TECH **THAT!**

Even as **C-DAC** takes giant strides in computing, it acts on its vision to facilitate solutions for scientific and socio-economic development

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Centre for Development of Advanced Computing (C-DAC) is a premier R&D organisation of the Department of Electronics and Information Technology (DeitY), Ministry of Communications & Information Technology (MCIT) for carrying out R&D in IT, Electronics and associated areas.

Way back in 1988, when the imports of Cray Supercomputers were denied to India as a result of a technology embargo, C-DAC was born with an objective to develop indigenous supercomputers and supercomputing technologies. With a group of talented people led by Dr Vijay Bhatkar, C-DAC produced the first supercomputer of the country in two years. An earlier version of this was benchmarked at the 1990 Zurich Supercomputing Show and it surpassed most other systems, placing India second after the US. The final result of the effort was PARAM 8000 released in 1991, which is not only considered India's first supercomputer but also a major milestone in the pursuit of computing by the country.

Over the years C-DAC has unveiled numerous improved supercomputers in the PARAM family, the latest being ParamYuva II. Made over a period of just three months, at a cost of ₹16 crore, ParamYuva II was unveiled on February 8 this year by Shri J Satyanarayana, Secretary, DeitY. ParamYuva II, with its computing power of 529.74 Teraflop per second, achieved a ranking of 69 in the June 2013 list of top 500 supercomputers of the world and became the fastest supercomputer in the country.

RESEARCH AND DEVELOPMENT AT C-DAC

The primary activity of C-DAC is research and development in areas of ICTE. Originally established to carry out research and to develop High Performance Computers, the R&D of C-DAC has expanded to various other areas such as grid and cloud computing, multilingual computing, heritage computing, professional electronics including VLSI and embedded systems, cyber security and cyber forensics, health informatics, software technologies and education related to these technologies.

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1. Tetra Solutions
2. Supercomputer Param Yuva II

HPC, GRID & CLOUD COMPUTING

High Performance Computing (HPC) is a key component in many applications: weather and climate modelling and forecasting, designing vehicles and airplanes; designing high-rise buildings and bridges; discovery of drugs; discovery and extraction of new energy sources such as oil and natural gas; and weather forecasting.

C-DAC's PARAM YUVA-II is ranked number 44 in the Green 500 list of World's Supercomputers announced in November, 2013. It is the number 1 system in India as per this list.

ParamYuva II is designed to solve complex computational problems. It is used for research in space, bioinformatics, weather forecasting, seismic data analysis, aeronautical engineering, scientific data processing and pharmaceutical development. Educational institutes such as the Indian

Online Handwritten Character Recognition

Institutes of Technology and National Institutes of Technology can be linked to this through National Knowledge Network, a high-speed, multi-gigabit, pan-India network.

Currently three supercomputing facilities are operated by C-DAC, namely National PARAM Supercomputing Facility (NPSF) at Pune, C-DAC's Terascale Supercomputing Facility (CTSF) at Bengaluru and Bioinformatics Resources & Applications Facility (BRAF) at Pune.

With a vision to facilitate collaboration amongst scientists and engineers for socio-economic development, C-DAC has also set up the Indian National Grid Computing Initiative, GARUDA, with more than 70 partners from academic and research institutions spread across 25 cities, interconnected through the National Knowledge Network. C-DAC has also developed an open-source software stack named "Meghdoot" for setting up a private cloud to offer basic services such as infrastructure, platform and software.

MULTILINGUAL COMPUTING & HERITAGE COMPUTING

India has 22 official languages and more than 100 languages are used with different scripts, grammar and language rules. C-DAC's R&D focus in language technology spans stan-

Is there any special project you are working on at present?

In addition to various research activities, C-DAC is also involved in many socially relevant activities.

Government of India Search Engine

C-DAC is developing a search engine to help citizens easily find pertinent information in the areas of Government Executive, Judiciary, Legislature and Institutions such as banking, education, healthcare, research, international missions, tourism, sports and other government or semi-government organisations and committees or commissions. This search engine enables cross-lingual search, ontology search and search through content in different formats such as HTML, PDF, MS-Office, etc.

Electronic Personal Safety System

The objective of the Electronic Personal Safety System is to assist women, children and the elderly in cases of emergency. The system has two components – the device, to be used by the people; and the backend system, to integrate with the police and other agencies. The compatible safety device can be provided by vendors but will integrate with backend via an inter-operable standard driver interface.

Aakash Tablet

Aakash, an Android-based tablet computer, is an initiative of the Ministry of Human Resource

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Professor Rajat Moona
Director-General, C-DAC

Development of India. It is a low-cost tablet with a seven-inch touch screen. In collaboration with IIT, Bombay, the device was provided under a pilot project for e-learning programme. C-DAC plays a crucial role in this project towards design, testing and evaluation. With the pilot project on, the current method will boost the robustness and performance of the Aakash Tablet, which may even be available to the common man soon.

C-DAC is involved in various R&D activities. How is this knowledge disseminated?

C-DAC carries out various training programmes and grooms about 5,000 graduates every year to help them develop their skills in critical areas of information technology and electronic product development.

A number of diploma programmes are built around C-DAC's R&D activities, such as wireless and mobile computing, VLSI design, linguistics and NLP, geo-informatics, healthcare informatics, embedded system design, system software development, automation SCADA systems, information security, etc. C-DAC also conducts a number of short-term professional programmes to train employees on specific technologies and offers formal degree programmes in collaboration with universities. C-DAC conducts various awareness programmes, workshops and seminars across the country on various research domains.

dardisation, linguistic resources and tools, text-to-speech, optical character recognition, machine translation, handwritten text recognition, search engines, prediction dictionaries, language support for mobiles, embedded devices, and application localisation.

C-DAC has developed localisation frameworks for applications in various domains such as banking and finance, administration, travel, etc. An example of its deployment is www.trainenquiry.com in Hindi.

Machine-aided language translation is an important technology for India, given the vast non-English speaking Indian population. C-DAC has initiated support of domain names in Indian languages (http://idn.cdac.in). Currently supported languages include Hindi, Marathi, Nepali, Bodo, Dogri, Maithili, Konkani and Sindhi.

PROFESSIONAL ELECTRONICS INCLUDING VLSI AND EMBEDDED SYSTEMS

High-integration Electronic Embedded Systems find application in every conceivable walk of life. Consumer applications include sub-systems used in cars, washing machines, cellphones, lifts, ATMs, toys, music systems, TV, PoS terminals, etc. Professional applications include communications, power, control, automation, medical, intelligent transportation systems and strategic areas.

C-DAC is spread across 10 cities in India with approximately 3000 staff members.

C-DAC has developed an open-source software stack named 'Meghdoot' for setting up a private cloud to offer basic services such as infrastructure and software

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1. Mukesh Kumar Meena, IAS Collector of Hyderabad District, hands Tarang to a boy in the presence of V Muralidharan, Director, C-DAC Hyderabad, and G Narayan Rao, CMD, Artificial Limbs Manufacturing Corporation of India
2. Mobile Telemedicine Solutions
3. Meghdoot Cloud Stack

C-DAC has designed, deployed and transferred manufacturing technology for numerous large-scale electronics systems as well as small footprint VLSI and Embedded System Products for applications ranging from energy measurement, medical appliances, power and process control, wireless broadband, sonar and acoustic detection, agri-electronics, etc, for a range of verticals such as railways, steel, power generation, defence, healthcare, agriculture, police and broadcast media.

C-DAC has also indigenously built RFID readers, automatic meter readers, area traffic control systems,

C-DAC Education and Training

parking lot management systems and acoustic torch for the visually challenged and many more.

Towards empowerment of the disabled, C-DAC has developed Tarang - Digital Programmable Hearing Aid, using indigenously developed Application Specific Integrated Circuit (ASIC) technology. Working on a single, easily available, rechargeable battery, Tarang has a low cost of ownership and maintenance, with a long operating life. During a recently organised function by Rajiv Vidya Mission (RVM) officials for distribution of hearing aid devices, Tarang was distributed to hearing-impaired children.

AWARDS AND ACCOLADES

C-DAC's Silver Jubilee Year (2012-13) was marked by many technological achievements. It became the first in the country to cross the half petaflop milestone with the launch of **Param Yuva II** and won the **National Award** for its **Digital Programmable Hearing Aid** product. Other notable awards include **SKOCH Awards for 2012-13**, **mBillionth Award South Asia 2013**, **National Award** for the empowerment of persons with disabilities 2012, **Manthan Awards 2012, eIndia 2012** and **e-Maharashtra 2012.**

CYBER SECURITY AND CYBER FORENSICS

C-DAC has developed solutions for mobile security for call/SMS/blacklisting/whitelisting, detection of malicious Android application and for carrying out forensics analysis. C-DAC has developed cyber forensic tools to analyse cyber crimes, which are being used by various government agencies. Three cyber forensics labs were set up for Central Board of Direct Taxes (CBDT) at DGIT, Delhi; DGIT, Mumbai; and DG, DRI, Mumbai.

HEALTH INFORMATICS

C-DAC has been working in health informatics since early 1990s to improve healthcare quality; reduce medical errors; reduce healthcare costs; increase administrative efficiency; and expand access to affordable healthcare. Major focus has been on implementation of hospital information management systems and telemedicine solutions.

C-DAC's Integrated Telemedicine Solutions have been deployed in many Indian states also in Myanmar and Tanzania. Cost-effective Software Development Kits for medical informatics standards have also been developed to promote standardisation in the field of health informatics.

SOFTWARE TECHNOLOGIES

C-DAC is spearheading the Free/ Open Source Software (FOSS) initiative within the country through its BOSS

Information Security Education & Awareness for all
www.infosecawareness.in

(Bharat Operating System Solutions) and NRCFOSS (National Resource Centre for Free and Open Source Software) initiatives. BOSS is a GNU/Linux distribution derived from Debian and is developed by C-DAC for enhancing the use of FOSS throughout India. C-DAC has been instrumental in supporting the vision of National e-Governance Plan (NeGP) by working on multiple levels. The National Service Delivery Gateway (NSDG), the backbone of e-governance services in India, is developed by C-DAC.

EDUCATION AND TRAINING

C-DAC has set up a separate wing for education and training. Through its nationwide training centres and Authorised Training Centres (ATCs), it conducts various postgraduate diploma and diploma programmes. About 5,000 graduates every year in Information Technology and electronic product development are being groomed.

C-DAC also offers some formal degree programmes in collaboration with universities, and imparts specialised IT training programmes to the government. It is the first Indian government agency that has expanded its training horizons globally.