paraguay	ARANDU	Deployed							
Peru	RAAP	Planned	Planned	Planned	Planned	Planned	Planned	Planned	
Uruguay	RAU	No interest							
Venezuela	CENIT	Deployed	Deployed	Planned	Deployed	Planned	Planned	Planned	Planned

5.10.3 Multicast

When asked about the Multicast service, only four NRENs answered the question, which shows that, just as in 2009, Multicast remains to be a pending issue that is difficult to address for the networks in the region. However, it is necessary to point out that RENATA (Colombia) is planning to implement 2 streaming sources within the next few months, and CEDIA (Ecuador) has similar plans; today CUDI (Mexico) has a Multicast/Ip Video streaming source deployed in its network and a new one is expected to be implemented within the next six months. CENIT (Venezuela) also declares to have a streaming source of this kind (which can be seen by following this link: http://video.cenit.gob.ve).

5.11 Customer and User Interaction and Support

5.11.1 Interaction with the user

In general terms, we can appreciate an important commitment on the part of NRENs with the work they do with specific groups users (communities and/or groups associated to a specific project, among others); only two of them, RAICES (El Salvador) and ARANDU (Paraguay) lack this type of support for the end user (see Table 5.11.1.1).

In terms of support provided online, RAU stands out for featuring a large number of portals or wikis for scientific (70) and technical (58) communities implemented by it. Table 5.11.1.2 shows the data submitted by the NRENs on this type of interaction with their users.

Table 5.11.1.1: Interaction with the user

Country	NREN	Provides support for the work of specific groups of users	Organises national user conferences	Organises training courses
Argentina	Innova|Red	√	√	√
Brazil	RNP	√	√	√
Chile	REUNA	√	√	X
Colombia	RENATA	√	√	√
Costa Rica	CONARE	√	√	√
Ecuador	CEDIA	√	√	√
El Salvador	RAICES	X	X	X
Guatemala	RAGIE	X	√	√
Mexico	CUDI	√	√	√
Paraguay	ARANDU	X	X	X
Peru	RAAP	√	√	√
Uruguay	RAU	X	X	√
Venezuela	CENIT	√	√	√

Table symbol key

√   Yes
-       No

Table 5.11.1.2: Number of portals or wikis for scientific and technical communities implemented in the NREN

Country	NREN	Portals/wikis or sites for scientific communities implemented in the NREN		Portals/wikis or sites for technical communities implemented in the NREN	
		Number	Topics	Number	Topics
Argentina	Innova|Red				
Brazil	RNP	4	Telemedicine		
			Metropolitan Networks		
			Training and knowledge dissemination		
			Digital Technologies for Information and Communication (CTIC)		
Chile	REUNA	4	Learning Objects	2	Videoconference
			Intellectual Property		
			Grid		Operational Networks
			ICT in Initial Teacher Training		
Colombia	RENATA			1	
Costa Rica	CONARE				
Ecuador	CEDIA	2	Implementation of IPv6 in the National network and information of the International Commercial and Advanced IPv6 network	2	Implementation of IPv6 in the National network and information of the International Commercial and Advanced IPv6 network
			Portal to manage virtual courses for members		Portal to manage virtual courses for members
El Salvador	RAICES				
Guatemala	RAGIE				
Mexico	CUDI	2	Network Engineering, MPLS, E2e, Multicast, IPv6, Security, QoS, Training, Astronomy, Libraries, Ecology, Earth Science, Education, Grids, Mathematics, Media, Health, Laboratories		
Paraguay	ARANDU				
Peru	RAAP				
Uruguay	RAU	70		58	
Venezuela	CENIT				

5.11.2 User support

Just as in the first Compendium (2009), the information on the direct relationship between the NRENs and their users, the type of support they declare to provide or not, does not make it possible to develop a valid tendency, except in the case of support via email, which is offered by 87% of the networks in the Compendium. Although it was not possible to generalize other tendencies, the fact is that academic networks in the region do consider support for their users as a relevant topic.

Just like in the previous version, this time REUNA (Chile) made it clear that all the types of support identified are conducted regularly. However, since they are not formalised services, the NREN thinks it is not appropriate to give a positive answer.

Table 5.11.2: User support

Country	NREN	FAQ	Troubleshooting	Help Desk	Incidents and trouble tickets management	Support via e-mail	Support via chat
Argentina	Innova|Red	No	Yes	Yes	Yes	Yes	No
Brazil	RNP	Yes	Yes	Yes	Yes	Yes	No
Chile	REUNA	No	No	No	No	No	No
Colombia	RENATA	Yes	Yes	Yes	Yes	Yes	Yes
Costa Rica	CONARE	No	Yes	Yes	No	Yes	Yes
Ecuador	CEDIA	Yes	Yes	No	Yes	Yes	No
El Salvador	RAICES	No	Yes	No	No	Yes	No
Guatemala	RAGIE	No	Yes	No	No	Yes	Yes
Mexico	CUDI	Yes	Yes	Yes	Yes	Yes	Yes
Paraguay	ARANDU	No	No	Yes	No	No	No
Peru	RAAP	No	No	No	No	Yes	No
Uruguay	RAU	No	Yes	Yes	Yes	Yes	No
Venezuela	CENIT	Yes	Yes	Yes	Yes	Yes	No

6. Funding and staffing

The present chapter provides information on the funding and staffing of the NRENs in the Compendium.

The NRENs budget is analysed in section 6.1, while section 6.2 is devoted to the staff working in the networks.

6.1   NREN budget

In terms of funding (see Table 6.1.1), all the NRENs –except CEDIA (Ecuador)- work their budgets on a calendar year basis. The information gathered in relation to annual funds shows scant budget situations, and what is more, if we take into account the fact that the amounts indicated are not only used to pay salaries, but also to pay for basic elements (such as electricity, equipment, etc.) and connection-; this is matched by the level of participation –or rather non-participation in most cases- of the region's governments in such funding and sustain for their academic networks. In fact, the critical nature of this situation enables only three NRENs to develop multi-annual budget plans, which implies a certain certainty regarding their networks' future sustainability.

Most NRENs identified their users and members as their sole source of funding, and three NRENs indicate them as partial major source of funding. Only CONARE (Costa Rica) features the government (or public agencies) as its sole source of funding, while governments partially sustain other three networks. The funding from international institutions represents small marginal contributions (see Table 6.1.2).

As regards the modality for charging their users (see Table 6.1.3), it is not possible to identify a tendency.

Table 6.1.1: NREN budget

Country	NREN	Budget year equal to the calendar year	Total budget for 2009 (or 2008/2009 in millions of euro (€M)	How much of the 2009 (or 2008/2009) budget is dedicated directly to NREN activities?	NREN able to develop multiannual budgets or multi-annual plans
Argentina	Innova|Red	√	M€ 0	M€ 0	X
Brazil	RNP	√	M€ 6	M€ 6	X
Chile	REUNA	√	M€ 1.14	M€ 1.14	X
Colombia	RENATA	√	M€ 0.79	M€ 0.79	X
Costa Rica	CONARE	√	M€ 0.3	M€ 0.3	X
Ecuador	CEDIA	X	M€ 1.4	M€ 0.2	X
El Salvador	RAICES	√	M€ 0.1	M€ 0.005	X
Guatemala	RAGIE	√	M€ 0.1	M€ 0.1	X
Mexico	CUDI	√	M€ 0.92	M€ 0.92	√
Paraguay	ARANDU	√	M€ 0	M€ 0	X
Peru	RAAP	√	M€ 0.185	M€ 0.002	X
Uruguay	RAU	√	M€ 0	M€ 0.24	√
Venezuela	CENIT	√	M€ 7.2	M€ 1	√

Table 6.1.2: Percentage estimate of the sources of NREN-related income

Country	NREN	Users/customers	Government/public agencies	The EU (e.g. for Framework Programme projects)	The IADB funds	Other sources
Argentina	Innova|Red	50%	20%		30%	
Brazil	RNP		95%			5%
Chile	REUNA	90%		2%		8%
Colombia	RENATA	65%	35%			
Costa Rica	CONARE		100%			
Ecuador	CEDIA	100%				
El Salvador	RAICES	100%				
Guatemala	RAGIE	100%				
Mexico	CUDI	100%				
Paraguay	ARANDU					
Peru	RAAP	100%				
Uruguay	RAU					
Venezuela	CENIT	100%				

Table 6.1.3 Charges to NREN customers

Country	NREN	How does the NREN charge its customers?	Details
Argentina	Innova|Red	Flat fee, based on bandwidth	
Brazil	RNP	We do not charge them directly	
Chile	REUNA	Combination of flat fee and usage-based fee	
Colombia	RENATA	We do not charge them directly	
Costa Rica	CONARE	We do not charge them directly	
Ecuador	CEDIA	Combination of flat fee and usage-based fee	
El Salvador	RAICES	Other	We charge the same fee to every member
Guatemala	RAGIE	Other	Currently it is a flat fee based on the number of members. We are changing this for 2011 so that it is a combination based on the number of members and the bandwidth used
Mexico	CUDI	Other	We charge a fixed annual fee depending on the membership category, regardless of the bandwidth
Paraguay	ARANDU	We do not charge them directly	
Peru	RAAP	Other	Some members contribute with a membership fee and others for Access to RAAP
Uruguay	RAU	Flat fee, based on bandwidth	
Venezuela	CENIT	Flat fee, based on bandwidth	

6.2   Staffing

Except in the cases of Brazil, where RNP has a staff made up of a large number of hired and outsourced people, and of REUNA (Chile) and CENIT (Venezuela), which feature 24 and 23 members of staff respectively working directly on the NREN activities, the number of people who actually constitute the staff of Latin American academic networks is very low, even reaching zero in the case of those networks which are maintained thanks to the volunteer work of certain people who have decided to bet on the incorporation of their countries and of their scientific and academic communities into advanced networks

Table 6.2.1: NREN staff

Country	NREN	Number of people who make up the total of paid staff hired part-time employed directly by the NREN	Number of members of staff directly involved in the NREN activities.	If the NREN has members of staff working part-time, indicate the number of equivalent full time employees (FTE)	Number of people outsourced as FTE
Argentina	Innova|Red	8	8	8	1
Brazil	RNP	190	305	0	115
Chile	REUNA	24	24	0	0
Colombia	RENATA	6	10	0	4
Costa Rica	CONARE	3	3	0	0
Ecuador	CEDIA	6	0	3.5	1
El Salvador	RAICES	0	0	0	0.2
Guatemala	RAGIE	0.25	0	0.25	0
Mexico	CUDI	16	16	0	0
Paraguay	ARANDU	0	0	0	0
Peru	RAAP	2	7	4	4
Uruguay	RAU	100	11	6.5	0
Venezuela	CENIT	176	23	23	0

Appendixes

1   Alphabetical list of the Latin American National Research and Education Networks that took part in the present study

NREN Acronym	Full name of the NREN in its original language	Country
CEDIA	Consorcio Ecuatoriano para el Desarrollo de Internet Avanzado	Ecuador
CENIT	Centro Nacional de Innovación Tecnológica	Venezuela
CONARE	Consejo Nacional de Rectores	Costa Rica
CUDI	Corporación Universitaria para el Desarrollo de Internet	Mexico
Innova|Red	Innova|Red	Argentina
RAAP	Red Académica Peruana	Peru
RAGIE	Red Avanzada Guatemalteca para la Investigación y Educación	Guatemala
RAICES	Red Avanzada de Investigación, Ciencia y Educación Salvadoreña	El Salvador
RAU	Red Académica Uruguaya	Uruguay
RENATA	Red Nacional Académica de Tecnología Avanzada	Colombia
REUNA	Red Universitaria Nacional	Chile
RNP	Rede Nacional de Ensino e Pesquisa	Brazil

NOTE: ARANDU (Paraguay) is not on the list since it is a Guarani name, not an acronym.

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2 Glossary

ALICE	América Latina Interconectada Con Europa – (Latin America Interconnected With Europe) – Initial project under which RedCLARA was created, implemented and established, among other relevant results
ALICE2	América Latina Interconectada Con Europa 2 (Latin America Interconnected With Europe 2) - Action's name: Expanding and Strengthening RedCLARA as an e-Infrastructure for Collaborative Research and Support to Development. Project jointly funded by the EC through the @LIS2 Programme
@LIS2	Alliance for the Information Society, phase 2, European Commission's cooperation programme
EC	European Commission
CLARA	Cooperación Latino Americana de Redes Avanzadas (Latin American Cooperation of Advanced Networks)
Gb/s	Gigabytes per second
GÉANT	Pan-European advanced network, managed by DANTE
HD	High Definition
AAI	AAI - Authorization and Authentication Infrastructure
IP	Internet Protocol
IPv4	Internet Protocol, version 4
IPv6	Internet Protocol, version 6
MAN	Metropolitan Area Network
Mb/s	Megabytes per second
MCU	Multi Conference Unit
NOC	Network Operation Centre
NREN	National Research and Education Network
PoP	Point of Presence
QoS	Quality of Service
RAN	Regional Area Network
RedCLARA	Advanced research and education network created by ALICE and managed by CLARA
SD	Standard Definition
TERENA	Trans-European Research and Education Networking Association
VoIP	Voice over Internet Protocol

To learn about CLARA, visit: http://www.redclara.net
To learn about the ALICE2 project, visit: http://alice2.redclara.net

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