eLAC2007 Goal 10: RedCLARA and Latin-American Research and Education Networks

María José López
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Abstract

RedCLARA interconnects to date the National Research and Education Networks (NRENs) of 12 Latin American countries (Argentina, Brazil, Chile, Colombia, Ecuador, El Salvador, Guatemala, Mexico, Panama, Peru, Uruguay and Venezuela) –and it is expected to have Bolivia (ADSIB) connected this year- and offers direct connectivity to the European GÉANT2 and the North American Internet2 networks (USA), and is also looking to peer with the TEIN2 network in Asia. It is currently expected that the funds still available in ALICE will allow the project to run and support RedCLARA and the CLARA organization until the end of March 2008. Of course, the extension is not enough and this is why the role that CLARA must play has been reinforced by expanding its responsibilities regarding the running and administration of the network and by increasing its staff (the manpower payments are increasingly being assumed by CLARA). These last two facts are helping CLARA to become less dependent on ALICE and to have a stronger position in the Latin-American region as an institution, which has served to further its participation in the formulation of new projects proposals.

In 2006 at the Lisbon Ministerial Forum (Portugal) CLARA was highlighted by the European Commissioner for the Information Society, Viviane Reding, as the main achievement in cooperation between both regions and was appointed as one of the eLAC2007 working groups. In fact, at the eLAC2007 Planning meeting, held in Lisbon on April 26 before the IV Forum, it was decided to appoint CLARA as one of the Working Groups of eLAC2007 with the mission of contribute to fulfill Goal 10, which intends to ‘Develop Research and Education Networks’.

The following document analyses RedCLARA and its relationship with the Latin-American Research and Education Networks in terms of its historic advances, sustainability, projects and the strengthening of National Networks, within the context of the 10th Goal of eLAC2007.
I. RedCLARA

1. History

The RedCLARA network was developed by the ALICE Project (América Latina Interconectada Con Europa) which was set up in 2003 with the co-funding of the European Commission (EC) through the @LIS Programme, which aims to promote the Information Society and bridge the digital divide throughout Latin America.

ALICE implemented the recommendations of the CAESAR study -funded by the DG IST Programme of the EC-, which was carried out between March and October 2002 to look into the feasibility of connecting the Latin American National Research and Education Networks (NRENs) to GÉANT by means of a Latin American regional research network –this network has existed since 2004 and it is called RedCLARA-; CAESAR concluded that there was a real demand for both the regional network and the connection to Europe, and that developing such an infrastructure was technically feasible.

The EC asked DANTE –which manages the GÉANT pan-European network- to coordinate ALICE and to transfer the knowledge gained over the past decade in Europe to Latin America. Hence, ALICE is managed by DANTE, and has 4 European partners, -the NREN of France, Italy, Portugal and Spain (RENATER, INFN/GARR, FCCN and RedIRIS respectively) - and 13 Latin American (LA) partners. When ALICE was conceived, the EC and DANTE stated that the objective of the project should be to connect at least seven Latin American NREN.

On July 9th, 2003 the LA partners of ALICE, at Valle del Bravo in Mexico, signed the Statutes for the creation of CLARA (Cooperación Latino Americana de Redes Avanzadas), with two strands in its objectives: the development of an infrastructure that integrates the Latin American NRENs and the creation of a non-governmental organization which represents the interests of these institutions. This was the formal constitution of CLARA as a non profit Civil Association, but it must be acknowledged that the initial idea for the creation of CLARA came up in June 2002 in the Toledo meeting (Spain), organized within the context of CAESAR.

On September 1st, 2004, RedCLARA began to provide direct connectivity with 155 Mbps, linking the NRENs (National Research and Education Networks) of Argentina, Brazil, Chile, Panama and Mexico, and connecting them to GÉANT at 622 Mbps through a connection between São Paulo (Brazil) and Madrid (Spain). This IP research network infrastructure was officially launched on November 17th, 2004, at the Ministerial Forum for the Information Society held in Rio de Janeiro (Brazil).
However, neither CLARA nor DANTE allowed themselves to be neither complacent nor conformist. RedCLARA was officially launched and while the celebration still continued, contracts were negotiated to enable those Latin American NRENs not yet connected to join the network. During 2005, the NRENs of Uruguay, Peru, Costa Rica, Panama, Guatemala, El Salvador and Ecuador got connected to RedCLARA, bringing the number of connected NRENs to twelve at the end of that year. In 2006 the connections to RedCLARA continued with Colombia, Venezuela and Nicaragua, although due to economic reasons Costa Rica decided to put down the connection in 2006. Finally, 2007 came up with a good and a bad news; the good one: during this year, the connection of Bolivia started to become a reality. The bad news: arguing economic reasons, Nicaragua decided to put down its connection to RedCLARA and its participation in CLARA.

2. RedCLARA funding and sustainability

80 per cent of the ALICE Project funding has been provided by the EC: €10 million; the remainder 20% has been provided by the LA project partners in accordance to the amount of access capacity. Originally, as agreed by the @LIS Programme (EC) the ALICE project was planned to last until 31 May 2006. However, it became clear during 2005 that the project would not be able to spend its budget within the given time-frame and an agreement was settled between the ALICE partners and the EC. This agreement extended the project until 31 March 2008 in order to be able to make full use of the project's budget. The EC approved the extension request by arguing “the firm commitment towards the ALICE project expressed by CLARA and the LA NRENs confirmed by an improvement observed in the LA co-funding account since the partners' meeting held in Guatemala in July 2005 and, on the other hand, the need of more time than initially foreseen for CLARA to develop from an organizational and financial point of view and for the LA NRENs, specially the less developed ones, to be able to interconnect for a sufficient period of time to prove to its users the benefits brought by connectivity”.

When it became clear that continuity of funding for RedCLARA would be delayed, the project partners applied for another extension to the project until 31 March 2008. At the same time, it was decided to make changes to the RedCLARA topology to benefit from reduced prices for some of the international RedCLARA capacity. The EC accepted the extension and Antonio Crespo, @LIS Programme coordinator sustained: “ALICE has created a firm foundation for research and education in Latin America and demonstrated the benefits that close collaboration provide for global and regional development, benefiting the wider community through initiatives such as monitoring climate change, telemedicine and e-learning”. This new extension will allow CLARA to use the remaining ALICE budget in order to ensure the sustainability of RedCLARA.

At this point it is important to recognize the support of ANTEL, the Uruguayan Governmental Telecommunications Company, who agreed to maintain the connection of Uruguay (Montevideo) to the RedCLARA PoP in Buenos Aires (Argentina) for one year without any cost apart from the collaboration of the University of La República.

But, what is going to happen to RedCLARA after March 2008? Without new EC funding CLARA would only be able to maintain the RedCLARA links to Europe and US, which is obviously not sufficient at all to support the regional needs. Hence, in the ALICE-CLARA Meeting sustained in Bogota, Colombia, in June 2007, the ALICE partners strongly expressed the need for continuity of EC funding starting as of April 2008; any funding gap during 2008 would seriously threaten the global research networking connectivity provided by RedCLARA to the majority of the countries connected to RedCLARA leading to a situation similar to that which existed in 2003 when regionally organized advanced networking did not exist. In this scenario, the support and commitment of the LA governments will be crucial.
3. RedCLARA topology and connections

Since its creation, the technical management of the RedCLARA network within LA is carried out by CLARA.

By the end of February 2007, RedCLARA’s backbone was structured in a ring topology connecting five nodes located in the cities of Sao Paulo (Brazil), Tijuana (Mexico), Panama City (Panama), Santiago (Chile) and Buenos Aires (Argentina). The ALICE Project funded the five 155 Mbps links of the backbone ring, and the 622 Mbps link connecting RedCLARA to GÉANT2. The WHREN-LILA (Western Hemisphere Research and Networking – Links Interconnecting Latin America) Project (http://whren.ampath.net/), supported by the US National Science Foundation Award #OCI-0441095, provided funds for another two links which connect RedCLARA to the western hemisphere: a 2.5Gbps link connecting Sao Paulo to Miami, which evolved from an original 622 Mbps link from the late AMPATH project; and another 1Gbps link running over a dark fiber segment established between San Diego and Tijuana. Each WHREN-LILA link gives RedCLARA access to an International Peering Fabric located in each of the US coasts: the AtlanticWave and the PacificWave exchange facilities, both of which provide multilayer/multi-protocol services between participating networks, in a Layer 3 distributed peering exchange facility over an Ethernet based infrastructure, with the best effort for large packet exchange and jumbo frame support.

In order to benefit from reduced prices for some of the international RedCLARA capacity, some links of the topology have been removed and new ones have been added, thus changing the configuration of the network. RedCLARA initially installed a sixth (new) node in the city of Miami (USA) which is able to receive new links and new connection agreements.

As part of the LAUREN initiative, an agreement established made it possible to set up three 155 Mbps STM-1 links between the following nodes: Panama City (Panama) – Miami (USA), Panama City (Panama) – Santiago (Chile), and in the following months also between Santiago (Chile) – Sao Paulo (Brazil). The implementation of these three links, together with the removal of the current Panama City (Panama) – Santiago (Chile) and the Sao Paulo (Brazil) – Tijuana (Mexico) STM-1 ALICE links, will complete the reorganization of the backbone for the new phase of the project (please see the RedCLARA topology map).

An agreement with WHREN-LILA allows routing traffic from both RedCLARA’s and WHREN-LILA’s PoPs in Miami, thus creating an alternative route to the Atlantic Wave fabric for RedCLARA. That agreement will also allow for backup traffic between Miami and Sao Paulo, closing the loop to ensure availability of the network, in the case of a link failure between Miami and Panama.

The IP advanced services currently available from the network will not be affected by these modifications. RedCLARA will be able to sustain the connectivity within the Latin American connected partners, and all the international traffic exchange agreements accomplished so far, together with the ability to provide the best service ever for the clients whenever needed, and compensate for the minor increments expected in some of the return-trip delays observed in the network.

Some connectivity services for the LA-NRENs will be also restructured in order to save resources and explore better services. The NRENs from Central America have been migrated from the connections in the Tijuana node to the new node in Miami; the Central America links are no longer funded by ALICE. Additionally, within the context of the agreement with LAUREN, the connection of the NREN from Venezuela was migrated from its access point in the Sao Paulo node to the node in Panama, a DS3 circuit from Panama City to Caracas.

On 17 August, 2007 the last modification to the RedCLARA backbone was introduced by establishing the connectivity between the router in Miami and the PoPin Sao Paulo, thus achieving a sort of partial closure of the backbone with all PoPs, except the one located in the Tijuana node, and offering a redundant step for all internal routing of the network. This allows RedCLARA to offer an alternative step for the traffic flowing from Central America and Mexico to Europe. Furthermore, the Miami node was directly connected to AtlanticWave with a 1Gbps link.
4. RedCLARA topology map

The links of Ecuador, Colombia, Peru and Uruguay are paid by ALICE.
II. RedCLARA and the National Research and Education Networks

1. Partners and projects

Since its creation in 2004, RedCLARA has become fundamental for Latin American research and education, now linking 12 countries and 729 universities across the continent (more than 671,986 Academics, 104,607 Researchers, 3,763,142 Students; in short, more than 4,539,735 potentially connected people) at speeds of up to 622Mbps, it has provided Latin American scientists and researchers with the ability to collaborate both regionally and as part of the global research community, through links to the European GÉANT2 and US Internet2 research and education networks.

The benefits that RedCLARA has reported to LA are highly significant. Firstly, the creation of the NREN of Peru, Colombia, Guatemala, Nicaragua, El Salvador and Ecuador (which will be shortly followed by the Bolivian one); secondly, the support that the Argentinean Government gave to the continuity and long term sustainability of its national research network now called Innova-Red, and finally the numerous ICT projects currently being developed thanks to the presence of RedCLARA thus helping to bridge the digital divide and to alleviate poverty in the region. These novel and high profile collaborative projects have broadened the scope of both academic research and educational/developmental areas: Astronomy projects such as EXPReS¹ and AugerAccess² are linking observatories in Chile and Argentina to partner institutions in Latin America.

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¹ EXPReS is a radioastronomy project which aims to expand the scope of Evlbi (electronic Very Long Baseline Interferometry) throughout Europe and beyond. By means of the Chilean education and research network, REUNA, RedCLARA links the radioastronomic observatory TIGO in Chile to other EXPReS members: See: http://www.expres-eu.org/.

² AugerAccess is a feasibility study on the improvement of the Pierre Auger Cosmic Ray Observatory, on the eastern side of the Argentinean connection, from its site in Malargüe to Mendoza in order to support international collaboration with European observatories. See: http://www.augeraccess.net/.
America and Europe, while the EELA grid computing initiative is sharing technical resources between the regions in order to allow faster solutions for research problems. Students and teachers in the region are now benefiting from the @lis-TechNet project, which links partners in Mexico, Chile and Costa Rica with Italy, Spain and the UK to create an international virtual teaching environment. In e-Health, the T@lemed initiative is bringing remote medical diagnosis and prescription services to isolated areas in Brazil and Colombia.

In the Latin-American future and in the future of research collaboration between LA-EU, RedCLARA is seen as the pillar which can really sustain that collaboration. Hence its inclusion in three international projects: EELA-2, EULACOOP and AMIGOS. In order to reinforce NREN development, and to enhance, intensify and foster regional research collaboration and increase networking training, the Inter-American Development Bank (IADB) approved the project

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3 EELA (E-Infrastructure shared between Europe and Latin America), a project which aims to deploy and, potentially, develop Grid applications in e-Education, Biomedicine, High Energy Physics, Climate, etc, not only through the implementation and operation of e-Infrastructure, but also through the creation of a human network devoted to work in collaboration in the field of e-Science. EELA intends to bring Latin America up to the same level of Grid development in Europe. See: http://www.eu-eela.org/.

4 Today the infrastructure which makes this revolution in scientific work possible is called Grid all over the World. One of the most accurate definitions of what a Grid is was written by one of the so-called “fathers” of Grids, Ian Foster, from the Argonne National Laboratory and Chicago University (USA): “(...) a Grid is a system which: 1) coordinates resources which are not subject to central control (…), 2) making use of standards and open interfaces and protocols (...), 3) in order to provide unique services quality” [Defining e-Science, National e-Science Centre, United Kingdom Ian Foster, What is the Grid? A Three Point Checklist, 20 July, 2002, pp. 2 and 3 <http://www-fp.mcs.anl.gov/~foster/Articles/WhatsTheGrid.pdf>].

The term Grid comes from the name given in English to the electricity supply network. Same as the electric wire lines, the Grid, which is the base infrastructure for e-Science, is a network of computers, supercomputers and other processing devices which operate –together with applications designed for the use of these computing resources- on communications networks (advanced data networks)

Not only its weft makes Grid technology similar to electricity supply networks, but also its essence: the idea is to offer a single point of access to a set of geographically distributed resources (supercomputers, clusters, storage, information sources, instruments, etc.). Thus, the systems distributed between different organisations can be used as a single virtual system (Virtual Organisations or Laboratories) in intensive applications on data, data bases, scientific instruments or instruments with a high computing demand. This new trend involves a radical change in the collaboration of network linked systems, particularly in high-provision computing due to its huge potential in terms of exchange and resources management.

The evolution towards e-Science represents a great opportunity to achieve general acceptance and promotion of Grid technology, which can be extended, same as the WWW did, from its original area of scientific computing to that of commercial applications.

The Grid, this infrastructure for e-Science, “will provide the researcher with the necessary resources (computational, informational, etc.) for their work from a unique interface which has the following characteristics: simple, transparent, agile, reliable, safe, permanent and economic” [FECYT – Spanish Foundation for Science and Technology, White Book on e-Science in Spain 2004, pp 10 and 11 http://www.fecyt.es/documentos/e-Ciencia.pdf].

As for the technology which makes Grid construction possible, the most commonly used in scientific environments is Globus Toolkit, an open source code software developed by Globus Alliance. This has been selected as a default standard by the twelve most important companies in the field of computing and high provisions (Compaq, Cray, SGI, Sun Microsystems, Entropia, IBM, Microsoft, Platform Computing and Veridian in the USA, and Fujitsu, Hitachi and NEC in Japan). The current version of Globus, based on Open Grid Services Architecture, shows a clear convergence towards Web Services technology, used in the field of e-Business. This represents great opportunity to achieve general acceptance and promotion of Grid technology, which can be extended just as the WWW did.”

5 @LIS-TECHNET, a network which runs live and is fed by a software made up of autonomous components that can dynamically interact with others and provide teaching and experimentation environments for network users: URL: http://www.alis-technet.org/index.php.

6 T@lemed, a Telemedicine project which intends to bring some basic medical services available in big hospitals to remote areas by making use of specialised equipment, the Medcom software –developed by the Fraunhofer Institute in Germany- and the Brazilian national research network. RNP. See: http://www.alis-telemed.net/.
“Strengthening of Regional Advanced Academic Networks through CLARA as a Regional Public Asset”.7

Furthermore RedCLARA will start to collaborate with the Caribbean; on 3 May 2006, given the needs related to connectivity and access to quality education in the Caribbean region, CARICOM (Caribbean Community) and the European Union signed a € 2.2 million funding agreement to support the development of CKLN (Caribbean Knowledge and Learning Network).8 Considering RedCLARA’s successful experience, CKLN has requested CLARA’s technical support to design the network and CLARA’s Board has agreed to provide the requested support.

2. National Research and Education Networks

CLARA has 17 members (Argentina, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Chile, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela), although just 12 of them are currently connected to RedCLARA. Those countries still not connected are: Bolivia, Costa Rica, Cuba, Honduras, and Paraguay. The last three on this list (Cuba, Honduras and Paraguay) are currently “non active members”, meaning that the participation of them in CLARA has been practically non-existent during the last period.

When the EC approved the last project extension, it also made some recommendations that must be followed by ALICE and CLARA: to consolidate the CLARA organization who will be responsible for RedCLARA after the end of the project; to help and support the new and non privileged NRENs in terms of gaining benefits and experience from network use and to commit them with the sustainability of the project; to strengthen the negotiations in order to establish the connection of Bolivia and to start the preliminary discussions with the NRENs of Paraguay, Cuba and Honduras. As it happened with Costa Rica, Nicaragua was disconnected early in 2007 due to economic restrictions, but in addition, Nicaragua decided to put down its participation in CLARA and ALICE.

The situation of Argentina has strongly improved, because the country solved its internal situation and signed a payment agreement with CLARA (on January 19th 2007) that has been respected. The Argentinean Department for Science, Technology and Productive Innovation, led by Tulio A. del Bono, was the organization that encouraged the country’s re-connection to the Latin American advanced network, in the context of the objectives set out for the Argentinean Bicentenary Plan. In 2007, Argentina replaced the ALICE and CLARA partner (RETINA) with a new organization: Innova-Red.

The Bolivia case is rather different: ADSIB (the Bolivian Agency for the Development of the Information Society) is connecting the country to RedCLARA. In order to achieve this during the present year, ADSIB has signed an agreement with ENTEL Bolivia (national provider) to get connected to RedCLARA. The Bolivian institution is funding this development through an agreement with the UNDP (United Nations Development Programme).

3. RedCLARA connected to National Research and Education Networks

Argentina: Innova-Red (38 institutions connected; 206,000 potential users). Connected to RedCLARA in 2004 at 155 Mbit/s. The Argentinean NREN was created in 1990 under the name of RETINA; in 2007, due to a change in its structure and management, it changed its name to Innova-Red. Before RedCLARA, Argentina solved its international connection to the advanced networks through the link of the FIU (Florida International University) to Internet2. Participation in

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7 See: http://www.iadb.org/projects/Project.cfm?project=RG-T1199&Language=English
ongoing projects that have benefited from the connection to RedCLARA: 1) EELA (E-Infrastructure shared between Europe and Latin America: www.eu-eela.org) and 2) Tier-3 of LHC (Large Hadrons Collider) at CERN.

**Brazil:** RNP - Rede Nacional de Ensino e Pesquisa (397 institutions connected; 1,120,000 potential users). Connected to RedCLARA in 2004 at 155 Mbit/s. The Brazilian NREN was created in 1989. Before RedCLARA, Brazil solved its international connection to the advanced networks through the link of the FIU to Internet2. Participation in ongoing projects that have benefited from the connection to RedCLARA: 1) EELA and 2) RINGrid (Remote Instrumentation Grid: www.ringrid.eu/).

**Colombia:** RENATA - Red Nacional Académica de Tecnología Avanzada (54 institutions connected). Connected to RedCLARA in 2006 at 10 Mbit/s. The Colombian NREN was created in 2006. Before RedCLARA, Colombia didn’t have an international connection to advanced networks. Participation in ongoing projects that have benefited from the connection to RedCLARA: National Grid Initiative (Grid Colombia: http://urania.udea.edu.co/grid-colombia/).

**Chile:** REUNA - Red Universitaria Nacional (17 institutions connected; 185,360 potential users). Connected to RedCLARA in 2004 at 155 Mbit/s. The Chilean NREN was created in 1992. Before RedCLARA, Chile solved its international connection to the advanced networks through the link of the FIU to Internet2. Participation in ongoing projects that have benefited from the connection to RedCLARA: 1) EELA, 2) RINGrid and 3) WHREN-LILA (Western Hemisphere Research and Education Network Linking Latin America: http://www.whren-lila.net/).

**Ecuador:** CEDIA - Consorcio Ecuatoriano para el Desarrollo de Internet Avanzado (22 institutions connected; 217,680 potential users). Connected to RedCLARA in 2005 at 10 Mbit/s. The Ecuadorian NREN was created in 2002. Before RedCLARA, Ecuador didn’t have an international connection to advanced networks. Rather than participating in ongoing projects, Ecuador acknowledges a benefit in terms of participation in international videoconferences and access to PlanetLab through RedCLARA.

**El Salvador:** RAICES - Red Avanzada de Investigación, Ciencia y Educación Salvadoreña (7 institutions connected; 84,295 potential users). Connected to RedCLARA in 2005 at 10 Mbit/s. The Salvadorian NREN was created in 2003. Before RedCLARA, El Salvador didn’t have an international connection to the advanced networks. SV does not recognize participation in projects by means of RedCLARA.

**Guatemala:** RAGIE - Red Avanzada Guatemalteca para la Investigación y Educación (9 institutions connected). Connected to RedCLARA in 2005 at 10 Mbit/s. The Guatemalan NREN was created in 2004. Before RedCLARA, Guatemala didn’t have an international connection to the advanced networks. Guatemala does not recognize participation in projects by means of RedCLARA but they are periodically transmitting the CUDI (MX) Virtual Days which they say has helped them to make their users understand the benefits of the network.

**México:** CUDI - Corporación Universitaria para el Desarrollo de Internet (146 institutions connected; 1,769,100 potential users). Connected to RedCLARA in 2004 at 155 Mbit/s. The Mexican NREN was created in 1999. Before RedCLARA, México solved its international connection to the advanced networks through a direct link to Internet2. Participation in ongoing projects that have benefited from the connection to RedCLARA: EELA.

**Panama:** RedCyT - Red Científica y Tecnológica (4 institutions connected; 97,800 potential users). Connected to RedCLARA in 2005 at 155 Mbit/s. The Panamanian NREN was created in 2002. Before RedCLARA, Panama didn’t have an international connection to advanced networks. Participation in ongoing projects that have benefited from connection to RedCLARA: "Development of Collaborative Services over Integrated Broad Band" (http://www.senacyt.gob.media/documentosDireccionInvestigacionDesarrollo/proyectosRedesAvanzada).
Peru: RAAP - Red Académica Peruana (7 institutions connected). Connected to RedCLARA in 2005 at 45 Mbit/s. The Peruvian NREN was created in 2003. Before RedCLARA, Peru didn’t have an international connection to advanced networks. Participation in ongoing projects that have benefited from the connection to RedCLARA: 1) EELA, 2) GDLN (Global Development Learning Network).

Uruguay: RAU2 - Red Académica Uruguaya (17 institutions connected; 119,500 potential users). Connected to RedCLARA in 2005 at 34 Mbit/s. The Uruguayan NREN was created in 1991. Before RedCLARA, Uruguay didn’t have an international connection to the advanced networks. Participation in ongoing projects that have benefited from the connection to RedCLARA: 1) University Decentralization (http://www.universidad.edu.uy/ensenanza/index.php), 2) University space through RedCLARA (installation of 7 videoconference room at RAU), 3) PlanetLab.

Venezuela: REACCIUN2 - Red Académica de Centros de Investigación y Universidades Nacionales (11 institutions connected; 740,000 potential users). Connected to RedCLARA in 2006 at 45 Mbit/s. The Venezuelan NREN was created in 1995. Before RedCLARA, Venezuela solved its international connection to the advanced networks through the link of the FIU to Internet2. Participation in ongoing projects that have benefited from connection to RedCLARA: 1) EELA, 2) WHREN-LILA.

The following table shows the numbers on which the statistics of institutions and potentially connected users are based. This information was given by the RedCLARA Connected NRENs Institutional Representatives, for the elaboration of this document, from July 19th to 25th.

<table>
<thead>
<tr>
<th>Country/NREN Connected to RedCLARA</th>
<th>Nº of Institutions Connected</th>
<th>Nº of Academics</th>
<th>Nº of Researchers</th>
<th>Nº of Students</th>
<th>Total Nº of Potentially Connected People</th>
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<td>2,500</td>
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<td>206,000</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uruguay / RAU2</td>
<td>17</td>
<td>9,000</td>
<td>500</td>
<td>110,000</td>
<td>119,500</td>
</tr>
<tr>
<td>Venezuela / REACCIUN2</td>
<td>11</td>
<td>370,000</td>
<td>72,000</td>
<td>298,000</td>
<td>740,000</td>
</tr>
<tr>
<td>TOTALS</td>
<td>729</td>
<td>671,986</td>
<td>104,607</td>
<td>3,763,142</td>
<td>4,539,735</td>
</tr>
</tbody>
</table>

Source: RedCLARA.

* In the statistics that were given by REUNA (Chile) and CEDIA (Ecuador), the number of academics is not separated from the number of researchers. These two NRENs gave a number that under the title of “Academics” it is the result of the addition of the number of academics and the number of researchers.

Due to lack of information in terms of the number of academics, researchers and students, from the institutions connected to the NRENs of Colombia and Peru, and regarding their number of institutions and inhabitants, it is correct to assume that the number of potential users of RedCLARA could be around 5 million. The concept of “potential users” must be clarified: it is referred to the total sum of academics, researchers and students of the universities and scientific centres that are currently connected to the RedCLARA NRENs; in most cases all these people are not actually using the connection to date, but since they could, they are correctly called “potential users”.

13
4. National Research and Education Networks evaluation of RedCLARA and future ambitions

From July 6th to 25th, 2007, a Survey entitled “Survey on Advanced Networks - Working Group 10 eLAC2007” was carried out among CLARA members. The survey intended to discover some of the issues that have already been addressed in this document in relation to the LA NRENs (year of NREN creation, year connection to RedCLARA, connection situation before RedCLARA, ongoing projects) and furthermore, the perception that NRENs representatives have of RedCLARA in terms of its functioning. To finalize this document, we will revise these perceptions because these will help to visualize the future directions that RedCLARA should take.

27 people answered the Survey questionnaire, all of them members of CLARA and just two of them from countries that are not connected to the RedCLARA network: Bolivia and Nicaragua. The other 25 questionnaires were responded by the institutional and technical representatives of the connected NRENs, and in a few cases by some other NREN staff members.

As for the reasons that the different NRENs had (or still have) to get connected to RedCLARA, 39% of the answers aimed at “a bet on the future”; 29%, the “need of advanced international connection”; 16%, the “need of advanced intra-regional connection”; 13% acknowledge the lack of an explicit demand for advanced connection; and 3% (1 answer), choose “other” and explained that even if there were no explicit demands for international advanced connection, it was a bet for the national scientific and technological development; this last answer can be also assumed as “a bet on the future”.

It is important to revisit the comments that came from Bolivia and Nicaragua, in their condition of non-connected countries:

Bolivia: “The ADSIB saw the advantage in terms of stopping the isolation and bet on the modernization of the academic sector in order to equal the positions in terms of technological development in the region”.

Nicaragua: “The researchers don’t know the potentialities which the advanced network offers to improve their research work, and the connection to the advanced networks foster the demands of the academic sector, that’s why it was a bet on the future” (Nicaragua decided to disconnect in early 2007 due to economic reasons).

Apart from these two comments, most people pointed out the need for international collaboration in the scientific scope and most of all recognized how important it is for them to know that the advanced networks are (were, when they decided to get connected) a platform that fosters the advance of research, therefore of Science and Technology, and finally, of innovation (in the sense of development).

At the time of asking about the decision of each NREN to get connected to RedCLARA, the obvious following question is: “Before the connection of the different NRENs to RedCLARA, which were the expectations regarding this connection?” The answers were the following: 26% chose the option “to increase collaborative work between researchers”; 20%, “to increase knowledge in network technologies”; 19%, “to have a tool for to increase the development of national knowledge”; 18%, “to be able to carry out at distance processes of high demand”; 15%, “to strongly increase the demand for distance education”; and 3% chose “others” and in the explanation the three persons who select this option, pointed to the necessity of increasing the international collaboration (this question allowed choosing multiple options).

With such small differences between the averages, it is quite obvious that the expectations or ambitions behind the connection decision had to do with enhancing the possibilities of developing a better Science—in terms of establishing contacts and collaborate with pairs all over LA and the world- and leveling the stage of knowledge in the use, application and developing of new technologies for the benefit of the Academia and Science in each country. Additionally, there’s a huge quota of need of being part of an international process, which is to become a full “member” of the Information Society, by integrating and using the advanced technologies for Education and
for the support of distance processes that requires broad band capacity to be performed, mainly for scientific and engineering motives.

After the connection to RedCLARA, so far, have these expectations been achieved? In general terms the answer was Yes, nevertheless in all the cases when the answer was No, the argument given was that the problem was the short time that has passed in order to be able to evaluate these items, because most of the potential network users don’t really know all the benefits that the connection to RedCLARA can bring to their work. The answers were:

<table>
<thead>
<tr>
<th>Expectation</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>to increase collaborative work between the researchers</td>
<td>72%</td>
<td>28%</td>
</tr>
<tr>
<td>to increase knowledge in network technologies</td>
<td>91%</td>
<td>9%</td>
</tr>
<tr>
<td>to have a tool to increase the development of national knowledge</td>
<td>39%</td>
<td>61%</td>
</tr>
<tr>
<td>to be able to carry out at distance processes of high demand</td>
<td>52%</td>
<td>48%</td>
</tr>
<tr>
<td>to strongly increase the demand for distance education</td>
<td>38%</td>
<td>62%</td>
</tr>
</tbody>
</table>

Obviously these answers are pointing to a need that has not been well attended: The potential LA users need to be educated in the use and benefits of the advanced networks and of the applications that these can support and, of course, help them by simplifying the tasks that they usually carry out or that have wanted to carry out but couldn’t due to technological constrains. Knowledge dissemination in this area must be carried out not only by CLARA but also by each NREN as a particular entity and by all of them as a whole, because they are the ones that better know their users and therefore the ones who can best conduct learning processes for those users.

The relationship that CLARA has with the member NRENs was ranked with qualifications that were expressed in a scale from 5 = Very Good to 1 = Very Bad. The qualifications were tabulated and the average for CLARA was of higher than Good:

<table>
<thead>
<tr>
<th>Item to be qualified</th>
<th>Average qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Relation of CLARA with the LA member NRENs</td>
<td>4.7</td>
</tr>
<tr>
<td>2. Response of CLARA to the doubts and requests of the LA member NRENs</td>
<td>4.4</td>
</tr>
<tr>
<td>3. Elaboration of international projects in benefit of CLARA member NRENs or of RedCLARA</td>
<td>3.9</td>
</tr>
<tr>
<td>4. CLARA relation with the relevant political institutions from CLARA member countries and with the EU</td>
<td>4.0</td>
</tr>
<tr>
<td>5. Internal communications of CLARA</td>
<td>4.3</td>
</tr>
<tr>
<td>6. Dissemination of CLARA (web, bulletins, participation in international events)</td>
<td>4.6</td>
</tr>
<tr>
<td>7. Information referred to the connection processes and modifications in the topology on the part of the NEG (communication of the NEG towards the NRENs)</td>
<td>4.0</td>
</tr>
<tr>
<td>8. NEG Network managing</td>
<td>4.3</td>
</tr>
<tr>
<td>9. Facility of contact with the NEG</td>
<td>4.2</td>
</tr>
<tr>
<td>10. NOC functioning</td>
<td>4.4</td>
</tr>
<tr>
<td>11. NOC Services</td>
<td>4.4</td>
</tr>
<tr>
<td>12. Facility of contact with the NOC</td>
<td>4.4</td>
</tr>
<tr>
<td>13. Quality of the connection contracted with RedCLARA</td>
<td>4.1</td>
</tr>
<tr>
<td>14. Performance of the connection contracted with RedCLARA</td>
<td>4.0</td>
</tr>
<tr>
<td>15. Level of satisfaction of your NREN regarding the connection to RedCLARA</td>
<td>4.0</td>
</tr>
<tr>
<td>16. Level of satisfaction of your NREN in terms of the RedCLARA backbone</td>
<td>4.2</td>
</tr>
<tr>
<td>17. Level of satisfaction of your NREN with CLARA</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Although CLARA has been well ranked, it is important to notice that the 3rd point has a qualification 0.1 point less than 4.0 which meant “Good”. This reveals that the CLARA members are waiting for CLARA, as an institution, to apply its knowledge in the advanced networks arena so as to develop and carry out projects that help them to show their users which are the real and tangible benefits of the RedCLARA network connection and of the applications that this can support.
Finally, in terms of the kind of projects the NRENs would like to work on or the areas in which they would like to develop new projects, the answers were the following:


Applications: Electronic Media using Multicast (Video and Voice), Multicast, Videoconference, Voice over IP.

Social: Poverty, Rural Communities, Language Teaching and Learning, Ecology.

It is important to acknowledge that in most of the identified areas there is some work done by different LA NRENs and also within the context of CLARA, particularly in Applications and in the Grid10 scopes. Besides, the identified areas are the ones that are leading research in Europe and in North America, which reveals the awareness existing in the CLARA community about the leading international tendencies and paradigms in Science and Technology: e-Science, e-Infrastructures for e-Science (Grids), e-Learning, e-Health and Data Management and Storage among the most relevant ones.

In addition, the interest in developing projects in Astronomy, e-Health (and Biomedicine) and e-Learning, reveals the need to take advantage not only of what is considered as "crucial" in the advanced networks scenario, but also of what could improve the development of the region; in e-Health and e-Learning it is quite obvious that the need in terms of the crucial factors in all of the LA Governments policies (Health and Education). In the area of health, the use of advanced networks has been successfully tested in Cancer (caBIG Project, USA),11 Malaria12 and Genomics research,13 among the most common. Apart from research, the network has been used with very good results to bring medical analysis to remote areas, where despite availability of medical equipment to conduct specialized exams (ultra sound scan, x-rays, blood tests, electrocardiograms, among others); there is a lack of suitable professionals to analyze the samples. In this case the network is used bring these exams to the suitable specialists, so that patients can, despite the isolation, have access to professional analysis with the same level offered in the most important medical centres. Tel@med, an initiative already mentioned in this document, has tested the effectiveness in this field in Latin America and –based on that project- Brazil has already established a network for the development of telemedicine: RUTE.14

In terms of Education, the most recurrent and at the same time successful projects in the region are developed along the lines of distance education (e-Education), but beyond the importance of using advanced networks to bring educational processes to the most deprived and isolated areas, the subject that cuts across Latin America horizontally is the articulation and study of technologies and applications destined to the development and implementation of Learning

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9 e-Science is defined worldwide as that science which is developed through global collaborations that can only be possible thanks to Advanced Academic Networks. These networks open up new opportunities to conduct research through new means and ways, without modifying the basic principles of science: the development of hypotheses, analysis and modelling remain unchanged in their essence and gain more possibilities for development. The result: a better Science.

10 The institutions which belong to CLARA and connected to RedCLARA are taking part in working groups devoted to research, development of knowledge and of implementation and use of technologies and applications in the following areas: Videoconference, Voice over IP (Internet Protocol), Security, Multicast, IPv6 (Version 6 of the Internet protocol) Advanced Routing and Measurements.


12 A good example of succesful work in this line es WISDOM - Wide In Silico Docking On Malaria, that aims to discover those drugs more effective against Malaria; the european Grids project more relevant in the world, EGEE, is dedying the Grid to this task, with very good results. See: http://wisdom.eu-egee.fr/malaria/.

13 One of the most important projects in this line, is the Human Genome Project, completed in 2003; after 13 years of study that was leads by the Energy Department and the National Research Institutes in the United States. See: http://www.ornl.gov/sci/techresources/Human_Genome/home.shtml.

14 See: http://rute.rnp.br/.
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Objects.15 LACLO is the institution that brings together all the teachers and students working on this subject.

In the case of Astronomy, this refers to the advantages that the most southern countries (Argentina and Chile) have in terms of geographical and sky conditions, with milestones such as the projects of Pierre Auger (Argentina), ALMA and AURA (Chile); the development of Astronomy projects, will also benefit the region in terms of international investments for research plus all that this involves (new working positions from construction to data analysis, tourism growth, etc).

In the particular case of Applications, the major repetitions in the answers were for Videoconference. This is not surprising at all, not only due to the benefits that this technology brings to those who use it (better interaction despite the distances, facilitation of the learning processes in distance education, reproduction of the face-to-face experience in a virtual mode improving the collaborative research or work experiences, etc.), but also because Videoconference is perceived as a “tangible” tool which is easy to use and which is already widely validated. So, in practical terms, the Videoconference systems help the NRENs to “seduce” their current users and moreover, the ones who they want to reach.

Strongly related to issues of Health and Education we find the social sphere. Here the necessities revealed by the survey have direct relation with regional problems. Poverty does not need to be described in this document, what is important, is that the connection to RedCLARA is seen as a tool that can help to fight poverty in the region; although it is not indicated in the survey how this could be done, certainly the natural answer is by improving Education and bringing Education to isolated and less benefitted areas, such as the Rural Communities that can also be helped in terms of Health, for example, by reproducing successful experiences like Tel@med. The most obvious need identified here was the one of Language Teaching and Learning. The situation of some countries in Central and South America where the illiteracy is a major problem, to use the network in order to teach Spanish, English and native languages (aboriginal tongues) is certainly a need that is perceived as likely to be addressed by a project that could be run over RedCLARA.

Finally, as for Ecology, the recognition and identification of this subject tends to be related to Earth Sciences, the study of El Niño and La Niña phenomena, and of course to Global Warming.

CLARA will have to be able to address the expectations and knowledge developing interests expressed by its member NRENs in order to “fill” its network with relevant content and data; in order to justify its crucial existence in the region and the maintenance and growth of its links to Europe, North America and therefore, the rest of the world; especially now, when the EC is starting to support the creation of an advanced network in the Caribbean (revealing, again, the importance that they are giving to the development of the American countries that are not on the top of the occidental map). This, plus the achievement of its future sustainability would be the key factors for the success of CLARA and the continuity of RedCLARA in time, which would also imply a better future for the region in the Information Society. Nevertheless, as important as the responsibilities that CLARA has for the near future, is the responsibility that the NRENs have in terms of finding out the ways that will help themselves and CLARA to reach the users (scientist, academics, researchers, engineers, students, etc) needs; each of the NRENs must take advantage of their connections to RedCLARA and not lie down on it and wait until changes take place.

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15 The Learning Objects (LO) technology has arisen in the last few years – stemming from the demonstrated success of networks and information technologies- as a real, effective and valid alternative to create, store and retrieve information, thus enriching the possibilities of the teaching-learning process, both for the student and the teacher, by giving them access to the large resources banks located in repositories which are geographically distributed all that part of the globe covered by advanced network.

16 Comunidad Latinoamericana de Objetos de Aprendizaje (LACLO) – Latin-American Community of Learning Objects. See: http://www.laclo.espol.edu.ec/.
III. Profile of the Latin-American National Research and Education Networks

1. Argentina

Short name of the organization: Innova-Red.
Long name of the organization in its native language: Innova-Red.
Long name of the organization in English: Innova-Red.
Website: Under construction
Executive contact: Alejandro Ceccatto
Technical contact: Juan José Nicolás
CLARA member: Yes.
Currently connected to RedCLARA: Yes, at 155 Mbit/s (one of the RedCLARA backbone nodes is located in Argentina).
Number of member institutions: 42 universities and higher education institutions, 8 national research laboratories and 5 governmental agencies.
Number of connected institutions: 38.
Number of Academics in those connected institutions: 3,500
Number of Researchers in those connected institutions: 2,500
Number of Students in those connected institutions: 200,000

About the NREN: This institution has been recently created and it works under the Argentinean Government. Before Innova-Red, RETINA was the Argentinean NREN.
RETINA was a project of the Asociación Civil Ciencia Hoy. Its mission was to satisfy the communications necessities of the Argentinean academic community. It operated since 1990 and it connected the scientific and academic sector to Internet in March of 1994. Till the implementation of Innova-Red, RETINA served 80% of the research of the Argentinean community. Since year 2001, RETINA administered the RETINA2 project, of access to Internet2
and to the Advanced Academic Networks of the world, and impelled the development of these networks in Argentina.

In 2007, Argentina replaced the ALICE and CLARA partner (RETINA) with a new organization: Innova-Red. The Argentinean Department for Science, Technology and Productive Innovation encouraged the country's re-connection to RedCLARA, in the context of the objectives settled in the established Argentinean Bicentenary Plan.

2. Bolivia

Short name of the organization: ADSIB
Long name of the organization in its native language: Agencia para el Desarrollo de la Sociedad de la Información en Bolivia
Long name of the organization in English: Agency for the Development of the Information Society in Bolivia
Website: http://www.adsib.gob.bo/home/
Executive contact: Luis Sergio Valle
Technical contact: Luis Machicado Moya
CLARA member: Yes
Currently connected to RedCLARA: No (it will be connected during 2007).
Number of member institutions: Not declared.
About the NREN: The National Network in Bolivia is in its formation process.
At the moment, the Agency for the Development of the Information Society in Bolivia (ADSIB) and the Vice ministry of Superior Education, Science and Technology has signed like representatives of CLARA in the country.
NREN Topology Map: Not available.
3. Brazil

Short name of the organization: RNP
Long name of the organization in its native language: Rede Nacional de Ensino e Pesquisa
Long name of the organization in English: National Network of Education and Research
Website: www.rnp.br
Executive contact: Nelson Simões
Technical contact: Alexandre Grojsgold
CLARA member: Yes.
Currently connected to RedCLARA: Yes, at 155 Mbit/s (one of the backbone nodes is located in Brazil).

Number of member institutions: 83 units of superior education, 35 units of investigation, 14 federal centers of technological education, 3 institutions of average, technical and professional education, 8 institutions of promotion, 2 hospitals, and 11 nongovernmental, Government and other institutions.

Number of connected institutions: 397.
Number of Academics in those connected institutions: 100,000
Number of Researchers in those connected institutions: 20,000
Number of Students in those connected institutions: 1,000,000

About the NREN: The National Education and Research Network (Rede Nacional de Ensino e Pesquisa - RNP) is the Brazilian infrastructure of advanced network for collaboration and communication in the fields of teaching and research. It connects almost 400 Brazilian institutions among them and with foreign institutes, making it possible for people and resources to interact through advanced applications. Besides connecting all federal institutions of higher education and research, this infrastructure, also called Ipê network, provides a test bed for the experimental development of new applications and network services for the benefit of its users.

Ipê maintenance and updating is supported by the Inter-ministerial Program of the Ministry of Education and the Ministry of Science and Technology (Programa Interministerial dos Ministérios da Educação e da Ciência e Tecnologia - PI-MEC/MCT), through a contract signed between the RNP Association and the Ministry of Science and Technology. Besides receiving public resources, RNP gathers private resources by means of projects with computer science enterprises and other organizations.
4. Colombia

Short name of the organization: RENATA
Long name of the organization in its native language: Red Nacional Académica de Tecnología Avanzada
Long name of the organization in English: National Academic Network of Advanced Technology
Website: www.renata.edu.co
Executive contact: Hector Jaime Rendon Osorio
Technical contact: Martha Inés Giraldo Jaramillo
CLARA member: Yes.
Currently connected to RedCLARA: Yes, at 10 Mbit/s.
Number of member institutions: 3 government entities and 6 regional networks constituted by 54 institutions.
About the NREN: RENATA is the union of efforts from the national government and the country's academic and scientific community to encourage the use of new-generation networks and the development of research, education and development projects; to increase the quality of educational processes and to promote collaborative work between local and/or international peers.
RENATA is in the process of organizing itself in order to become a civil, non-profit and private corporation. Its objective is to articulate, promote and facilitate actions for the execution of scientific and technological education, innovation and research projects which promote the development of the knowledge and information society in Colombia and in which the national academic network of advanced technology -RENATA- serves as a fundamental tool.

The main members of RENATA are Regional Academic Networks, which are the result of the local or regional association of public or private entities that acknowledge the benefits and make use of the Network. Below is the list of regional networks and their member institutions:

RENATA was consolidated thanks to the @LIS project - through CLARA - and the resources provided by the Connectivity Agenda of the Ministry of Communications. Apart from the Ministry of Communications, the Ministry of National Education and the Colombian Institute for Science and Technology Development -Colciencias- also take part in this initiative as members of the national government.

Internal backbone bandwidth: 10 MB (it is envisioned to enlarge it in the future)

The connection to RedCLARA is through Cable & Wireless Panama (CWP). For this, RENATA has 5 E1’s in the submarine cable MAYA from its start point in Tolú (Colombia) to the end point in the María Chiquita station in Panama (Atlantic), from that point CWP transports in its SDH/DWDM ring this capacity from María Chiquita to the Meet Me Room of Global Crossing in the Global Crossing POP in Panama (Pacific).

Colombia Telecomunicaciones is responsible of the transportation capacity inside the Colombian territory: from the MAYA cable in Tolú to the RENATA equipments.

Last mile for its member institutions: 10 MB

The current capacity of each one of the connections at national level is of 10 Megas, this capacity is given by the SDH network of Colombia Telecomunicaciones at 5*E1’s in each one of the nodes of the different regional Colombian networks: Barranquilla, Bucaramanga, Cali, Popayán, Medellín and Bogotá.

Ongoing projects: Grid Colombia (www.renata.edu.co) and open calls for research projects in the innovation and technological development scopes (they must made use of the RENATA infrastructure and services) (www.renata.edu.co)

Brief description of the main problems:
- Migration to IPv6. There’s a migration plan that will last 18 months.
- Complex routing. There’s a routing plan but it is too demanding in terms of configuration and of hardware specifications.
- High costs of the national communication channels and of the connection to RedCLARA.
- The NOC is not administered by the Network, but for the service supplier and it is constrained to and Agreement of Service Levels.
5. Costa Rica

Short name of the organization: CR2Net
Long name of the organization in its native language: Red Nacional de Investigación
Long name of the organization in English: National Research Network
Website: www.cnet.cr/cr2net/
Executive contact: Eugenia María Flores Vindas
Technical contact: Carlos Fernández
CLARA member: Yes
Currently connected to RedCLARA: No.

Number of member institutions: 1 ministry, 2 nongovernmental institutions, 3 universities, 3 scientific-technological institutes or academies.

About the NREN: By means of Executive decree Nº 29431 - MICIT, signed on April 18th of 2001, it was settled down the creation of the National Research Advanced Network -CR2Net-, a high speed network devoted to offer the necessary conditions of connectivity for an adequate development of the Research in all the knowledge areas and at the service of Superior Education.

Due to the proper management of CR2Net, it was created a Council of the National Research Advanced Network Outpost; this organism is assigned to the Ministry of Science and Technology, which is formed in two levels of action:

- The Directive Council of CR2Net integrated by:
- The Minister of Science and Technology
- The president of the Costa Rican Institute of Electricity
- The Executive President of the Costa Rican Box of Social Insurance
- The Director of the University of Costa Rica
- The Director of the Technological Institute of Costa Rica
- The Director of the National University
- The Director of the at a distance State University
- The President of the National Academy of Sciences
- The President de CRNet

Some of the objectives of CR2Net are:
- To become the facilitator of the collaborative research at national level as much, as international.
- To promote the development of Advanced Research Networks.
- To equip the country with one most advanced instruments of research that today are available.
- To facilitate the tools that will allow to the national researchers get to know and to use the last technological advances.
- To promote the research in all the areas of knowledge for the development of the Costa Rican society.
- To provide the required infrastructure for the advance of the medicine, by means of the use of remote diagnosis, interchange of medical images of hi-res, remote qualification and collaboration with other medical centers.
- To offer to the country the capacity to prevent to the Costa Rican population on possible natural disasters.
- To impel education and learning by means of the at a distance education.

NREN TOPOLOGY MAP
6. Cuba

Short name of the organization: RedUniv
Long name of the organization in its native language: Red Universitaria
Long name of the organization in English: University Network
Website: www.mes.edu.cu
Executive contact: Jorge Luis López Presmanes
Technical contact: It doesn’t have one.
CLARA member: Yes, but non active.
Currently connected to RedCLARA: No.
Number of member institutions: 22 universities and research or study centers.
About the NREN: RedUniv is the academic network of the universities and national research centers assigned to the Ministry of Superior Education of Cuba. In addition, it represents all the universities and Cuban research centers in the project.

7. Chile

Short name of the organization: REUNA
Long name of the organization in its native language: Red Universitaria Nacional
Long name of the organization in English: National University Network
Website: www.reuna.cl
Executive contact: Paola Arellano
Technical contact: Sandra Jaque
CLARA member: Yes.
Currently connected to RedCLARA: Yes, at 155 Mbit/s (one of the backbone nodes is located in Chile).
Number of member institutions: 15 universities, 1 observatory and 1 governmental institution.
Number of connected institutions: 17.
Number of Academics/Researchers in those connected institutions: 13,214
Number of Students in those connected institutions: 172,146

About the NREN: REUNA, Red Universitaria Nacional (National University Network - Chile), is a non-profit private corporation made up of 14 Chilean universities and the National Commission for Scientific and Technological Research (CONICYT). It is an initiative of university collaboration that counts on the only technological infrastructure of advanced networks of academic nature, dedicated to research and development in Chile.

It was born in 1992, with the creation of the first university network connected to Internet, and in 1998 it is empowered by the launch of REUNA2, the first high speed network of Latin America. In the year 2000, REUNA integrates the Advanced Education Networks, by means of its connection to Internet2.

REUNA provides to their community with services in matters of Information and Communications Technologies, supported by a work team highly qualified and committed, that promotes the interuniversity work through the use of its infrastructure of advanced research and education network, connecting its member institutions with its international pairs, in order to increase the quality of their supply and take advantage in a collaborative way of the opportunities that the internationalization gives.

Internal backbone bandwidth: 310 Mbps in the central cord and 155 Mbps in the edges.
Last mile connection for its member institutions: 1 Gbps over dark fiber.

Ongoing projects:
- II Taller de Articulación de e-Ciencia: "Cimentando el camino para el desarrollo de la e-Ciencia en Chile".
- Kimen - Integración de Comunidades Educativas a través de Herramientas TIC para Potenciar el Mercado de Desarrolladores de Contenido, Favorecer la Calidad y Equidad de la Educación.
- MECESUP AU0307 - Mejoramiento de la Calidad y Nivel de los Servicios Tecnológicos de Apoyo a la Docencia.
- RINGrid - Remote Instrumentation in Next-generation Grids.
- EELA - E-Infrastructure Shared Between Europe and Latin America.
- UCRAV II - Servicio colaborativo de instrumentación de alto valor, mediante análisis remotos con un alto nivel de interacción cliente–prestador.
- Red Inalámbrica Transversal de Alta Velocidad para el Desarrollo Productivo y Social de la IX Región.
- Principio biofarmacéutico, espermicida humano, obtenido de Latrodectus Mactans.
- KAWAX: La necesidad en Chile de una infraestructura tecnológica colaborativa de apoyo a la investigación Astronómica.

Download NREN topology map at: http://www.reuna.cl/joomla/index.php?option=com_&taskcont ent =view&id=80&Itemid=105
8. Ecuador

Short name of the organization: CEDIA.

Long name of the organization in its native language: Consorcio Ecuatoriano para el Desarrollo de Internet Avanzado.

Long name of the organization in English: Ecuadorian Consortium for the Development of the Advanced Internet.

Website: www.cedia.org.ec

Executive contact: Carlos Monsalve

Technical contact: Romel Vicente Torres Tandazo

CLARA member: Yes.

Currently connected to RedCLARA: Yes, at 10 Mbit/s.
Number of member institutions: CEDIA is integrated by 22 polytechnical universities, schools and research & development institutions of Ecuador.

Number of connected institutions: 22.

Number of Academics/Researchers in those connected institutions: 7,680

Number of Students in those connected institutions: 210,000

About the NREN: CEDIA was born the 18th of September of 2002, in the Palace of Government in Quito, later the 10th of January of 2003, the Ministry of Education and Culture, emitted the ministerial agreement of approval of its statute.

The CEDIA objective is to integrate to all the universities and research and development centers of Ecuador, through a high speed academic network, allowing the access to the advanced networks, to the development of new high technology applications and the cooperation between scientists of the world. Its mission is to promote and to coordinate the development of advanced networks of informatics and telecommunications, focused on the scientific, technological, innovating and educative development of Ecuador. CEDIA looks for the creation of a telecommunications network with advanced capacities, to foment the development of projects and applications related to the new Internet generation, and that demand for its development the use of telecommunications and computing network technologies.

Internal backbone bandwidth: 10Mbps

Last mile connection for its member institutions: Optic Fiber

Brief description of the main problems: Some problems in the connection by using IPv6 (solved)
9. El Salvador

Short name of the organization: RAICES.
Long name of the organization in its native language: Red Avanzada de Investigación, Ciencia y Educación Salvadoreña.
Long name of the organization in English: Research, Science and Education Salvadorian Network.
Website: www.raices.org.sv
Executive contact: Rafael Ibarra
Technical contact: Carlos Bran
CLARA member: Yes.
Currently connected to RedCLARA: Yes, at 10 Mbit/s.
Number of member institutions: 8 universities and 1 technological institute.
Number of connected institutions: 7
Number of Academics in those connected institutions: 4,092
Number of Researchers in those connected institutions: 207
Number of Students in those connected institutions: 79,996
About the NREN: RAICES (Red Avanzada de Investigación, Ciencia y Educación Salvadoreña) is a private non-profit association integrated by seven Salvadoran institutions of superior education.
Its board of directors is constituted, at the present time by:
- President: Rafael Ibarra (Universidad Centroamericana José Simeón Cañas)
- Vice-president: Guillermo Vásquez (Instituto Tecnológico Centroamericano)
- Secretary: Mario Rafael Ruiz (Universidad Francisco Gavidia)
- Treasurer: Carlos Bran (Universidad Don Bosco)
- Vowel: Lorena Duque de Rodríguez (Universidad Tecnológica)
Network topology map: Not available.

10. Guatemala

Short name of the organization: RAGIE
Long name of the organization in its native language: Red Avanzada Guatemalteca para la Investigación y Educación
Long name of the organization in English: Advanced Guatemalan Network for Research and Education.
Website: www.ragie.org.gt
Executive contact: Luis Roberto Furlan Collver
Technical contact: Marco Antonio T.
CLARA member: Yes.
Currently connected to RedCLARA: Yes, at 10 Mbit/s
Number of member institutions: 6 universities, 2 non governmental institutions and 1 research center.
About the NREN: The Advanced Guatemalan Research and Education Network is a civil association without aims of profit, constituted by Universities, Research Institutes and other Guatemalan institutions dedicated to research and education. In order to acquire it aims, it develops projects through networks and by the operation of telecommunications.

The objective of the Association consists in promote the development of the Information Society, as well as the creation of academic and education networks in Guatemala, which will be able to be interconnected abroad with other networks of their same nature. The aims of the Association are the following ones:

- To cause the exchange of information, coincident with the scientific, academic intentions, of research and development of its members;
- To promote the use and extension of communication channels between the research, scientific, academic and of development institutions in Guatemala;
- To administer and operate the network.

Internal backbone bandwidth: 100 Mbps.

Last mile connection to its member institutions: Optic Fiber at 100 Mbps.

Ongoing projects: Although some of the member institutions are currently participating in some projects, RAGIE –itself- is not participating in any project.

Brief description of the main problems:

- Although RAGIE has a high capacity local loop, the international connection cost has RAGIE restricted to 10 Mbps (out), a real bottle neck.
- RAGIE has grown because of the enthusiasm and courage of its members, nevertheless, RAGIE is now needing to have a full time staff to create projects and give continuity to its regular tasks. For this, RAGIE needs financial resources.
11. Honduras

Short name of the organization: RHUTA
Long name of the organization in its native language: Red Hondureña de Universidades para Telecomunicaciones Avanzadas
Long name of the organization in English: Honduran Universities Network for Advanced Telecommunications.
Website: www.unitec.edu
Executive contact: Ramón Sarmiento
Technical contact: Daniel Montenegro
CLARA member: Yes, but non active.
Currently connected to RedCLARA: No.
Number of member institutions: 5 universities and research centers.

About the NREN: On April 25th of 2005, the principals of the public and private universities of Honduras, in conjunction with the representatives of state and international institutions of telecommunications, created the Honduran Network of Universities with Advanced Telecommunications (RHUTA). Till date UNITEC has represented Honduras in CLARA, and as RHUTA has no website, for CLARA the UNITEC website is the valid one meaning that is the one that represents RHUTA.
12. Mexico

Short name of the organization: CUDI.
Long name of the organization in its native language: Corporación Universitaria para el Desarrollo de Internet.
Long name of the organization in English: University Corporation for the Development of Internet.
Website: www.cudi.edu.mx
Executive contact: Carlos Casasús
CLARA member: Yes.
Currently connected to RedCLARA: Yes, at 155 Mbit/s (one of the backbone nodes its located in Mexico).
Number of member institutions: 4 non governmental institutions, 19 research centers, 33 universities, 11 institutes, 1 independent faculty, 7 superior schools and 1 governmental institution.
Number of connected institutions: 146.
Number of Academics in those connected institutions: 160.000
Number of Researchers in those connected institutions: 9.100
Number of Students in those connected institutions: 1.600.000

About the NREN: The Corporación Universitaria para el Desarrollo de Internet (CUDI) -University Corporation for the Development of Internet-, is a civil association integrated by the universities of Mexico. Of private character and without profit aims, CUDI was founded on April of 1999. Its mission is to promote and to coordinate the development of a telecommunications network of the higher technology and ample capacity, focused to the scientific and educative development in Mexico. CUDI is the organism that handles the project of Internet2 network in Mexico and looks forward to impel the development of applications that use this network, fomenting the collaboration in research and education projects between their members.

NREN TOPOLOGY MAP
13. Nicaragua

Short name of the organization: RENIA
Long name of the organization in its native language: Red Nicaragüense de Internet Avanzada.
Long name of the organization in English: Advanced Internet Nicaraguan Network.
Website: www.renia.net.ni
Executive contact: Roberto Blandino
Technical contact: Derman Zepeda
Currently connected to RedCLARA: No – they decided to put down their connection and to get off the ALICE project – due to economic reasons in late April 2007.
Number of member institutions: 6 universities and 2 nongovernmental institutions.
About the NREN: RENIA is an organism of national technical cooperation, constituted by the university networks affiliated of Internet. It promotes the elevation of the capacity and quality of the Internet services for its members and facilitates the access to the world-wide network of advanced Internet.
Internal backbone bandwidth: 10/100 Mbps
Last mile connection for its member institutions: Optic Fiber and in some cases Wireless.
Ongoing projects: RENIA does not participate in projects at the date.
Brief description of the main problems:
- High costs of the connection.
- There’s no technical staff working for RENIA at full time.
- There’s not enough equipment to administrate the network and to offer network services.
14. Panama

Short name of the organization: RedCyT
Long name of the organization in its native language: Red Científica y Tecnológica
Long name of the organization in English: Scientific and Technological Network
Website: www.redcyt.org.pa
Executive contact: José Causa Díaz
Technical contact: Máximo Escobar
CLARA member: Yes.
Currently connected to RedCLARA: Yes, at 155 Mbit/s (one of the backbone nodes its located in Panama).
Number of member institutions: 7 universities and 3 governmental institutions.
Number of connected institutions: 4.
Number of Academics in those connected institutions: 4.500
Number of Researchers in those connected institutions: 300
Number of Students in those connected institutions: 93.000

About the NREN: RedCyT, Red Científica y Tecnológica (Scientific and Technological Network), is a foundation without aims of profit with academic base, whose intention is to foment the development of the scientific and technological interest of the country. RedCyT also represents the physical network that will unite the research and superior education organizations by giving them a fast access to the information and the advantageous use of new applications.
15. Paraguay

Short name of the organization: Arandú.
Long name of the organization in its native language: Doesn’t have one.
Long name of the organization in English: It doesn’t apply; Arandú is a word in Guaraní language (native tongue) that means knowledge or wisdom.
Website: www.arandu.net.py
Executive contact: Jorge Cabañas
Technical contact: Cristian Cappo
CLARA member: Yes, but non active.
Currently connected to RedCLARA: No.
Number of member institutions: 22 universities.

About the NREN: Arandú is a project impelled by the National Center of Computation of the National University of Asuncion, that points at the creation of new generation national academic network for the development of science and the technology.
This project, that counts on the support of the National Council of Science and Technology (CONACyT), will make possible the connection of the participants of ARANDU to other regional advanced networks; the concretion of this project does not have to be associated exclusively to the idea of a network of great capacity, if not rather, to the quality in infrastructure of services and protocols, that the use of innovating applications makes possible, mainly in real time.

Network Topology Map: Not available.

16. Peru

Short name of the organization: RAAP
Long name of the organization in its native language: Red Académica Peruana
Long name of the organization in English: Peruvian Academic Network
Website: www.raap.org.pe
Executive contact: Beau Flores
Technical contact: Daniel Díaz
CLARA member: Yes.
Currently connected to RedCLARA: Yes, at 45 Mbit/s
Number of member institutions: 3 national universities, 2 private universities, 2 research centers.
About the NREN: The Peruvian Academic Network (RAAP) is an initiative of diverse public and private institutions oriented to the development of the academic networks in Peru.
When they speak of “networks” they make a double reference; on one hand, they talk about the development of research, teaching and exchange of information activities; on the other hand, they are speaking of the implementation of a high speed and last generation architecture of connectivity that makes this interchange possible in a much more efficient way.
Internal backbone bandwidth: 10 Mbps
Last mile for its member institutions: Connections with Optic Fiber in Fast Ethernet, with 2 Mbps.
Brief description of the main problems:
- Major difficulties to get access to Internet.
- Problems of IPv6 connection to RedCLARA.

**NETWORK TOPOLOGY MAP**

17. Uruguay

Short name of the organization: RAU
Long name of the organization in its native language: Red Académica Uruguaya
Long name of the organization in English: Uruguayan Academic Network
Website: www.rau.edu.uy/redavanzada/
Executive contact: Ida Holz
Technical contact: Luis E. Castillo Acosta
CLARA member: Yes.
Currently connected to RedCLARA: Yes, at 34 Mbit/s
Number of member institutions: 31 university faculties, institutes and schools.
Number of connected institutions: 17
Number of Academics in those connected institutions: 9,000
Number of Researchers in those connected institutions: 500
Number of Students in those connected institutions: 110,000
About the NREN: The Uruguayan Academic Network (RAU) is a development of the Universidad de la República, administered by the Servicio Central de Informática Universitario (SeCIU) that operates since
year 1988. It joins up the Faculties, Schools, Institutes and Services of the Universidad de la República and numerous organizations of superior education and investigation of the country.

In correspondence to the guidelines established in the regional and world-wide instances of reflection about the mission of the University Academic Networks, RAU looks for to be a scope of integration, communication and discussion, at the service of the objectives of education, research and the social transformations.

The nodes of the Uruguayan Academic Network are 48, being able to discriminate between pertaining to the Universidad de la República -36- and those of other Academic and Research organizations -14. RAU is at the service of 31 Faculties, Institutes and Schools.
18. Venezuela

Short name of the organization: REACCIUN2

Long name of the organization in its native language: Centro Nacional de Innovación Tecnológica (CENIT), Red Académica de Centros de Investigación y Universidades Nacionales / REACCIUN

Long name of the organization in English: National Centre of Technological Innovation (CENIT), Academic Network of Research Centres and National Universities / REACCIUN

Website: www.reacciun2.edu.ve

Executive contact: Amely Caraza

Technical contact: Francisco Obispo

CLARA member: Yes.

Currently connected to RedCLARA: Yes, at 45 Mbit/s

Number of member institutions: 17 regional government entities and governmental institutions, 5 foundations, 3 ministries, 8 nongovernmental institutions, and 34 university faculties.

Number of connected institutions: 11

Number of Academics in those connected institutions: 370,000

Number of Researchers in those connected institutions: 72,000

Number of Students in those connected institutions: 298,000

About the NREN: CENIT is a foundation with basis in the Ministry of the Popular Power for Science and Technology (MPPCT), it was created by a presidential decree in April 17th 2006, and its objective is to work in research, development and innovation in the area of information and communication technologies in accordance to the socio-productive model of the country. As strategic objectives, CENIT aims to contribute to leverage the technological capacities of the National System of Science, Technology and Innovation in order to foster the scientific, academic and technological sectors, and to consolidate a research, development and technological innovation system to give response to the needs and requirements of the country. CENIT is looking forward to foster the development of the infrastructure of the Academic Network of Venezuela, in conjunction with the social networks that are currently working with the "transformation engines".

Internal backbone bandwidth: 155 MBPS.

Last mile connection for its member institutions: 34 MBPS y 8 MBPS.

Ongoing Projects:
- GRIDS http://www.cecalc.ula.ve/
- Videoconferencia
- Tele-educación
- Tele-salud

Brief description of the main problems: The network is in a stabilization process, because some of the connections with some member institutions have not been totally established. The projects development is starting.