European Union's Horizon 2020 Programme
European Commission
Directorate General for Communications Networks, Content and Technology
eInfrastructure

Magic
Middleware for collaborative Applications and Global vIrtual Communities

Project[9] Number: 654225

Project Acronym: MAGIC

Final Report

Period covered by the report: from 01/05/2015 to 30/04/2017
Periodic report: Entire project

[9] The term 'project' used in this template equates to an 'action' in certain other Horizon 2020 documentation

1. Executive Summary

MAGIC aims at promoting the sharing of applications between Research and Education Networks (NRENs) by means of:

a) Promoting the deployment of the platforms that ease the access of end users to the applications they need by providing them with:

1. A global identity that ensures the service provider that the end user is the person with the right to access the service. This is done thru the creation, operation and maintenance of Identity Federations associated to the Global Meta-Federation: eduGAIN.
2. Access to a globalized roaming service for WiFi connectivity in campuses around the World, i.e. automatic access to the Internet in any associated University campus around the World for students, professors, researchers and all the academic community.

b) Facilitating the sharing of applications run by NRENs worldwide. This would create value by providing access to end users of a large set of applications tailored to the academic community and at the same time it would provide those applications with a worldwide market of users and a large developers community to enhance and improve those applications. To do this we:

1. Agree on standards for groupware that allow groups of users (user communities) to access applications run in servers across the world without the burden of re-creating the lists of users in each new application.
2. Build a prototype of applications container where the user communities can build their workspace to ease their collaborations including in the same workspace applications developed/run by NRENs across the World. These applications can be provided in cloud mode thru the network, or locally by taking advantage of Open Source codes. Two containers have been tested: Colaboratorio by RedCLARA and Sympa by RENATER.
3. Build a catalogue of applications that are ready to be included in this and other containers as well as applications that can be shared worldwide that are run by NRENs for the benefit of their users and can be also accessed by users of other NRENs. This catalogue follows the lines of the GÉANT Catalogue.

c) Promoting technologies that favour the inter-operation of real time applications such as room videoconferencing (H.323), Web-Videoconferencing and Voice applications. To do this we:

1. Promote the deployment of NRENnum, the technology allowing the use of the existing and deployed DNS (Domain Name Server) system to resolve identification between SIP numbers and actual machines running the service to create global dialling schemes.
2. To develop an Open Source prototype ensuring the integration of legacy H.323 video networks with modern Web-Videoconferencing and voice applications through SIP dialling that uses NRENnum.

d) To develop a set of Global Science Communities that take advantage of the technologies promoted in this project and serve as a test group while promoting the participation of Latin American and other regions' researchers in European Commission Calls and those of other international funding agencies with high impact in the participating regions and other networking activities.

For the promotion of the deployment of Federations of Identity connected to eduGAIN and the academic Wi-Fi roaming eduroam, we have focused our action through training of the NREN technicians and promotion of the advantages of the technologies in meetings and conferences where the NRENs meet regionally and Worldwide. In order to maximize impact, our strategy has been to take advantage of the regional organisations that group NRENs in the participating World regions, namely: ASREN for the Arab Countries, CAREN for Central Asian countries, UbuntuNet Alliance for East and South Africa, CKLN for The Caribbean, TEIN for South and East Asia, GÉANT for Europe and RedCLARA for Latin America.

We have conducted 7 training workshops in Chile (July 8, 2015), Amman, Jordan (8 to 10 September 2015), Jamaica (7 to 9 October 2015), Beirut, Lebanon (December 3 to 4, 2016), Kyrgyzstan (February 27 - 28, 2017),

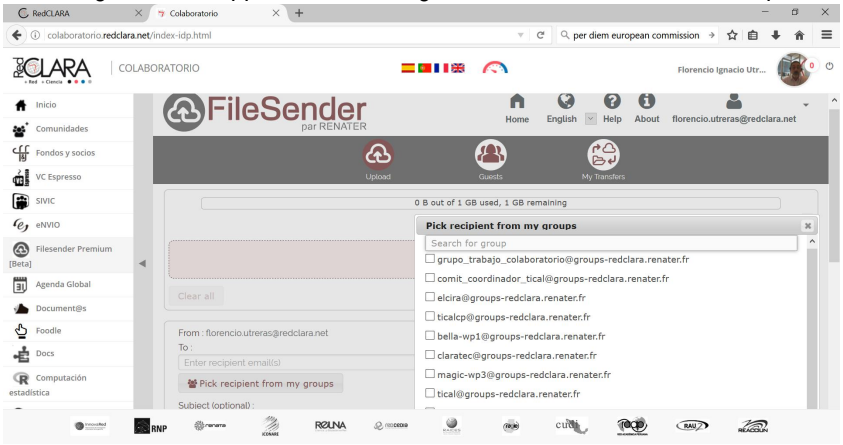
Tajikistan (March 1 - 2, 2017), Barbados (April 10-12, 2017) with 112 technicians trained who work for 78 NRENs in 78 non European countries as shown in the map “MAGIC Partner Regions”.

To support the training that those NRENs will have to provide to their members institutions we have developed on line training material in the form of documentation, presentations and videos. We have also collaborated with NSRC, GEANT and REFEDS to make their videos available to Spanish and Portuguese populations (the original version is already in English).

As a result of this effort 16 new countries have joined eduroam and 7 new federations have been established while 5 more are in different status of their implementation process. The map of coverage of eduroam in the world is becoming increasingly dense, making the roaming of Internet access for academic and researchers a reality Worldwide. The process is going in the same sense for eduGAIN. As the different regions mature the long term effect of the MAGIC actions will prove to have been crucial for this worldwide implementation of these two enabling technologies. In this way, access of academic and researchers to the content and applications is becoming truly mobile across the World.

In order to ease the use of applications aimed at group collaboration, such as web conferencing, document sharing, meeting scheduling and others, users create user groups in social networks or other platforms such as Sympa (RENATER) or Colaboratorio (RedCLARA). Within each platform, the user groups are able to share information between the applications, for example, a PowerPoint presentation made at a Web conference can be shared within the group using a wiki or a virtual disk accessible to all members of the group. In this project, we aimed at agreeing on a set of standards to handle the user group information, such as user group name, list of users, platform, etc. The standards chosen had to be inter operable, i.e., such that information on these user groups can be shared across platform, allowing for example a Biodiversity user group created within the Colaboratorio platform to be recognized as in the Sympa or other platform. This enables the groups to use applications available in another platform without going through the burden of creating again the user group and establishing all administrative permissions.

We have chosen Colaboratorio and SYMPA as the basic technologies for GMF (Group Management in Federations) while VOOT has been selected to carry on the integration. As a key result of this project, we have implemented a test bed where user groups built in the Colaboratorio can now use applications in the SYMPA environment as easily as authenticating as user of a user group in the Colaboratorio. This allows automatically to extend the number of applications provided to the users of both platforms through general agreements between the platform providers. This combination of technologies is a building block for applications sharing between NRENs and has the potential to allow users across the World to take advantage of collaboration applications developed and run elsewhere without leaving its familiar environment or having to open a new account somewhere else.



As an example, we see in the figure how the FilseSender application hosted in RENATER allows to send a file to user groups within the RedCLARA environment.

The pilot has been deployed in two NRENs in Europe and Latin America, while the Colaboratorio platform has become operational in 10 NRENs of Asia, The Arab Countries, West and Central Africa, the Caribbean and Latin America while several other are in testing status in South and East Africa, The Arab Countries and Central Asia. In these deployments the user can now use 11 applications, 8 of which were integrated or developed within the MAGIC project. A catalogue of applications was built and recommendations for NRENs and external providers to publish their applications in the catalogue and to be able to be integrated in the Colaboratorio framework was established.

In this way NRENs and RRENs will have access to an enormous set of applications being developed worldwide by other RENs, NRENs who at the same time will have access to a larger user base and collaborations to enhance and expand their applications using the Open Source principle.

The work in objective c) aimed at disseminating and training on NRENnum technology which allows to use the existing and DNS system (Domain Name System) which is used day to day to translate names such as www.magic.eu into IP numbers that are understood by the Internet routing machines. The DNS system is a solid dependable system, hence the idea of using it to translate videoconference names and numbers into IP numbers to ease the identification of services such as Videoconference Rooms (H.323), web conference systems, VoIP calls (softphones, IP phones) and mobile devices. The idea is to use a standard E.164 numbering scheme (telephone system numbering) to identify all devices and thus make dialling though all these systems alike.

We developed training material in the form of on line material including video presentations to allow anyone interested in deploying NRENnum to do it in just a few minutes. We also made dissemination presentations in several meeting in Africa, Latin America and Asia and provided support for the deployment of new NRENum domains. As a result of this effort, 9 countries have joined the NRENnum.net community from Asia, Central Asia, Europe and Latin America.

The other important challenge that we faced in this project regarding the video conferencing facilities is the integration between Videoconference Rooms (H.323) and web conference systems. Commercial systems exist for this, but the academic community has strong interest in Open Source solutions. Thus, with the support of our Brazilian partner we developed an open source gateway to integrate MCONF and the H.323 systems using SIP dialling. This solution is now available for all partners to include in their MCONF solution.

In order to put this technology to work with end users across the World, in Objective d) we fostered the development of 3 Global Science Communities (GSC) by starting from existing communities, where available, in three major scientific topics of global interest: Biodiversity, Environment and e-Health. The fourth one, Remote Instrumentation was supported following a request from the community in Mexico. The communities succeeded in attracting researcher from Africa, the Arab Countries, Europe, the Caribbean and Latin America. We worked with these communities using the proposed collaboration tools available through the Colaboratorio platform. Using these tools, we organized Global Science 20 events by web conference on topics of their interest and 4 web conference based Virtual Information Days on H2020 calls. The number of researchers attending these conferences were in some cases up to 75 at the same time, proving the efficiency of the tool and its capacity to support such a large number of users. All interactions of the GSCs were carried out through the Colaboratorio tools which are also integrated with e-mail lists facilitating in this way the use, in particular for people on the move.

The other cornerstone of the support to the user communities is the Funding and Partners Database, an application developed to facilitate access from users to funding opportunities around the World. This includes H2020 and Erasmus calls, but also opportunities from the German agencies DFG and DAAD, the US agency NSF and many others. The collecting and organisation of these funding opportunities is made by a specialist every day and the application alerts the 3500 registered users according to their profile. The application framed into the Colaboratorio also allows for specific searches and the possibility of seeking for potential partners among the platform registered users. This tool is a great attractor for users to stay and register in the Colaboratorio environment. The use of the applications has increased from 350 views of specific funding opportunities to 1352 in one year, a 4-fold increase.

In order to reach the community of NRENs we have participated in the main conferences of the Regional Research and Education Networks namely: ASREN's e-AGE, GEANT's TNC, RedCLARA's TICAL, Ubuntunet Alliance Conferences, CAREN Conference, WACREN conferences and IST Africa 2015 and 2017 conferences. In all these conferences we have distributed leaflets and give away as well presented in workshops and panels. In particular we have joined forces with SciGaia and TANDEM to create awareness through joint activities in TNC and IST Africa events.

The dissemination tools also include the website: http://magic-project.eu where we have included a large series of video testimonials and dissemination material. We also make intensive use of social networks to make sure that the NREN community and the end users at large are aware of the possibilities opened by MAGIC.

2. Overview of the Results and their Exploitation and Dissemination

2.1. Platforms for Mobility

As said in the Executive Summary, in this set of activities we aimed at promoting the deployment of the technological platforms that ease the access of end users to the applications they need. i.e., the platforms that support the academics, students and researchers when they move within their country, region or worldwide. To carry out this work, we have worked with regional partners through their Regional Research and Education Networks (RRENs), which are also named as "Focal Points". This strategy was very important, since working by regions is the only way to reach all countries in the regions and also because the RRENs are the organisations that will continue the work after the project ends and hence will ensure sustainability of the effort.

During the first year (2015-2016), the activities of this work package were focused on planning, dissemination and training. Looking deeper inside the project regions:

In the beginning of MAGIC Project, during TICAL 2015 (July 8, 2015) in Viña del Mar, Chile was presented the Mobility Federated Services and Nrenum.net workshop. There were 11 participants from five Latin American countries: Chile, Costa Rica, Ecuador, Mexico and Peru.

In the Arab Region, ASREN conducted the first workshop "First workshop on Joining eduroam and Identity Federation" in Amman, 8-10 September 2015 at ASREN headquarters. The workshop was organized in cooperation with the MAGIC and EUMEDCONNECT31 projects, and was designed for staff of National Research and Education Networks (NRENs) and Universities.

The workshop was attended by 13 participants representing five Arab countries: Morocco, Algeria, Lebanon, Palestine and Jordan. The training was conducted by ASREN in cooperation with CESNet of the Czech Republic. The workshop mainly discussed the technical and policy issues related to implementing eduroam, AAI and joining eduGAIN.

After the first workshop, there were more two events: one in Dar es Salaam regarding Federated Applications (FedApps) Training. This session was held on 26-28 April 2016, as part of UbuntuNet Alliance's strategy for deployment of AAI in the region, during this first event, eduroam was not covered extensively, but it was teaser enough to spark the interest in additional training. The training - supported by the MAGIC project - was facilitated by UbuntuNet Alliance and SANReN, South Africa. This training was attended by 22 engineers from 14 NRENs.; and the second in Beirut, Lebanon "Workshop on Identity Federation Infrastructure" December 3 to 4, 2016, American University at Beirut (AUB), Beirut, Lebanon. Twenty-two participants representing Morocco, Algeria, Lebanon, Palestine, Oman, Egypt, Somalia, Malawi and Jordan attended the workshop. The workshop was coordinated with CESNet and GEANT.

ASREN annual conference e-AGE 2015, Casablanca 7-8 December 2015. A special session and a booth on MAGIC federation and eduroam. Oman and Morocco received ASREN Trophy for success on IdP implementation. In the next year conference, e-AGE 2016, in Beirut, 1-2 December 2016. A side roundtable was allocated for eduroam and IdP discussion. Algeria was recognized for its success in federation start up.

eduGAIN and eduroam used to be on the top of the agenda of ASREN regional meetings with EUMEDCONNECT3 and AfricaConenct2 meetings. The main reason is to promote and follow up with NRENs on these developments. It was also discussed during ASREN monthly VC meetings.

UbuntuNet Alliance has continued to promote deployment of the service in the region, and during the Federated Applications training in Dar es Salaam in April 2016, eduroam was not covered extensively, but it was teaser enough to spark the interest in additional training.

In The Caribbean, it was conducted on October 7 to 9, 2015, a Federated Access and eduroam workshop in West Indies, Jamaica. There were 16 participants from 11 institutions. Technicians, academics and researchers in the Caribbean had the opportunity to benefit from "Caribbean MAGIC", a 3-day series of technical training and scientific discourse from April 10-12 at the University of the West Indies (UWI), Cave Hill Campus in Barbados.

Collaborating with the UWI, MAGIC has hosted a 2-day training session on eduroam, facilitated by GÉANT, Europe's leading collaboration on e-infrastructure and services for research and education. This have target the technical and IT representatives from various universities and colleges in Barbados and the Eastern Caribbean. For further information on eduroam, and its application in the Caribbean region.

In the end of project, in 2016 – 2017, there were two sessions in Central Asia, the first one in Kyrgyzstan and the second in Tajikistan.

Date	Activity	Venue	Qty of participants
May-15	Kickoff Project		
July-15	Mobility Federated Services and Nrenum.net workshop	Viña del Mar, Chile	11 participants
September-15	First workshop on Joining eduroam and Identity Federation	Amman, Jordan	13 participants
October-15	Federated Access and eduroam workshop	West Indies, Jamaica	16 participants
December-15	Workshop on Identity Federation Infrastructure	Beirut, Lebanon	22 participants
	e-AGE 2015 (special session and a booth on MAGIC federation and eduroam)	Casablanca, Moroco	
April-16	Federated Applications (FedApps)	Dar es Salaam, Tanzania	22 participants
December-16	e-AGE 2016	Beirut, Lebanon	
February-17	eduroam workshop in Kyrgyzstan	Bishkek, Kyrgyz Republic	14 participants
March-17	eduroam workshop in Tajikistan	Osimi, Tajikistan	14 participants
April-17	Caribbean MAGIC	Cave Hill, Barbados	

The project has trained 112 engineers

From May to October 2016, work package 2 focused on consulting in eduroam and AAI implementation. Unfortunately, MAGIC project manager, Florencio Utreras, has reported that he has received a letter from CKLN's Director, Ken Sylvester informing that CKLN closed at the end of September 2016. The European Commission has been informed of the situation and consultations are underway to decide on the avenues to take as what regards the contract with the EC and the work that CKLN had committed. Although there was no Caribbean representant anymore, MAGIC Project team has maintained the support to the institutions of that region. The result of this effort was the installation and configuration of a secondary National Proxy Radius Server (NPRS) for TTRENT (Trinidad & Tobago Research and Education Network) that can be used a secondary server for other National Roaming Operators (NROs) in the Caribbean. Peering and testing of the new NPRS with the eduroam Top Level Radius Server (eTLRS). Migration of institutions in Trinidad & Tobago to the new NPRS; Assessment of institutions regionally to determine which ones have the wireless infrastructure to support deployment of eduroam, and assisted institutions with the planning and deployment of eduroam (UWI, UTT, COSTAATT).

The addition of a RADIUS proxy server outside of Trinidad & Tobago to ensure Security, Stability, and Resiliency of the eduroam service regionally. Deployment of eduroam in five additional countries (Anguilla, Barbados, Grenada, Montserrat and Jamaica) and one additional eduroam pilot in Barbados.

Beside those actions, in Central Asia, at the beginning of July, in Bishkek, Kyrgyzstan, it was signed a contract between the European Commission and GÉANT, that guarantee the launch of the 3rd phase of the EU-funded Central Asia Research and Education Network (CAREN) project which resumes regional R&E connectivity after the previous project phase ended in August 2015. Just after that, CAREN has signed an agreement on the collaboration between CAREN and MAGIC. Between October 27 and 28 the 1st TEIN-CAREN joint workshop was held in Bishkek, Kyrgyzstan.

In the Arab region, it has been noticed an expansion of eduroam coverage in the countries that have already had eduroam implemented, like Algerian, Morocco and Lebanon. In addition, Jordan has implemented eduroam at one university with five campuses.

2.1.1. Relevant action in Mozambique

A strategic action in Africa was made between RNP and MoRENet (Mozambican NREN). Since 2013, MoRENet has been working with the Brazilian NREN (RNP) within an international cooperation framework, which comprises training activities, exchanging good management and governance practices of networks, technical visits and, more recently, information exchange under technical and operational management. Because of this collaboration activity, a work plan comprising four phases was developed.

Preparation: In this phase, RNP and MoRENet have elaborated an implementation plan of the Project, which has

detailed all work that would be done to implement an Identity Federation and eduroam. This phase also comprises the elaboration of structural documents required to implement the federation and the eduroam-roaming operator, which also includes the signature of adhesion term to eduroam international and the MAGIC project;

Federation Implementation: corresponded to the implementation of the federation of authenticity and authorization in Mozambique, which comprised a one-week-online-training as well as an assisted support performed through web conference.

eduroam implementation: as previously exemplified, this phase corresponded to the implementation of the eduroam-roaming operator in Mozambique, which included a one-week-online-training as well as an assisted support performed through web conference;

Month	Performed Activities
September	Planning and schedule
September	Preparing and conducting online training
October	Definition of the name of the Mozambican federation (CAF-Moz)
October	Signing of the memorandum of understanding (MoU) of MAGIC Project
October	Writing Polycies
October	Writing the term of adhesion
October	Drafting of the technical specifications document
October	Writing the file "Metadata Registration Practice Statement"
November	Web page development of the Mozambican federation
November	Writing Polycies (version in English)
November	EduGAIN Policy Acceptance Signature
November	Inclusion of Caf-moz in REFEDS
November	Inclusion of Caf-moz in eduGAIN
November	Start up of federation core configuration
December	Review the federation core installation procedures
January	Installing the federation core
January	Elaboration of the federation XML file (Metadata feed)
January	Installing and Setting Test SP
March	Validation of the federation XML file in eduGAIN
March	Installation and Setting of the first IdP of the federation

Mozambique implementation timeline

The first phase of the Project was concluded six weeks after the first formal meeting of the project. More specifically on October 28th, 2016, with the conclusion of the following tasks:

- Webinars about federation and eduroam;
- Elaboration of the Project implementation;
- Infrastructure availability in the MoRENet client institution;
- Term of adhesion signed by MoRENet;
- Elaboration of structural documents.

The elaboration of structural documents has proved to be an essential activity that assists both the communication among the new service, MoRENet clients as well as the international eduroam and eduGAIN service, to which the federation and Mozambique roaming operator (RO) had the intention to integrate because of a RNP suggestion. Due to this directive, the following documents were elaborated:

- Agreement-signing-memo among MAGIC and MoRENet;
- Elaboration of the Use Policy of the eduroam-roaming operator;
- Web Page for the eduroam-roaming operator in Mozambique;
- Elaboration of the document with eduroam technical specification;
- Elaboration of adhesion term for eduroam client institutions;
- eduroam statement signature.

During a meeting held on October 28th 2016, one of the most significant activities of the second phase of the project, corresponded to the implementation of the federation: one-week-online-training.

2.1.2. Countries eduroaming:

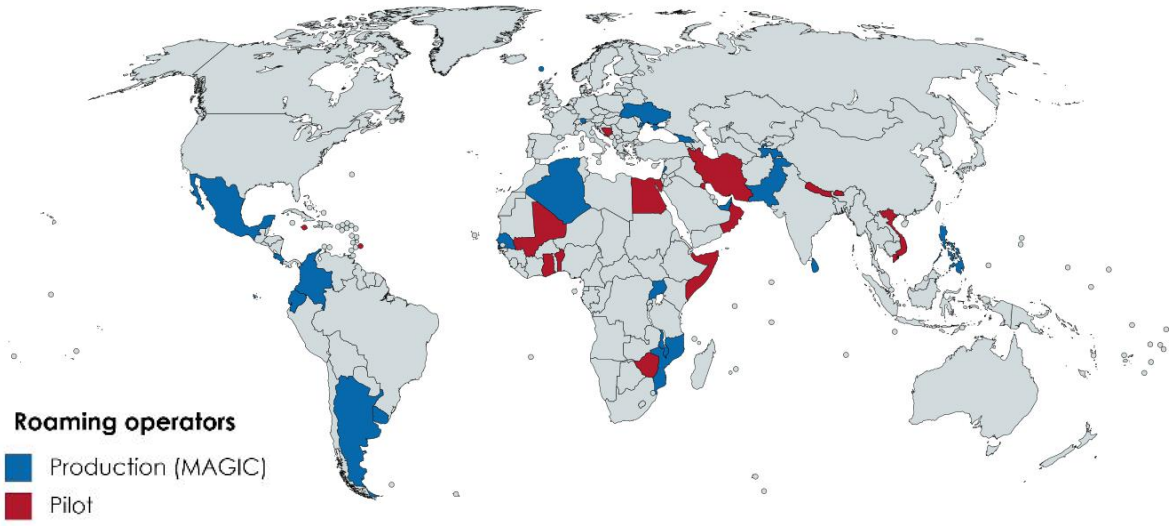
In June 2015, when MAGIC started, there were 74 countries eduroaming and 13.390 hotspots, a year later, in June 2016, MAGIC and worldwide eduroam efforts changed those numbers into 77 countries and 17.937 hotspots (Georgia, Ukraine and Uruguay, were added in the MAGIC scope). In April 2017, eduroam counted with 89 countries.

eduroam in Africa: Since MAGIC started the eduroam status in Africa is growing, today there are 6 production deployments - Kenya, Morocco, Uganda, South Africa, Zambia, Algeria - and 10 Pilot deployments - Zimbabwe, Somalia, Ghana, Malawi, Nigeria, Senegal, Egypt, Sudan, Tanzania, Tunisia.

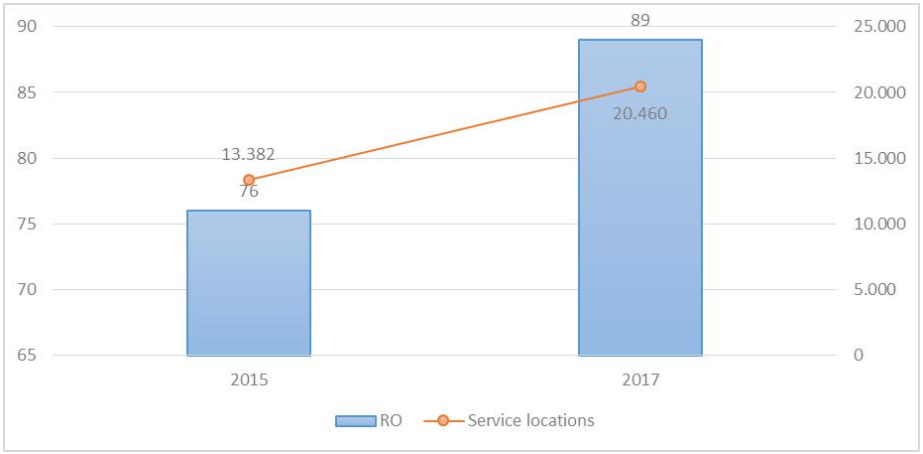
1. Bosnia & Herzegovina (Dec, 2015)
2. Vietnam (Sept 2015)
3. Bhutan (Jan, 2017)
4. Nepal (Jan, 2017)
5. Iran (Jan, 2016)
6. Oman (Apr, 2017)
7. Egypt (Feb, 2016)
8. Kuwait (Mar, 2017)
9. Jamaica (Nov, 2015)
10. Barbados (Apr, 2017)
11. Mali (Nov, 2016)
12. Ghana (Mar, 2016)
13. Somalia (Feb, 2016)
14. Zimbabwe (Jan, 2017)
15. Benin (Dec, 2016)
16. Mozambique (April, 2017)
17. Uruguay (Pilot in ELCIRA production in MAGIC)

New pilots and production territories

Below are marked the countries that are eduroaming worldwide:



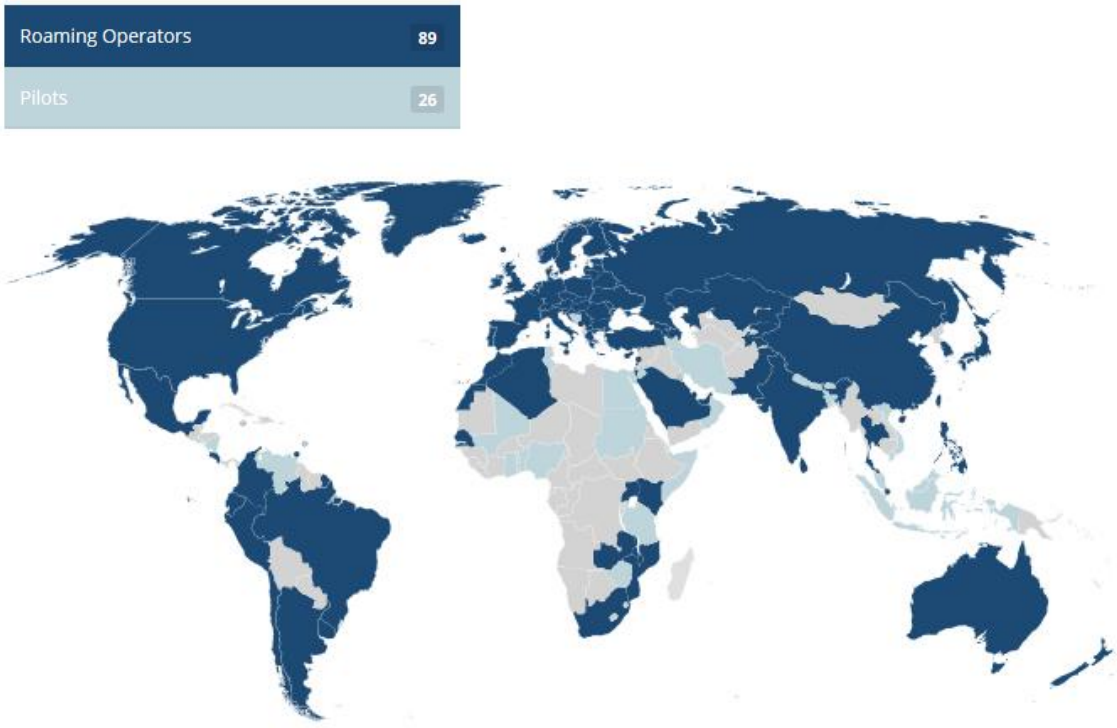
eduroam scenario, in numbers, before and after MAGIC Project



Just remembering that membership of the European Confederation is within the scope of this group and not reported to the GeGC (Global eduroam Governance Committee). Same with the Latin American Confederation (CLATe).

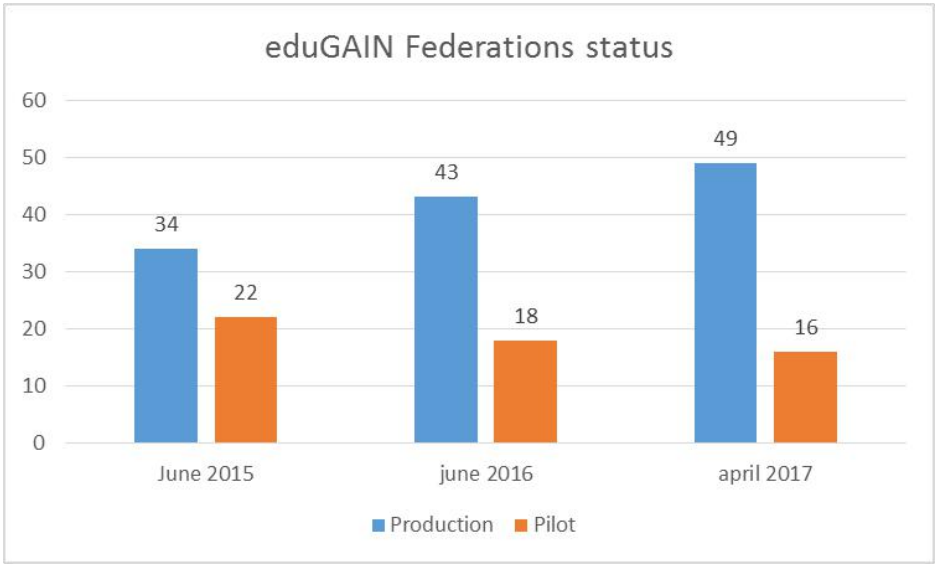
So, as result of MAGIC project, there are 15 new pilots and 22 new territories - all supported by MAGIC with 4 in Europe, 6 in CLATe and 3 in combination with the XeAP project within TEIN*CC/TEIN/APAN/AARNet.

The actual eduroam world map:



2.1.3. Expanding eduGAIN

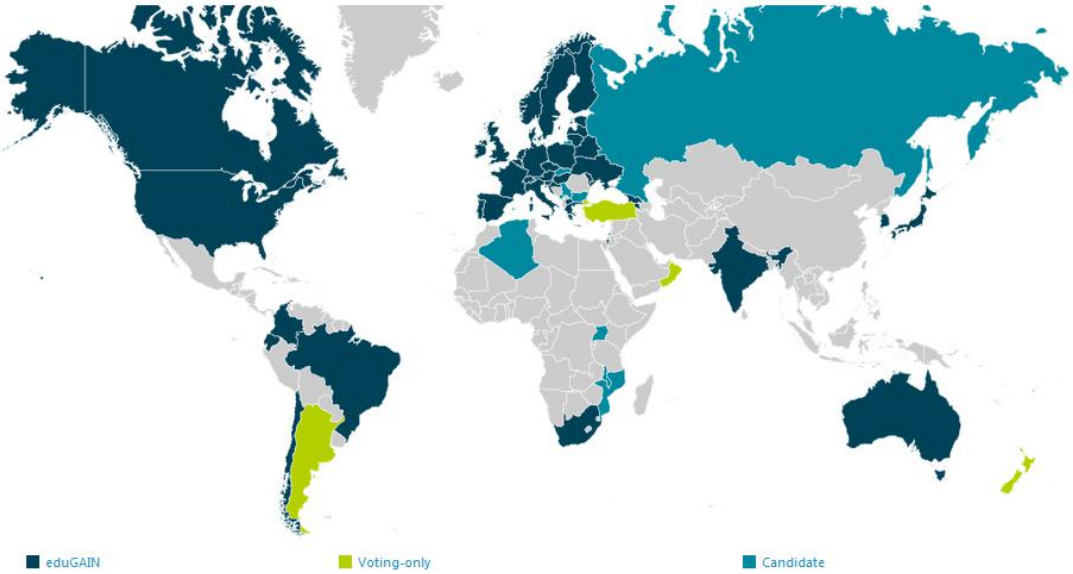
Regarding AAI, when MAGIC started there were 34 Federations in production and 22 in pilot in the world (June 2015), a year later (June 2016) the work carried out by MAGIC's WP2 has change these numbers into: 43 Federations in production and 18 in pilot (Zambia, Romania, Serbia, Macedonia, Bulgaria and so on). At the end of MAGIC project, eduGAIN had 49 federation in production with the eduGAIN Steering Group approval, to admit the South African Identity Federation (SAFIRE) as the first fully participating member from Africa.



This advance is result of many training sessions, speeches in conferences and in some regions even consulting. This shows that when a project is running with feasible goals it is possible to motivate partners to reach them. In the MAGIC project, although the goals were challengeable, the project team have motivated their partners in order to implement AAI, infrastructure and governance. This represents that specific project helps to create an effort to improve, in a very short time, the maturity level in some areas, in this case, Identity Management.

In Latin America, CUDI (Mexican NREN) keep pushing forward the AAI in Mexico. Currently the Mexican Identity Federation has a federated service implemented by CUDI. Work is also under way on the implementation of a service at the University of Colima, which is expected to be available by the end of December 2016. CUDI is also working on federating some of the applications found on its collaboration platform, which is also expected to be available by the end of 2016. Mexican NREN implemented a discovery service (DS) for the Mexican Federation of Identities, in which are added the CUDI´s IdP and the University of Colima.

Below are marked the countries in eduGAIN worldwide at: https://technical.edugain.org/status

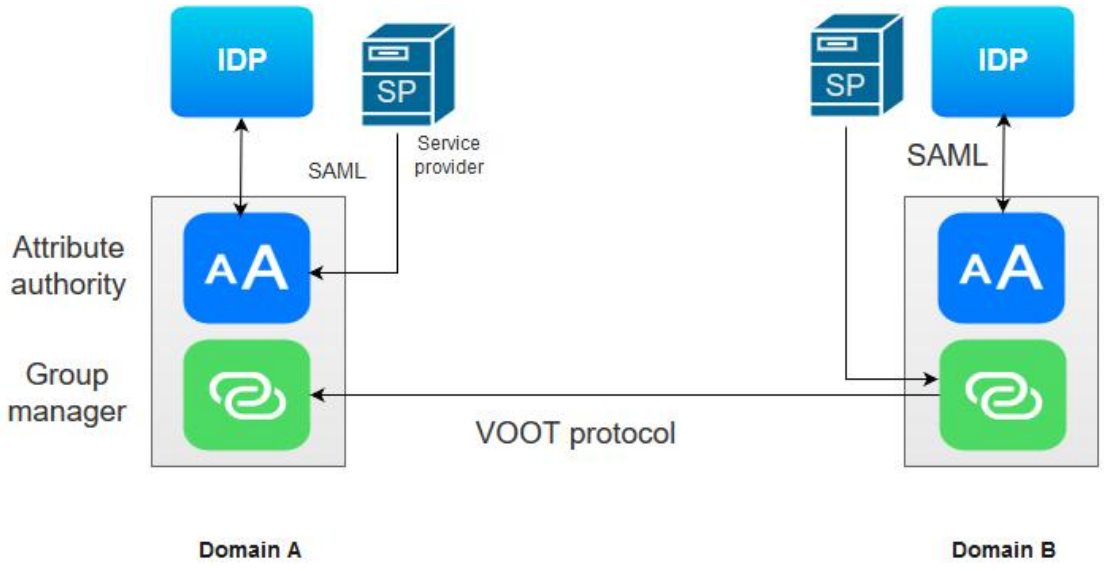


2.2. Cloud Provisioning and Groupware Standards

Within the first six months of the project, the MAGIC group carried out an study and assessment of the standards available for Group Management in Federations or groupware standards. The goal was to select one protocol and define the way that two domains can share end-users' group membership information for applications usage. The above means to have a way that applications became aware of the group an end-user belongs to, even if the information resides in another domain. In practical applications this can be used to authorize access or share resources in applications without the need for end-user to manually re-create groups. The study of the protocol options were consigned in the deliverable "D3.2 Assessment of the existing Group Management Standards and Value Services for Global Communities" completed by October 2015.

During the months of September 2015 to in January 2016, the MAGIC project team evaluated the groupware standard alternatives and the possible applications to implement a pilot case. The evaluated technologies included SCIM, HEXAA, PERUN, and VOOT for group managers, and Colaboratorio, Webconference (MCONF/Jitsi), Cloud storage, Zimbra, Wiki and eLarning platforms as possible services. The result from this evaluation found that the best alternative for group management was to use a combination of SAML attributes with the VOOT standard. The VOOT protocol was selected because it is simpler than SCIM, and the attributes are more adapted to NREN needs. The SAML part was accepted because it is the native protocol in the academic federations, and it has the concept of an Attribute Authority, which is a component that can store the group membership information and share it through a SAML protocol transaction. The VOOT acronym stands for Virtual Organisation Orthogonal Technology (VOOT), and is an extension of the SCIM standard to manage virtual organizations.

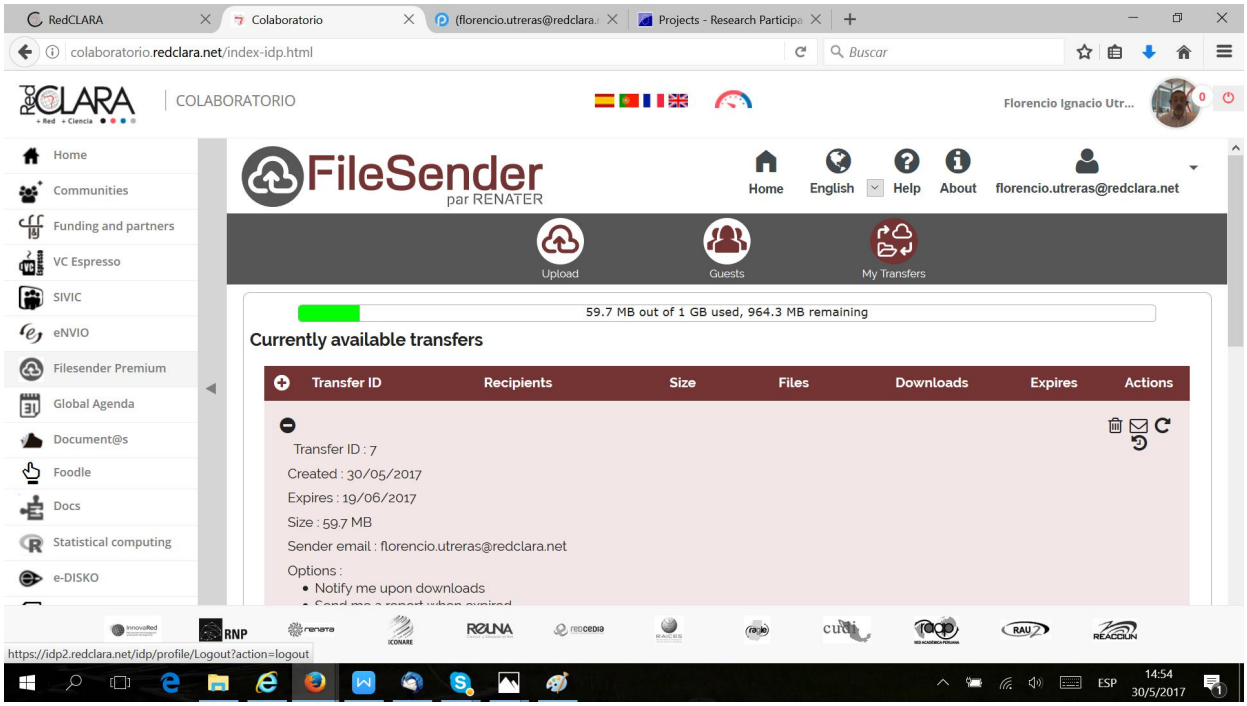
The work was concluded in January 2016 in a presence meeting at Vienna, in which the project work package members agreed the standards and the technical solution. The overall architecture of the selected solution was described in this picture:



In the services area, the MAGIC project selected the services: Dokuwiki, an online collaborative web edition tool also knows as wiki; Colaboratorio, the cloud services environment from Latin-America that has the function to create an administer communities for the end-user and connect applications to then; The FileSender Premiun, a big file transfer service used to send file that can't be transferred using regular email service; eduDRIVE (e-DISKO), a file storage service based on the open-source software called ownCloud and adapted to the academic federations by the Brazilian NREN RNP.

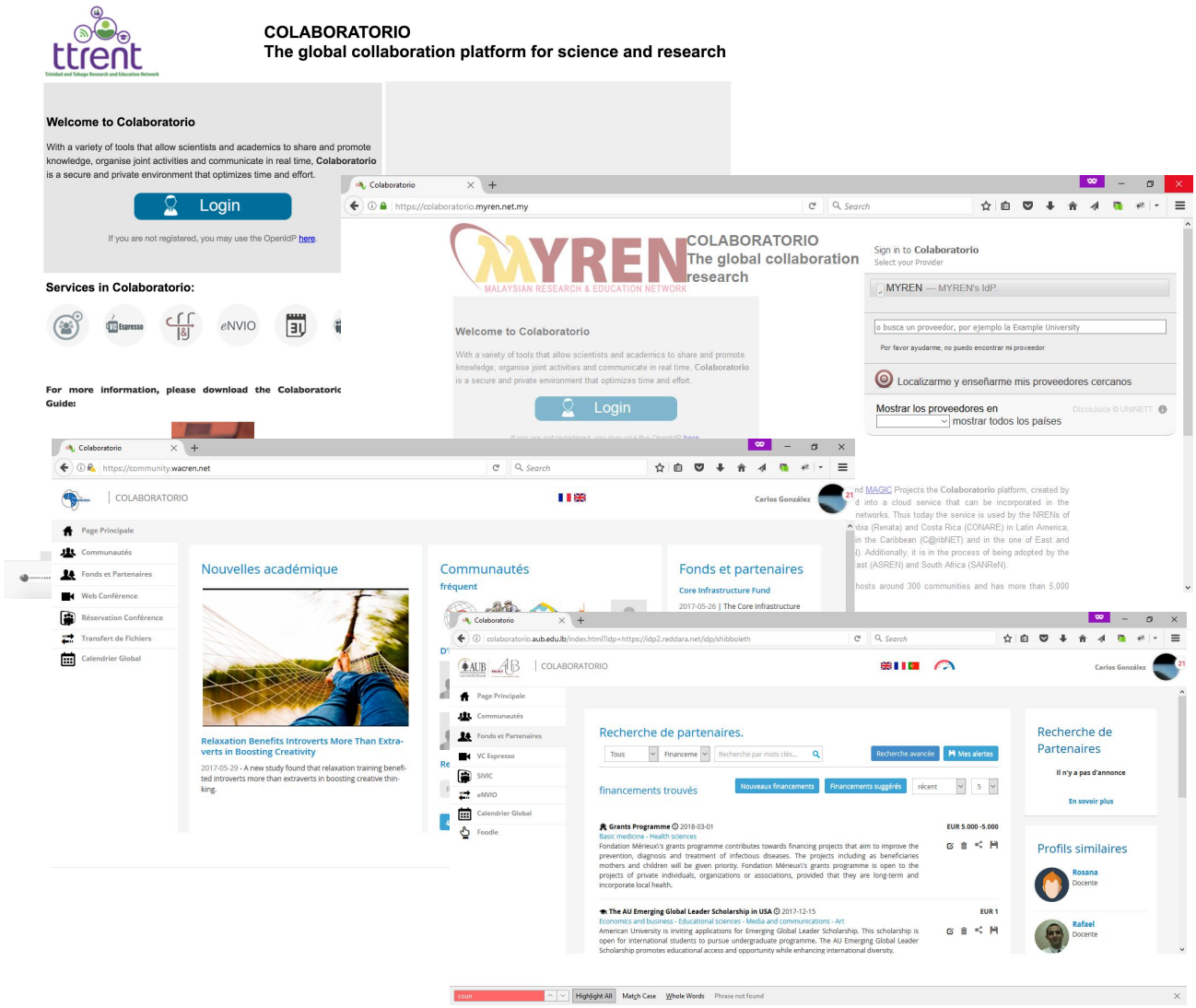
During the period between January and August 2016, the group worked in the first pilot implementations of the applications to test the VOOT and SAML standards. Due to the global nature of the MAGIC project, the providers were selected in different regions. Dokuwiki was provided by CESNET from the Czech Republic, Colaboratorio from Latin-America, and FileSender Premium from France. The goal was to probe that and integration like this could be

achieved even between different environments with its own technologies. The first pilot applications integration was completed. In the Dokuwiki integration, the end-user is allowed to create a web page that can be edited. The permissions to edit the file are assigned by Dokuwiki depending on the members of the end-users' group defined in Colaboratorio, and obtained through a VOOT protocol API call. The SIVIC reservations system in Colaboratorio, was adapted to permit an end-user to schedule a conference, and invite all the members of a group by selected the group name from a list. In a similar fashion, the FileSender premium was modified to allow sharing a file through a selection of a group. All the members in the group would see the shared link with the option to download it. The project show how in a global scale, the academic providers can integrate their platforms to authenticate, and authorize based on groups defined in other parts of the world.



RENATER's FileSender Premium integrated into the Colaboratorio

Another important result was the spread and deployment of the Colaboratorio instances in different parts of the world. The Colaboratorio service is a communities management environment that integrates applications for scientific and academic collaboration. Colaboratorio joins the community space with applications oriented to the community collaboration. For instance, a user from a community can start a web conference in the community room, and record the session. The recording file will be stored in the communities space in the system and accesible to the community members. In the MAGIC time-line, the first countries in adopting Colaboratorio were Nigeria (NgREN), Ecuador (CEDIA), and Costa Rica (CONARE) during the first six months of the project (up to September 2015). The work continued, and Colaboratorio was deployed in the NRENs from Morocco (MARWAN), Lebanon (AUB), and Mexico (CUDI) during 2016. Finally, during the first 5 months of 2017, the MAGIC group achieved the implementation of Colaboratorio in Trinidad and Tobago (TTRENT), and Malasya (MYREN). It is worth noticing that the Colaboratorio service integrates communities from all of these countries in a single environment. The above means that communities from a region like Latin-America, could be consulted from other like Asia, and users would be able to join any community without worrying about the community location. This increases the opportunity to find partners and formalize global research groups, partners or projects across regions. Nowadays, with the MAGIC advances, Colaboratorio is present in the regions of Latin-America, Asia, Middle-East and Africa.



Colaboratorio Deployments

In Collaboration with RENATER, the Colaboratorio service was translated to French language. Under progress work is done to achieve translation to Arab language and other Colaboratorio implementations, in Ethiopia, Kyrgyzstan, and Egypt. With the lunched collaboration, it is expected to translate Collaboratorio to Rusian language also.

The MAGIC effort do not stopped there, and the group look for other applications that could be in the pilot of group management. In this context, the applications eduDRIVE provided by RNP, and Etherpad from RENATER France were implemented between January and May 2017. The eduDRIVE service is a file storage service, similar to Dropbox, with the advance of being provided woth open-source software, and the academic community. The eduDRIVE was integrated to Colaboratorio with the name e-DISKO, and was modified with two main features: a) The user can share a file to a group by selecting the name, and b) the user can create a community store space in which only the members of the group or community can access the files. In the case of Etherpad, the implemented scenarios were similar, with the group's invitation, and the permission of edition a single pad by the members of a community.

In the last semester, the MAGIC project completed other important result that was the MAGIC Service Catalogue. The Catalogue is a tool used to list the cloud academic services provided by the NRENs or commercial providers, and their attributes list including privacy, service levels, policies, invoice and support among many others. The MAGIC team based on the GÉANT's Service Catalogue what will allow future integration to search and found applications in different parts of the world. The applications registered in the catalogue were 11:

MCONF/VCEspresso, Envio, Funding and Partners, FileSender Premium, SIVIC, Dokuwiki, Okeanos, Colaboratorio (Communities), e-DISKO, R, and Etherpad. GRNET has supported the launch of the WACREN Cloud Pilot - Open Call, available at http://wacren.net/en/news/wacren-cloud-pilot-open-call. The initial work and deployments were carried out in Nigeria, one of the WACREN member countries.

Finally, in the context of adding applications, and achieve synergies with other projects, the MAGIC team contacted the SciGaIA partners. They kindly provided te necessary for MAGIC to implement the "R" application in the Colaboratorio environment. Provided by the National High Computing Center (CENAT) from Costa Rica, the "R" is an statistical computing application that runs in big computing clusters, and allows and en-user to send tasks to the computing facilities at the CENAT.

2.3. Agreements for Real Time Collaboration

The agreement on real-time collaboration aimed to promote and achieve further adoption of the global real-time communities standards. The Global Real Time Communications (GRTC) working group defined the ENUM dialing standard as the way forward as dialing method to integrate video and voice networks. A unique dialing method is the way forward to get really transparent, easy and unified communications between multi-vendor video-conference systems. In this line of work, the NRENum.NET service was created in August 2006 as a global ENUM service provided by GÉANT. The NRENum.NET service allows to easy use of the Internet domain name services (DNS) for translating GDS standard numbers (+1232090399), like the ones used in the telephone network, to SIP URI addresses (sip:2983130@redclara.net) that can be used in video-conference and audio network connectivity.

In the first months of the project, up to July 2015, the MAGIC project signed an agreement with eduCONF, the real-time services project from GÉANT. The agreement setup the basic agreements in order to advance in the key elements for the real-time communications integration. The main elements were: a) To have NRENum.NET as the global standard for dialing services, b) To share and integrate video-conference resource directories using web services APIs, c) Promoting DNSsec to enhance security in the NRENum.NET infrastructures.
The NRENum.NET as a global standard agreed that the NRENum.NET is the way forward in the dialing infrastructures. This technology will replace the Global Dialing System (GDS) services based on complex gatekeeper infrastructures. This agreement was the base start in order to align forces, and follow common paths in order to achieve better standardization.

In July 2015, the MAGIC project carried out a workshop on NRENum.NET service implementation. The session took place in Viña del Mar (Chile), and have the 11 participants from five Latin American countries: Chile, Costa Rica, Ecuador, Mexico and Peru. The goal in this session was to prepare and engage the Latin-American NRENs in the NRENum.NET service, so they could start with the country delegation process. In the following months, the MAGIC obtained the returns from this session because we got the NRENum.NET implementation on 4 countries of the five that participated.

With the MAGIC project work, the NRENum.NET service got promotion and was spread in other parts of the world. The MAGIC group developed training material in the OpenEDX platform so technical representatives from different institutions can be trained on implementing the NRENum.NET services. The format of the training is like a Massive Open Online Course (MooC). It includes audio and video resources that explain how to deploy the DNS infrastructures, fill out the requirements and ask for the country prefix delegation to GÉANT. The NRENum.NET courses were developed in English and Spanish versions, and can be located through the OpenEDX platform from RedCLARA in the Colaboratorio environment.

The MAGIC project achieved in the first semester of 2016 that the following NRENs join to the NRENum.NET service: Ecuador (CEDIA), El Salvador (RAICES), Mexico (CUDI), Uruguay (RAU), Sri Lanka (LEARN) and Chile (REUNA). All of these countries completed the service implementation by setting up their Domain Name System (DNS) services, complete the registration steps to join the NRENum.NET service, and carry out the testing to enable it.

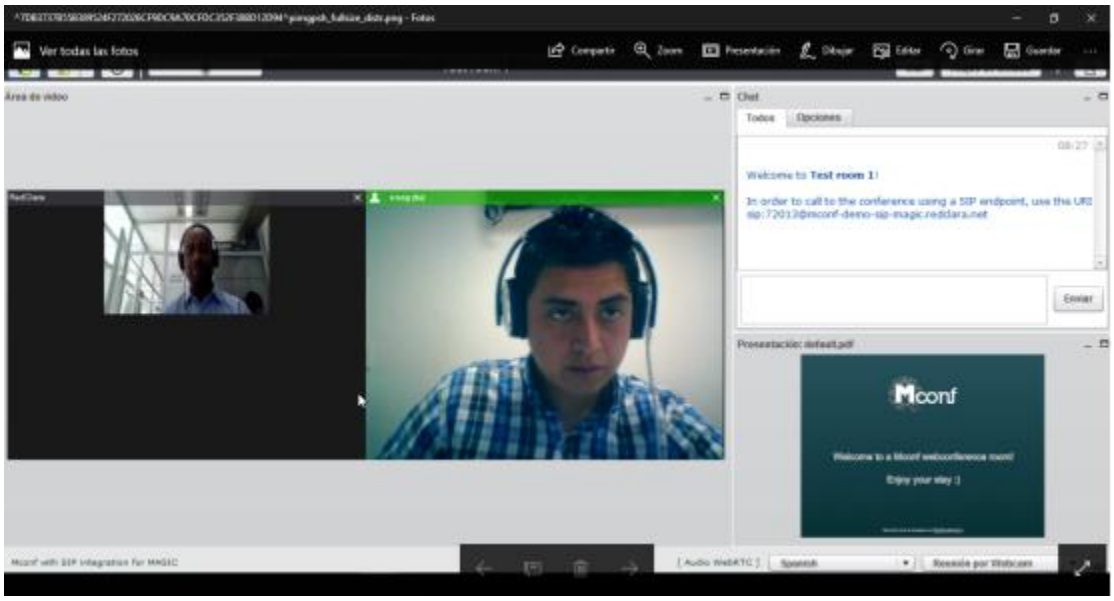
The MAGIC project also focus efforts on strength security on NRENum.NET infrastructures, by promoting the adoption of secure domain name services (DNSsec). The MAGIC provided training material, and achieved to secure the DNS zones of the NRENs. The developed material was developed and can be found in the MooC platform edx.redclara.net.

In January 2016, a representative from RedCLARA carried out an NRENUm.NET promotion session in the 41 Asia Pacific Advanced Network (APAN) Meeting. The event took place in Manila, Philipines, and counted with the participation of several Asian countries. In the MAGIC session participated members from TEIN*CC and the NRENs from Japan, South Corea, China and Malasya.

During the period up to September 2016, the MAGIC project promoted the implementation of the secure DNS or DNSsec, in the NRENs that already have the NRENum.NET service in place. The result was that secure DNS zones of the NRENum.NET service were implemented in Ecuador (CEDIA), El Salvador (RAICES), Perú (RAAP), Colombia (RENATA), and Czech Republic (CESNET). The mentioned NRENs deployed their DNSsec systems, and provided the proper encryption certificates to be connected with the NRENUM.NET root tree.

The MAGIC team continued the work complete the scope, and have 3 additional countries in other regions that implement NRENum.NET service. At the end of the project, the achievement was of 9 new NRENum.NET members globally divided in 5 in Latin-America, 2 in Asia Pacific/Central Asia, 1 in Europe, and 1 in Middle-East. The following NRENs have joined the NRENum.NET service: Ecuador (CEDIA), El Salvador (RAICES), Mexico (CUDI), Chile (REUNA), and Uruguay (RAU), Sri Lanka (Asia/Pacific), Lebanon (Middle East), Czech Republic (Europe), and Kazakhstan (Central Asia). Even as the goal was to have three members in the Asia-Pacific region, the MAGIC team successfully accomplished to add Central-Asia and Middle-East as other implementation regions.

The project developed between January and Abril 2017, the integration of the web-conference system MCONF to SIP video platforms. This integration allows dialing from a running web-conference in MCONF to any SIP capable device, like a hardware based video-conference terminal. The features developed involved the bi-directional transmission of audio and video, having the speaking person at the hardware SIP device video in the Webconference (speaker switching mode), the capacity to see multiple web-conference participants at the SIP end-point, sharing the content from the SIP endpoint to the web-conference, sharing the content from the web-conference to the SIP end-point, dialing from the web-conference using DTMF tones, and the testing with an ENUM dialing based network. From the end-users perspective the usability of the system will be improved, and the barrier of the need of having all users in the same conference system will be removed. The new system is expected to benefit thousands of users of the MCONF system, and of course, the MAGIC partners that will be able to implement this system without cost.



Webconference and H.323 rooms interacting through the Gateway developed by MAGIC

As support of the previous development, the MAGIC team developed training material for the implementation of the unified network based in MCONF. The training explains the architecture of the system, its components and the resources that need to be used in order to achieve a final implementation. Since the month of May 2017, this material is open for acess in the Colaboratorio's OpenEDX platform.

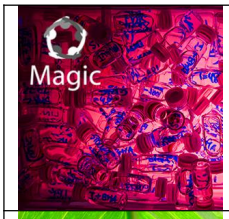
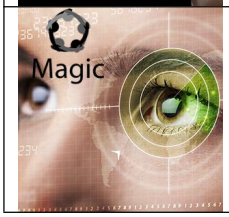
2.4. Global Science Communities

a) Global Science Communities

To establish the Global Science Communities the team took, as input, the topics identified by the ELCIRA project and then cross checked the information with the needs and interests identified by the participating regional organisations. The priority areas are: e-Health, Environment and Biodiversity.

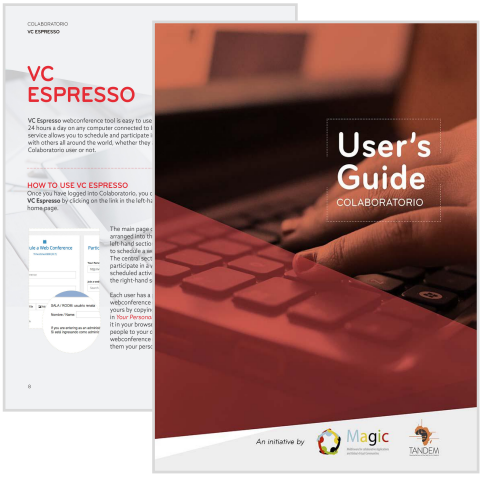
In addition, the project team agreed to include Remote Instrumentation as requested by an existing group in Mexico because it was a community initiated priority topic and because the group had shown interest, enthusiasm and willingness to enhance the work developed earlier by their members as well as to have the opportunity to learn and share knowledge with peers from around the world.

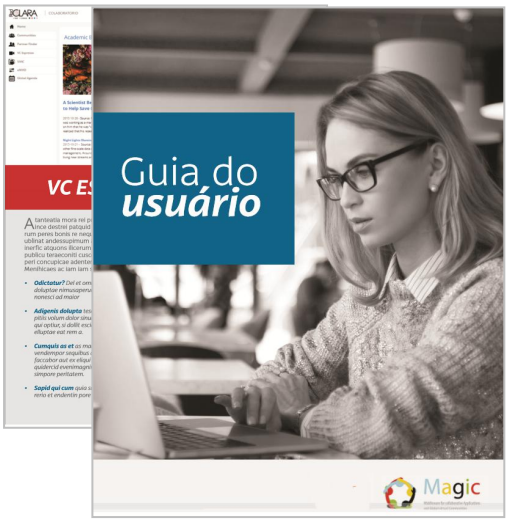
The project team the proceeded and identified people from within the selected priority areas to act as community champions – to provide guidance and direction in the field. The table below shows the four communities established, their respective champions and the membership as at the end of the project.

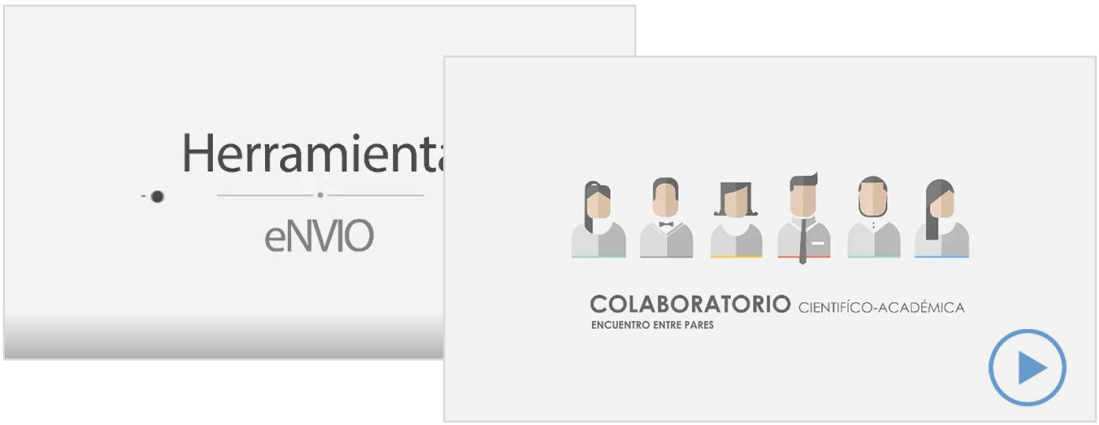
	**Global Science Community on e-Health** Champion: Prof. Luiz Ary Messina, National Coordinator of RUTE (Rede Universitária de Telemedicina), Brazil. Members 2017: 77
	**Global Science Community on Biodiversity** Champion: Prof. José Ramón Martínez, Professor and researcher of the Universidad Autònoma de Santo Domingo (UASD), Dominican Republic. Members 2017: 35
	**Global Science Community on Environment** Champion: Dr David C. Smith, Coordinator Institute for Sustainable Development, The UWI,University of the West Indies, Jamaica. Members 2017: 32
	**Global Science Community on Remote Instrumentation** Champion: Prof. Patricia Santiago, Associate Professor Physics Institute, Universidad Autònoma de México (UNAM), Mexico Members 2017: 17

The activities of the GSCs were focused on addressing emerging and trending topics in the particular fields of the communities. The events both virtual and face to face and each had a different format, objectives and results. In total, 24 events were held during the life time of the project, 16 of which were virtual, whereas the rest were face to face, held back to back with major international events. Four of virtual events were related to the H2020 Programme and were aimed at promoting the funding programme and its upcoming calls, requirements and procedures on how to submit proposals. All virtual events were recorded and the video recordings and slides are available for consultation from the event specific websites.

Additionally, activities include training on the use of collaborative tools with both community members and participants in the conference and informative days in order to enhance the use of the collaborative platform and strength the appropriation of the platform. This activity also fostered the work developed by WP3 related to the deployment of local versions of Colaboratorio, which is the case of the Colaboratorio in Lebanon and Morocco. Training materials were developed in order to offer material that could be disseminated among the research communities and their peers. A PDF user guide and training videos in different languages are available at: http://magic-project.eu/index.php/training







List of WP5 Virtual and Face-to-Face Activities

1. June 17-24, 2015
   Second Virtual Cycle for Latin America and the Caribbean about Horizon 2020
   https://eventos.redclara.net/indico/event/495/overview

2. December 15, 2015
   Politics and models of implementation of Open Access in the world took place
   https://eventos.redclara.net/indico/event/623/

3. February 2, 2016
   Global Science Community on e-Health Opening Conference
   https://eventos.redclara.net/indico/event/634/

4. February 11, 2016
   Global Science Community on Biodiversity Opening Conference
   https://eventos.redclara.net/indico/event/639/

5. February 18, 2016
   Global Science Community on Environment Opening Conference
   https://eventos.redclara.net/indico/event/640/

6. February 25, 2016
   Global Science Community on Remote Instrumentation Opening Conference
   https://eventos.redclara.net/indico/event/641/

7. May 5, 2016
   Global Science Community on Biodiversity: Experience from around the World

https://eventos.redclara.net/indico/event/661/overview

8. May 11-13, 2016
   IST-Africa 2016 Conference , Durban, South Africa
   http://www.ist-africa.org/conference2016/

9. June 30, 2016
   Webinar on Science Communication
   https://eventos.redclara.net/indico/event/719/

10. July 8, 2016
    Info Day, Horizon 2020 - 'Health, demographic change and wellbeing'
    http://ec.europa.eu/research/index.cfm?pg=events&eventcode=314FDE2A-B120-5C11-0BC24DEE2CA8115E

11. September 6, 2016
    Global e-Health Grand Round: eHealth (Health informatics, Telemedicine and Telehealth)
    https://eventos.redclara.net/indico/event/713/page/5

12. September 13-15, 2016
    TICAL 2016, Buenos Aires Argentina
    http://tical2016.redclara.net/

13. September 13, 2016
    Global e-Health Grand Round: Cardiology I
    https://eventos.redclara.net/indico/event/713/page/4

14. September 20, 2016
    Global e-Health Grand Round: eHealth (Health informatics, Telemedicine and Telehealth)
    https://eventos.redclara.net/indico/event/713/page/6

15. September 27, 2016
    Global e-Health Grand Round: Child and Adolescent Health
    https://eventos.redclara.net/indico/event/713/page/7

16. October 4, 2016
    Global e-Health Grand Round: eHealth (Health informatics, Telemedicine and Telehealth)
    https://eventos.redclara.net/indico/event/713/page/8

17. October 11, 2016
    Global e-Health Grand Round: Cardiology II
    https://eventos.redclara.net/indico/event/713/page/9

18. November 2, 2016
    Workshop on End User Engagement at UbuntuNet-Connect 2016 Conference Entebbe, Uganda
    https://events.ubuntunet.net/indico/event/1/

19. December 1, 2016
    Biodiversity Session at e-AGE 2016
    Beirut, Lebanon
    http://asrenorg.net/eage2016/

20. December 14, 2016
    Horizon 2020 Info Day on ICT-39 Call
    https://events.ubuntunet.net/indico/event/9

21. March 28-29, 2017
    e-Infrastructures for Worldwide Collaboration: assessing the present and road mapping the future
    Abidjan, Ivory Coast
    https://indico.wacren.net/event/51/

22. March 27-28, 2017
    Supporting Campus Libraries to embed NREN Services and e-Infrastructure - WACREN 2017 conference - Catalysing Quality Higher Education and Research
    Anidjan, Ivory Coast
    https://indico.wacren.net/event/50/

23. April 10-12, 2017
    Enviro-health - Caribbean MAGIC: Enhancing Collaboration in Research and Education
    https://eventos.redclara.net/indico/event/794/overview

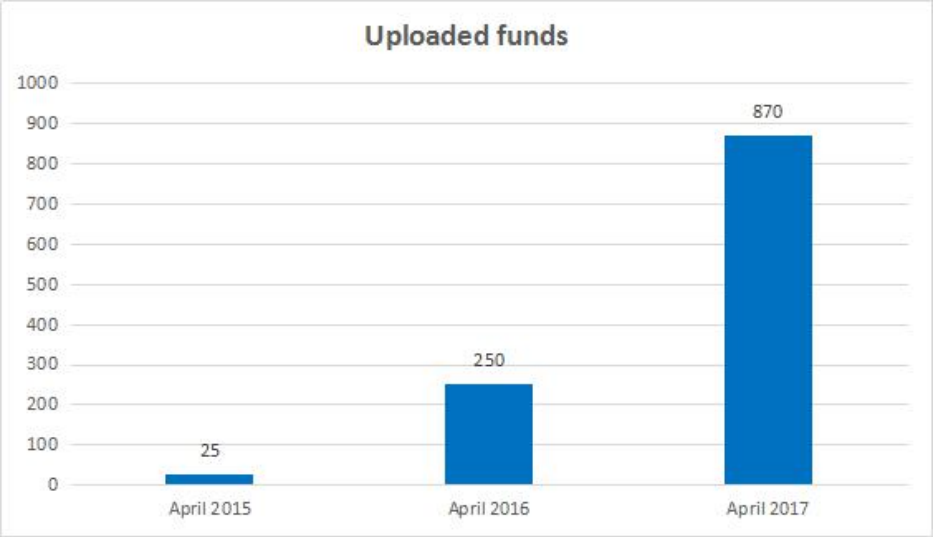
24. April 25-26, 2017
    Central Asia Research and Education Network (CAREN) – 2nd CAREN Conference
    https://icaren.org/2nd-caren-regional-networking-conference/

A survey of MAGIC virtual events was launched with the purpose of obtaining information form the communities on the challenges of working collaboratively. The survey was open to members of the GSCs and also the wider community. The survey also aimed at collecting suggestions on improving the virtual collaboration experience.

b) Information System on Worldwide Funding Opportunities

The Funding Opportunities Database and Partner Search application developed by the ELCIRA Project was extended during the lifetime of MAGIC and has become a trusted platform providing valuable funding and partner information for the global communities and other worldwide research groups. The activities related to the Funding and Partners service included improving the feeding and delivery processes of information to the users.

The modification in the system included a reviewing the format to feed the system and the information display for users. This modification allows to increase the number of sources of calls and to display accurate and useful information in every search.

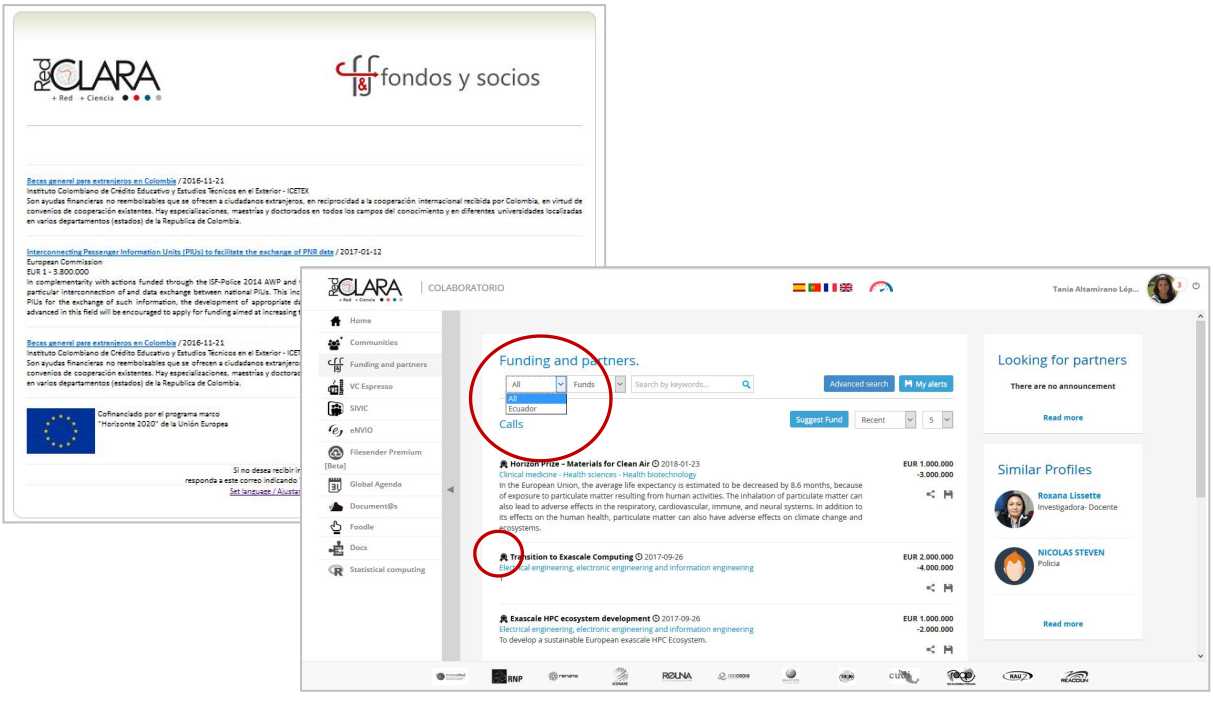


The work continued with the implementation of alerts by email, which are sent to all registered users in the Colaboratorio. The alerts are filtered and sent based on the interests of the users in accordance with the user's profile.

A pilot for the Funding and Partner Application was done with the National Research and Education Network of Ecuador, CEDIA. The pilot involves a local platform where the NREN is able to customise the system and feed it with their country specific calls for the domestic research and education community. This enriched (in terms of content, browse and design) system is deployed as an additional feature in Colaboratorio that could be available for other institutions in the future. This task held along with WP3, included a process of identification of needs, development of the pilot and the presentation of the results to the NREN.

The result is a new option integrated on the main menu of the tool, where users from Ecuador have the opportunity to do a specific search for calls dedicated to their country facilitating the process to identify open calls and partners around the world.

Also the Advanced search option was updated to include more Boolean operators (AND - OR fields) for a more accurate result. In terms of design it was included on the information presented icons that help the user to identify in an easier and more friendly way the information presented. The icons are dedicated to: scholarships, awards and funding.



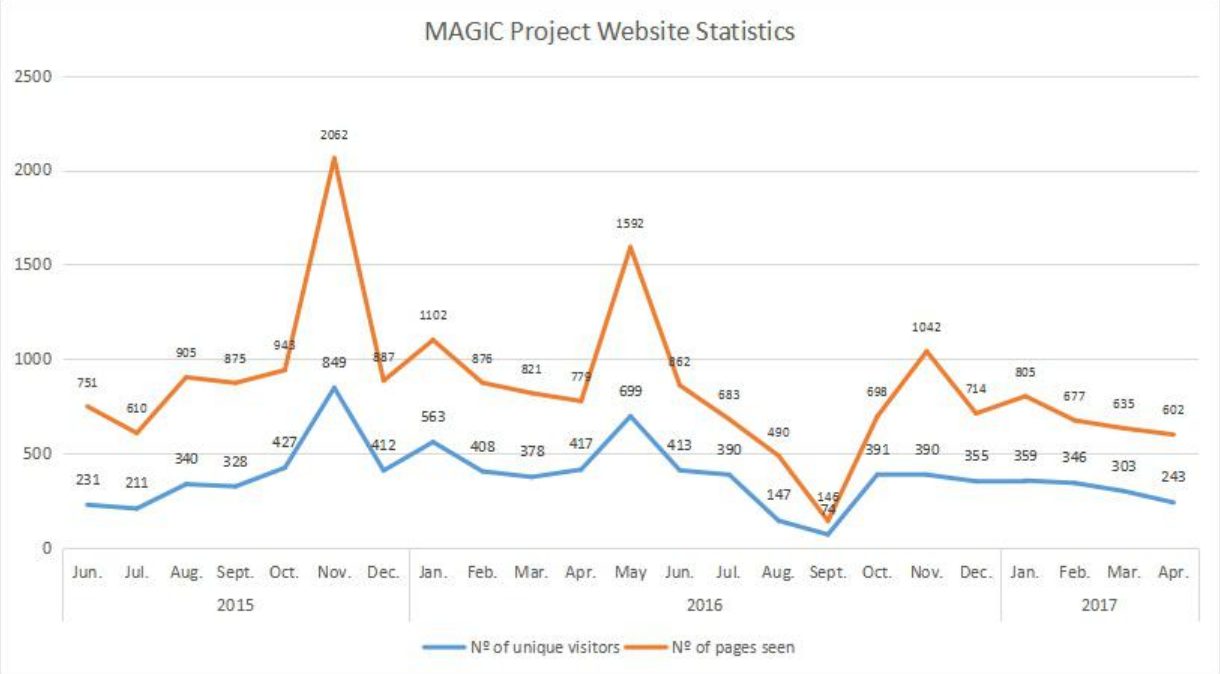
Funding&Partners Application for fund search Worldwide

2.5. Dissemination and Training

The activities carried out by WP6 were divided in 5 different items, each one of them composed by a number of different actions and activities. The results of them are briefly exposed in the following paragraphs.
Promotion, awareness-raising and positioning:

- Planning of dissemination and co-ordination of training activities - Results and Exploitation:
  - D6.1 First Dissemination and Training Plan Baseline
  - The MAGIC Brand: Logo, presentation, deliverables and documents templates, vinyl banners were done and all the were templates published and available for their download from the website
- On-line presence: MAGIC's on-line presence consists in its Intranet, which is based in Colaboratorio, its Website, Facebook and Twitter social interphases.
  - Regarding its Intranet, has been extensively used by the project partners for all its internal communications and for the different WP interaction.
  - Creation and management of the project's website: depicting information related to the project development, advances, achievements, training activities, etc., the website was on-line on 8th June 2015. After the first review (July 2016), and following the reviewers recommendations the navigation map was changed (August 2016) in order to better show to the website users and visitors, how to get the project's benefits, the changes didn't modify the site statistics, which is not surprising given the project's focus which is not in the website use but in the services and applications, the site it is just another entrance to that and the first visible face of the project. The website general statistics are the following ones:

MAGIC project Website	2015							2016												2017			
	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Nº of unique visitors	231	211	340	328	427	849	412	563	408	378	417	699	413	390	147	74	391	390	355	359	346	303	243
Nº of pages seen	751	610	905	875	943	2062	887	1102	876	821	779	1592	862	683	490	146	698	1042	714	805	677	635	602



- Creation and management of the project's social media channels: Most of the interactions through these two channels are with worldwide NRENs and researchers.
  - Facebook: "Magic a global connection", the project's presence on Fb, went live on-line on 25 June 2015, has 198 likes by May 29, 2017.
  - Twitter: @MACIC_our_voice, the project's presence on , was on-line on 5 June 2015, has 142 followersby May 29, 2017.
- Promotional Videos: 16 promotional videos where scientists and members of the project give their testimonials about the importance of MAGIC for them, were published in the website and profusely disseminated through the social media channels.
- Internal communications and dissemination of project's advancements:

- Colaboratorio: MAGIC's intranet was done in this collaborative platform and it has been widely used by the project partners.
- Newsletters: under the name of "MAGIC TIME" five editions of the newsletter were delivered to all the project members, three in 2015 and 2 in 2016 (January and May), all of them can be checked out at http://magic-project.eu/index.php/2015-05-28-22-53-32/newsletter. After the last edition it was defined that the MAGIC bulletin was not really efficient to communicate and help to disseminate the news produced by the project, the strategy changed and every time WP6 needed to share an information and/or invitation made by other WP, a news was written in English, then published in the website, and translated into Spanish and Portuguese in a document format, and shared with all the project members together with a picture asking them to share the information with their local communities. This new way of functioning worked fine, the project partners did a good job disseminating the project; most of their publications were reported in WP6 deliverables.

- Production of online and physical dissemination material tailored to different audiences/users and project needs: within the project lifetime the following pieces were done and delivered, tayloring different audiences:
  - Printed material: Within the project lifetime we did and delivered at relevant international eventos, the following pieces:
  - 1st project brochure:
    - Printed in:
      - Spanish (1000 copies)
      - English (1500 copies)
      - Portuguese (1000 copies)
    - Published in all these languages plus French in the website.
    - Global Science Communities Flyers (400 copies)
    - Global Science Communities invitations (150 copies)
    - Global Science Communities 2nd Flyer (150 copies)
    - 2nd project brochure in English (500 copies)
  - Branded material (give-away goodies): Within the project lifetime we did and delivered at relevant international events, the following pieces:
    - 400 Umbrellas
    - 1000 Speakears for mobile devices
    - 1500 Vintage puzzles
    - 200 Pendrive-key holders
    - 300 Pendrives
    - 200 Power banks
    - 200 Headphones

    All these pieces were distributed in the following events, the numbers showed in the table are of the pieces delivered in each one of those events.

Pieces	TICAL2015	RNP2015 Forum	ICT2015	Ubuntu Net Connect 2015	e-AGE 2015	TNC16	TICAL2016	IST-Africa 2016	Ubuntu Net Connect 2016	e-AGE 2016	WACREN Conference	Caribbean MAGIC
Printed material												
1st MAGIC Brochure in Spanish	600	50	100			100	150					
1st MAGIC Brochure in Portuguese		300	130	200				200			170	
1st MAGIC Brochure in English		100	500	200	300	300			100			
Global Science Communities Flyer							200	200				
Global Science Communities printed invitations								150				
Global Science Communities 2nd Flyer										150		
2nd MAGIC Brochure in English							200	100	100	100		
Global Science Communities Brochure												200
Branded material												
Umbrellas	257	60							33	50		
Speakers			500	250								
Puzzles			700	300								
Pendrives-key holders					200							
Pendrives								300				
Power banks										200		
Headphones												200

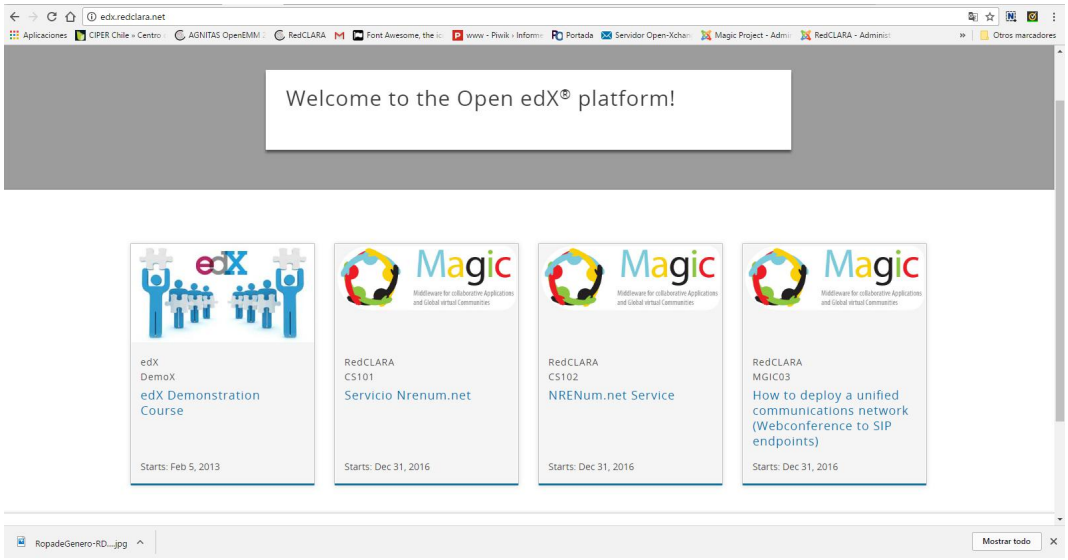
- Participation in specific international events to promote the advances and successes of the project. MAGIC

participated at:

- 6-8 May 2015, Lilongwe, Malawi: IST-Africa 2015; RedCLARA representatives.
- 11-12 June 2015, Paris, France: MAGIC Kick off.
- 15-18 June 2015, Porto, Portugal: TNC2015 on GÉANT stand,GÉANT representatives.
- 6-8 July 2015, Viña del Mar, Chile: TICAL2015. Exhibition booth.
- 25-27 August 2015, Brasilia, Brazil: RNP2015 Forum. Exhibition booth with RNP.
- 20-22 October 2015, Lisbon, Portugal: ICT2015. Joint exhibition booth with TANDEM and Sci-GaIA + Networking Session.
- 16-20 November 2015, Maputo, Mozambique: Sci-GaIA Workshop on Open Science and UbuntuNet Connect 2015 Conference. Representatives from RedCLARA, RNP, GRnet, CKLN. Presentations.
- 7-8 December 2015, Casablanca, Morroco: e-AGE 2015. Exhibition booth and presentations. Representatives from RedCLARA, GRnet, GÉANT, TEIN and ASREN.
- 24-29 January, Manila, The Philippines: APAN41. Representative from RedCLARA. Presentation.
- 15 March 2015, Dakar, Senegal, second joint Sci-GaIA - TANDEM - MAGIC Workshop on Promoting Open Science in Africa (in the framework of the WACREN Conference 2016). Representatives from RedCLARA, GRNet, UbuntuNet Alliance and WACREN. Presentations.
- 11-13 May 2016, Durban, South Africa: IST-Africa 2016. Representatives from UbuntuNet Alliance, CKLN and RedCLARA. WP5 session “Global Science Communities - That’s MAGIC!”.
- 2-16 June 2016, Prague, Czech Republic: TNC16. Two slots of participation in the GÉANT dissemination booth + a full session together with TANDEM and SciGAia: “MAGIC + Sci-GaIA + TANDEM: Towards Sustainable e-Infrastructures”.
- 13-15 September 2016, Buenos Aires, Argentina: TICAL2016. Promotion stand.
- 30 October 2016 to 4 November, Kampala, Uganda, UbuntuNet Connect 2016: Workshop and presentations.
- 1-2 December 2016, Beirut, Lebanon: e-AGE 2016. Global Science Community Session on Biodiversity.
- 25-26 April 2017, Bishkek, Kyrgyzstan: CAREN Regional conference. Presentation
- March 30-31 2017, Abidjan, Ivory Coast: WACREN2017. Presentations and panel sessions.

Training:

- All the user communities activities and training face-to-face sessions and on line training material published, recieved the support of WP6 by means of dissemination support, and coordination of some issues related to the training needs. As those events where listed by the other WP, there is no need to repeat the list here.
- The MOOC Platform OedX that is provided as a cloud service by France Numérique, a partner of RENATER, is the platform in which two courses (one of them in two languages) have been done: 1) Servicio NRENum.net (course 1 in Spanish), NRENum.net Service (the same in English); 2) How to deploy a unified communications network (Webconference to SIP endpoints). Under the http://edx.redclara.net/ URL, these courses are available through the MAGIC Project website, under the Training tab.



The MAGIC MOOC Platform

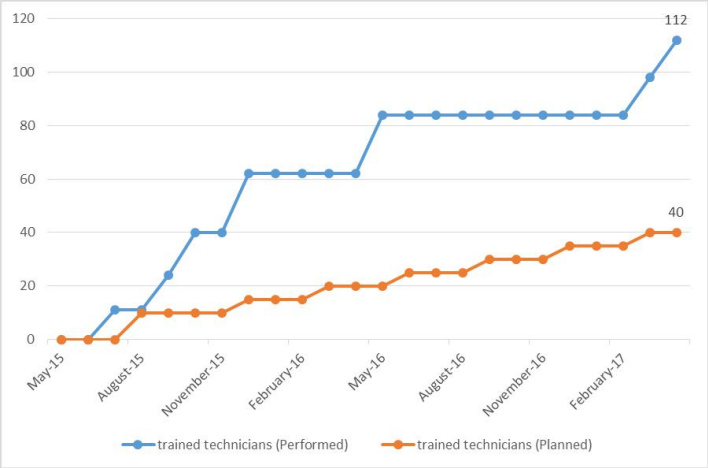
3. Socio-economic Impact of the Project

a) Adoption of European infrastructure standards eduroam and eduGAIN in several developing countries. Globalisation of these standards.

Following the strategy of extensive training carried out at regional meetings followed up afterwards with training material on an e-learning platform, and the availability of a service platform to lower the barrier of hardware and software deployment plus the leadership of a local NREN in each region, the project has created the basis for a deployment of eduroam and eduGAIN in each region involved in the project.

Indicator (DoA): *Number of trained technicians in AAI from Africa, the Arab Countries, the Caribbean, Central Asia and Asia Pacific is over 30.*

Advances in the Indicator:



1) Mobility Federated Services and Nrenum.net, Venue: Viña del Mar, Chile
Attendees: 11 participants from five Latin American countries: Chile, Costa Rica, Ecuador, Mexico and Peru.

2) Federated Access and eduroam workshop in the Caribbean, Venue: West Indies, Jamaica
Attendees: 16 participants from 11 institutions.

3) Workshop on Joining eduroam and Identity Federation, Venue: Amman, Jordan
Attendees: 13 participants representing five Arab countries

4) Federated Applications (FedApps) Training session, Venue: Dar es Salaam
Attendees: 22 engineers from 14 NRENs.

5) Workshop on Identity Federation Infrastructure, Venue: Beirut, Lebanon.
Attendees: 22 participants from 9 NRENs

6) eduroam workshop in Kyrgyzstan, Venue: Bishkek, Kyrgyz Republic
Attendees: 14 participants from 12 institutions of Kyrgyzstan.

7) eduroam workshop in Tajikistan, Venue: Dushanbe, Tajikistan
Attendees: 14 participants from 13 institutions of Tajikistan.

Total trained engineers during the project *112*

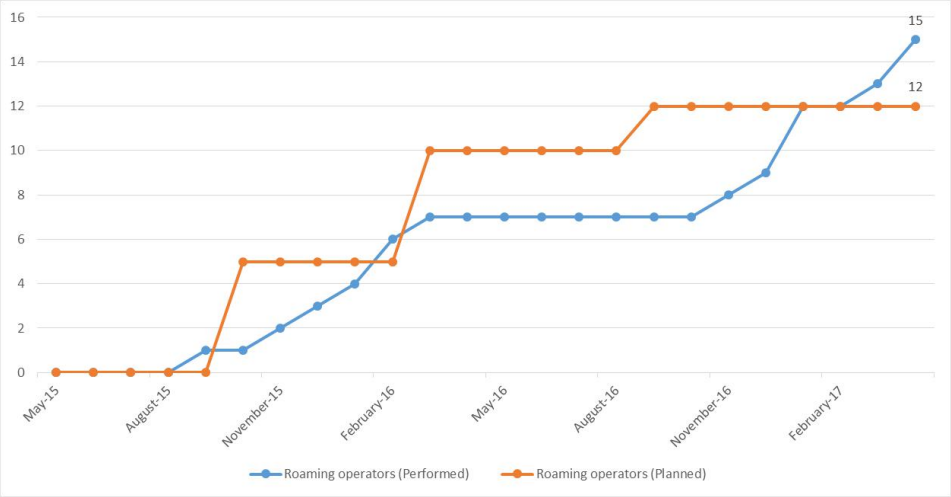
b) Coordination with several continents in basic infrastructure deployment

The project included the collaboration of NRENs and Regional Networks in The Arab Countries, South and East Africa, Weast and Central Africa, Asia, the Caribbean, Europe and Latin America on the development of agreements,

human capacities and a network of collaborators that will foster the deployment of basic infrastructure needed for secure, authenticated access to collaboration tools as well as a means to application-sharing across the NREN world with the potential to include the commercial market serving NRENs and the university/research community. This basic infrastructure is eduroam, eduGAIN and the proposed agreement for the interoperable groupware management system.

Indicators: *12 countries entering eduroam thanks to MAGIC*
4 new pilot federations

Advances in the Indicator:

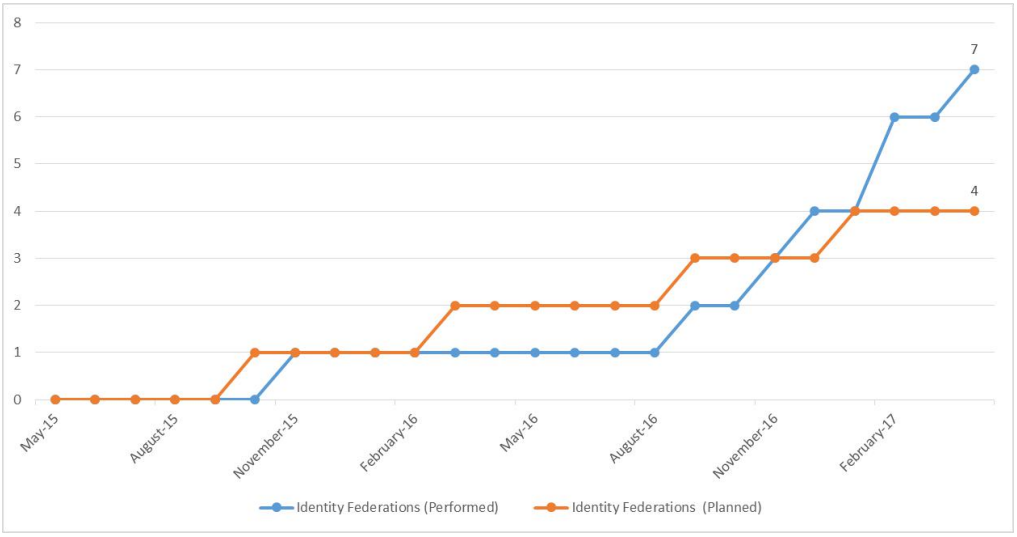


Number of countries already active in eduroam having become part of the eduroam federation: 15

* *.vn Viet Nam - September 2015*
* *.jm Jamaica - Nov 2015*
* *.ba Bosnia & Herzegovina - December 2015*
* *.ir Iran - Jan 2016*
* *.eg Egypt - Feb 2016*
* *.so Somalia - Feb 2016*
* *.gh Ghana - Mar 2016*
* *.ml Mali - Nov 2016*
* *.bj Benin - Dec 2016*
* *.zw Zimbabwe - Jan 2017*
* *.bt Bhutan - Jan 2017*
* *.np Nepal - Jan 2017*
* *.kw Kuwait - Mar 2017*
* *.om Oman - April 2017*
* *.bb Barbados - April 2017*

Pilot federations already created and in process of becoming eduGAIN members: 7

* *Oman - Oman KID (Nov 2015 - joined as eduGAIN member)*
* *Uganda - RIF - applied to join eduGAIN - 6 September 2016*
* *Korea - KAFE (Nov 2016 - joined as eduGAIN member)*
* *Singapore - SGAF - applied to join eduGAIN - 14 Dec 2016*
* *India - INFED (Feb 2017 - joined as eduGAIN member)*
* *South Africa - SAFIRE (Feb 2017 - joined as eduGAIN member)*
* *Mozambique - CAFMoz - applied to join eduGAIN - April 2017*



Work in progress towards creating a Federation: 5

Jordan
Lebanon
ASREN
Mexico
WACREN eduID

c) Facilitation of standards to develop a global interoperable market of collaboration services for academia and other interest groups. Potential to ease the creation of a global market.

The project has included several world regions in the discussion for Open Standards in Real Time Collaboration and Service Delivery, including Groupware Management. This is easing the way for a global adoption of these standards which will help the creation of a global market for collaborative and other applications, be these provided by one NREN, or by external providers, to the academic community.

Indicators: *3 world regions incorporated in the pilot federated groupware service*

Advances in the Indicator:

The following 3 regions have deployed a federated groupware service:

Europe: CESNET (Czeck Republic), RENATER (France)
Latin-America: RedCLARA (Latin-America)
Africa: WACREN (West and Central African)
Moreover, the Colaboratorio platform already deployed in Malaysia, Kyrghistan and Lebanon, among others represents the seed for the integration of those regions into de federated groupware services.

d) Concertation in the development of worldwide services

The project has worked jointly with the GÉANT project as well as the GSD and GRTC groups of the Global CEO Forum in order to promote and pilot the agreements reached for Real Time Collaboration standards as well as application sharing and service delivery. This has made possible to include in these agreements several world regions that have been absent from these forums, such as Africa, Central Asia and the Caribbean

Indicators: *6 countries in 2 regions having incorporated NRENum.net for Global dialling*

Advances in the Indicator:

In work package 4, the MAGIC team succeeded to incorporate 9 new countries in 5 regions to the NRENum.net service.

- Ecuador (Jul/2015),
- El Salvador (Sep/2015),
- Mexico (Oct/2015),
- Uruguay (Nov/2015),
- Czech Republic (Dec/2015),
- Sri Lanka (Dec/2015),
- Chile (Jan/2016)(Aug/2016).
- Lebanon (Aug/2016)
- Kazakhstan (April/May 2017)

These countries were spread 4 regions, divided in four deployments in Latin-America, one in Europe, one in Middle-East, and one in Asia. As it is seen, the milestone number was achieved. Nevertheless, it is worth mentioning that the group expected to have 3 deployments in Asia and was not fulfilled. The group identified some barriers like internal NREN governance that make difficult to achieve the required consensus on the standards.

e) Application-sharing among NRENs and the global academic community.

The project has selected applications being provided by NRENs and proposed a model for application-sharing so that NRENs may become providers of one to the other and/or to/from Regional Networks to take advantage of efforts made in one part of the world in benefit of another one. In particular, this will boost the use of academic applications developed by NRENs by adding a significant number of potential users to them and favouring in this way collaboration and economies of scale.

Indicators:

5 NRENs using applications built and deployed/hosted by another.
2 NRENs with a pilot cloud applications portal implemented
The number of applications deployed in the pilot test will be at least 2
The catalogue of the applications/services provided by NRENs available for use of other NRENs contains at least 10 applications

Advances in the Indicator:

The project team reached the number of 10 NRENs using applications built and deployed/hosted by another. The following table show the provider and customer NRENs relation. It is worth mentioning that Colaboratorio integrates several applications like Funds and partners, the web-conference, and the communities' management service among others.

		Provider					
		CESNET (Czech Republic)	RedCLARA (Latin-America)	RENATER (France)	UNINETT (Norway)	RNP (Brazil)	CONARE (Costa Rica)
Customer NREN	CEDIA (Ecuador)		Colaboratorio			VCEspresso	
	CONARE (Costa Rica)					VCEspresso	
	CUDI (México)		Colaboratorio				
	RENATA (Colombia)		Colaboratorio				
	RedCLARA (Latin-America)	Docuwiki		Sympa, Etherpad, Filesender Premium	Foodle	VCEspresso, e-DISKO	R
	TTRENT (Trinidad and Tobago)		Colaboratorio			VCEspresso	
	WACREN (West and Central Africa)		Colaboratorio	Sympa		VCEspresso	

	MyREN (Malaysia)		Colaboratorio				
	AUB (Lebanon)		Colaboratorio				
	MARWAN (Morocco)		Colaboratorio				

8 NRENs have adopted RedCLARA's Colaboratorio as the cloud applications portal (see the previous table) 3 from Latin-America, 1 from the Caribbean, 2 from Africa, 1 from Middle-East and 1 from Asia Pacific.

7 applications were deployed exclusively as part of the project: 3 in the first stage (CESNET's Docuwiki; RENATER's Sympa and Filesender) and other 4 in the second stage: Open-Edx in RedCLARA's infrastructure, RENATER's Etherpad, CONARE's R (Web Access Component) and RNP's e-DISKO.

11 applications are listed in the Catalogue:

- 4 by RedCLARA Communities, Funding & Partners, SIVIC, e-DISKO, R
- 2 by RNP: mconf (webconference) and eduDrive
- 2 by RENATER: Filesender Premium and Etherpad
- 1 by CESNET: Docuwiki.
- 1 by GRNET: Okeanos.

f) Worldwide research communities using collaboration tools to improve their daily work

The project will foster the use of collaboration technology among worldwide research communities working in three (3) selected areas. This will serve as a proof of concept and support dissemination by developing NRENs among their researchers of the potential of the use of these tools for their collaboration work across the world. The project will also extend the Funding Opportunities Database and Partner Search application developed by the ELCIRA Project to cover the developing regions and provide valuable funding information for the defined global communities and others. Finally, the project will support dissemination of funding opportunities available in the H2020 project and other funding opportunities through regional Virtual Information Days that follow the EC Information days and other international call for proposals.

Indicators: *The number of global research communities selected for special support will be three (3).*
The number of information days will be at least two (2) each year depending upon the number of existing calls.
Finally, the database of funding opportunities will be a key result for all researchers to find collaboration opportunities worldwide.

Advances in the Indicator:

4 global research communities have been selected and are active: Biodiversity, Environment, e-Health and Remote Instrumentation

4 information days on H2020 were organised

The Database of funding opportunities is complete and providing information on a global at a Global scale with continuous feeding and automatic e-mail distribution for subscribers.

g) Growth of the use of the Funding and Partners system

In order to measure the usefulness of the Funding and Partners Database and its impact in the research community we have measured three indicators

Indicators:

Number of Uploaded funds
Number of Alert e-mails sent
Number of clicks on the alerts

Advances in the Indicators:

# of Uploaded funds	# of Alert Mail Sent	# of Clicks on the alerts sent:
April 2016: 250	April 2016: 25,850	April 2016: 350
April 2017: 870	April 2017: 38,000	April 2017: 1,352

4. Conclusions on the project

The project was able to carry on a worlwide effort in the promotion and deployment of key technologies to support the work of researchers, academics and students thanks to a Federated Strategy where the tasks have been performed in close collaboration by the RRENs (Regional Research and Education Networks) and more advanced partners. This model follows the work already used in the deployment of research networks around the World, where RRENs play a key role in the deployment of such infrastructures at the regional level, supporting the work of NRENs (National Research and Education Networks) at the national level.

Moreover, this regional strategy is key in sustainability of the effort as now are the RRENs and their associated NRENs who will relieve the challenge of continuing the expansion of the technology in their region taking advantage of the training material left by MAGIC as well as the 112 engineers that the effort succeded to train. And last, but not least, the collaboration network allowing NRENs and RRENs to interact and continue this collaborative effort in favour of the user communities.

We have been able to work in this way with 8 regions of the World as shoen in the table below:

Region	Regional Organisation	Supporting NREN
Southern and East Africa	UbuntuNet Alliance	CSIR
West and Central Africa	WACREN	RENATER
Central Asia	CAREN NOC (NITC)	GÉANT
Asia	TEIN*CC	GÉANT
Arab Countries	ASREN	GRNET
The Caribbean	CKLN	RNP
Latin America	CLARA	

For each region we have supported, through the different projects partners as well as the Supporting NREN for each region, activiites in training, dissemination, community building and deployment. The success of this strategy has lead us to go beyond expectations in most indicators and achieving the proposed results across the different work packages.

Through the support of the partners and this regionalised management, we have been able to overcome different difficulties, such as complex economic scenarios in Brazil and Colombia, or even the withdraw of one partner who was in charge of the Caribbean region. The support of the group has carried out the work with great success in terms of indicators and within budget and time.

Particular points to be underlined for each work packages are:

WP2

For the second time a project funded by European Commission, has helped to disseminate identity federations and eduroam. In the first project, ELCIRA, the effort was only in Latin America and showed a very successful model to encourage NRENs to invest in this kind of technology in order to provide better and safer services. Using the same mindset, MAGIC project was designed, but globally.

Obviously, as the project scope has growth a lot, it was mandatory to expand the project team and the interactions between world regions. The project was executed with one project leader (RedCLARA), Work package coordination

(RNP), Focal Points (UbuntuNet, WACREN, CAREN, TEIN*CC, ASREN, CKLN and RedCLARA) and NRENS partners. With that, it is possible to observe how global this project was, with multicultural interactions, training and workshops conducted by distant partners, i.e., let us remember the Kyrgyzstan training in February, 2017. This training was conducted by GÉANT, with material developed by CESNET for MAGIC Project in Central Asia. Without a project like MAGIC, it is almost impossible to execute this kind of dissemination.

The results of all this effort will be harvested now and in the near future, as there are many NRENs that are still working to implement AAI and eduroam in their regions, this will lead to continuous increase in the number of adoptions of the technology in the near future.

WP3:

The MAGIC project succeeded in defining a set of standards for group management in federations, and carried out successful deployment in four different application scenarios. These implementations are the basis for a new level of integration in the academic federations, and will allow providers to take group based decisions like authorizing, inviting, or sharing. All of this without caring where in the world the group definition is located. The possibilities are infinite, we can imagine a group of physicians being authorized to access medical repositories, a group of physicists sharing results to a global audience registered in a group just in one step, among many others.

The spreading of Colaboratorio as a global communities platform was empowered by the MAGIC project. The new deployments in different continents opens the possibilities on creating communities of different parts of the world, look for partners and resources, use applications group aware and share documentations, schedule meetings, organize and record webconferences or use a MOOC Platform to deliver training material. Furthermore, with the new group capabilities, the Colaboratorio environment will be easily integrated to new commercial or academic platforms promoting the use by the researchers, academics and students

WP4:

The MAGIC project achieved completed its goals on number of institutions adopting the NRENum.NET standards. The NRENum.NET is expected to became the first really global dialling infrastructure at global scale, and the MAGIC project carried out an important role to promote and spread it. It is a work in progress, and will require lots of efforts, specially in the Asia Pacific region where the required level of agreement was not fully achieved.

MAGIC's work was easierr to carry out in the secure DNS promotion scope, and the goal was achieved. Most of the NRENs invited found that securing infrastructures is a need and is a top priority. Promotion of a secure DNS environment shall continue, and an on line promoting strategy combined with a right advisory team could achieve a faster deployment in the near future.

In the unified communications area, the integration between MCONF (Webconference) and SIP traditional networks (in particular H.323 used in large videoconference rooms) will benefit to a community of thousands of users globally, more than 11.000 just in Latin-America. In addition, worldwide NRENs will benefit with an MCONF implementation due to its open-source nature. This Open Source Gateway is a great value for the global NREN community.

WP5

The MAGIC project has shown that it is possible for researchers and academics with common interest to collaborate at a global level. This is made simple with good internet connectivity provided and supported by research and education networks. The MAGIC project supported the communities with a virtual collaborative platform (Colaboratorio), a means of information exchange and best practice sharing (virtual events) and in some cases face to face meetings for human networking. The role of community champions cannot be over-emphasized. They play a critical role of elder and coordinator.

The 16 virtual events that the project organised were a major output of the of the Global Science Communities because they provided a forum for the communities to interact. Members of the MAGIC-supported global science communities in e-Health, Biodiversity, Environment and Remote Instrumentation were able to come together regularly and share experience and best practice. They were also able to stay on top of things in their respective fields by having a platform where they could discuss emerging issues. One peculiar thing with the Global Science Communities was that they removed isolation of researchers as researchers and/or academics in remote locations,

who would otherwise be cut off, were able able to stay connected, collaborate and learn from others in their fields of expertise and interest.

Support for Global Science Communities needs to continue and research and education networks should coordinate them at regional or global level in the same way the Global NREN Public Relations Network coordinates research and education networking publicity and dissemination activities at the global level. While community champions have proved to be very important in animating the communities, perhaps going down to regional champions would ensure that there is increased participation at regions rather than relying on research and education networks alone.

WP6

MAGIC was able to reach researchers, scientists, engineers, NREN leaders, from all over the world through its participation in relevant international conferences, both in the form of its participation through dissemination booths and of presentations, panel sessions and workshops. This face-to-face outreach, was crucial to take the message of the importance and utility of the MAGIC project developments, training and communities to the target audiences, and results such as the addition of RENAM, EtherNET and InnovaRed to the project is a proof of that. These face-to-face efforts were well complemented with the on-line communications display throughout the project's website and Facebook and Twitter channels, that through the project partners websites, bulletins, newsletters and social media channels and interactions contributed to amplify the project's outreach, and what is also very important, the project and the project's brand recall (this particular issue was instantiated by two sentences that were used as slogans in the social media and face-to-face environments: "Do you believe in MAGIC?" and "We believe in MAGIC").

The project members helped to enlarge MAGIC's outreach throughout the publication of reports and articles about the project and its advancements by means of their own communication channels such as the GÉANT's CONNECT magazine and the RedCLARA's DeCLARA bulletin, that regularly reported about the project in their different editions, not to mention their websites and the project partners websites.

There was also a very consistent collaborative work with SciGAia and TANDEM with collective activities in the context of the EC ICT2015, UbuntuNet Connect 2015, and e-Infrastructures for Worldwide Collaboration: Assessing the present and road mapping the future. Joint workshop (WACREN Conference 2017).

The success of MAGIC dissemination and of the project itself can be measured through the testimonials of project's participants and scientists that recorded videos with their testimonies about their experiences with MAGIC and with the use of the MAGIC developments, that were sent to WP6 for its publication both in the project's website and social media channels (see: http://magic-project.eu/index.php/about/2015-05-28-22-53-32/magic-videos).

In terms of training the numbers that have been given in the upper paragraphs are quite sufficient to describe the success that MAGIC had in this area, which is also complemented (and after the project's end will continue to be) by the MAGIC on-line courses in NRENum.net and Webconference to SIP endpoints, which are freely and fully available for worldwide technicians.