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«The European Union is made up of 25 Member States who have decided to gradually link together their know-how, resources and destinies. Together, during a period of enlargement of 50 years, they have built a zone of stability, democracy and sustainable development whilst maintaining cultural diversity, tolerance and individual freedoms. The European Union is committed to sharing its achievements and its values with countries and peoples beyond its borders».

The European Commission is the EU's executive body.

CLARA Compendium of National Research and Education Networks in Latin America

2009

Contents

Introduction

Since the launch of RedCLARA[1], a frequent demand from the scientific and governmental fields and from National Research and Education Networks (NREN) in Europe, North America, Asia and Latin America is for comparative information between the different networks connected to our regional advanced network. The reference to the TERENA Compendium has been, since then, a constant feature, and it has become evident that it is necessary to have a source of information that serves as reference for all those who are interested in the development of research and education networks in Latin America.

Trying to meet such decisive requirement, already in its formulation the ALICE2 project –initiated in December 2008 thanks to the co-funding from the European Commission through its cooperation programme @LIS2- included the annual elaboration of a Compendium of the Latin American NREN that are part of the project. This is the rationale behind the elaboration of the present document.

It is necessary to point out that that the questionnaire developed for this first CLARA Compendium of National Research and Education Networks in Latin America, is an adaptation from the one that TERENA annually applies since 2001 among the networks that are part of it, as well as some neighbouring networks, for the elaboration of its own Compendium.
We therefore thank the collaboration offered by TERENA to ALICE2 and CLARA; without it, it would have been a lot more difficult to fulfil our mission.

Regarding the results of such questionnaires, it is important to mention that they represent the situation until the first week in November 2009. In relation to the tendencies, these have been summarised in the chapter titled “Key findings summary”.

As for the data collected, it is necessary to indicate that their systematisation and comparison is what gives birth to this document, but all the questionnaires have been published just as they were received by us on the Compendium sub-section on the ALICE2 website: http://alice2.redclara.net/index.php/es/documentos/compendio.

We hope this first edition of the CLARA Compendium of National Research and Education Networks in Latin America serves as a reference material. We know the information herein contained is valuable. We believe we can improve this document year after year and we are certainly open to receiving your suggestions, contributions and opinions

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Communications and Public Relations Manager
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1 November 2004, as part of the ALICE project (Latin America Interconnected with Europe) and within the context of the Europe-LAC Ministerial Summit (held in Río de Janeiro, Brazil).

Key findings summary

For the first edition of the CLARA Compendium of National Research and Education Networks in Latin America only the NRENs (National Research and Education Networks) from those countries in the region which are members of the ALICE2 project, all of them connected to RedCLARA, were considered. Only eleven of them responded to the questionnaire. Venezuela and Peru refrained from doing so.

The questionnaire was sent to the Directors and Technical Representatives in each network so as to obtain the most reliable possible information.

Legal form and history

The vast majority of the NREN declares to be a separate legal entity in its own right, independent from the Government.

As regards the history of their creation and foundation, the development of Latin American NREN has been the result of a process where the older networks (Chile – 1986, Argentina – 1990, Uruguay – 1991, Brazil – 1992 and Mexico – 1999), were influenced by the technological developments and by the particular future vision of some researchers, whereas the newer ones were marked by the foundation of CLARA, the establishment of RedCLARA and the strong influence of the ALICE project.

Changes

The changes that have taken place in the NREN during 2009 and those expected for 2010 are related to the extension and improvement of the services provided to the institutions connected to each network. The infrastructure issue is also relevant and is always related to the need for expanding bandwidth for national backbones and last mile links.

Connection policies and level of connectivity

In terms of connection policies, the numbers are consistent with the "juvenile" condition of the NREN in the region, most of which are less than 6 years old (beginning of the ALICE Project). Only 46% of the eleven networks which answered the Questionnaire on which the Compendium is based declare to have a policy. Most of the connections are in the sphere of universities, research centres and Institutes of further education; none of the NREN connects today primary and/or secondary schools; only three of them declare to connect facilities like libraries, museums and/or archives; and also three of them declare to provide connectivity to governmental bodies. Only one of them declares to have non-university hospitals connected.

As for the level of connectivity that the NREN provide to each type of institution, the strongest point is in universities, institutes of further education and research centres; only in three NREN these connections are higher than 1 Gb/s though lower than 10 Gb/s. As

for the typical connections for universities (which is the type of institution featuring the highest number of connections in all NRENs), they are all measurable in Mb/s, except in the case of four national networks.

PoPs, network and connection services

There is a significant variability in this subject: CEDIA, for instance, declares to have no PoPs, nor circuits nor sites; although it is located in a significantly smaller territory compared to Brazil and Argentina, REUNA, in Chile, features 54 circuits from 10 PoPs, while RNP in Brazil, with 27 PoPs, manages 29 circuits; and Innova|Red (Argentina), with 2 PoPs, manages 23 circuits. This is just to exemplify the level of variability that takes place among the different NREN. What calls the attention is the low existence of Optical PoPs, which serves to illustrate the slow incorporation of optical networks into the region's NREN.

Except in the cases of RNP and CUDI -, for all NREN the main connection with the world of research and education networks is developed through RedCLARA. The second connection in terms of importance (except RNP and CUDI) is, in general terms, the one the NRENs have to Commercial Internet. The dark fibre connections and the optical traffic are practically nonexistent in Latin American networks. No congestions problems can be seen in the networks.

In accordance with the global tendency, the request for IPv4 prefixes has been low over the last year for NRENs (except in the case of RENATA with 25): only three NRENs declare they do not support IPv6. However, two of them expect to solve this situation in 2010. As regards IPv6 prefixes allocation, the number is important for each network. The leader in this sense is RAU, with 40 prefixes allocated.

Other services

Nine NRENs declare they have a Network Operations Centre (NOC) to respond to the needs of all their users.

In relation to Quality of Service (QoS), only three out of the eleven networks that responded to the questionnaire on which this Compendium was based said they offer Premium QoS, which barely equals 27%; regarding the IP Best Efforts, five networks declared they have this kind of QoS (45%), 3 declared they do not offer it (27%) and 3 have considered it for the future (27%).

In terms of Security Incident Response, six NREN (55%) stated they offer this service, and five of them said they do this autonomously (only one of the has outsourced it). 27% of the NREN (3) declared they have planned the implementation of this particular security service, and only two of them (representing 18% of the sample) indicated they do not have it, but they did not mention this as part of their future implementation plans. Only two NREN have a security policy.

Only two NREN, RNP and REUNA stated they have Certification Authorities; three NREN (Innova|Red, CEDIA and RAU) indicated they expect to be able to offer certificates for users in the future. CoNARE, RAICES, RAGIE and REDCYT do not expect to do so, while RENATA and CUDI refrained from answering.

As regards housing, storage, hosting and content delivery services, REDCYT stated it has distributed storage service for grid users already installed; only Innova|Red said it provided housing for commercial content servers; a better situation can be seen in terms of video servers. RNP, REUNA and CUDI indicated they have them already installed in their NRENs. Finally, only CEDIA declared to have mirroring.

Budget

In terms of funding, NRENs –except CEDIA- work on a year calendar based budget. Although it is true that only half of the networks provided information regarding their annual funds, only by considering this sample it is valid to regard their budgetary situation as critical. In fact, this critical situation allows only two NREN to develop multi-year budget planning, which implies some degree of certainty in relation to the network's future sustainability.

Only two (RNP and CoNARE) of the NREN which provided information on the sources of income that make up their annual budgets identified their governments (or public bodies) as their sole sources of funding. The majority of funding of the NREN in the Compendium comes from the participation of users and/or clients; this is the sole source of funding for CEDIA, RAICES, RAGIES and CUDI; it represents 90% for REUNA (which completes its total with 8% coming from other sources and 2% from the EU through participation in international collaboration projects). Only Innova|Red is outside the norm, but not entirely, with 50% of its budget coming from users and/or clients, that is, the main part. The remaining half is divided between the Inter American Development Bank (IADB) with 30% and the government or public bodies with a 20% contribution to the network.

Regarding the modality for charging their users, only RNP and CoNARE indicated their NREN do not charge a fee to their beneficiaries directly; Innova|Red, RAICES and RAU charge a flat fee, based on bandwidth; REUNA and CEDIA apply a combination of flat fee and usage-based fee. None of the NRENs declared to charge a traffic-based fee. RENATA charges a connectivity fee plus maintenance charges. RAGIE did not explain its charging modality. However, it does not correspond to any of the modalities presented in the questionnaire that originates the present Compendium. CUDI, in turn, charges a fixed annual fee which depends on the membership category of each member. Bandwidth is not taken into account to calculate this fee. Panama did not provide an answer on this matter.

1 Basic information

1.1 NRENs that responded to the questionnaire

For this first edition of the CLARA Compendium of Research and Education Networks in Latin America, only the NREN from those countries in the region which are members of the ALICE2 project, all of them currently connected to RedCLARA, were considered. Of these thirteen networks, eleven responded to the questionnaire. Venezuela and Peru refrained from doing so, the first because of the change that today affects the NREN conformation, and the latter due to lack of time.

The questionnaire was sent to the Directors and Technical Representatives in each network, so as to get the most reliable possible information.

In most of the tables and graphs, acronyms were used in order to identify each NREN; additionally, the order in which each NREN is presented in the same tables follows the alphabetical order of the names of the countries that were asked to answer the questionnaire.

Table 1.1.1: NRENs and URLs

Country	NREN	URL
Argentina	Innova|Red	http://www.innova-red.net/
Brazil	RNP	http://www.rnp.br/
Chile	REUNA	http://www.reuna.cl/
Colombia	RENATA	http://www.renata.edu.co/
Costa Rica	CoNARE	http://www.conare.ac.cr/
Ecuador	CEDIA	http://www.cedia.org.ec/
El Salvador	RAICES	http://www.raices.org.sv/
Guatemala	RAGIE	http://www.ragie.org.gt/
Mexico	CUDI	http://www.cudi.edu.mx/
Panama	REDCYT	No posee sitio web
Peru	RAAP	http://www.raap.org.pe/
Uruguay	RAU	http://www.rau.edu.uy/redavanzada/
Venezuela	CENIT - REACCIUN	http://www.cenit.gob.ve/cenitcms/index_1.html

Colour key for Table 1.1.1:

Countries that answered the questionnaire

Countries that did not answer the questionnaire

1.2 Legal form of NRENs

The Latin American NRENs have various legal forms. However, the big majority of them declare to be a separate legal entity in their own right, independent from the Government. In fact, the only institution which declares to be part of a governmental agency is Innova|Red (Argentina).

This section features the distinction between two parameters which, when brought together, help characterise the legal form of each NREN:

Autonomous legal entity (separate legal entity of its own right)

It is necessary to mention the independence from governmental bodies that NRENs declare to have, an independence which imposes quite a few complexities in terms of financial sustainability, but which at the same time help them remain outside socio-political fluctuations.

Relationship with the Government

Except in the case of Argentina, the NRENs feature complete autonomy from their countries' governmental power, although a significant number of them acknowledge an indirect relationship through their members or its funding (as it is in the case of RAU).

Table 1.2.1: Legal form of NREN

Country	NREN	Autonomous legal entity?	Relationship with the Government	Comments / Parent organisation
Argentina	Innova|Red	No	Part of a governmental agency or a ministry	Scientific and Technical Research National Council (CONICET)
Brazil	RNP	Yes	The Government appoints at least half of the members of the Governing body	
Chile	REUNA	Yes	No formal relationship	
Colombia	RENATA	Yes	Indirect relationship	Three (out of 11) governmental institutions are founding members of the Corporation
Costa Rica	CoNARE	Yes	Indirect relationship	
Ecuador	CEDIA	Yes	Indirect relationship	The members are universities, mostly State-owned ones; there are strategic members which are part of the Government. The Ministry of Science and Technology is a member.
El Salvador	RAICES	Yes	No formal relationship	
Guatemala	RAGIE	Yes	No formal relationship	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 not, however, any formal links.
Mexico	CUDI	Yes	Indirect relationship	
Panama	REDCYT	Yes	Indirect relationship	
Uruguay	RAU	No	Indirect relationship	Its authorities do not depend on the Government. It has parliamentary budget approved by the executive power.

1.3 NRENs' history

As regards the history of their formation and foundation, the development of Latin American NREN has been the result of a process which in the oldest networks (Chile – 1986, Argentina – 1990, Uruguay – 1991, Brazil – 1992, and Mexico – 1999), were influenced by the technological developments and the particular vision of future of some researchers, whereas the newest ones were marked by the foundation of CLARA, the establishment of RedCLARA and the strong influence of the ALICE project.

As part of the research developed in order to elaborate this Compendium, NRENs were asked 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 NREN

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	http://www.innova-red.net
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		2007	http://renata.edu.co/index.php/quienes-somos-identidad-y-objetivos-de-renata.html
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	
Guatemala	RAGIE	1995		2004	
Mexico	CUDI	1999	1999	1999	http://www.cudi.edu.mx/index.html
Panama	REDCYT	2005	2005	2004	
Uruguay	RAU	1991	1995	1991	http://www.rau.edu.uy/rau/historia.htm

1.4 Major changes in the NRENs

The NREN were asked to give a brief description of the major changes that have taken place inside them during the recent period (2008-2009) or the changes expected for 2010. The following table contains the answers given by the Latin American networks connected to RedCLARA (some texts were slightly edited to facilitate their reading). It is important to mention that the fact that some NRENs did not answer does not necessarily imply that there have not been any changes in them.

In general terms, it can be said that the changes that have taken place in the NRENs during 2009 and those forecast for 2010 are related to the extension and improvement of the services provided to the institutions connected to each network. The infrastructure issue is also relevant and is always related with the need to expand the bandwidth of national backbones and last mile links.

Table 1.4.1: Major changes in the NREN

Country	NREN	Major changes
Argentina	Innova|Red	
Brazil	RNP	
Chile	REUNA	In May 2008 the videoconference system was integrated with an MCU for the university service. In November 2009 the regional nodes at 1 Gbps are created.
Colombia	RENATA	
Costa Rica	CoNARE	RED_CONARE is starting its functions and is coordinating its consolidation in order to articulate its services and development in its initial scope of action, which is in the universities in CoNARE. In its first phase, it integrated the central campuses of each of these universities. However, in subsequent stages the access to the different campuses distributed across Costa Rica will have to be materialised.
Ecuador	CEDIA	The main changes occurred in 2009 were (March) the appointment of a new Executive Director and therefore of the work team. This resulted in the change of venue from ESPOL –which had hosted CEDIA since its creation- to the Universidad de Cuenca. Besides, the network moved from infrastructure improvement to the development of advanced network projects (currently the internal infrastructure is quite superior to others in CLARA since it succeeded in upgrading the internal backbone to 1 GB). From the point of view of relations with the Government, these have improved. It is the case of the Ministry of Science and Technology, and the participation of other ministries, such as Telecommunications, has been engaged. As for the technological aspects, there has been an improvement of the services and the quality of the service provided thanks to new policies and SLA applied to the provider. In the same way, new technologies have been implemented following an updates schedule, which includes, among other things, Native IPv6 implementation and VoIP over the network.
El Salvador	RAICES	Change in the network's topology: from a star to a ring, moving from 2 Mbps links to 100 Mbps links between each member.
Guatemala	RAGIE	Our link to RedCLARA has changed to a STM-1, which will enable the immediate and future bandwidth growth. Today, given the prohibitive costs, we are only using 18 Mbps. One way in which we expect to increase bandwidth is to provide Internet commodity to our members through STM-1. This will leave us overhead, which will allow us to achieve greater bandwidth to RedCLARA. The university system in Guatemala is different to most countries where everything is based in the capital. In fact, most universities have campuses across the country. Today, only the campuses that are located in the capital are connected and in 2010 we expect to begin the connection process to other campuses, particularly those located in the most densely populated areas. To this end, we are considering the possibility of purchasing dark fibre, since it promises to be a lot more cost-effective.
Mexico	CUDI	In 2008 the CUDI videoconference system was integrated with the central MCU in order to provide service to universities. For 2010 (middle of the year) an extension from 155 Mbps to 1 Gbps will be carried out and a new cross border link between Mexico and the USA will be established.
Panama	REDCYT	Future actions: change of directing board, separation of member networks, ASN update, implementation of DNS services under IPv6, implementation of website and improvements to the network's monitoring system.
Uruguay	RAU	Since 2006 we are in the process of changing our connections to optical fibre. This process will continue in 2010. Besides, we are planning to offer new services like Grid, QoS, Multicast, etc.

2 Users / Clients

IWe begin this section with information related to the NREN's connection policies –are there any such policies within each national network? Do NRENs have acceptable use and security policies? What kind of institutions can be connected to their networks?-, in section 2.2. Section 2.3 reviews the levels of connectivity that the NRENs provide for university and Institutes of further education and research centres that are part of them.

2.1 Overview

In terms of connection policies, the numbers are consistent with the "juvenile" state of the NRENs in the region, most of them less than 6 years old (beginning of the ALICE project). Only 46% out of the eleven networks that answered the Questionnaire that articulates the CLARA Compendium of National Research and Education Networks in Latin America declares to have a connection policy (see Table 2.2.1). The majority of connections are in the world of universities, research centres and Institutes of further Education, and at present none of them connects primary and/or secondary schools. Only three of them declare to connect facilities like libraries, museums and/or archives. There are also three networks which provide connectivity for Governmental agencies and only one network declares to have non-university hospitals connected. (See Table 2.2.2)

As for the level of connectivity that NRENs provide for each type of institution, it is necessary to mention that the highest number is in universities, Institutes of further education and research centres. Table 2.3.1 shows those levels of connectivity. Only in three NRENs these are higher than 1 Gb/s although lower than 10 Gb/s. Regarding the typical connections for universities (which is the type of institution showing the highest number of connections in all NRENs), these are all measurable in Mb/s, except in the case of four networks.

2.2 Connection policies

46% of the NRENs that answered the Questionnaire used for the elaboration of the present Compendium declare to have a national backbone connection policy; 55% also have a network acceptable use policy (See Table 2.2.1).

In relation to the institutions that each NREN can connect, all of them allow the connection of universities, Institutes of further education (except REUNA and CEDIA), libraries, museums and archives (except REUNA and RAICES), non-university hospitals and government agencies (RNP and RAICES are the exception in both cases and REUNA is also the exception only in the first case). As for the possibility of connection for primary and secondary schools, there is a feasibility of nearly 50%. These tendencies are presented in Table 2.2.2, which also includes the numbers provided by each NREN in relation to the total amount of institutions connected to them.

The entities connected to the NREN through a Commercial Internet provider have not been taken into account.

- None of the NRENs declares to have connections for primary and/or schools.
- Based on the figures actually provided by NREN:
  - Only Innova|Red, CUDI and RAU declare to have connections for institutions like libraries, museums and/or archives.
  - Only CUDI declares to have non-university hospitals connected to its network.
  - Only Innova|Red, REDCYT and RAU declare to have connections for Government agencies.

Table 2.2.1: Connection and Acceptable Use Policies

Table symbol keys

√	Exist
-	Does not exist
NC	No answer

Country	NREN	Connection policy	Acceptable use policy
Argentina	Innova|Red	-	-
Brazil	RNP	-	√
Chile	REUNA	√	-
Colombia	RENATA	-	√
Costa Rica	CoNARE	-	-
Ecuador	CEDIA	√	√
El Salvador	RAICES	-	-
Guatemala	RAGIE	-	√
Mexico	CUDI	√	√
Panama	REDCYT	√	√
Uruguay	RAU	√	-

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

Table symbol key

√	Allowed, but number of institutions connected is not recorded
-	Not allowed
NC	No answer

Country	NREN	Universities	Institutes of further education	Research institutes	Secondary schools	Primary schools	Libraries, museums, archives	Hospitals (non-university)	Government agencies (national, regional, local)
Argentina	Innova|Red	90	5	13	-	-	1	√	4
Brazil	RNP	√	√	√	-	-	√	-	-
Chile	REUNA	√	-	√	-	-	-	-	√
Colombia	RENATA	90	√	3	√	√	√	√	√
Costa Rica	CoNARE	√	NC	NC	NC	NC	NC	NC	NC
Ecuador	CEDIA	22	-	2	-	-	√	√	√
El Salvador	RAICES	6	1	√	-	-	-	-	-
Guatemala	RAGIE	6	√	√	√	√	√	√	√
Mexico	CUDI	72	86	32	√	√	1	14	√
Panama	REDCYT	3	√	√	√	√	√	√	2
Uruguay	RAU	3	√	4	√	√	2	√	3

2.3 Level of connectivity by type of institution

Since the highest number of connections within each Latin America NREN connected to RedCLARA is universities, Institutes of further education and research institutes, Table 2.3.1 presents the levels of connectivity for each of these types of institutions.

In relation to the connection modality of institutions to each NREN, in general terms they are carried out mainly through a PoP (Point of Presence) in the national network's backbone and secondly through a MAN (Metropolitan Area Network) or RAN (Regional Area Network) managed by the NREN. Further details on this can be found on the individual questionnaires answered by each NREN, all of them published in:
http://alice2.redclara.net/index.php/es/documentos/compendio.

It is important to mention that only three NRENs (RNP, REUNA and CEDIA) declare they offer connectivity equal or higher that 1 Gb/s although lower than 10 Gb/s. As for the typical connections for universities (the type of institutions showing the highest number of connections in all NREN), these are measurable in Mb/s, with the exception of REUNA, CEDIA, RAICES and RAGIE.

Table 2.3.1: Connectivity level by type of institution

Country	NREN	Universities			Further education institutions			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	<10 Mb/s	<10 Gb/s	<100 Mb/s	<10 Mb/s	<10 Gb/s	<100 Mb/s
Chile	REUNA	<1 Gb/s	<10 Gb/s	<10 Gb/s	NDC	NDC	NDC	<1 Gb/s	<1 Gb/s	<1 Gb/s
Colombia	RENATA	<10 Mb/s	<100 Mb/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	<1 Gb/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	NDC	NDC	NDC
Guatemala	RAGIE	<1 Gb/s	<1 Gb/s	<1 Gb/s	NDC	NDC	NDC	NDC	NDC	NDC
Mexico	CUDI	<10 Mb/s	<1 Gb/s	<10 Mb/s	NC	NC	NC	<10 Mb/s	<100 Mb/s	<10 Mb/s
Panama	REDCYT	<10 Mb/s	<10 Mb/s	<10 Mb/s	NDC	NDC	NDC	NDC	NDC	NDC
Uruguay	RAU	NC	NC	<100 Mb/s	NDC	NDC	NDC	NC	NC	<100 Mb/s

Table symbol keys

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
<10 Mb/s	Less than 10 Mb/s
<100 Mb/s	10 Mb/s or more, but less than 100 Mb/s
<1 Gb/s	100 Mb/s or more, but less than 1 Gb/s
<10 Gb/s	1 Gb/s or more, but less than 10 Gb/s
<40 Gb/s	10 Gb/s or more, but less than 40 Gb/s
>40 Gb/s	More than 40 Gb/s
NC	No answer
NDC	No connectivity declared

3 Network & connectivity services

This section offers an overview on those characteristics that are most significant in terms of the technical features and connectivity services provided by NRENs. This is where we take a look inside each network.

Section 3.1 provides information related to the PoP, circuits and sites managed by each network. Section 3.2 is related to the capacities of the same networks. Section 3.3 is related to the changes in terms of topology capacities and modifications that are planned to be implemented in the future in the NRENs. Section 3.4 is devoted to the external connections that Latin American national networks have, while section 3.5 looks into the issue of dark fibre use and future implementation. In this point, the results are totally opposed to the ones obtained by TERENA in its Compendium.

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

The number of Points of Presence (PoPs) in the network and the number of circuits and sites managed by each network are indicators of the degree of complexity of a network. A PoP is defined as a point in the NREN backbone. This point can connect client networks directly or aggregations of independent networks, such as a MAN (Metropolitan Area Network) or external networks.

The number of circuits managed is the number of links that, managed by the NREN, carry production traffic. The number of sites managed is that in which the NREN manages the routing or switching equipment used for connecting a client network to the PoP.

As can be seen in Table 3.2.1, there is a considerable variability in this subject between the eleven NRENs that participated in this study. CEDIA, for instance, declares not to manage any PoPs, or circuits or sites. Although it is located in a significantly smaller territory than that of Brazil or Argentina, REUNA, in Chile, features 54 circuits from 10 PoPs, while RNP in Brazil manages 29 circuits with 27 PoPs and Innova|Red manages 23 circuits with 2 PoPs. This is just an example of the level of variability existing between the different NRENs. What calls the attention is the low existence of Optical PoPs, which serves to illustrate the slow incorporation of optical networks into the region's NREN.

Table 3.1.1: Level of Connectivity by Institution type

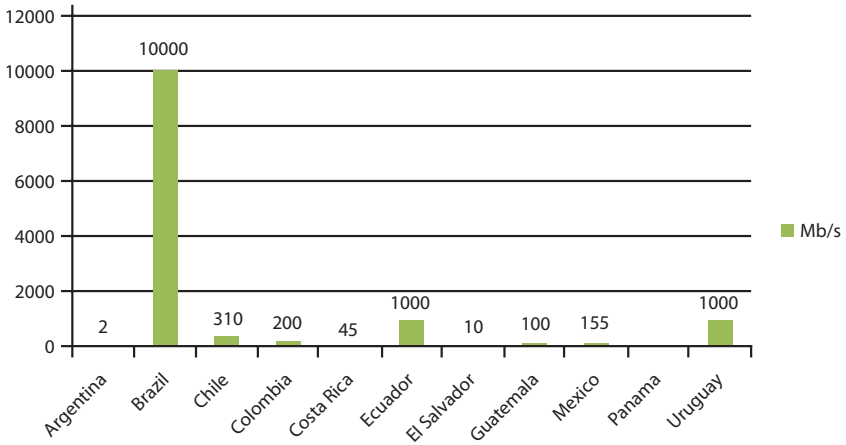
Country	NREN	Number of PoPs	Number of Optical PoPs	Number of Circuits	Number of Sites
Argentina	Innova|Red	2	2	23	
Brazil	RNP	27	0	29	27
Chile	REUNA	10		54	19
Colombia	RENATA	8	8	1	8
Costa Rica	CoNARE	1	1	1	1
Ecuador	CEDIA	0	0	0	0
El Salvador	RAICES	1	1	8	8
Guatemala	RAGIE	6	1		1
Mexico	CUDI	18	0	6 backbone and 15 aggregated	8
Panama	REDCYT	1	0	1	1
Uruguay	RAU	3	1		37

3.2 Network core capacity

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

The graph illustrating the capacities of each NREN offers measurements in Mb/s

Graph 3.2.1: Network backbone core capacity



3.3 Changes expected in the NREN

The NREN were asked to provide a descriptive overview of the most important initiatives related to the development of the underlying network expected to be seen on their networks over the next 2-5 years. Table 3.4.1 shows the answers given. It is important to mention that they were also asked to associate an approximate level of confidence to each initiative on the following terms: Quite Certain, Likely, Uncertain.

Table symbol key

Quite Certain	Likely	Uncertain

Table 3.3.1: Changes expected in the NREN

Country	NREN	2009	2010	2011	2012
Argentina	Innova|Red	Development of 2 backbones at 10 Gbps: Buenos Aires – Santiago (B1) and Buenos Aires Bariloche– Osorno (B2)	Development of Buenos Aires – Porto Alegre backbone (B3) Development of PoPs B1 Development of PoPs B2	Development of PoPs B3	
Brazil	RNP		Backbone extension for the connection of 24 out of 27 PoPs at 10 Gb/s		
Chile	REUNA		To increase to 1 Gb/s (minimum) the backbone's northern half, using lambda over DWDM	To increase to 1 Gb/s (minimum) the backbone's southern half, using lambda over DWDM	
Colombia	RENATA				
Costa Rica	CoNARE			Bandwidth increase in the "ring of the inter-institutional VPN" (illuminated fibre ring which links the network's member universities)	
Ecuador	CEDIA				
El Salvador	RAICES	Construction of a ring between NREN members and bandwidth increase between them	External bandwidth increase (towards RedCLARA)		
Guatemala	RAGIE		Network extension to rural areas	External bandwidth increase (towards RedCLARA) at 34 Mb/s	
Mexico	CUDI		Bandwidth increase in the backbone from 155 Mb/s to 1 Gb/s	Bandwidth increase in the backbone from 1 Gb/s to 10 Gb/s	
Panama	REDCYT			Network infrastructure improvement	
Uruguay	RAU		Increase of the number of nodes to 10 Mb/s		Urban connections in dark optical fibre Inter-urban Connections inter hired by IRUs

3.4 External connections

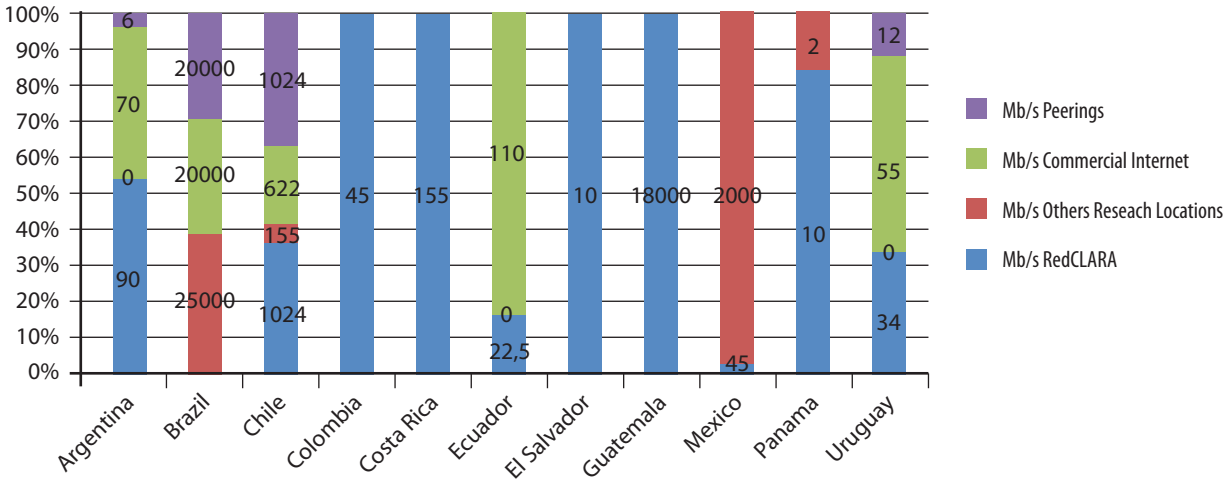
NRENs were asked to produce a list of all their external connections at the end of June 2009, excluding backup links.

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 the Commercial Internet excluding Internet Exchanges
- Peerings, connections to Internet Exchanges

Except in the case of RNP and CUDI –which feature connections with other research institutions which are widely superior to the ones they have with RedCLARA-, for all NREN the main connection with the world of research and education networks is developed through RedCLARA. The second connection in terms of importance (except in RNP and CUDI) is, in general terms, the one NREN have to Commercial Internet.

Graph 3.4.1: External connections



3.5 Dark fibre

In trying to see if the dark fibre adoption tendency seen in Europe was reflected in Latin America, NRENs were asked what percentage of their backbones is dark fibre, what the percentage of this fibre is on long term lease (IRU) and what portion is owned by the NREN. The same questions in terms of forecast for early 2011 were applied. The results are far from the favourable situation seen in the European continent. Only Innova|Red currently has a minimal portion of its network in dark fibre (1% owned by it) and only that NREN together with REUNA and RAGIE plan to adopt dark fibre over the next two years.

Table 3.5.1: Dark fibre in NREN backbones

Country	NREN	Present situation			Expected situation, early 2011		
		% of the NREN backbone that is dark fibre	% of this fibre that is IRU	% of this dark fibre that is owned by NREN	% of the NREN backbone that is dark fibre	% of this fibre that is IRU	% of this dark fibre that is owned by NREN
Argentina	Innova|Red	1	0	1	80	79	1
Brazil	RNP						
Chile	REUNA				50	100	
Colombia	RENATA						
Costa Rica	CoNARE						
Ecuador	CEDIA						
El Salvador	RAICES						
Guatemala	RAGIE				50	50	
Mexico	CUDI						
Panama	REDCYT						
Uruguay	RAU						<1

4 Traffic

In order to take a closer look into the issue of data transfer within each Latin American NREN connected to RedCLARA, it was decided to address the network's congestion issue, which is analysed in section 4.1. Section 4.2 features an analysis of the issue of data traffic over the NREN's optical networks and their monitoring.

IPV4 and IPv6 are covered in section 4.3.

4.1 Network Congestion

It is not possible to identify a tendency in terms of network congestion given the type of information provided by NRENs and the types of networks they operate –the disparity between each other-. Despite this acknowledgement, in general terms there is no evidence of a serious congestion issue, except the one Uruguay features in the Access Network.

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%	50%	30%	20%	100%		
Chile	REUNA	25%	60%	15%												
Colombia	RENATA										80%	10%	10%	20%	70%	10%
Costa Rica	CoNARE															
Ecuador	CEDIA															
El Salvador	RAICES	100%			100%			100%			100%			100%		
Guatemala	RAGIE															
Mexico	CUDI							70%	20%	10%						
Panama	REDCYT	60%	40%					60%	40%		60%	40%				
Uruguay	RAU	95%	5%		80%	10%	10%		20%	80%				20%	80%	

Leyenda de la Table

☺	% of institutions experiencing no or very little congestion
😐	% of institutions experiencing some or moderate congestion
☹	% of institutions experiencing serious congestion

4.2 Optical Traffic

The NREN were asked what types of traffic are carried on their optical networks, but no traffic of this kind was indentified. Despite the above, it is important to mention that CLARA has information regarding the optical traffic carried by RNP and REUNA (the latter only in the connection of its regional networks at a local level).

4.3 IPv4 and IPv6

In accordance with the global tendency, the request for IPv4 prefixes has been low over the last year for the NRENs (except in the case of RENATA, which gathers 25): only three NRENs declare to support IPv6, although two of them expect to solve this situation in 2010. As for IPv6 prefixes allocation, the number is important in each network, RAU being the leader with 40 prefixes allocated.

Table 4.3.1: IPv4 requests and IPv6 prefixes

Country	NREN	IPv4 requests in the last year	When was native IPv6 introduced	IPv6 Prefixes allocated
Argentina	Innova|Red	1, class C	Before 2007	32
Brazil	RNP	50	2002	20
Chile	REUNA	4	2007	/32
Colombia	RENATA	25	2008 (noviembre)	/32
Costa Rica	CoNARE	1	Not supported, expected for the second half of 2010	
Ecuador	CEDIA	15	Not supported, expected for 2010	24 prefixes /48
El Salvador	RAICES	0	Not supported	8
Guatemala	RAGIE	1	2008	5
Mexico	CUDI		2001	
Panama	REDCYT	0	2005	5
Uruguay	RAU	Allocations for each member	2006	40

5 Other services

This chapter features an overview of the services that the NREN are providing for their users, over the connectivity service, in the following areas: Network Operations Centres (NOC) (5.2), Quality of Service – QoS (5.3), Security Incident Response (5.4), Certification Authority (5.5), Housing, Storage, Hosting and Content Delivery (5.6), Communication Tools (5.7), Networked Computing Resources – Grids (5.8), and Client and User Support (5.9).

It is necessary to point out that although it is true that traffic monitoring should be included here, it was analysed in the previous chapter in section 4.2, together with types of traffic.

NREN were asked about the existence of Authorisation and Authentication Infrastructures (AAI) within their organizations, but none of them gave a positive answer in this point and the majority simply did not answer. This is why this subject was not taken into account in the present chapter.

5.1 Overview

Nine NRENs declare they have a Network Operations Centre to meet the needs of all their users.

In relation to Quality of Service (QoS), only three out of the eleven NRENs that answered the questionnaire which articulates this Compendium stated they offer Premium QoS in their networks. This equals barely 27%. As for IP Best Efforts, five networks declared they have this kind of QoS (45%), 3 said they do not offer it (27%) and 3 have considered it for the future (27%).

In terms of Security Incident Response, six NRENs (55%) declared they offer this service, and five of them said they do this autonomously (one one of them has outsourced it). 27% of the NREN (3) declared they have planned the implementation of this particular security service, and only two NRENs (representing 18% of the sample) indicated they do not have this service and did not say its implementation was part of their future plans either. Only two NRENs have a security policy.

Only two NRENs, RNP and REUNA, stated they have Certification Authorities; three NRENs (Innova|Red, CEDIA and RAU) indicated they expect to issue certificates for users in the future. CoNARE, RAICES, RAGIE and REDCYT do not have this expectation and RENATA and CUDI refrained from answering.

As for Housing, Storage, Hosting and Content Delivery Services, REDCYT stated it offers distributed storage service for Grid users and only Innova|Red said it provides hosting for commercial content servers. A better situation can be seen in terms of video servers: RNP, REUNA and CUDI indicated they have them already installed in their NRENs. Finally, only CEDIA declared to have mirroring.

5.2 Network Operations Centres - NOC

All but one of the NRENs that declared to actually have a NOC (78%) indicated this service is directly provided by the network; the case of CEDIA is the only one outside the standard. The Ecuadorian network's network operations centre is run by another institution, in an outsourcing modality. 100% of the nine NRENs that provided information on this subject indicated that the NOC service is available for all their members.

Table 5.2.1: NOC

Country	NREN	Network Operations Centre (NOC)		NOC serves all members/ users in your NREN	
		Provided by the NREN	Is run by another institution (*outsourcing*)	Yes	No
Argentina	Innova|Red	x		x	
Brazil	RNP	x		x	
Chile	REUNA	x		x	
Colombia	RENATA	x		x	
Costa Rica	CoNARE				
Ecuador	CEDIA		x	x	
El Salvador	RAICES	x		x	
Guatemala	RAGIE				
Mexico	CUDI	x		x	
Panama	REDCYT	x		x	
Uruguay	RAU	x		x	

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). Such parameters were used for the objectives of this Compendium and NRENs were asked to choose the parameter that was closest to their individual situation (see Table 5.3.1); additionally, since it was expected that many of the NREN would say they do not provide these QoS levels, they were asked to indicate the main reason why they do not offer them (Table 5.3.2).

In networks experiencing congestion, QoS enables Premium traffic to move without any problems across those areas where traffic might be experiencing congestion problems. Only a minority (three NRENs, namely: RNP, REUNA and RENATA) of the

eleven networks that answered the questionnaire that articulates this Compendium indicated they offer Premium QoS, which barely represents 27%. And while the IP Less than Best Efforts classification does not show any tendency that is worth analysing (only 1 NREN indicated it offers this type of QoS, 4 said they did not and 1 considers it for the future), the situation seen in relation to IP Best Efforts is a lot more favourable: 5 NRENs indicate they offer this type of QoS (45%), 3 say they do not offer it (27%) and 3 indicated they have considered it for the future (27%). This information is presented in Graph 5.3.1.

As for the main reasons for not providing the QoS levels indicated (Table 5.3.2), there were answers from seven NRENs: two of them – Innova|Red and REDCYT- mentioned the NREN hardware's incapacity to support those types of QoS. REDCYT added that NREN users have not requested this service. CUDI indicated that it is not physically possible for the NREN to provide this service unless all the dominions in the route participate. RAICES declared that for its NREN this is not economically feasible. This answer is related to RAGIE's, which mentions the lack of technical and human resources and points out that all the work they do is done by volunteers. The "other" alternative was also ticked by CoNARE and RAU. The first states it does not provide QoS because they are in the process of organizing their nodes, while RAU mentions an over provisioning and declares that it has planned the implementation of this service for some cases, pointing out that they have already performed some tests with "diffserv".

Table 5.3.1: ¿Do you offer QoS in your network?

Country	NREN	IP Best Efforts			Premium			IP Less than Best Efforts		
		Yes	No	In the Future	Yes	No	In the Future	Yes	No	In the Future
Argentina	Innova|Red	x					x		x	
Brazil	RNP	x			x					
Chile	REUNA	x			x					
Colombia	RENATA	x			x			x		
Costa Rica	CoNARE			x			x			x
Ecuador	CEDIA	x				x			x	
El Salvador	RAICES			x						
Guatemala	RAGIE		x			x			x	
Mexico	CUDI		x							
Panama	REDCYT		x			x			x	
Uruguay	RAU			x						

Graph 5.3.1: IP Best Efforts QoS

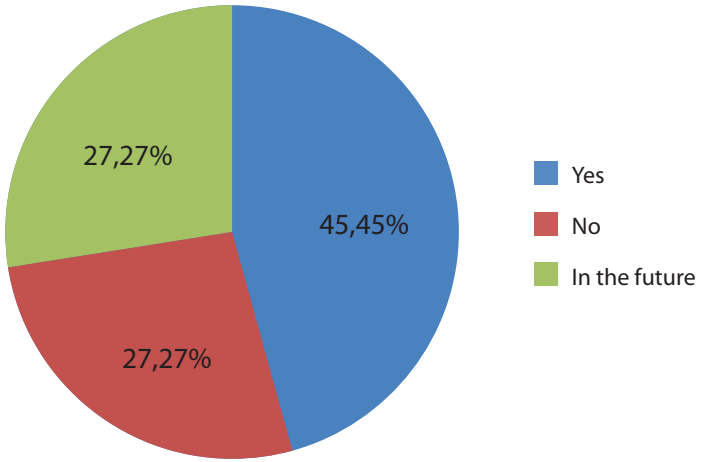


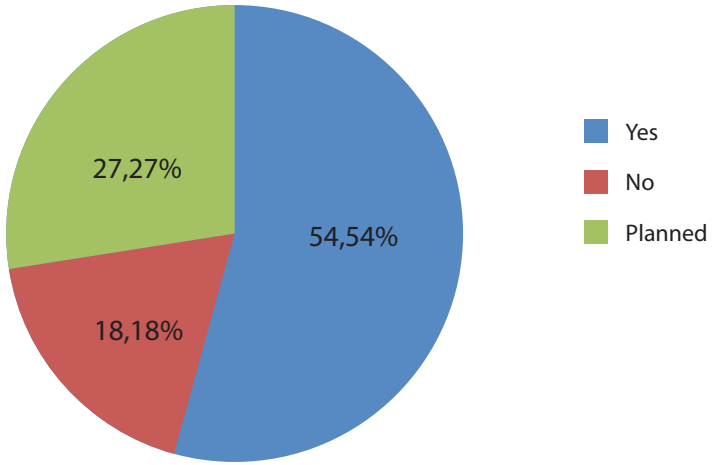
Table 5.3.2: Main reasons for not providing QoS

Country	NREN	Main reason for not providing the indicated QoS levels					
		Hardware Incapacity	No demand from users	Impossible without the participation of all the dominions in the routr	Not economically feasible	We prefer to over provision the network	Other - indicate
Argentina	Innova|Red	x					
Brazil	RNP						
Chile	REUNA						
Colombia	RENATA						
Costa Rica	CoNARE						We are in the process of organising the nodes
Ecuador	CEDIA						
El Salvador	RAICES				x		
Guatemala	RAGIE						We do not have the human resources nor the equipment required, all our work is done by volunteers
Mexico	CUDI			x			
Panama	REDCYT	x	x				
Uruguay	RAU						In general, there is over provisioning. In some cases we plan to implement it. There have been tests with diffserv

5.4 Security Incident Response

Of the eleven NRENs that answered the questionnaire used for the elaboration of the CLARA Compendium of National Research and Education Networks in Latin America, six of them (RNP, REUNA, RENATA, CEDIA, CUDI and RAU) provided a positive answer in relation to the provision of security incident response for their users community; they represent 55% of the NRENs in the Compendium and all but RENATA –which declared it runs this service in an outsourcing modality- offer this service autonomously. Innova|Red, CoNARE and RAGIE, 27% of the NRENs that answered the questionnaire, report this service as "planned". RAGIE and REDCYT, 18% of the sample, only indicated they do not offer this service and did not indicate if they have future plans for its implementation.

Graph 5.4.1: Security Incident Response offered by the NREN



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; only 18% of the eleven networks that answered the survey (that is to say, two NRENs) gave an affirmative answer.

Table 5.5.1: Security Policy

Table symbol key

√	Exist
-	Does not exist
NC	No answer

Country	NREN	Security Policy
Argentina	Innova|Red	-
Brazil	RNP	-
Chile	REUNA	-
Colombia	RENATA	√
Costa Rica	CoNARE	-
Ecuador	CEDIA	-
El Salvador	RAICES	-
Guatemala	RAGIE	-
Mexico	CUDI	√
Panama	REDCYT	-
Uruguay	RAU	-

5.6 Certification Authority

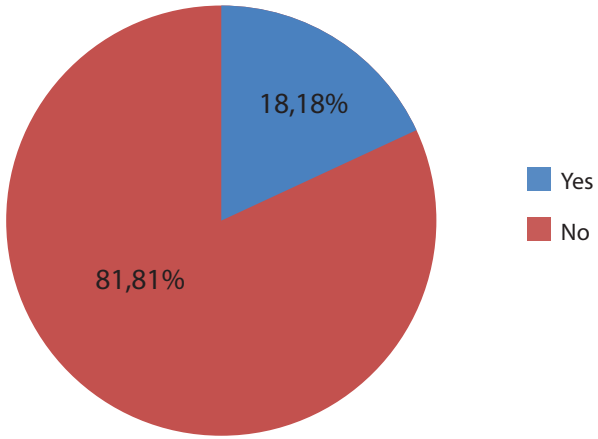
Only two of the eleven NRENs in the Compendium, RNP and REUNA, declare to have a Certification Authority (CA), which represents only 18% (see Graph 5.5.1). This meagre result is related to the incorporation stage of Latin American networks into the world of grids, a process that began in 2006 thanks to the EELA (E-Infrastructure shared between Europe and Latin America) and EELA-2 (E-science grid facility for Europe and Latin America) projects, both funded by the European Commission.

RNP issues server (since the service has been recently begun no certificates have been issued to date, though), end user and CA certificates; it uses them for grids and for Authorisation and Authentication Infrastructure (AAI). Its CA is not part of TAGPMA (The Americas Grid Policy Management Authority).

REUNA issues server (18 have been delivered and 34 certificates are expected to be issued in 2009) and end user certificates; it uses them for grids. This NREN's CA, REUNA-CA, is part of TAGPMA.

Only three NRENs (Innova|Red, CEDIA and RAU) indicated they wish to be able to issue certificates for users in the future. CoNARE, RAICES, RAGIE and REDCYT indicated they do not have any expectations in this sense; RENATA and CUDI refrained from answering.

Graph 5.6.1: Does your NREN have a Certification Authority?



5.7 Housing, Storage, Hosting and Content Delivery Services

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

Only REDCYT states it offers distributed storage service for grid users; 6 NRENs indicate they are planning to offer it and one NREN indicates it does not plan to do so.

None of the NRENs declares to offer distributed storage for any kind of NREN user; 4 of them indicate the service is part of their plans and 4 are not interested in it.

There are no NRENs which offer the dedicated (or special) connectivity service to provide high connectivity levels for commercial content servers, but 3 NRENs are planning to offer it, although 3 NRENs indicate they do not consider this.

Only Innova|Red provides hosting for commercial content servers and 6 NRENs are not interested in providing this service.

Video servers have been installed in 3 NRENs (RNP, REUNA and CUDI); 4 NRENs expect to have this kind of servers in the future while 2 NRENs do not indicate any interest in this sense.

Only CEDIA offers mirroring; 3 NRENs have included this in their future plans and 4 are not interested in this type of replica creation.

It is necessary to mention that Colombia refrained from answering this question in the questionnaire and that Costa Rica put zeros in all boxes, which lead to think that they do not offer this type of services and that they are not part of their immediate future plans.

Within the questionnaire answered by NRENs for the elaboration of the CLARA Compendium of National Research and Education Networks in Latin America, there was a question on the Multicast service; very few of them decided to answer this question, which indicates that Multicast does not represent a real interest for the networks in the region. However, it is necessary to point out that today CUDI has 4 sources of Multicast/IP video streaming implemented in its network and plans to double this number within the next six months; other NRENs that also have plans for the implementation of such sources are RENATA (2), CEDIA (1) and RAICES (1).

Table 5.7.1: Housing, Storage, Hosting and Content Delivery Services

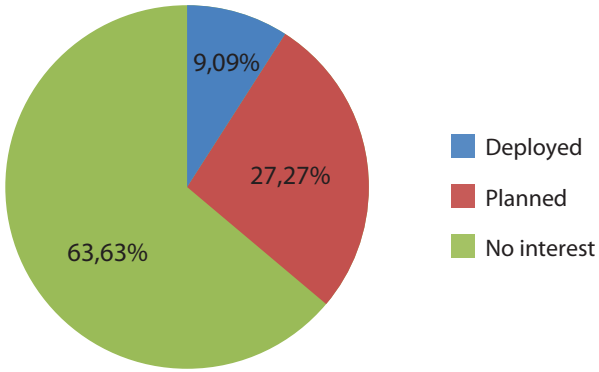
Country	NREN	Distributed Storage for GRID users	Distributed Storage for any NREN users	Dedicated/special connectivity to provide high levels of connectivity to commercial content servers or commercial content	Hosting of commercial content servers or commercial content on the NREN network	Video servers for use by NREN sites	Mirroring of content from outside the NREN network
Argentina	Innova|Red	Planned	Planned	Planned	Currently deployed	Planned	Planned
Brazil	RNP					Currently deployed	
Chile	REUNA	Planned	No interest	No interest	No interest	Currently deployed	No interest
Colombia	RENATA						
Costa Rica	CoNARE	0	0	0	0	0	0
Ecuador	CEDIA	Planned	Planned	No interest	No interest	Planned	Currently 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		Currently deployed	Planned
Panama	REDCYT	Currently deployed	Planned	No interest	No interest	Planned	Planned
Uruguay	RAU	Planned	No interest	No interest	No interest	No interest	No interest

5.8 Communication Tools

5.8.1 VoIP

As for the Voice over IP (VoIP) service, only RNP currently offers it (providing central administration and inter-institutional VoIP service between its network's members); of all the networks in the Compendium, 10 of them do not offer this service, 27% expect to be able to offer it in the future and 64% do not regard it as part of their interests.

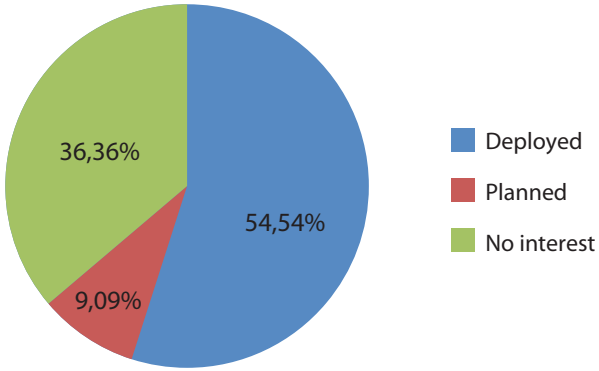
Graph 5.8.1: NREN providing VoIP service



5.8.2 Video streaming and Videoconference

55% of the NRENs (6) that answered the questionnaire that articulates the present document provide a videoconference service run centrally; only one of them, Innova|Red (representing 9%) says this service is part of its plans, while the remaining four NRENs (36%) –CoNARE, RAICES, RAGIE and RAU- are not interested in providing this kind of service.

Graph 5.8.2: Videoconference Service run centrally



For those NRENs which actually provide the service there were seven further questions (see Table 7.2.1) about the service provision; the answers show a significant development of the NRENs which offer the service –except in the case of REDCYT, which is in an initial development stage and to date declares to have the Videoconference-related services in a planning stage-: all of them provide Standard Definition (SD) Services MCU channels, centrally provided archiving of conference/streaming and (centrally provided) support for users; three of them provide High Definition (HD) Services MCU channels; there are also three networks that offer online booking systems; two NRENs allow other communities outside their NREN to book channels on their MCUs. Finally, only two NRENs have plans to support GDS.

Table 5.8.2: Additional services over the Videoconference service

Country	NREN	Standard Definition (SD) Services MCU channels	High Definition (HD) Services MCU channels	Communities outside your NREN able to book channels on your MCUs	Centrally provided archiving of conference/ streaming	Online booking system	Centrally provided support for users	GDS supported
Brazil	RNP	Deployed		No	Deployed	Deployed	Deployed	
Chile	REUNA	Deployed	Deployed	No interest	Deployed	Deployed	Deployed	No interest
Colombia	RENATA	Deployed	Deployed	Deployed	Deployed	Planned	Deployed	Planned
Ecuador	CEDIA	Deployed	Deployed	Planned	Deployed	Planned	Deployed	No interest
Mexico	CUDI	Deployed	Planned	Deployed	Deployed	Deployed	Deployed	
Panama	REDCYT	Planned	Planned	Planned	Planned	Planned	Planned	Planned

5.9 Networked Computing Resources - Grids

Despite the strong incorporation of e-Infrastructures 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 and Uruguay, and the participation of CLARA, RNP and REUNA in the EELA and EELA-2 projects, only the latter NREN declares to offer grid services for the community it serves. The services provided are: dedicated point-to-point IP circuits, storage facilities managed by REUNA, computing CPUs – alto managed by REUNA-, and monitoring.

Innova|Red, RNP, CEDIA, RAICES, CUDI, REDYT and RAU, 64% of the NRENs, state they have planned to implement this service. RAGIE (9%) outright indicates it does not plan to do so. RENATA and CoNARE (18%) did not answer the question. The percentages mentioned here are presented in the Graph 5.5.1.

Considering that the reality that countries face in the field of grids is related, in many cases, to the participation in the EELA-2 project, NRENs were asked about the disciplines in each of their networks that make use of grids existing in the region. In order to simplify the answering process, we included a box for those who could not identify any areas or did not have any knowledge on the subject (no/I do not 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 5.8.1; the numbers included in it correspond to the total marks that resulted in each discipline according to the three evaluation categories presented. Within the areas that currently make use –identifiable by the NRENs- of computing grids, the areas that stand out with three marks each are: High Energy Physics and Climatology; Astro-science and Earth Science with one mark each. In all disciplines NRENs admit that there are plans for grid use in the research and projects that are expected to be developed through them in the future, but the most evaluation marks were obtained in Biomedicine (4), Climatology (3) and Other Physics (3). In the “others” category, at planning level, the areas of Supercomputing, education and e-Health were identified.

Graph 5.9.1: Is your NREN offering Grid services to the community you serve?

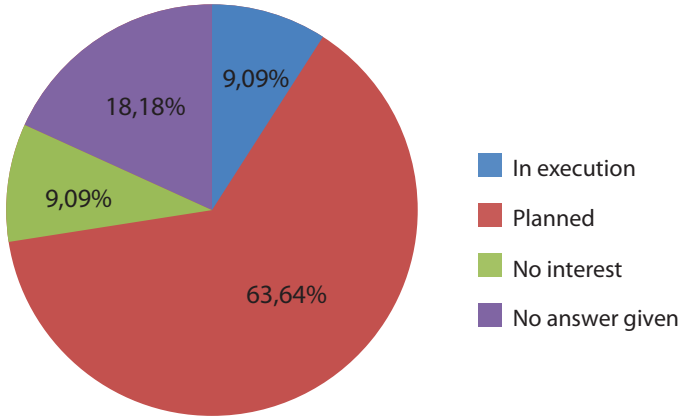


Table 5.9.1: Disciplines that make use of grids in Latin American countries according to the NREN's perception

Discipline	Currently running	Planned	No / Don't know
High Energy Physics	3	1	2
Other Physics		3	1
Computational Chemistry		2	1
Other Chemistry		1	1
Biomedical		4	
Astrocience	1	2	1
Earth Science	1	2	1
Climatology	3	3	
Arts and Humanities		1	1
Other – please state:		3	

5.10 User and client interaction

5.10.1 User interaction

In general terms, a significant support work can be appreciated from the NRENs for the work done by specific groups of users (that can be communities and groups associated to a specific project, among others); only three networks (RAICES, RAGIE and RAU) indicate they do not offer this service. In relation to the organization of national conferences of or for users, nine out of the eleven networks state they develop this kind of activities. The exceptions are RAICES AND RAU. And all but one of the NRENs that answered the questionnaire used to elaborate the present document, RAICES, indicate they organize training courses aimed at their clients and users.

In terms of support through online means, RAUN stands out for presenting a large number of portals or wikis for scientific (68, followed by CUDI with 18) and technical (58) communities implemented by it.

The full list of the wikis and portals mentioned by the NRENs is published in the questionnaires that each of the networks answered, available at:
http://alice2.redclara.net/index.php/es/documentos/compendio.

Table 5.10.1.1: User interaction

Country	NREN	Provides support for the work of specific groups of users		Organise national user conferences		Organise training courses	
		Yes	No	Yes	No	Yes	No
Argentina	Innova|Red	x		x		x	
Brazil	RNP	x		x		x	
Chile	REUNA	x		x		x	
Colombia	RENATA	x		x		x	
Costa Rica	CoNARE	x		x		x	
Ecuador	CEDIA	x		x		x	
El Salvador	RAICES		x		x		x
Guatemala	RAGIE		x	x		x	
Mexico	CUDI	x		x		x	
Panama	REDCYT	x		x		x	
Uruguay	RAU		x		x	x	

Table 5.10.1.2: Number of portals or wikis for scientific and technical communities implemented in the NREN

Country	NREN	How many scientific communities portals/wikis or sites area implemented in your NREN?	How many technical communities portals/ wikis or sites area implemented in your NREN?
Argentina	Innova|Red	0	0
Brazil	RNP		1
Chile	REUNA	2	2
Colombia	RENATA	0	3
Costa Rica	CoNARE	0	0
Ecuador	CEDIA	0	0
El Salvador	RAICES	0	0
Guatemala	RAGIE		
Mexico	CUDI	18	
Panama	REDCYT	0	0
Uruguay	RAU	68	58

5.10.2 User support

As for the direct relation between the NRENs and their users, the type of support that each admit to provide or not no to provide, it is not possible to indentify a valid tendency, even though a significant level of support along these lines can be appreciated.

REUNA makes it clear that all the types of support identified are carried out in a regular way. However, it indicates that since these services have not been formalized, it does not think it is appropriate to mark them with a positive answer.

Table 5.10.2: User support

Country	NREN	FAQ	Troubleshooting	Help desk	Incidents Management and trouble tickets	Support via e-mail	Support via chat
Argentina	Innova|Red	No	Yes	Yes	Yes	Yes	No
Brazil	RNP	No	No	No	Yes	No	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	No	Yes	Yes	No	No	No
El Salvador	RAICES	No	Yes	No	No	Yes	No
Guatemala	RAGIE		Yes			Yes	
Mexico	CUDI	Yes	Yes	Yes	Yes	Yes	Yes
Panama	REDCYT	No	Yes		No	Yes	Yes
Uruguay	RAU	No	Yes	Yes	Yes	Yes	No

6 Funding and staffing

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

The NREN budget is analysed in section 6.1, while section 6.2 deals with the staff working in the networks.

6.1 NREN budget

In terms of funding (see Table 6.1.1), all the NRENs –except CEDIA- have a budget year equal to the calendar year; and although it is true that only half of the networks provided information regarding their annual funds, only by taking into account this sample it is valid to regard their budget situation as poor –even more so if we take into account that the amounts mentioned are not only used to pay salaries but also to pay for basic supplies (such as electricity, equipment, etc.) and connection; this, in turn, in consistent with the level of participation of the governments in the region in terms of funding and sustainability for their academic networks. In fact, the critical nature of this situation enables only two NRENs to develop multi-annual budget plans, which implies a certain uncertainty regarding the network's future sustainability.

Only two (RNP and CoNARE) of the NRENs that provided information regarding the source of the funds that make up their annual budgets (see Table 6.1.2) identified their governments (or public agencies) as their sole source of funding. Apart from these networks, most of the funding of the NRENs in the Compendium comes from the participation of their users and/or clients. This is the sole source of income for CEDIA, RAICES, RAGIE and CUDI and represents 80% for REUNA (which completes the total with 8% from other sources and 2% from the EU through its participation in international collaboration projects. Only Innova|Red is outside this standard, but not entirely, as 50% of its budget comes from users/clients, that is to say, a significant part of it. The other half is split between the Inter American Development Bank (IADB) with 30% and the government or public agencies with a 20% contribution to the network.

As for the budget figures, it is necessary to mention that CEDIA mentioned that M€ 1,2 are used directly to pay for commercial internet.

As regards the modality for charging their clients (see Table 6.1.3), only RNP and CoNARE indicated that their NREN do not charge their users directly; Innova|Red, RAICES and RAU charge a flat fee, based on bandwidth; REUNA and CEDIA use a combination of flat fee and usage-based fee. None of the NRENs declares to charge a traffic-based fee. RENATA charges a connectivity fee plus maintenance charges. RAGIE does not explain its charging modality and does not answer any of the modalities presented in the questionnaire that articulates the present Compendium. CUDI, in turn, charges an annual fixed fee which depends on each member's membership category while bandwidth is not taken into account when charging. Panama did not provide an answer on this topic.

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	
		Yes	No			Yes	No
Argentina	Innova|Red	x					
Brazil	RNP	x					
Chile	REUNA	x		M€ 1.140	M€ 1.140		x
Colombia	RENATA	x					
Costa Rica	CoNARE	x		€ 307.000	€ 307.000		x
Ecuador	CEDIA		x	M€ 1,4	€ 200.000		x
El Salvador	RAICES	x		M€ 0,1	5%		x
Guatemala	RAGIE	x		M€ 0,1	M€ 0,1		x
Mexico	CUDI	x				x	
Panama	REDCYT	x					x
Uruguay	RAU	x				x	

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

Country	NREN	Users / clients	Government / public bodies	The EU (e.g. for Framework Programme projects)	The IDB funds	Other sources
Argentina	Innova|Red	50%	20%		30%	
Brazil	RNP		100%			
Chile	REUNA	90%		2%		8%
Colombia	RENATA	70%	30%			
Costa Rica	CoNARE		100%			
Ecuador	CEDIA	100%				
El Salvador	RAICES	100%				
Guatemala	RAGIE	100%				
Mexico	CUDI	100%				
Panama	REDCYT					
Uruguay	RAU					

Table 6.1.3: Charges to NREN clients

Country	NREN	We do not charge them directly	We charge a flat fee, based on bandwidth	We charge a traffic-based fee	We use a combination of flat fee and usage-based fee	Other
Argentina	Innova|Red		x			
Brazil	RNP	x				
Chile	REUNA				x	
Colombia	RENATA					x
Costa Rica	CoNARE	x				
Ecuador	CEDIA				x	
El Salvador	RAICES		x			
Guatemala	RAGIE					x
Mexico	CUDI					x
Panama	REDCYT					
Uruguay	RAU		x			

6.2 Staffing

Except in the cases of Brazil, where RNP has a staff made up of 150 hired people plus 150 outsourced staff, and of REUNA, which has 24 employees directly working on NREN activities, the number of people that actually make up the NREN work teams is very low, even reaching zero in the case of those networks that are run thanks to the volunteer work of some people who have decided to bet on their countries and scientific and academic communities' incorporation into advanced networks.

Table 6.2.1: NREN staff

Country	NREN	Total number of paid staff directly employed by your organisation	Number of staff directly engaged in NREN activities	Some of the NREN staff could be working part-time, indicate the number of staff but in full-time equivalents	People working for the organisation as subcontractors or on outsourced basis
Argentina	Innova|Red	8	8	8	0
Brazil	RNP	150	150		150
Chile	REUNA	24	24		
Colombia	RENATA	5			
Costa Rica	CoNARE	3	3		
Ecuador	CEDIA	6		3,5	1
El Salvador	RAICES	0	0	0	0,20
Guatemala	RAGIE	0,25		0,25	0
Mexico	CUDI	-	-	-	-
Panama	REDCYT	-	-	-	-
Uruguay	RAU	100	11	6,5	0

Appendices

1 Alphabetical List of Latin-American Research and Education Networks

NREN Acronym	Name of the NREN in its original denomination	Country
CEDIA	Consorcio Ecuatoriano para el Desarrollo de Internet Avanzado	Ecuador
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
REACCIUN	Centro Nacional de Innovación Tecnológica (CENIT), Red Académica de Centros de Investigación y Universidades Nacionales	Venezuela
REDCYT	Red Científica y Tecnológica	Panama
RENATA	Red Nacional Académica de Tecnología Avanzada	Colombia
REUNA	Red Universitaria Nacional	Chile
RNP	Rede Nacional de Ensino e Pesquisa	Brazil

2 Glossary

ALICE	*América Latina Interconectada Con Europa* - Initial Project, under which the RedCLARA Network was created, implemented and settled, among other extremely relevant results.
ALICE2	*América Latina Interconectada Con Europa 2* - Action Name: Extending and Strengthening RedCLARA as e-Infrastructure for Collaborative Research and Support to Development. This project is co-funded by the EC through the @LIS2 Programme
@LIS2	Alliance for the Information Society, phase 2 - a European Commission Programme aiming to continue the promotion of the Information society and fight the digital divide throughout Latin America
CE	European Commission
CLARA	*Cooperación Latino Americana de Redes Avanzadas* - Institution in charge of the implementation of the ALICE2 project.
Gb/s	Gigabytes per second
GÉANT	Pan-European advanced network, managed by DANTE
HD	High Definition
IAA	AAI - Authorization and Authentification 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	Latin American advanced network, created by ALICE and managed by CLARA
SD	*Standard Definition*
TERENA	*Trans-European Research and Education Networking Association*
VoIP	Voice over the Internet Protocol

If you want to know more about CLARA, please visit: http://www.redclara.net
In order to know more about the ALICE2 project, please visit: http://alice2.redclara.net