



SCALAC

Advanced Computing System for
Latin America and the Caribbean

High-Performance Computing “Big” Robust Systems Report and Analysis in Latin America and the Caribbean

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Summary

High-performance computing (HPC) Infrastructure supports advanced computing applications and research. Countries in Latin America and the Caribbean have invested in HPC infrastructure through institutions, universities, and special projects, primarily due to their interest in supporting Artificial Intelligence (AI) workloads and enhancing digital transformation.

Conversely, the international political landscape underscores the vulnerabilities and digital reliance of the region. There is not only an absence of assurance regarding data sovereignty, but also a lack of potential technological autonomy or a definitive reduction in technological dependence, except in Brazil.

Starting with Deliverable 2 of the RISC-2 project and following the consecutive reports from SCALAC, the HPC Observatory¹ has continued its efforts for Latin America and the Caribbean, considering the robust HPC infrastructures mapped in these regions and the public nature of the information. This version of the document, titled "High-Performance Computing “big” Robust Systems," considers the last two reports. It focuses on the major infrastructures that publish information in Latin America and the Caribbean, as well as some interesting systems, while observing and comparing the collected information and other parameters from previous reports. This third version addresses the confrontation of information from past published reports, focusing on data related to AI workloads, connectivity, energy provision, and usage.

¹ HPC Observatory: <https://scalac.redclara.net/en/hpc/hpc-observatory>



Expanding on Latin American and Caribbean HPC Infrastructure Analysis

This report from the HPC Observatory signifies a major advancement in understanding high-performance computing capabilities in the Latin American and Caribbean (LAC) region. Building on the groundwork established by earlier RISC-2 and SCALAC reports, this third iteration provides an updated and more comprehensive analysis of the key HPC systems currently operating in the LAC region for which public information is available.

A key objective of this new analysis is to provide a comparative perspective by drawing upon the data compiled in earlier reports. This longitudinal approach allows for the identification of trends and the assessment of the evolution of HPC infrastructure within the region over time. Beyond simply cataloging existing systems, the report places a particular emphasis on several critical aspects that are shaping the current and future landscape of HPC in LAC.

The increasing importance of Artificial Intelligence (AI) workloads is a central theme, with the analysis delving into the capacity and utilization of HPC infrastructure to support these computationally intensive tasks. This includes examining the types of hardware and software configurations prevalent in the region that are geared towards AI applications.

Connectivity is another crucial dimension explored in detail. The report examines the connectivity that supports these HPC systems (via academic networks or private commercial), acknowledging that robust and high-speed connections are crucial for data transfer, collaboration, and access to remote resources. This aspect is vital for fostering a collaborative research environment within the region and with international partners.

Energy considerations are also given significant attention. The analysis examines the energy consumption profiles of major HPC systems and explores available information on energy provision. This is an increasingly important factor given the environmental impact and operational costs associated with large-scale computing towards a sustainability analysis.

Finally, the report provides insights into the usage patterns of these HPC infrastructures. Where available, data on the types of scientific disciplines, academic and industrial sectors leveraging these resources, as well as the scale and nature of



the computational problems being addressed, are analyzed. This offers a valuable understanding of the impact and application of HPC within the LAC region.

By focusing on these key areas – AI workloads, connectivity, energy, and usage – and by building upon prior findings, this latest HPC Observatory report delivers a comprehensive and nuanced overview of the state of major HPC infrastructures in Latin America and the Caribbean, providing valuable information for researchers, policymakers, and stakeholders in the field.

The report is organized as follows: Section 1 introduces this report, describes the context and methodology used, and provides a general overview of the infrastructure potential in the region. This document includes energy types, cooling methods, and connectivity to a high-speed collaborative network via an NREN, RedCLARA, or a private commercial connection. Section 2 presents the list of infrastructure considered, focusing only on the major projects and interesting configurations, following the proposed method, now with performance discrimination. Section 3 analyzes the footprint concerns and sustainability issues. Finally, Section 4 contains the concluding remarks and recommendations.



1. Introduction

In the previous rapport, we present that HPC Infrastructure investment in Latin America has been a topic of discussion. According to an Inter-American Development Bank (IDB) report², massive infrastructure transformation is needed in Latin America and the Caribbean. The report emphasizes efficiency, digital technologies, and a focus on the quality and affordability of consumer services. Latin American and Caribbean countries should invest around 6.2% of their annual Gross Domestic Product (GDP) in infrastructure to meet their needs. However, the actual investment in infrastructure needs to catch up to this target, ranging from 2.3% to 4% of GDP on average^{3 4}.

Although Latin American high-performance computing infrastructures have been present in the Top500 for over a decade, they're mostly concentrated in two key countries: Brazil and Mexico. Countries like Argentina (which entered the Top 500 list in November 2023 and remains on it) and Chile (which is boosting capabilities for key projects on the continent) are growing their potential to join the ranks of major infrastructure machines. Brazil still leads the way in HPC in Latin America and the Caribbean, with eight supercomputers in the Top500, putting it 12th globally, ahead of the United Arab Emirates and behind Poland.

As is known, Brazil's positioning is due to both Brazilian public investment (which legally allocates a significant percentage of GDP to this type of investment) and private investment. Likewise, thanks to an important scientific activity that not only demands this type of infrastructure but also uses it, a meaningful community is created. This community maintains a shared vision and collaborative policies, providing national access to HPC infrastructures (via SINAPAD) even including other countries, as is the case with SCALAC. However, looking at the information gathered from the Latin American Artificial Intelligence Index (ILIA)⁵, compiled by CENIA⁶ and also supported by SCALAC, investments in all countries have increased.

² <https://impact.economist.com/new-globalisation/infrascopes-2024/en/>

³ <https://www.cepal.org/en/news/infrastructure-investment-latin-american-and-caribbean-countries-remains-below-needs-region> primary reason for supporting AI workloads has been to develop and support AI, Machine Learning, and Deep Learning applications, as well as to

⁴ <https://www.wilsoncenter.org/article/latin-america-must-prioritize-infrastructure-spur-economic-growth>

⁵ <https://indicelatam.cl/>

⁶ <https://cenia.cl/>



As previously reported, outside the top 500, the region has seen an interesting trend. Today, we have diverse, scalable, and varied infrastructures in place, concentrated in different types of centers. These include those hosted by universities, research centers, and private companies across multiple countries (such as oil and services companies). On one hand, this creates a dynamic and diverse landscape for HPC; on the other hand, it raises concerns about actual usage, dependence on technology and suppliers, connectivity, and social and environmental impact. As mentioned earlier, the main reason to support AI workloads has been to develop and support AI, Machine Learning, and Deep Learning applications, as well as ensure data sovereignty.

With this information, the HPC Observatory for Latin America and the Caribbean, now carried out by SCALAC in collaboration with RedCLARA, has proposed conducting an inventory of strategic infrastructure using the methodology presented below, addressing critical systems and large-scale infrastructures.

1.1. Methodology

The list was built following the same methodology used for the previous reports: with the information provided by technology heads, directors, or technological administrators from various sites, as well as pre-collected data from the past reports collected by the HPC Observatory and information from Top500, SCALAC, and RedCLARA. This included technical aspects, as well as real and theoretical measurements (based on manufacturer and network provider guidelines). The methodology incorporates feedback from previous reports, input from the specialized community, and interest groups that have confirmed their involvement.

As per the previous report, some information is shared with sellers confidentially, based on equally confidential details from manufacturers and integrators. In other cases, where potential bias existed, tests and precise data were requested from independent administrators and engineers.

The information then requested to compile the list was the following:

- Institution
- Country
- City
- Institution (Including Type of Institution)
- Web (URL)
- Type of HPC Infrastructure (Cluster or other)
- Manufacturer
- Technological Description



- Cores CPU/GPUs
- CPU/GPU Tech Processor Type
- # Processors Cores by Processors (CPUs and GPUs)
- Interconnection
- RAM per Node (GiB)
- Total Memory (GiB)
- Year of implementation
- # Nodes
- # Racks
- Cooling Type
- Power consumption (kW)
- Power Provision Type (Renewable, Nuclear)
- Operating System
- Theoretical TeraFLOPS (R_{peak})
- Real TeraFLOPS (Only with HPL, R_{max})
- Applications (Workloads Definition)
- Number and Type of Users
- Contact
- Seller
- Storage Information
 - Manufacturer
 - Description
 - Capacity (TB)

After the information is processed, its visibility is confirmed (for example, if the owning institutions publicly display the information and there are doubts, we request it directly from the entities that own the machine). Then, the information is reviewed, and the measured and analyzed results are gathered for publication in various SCALAC reports linked to the HPC Observatory for Latin America and the Caribbean. These results are also used for further analysis.

Given this information, data was collected and only the Top500 robust infrastructures in Latin America and the Caribbean, along with five additional non-Top500 systems deemed critical, were used. This decision was made because there have been no significant changes since the November 2024 report, and it is crucial to analyze and present the other factors.

For this report, the metrics and technical features presented in the HPC Infrastructure List are:

- Institution
- Country
- Institution type (Public, Private or mixed)
- Web (URL)



- Manufacturer
- Cores CPU
- Number of GPUs
- GPU Technology
- Processor Type
- Interconnection
- Year of Implementation
- Theoretical TFlops (GPU (FP32) + CPU)
- Measured TFlops (HPL using LinPack⁷)

1.2. About SCALAC

SCALAC is the advanced computing system for Latin America and the Caribbean, created on March 1, 2012, with the ***Declaration of Bucaramanga***, as a regional alliance with the support of national education and research networks grouped by RedCLARA. In 2018, it was formalized as an international civil society with legal headquarters in Costa Rica.

Strategically, SCALAC is the alliance that combines advanced computing capabilities and knowledge for Latin America and the Caribbean. Its vision is to be a non-profit organization that supports and promotes the development of advanced computing (called supercomputing and quantum computing) in Latin America and the Caribbean to guarantee not only the reduction of gaps, technological autonomy, and data sovereignty but also collaboration around regional needs and expectations and equal integration with global partnership as peers.

1.2.1 Organization of SCALAC

SCALAC is a non-profit organization (Non-Profit Association in Costa Rica (Affiliation Number: 3-002-788193) mainly comprised of two governance bodies: the board of chairs and the council.

The Council or **directive council** is the governing body with the authority to issue directives or mandates with civil and legal responsibility. The council has the power to make decisions that must be followed (Decision-Making Authority, Implementation Focus: Their role often involves ensuring that specific goals or objectives are met through the directives they issue, and Accountability)

⁷ <https://top500.org/project/linpack/>



The 2024-2026 Council is made up of the following members:

Philippe O. A. Navaux (Brazil), President
Salma Jalife (México), Vicepresident
Alvaro de la Ossa (Costa Rica), Secretary
Carla Osthoff (Brazil), Treasurer
Harold Castro (Colombia), First Vocal
Nicolás Wolovick (Argentina), Second Vocal
Luis Eliecer Cadenas (Venezuela – RedCLARA), Fiscal

The board of chairs (**board**) is the executive and leadership body responsible for overseeing management and execution, ensuring it operates in the best interests of its shareholders or stakeholders. This board plays a crucial role in setting SCALAC’s strategic direction and policies.

The 2024-2026 Board is made up of the following members:

Carlos J. Barrios (SC3UIS, Colombia), General Chair
Esteban Meneses (CENAT-CNCA, Costa Rica), Vice General Chair
Ginés Guerrero (NLHPC, Chile), Strategic Infrastructure and Services Chair
Lizette Robles (CADS-UDG, México), Communication Chair
Esteban Mosckos (UBA, Argentina), Training, Outreach and Education Chair
Isidoro Gitler (ABACUS-CINVESTAV, México), I+D+I Chair
Carlos González (RedCLARA, Colombia), RedCLARA Liason

The steering board committee to support the action of the board is made by:

Sergio Nesmachnow (UdelaR, Uruguay)
Robinson Rivas (UCV, Venezuela)
Antonio Tadeu Gomes (LNCC-SINAPAD, Brazil)
Moisés Torres (RedMexSu-CUDI, México)
Claudio Chacon (CEDIA, Ecuador)
Dennis Cazar (UNQ, Ecuador)

And finally, Esteban Hernández guarantees the executive direction from January 2025.

1.3. Organization, Design, and Publication

The design and published graphical edition of this version of the report is led by Lizette Robles Dueñas.



2. HPC Big-Ones Robust Infrastructure List

Institution	Country	Institution Type	Platform Name / Id	Manufacturer	Node Description	CPU	#CPUs	GPU	#GPUs	Interconnect	Year	Theoretical Tflops (GPU (FP32) + CPU)	Tflops (HPL)
Servicio Meteorológico Nacional		Public	Clementina XXI	Lenovo	ThinkSystem SD650-I V3	Intel Xeon Max 9462	160	Intel GPU Max 1550	296	Infiniband NDR 400	2023	613,376	397,312
Petróleo Brasileiro S.A		Mixed	Pégaso	Eviden	Supermicro 4124GO-NART+	AMD EPYC 7513	504	NVIDIA A100 SXM4 80GiB	2016	Infiniband HDR 200	2022	43008	1,952,768
			Dragão	Eviden	Supermicro SYS-4029GP-TVRT	Intel Xeon Gold 6230R	544	NVIDIA Tesla V100 SXM2	2176	Infiniband EDR 100	2021	1,434,624	919,552
			Gaia	Dell EMC	Dell PowerEdge XE8545	AMD EPYC 74F3	352	NVIDIA A100 SXM4	704	Infiniband	2023	1,405,952	713,728
			Atlas	Eviden	Bull 4029GP-TVRT	Intel Xeon Gold 6240	272	NVIDIA Tesla V100 SXM2	1088	Infiniband EDR 100	2020	90,624	448,512
			Gemini	Dell EMC	Dell PowerEdge XE8545	AMD EPYC 74F3	176	NVIDIA A100 SXM4	352	Infiniband	2023	702,464	395,264
			Fênix	Eviden	Bull 4029GP-TVRT	Intel Xeon Gold 5122	720	NVIDIA Tesla V100 SXM2	2880	Infiniband EDR 100	2019	549,888	323,584
SiDi		Private	Iara	Nvidia	NVIDIA DGX A100	AMD EPYC 7742	50	NVIDIA A100 SXM4	200	Infiniband HDR 200	2021	422,912	3,705,384
Software Company MBZ		Private	Nobz1	Lenovo	ThinkSystem C2397	Intel Xeon Platinum 8280	2880			Ethernet 100	2022	713,728	36,352
Laboratório Nacional de Computação Científica - LNCC		Public	Santos Dumont	Eviden	BullSequana X1000	Intel Xeon Gold 6252	564			Infiniband FDR	2019		
						Intel Xeon Gold 6252	188	NVIDIA Tesla V100 SXM2 32 GiB	384				
						Intel Xeon Gold 6148	2	NVIDIA Tesla V100 SXM2 16 GiB	8				
					TOTAL		754		392				18,504

Table 1. Big Ones HPC Systems List



3. Usage Analysis and System Peak Performance

Previous information consists of established and big systems in LAC, however there are many systems providing HPC services across Latin America and Caribbean. In the last report we showcased 15 systems where the only one in the TOP500 list is Santos Dumont. Private companies' clusters do not tend to share information about usage.

This year the information grew in rows as many systems were added, and it also grew in columns with new relevant characteristics. We almost doubled the systems, reaching 29 in 2024. Besides, thanks to the suggestions of Lic. Marcos Mazzini (UNC Supercómputo), we added a simple but important column: personnel working in the cluster classified by full, semi and part-time dedication. We also asked for the information of CPU and GPU packages and the number of them present in the cluster. Using tabulated data provided by Lic. Carlos Bederián (UNC Supercómputo) and curated by Analyst Alejandro Silva (UNC Supercómputo) we obtained derived information of fp64, fp32 and fp16 peak FLOPS metrics accumulated by CPU and GPU respectively.

Usage information was again obtained using the SLURM commands:

```
$ sreport cluster Utilization -p -t hours start=2024-01-01 end=2025-01-01
$ sreport cluster UserUtilizationByAccount start=2024-01-01 end=2025-01-01 format=u -Pn -t
hours | awk -v threshold=1024 '$1 > threshold {count++} END {print "Active users in 2024
with more than " threshold " core-hours:", count}'
```

Two clusters, namely Lovelace (Brazil) and Fierro (Argentina) used PBS and SGE respectively as resource manager and it was not possible to obtain similar information to the one provided by SLURM.

As many as eighth (8) systems have incomplete information but we decided to keep them in the list, since it helps to show the picture that we saw. We also highlighted systems with the lowest downtime (Lovelace, Brazil), highest utilization (Clemente, Argentina) and highest number of active users (Santos Dumont, Brazil). The list is presented in the next Table 2.



Country	Institution	Name	%down over total	%use over avail.	Active users	Personnel Full, Half, Simpl
	CAB	Fierro			80	1,1,0
	CCT-Rosario	Capitán	12.89%	49.56%	79	3,0,0
	CCT-Rosario	Aconcagua	28.96%	32.97%	7	3,0,0
	CIMEC	Pirayú	43.54%	83.95%	39	1,2,0
	CONICET	TUPAC	57.08%	59.65%	26	0,1,1
	Exactas-UBA	CeCAR	4.25%	21.74%	34	0,0,3
	IATE-UNC	Clemente	0.50%	98.59%	22	1,0,1
	UNC Supercómputo	MendietaF2	5.09%	75.26%	85	3,0,0
	UNC Supercómputo	Eulogia	4.75%	93.02%	66	
	UNC Supercómputo	Serafín	10.71%	92.34%	180	3,0,0
	UNC Supercómputo	Mulatona	19.90%	73.72%	26	
	CENAPAD-SP	Lovelace	0.27%	91.31%	420	7,1,0
	LNCC	Santos Dumont	21.75%	72.72%	1740	4,1,0
	UFRJ	Lobo Carneiro	2.26%	76.96%	117	2,0,0
	UNESP	Central	10.99%	94.98%	110	2,3,0
	UNESP	SPRACE			5	2,3,0
	UNICAMP	Coaraci	2.12%	49.45%	157	3,0,0
	NLHPC	Leftraru	26.41%	55.76%	354	8,0,1
	PUC, Ingeniería	Cluster	14.33%	40.45%	55	0,1,0
	BIOS	Tayra	31.68%	5.55%	11	
	UIS	Guane-1	26.13%	77.88%	20	1,0,0
	UNIAndes	Hypatia	4.80%	57.35%	108	2,0,0
	UniCartagena	PACCA	25.65%	1.36%	3	1,0,0
	CNS-IPICYT	Thubat Kaal II	19.79%	26.34%	27	3,0,0
	UniGuadalajara	Leo Atrox	40.81%	40.17%	35	2,0,0
	UniSonora	Ocotillo	15.70%	46.32%	42	3,0,0
	UniSonora	Pitaya	6.09%	0.00%		
	CNS	ClusterUY	1.38%	43.92%	118	0,2,1

Table 2. Reference HPC Systems List

Comparison to previous year's table shows a general improvement in uptime, utilization and active users, however many systems are well below standards, with downtimes higher than 10% and utilization below 70%. If we filter by those categories we end up with just four systems: MendietaF2, Eulogia, Lovelace and Lobo Carneiro. Not surprisingly active users are somehow proportional to system size, and Santos Dumont, Lovelace, Leftraru, Serafín and Coaraci are the most demanded supercomputers.

New columns shed some light to different aspects of the systems. As we add how many people and time dedication they put in the system, some centers stand out, and that partially explains good uptimes and/or active users, namely Leftraru, Lovelace and Santos Dumont are the only systems with strictly more than 3 fulltime



sysadmins. In general, we observe understaffed centers, and we believe this correlates to high downtimes, low utilization and low number of active users.

Package count finishes the picture of where we are in Latin America and the Caribbean. Top10 CPU Rpeak fp64 systems, the traditional measure for HPL and TOP500 are shown in Table 3.

Country	Institution	Name	Rpeak CPU fp64 TFlop/s
	LNCC	Santos Dumont	1,101.20
	UNICAMP	Coaraci	589.20
	NLHPC	Leftraru	373.10
	UniGuadalajara	Leo Atrox	350.90
	CENAPAD-SP	Lovelace	314.40
	UNC Supercómputo	Serafin	157.30
	CIMEC	Pirayú	116.70
	CNS	ClusterUY	90.40
	UNC Supercómputo	Eulogia	85.20
	CNS-IPICYT	Thubat Kaal II	67.30

Table 3. Top10 traditional HPC Systems List.

For AI workloads the key measure is Rpeak fp16, and here Santos Dumont separates even more from the pack. These ten systems should be considered the only AI-capables machines on the list. Results are displayed in Table 4 below.

Country	Institution	Name	Rpeak GPU fp16 TFlop/s
	LNCC	Santos Dumont	43,008.00
	UNICAMP	Coaraci	6,934.20
	UNC Supercómputo	MendietaF2	6,273.80
	CENAPAD-SP	Lovelace	3,120.00
	NLHPC	Leftraru	2,989.20
	CNS	ClusterUY	1,783.80
	UNESP	Central	1,448.20
	CCT-Rosario	Capitán	1,000.00
	UIS	Guane-1	543.00
	UniSonora	Ocotillo	448.00

Table 4. Top10 HPC-AI Systems List.



4. Final Remarks

We leaped forward in rows and columns, and although the scale is really small, in terms of systems and characteristics, this simple information is crucial for knowing the general panorama and understanding our problems with our way of measuring. It could be argued that HPL, HPCG should be run to benchmark the machines, but although it is important, we are focusing on a much more basic level, more compatible with the extreme heterogeneity of our systems, and the infrastructure problems that sometimes plague our HPC centers. Being able to run a simple `sreport` SLURM command tells a lot: infrastructure is collecting stats, the system is working throughout a year, among others. Having the information on how many human resources run the systems, we try to understand how understaffed we are and try to expose this problem. Finally, although a list of CPU and GPU models is far from any real benchmark, it is easy to obtain and depicts other potential problems: heterogeneity, small systems, and little support for nowadays AI.

In Latin America and the Caribbean HPC infrastructure is different because conditions are different, and we, as SCALAC, are building our version of HPC. Old platforms are a reality, and we strive to maximize what they can do by being imaginative in software and hardware upgrades. We have a culture of many small scattered systems with low utilization, and this culture should change to make efficient use of money in shared infrastructure with reasonable utilization. Energy consumption, water consumption and green house emissions are not directly our problem, given the amount and size of our platforms. That will be a problem to be addressed in the future as HPC infrastructure in LAC grows.

On the other hand, it is important to observe where and how different systems are deployed to support HPC and AI needs [5] [6] [7]. There are essential environmental and infrastructural challenges and concerns. For example, environmental constraints related to corrosion and humidity (in coastal and sea-level environments) result from high humidity and salt-laden air, which accelerate corrosion of sensitive electronic components and shorten system lifespan [8]. Additionally, in Latin America and the Caribbean, some areas experience significant temperature fluctuations (such as in sea level and rainforest installations), facing intense heat and extreme climate events like tropical storms [9]. This complicates thermal management for HPC systems that already produce substantial heat and increases flood risks due to climate change, rising sea levels, and storm vulnerability. Finally, infrastructure and deployment challenges—such as power stability, cooling requirements, physical space, vibration sensitivity, and logistics and maintenance access—are critical issues that will be explored in a more detailed white paper for the HPC Observatory for Latin America



and the Caribbean. Beyond good intentions, it is vital to consider strategic options like deploying micro-data centers, ensuring access to more secure and robust HPC systems (using RedCLARA, for example), and focusing on sustainability, green infrastructure, cooperation, human skills, and activity [10].

We hope this report gives a picture of what we are in terms of heterogeneity, computing power, human resources and utilization, because knowing what we are is the starting point to advance through LAC cooperation.

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