National Supercomputing Mission

> ***Mains Syllabus: GS II - Government policies and interventions for development in various sectors and issues arising out of their design and implementation;***
>
> *GS III - Achievements of Indians in science & technology; indigenization of technology and developing new technology.*

Why in the News?

Recently, the National Supercomputing Mission has been extended till December 2025.

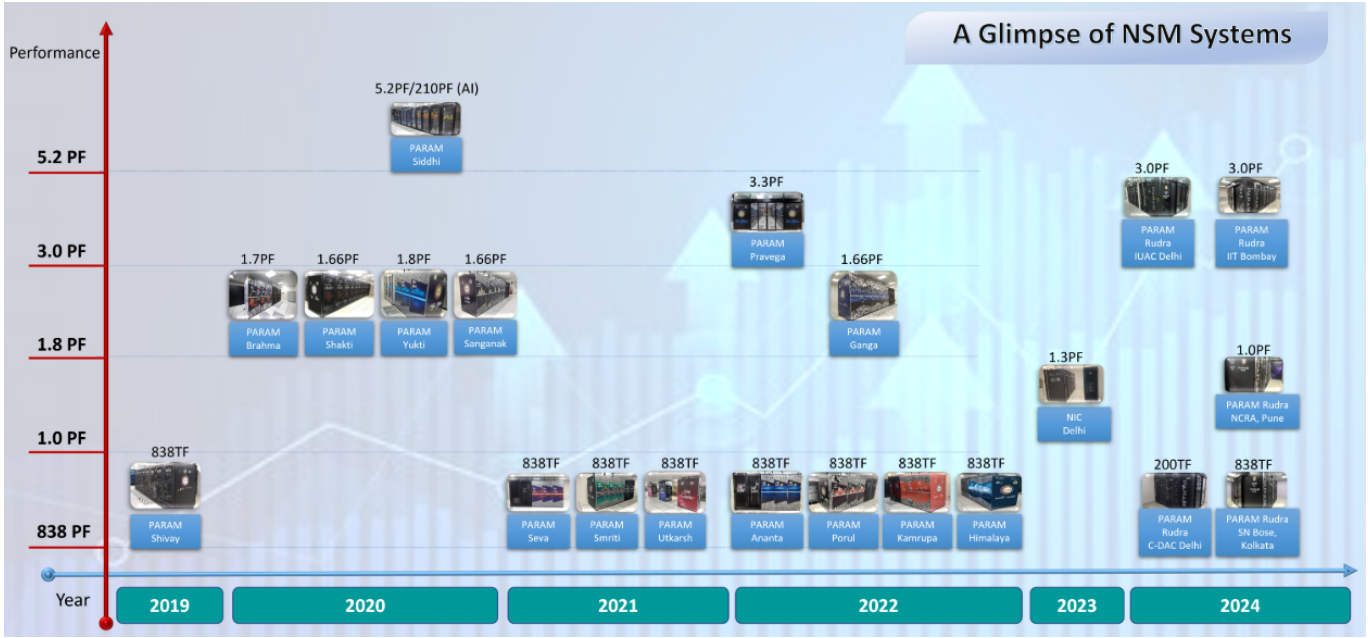
What is the National Supercomputing Mission(NSM)?

- **NSM** - It is a flagship initiative by the Government of India, launched in 2015, to empower the country with high-performance computing (HPC) capabilities.
- **Aim** - To enhance India's technological prowess in supercomputing, foster research and development (R&D), and support scientific advancements across academia, industry, and government sectors.
- **Features** - The Mission envisages empowering our national academic and R&D institutions spread over the country by installing supercomputers of various capacities.
- **Nodal ministry** - The Mission is being steered jointly by the Department of Science and Technology (DST) and Ministry of Electronics and Information Technology (MeitY)
- **Implementing agency** - Centre for Development of Advanced Computing (C-DAC), Pune and the Indian Institute of Science (IISc), Bengaluru.
- **Phases of implementation**
    - **Phase 1** - Creating a basic supercomputing infrastructure by installing six supercomputers across various institutions.
    - **Phase 2** - Indigenous manufacturing of supercomputers, including developing a local software stack.
    - **Phase 3** - Complete indigenization of supercomputing, including the design, development, and manufacturing of key components within India.
- **National Knowledge Network (NKN)** – Academic institutions and R&D labs are connected over a high-speed network to provide access to supercomputers.
- Academic and R&D institutions as well as key user departments/ministries would participate by using these facilities and develop applications of national relevance.
- **Trinetra Network** - Under the NSM, C-DAC has developed the indigenous high-speed communication network, "Trinetra," to enhance data transfer and communication between computing nodes, strengthening India's supercomputing capabilities.
- **Trinetra Phases** – It is being implemented in three phases

    - Trinetra-POC, a proof-of-concept system to validate key concepts
    - Trinetra-A (100 Gigabits per second), a network with advanced connections, successfully deployed and tested in the 1PF PARAM Rudra at C-DAC Pune;
    - Trinetra-B (200 Gigabits per second), an upgraded version with improved capabilities, set to be deployed in the upcoming 20PF PARAM Rudra supercomputer at C-DAC Bangalore.
- **Rudra servers** - PARAM Rudra supercomputers are built using indigenously designed and manufactured HPC servers, known as "Rudra", along with an indigenously developed system software stack.
- "Rudra" Server is the first of its kind in India which is at par with globally available other HPC class Servers.
- **Human resource development** - Mission also includes development of highly professional High-Performance Computing (HPC) aware human resource for meeting challenges of development of these applications.

What is the current status of the mission?

- **Current strength of super computers** - Under NSM, as of March 2025, a total of ***34 supercomputers*** with a combined compute capacity of ***35 Petaflops***, have been deployed across various academic institutions, research organizations, and R&D labs.





PARAM Shivay
[838 TF]

IIT BHU Varanasi



PARAM Shakti
[1.66 PF]

IIT Kharagpur



PARAM Brahma
[1.75 PF]

IISER Pune



PARAM Yukti
[1.8 PF]

JNCASR Bangalore



PARAM Sanganak
[1.67 PF]

IIT Kanpur



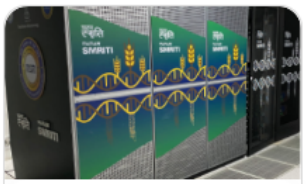
PARAM Pravega
[3.3 PF]

IISc Bangalore



PARAM Seva
[838 TF]

IIT Hyderabad



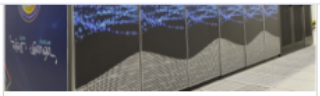
PARAM Smriti
[838 TF]

NABI Mohali



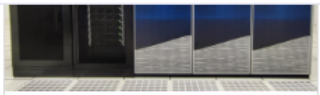
PARAM Utkarsh
[838 TF]

C-DAC Bangalore



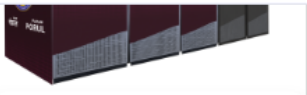
PARAM Ganga
[1.67 PF]

IIT Roorkee



PARAM Ananta
[838 TF]

IIT Gandhinagar



PARAM Porul
[838 TF]

NIT Trichy



PARAM Himalaya
[838 TF]

IIT Mandi



PARAM Kamrupa
[838 TF]

IIT Guwahati



PARAM Siddhi-AI
[5.27 PF]

C-DAC Pune



PARAM Rudra
[3PF]

IUAC Delhi



PARAM Rudra
[838 TF]

SN Bose Kolkata



PARAM Rudra
[1.3 PF]

GMRT Narayangaon



PARAM Rudra
[200TF]

C-DAC Delhi



PARAM Rudra
[3PF]

IIT Bombay

- **Latest addition** - In 2024, three PARAM Rudra supercomputers were dedicated to facilitate advanced studies in physics, earth sciences, and cosmology.
- **Utilization rate** - The supercomputing systems commissioned under NSM have achieved an overall utilization rate of over 85%, with many systems exceeding 95%, demonstrating a high level of usage and efficiency in their computational capacity.
- **Applications** - These supercomputing systems have supported research in critical domains such as Drug Discovery, Disaster Management, Energy Security, Climate Modeling, Astronomical Research, Computational Chemistry, Fluid Dynamics, and

Material Research.
- **Inclusive approach** - NSM has created opportunities for researchers from Tier II and Tier III cities to conduct research by providing access to state-of-the-art supercomputing facilities.
- Start-ups and MSMEs are leveraging these supercomputing resources to advance their HPC-driven projects.
- **AIRAAWAT** – It is the AI supercomputer installed at C-DAC, Pune with the capacity of 13,170 teraflops.

What is the role of semiconductor mission in strengthening supercomputing mission?

- **The India Semiconductor Mission (ISM)** – It aims to build a strong semiconductor and display ecosystem, positioning India as a global hub for electronics manufacturing and design.
- **Supporting NSM** – The semiconductor mission is set to give a big boost to the National Supercomputing Mission (NSM).
- Supercomputers need powerful parts like processors, memory chips, and special accelerators — all of which are made using advanced semiconductor technology.
- **Reducing import dependency** - Until now, India had to rely heavily on imports for these components.
- With ISM, India is focusing on making these high-tech parts right here at home.
- **Specialization** - It will also allow India to build supercomputers that are customized for our own scientific and industrial needs.
- By developing these technologies within the country, ISM will help NSM move closer to its dream of making India self-reliant and a global leader in supercomputing.

What lies ahead?

- The National Supercomputing Mission is a transformative initiative that strengthens India’s position in global supercomputing.
- By fostering indigenous development, research, and innovation, NSM supports critical sectors and prepares the nation for future technological challenges.
- With continued investment and strategic deployment, India is poised to become a global leader in High-Performance Computing.

Reference

PIB | National Supercomputing Mission

SHANKAR IAS PARLIAMENT
Information is Empowering