

# Plan Ceibal

## Technical Implementation by LATU

Por Patricia Linn\*

***The technical implementation of the Ceibal Plan is being done at LATU. They are in charge of logistics, assigning and identifying each computer, the follow-up since it leaves the laboratory up to the child it is given to, and the technical aspects as installing programs in laptops and servers, of connections to the Ceibal Net, connections between computers, and more.***

The Ceibal Plan, Educational Connectivity Project of Basic Information Technology for the Apprenticeship on Line, (Conectividad Educativa de Informática Básica para el Aprendizaje en Línea, CEIBAL) is based on the idea of the founder and director of the Media Lab of the Massachusetts Institute of Technology (MIT), Nicholas Negroponte, which was summed up in the international project "One Laptop per child" (OLPC).

The idea Negroponte exposed at the Americas Competitiveness Forum (1) organized by the National Agency for Investigation and Innovation (ANII) is that each child on the planet should dispose of a portable personal computer, to combat or avoid, the new illiteracy, which is the one of those who do not know how to manipulate a PC or how to manage Information and Communication Technologies (TICS), and so reduce the

digital divide in the less developed countries.

To put this in practice he looked for designers and later for manufactures that could produce small portable computers, laptops, which, even if their monitors had fewer pixels, would be, on top of cheap, good. It was important that they would be resistant to knocks, their screens visible even if they had sun light on them, and they had to include whatever necessary to be connected wireless to an internet provider and or to other computers.

As a result, portable computers emerged with programs orientated more towards creation than to reproduction. Each machine, for example, has a camera that films and allows the video obtained to be edited, even though videos can be seen more emphasis is made in the use of the computer for creative work. There is also a program which permits the creation of music, and music can be also heard.

Once Uruguay decided to enter the international program it received a certain know how the OLPC offers, but only took what it needed. The Ceibal Plan is a Uruguayan project with its own educational components, it is a social-educational project developed jointly between the Ministry of Education and Culture (MEC), the Technologic Laboratory of Uruguay (LATU), The National Administration of Communication (ANTEL) and the National Administration of State Education (ANEP).



### Technical Area

The technical implementation of the plan is developed at the LATU by decision of the Governmental Executive Power, and a team headed by Miguel Mariatti, Director of the Ceibal Plan for the LATU. They are in charge of the logistics, the technical part of the computers and the connection between them.

"The task of Logistics is organizing, controlling and administrating the computers" explained Fiorella Haim, who is in charge of the technical area of the Ceibal Plan (2), when Uruguay Ciencia interviewed her. Logistics includes the work of assigning one computer to each

child, identifying the child, school and computer to whom it corresponds. There is an agreement with the National Post Office to distribute and follow up of the machines. This means that the Post Office registers the serial number of each one, the date it leaves, and its delivery, to which child it has been given, to which school, and if the computer has a failure, when it is sent for repair, the day it arrives at the service center, what was wrong with it, and when was it reintegrated.

If a child has a problem with the computer, Fiorella Haim says, there is a telephone number, free of charge, 0800-2342, where they can ask for advice if necessary. From the call center the child receives the instruction s/he needs to solve the problem, in case it cannot be solved by phone, a code number is given to the child for him to take the computer to the Post Office, register it with that number given to him, and send it to the service center.

Logistics also does the coordination of the people responsible for the repairs, and controls the use of the computers so that if one of them is reported as lost, the technical center knows from where another person using it is connected and can block its use.

Logistics works with the Post Office, which "happily reaches everywhere in the country" Haim comments, with the service center and with the technical department, which is the one that installs the programs on the computers to be able to follow them up. It also has to be in contact with the primary state schools authorities, Primary Education Council (Consejo de Enseñanza Primaria), to be able to have the register of all pupils, teachers and schools where the computers should be sent.

## Internet

The LATU team has to see that all the computers have the necessary basic programs to function, they have to add those that the Education Commission, who is in charge of all the educational aspects of the plan -intergraded by representatives of the CODICEN, Primary Education Council, Uruguayan Teaching College, Federation and Ministry of Education and Culture- considers valuable didactically, and they have to make sure that all computers can connect to internet.

To be able to do this they must take Internet to the schools, which, if possible, will be done through ADSL (3) by cable. This has been done only to a limited number of schools, but which cover a great number of pupils. Almost 80% of the pupils have a connection with ADSL but they represent 30% of the schools. "There are lots of schools with very few pupils" Haim said.

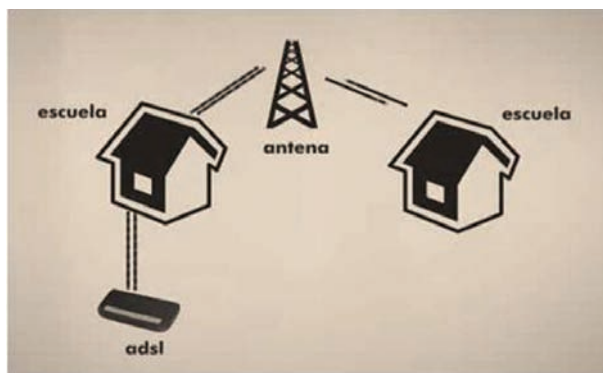
To reach the schools that are far from the telephone centers where ADSL does not reach, other solutions are being studied in coordination with ANTEL, for example, through cell phone technology, or through satellite technology, or establishing wireless connections from a school which has ADSL.



When there is a cell phone base near the school an EDGE (4) modem is connected to the USB at the school service. EDGE is an intermediate technology between the second generation, 2G, and the third generation, 3G (5). The problem with this type of connection is that with this technology the broad band is very limited. It will change when all over the country there will be a 3G net, which has greater capacity.

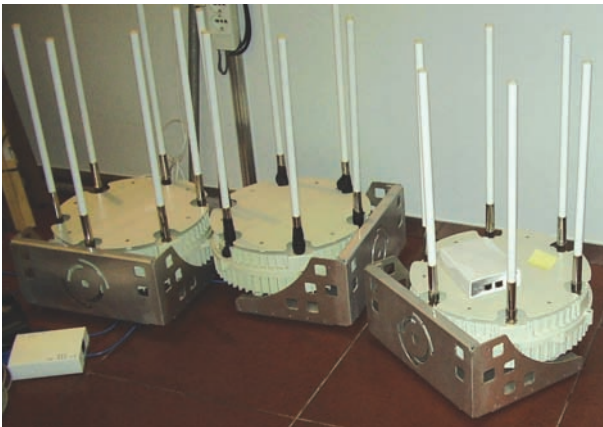
When there is no cell phone base near, wireless connections are established between schools. This can be done, basically, depending on the distance between them, the land, if there are trees or not, if there are some or no elevations, or any obstacle in the middle, as there must be a clear line between the schools to be connected. For this reason it is necessary to know the geography of each department. So they use geographic data from NASA, data about forestation from the Ministry of Livestock, Agriculture and Fishery, and data obtained from Land Surveyors.

ANTEL has connected 818 modems, through ADSL, to educational centers, 574 with EDGE technology, 20 with satellite service and seven with 3G. Of these, 864 schools already have the Ceibal Plan server plus antennas. They foresee that by the end of 2009 Internet connection will be available from all state primary schools in the country and from all the secondary school in the country except the capital city, Montevideo.



### Wireless net

Once the first step is solved, the connection to Internet, the next step is to study and decide which is the best place in the school to put a device to negotiate the traffic of data from and to the wireless stations, that is an Access Point (AP) (6). These would allow children and their teachers to communicate through Internet, and with each other, wireless from every corner of the classroom, or playground. Also it must be decided how many AP to put, because a rural school with only one classroom can be covered with only one equipment but in a school with 300 pupils, three stories high, one AP would probably not be enough to reach all classrooms.



Schools must be studied, maps are made, and several things are to be taken into account, such as materials used to build the schools and the type of construction. From this information the amount of AP to install is decided and what type of antenna to use. "It is like assembling a puzzle," Haim says. The criteria that is used at the moment during this phase, is that 100% of the

classes in each school should be covered.

The aim is that in each small town there has to be another access to Internet away from the school building. The criterion in the design of the Ceibal Plan is that a child that lives in a small town should not have to walk more than 300 meters from his house to be able to communicate. This will be done in small towns that have more than one school or a school with more than forty children. In smaller towns where there is only one school with less than forty children, the access is concentrated in the school, at least at this phase. It is planned eventually to provide more and more accessibility.

### Content filters

Once Internet is connected in each school, a server is installed which controls the functions of the net: firewall, proxy, cache, and a filter of contents is installed.

The Education Commission establishes the criteria of the filters configuration. The technical department helps on occasions informing the Commission about some of parents and teachers claims about the use or frequent access to some programs that are not considered adequate for different reasons, so that they can evaluate if the access should be blocked or not.

When the computer is connected to Internet through other channels without going through the Ceibal Net, it has access to all the programs that other users of Internet have. The possibility of putting a filter in each computer instead of in the Ceibal Plan servers has been considered, but the decision to include them is not done by the Technical Department at LATU, it is a decision from the Political Commission, integrated by representatives of CODICEN, Primary Education Council, Ministry of Education and Culture, LATU, ANTEL, and the Agencies of AGESIC (7) and ANII.

At the technical department of LATU studies have been done on the cost in performance that would imply putting filters in each laptop. As these machines are not very potent, adding filters to its contents would slow them



## Organización Integral de Congresos

**Informamos a nuestros clientes y amigos los datos de nuestra nueva casa:**

**Dirección:**

**20 de Setiembre 1496**  
esq. Dr. Pouey (ex Gastón Ramón)

**Nuevos Teléfonos:**

+5982 **706 96 29/30**

**Dirección Electrónica:**

**info@congresoselis.com.uy**  
**www.congresoselis.com.uy**



down; they would consume more resources of the net by actualization, management, and verification traffic. Also the filter in the laptops does not have the potential that a filter in a server has, it is more permissive.

### Connections between laptops

The machines have small antennas that are used to enable them to be connected to AP as to other machines. For example if a user is using its computer near a window of one of these schools that has connectivity, and outside at a distance of a block away there is another user with a computer that does not receive the AP that is inside the school, it can jump into Internet through the computer that is near the window. This way the range of AP can be extended, but never more than 500 meters.

A chain of connections can be done. "Even though theoretically uncountable connection could be done" says Haim, "we tested and found that it is possible to make connections with five computers of reasonable capacity to navigate. But in practice, according to the information of how the machines are handled, very rarely we have seen more than two "jumps" of computers to reach Internet."

In case they are far away from the server and none of the computers can connect to Internet, the mesh system permits them to connect between themselves and then carry out collaborative tasks as on a private net.

### Theft and loses

As part of the control and follow-ups of the computers the technical department has developed an anti-stealing system. If a machine does not connect with the Ceibal Net within a certain period of time it is blocked and it stops functioning.

When the machine is lost or is believed to have been stolen, apart from reporting the theft to the police, as one would do when anything stolen, it is also reported to the

call center. This machine is included in a list to be identified in case it is connected to the net, because when the machine is connected to a server the first thing the server does is ask if the machine has been stolen or not. If it is on the list as stolen, it immediately becomes totally useless. If it was not stolen, it is activated.

Up to now there has been no stealing reported, but lost ones yes, not to many considering that 180 thousand computers have been delivered. "It is understandable considering that the users are children" Haim comments.

### Organization

The technological area is divided into four departments: one working on projects, one on connectivity, and one on systems and another on support.

The planning described previously of how to take Internet to each school, how to distribute it in the school and in the town, what equipment is installed and where, is done by the Project Department. This means it designs the connectivity project which eventually becomes a detailed guide that later is implemented by the Connectivity Department. The latter is in charge of calling for suppliers, or getting in contact directly with providers they have already registered, and they must verify the installation as well as the design.

To verify that the installations are as indicated in the project, they go along the streets of the city or town in a car with GPS and antennas connected to a computer that generates images and at each point they measure, amongst other things, the quality of the signal and the velocity of the connection. This also gives them the possibility to control the suppliers, as they verify the installations that have already been installed according to the specifications of the project.

Second they verify the design, even though an overall photographic control has been done beforehand to detect high spots, etc., it could be that reality has not been well captured and the connectivity project applied does not work correctly. Once Connectivity makes the verification



the design is adjusted to the new data found.

The third department is the Support Department; it monitors the condition of the net components, the servers and the AP, distributed all over the country. On monitors with a color code like the traffic lights, a detailed map can be seen of the school, what is functioning well will appear green, what is on alert yellow and what is not functioning well red. It also attends all the claims that come through the call center; sometimes problems appear that cannot be detected at a distance.

The fourth department is the System Department; it is in charge of the applications included in laptops and on the servers of each school and also it develops new applications like the ones that allow the center to cancel a machine that has been stolen and the activation of software. It also gives support to those who want to develop new products. LATU does not develop educational software, but they favor other firms to become involved. There is a person in charge, specifically, to encourage third parties by lending them a machine or giving them training so that they can generate products that are compatible, then the Educational Commission decides if they can be installed in the machines or not. System is also in charge of the configuration and maintenance of the server and to give support to those using a specific application.

The Primary Education Council is in charge of preparing training courses for teachers, except for the particular case of training teachers to use the Turtle or Logo, Tan Tan and E-toys, for which LATU was asked to offer workshops for computer teachers from all over the country. These meet weekly at LATU coming from all regions, in groups of twelve or fifteen. They are explained how the programs work, but they are not told what to do with them, as this is an educational matter.

### Notes:

- (1) Forum of the Americas, which took place on march, 30, 2008 at the Conrad Hotel, Punta del Este.
- (2) Fiorella Haim is an Engineer in Electronics and Technology. She has a Master Degree obtained in USA and works at the electronic projects department, created at LATU in 2006.
- (3) Wikipedia definition
- (4) Wikipedia definition
- (5) Wikipedia definition
- (6) Wikipedia definition
- (7) AGESIC is the acronym for Agency for the Government development of Electronics management and of the Society of Information Technology.

*\*Patricia Linn es Bachiller en Química por la Universidad de la República, periodista científica y Directora de Uruguay Ciencia.*