# National Supercomputing Mission

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**Manifest pedagogy:**India has lagged behind in the race of building supercomputers despite being a leader in the IT enabled services (ITES). Hence, National Supercomputing Mission is a step in the right direction. An aspirant has to envision this topic with a future utility.

**In news:** India plans to indigenously develop 60 supercomputers over the next three years.

**Placing it in syllabus:** Achievements of Indians in Science and Technology

**Dimensions:**

- National Supercomputing mission(NSM) and it's phases
- C-DAC
- Prospects of supercomputing

**Content:**The 60 supercomputers to be developed indigenously will be implemented by the Centre for Development of Advanced Computing (C-DAC) and six machines will be installed by the end of the year.

National Supercomputing mission(NSM) and it's phases:

- The government launched National Supercomputing Mission **to connect national academic and R&D institutions with a grid of over 70 high-performance computing facilities.**
- Estimated cost is Rs 4,500 crore in which Rs 2,800 crore will come from the **Ministry of Science and Technology** and the rest from Ministry of Electronics and Information Technology (**MeitY**).

- Jointly implemented by the Department of Science and Technology (**DST**) and **MeitY** and led by **C-DAC** and Indian Institute of Science (**IISc**), Bengaluru.
- The mission **supports the government's vision of 'Digital India' and 'Make in India**' initiatives.

In the **first phase** of the National Supercomputing Mission, **three supercomputer machines,** to be fully designed, manufactured and assembled in India are being installed at IIT (Banaras Hindu University), Indian Institute of Science, Education and Research (IISER), Pune and IIT, Kharagpur.

After a delay of more than three years, **French technology firm Atos** recently got a **₹4,500-crore contract** to build 70 supercomputers, manufactured and designed in India.

While the **first few supercomputers** under the contract will have all **imported parts**, Atos has partnered with Indian contractors to **build most of the parts in facilities in Chennai and Pune.** In the **next phase,** supercomputers will not only be **manufactured but also be designed by CDAC in India.**

Eventually, CDAC plans to connect all the supercomputers to a common grid, which will allow any institute access to supercomputing power, making the common system among the fastest in the world.

- Hon'ble Prime Minister Narendra Modi recently inaugurated NSM's first indigenously built supercomputer **'Param Shivay**' at **Indian Institute of Technology, BHU, Varanasi.**
- The new Supercomputing Centre is equipped with the latest **Intel based processor, high memory compute nodes and with a peak computing power of 837 Teraflops**.

Applications:

- Improving weather services;
- Natural disaster prediction;

- Disaster simulation and management;
- Support computational biology;
- Drug discovery;
- Space ambitions;
- Molecular Dynamics;
- Discovery and extraction of new sources of oil and gas;
- Atomic Energy Simulations;
- National Security/Defence Applications;
- Big data analytics.

**C-DAC:**

- The **premier R&D organization** of the Ministry of Electronics and Information Technology (MeitY) for carrying out R&D in IT, Electronics and associated areas.
- Was set up in **1988** to build Supercomputers in context of denial of import of Supercomputers by USA.
- Since then C-DAC has been undertaking building of multiple generations of Supercomputer starting from **PARAM with 1 GF in 1988.**
- C-DAC then started building **Indian Language Computing Solutions** with setting up of GIST group (Graphics and Intelligence based Script Technology).
- **National Centre for Software Technology** (NCST) was set up in 1985.
- C-DAC started its education & training activities in 1994.
- C-DAC represents a unique facet working in close junction with MeitY (it's parent ministry) to realize nation's policy and pragmatic interventions and initiatives in Information Technology.

Prospects of supercomputing in India:

The supercomputer effort in India began in the late 1980s, when the US stopped the export of a Cray supercomputer because of continuing technology embargoes. In response, the Indian

government set up the C-DAC which in 1990, unveiled the prototype of the **PARAM 800**, benchmarked at 5 Gflops, making it the second fastest supercomputer in the world at that time.

Today the USA's **Summit** is the fastest supercomputer in the world (in June 2018, US took away the top rank from China). The Chinese mastery of the wide range of technologies positions them well for winning the next races in supercomputers.

Supercomputers operating at such incredible speeds will encounter a variety of **barriers** like network and interconnectivity hardware, that previous generations of designers did not have to contend with. Similarly, the cooling system will become a central design constraint.

Hence India needs to focus on innovation as **supercomputer sector is innovation craving.** This is both a daunting barrier and an exciting opportunity for India. There are **several imperatives** if India is to regain some measure of competitiveness in this strategically vital sector.

- India must move away from the perspective that the application of supercomputers is more important than supercomputer technologies themselves.
- India must understand that it is possible to start from the current state of the art itself and there is no need to entirely retrace the path already taken by China and other countries( NSM is a major step in this regard).
- India has to understand that supercomputer research always requires fundamental research into the next stages of computing (e.g quantum computing which is still in the theoretical stage).
- Though NSM is a laudable first step, it needs to be followed up by the identification of clear objectives and allocation of adequate resources.
- Bureaucratic red tape should be avoided and scientists and engineers should be allowed to take bold and radical

steps without fear of reprisal.

Supercomputers are strategic in the most important sense, namely, the creation of an ecosystem that extends well beyond the boundaries of science and technology and has the capacity to transform the country. However appropriate infrastructure – both digital as well as physical is very much needed. Hence for India to become a **knowledge-driven, multi-trillion-dollar economy,** which is able to support cutting-edge science, investment in supercomputing is a necessity.

As of June 2019, India was ranked **17th on the TOP500 list ranking** based on Rmax.

India's three systems on TOP500 list ranking are:

- **Pratyush** (Indian Institute of Tropical Meteorology) – **53rd rank**
- **Mihir ( National Centre for Medium Range Weather Forecasting) – 86th rank**
- **INC1 – Lenovo C1040 (Software Company (M)) – 428th rank**