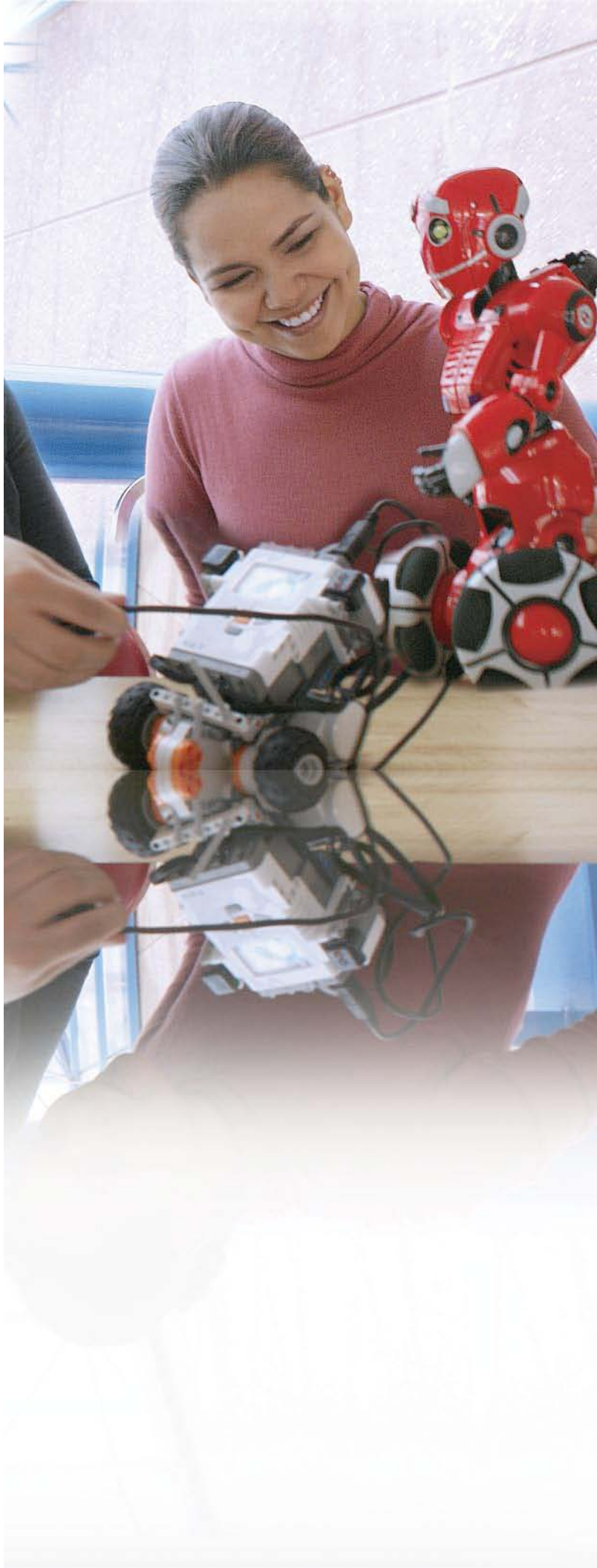


Computing Research Center (CIC IPN)

Instituto Politécnico Nacional, México

2012



Index

| | |
|--|----|
| Postgraduate Programs..... | 03 |
| CIC Academic Programs and Students Graduate Statistics..... | 09 |
| Research Lines at CIC..... | 11 |
| Relevant Aspects | 13 |
| Microtechnology and Embedded Systems (MICROSE-Lab)..... | 15 |
| MICROSE Research Programs:..... | 15 |
| Micro and Nanotechnology..... | 17 |
| Complementary Activities..... | 19 |
| IPN Mexican National Presence..... | 21 |
| IPN Collaboration with Other Institutions..... | 23 |
| CIC International Cooperation..... | 25 |



Postgraduate Programs

The Computing Research Center (CIC IPN)

offers a qualification of the highest academic standard in Mexico.

The Computing Research Center (CIC IPN) graduate professionals from the computer, electrical and electronic engineering, including all student interested in acquiring new knowledge in the fields of: nanotechnology and microtechnology, hardware and software, including innovative combination of these disciplines to solve new challenges in the field of engineering. At doctoral level, graduate professionals interested in deepening their knowledge in the theory and techniques of modern computing that can make original contributions in the area.

PhD in Computer Sciences

The advance of Information and Communication Technology has a strong impact on the development of virtually all productive sectors and in most areas of science. This program addresses the existing backlog of researchers in the field of computer science and of scientists conducting basic and applied research for the benefit of strategic sectors and necessary in the current process of modernization.

Objective:

Prepare human resources for academic excellence at doctoral level, professionals with a deep knowledge in the Computer Sciences field, according to the highest international standards of quality and competitiveness, to generate new knowledge in the areas of computer science and computer engineering.

Postgraduate Programs



MSc in Computer Science

The program is inserted in a context in which societies evolve and develop together with proper advances in the field of Information and Communication Technology. Under this global scenario, it encourages an innovative thinking to the students to be graduated with a high-level training in information technology for scientific research and technological development.

Objective:

Prepare high level specialists capable to implement, innovate, develop and apply new technologies for computer science, participating as leaders of work groups in solving problems for public and private sector.



MSc in Computer Engineering

The program is relevant to address the technology gap in development and technology transfer related to special-purpose and high performance computer systems, including disciplines related with the technological innovation, such as nanotechnology and microtechnology; The program was created in response to the lack of specialists to meet the technological needs of industries and strategic sectors, essentially for modern economic development.

Objective:

Prepare high level students capable of developing advanced computer systems to strengthen creativity and technological innovation, working in a spirit of leadership in solving engineering problems involving: design, analysis and implementation of devices and systems processes.

MSc in Computer Engineering considers the design and use of computing components, software or hardware or a combination of both, to solve technical problems in an efficient and competitive way.



CIC Academic Programs and Students Graduate Statistics

Two early centers supported the Computing Research Center (CIC IPN) foundation:

- In first place the National Calculus Center of the IPN (CeNaC) created in 1963, these Center offered the first program of Master of Science in Computing in Mexico.
- The Technological Research Center in Computation of the IPN (CINTEC) founded in 1988, a year after the Master in Computing Engineering program began.

The Computing Research Center (CIC IPN) was founded in 1996, since that year offered three postgraduate programs: MSc in Computer Science, MSc In Computer Engineering and PhD in Computer Science.

Students enrolled in the postgraduate programs at CIC IPN

| Postgraduate programs certified by the Mexican National Science and Technology Council CONACyT. | students |
|---|----------|
| MSc of Computer Science (MCC) | 81 |
| MSc in Computer Engineering (MCIC) | 54 |
| PhD in Computer Science (DCC) | 55 |
| Total | 190 |

Total of graduates on the CIC IPN programs.

| Graduate levels, since 1996 | Total |
|-------------------------------|-------|
| Master in Science (MCIC, MCC) | 432 |
| Ph. Doctor (DCC) | 89 |
| Total of graduates | 521 |

CIC Academic Programs and Students Graduate Statistics



Professors profile

The National Researchers System (SNI- CONACyT) certifies and recognizes 27 of our professors as members, due to the research work done at the CIC IPN.

There are 50 full-time professors involved in the research activities of the CIC IPN programs, 80% of the staff has the PhD degree

Research Lines at CIC

- Micro-technology and Embedded Systems
- Digital Signal Processing
- Communications and Computer Networks
- Intelligent Processing of Geospatial Information
- Artificial Intelligence
- Database and Software Technology
- Real-Time and Automation



Aguilar Ibáñez Carlos Fernando
Aguilar Jauregui Maria Elena
Alvarez Gallegos Jaime
Argüelles Cruz Amadeo José
Balladares Ocaña Leandro
Barrón Fernández Ricardo
Botello Castillo Alejandro
Calvo Castro Francisco Hiram
Camacho Nieto Oscar
Chimal Eguía Juan Carlos
Coyote Estrada Hugo César
Cruz Cortés Nareli
Díaz de León Santiago Juan Luis
Espinosa Sosa Osvaldo
Felipe Riverón Edgardo Manuel
Figuerola Nazuno Jesús Guillermo
Godoy Calderón Salvador
Guelboux Kahn Alexandre Felixovich

Gutiérrez Aldana Alfonso
Guzmán Arenas Adolfo
Guzmán Lugo José Giovanni
Levachkine Serguei Pavlovich
Luna García Rene
Manrique Ramírez Pablo
Martínez Castro Jesús Alberto
Martínez Luna Gilberto Lorenzo
Medel Juárez José de Jesús
Menchaca García Felipe Rolando
Menchaca Méndez Rolando
Molina Lozano Herón
Moreno Armendáriz Marco Antonio
Moreno Ibarra Marco Antonio
Oliveros Ceja Jesús Manuel
Orantes Jiménez Sandra Dinora
Oropeza Rodríguez José Luis
Peredo Macías Cuauhtémoc

Peredo Valderrama Ruben
Pogrebnyak Oleksiy
Ponce Ponce Victor Hugo
Quintero Téllez Rolando
Ramírez Salinas Marco Antonio
Retchkiman Konigsberg Mordejai Zvi
Rubio Espino Elsa
Sánchez Fernández Luis Pastor
Sandoval Reyes Sergio
Sidorov Grigori Olegovich
Sossa Azuela Juan Humberto
Suárez Guerra Sergio
Taud Hind
Téllez Castillo Germán
Torres Ruiz Miguel Jesús
Urbieto Parrazales Romeo
Villa Vargas Luis Alfonso
Yáñez Márquez Cornelio

Relevant Aspects



The Computing Research Center CIC has a highly qualified staff; 80 % of them are certified by the Mexican National Researchers System.

The Computing Research Center CIC has adequate facilities and modern laboratories with proper equipment, it also has the cooperation and support of the Center for Nanoscience and Micro and Nanotechnology of IPN in Mexico.

Students may carry out abroad research in a foreign institutions complementing the research of the thesis.

The Computing Research Center CIC has a specialized library with more than 14,000 titles, with access to the most important databases of electronic books and journals.

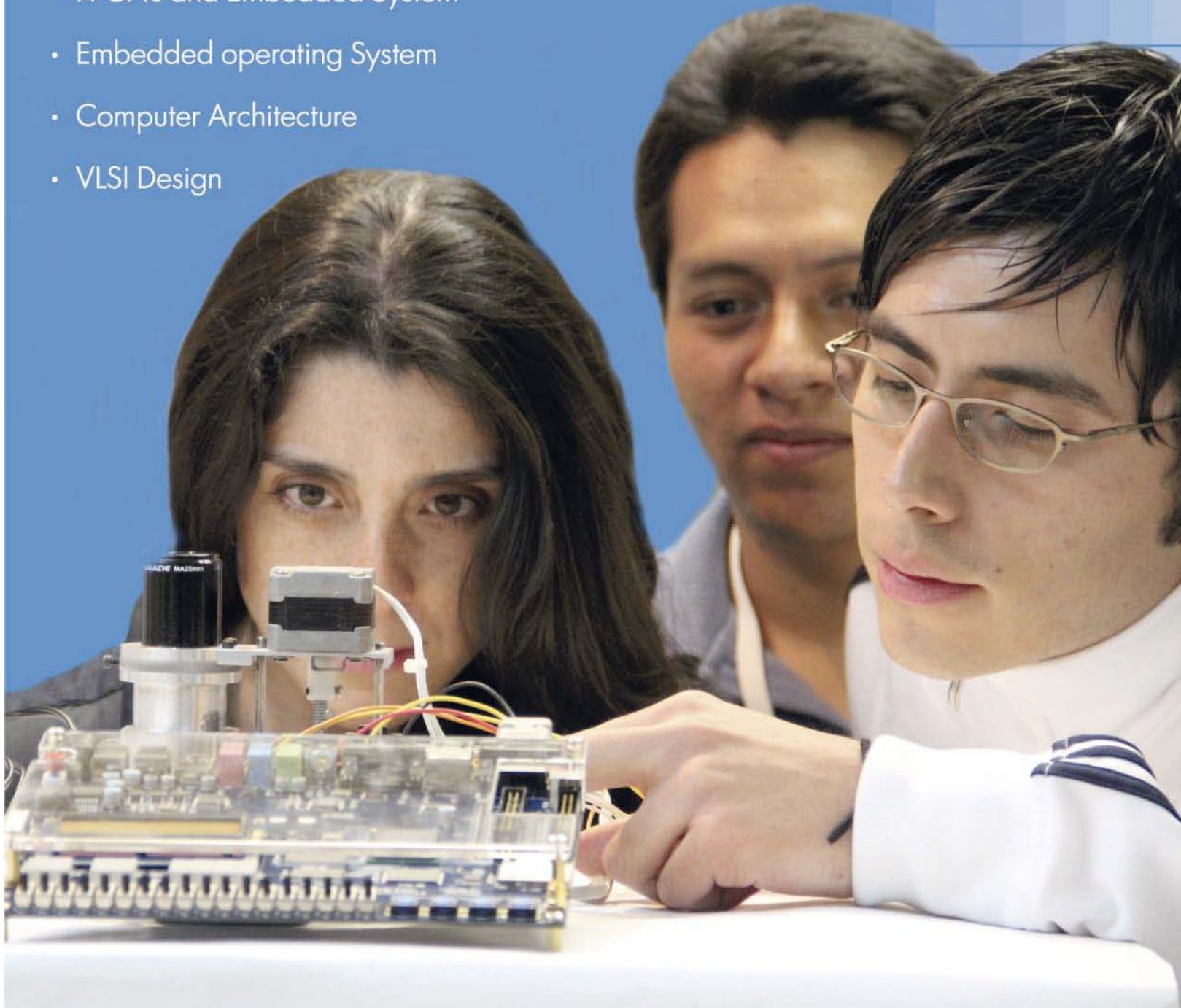
CIC also edit the “Computación y Sistemas” journal, with an iberoamerican coverage, sponsored by CONACyT and recognized in the Mexican Scientific Research and Technology Journal Index.

MICROSE-Lab

Microtechnology and Embedded Systems

Microtechnology and Embedded System Lab, a place in Mexico where students receive high education and training with international competitive skills in the area of computer engineering. Microse-lab activities are focused on:

- Software Development for Specific Applications
- Micro-Nano-Technology (MEMS-NEMS)
- FPGA's and Embedded System
- Embedded operating System
- Computer Architecture
- VLSI Design



Microtechnology and Embedded Systems

MICROSE Research Programs:

High Performance Computer Architecture:

new ideas to develop low power and high performance micro architecture and circuits for future processors. Simulation, design and integration of high performance and low power circuits, for superscalar processors.

Micro-Nano-Devices:

ideas to develop micro and nano devices for specific applications, mainly specific sensors.

Reconfigurable Computing:

Design and integration of application's kernels with high computing demand in programmable modules written in VHDL / Verilog / SystemVerilog to be synthesized in architectures of FPGA's reconfigurable.

Cities with Technology and Connectivity:

ideas to integrate new technologies to improve habitant's comfort.

Alligator Project:

The design of a Superscalar Processor (MIPS R10000) using HDL and Mentor Graphics CAD.

Modular Architecture for Synthesized Applications MASA: A big project that includes a combining work technologies as Operating Systems, Reconfigurable Hardware, Dynamic Reconfiguration, Synthesizers and Hardware Libraries.

HPCA and RC skills.

To develop specific computing skills, CIC has prepared special courses, that includes tools and specific training.

| Courses | Tools | Specific training |
|---|--|---|
| Computer architectures, Processor design, Systems Programming, Operating System and Hardware Description Languages. | Simplescalar-3.0, Cacti-3.0, Alligator- 0r0. | VLSI Design CAD: Mentor Graphics, HDL Designer Series, Leonardo Spectrum, ModelSim, Questa, Certe, Tanner and Hspice |

The project GUIAME (guide me in Spanish):

Administration and control by complex systems of monitoring of smart vehicular traffic, using GPS, GIS, DB's, and Telecommunications: MAN, WiMAX and GPRS, GSM, EDGE (Cellular Network)

Embedded System Design:

Integrate SBC, FPGA's, peripherals, appropriated OS and develop software for specific mobile applications.

| Courses | Tools |
|---------------------------------------|-----------------------------|
| Computer Architectures | Simulators, Bosh, Qemu, VM, |
| Systems Programming , C, C++, Java | Linux |
| Operating System | OpenEmbedded |
| HDL | Android, Meego |
| | Windows, Windows Embeded |
| | WindowsPhone7 |

Micro and Nanotechnology

Microtechnology Facilities.
Characterization Laboratories

- Microscopy : Laser Scan, Atomic Force,
- Spectrometry: RAMAN, Ellipsometer

Clean rooms: Class 100 and 1,000

Equipments:

- RIE -Reactive Ion Etching,
- Sputtering,
- Mask Aligner EVG320.



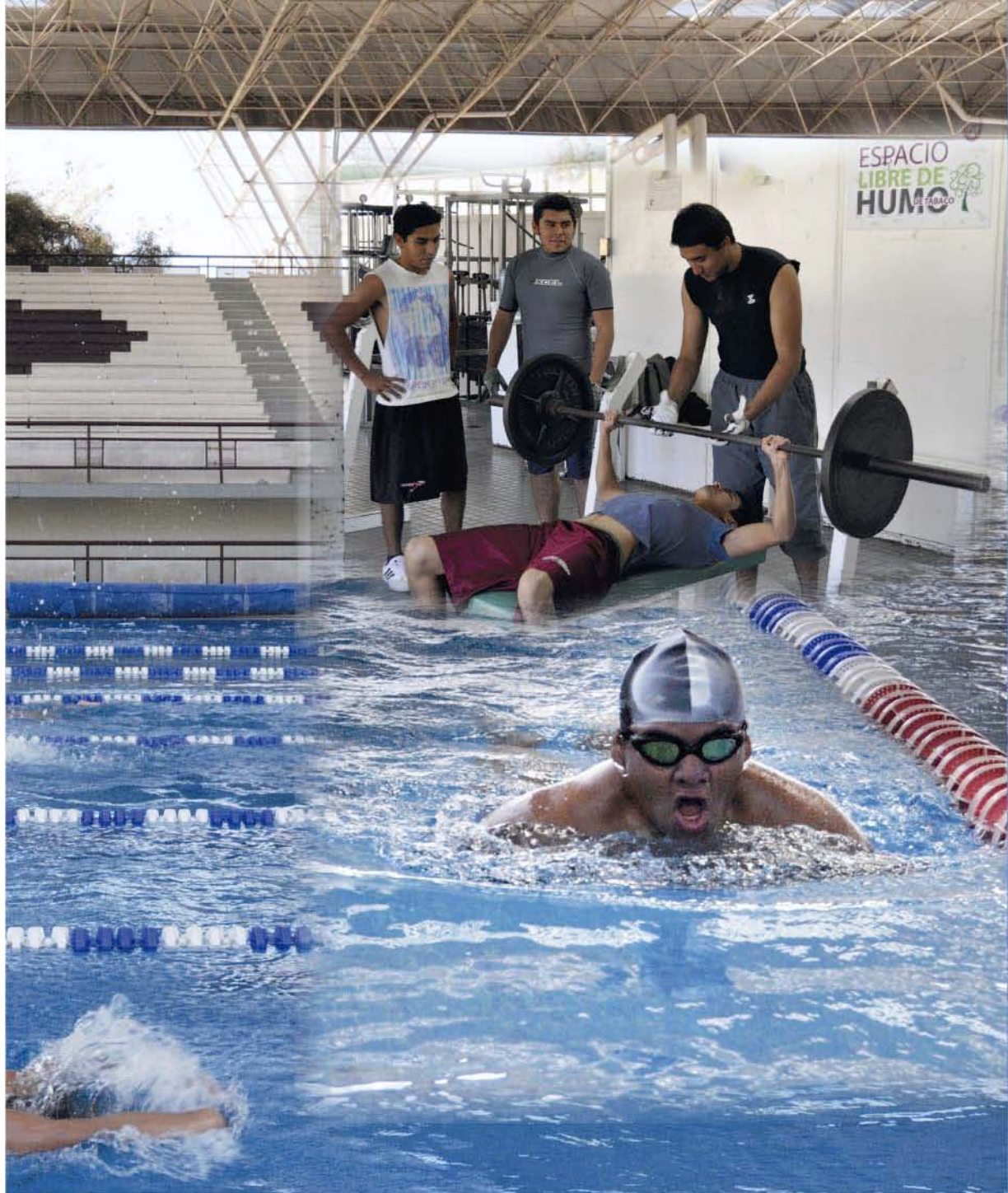
Micro and Nanotechnology

Research network in the building of sensors & biosensors

| Research fields | CIC IPN Networks |
|------------------------------|----------------------------------|
| Food sciences | Micro and Nanotechnology Network |
| Health sciences | Biotechnology Science Network |
| Strategic research in Energy | Mexican Petroleum Ins |

Micro-Nano Devices Design skills

| Courses: | Tools: |
|---------------------------|--------------------------------------|
| Analog IC Design | H-SPICE, Tanner, (LEDIT, SEDIT, LVS) |
| Advanced Analog IC Design | Mentor Graphics |
| Low power Design | HDL Designer Series |
| Analog Signal Processing. | Leonardo Spectrum |
| Modern Physics | ModelSim |
| Multiphysics Simulation | Questa |
| | Certe |
| | COMSOL |
| | SUMMIT V |



Complementary activities

In the IPN, the practice of complementary activities is the strategy to reach an integrated education, considered as a combination of:

Sports

The IPN has modern facilities for the daily practice of sports such as swimming, cycling, tennis, soccer, baseball, football, basketball, track and athletic practices, Taekwondo, Judo, wrestling, etc.

Recreation

In the IPN camps the facilities at Zacatenco has large green areas, sculptural spaces, outdoor areas and a bell chime musical park.

Complementary activities

Culture.

For all artistic expressions there is a space in the Field of Zacatenco, IPN promotes: theater, dance, music, film art, folk art, among others. The season of the IPN Symphony Orchestra and the performances of choral Alfa Nova are examples of this activity promoted by the IPN to the general public.

Entertainment and Dissemination of Science and Technology.

IPN includes the Luis Enrique Erro Planetarium building and the Constellations area, modern infrastructure created to raise awareness of space science and their importance on our lives.

These programs are offered to all polytechnic students to supplement their education through activities: training, technical updating and professional management training, continuing education and foreign language teaching.

Entrepreneurship Culture:

The IPN promotes direct linkage with the productive sectors as part of its institutional strength by including youth entrepreneurship training, business program Poliemprende becomes the bridge that links learning with practical application, encouraging creativity, initiative, ability to take risks and work and economic independence of students by supporting students to carry out the incubation process of their own business.

- In 2010 is reported a graduation of 213 students in the Engineering Entrepreneurship Program, in collaboration with INSA-Lyon (France) and the Polytechnic Foundation support.
- The Institutional Program for Entrepreneurs (PoliEmprende) includes students in entrepreneurial projects for the start-ups. From 2004 to 2009, more than two thousand supported 790 projects involving 10 000 students and 685 teachers and 406 companies were preincubated.

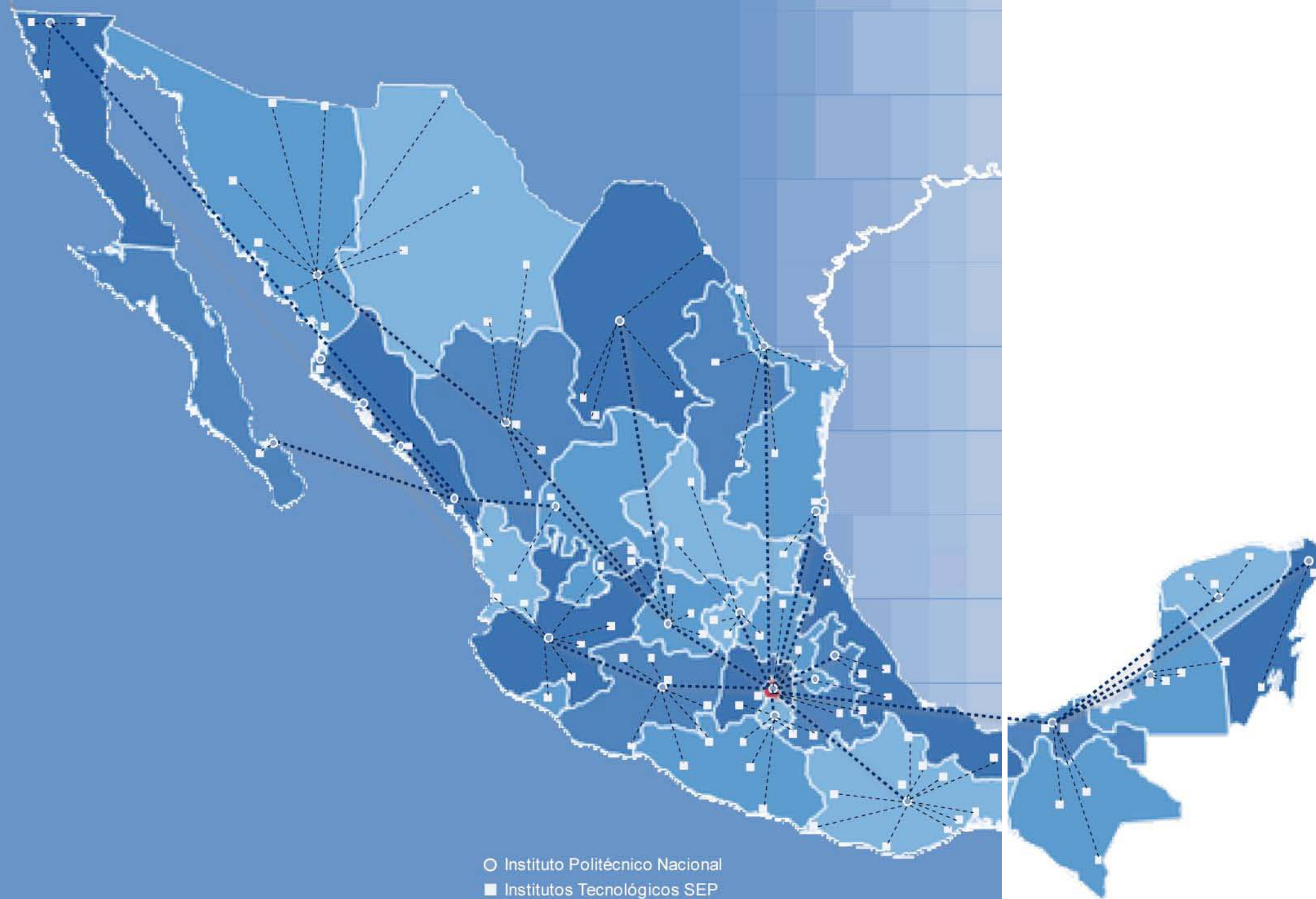
Services and technological solutions.

In connection with activities of the productive sector in 2010 was achieved an increase of 48.9 percent in pre-incubated projects, 56.2 percent in participating entrepreneurs, 28.9 percent graduated companies and 39.7 percent in the number of students in these programs.

250 companies were created, generating a total of 813 jobs, 331 agreements were negotiated increasing the technological link that allowed the flow of revenue of more than 76.3 million US Dls.

IPN

Mexican National Presence.



IPN – Mexican National Presence.

Mexico Federal Technological Institutes

Founded in 1936, the Instituto Politécnico Nacional (IPN) is the most important public technological higher education institution in Mexico. Academic quality is one of our main distinctions: more than 94% of all IPN students are trained in an educational program at a quality level recognized by external agencies.

The IPN has an extensive coverage in the Mexican Republic with 81 academic units, the infrastructure of the IPN network (IPN, Cinvestav, TV Channel 11) covers over 80% of the states, these can be extended with the collaboration of the Technological Institutes and Universities in the states.

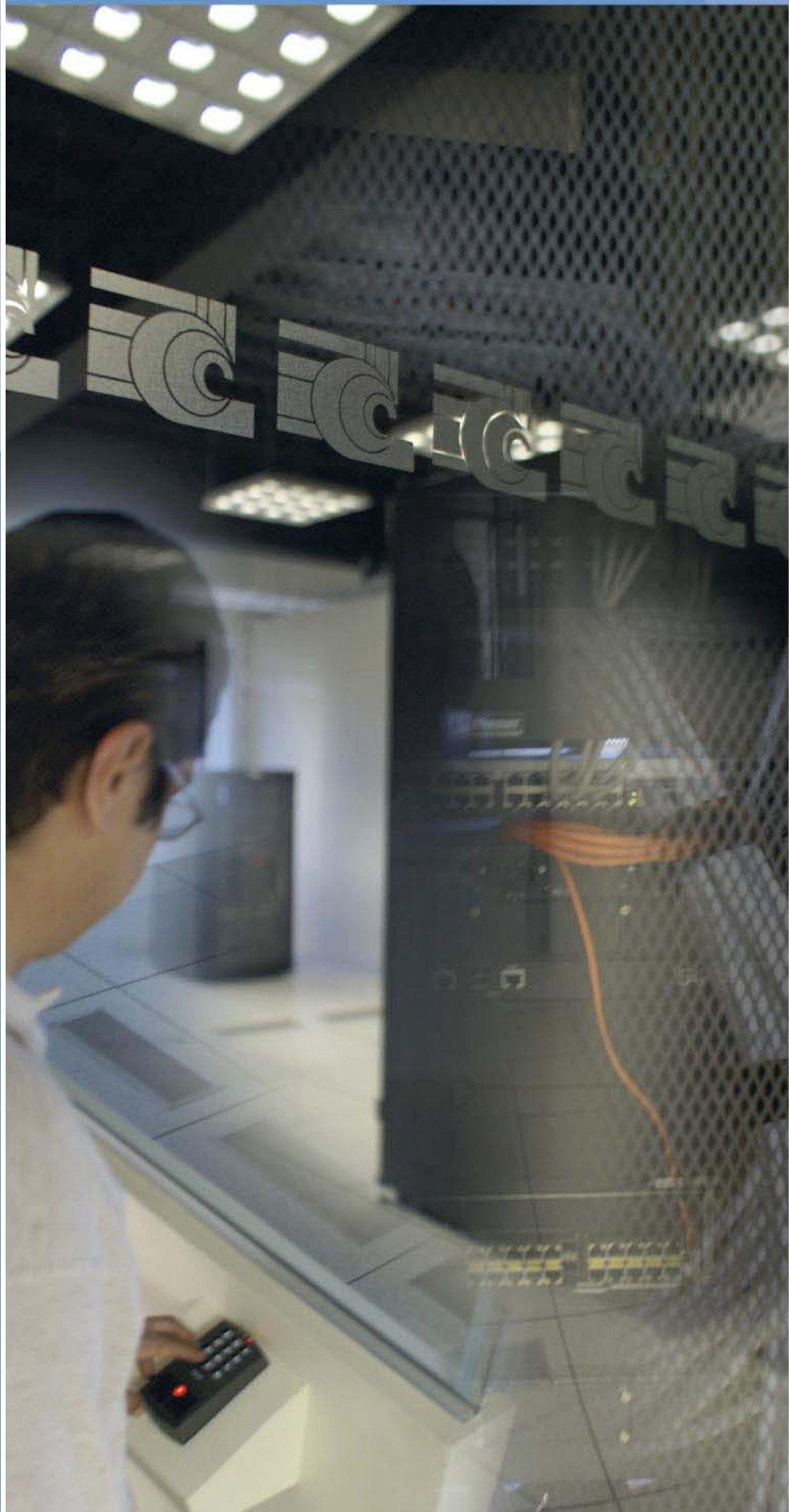
IPN

Collaboration with Other Institutions

Besides all the collaboration that the IPN has established with several institutions, the CIC-IPN works particularly closed with Universities and public and private companies:

| Country | Academic and Research Institutions |
|--------------------------|--|
| Brazil | Universidade do Sao Paulo UNICAMP Universidade Estadual de Campinas |
| Canada | University of Alberta New Brunswick University |
| Chile | Pontificia Universidad Católica de Chile. Universidad de Los Lagos de la República de Chile |
| France | Université Joseph Fourier à Grenoble, Institut Aéronautique et Spatial. |
| Germany | Freie University of Berlin, University of Stuttgart, University of Applied Science Cologne. |
| Portugal | Universidade do Porto, Instituto Superior Técnico / Universidade Técnica de Lisboa. |
| Russia | Lomonosov University in Moscow |
| Spain | Universidad Politécnica de Cataluña UPC, Universidad Politécnica de Madrid UPM Universidad Complutense de Madrid, Barcelona Supercomputing Center BSC |
| United States of America | Oklahoma State University, San Diego Supercomputer Center, University of California (Irvine) UC-I New Mexico State University. |

IPN - Collaboration with Cther Institutions

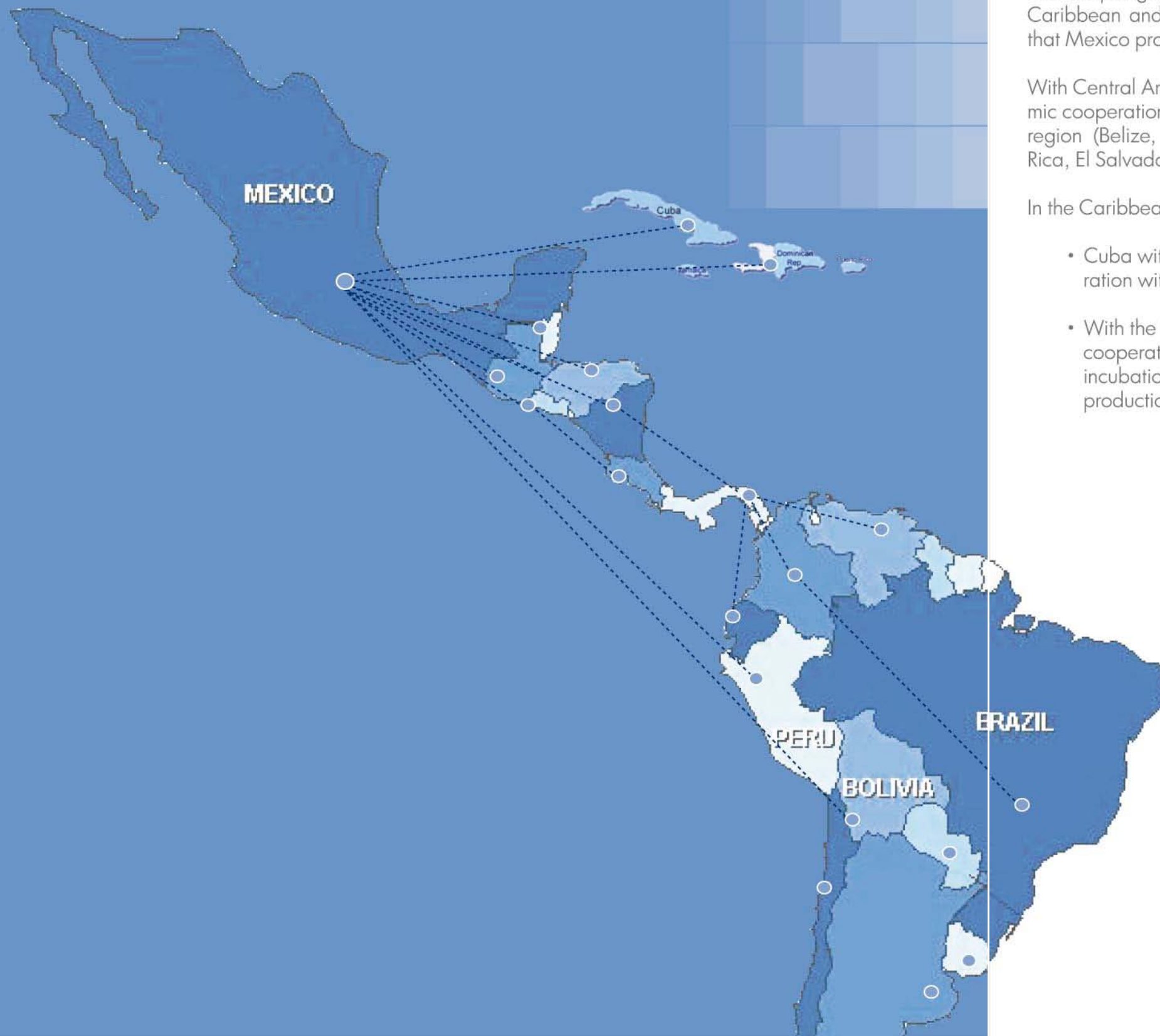


Business enterprise:

| | |
|----------|---|
| Foreign | <ul style="list-style-type: none">Intel (Internship Program at Intel Guadalajara),Microsoft,LACCIR;SANDIA;Mosis,MINATEC, |
| National | <ul style="list-style-type: none">Petróleos Mexicanos (PEMEX), Mexican Oil CompanySistema de Transporte Colectivo (Metro), Mexico Metropolitan SubwayInstituto Mexicano del Petróleo IMP, Mexican Oil Institute |

CIC

International Cooperation



CIC International Cooperation

The CIC postgraduate programs can be expanded to central, Caribbean and south America countries by the agreement that Mexico promotes to increase international relationships.

With Central America the IPN has strong institutional academic cooperation agreements covering all the countries of the region (Belize, Guatemala, Nicaragua, Honduras, Costa Rica, El Salvador and Panama).

In the Caribbean, the IPN has strong relations including:

- Cuba with an extensive program of academic cooperation with the most important Universities,
- With the Dominican Republic the IPN has expanded cooperation with the transfer of the IPN business incubation model, achieving a growth in more than 50 production units in that country.





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