प्रगत संगणन विकास केंद्र
CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTING

NATIONAL PARAM SUPERCOMPUTING SYSTEMS

ANNUAL REPORT 2025

इलेक्ट्रॉनिकी एवं
सूचना प्रौद्योगिकी मंत्रालय
MINISTRY OF
ELECTRONICS AND INFORMATION TECHNOLOGY

सत्यमेव जयते

विज्ञान एवं प्रौद्योगिकी विभाग
DEPARTMENT OF
SCIENCE & TECHNOLOGY

सत्यमेव जयते

सी-डैक
CDAC

Thanks to our Funding Agencies

E. Magesh
Director General
C-DAC

Message from **Director General**

I am proud to present this year's report on the National Supercomputing Mission (NSM), a year that marks a transformative leap in India's journey toward becoming a global leader in High Performance Computing (HPC). As we move through 2025, the mission has evolved from the establishment of infrastructure to the creation of a self-sustaining, indigenous ecosystem that powers the nation's most critical scientific and strategic breakthroughs.

Our commitment to democratizing access to high end computational resources has reached new heights. We have successfully commissioned 38 supercomputing systems across India, bringing the total computational capacity to more than 47 Petaflops. These systems are ensuring that researchers in even the most remote institutions have access to the same computational power as those in the country's largest research hubs. Moving ahead we are marching towards achieving a cumulative compute power of 100+ Petaflops.

The growing scale and utilization of these resources demonstrate the vibrant demand for innovation within India's scientific community. Over 12.1 million computational tasks have been executed to date, with more than 14,313 active users, including over 2,894 PhD scholars. More than 270 academic and research institutions are now integrated into the NSM infrastructure through the National Knowledge Network (NKN). These systems have powered high-impact research across diverse fields, including genomics, drug discovery, climate modeling, and seismic data analysis. Notably, NSM resources have facilitated the publication of more than 400 research papers in prestigious international journals this year, showcasing the global reach and significance of our work.

A defining achievement is our progress toward Phase III of the mission full indigenization. Beyond the successful deployment of RUDRA servers, we have integrated the Trinetra indigenous high-speed interconnect, a crucial advancement that will help in reducing our dependence on imported proprietary technologies. As of now, 50% of our supercomputing ecosystem is fully indigenously developed, reflecting India's growing self-reliance in the design, manufacture, and operation of world-class supercomputing systems.

As we look to the future, the convergence of HPC, Artificial Intelligence (AI), and Quantum Computing represents the next frontier. We are scaling up our AI compute platforms to meet the growing demand in this rapidly evolving field. C-DAC remains committed to supporting the HPC community and ensuring our researchers are equipped with the most advanced tools to address the grand challenges of our time.

I would like to extend my deepest gratitude to the Ministry of Electronics and Information Technology (MeitY) and the Department of Science and Technology (DST) for their unwavering support. To the researchers and the HPC teams at C-DAC, your passion and dedication are the driving force behind our success. Together, let us continue to innovate and build a self-reliant, technologically sovereign India.

Message from **Centre Head**

Sanjay Wandhekar
Centre Head, C-DAC Pune

High Performance Computing (HPC) continues to evolve at an extraordinary pace, transforming the landscape of scientific discovery, technological innovation, and national development. Today, HPC plays a pivotal role in enabling breakthroughs across disciplines such as artificial intelligence, climate science, computational biology, materials research, and advanced engineering. With rapid advancements in computing architectures, AI-accelerated workloads, and energy-efficient system designs, the global HPC ecosystem is entering a new phase of capability and impact.

The National Supercomputing Mission has emerged as a cornerstone initiative for building a robust and self-reliant supercomputing ecosystem. Through its successive phases, the mission has enabled leading academic and research institutions across the country to access world-class computational resources for addressing grand scientific and societal challenges. The commitment and expertise of the teams at C-DAC have played a crucial role in designing, deploying, and supporting PARAM supercomputing systems that empower researchers and innovators nationwide.

The past year has witnessed significant milestones under the mission. The inauguration of 3 Petaflops PARAM RUDRA supercomputing systems at Indian Institute of Technology Bombay and Indian Institute of Technology Madras marks a major step in strengthening the country's advanced computing capabilities. In addition, the 838 Teraflops PARAM facility at Indian Institute of Technology Patna has also been inaugurated, further expanding the reach of high-performance computing to emerging research hubs across the nation. These systems are powered by indigenously developed RUDRA servers and an indigenous HPC software stack.

A major technological advancement under the mission is the development of the PARAM RUDRA-SPX and Rudra -III servers, next-generation indigenous AI and HPC servers designed to support the growing convergence of supercomputing and artificial intelligence. These servers are planned for deployment in upcoming HPC systems under the mission and represents an important step toward strengthening India's sovereign computing infrastructure.

Complementing these hardware advancements is the continued evolution of the Trinetra HPC interconnect network, which plays a vital role in ensuring high scalability, low latency, and efficient data movement across PARAM systems. Alongside this, the C-DAC HPC Cluster Suite (CHCS) provides a comprehensive software framework for managing large-scale HPC environments, enabling optimal utilization of computing resources across the national supercomputing ecosystem.

As we move forward, the National Supercomputing Mission is entering a transformative phase where HPC and AI are increasingly converging. With continued R&D in indigenous technologies, advanced system architectures, and next-generation platforms, we remain committed to empowering India's scientific community with world-class computing infrastructure. Together, we will continue to harness the power of supercomputing to address complex national challenges and to build a technologically advanced and self-reliant India.

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Executive Summary

The Centre for Development of Advanced Computing (C-DAC), a premier research and development institution under the Ministry of Electronics and Information Technology (MeitY), plays a pivotal role in advancing High Performance Computing in India. C-DAC's initiatives are fundamentally integrated with national programmes such as the National Supercomputing Mission (NSM), "Atmanirbhar Bharat," and "Make in India." Through the development and deployment of indigenous supercomputing systems across the country, C-DAC is fostering technological self-reliance and driving innovation.

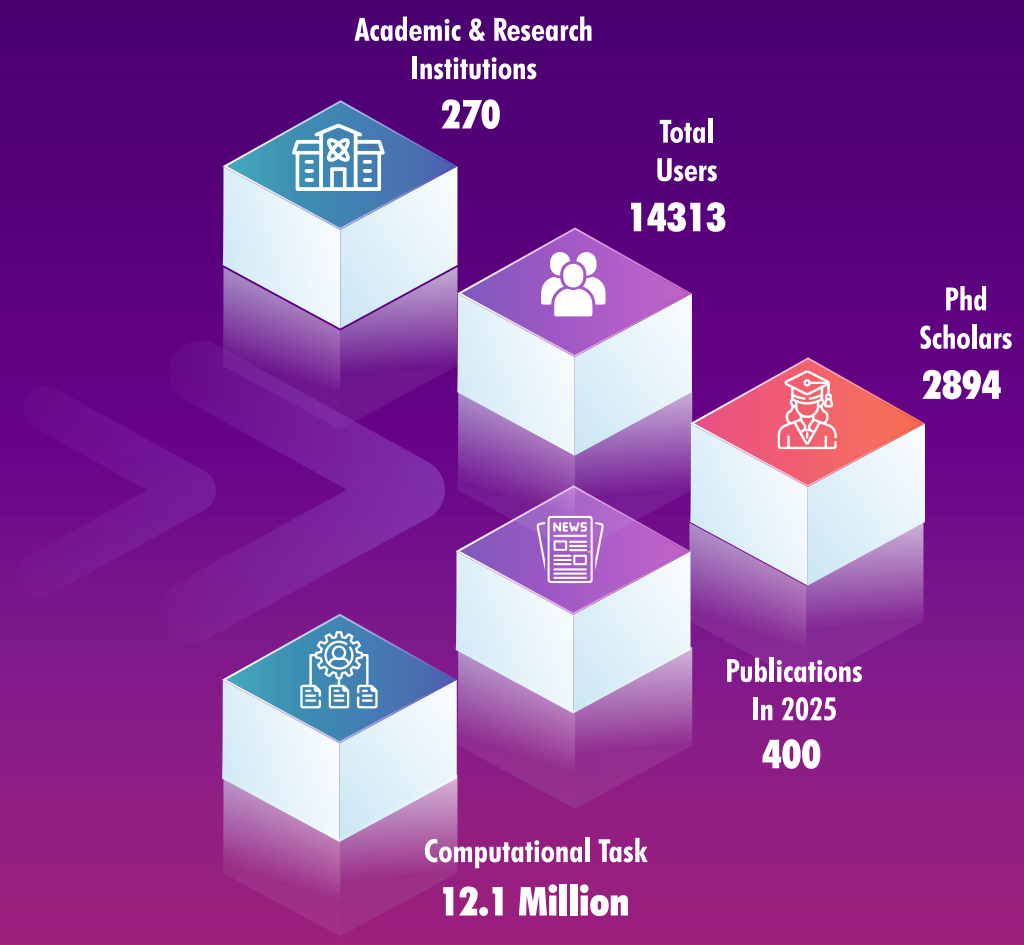
The National Supercomputing Mission (NSM) is being implemented in phases to advance and strengthen India's supercomputing infrastructure. Starting with the local assembly of HPC subsystems in Phase 1, the mission progressed to domestic manufacturing in Phase 2, and has now reached a pinnacle in Phase 3 with the deployment of systems powered by the indigenously designed and manufactured "Rudra" servers. By integrating a proprietary Indian HPC software stack with locally manufactured hardware, these supercomputers are establishing an autonomous foundation for the nation's digital future. This synergy of domestic innovation effectively eliminates foreign dependencies, sustaining indigenous leadership and securing a resilient technological future.

As Phase 3 continues to unfold, the National Supercomputing Mission (NSM) has scaled to a cumulative compute capacity of 47 Petaflops, significantly transforming India's scientific research landscape. The “Annual Utilization Report 2025” highlights the mission's progress, detailing indigenous innovations, system performance, and valuable user feedback from across the nation, showcasing how homegrown technology and sophisticated scientific applications are shaping the nation's digital future. The system utilization rate has surpassed 83%, reflecting growing adoption and effectiveness of new installations. Notably, the contribution of indigenous technology has grown from 15% to 50%, underscoring the nation's expertise in advanced technical developments.

The deployment of Rudra-based supercomputers, with capacities ranging from 838 Teraflops to 20 Petaflops, has vastly expanded the nation's computational footprint. Building on the success of these Rudra-based systems, we are pleased to introduce the Rudra-SPX, Rudra-III and Rudra-GRX server engineered for both high performance and energy-efficient computing. This advanced architecture seamlessly integrates across HPC, cloud, and edge computing environments, providing robust support for GPUs to further elevate processing capabilities. An additional computational capacity of 23 petaflops, powered by these Rudra-SPX servers, and 31 petaflops based on Rudra-III is scheduled for deployment over the coming year along with Rudra-GRX server.

By December 2025, the NSM's systems have supported approximately 14,313 users nationwide, including over 2,894 PhD scholars, who have collectively carried out 12.1 million computational tasks. These systems have contributed to over 400 scientific publications in 2025, adding to a total of 1,178 publications over the past three years. To ensure seamless support, a dedicated ticketing system has been established, which has successfully resolved around 15,147 user queries to date.

National PARAM Supercomputing Systems under NSM



The National Supercomputing Mission (NSM) is dedicated to architecting ecosystem of High Performance Computing (HPC) facilities, fundamentally bolstering India's digital infrastructure. The mission has successfully deployed 38 systems with a combined computational capacity of 47 Petaflops, serving as a vital catalyst for domestic scientific breakthroughs by provisioning cutting-edge resources to academia and research bodies. These supercomputing clusters are seamlessly integrated via the National Knowledge Network (NKN), a high-bandwidth backbone that ensures secure, low-latency connectivity and facilitates ubiquitous remote access, thereby democratizing high-end computational power for researchers nationwide.

The mission's utility spans a diverse array of critical national imperatives, including genomics, drug discovery (NSM Platform), flood forecasting, disaster management, urban environment and weather modeling, seismic data processing for oil and gas, telecom network optimization, material science, and chemistry.

Beyond the provision of infrastructure, the National Supercomputing Mission remains steadfast in its commitment to building a cadre of experts proficient in sophisticated HPC management. This initiative supports the field of Science, Technology, Engineering and Mathematics (STEM), empowers the scientific community to tackle multifaceted challenges with absolute computational precision.

A Journey Through NSM's Milestones

PARAM Systems at a Glance

- PARAM Rudra IIT Madras
- PARAM Rudra IIT Bombay
- PARAM Rudra IIT Patna
- PARAM Rudra at SN Bose Kolkata
- PARAM Rudra at GMRT Pune
- PARAM Rudra at IUAC Delhi
- PARAM Siddhi-AI at C-DAC Pune
- PARAM Kamrupa at IIT Guwahati
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- PARAM Ananta at IIT Gandhinagar
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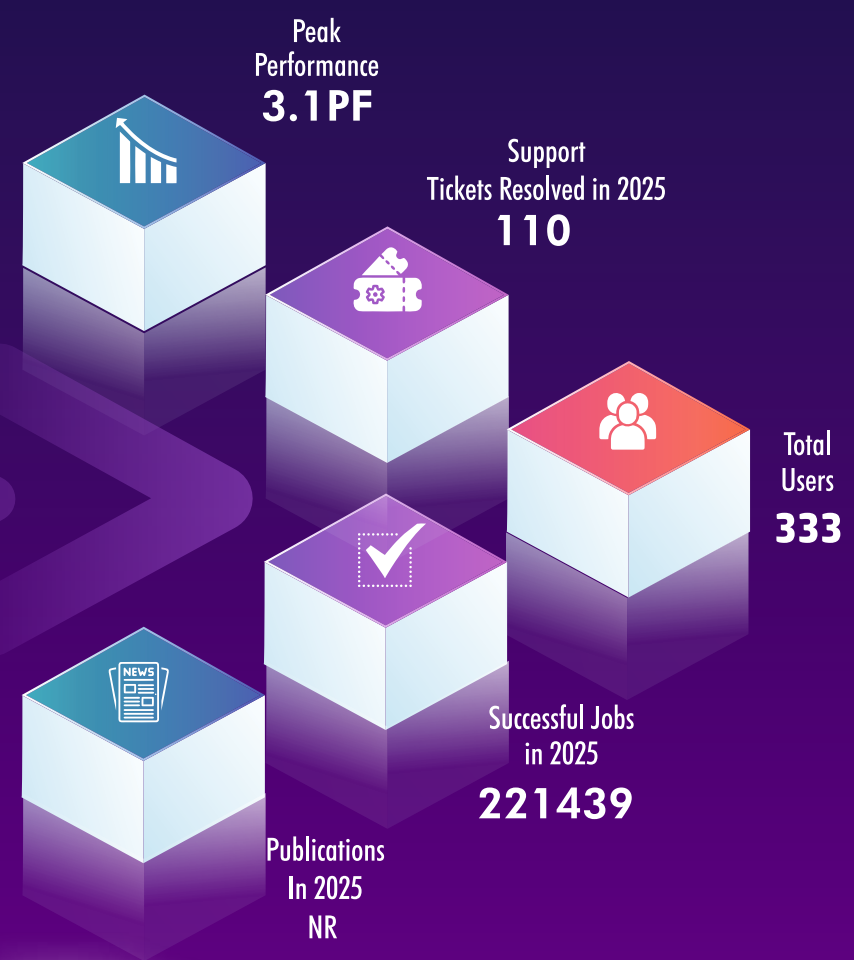
- PARAM Ganga at IIT Roorkee
- PARAM Sanganak at IIT Kanpur
- PARAM Pravega at IISc Bangalore
- PARAM Shivay at IIT(BHU)Varanasi
- PARAM Shakti at IIT Kharagpur
- PARAM Brahma at IISER Pune
- PARAM Yukti at JNCASR Bangalore

PARAM Rudra

IIT Madras, Chennai

PARAM Rudra is a state-of-the-art supercomputing facility developed under Phase 3 of the National Supercomputing Mission (NSM). It was inaugurated by Shri S. Krishnan, the Hon'ble Secretary of the Ministry of Electronics and Information Technology (MeitY), Government of India. Deployed at IIT Madras, the system is built using indigenous Rudra servers which are engineered and manufactured in India. The system delivers a peak performance of 3.1 Petaflops. Designed and implemented by C-DAC, the facility supports the high-performance computational needs of IIT Madras and other research and engineering institutions in the region. It features a robust storage infrastructure and substantial system memory, enabling the efficient processing of large-scale data and advanced scientific computing workloads



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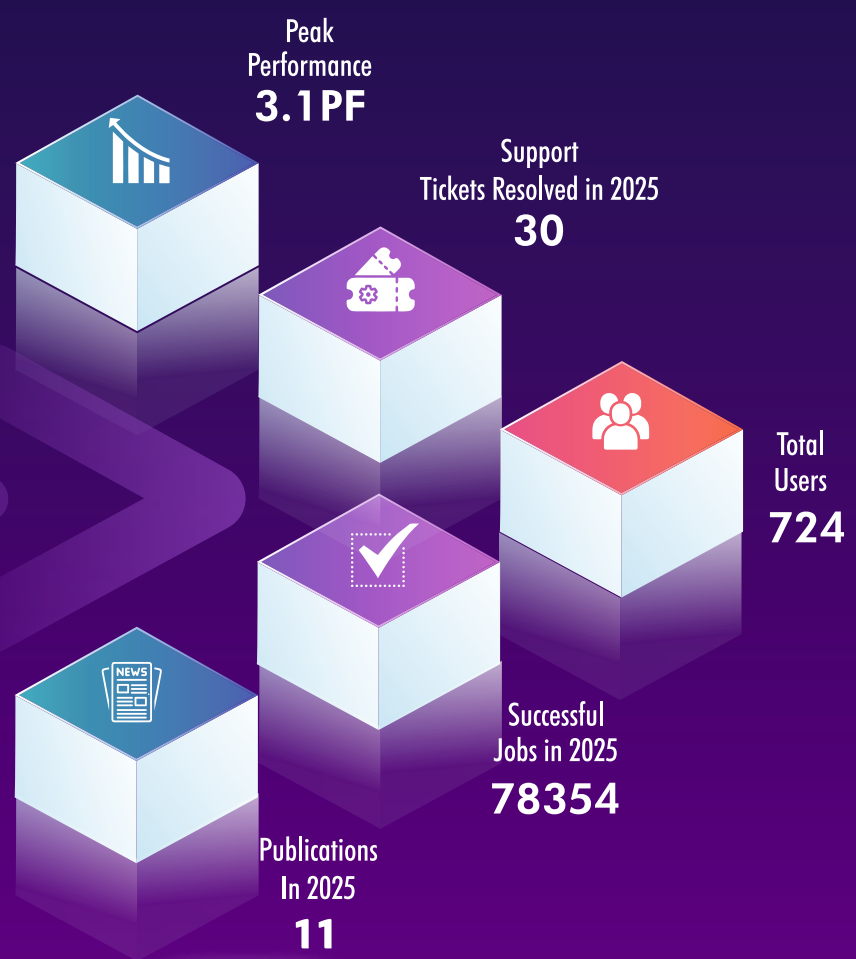
PARAM Rudra

IIT Bombay, Mumbai

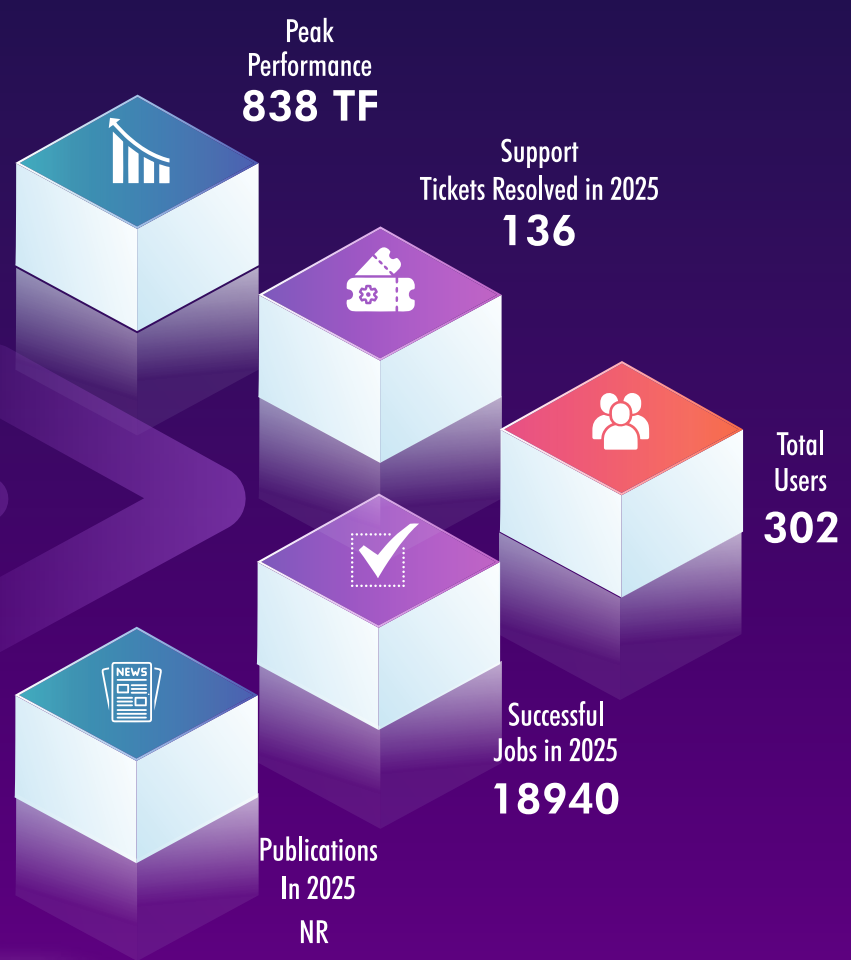
PARAM Rudra is a cutting-edge supercomputing system implemented under Phase 3 of the National Supercomputing Mission. Built using indigenously designed Rudra servers, it was inaugurated by Prof. Abhay Karandikar, Hon'ble Secretary of the Department of Science and Technology (DST), Government of India. The facility offers a peak performance of 3.1 Petaflops. PARAM Rudra is deployed by C-DAC at IIT Bombay and it features advanced high-performance computing with extensive memory and storage capabilities, enabling AI-driven research and large-scale scientific simulations across a wide range of scientific and engineering domains.



PARAM Rudra

IIT Patna

PARAM Rudra is a modern supercomputing facility commissioned under Phase 3 of the National Supercomputing Mission. It was inaugurated by Shri Amitesh Kumar Sinha, the Hon'ble Add. Secretary of the Ministry of Electronics and Information Technology (MeitY), Government of India. Based on indigenous Rudra servers, the system offers a peak computing power of 838 Teraflops. Designed and deployed by C-DAC, it supports the computational requirements of IIT Patna as well as other research and engineering institutes in the region. The system serves as a critical resource for a wide range of scientific research areas, including materials science, earth science, chemical and biological sciences, high-energy physics, cosmology, astrophysics, and related fields.



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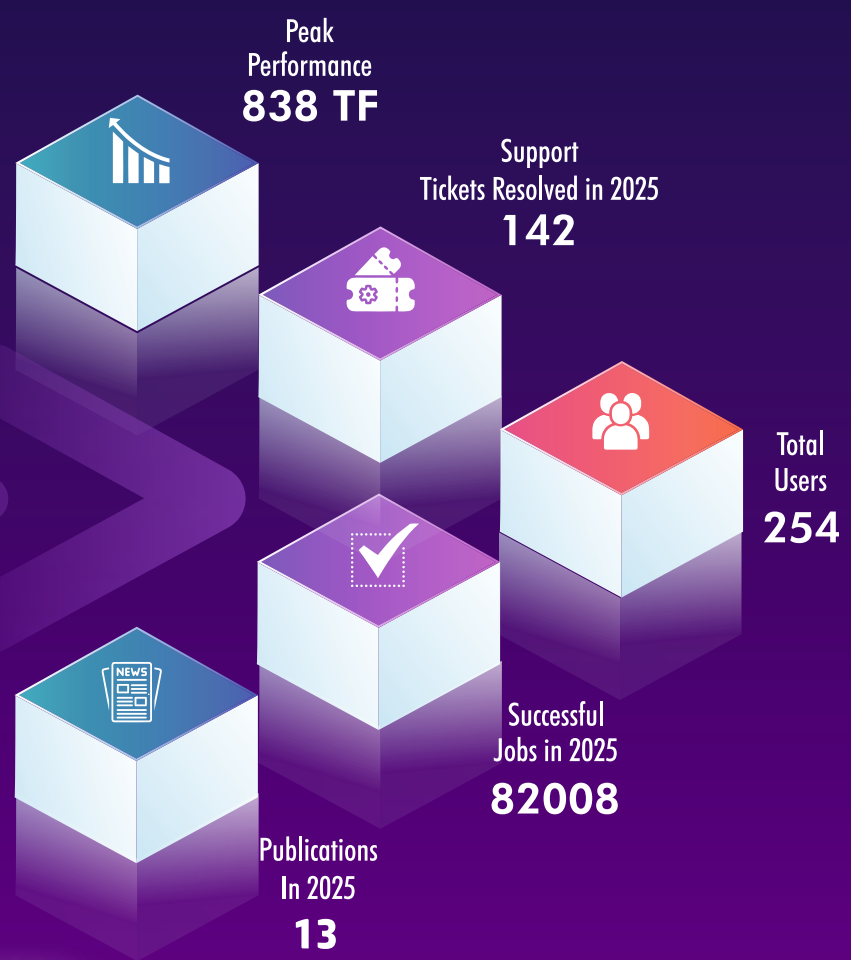
PARAM Rudra

S. N. Bose National Centre for Basic Sciences, Kolkata

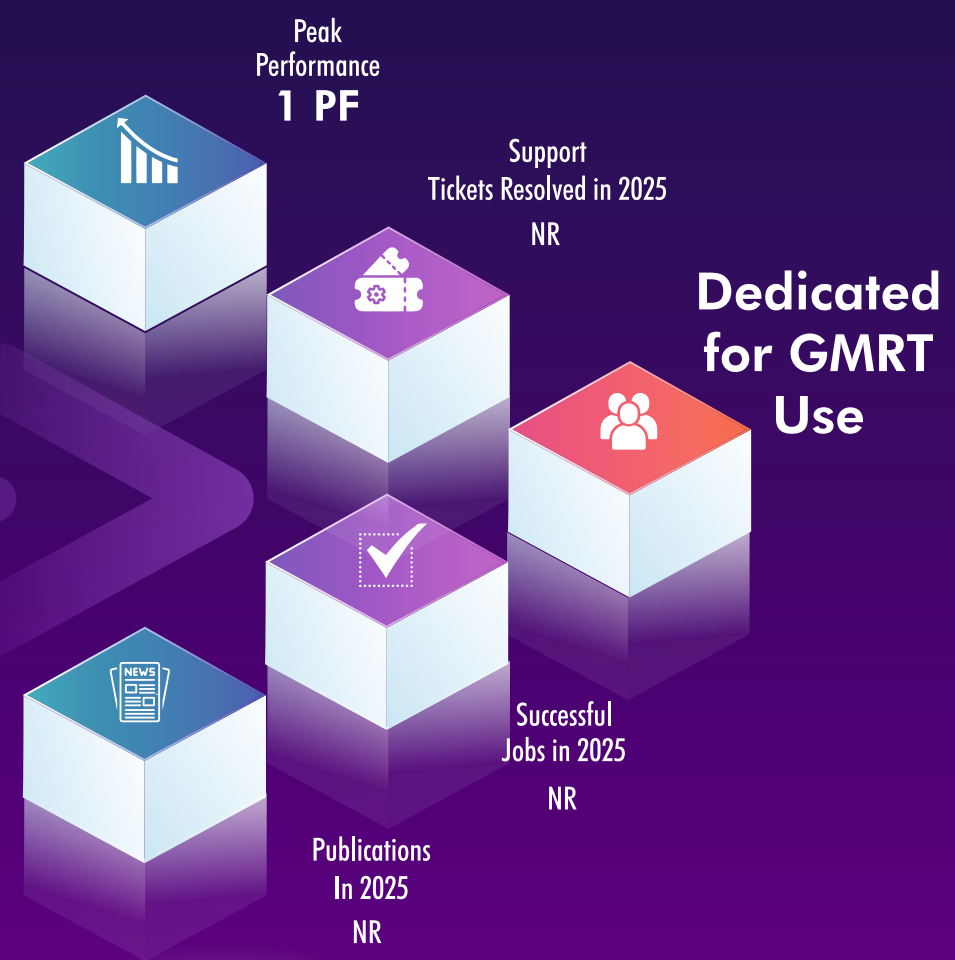
PARAM Rudra, an advanced supercomputing facility built using indigenous Rudra servers, was implemented under Phase 3 of the National Supercomputing Mission in September 2025. With a peak computing power of 838 Teraflops, it was designed and commissioned by C-DAC to meet the computational needs of the S. N. Bose National Centre for Basic Sciences (SNBNCBS), Kolkata, and several other research and engineering institutions in the region. The system supports cutting-edge research across diverse scientific fields, including materials science, earth sciences, chemical and biological sciences, high-energy physics, and cosmology.

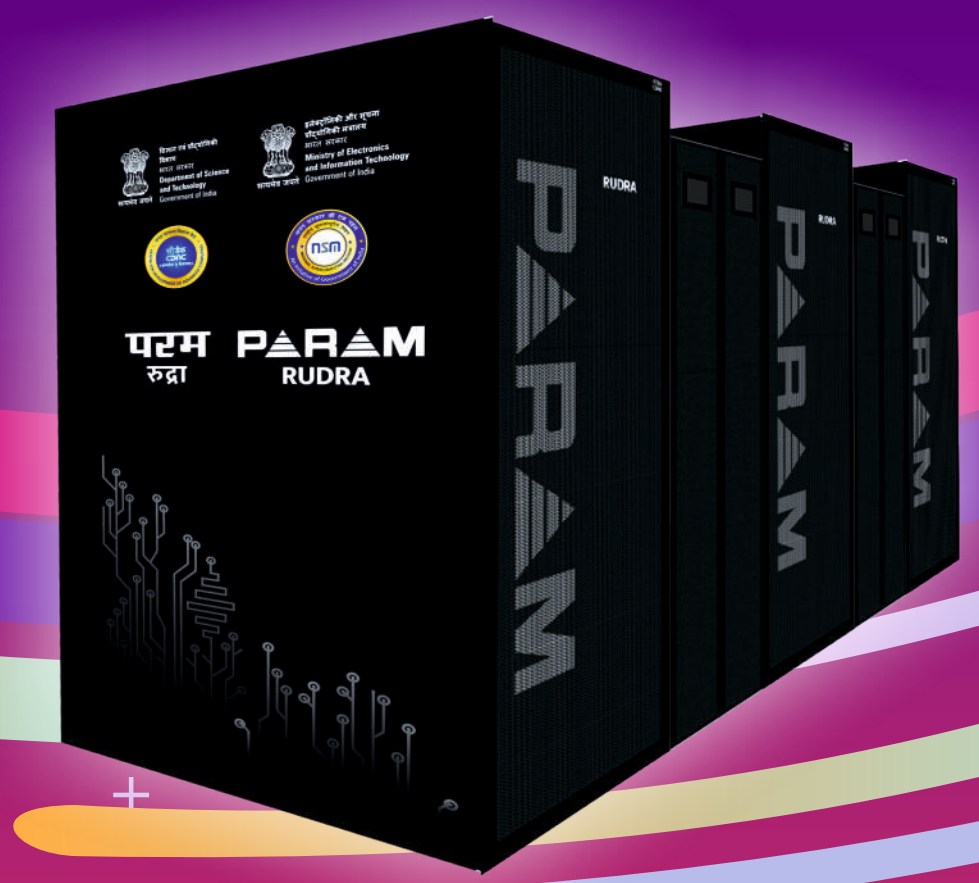


PARAM Rudra

GMRT Narayangaon, Pune

PARAM Rudra, a state-of-the-art supercomputing facility, was implemented under Phase 3 of the National Supercomputing Mission. With a peak computing power of 1 Petaflops, it was designed and commissioned by C-DAC to cater to the computational needs of GMRT Narayangaon, Pune, and several other research and engineering institutions in the region. The system plays a pivotal role in advancing research across a range of scientific fields, including materials science, earth science, chemical and biological sciences, high-energy physics, cosmology, astrophysics, and more.





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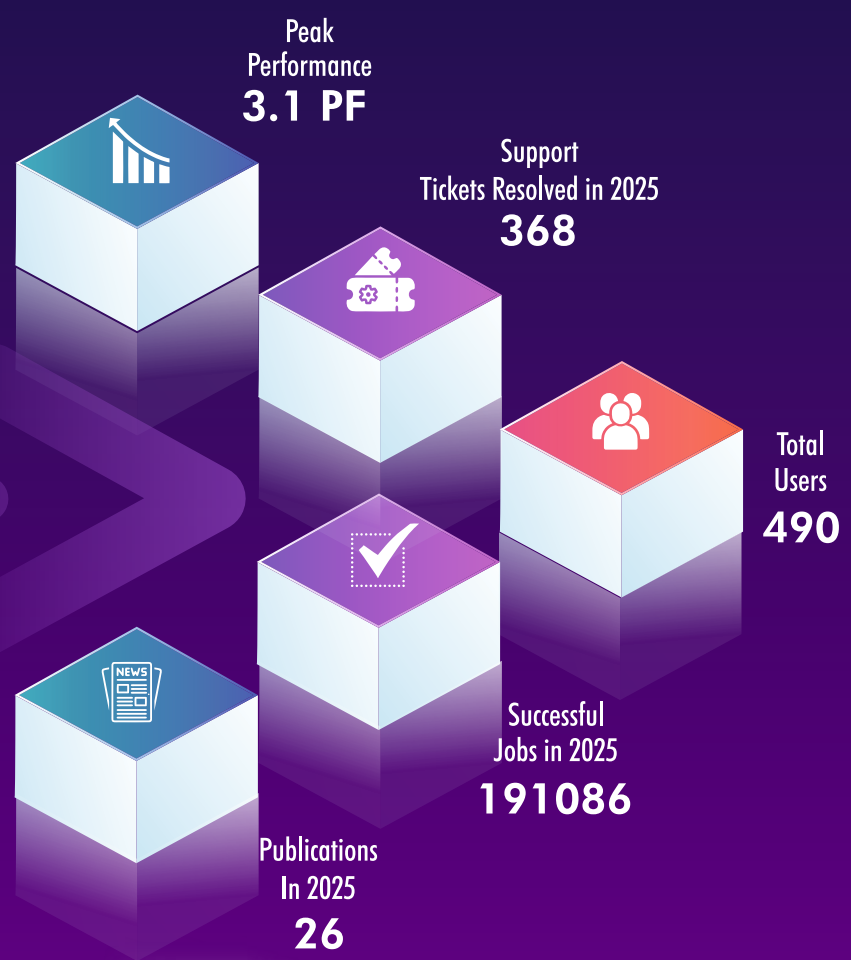
PARAM Rudra

IUAC, Delhi

PARAM Rudra is a state-of-the-art supercomputing facility implemented under Phase 3 of the National Supercomputing Mission. Featuring indigenously designed and manufactured Rudra servers, the system achieves a peak performance of 3.1 Petaflops. Developed and deployed by C-DAC, it caters to the high-performance computing needs of IUAC, Delhi, as well as other research and engineering institutions in the region. The facility plays a vital role in supporting multidisciplinary scientific research, with a particular focus on material science and atomic physics.



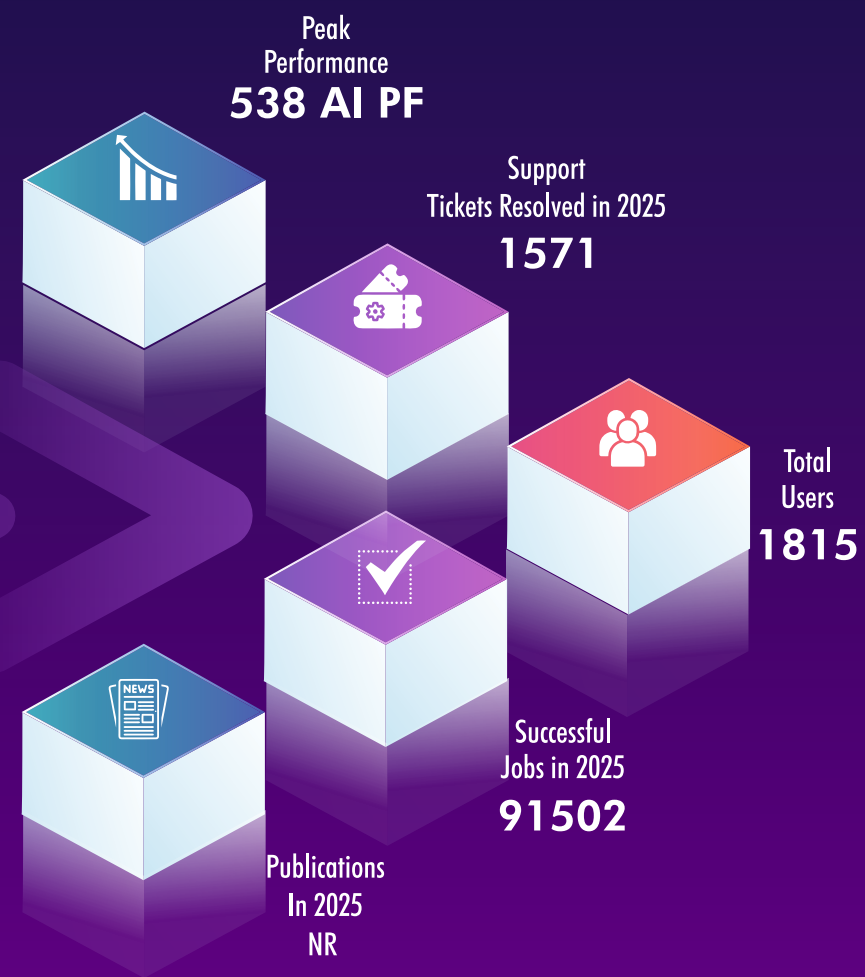
PARAM Siddhi AI (AIRAWAT-PSAI)

C-DAC, Pune

AIRAWAT–PARAM Siddhi AI (AIRAWAT-PSAI) is a flagship HPC-AI initiative of the Ministry of Electronics and IT (MeitY), Government of India, implemented by the Centre for Development of Advanced Computing (C-DAC).

PARAM Siddhi-AI, commissioned in 2020 under the National Supercomputing Mission, was India's fastest HPC-AI supercomputer, delivering 6.74 Petaflops (Double Precision) and 210 AI Petaflops, and ranked 62nd in the Top500 in November 2020. Subsequently, the infrastructure was further strengthened with an additional 128 AI Petaflops upgrade. With this enhancement, the upgraded AIRAWAT-PSAI system now delivers a total peak compute capacity of 538 AI Petaflops (Mixed Precision) and 17.48 Petaflops Double Precision (DP).

Currently, the AIRAWAT-PSAI system is operational under the aegis of the National PARAM Supercomputing Facility (NPSF), C-DAC, Pune, supporting advanced research in artificial intelligence, machine learning, scientific computing, and large-scale data analytics.



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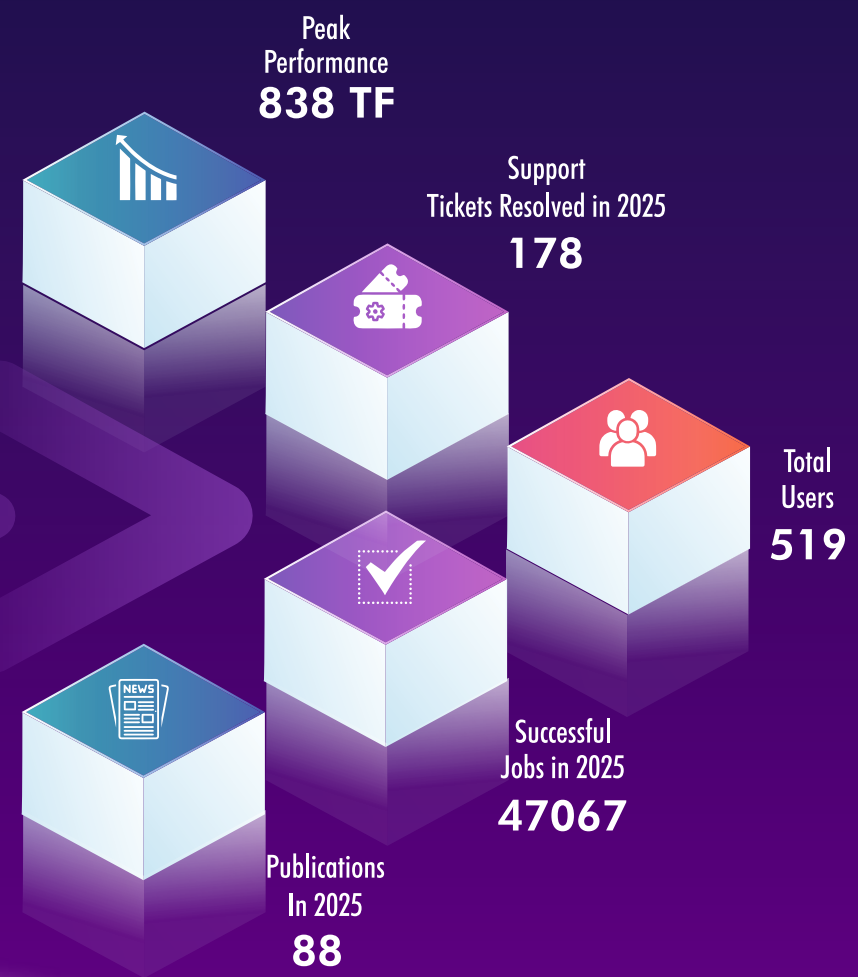
PARAM Kamrupa

IIT, Guwahati

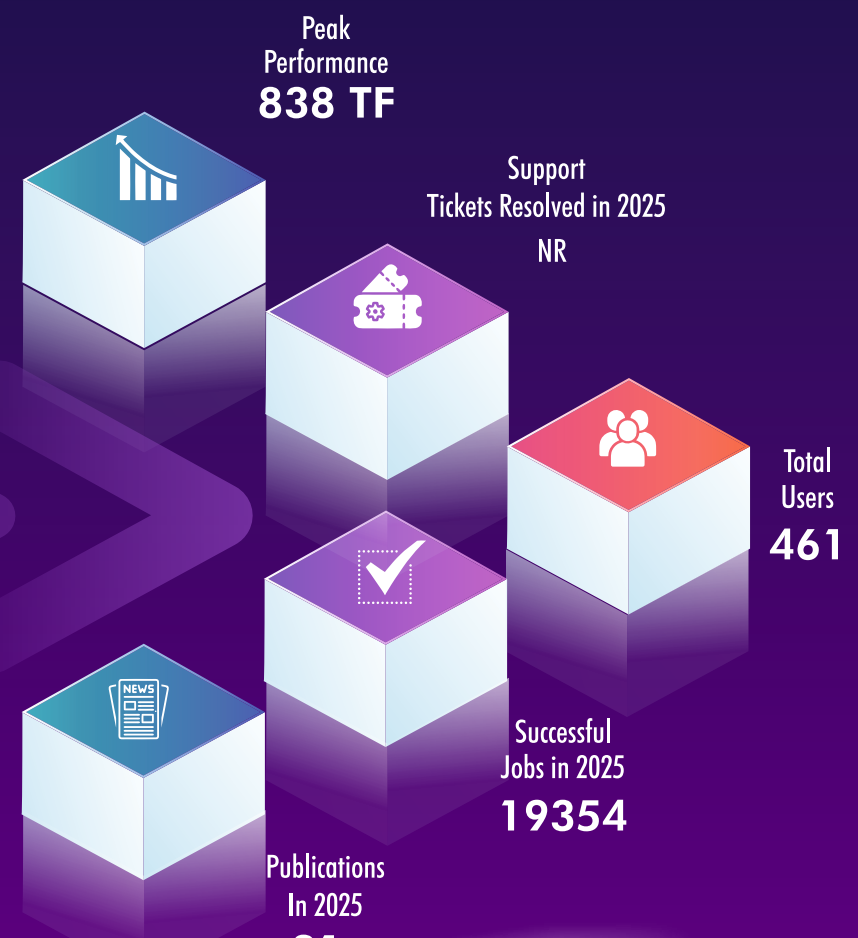
PARAM Kamrupa, deployed at IIT Guwahati under the National Supercomputing Mission in 2022, delivers a peak computing power of 838 Teraflops. The system was inaugurated by Smt. Droupadi Murmu, Hon'ble President of India. PARAM Kamrupa supports research across various scientific domains and is also utilized for AI/ML applications.



PARAM Himalaya

IIT Mandi

PARAM Himalaya, implemented at IIT Mandi under the National Supercomputing Mission, with a peak computing power of 838 Teraflops, serves as the primary computational resource for IIT Mandi and several prominent research and engineering institutions in the region. The system is powered by Cascade Lake processors and Volta series GPUs, interconnected via a high-speed network, and incorporates the latest advancements in both hardware and software technologies.



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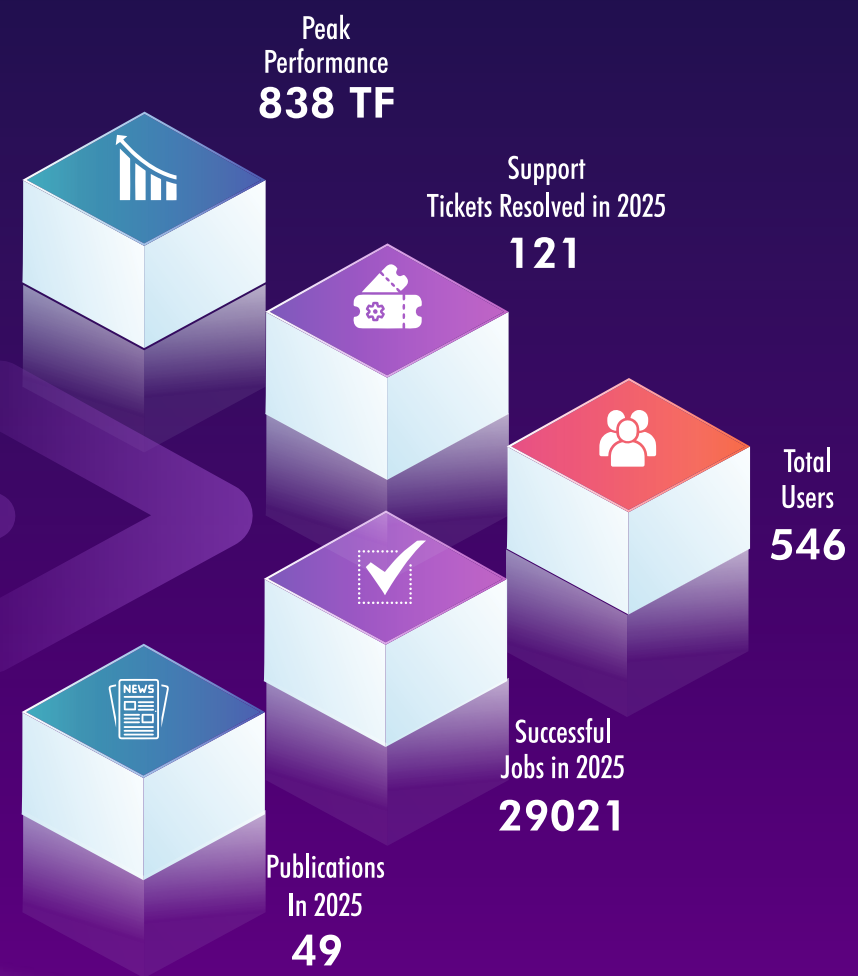
PARAM Porul

NIT Trichy

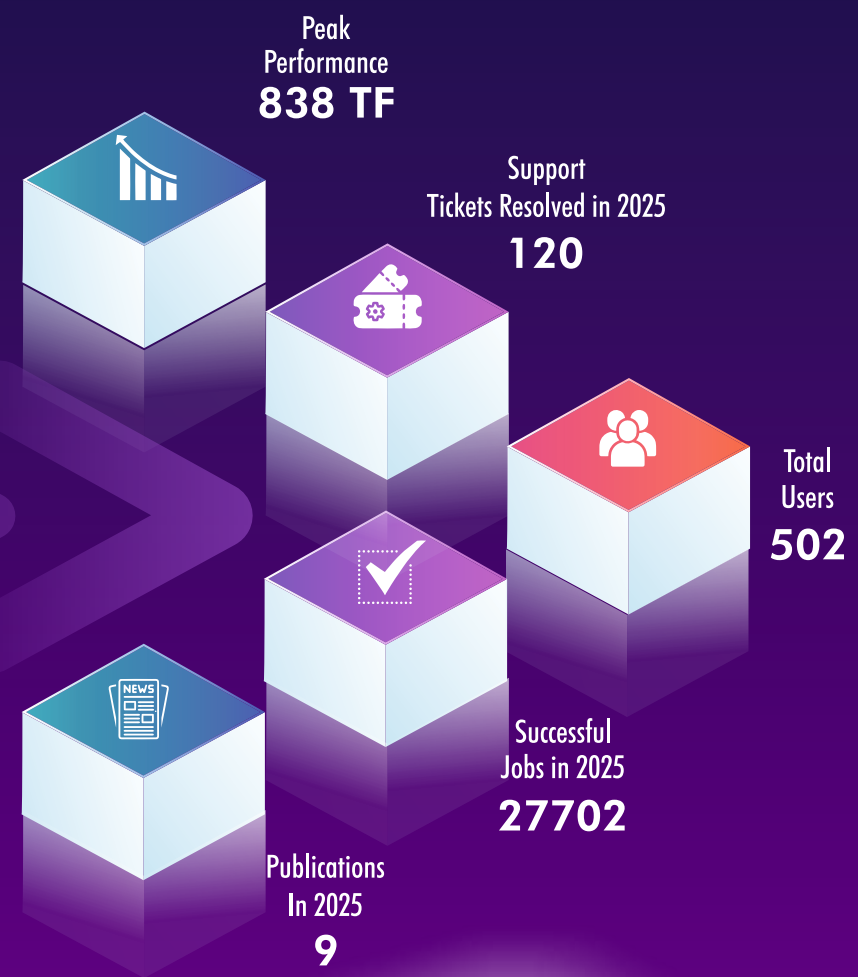
PARAM Porul, an advanced supercomputing facility at NIT Trichy, was implemented during Phase 2 of the National Supercomputing Mission and inaugurated by Dr. Bhaskar Bhat, Chairperson of the Board of Governors, NIT Trichy, in May 2022, delivers a peak computing power of 838 Teraflops. This state-of-the-art system features a heterogeneous and hybrid architecture, integrating Cascade Lake processors and Volta series GPUs , interconnected via a high-speed network for enhanced performance.



PARAM Ananta

IIT Gandhinagar

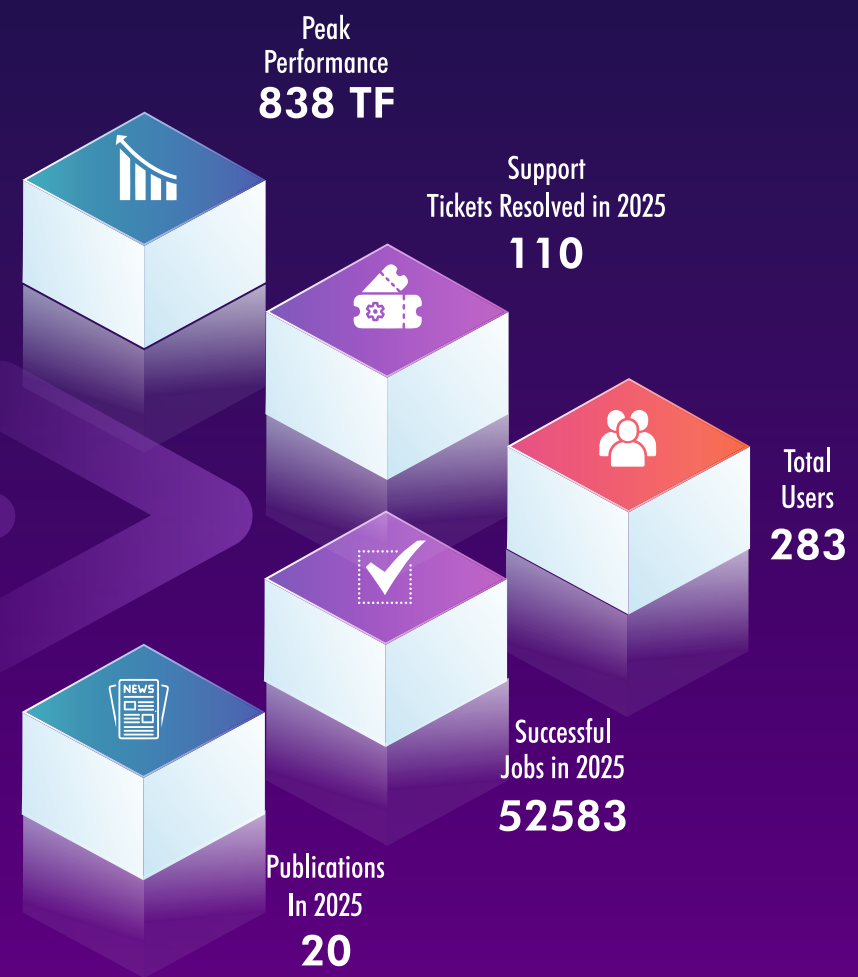
PARAM Ananta, implemented at the IIT Gandhinagar, was deployed under the National Supercomputing Mission in 2022, delivers a peak computing power of 838 Teraflops. The system was inaugurated by Smt. Sunita Verma, Group Coordinator and Scientist G at the Ministry of Electronics and Information Technology. The cluster is designed to support a wide range of scientific and engineering research applications, PARAM ANANTA plays a crucial role in advancing research capabilities in various domains.

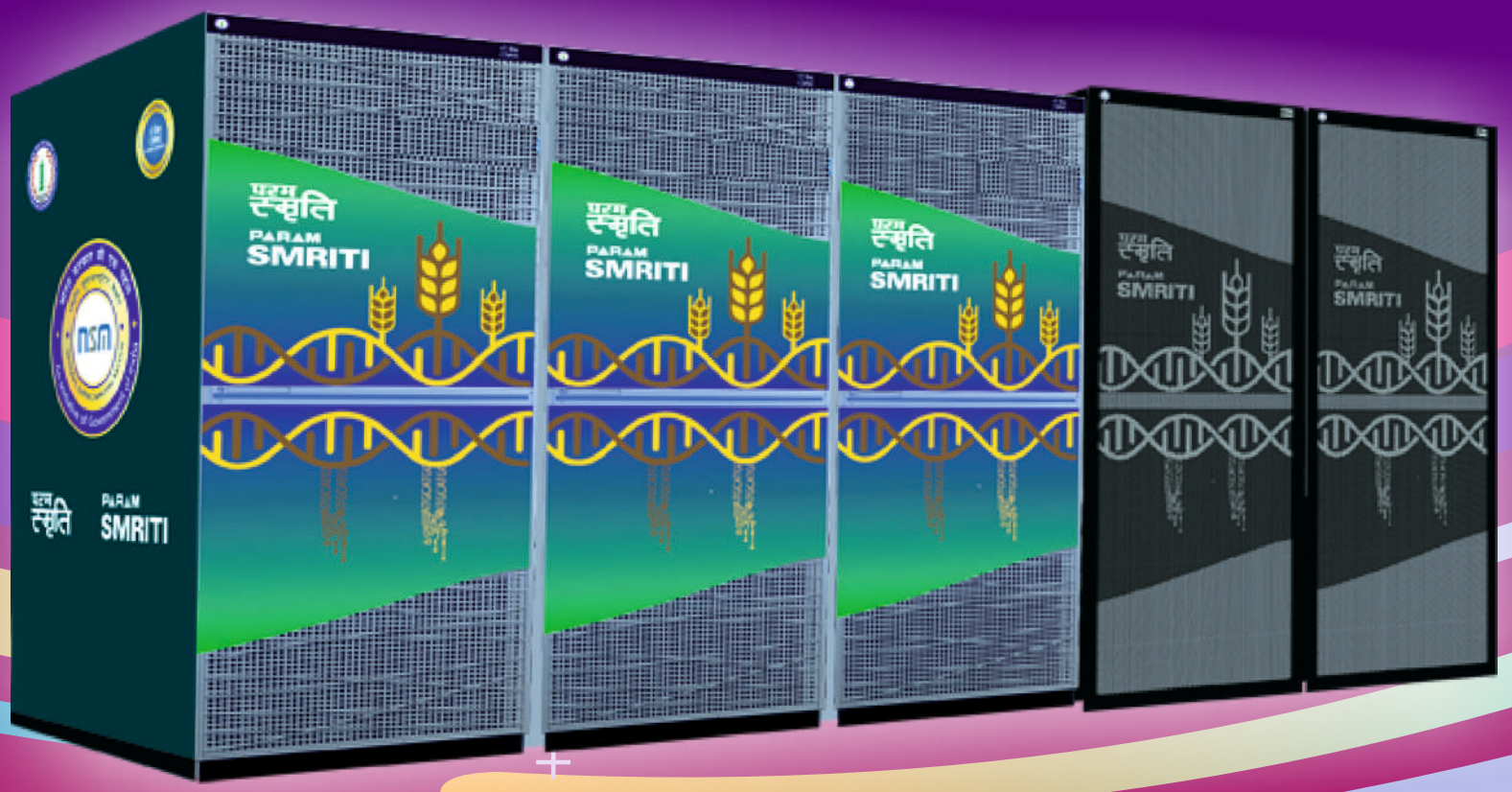


PARAM Smriti

NABI Mohali

PARAM Smriti, deployed under the National Supercomputing Mission, was inaugurated in October 2021 by Jitendra Singh, Hon'ble Union Minister of Science and Technology. With a peak computing power of 838 Teraflops, the supercomputer is installed at the National Agri-Food Biotechnology Institute in Mohali and is primarily dedicated to advancing agricultural research applications.

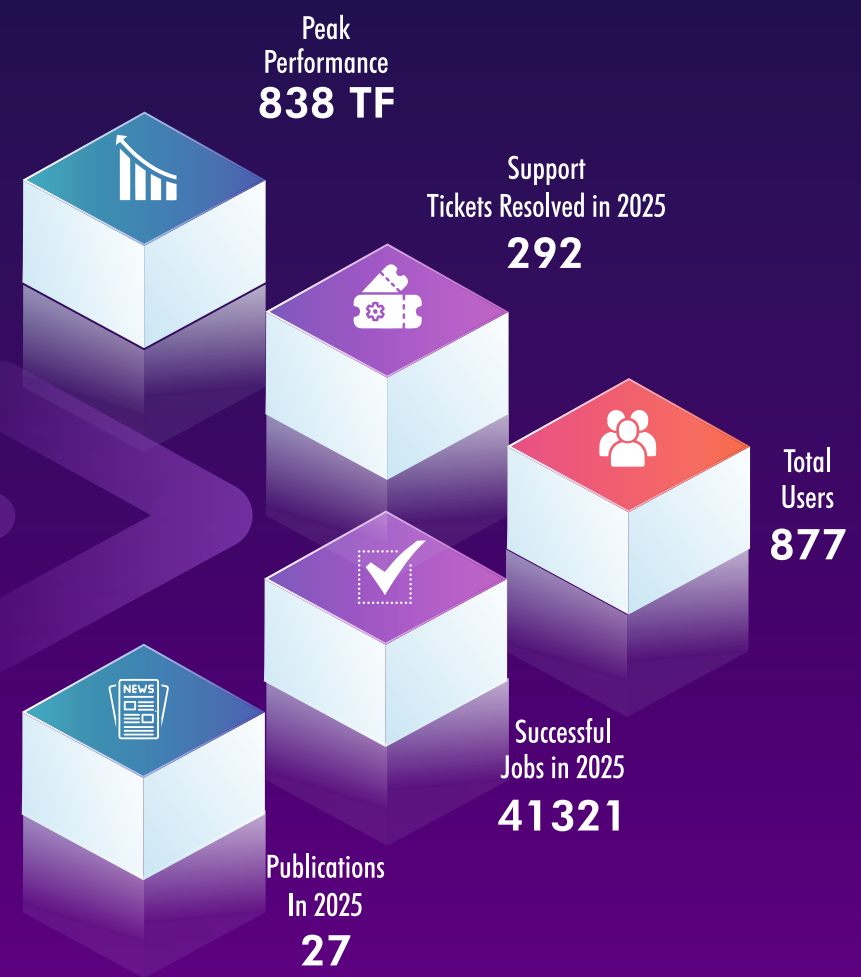


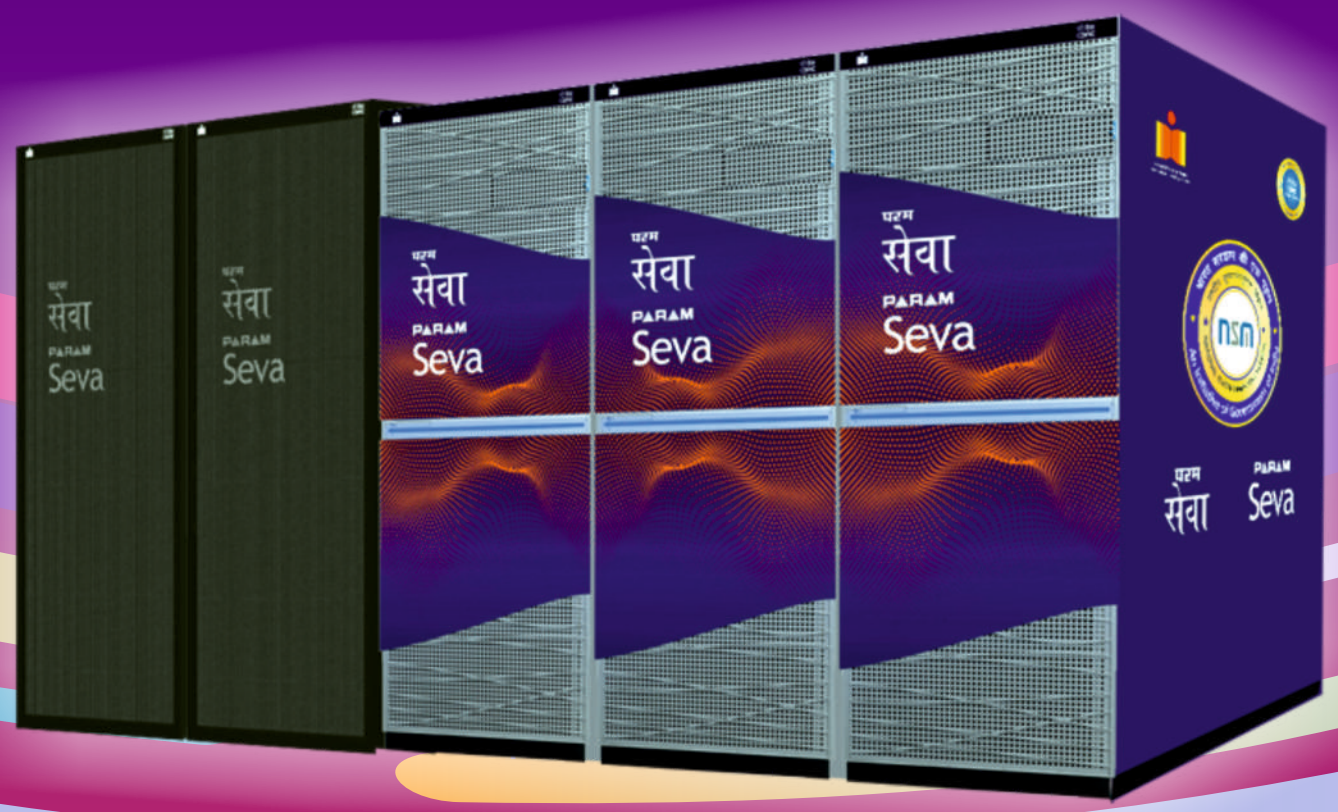


PARAM Seva

IIT Hyderabad

PARAM Seva supercomputer deployed under the National Supercomputing Mission at IIT Hyderabad, featuring a heterogeneous and hybrid configuration, delivers a peak computing power of 838 Teraflops. It marks a significant milestone in India's progress in high performance computing. The system was inaugurated by Shri Dharmendra Pradhan, Hon'ble Minister of Education, in January 2022, representing a key advancement in strengthening the nation's computational research infrastructure.

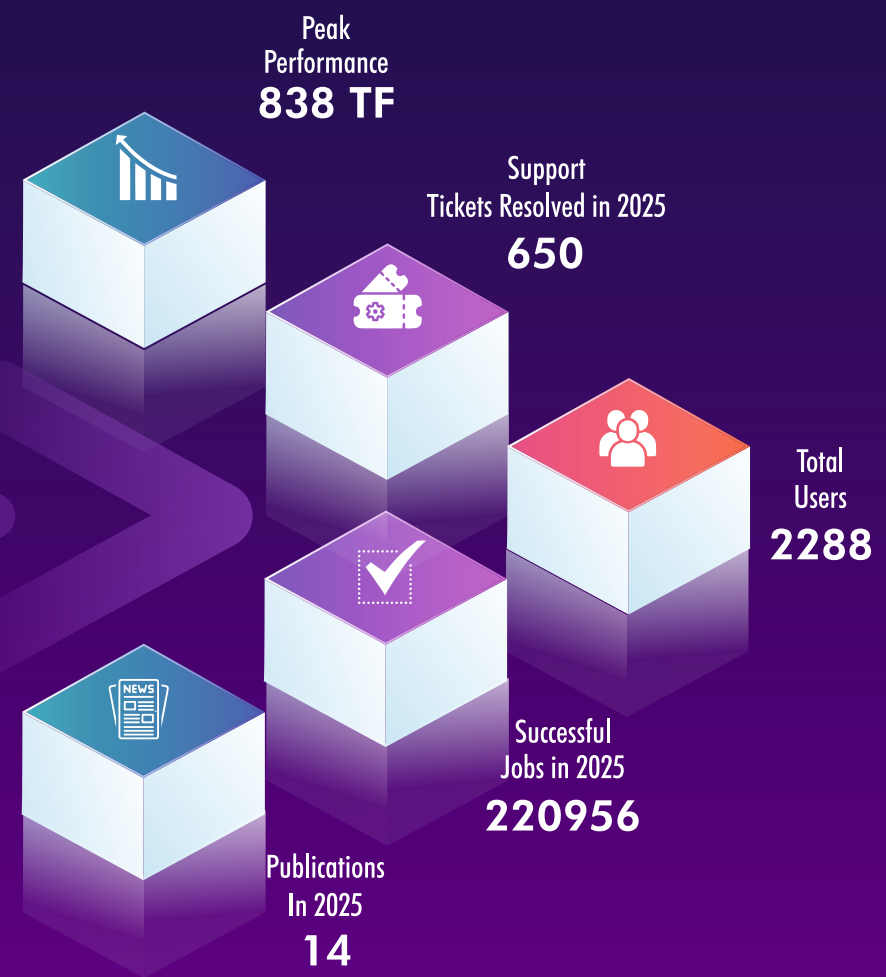




PARAM Utkarsh

C-DAC, Bengaluru

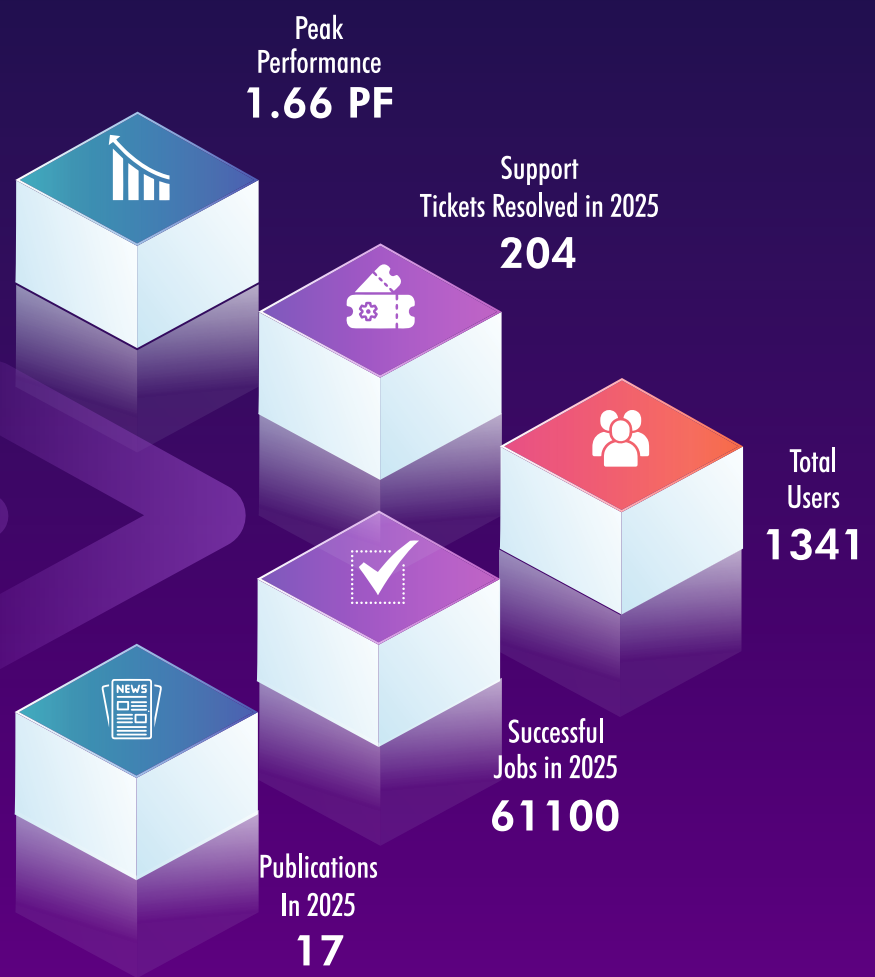
PARAM Utkarsh, implemented at C-DAC Bangalore under the National Supercomputing Mission, delivers a peak performance of 838 Teraflops and serves as a crucial resource for a wide range of tasks, including HPC simulations, Big Data Analytics, and Cloud services. It primarily supports the Micro, Small, and Medium Enterprises (MSME) sector. By 2025, the system has onboarded 21 startups and MSMEs, further enhancing its impact.



PARAM Ganga

IIT Roorkee

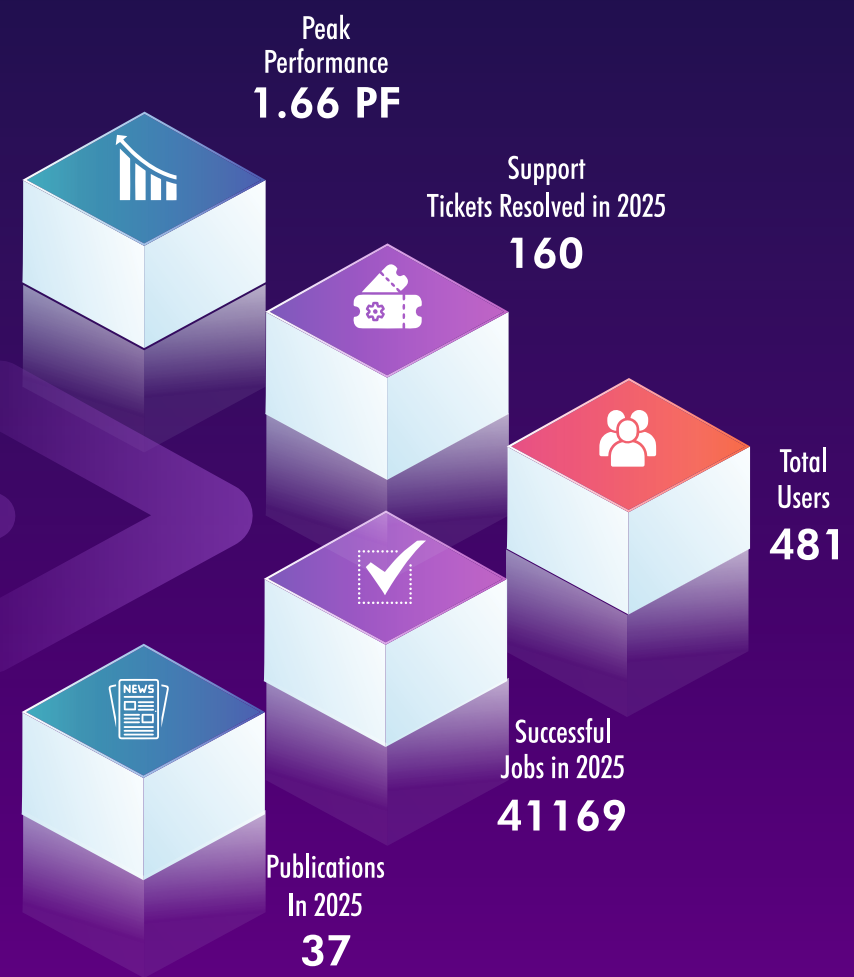
PARAM Ganga, deployed at IIT Roorkee under the phase 2 of National Supercomputing Mission, is a cutting-edge High-Performance Computing system with a peak performance of 1.66 Petaflops. The system is equipped with Cascade Lake processors and Volta series GPUs, interconnected via a high-speed network. It was officially inaugurated in March 2022 by Shri B. V. R. Mohan Reddy, Chairman of the Board of Governors at IIT Roorkee. PARAM Ganga supports scientific simulations, engineering analysis, AI/ML processing, data modeling, analytics, and interdisciplinary research.



PARAM Sanganak

IIT Kanpur

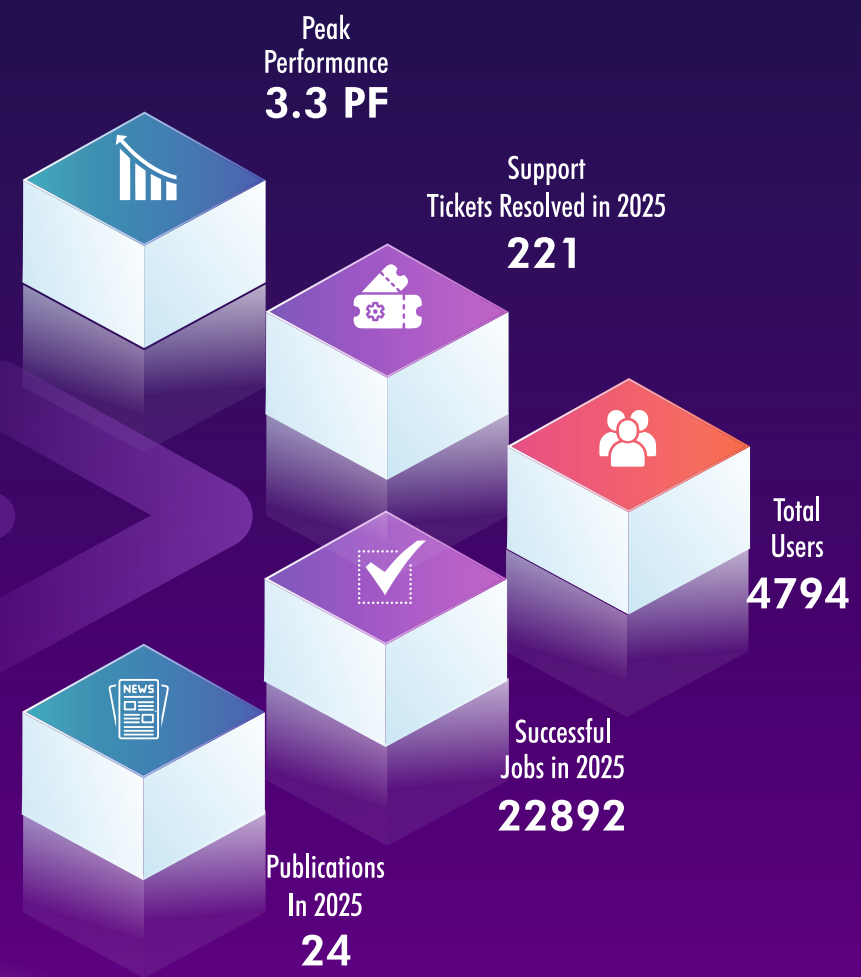
The PARAM Sanganak supercomputing facility was implemented under the National Supercomputing Mission in 2021, delivering an impressive peak computing performance of 1.66 Petaflops. Engineered and deployed by C-DAC, this advanced system serves as the primary computational backbone for the institute. PARAM Sanganak represents the forefront of modern high performance computing. By providing high throughput processing capabilities, the facility effectively supports complex simulations and data-intensive modeling to enable cutting-edge research and multidisciplinary innovation.



PARAM Pravega

IISc Bengaluru

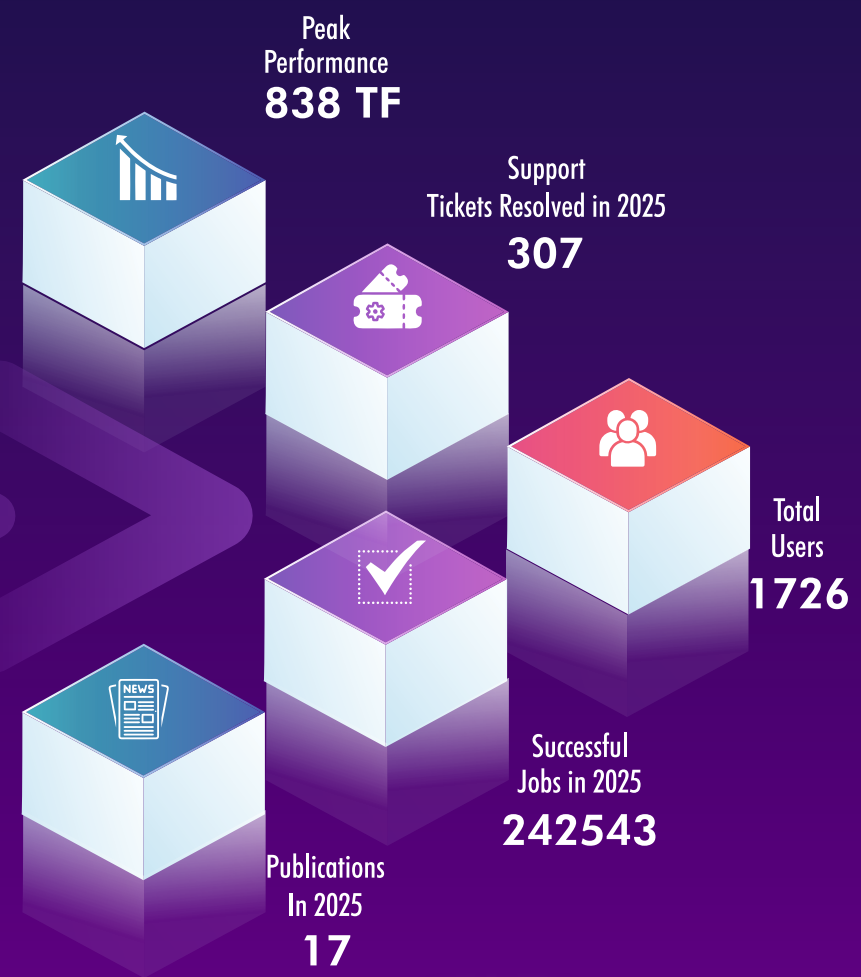
PARAM Pravega inaugurated during Phase-2 of the NSM delivers an impressive peak computing power of 3.3 Petaflops. The facility has been meticulously designed to meet the advanced computational demands of IISc Bengaluru, as well as several other research and engineering institutions in the region. Notably, PARAM Pravega serves as a vital resource for enabling cutting-edge research across a broad spectrum of scientific domains.



PARAM Shivay

IIT BHU, Varanasi

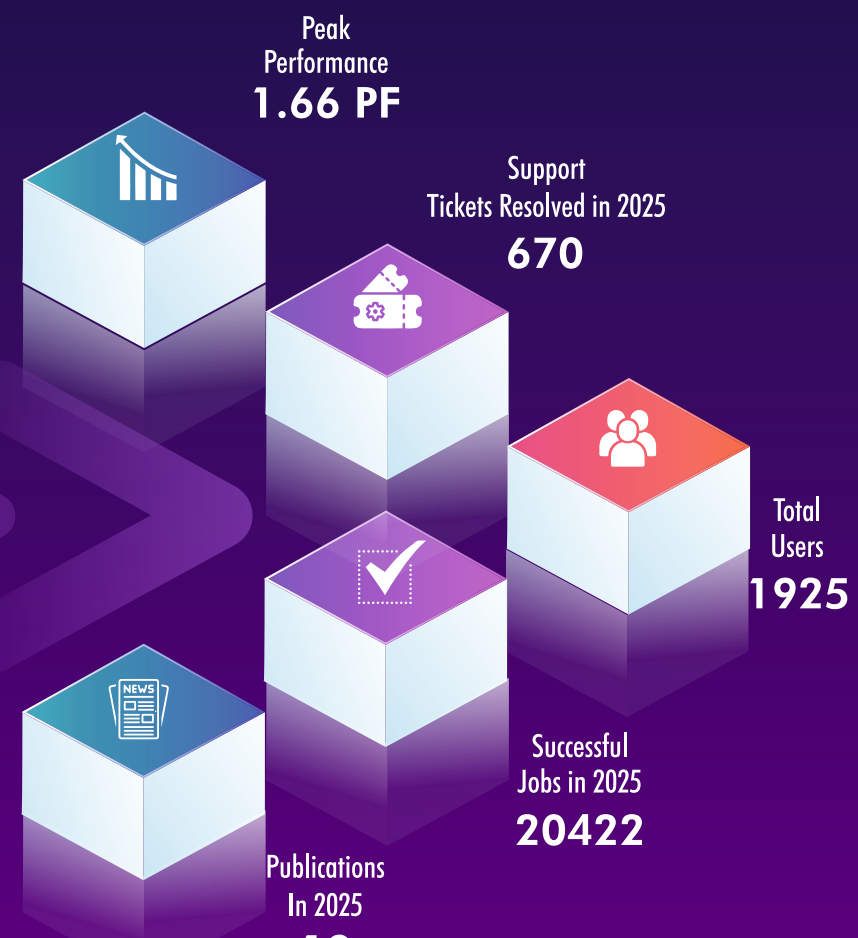
PARAM Shivay, the first supercomputing system deployed under the National Supercomputing Mission by C-DAC at IIT (BHU), Varanasi, was inaugurated in February 2019 by Hon'ble Prime Minister Shri Narendra Modi. This advanced facility delivers a peak computing performance of 838 Teraflops, powered by a combination of CPUs and GPUs. Its commissioning marked a significant milestone in enhancing the country's research and development capabilities. PARAM Shivay is used for research applications across various scientific domains, including advanced climate modeling, drug discovery simulations, AI-based pattern recognition, and large-scale data analysis.



PARAM Shakti

IIT Kharagpur

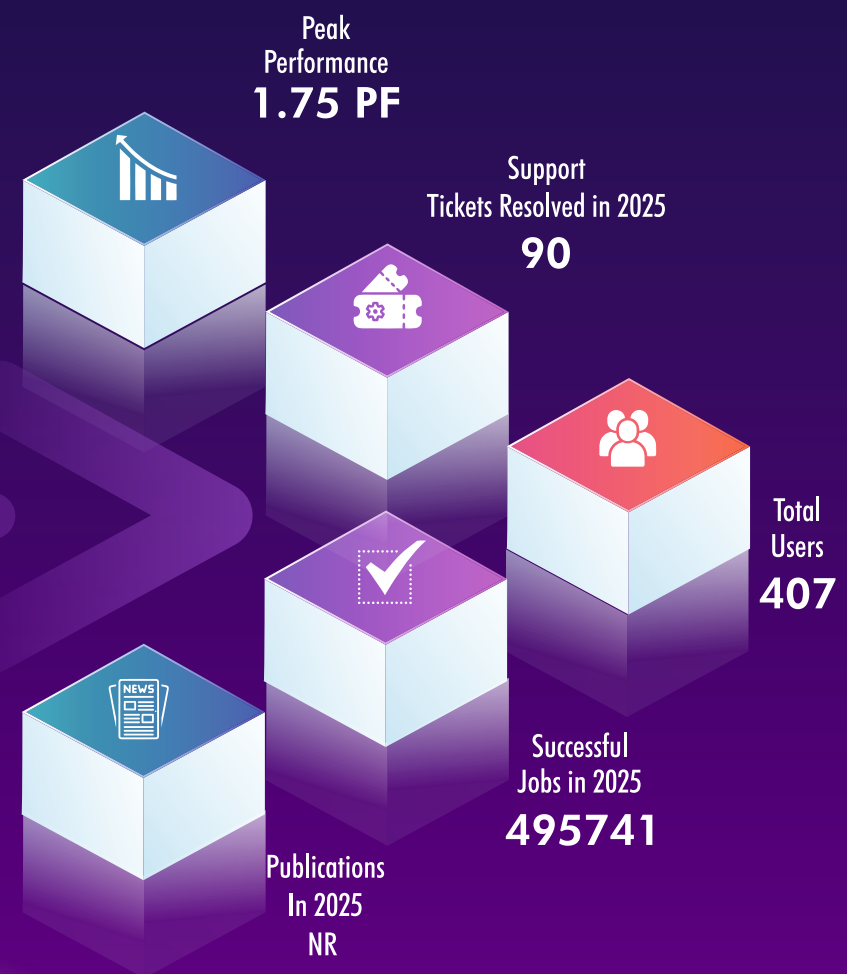
PARAM Shakti, an advanced supercomputing facility implemented at IIT Kharagpur under the National Supercomputing Mission, was inaugurated in March 2022 by the Hon'ble Governor of West Bengal, Shri Jagdeep Dhankhar. With a peak computing capacity of 1.66 Petaflops, the system was designed and deployed by C-DAC to support the computational needs of IIT Kharagpur as well as nearby scientific and engineering research institutions. Built using the latest hardware and software technologies, PARAM Shakti provides powerful high-performance computing capabilities.



PARAM Bramha

IISER Pune

PARAM Brahma, implemented at the Indian Institute of Science Education and Research (IISER) Pune under the National Supercomputing Mission in 2020, delivers a peak performance of 1.75 Petaflops. The system is designed to meet the computational needs of IISER Pune as well as neighboring research institutions. PARAM Brahma is used for advanced climate modeling, drug discovery simulations, AI-based pattern recognition, and large-scale data analysis.

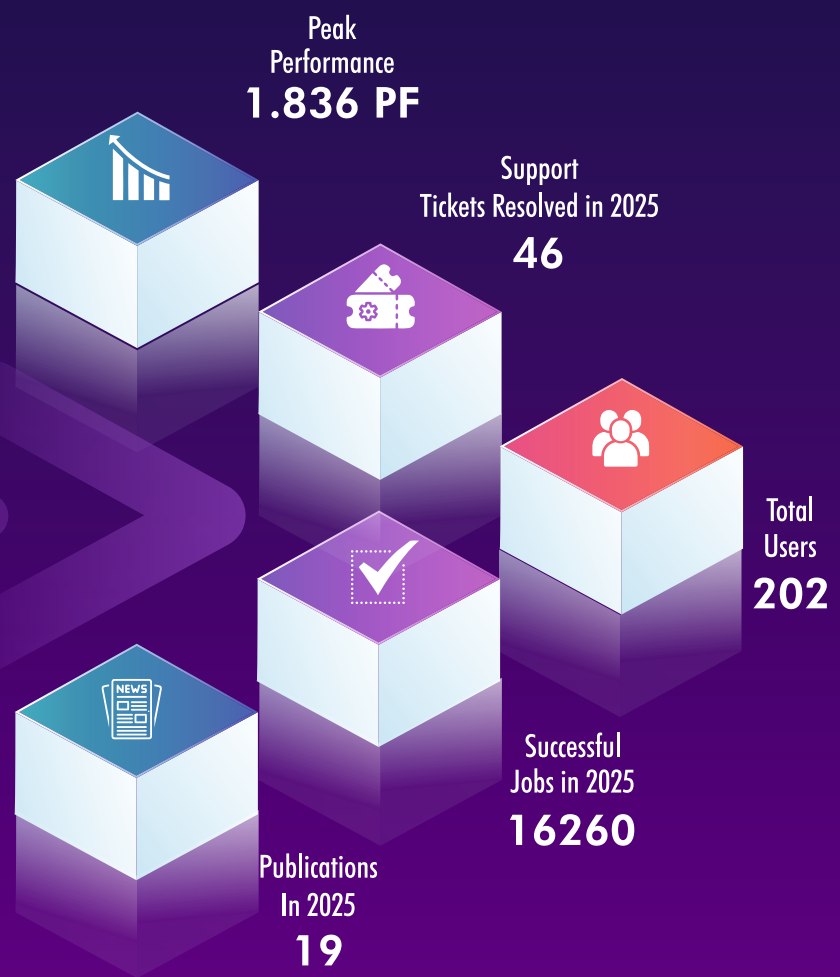


*NR -Not Received

PARAM Yukti

JNCASR, Bengaluru

PARAM Yukti is an advanced supercomputing system implemented to meet the computational demands of JNCASR, Bangalore. Delivering a peak performance of 1.8 Petaflops, it integrates Cascade Lake processors and Volta series GPUs, interconnected via a high-speed network. In line with the Make in India initiative, a significant portion of the system's components is locally manufactured and assembled. It is primarily used for scientific research, data-intensive simulations, AI/ML modeling, and complex computational tasks.



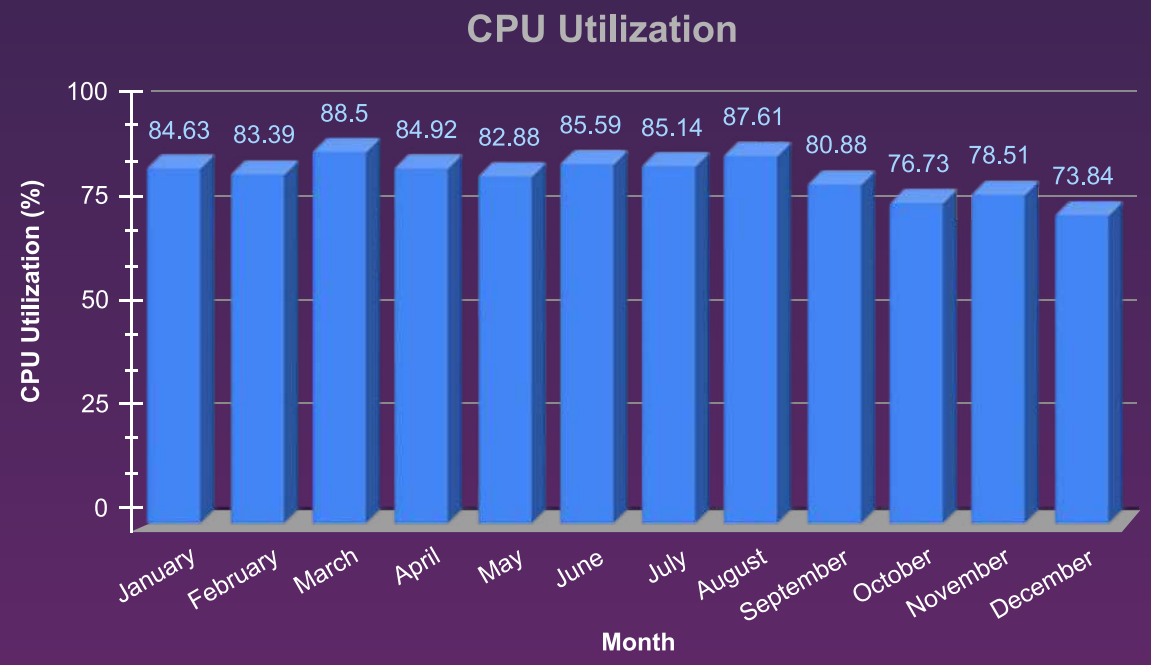
HPC Testbed Systems at C-DAC Pune, and PARAM Vidya HPC Systems across India

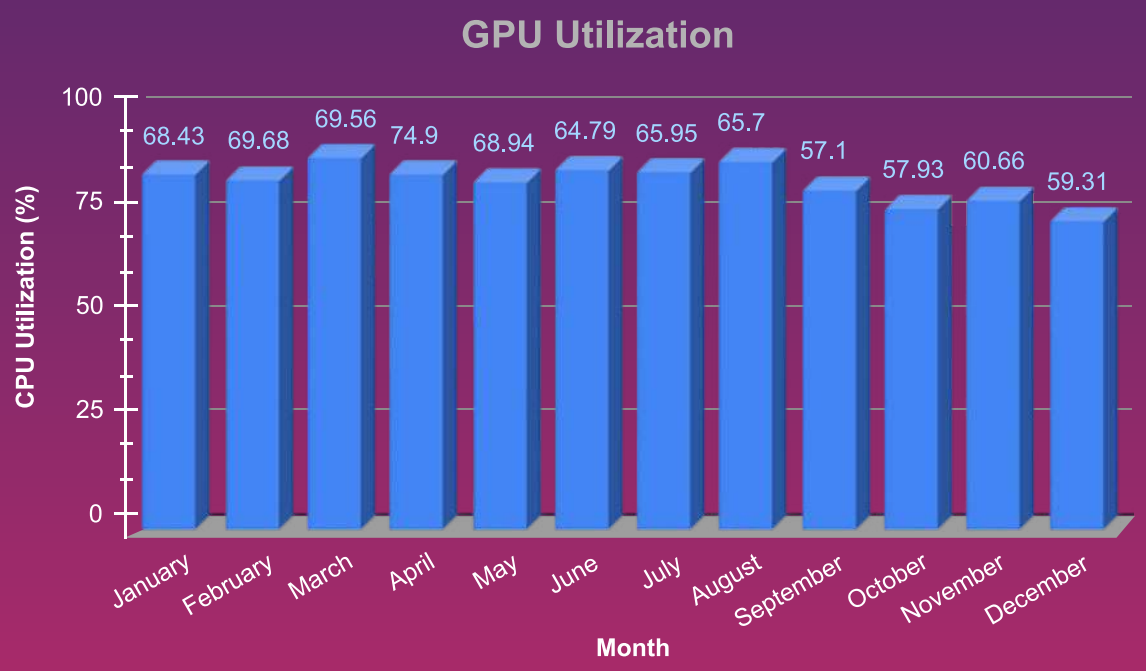
- Rudra-based 1PF HPC testbed system at CDAC Pune, utilizing Cascade Lake processors for in-house HPC application development, porting, and benchmarking.
- Grace Hopper testbed: The H100 GPU is based on the Hopper architecture and GH200 GPU (grace) provides high performance for large-scale AI model training, inference, and scientific computing.
- Intel Habana Gaudi 2 AI Accelerator is an artificial intelligence accelerator developed by Intel for deep learning training and inference workloads. It is based on the Gaudi architecture and includes multiple Tensor Processing Cores along with integrated high-bandwidth memory and on-chip networking.
- SambaNova System, SambaNova SN40L AI Accelerator is based on the Reconfigurable Dataflow Unit (RDU) architecture, designed to accelerate large-scale AI model training and inference.
- 50TF PARAM Vidya deployed at Five different locations, targeting training activities for educational
- To ensure nationwide accessibility and outreach, nine dedicated nodal centers have been set up in strategic locations across These centers act as hubs for training, research, and collaboration, playing a pivotal role in the mission's success. Centers are namely IIT Palakkad, IIT Kharagpur, IIT Goa, IIT Madras, Delhi Technological University, Walchand College of Engineering, NIT Arunachal Pradesh, Pondicherry University, IGNTU Amarkantak.

Comprehensive Utilization Report

Month wise
System Utilization (CPU)

The cumulative CPU utilization across all NSM sites from January to December 2025 reflects usage of the system. The system's overall utilization has gradually increased, averaging 83% over time.



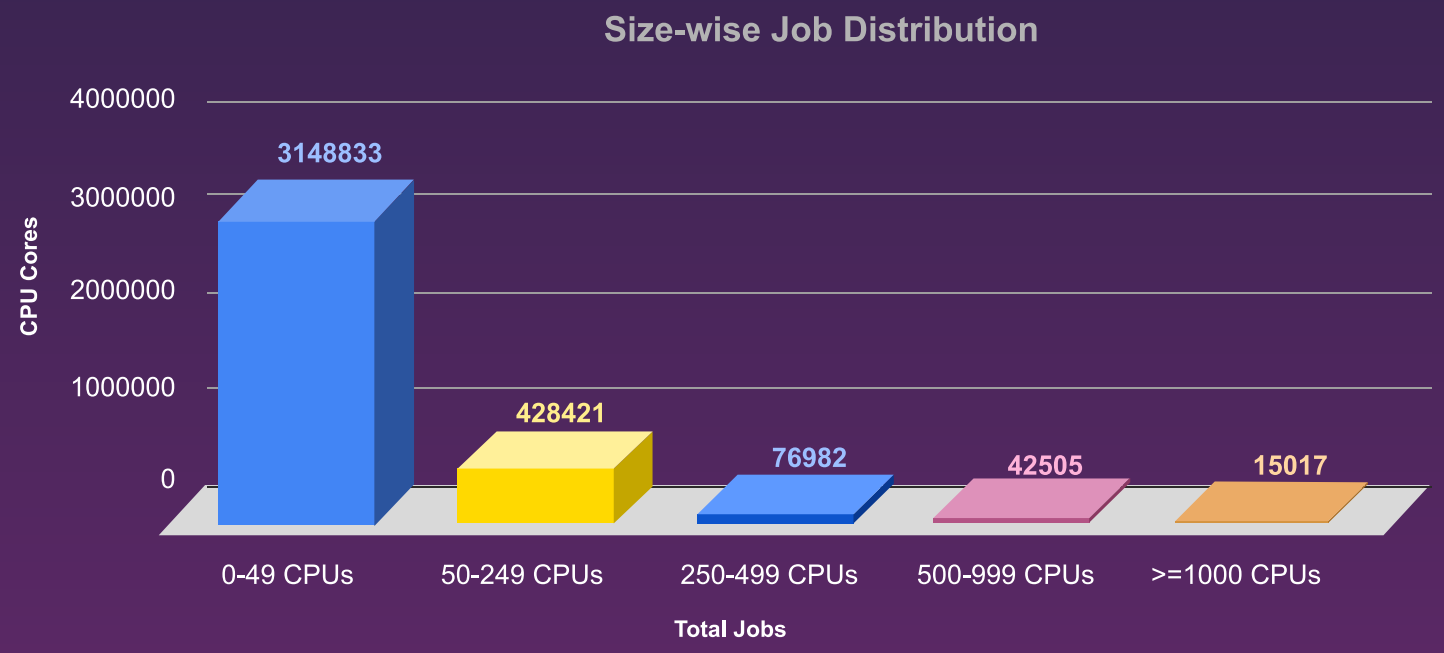


Month wise
System Utilization (GPU)

The cumulative GPU utilization across all NSM sites from January to December 2025 reflects better usage of the system. A consistent upward trend is observed in the overall utilization of the system over time.

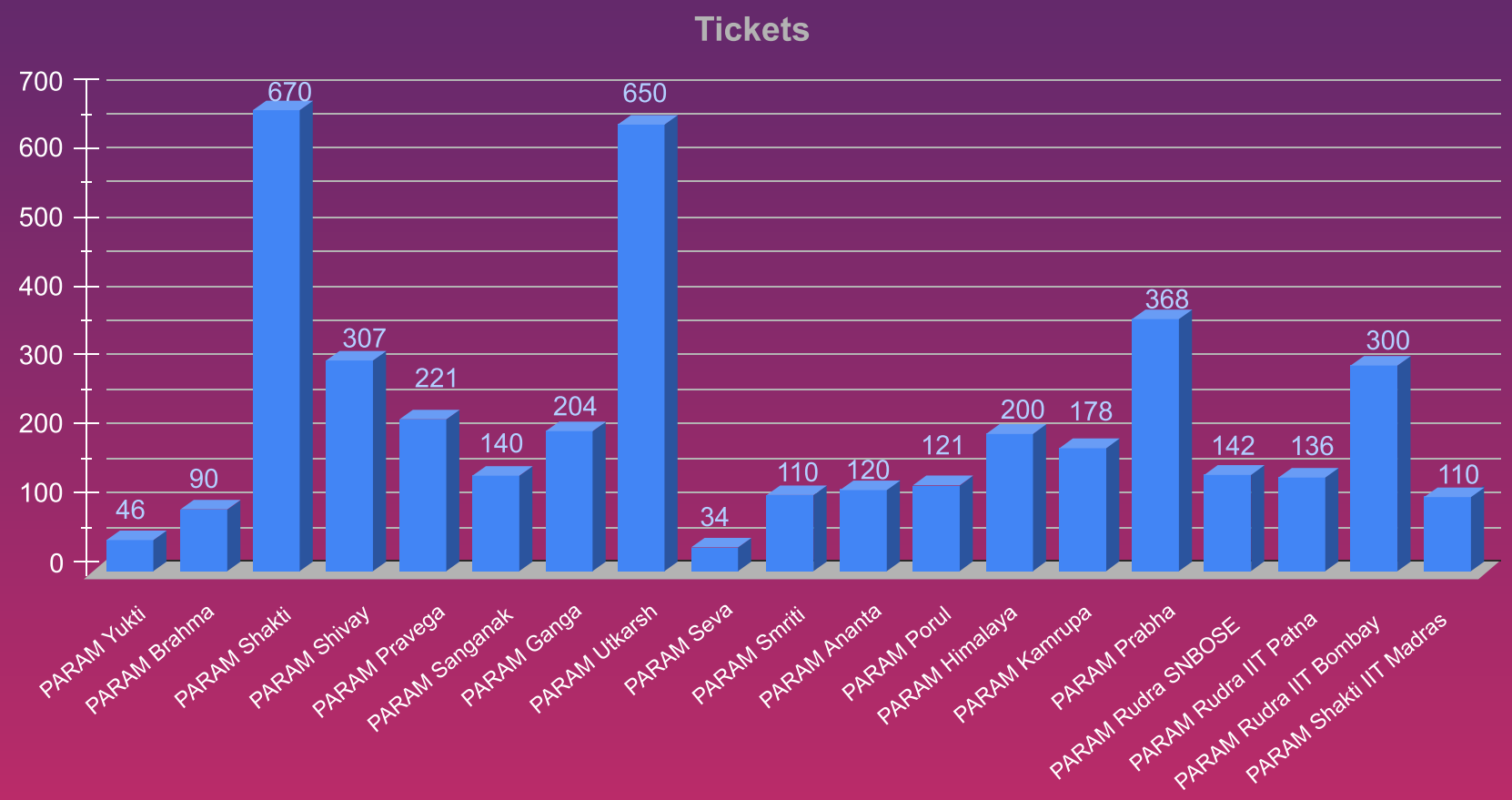
Distribution of Jobs by Job Size

The graph depicts the job count across all NSM sites based on job size, where job size denotes the number of CPU cores utilized by the jobs.



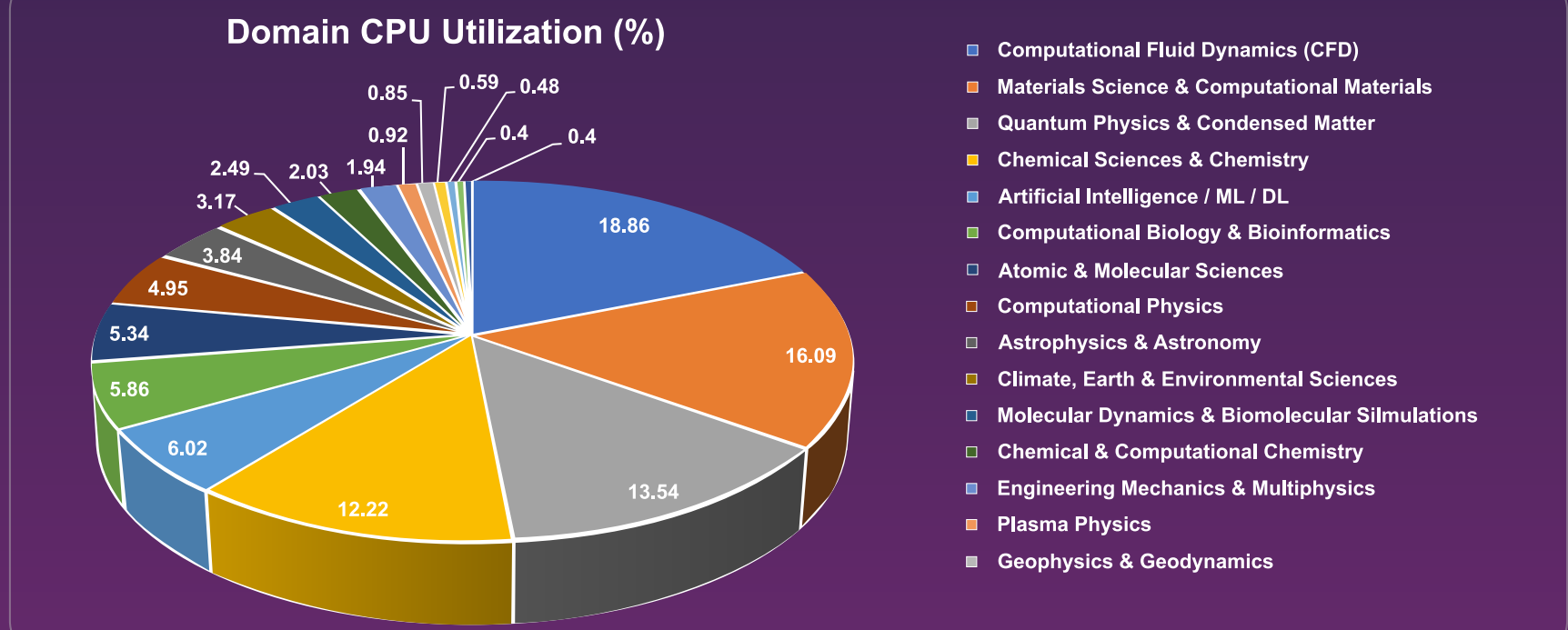
Support Call Addressed

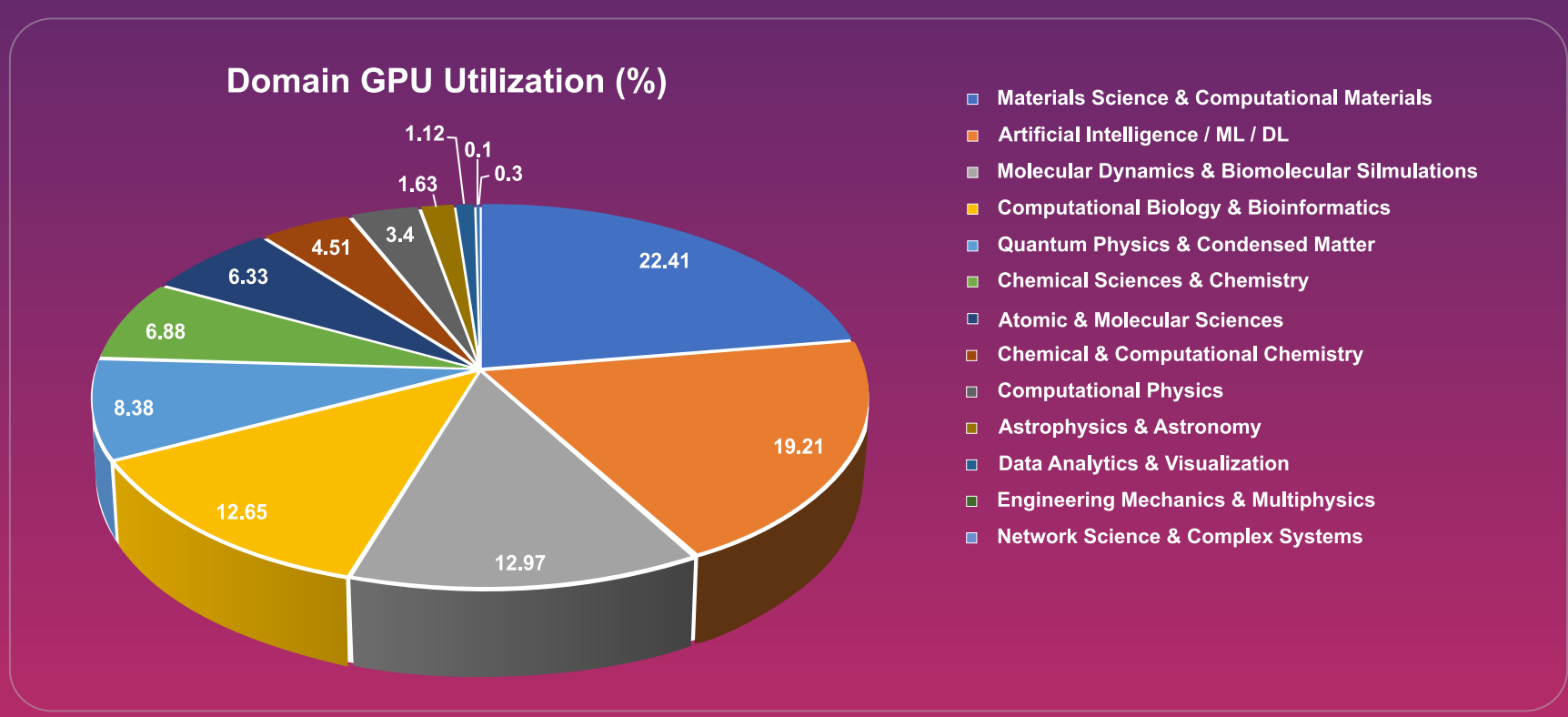
This Chart illustrated the C-DAC HPC team's efforts in addressing support calls aimed at resolving user issues.



Domain Wise System Utilization

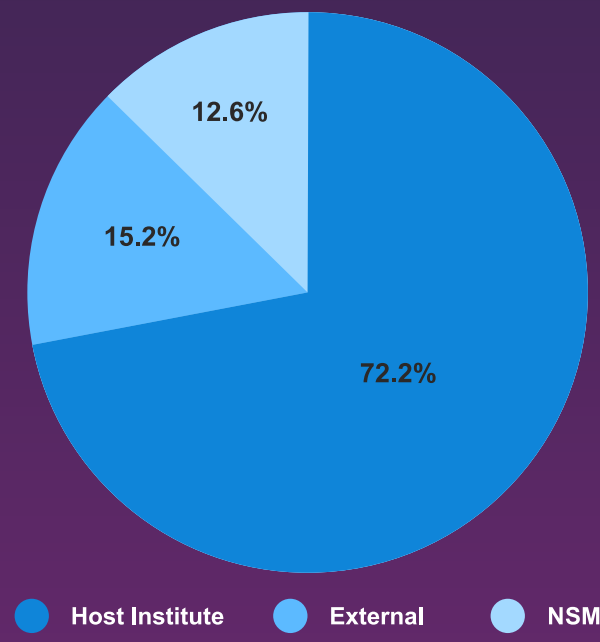
The pie chart shows the system CPU and GPU utilization for the year 2025 with respect to different application domains.



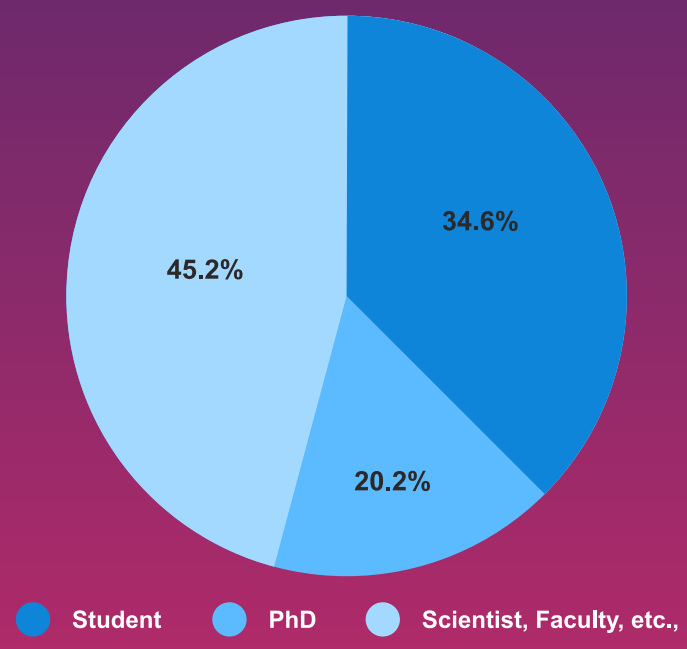


User Statistics

The chart below illustrates users of different categories across all NSM sites.



This Pie chart demonstrate the total number of users **14313**, comprising Host Institute **10329 (72.2%)**, External Users **2177 (15.2%)**, NSM Users **1817 (12.6%)**

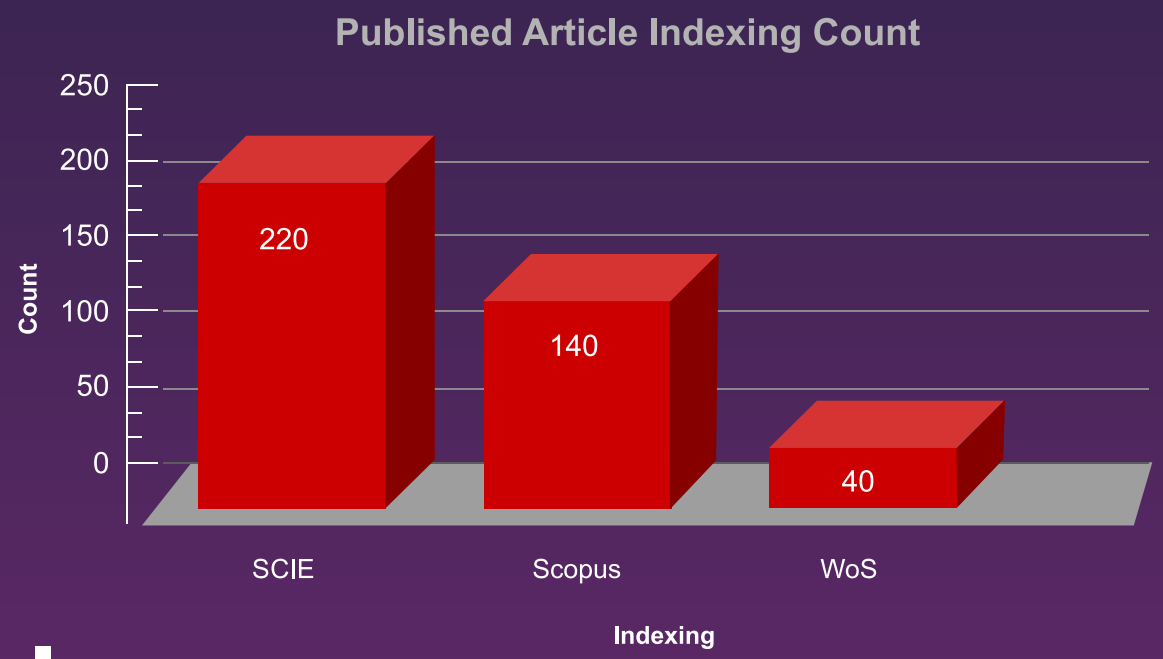


This Pie chart demonstrate the total number of users **14313**, comprising **4946 (34.6%)**, students, PhD scholars **2894 (20.23%)**, **6463 (45.2%)** others (including faculty, scientists, industry professionals, etc.).

Publications

In 2025, NSM systems contributed to a total of 400 publications. Included below are the impact factors and indexing counts for these publications. Published Articles Indexing Count.

A total of 400 articles are published in journals indexed by SCI/SCIE, which represents the high quality of the research content and its global acceptability.

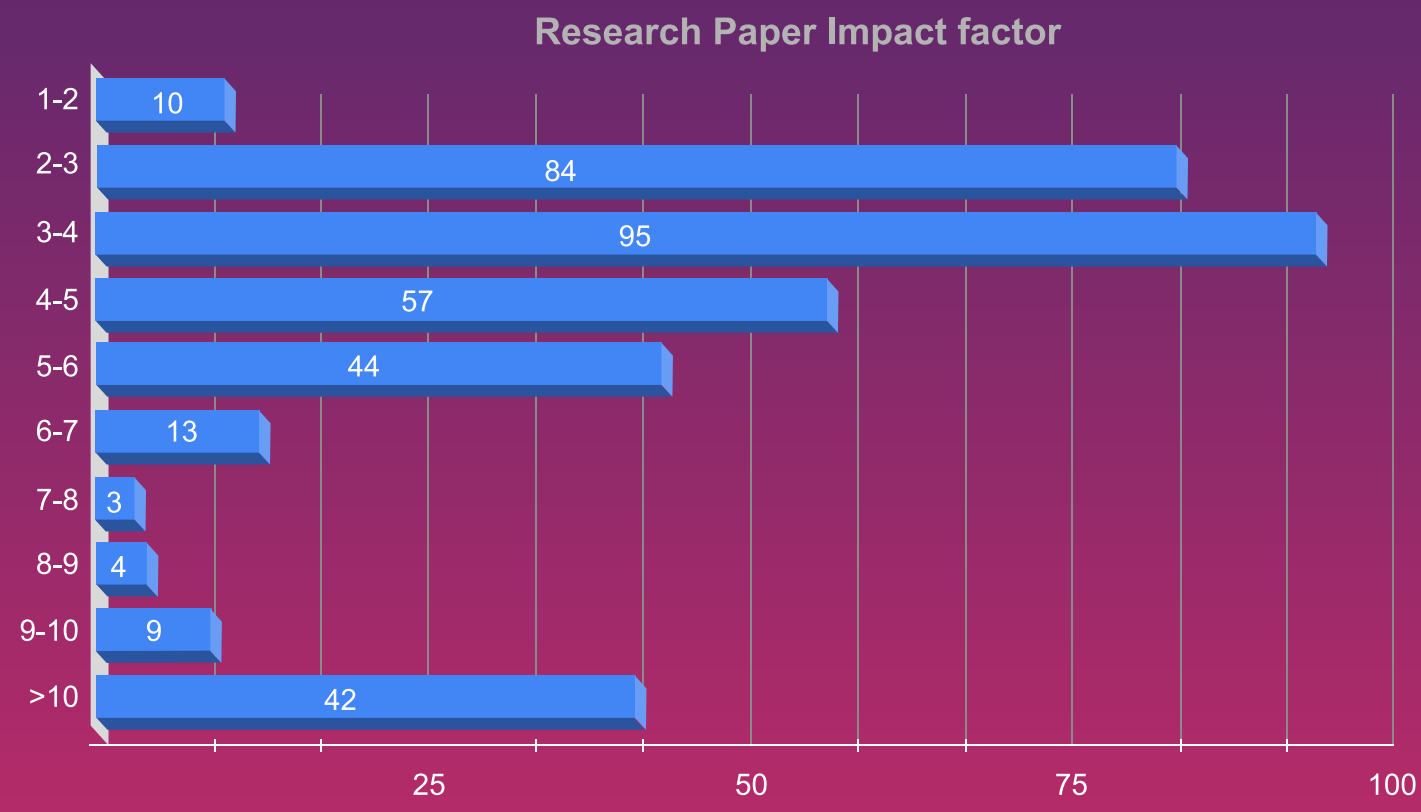


Published Articles

Impact Factor Range

Impact factor measures a journal's citation influence, offering researchers increased visibility and broader readership.

The graph indicates 361 research articles published in journals which have good impact ranges of 2-3, 3-4 and 4-5 respectively. Additionally, some journals have exceeded an impact factor of 10.



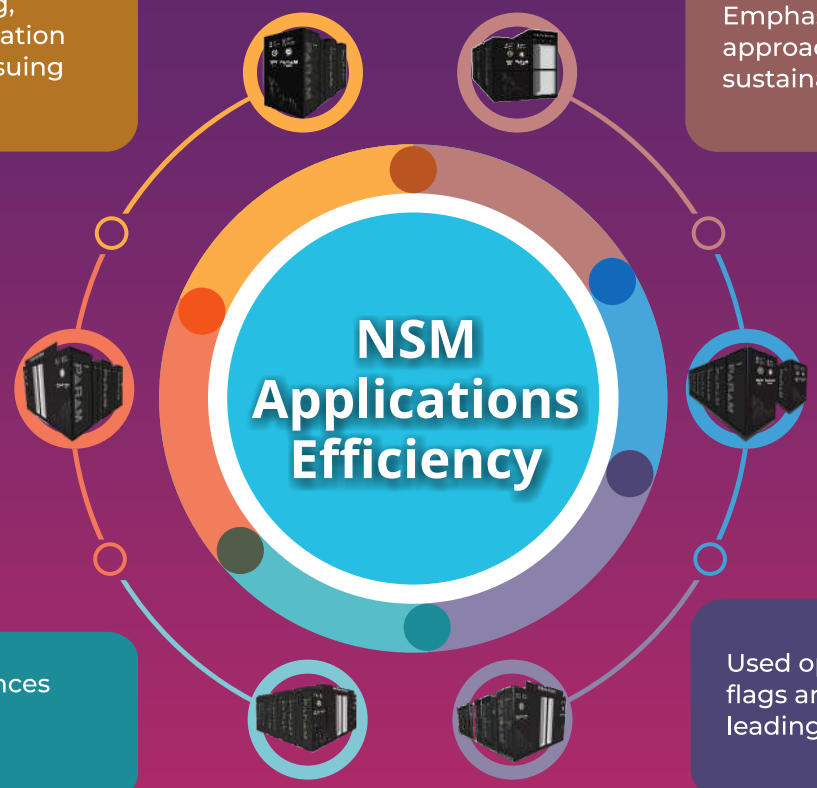
Leveraging NSM Systems for Application Services and Development:
Socio-Economic Outcomes

Utilization of PARAM Supercomputing Infrastructure

The PARAM family of supercomputers has supported several large-scale scientific and engineering applications across multiple research domains, demonstrating strong computational capabilities for complex simulations.

Significant advances in data handling, algorithm parallelization and optimization ensure rapid flood forecasting and issuing timely warning for hazard mitigation

Emphasized CPU optimization and integrated approach to weather, air quality & hydrology for sustainable efficient urban planning



Scalability (in Anuga & other codes) thru parallelization strategies, sets stage for enhanced GPU parallelization

Used MPI and Big Data techniques to improve efficiency of genomics and drug discovery research

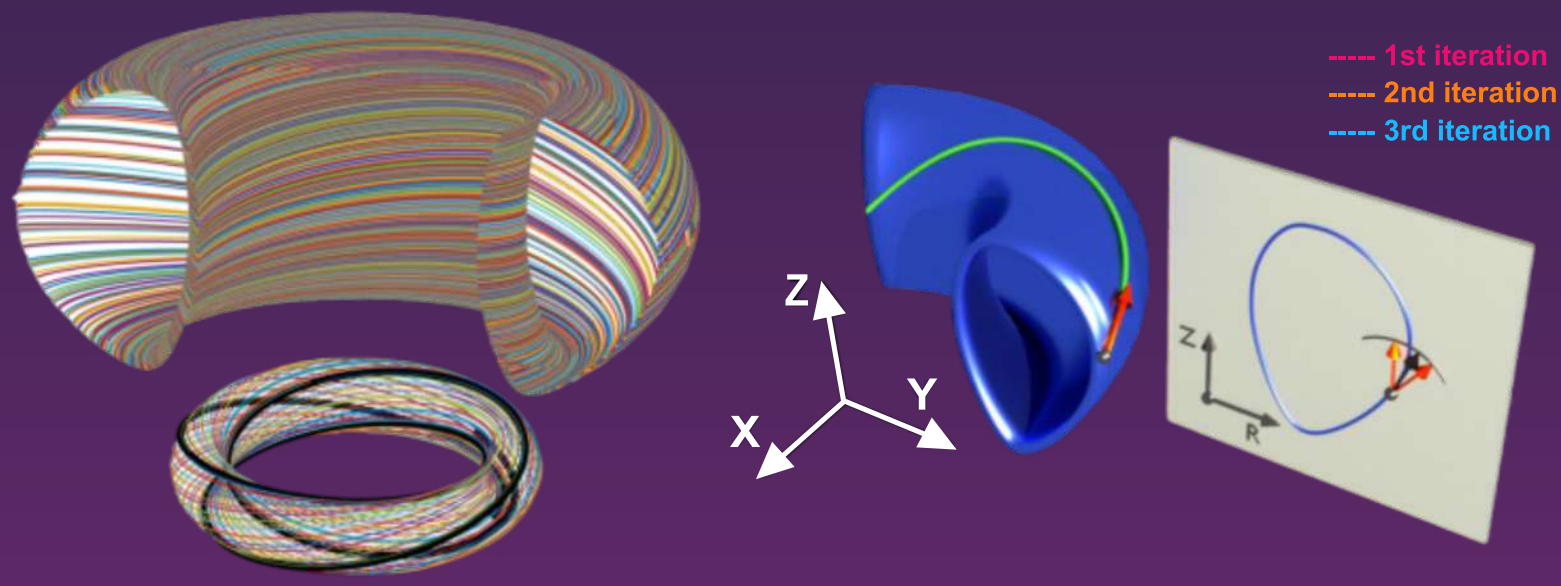
Parallel computing significantly enhances simulation speeds for able wildfire management

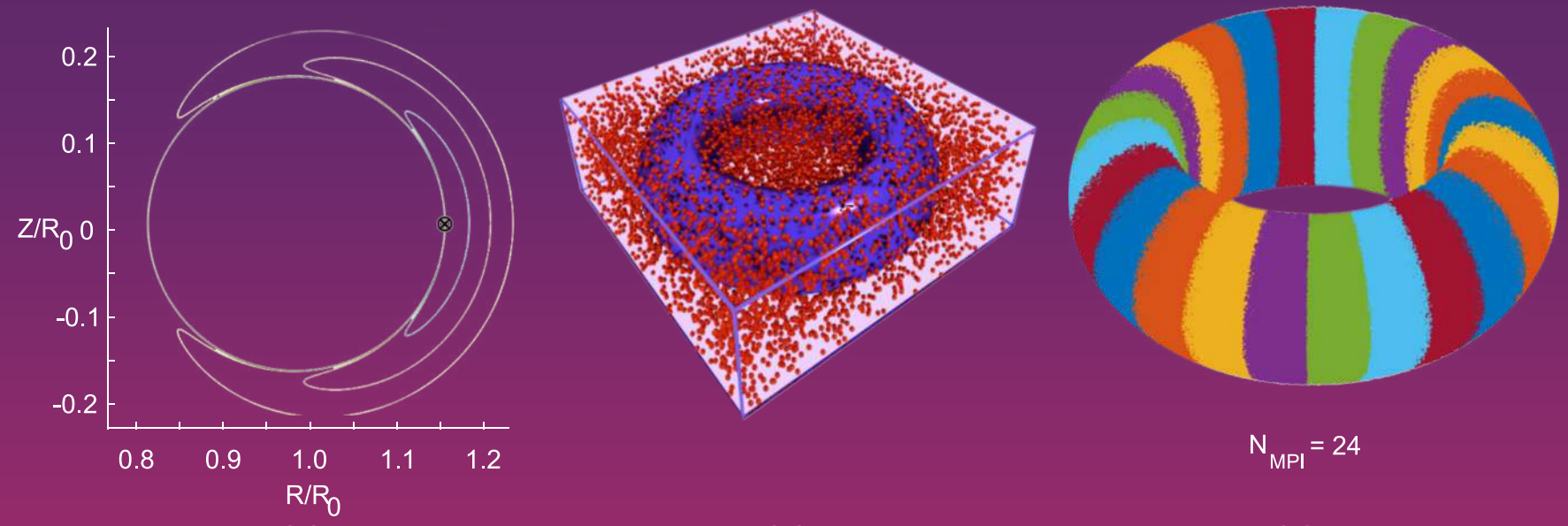
Used optimization techniques like compiler flags and vectorization to reduce compute time leading to efficient seismic data processing

Atmospheric Chemistry Simulations using G2C3

The G2C3 (Global Gas-phase Chemistry model) has been executed on PARAM systems to investigate atmospheric chemical processes and pollutant transport at regional and global scales. The model enables detailed simulation of chemical reactions occurring in the atmosphere and their interaction with meteorological parameters.

G2C3 integrates multiple computational components to represent atmospheric processes.





Materials Science Simulations using VASP

The Vienna Ab initio Simulation Package (VASP) has been widely utilized on PARAM supercomputing platforms for computational materials science and condensed matter physics research. The software performs first-principles calculations based on Density Functional Theory (DFT) to investigate the electronic structure and physical properties of materials.

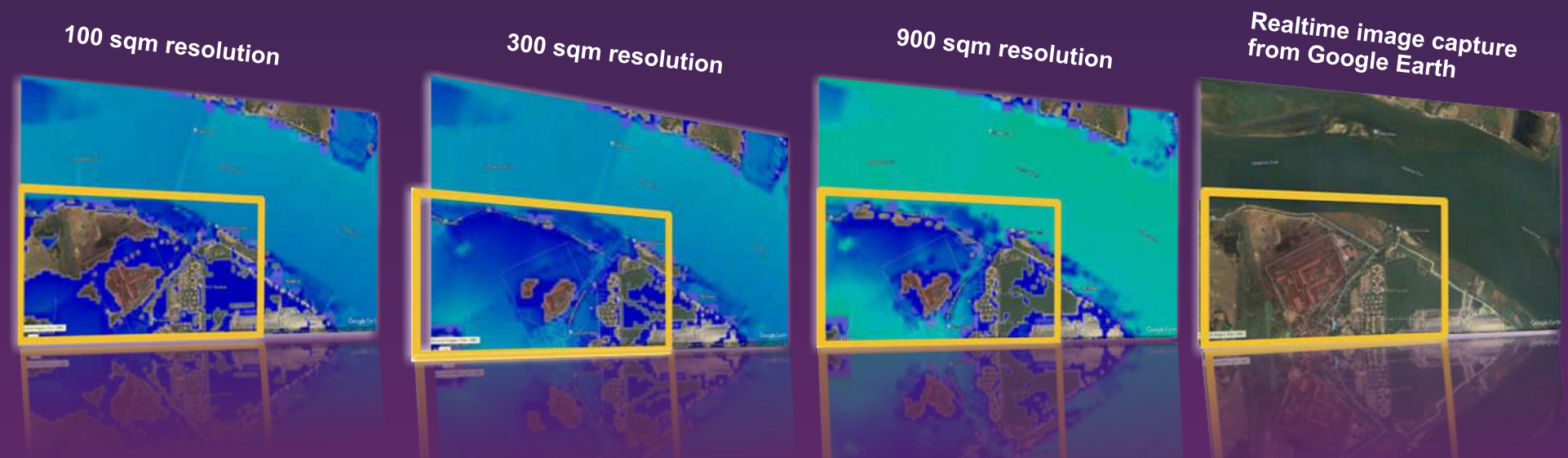
Applications, Tools, Programming Models Enabled on NSM PARAM Systems

HPC Applications	**Bio-informatics**	MUMmer, HMMER, MEME PHYLIP, mpiBLAST, ClustalW	**Visualization Programs**	GrADS, ParaView, Visit, VMD
	Molecular Dynamics	NAMD, LAMMPS, GROMACS (CPU & GPU)	**Libraries**	Scientific & Mathematical Libraries, NetCDF, PNETCDF, Jasper, HDF5, Tcl, Boost, FFTW
	Material Modelling, Quantum Chemistry	Quantum-Espresso,Abinit, CP2K, NWChem		
	CFD, Aerospace	OpenFOAM, FDS, SU2	**Programming Models**	MPI, OpenMP, OpenACC, CUDA, SYCL, Julia, Pthreads
	Weather, Ocean, Climate	WRF, RegCM, MOM, ROMS		
	Disaster Management	ANUGA Hydro, SpeckFEM3D	**Benchmarks Performed on Latest Architectures**	
AI/ML/DL Tools/ Technologies/ Libraries	**DL Framework:** TensorFlow, keras, theano, pytorch, scikit-learn, scipy, cuDNN		**Architecture**	Intel, AMD, IBM, Nvidia, ARM, Graphcore
	Data Science: Numpy, RAPIDS		**Key Application Areas**	Atmospheric Sciences, Molecular Dynamics, Computational Fluid Dynamics, Deep Learning
	Dist. DL Framework: TensorFlow & Pytorch with Horovod			
	Container Technology: enroot			
	DL App. Dev. Platform, web based IDE: JupyterHub		**Open Source Applications**	WRF, LAMMPS, NAMD, GROMACS, OpenFOAM
Installed additional applications, libraries, tools on different NSM systems as per requirements from users of respective systems				

ANUGA CPU/GPU Optimizations: Outcomes and Impact

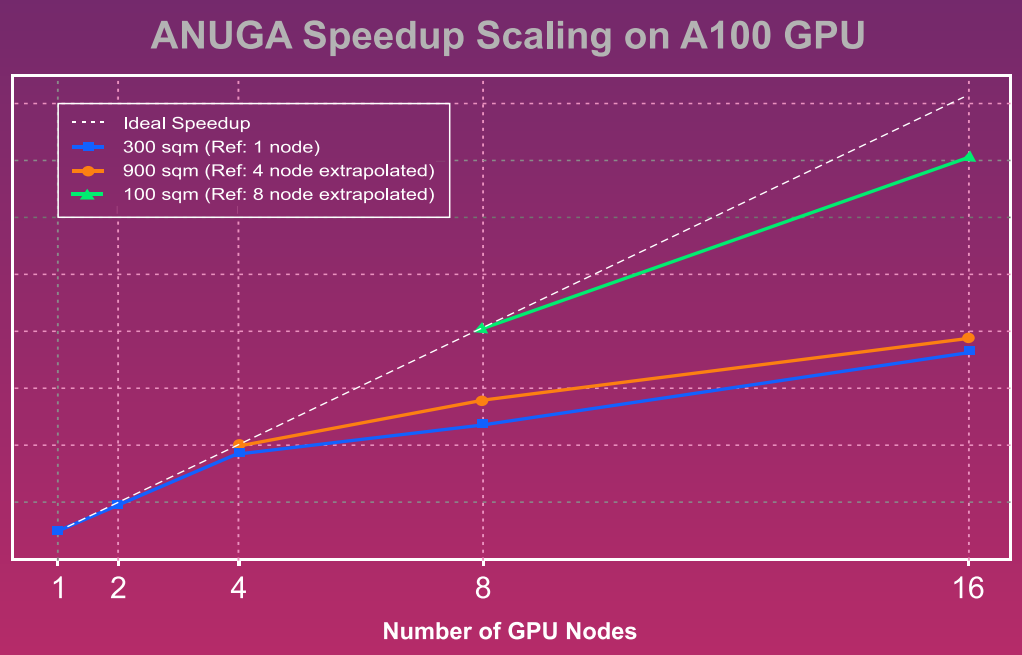
The ANUGA hydrodynamic flood simulation model has been optimized for the Mahanadi Delta dataset (11,372 km²) at resolutions of 900 sq m, 300 sq m, and 100 sq m for the CPU version. With these optimizations, a one-day simulation can now be completed within one hour for the 900 sq m and 300 sq m resolutions on CPU.

However, the 100 sq m resolution presents significantly higher computational and memory requirements, necessitating GPU acceleration to enable finer resolutions for improved simulation accuracy.



Impact of Resolution: An area near an industry located close to the riverbank appears mostly submerged in both the 900 sq m and 300 sq m resolution outputs. However, in the 100 sq m resolution simulation, the flooding pattern is depicted more realistically, capturing finer terrain details and providing a more accurate representation of the inundation extent.

In collaboration with the National Computational Infrastructure (NCI), Australia, C-DAC has successfully ported ANUGA onto GPUs and validated its performance on the NSM clusters. As a result, all three resolutions of the Mahanadi Delta dataset — 900 sq m, 300 sq m, and 100 sq m — are now operational on GPUs. 300 sq m resolution dataset that previously ran on 96 CPU nodes can now be executed on 8 GPU nodes (16 A100 Cards)



Key outcomes of this work include:

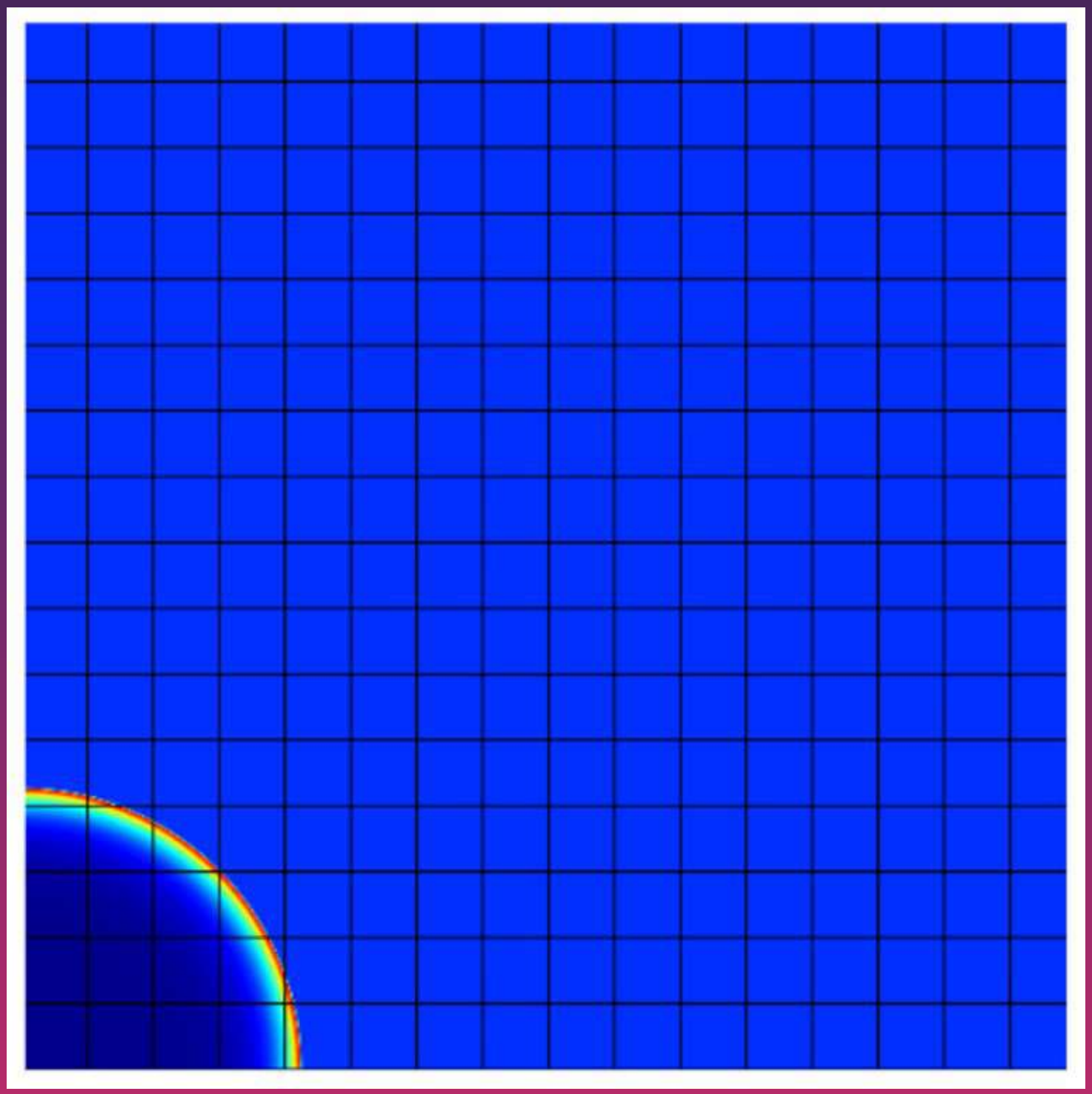
- Excellent scaling performance observed across GPU nodes
- Substantial reduction in computational resource requirements
- Enhanced capability to model finer resolutions and larger river basins

This advancement positions C-DAC to tackle high-resolution hydrodynamic simulations across complex geographies with greater efficiency and accuracy.

AMReX

AMReX is a framework for block-structured adaptive mesh refinement (AMR) to solve partial differential equations on massively parallel architectures. It provides GPU acceleration support (CUDA, HIP, SYCL), enabling high-performance simulations across CPUs and GPUs with dynamic mesh refinement for complex multiphysics applications.

The Sedov Blast Wave simulation models the propagation of a strong spherical shock wave generated by an intense point explosion in a uniform medium, using hydrodynamic equations. It studies how energy from the explosion expands outward, forming a self-similar shock front and testing the accuracy of numerical methods and adaptive mesh refinement in capturing shock dynamics.

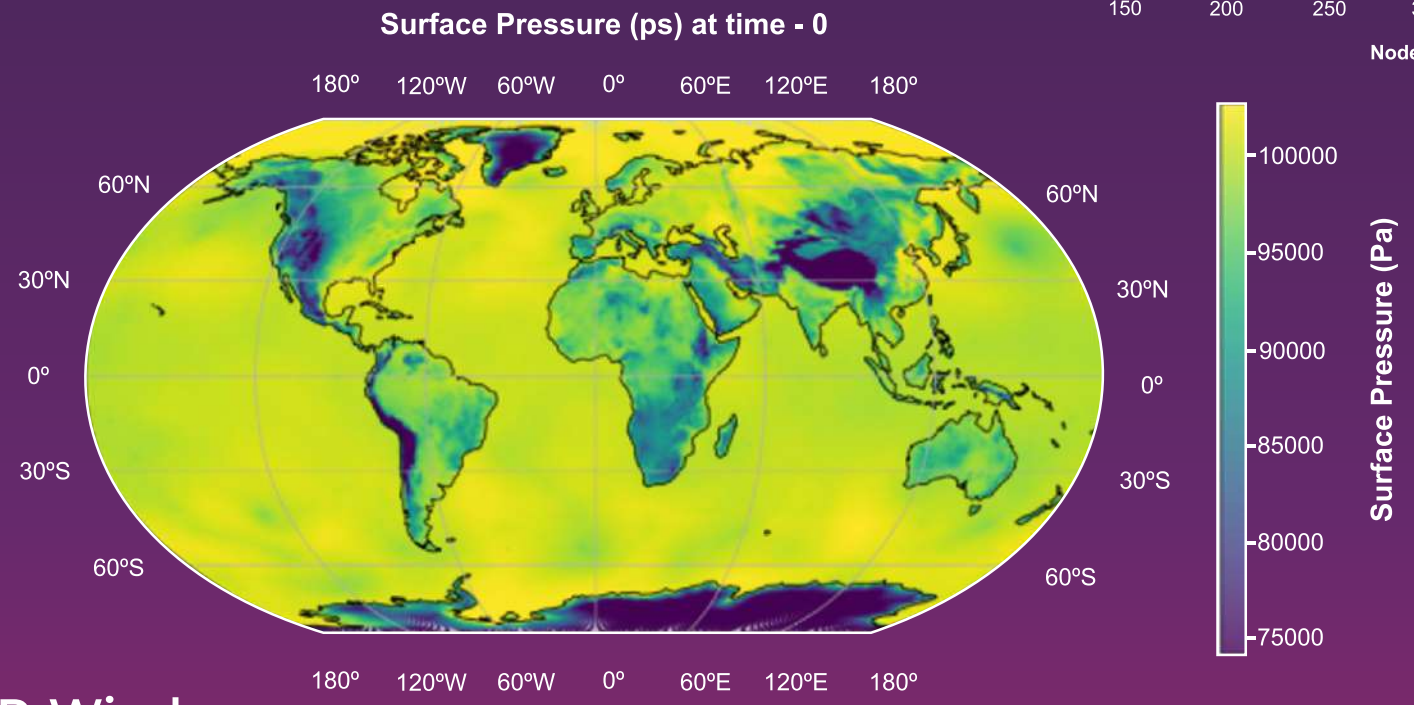


E3SM

E3SM is an Earth system model that simulates atmosphere, ocean, land, and ice processes with high fidelity and is widely used as a compute-intensive scalability benchmark for HPC systems.

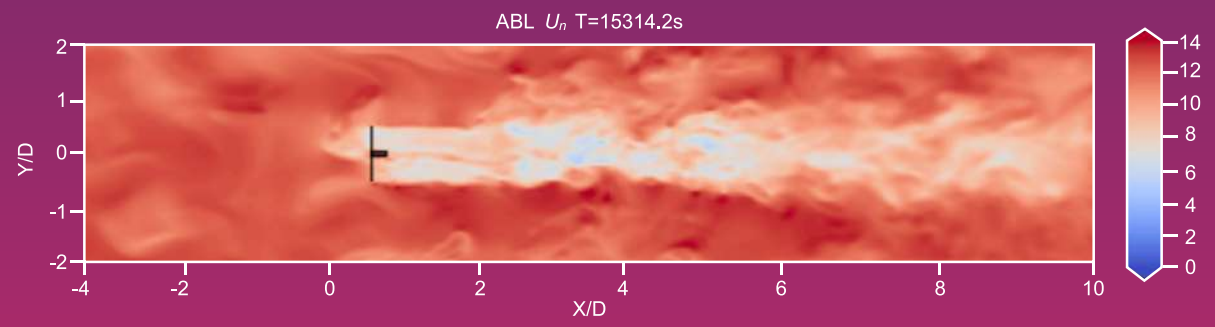
Evaluated the F2010-SCREAMv1 dataset with ne120pg2_ne120pg2 resolution (~50 km global grid) on the NSM system and observed sub-linear scaling up to 384 nodes.

Future work includes Indian regional pollution datasets using larger HPC systems.



AMR-Wind

AMR-Wind is a massively parallel adaptive mesh refinement (AMR) incompressible flow solver designed for large-scale wind farm and atmospheric boundary layer simulations on HPC systems.



Demonstrated the Neutral ABL dataset (1024 × 1024 × 368 cells, ~390 million cells) with a 2560 × 2560 × 896 m computational domain, which represents a complex, compute-intensive workload. This model provides strong potential to exploit upcoming large HPC systems and conduct advanced scalability studies with more complex datasets.

AIRAWAT-PSAI Stats & Information

AIRAWAT–PARAM Siddhi AI (AIRAWAT-PSAI) integrates advanced HPC and AI capabilities, supporting high-performance computing and large-scale AI workloads. It combines the AIRAWAT PoC infrastructure with PARAM Siddhi-AI, creating a unified platform that significantly enhances computational power. The platform's upgrades further boost its capacity, making it one of the leading systems for AI and scientific computing research.
Currently, the AIRAWAT-PSAI system is operational under the aegis of the National PARAM Supercomputing Facility (NPSF), C-DAC, Pune, supporting advanced research in artificial intelligence, machine learning, scientific computing, and large-scale data analytics.

Key Clients and Use Cases:

The AIRAWAT-PSAI platform supports several national missions, government organizations, and industry partners for large-scale AI development and deployment:

- NLTM / Mission Bhashini Consortia :
  Around 90 Bhashini consortia members are utilizing the AIRAWAT-PSAI platform for the development, training, and fine-tuning of India-specific language models for Automatic Speech Recognition (ASR), Text-to-Speech (TTS), and Speech-to-Speech Translation.

- Oil and Natural Gas Corporation (ONGC), New Delhi:
  Implementation and integration of a Retrieval-Augmented Generation (RAG) pipeline for intelligent information retrieval.

- Indian Oil Corporation Limited (IOCL): Development of solutions for text extraction from images and structured data processing.

- Centre for Development of Telematics (C-DOT), New Delhi and Bengaluru Divisions:
  Work on reasoning and RAG-based knowledge retrieval modules, facial recognition and image analysis, and network energy optimization using Large Language Models (LLMs).

- National Informatics Centre (NIC):
  Integration with the Gov.in secure intranet portal for AI models supporting document summarization, interactive querying, and AI assistant services, including applications for the Ministry of Home Affairs (PADMA Awards).

- AiKosh / IndiaAI, MeitY:
  Implementation of data anonymization within the AIKosh toolkit and testing of datasets using GPU acceleration.

- Defence Estate Department (Southern Command): Extraction, correlation, and management of information from large volumes of defense estate documents.

- Assisto:
  Deployment of proprietary AI models utilizing the AIRAWAT-PSAI infrastructure through API-based endpoints.

NSM HRD: Training and workshop

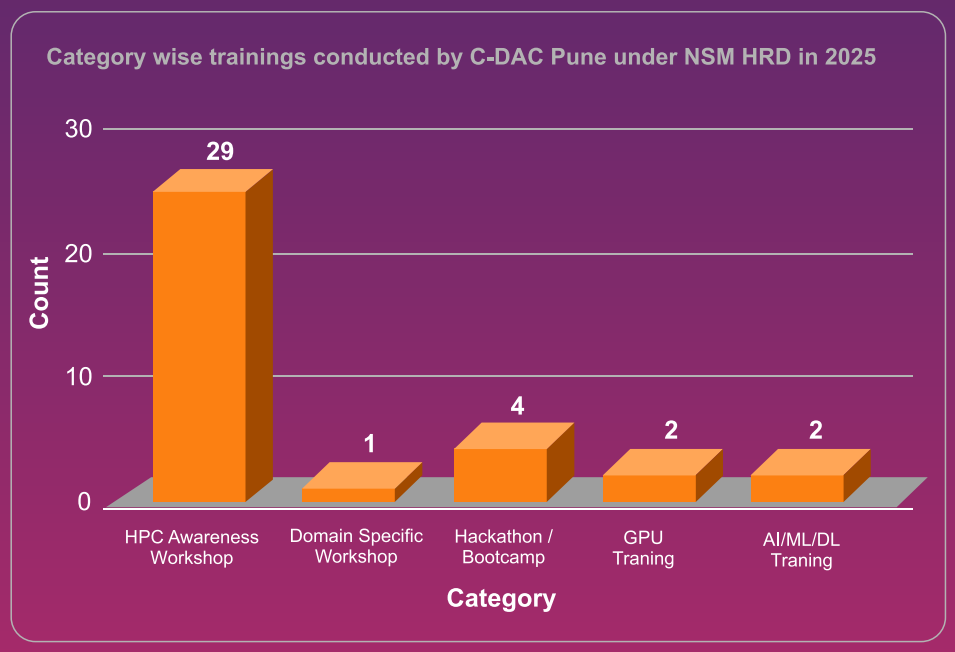
Activities under NSM HRD

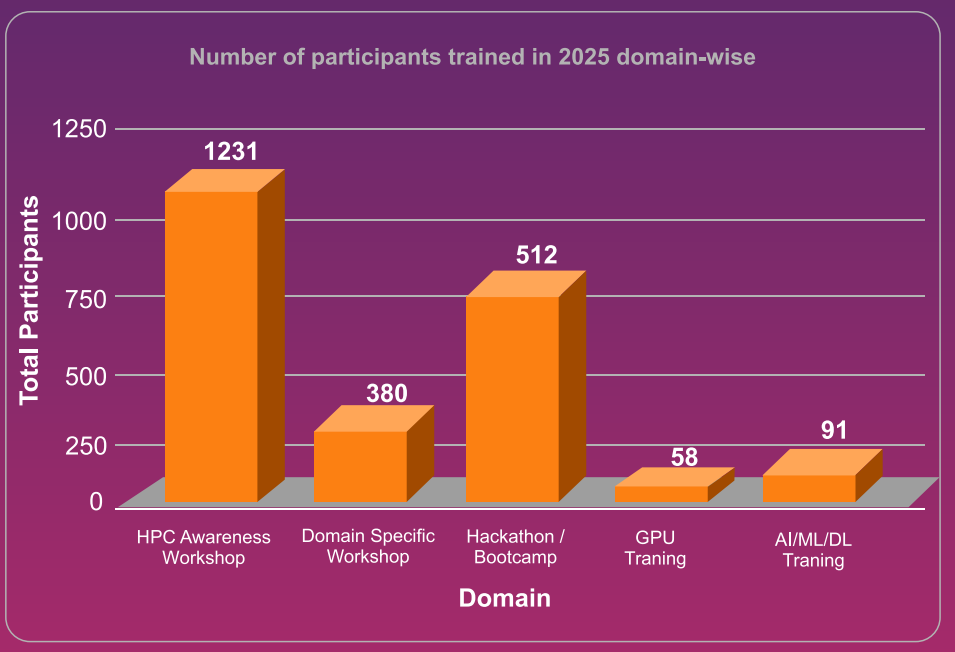
National Supercomputing Mission - Human Resources Development activities are meant to promote High Performance Computing (HPC), which includes spreading HPC awareness, conducting faculty development programs, creating MOOC content, and hosting targeted HPC workshops, hackathons, and bootcamps. Notable events in 2025 included the HPC Awareness Workshop 2025, HPC Domain-Specific Workshop 2025, Mini Hackathons at IIT Guwahati and IIT Kharagpur, AICTE Quality Improvement Program (QIP) 2025, GPU Application Open Hackathon 2025, Month-long Hackathon at IIT Madras, HPC Workshops at IIT BHU and DTU, and the HPC Cluster Management Workshop. 2025.

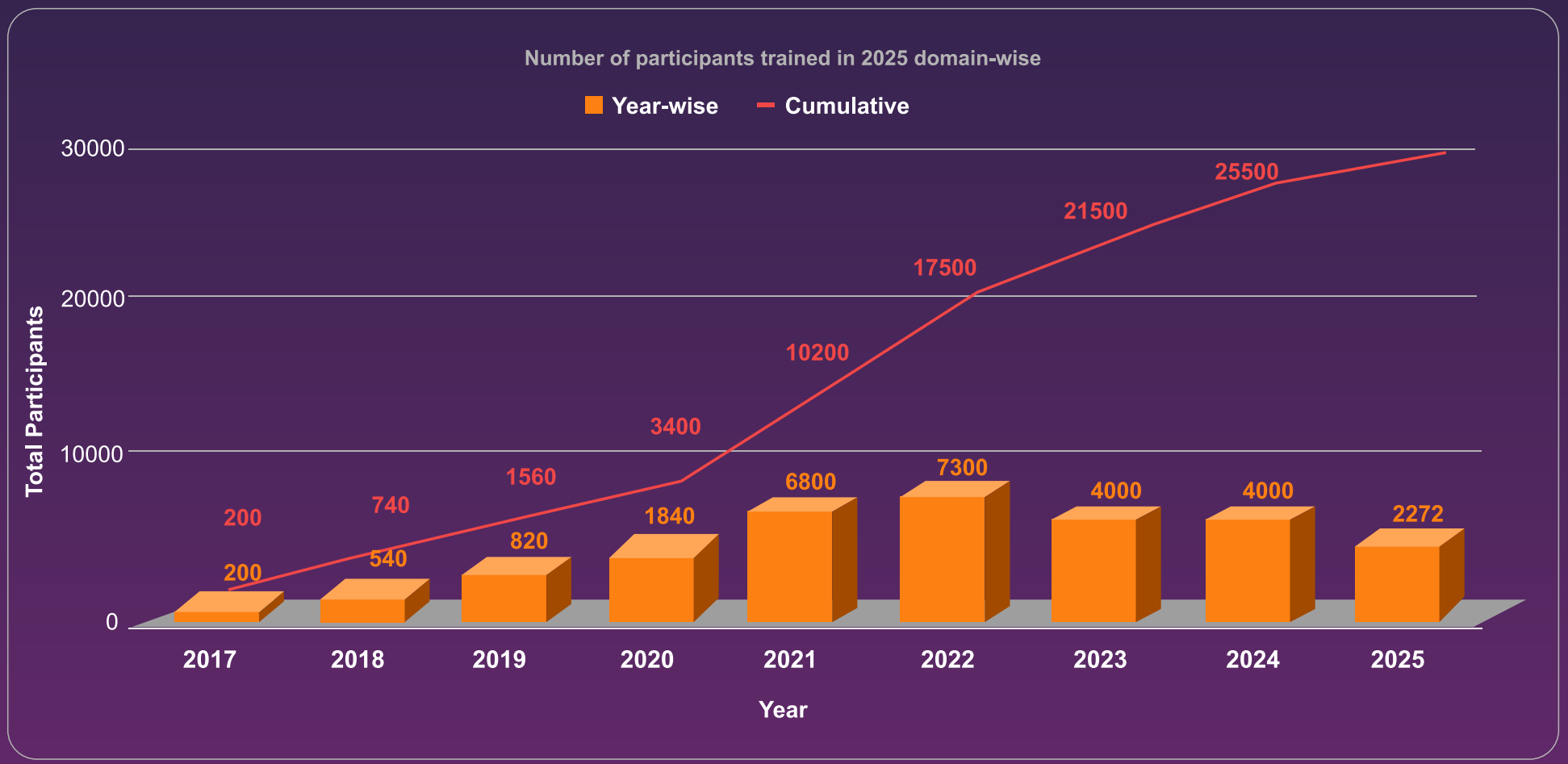
The compute resources were provided for the HPC community, and collaborations with NSM nodal centres, Nvidia, and AMD enriched the training content. The training activities were designed to enhance knowledge in HPC, AI/ML, and HPC domain-specific research. HPC training was delivered across nearly all states through various events and courses.

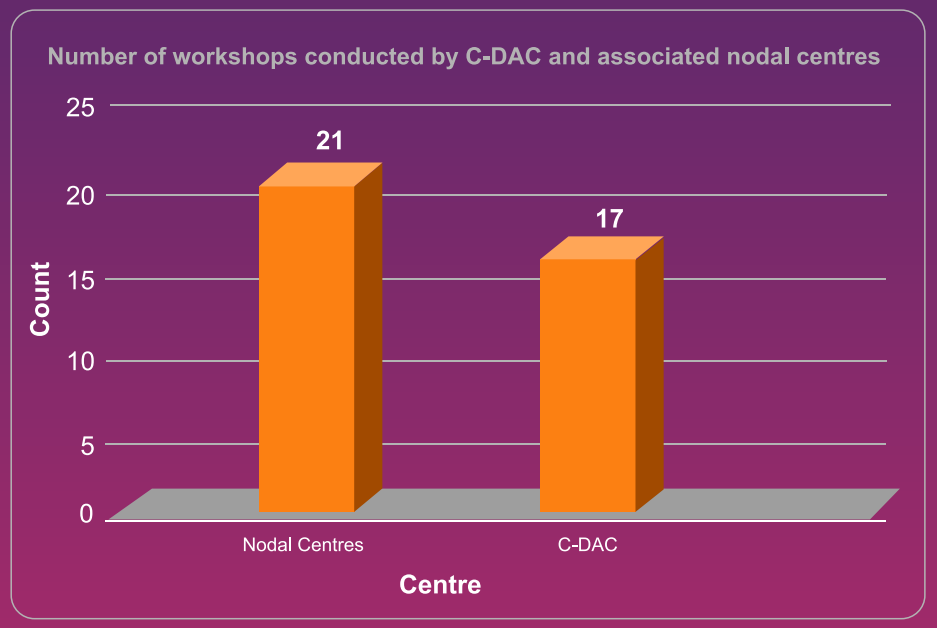
In 2025, the NSM HRD successfully conducted over 38 HPC training programs and trained over 2272 participants. These initiatives aimed to develop a skilled workforce in HPC/ AI and related domains.

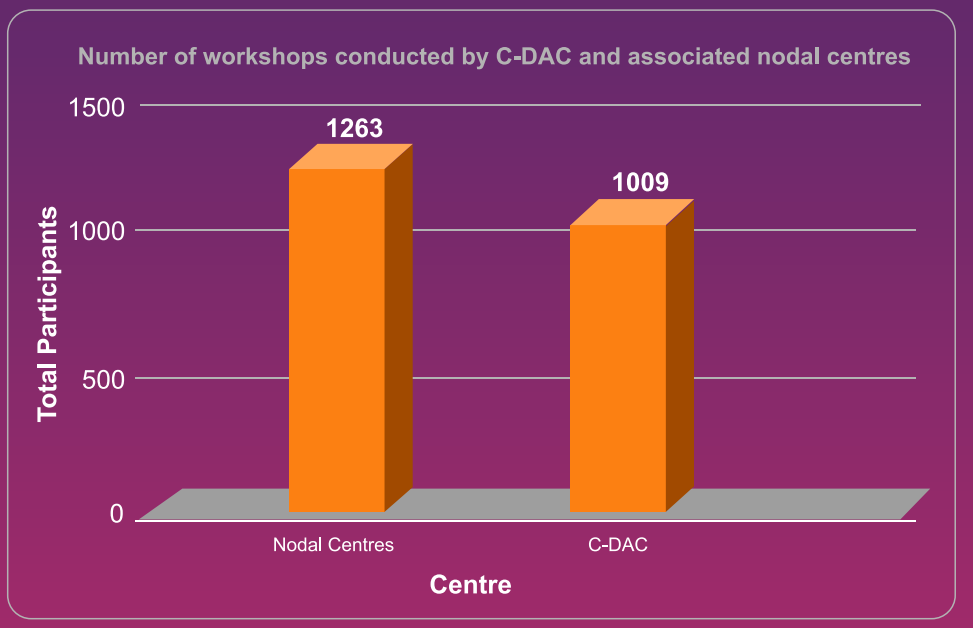
As part of expanding the national HPC training ecosystem, new NSM Nodal Centres were established at Delhi Technological University (DTU), NIT Arunachal Pradesh, Indira Gandhi National Tribal University (IGNTU), Amarkantak, and Pondicherry University. These nodal centres serve as regional hubs for organizing HPC training programs and support the adoption of HPC in academic curricula and research activities by enabling institutions to access NSM supercomputing resources and related training. Their establishment across diverse geographic regions helps expand participation from institutions that previously had limited exposure to HPC infrastructure and training.











Above graph details till date participants trained under NSM HRD for niche areas like HPC, AL/ML/DL

C-DAC Indigenous Products

Rudra Servers

As part of NSM Phase-3, C-DAC has designed the Rudra server series. After successful deployment of supercomputing systems based on Rudra-1 servers across various locations in the nation, C-DAC is now ready with the next-generation design, Rudra-SPX, Rudra-III, and Rudra-GRX.

RUDRA-SPX

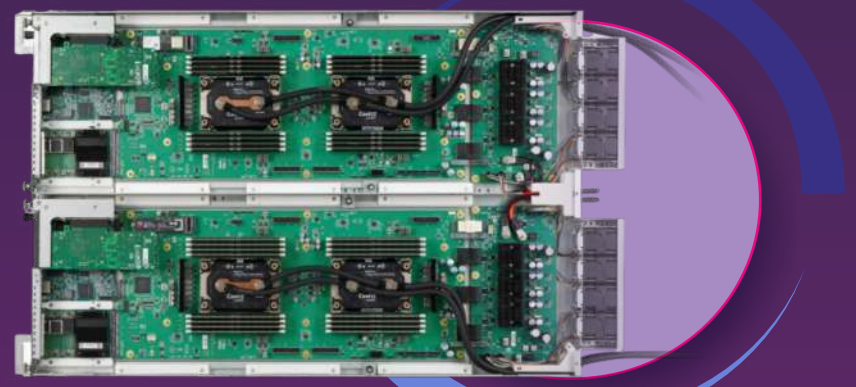
RUDRA-SPX is C-DAC's indigenously designed and developed server platform. It is secure, reliable, dense form factor, rack mountable in both 21" and 19" configurations with remote management capability.

Salient Features

- Based on Intel® 4th and 5th Generation Xeon® Scalable Processors Sapphire Rapids (56 cores) / Emerald Rapids (64 cores)
- Dual Socket with TDP support up to 350W per CPU
- Memory: DDR5, RDIMM 5600/ 4800 MT/s 1-DPC, 8 Channels per socket supporting up to 2TB / socket.
- Interfaces supported up to
  - Four PCIe Gen5.0 (32GT/s) x16 ports
  - Two OCP NIC 3.0 cards (400Gbps)/ C-DAC's Trinetra Network card
  - Two (stacked) M.2 NVMe
  - One x8 PCIe 3.0 Ethernet card

System Management

- IPMI 2.0
- Intel Node Manager
- KVM Via BMC 1G interface
- Redfish/ REST interface
- WebUI-Vue as web interface
- Remote Debug - Intel ASD and ACD
- Secure Boot
- Dedicated Management Ethernet with NCSI Fail over Management Network



Rudra-SPX CPU-CPU 1OU - Liquid cooled(hybrid)

Rudra-SPX CPU-GPU 5OU - Liquid cooled(hybrid)

RUDRA-SPX server platform is designed to run complex workloads utilizing good compute power, GPU support and network options. It can handle various demanding applications and workloads, like high performance computing (HPC), Artificial Intelligence(AI), Cloud and Edge computing, communication and 5G network applications.

Rudra-III

Rudra-III features AMD EPYC 9004 Series Processors (Genova). With a compact, high-density design, these servers deliver energy-efficient, high-performance computing for HPC, cloud, edge, and communication workloads, and support seamless GPU integration for enhanced acceleration.

Salient Features

- Dual Socket 4th Gen AMD EPYC 9004 Series Processors
- UBB with 8x AMD Instinct MI300X Platform
- 24 channels DDR5, 4800MT/s (up to 6TB)
- 8x SATA, 8x E1.S NVMe, 5x M.2 NVMe SSD
- 10x OCP NIC 3.0 (1*400G or 2*100G per NIC)
- DC-SCM 2.0 Card
- 8OU Height
- Compatible with OCP ORv3, 21" Rack
- 54V DC Busbar power supply
- Air Cooled System

Rudra-III HPC-AI Server: 8OU

- Dual Socket 4th Gen AMD EPYC 9004 Series Processors
- UBB with 8x AMD Instinct MI300X Platform
- 24 channels DDR5, 4800MT/s (up to 6TB)
- 8x SATA, 8x E1.S NVMe, 5x M.2 NVMe SSD
- 10x OCP NIC 3.0 (1*400G or 2*100G per NIC)
- DC-SCM 2.0 Card
- 8OU Height
- Compatible with OCP ORv3, 21" Rack
- 54V DC Busbar power supply
- Air Cooled System

Rudra-III HPC-AI Server: 2OU

- Dual Socket 4th Gen AMD EPYC 9004 Series Processors
- 24 channels DDR5, 4800MT/s (up to 6TB)
- 8x SATA, 5x M.2 NVMe SSD
- 2x OCP NIC 3.0 (1*400G or 2*100G per NIC)
- DC-SCM 2.0 Card
- 2OU Height
- Compatible with OCP ORv3, 21" Rack
- 54V DC Busbar power supply
- Air Cooled System

Rudra-GRX

Next generation of Rudra server platform, Rudra-GRX based on Intel® Birch stream Platform is being designed.

Main Features:

- Sixth Generation Xeon® Granite Rapids AP Server Processor with up to 120 cores
- Dual Sockets with TDP support up to 500W per CPU.
- 12 Channels of DDR5 per socket supporting up to 3TB/socket.
- DDR5 RDIMM 6400 MT/s 1-SPC
- DC-SCM 2.0 Specification compatible
  Interfaces supported
  - Two OCP NIC 3.0 cards
  - Up to 8 PCIe Gen5.0 (32GT/s) x16 ports,
  - Up to 4 x16 CXL 2.0 Ports
    Up to 6 UPI 2.0 links support per CPU

Trinetra Network: Accelerating Indigenous Supercomputing Solutions

Trinetra, the pinnacle of high performance HPC networks, forms the backbone of every PARAM system. Integrated with the Rudra server platform, it empowers fully indigenous HPC solutions, marking a decisive leap toward ‘AtmaNirbhar Bharat’ in cutting-edge hardware innovation.

India’s drive for indigenous supercomputing excellence is embodied in the Trinetra network. This advanced HPC backbone is central to PARAM systems, with its development unfolding across multiple progressive stages:

Trinetra-POC:
The proof-of-concept phase explored the architectural principles of switchless networks and 3D Torus topology.

Trinetra-A:
This phase delivered a 100 Gbps network, successfully deployed on the PARAM Rudra system at C-DAC Pune and validated across multiple scientific applications. Performance benchmarks demonstrated parity with industry-standard InfiniBand systems.

Trinetra-B:
The latest iteration features 200 Gbps links and will power the upcoming PARAM 20PF system, delivering enhanced scalability and superior network performance.

TrinetraNG:
Next generation HPC network supporting both scale-out and scale-up implementation for Indigenous RISC-V based processor and GPU based systems. TrinetraNG is capable of scaling to Exascale levels as well as provide GPU domain support upto 4096 instances. Built using switchless, large radix implementation and support for silicon photonics makes it state of the art network.

Trinetra-A
Network Interface Card(NIC)

Trinetra-B
Network Interface Card(NIC)

PARAM SHAVAK

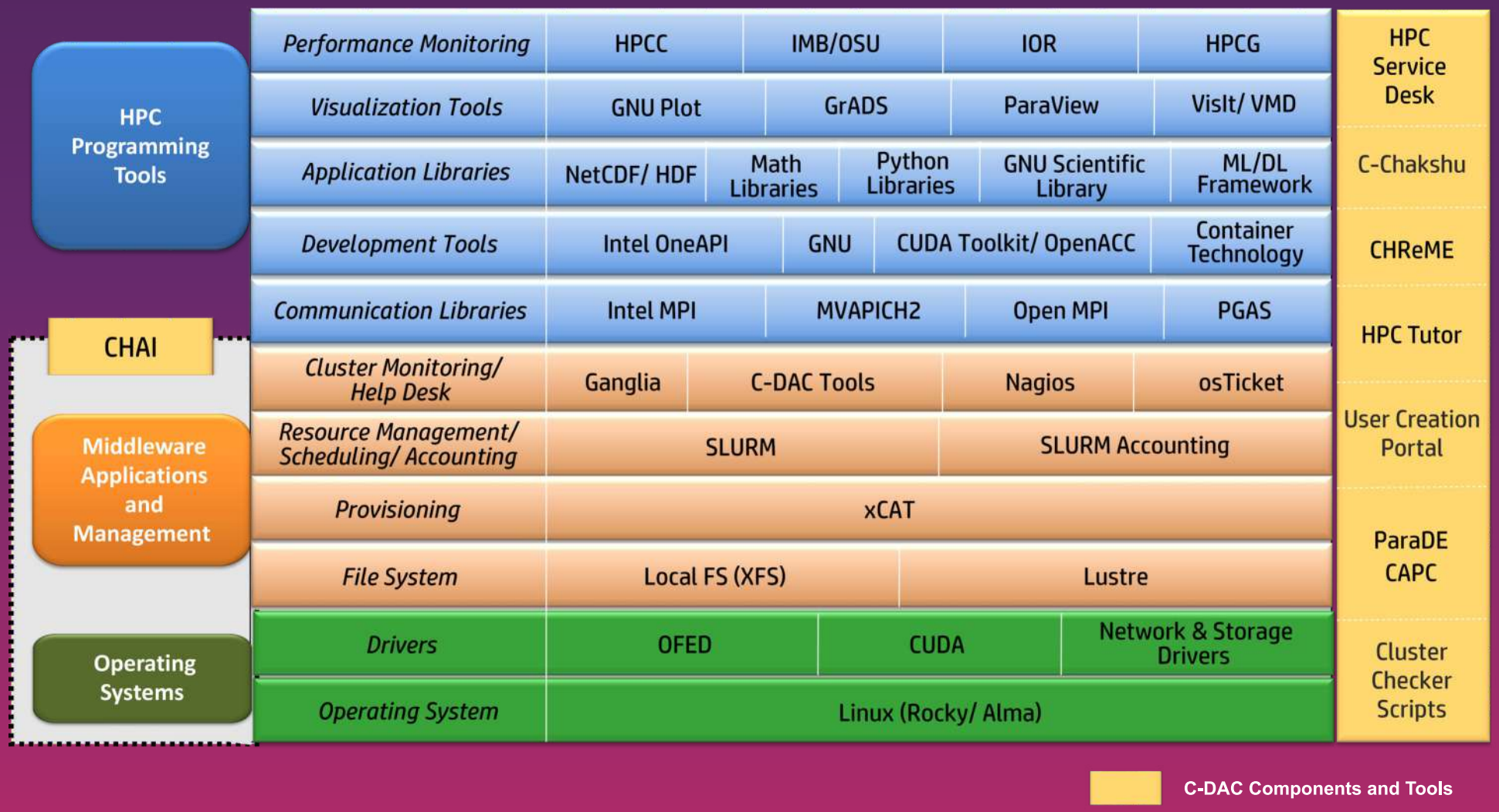
PARAM Shavak, designed and developed by the Centre for Development of Advanced Computing (C-DAC), is an indigenous, compact, and energy-efficient High Performance Computing (HPC) system built on the Rudra Server platform. Powered by high-performance Intel Xeon processors, it provides a powerful and scalable computing environment capable of handling demanding scientific simulations, data analysis, and data-driven research workloads. The system enables academic institutions and research organizations to deploy supercomputing capabilities within their own premises, effectively bridging the gap between traditional desktop computing and large-scale supercomputing environments.

PARAM Shavak is supported by a range of indigenous software tools developed by C-DAC, including the PS-BOSS Operating System, HPC Application GUI utilities, Application Containerization Framework, AI-Assisted User Support, and the PARAM Shavak Portal. These are complemented by C-DAC's suite of home-grown HPC technologies such as CHReME, ONAMA, and HPC Tutor, which are designed to simplify HPC application execution, system management, and user training, thereby enhancing accessibility and usability of high-performance computing for researchers, engineers, and students.

C-DAC's HPC Cluster Suite (CHCS)

CHCS is a system software stack specifically designed for the deployment and management of High-Performance Computing (HPC) environments. It represents an advanced and innovative solution built on a customized open-source software framework, further enhanced with indigenous tools, technologies, and automation scripts. The platform enables the systematic configuration, deployment, and management of HPC and AI-based computing systems, thereby simplifying large-scale infrastructure management. Currently, supercomputing systems deployed under the National Supercomputing Mission (NSM) are built and managed using the CHCS software stack. With the anticipated transition toward Exascale computing systems, CHCS is being further enhanced through the development of a customized provisioning tool. This tool is designed to efficiently initialize and boot thousands of compute nodes in significantly less time, representing a major advancement in large-scale HPC provisioning and system management.

C-DAC's HPC System Software Stack



Indigenous Components of CHCS:

CHAI:
The C-DAC HPC-AI (CHAI) Cluster Manager Tool is a unified, modular automation framework designed to simplify and accelerate the deployment, configuration, and management of HPC and AI clusters. It integrates provisioning, orchestration, workload scheduling, and monitoring using industry-standard tools like xCAT, Ansible, SLURM, OpenLDAP and Kubernetes etc.

C-CHAKSHU:
C-Chakshu is a high-performance computing (HPC) multi- cluster monitoring and management platform designed for the National Supercomputing Mission (NSM) sites in India. This innovative platform offers a centralized web-based dashboard, providing a unified view of all NSM HPC clusters across geographically diverse locations nationwide.

CHReME:
The C-DAC HPC Resource Management Engine portal is a user- friendly tool designed to streamline job submission, management, and monitoring for High Performance Computing (HPC) systems. It seamlessly integrates with various schedulers like Torque, OpenPBS, Sun Grid Engine, Moab, and Load Leveler, eliminating the need to learn complex command- line interfaces. This innovative portal empowers a wider range of users to leverage HPC resources, boosting overall cluster utilization.

Parallel Development Environment (ParaDE):
This innovative Integrated Development Environment (IDE) empowers users to develop hybrid parallel applications with ease. It removes the complexity often associated with High Performance Computing (HPC), making it accessible to a wider audience. Furthermore, the IDE promotes data mobility, ensuring seamless data access regardless of location.

C-DAC's Automatic Parallelizing Compiler (CAPC):
CAPC is a powerful tool that simplifies parallel programming. It automatically transforms sequential programs into equivalent parallel versions, unlocking the processing power of parallel architectures.

C-DAC HPC Application Profiler (C-HAP):
CDAC HPC Application Profiler is a software tool that provides comprehensive performance analysis for High- Performance Computing (HPC) applications. It offers a wide range of features to help identify hotspots and bottlenecks, analyze application-level and node-level performance, visualize data consumption, suggest compilation options, and more. In addition, the tool has a user-friendly interface, eliminating the need for complex command-line submissions, and provides valuable insights into the performance of HPC applications.

HPC Service Desk:
HPC Service Desk is a ticketing system that streamlines HPC user support by routing inquiries, allowing for customization of data collection, and preventing duplicate responses from agents. It empowers agents with fast responses, SLA management, and collaboration tools. Users benefit from a quick response portal. This Desk provides valuable reporting and scales with the NSM vision, making it a powerful asset for managing user support.

HPC Tutor:
HPC Tutor is a revolutionary web-based blended learning platform designed to empower novice users with hands-on experience in the realm of High-Performance Computing (HPC). It seamlessly integrates theoretical knowledge with practical application, offering an engaging and educational journey in the HPC domain. The platform transcends traditional learning methodologies by providing an authentic and interactive learning experience. By leveraging real-time access to supercomputing systems, it equips users with the practical skills and insights required to excel in the dynamic field of High-Performance Computing.

Future Roadmap:

Pivotal Developments and Initiatives for the Year Ahead

In pursuit of advancing India's leadership in supercomputing, the roadmap for the upcoming year focuses on introducing the next-generation Rudra-SPX, Rudra-III, and Rudra-GRX servers as well as completing the deployment of Rudra-I. These initiatives are key to realizing our vision of positioning India at the forefront of High Performance Computing (HPC) and Artificial Intelligence (AI).

In alignment with the goals of Phase 3 of the National Supercomputing Mission, the deployment of Rudra-I systems is nearing full-scale completion across multiple locations. Rudra-I has achieved significant institutional acceptance, underscoring its strength in supporting mission-critical applications and validating India's self-reliance in the high-end server market. Key deliverables for the completion of Rudra-I deployments include the full-scale integration of a 20 PF flagship HPC system at C-DAC Bangalore and the scheduled deployment of and 838 TF HPC system at IIT Jammu in 2026.

Parallel to the completion of our current deployment cycle, our roadmap transitions to the introduction of the Rudra-SPX, Rudra-III and Rudra-GRX server series under Phase 3 of the National Supercomputing Mission. Engineered to meet the escalating demands of the global AI landscape, represents a significant leap in computational density and architectural efficiency.

Rudra-SPX Based Deployments: Cutting-Edge HPC and AI with Intel Emerald Rapids

The Rudra-SPX series, powered by the latest Emerald Rapids processors, is optimized for HPC and AI workloads. With enhanced memory bandwidth and advanced interconnects, it supports Deep Learning and Federated Machine Learning research. This domestic infrastructure ensures India's research institutions have access to cutting-edge, globally competitive technology.

An additional computational capacity of 23 petaflops, powered by the Rudra-SPX servers, is scheduled for deployment over the coming year, as detailed below:

- 8 PF HPC system at IISc Bangalore
- 5 PF HPC system at IIT Kanpur
- 4 PF HPC system at IIT Kharagpur
- 4 PF HPC system at CSIR-4PI Bangalore
- 1 PF HPC system at IUCAA Pune
- 1 PF HPC system at CR RAO AIMSCS Hyderabad

Rudra-III Based Deployments: Powering Next-Gen HPC with AMD EPYC 9004

Rudra-III features AMD EPYC 9004 Series Processors (Genova). With a compact, high-density design, these servers deliver energy-efficient, high-performance computing for HPC, cloud, edge, and communication workloads, and support seamless GPU integration for enhanced acceleration.

The following systems, based on the Rudra-III servers, are scheduled for deployment over the coming year:

- 30 PF HPC system at C-DAC Bangalore
- 1 PF HPC system at MCT-MHoW

Rudra-GRX: Next-Generation HPC Server Powered by Intel Granite Rapids

The Rudra-GRX series is Next generation of Rudra server platform, leverages sixth-generation processor architecture, engineered for versatility, it integrates sophisticated liquid or air-cooling solutions to provide the high-efficiency throughput required for modern cloud and HPC environments.

PARAM Supercomputers - NSM in News

राष्ट्रीय सुपर कंप्यूटिंग मिशन के तहत संस्थान में सुपर कंप्यूटर लगाया गया

आईआईटी : सुपर कंप्यूटर 'परम रुद्र' शुरू, शोध को मिलेगी रफ्तार

पटना, वरीय संवाददाता। आईआईटी पटना में अत्याधुनिक सुपर कंप्यूटर 'परम रुद्र' की शुरुआत शनिवार को हुई। उद्घाटन भारत सरकार के इलेक्ट्रॉनिक्स एवं सूचना प्रौद्योगिकी मंत्रालय के अतिरिक्त सचिव अमितेश कुमार सिन्हा ने किया। यह सुपर कंप्यूटर राष्ट्रीय सुपर कंप्यूटिंग मिशन के तहत स्थापित किया गया है।

मौके पर आईआईटी पटना के निदेशक प्रो. टीएन सिंह, आईआईटी पटना के समन्वयक प्रो. सोमनाथ त्रिपाठी, नवीन कुमार और सी-डैक के डॉ. चितरंजन सिंह रहे।

मुख्य अतिथि अमितेश कुमार सिन्हा ने बताया कि देशभर में अब तक 37 सुपर कंप्यूटर लगाए जा चुके हैं, जिनकी कुल क्षमता 39 पेटाफ्लॉप्स है। इनका उपयोग 12 हजार से ज्यादा

37 सुपर कंप्यूटर लगाए जा चुके हैं अब तक देशभर में

- आने वाले समय में 10 और सुपर कंप्यूटर लगाए जाएंगे
- इनके लगने से क्षमता 100 पेटाफ्लॉप्स हो जाएगी

आईआईटी पटना में सुपर कंप्यूटर के उद्घाटन मौके पर अतिरिक्त सचिव अमितेश सिन्हा, निदेशक प्रो. टीएन सिंह व अन्य।

आईआईटी पटना के 10 विभागों के 400 विद्यार्थी लाभान्वित होंगे

यह सुविधा से मौसम और जलवायु, बायोइन्फॉर्मेटिक्स, केमिस्ट्री, मटेरियल साइंस, एआई, डेटा साइंस और क्वांटम कंप्यूटिंग जैसे क्षेत्रों में शोध को बढ़ावा देगा। इससे आईआईटी पटना के लगभग 10 विभागों के 60 शिक्षक और 400 छात्र सीधे लाभान्वित होंगे। आसपास के अन्य शैक्षणिक और शोध संस्थानों को भी इसकी कंप्यूटिंग क्षमता का लाभ मिलेगा। परम रुद्र सुपर कंप्यूटिंग सुविधा आईआईटी पटना व इसके आसपास के शैक्षणिक एवं अनुसंधान संस्थानों की शोध क्षमताओं को बढ़ाएगी।

Major Boost to Computational Research as Param Rudra Supercomputer Launched at IIT Patna

GOPAL VIDYARTHI

PATNA: In a significant step toward strengthening computational research in India, the state-of-the-art Param Rudra supercomputer was inaugurated at Indian Institute of Technology Patna on Friday under the National Supercomputing Mission. The facility was formally launched by Amitesh Kumar Sinha, Additional Secretary, Ministry of Electronics and Information Technology.

The inauguration ceremony was attended by IIT Patna Director Prof. T. N. Singh, coordinator Prof. Somnath Tripathi, Naveen Kumar, and Dr. Chitranjan Singh from the Centre for Development of Advanced Computing. Addressing the gathering, Amitesh Kumar Sinha said that under the National Supercomputing Mission, 37 supercomputers have already been installed across the country with a combined computing capacity of 39 petaflops, currently being used by more than 12,000 researchers. He added that 10 more supercomputing systems would soon be installed at various academic and research institutions, taking India's total computing capacity beyond 100 petaflops.

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THE HINDU

CMC inaugurates Param Shavak supercomputer at Ranipet campus

THE TIMES OF INDIA

Supercomputer launched at IIT-Patna to boost research

Patna: The first Param Rudra supercomputer in Bihar was inaugurated on Friday at IIT-Patna.

The state-of-the-art facility, established under the National Supercomputing Mission (NSM), was formally launched by Amitesh Kumar Sinha, additional secretary, union ministry of electronics and information technology (MeitY).

"It is a historic milestone, a matter of great happiness for all of us, and it will bring revolutionary changes in Bihar and its neighbouring regions. The students, faculty and researchers will gain convenience in undertaking complex computing across various fields," said IIT-P director T N Singh.

"It is the first Param Rudra supercomputer established in any institute or government office in Bihar," an IIT-P official added.

Speaking on the occasion, MeitY additional secretary Sinha said, "Under the NSM, 37 supercomputers have been deployed across the nation with a combined compute capacity of 39 PetaFlops. More than 12,000 researchers nationwide are using these systems. Ten more supercomputing systems will soon be deployed at various academic and research institutes, taking the total compute capacity to over 100 PetaFlops."

Sinha added, "Indigenous supercomputing technologies such as HPC processors, servers, cooling systems, interconnects, software stacks and storage are being developed to create a robust supercomputing ecosystem in the country, while enhancing design, development and manufacturing capabilities."

"The Param Rudra supercomputing facility will significantly enhance research capabilities at IIT-Patna and surrounding academic institutions. This facility will benefit approximately 60 faculty members and 400 students across 10 departments, supporting research in fields such as computational astrobiology, computational astrochemistry, reaction dynamics, computational material design, molecular electronics, computational fluid mechanics, computational nano-bio interfaces, AI and data science, and quantum computing," the IIT-P said in a statement.

After IIT Madras, PARAM Rudra supercomputing facility inaugurated at IIT Bombay

The state-of-the-art PARAM Rudra supercomputing facility has been inaugurated at IIT Bombay, strengthening India's indigenous high-performance computing ecosystem and expanding research capabilities for academics, students and institutions nationwide.

The state-of-the-art PARAM Rudra supercomputing facility has been inaugurated at IIT Bombay.

PARAM Supercomputers - NSM in News

Printed from
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30 petaflops device: Bengaluru to host India's most powerful supercomputer; climate research set for major push

TNN | Oct 17, 2025, 06.49 AM IST

BENGALURU: Amid brickbats over infrastructure, here's something that gives Bengaluru its bragging rights: The premier tech city will soon host India's most powerful supercomputer with a speed of 30 petaflops, which will help scientists and researchers work faster in important areas like AI, quantum computing, and climate research.

Industry experts said a strong tech ecosystem along with engineering talent has made Bengaluru a key hub for semiconductor and chip design, with nearly 20% of the world's chip designers based in the city. The new supercomputer facility will make Bengaluru the epicentre of India's next phase in high-performance computing and technological innovation.

S Krishnan, secretary of the ministry of electronics and information technology, made the announcement at the launch of Super Computing India 2025 here on Tuesday. The new machine is being built by the Centre for Development of Advanced Computing (C-DAC) under the National Supercomputing Mission.

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Tech boost at IIT Madras: Indigenous PARAM SHAKTI supercomputer goes live under national mission

Hemali Chhapia / TNN / Jan 10, 2026, 11:14 IST

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IIT Madras (File Photo)

MUMBAI: When S Krishnan, Secretary of the Ministry of Electronics and Information Technology, inaugurated the PARAM SHAKTI supercomputing facility at IIT Madras earlier this month, it marked more than the launch of a machine. It signalled a maturing phase in India's scientific infrastructure — one where scale, sovereignty and scientific ambition are beginning to converge.

At the heart of the new facility is *Param Rudra*, a 3.1-petaflop supercomputing system built entirely in India using C-DAC's RUDRA series of servers and an indigenous software stack running on open-source platforms such as AlmaLinux. In computational terms, this means the system can perform more than 3.1 quadrillion calculations per second. In practical terms, it allows Indian researchers to compress years of experimental work into months, and sometimes weeks, across fields as diverse as aerospace engineering, materials science, climate modelling, drug discovery and advanced manufacturing.

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Going 'Super': Gujarat to acquire Param Rudra for scientific institutes

Shastri,Parth / Mar 1, 2025, 00:35 IST

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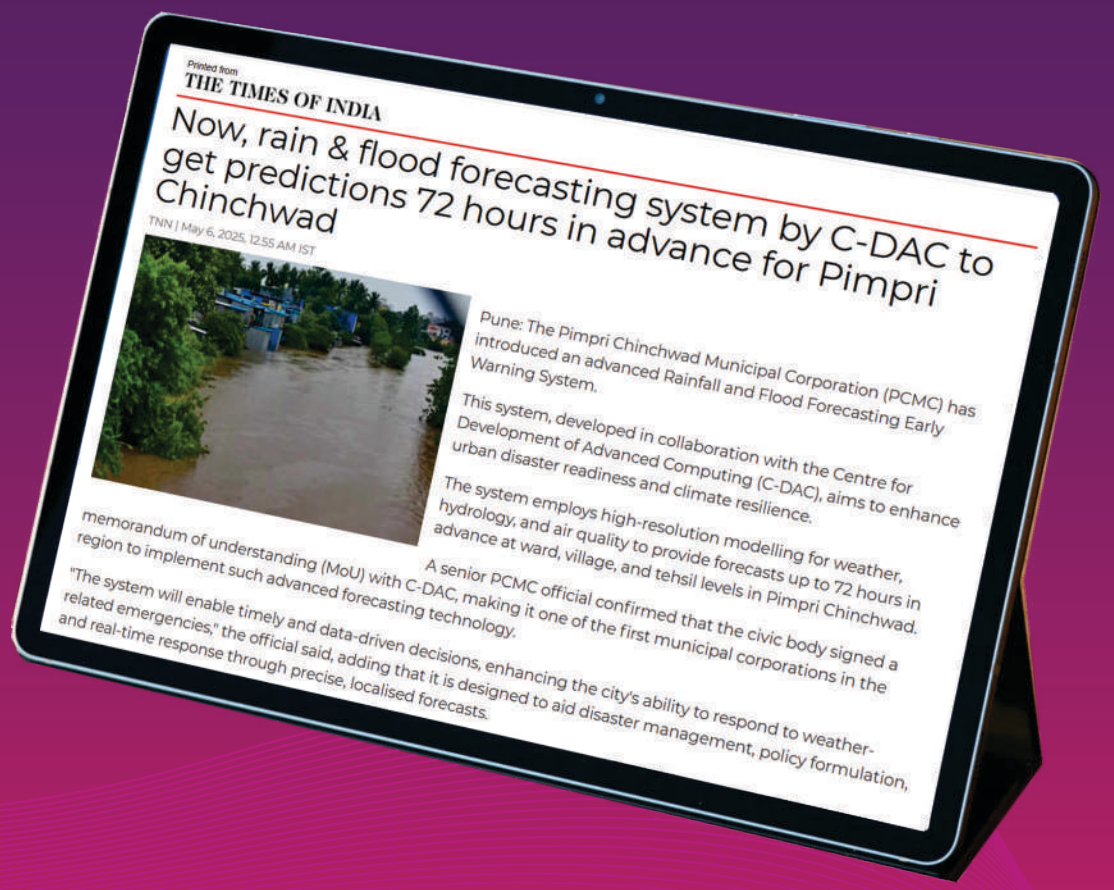
Ahmedabad: Gujarat currently boasts of having 26 Param Shavak supercomputer labs across the state for high-speed and high-capacity computing. Senior officials in the department science and technology (DST) said that the state is soon going



Printed from
THE TIMES OF INDIA

Now, rain & flood forecasting system by C-DAC to get predictions 72 hours in advance for Pimpri Chinchwad

TNN | May 6, 2025, 12.55 AM IST

Pune: The Pimpri Chinchwad Municipal Corporation (PCMC) has introduced an advanced Rainfall and Flood Forecasting Early Warning System.

This system, developed in collaboration with the Centre for Development of Advanced Computing (C-DAC), aims to enhance urban disaster readiness and climate resilience.

The system employs high-resolution modelling for weather, hydrology, and air quality to provide forecasts up to 72 hours in advance at ward, village, and tehsil levels in Pimpri Chinchwad.

A senior PCMC official confirmed that the civic body signed a memorandum of understanding (MoU) with C-DAC, making it one of the first municipal corporations in the region to implement such advanced forecasting technology.

"The system will enable timely and data-driven decisions, enhancing the city's ability to respond to weather-related emergencies," the official said, adding that it is designed to aid disaster management, policy formulation, and real-time response through precise, localised forecasts.

NSM User's Feedback

User Feedback Reviews for Annual Report 2025

Supercomputers use thousands of CPU/GPU cores simultaneously. For a PhD student, this means running multiple versions of an experiment at once rather than waiting for one to finish before starting the next. Param to me is one of the best supercomputer which highly smooth my research work.

Sutapa Chattopadhy
PhD Student, Department of Physics
Savitribai Phule Pune University

PARAM Ananta has provided a stable and high-performance computational environment essential for large-scale quantum chemical calculations, molecular dynamics simulations, and machine learning workflows. The queue management system is generally efficient, and the technical support team is responsive and helpful in resolving issues. Continued improvements in job scheduling flexibility for long GPU jobs, faster scratch I/O performance, and periodic user training workshops on optimized parallel workflows would further enhance user productivity. Overall, the facility is a highly valuable national resource for computational research.

Anirban Mondal
Associate Professor, IIT Gandhinagar

The PARAM Shivay HPC system under the National Supercomputing Mission has been highly beneficial for my research work in fractional-order ecological modelling. The availability of large-scale parallel computing resources enabled extensive parameter-sweep simulations and high-resolution iso-spike diagram generation that would be computationally impractical on conventional systems. The overall system performance, job scheduling, and computational throughput are excellent and have significantly accelerated research productivity. The technical support team is responsive and helpful in resolving execution and environment-related issues. The software ecosystem and libraries available on the system adequately support scientific computing workflows.

PRAJJWAL GUPTA
Research Scholar, IIT(BHU)
Varanasi, PARAM Shivay User

Regarding the experience of using PARAM Rudra, the availability of a large number of high-performance CPU cores and nodes with substantial memory, along with well-equipped GPU nodes, has made our computational work highly efficient and comfortable. Furthermore, the support staff at the online portal extremely helpful and responsive, providing excellent assistance throughout the computational workflow.

Amar Kumar
Ph.D. Student, Indian Institute of Technology
Delhi, PARAM Rudra IUAC User

NSM User's Feedback

User Feedback Reviews for Annual Report 2025

Being employed in the remotest places of the country with limited computational support, PARAM Brahma is greatly helping me in guiding my PhD students on wide range of research problems. The support staff team is highly helpful and has been always there to help us in installing different utilities and software's required for our calculations. We are greatly indebted to their service and help.

Dr. Manzoor Ahmad Dar
Assistant Professor
Islamic University of Science and Technology
J & K, India

The NSM facility, particularly PARAM Rudra, has been instrumental in advancing our work on modelling fusion excitation functions and barrier distributions. The computational power available has enabled detailed and large-scale simulations that significantly enhance our understanding of nuclear structure and reaction dynamics across the nuclear chart. Over the past year of usage, access to the system has been smooth and well-managed. The user interface, job submission process, and communication with the support team have been efficient and responsive. The overall experience has been highly positive, and the world-class computational capabilities have greatly supported our research needs.

Rishabh Kumar
Research: Associate, Inter-University
Accelerator Centre, PARAM Rudra IUAC User

The support provided by the PARAM supercomputing facility has been extremely helpful and highly supportive throughout this research. The computational resources enabled large-scale molecular dynamics simulations and machine-learning potential training that would not have been feasible on standard computing systems. The system performance was reliable, and job scheduling was efficient, allowing timely completion of simulations. The technical support team was responsive and cooperative, providing prompt assistance in resolving software and runtime issues. Their guidance ensured optimal utilization of resources and smooth execution of workflows. Overall, the PARAM system has played a crucial role in advancing this study, and its infrastructure significantly strengthened the quality and scope of the research.

Balasaheb J. Nagare
Professor and Head, Department of Physics
University of Mumbai, PARAM Rudra IUAC User

PARAM Smriti has been significantly helpful in successfully executing our research work. We also remain thankful for the support team's technical assistance. We have graciously acknowledged PARAM Smriti in 13 publications in 2025 and 8 publications in 2024. We are grateful to PARAM Smriti for providing reliable, uninterrupted computational resources essential to carrying out large-scale first-principles simulations.

Prof. Abir De Sarkar (Scientist-G)
Institute of Nano Science and Technology
Sector-81, SAS Nagar, Punjab

NSM User's Feedback

User Feedback Reviews for Annual Report 2025

The seamless access to the PARAM SMRITI supercomputing facility has significantly enhanced the efficiency of my work, enabling me to perform complex simulations and analyses that are critical to the success of my project. I deeply appreciate the team's dedication to maintaining such a high level of service, which has greatly contributed to the advancement of my research in computational catalysis.

Jaswant Khumawat
Research Scholar
Indian Institute of Technology Ropar

PARAM Smriti supercomputing facility by C-DAC, Pune has been of great help to my research group. Our group primarily attempts to solve chemical problems using wave function-based methods such as coupled-cluster (CC) theory. Computational calculations with wave function-based techniques are notorious for their large disk and memory requirements. PARAM Smriti supercomputer is equipped with a higher number of cores and memory per node. We were able to meet our computational needs after the facility has been available to us. Also, the support team at C-DAC very efficiently provides the necessary assistance regarding any issues. We express our sincere gratitude to C-DAC, Pune and the team behind PARAM Smriti.

Achintya Kumar Dutta
Associate Professor, IIT Bombay

I have utilized NSM HPC resources for performing DFT and ab initio calculations related to conformational analysis, sulfur-centered hydrogen bonding, and metal– molecule interaction studies. Through this, I developed skills in job submission using SLURM, and data analysis using tools like Multiwfn and VMD. I also improved scripting abilities for automating workflows. The technical support provided under NSM was timely and efficient, enabling smooth execution of computational tasks. Overall, NSM access significantly enhanced the scope and quality of my research

Poonam Bhadoria
Research Scholar, IIT(BHU)
Varanasi, PARAM Shivay User

The PARAM Shivay facility provides a reliable and efficient high-performance computing environment that significantly accelerates computational research involving large-scale numerical simulations. The availability of multi-core processing and high memory capacity enabled extensive parameter sweeps, long-time integrations, and high-resolution bifurcation analysis that would be impractical on conventional systems.

Anuj Kullu
Research Scholar, Institute of Science
IIT(BHU), Varanasi, PARAM Shivay User

How to Access NSM PARAM System

Recommended process for creating a user account to access the NSM facility:

1. Visit nsmindia.in
2. Navigate to the "How to access NSM HPC System" section, where you will find a link to the User Creation portal.
3. Click on the provided link to access the registration page.
4. Fill in all required information on the registration page.
5. Upload the necessary documents as instructed.
6. Once the form is complete, submit the details.
7. The NSM committee will review the submission.
8. If accepted, users will receive an email containing their user credentials and allocated cluster.

Note: For any inquiries, please contact - nsmsupport@cdac.in

Recommended process for creating a user account to access PARAM Siddhi-AI:

1. NPSF has implemented a Web Application which has completely digitized the user on-boarding process (Technical Affiliation Scheme) and it has made it available at https://airawat-psai.cdac.in/tas/web
2. The process requires Digital Signature to be executed by the applicant for which C-DAC's eHastakshar (eSign)services are integrated with the Web Application.
3. To begin the process, prospective users should navigate to https://airawat-psai.cdac.in/ and fill out the online application form available at https://airawat-psai.cdac.in/tas with all the required details.
4. Once the form is filled out, prospective users proceed to finalize the eHastakshar (e-sign) process.
5. Upon successful completion of the TAS form and the e-signature (digital signing) process, the form is submitted to the National PARAM Supercomputing Facility (NPSF), C-DAC team via auto-generated email for scrutiny and approval.
6. Following approval from the relevant authority, an account will be created for the user on the PARAM Siddhi-AI system as part of the onboarding process.
7. Users will then be notified about their account details and system access details via email, along with any required manuals and advisories for using the system effectively.

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