ALICE2

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

The European Commission is the executive body of the European Union.

The ALICE project started while we were living through the worst economic crisis experienced in the region in the last eighty years. CLARA had to make use of all its creativity and collaboration capacity in order to obtain, now without DANTE's support, the resources to operate during the time between the end of the first project and the beginning of the second, and manage to have the necessary financial guarantees to launch ALICE2. We deeply thank the support to meet these commitments that we received from all members and from Brazil in particular.

With the implementation of the ALICE2 project it will be possible to connect all countries in continental Ibero-America and we will have the opportunity to consolidate a large-capacity regional network which will be sustainable when the funding provided by the European Economic Community comes to an end.

Today we have an optimist view of our Project's future and we invite you to share this enthusiasm with us.

Carlos Casasús

President of the RedCLARA Directing Council

RedCLARA 2008 Annual Report
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Chapter 1
Introduction

As part of the @LIS2 programme, on November 30th, 2008, the European Commission (EC) signed an €18 million contract with RedCLARA for the implementation of the ALICE2 project. The Project's promise was that it would give continuity to the enormous achievements of its predecessor, ALICE (which had been led by DANTE, institution run by the pan-European network GÉANT), and would consolidate and expand RedCLARA in Latin America, improving connectivity between Latin American and European researchers.

To provide an enduring and front-line e-Infrastructure for collaborative research and education, and support Latin American development through them were the outstanding goals and the Project accomplished them.

ALICE2 would work on disseminating the potential of RedCLARA's use for the creation and implementation of applications that have an impact on the region, thus helping to reach the goals agreed by Governments in the UN's MDG Plan (Millennium Development Goals) and the goals of the EC's Seventh Framework Programme (FP7).

December 2008 marked the beginning of ALICE2 and although its completion date was scheduled for September 2012, the @LIS2 Programme granted an extension for the implementation to continue until January 2013.

ALICE2: The name that summed up the real meaning of collaboration between Europe and Latin America

The Project was coordinated by RedCLARA and its members were the National Research and Education Networks (NREN) from 14 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Mexico, Panama, Peru, Uruguay and Venezuela, all of them beneficiaries of @LIS2), 4 European countries (Spain, France, Italy and Portugal) and the international organisations RedCLARA and DANTE (non-profit organisation that works in association with European NRENs to plan, build and operate advanced research and education networks in Europe with joint funding from the EC).

On November 30th, 2008, ALICE2 committed itself to accomplish five outcomes:

1. A sustainable, high-quality infrastructure with evolving capacity and low maintenance costs, RedCLARA2, which will become the base infrastructure for collaboration in research and education within Latin America and with Europe.
2. A group of user communities (researchers, educators, students) who work together to solve MDG-related issues and who participate in the ALFA and FP7 calls.
3. A strong, well-managed, inclusive and sustainable organisation, with a clear funding model.
4. A network with vast coverage across the Latin American region, with strong links with the Caribbean.
5. A large group of technicians, managers and community leaders, with the skills to collaborate with their European counterparts and take advantage of funding opportunities.

These five outcomes would be materialised through the implementation of the actions aimed at reaching the Project's goals, namely:

1. To sustain and further the development of RedCLARA's infrastructure through the provision of a permanent, inclusive and persistent environment for electronic collaboration for research and education in Latin America, with an emphasis on supporting collaboration spaces for higher education and research between Latin America and Europe. This enhanced version of RedCLARA will be based on long-term (IRU: Indefeasible right of use) contracts for the use of dark fibre and wavelengths in order to ensure low recurrent costs.
2. To create user communities in order to ensure the use of RedCLARA in MDG-related applications, and promote collaboration within Latin America and with European researchers in FP7 priorities and strengthen collaboration with European initiatives such as the ESO Astronomical Observatories, the Pierre Augier Observatories and others.
3. To develop a funding model that provides stability and long-term sustainability for Latin American regional research and education networks. This model will be based on a stronger RedCLARA organisation, on a widely adopted cost-distribution system and on a solid financial administration.

4. To consolidate RedCLARA's long-term existing geographical coverage and try to expand it in order to include developing research and education communities in Latin American countries, and continue contributing to the region's digital inclusion through its research and education communities. To do this, the Project will attempt to engage all Latin American countries in the initiative and create synergies with NRENs, by creating a terrestrial communications infrastructure which can also be used locally to build or expand NRENs.
5. To strengthen NRENs and their user communities so they become active members of the community of world research and education networks, providing training and tools for their technical, administration and academic communities.

The Visibility goal, related to all dissemination actions of the Project's activities, was naturally added to the goals above.

The goals were all accomplished and this is what the following pages sum up, beginning with a summary of everything accomplished by the human team who gave life to ALICE2 and who gave content and meaning to RedCLARA's powerful infrastructure, and continuing with the words of technicians, engineers, researchers and leaders from the NRENs that are part of RedCLARA. The book ends with the interviews with the leaders of regional networks and of the most important networks in today's global scene. The choir represented by the 34 interviews not only speaks of how RedCLARA has boosted progress in Latin America, but also of how the threads of collaboration are woven within this part of the world and also with the global community, and what the future and mission of networks look like.

First steps

Officially launched on 1st December 2008, ALICE2 reached January 2009 with its branding image and website in proper order to clearly show the big advances of its first year of implementation, in which RedCLARA's core team was strengthened in order to carry out the more than 100 activities that were part of the Project, thus expanding it from five to fifteen people in a short period of time.

Under a complicated scenario, like that of 2009, as a result of the world economic crisis, the development of Information and Communications Technologies (ICT) and the increase of efficiency in their use were fundamental for the region, given their potential to generate productivity profits and improve the coverage of services for the population, such as education, health and government services. With this in mind, on March 17th that year, at the ECLA office in Santiago de Chile, with the participation of Laura López, Secretary of the ECLA Commission, and Jaime Pérez Vidal, Head of the European Commission Delegation in Chile, the three projects with which the European Union's @LIS2 Programme promoted –with €22 million for the 2009-2012 period- access to and productive use of ICT were launched: Inclusive political dialogue and exchange of experiences (coordinated by ECLA), ALICE2 (RedCLARA) and

Regulatory dialogues (REGULATEL). Total funding for the three initiatives, including counterparts, is €31 million.

ALICE2 was taking its first steps

Before analysing step by step –or, more precisely goal by goal- the route followed by ALICE2 in its four years of life, we will take a look at the landmark represented by its launch, held on May 14th, 2010 in Madrid, Spain.

"For the Commission, RedCLARA is a particularly good example of this cooperation between Europe and Latin America and, especially for the Information Society Directorate, this is the most concrete and successful case of implementation of the recommendations of previous Ministerial Forums on the Information Society for bridging the digital divide and establishing a unifying connectivity". With these words, Mario Campolargo, Director of Emerging Technologies and Infrastructure of the European Commission's Information Society, began his speech at the official launch ceremony for the ALICE2 project and the second phase of RedCLARA, as part of the Ministerial Conference on Science and Innovation in Europe, Latin America and the Caribbean (EU-LAC), held at the IFEMA Fairgrounds in Madrid (Spain).

Campolargo indicated that the importance of the ALICE2 launch had an impact on European and Latin American research and education communities: "It marks a very important development in the collaboration between Latin America, the Caribbean and Europe, which we hope will be accompanied in the near future by an improvement in connectivity and the eventual deployment of new fibre systems connecting both regions".

Florencio Utreras, Executive Director of RedCLARA, was in charge of introducing ALICE2 and RedCLARA to the ministers and their delegations, through a speech in which he stated that through RedCLARA's new phase the idea was to expand and promote the work done by the network on the identification of research communities, the development and consolidation of a sustainable model, regional inclusion and the creation of capacities. Along the same lines, Martha Giraldo, President of the RedCLARA Directing Board and Executive Director of Colombia's national network, RENATA, indicated that the only way for Latin America to become competitive was through the creation of virtual research institutions featuring researchers from several countries.

The speeches and presentations by Campolargo, Utreras and Giraldo were followed by the concert in which, for the first time in history, the sounds of pre-Hispanic instruments joined the sound of those of ancient Greece. Such unique combination was (and is) possible only thanks to the perfect combination between the capacities of the advanced networks GÉANT, EUMEDCONNECT and RedCLARA, grid computing and the unique and complex technique of physical modelling synthesis developed by the ASTRA project (Ancient instruments Sound/Timbre Reconstruction Application), which enabled the recreation of the sounds of the European instruments

Barbiton and Epigonion (played at the launch of GÉANT's third version in December 2009 in Stockholm) and exclusively for the launch of ALICE2, of a drum from the Gentilar culture (northern Chile), dating from 1200 and 1470 b.c. and a bone flute (quena) from the Nasca culture (southern Peru), dating from 1000 to 700 b.c.

With the participation of the Lost Sounds Orchestra and Caprici Art and Music, three villanelas (typical song from the Neapolitan baroque) were performed and the Prelude of the first musical work written in Latin America was recreated. This work is called "The Purple of the Rose", a one-act opera written by Tomás de Torrejón y Velasco, based on a script by Pedro Calderón de la Barca; 1701.

At the end of the Prelude, Florencio Utreras and Martha Giraldo gave the Spanish Minister of Science and Innovation, Cristina Garmendia, and the Argentinean Minister of Science, Technology and Productive Innovation, José Lino Salvador Barañao, the illustrated map of RedCLARA's topology as a present. Minister Garmendia thanked for the gesture while unfolding the map for the audience and also thanked for the wonderful concert performed.

The words of Campolargo regarding the Commission's expectation about the network's future were still lingering in the air, and the same happened with the words of Martha Giraldo: "Thanks to European cooperation, Latin America has built a powerful infrastructure supported by regional and national organisations which manage, develop and promote its use. The ALICE2 Project is and will continue to be a powerful tool for Latin America's development and for the accomplishment of greater collaboration between our researchers and their peers in Europe and worldwide".

RedCLARA: The e-Infrastructure for Latin American development

In 2009, as a result of the contracts signed in the first two ALICE2 tenders, the agreement with the AugerAccess Project and the Silica Networks Company and the contribution from RNP, three contracts were obtained and these kick-started the implementation of RedCLARA's new generation: an entirely optical network devoted to providing services at the level of virtual circuits in layer 2 (which enables the creation of networks with special features for applications such as access to high-cost instruments) and not only IP (the usual Internet mechanism), as it was at the beginning of the Project. Additionally, RNP's contribution strengthened international access.

The circuits implemented in 2009 were:

- 10 Gbps multiple-wavelength links (initially 2 Gbps, expandable up to 20) between Buenos Aires (Argentina) and Santiago (Chile) to be shared by RedCLARA and InnovaRed, while AugerAccess would have transport over InnovaRed of at least 1 Gbps. The great advantage of this network was that its layout coincided in Argentina with several cities served by InnovaRed and, consequently, synergies with the Argentinean NREN were created. This is a model of what the terrestrial networks that

RedCLARA aimed to implement throughout the region should be like in the future.

- 2.5 Gbps wavelength between Salvador and Guatemala. The first terrestrial link in Central America was awarded to the NAVEGA company.
- RNP's contribution of a 1 Gbps (VPN) circuit to the USA: the link delivered in Layer 2 made it possible to become involved with North American networks at the level of virtual circuits for special applications, which would facilitate the use of this type of services once RedCLARA's new version is fully operational.

In 2011 RedCLARA's backbone evidently increased its capacities, expanding benefits for the NRENs connected and the possibilities for the development of science, innovation and research. In February the activation of a 1 Gbps backup link for the 10 Gbps Buenos Aires – Santiago backbone was completed. Two months later, the expansion to 1 Gbps of the link between Panama and Miami was carried out, representing a very significant increase compared to the 155 Mbps previously existing.

The implementation of a (622 Mbps) STM-4 ring between Sao Paulo, Santiago and Panama was started on July 7th, 2011 – with the link between Santiago and Panama- and was completed on September 6th the same year, with the activation of the two remaining segments, Santiago-Sao Paulo and Sao Paulo-Panama. Thus, the capacity of RedCLARA's backbone was increased four times between these important points of presence. This also made it possible to ensure the backbone's connectivity, making it resistant to failures by generating multiple paths between its points of presence.

Three months before the end of 2011, the links between Guayaquil-Lima, Bogotá-Caracas and Caracas-Panama were increased to 622 Mbps, thus raising the minimum capacity of RedCLARA's backbone from 155 to 622 Mbps, a very important increase for countries like Chile, Argentina and Colombia, where the need for bandwidth in on the increase.

On April 20th, 2012, RedCLARA implemented the most important update for its intercontinental connectivity, by completing the installation of a 2.5 Gbps link to GÉANT, which increased by four times the capacity available to date (622 Mbps): a highly significant landmark for collaboration in research and education between Latin America and Europe. And if this outstanding connection increase was not enough to celebrate ALICE2's final year, only one month after the 45 Mbps connection (with Ethernet technology) to C@ribNet was completed, thus establishing a definite link with the Caribbean's advanced network; since then we have been able to exchange traffic directly and fluently with this emerging regional network.

In August 2012, RedCLARA completed the implementation of the first optical fibre segment in Central America, between San José (Costa Rica) and Panama City (Panama). The network, based on dark fibre and initially operating at 1 Gbps, featured a potential capacity that was limited only by the equipment used and the IRU hiring modality,

which ensured low costs, thus contributing to the organisation's sustainability.

At the end of the year, on December 21st, the implementation of the optical fibre network in Central America activated the installation of a terrestrial Ethernet 1 Gbit/sec link between San Salvador (El Salvador) and San José (Costa Rica), thus increasing the capacity of the backbone's San José – Managua – San Salvador segment to 1 Giga; a network node placed in Nicaragua, to which the country will get connected when it joins RedCLARA. This network was completed in January 2013 with Guatemala's connection to Mexico, which is the last segment of the Central American optical fibre.

The first month of 2013, and the last for ALICE2, was spent on finishing the final details of the promised fully optical network devoted to delivering services at the level of virtual circuits in layer 2 and not only IP. The final completion would be accomplished with the links between Buenos Aires (Argentina and Porto Alegre (Brazil) at 10 Gbps and between Lima (Peru) and Antofagasta (Chile) at 2.5 Gbps. The latter link is part of the multiple 10 Gbps wavelengths (initially there were two, expandable to 20) between Buenos Aires (Argentina) and Porto Alegre (Brazil). These wavelengths are shared by RedCLARA and RNP, and are the result of an agreement with Global Crossing (today Level3) and –thanks to RNP's management- the FINEP funding was complemented with contributions from RNP between Porto Alegre and Sao Paulo. This completed the arrival at RedCLARA's Sao Paulo POP.

Communities: RedCLARA and ALICE2 promoted collaborative science

In terms of applications and content, an area that was not completely new for RedCLARA, but an area in which ALICE2 strongly increased the range of the institution's activities, giving it the responsibility of identifying research groups who work at a regional level and support their activities. Although this area was implemented at a much later stage, it had relevant achievements in 2009, like the organisation of the e-Science Workshop in Asunción (Paraguay, as part of ALICE2's second half-yearly meeting) and the creation of an Applications Committee to advise RedCLARA in the identification of priorities, research groups and applications which are necessary to support R+D across the region.

In 2010, 32 communities from all over Latin America participated in the call for the identification of RedCLARA Communities (COMCLARA), which offered various areas of research the opportunity to join ALICE2 and strengthen their work links, consolidate their relations and make use of telecommunications and computing resources available through RedCLARA, in order to promote the development and progress of scientific work across the region. Nine communities were chosen (the area they belong to and the leading countries are given between brackets):

- Latin American Colaboratory of Experimental Software Engineering Research (Education, Colombia)

- Latin American Network of Nanotechnology and Society (Materials Technology, Costa Rica)
- Microorganisms, Agriculture and Food Network (Food, Peru)
- Integrated Coastal Management of the Southern Cone (Multidisciplinary, Uruguay)
- Map and Programme of digital dance (and performance) arts (Cultural heritage, Brazil)
- Latin American Community of Learning Objects (Education, Ecuador)
- Latin American Community of Digital Libraries and Repositories (TIC Digital Libraries, Colombia)
- Large Aperture Gamma Ray Burst Observatory (Astronomy, Argentina)
- Education and research (Education, Colombia)

The communities selected received support from the ALICE2 project, which was materialised through the hiring by RedCLARA of a coordinator devoted to tasks of motivation, mobilisation and internal coordination between its members, and through the participation of the main organiser and/or the coordinator in at least one annual meeting in a relevant congress of their speciality, in which working in networks is promoted. These communities also had access to the videoconference services of national networks for the development of regular activities, such as workshops, virtual information dates and distance seminars, and access to technical advice from RedCLARA on the use of its services and applications so the goals set by each community could be accomplished.

In May 2011, COMCLARA began implementing its second phase. During the process, 37 proposals from Chile, Colombia, Costa Rica, Ecuador, Guatemala, Mexico, Nicaragua, Panamá, Peru and Uruguay were submitted, representing various areas of research like water, food, biodiversity, biotechnology, social science, natural disasters, education, nanotechnology, cultural heritage, health and information and communications technologies(ICT) and grids. Nine of them were chosen:

- Map and Programme of digital dance (and performance) arts (Cultural heritage, Brazil)
- Initial Teacher Training (Education, Chile)
- International Network for the Recovery of the Immaterial Heritage of Musical Traditions (Cultural heritage, Chile)
- Scientific and High-Performance Computing (ICT-Grids, Colombia)
- Community of Art and Culture in the Network (Cultural heritage, Colombia)
- Latin American Community of Research and Knowledge Creation (Education, Colombia)
- Latin American Community of Digital Libraries and Repositories (TIC Digital libraries, Colombia)
- Latin American Community of Space Data Infrastructure (Natural disasters, Ecuador)
- Flu Programme for Central America and Panamá - FLU—CAP (Health, Guatemala)
- Latin American Open Regional Community for Social and Educational Research (Education, México)

- Image Processing Online Latin America (Health, Uruguay)
- Large Aperture Observatory for Gamma Ray Bursts (Astronomy, Venezuela)
- Latin American Community of Learning Objects (Education, Venezuela)

If we consider the total number of communities in the COMCLARA programme in its two versions, one of the main achievements of these groups was the elaboration and submission of 38 projects in international funding entities, of which 7 were finally granted financial support to ensure their sustainability for at least one more year after the end of ALICE2.

Having said that, as regards network use, it is important to point out that all the communities jointly reached 988 Gb of data transferred, 474 videoconferences conducted, 289 simultaneous connections of videoconference equipment, and the possibility of accessing activities transmitted by advanced networks for 3.036 users.

The groups initially created were consolidated by the end of the process, significantly increasing the number of members in them. For instance, of the 297 initial members, the COMCLARA programme concluded with a total of 746 members. Also, 37 strategies alliances were created, and they will contribute to improving the chances of receiving new resources through collaboration projects, either with entities in Latin America, or other regions across the globe.

As regards the visibility of these communities, their members organised 118 dissemination activities and participated in more than 69 events (congresses, meetings), some of the face-to-face and some others remotely, and in all of them the communities and their representatives had the support of RedCLARA as a sponsoring entity.

The COMCLARA 2010-2011 and 2011-2012 communities participated regularly in monthly and bimonthly meetings through videoconference and also face-to-face, as part of the ALICE2 meetings held in Managua (Nicaragua, 2010), Montevideo (Uruguay, 2011) and Lima (Peru, 2012), thus showing their commitment to the development of collaborative research and the effective use of RedCLARA for this same purpose. Additionally, in 2011 they participated in two face-to-face meetings in Colombia and Mexico that brought together the IADB and ALICE2 communities, creating excellent opportunities for supporting and strengthen the creation of research communities in Latin America and develop personal links and institutional synergies between the members of research communities.

Launched in March 2011, the ReCLARA Portal promoted a suitable collaborative environment for the deployment of the COMCLARA communities' activities, as well as those of the CLARA-TEC Work Groups, and for the creation of new communities that were able to benefit from its services. By the end of 2012, the Portal had a bit more than 1.700 registered users.

Info Days

2010 was an intense year in terms of the promotion of those research activities included in the priorities areas established by the European Commission's Seventh Framework Programme (FP7), where the aim was to encourage the participation of these Latin American research communities in FP7. It is in this context where FP7 Virtual Information Days (InfoDays) are developed: videoconference sessions aimed at giving information about the opportunities for cooperation between Europe and Latin America in science and technology. Four of these days were held in July 2010, and each of them helped clarifying scenarios for the development of future joint projects between institutions in both continents.

With the strong support and important collaboration from the European Commission, particularly of the International Relations Office of the General Research Directorate, the four InfoDays (videoconference version of the traditional information days of the FP7 Programme calls) were held on July 8, 19, 22 and 27. They were intended to cover different specific areas of science and technology, and gave clear indications on what was expected in FP7 in terms of future research and collaboration proposals to be jointly developed by institutions from Latin America and Europe.

The activities developed were regarded a success and served not only to clarify the doubts of researchers about the different FP7 calls, but also to help RedCLARA structure a plan of InfoDays to be developed in the future.

The first InfoDay was held on July 8 through the ISABEL platform, thanks to the organisation of the GLOBAL project and the collaboration of RedCLARA. This InfoDay was focused on e-Infrastructures (related to the FP7's ninth call) and the submission of proposals for possible projects in this field in the specific areas identified for FP7. Thirteen Latin American proposals were submitted that day from: Venezuela (3), Colombia, Peru (2), Ecuador (2), Mexico (3), Costa Rica and Brazil.

Unlike the first day, the three following sessions were structured through the presentation delivered from Brussels by experts on each of the topical areas defined, followed by a discussion with Latin American participants to clarify doubts. These three InfoDays were developed through a videoconference system provided by RedCLARA's member networks RNP (for the link with Brussels for the three sessions), RENATA (for the Latin American connection on July 19) and REUNA (for the Latin American connection on July 22 and 27). The three sessions featured live transmission through Commodity and Advanced (streaming) internet.

As regards participation in each InfoDay, this was very successful. Actually, all the sessions involved a total of 59 points connected through videoconference in Latin America and 734 connections via streaming (live transmission through the internet).

The information days InfoDays 2011 were held on July 20 and 25. The meetings, which featured speakers in Brussels and participants in Argentina, Costa Rica, Chile, Colombia, El Salvador, Ecuador, Guatemala, Mexico, Peru, Uruguay and Venezuela,

were conducted through videoconference thanks to the collaboration of the national networks connected to RedCLARA, especially REUNA (Chile), RENATA (Colombia), RedCONARE (Costa Rica), which contributed with MCU capacities and coordination, and CUDI (Mexico), RAAP (Peru), REUNA (Chile) and RENATA (Colombia), which provided transmission. Thanks to this effort, nearly 250 participants through videoconference plus 130 via streaming constituted the event's audience.

The InfoDays 2012 were carried out on June 16 and 17, and were focused on the various topics addressed by FP7 in its calls. They connected 63 videoconference rooms throughout Latin America, thus showing the strength in terms of content and participation that was generated by these activities, which were definitely drivers of development for the Latin American region.

CLARA-TEC Work Groups

Eleven technical Work Groups (WG) were created at the beginning of ALICE2, as part of RedCLARA's technical forum, CLARA-TEC. Then, in the Project's first half-yearly meeting, held in San José de Costa Rica (August 2010), it was established that they would have a coordinator and sub-coordinator (secretary), and that each WG would have a duration of two years and would feature an online discussion list, a 300 MB wiki, financial support for participation in CLARA-TEC meetings, scholarships for the organisation of some tasks and access to the equipment funded by ALICE2 for these purposes (servers). The WGs for the 2010-2011 period were the following:

IPTV WG

Coordinator: Jaime Martínez – RENATA
Sub-coordinator: Máximo Escobar – REDCYT
Collaboration: RAAP, RAU, CUDI
Outcome: It was decided that the best alternative for this application is to have a distributed, multichannel service (with a timetable for everyone) and the MPEG-4 AVC / H264 format was chosen to work with it. A free software solution will be adopted to ensure service stability and availability and the provision of support.

Videoconference WG

Coordinator: Daniel Díaz – RAAP
Sub-coordinator: Walter Munguía Martínez - RAAP
Collaboration: Open to all
Outcome: the VC SIP/H.323 platform was specified, taking into account the conditions of equipment and the experience of the GLOBAL project.

Eduroam WG

Coordinator: Johnny Laura – RAAP
Sub-coordinator: José Luis Quiroz Arroyo - RAAP
Collaboration: RENATA, CUDI
Outcome: Progress was made in paving the road for the implementation of eduroam across the region and the need to use digital certificates to ensure integration with the service in Europe was highlighted.

Security WG

Coordinator: Liliana Solha - RNP
Sub-coordinator: Claudia Inostroza - CLARA
Collaboration: CUDI, RAAP, RAGIE, REUNA

Outcome: New possibilities open up for monitoring through Darknet and for conducting security audits (backbone infrastructure, corporate servers and systems and project critical servers).

Measurements WG

Coordinator: Daniela Brauner – RNP
Sub-coordinator: Albert Astudillo - REUNA
Collaboration: REUNA, Innova-Red, RAGIE, RAU, CUDI
Outcome: The topics under discussion presented include dissemination in institutions, the use of the backbone by NRENs, problems with permissions, authentication and firewall for access to information on measurements, and the auditing of monitoring points (Security WG). At the same time, in terms of policies and procedures for the use of services, bandwidth consumption and the regularity of measurements were discussed.

Serv-IPv6 WG

Coordinator: Azael Fernández Alcántara – CUDI
Sub-coordinator:
Collaboration: CUDI, RENATA, RENIA, REUNA
Outcome: Organisation of a training session on IPv6 and the proposal for the organisation of a competition for the development of specific applications for this protocol. Also, the WG discussed the need for more local IPv6 Relays within RedCLARA, in each NREN and within the participating institutions, so as not do depend on external equipment.

VoIP WG

Coordinator: Paulo Aguiar – RNP/UFRJ.
Sub-coordinator: Iara Machado - RNP.
Collaboration: REUNA, RAAP
Outcome: It was made evident that it is necessary to elaborate an inclusion strategy between the NRENs in RedCLARA that already support VoIP, and establish a basic platform for interoperation based on their individual experience. Furthermore, there are plans to organise a training session to refresh knowledge to prepare NRENs to implement the service.

Hybrid Networks WG

Coordinator: Hans Reyes - CUDI.
Collaboration: Open to all.
Outcome: It featured discussions on the definition of a hybrid network, with the presentation of practical examples of its use, the reasons for its implementation and the applications to benefit from its adoption. The organisation of training session was proposed.

There were nine WGs for the period extending from August 2011 and February 2013. Their objectives and solid outcomes delivered were presented at ALICE2's second half-yearly meeting, held in Cuenca, Ecuador, in November 2012, and were widely celebrated by the directors of the Project's member NRENs:

SCIFI-WG–Intelligent control system for wireless networks

Objective: Development of an open platform for centralised control of points of access.
Coordinator: Luiz Claudio Schara Magalhães, UFF – Universidade Federal Fluminense (RNP).
Outcome: Application ready to be used by universities.

PIT VOIP-WG – Point of Exchange for Voice Traffic over IP

Objective: To model and implement a point of exchange for voice traffic over IP in RedCLARA, through the interconnection of national networks' telephone networks.
Coordinator: Alex Galhano Robertson (RNP).
Outcomes:

- The PIT VoIP system is installed and working.
- Strong incentive for NRENs to actually create their national services of telephone interconnection.
- Incentive to install VoIP in their offices.
- Dissemination activities.

Measurements WG

Objective: Development of a monitoring infrastructure based on perfSONAR (PERFormance Service Oriented Network monitoring ARchitecture) .
Coordinator: José Augusto Suruagy Monteiro, UFPE - Universidade Federal de Pernambuco (RNP)
Outcomes:

- The pilot is ready in RAAP, RAGIE, RAU, REUNA, RNP and CEDIA (currently trying to engage more people in the use of measurements)
- Participation in the PERT initiative

CSIRT-WG - Computer Security Incident Response Team

Objectives: To implement a monitoring infrastructure with sensors for RedCLARA, which makes it possible to obtain data on malicious activity and thus generate security incident notifications. To promote a responsive and coordinated response to security incidents. To create and disseminate security best practices focused on academic environments.
Coordinator: Liliana Solha, RNP
Outcomes:

- CEDIA is working on the deployment of its CSIRT
- At present the WG is working to motivate other NRENs

MOF-WG - Mobility with OpenFlow

Objective: To promote research and the development of a solution capable of offering mobility to the users of a Wi-Fi network by using technologies such as OpenFlow Wireless and IPv6.
Coordinator: Liane Margarida Rockenbach Tarouco/ Leandro Bertholdo, UFRGS - Universidade Federal do Rio Grande do Sul (RNP)
Outcome: Training on Open flow

DEIM-IPV6-WG

Objectives: The coordination and implementation of activities/projects that enable the design, planning and, finally, the implementation of IPv6 in the network segments of RedCLARA's services and applications and of the NRENs that are part of it.
Coordinator: Azael Fernández Alcántara, UNAM – Universidad Nacional Autónoma de México (CUDI)
Outcome: Currently in a dissemination stage.

MCONF-WG - Multiconference system for web interoperable access and wireless devices

Objective: To make available a user-friendly conference system that can be integrated with mobile devices through the creation of an Android application and the development of an integrated management system on the web.
Coordinator: Valter Roesler, UFRGS - Universidade Federal do Rio Grande do Sul, RNP.
Outcomes:

- The application is ready to be used
- The coordinator proposed the creation of a world collaborative network – the use and collaboration model needs to be defined
- The academic network BELNET (Belgium) adopted MCONF as a service

IPTV-WG

Objective: To implement in NRENs an IPTV transmission platform that makes it possible to offer multichannel IP-TV through RedCLARA with support for multicast and IPv6.
Coordinator: Jaime Leonardo Martínez Rodríguez, UNICAUCA – Universidad del Cauca, RENATA
Outcomes:

- Application ready and tested –dissemination and the creation of a use and collaboration model are needed to create the channel
- A training session for NRENs was conducted – with 103 participants!
- What remains to be done is the transfer towards RedCLARA and the creation of its IPTV channel

Mobility-WG

Objective: To apply mobile technologies and network middleware to provide itinerancy services in secure architectures in RedCLARA.
Coordinator: José Luis Quiroz Arroyo, INICTEL-UNI/RAAP
Outcomes:

- WG continues to coordinate the deployment together with other NRENs
- RNP and RAAP are part of the global eduroam community
- WG is working on the transfer towards RedCLARA of the global service operation.

Sustainability

In the area of sustainability (goal 3), in 2009 RedCLARA began working on the expansion of its membership towards other regional, entrepreneurial and innovation organisations, aiming at accomplishing a better connection with innovation activities and therefore serve as a regional bridge, not only for research and education, but also to incorporate the entrepreneurial sector, without abandoning its mission of constituting an infrastructure for R+D and not a commercial one.

As part of the Conference of the Americas on International Education (CAIE), held in Calgary between October 20 and 23, 2010, the Inter American Organisation for Higher Education (IOHE)

and RedCLARA signed a collaboration agreement that identifies important actions to be jointly undertaken in the field of science, technology and innovation. On October 22, Luis Furlán, President of the RedCLARA Directing Board, and Raúl Arias Lovillo, President of IOHE and Vice-Chancellor of the Universidad Veracruzana, with the participation of Patricia Gudiño, General Secretary of IOHE and Carmen Gloria Labbé, Director of Innovation and Development at RedCLARA, as witnesses, ratified the alliance that both institutions sustain since 2008, by signing an addendum stipulating:

1. *The organisation of spaces to meet and exchange knowledge, which will bring together the following actors and purposes:*
   - *Universities and enterprises in order to find joint areas of work in innovation.*
   - *National bodies in charge of public policies and universities for the analysis of public policies in innovation.*
   - *Universities for the exchange of good practices in the promotion of an enterprising culture.*
   - *Multilateral organisations and universities to identify project lines which promote the strengthening of innovation in Latin America.*
2. *The creation of networks.*
3. *The development of joint projects for the identification of instruments and actions which support the implementation of public policies related to science, technology and innovation.*

The complementarity between RedCLARA and IOHE began to be shown in 2008, through the joint development of the project called Regional Strategy and Interoperability and Management Framework for a Federated Latin American Network of Institutional Repositories of scientific documentation, and through the Addendum signed in 2010, which deepened that complementary collaboration.

Paving the road towards RedCLARA's sustainability, the "Proposal for an Action Plan on the Information and Knowledge Society of Latin America and the Caribbean (eLAC2015)", signed at the Third Ministerial Conference on the Information Society of Latin America and the Caribbean, held in Lima, Peru from November 21 to 23, 2010, highlighted RedCLARA's relevance in its Goal 23:

> *"Goal 23: to connect via broadband all educational centres, increasing the density of computers, as well as the use of converging educational resources. In this context, to promote public policies which support collaborative teaching and research activities through the use of national and regional research and education networks. In particular, to promote the support for the Latin American Cooperation of Advanced Networks (CLARA) and CARIBnet network in the management and implementation of a passive infrastructure, thus strengthening the regional network for science, technology, research and innovation."*

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RedCLARA's position within the eLAC2015 priorities was not only a sign of the necessary political support required for the future sustainability of the regional advanced network infrastructure, but also a promise of scientific and academic development and progress across the continent.

2011 is certainly remembered as the year in which the three projects benefited by @LIS2 –led by ECLA, REGULATEL and RedCLARA- joined efforts to expand the visibility of the programme that has made their development possible. Because the message was clear at the meeting organised by the European Commission on March 18 and 19 to analyse the @ LIS2 components (Political dialogues, regulatory dialogues and ALICE2): a strong joint articulation was required and it was intended to implement a third phase for the Programme.

Thus, work began in March 2011, with the articulation of a visibility plan for @LIS2, aimed at increasing its own dissemination and that of the three projects it sustains as a whole, no longer individually; the plan was approved three months later. That articulation of future actions resulted in the creation of the @LIS website (task done by RedCLARA) that was published on the URL http://www.alis2.eu/, the elaboration of a brochure (done by ECLA), the organisation of a showcasing event and the participation in different scientific, legislative, parliamentary and ministerial actions, activities and meetings; an example of the first type of activities is RedCLARA's participation in the meeting of the ALFA communities (June 5-7, 2011, Brussels), which requested access to the RedCLARA Portal's services, launched in March the same year.

On June 9, 2011, ALICE2, ECLA and REGULATEL got together with DG Relex, DG Research, DG Infso and EuropeAid in Brussels, in order to plan a visibility action for @LIS2, to be held in Brussels in November 2011, and to define the participation in several high-level meetings, including ALInvest, which was held in Cartagena de Indias between July 20 and 22. This visibility action was organised as part of the "New Dynamics of Latin America" summit, which featured the participation of the main representatives of the projects jointly funded by the European Commission's @LIS2 programme of EuropeAid: Alicia Bárcena, Executive Secretary of the Economic Commission for Latin America (ECLA – Inclusive Political Dialogue and Exchange of Experiences project), David Pérez Taveras, President of the Latin American Forum of Telecommunications Regulatory Entities (REGULATEL – "Regulatory Dialogues" project) and Florencio Utreras, Executive Director of the Latin American Cooperation of Advanced Networks (RedCLARA – ALICE2 project). The speakers included Rudolf Strohmeier, adjunct general director of the European Commission's Department of Research and Innovation, Philipp Murmann, member of the Education, Research and Technological Assessment of the German Parliament and Arancha Díaz-Lladó, director of public relations of Telefónica Latin America.

Aiming at the future sustainability and strengthening of cooperation links, during October and November 2011 DANTE (Europe), GARR (Italy), RNP (Brazil), RENATA (Colombia) and TERENA (Europe) jointly prepared and submitted the ELCIRA (Europe Latin America collaborative e-Infrastructure for Research

Activities) project to the European Commission's Seventh Framework Programme (FP7). The proposal aimed at coordinating and expanding the development and use of a series of collaborative tools and services that were being developed by the institutions mentioned above. Once the proposal was approved, in July 2012, ELCIRA had its launch meeting as part of the TICAL Conference 2012.

The alliance established in 2012 between the Confederation of Open Access Repositories (COAR) and LA Referencia (Federated Network of Institutional Repositories of Scientific Publications) is another action that showed how we are working for the future of RedCLARA and of the Latin American scientific production. It was led by RedCLARA and funded by the Inter-American Development Bank's (IADB) Regional Public Assets Fund- and featured the participation of Argentina, Brazil, Chile, Colombia, Ecuador, México, Peru and Venezuela to share and give visibility to the scientific production generated in higher education and scientific research institutions.

2012 was a powerful year for RedCLARA's future as an institution. In fact, during that year the implementation of a new membership model was analysed and work was done on the strategic plan that will rule the corporation's actions over the 2013-2018 period.

It is important to point out that, in parallel to the activities mentioned, RedCLARA had regular meetings with ECLA and REGULATEL with the aim of promoting the development of a new optical fibre infrastructure in Latin America. This is complemented by RedCLARA's participation in the ELLA project, which focused on the development of a feasibility study to implement a new submarine cable between Europe and Latin America.

TICAL

As part of the innovation plan developed by RedCLARA, and with the aim of getting universities to exchange good practices and jointly face the challenges of information society, RedCLARA founded in 2011 the Latin American Network of Information Technologies Directors, whose first meeting was held in Santiago de Chile, on January 18 and 19, with the participation of representatives from nine member universities of some of the academic networks connected to RedCLARA; they became the cluster that expanded the project across the region.

TICAL, constituted as an innovation community, aims to create a space for collaboration between users, and between users and enterprises, which makes it possible to exchange good practices and knowledge on the use of ICT in the university sector. The idea is to address those topics of major importance for group members, enabling them to share experiences, applications, methodologies, infrastructure, etc, thus facilitating the promotion of proper use of ICT in the region's universities.

The preparatory meeting in Santiago, where the organisation of the first TICAL conference was defined, featured the participation of the following directors of technology from Latin American universities: Rodrigo Padilla (Universidad de Cuenca, Ecuador),

Carlos García (Universidad de Cuyo, Argentina), Ronald Vargas (Universidad Nacional de Costa Rica), Juan Carlos Gallardo (Universidad de Los Lagos, Chile), Héctor Restrepo (Universidad de Antioquia, Colombia), Jorge Portillo (Universidad Tecnológica, El Salvador). These directors were accompanied by Sandra Jaque, Technical Manager of Chile's National University Network, REUNA; Florencio Utreras, Executive Director of RedCLARA and Carmen Gloria Labbé, Director of Innovation and Development of RedCLARA.

The TICAL 2011 Conference was held at the City of Knowledge in Panama City, on June 20 and 21, and was supported by REDCYT, IADB –through the Project called "Strengthening of Regional Advanced Academic Networks through CLARA as a Regional Public Asset", the European Commission in the context of the ALICE2 project, Internet Society and PADTEC.

TICAL 2011 greatly exceeded the expectations created at the initial meeting in Santiago, and featured the participation of a hundred delegates from all over Latin America, who could share and be enriched by the experiences, discussions and projections on the challenges currently faced by universities, which is under stress due to the changes affecting society. Undoubtedly, as a result of this initiative –the first of its kind at a regional level- a collaboration scenario opened up, and this was confirmed a year later with the success of TICAL 2012, held in Lima (Peru) on July 2 and 3, where the number of participants of 2011 was doubled.

Inclusion

In ALICE2's goal 4 (inclusion), 2009 started with the incorporation of Costa Rica to ALICE2 and RedCLARA; and the Project's first half-yearly meeting was held precisely in that country's capital, San José, and it is important to point out that it featured the participation of the representative of the Caribbean's network, C@ribnet (led and managed by CKLN), Carlton Samuels, which originated a very positive step of rapprochement, collaboration and inclusion. During the same year, Bolivia signed its incorporation into ALICE2, and its connection to RedCLARA was left pending and depended on the result of the Negotiated Process that was being conducted to obtain its physical connection to the network. The second meeting of the ALICE2 members was held in Asunción, Paraguay, which meant a very important motivation for the creation of the national Paraguayan network and its future incorporation into ALICE2.

It is important to mention that in April 2009, the process aiming at Honduras's reincorporation was resumed. In fact, three of the leaders of Latin American NRENs belonging to RedCLARA who were going to participate in a seminar with Honduran universities with the intention of establishing a national network - Carlos Casasús (CUDI), Luis Burlan (RAGIE) and Rafael Ibarra (RAICES)- had a meeting with Honduras's minister of science and technology, Myriam Mejía, and informed her about the advantages of advanced networks, the benefits of organising an NREN and the perspectives of joining RedCLARA. "The minister of technology was

enthusiast and acknowledged that it is important for Honduras not to remain behind in terms of advanced networks", told Ibarra after the meeting.

In April 2010, shortly after the Project's launch (see chapter 2, First steps), the ALICE2 and CLARA-TEC half-yearly meetings were held in Santa Cruz de la Sierra, Bolivia, with the aim of accomplishing ADSIB's incorporation into RedCLARA through the creation, implementation and connection of its NREN. Apart from the leaders of the Latin American NRENs that are members of ALICE2, the Project's meeting featured the participation of the Project's European members from Spain, Portugal and DANTE, the Executive Director of CKLN (the Caribbean), Ken Sylvester, and the director of the Mercosur Digital initiative, Marta Pessoa (Brazil).

On Thursday May 13, 2010, the institutional representatives from the Latin American and European academic networks that make up the ALICE2 project's membership gathered for the first time in Madrid (Spain) since the beginning of ALICE2. The host was RedIRIS, led by Tomás de Miguel Moro, Director, and Alberto Pérez Gómez, Deputy Director, and the representatives from Latin American National Research and Education Networks (NREN) were joined by the leaders of the European networks associated to ALICE2: Dany Vandromme, Director of Renater (France), Fernando Liello, representative of GARR (Italy), Pedro Veiga, Director of FCCN (Portugal), Cathrin Stöver, International Relations Manager at DANTE, and Tom Fryer, Relations International officer at DANTE. They were also joined by TERENA's representative, John Dyer, business and technology strategist. This effort took place as part of the ALICE2 Launch (see number 2, First steps).

From May 19 to 21, 2010, RedCLARA's Communications and Public Relations Manager, and the Executive Director of Innova|Red (Argentina) participated in the Workshop on how to Build a Network Infrastructure for Research and Development, organised in Durban, South Africa, by the UbuntuNet Alliance, in collaboration with DANTE and the EC's e-Infrastructure unit, as part of the IST-Africa Conference. This was the third of a series of NREN Workshops organised as part of IST-Africa, and the first that featured RedCLARA's participation, thus marking the strengthening of the South-South collaboration of work in research and education networks. The UbuntuNet Alliance and its Community of NRENs saw a great potential in the collaboration with RedCLARA and its NRENs. In the words of Margaret Ngwira from the UbuntuNet Alliance, "the South-South collaboration between RedCLARA and the UbuntuNet Alliance is critical, since the two regions have a lot to share and learn from each other and, undoubtedly, they have a bright future which the interconnected network can only make even brighter".

On July 30, 2011, Paraguay's national education and research network, Arandu, began to operate in experimental mode. This was its first implementation phase, done thanks to the leadership of the Paraguayan Council for Science and Technology, the support of the Mercosur Digital project and the agreement signed between Arandu, the Paraguayan Communications Company (COPACO), the Brazilian

academic network –RNP, and RedCLARA. The agreement stipulated that RNP and RedCLARA would provide the necessary equipment for the installation of a DWDM network with a maximum capacity of up to 10 Gbps for the Asunción-Ciudad del Este segment, and COPACO would make available its optical fibre for the connection to RedCLARA. Once the first implementation phase was completed, Arandu used COPACO's IP network with 1 mbps available to get connected to RedCLARA. This opened up the road to Paraguay's future connection to RedCLARA.

On September 29, 2010, as part of ALICE2's second half-yearly meeting, the members of RedCLARA's Directing Board, accompanied by the Executive Director, Florencio Utreras, visited the Vice President of Nicaragua, Jaime Morales Carazo, with the aim of promoting the incorporation of this country into advanced networks. The Nicaraguan Government officials accompanying the Vice President were Eduardo Bolaños, General Director of the Vice-Presidency of the Republic, and Guadalupe Martínez, Executive Secretary of the Nicaraguan Council of Science and Technology (CONICYT), which is chaired by Mr. Morales Carazo. During the meeting, the members of RedCLARA explained how they put forward strategic projects aimed at multiplying the possibilities of progress for Latin American science and academia, as well as enabling collaboration through advanced telecommunications networks for research.

The Nicaraguan Vice President emphasised that the advanced network is the infrastructure for scientific collaboration that makes it possible to undertake global challenges. "At the same time, it is the test field of what the internet of the future will be like. These networks are crucial for the globalisation of Research and Development (R+D). Given the relative position for Latin America and the reduced critical mass of researchers, the coordinated actions of these networks are even more necessary, since they are natural mechanism for effectiveness. The region has an infrastructure for this purpose, RedCLARA", he pointed out.

In 2011, a strong movement –involving the government and featuring the participation of higher education institutions- was originated in Honduras for the establishment of the first national academic network, which was strengthened by the organisation of ALICE2's first half-yearly meeting at the Universidad José Cecilio del Valle in Tegucigalpa. The action's leader was the Sub Director of Science and Research of the Competitiveness and Innovation Directorate, belonging to the Technical Secretariat for Planning and External Cooperation, SEPLAN, Ivette Castillo de Colindres, who stated after the visit to Honduras by the ALICE2 members that: "we have created the CONSORTIUM of Universities, where all the universities in the country (20 in total) participate. Together with SEPLAN, they aim to boost the creation and training, as well as the use and development of scientific and technological tools. As part of the objectives established, the importance of the incorporation into RedCLARA is evident, connecting more than 1.000 universities across the region to other supra-national networks, and to top-level scientific information. It will enable an extended cooperation for the promotion

of scientific and technological development at a national and international level, so that universities and research centres in the country establish links with the scientific community and develop R+D+I processes, improving the quality and contents of the higher education sector".

As regards collaboration with emerging regional networks in the Caribbean and Sub-Saharan Africa, 2011 featured a very close relation with C@ribnet and UbuntuNet Alliance. The latter was definitely incorporated to the communications and public relations group (see 9. Visibility) and with the second one collaboration was furthered for community development. In fact, Luis Núñez, Academic Relations Manager, participated –as part of the CHAIN project's meeting- in the UbuntuNet Alliance meeting in Nairobi, Kenya, between November 23 and 25, in order to introduce the strategy followed by RedCLARA for community creation in Latin America to a hundred Directors of Technology from African academic institutions.

It is necessary to point out that by the end of 2011, C@ribnet's interconnection with RedCLARA was already envisioned. It was finally accomplished in May 2012 and it gave a new value to the collaboration between both networks.

The 2012 ALICE2 half-yearly meetings, held in July in Lima (Peru) and in Cuenca (Ecuador) in November, featured the participation of representatives from C@ribnet, which shows a well-established, prosperous and promising collaboration. With UbuntuNet Alliance collaboration continued to grow and the participation of its Executive Director in the Project's meeting in Lima was a proof of this.

As regards the incorporation of new countries to RedCLARA, the technical contributions provided by Nicaragua and Bolivia were very strong, and they expect to accomplish the connection of their NRENs to the network.

ALICE2 did not accomplish the connection of Honduras, Nicaragua, Bolivia, Paraguay and Cuba. However, the progress shown in favour of the future connection of the first four countries in actually concrete and they hold out the prospect of a favourable future for the region. It only remains to continue building that road to get to the end of it.

Training

In its four years of life, ALICE2 enabled the training of 973 people (members and partners of the NRENs which are part of the project in Latin America) in technical and management aspects, thus strongly contributing to the creation of capacities in the region.

2009 was a hectic year in terms of knowledge management in RedCLARA. Always within the context of the ALICE2 project, sometimes in combination with other research and development initiatives led by RedCLARA, the training activities dealt with both the purely technical area as well as the management side. Eight training sessions and 202 participants in three countries showed this. Below is a brief summary of the 2009 training activities:

- Advanced Network Seminar, CONARE (National Council of University Vice-Chancellors), San José de Costa Rica, May 27th, 2009.
- Network Security Overview: A practical view of defense in-depth and wireless security, CONARE, San José de Costa Rica, August 12th to 14th, 2009.
- Analysis and identification of good practices in the creation of organisational structures for human resources management, CONARE, San José de Costa Rica, August 11th, 2009.
- Inter-university Networks Workshop, Universidad Mayor de San Andrés (UMSA), La Paz, Bolivia, November 2nd to 4th, 2009.
- Workshop on Implementation of Services with IPv6, National Computing Centre of the Universidad Nacional de Asunción, Paraguay, November 18th to 20th, 2009.
- Marketing Behavioural Workshop, National Computing Centre of the Universidad Nacional de Asunción, Paraguay, November 6th to 17th, 2009.
- e-Science Workshop, National Computing Centre of the Universidad Nacional de Asunción, Paraguay, November 18th, 2009.
- Technical Updating Seminar, National Computing Centre of the Universidad Nacional de Asunción, Paraguay, November 16th, 2009.

Nine training activities and 250 participants were accomplished by RedCLARA in 2010. All the courses and workshops were evaluated as good and excellent.

- Isabel videoconference Platform and VCC (Virtual Conference Centre), INEGAS at the Universidad Autónoma Gabriel René Moreno, Santa Cruz de la Sierra, Bolivia, April 14th, 2010.
- perfSONAR tools to support videoconferences, Universidad Autónoma Gabriel René Moreno, Santa Cruz de la Sierra, Bolivia.
- Workshop for the Exchange of Good Practices in the elaboration of a Marketing Plan de, online, June 30th, 2010.
- Distance course on Videoconference Management, November 2010 to May 2011.
- Deployment of the 6 version of the Internet Protocol, IPv6, Universidad Centroamericana José Simeón Cañas (UCA), San Salvador, El Salvador, 2010.
- Technical Training on VoIP, Universidad Nacional Autónoma de Nicaragua (UNAN), Managua, Nicaragua, from September 29th to October 1st, 2010.
- Technological Updating Workshop, Universidad Nacional Autónoma de Nicaragua (UNAN), Managua, Nicaragua, September 28th, 2010.
- Project Management, Universidad Nacional Autónoma de Nicaragua (UNAN), Managua, Nicaragua, September 27th and 28th, 2010.
- Best Practices in Videoconference Planning and Management, Universidad Nacional Autónoma de Nicaragua (UNAN), Managua, Nicaragua, September 29th, 2010.

Nine training activities, including courses, seminars and workshops took place in 2011, distributed in four countries and online sessions, reaching a total of 319 students:

- Mechanisms for transition to IPv6, Universidad José Cecilio del Valle en Tegucigalpa, Honduras, June 20th to 22nd, 2011.
- Campus Networks Design, Universidad Panamericana, Guatemala, August 29th to September 2nd, 2011.
- International Seminar on Advanced Networks Applications, Guatemala, August 30th, 2011.
- Distance course on Project Formulation and Management for the Seventh Programme for Managers from NRENs, October 11th to December 3rd, 2011.
- Distance course on eduroam, October 24th to November 15th, 2011.
- Technical Updating Workshop, Hotel Four Points in Montevideo, Uruguay, November 8th, 2011.
- Digital Identity Management, Hotel Four Points in Montevideo, Uruguay, November 9th to 11th, 2011.
- Distance course on Network Management, November 28th to December 28th, 2011.
- Network Monitoring and Management course, Universidad Nacional Autónoma de Nicaragua in Managua (UNAN), Managua, Nicaragua, December, 2011

And the Project's final year was closed with a grand finale, with seven training activities, two of them conducted over the moodle e-Education platform and five of them face-to-face (in Peru and Ecuador), covering a total of 202 participants:

- Distance course on VoIP, online, May to June, 2012.
- Network Management, Universidad de Cuenca, Ecuador, June 18th to 20th, 2012.
- Distance course on Streaming-IPTV, online, June to July, 2012.
- Security incidents: A practical view, Lima, Peru, July 4th to 6th, 2012.
- Sustainability and Consolidation Workshop for community leaders, Lima, Peru, July 3rd and 4th, 2012.
- Technical Updating Workshop (as part of TICAL 2012), Lima, Peru, July 2nd and 3rd, 2012.
- Networks Based on OpenFlow Software: Universidad de Cuenca, Ecuador, November 14th to 16th, 2012.

The last courses were evaluated as excellent and good.

Visibility

In terms of visibility, what was done at the end of 2008 was complemented by the beginning of the process of extended dissemination of ALICE2, through the publication of the already traditional DeCLARA bulletin (with four annual issues, which

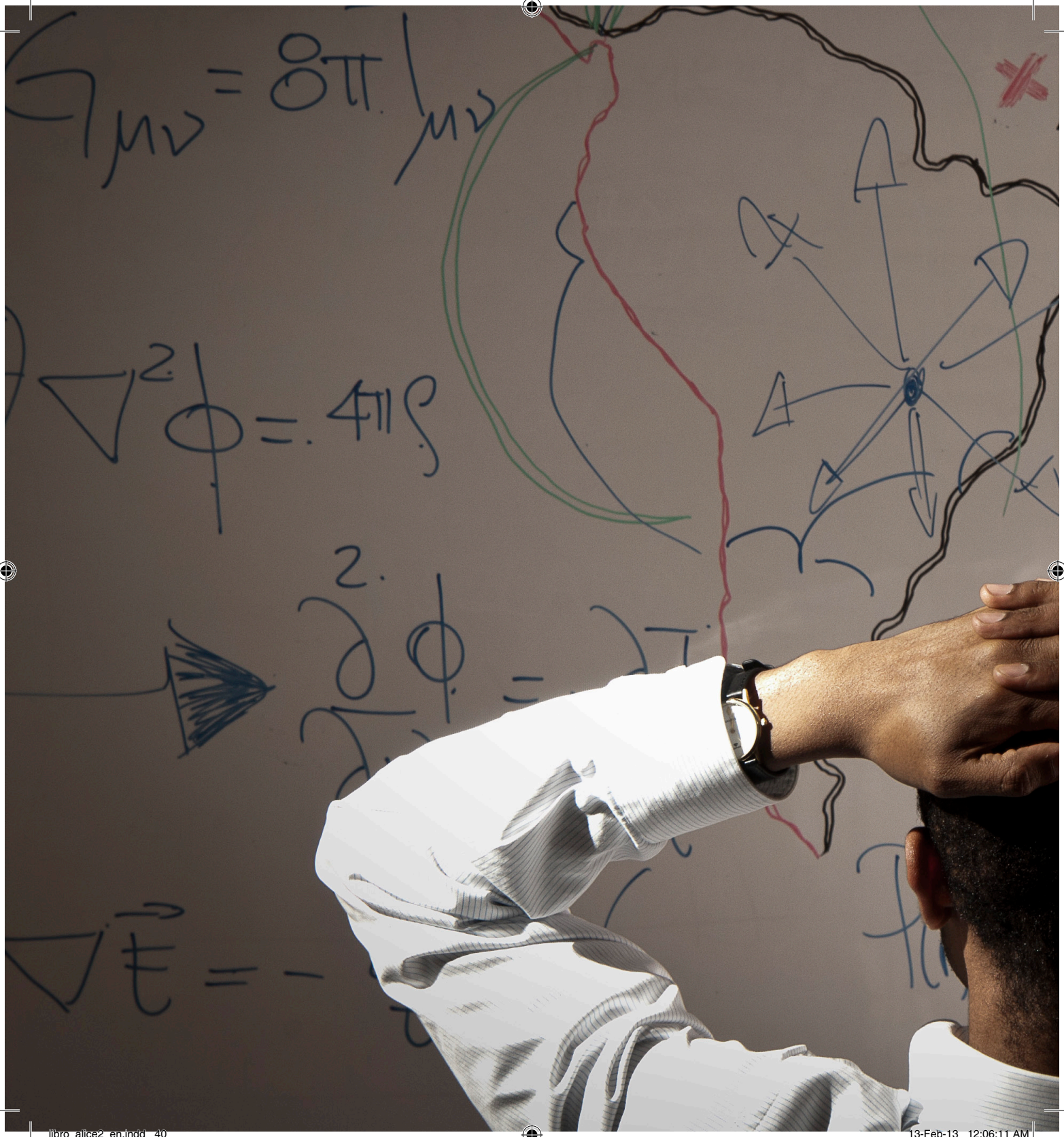
were sustained until the Project's completion) and the reappearance of the biweekly newsletter DeCLARA Express, which also circulated in the distribution list reaching nearly two thousand people. But beyond the number of issues of DeCLARA bulletins (16), DeCLARA Express (94), DeCLARA up to Date (31), case studies (9), brochures (6) and maps (3) produced over the Project's implementation, even beyond the three editions of the Compendium of Latin American networks and the hundred presentations about it that were given at nearly fifty international events, in the four years of ALICE2, the team in charge of Visibility worked on the creation of a work group under the name of LA NREN PR Network (Public Relations Network of the Latin American NRENs), which became a powerful human network that strongly boosted collaboration and the dissemination of the activities organised by ALICE2, RedCLARA and each of the member NRENs.

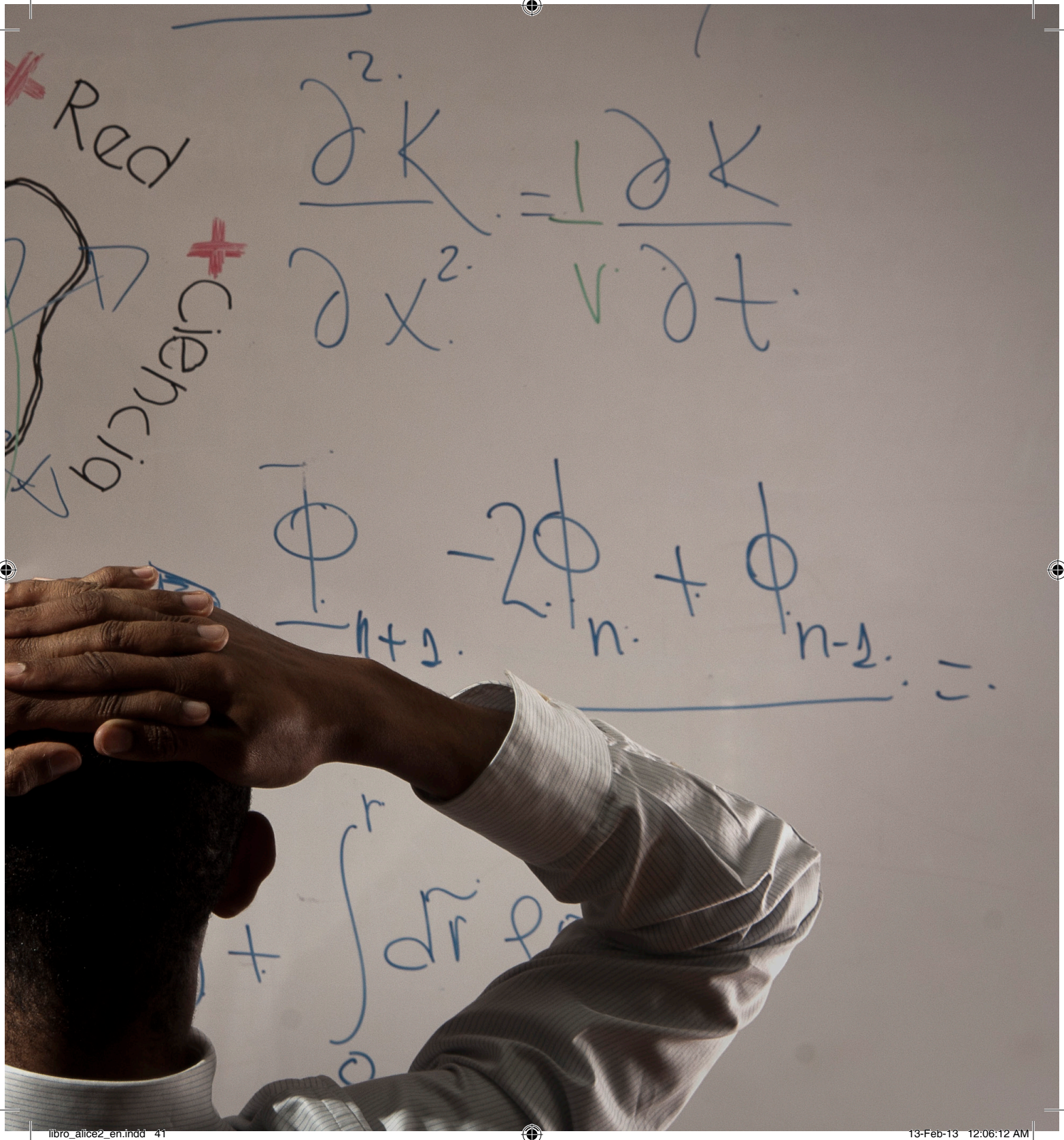
Over its three years of life, this human network was constituted by the representatives from the Latin American NRENs CUDI, RAU, RENATA, RAICES, RAGIE, InnovaRed, CEDIA, RAAP, REUNA, RNP, the European NREN RedIRIS and the regional networks from the Caribbean, C@ribnet, Europe, GÉANT, and, of course, RedCLARA.

The first virtual meeting of this network was held on March 30th, 2010, with the aim of joining efforts in the dissemination of the initiatives implemented by the NRENs and RedCLARA. Following that first meeting, three more virtual meetings and two face-to-face meetings were held, one in Managua, Nicaragua, on September 27th and 28th, with the participation of Paul Maurice, from the Pan-European network GÉANT, and Cristina Lorenzo Fernández, from the Spanish RedIRIS; and the second one in Montevideo, Uruguay, on November 7th and 8th, 2011, where the participation of RedIRIS and GÉANT representatives was complemented by the presence and collaboration of the C@ribnet representative. In this last meeting, the organisation of a Global Virtual Day was defined. The event was held on March 22nd, 2012 via videoconference, with the participation of experts in Mexico, Chile and Spain, who addressed topics related to the Mayan apocalypse, the hazard scenarios for big earthquakes and tsunamis in Chile, Japan and Mexico, the case of El Hierro in the formation of a submarine volcano and the work done in Jamaica for the disaster preparation and emergency management. The event was followed from eleven Latin American countries and Spain through advanced networks and with live and direct transmission through commercial internet.

As regards the Latin American group's relation with its European peer, TERENA's TF-CPR, it is necessary to point out that in 2011 and 2012 RedCLARA was invited to present its advances in terms of communications and public relations and it started working on the search of synergies that boost the collaboration in this area of the networks in both continents. RedCLARA's active collaboration in the Global Communications and Public Relations Network led by DANTE since May 2012 is nested along the same lines.

The activities of this group were conducted regularly through the mailing list LA_prnetwork@listas.redclara.net –which served to exchange information and request dissemination that was always effective- and through the virtual meetings held via videoconference. Upon ALICE2's completion, the group undertook to perpetuate its work over time.




Red
Ciencia

Chapter 2
The voice of researchers

Lina Barrientos Pacheco
Universidad de La Serena (REUNA)
Achalai Community

How do you use the connection to RedCLARA's advanced network?

In the first stage it was used basically in videoconferences, streaming transmission and use of the portal to:

a) Transmit of 4 Classes-Conferences for the communities of Academic Institutions related to our research subject, namely music and musical instruments or pre-Hispanic sound objects.

b) Use of VC for 19 coordination and study meetings between community members.

c) Archive documentation and reports resulting from the work meetings and publish scientific articles and others produces by community members, in Achalai/COMCLARA's wiki.

d) As indicated in Achalai's programme, the plan for 2013 is to archive the reconstituted sounds and produce and transmit virtual concerts in real time with performers in different parts, something for which RedCLARA's advanced network connections will be very useful.

What has been the contribution of this connection to your work?

So far only occasionally as support, since not all

community members have easy access; several key members in the study of instruments do not belong to an institution that is part of RedCLARA.

We have contact through email on a daily basis, and we also use Skype occasionally.

Could or can your initiative operate –and be effective- through commercial Internet?
To operate through commercial internet would be worse and almost impossible, due to the costs this would imply and because it goes beyond academic borders.

The use of internet through RedCLARA opens up a space and an international academic network and we make ourselves known in the international academic arena.

How important is RedCLARA for the development of Achalai's research and academic activities?
I think it is a good example of academic work, but I think we haven't yet been able or dared to take advantage of it.

Our plan is to be able to deliver an inter-institutional virtual class on Latin American ethno-musicology.

What should be the role of advanced networks over the next few years in relation to science and the academia?
To continue encouraging the existing communities and the creation of new ones, which can also interact between themselves, so that the various member institutions of the network believe in these actions, invest on equipment and renew them permanently, establishing suitable spaces for transmissions and connections.

This modality can enhance academic work in the field of scientific research and artistic creation, as regards their production, as well as in the dissemination of their results and creations through teaching and outreach activities across the globe.

J. Vladimir Burgos Aguilar,

Open Content Coordinator (CKO)

Centre for Innovation in Technology and Education – Innov@TE (CUDI)

Coordinator of the CLARISE Community

¿De qué modo emplea la conexión a la red avanzada dHow do you use the connection to RedCLARA's advanced network?

At the moment we use it for videoconferencing and for video transmission through internet in massive groups of users. We are working on and asking for advice in order to connect to advanced networks applications with greater data processing, such as institutional repositories, remote and distance laboratories.

What has been the contribution of this connection to your work?

Access to experts and specialists in different countries, the submission of international projects and scientific and academic collaboration between national networks.

Could or can your initiative operate –and be effective- through commercial internet?

No, it couldn't, this is why we are doing research to connect other applications that are different from videoconference.

How important is RedCLARA for the development of the research and academic activities of the project in which you participate?

It is highly important, since through RedCLARA we have the possibility of creating and strengthening academic and research networks through national networks; proposing and implementing projects with an international impact and contribute to the efforts for the development of a Latin America

that is interconnected for the strengthening of the collaboration and teamwork culture.

What should be the role of advanced networks over the next few years in relation to science and the academia?

Support the development of international, national and institutional policies in favour of internet use as a "human right" for the development of societies in general; every human being must have the chance to have access to internet and to be trained to make the most of its potentialities. Beyond the metal (hardware) and systems (software) "education" must be regarded as a vital, though not sufficient, condition for the development of personal and social progress, but with the potentiality of promoting regional wellbeing and development.

We must work not only on bridging the "Digital Divide", but also on bridging the "Educational Divide" and the "access to digital knowledge divide". For a society based on knowledge it is fundamental to guarantee that every person has the same opportunities of access to technology and knowledge in order to develop the necessary skills which allow him/her to get along in his/her environment, because people who do not have these opportunities will be destined to live precariously and societies will be deprived of their contributions.

Brenda Lara Subiabre

Universidad de Los Lagos (REUNA)
Initial Teacher Training Community – ICT in ITT

How do you use the connection to RedCLARA's advanced network?
Mainly to organise videoconferences between network members. The videoconferences we have feature the participation of several countries, and comprise meetings, presentations, forums, among others. Furthermore, it has allowed us to share videos, which we cannot host in other spaces.

What has been the contribution of this connection to your work?
It has been enormously valuable, since it enabled us to constitute ourselves as a community. When resources are limited, we can still get together and work through videoconferences. This type of systems and the capacity of RedCLARA's technological networks help us avoid hampering the development of knowledge in our fields. Additionally, students from participating universities have also had the chance to experience what can be done through this type of connections, and see how space barriers can be overcome to develop joint initiatives.

Could or can you initiative operate –and be effective- through commercial internet?
It is very hard to develop it through commercial internet, since it requires a large transmission capacity.

How important is RedCLARA for the development of the research and academic activities of the project in which you participate?

RedCLARA has been a great contribution to our network, since through COMCLARA we have attained many accomplishments and have also made ourselves known, established strategic alliances with other networks and disseminated our proposal. Today we still have its support and we are working to be a sustainable community.

What should be the role of advanced networks over the next few years in relation to science and the academia?

To continue providing technological support to sustain the development of research, something that will enable us to move forward in the democratisation of knowledge and in the strengthening of academic relations, both in the Latin American region and in the rest of the world. Today more than ever higher education institutions must be connected and develop joint initiatives which enable them to tune up their offer and move forward in the production and development of knowledge in a more globalised way.

Xavier Ochoa

Director of the Research Programme on Teaching and Learning Technologies, Escuela Superior Politécnica del Litoral (CEDIA)

LACLO Community

How do you use the connection to RedCLARA's advanced network?

The LACLO community makes constant use of the connection provided by RedCLARA to organise virtual meetings between its members. Usually these meetings feature the participation of more than ten researchers, which is why it would be difficult to organise them if our universities were not linked through the academic network. Our LACLO projects, like a repository with class recordings, also require a high bandwidth for the synchronisation of the repositories from the different universities.

What has been the contribution of this connection to your work?

Connection has enabled us to develop a critical mass of researchers, even if for economic reasons we cannot physically meet at a place. Having the connection through RedCLARA allowed us to work on project proposals remotely, with the participation of countries ranging from Mexico to Argentina and Chile.

Could or can your initiative operate –and be effective- through commercial internet?

When we have tried to organise meetings through commercial internet (for example, when one of the participants is at home or outside the university), we have always had connection problems which severely affect this person's participation and the flow of conversation. Certain projects, like the one already mentioned class recordings repository, would not be possible if we didn't have an inter-university connection.

How important is RedCLARA for the development of the research and academic activities of the project in which you participate?

RedCLARA is a facilitator in the research process. It helps us incorporate new members regardless of their geographical location; it gives us the support we need when putting forwards projects which require high interconnectivity between universities and it provides us with a forum where we can disseminate the results of such projects.

What should be the role of advanced networks over the next few years in relation to science and the academia?

I think advanced networks must innovate in the services they deliver to research groups and to universities, starting with the simplest ones (desktop videoconference, intranet for research groups) and continuing with the most complex but useful ones, like the creation of an e-Infrastructure (we could also call it an academic cloud) which merges the services traditionally provided by grid computing together with the new services derived from cloud computing. These infrastructures would enable research groups to have the necessary computing and communications resources, without the need to understand or invest on these resources.

Chapter 3
The voice of CLARA-TEC´s Work Group leaders

Azael Fernández Alcántara

UNAM – Universidad Nacional Autónoma de México (CUDI)
Coordinator of the IPv6 Deployment and Implementation Group – WG – DEIM-IPv6

What do you think has been your Work Group's major contribution to the concert of Latin American academic networks and to RedCLARA?
Our contribution has been that of a very active "musician" aiming at keeping the region and the NRENs up to date on the evolution and advances or improvements with IPv6, through talks, workshops and good practice documents and reports, which have supported the deployment of IPv6 in the best way, taking into account aspects such as security; all of this thanks to the collaborative and inclusive work of some of the group's members.

As I have said before: to serve as a point for reference and consultation, especially on everything related to IPv6 and, at the same time, as a link with other similar work groups existing in related national organisations.

Likewise, one of the group's objectives is to prepare RedCLARA to run applications which benefit from the new IPv6 features.

To date, thanks to the effort of many people, almost all the academic networks connected to RedCLARA, or that were connected at some point, have IPv6 support.

The IPv6 work group has worked in three different stages under three names: IPv6-WG -> WG-Serv-IPv6 -> WG-DEIM-IPv6 (IPv6 Deployment and Implementation Group), and currently has 38 members.

What do you think has been RedCLARA's contribution to Latin America?
There have been many and very significant contributions, but the inclusion of countries and the consolidation of work groups and communities in the academic and research fields have undoubtedly represented a landmark in the development of the internet and of personal relations in our region.

What is the key important aspect of CLARA-TEC for you and your network?
To be the meeting point for the technical community to be up to date on current issues; the training added to the feedback received and transmitted by myself within my country's NREN, CUDI, and within my own university, the UNAM.

How important is for your Work Group the collaboration established within CLARA-TEC and through it with national and regional networks?
It has been essential to disseminate what's been done mainly by the more active members in the group.

Having the chance to personally meet present or future collaborators has been very useful to work together in a better way.

If RedCLARA did not exist, what do you think the technical development scenario in the region would be like?
Undoubtedly it would be completely different and we would be far from able to share knowledge between countries and educational centres in an economic, efficient and open way.

From your point of view, what should be the role of RedCLARA over the next five years?
It should continue providing support, as much as possible, and also aim at the consolidation and evolution of work groups and communities.

It should ensure the continuity of the links and other network infrastructure, so that current and future applications and services can in turn benefit from the capabilities that RedCLARA can and could provide.

It will always be necessary to have an "orchestrator" to keep the rhythm and the active and vital participation of the Latin American community going.

The only thing left to be said is that I deeply thank the strong support received from the RedCLARA staff and from every member of the IPv6 group and I'd just like to add that you will always have me as a friend and collaborator in any required task.

Alex Galhano Robertson

WG-PIT VOIP | Point of Exchange of Voice Traffic over IP
RNP

What do you think has been your Work Group's major contribution to the community of Latin American academic networks and to RedCLARA?
I would say there are three good contributions:

1- The dissemination of technical contents about VoIP for Latin American countries.

2- The encouragement of VoIP technology can help NRENs to deploy national IP telephone networks for the universities in their countries.

3- The inclusion between different teams in different countries around a goal that benefits their countries and their researchers.

What do you think has been RedCLARA's contribution to Latin America?
The responsibility undertaken, the coordination of these work groups, giving them the opportunity to improve collaboration for teaching and research in Latin America.

What is the key important aspect of CLARA-TEC for you and your network?
To me, the opportunity to work together with technicians from other countries, having the chance to learn about other cultures and about the reality of other national networks and, above all, being able to help them. I feel useful because of the work we have done: with the VoIP course, with the meetings and for making the interest in IP telephony grow.

How important is for your Work Group the collaboration established within CLARA-TEC and through it with national and regional networks?
Apart from the VoIP technology and its benefits (or

any other technology under research), I think it is very important that CLARA-TEC has promoted the inclusion of countries. Collaboration itself is a great benefit for everyone!

If RedCLARA did not exist, what do you think the technical development scenario in the region would be like?
I think it would be stranded, with few significant technical advances. Maybe, a few national networks would still exist.

From your point of view, what should be the role of RedCLARA over the next five years?
The same it has now! I think RedCLARA must continue doing its excellent work. It must be the reference for networks and services for Latin American NRENs.

Jaime Leonardo Martínez Rodríguez

Unicauca – Universidad del Cauca (RENATA)
Coordinator of the IP Television Work Group - WG-IPTV

What do you think has been your Work Group's major contribution to the community of Latin American academic networks and to RedCLARA?
The work group for IPTV streaming technologies contributed to the development of a content distribution platform that enables RedCLARA's member institutions to have a tool to disseminate their audiovisual content and their live events. The platform works with IPv4 and IPv6 addressing, contributing to the use of the new IPv6 addressing. Thanks to the support from RENATA and RedCLARA, we disseminated the knowledge acquired through courses delivered over the RedCLARA Aprende platform (RedCLARA learns). It is now possible to have a platform that works in a distributed and collaborative way; bringing synergies together even to support a dissemination activity.

What do you think has been RedCLARA's contribution to Latin America?
RedCLARA facilitates the encouragement for the creation and development of academic networks in Latin America; it contributes to the academic and research communities with infrastructure, services and cooperation between this huge community.

What is the key important aspect of CLARA-TEC for you and your network?
This is the place to learn firsthand, through the voice of the technical leaders of each research and education network, about the news and activities in every network, since none of them is static; furthermore, the exchange of technical experiences and the huge contribution to knowledge by means of training courses.

For the work group it represents an opportunity to disseminate advances in the topics developed by each group, discuss what has been done, and plan activities to benefit the technical and academic community.

How important is for your Work Group the collaboration established within CLARA-TEC and through it with national and regional networks?
In CLARA-TEC I have always found people who, from their own areas of knowledge, have made great contributions to the development of group activities; you can feel the true collaboration with their infrastructures and staff to conduct tests and maintain the national and regional services.

Thanks a lot for all the contributions made by CLARA-TEC participants to the work group and for all the contributions to be surely made; thanks a lot for the opportunities given to the work group to attend important network meetings, be updated on what is being done in the field of the group's topic and bringing all that knowledge to incorporate it into the development of the activities of the work group.

If RedCLARA did not exist, what do you think the technical development scenario in the region would be like?
There would be regional connections, a few between one country and another and a few international ones, and project initiatives, but implemented independently.

From your point of view, what should be the role of RedCLARA over the next five years?
From my point of view, making efforts to have its own communications infrastructure, expanding the portfolio of basic services offered to the community and finding, through projects and services that benefit the community, a sustainable funding model for the development of its activities.

José Luis Quiroz

INICTEL-UNI - National Research and Training Institute on Telecommunications of the National Engineering University (RAAP)

Coordinator of the WG-Mobility

¿What do you think has been your Work Group's major contribution to the community of Latin American academic networks and to RedCLARA?
I think we made a contribution when we decided to bet on the eduroam☺ adventure in Latin America; the way in which we began working in eduroam created some expectations in other networks, which is why we would, in the end, build the bridge toward Europe and from there to other latitudes, an infrastructure which is now ten years old and has a long life ahead.

What do you think has been RedCLARA's contribution to Latin America?
To strengthen collaboration between countries and get closer together, as this makes us stronger as a region... and Ii believe that if keep up this rhythm we can make RedCLARA big.

What is the key important aspect of CLARA-TEC for you and your network?
CLARA-TEC has enabled us to participate in collaborative activities, acquire new knowledge and disseminate it, exchange experiences and apply best practices. Undoubtedly, these actions have benefited us and helped us to improve our networks.

How important is for your Work Group the collaboration established within CLARA-TEC and through it with national and regional networks?
Very important; it has been proven that through collaborative work it is possible to move forward, reach our goals and succeed in accomplishing sustainability over time. The interaction between networks is essential for the development of countries, because behind them we find this big

component... the human network; without it we could not do anything.

If RedCLARA did not exist, what do you think the technical development scenario in the region would be like?

Wow, I'd rather not think about it! We would be countries with isolated knowledge, without sharing it, maybe countries little known or not known at all by others. We would be like flowers in a flower shop, each in a different vase... beautiful, but separated... there is no beauty; you have to bring them together! ☺

From your point of view, what should be the role of RedCLARA over the next five years?

Inclusive and collaborative! We know it has been playing this role, but maybe it is necessary to give it a new turn; there are still countries without an NREN, due to different reasons, but I think that if we present alternatives that make people ask themselves, why is it that RedCLARA is not in my country?. I am sure they would do anything to become part of it. Here WGs play an important role, because one way or another within WGs the collaborative work that favours the inclusion of communities is developed and encouraged; we have to innovate collaboration in every sense! We should extend participation towards those countries without an NREN, by including them in the WGs' discussion lists, which would be a good start. In the WG-Mobility's discussion list we have members from Latin America with and without an NREN, as well as members of RedIRIS and TERENA. This motivates us to the bone☺.

It is also necessary to continue promoting and participating in collaborative projects, promoting alliances, the exchange of experts, consultancy on management for the new NRENs and, why not, to promote the command of the two languages in Latin America, Spanish and Portuguese. We are all committed; we are all RedCLARA☺.

Liane Margarida Rockenbach Tarouco y Leandro Bertholdo

UFRGS - Universidade Federal do Rio Grande do Sul (RNP)

Coordinators of the Mobility with OpenFlow Work Group– WG-MOF

What do you think has been your Work Group's major contribution to the community of Latin American academic networks and to RedCLARA?
We believe the major contributions in this first year for the WG has been to share with the RedCLARA community the results of our studies on SDN and OpenFlow: tests with different controllers, a deeper study on the OpenFlow protocol versions and its use both in a platform for testing and for teaching (mininet), sharing its experience as users in a production network of RNP's Point of Presence (PoP-RS).

All these activities ended with a course for the RedCLARA community, where the experience gained was shared, showing and teaching in the most practical possible way its potential and facilities and the challenges of software defined networks (SDN).

Already in this first phase we saw the interest and participation of the CLARA-TEC community; this included the active participation of a technician from the REUNA network in the training activity.

What do you think has been RedCLARA's contribution to Latin America?
The possibility of exchanging information between countries and the awareness about the diversity that can be found in each of those countries, thus learning about possibilities for research associations. Furthermore, we cannot forget that the network infrastructure created over the years was what made everything possible, and without it any attempt to sustain remote communication between researchers across in the region may not be so fruitful.

What is the key important aspect of CLARA-TEC for you and your network?
We believe one of the most important of RedCLARA's activities has been to bring researchers and technicians from Latin American countries together, enabling them to share their experiences and the developments in each country.

How important is for your Work Group the collaboration established within CLARA-TEC and through it with national and regional networks?
For the MOF group it was important to have exchanged ideas at the CLARA-TEC forum, so that we could learn about the development and interest in SDNs in general.

If RedCLARA did not exist, what do you think the technical development scenario in the region would be like?
Considering the time we were in contact with RedCLARA this year, and the effort we saw in every member country a long time ago, if the network had not been created, it would probably be very difficult to have any joint collaboration between countries in the field of advanced networks for the application of technologies like SDN.

From your point of view, what should be the role of RedCLARA over the next five years?
To continue improving the network interconnection between the different countries in Latin America and provide an additional international way out for commercial and academic internet in the United States and Europe. To continue encouraging research on advanced networks.

Valter Roesler

UFRGS - Universidade Federal do Rio Grande do Sul (RNP)

Coordinator of the Multiconference System for Web Interoperable Access and Mobile Devices – WG – MCONF

What do you think has been your Work Group's major contribution to the community of Latin American academic networks and to RedCLARA?
I think the main contribution of the WG-MCONF is the development of and implementation of an independent web conference system over free software, which is being used in RedCLARA under the name VC-Espresso. With an independent development, it is much easier to adapt the system to our needs.

The system was born of an initiative at the UFRGS (Universidad Federal do Rio Grande do Sul) to conduct tests on a very large scale, and a global network of MCONF web conferences is being created; it already includes several countries around the world and currently has 11 servers in Europe, North America, Central America and South America.

The MCONF system is receiving a lot of funding for its improvement and features Brazil's RNP (Rede Nacional de Ensino e Pesquisa) as the first contributor. It later received contributions from RedCLARA and the Brazilian government, through its funding agency and the Ministry of Education.

What do you think has been RedCLARA's contribution to Latin America?
RedCLARA is more than a simple physical network interconnecting Latin American countries. RedCLARA enables a real inclusion between researchers from various parts of the world, focusing on Latin America. Through this network we can share experiences and focus on the common good, rather than implementing several individual initiatives, strengthening and optimising efforts to reach a common goal.

What is the key important aspect of CLARA-TEC for you and your network?
CLARA-TEC is a technical community which enables a real inclusion among those responsible for the network's operation, with common definitions and services for everyone in Latin America. Furthermore, together with backbone managers, CLARA-TEC allows the people in the community and WG coordinators to meet, thus homogenising the services offered at a continental level and, eventually, at a world level through initiatives like Eduroam, Edugain and MCONF.

How important is for your Work Group the collaboration established within CLARA-TEC and through it with national and regional networks?
It is important to promote the service among member countries, and it is also important to see what they are doing and how they manage their networks. They all evolve in this regard.

If RedCLARA did not exist, what do you think the technical development scenario in the region would be like?
Without the existence of RedCLARA, communication between Latin American countries and between Latin America and the rest of the world would be impaired. Furthermore, there would be less homogeneity in the services offered by the different NRENs in America. In the particular case of the WG-MCONF, the tool would exist only in Brazil, and it would take a lot more to be expanded towards Latin America. The dissemination of results is faster through the network of RedCLARA meetings.

From your point of view, what should be the role of RedCLARA over the next five years?
To continue focusing on the incorporation of countries, the backbone's expansion and the increase of links' speed. On the other hand, it would be very important that RedCLARA continues to enable inclusion among WG coordinators and those responsible for high-speed networks, thus making it possible that the main network services are offered homogeneously throughout Latin America, thus bringing further growth for everyone.

Luiz Claudio Schara Magalhães

UFF - Universidad Federal Fluminense (RNP).

Coordinator of the Intelligent Control System for Networks Wireless Work Group - WG-SCIFI

What do you think has been your Work Group's major contribution to the community of Latin American academic networks and to RedCLARA?
My work group (SCIFI) has developed a last mile technology which is very useful for the members of the academic networks that are part of RedCLARA. Wireless access is increasingly more important and for many people it is the only way to access the internet. The development of open code software (free of charge), which enables lower cost hardware to have the same features of high-cost wireless equipment, is a "bonus" for research institutions and universities that today are in the process of developing wireless infrastructure.

For example, USP spends 25 million Reais (nearly US$ 12 million) to develop wireless access throughout its campus. By using SCIFI this cost would go down to 3 million Reais. UFF, UFV and UFOP in Brazil are using SCIFI for their campuses.

Although SCIFI is not at the leading edge of academic networks providers, it can be used to show the value of cooperation and create a core of users which is more closely incorporated; as open code software it creates an opportunity for community construction.

What do you think has been RedCLARA's contribution to Latin America?
Before RedCLARA there was not much interaction or physical links connecting Latin American networks. Communication with Europe was mediated through the United States, to which the majority, if not the entirety, of Latin American countries were connected. Networks become more useful as they have more

users, and the lack of motivation to interconnect Latin America did not help countries. RedCLARA has brought the experience of many countries and made it possible that not only ideas become evident, but also showed the similar needs of member networks, thus promoting progress across the region.

What is the key important aspect of CLARA-TEC for you and your network?

Although I am not a member of any NREN, as a professor in a client institution, attending CLARA-TEC meetings has enabled me not only to learn about new cutting edge technologies for network practices and research, but also to meet other people from countries with similar experiences and learn from their accumulated knowledge. The creation of a group of experts, who are struggling with different problems in similar contexts, is a very valuable asset. Since all countries in the region face similar problems, solutions can be reused and the exchanged promoted by CLARA-TEC enhances everything.

How important is for your Work Group the collaboration established within CLARA-TEC and through it with national and regional networks?

Working in networks is a largely applied science. The technology that is being developed is intended to be used, and not only by the academic world of increasing knowledge. In Work Groups we deal with real problems in a timely way, and we need a group of users to validate the solutions developed. With CLARA-TEC we have access to a greater group of users and to different scenarios with similar problems, which enables the development of useful and general solutions.

If RedCLARA did not exist, what do you think the technical development scenario in the region would be like?

Brazil has a history of network research, so RedCLARA's role has been to open our eyes so we can see that the technology is being developed in the country, that it has needs that are very different from those of developed countries like the United States or those densely populated regions like Europe, Japan and Korea, and that it can be used by other countries, by our neighbours. For a long time, maybe due to language barriers, Brazil has not cooperated with our closest neighbours. And RedCLARA has not only contributed to connecting the region and promoting the development of new technologies like the one developed by my group, which serves institutions that require large wireless networks but that cannot afford the technologies developed by richer countries.

From your point of view, what should be the role of RedCLARA over the next five years?

That is not a simple question. Although it is clear that in some countries academic networks have found the way, in others the benefits of promoting science are not so clear, since they are still struggling for survival. I think RedCLARA should find ways to make networks self-sustainable and promote initiatives which turn academic networks into a good alternative for commercial offers. The work group's programme, which makes it possible to deal with specific problems, should continue. The increase of connectivity in the area should also be promoted.

José Augusto Suruagy Monteiro

UFPE - Universidade Federal de Pernambuco (RNP)

Coordinator of the Measurements Work Group - WG- Measurements

What do you think has been your Work Group's major contribution to the community of Latin American academic networks and to RedCLARA?
Our WG (WG Measurements) contributed to the dissemination of tools for monitoring academic networks based on perfSONAR in some Latin American networks that had a more direct participation in it; we hope that it will be soon implemented as a service in RedCLARA's backbone.

What do you think has been RedCLARA's contribution to Latin America?
In my opinion, RedCLARA's greatest benefit has been the promotion of inclusion and the exchange of experiences, and having served as an agent of change for the development of many national academic networks.

What is the key important aspect of CLARA-TEC for you and your network?
CLARA-TEC has been a forum for the exchange of information and for training on topics of interest for all national networks, despite the diversity of development stages they are in. To me, personally, this was the opportunity to get familiar with the reality of many countries and collaborate in the dissemination of measurements technology with the aim of not only meeting the demands of network operators, but especially of its users.

How important is for your Work Group the collaboration established within CLARA-TEC and through it with national and regional networks?
The face-to-face meeting, as well as the CLARA-TEC discussion list, have been the main instrument for

dissemination and encouragement and commitment for the implementation of the actions proposed by our WG.

Sadly, since this is voluntary work, it is not always possible to accomplish the desired goals in the expected timescales, given the local demands each individual in his/her national network.

If RedCLARA did not exist, what do you think the technical development scenario in the region would be like?

If RedCLARA did not exist, the connectivity and articulation levels of many national networks would certainly not be what they are today. The same applies to the more consolidated networks; the synergy created yields profits for connectivity and regional associations.

From your point of view, what should be the role of RedCLARA over the next five years?

From my point of view, despite the achievements already accomplished, it is necessary to go further in the consolidation of national networks and in the self-sustainability of this big regional network, in order to continue and move always forward in terms of services and the usefulness for the entire academic and research population of Latin America.

Chapter 4
The voice of the leaders of the Latin American NRENs

Paola Arellano

Executive Director
National University Network
REUNA
Chile

What would you say is the most important aspect of research and education networks?
Research networks have an important role not only as excellence digital platforms for the development of science, education and culture in our respective countries, but also as articulators of institutions, communities and people to support research and teaching at both local and international level.

How would you describe the role of RedCLARA both at a regional and global level?
As the network that interconnects, articulates and supports national networks, thus creating synergies for science and education across the region.

What has been the key important aspect of the ALICE2 project for your network?
The strengthening of the space for collaboration across the region and with European peers. This has led, through a joint work of members, to the construction of valuable initiatives which exceed local needs and position Latin America's work within the global context.

How important for REUNA is the collaboration with other national and regional networks and how do you collaborate globally?
Today science and education are conducted globally, collaboratively and increasingly openly. The relation and support between national networks become

fundamental for the establishment links between groups that share interests, resources and problems. In REUNA we are convinced that teamwork leads to better results. This is why the development of skills, management of new projects and articulation of communication actions between networks have been part of our commitment and work throughout the implementation of the ALICE project.

Could you describe your vision of research and academic networks in the future?
Since their beginnings until today, research and academic networks have gained recognition as managers of an exclusive digital infrastructure for the development of science, education and culture in their respective countries. But today, and even more so in the future, they will be an important articulator of communities and research groups in multiple fields of knowledge, especially those which have been growing alongside ICT.

On the other hand, in the countries where no state support if given, and based in our own experience, we believe that networks should lead the construction of the infrastructure required by science in their countries, and they should also propose and implement funding strategies. This is a significant challenge, considering the high cost required by the installation of this type of specific niche infrastructures.

According to your point of view, what should be the role of RedCLARA over the next five years?
RedCLARA must be an articulator of the interests of National Networks, take advantage from its regional position top leverage both its own development and that of its members and, through these members, the development of research and education communities.

Carlos Casasús

Executive Director of the
University Corporation for
the Development of Internet
CUDI
México

What comes to your mind when you hear a researcher talking about collaboration?
Today research is no longer conducted by a researcher isolated in his/her workstation, as productive research is necessarily conducted by means of multidisciplinary scientific teams and, in many occasions, located in different institutions. Collaboration is a necessary condition for modern research.

What would you say is the most important aspect of research and education networks?
Research and education networks make it possible to carry out the modern research in which multidisciplinary teams that are geographically distributed take part.

How would you describe the role of RedCLARA both at a regional and global level?
RedCLARA has made it possible to have an advanced network in Latin America to support collaboration, research and teaching in our countries and in the rest of the world. Furthermore, it has incorporated us into a worldwide community of advanced networks, which is crucial to globalise our education and research institutions.

What has been the key important aspect of the ALICE2 project for your network?
The ALICE2 project has enabled CUDI, on the one hand, to have a better connectivity towards our peers in Latin America and Europe and, on the other, the creation of a human group in most of the countries in our region, driven by similar concerns, which has become fundamental to do collaborative research

and to show the benefits of globalisation in higher education activities.

How important is for CUDI the collaboration with other national and regional networks and how do you collaborate globally?
Today higher education needs to take a global approach. Mexican universities are invariably making efforts to join globalisation and increase collaboration with other institutions in the region and the world. Connectivity is a fundamental tool to do so.

If RedCLARA did not exist, what would the science, research and innovation scenario in your country be like?
RedCLARA has been decisive for our universities to be able to have a global approach. Without these collaborations, Mexico's higher education would be severely limited.

Could you describe your view of research and education networks in the future?
Research and education networks will continue playing a fundamental role to make university connectivity and inter-institutional collaboration more effective, not only between universities in the same country but between universities located anywhere in the world.

In a not very distant future, networks will not only offer basic connectivity services. They will be able to offer computer services with global scale economies. Services like cloud computing, supercomputing grids, federated identification, videoconferences with the global community of scientists and large bandwidth connectivity with scientific instruments which are increasingly more complex and fundamental for modern science.

According to your point of view, what should be the role of RedCLARA over the next five years?
RedCLARA's fundamental role over the next five years must be to ensure the existence of a high-capacity regional network which guarantees Latin America's institutions the possibility of collaborating, participating in joint research projects and obtaining computer services over the network in conditions that can be compared to those available for universities in the world's most developed countries.

Álvaro De La Ossa

Executive Director
RedCONARE
Costa Rica

What comes to your mind when you hear a researcher talking about collaboration?
That it is nowadays one of the most important skills or attitudes of any researcher. That it would be desirable that more researchers were aware of the need to be educated with that attitude in mind. And that, unfortunately, a lot of people do not clearly understand that collaboration requires not only attitude, but also commitment.

What would you say is the most important aspect of research and education networks?
Research and education networks provide researchers, teachers and students with opportunities for dialogue and exchange. This exchange has the immediate impact of enriching collaboration relations, since it lays the foundations of mutual trust between the parties involved. Research and education networks are important in that they promote social behaviour patterns based on mutual respect, exchange and complementation.

How would you describe the role of RedCLARA both at a regional and global level?
At a regional level, RedCLARA is the sum of all national research and education networks in Latin America and as such it aims to promote science, education, culture and innovation across this region. At a global level, RedCLARA has the duty of interacting with regional networks from the rest of the world in order to safeguard regional interests and promote a true global horizontal collaboration in science and education.

What has been the key important aspect of the ALICE2 project for your network?

The ALICE2 project has enabled RedCLARA and the regional networks that are part of it to define and implement actions towards their sustainability as public asset projects, through the creation of content and added value for the promotion of research, education, culture and innovation.

How important is for RedCONARE the collaboration with other national and regional networks and how do you collaborate globally?

For RedCONARE the collaboration with other NRENs is crucial, for many reasons. Firstly, because the Latin American advanced network would not exist without those collaboration relations between its members. These relations support an exchange model in which all parts obtain benefits, either through the use of a service, access to information and knowledge or through the improvement of some of their processes. Secondly, because national and regional networks typically work as supportive organisations, that is, that even if there are significant differences in the capacities and resources that these networks have, they all receive the same benefit through the products and services developed by the community. Collaboration between two networks is based on two basic principles: on the one hand, mutual respect, which includes mutual trust and loyalty, and on the other, solidarity, the principle which guarantees that the entire community is moving forward at nearly the same pace and in the same direction.

If RedCLARA did not exist, what would the science, research and innovation scenario in your country be like?

The national scenario would still be what it was without the Latin American network: fragmented and disjointed. These problems have not disappeared, but the presence of the national network now offers a meeting space that did not exist before it. Without it, the national scenario would still be fragmented because there would still be international connection and collaboration initiatives that would only respond locally or temporarily to the interests of a few groups and not of everyone. And it would be disjointed because those initiatives would be operating independently from each other, without sharing information or resources and without promoting synergies.

Could you describe your view of research and education networks in the future?

I see advanced research and education networks as a resource with two complementary aspects. On the one hand, as a provider of networking services, as we see RedCLARA nowadays, which goes beyond the mere service provision to get involved with national networks, understand their needs and work together with them in order to meet these needs. On the other hand, I see them as a promoter and permanent innovator in the practice of science and education.

According to your point of view, what should be the role of RedCLARA over the next five years?

RedCLARA should accompany its member NRENs in the search for a political, financial and operational sustainability, in order to help them ensure that the resources they have are invested mainly on the rationale behind advanced networks: the support to and improvement of research and education.

Luis Furlán

President of the Directing Board of the Guatemalan Advanced Network for Research and Education
RAGIE
Guatemala

What comes to your mind when you hear a researcher talking about collaboration?
Collaboration is one of the main pillars of e-Science. Today, research is rarely done by one single individual. It is conducted by groups of colleagues who most of the times are scattered across the globe. Collaboration involves the sharing of knowledge, experiences, data and even instruments.

What would you say is the most important aspect of research and education networks?
They are the means through which collaborative initiatives can be carried out. In general, a lot is said about the use of networks in Science. However, for countries like many in our region, they can have a very important role in education: creating joint postgraduate programmes, providing remote places with access to libraries and other resources that are not available locally by bringing experts from all over the world through videoconferences, etc.

How would you describe the role of RedCLARA both at a regional and global level?
RedCLARA provides the region with the infrastructure and the capacity to bring people together, which is necessary to be able to sustain collaboration between members in the region and with colleagues worldwide.

What has been the key important aspect of the ALICE2 project for your network?
ALICE2 has had two impacts on RAGIE. The first is the promotion of the development/support for different communities of researchers and academics. Two communities were created, one on Flu in Central

America and Panama and one on Biodiversity. Also, we are participating in the LAGO community. The creation of collaboration and support tools for communities has been fundamental.

On the other hand, there have been advances for RAGIE in terms of infrastructure. We have acquired an international bandwidth, many times larger than the one we had. And it has also given us the possibility to expand ourselves towards the country's interior by taking advantage from the Guatemala City-Tapachula link, which is part of RedCLARA's backbone.

How important is for RAGIE the collaboration with other national and regional networks and how do you collaborate globally?

RAGIE has been mainly the receiver of the benefits of the collaboration with other NRENs and regional networks. Being able to receive conferences by experts from the entire region and other parts of the world has been very important to promote RAGIE within our institutions. In particular, we have had a pretty close relation with our sister network CUDI, with their Virtual Days and other activities.

In 2013, if all goes well, RAGIE will have the opportunity to take a more active role through two initiatives:

a. The Mesoamerica project, in which the idea is to incorporate the information systems of the different National Centres for Disaster Prevention and Reduction in Mexico, Central America and some countries in South America. This project also has awoken the interest of other initiatives in other parts of the world.

b. In July 2013, the Pan American Summer Institute (PASI) will be held in Guatemala. This is a two-week course aimed at PhD candidates and recently graduated Doctors in different disciplines, and which will deal with the topic of "Methods of Computing Discovery for the Solution of Multidimensional Problems". Participants will come from the entire western hemisphere and will see the latest techniques in the use of High Performance Computing and Advanced Networks.

If RedCLARA did not exist, what would the science, research and innovation scenario in your country be like?

Although some use of RedCLARA has been made, in general in our country we haven't taken advantage of the benefits offered by it. The main problem is that most universities focus on teaching and do not conduct research. Also, we haven't found the necessary support from the government and private sectors. The problems that affect the country are too overwhelming for the country: high poverty rates, illiteracy, unsanitary conditions, etc. The sad thing is that these very same problems could be the main beneficiaries of using RedCLARA.

However, I cannot finish this answer in a negative tone. Through RedCLARA some scientists have been able to conduct highly important research without leaving the country. Also, having this tool available is beginning to influence the way of thinking of local scientists who have obtained their postgraduates

abroad, so that they return to the country instead of remaining abroad. These changes are almost unnoticeable but they move in the right direction towards a national strengthening of S+T+I.

Could you describe your view of research and education networks in the future?
I am fully convinced that the use of these networks is essential for the development of S+T+I at a global level. For our region it will be useful to see how this is done in countries with greater development and thus avoid many difficulties that they have already gone through. If we do it well, this should facilitate and speed up the development of S+T+I in our countries, strengthen collaboration at a regional level and, as a consequence, reduce the big scientific divide between LA and the rest of the world.

My vision for the advanced networks of the future is that their cost becomes totally affordable for any scientist/educator and that their use is pervasive and as transparent for the user as the use of a pen is at present... a technology which, in its time, represented a revolution.

According to your point of view, what should be the role of RedCLARA over the next five years?
I think that in five years' time, the technologies and tools provided by RedCLARA will still not be easily available in our region. Therefore, one of the key functions is to continue providing the necessary infrastructure. However, I also think that this will change rapidly and that RedCLARA will have two clear roles to play: firstly, to be at the frontier of S+T+I, serving as an experimental table for new ideas, projects, methodologies, etc. Secondly, and this is a role that will become a priority, to continue promoting the development of the "human" network of researchers and academics, putting forward multidisciplinary and multinational projects to solve the problems of our region.

Lucas Giraldo

Executive Director of the
National Academic Network
for Advanced Technology
RENATA
Colombia

What comes to your mind when you hear a researcher talking about collaboration?
My first image is the progress of science and innovation through various capacities and disciplines, integrated in favour of a better future. I see a scientific world without any kind of apprehensions or selfishness, where we can combine together various ways of thinking and acting through collaborative tools and with technological support.

What would you say is the most important aspect of research and education networks?
The possibility of turning the regional scientific inclusion and world collaboration into a reality.

How would you describe the role of RedCLARA both at a regional and global level?
A great articulator; a leader in the promotion, use and incorporation of advanced technology networks in an innovative way in order to place our researchers within the global scenario.

What has been the key important aspect of the ALICE2 project for your network?
The possibility of getting connected to a world of scientific and academic possibilities, as well as actively involving us in world research projects.

How important is for RENATA the collaboration with other national and regional networks and how do you collaborate globally?
It is not important, IT IS ESSENTIAL. The nervous system of regional networks lies in its capacity for collaboration and joint articulation.

If RedCLARA did not exist, what would the science, research and innovation scenario in your country be like?

We would have probably moved forward, but locally, that is to say, the possibility of implementing joint collaborative projects would have been a lot more difficult and slower. Additionally, it would have NEVER been possible to have a suitable articulation of collaborative tools and the construction of an infrastructure which really connects us effectively to the planet.

Could you describe your view of research and education networks in the future?

Networks used for strengthening science, education, culture and innovation in Latin America through the innovative use of advanced networks in articulation with national networks.

According to your point of view, what should be the role of RedCLARA over the next five years?

RedCLARA will have to be known as a key actor in the strengthening of science and technology in Latin America, succeeding in getting the end users of NRENs to make use of collaboration applications and platforms federated through it. Additionally, 85% of the networks from Latin American countries should be active members.

Ida Holz

Executive Director of the
Uruguayan Academic Network
RAU
Uruguay

What comes to your mind when you hear a researcher talking about collaboration?
I think of RedCLARA as a tool to collaborate with other researchers in the region or with researchers in other parts of the world.

Unfortunately, there are not many researchers who talk about collaboration and I believe a strong dissemination work is required for them to learn about the possibilities for strengthening their work by using networks to get connected, meet and cooperate with peers anywhere in the globe.

What would you say is the most important aspect of research and education networks?
Communication networks for research and education really open up a great range of possibilities for creating new ways to face education plans at all levels.

In the same way, researchers can collaborate with their peers and, in many cases, remotely use tools they do not have to move forward in their work.

How would you describe the role of RedCLARA both at a regional and global level?
I think RedCLARA is a body which has had and still has the vision and the will to join efforts in the field of R+D in order to move forward towards a greater development of Latin American countries, creating the suitable communication infrastructure for those purposes.

What has been the key important aspect of the ALICE2 project for your network?
First, the European Commission's project called ALICE

was the initiative that made it possible, through its financial contribution and logistic support, to reach a long time dream for many in Latin America, which consisted in creating an advanced communications network in the region (RedCLARA) to benefit the academia and research and, therefore, our countries' development.

The renewal of the support from the European Commission through the ALICE2 project created the conditions to move forward and consolidate the planned infrastructure by acquiring and installing own optical fibre, either owned or under IRU modality, which goes through and penetrates most of the countries, which enables us to foresee with greater certainty RedCLARA's continuity and permanence and, therefore, the collaboration between the countries in the region.

This project has created a highly important boost for the development of the Uruguayan Academic Network.

How important is for RAU the collaboration with other national and regional networks and how do you collaborate globally?
Uruguay is the country with the smallest population in Latin America, although it has a long tradition of social awareness and the education of its population at all levels. All public education, from pre-school to universities, has been secular and free of charge for more than a century and it is compulsory at both primary and secondary levels.

This has turned it into a country with a great cultural tradition and high educational level. However, its scarce population makes researchers need to communicate and collaborate with researchers in the region and at a global level.

In this sense, RAU has participated since the beginning in the creation and consolidation of the Latin American bodies related to internet development and, among these with RedCLARA, which provides the means to facilitate the cooperation required.

If RedCLARA did not exist, what would the science, research and innovation scenario in your country be like?
It is difficult to think what it would be like, considering that we are close to celebrating the tenth anniversary of CLARA's creation, ten years that have completely changed technology and communications.

I think we would have worked in more isolation and therefore with less benefits for the development of education and research.

However, I think even today a big part of our educators and researchers have not become fully aware of the extraordinary tool implemented to benefit their work and a lot of dissemination and work is required for that to happen.

Could you describe your view of research and education networks in the future?
That is like looking through a crystal ball. Progress in technology is very vertiginous and predicting the future is an adventure.

Undoubtedly, we are walking towards new forms of education and research in which technological means and communications will enable a large cooperation between organisations and countries at all levels of human activity and thus a big progress in all areas of knowledge.

According to your point of view, what should be the role of RedCLARA over the next five years?
To bring Latin American countries together with a high-speed network and to work hard in encouraging collaboration by providing initiatives that add content and support projects which show the benefits of communication and union with each other.

Rafael Ibarra

President of the Directing Board of the Salvadorian Advanced Network for Research, Science and Education
RAICES
El Salvador

What comes to your mind when you hear a researcher talking about collaboration?
I think collaboration is the only way to move science forward nowadays. It is very difficult that today somebody can work on his/her own in the field of research, in any scientific discipline, either social areas, health, exact and natural sciences or engineering, since results, experiments, measurements, analyses, failures and advances must be shared, taking into consideration the respect for the merits of every person and institution.

The cost of implementing and maintaining laboratory, equipment and computers to develop research projects are high if they are covered by one single institution, or even sometimes by one single country. Talents, capacities and experiences are also assets which produce more if they are shared.

This collaboration between peers is carried out both inside a country and at an international level, and the most efficient way to accomplish it is through advanced networks, of which RedCLARA and its member national networks are the best representatives in the region.

What would you say is the most important aspect of research and education networks?
The capacity to share information and establish novel ways of cooperation between peers, researchers and teachers of similar disciplines. These networks enable scientists and researchers interested in various phenomena and issues which are part of the research agendas of countries and institutions can review and build on the experience and results of

other colleagues, both in the Latin American region and across the globe.

Research and education networks facilitate and promote collaboration between researchers in a country and between them and their peers in other nations. It has become an efficient coupling which takes place when research and education networks themselves as formal organisations manage the advanced networks in a country.

Thus, the most relevant contribution of advanced networks in the provision of a communications channel with updated technology and in constant progress, with high speed channels with the lesser rate of shared use and therefore with the greatest efficiency and quality.

How would you describe the role of RedCLARA both at a regional and global level?
RedCLARA is a facilitating and articulating entity for the development of research projects in different areas of scientific knowledge in Latin America. This organisation is bound to become the meeting point for researchers, scientists and higher education teachers in the region, providing efficient connectivity at high speed, virtual spaces and modern tools for communication, storage and processing of scientific information.

For the rest of the world, RedCLARA is already a model which represents Latin America in international forums which deal with the development of e-Science. To a great extent, RedCLARA knows about and collects concerns, national situations and the state of development of local science and technology in our countries. It is a qualified mouthpiece, since its members are precisely the national research and education networks in Latin American countries, and this allows it to keep the information it manages updated, present the region's situation to the rest of the world and have an impact on the materialisation of projects for mutual benefit.

What has been the key important aspect of the ALICE2 project for your network?
ALICE2 and its predecessor, ALICE, have been fundamental for the existence and development of RAICES, El Salvador's national research and education network. As in other countries that are members of RedCLARA, before this project there wasn't a national research and education network, and it was thanks to this opportunity of accomplishing connectivity with financial support from the European Commission that the national actors involved decided to get organised and constitute RAICES.

The ALICE2 project has also provided many hours and ways of training, and human resources education; creation and development of research communities; provision of speedy, modern and communication tools which are efficient for researchers themselves; initiatives which aims at the inclusion of more countries, more networks, more local members and more scientists; and a sustainable strategy of continental connectivity beyond frontiers.

All these accomplishments have made it possible for the members of our RAICES network to be in contact with peers in Latin America and other regions. This

is a new way available for local researchers and teachers to have communication and eventually work together with other colleagues. Likewise, it is a way in which our members can learn about opportunities for collaborative projects.

How important is for RAICES the collaboration with other national and regional networks and how do you collaborate globally?
For a network like RAICES, which has initiated its work and has been motivated at the same time by the existence of RedCLARA, collaboration with other national and regional networks is a strategic activity which supports its own growth and development.

Unfortunately, El Salvador is not a country which stands out because of its high volume of research activities or great scientific development. The alliance and possible participation of our universities in collaborative projects at a regional level is a significant support in the search for our own development, since it makes it possible to come across other work groups which have made more progress in these issues.

If RedCLARA did not exist, what would the science, research and innovation scenario in your country be like?
We would still be trying to work in each institution in isolation on these so important issues. Although there are other dynamics, initiatives and projects which have been being implemented for some time, the existence of RedCLARA has made it possible to have some resources which otherwise would be neither available nor accessible for our researchers, teachers and institutions.

In other words, although there would be some progress made, I think the existence of RedCLARA has enabled us to visualise and, in some cases, experiment other ways to develop projects in the field of science and technology.

Could you describe your view of research and education networks in the future?
They will be an increasingly relevant actor in the development of scientific research as a driver for countries' development, as they make it possible that papers, projects and result dissemination reach more people, work groups and institutions.

Research and education networks, both national and regional ones, will provide top-quality services as regards communications, data and information transmission, community management, project development and other forms of progress for the region's science and technology.

According to your point of view, what should be the role of RedCLARA over the next five years?
Apart from the telecommunications infrastructure's maintenance, management and permanent improvement for exclusive use by national academic networks, it must continue to articulate the collaborative work of research communities, both the ones it has promoted and those which approach the network, already existed or are being created, in any field of knowledge.

The permanent improvement and innovation in the services it offers must have a predominant place in RedCLARA's tasks, especially those which enable it to better show partners the advantages of taking part in these regional networks.

It must also continue making efforts to expand the quantity and quality of network members, reaching countries still not connected and institutions that still do not take part of these benefits.

Together with its members, national networks, RedCLARA must continue working to make the importance of having and expanding this important tool for e-Science development visible for political actors, decision-makers and authorities from the NRENs' member institutions.

It must keep and strengthen its alliances with other peer actors across the globe, in order to succeed in transferring these benefits to its Latin American members.

All these actions and other additional ones must aim at ensuring the sustainability of RedCLARA and the NRENs, based on the everyday and expanded use of the communications infrastructure, as well as the services and tools provided by RedCLARA, with the common goal of making innovation, science and technology in our region move forward.

Villie Morocho

Executive Director of the Ecuadorian Consortium for the Development of Advanced Internet
Ecuador

What comes to your mind when you hear a researcher talking about collaboration?

The growth of research work is based, from my point of view, on the quantity of collaborations it may have. That is, if a research project has local, national and even international collaborators, it can be foreseen that this work is supported at that level. Therefore, if a researcher talks about collaboration, what we aim at from CEDIA is to facilitate his/her life so that this collaboration can really be conducted through the means made available by CEDIA, which range from videoconferences to possible access to international scientific networks.

What would you say is the most important aspect of research and education networks?

Firstly, its human resources, that is, the contacts between the people who are part of these networks. The trust accomplished to be able to put forward large-scale projects, which in turn make it possible to get associated without much hassle. That trust means to scale up towards new members or new partners of an eventual project, since it becomes a bond of trust among everyone. Secondly, all the technological deployment which enables the interaction of this group of people.

How would you describe RedCLARA's role at both a regional and global level?

Its unique and necessary work enables the integration of people and work teams around issues of regional interest. Furthermore, the chance to submit projects ranging from small collaboration projects to large ones like those submitted to the European Union as part of framework programmes.

What has been the key important feature of the ALICE2 project for your network?
The possibility of becoming involved at a world level, starting with Latin American relationships but reaching a world level due to the relationships that can be accomplished through RedCLARA. Getting an initial funding as well, which undoubtedly couldn't have been achieved solely through the intervention of RedCLARA's members. Therefore, I think the European Union's collaboration through this project is a totally relevant factor.

How important is for CEDIA the collaboration with other national and regional networks and how do you collaborate globally?
This is one of the main points promoted from CEDIA; collaboration with other researchers in South America and the world through the national networks in those countries.

If RedCLARA did not exist, what would the science, research and innovation scenario in your country be like?
We would have had to look for other means of international collaboration, which nonetheless would have been less fruitful than what we have accomplished with RedCLARA. Furthermore, I am certain that the trust bonds achieved through RedCLARA are unique and wouldn't have been achieved without this institution.

Could you describe your view of research and education networks in the future?
Researchers having them as part of their lives, without the need to have introductory means about international relations through RedCLARA. It would be like thinking whether we need to teach a researcher how to use the internet. Then I think that taking advantage of the trust and technological benefits of NRENs will be part of every academic's work.

According to your point of view, what should be the role of RedCLARA over the next five years?
To encourage this future vision.

Nelson Simões

Executive Director of the National Education and Research Network
RNP
Brazil

What comes to your mind when you hear a researcher talking about collaboration?
On one occasion the vice-chancellor of an important university located in the Amazon basin told me that "he felt far from Brazil although close to the world". The hard isolation created by thousands of kilometres and many hours by plane (or even more by boat) is still, in many senses, a barrier for normal relations between researchers, professors and students. But to talk about collaboration is to talk about the network and its applications.

What would you say is the most important aspect of research and education networks?
Apart from this coming together and inclusion of their communities, research networks play an extremely important role in people's qualification and in the provision of various solutions which would not be possible in isolation – advanced services, R+D projects, experimentation of new models and testing of solutions. Along this road, some of the results obtained become the fuel and motivation for better public policies and innovation.

How would you describe the role of RedCLARA both at a regional and global level?
A high-performance network bringing together 14 Latin American countries is a possibility for effective collaboration that we did not have before 2003. To develop this collaboration space over the last ten years involved incorporating universities, supporting multinational research projects, providing new applications for distance collaboration and helping to strengthen the importance of science and education in the regional agenda.

What has been the key important aspect of the ALICE2 project for your network?

A very intelligent and visionary vision of inter-regional inclusion with concrete results. Through the creation of this cooperation project it was possible to lay the foundations and build on the new association opportunities in the academic and entrepreneurial fields. It is difficult to imagine how the same result could be accomplished in so little time without this strategic alliance with Europe.

How important is for RNP the collaboration with other national and regional networks and how do you collaborate globally?

For the Brazilian academic network, inclusion within Latin America is the answer to the expectations of many of our clients in relation to the development of the research they conduct. Projects in health, agriculture, biodiversity, mathematics, arts and humanities, among many other areas, depend on a daily basis on our capacity to offer better collaboration services and platforms. Many virtual organisations live on web conference applications, transference of large volumes of data or simply collaborative work spaces. We are living in an era of intense mobility and inclusion. We have the challenge of building a global, straightforward and secure environment which allows everyone to explore their potential and ideas together.

If RedCLARA did not exist, what would the science, research and innovation scenario in your country be like?

The value of a network depends directly on how many of us are part of them. We still have a lot to do to establish better and greater connections for education and research institutions. However, the challenge that was overcome with the implementation of RedCLARA is an effective demonstration of the capacity we have to build new solutions. It is certainly not easy for the institutions involved in the consolidation of this regional space to devote themselves to the huge national challenges and develop RedCLARA simultaneously. However, this is not about choosing. We cannot exist without this inclusion provided by CLARA and, I think there isn't a sustainable development alternative for any country in Latin America which is not based on inclusion, cooperation and qualification through education, research and culture.

Could you describe your view of research and education networks in the future?

National research networks will be something completely different from what we have today, resulting mainly from the overcoming of the restrictions that still persist in our region, both in terms of their and quality of the physical infrastructure for communications, storage and computing, as well as in terms of the limitation of qualified people to run and use this environments. I think they will continue to be strategic organisations to put forward initiatives for global inclusion and collaboration. They will be much more oriented towards bringing people together and testing ideas and, even so, contributing to scale economies and innovation.

According to your point of view, what should be the role of RedCLARA over the next five years?
To reach its sustainability and maintain its high performance. To support the consolidation of its members, especially the younger national networks.

José Sosa

President of the National Centre for Technological Innovation Foundation (CENIT)
REACCIUN
Venezuela

What comes to your mind when you hear a researcher talking about collaboration?
Collaboration in the context of research is related to the exchange of ideas and shared work in the collective construction of knowledge, of knowledge management as part of the sum of interrelated elements which are included in every research process. From the current point of view of research related to Free Information Technologies, collaboration implies sharing sources, repositories and databases, exchange in discussing paradigms, analysis of global environments, implementation of joint research around areas of common interest and production of free knowledge available for other researchers.

On the other hand, collaboration is a mechanism which can have an impact on the improvement of research processes with the convergence of experiences and expertise, thus strengthening the attention to needs through projects.

What would you say is the most important aspect of research and education networks?

- Promotion of applied research with exchange of knowledge as the answer to real problems contextualised in time-space-community.
- Access to academic knowledge and the knowledge stemming from the experiences of learning communities (popular innovators).
- Encouragement for the training of new researchers.
- Support for the development of multidisciplinary projects which address the region's strategic and critical areas from various dimensions.

How would you describe the role of RedCLARA both at a regional and global level?
As an opportunity for inclusion for the scientific and academic sectors through the promotion of local research networks that come together under research lines in response to the local and/or regional needs, thus contributing to the global community.

RedCLARA is a network which has played the role of information and knowledge manager; it has enabled the dissemination of new spaces through the use of advanced networks and the internet. It has been a road that has encouraged relations and the exchange between researchers at a global level, eliminating barriers and building new ways for intellectual growth.

What has been the key important aspect of the ALICE2 project for your network?
For our Network, ALICE2 has made a contribution in the field of science, research and in the creation of communities of scientists, through the interaction with a powerful telecommunications network, exclusively devoted to the progress of academic disciplines across the region, and in direct communication with scientific communities around the world.

On the other hand, it has enabled the operational and actual interrelation in joint research projects and developments between actors in the European and Latin American academia, leaving behind rhetoric and transcending into collaborative activities in different areas of interest. It has enabled the addition of new values linked by one single code despite having symbolic barriers like language or culture. It is the opportunity to develop knowledge communities for research associated to areas and problems of common interest in different nations.

How important is for REACCIUN the collaboration with other national and regional networks and how do you collaborate globally?
The participation of REACCIUN in collaboration with other networks contributes to the development of education, science, research and innovation in the countries that are part of the allied networks, thus providing the scientific and academic sectors with the possibility of accessing academic and research resources remotely and participating in multidisciplinary collaboration projects, at both national and international level.

For REACCIUN collaboration is very important, since it results in the opportunity to offer a differentiating service for the academia and research centres, through which researchers, teachers and students can exchange experiences and share results in the search for answers to the problems to be addressed. Additionally, it represents the opportunity to strengthen and expand its presence in collaborative work through the use of advanced networks and incorporating Venezuela as an active nation in R+D+I into international networks which cut across diplomacy and are reflected in concrete actions, thus promoting regional inclusion and joint management.

If RedCLARA did not exist, what would the science, research and innovation scenario in your country be like?
There would be limitations in the possibility of

promoting the exchange of knowledge with the different academic, scientific and artistic institutions in Latin America, Europe and different parts of the world. Likewise, there would be limitations to guarantee a robust, dynamic, reliable, high-quality and availability service, suitable for the high demands of the country's scientific-academic sector, and this would reduce the development of new advanced services.

Could you describe your view of research and education networks in the future?

In the short term, research and education networks must become an alternative for the convergence of researchers and communities, as a way to offer concrete solutions to the real needs of the population.

In the mid-term, they must have an impact on the development of new methodologies for online collaboration and expand their coverage towards innovators and organised communities.

In the long term, they have to offer platforms and access, and coordinate collaborative research plans which encourage the participation of the social actors who experience the needs, so that they have a leading role in the socio-cultural and scientific-technological changes that have to do with them.

During the entire implementation, networks must emphasise the encouragement for the creation of knowledge and research for the development of innovative proposals for the region in new areas of knowledge such as nanotechnology and robotics, among others, with the idea of moving forward in the development of the region's technological potential.

In a cross-cutting way, advanced networks, networks based on intelligence systems and on supercomputing systems which enable the creation of new knowledge and the processing of data from other perspectives which increase efficiency and effectiveness in the development of results. Likewise, the barriers still present, like language or the quality of connectivity, will move on to a different level, since the quality of communication channels will be even greater and the distractions still present in the network would tend to disappear.

According to your point of view, what should be the role of RedCLARA over the next five years?

RedCLARA must continue to encourage and strengthen the development of collaborative activities in issues related to advanced networks technologies and issues related to education, science, innovation and research, as a promoter of collaborative R+D+I and as the creator of best practices and of a knowledge space in permanent growth and development. (Construction and creation of new knowledge for the new global process being developed. A technological platform where lots of contents are hosted, such as:

1. Knowledge communities
2. Digital library
3. Researchers' profiles
4. Researchers' papers
5. Promotion of everything related to science and technology
6. Projects aimed at the science and technology area

(Among others).

Carmen Velezmoro

Executive Director of the Peruvian Academic Network
RAAP
Peru

What comes to your mind when you hear a researcher talking about collaboration?
I think about the exchange of knowledge, techniques, publications, etc. which help him/her to improve his/her scientific work, as well as the interrelations he/she has with different researchers worldwide working on the same topic.

What would you say is the most important aspect of research and education networks?
The most important aspect is the fact of sharing experiences between actors in each network and the possibility of submitting joint projects to obtain funding that benefits each participating institution, not only from the economic point of view, but also for the scientific progress of their researchers. Likewise, education networks make it possible to organise several activities without having to move from one place to another, which entails financial and energy savings and thus contributes to protecting the environment.

How would you describe the role of RedCLARA both at a regional and global level?
The role played by RedCLARA in the sense of the questions above, is that of articulating and promoting the creation of research and education networks in Latin America, as well as the connection of LA researchers with researchers in other continents.

In general, RedCLARA promotes the use of ICT through technological developments which make it possible to have better tools for connectivity between researchers. Likewise, it promotes the use of

ICT as a tool for research like grids, image transmission for different purposes, better sound, etc.

What has been the key important aspect of the ALICE2 project for your network?
The ALICE2 project has enabled the training of the technicians who work in the institutions belonging to our network. This has improved capacities and has also accomplished a multiplying effect. On the other hand, the ALICE2 project has made it possible to share with other Latin American and European networks experiences in the functioning of the network itself, its problems, achievements and future expectations.

As for the creation of collaboration networks between researchers, the ALICE2 project has brought LA researchers together, with the resulting creation of networks featuring participation of researchers from different institutions in the country, which has developed in them an interest in the use of advanced networks.

How important is for RAAP the collaboration with other national and regional networks and how do you collaborate globally?
Collaboration with other national and regional networks is important, since it makes is possible to disseminate in our country what is being done in different fields of science, as well as to disseminate and present what is being done in our country in order to give more visibility to its activities in favour of science and research. Likewise, collaboration with other networks makes it possible to articulate the researchers in Peru with researchers belonging to other national or regional networks. On the other hand, it enables the participation in joint projects which benefit the entire Latin American region.

If RedCLARA did not exist, what would the science, research and innovation scenario in your country be like?
Although in our country advanced networks have not become an essential tool for researchers, the existence of RedCLARA has made it possible to interact with other networks and make developments which will benefit future researchers. The world of science, research and innovation in Peru depends also on the support given by the government, which in the last two years has accomplished an increase thanks to the funds the IADB is granting for innovation and research; in this new scenario, the interest in learning about the benefits provided by RedCLARA through the national network (RAAP) begins to increase.

Could you describe your view of research and education networks in the future?
Research networks in the future will be essential; every researcher will have to belong to a network, since it has been proven that research work and scientific progress cannot take place in isolation. It is not possible to double efforts to accomplish the same objective in different countries or in different regions within each country. As for education, we will see networks being used for interaction between students located at very far distances, students who use networks to make simulations which allow them to better accomplish their learning objectives, students at different levels attending

world conferences without having to move. The greater the needs, networks will also have to develop better and new tools for their efficient management.

According to your point of view, what should be the role of RedCLARA over the next five years?
In the next five years RedCLARA should continue supporting Latin America's scientific development. Although some countries already stand out because of their progress and contribution to science, the role of RedCLARA should precisely be to get those countries with less progress in science, technology and innovation articulated with the more advanced ones. RedCLARA should play an important role in promoting the use of advanced network tools in favour of research and education throughout Latin America.

Chapter 5
The voice of the leaders of large networks and regional networks

Salem Al-Agtash

ASREN's Managing Director
The Arab States

What comes to your mind when you hear that a researcher is talking about collaboration?
Scientists are no more isolated and collaboration has become essential and a key to conducting research. Collaboration is about availability of high-speed networks, access to sophisticated computing e-Infrastructure, and sharing of resources and data-intensive applications.

What would you identify as the main importance of research and education networks?
Research and Education Networks are essential tools for connecting researchers and institutions and for sharing scientific applications, services, and computing resources. With these networks, researchers have access to an open world of education, science, and applications and is key for consolidating efforts to address World's pressing problems and crisis that are common to all nations. The networks represent an extremely important outreach infrastructure to a wider research population that has an amazing potential, most dramatically in its impact on enabling developing countries to boot up and join the globalizing developed world.

How would you describe the role of ASREN at both a regional and a global level?

ASREN's role will focus on developing a pan-Arab e-Infrastructure to support e-Science and education and facilitate the collaboration and cooperation among researchers and academicians in the Arab region across the Arab Countries. ASREN has been collaborating with other regional networks for harmonization and coordination of regional e-Infrastructures in an effort to build interoperability standards and facilitate access to research communities at the global level. ASREN will be an intermediary connecting the west and the east, as well the north and the south.

How important for ASREN is collaboration with other regional networks and in what ways do you collaborate at a global level?

Collaboration with other regional networks has many advantages mainly in sharing resources, experiences, as well best practices and successes. ASREN organizes every year the e-AGE forum (Integrating Arab e-Infrastructure in a Global Environment) as the launching pad for R&E connectivity and cooperation at the global level. e-AGE brings together ASREN, EUMED, GÉANT, RedCLARA, Ubuntunet, WACREN, APAN, and Internet2 regional R&E network stakeholders and region's foremost innovators, leaders, scientists, and businesses. The goal is to discuss and debate models of innovation, integration of R&E networks, policies for sustainable development in education, means of knowledge sharing and dissemination, capacity building programs, and region-wide e- infrastructure deployment to tackle today's crises and worlds most pressing problems in environment, economy, health, energy, and many others. The forum plays an important role in bringing leaders and policy makers to plan for building a global e-infrastructure for R&E based on real life broad inclusiveness beyond any political protocols. e-AGE 2012 will be held in United Arab Emirates and targets audience from all over the world.

How do you think global collaboration among regional networks will change in the coming years?

Global collaboration will be driven by needs, most importantly in a wider access to knowledge resources. Global access, so long denied, will be possible during the coming years to researchers everywhere. Access alone, though critical and a priority, is not the key element to world successful research collaboration, but it is more related to the development and empowerment of research communities and sharing of resources as the building blocks for strong and sustainable research communities in the 21st century.

Could you describe your vision of R&E networks in the future?

Our vision at ASREN for the coming few years is to build on EUMEDCONNECT 3 and establish research and education networks in the Arab countries where such networks do not exist, create links [virtual or dark fibre] between the Arab neighbouring countries, develop four main POPs linking to other regional research and education networks in Europe, Africa,

America, and Asia. This will facilitate emergence of a truly integrated Arab e-Infrastructure that can mobilize Arab research communities into a wider collaboration context focusing on local problems and issues related to poverty, environment, health and social disparity.

Gregory Bell

ESnet
The United States of America

What comes to your mind when you hear that a researcher is talking about collaboration?
ESnet is a science network, dedicated to accelerating the process of discovery. Because modern science depends upon large-scale teams, we think about collaboration every day. When I hear about a new collaboration, I ask myself: 'how could ESnet improve the productivity of that collaboration?' For instance, we routinely work with scientists to facilitate the transfer of large data sets, assure their remote instrumentation can be accessed reliably, or consult regarding a new distributed data model. Each time we engage with a new collaboration, our team learns about new network requirements and emerging challenges that scientists are facing. In turn, this conversation helps us develop new services and best practices can be applied to other collaborations.

What would you identify as the main importance of research and education networks?
Innovation. Research and education networks are different from the commercial Internet: they face different challenges, offer different services, and are growing far faster. ESnet for instance is projected to carry over 100 Petabytes of science traffic per month by 2015 – a 72% increase per year. Our exponential growth results from the explosion in data generated at experimental facilities around the world. While experiments like the Large Hadron Collider have been known for creating massive data sets, this trend is emerging across nearly all science collaborations including those involved in climate, genomics, and materials discovery. New detectors being deployed at X-ray synchrotrons are generating data at unprecedented resolution and refresh rates,

for example. The current generation of instruments can produce 300 or more megabytes per second, and the next generation will produce data volumes many times higher.

In order to respond to challenges posed by the worldwide data revolution, R&E networks are investing in partnerships to support applied research, development, and innovation activities with the aim of delivering new capabilities that work across multiple domains for Labs and universities around the globe.

How would you describe the role of ESnet at both a regional and a global level?

ESnet has the mission of accelerating scientific discovery for projects funded by the US Department of Energy's Office of Science, which supports 27,000 PhDs, graduate students, and engineers at 300 institutions (and claims credit for roughly 100 Nobel Prizes). Besides interconnecting the DOE's National Laboratory system, its supercomputing sites and its experimental facilities, ESnet links the National Labs to 140 research and commercial networks around the world. We actively contribute to the community by sharing our best practices and innovations in joint forums like the GLIF (The Global Lambda Integrated Facility) collaboration as well as partner in developing new interoperable services, capabilities and standards that mutually benefit the science mission. Prime examples of our community contributions include development around inter-domain virtual circuit and performance measurement technologies as well as the associated standards development within the Open Grid Forum (OGF) and DICE collaborations. Within the U.S., we have a very close and complementary partnership with Internet2, which has also yielded many important collaborations - most recently around emerging 100 Gigabit Ethernet and software-defined networking, among others.

How important for ESnet is collaboration with other regional networks and in what ways do you collaborate at a global level?

Modern science depends upon advanced R&E networks to connect scientists to each other and to research facilities, wherever in the world those might be located. One of the most well-known examples of such a facility is the Large Hadron Collider at CERN, which depends on high-performance networking to deliver data to thousands of researchers distributed globally. We expect that in the coming years, more and more facilities – in a range of disciplines – will adopt the same data model. As a result of this rapid paradigm shift, it is imperative that regional and national networks collaborate to deliver services that work seamlessly across multiple states, regions, countries and continents. Partnership is absolutely vital, because science discovery depends on it. To this end, ESnet collaborates with peer networks in many domains including network operations, engineering, software development, standards work, emerging services, and long-term strategy. We have been active in global collaborations that have led to the development of standardized, open-source tools for performance measurement, multi-domain virtual circuits, and other services and tools.

How do you think global collaboration among regional networks will change in the coming years?
Without a doubt, we will need to step up our global collaborative efforts. Over the past several decades, we've worked as a community to successfully develop tools and services that are tailored to the multi-domain needs of global science. These tools are now moving from prototype deployments into hardened, production-ready services. Over the next decade, these services will continue to be adopted and refined, leading to an even more seamless and consistent end-to-end experience for our users. At the same time, I think it's critical that we focus attention on outreach and education. As the data revolution continues to unfold, many scientists who have never used the network before will be forced to do so as their datasets grow too large to ship via portable media. Many of these scientists participate in small collaborations without the level of IT expertise of larger collaborations like the LHC. The R&E network community needs to come together and develop models and best practices that any researcher can easily adopt as part of their science workflow.

Could you describe your vision of R&E networks in the future?
In the future, we'll think of R&E networks as instruments for discovery, not just infrastructures. These instruments will be programmable, and they will offer a rich services interface to meet the needs of any collaboration. R&E networks will constantly communicate with each other over simple web-service interfaces, coordinating the lifecycle of service requests, brokering competing demands, and optimizing network services based on the specific requirements of individual workflows. They will do all this in a global context, while coping with a massive yearly growth in traffic. Networks will consume much less energy in general, and the energy they consume will be proportional to the work performed, which is currently not the case. ESnet has been a pioneer in the area of programmable networks, advanced capability development, and network energy efficiency - and we expect to continue in those roles for many years to come.

Niels Hersoug and Matthew Scott

DANTE/GÉANT's General Managers

Europe

What comes to your mind when you hear that a researcher is talking about collaboration?

Niels: It is a major strength that there is a shared willingness among researchers around the world to work together for the benefit of mankind. The ability to collaborate is dependent on having the correct infrastructure in place, and it is out of a desire to help collaborative work around the globe that many of us are here at DANTE. RedCLARA is another good example of how well things can work when that drive to support collaboration is there.

Matthew: Collaboration creates general benefits for society at many levels. It brings people with similar skills together to work towards a common goal, creating what we call the research village, that is to say the idea that no matter how geographically far apart people are, they can work closely together.

What would you identify as the main importance of research and education networks?

Niels: In addition to the support R&E networks give to research, we must also remember the important role of facilitating education. It is also essential that we continue to work to break down the digital divide, a topic which is very dear to the European Commission in contrast to commercial providers.

Matthew: Absolutely, it is crucial that we create equality of opportunity for people all around the world to access their peers and partners in the research and education community both locally and globally.

How would you describe the role of GÉANT at both a regional and a global level?
Matthew: Within Europe, GÉANT acts as the common community for European researchers and also as a society of European NRENs in which they can collaborate on new services. Globally we see GÉANT very much as being at the heart of the Research and Education Village. An example of this is the fact that GÉANT enables the exchange of connectivity between other world regions.

Niels: DANTE has nearly 20 years' experience of establishing regional research and education networks. This experience is something we have shared and continue to do so with other world regions.

Matthew: In addition to providing connectivity, GÉANT also provides services to meet user needs within Europe. This is again something that we can share with other world regions. The ELCIRA project led by RedCLARA, and which DANTE and GÉANT are closely involved in, is an example of how we can share experiences of services and work to create interregional services which benefit global collaborations.

How important for GÉANT is collaboration with other regional networks and in what ways do you collaborate at a global level?
Niels: International collaboration is key for us. DANTE has put a lot of effort into supporting other regional networks over the years, with the support of European Commission (EC) funding, meaning that connectivity costs between regions have always been shared. We have also helped other networks justify to their local funding bodies the importance of Research and Education Networks.

Matthew: For the EC-funded regional projects, DANTE has acted as the conduit between the European Commission and the regions. This has helped to create very powerful links between the regions and Europe. But as organisations such as RedCLARA in Latin America and the TEIN* Cooperation Center in the Asia-Pacific region adopt the role of managing the EC-funded projects, DANTE continues to work closely with them to support them in their work.

How do you think global collaboration among regional networks will change in the coming years?
Niels: We will see a change in the difference in the capacities provided by smaller networks and the larger ones. Gradually, connectivity will grow to the point where there is greater equality in bandwidth across world regions.

Matthew: Providing sufficient bandwidth between regions will continue to be an important part of global collaboration, but the major focus will be on the provision of interregional services which facilitate global collaboration.

Could you describe your vision of R&E networks in the future?
Matthew: For big projects the issue will continue to be about providing unconstrained bandwidth which commercial providers are not interested in providing, given the bursting nature of research networking. More and more, we will be working together to serve

large science projects which are distributed around the globe, work which would be impossible without high bandwidth. Research projects which depend on data from the European Southern Observatory in Chile and the Pierre Auger Observatory in Argentina are good examples of this.

Beyond the issue of bandwidth, the quality of the services provided on R&E networks will be very important, be they for network monitoring, bandwidth-on-demand connectivity, eduroam, global access to services via federations, collaboration tools, etc.

Niels: It is vital that we keep significantly ahead of the commercial providers and try out things which are not commercially attractive. We have to deliver the unthinkable.

Askar Kutanov

Regional Coordinator of CAREN Central Asia

What comes to your mind when you hear that a researcher is talking about collaboration?
Science has no borders and researchers need communicate and exchange information with colleagues in different countries. Also, access to information and recent publications are important.

What would you identify as the main importance of research and education networks?
Research and education networks provide opportunities to work more effective and faster under minimum cost, and are a good mechanism for science and education development.

How would you describe the role of CAREN at both a regional and a global level?
CAREN plays an important role in building regional e-Infrastructure for research and education, and its integration to global research infrastructure. Also, at regional level CAREN provides opportunities for strengthening and capacity building of NRENs (National research and Education Networks) participating in the project, as well to strength regional collaboration among them. At global level CAREN, geographically located between Europe and Asia, could play role as modern Silk Road and high-speed highway for research and education.

How important for CAREN is collaboration with other regional networks and in what ways do they collaborate at a global level?
Collaboration with other regional networks is important for CAREN. There is need to learn the best practices and success case studies in applications development from other regional networks.

How do you think global collaboration among regional networks will change in the coming years?
Global collaboration among regional networks will be more focus on Planetary Emergencies.

Could you describe your vision of R&E networks in the future?
R&E networks could get further development and extend their services in the future.

David Lambert

Internet2 President and CEO
The United States of America

What comes to your mind when you hear that a researcher is talking about collaboration?
What comes to my mind is the amazing and critical work researchers in our community do. Members of our community are collaborating to solve some of the most critical problems burdening global society--clean energy, climate change, cancer cures, astronomy, high-energy physics, and many other important issues.

It is imperative that researchers and their technology colleagues collaborate and provide tools that ultimately provide faster outputs of their research. Whether this is providing solutions to send massive data sets at the press of a button – instead of shipping hard drives around the world, or providing the best possible solutions for fully interoperable and reliable video conferencing to collaborate with research colleagues across the globe. Our community must always serve their needs with the best solutions available now, and lead the charge for innovative and transformative solutions that enable more breakthrough discoveries tomorrow.

What would you identify as the main importance of research and education networks?
I would propose the critical importance of research & education (R&E) networks lies in stewardship and facilitation of the community – providing them what they need to develop and deliver real, transformative solutions to their unique, collective problems. The networks themselves are just the initial example of the community's ability to create solutions to collective opportunities and challenges.

When the first 34 Universities created Internet2, we did so because commercialization and a much broader use of the Internet, a goal very much supported, had impaired our ability to support large-scale scientific data transfer needs. Establishing a community-operated and later community-owned network devoted to our unique needs was quickly identified as the solution. Today, we face new challenges, and while the network is a cornerstone of our community, we must use the same collaboration concepts to develop and implement better yielding technology solutions that meet the needs of all mission areas and functions members support.

How would you describe the role of Internet2 at both a regional and a global level?

At both levels, I would describe Internet2's role as the same. First, Internet2 was established to be the symbol of a set of ambitions for the research & education community. Secondly, Internet2 was created to be an agent these leaders can use to develop and implement solutions to common problems. That was the original definition of Internet2, and it holds true today. Though our community is much bigger today than it was 15 years ago – and its reach must be broader and deeper to be optimally effective, this definition applies now more than ever with the challenges facing research and education.

How important for Internet2 is collaboration with other regional networks and in what ways do you collaborate at a global level?

Internet2 places high priority in optimizing the role of all partners in the traditional 4-tier model of state, regional, national and global R&E networks. The ecosystem is dramatically expanding with new or increasing state efforts, competitive commercial offerings and other forces for change pushing against the historical R&E network model. Through broad collaborations with end users, existing and new network partners and other interested parties, Internet2 seeks to develop a contemporary set of models that link its own networking efforts with those elsewhere in the ecosystem—to create a coherent mission, business, operational and technical capability for the future.

Internet2 collaborates with its many international partner organizations to promote the development of these coherent network capabilities and architectures. For example, Internet2 is a partner in DICE, a strategic collaboration between European and North American Research and Education Networking partners focusing on optimizing trans-Atlantic networking operations for all research and education users. We also work with our global partners to provide above the network services. For example, Internet2 is working in partnership with several peer RENs, including RedClara, to enable seamless, interoperable, high quality video collaboration across institutional and international boundaries. Internet2 also works with its partners to ensure access to globally distributed science facilities and projects, including CERN's Large Hadron Collider in Switzerland and the SOAR and Prompt telescope projects in Chile.

How do you think global collaboration among regional networks will change in the coming years? Internet2 strongly believes that globalization is changing our mission and strategies—
and those of our higher education partners and universities—and will invariably shape the Internet2 of the future.

Because science, education, research and service are not bound by geographic borders, the long-term success of Internet2 relies on strengthening partnerships and collaborative opportunities with international counterparts, but also on our ability to seek out new ways of collaborating and extending our capabilities in support of the Internet2 membership. These partnerships create the bridges required between our respective communities, and support the teaching, learning, clinical and outreach missions of our membership and their communities.

Describe your vision of R&E networks in the future. R&E networks must harness and build upon community experience in successfully developing collective solutions to meet the unique needs of the R&E community at-large and provide new dimensions of support for members to garner the resources required to develop and deliver unique solutions for researchers and educators.

Internet2 strives to continually earn the right to be an agent for the R&E community by assisting them in developing *transformative solutions* that address collective needs and problems, delivered by the *community*, enabled by advanced technologies that combine to create a complete platform for innovation. We are working hard to create an even better collaborative environment and provide innovative tools and technologies for community collaboration and solution delivery to enable the community to support all of their mission areas in new, unprecedented ways.

Further, Internet2 aims to mobilize the community to collaborate on defining a prioritized set of initiatives that will address their issues and needs, advocate with other organizations--commercial providers, open-source groups, government, global partners, etc.--to remove barriers to the community's collective success, and serve the community in any other possible role to accomplish collective goals.

Ultimately, R&E community leaders can utilize a unique service-delivery mechanism to transform current business and service models – free of limitations imposed by current structures, models, and technologies, and deliver better yielding and perhaps previously unimaginable solutions. The results will be reduced education costs, new markets created, solutions to burdening societal problems more rapidly, and strengthened positioning of global research and education long into the future.

George McLaughlin

Interim General Manager of APAN Asia – Pacific

What comes to your mind when you hear that a researcher is talking about collaboration?
I see a dynamic environment where the researcher is interacting with his/her collaborators across the country, and around the world, using high quality immersive environments; where the researcher's local team controls a scientific instrument on another continent as part of their experiments; and where the data collected can be compared, contrasted and analysed against data held in massive databases, from related experiments, located a several other centres around the globe. The innovative approaches used in network-enabling these collaborations lead to massive acceleration of the research outcomes, more timely results, and an edge on potential commercialisation.

What would you identify as the main importance of research and education networks?
Research and Education Networks provide a "first mover" advantage whereby educators can develop and deploy innovative approaches to teaching and "challenge setting", and students can take advantage of a richer and more interactive environment for learning and discovery, well ahead of services currently offered through traditional mechanisms.

The deployment of globally linked Regional Research and Education Networks provide researchers with access to instruments, massive data sets, vast computing and analytical resources and easy virtual access to collaborators anywhere, enabling disruptive enhancements to all areas of research.

How would you describe the role of APAN at both a regional and a global level?
APAN's Member countries account for more than 55% of the world's population. APAN has engendered strong regional network-enabled collaboration across Asia where the potential is enormous.

An important role for APAN is to help train the next generation of network engineers and applications specialists. APAN has a strong focus on network engineering, network research and advanced audio-visual communications services; it also has an important role in supporting a number of application areas that are highly dependent on networks. The APAN medical working group is among one of the most active among the R&E community. In recent times, intercontinental cyber-cultural performances have become a feature of APAN meetings. Earth Monitoring and Agriculture are among other applications areas where APAN has a strong presence.

APAN partners with the other Regional Research and Education Network organisations. Internet2, DANTE, CANARIE, RedCLARA, TERENA and the World Bank are all Liaison Members of APAN. APAN also has a range of MoUs and other agreements with organisations such as the Trans-Eurasian Information Network (TEIN), GLORIAD, NICT, and with UNESCO's CONNECT-Asia initiative. APAN is an active participant in many programs with our other regional partners.

How important for APAN is collaboration with other regional networks and in what ways do you collaborate at a global level?
Collaborations at all levels (networking, performance, advanced communications services, applications) must be global in scope. This is very important for APAN while noting that excellent technical networking and innovative advanced communication services, must have an engaged user base ready to exploit such improvements. Awareness raising of the opportunities that R&E networking enables is an important function for everyone involved.

A feature of APAN's twice-yearly meetings is the Global Collaborations workshops, where examples from around the world and within Asia are presented.

There are many active research collaborations between APAN's Member communities and those of the Member communities in other Regional Research and Education networks.

How do you think global collaboration among regional networks will change in the coming years?
We live in an environment where disruptive changes as a result of new technologies impact how people live, work and play in ways not anticipated even a few years ago. It is unlikely that this pace will slow.

Most of these disruptive technologies no longer result from the publicly funded research sector. There are new challenges for the R&E networking community and closer collaboration, and exploiting new developments wherever they occur will be important for the future.

Inter-regional network collaboration will increase. High-end science instruments that are enormously expensive to build and operate, will only be located

in a small number of sites around the world. Research collaborations will increasingly be built around global teams funded by multiple agencies in different countries. Virtual environments will become the norm for the globally distributed collaborations, supported by the global R&E Network mesh.

Could you describe your vision of R&E networks in the future.

In the past the expertise within the R&E community was, in most cases, well in advance of the commercial sector. That is no longer the case. We have been focussed (largely) on terrestrial, cable and fibre network, while the commercial world and the user communities are moving to high throughput mobile environments. The pace of change continues to increase. In order to remain relevant, the organisations responsible for R&E networking will have to be highly adaptive, respond rapidly to change, and importantly engage closely with their user communities to determine how they can best exploit the changes to benefit their users and their collaborations.

Jim Roche

CANARIE's President and CEO
Canada

What comes to your mind when you hear that a researcher is talking about collaboration?
Almost all researchers are collaborating, regardless of their field of research. The questions that we ask these researchers are designed to uncover what kind of digital infrastructure they will need for their collaboration. In particular, do they have any extraordinary needs for data transfer, compute or storage.

What would you identify as the main importance of research and education networks?
R&E networks underpin the increasingly collaborative and digitally-driven research undertaken by university and government researchers around the world. Our R&E networks facilitate this research in the same way that roads facilitate transportation. Done properly, R&E networks increase the impact of research funding in all disciplines.

How would you describe the role of CANARIE at both a regional and a global level?
Like all NRENs, CANARIE focuses inward and outward. Within Canada we work closely with the research and education community to ensure that we are delivering digital infrastructure that meets our community's growing needs. This includes high performance networking, cloud computing, software platforms, cloud services and more. Globally we work closely with the rest of the NREN community to ensure international connectivity and to drive innovation.

How important for CANARIE is collaboration with other regional networks and in what ways do you collaborate at a global level?

Collaboration international is a key element of our strategy as Canada's national NREN. We work with other NRENs on policy initiatives, technology development, bandwidth acquisition and more. The NREN community is tight-knit and inclusive. CANARIE would not enjoy the success it has seen without the close working relationships with the global NREN community.

How do you think global collaboration among regional networks will change in the coming years?

Collaboration has always been important among the NREN community. International collaborative research projects are growing in scope. Big science increasingly is becoming global rather than local in its focus. Examples include the LHC and SKA. Moreover, most jurisdictions are coping with fiscal challenges. All these factors point to a need for even closer collaboration among the global NREN community.

Could you describe your vision of R&E networks in the future?

We will continue to push the envelope of what is possible both in terms of bandwidth but also in terms of the underlying technology. NRENs will also provide increasingly sophisticated services that leverage the networks. Cloud computing will continue to grow in importance. In Canada, CANARIE will also continue to use its position to stimulate growth in the technology sector.

Ken Sylvester

CKLN's CEO
The Caribbean

What comes to your mind when you hear that a researcher is talking about collaboration?

I think of an individual or research organisation wanting to expand the scope of their study by including and collaborating with others interested in the same subject…perhaps bringing a different perspective or orientation. For instance, if someone is doing some research on the role of young fathers in their children's lives, this might be both a quantitative and qualitative study on a particular cohort of men in a particular country. However, if there is another researcher/research institution conducting a study on the same or a similar cohort of men in another country, both could benefit by comparing and contrasting their findings and developing a common analysis. Or it may be that the other researcher is focussing on very specific economic factors affecting male decision making...each of these studies could conceivably be strengthened and enriched by collaboration. What is important however, is that research findings be a "translated" into layman's terms so they can be used, especially by policy makers, and ultimately not just serve the benefit of research, but serve to further development in our nations and region. The other obvious spin off is that by collaborating, scarce research funding can be stretched, and the personal connection between individuals adds to the richness of globalisation!

What would you identify as the main importance of research and education networks?

Research and education networks provide a platform for collaboration and partnerships in achieving economies of scale for knowledge development and research. Enabling teaching and learning

institutions, researchers, special interest groups and regional organisations to communicate and strengthen each other, contributing towards the development of our respective nations. I think especially the ability to work with others who have dissimilar perspectives, cultures and ideas also allows for growth in understanding and (hopefully) lead to greater understanding, appreciation and perhaps even adaptation of ideas and concepts.

How would you describe the role of CKLN at both a regional and a global level?

CKLN is a regional agency of the Caribbean Community, CARICOM and thus answers to the heads of state of all twenty (20) member states. These Heads have given CKLN the mandate to establish the infrastructure for regional network, C@ribNET, and to facilitate the development of national research and education networks (NRENs) that will be the user groups for the network. So we are really now facilitators, incubating the NRENs, and enabling collaboration by convening meetings among Caribbean NRENs and with others through our international connections to other networks such as RedCLARA, Géant, Internet 2, Ubuntunet Alliance, APAN etc. CKLN is seen as providing this critical network, and so is now beginning to be sought out as a significant partner for regional institutions exploring applications requiring regional and international connectivity. Likewise, the international networks see that this hole has now been plugged, and are also beginning to more actively engage with the Caribbean, through the CKLN.

How important for CKLN is collaboration with other regional networks and in what ways do you collaborate at a global level?

Collaboration is critical for us, and we are happy that networks such as RedCLARA have been alongside us from the inception. We have been able to benefit from certain skill sets that we do not yet have in the Caribbean – for instance engineering, applications development. We are the new kid on the block, and so we look to those that have the experience, to guide us and help us until we identify and strengthen the skill sets within our own Caribbean ranks. We recently collaborated with RedCLARA on the first Global Virtual Day by providing a presenter and translator for the session. We see that once the regional NERNs become more established, these types of collaborative efforts will increase, and CKLN will certainly encourage and facilitate these as far as possible. This would extend to teaching and learning possibilities across the globe, as there are specific topics and sectors in which the region has some unique perspectives and advantages. Governments can certainly utilise the network for greater and more frequent discourse on critical regional issues, and this of course extends internationally.

How do you think global collaboration among regional networks will change in the coming years?

The current generation was born into the digital age and therefore have expectations of how they communicate. Their demands and uses will guide how the networks will change in the coming years... speed, high resolution, real time, wireless access on a wide range of devices. What will be critical is

the capacity of the networks to manage the traffic, ensure security, speed of response for services etc.

Could you describe your vision of R&E networks in the future?

I see R&E networks becoming not just national but across nations…so not just an Jamaican network, or an Argentinian or Italian network, but networks of Poets, or networks of Physicists, Geologists, choreographers etc….more speciality networks that utilise their respective national and regional networks. It will be an exciting time, and one in which our 3 and 4 year olds will consider the norm. Current developments and inventions will be tested and many new applications developed….the sky is the limit, but it will be important to keep certain protocols and systems in place to avoid abuse. But I think the possibilities are as limited as the imagination of the students and users of networks to advance their dreams.

Francis Frederick Tusubira

CEO of UbuntuNet Alliance
East and Southern Africa

What comes to your mind when you hear that a researcher is talking about collaboration?
I always see beneficiaries – not the researchers, but our communities who are impacted positively by relevant research. To me, collaboration is about the mutual harnessing of resources, experience, and knowledge within and beyond our national and regional borders so that the best solutions in any field can be brought to bear in improving the quality of life of our people.

What would you identify as the main importance of research and education networks?
This depends on the interpretation of "research and education networks": At the infrastructure level, it is the killing of distance between educators and researchers around the world as well as the online resources they need, creating an immediacy of presence of both. I used to tell my students that telecommunications is about the death of distance. At the human level, it is the removal, through easy and regular interaction, of the perceptions that often become a barrier to the seamless and synergetic flow of knowledge around the world.

How would you describe the role of UbuntuNet Alliance at both a regional and a global level?
As we say in the Alliance, our role is creating the human and infrastructure networks that will enable research and education collaboration in order to increase the contribution of our research and education institutions to national development.

How important for UbuntuNet Alliance is collaboration with other regional networks and in what ways do you collaborate at a global level?
Collaboration is absolutely vital for our region: we are several stages behind the rest of the world. We need to learn from the best practices and the failures of our peers in areas ranging from network design and operations; to cost and price models; to communication strategy and public relations. We need to enable the linkages between our content networks and their peers around the world. All these are areas of current or potential collaboration.

How do you think global collaboration among regional networks will change in the coming years?
As connectivity improves and barriers to collaboration disappear, there will be a rapid increase in the intellectual output of those regions (for example Africa) that run a very high intellectual property deficit. This will increasingly lead to equal partnerships in global collaboration; and will also drive the demand for similarity in performance of networks anywhere in the world. The platforms will become ubiquitous, disappearing in the background, and people and content networks will personify the global collaboration.

Could you describe your vision of R&E networks in the future?
The R&E sector is growing bigger and bigger, and as they take on board hospitals, libraries, schools, and a whole multitude of anchor institutions as planned in say US UCAN, the global mass-market will become irresistible for the private sector. They will be able to offer the infrastructure services and applications NRENs now offer to their members at much more competitive prices. RENs will migrate away from that layer to higher value layers of human networks, leaving the lower layers either to the private sector, or dedicated companies owned by (or hired by) RENs.

Florencio Utreras

Executive Director of RedCLARA
Latin America

What comes to your mind when you hear that a researcher is talking about collaboration?
I think on Latin American researchers working together in solving big common problems that are affecting the region, such as: forecasting of natural disasters (earthquakes, volcanoes, floods, etc..), the discovery of drug and treatment of infectious diseases (Chagas disease, malaria, cholera, etc..), adding value to our basic goods by discovering new processes, uses and trading forms, etc.. I think on generating a critical mass in our region, joining forces of small groups to form relevant groups at a global level. Well, I think on the huge possibilities of an integrated region.

What would you identify as the main importance of research and education networks?
The vision of the future, the ability to discover the new applications and uses that will shape the way in which we work, study and entertain during the upcoming years. The collaboration between university and research systems that seeks to integrate teams of large size and capability to solve major regional and global problems. The ability to make contributions to the advancement of technology, as was the Internet, the WWW and now the IPv6 or optical networks controlled by the user, or data roaming systems or identity federations, etc. In summary, the NRENs are an causal agent of technological change, academic collaboration and vision of the future.

How would you describe the role of RedCLARA at both a regional and a global level?
RedCLARA is a major initiative of regional collaboration that integrates the efforts of the National Networks, among themselves and with the rest of the world. For the Global community RedCLARA represents a success in terms of collaboration within a region that it's on its way of integration of its research and university systems. That is why other regions are analysing how we have managed to have an organization in which all the Latin American countries cooperate unreservedly and generously. An organization that has earned the prestige of responsibility and efficiency, both with international and regional institutions; an organization that is leading the development of services for researchers and research groups and that is actively collaborating at a global level.

How important is for RedCLARA to collaborate with other regional networks and in what ways do you collaborate at a global level?
Collaboration with other regions is essential. Nowadays research and education are global, our academics need to be integrated with research teams from other continents to exchange data, access to instruments, use computer facilities, etc. Without that collaboration, no matter how efficient and powerful our networks can be, they would be truncated, and would fail to meet its mission of integrating Latin America into the world.

The collaboration can adopt multiple shapes. First with the interconnection of our networks and the contributions from international organizations and projects, that along with our counterparts in other continents, especially in Europe, had help us to build what we have. Without such cooperation, RedCLARA would not exist in the way it does today. Second, through the exchange of information for collaboration between our researchers, the permanent contact that allows us to identify persons and institutions with which our researchers can collaborate on specific subjects, and, of course, with agreements in areas such as: identity federations, application sharing (e.g. videoconferencing), mobility (roaming), etc.

How do you think global collaboration among regional networks will change in the coming years?
It should tend to further integration, especially for those applications that promote collaboration. For a researcher, it should be as simple as using a phone to carry out a videoconference meeting, sharing documents, working together to manage a project, organizing a conference, etc. And this should be done without the need of identifying yourself separately in several systems, but ensuring the security of applications, data, documents and people. The key is the integration of services.

Could you describe your vision of R&E networks in the future?
For me they are the spearhead of technological advancement and integration of our global capabilities for research and academic activities in general. As institutions of higher education and research are where knowledge is shaped, and above all, where young people that will build the future is trained, it is their ability of collaboration

and integration what will define what we will do or stop doing tomorrow. The Research and Education Networks are and should be the spaces for the proposition of new applications and ways of working in this hyper-connected society that we are building.

David West

Manager of the Projects CAREN, EUMEDCONNECT3 and TEIN3 (DANTE)
Central Asia, East Mediterranean and Asia – Pacific

What comes to your mind when you hear that a researcher is talking about collaboration?
This increasingly seems to be the way research is heading – it has been said before, but with science becoming mega science, and laboratories becoming 'collaboratories,' connection to research facilities around the world is vital. I would want researchers to know that there are eInfrastructures available to them now wherever they are, to help them collaborate on a global scale.

What would you identify as the main importance of research and education networks?
By providing dedicated bandwidth, research and education networks enable researchers to share knowledge quickly and easily. For the scientist, connection to a research and education network can manifest itself as videoconference that is crystal clear, or an uninterrupted tele-surgery session, or the ability to participate in large-scale experiments. The commercial internet cannot provide such reliable and cost-effective data transfer. Without research and education networks, researchers in developing regions would be less able to participate in important international research efforts, and in some cases not participate at all. For governments research networks have become essential infrastructure for national and regional development.

How would you describe the role of CAREN, EUMEDCONNECT3 and TEIN3 at both a regional and a global level?
Within a geographic region, there may be shared research objectives and interests – for instance, in central Asia, where CAREN operates, research

priorities include Earth observation to mitigate the effects of natural disasters, or the surveillance of certain local diseases. However, increasingly the view becomes global - we know that malaria research is being conducted internationally, as a disease that affects many regions worldwide. Similarly crop research, and so these regional networks must, and do, link into global networks also.

How important for CAREN, EUMEDCONNECT3 and TEIN3 is collaboration with other regional networks and in what ways do they collaborate at a global level?
All the networks mentioned here link into GÉANT, the pan-European network and so there is the potential for region-to-region collaboration. One specific example we identified recently is that land management researchers in North Africa needed to transfer large satellite images to specialist facilities in France for processing before being returned, and they used the connections of EUMEDCONNECT3 and GÉANT to do so. There are many more case study examples which can be found by looking at the regional websites: www.tein3.net. www.eumedconnect3.net and www.caren.dante.net.

How do you think global collaboration among regional networks will change in the coming years?
I see that it will continue to intensify as further countries join regional network programmes, as network capacities increase and as science and research demand ubiquitous access to resources and data globally. I believe this is an irreversible trend with great benefits for all which will help developing countries participate on an equal footing in international research collaboration.

Could you describe your vision of R&E networks in the future.
I think R&E networks will continue to advance in capacity and capability ahead of the commercial services to provide researchers with services that increase the security, accessibility and manageability of the users' experience of the network. Increasingly additional resources will be available through the R&E network cloud: some developed in-house within the R&E community, others using best of breed commercial applications. While the base unit of R&E networking will continue to be the national level, regional level inter-working and network development will become increasingly important in other world regions, as it is already is in Europe.