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Introduction

Since the launching of Ibercivis in 2008, the project has developed a huge activity which we are going to show in these pages.

Ibercivsi is a complex and multidisciplinary project that includes various dimensions of the scientific activity. It is, at the same time, a volunteer computing platform based on BOINC with a distributed infrastructure that supports multiple applications; a tool of science diffusion, technology and scientific methodology; and a meeting place for TIC, Physics, Biochemistry, Mathematics··· researchers with the same objectives and common tasks.

Ibercivis is also a Spanish-Portuguese Project. In 2009 Portugal set up the platform in its territory and their researchers and citizens work nowadays actively in it.

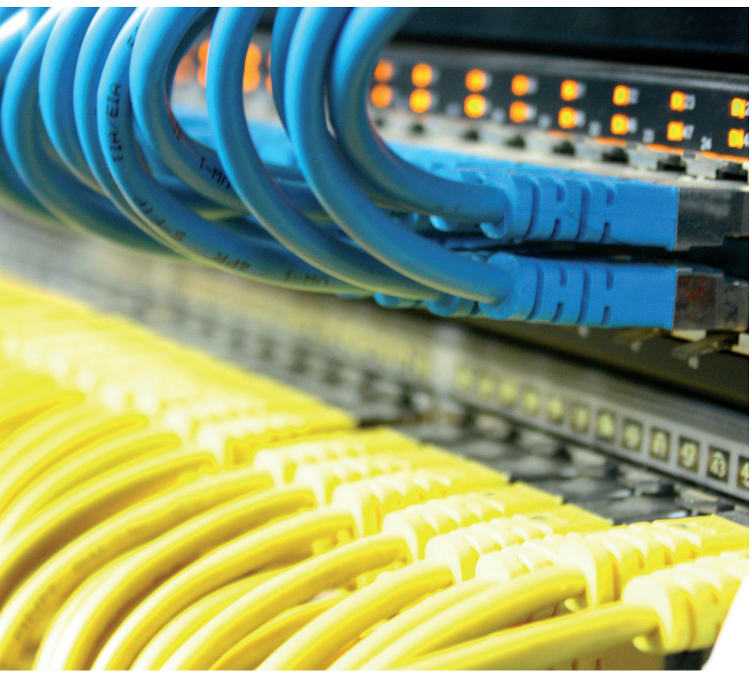
During 2009, Ibercivis has centred its activity in the creation of a powerful infrastructure, solid, scalable and failure-resilient. Everything with the objective of fulfilling the important compromises achieved for the following months: spread ibercivis platform to more citizens throughout an important diffusion effort and export the project to Latin America and Europe.

Citizens contribute in an increasing and continuous way with their resources, and they certainly are the major figures of our Project. Thanks to the improvements and enlargements foreseen, participants will increase during 2010 and researchers will have Ibercivis as an important resource in order to face up their computational requirements.

Alfonso Tarancón

1

Computation and research



Most of the research programmes are base on simulations which need thousands even millions of calculation hours in data processors

1.1 Computation: A tool for research

Scientific and technologic development has turned into one of the main pillars in the day by day of the developed societies, undoubtedly, a strong bet for its growth that will yield large profits. It's no wonder then that developed countries, are the ones that have bigger investments in I+D, as Sweden, Finland or Switzerland[1] for example, which are the European countries that invest more in proportion to their PIB.

Computers are one of the basic research tools used. Most of the research programmes are based on simulations which need thousands even millions of calculation hours in data processors. That's the reason why Universities and research centres own specialized equipment in order to execute these simulations efficiently. The statistical study made up from the countries which have the most powerful computers in the world, top500[2] list, shows that 58.20% of the 500 supercomputers are in EEUU, 8,8% in United Kingdom, 6% in Germany, 4.60% in France and 4,20% in China.

Nowadays, being in the "top ten list" is really prestigious for any country so there is a hard computational

1 http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/introduction November 2009

2 http://www.top500.org/stats/list/33/countries November 2009 race in order to appear and also increase positions in this list.

1.2 Computational paradigms

Despite the recently emergence of the information Technologies (TIC), during the last decades computation has suffered enormous transformations. Scientific advances have needed the development of big specialized equipments connected to high speed networks in order to provide a powerful structure to the scientific community. This computational model is named HPC (High Performance Computation). MareNostrum in the BSC (Barcelona) or Finisterrae in the CESGA (Santiago de Compostela) are examples of supercomputers.

In the field of supercomputers (HPC) we can find the most powerful, compact and with higher calculation, processing and communication capacity computers. This way even though they have lots of individual data processors, they work as a unique one.

There are some scientific problems which don't need some requirements, as a fast communication between data processors, and they can be executed in less sophisticated architectures. Besides, more and more Data Processing Centres (CPD) with medium power (hundreds of data processors) are appearing all around the world. Thanks to Internet these CPDs can be used from every place in the world and as they are also connected in between them, they can have a higher optimization of the resources. This is how Grid Technologies appeared. Nowadays, Europe is situated at the top of these technologies.

Grid computation is a distributed computation paradigm in which several computers with different characteristics are linked by a high speed net. Until now, European Union has promoted Grid technologies through research Framework Programmes (At present VII). EGEE (Enabling Grids for E-sciencE) is now in its third stage, and it is creating a grid distributed infrastructure in which more than 27 countries are participating. This is the most important grid project in Europe.

Along 2010, EGEE is centred in the transition to a sustainable operational model of the infrastructure. Central resources, coordinated by EGEE until

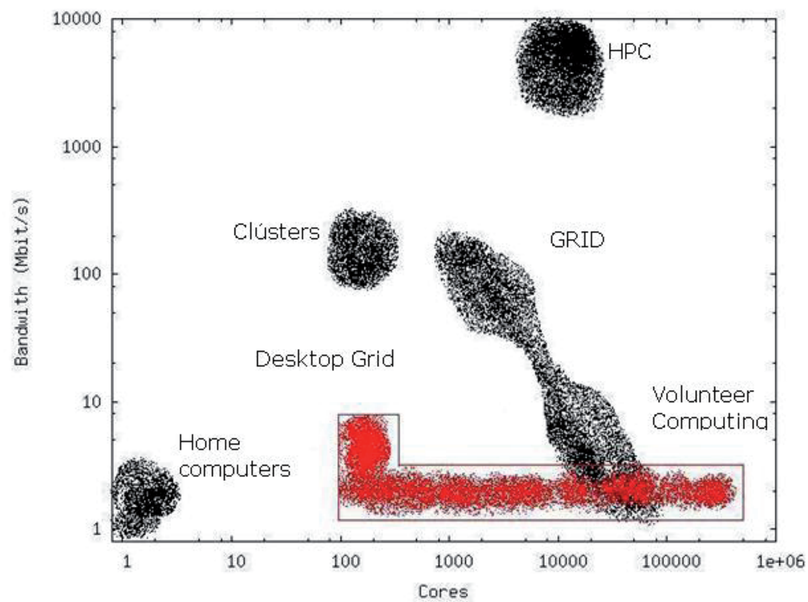


Image: the graph shows the distributions of each of the paradigms in relation to the bandwidth and cores now, will be from now on administered throughout the EGI (European Grid Initiative) and each of the participant countries will be managed by their own National Grid Initiatives (NGI). The Spanish NGI is coordinated from the Instituto de Fisica de Cantabria (IFCA) and has an important role in Europe. BIFI participates in the Spanish NGI by lending resources and giving support to users.

Important grid infrastructures are available in Spain, at national scale one of them is GRID-CSIC (www.grid.csic.es) and at regional scale is ARAGRID (www.aragrid.es) which will start working during 2010. Some computation grid examples are Aragrid Project, carried out in the BIFI, in which 4 distributed nodes in Aragon (2 in Zaragoza, 1 in Huesca and 1 in Teruel) are connected through RIA net (Aragon Researching Net) and Piregrid Project which is the Trans Pyrenees Computational Net that will bring the companies closer to grid technologies.

Other highly efficient infrastructures used in research are clusters which are several computers joined together in the same place and linked by a high speed network that make one powerful and accessible computer. Clusters are used in research due to their high output and availability and their scalability.

Finally, volunteer computing refers to the voluntary participation of the citizens in different projects lending their personal computers in their idle moments. If we consider all the computers participating in volunteer computing projects based on BOINC throughout the world, we have millions of calculating cores (http://boincstats.com). Here is where Ibercivis is placed. In the following sections we will describe this project precisely.

1.3 Volunteer Computing

Volunteering emerges as a non lucrative social activity, particular and free, which appears in order to benefit a community or the human race. There are volunteers in many different society fields, such us social volunteers, environmental volunteers, aid workers, sport volunteers, cultura... In most of the cases people play an important role with their physical activity, this means that their presence is needed and that they have to make a physical effort. But, how can be the scientific volunteering done without scientific knowledge?Very simple: with volunteer computing.

1.3.1 Volunteer computing origins: SETI@home

Volunteer computing began with the Project entitled SETI@home, Search for ExtraTerrestrial Intelligence, in the University of Berkeley in California.

This project uses the Arecibo radio telescope in Puerto Rico, whose principal aerial has 305 meters diameter, in order to track radio signals from out space.

These signals mainly have noise and human produced signals from TV stations, radars and satellites, but they also have signals and noise from the universe, our galaxy and other galaxies. These signals can be produced in a natural way by distant stars, but there is also the possibility that intelligent beings send us radio signals in order to show us their existence. With this research, they try to leak signals received in order to find something sent by extraterrestrial intelligent beings. As all this information needs to be analyzed, large computers are required. That is how in May 1999 the SETI@home project was launched. This project invited thousands of people to participate with their personal computers. Nowadays, ten years later, it has the worldwide support of more than a million participants.

Image: Arecibo radio telescope

1.3.2 BOINC (Berkeley Open Infrastructure for Network Computing)

In order to carry out SETI project, a program designed to be executed in the citizen's computers, BOINC is used. Although BOINC was firstly design for SETI, presently is a program that installed in a computer, gives the opportunity to participate in other projects apart from SETI@home. The application areas for these projects are varied: from physics and mathematics to biology, climatology, etc... But all of them have the same common characteristic: they need a huge calculation requirements. Furthermore, most of these projects are studies coming from universities or public entities that want advances in science and not economical profits.

Some of these participant projects are Einstein@home, Climate Prediction, Rosetta@home e Ibercivis[3] BOINC allows users to choose in which projects they want to participate. Just with a click, the user selects in between all of the applications from Ibercivis in which they want to collaborate in.

In November 2009, nearly 5 million users from 267 different countries participate in BOINC, with a total equivalent power of 2.698 TeraFLOPS. This is equivalent to 2 million calculation cores working continuously.

Nearly 5 million users from 267 countries participate in BOINC

3 http://boincstats.com/index.php?list=full&or=0

Next diagram shows the basic operations once a user decides to participate in BOINC. You can appreciate the plain execution and a very important thing; users are not bothered in heir regular work.

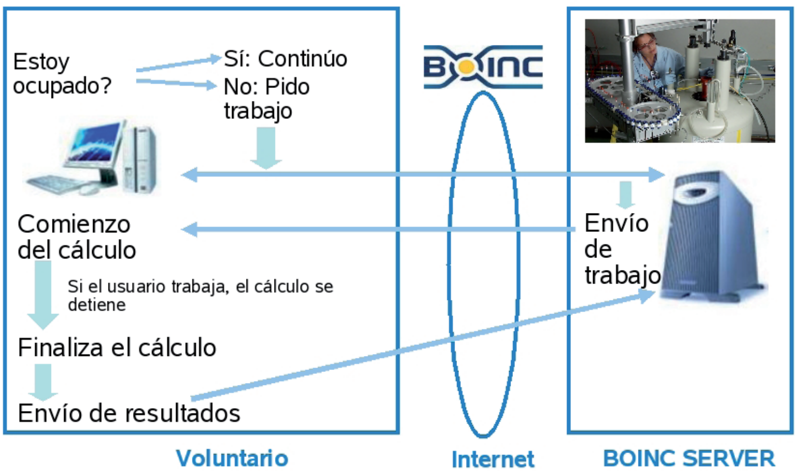


Image: Boinc operation graph

Volunteer computing has been consolidated all around the World as an effective and reliable tool for scientific calculation taking advantage of the idle moments (those in which computers are plugged in but not used, or scarcely used) of the personal computers from citizens and institutions.

1.3.3 Advantages and disadvantages of the volunteer computing

Volunteer computing has many advantages regarding other computational platforms.

First of all, sharing resources is the basis of volunteer computing, which means an important saving on the purchase of equipment and energy supply. Centres which don't have the latest technology can carry out their research quickly and efficiently.

Advantages

1. Resources are shared with those who doesn't have
2. Easily scalable
3. There is a combination of science and citizens

Secondly the system can be perfectly scalable with very little effort. The number of users is increasing continuously. Moreover, as new applications are being added more users are added also, especially when applications come from countries in which diffusion campaigns and social events are done.

Finally, volunteer computing establishes a link between science and citizens so it becomes an efficient scientific diffusion tool. After all, research benefits society and it

Computers are used for scientific calculations whenever they are idle, that is, plugged in but not used or scarcely used

is very important that citizens keep informed of the new developments especially when they have collaborated in them even in an indirect way.

However, there are also disadvantages in this computational system. One of the main ones is the bandwidth, since the user lines are commercial slow speed connexions. This characteristic forces the system to adapt to users in order not to saturate the net, so a high computation capacity is achieved but it is thwarted by the bandwidth. Another disadvantage is the system availability, because the daily average number of users, which is more or less constant, can in some moments fluctuate. Stability in the average number of users is not scalable nor easily to predict.

Despite volunteer computing is worldwide used in different scientific and technologic areas, not all of the applications can be executed in this kind of infrastructure. These applications should be separable in short fragments, calculations should be independent, and there are some data volume limitations. These limitations are more precisely described in section 2.4.10 How to join Ibercivis as a researcher

Citizens get involved in leading research without effort.

1.4 Popular science importance

Successive scientific advances, cumulative and increasingly complex, often become unintelligible to non-experts in these fields; therefore the separation between citizens, science and knowledge becomes gradually bigger.

Fortunately, in the field of computing, the distance between experts and non-experts is not so big. In fact, most of the families have a similar computer to the ones used in some research laboratories. These home computers can perform billions of operations per second[4] and they are only used at certain times of the day and their full potential is not exploited. This means that there is a huge group of underutilized resources that gathered together will become a powerful tool for the scientific community.

Citizens can feel closer to science; in fact, a certain approach to scientific knowledge is achieved because they are interested in everything that happens on their computers, they feel that they are somehow participating in science.

This platform thus becomes an opened window to users. They get involved in leading research and scientific advances.

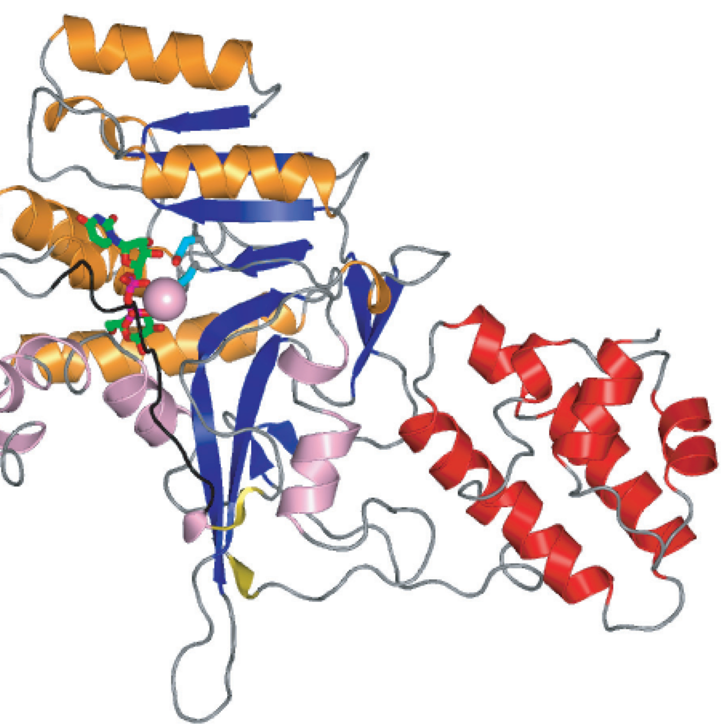
4 One of the measures of the computer power is the amount of decimal numbers multiplications that can be done in 1 second. 1Gflops means that you can do 1 billion multiplications per second.

2

Ibercivis: Calculation platform

The volunteer computing Project called Ibercivis arose thanks to two important concerns. On the one hand, researchers need high computing facilities and on the other hand the separation between science and citizens is quickly increasing.

Ibercivis is a volunteer computing platform which gives researchers a powerful computing tool using idle computers of the citizens. At the same time Ibercivis joints science and society using different diffusion media.



2.1 Origins and history

Ibercivis arose from ZIVIS, an initiative from the Institute for Biocomputation and Physics of Complex systems, Zaragoza Town Hall and the Fusion National Laboratory in the CIEMAT. His goal was to create a computing platform in order to help researchers in Zaragoza. It was supported by the municipal plan of 2004 for the development of Knowledge Society, which expected to place the city of Zaragoza in 2010, in an important European place; as a city with great economic development based on new information technologies and knowledge management.

Zivis Project was sponsored by the Zaragoza Town Hall, Telefonica, Endesa, IberCaja, Zaragoza Ciudad del Conocimiento Foundation and the University of Zaragoza.

As Zivis had a great success, this initiative was spread to the whole country and other institutions decided to join the project. On June 20th 2008, Ibercivis was presented by the Secretary of State for Communication, D. Carlos Martinez, at the headquarters of the CSIC in Madrid.

2.2 Participation

2.2.1 Researcher's participation

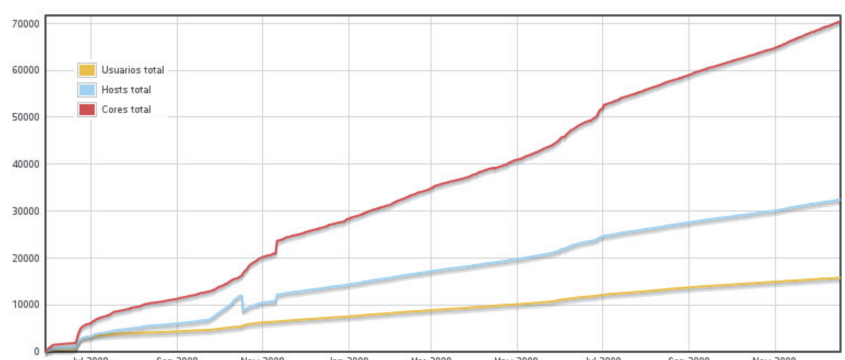
In 2008 there were three research projects involved in Ibercivis, and in 2009 this number has increased up to eight applications: Fusion, Docking, Materials, Nanoluz, Neurosim, Adsorption, Amyloid and Quantum. Also three new applications are being developed and they will be incorporated in the following months.

2.2.2 User's participation

In December 2009, 16.000 citizens were participating in Ibercivis, although the total number of cores was approximately 70.000.

In **Graph 1** you can see the total number of users and cores. This function is increasing because it sums up total registers, not taking participation into account.

The number of those who connect daily is even more relevant than the total number of participants, because these people are the basis of the stable computing resources. This is the basic infrastructure of Ibercivis. Every day it allows the continuous execution of the different applications.

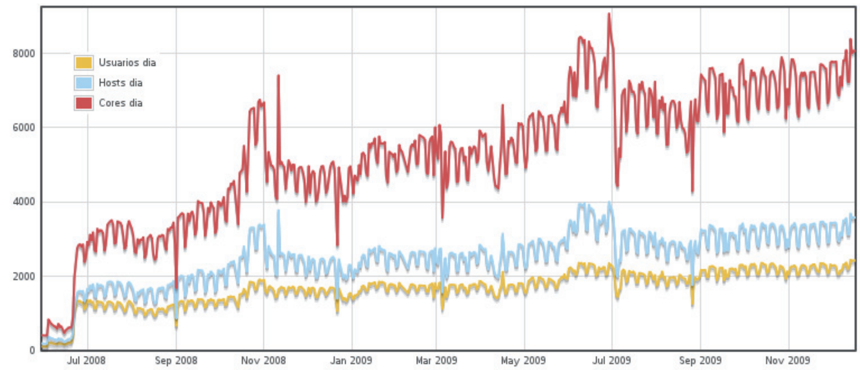


Graph1: Total participation evolution in Ibercivis

Ibercivis data

- **There are 8 applications and 3 more are being developed**
- There are more than 16.000 users
- **There are 70.000 cores registered**
- There are researchers from Portugal, Argentina, Mexico and Spain.

Currently, each day 2.100 people connect to Ibercivis, providing around 8.000 cores. It can be seen that the number of these participants experienced a quantum increase after the public presentation in June 2008 and began to grow steadily after the summer. The competition between French and Spanish teams, which took place in October 2008, and the period in which the awards were established, June 2009, marked a further significant increase.



Graph 2: Daily statistics of participation in Ibercivis (July 2008 to December 2009)

In **Graph 2** you can see the evolution of the daily participants since June 2008. Every weekend you can see that connexions decrease around 20%, either because people use more their computers or because there are computers which are only switched on during the week.

The total number of real calculation hours which have been carried out since the beginning of the project is approximately 12 million hours. The daily average of the last period has been 30.000 hours of CPU. It could be said that the "daily equivalent cluster" is about 1.500 active cores.

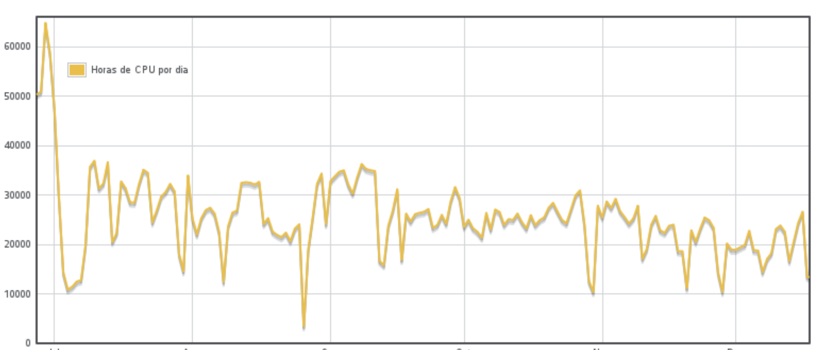


Image: CPU daily hours statistics (July 2008 to December 2009)

2.3 Ibercivis structure

2.3.1 Infrastructure: software and hardware

At the software level, Ibercivis project consists of several services, some of them are part of the core of Ibercivis and other ones complement it (backup, monitoring, and replication).

BOINC is the most important service of the core of Ibercivis and it is divided into several parts:

- Scheduler: A service that manages the projects and assigns works to clients.

- Validator: Validates each result of the execution of a workunit by a client.

- Assimilator: Creates the final result of a project from the validated results.

- Transitioner: Manages the status changing of the workunits and results.

- Feeder: Creates shared memory segments to move registers from the database to the scheduler.

Other services that are part of the core of Ibercivis:

- Web server: It is used for the files downloading and uploading. In volume terms, projects normally mange from one to several terabytes of file results.

- Database: The Ibercivis database is unique. All computers and processes share it. In relation to infrastructure, it is replicated in several slaves and there are two masters in which you can write.

Other services that are not part of the core of Ibercivis. There are dozens of services; most of them are standard unix services. The more important ones are:

- Backup: a safeguard system that performs incremental backups daily

Glossary

Client: Each of the citizens participating in Ibercivs. It is also used to refer to the BOINC programme which is installed in the computers in order to execute works.

Server: Computer in which an informatics application is executed providing services to clients.

Workunit: Part of the work that has to be performed from an application.

TeraByte: 1TB = 1024GB.

Backbone: Skeleton or main structure used to build the rest of the system.

Porting: Adapting process of a programme or application so that it can be executed in different operating systems.

Middleware: Software to manage the use and connexion of several services in distributed applications by abstracting from Communications Networks and Operating Systems used.

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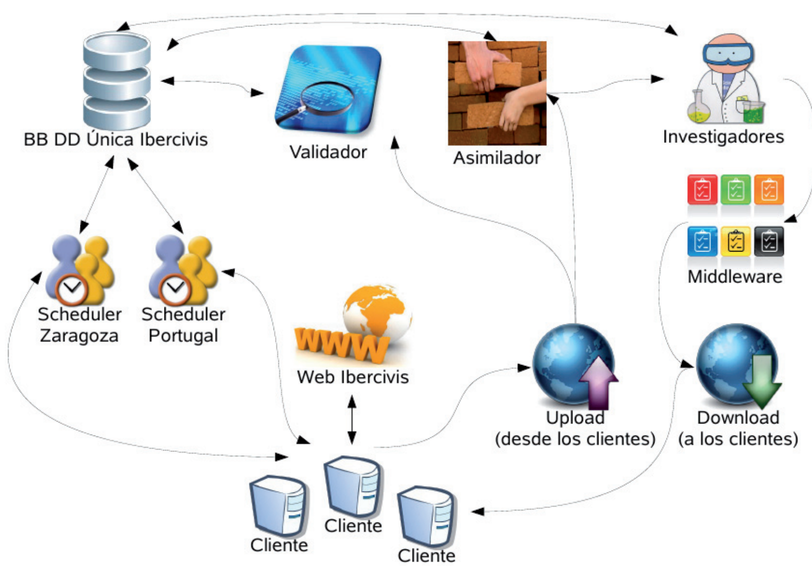


Image: Diagram of the software infrastructure of Ibercivis and stores them on disks that are replicated in mirror. Copies of the server settings and of all files except system and results (it does not make sense to backup the results files as they are processed and deleted daily) are made daily.

- Monitoring: Computers and services that are part of the project are monitored. The system sends e-mails with the status of the project to system administrators. You can also check the status via web services, showing both the status of services and the statistics of the Ibercivis processes.

- Website: The Ibercivis website is almost a separate project. It is available in several languages, as Spanish, Portuguese (www.ibercivis.pt) and English (depending on the language of the browser) and it is the main source of information of the project.

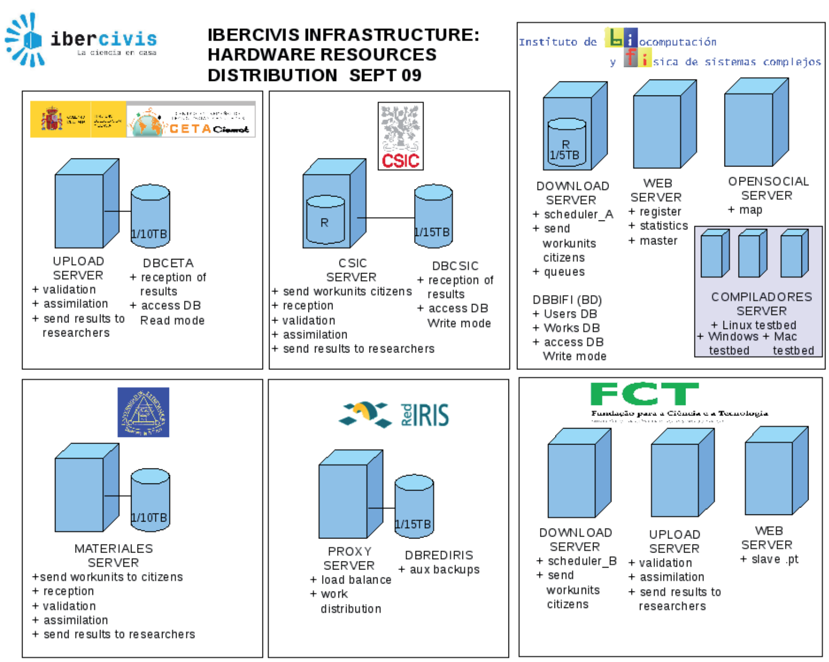


Imagen: Hardware infraestructure diagram of Ibercivis

At the **hardware** level, the Project currently has 16 computers distributed between Spain and Portugal according to the following structure:

- 6 computers in Zaragoza, which are part of the backbone of Ibercivis. All the necessary components for the correct operation of the project are in these servers. Also the website, monitoring system, backup systems... are part of these computers.

- 2 computers in Portugal where the BOINC scheduler is executed. They run a MySql slave and they serve the uploading, downloading, validation and assimilation of some of the projects.

- 5 computers in Ceta-Cimea in Trujillo (Extremadura) where a MySql slave is executed. They serve the uploading, downloading, validation and assimilation of some of the projects.

- 1 computer in CSIC in Madrid.

- 1 computer in RedIRIS in Madrid. This computer is located in a room next to the neutral node Hispanix, where all the Spanish IP traffic is routed. Due to this situation, this computer is used as an inverse http proxy. All downloads and uploads go through it, so the web traffic is optimized and controlled.

• 1 computer in the University of Extremadura which is dedicated to the downloading and uploading of files from one of the applications: materials.

Ibercivis has 48 CPUs and 64 GB of RAM. All the computers are configured with OpenSuse GNU-Linux x86-64.

2.3.2 Applications

It can be said that 50% of the project Ibercivis is giving researchers a calculation platform where they can execute their scientific applications. As other national and international computing infrastructures, in order to ensure quality and proper functioning of the platform, the applications executed in Ibercivis must pass some processes and controls.

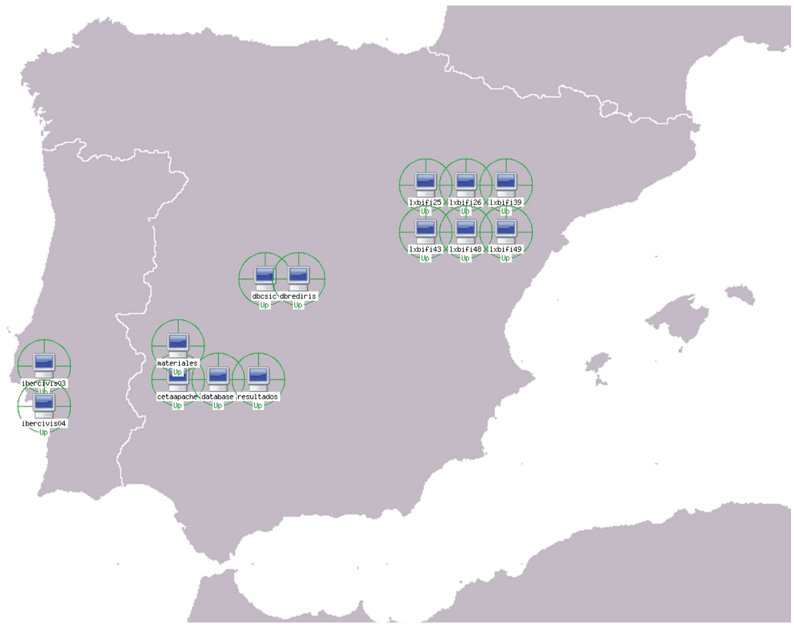


Image: Distribution of the computers in Spain and Portugal

The process of launching an application, as can be seen in the accompanying graph, goes through several phases since it is proposed by a scientific research group until it is fully integrated into the infrastructure Ibercivis:

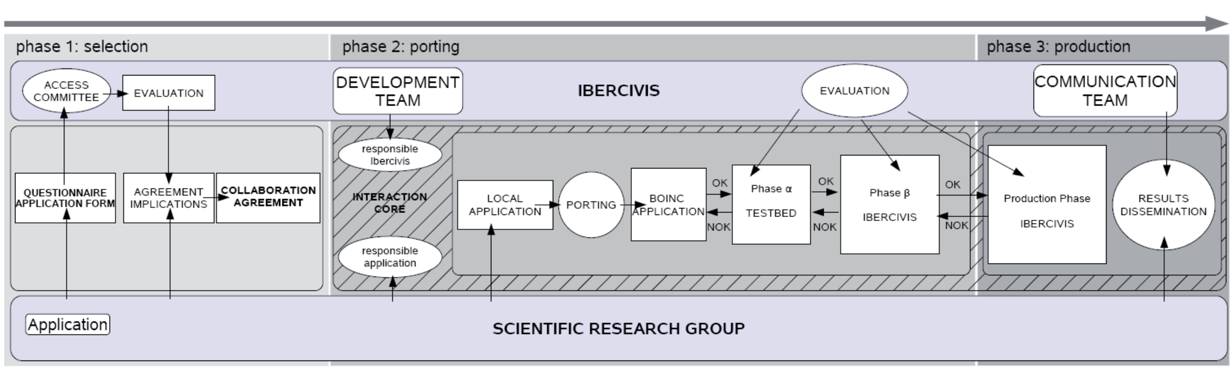


Image: Launching phases of an application

Phase 1

The phase of selection is the first one. A committee of scientific experts from Ibercivis has to evaluate the application in two fundamental aspects: the scientific one (objectives, methodology used ...) and the technical one (needs: RAM, disk, libraries ...) ensuring that such application adapts to the philosophy of Ibercivis and that it can be ported to the BOINC platform.

Phase 2

In the second phase, called porting, the development team of Ibercivis, with the aid of the scientific research group, will port the application so that it can be executed on BOINC in different platforms (Linux, Windows and MacOSX).

The BOINC application created after porting will go through two subphases:

• Porting – ALFA Phase: Once created, we proceed to test these applications on a small-scale BOINC platform (~ 10 CPUs). It is then when the validator and assimilator responsible for checking results are created.

• Porting - BETA Phase: If the results obtained in the alpha phase are correct and the error rate is less than a predefined factor, the application will turn into beta phase. In this phase Ibercivis infrastructure is used, results are sent to those clients who allow these applications on their computers (~ 10% of Ibercivis). If the results in beta are not satisfactory, the application is tuned back to alpha phase.

Phase 3

Finally, the third phase is the launching in Ibercivis. If everything is Ok in beta phase, the application will be sent to the 100% of Ibercivis clients (although a client can always choose whether or not they participate in an application) If the results obtained are not the expected ones, this application goes back to beta phase in order to solve problems.

As mentioned previously, during the porting there is a constant communication between the research team and the porting team because the research team should be in charge of sending the different jobs and ensuring that these are correct.

Next graph shows the cycle of an application:

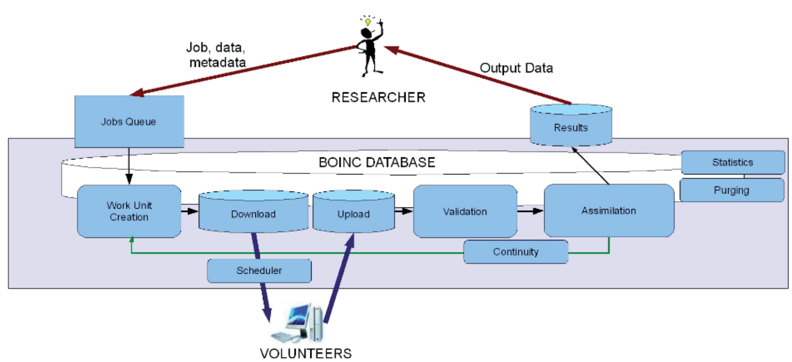


Image: Cycle of an application

When a research team wants to run a job or work in Ibercivis, they send the different input files to create the workunits associated with that job. Normally, at least one result associated to each of these workunits is expected. This result is generated by a client (BOINC calls result to each of the workunits, even if the result is not executed) Different results may be achieved from one workunit (for example in redundancy).

When all the results associated to workunits associated to a job are completed, it is said that the job is complete. Ibercivis provides the research teams with a middleware in order to send these jobs, check their status in each moment, etc...

2.4 Research in Ibercivis

2.4.1 Fusion

The development of humanity inexorably implies higher energy demands. Fossil fuels will run out relatively soon, and renewable energies can hardly satisfy future demand. The fusion, a clean enough nuclear process, may be a worthwhile and never ending energy source in the future.

Fusion occurs when two energetic nuclei fuse into a heavier one, a process in which a tremendous amount of energy is generated. The luminosity and heat of stars, for instance, is the result of the fusion of hydrogen atoms. Matter in stars is in the plasma state, an almost completely ionized gas.

Due to the electric repulsion of two atomic nuclei - two positive charges always repel each other -, the plasma must be at a very high temperature in order fusion to take place, approximately, at 100 million centigrade degrees. Fusion reactors are complex machines which hold plasma within a chamber in such a way that it does not touch the chamber walls. That is achieved by means of very powerful magnetic fields and the most advanced technology. However, no reactors have been built yet capable of maintaining controlled fusion in a commercially viable way.

The next step of the scientific community shall be the construction of the reactor ITER (International Thermonuclear Experimental Reactor) in the south of France, promoted by an international consortium which shall invest 10,300 million Euros. ITER's aim is to prove the viability of fusion energy.

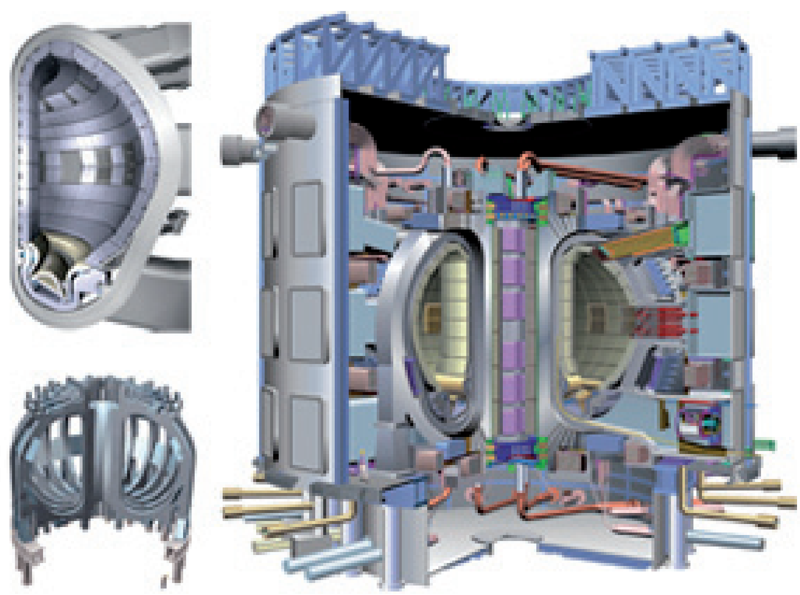


Image: ITER, within the cryostat keeping the coils in a superconducting state and within the shielding isolating it from the exterior

Fusion may be a worthwhile and never ending energy source in the future

Scientists of CIEMAT (Center for Energetic Environmental and Technological Research), who have worked on the plasma calculation for the Spanish Stellarator TJ-11, and scientists of BIFI (Institute of Biocomputation and the Physics of Complex Systems) University of Zaragoza, make simulations of the plasmas in the ITER project.

The computers of private citizens collaborate in that project through Ibercivis, calculating the trajectories of nuclei in the plasma, which enables the prediction of their behaviour as an ensemble.

Results obtained with the participation of Fusion in Ibercivis:

CONFERENCES

- Comparison between 2D and 3D transport in ITER using a Citizen Supercomputer. A. Bustos, F. Castejón, L.A. Fernández, V. Martín-Mayor, A.Tarancón, J.L. Velasco. 36th EPS Conference, 29th June – 3rd July 2009, Sofia, Bulgaria.
- Comparison between 2D and 3D transport in ITER using a Citizen Supercomputer. A. Bustos, F. Castejón, L.A. Fernández, V. Martín-Mayor, A.Tarancón, J.L. Velasco. Oral contribution in the 32 Bienal of the RSEF, Ciudad Real, September 2009.

PUBLICATIONS

- Paper in the review Physics of Plasmas entitled 3D features of 2D Transport in ITER: results from Ibercivis (a Citizen Supercomputer). Authors: Francisco Castejón , Luis Antonio Fernández , Jerónimo García , Victor Martín Mayor , Alfonso Tarancón , Jose Luis Velasco.
- Article Ibercivis: una infraestructura estable de computación voluntaria o la ciencia en casa. F. Castejón, A.Tarancón. Review Vértices, March 2008.

2.4.2 Proteins Docking

Understanding the binding or docking process between human proteins and small molecules is crucial for the development of drugs improving the treatment of diseases like cancer. These small molecules, usually known as ligands, may modify the properties of the proteins with therapeutic effects. With Ibercivis, scientist from the Centro de Biología Molecular Severo Ochoa (CSIC-UAM) simulate the docking of certain proteins with a collection of ligands in order to identify the more promising ones for further experimental analysis.

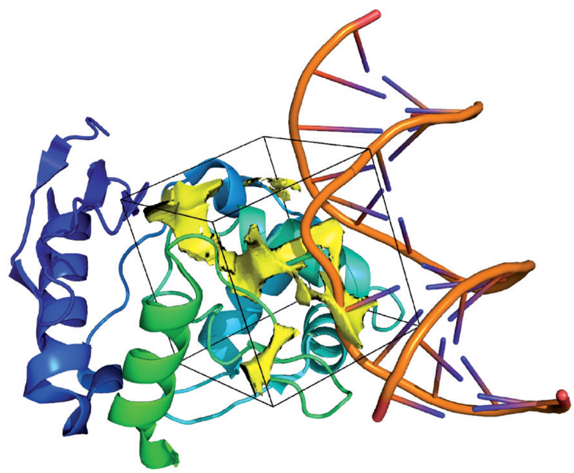


image: Characterization of the active site for carbon atoms interactions. The box shows the region where docking studies will be preformed.

MGMT, a protein making certain cancer cells resistant to some drugs used in chemotherapy, is the first protein they have worked with. The goal is to find a ligand that inhibits MGMT protein.

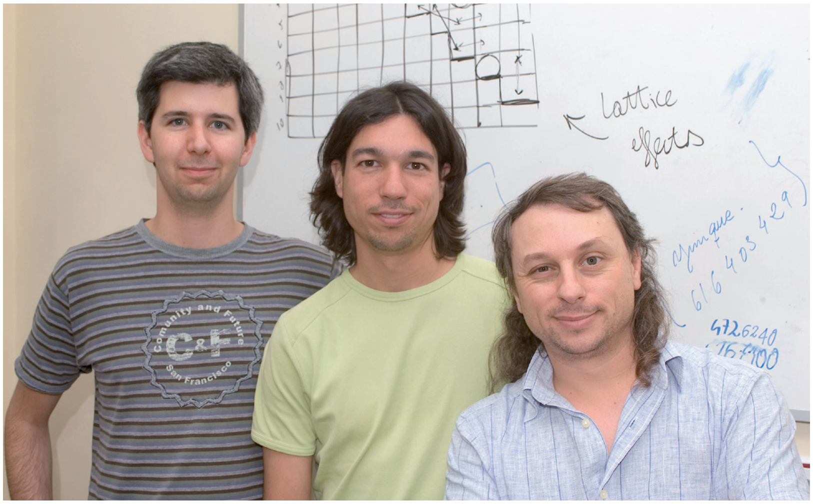


imagen: Docking research team

Identifying a ligand able to bind to a protein is a complex task. The available potential ligands constitute a chemical library, a collection of millions of molecules. Trying all of them in a laboratory would be unviable, in terms of time and resources. Therefore, a virtual screening is needed.

A single docking (a protein with one ligand) takes five minutes approximately. Processing all the ligands in a library will take 40 years in a single machine. Fortunately, thanks to the Ibercivis computers this process will be performed in a more reasonable shorter time. Two complete virtual screenings have been accomplished since the launching of the project. If any of the selected ligands is experimentally successful, it will become the active principle of a new drug in the future.

Objective: Find a ligand that will inhibit the protein that makes certain cancer cell resistant to some drugs used in chemotherapy

2.4.3 Materials

Theoretical Physics at the Complutense University of Madrid, Extremadura University and the Institute of Biocomputing and Physics of Complex Systems analyze by computer simulations how the impurities (non-magnetic atoms) in magnetic materials modify the properties of the phase transition.

In some materials, when they have a high degree of purity, there is a first order transition. Such transitions are characterized by a sudden change and coexistence during the transition from the two states. For example, water at 0°C does not crystallize as a whole, but crystallizing regions (ice) appear and coexist with water until it freezes completely.

However, beyond a certain level of impurity, such materials shall undergo a second order transition, where the phase shift is done gently so that the system transition point has no coexistence between the two phases.

A macroscopic magnet contains about one quadrillion constituents. Working with so many elements is impossible for any computer. The only way to reach conclusive results is to simulate small systems and to study how their properties vary with increasing size. The more we increase the size, the more we approach the real phenomenon. A large number of calculations are needed to be made and computers of Ibercivis are crucial for it.

Materials: how the impurities (non-magnetic atoms) in magnetic materials modify the properties of the phase transition.

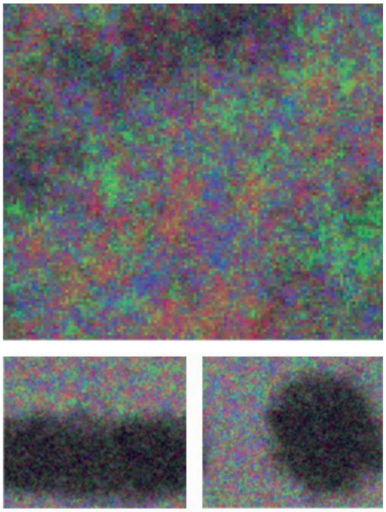


Image: Above: System with a 10% dilution in which there is no coexistence of phases. However, there are magnetized regions of all sizes; it is the equivalent of a hailstorm. Bottom: Pure models near the transition which shows a bubble and a magnetized band. The black region is the equivalent of an iceberg floating in the sea.

Results obtained with the participation of Materials in Ibercivis:

PUBLICATIONS	THESIS
• Microcanonical Study of the Site-diluted Eight-state Potts Model in 3D. L. A. Fernández, A. Gordillo-Guerrero, V. Martín-Mayor y J. J. Ruiz-Lorenzo.	• Phase Transitions in Disordered Systems. Antonio Gordillo Guerrero. Universidad de Extremadura. December 2009.

2.4.4 Neurosim

Proteins are made up of amino acids, which are molecules composed of a few atoms. In proteins, amino acids are strung one after another according to a sequence that is encoded in the genes. This sequence consists of a variable number of amino acids (from a few hundred to tens of thousands) and it is called the primary structure of the protein.

The different substructures are coupled to each other and form the tertiary structure of the protein, ultimately responsible for its biological function. Sometimes, several tertiary structures are combined in a certain way and it is said that they form a quaternary structure.

The number of proteins whose amino acid sequence is known is very high (reaching several million). However, with the experimental methods available today (X-ray diffraction, nuclear magnetic resonance, electron microscopy, etc···), it has only been possible to determine the tertiary structure of a small percentage of these proteins.

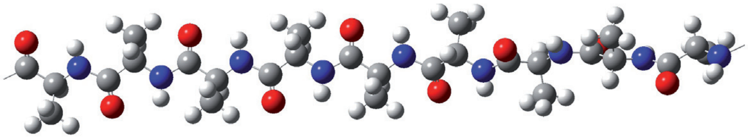


Image: Molecular structure of the amino acid called Alanine. Representation called CPK

Neurosim analyzes structural properties of aminoacids and small peptides that act in the brain and nervous system and are involved in neural mechanisms of learning and memory

Since the nature of the amino acids that make up a protein and their sequence determine the final structure of this protein, one of the greatest challenges of modern science is to infer 3D structure from the amino acid sequence.

To shed light on the construction of proteins, scientists at the Instituto de Estructura de la Materia del CSIC analyze the structural properties of amino acids and small peptides (sequences of a few tens of amino acids) known as neuropeptides. They act in the brain and nervous system and are involved in neural mechanisms of learning and memory.

2.4.5 Nanoluz

Scientists at the Institute of Optics Daza Valdés CSIC investigate the light behaviour in metal nanoparticles which could simplify the medical and biological analysis.

Knowing how the light moves at these length scales is useful to achieve the following technological goals:

- Explore the world of tiny things. We can build light sensors to modify and analyze what happens in nature at a nanoscale, i.e. at one millionth of a millimetre.

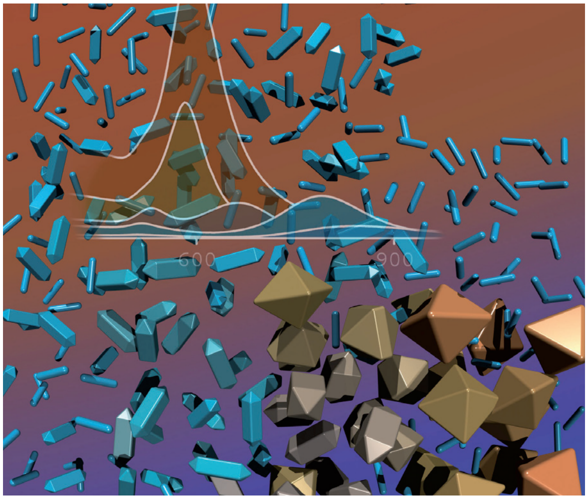
- To transmit and process information like electrons in a microprocessor. There are devices that already use light to switch and process signals such as optical fibbers through which we get Internet data and television at home. These developments are part of the challenge. To shape the flow of light in small structures and to fabricate optical computers is still a distant goal.

- Improve the performance of solar panels.

- Produce light (illumination) through devices.

Nanoluz project focuses on solving the Maxwell equations to describe the behaviour of light in metal nanoparticles. These particles are produced in advanced laboratories of colloidal chemistry in order to change the colour and optical properties of the media in which they occur.

We could detect the presence of diseases from a small amount of body fluid



The most immediate objective is to design strategies for the use of these particles in biosensors having sensitivity to individual molecules. Through nanoscopic biosensors based on the interaction of light with these molecules we could detect them and deduct from a small amount of body fluid -as a tear- the presence of diseases. Thus, many medical tests would no longer have to rely on the extraction of macroscopic amounts of blood.

2.4.6 Adsortion

Researchers from the Instituto de Química-Física Rocasolano from CSIC study adsortion properties of the Pillared clays that have a great relevance for the industry: for example catalysers, materials to storage gases and materials used in separation processes. This kind of clays is used in processes like biofuels production starting from vegetable fats, the storage of natural gas (room temperature) or the storage of greenhouse gases produced in industries.

Pillared clays consist on several equidistant layer sheets. Between sheets, molecules known as pillars are randomly placed.

In Ibercivis, each Adsortion job sent to a volunteer computer executes the adsortion simulation of a fluid with a fixed environmental conditions in a fixed pillars configuration.

The simulation, mixed with physic laws and experimental measurements, allows achieving ideal constructions that

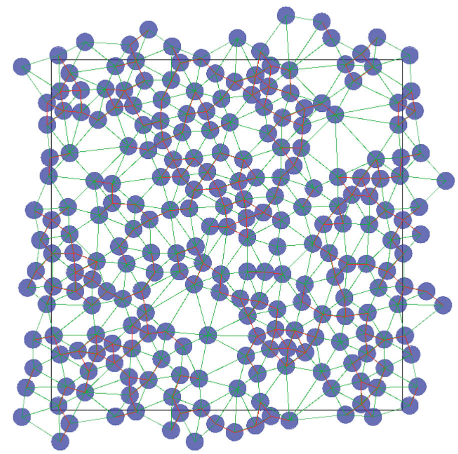


Image: 2D representation of a pillars (blue circles) configuration tessellated with Dealuny triangles. In red we can see regions where methane molecules can not go trough.

need aspects and real physical systems behaviours. Those constructions, known as physical models, help us understand the mechanisms that govern them and allow us to predict their behaviour.

Thanks to the simulations executed in the volunteer's computers we are obtaining valuable information concerning approachable volume for fluid molecules and catalytic properties of the clays in a reduced time, much lower to the time needed if these calculations were ran in one single computer.

Thanks to Ibercivis we are obtaining valuable information concerning approachable volume for fluid molecules and catalytic properties of the clays in a reduced time, much lower to the time needed if these calculations were ran in one single computer

Results obtained with the participation of Adsorcion in Ibercivis:

CONFERENCES

Modelado y simulación de procesos de adsorción en arcillas con pilares intercalados. Authors: Alberto Gallardo Sanz, Noé G. Almarza, Enrique Lomba, Claudio Martín. XVI Congreso de Física Estadística, September 2009 in the University of Huelva.

2.4.7 Amiloide

Amyloid diseases are a group of neurodegenerative diseases that include Alzheimer's disease, Parkinson's disease, familial amyloid polyneuropathy (FAP, also known as amyloidosis), and even diseases such as transmissible spongiform encephalopathy (commonly known as "Mad Cow disease") or in humans (Creutzfeldt-Jakob disease). All these diseases are characterized by the formation of aggregates of protein and fibber (amyloid), toxic for the nerve cells, and therefore responsible for the neurodegeneration observed in patients.

Alzheimer's disease is a degenerative disease of the central nervous system characterized by progressive memory loss and impaired cognitive function that nowadays affects millions of people around the world.

The familial amyloid polyneuropathy (FAP) is a degenerative disease of the peripheral nervous system and it is a disorder characterized initially by changes in temperature sensitivity and pain in the lower extremities. It progresses to a state of physical weakness of all patients with multiple complications. There are several outbreaks of the disease in the world, Portugal is one of the principal. The PAF was identified in the 1950s, by Professor Corino de Andrade (1906-2005), and since then, efforts to characterize the disease and therapeutic solutions have been done.

El proyecto Amiloide desarrollado sobre la plataforma de ComputaciónThe Amiloide project developed on the volunteer computing platform Ibercivis intends to seek compounds that can interfere with the formation

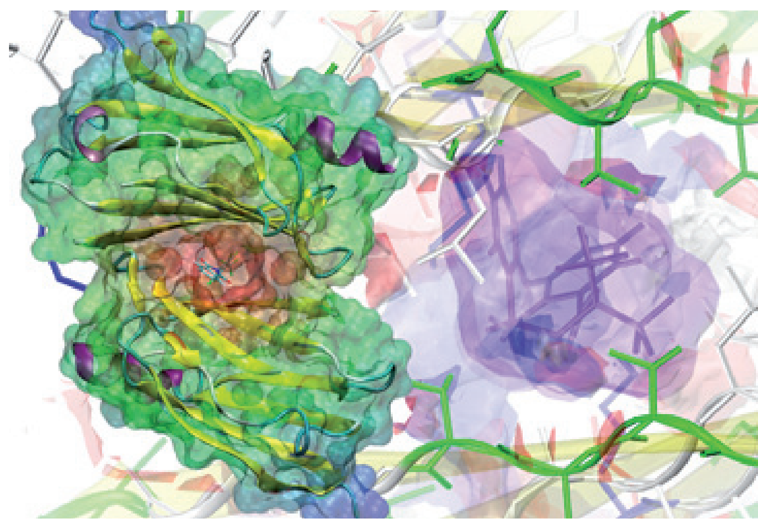


Imagen: ttr-stabilizers

of aggregates and amyloid fibrils in neurodegenerative diseases such as FAP and Alzheimer's disease. This

The aim of Amiloide is to search compounds that can interfere with the formation of aggregates and amyloid fibrils in neurodegenerative diseases such as FAP and Alzheimer's disease

computing project is part of an effort of the Center for Computational Neuroscience and Cell Biology (CNC), University of Coimbra, in characterizing the molecular mechanisms of amyloid.

2.4.8 Cuanticables

For years, there has been an increasing miniaturization of the electronic devices of domestic use. This reduction of size has been possible thanks to the corresponding reduction of the components that are part of the circuits and internal elements. This way, whereas the first transistors had a size of several centimetres, the modern transistors do not exceed magnitudes of a few millimetres. These advances have been possible thanks to the improvement in the technologies of manufacture and manipulation of semiconductors. Inside the scientific community, a qualitative jump in the process of miniaturization is expected by using wires and components that contain only a few particles inside the material.

This field offers the most interesting scenes, due to the fact that in so small scales, the behaviour of the particles is governed by the Quantum Mechanics laws. In these small cables and devices, the electrons that transport the currents reveal some spectacular characteristics of the quantum nature. Especially, as consequence of the duality particle - wave, the electrons can present effects of interferences in its movement, similar to those that the light presents.

The aim of cuanticables is to analyze to what degree the faults that contain the materials affect in the capacity that has a quantum cable to lead the current. For this purpose, researchers of the University of Buenos Aires develop a theoretical model which simulates the quantum wire, the impurities and the electrodes to which the quantum wire connects. They study in this frame the behaviour of the current that is generated across the wire when an external voltage is applied to it and they centre on understanding the role of the impurities, since this ingredient always is present in the real materials.

Cuanticables analyzes to what degree the faults that contain the materials affect in the capacity that has a quantum cable to lead the current.

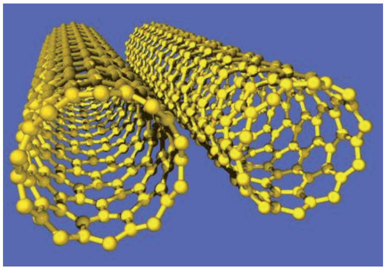


Image: Cuantic wire

2.4.9 Future Applications

Besides these applications, others will be launched shortly:

- **Criticalidad:** Electronic transport in disordered systems in Anderson transition, Institute of Physics, Autonomous University of Puebla, Mexico. This project studies the electronic transport properties of one-dimensional Anderson model with long-range couplings at the point of metal-insulator transition (critical point), described by random matrix model band (PBRM model, for its acronym in English) . In particular it focuses on the distribution of the conductance as a function of b bandwidth PBRM model, the number of M terminals attached to the system and the α coupling strength of them.

- **Sanidad:** application developed by the Radiophysics and PR Services Hospital Universitario Puerta del Mar de Cádiz. It uses Monte Carlo simulation techniques of transport and interaction of particles (photons, electrons and positrons) and has a long tradition in the field of Medical Physics. But they have an associated problem, large CPU times are needed to carry out some specific problems, and Ibercivis is a perfect platform to face the problem.

- **Mamografías:** Training and simulation of neural networks application used to optimize the input space in neural classifiers through features selection. The goal is to make a selection of features for the problem of classification of clusters of microcalcifications in mammography. This application is being developed by the University of Extremadura.

2.4.10 How to join Ibercivis as a researcher

Ibercivis is a volunteer computing platform used by researchers from different areas with high computational needs.

If you belong to a research group and you have an application that can be executed in Ibercivis, download the document "Questionnaire new applications" that is in the Ibercivis website → Ibercivis → Launch your application and once you have completed send it to desarrollo@ibercivis.es

Appropriate applications to be executed in Ibercivis are those that have the following characteristics:

- Science-technology interest
- Runs fragmentable in short periods, about 30-60 minutes each.
- RAM usage under 500 Mbtyes
- Zero-parallelism
- Input/output low for each job (maximum of 1 Mbyte) in order to not saturate domestic bandwidth.
- No licenses needed
- Millions of jobs needed to be run.

Proposed projects for implementation will be analyzed by Ibercivis team. Those which fulfil the requirements will be approved. Collaboration between research team and Ibercivis team will be established to make the necessary changes in the applications in order to be executed efficiently in Ibercivis architecture.

2.4.11 How to join Ibercivis as a user

First of all you must access www.ibercivis.es website and follow the BOINC installation steps. To create a BOINC account you must indicate a nickname and a valid email address. Next you must select Ibercivis in the "Choose a project" BOINC Manager.

Once inside Ibercivis you have to choose the applications that you wish to participate in by checking the appropriate checkbox.

Everything is ready to work with Ibercivis!

3

Ibercivis: Diffusion platform

3.1 Communication activities

3.1.2 Ibercivis in the Web

If the computing power provided to researchers is 50% of Ibercivis, the other 50% is the popularization of science.

Since its origins Ibercivis has a website where the information about the project is published. Initially it was a very simple webpage, with relevant data of the different applications. But in May 2009, a new website was presented. The design was updated with new content,

Image: Webpage Ibercivis

blogs, press and news, and the latest innovations in order to arouse the public interest not just in computing but in the contents and results of research which are parts of this platform.

The design and interactivity of the new website is the answer to the needs and trends of modern society. It also uses a content management system. The information can be found in English, Spanish and Portuguese.

A very interesting part of the website is the display map which shows the activity of Ibercivis in real time: you can see how the works are sent by servers to users and how the data are returned to storage servers.

3.1.2 Publications

In addition to the publications of each of the research teams (different applications) previously described, the project Ibercivis has appeared in various publications. On May 9th 2009 in the prestigious international journal Physics of Plasmas (Vol.16, Issue 5) the results of fusion research carried out in Zivis, predecessor of Ibercivis, were published:

• Finite orbit width effect in collisional ion transport in TJ-II is the title of this research written by

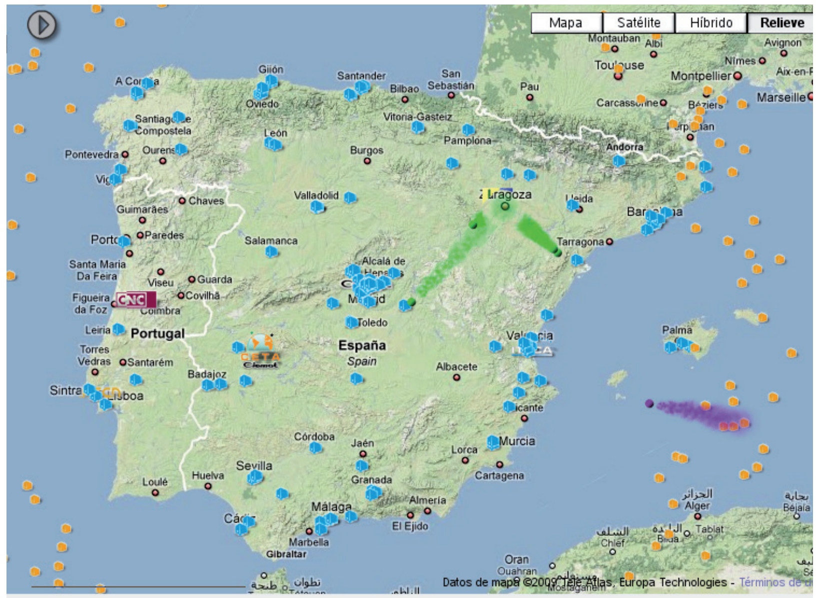


Image: Ibercivis map available in the website

JL Velasco, F. Castejon, A. Tarancón. More information: http://link.aip.org/link/?PHP/16/052303.

It is also relevant the article published in International Science Grid This Week with a description of the project: http://www.isgtw.org/?pid=1001643

3.2 Diffusion activities

Ibercivis Awards: In June 2009 a contest was held and citizen participation increased and caused a growth in the number of users. These awards were sponsored by Ibercaja, Sun Microsystems, Zaragoza Town Hall, the Diputacion Provincial de Zaragoza and HP... Those who participate and had the bigger number of credits achieved were the ones that won the contest. The different modalities of participation were:

Ibercaja Award Ibercivis 2009. one laptop computer HP mini 701 for each regional council and one for Ceuta and Melilla.

Zaragoza Town Hall Award Ibercivis 2009 one laptop computer for the citizen of Zaragoza who had the bigger number of credits achieved.

Diputacion Provincial of Zaragoza Awardp Ibercivis 2009 one laptop computer HP mini 701 for each "partido judicial" (region) of the province of Zaragoza.

Hewlett-Packard Award 2009, one laptop computer for the participant with more credits.

Sun Microsystems Award 2009 two workstations for the Ibercivis team with more credits.

The award's ceremony was held in July 2009 in the Water Digital Pavilion of Zaragoza and was organized by the Zaragoza Town Hall. Due to this contest Ibercivis Project appeared several times in press.

Image: Organizers and Winners in the Ibercivis award's ceremony

Fairs. Ibercivis participated in the Pabellón de la Ciencia in Octuber 2009 in the Zaragoza Trade Fair with the aim of showing citizens how Ibercivis works and how to participate in it. A stand with brochures and informative materials was settled and qualified personnel attended participants.

Unidades didácticas for institutes. Teaching units of the applications Fusion, Docking and Materials have been distributed in some Institutes in order to promote the participation of younger people in Ibercivis and to spread scientific knowledge. Furthermore, these teaching units are available in the website, so anyone can download them.

Conferences in Secundary Schools. C.F. Sansueña and I.E.S Luis Buñuel have been two centres in which an informative talk about Ibercivis is been given. In this talk it was shown how to collaborate with science and how to participate in the different applications. In C. F. Sansueña a poster was made and it was sent to the Vaticano.

Press appearances. Ibercivis has appeared in several media. Ibercivis awards in June 2009, or on the Internet day in May 2009 are some of the events with media appearances. Also interviews on radio (national and local stations) have been made. The support received by the Deputy Prime Minister Maria Teresa Fernandez de la Vega together with the Secretary of State for Research, Carlos Martinez at the launching ceremony of Extremadura Centre for Advanced Technologies (CETA-CIEMAT) located in Trujillo, was very important. More information in:

http://www.hoy.es/20090329/regional/crisis-oportunidad-para-apostar-20090329.html

Club de Innovación. Ibercivis appears in the Club de Innovación website as a success case in the category of Tecnología de las Comunicaciones y Administración electrónica. Club de Innovacion is the place were how the INNOVATION is being applied in the different public administrations is published. The best projects which are being carried in the different public administrations are published in it.

Internet Awards. Ibercivis was a finalist in the category C4 Mejor iniciativa. More information in:

http://premiosdeinternet.org/index.php?body=categoria_top3&id_rubrique=8&orden=hasard&sentido=0

Image: Ibercivis webpage in Facebook

Nomination to the awards. José María Savirón de divulgación científica.

Ibercivis in Facebook: Ibercivis has a webpage in Facebook which has more than 600 fans. New events are published and participants can argue and discuss about Ibercivis. Videos and photos of the different applications are published too.

4

Project expansion

4.1 Ibercivis as an institution

Ibercivis consolidation as a Foundation is a key step. Some times it is difficult to participate in ambitious projects or ask for grants if the project is not consolidated. This is why during 2009 the Ibercivis Foundation Statutes were drawn up. CIEMAT, Zaragoza Town Hal, the Direccion General of Aragon, the Ministry of Science and Innovation, RedIRIS and CSIC are some of the participant institutions.

Therefore, a non-profit foundation is going to be created in order to ensure the permanence of the project and to give this project a formal structure and legal status. Ibercivis foundation will give participants different tasks and responsibilities in relation to their involvement.

4.2 Portugal

Ibercivis was launched as a Spanish initiative of volunteer computing, but in 2009 it spread to Portugal becoming a Spanish and Portuguese initiative. This expansion has been made at different levels: infrastructure, application and political levels.

In the infrastructure the scheduling has been doubled, one is in Zaragoza and the other one is in Lisbon. In

Portugal there is also an upload and download server for applications and a web server in order to host Ibercivis web pages. Ibercivis has its own domain in Portugal www.ibercivis.pt, where all the contents are in Portuguese.

A new ibercivis application called Amloide is carried out in the Centro de Neurociencia Computacional y Biología Celular (CNC) of the University of Coimbra. Diffusion and promotional documentation is also being prepared.

Finally, the support received from the different institutions in Portugal has been very important. The Ibercivis presentation in Portugal in July 2009 was chaired by the MCTES Minister D. José Mariano Rebelo Pires Gago and the UMIC (Agência para a Sociedade do Conhecimento) President Luis Magallaes.

Other participants in the Project are LIP, Laboratório de Experimentação e Física de Partículas, CNC (Centro de Neurociências e Biologia Celular, Universidade de Coimbra), FCCN (Fundação para a Computação Científica Na-

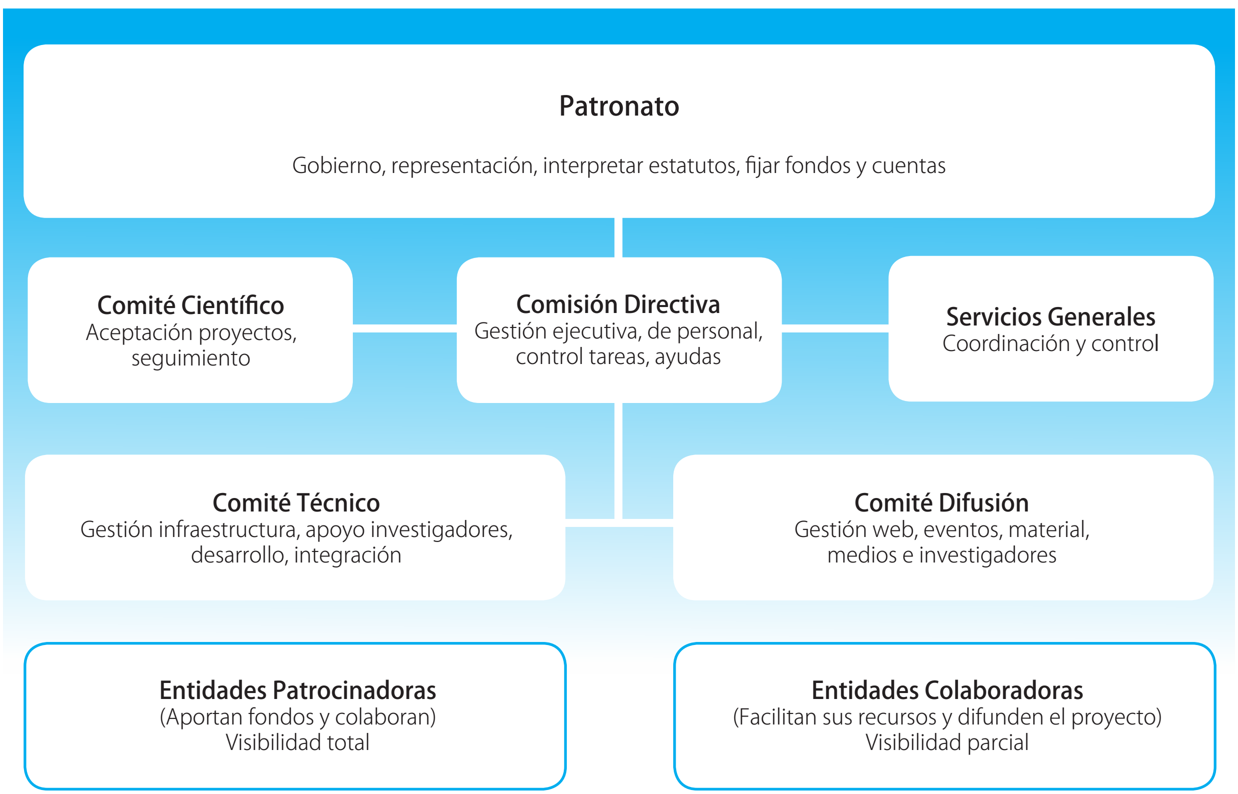


Image: organization of the Ibercivis foundation cional) and Ciência Viva. Ibercivis Project was officially launched in Portugal in February 2010.

4.3 Latin America as benchmark

After the expansion of Ibercivis to Portugal an expansion phase to Latin America is being prepared, a key point in the project strategy. Within this phase, speeches in various media and presentations in schools will be made. Qualified personnel will travel to Havana and Buenos Aires to coordinate communication events.

These tasks are within the Collaboration projects Hispano-Argentina and Hispano-Cuban that were approved in November 2009 as part of the Plan Nacional de I+D, Subprograma Fomento de Cooperación Científica Internacional (FCCI) in the category of ACI-promociona. An international Congress will be held in Cuba during the last months of 2010, in which volunteer computing and Ibercivis project will be presented.

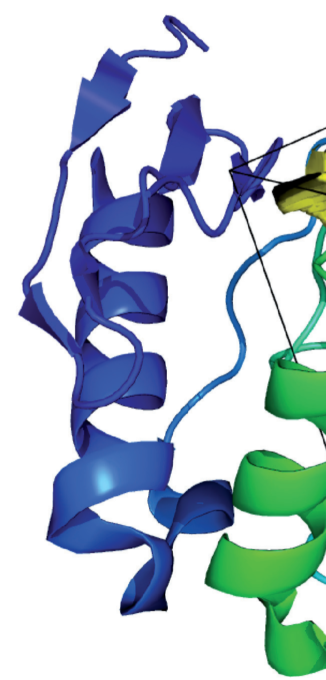
Apart from Argentina and Cuba, soon another application from the Benemérita Universidad Autónoma de Puebla en México is going to be part of Ibercivis. This will be an excellent opportunity for Ibercivis because it will appear in the press and people will start having information about the project.

4.4 European projection

Ibercivis takes part in two important projects of the VII Framework Programme:

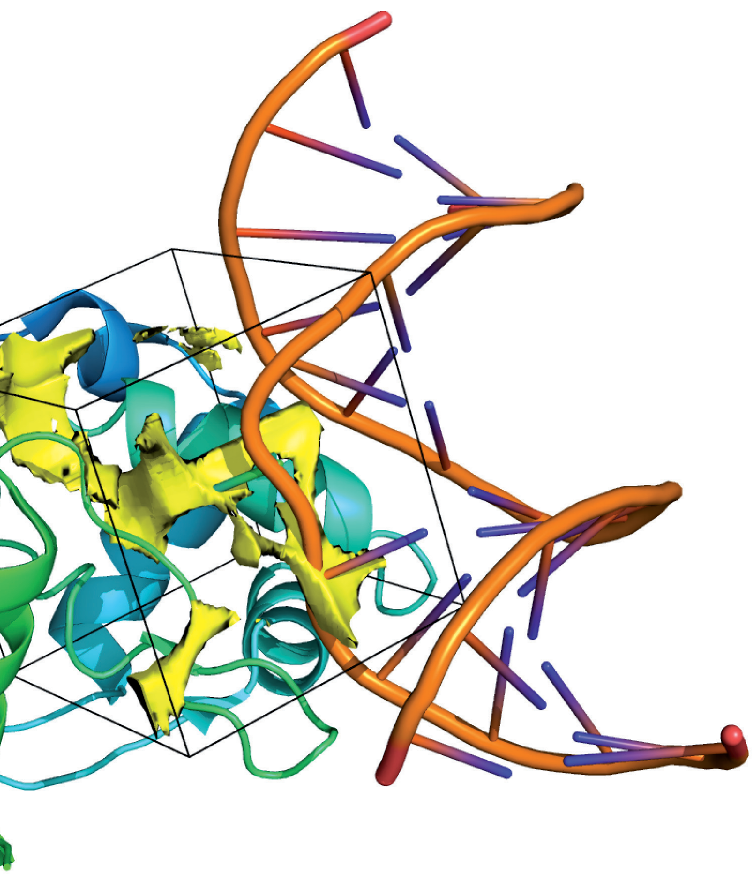
- EDGI: Interconnection of Grids, Desktop Grids y Clouds at a European level.

- DEGISCO (Desktop Grid for International Scientific Collaboration): Desktop Grids expansion.



5

Projects subventions



During 2009, Ibercivis has received funds from the Ministry of Science and Innovation, Direccion General of Aragon, Ibercaja, Zaragoza Town Hall and all participating institutions.

Ibercivis Awards held in June 2009 were sponsored by Ibercaja, Sun Microsystems, Zaragoza Town Hall, Diputacion Provincial de Zaragoza and HP.

In addition, Ibercivis has the following subventions (given in 2009) to perform different activities during 2010:

- **Acciones complementarias**
  Título: IBERCIVIS, la ciencia en casa.
  Ref: TIN2009-07010-E/TIN

- **ACI- promociona**
  Title: Cooperación Hispano-Cubana en temáticas de Computación Avanzada. Ref: ACI2009-1027
  Title: Cooperación Hispano-Argentina en temáticas de Computación Avanzada. Ref: ACI2009-1033

- **Collaboration agreement with Dirección General de Aragón.**

- **Collaboration agreement with Ibercaja.**

6

Working Team

Ibercivis Working Team has four different parts: Management, Development, Research and Communication.

Ibercivis is a platform promoted by Spanish research centres from different knowledge areas.

Centro Extremeño de Tecnologías Avanzadas (CETA)

Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT). Ministry of Science and Innovation

Consejo Superior de Investigaciones Científicas (CSIC). Ministry of Science and Innovation

RedIRIS and Ministry of Science and Innovation

Instituto de Biocomputación y Física de Sistemas Complejos (BIFI) of the University of Zaragoza

Portuguese participation:

LIP, Laboratório de Experimentação e Física de Partículas

CNC, Centro de Neurociências e Biologia Celular, Universidade de Coimbra

FCCN, Fundação para a Computação Científica Nacional

Ciência Viva, Agência Ciência Viva

In addition, Ibercivis has the collaboration from local government as the Zaragoza Town Hall and various public and private institutions interested in promoting scientific culture and citizen participation.

Task distribution among organizers is:

BIFI: Project Management.

CETA-CIEMAT: Provides storage resources.

CSIC: Provides researchers and develops diffusion tasks.

RedIRIS: Provides redundancy and security services

LIP: Provides storage resources.

CNC, FCCN: Provide researchers and project coordination in Portugal

Agencia Ciencia Viva: Develops and coordinates dissemination work in Portugal

Centers

Instituto de Biocomputación y Física de Sistemas Complejos (BIFI)

The Institute for Biocomputation and Physics of Complex Systems (BIFI) is a research institute of the University of Zaragoza that promotes interdisciplinarity to face the big challenges of innovation and development. The BIFI has researchers from the University of Zaragoza and from other Spanish and foreign universities. Its aim is to develop a competitive research in computation applied to physics of complex systems and biological systems. In addition to research in basic science, a fundamental point of the institute is technology transfer between universities and companies.

To accomplish these objectives, BIFI has researchers from different fields, whose collaboration is being very significant. In particular, supercomputing experts, physicists working in materials science, quantum chemistry or complex networks, and biologists working on structural problems like drug development and protein folding.

More information at: www.bifi.es

BIFI Ibercivis team (from left to right) Francisco Sanz, Darío Ferrer, Alejandro Rivero, Elisa Cauhe, Fermín Serrano, Jose Félix Saénz, Beatriz Antolí, Alfredo Ferrer, Alfonso Tarancón y Gonzalo Ruiz.

Consejo Superior de Investigaciones Científicas (CSIC)

The State Agency Council for Scientific Research, (CSIC) is the largest public institution dedicated to research in Spain and the third in Europe. It belongs to the Ministry of Science and Innovation, through the Secretary of State, the main objective is to develop and promote research in order to obtain benefits in scientific progress and technological developments. The collaboration with Spanish and foreign entities is opened.

CSIC has a central role in science and technology policy, covering from basic research to knowledge transfer to the industrial sector. The hart of the CSIC are the research centres and institutes, located in all Spanish regions, more than 12,000 workers, over 3,000 are researchers on staff, and many other doctors and scientists. CSIC has the 6 percent of all the Spanish staff involved in Research and Development, which generates about 20 percent of the national scientific production. It manages important infrastructures; the most complete and extensive network of special libraries and has several joint research units.

More information at: www.csic.es

CSIC Ibercivis team. In front Left to right: Aurelio Herrero, Pilar Tigeras (Vicepresidenta Adjunta de Organización y Cultura Científica) and Víctor Castelo. Other researchers and Communication personnel.

Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT) y Centro Extremeño de Tecnologías avanzadas

The CIEMAT, an Organism of the Ministry of Education and Science, is a Public Research Agency with excellence in energy and environment, as well as in many vanguard technologies and in various areas of fundamental research.

Since its creation in 1951, then as the JEN, and since 1986 as the CIEMAT, it has been carrying out research and technological development projects, serving as a reference for technical representation of Spain in international forums, and advising government on matters within its scope.

CIEMAT is technically and geographically diversifying to better care for the R&D needs of Spain in general and its Autonomous Regions in particular. CIEMAT activities are organised around research projects that span the bridge between R&D and the interests of society.

The CIEMAT team is made up of approximately 1200 people, of whom 47% are university graduates.

More information at:
www.ciemat.es

CIEMAT Ibercivis team (Left to right) Ramón Gavela, Begoña Bermejo, Stefano Troiani, Isabel Redondo and Paco Castejón

The Centre for Advanced Technologies of Extremadura (CETA-CIEMAT) is a centre of CIEMAT devoted to research, development and service in information and communications technologies for the benefit of science, industry and society in general, in the contexts of Extremadura, Spain, Latin America and also with the countries of the Mediterranean basin.

The core of the CETA-CIEMAT is a centre of GRID computing. It's a part of the European network of GRID centres (at present EGEE network) and it is the central driver of the Latin American network of GRID centres (including the project EELA).

In this sense, the CETA-CIEMAT is an active driver of eScience programs, defined as large-scale scientific activities that are developed through distributed global collaborations between scientific institutions around the world.

The Centre's mission is to contribute to the consolidation and dissemination of eScience and information technologies, especially GRID, as a fundamental technological basis for the development of scientific programs.

Red Académica y de Investigación española (RedIRIS)

RedIRIS started operating in 1998 and it is the Spanish academic and research network that provides advanced communication services to the scientific community and national universities. It is funded by the Ministry of Science and Innovation and it is included in the Ministry's map of Special Scientific and Technological Facilities. It is managed by the Public Corporate Entity Red.es, which reports to the Ministry of Industry, Tourism and Trade.

RedIRIS has over 360 affiliated institutions, mainly universities and public research centres, which join this community by signing an affiliation agreement.

More information at: http://www.rediris.es and http://www.red.es

RedIRIS Ibercivis team (Left to right) Antonio Fuentes, Tomás de Miguel and Cristina Lorenzo.

Laboratorio de Instrumentación y Física Experimental de Partículas (LIP)

LIP is a scientific and technical association of public utility whose goal is the research in the fields of Experimental High Energy Physics and Associated Instrumentation.

LIP's research domains have grown to encompass Experimental High Energy Physics and Astroparticles, radiation detection instrumentation, data acquisition and data processing, advanced computing and applications to other fields, in particular Medical Physics.

The main research activities of the lab are developed in the framework of large collaborations at CERN and at other international organizations and large facilities in Europe and elsewhere, such as ESA, SNOLAB, GSI, NASA and AUGER.

There are two laboratories in Coimbra and Lisbon, LIP has about 170 people. (over 70% hold a PhD degree and many are professors at the local universities)

More information in: http://www.coimbra.lip.pt

Centro para la Neurociencia y Biología Celular (CNC)

The Center for Neuroscience and Cell Biology (CNC) is a Research Institute committed to excellence in Bioscience and Biomedicine. It was the first Associated Laboratory in Portugal, and is part of the Network of European Neuroscience Institutes (ENI). The CNC is also involved in collaborations between the Portuguese government and the Massachusetts Institute of Technology (MIT) and Harvard Medical School (HMS).

The CNC brings together researchers from the Faculties of Medicine, Pharmacy and Science and Technology at the University of Coimbra, as well as from the University Hospitals (HUC) and Pharmaceutical industries. The diverse scientific background has been crucial in advancing innovation in fundamental and translational research.

More information in: http://www.cnbc.pt

Fundación para la Computación Científica Nacional (FCCN)

FCCN is a private non-profit public entity which became operational in January 1987. Since then and with the support of several universities and national R & D, FCCN has contributed to the expansion of the Internet in Portugal.

The main activity of FCCN is the planning, management and operation of the Science Technology and Society net (ACE), a high-performance network for institutions with higher communication requirements, which is an experimental platform for applications and advanced communications services.

ACE is a computer network that uses Internet protocols to provide a platform for communication and collaboration between institutions of education, science, technology and culture.

Apart from the management of the ECA, FCCN is the entity responsible for managing the registry service areas .pt

More information in: http://www.fccn.pt/

Ciência Viva - Agência Ciência Viva

Launched in June 1996, Decree N. 6/MCT/96 of 01.07.1996, the Ciência Viva programme is the contribution of the Ministry of Science and Technology to the promotion of a scientific and technological culture among the Portuguese population, especially young people and students of primary and secondary schools.

Ciência Viva was established as an open programme, promoting alliances and fostering autonomous actions through the definition of three fundamental action tools:

1. A support programme, aimed at the experimental teaching of science and at the promotion of scientific education in the school.

2. A National Network of Ciência Viva Centres, designed as interactive spaces aimed at creating an awareness of science among the population.

3. National scientific awareness campaigns, fostering the creation of science associations and providing the population with the opportunity to make scientific observations and to establish a direct and personal contact with experts in different fields of knowledge.

More information in: http://www.cienciaviva.pt/home/

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