



I D C C A S E S T U D Y

An *Insurgente* of the Supercomputing and Innovation in GUANAJUATO

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Digital transformation among organizations is an unstoppable trend, and is a reality in research and development centers. This demands a constant increase in processing capabilities as an essential element to innovate and evolve in cutting-edge science.

The CESC (Centro Estatal de Supercómputo de Guanajuato, the State Supercomputing Center of Guanajuato) is not only a case of growth in technology capabilities or creative spaces to solve complex assignments but also an example of innovation from its conception. It has become a collaborative solution for the state research centers and a changing factor for the economy in the region enabling new services, driven by highly specialized human capital and top-performing computing equipment.

According to the project research officers interviewed by IDC, the new space fulfills the needs of research and development experts. It also intends to accelerate the adoption of 3rd Platform technology, such as big data and analytics, by the regional organizations. It offers businesses and public companies a leased datacenter and infrastructure with consulting services of internationally renowned researchers to exploit their databases with innovative solutions. The CESC is helping organizations become competitive internationally.

IDC'S OPINION

The CESC (Centro Estatal de Supercómputo de Guanajuato, the State Supercomputing Center of Guanajuato) is a singular case to analyze. The organizations that are responsible for the project, the Centro de Investigación en Matemáticas, AC (CIMAT, the Center for Research in Mathematics) of Guanajuato, and the other organizations in collaboration, are not only expert users but also vanguard researchers and developers of Information and Communication Technologies (ICT). They form a unique community with clear and specific demands on the required supercomputing infrastructure, such as extreme flexibility, open and low-cost solutions, as well as the consulting and support services provided by the vendor of the solution, which, in this case, is Hewlett Packard Enterprise (HPE).

Such demands gave way to the creation of the CESC, a supercomputing cluster made of 1,800 nodes. It will help solve the high-level processing demands of modeling, analysis of large databases, and resolution of complex assignments, among others.

However, this is not a static project. The researchers continuously evaluate alternatives to keep updating and growing CESC's processing and storage capabilities, so they decided to make it available to the business and government markets in Guanajuato. By doing this, the center is sustainable in both the mid- and long-term, and CIMAT is positioning itself as an enabler of economic development in the region.

Hence, the challenges, beyond technology, are around the communication and business strategies that may balance their research duty and the offering of technology and consulting services.

ABOUT THE CLUSTER AT THE CENTRO ESTATAL DE SUPERCÓMPUTO DE GUANAJUATO

The supercomputing cluster implemented by the CIMAT at the CESC is an important project for the lowlands in North-Central Mexico (called Bajío), which is trying to position itself as one of the most competitive regions in the country. The project was created with the joint efforts of many research centers in Guanajuato to promote research in cutting-edge global science and develop highly specialized human capital. The current objective is to compete in the specialized services market, such as analysis of large databases, modeling, and resolution of complex assignments, among others, to guarantee its sustainability in the long term and accelerate the development of the local economy for the business, supply chain, and public sector institutions and organizations.

PREVIOUS SITUATION

CIMAT has been developing a supercomputing infrastructure to solve the demands of greater processing power within its community of researchers, teachers, and students of undergraduate and postgraduate degrees who work in basic and applied mathematics, probability and statistics, and computer science.

"There is an exponential growth in the volume of data, which requires more robust computing infrastructures to be able to exploit information decisively and reliably and in the shortest time possible," affirms Dr. Salvador Botello Rionda, principal researcher in the department of computer science at CIMAT and the project manager of the CESC.

During the discussions with other research centers, the researchers realized that all of them faced the same challenge —how to increase their high-performance processing capabilities. However, they did not have the financial or technical infrastructure capacities to build them by themselves. Therefore, they decided to combine their efforts and create the CESC of Guanajuato.

Even though the idea was formulated in 2010, its creation process began long ago during the integration of different research centers into a collection of resources from the federal and state governments, which cost around 100 million pesos. The research centers —CIMAT, the Center of Research and Advanced Studies (CINVESTAV), Optical Research Center (CIO), Center of Applied Innovation in Competitive Technologies (CIATEC), University of Guanajuato, Technology Park of San Miguel, and the Mexican Center of Renewable Energy S.C.— joined efforts from the cities of Guanajuato, Irapuato, Leon, San Miguel de Allende, and Salamanca. Collectively, they helped build the datacenter in the city of Guanajuato and start the operation of the CESC supercomputer in 2017.

BUSINESS CHALLENGES

The CESC is already operating. However, because of Mexico's economic situation, it faces the challenge of creating its own resources to guarantee its technology update and growth in the future since one of the most impacted segments due to federal budget cuts in science and research. This is why the CESC needs to be self-supporting.

Hence, the CESC is looking to offer the services and solutions of its technology infrastructure to the market, including the development of customized solutions, leasing of equipment to run packaged software, and hosting and storing information with high availability, among other options.

With this new information and communication technology infrastructure, the center has the capability to become an instigator for regional development, mostly in market segments with a strong presence worldwide, such as automotive, food, and footwear. It can also help traditional industries, such as agribusiness, as mentioned by Pedro Daniel Uribe Flores, Director of the Planning and Information Department at CIMAT.

The center has strong competitive advantages, such as highly specialized human capital in different areas of knowledge, with the ability to understand and configure clear strategies for complex assignments, from logistics organization, layouts, and even simulations and modeling with different variables.

"There is a universe with a wide and diverse demand. If you consider which are the fundamental components to support different organizations, then it makes a lot of sense to count on services, such as those offered by the CESC of Guanajuato," states Flores.

IMPLEMENTED SOLUTION

For the creation of the CESC, the state research centers involved in the project, through the Council of Science and Technology of Guanajuato (Consejo Nacional de Ciencia y Tecnología [CONACYT]), launched a public tender for the infrastructure, in which Hewlett Packard Enterprise (HPE) participated.

"HPE lent a machine for performance testing and assured us that it would create an infrastructure with such capacity. This gave us confidence by proving that HPE's performance was suitable," highlights Botello Rionda.

"Moreover, the solution proposed by the vendor provided advantages, such as low costs with rapid response, help, and close support to the needs of the center, which helped build a trust with HPE," adds Botello Rionda.

Botello Rionda adds that the CIMAT is an expert in the use of ICT. Thereby, the top interest was the usability and adaptability of the infrastructure since it can optimize the performance and get the most out of it for the CESC.

"One of our requirements was a moldable and adaptive infrastructure so that the experts at the center could develop solutions and make its management flexible. This was one of the attributes offered by HPE", affirms Botello Rionda.

Currently, the *Insurgente* (Insurgent) supercomputer has a capacity of 1,800 nodes in an open platform, with Linux OS in Ubuntu version, AMD Opteron, and Intel Xeon processors. Additionally, the CESC is in the process of deploying a fiber-optic network to enable the interconnection among all of the integrated research centers.

"The datacenter has the necessary conditions to host the infrastructure of high-performance ICT. It has the capacity to grow even 50 times what can be hosted using the current technology infrastructure so we can offer hosting services to third parties or establish an alliance with an organization dedicated to such services", according to the researchers.

OBTAINED BENEFITS

The capacity of high-performance computing, which had 1,000 nodes, doubled with the CESC. It's now enabled to implement more developments and numeric modeling in a shorter time. The time consumed during processing alone has been reduced by half during the first tests.

Recently, a company in the beverages industry requested CIMAT's support to help it reduce its manufacturing time of a distilled beverage that used to take an average of seven years. With the development of a new model with possible scenarios, in which improvements could be implemented, the time frame could be reduced to three years.

"Opening to the market helps us increase the adoption of big data and analytics in the manufacturing industry to increase competition, mostly in organizations with a presence in the global market, such as those in the automotive and food industries. Likewise, we will have the chance to promote an innovative culture in all market segments, including education, reinforcing the visionary businesses with fresh and ambitious projects. These kinds of organizations, more willing to take risks, incent others that are more conservative to explore their opportunities," asserts Flores.

EXPECTATIONS FOR THE FUTURE

For CIMAT, the need for greater capacities in high-performance computing is a constant. In the short term and midterm, there is a plan to create a datacenter at its facilities in Mérida in addition to modernizing its infrastructure in Monterrey.

The *Insurgente* is expecting to become a repository of satellite images as projected by CONACYT. Meanwhile, the CESC is getting ready to take part in the fiber-optic network also planned by the CONACYT to remotely interconnect all of its research centers throughout the country.

ESSENTIAL GUIDANCE

The CESC of Guanajuato is a case that should be replicated in government organizations that do not have a robust infrastructure for high-performance computing for their research and development facilities. This approach of collaboration with other states or research organizations to build a similar facility can help them reduce the cost of their investment, increase their processing capacities, and even share it with the private and public sectors to guarantee their long-term sustainability and become instigators of economic growth in their regions.

To succeed, these shared computing centers will need to address several challenges that are more related to the project management and the business strategy to encourage success over the time:

- An agreement with all of the research centers involved on how to deploy and exploit the supercomputer for the use of their potential customers and themselves
- The creation of value-added offers to take advantage of the datacenter (as an available hosting infrastructure), the capacity of high performance processing, and high-level consulting services for the resolution of assignments in the specialization areas of each of the research centers
- The preparation of a financial analysis of its offer to ensure the resources to operate, update, and grow the center in the midterm and long term, taking into account the economic capacities of their potential customers

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