ANNUAL REPORT

2018-2019

"C-DAC with its focus in Advanced Computing is uniquely positioned to establish dependable and secure Exascale Ecosystem offering services in various domains"

CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTING

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One Vision. One Goal... Advanced Computing for Human Advancement...

Governing Council

(As on 31st March 2019)

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Governing Council, C-DAC

Contents

Overview

The year 2018-19 is marked with several technological achievements, events and recognitions for C-DAC. First Supercomputing System under National Supercomputing Mission (NSM), PARAM ShivaY with a peak computing power of 837 TF was inaugurated by Shri Narendra Modi, Hon'ble Prime Minister of India on February 19, 2019 at IIT BHU, Varanasi. India's first indigenously developed National Common Mobility Card (NCMC) Compliant Payment Eco-system for transport 'Sweekar' (Automatic Fare Collection System) and 'Swagat' (Gate) were launched by Shri Narendra Modi, Hon'ble Prime Minister on March 04, 2019 in Ahmedabad. Emergency Response Support System (ERSS) and 112 app were launched by Shri Rajnath Singh, Hon'ble Union Minister of Home Affairs on February 19, 2019 in New Delhi. C-DAC's Learn Indian Languages through Artificial Intelligence (LILA) Hindi Pravah for Mobile (Android and iOS) and web platforms was launched by Shri. Venkaiah Naidu, Hon'ble Vice-President of India during the Hindi Divas Samaroh on September 14, 2018 at Vigyan Bhavan, New Delhi. C-DAC's GIST Mail- a unique multimodal, multilingual, secure and accessible emailing system for Indian Languages was also released.

Since its inception, C-DAC's PARAM Yuva II system has executed more than 3,84,983 jobs till March 2019 by several HPC users from 115 different institutions spread across the country from various science and engineering domains. An entry level HPC System, PARAM Shresta with a compute power of 100 TF and 200 TB of storage was developed under NSM Build approach. C-DAC also continued the development of indigenous server platform, Rudra and indigenous HPC network, Trinetra. C-Chakshu, an HPC multi cluster monitoring and management platform, was developed and deployed on HPC systems including PARAM Sangam, PARAM Shresta and PARAM ShivaY. A spatial hydrogeological decision support system (HDSS) named 'Jaldhara' was developed for Water Budgeting in Sikkim. C-DAC continued carrying out R&D in HPC applications including Panorama Phase II – Marine Forecast Visualization System, Mangrove mapping of coast of Maharashtra and development of an efficient cooling system for High end HPC servers. Meghdoot – software suite for building cloud computing environment was enhanced with Openstack Queens version and management and security related features were added. Development of C-DAC Big Data Software Suite and Machine Learning Software Stack were completed for PARAM Shavak. Tools including "TANGO" for conformation generation optimization and "SUM" for aiding facility managers to manage data of users and take appropriate decisions were launched during the event "Accelerating Biology 2019: towards Thinking Machines" held at Pune during February 5-7, 2019.

Kanthasth, a Translation memory system was launched by Shri Kiren Rijiju, Hon'ble Minister of State for Home Affairs, Government of India, on August 20, 2018. E-aksharayan, Indian language OCR software was released at Bhashantara, the symposium for Indian Languages Technology Industry on July 30, 2018. Developed and deployed, Speech based Assistive Aids in Bangla for visually impaired people of Tripura. Under the Speech to Speech (S2S) translation initiative, Hindi S2S system has been developed. Deployed JATAN Virtual Museum Builder, DIGITĀLAYA (डिजिटालय) software and DARSHAK Mobile App for various museums and archives in the North East states.

As part of Microprocessor Development Program, a 64-bit quad core out-of-order processor has been designed and validated on FPGA platform and completed booting over Linux and porting of applications. Under Intelligent Transport System, C-DAC has developed Pedestrian Safety Enhancement Controller (PeSCo), an accessible controller that gives variable green signal timings for pedestrians. Smart Post Kiosk developed by C-DAC enables the public to post their speed post and registered documents from anywhere in the country round the clock and thus eliminating the need to approach a post office. Apple^{Sense} system was developed for quality inspection of Apple fruit based on acoustic sensing and digital image processing technologies. As part of National Mission on Power Electronics Technology (NaMPET) Phase II, eight technologies have been transferred to industries and NaMPET Phase-III towards R&D in New Horizon in Power Electronics has been initiated. C-DAC has developed and implemented the Real Time Energy Assessment solution (REAL) project across various states of North East Region.

National Voters Services Portal (www.nvsp.in) including ERO-Net was migrated on VMWare and the same was made live during the year. Launch of ERO-Net was completed for several states and an android based application was developed to carry out form processing operations by ERO, AERO and supervisor for various form types. Unified Portal for EPFO was enhanced during the year. 1,69,360 establishments have been registered, 2,78,37,455 members have been enrolled and Rs. 97,126.5 crores have been disbursed to beneficiaries by EPFO. Bharat Operating System Solutions (BOSS) 7.0 was released during the year and there were around 15 lakhs deployments of the latest BOSS version under Tamil Nadu Free Students Laptop Scheme. More than 45 lakhs signatures for various agencies have been offered using C-DAC's eSign service till March, 2019. About 4200 Government departments and agencies have been integrated by using Mobile Seva platform. 231 departments have been integrated and around 8.6 crores transactions have been completed using e-Pramaan, National e-authentication service of C-DAC. Around 65 workshops/trainings were conducted for rollout of OLabs during the year and 2,848 books were published on eBasta portal by CBSE, State Boards and private publishers till March 2019. 300 outreach workshops were held on Vikaspedia at various levels (block/district/state) across 17 states/UTs during the year and about 14,500 first level service providers were trained on digital information access and sharing in Indian languages in collaboration with various government institutions.

C-DAC continued its R&D efforts in Cyber security and Cyber Forensics addressing various challenges including identity management, mobile security, design validation, cloud security, proactive threat analysis and security testing. C-DAC has setup Cyber Forensics Labs using its indigenously developed solutions like TrueImager, SimXtractor, True Traveller, CyberCheck, Win-Lift and MoblieCheck. Face recognition solutions developed by C-DAC are being used by various user agencies for surveillance purposes. COPS (C-DAC Open Process Solution) SPADE (SCADA Protocol Anomaly Detector) solution has been field tested at Karnataka Power Transmission Corporation Limited (KPTCL), Bangalore towards detection of known and un-known attacks. Towards Threat Intelligence, Cyber Threat Management System (CTMS) solution has been integrated with sensors deployed across various locations. During the year, C-DAC has carried out security audits for various government and private agencies and has executed a total of 351 security audits and issued safe to host certificates. As part of Information Security Education & Awareness (ISEA) Phase II initiative, total 836 awareness workshops were conducted covering 95,161 participants.

As part of National roll-out of its Health Informatics solutions, C-DAC is working on medical imaging, healthcare data analytics, alternative medicine, etc. "e-Aushadhi" solution is being deployed in North-Eastern states as per the mandate for Nation-wide rollout from the Ministry of Health and Family Welfare (MoHFW). Virtual Instrumentation System (Karkat Nirnay Yantra) has been developed using infrared thermal imaging based integrated methodology for early detection of breast cancer. C-DAC continued proliferation of its Hospital Management Information System at various hospitals and Blood Bank Management System. Newer versions of C-DAC's Medical Informatics Software Development Kit (SDK) for Digital Imaging and Communications in Medicine (DICOM) V3.5, V1.0 for Continuity of Care Document (CCD) and Systematized Nomenclature of Medicine -Clinical Terms (SNOMED-CT) Toolkit -CSNOtk v5.0 were developed and released during the year.

C-DAC imparts various Industry Specific Post Graduate Diploma Programmes, Formal Education Programmes in Collaboration with Universities, IT training & Skill Development Programmes throughout the year. C-DAC has also aligned its activities towards development and deployment of technologies for education and training. C-DAC has completed the third cycle for AFCAT during February 16-17, 2019 at 108 cities for over 1.3 lakh candidates and STAR during March 14-17, 2019 for over 4.5 lakh candidates. As part of initiatives in education, C-DAC has been registered as one of the assessment agencies and has proctored lakhs of students under Pradhan Mantri Gramin Digital Saksharta Abhiyaan (PMGDISHA).

The above-mentioned activities resulted in several research publications, patents, awards, recognitions and new collaborations with academic organizations within the country and abroad.

The annual report covers the achievements and major activities of C-DAC during the year 2018-19.

Major Activities in Thematic Areas

High Performance Computing (HPC), Cloud Computing and Big Data

C-DAC is actively pursuing research, design, development and deployment of infrastructure, applications and capacity building in HPC under National Supercomputing Mission (NSM). C-DAC is deeply engaged in various activities in the areas of HPC Systems and Facilities, HPC System Software, HPC Applications, HPC Solutions and Services, Cloud Computing and Big Data. The main activities carried out by C-DAC in this thematic area during the year 2018-19 are given below.

National Supercomputing Mission (NSM)

"National Supercomputing Mission (NSM): Building Capacity and Capability" was approved by Cabinet Committee on Economic Affairs (CCEA) on April 9, 2015 to be implemented jointly by MeitY and DST with IISc Bangalore and C-DAC being the executing agencies. Under Build approach it is envisaged to design and manufacture the sub-systems of HPC system locally in India. C-DAC is entrusted with building systems indigenously in a phased manner (Phase-I: Assembly in India, Phase-II: Manufacturing in India and Phase-III: Design and Manufacturing in India) with all the phases to start simultaneously. NSM Technical Advisory Committee (NSM-TAC) has mandated C-DAC to work on all the phases concurrently. In all three phases, the system software stack is being indigenously developed by C-DAC, which is based on Open Source Software and Tools, complemented with in-house software tools. For building the HPC systems for Phase 1 and Phase 2, C-DAC is integrating subsystems such as Compute node servers and HPC network elements assembled and manufactured in India. Under Phase 3, C-DAC is designing subsystems such as CPU motherboard, Direct Contact Liquid Cooling technology, Interconnect network components, System software and System engineering.

PARAM ShivaY

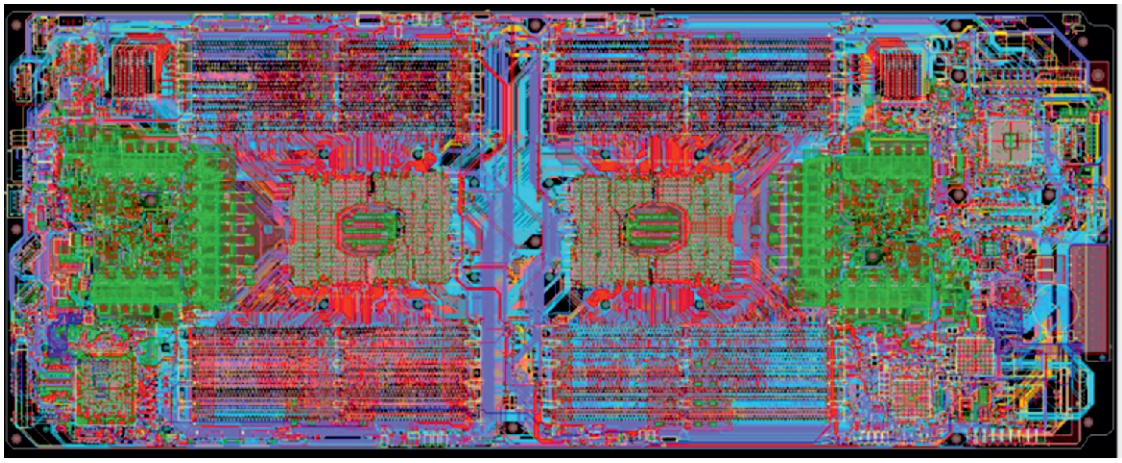
The first Supercomputing system under NSM, PARAM ShivaY was installed at IIT BHU, Varanasi with C-DAC's system software stack developed under NSM build approach. The system has 212 CPU nodes and 11 GPU nodes amounting more than one lakh

PARAM ShivaY

twenty thousand computing cores (CPU and CUDA cores). The system has sustained compute power of 525 TF and peak computing power of 837 TF. The system was built with the latest cutting-edge hardware and software technologies. PARAM ShivaY is designed and commissioned to cater the computational needs of IIT-BHU, Varanasi and various Research and Engineering institutes around Varanasi. PARAM ShivaY was inaugurated by Hon'ble Prime Minister of India Shri. Narendra Modi on February 19, 2019. C-DAC is currently working on two more similar systems to be deployed at IIT Kharagpur and IISER Pune under Phase 1.

Server Platform with Board Management Controller - Rudra

During the year, C-DAC continued the development of Indigenous Server Platform –Rudra in the dense half U form factor under Open 19 framework. It uses Intel Xeon Sky Lake and Cascade Lake Scalable Processor (SP) with Intel C624 Chipset. The platform design is based on Intel's reference design with modifications required to serve usage models including HPC and communication. PCB design for Rudra Server and associated boards has been completed.



Rudra Server Board

HPC Network – Trinetra

During the year, C-DAC continued the development of Indigenous HPC Network - Trinetra. A test setup consisting of two nodes, incorporating Trinetra-PoC platform with integrated hardware (HLI, TLI, EPS) and software components (Networking stack, MVAPICH), executed OMB benchmark (MPI application). This demonstrated integration of all the hardware and software components of System on Chip (SoC) platform and paved the path for cluster-based setup and validation.

NSM Applications

During the year, C-DAC initiated the development of the following applications which were approved by NSM-TAC and NSM Executive Board (NSM-EB)

- Establishment of a Leadership Centre in Computational Biology (LCCB)
- Multi-sectoral Simulation Lab and Science-based Decision Support Framework to address Urban Environment Issues
- Early Warning System (EWS) for Flood Prediction in the River Basin of India
- HPC Software Suite for Seismic Imaging to aid Oil and Gas Exploration

NSM Human Resources

The mission also includes building capacity in HPC-aware Human Resources at all levels for meeting the challenges of development of HPC applications and managing, monitoring and running HPC systems. C-DAC conducted workshops at KU Kurukshetra, SVNIT Surat and VNIT Nagpur and Faculty Development Programmes (FDP) at VNIT Nagpur, NIT Agartala, IIT Mandi and GU Goa during the year.

Hackathon 2018

C-DAC arranged a 5-days GPU Application Hackathon (GAH-2018) at Pune during September 17-21, 2018 in association with OpenACC.org, IISER Pune and Nvidia under the aegis of National Supercomputing Mission. More than 50 teams had applied while 14 teams across 8 scientific domains were selected to participate in the event. The participating teams were from IITs, PRL, ISRO Lab, TIFR, IITM, IISER, C-DAC etc. They were guided by 24 mentors and achieved an average of 5X speedup for their application. The best speedup achieved by a team was of 30X.

High Performance Computing (HPC)

HPC Systems and Facilities

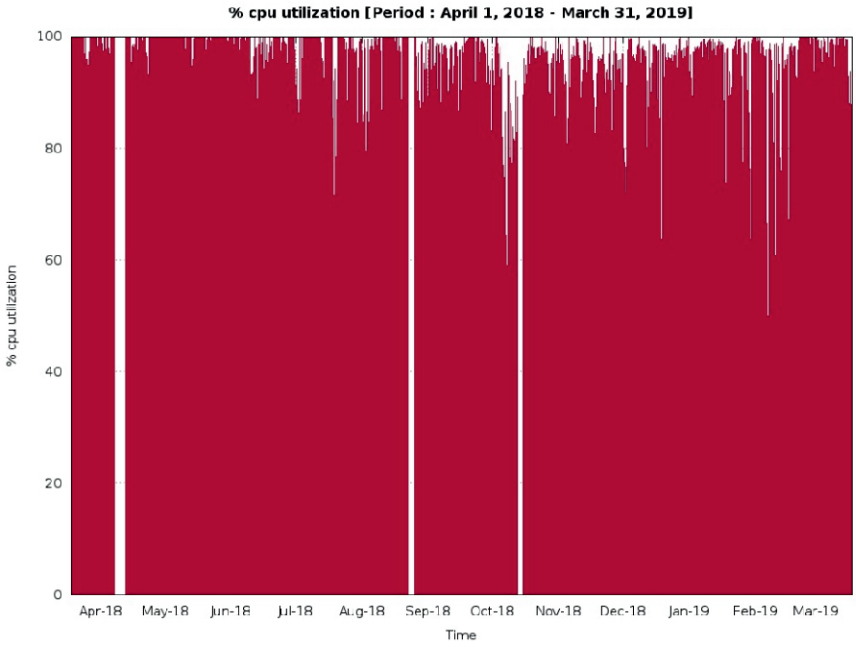
HPC Shreshta Cluster

During the year, C-DAC developed an entry level HPC system called PARAM Shreshta with a computing power of 100 TF and 200 TB of storage under NSM Build approach. It is configured with dense compute nodes having latest Intel Xeon Processor Scalable Family CPUs and NVidia V100 GPUs connected over 100 Gbps interconnect to achieve maximum compute performance per rack. The system is customizable as per the requirements of the end-user. It comes with an integrated data centre infrastructure (UPS, Cooling and Fire safety). The uniqueness of the system lies in its HPC software stack, which is residing on the underlying HPC hardware to make the usage of the system efficient and easy. The system is ready to be used for HPC users and is preinstalled with development environment and widely used scientific, engineering and academic HPC applications for domains such as Weather and Climate, Computational Fluid Dynamics (CFD), Seismic, Life and Material sciences.

PARAM Shreshta

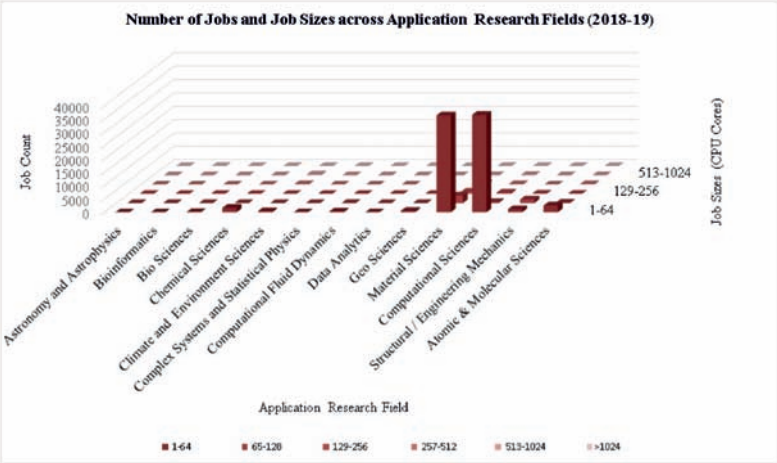
PARAM Yuva II

Since its commissioning in February 2013 at C-DAC's National PARAM Supercomputing Facility (NPSF), PARAM Yuva II has been widely used by scientists and engineers for research. More than 3, 84, 983 jobs have been processed by PARAM Yuva II till March, 2019. About 1138 users including 256 PhD scholars across 115 institutions executed their jobs on PARAM Yuva II for their scientific research covering a large no. of cross functional domains. Utilization of PARAM Yuva II was high throughout the year barring the scheduled maintenance periods as seen from the CPU utilization shown in the figure below.



CPU Utilization of PARAM Yuva II from April 1, 2018 - March 31, 2019

Following plot depicts distribution of jobs with reference to number of CPU cores requested, binned by ranges 1-64, 65-128, 129-256, 257-512, and 513-1024 and above.



Number of Jobs and Job Sizes across Application Research Fields (2018-19)

Deployments of PARAM Shavak

During the year, C-DAC continued to proliferate its PARAM Shavak – A Supercomputer in a Box system of C-DAC at various academic and research institutions across the country to promote HPC literacy. PARAM SHAVAK DL GPU System helps academic institutions and research organizations employ deep learning techniques for GPU accelerated machine learning applications. PARAM Shavak Virtual Reality (VR) System enables collaborative VR experiences come alive and facilitates users to extend their reach beyond the traditional domains of design, manufacturing and entertainment in various areas including healthcare, advertising and education. More than 70 PARAM Shavak systems have been deployed across the country.

Demonstration of PARAM Shavak - VR setup to Hon'ble Minister E&IT

HPC System Software

C-DAC Automatic Parallelizing Compiler (CAPC)

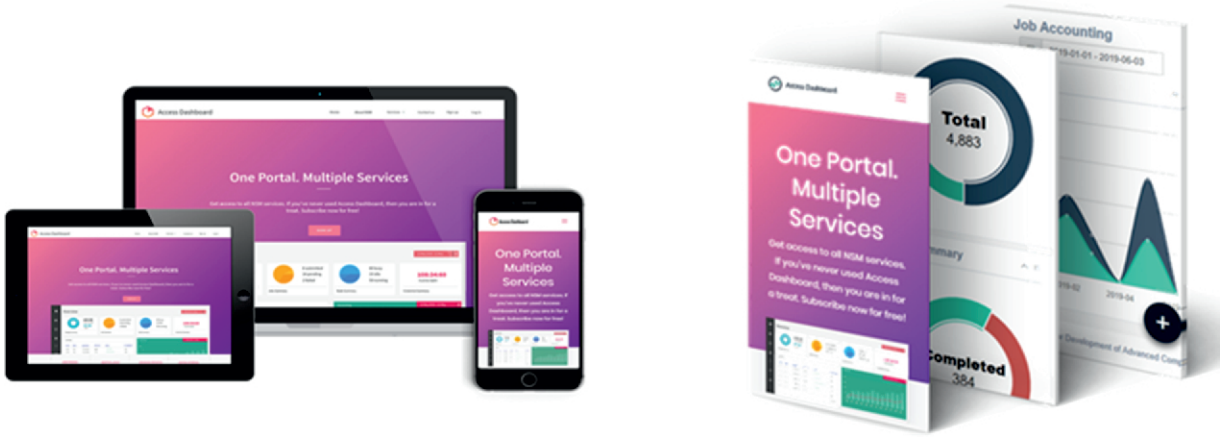
CAPC facilitates making a traditional C program to be parallelized and run on multi-core CPUs and GPUs. It ensures that a C language program is portable across different architectures. CAPC is of great value to novice parallel programmers as they can jumpstart using their C programs on the latest parallel architecture.

SuParikshan – Supercomputer Monitoring and Management

SuParikshan is an indigenously developed light weight software to monitor the health of NSM supercomputer systems. An enhanced version of the software was released during the year. Key enhancements include dynamic card based Graphical Analyser which allows comparison of various parameters to infer the resources' status, usage patterns, cause-effects of changes in the system based on the archived historical information, email escalation of critical alerts to respective system administrators, monitoring of the electrical power consumption and temperature of the HPC cluster nodes and effortless installation, configuration and custom scripts execution by system administrators.

NSM Dashboard

NSM Dashboard provides the environment for all categories of users to use HPC infrastructure for solving important research challenges, learning, experimentation and training. The UI/UX is designed with novel and contemporary ideas so that users can instinctively navigate and solve their problems on the NSM HPC system. Its key features include secure access to all NSM resources/services, seamless integration of all NSM services, job submission, management and accounting, user management, resource management, service management, visualization tools etc.



NSM Dashboard

C-CHAKSHU

C-DAC CHAKSHU is an HPC multi cluster monitoring and management platform developed by C-DAC which enables the effective usage of HPC systems by comprehensive monitoring. It gives real time system infrastructure insights to code developers, system administrators, system architects, HPC users etc. Key features include application performance monitoring and analysis, integrated ticketing system for better user support, real-time 3D system rack view, job accounting and analysis. This was deployed on three HPC systems including PARAM Sangam, PARAM Shreshta and PARAM ShivaY IIT-BHU Varanasi during the year.

C-CHAKSHU - Multi-Cluster Monitoring Platform

HPC Cluster Scheduler

The modern HPC systems contain multiple computational elements having different (heterogeneous/distinct) architecture. Application programs are written to exploit these heterogeneous devices to accomplish the results at a faster pace. These hybrid applications require appropriate resources to be allocated for their execution. The scheduler software takes care of resource tracking, allocation and reclamation of the resources in the HPC cluster.

C-DAC is working on a scheduler software which will help to improve the turnaround time of jobs, resources utilization and power consumption of the HPC Cluster. This scheduling mechanism can be integrated with popular cluster Local Resource Managers (LRMs) present in the HPC cluster.

MLStack- Machine Learning Software Stack

MLStack is a collection of Machine Learning/Deep Learning (ML/ DL) libraries along with its dependencies that provides simple interface for customized configuration, installation and deployment of ML/ DL frameworks. It also provides various case studies to make a novice user use this stack with ease and comfort. MLStack can be deployed on a single desktop machine, on a server and on HPC Cluster with only CPUs as well as HPC Clusters with CPUs and GPUs. During the year, the development of MLStack with default and custom deployment is completed for PARAM Shavak. Development of MLStack for HPC Clusters is under progress.

Supercomputing User Management (SUM)

SUM is a portal application which aids facility managers to manage data of users and take appropriate decision based on data. SUM is enabled with Decision Support modules such as Utilization Report in terms of Graph and Pie Chart, document management and automation etc. This was launched during the event named "Accelerating Biology 2019: Towards Thinking Machines" held at Pune during February 5-7, 2019.

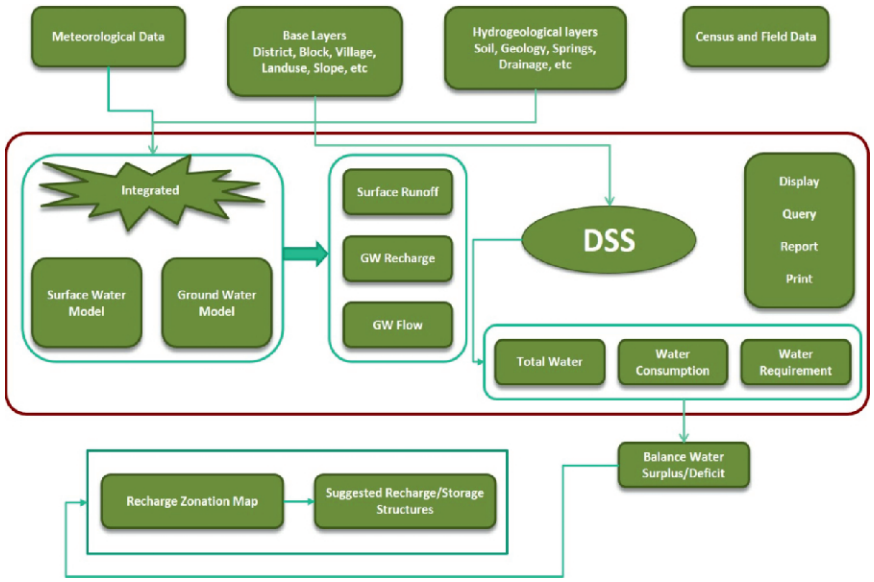
HPC Applications

Panorama Phase II - Marine Forecast Visualization System

C-DAC is developing a GIS based marine weather decision support system that shall process numerical weather and ocean state global and regional forecast output, global observations and satellite images to aid the naval operations at sea. It shall enable user-friendly on-board 2D and 3D visualization of atmosphere as well as ocean forecast for 10 days. Automated system shall facilitate real time data download from multiple sources, database management, state of the art data compression, multi-parameter visualization, extreme event analysis, alerts and real time data dissemination to ships sailing across globe.

Hydrogeological Decision Support System for Water Budgeting in Sikkim

A spatial hydrogeological decision support system (HDSS) named 'Jaldhara' was developed by C-DAC for Water Budgeting in Sikkim using open source software libraries. HDSS was designed to provide the information and run user-defined queries on water budget analyses information. It provides estimates on requirement of water by different strata e.g., population, industrial, livestock and estimation/ projection of water availability, water requirement and water status – surplus/ deficit.



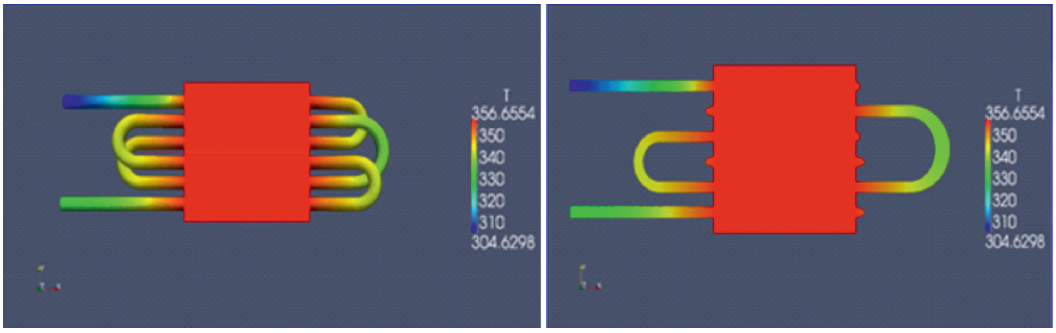
Flow diagram of Hydrogeological Decision Support System

Mangrove Mapping of Coast of Maharashtra

C-DAC is working on an initiative for mapping of Mangrove forests in the coast of Maharashtra. The Mangrove change detection is being carried out with reference to year 2005. The sample plots are being laid down in mangrove forests and necessary measurements are being carried out with respect to species identification and girth and height measurement of trees inside the plots. The species and their associations need to be identified using satellite remote sensing data (LISS IV). Expected outcomes include Mangrove map for the state of Maharashtra (2017-18) and change detection of Mangroves from 2005 to 2017-18.

Development of an Efficient Cooling System for High End HPC Servers

C-DAC in collaboration with IIT Bombay is working on an initiative to design a modular PWC_A&EC (Panel Water Cooler with provision of Air and Evaporative Cooling) and demonstrate the effectiveness of this technology to handle 30 kW heat load generated from a DCLC based HPC system. This also includes design of a modular Coil On-Chip Liquid Cooling System (COC_LC) and demonstration of the effectiveness of this technology to handle heat load from 180W to 360W. A CFD model was developed to analyse the heat transfer behaviour of cold plates using OpenFOAM CFD toolbox. An experimental work carried out by Vishwakarma Institute of Technology (VIT) Pune was used to validate the CFD model. As the model predicts temperature distribution of cold plate reasonably, the model will be helpful to optimize different internal configurations of the cold plate and optimize its operating parameters.



Temperature Contour of Cold Plate Simulation at P=3.41 W

HPC Solutions and Services

During the year, C-DAC was engaged in providing / offering HPC solutions and HPC related services to various agencies. The details regarding some of the engagements are given below.

- C-DAC has signed a turnkey contract with National Atmospheric Research Laboratory (NARL) to establish 1.2 Peta Flop supercomputing system along with support infrastructure at NARL, Tirupati.
- C-DAC has upgraded existing HPC facility at Indian Agricultural Statistics Research Institute (IASRI), New Delhi. Under a joint MOU, it is extending technical support on existing HPC facilities of five domain centres located at National Bureau of Plant Genetic Resources (NBPGR) New Delhi, National Bureau of Animal Genetic Resources (NBAGR) Karnal, National Bureau of Fish Genetic Resources (NBFGR) Lucknow, National Bureau of Agriculturally Important Microorganisms (NBAIM) Mau and National Bureau of Agricultural Insect Resources (NBAIR) Bangalore.
- C-DAC continued to extend consultancy services during the year for Vikram Sarabhai Space Centre (VSSC) in implementing a 2 Petaflop supercomputing facility with 2 Petabytes of High-Performance Storage along with the data centre ecosystem to carry out operational research.

Cloud Computing and Big Data

Cloud Computing

Meghdoot - Software Suite for building Cloud Computing Environment

Meghdoot is a comprehensive cloud suite developed by C-DAC that constitutes free and open source tools across all layers of cloud. During the year, the Meghdoot cloud suite was enhanced with OpenStack Queens version and management and security related features were added. Key features include high availability for controllers and services, enhanced security, Software Defined Networking (SDN) and Network Functions Virtualization (NFV) functionalities. Meghdoot was deployed at Assam Society for Comprehensive Financial Management System (AS-CFMS) Dispur and Tripura State Data Centre Agartala. Deployments are under progress for Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO) Chennai and Indian Financial Technology & Allied Services (IFTAS) Hyderabad and Mumbai.

Big Data

C-DAC's Big Data Software Suite (C-BDSS) for PARAM Shavak

C-BDSS is an open source platform that provides with the processing and analysis capabilities to run Big Data applications in varied domains. C-BDSS integrates big data tools and technologies that allow to address the spectrum of big data challenges with ease and comfort. It enables novice users to leverage the full power of Hadoop and its ecosystem components including Spark,

which accelerates the path to informed decisions. The platform blends the Big Data technologies that are well suited for structured, unstructured and streaming data. C-BDSS relieves the users from the task of setting up the Big Data Analysis lab, in turn allowing them to address the target applications more actively. This abstraction provides users from novice to expert level, a fast and flexible platform for adhoc data exploration, discovery and analysis. The suite also packages a good set of use cases and the corresponding sample datasets to gain initial exposure. CBDSS for PARAM Shavak was deployed at JIS Foundation Kolkata during the year. Development of C-BDSS for HPC Clusters is under progress.

TANGO

TANGO (high Throughput conformAtioN Generations and Optimization) is a conformation generation and optimization tool developed by C-DAC which uses semi-empirical energy calculations. The energy calculations are performed using MOPAC. The unique feature of this tool lies in the implementation of MPI for conformation generation and optimization. A well- defined architecture handling the input and output generation has been employed. This was launched during the event named "Accelerating Biology 2019: Towards Thinking Machines" held at Pune during February 5-7, 2019.

TANGO - high Throughput conformAtioN Generations and Optimization

Genovault

Funded by Department of Biotechnology, Genovault is a software for Genomics data repository using cloud computing approach. During the year, data types and formats of available public domain repositories such as Short Read Archive (SRA) at NCBI and European Nucleotide Archive at EBI were analysed by C-DAC. The huge genomics data storage and management is possible with this initiative.

Personal Health Train for Radiation Oncology in India and the Netherlands

C-DAC is working on an initiative called "personal health Train for RAdiation oncology in India and the Netherlands (TRAIN)" that unites academic, industrial and clinical leaders to improve care for cancer patients via Big Data science. TRAIN focuses on head and neck cancer, which is a societal challenge both in India and the Netherlands due to its disappointing outcomes, practice variations, high incidence and the level resources needed for diagnosis and treatment. TRAIN will address this challenge by the introduction of Decision Support Systems that can predict which treatment leads to an optimal outcome given the individual patient characteristics and local diagnostic and treatment capabilities.

Molecular Tailoring Approach for predicting structures of large molecules on HPC Clusters

C-DAC is working on an initiative that aims at predicting structures of large molecules using Divide and Conquer approach named as MTA (Molecular Tailoring Approach). The objective of this initiative is to make this HPC application available to the user community through PSE (Problem Solving Environment) developed by C-DAC.

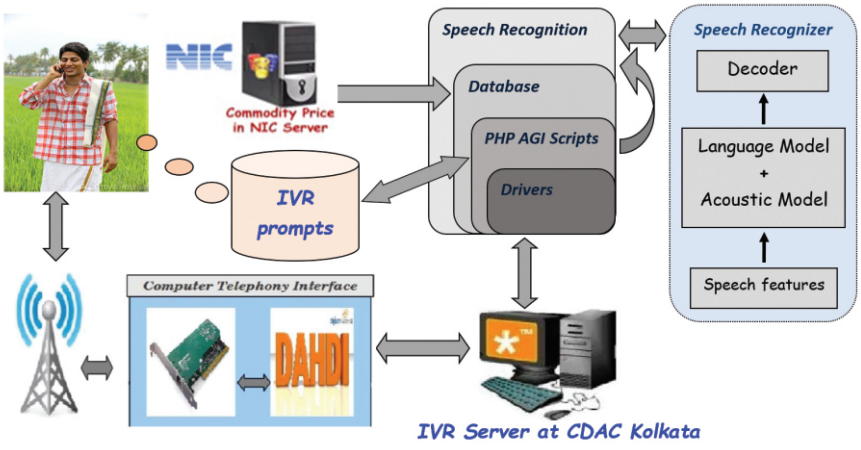
Multilingual Computing and Heritage Computing

Artificial Intelligence techniques have been effectively applied by C-DAC towards development of useful language computing solutions. R&D in the area of speech technologies, translation systems, optical character recognition, development of web/mobile based language tools, cloud-based language services, assistive technologies for differently abled, cross-lingual search, Internationalized E-mail, testing and evaluation systems and digitization. Significant contributions of C-DAC in these areas are covered in the sections below.

Speech Technologies

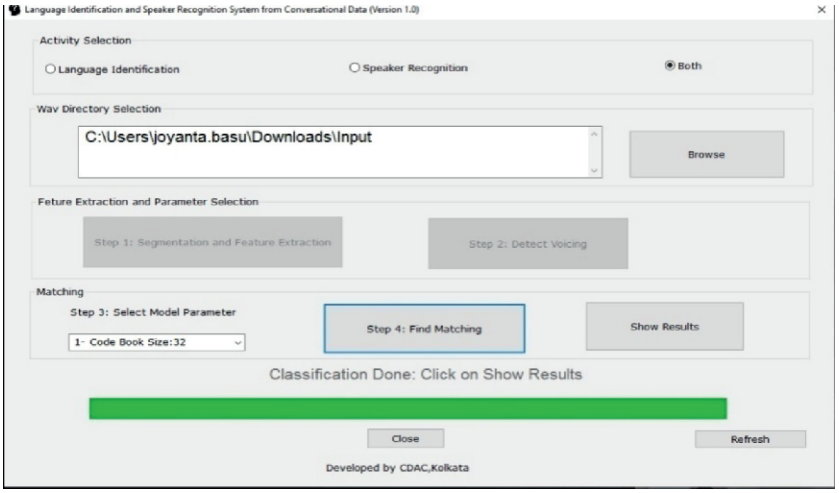
Speech-based Access for Agricultural Commodity Prices & Weather Information in Bengali Language

As part of ASR consortium, system has been developed for real-world telephony spoken dialogue system that provides Market wise commodity prices information enlisted in AGMARKNET and district wise weather information enlisted in IMD to farmers in Bengali.



Deployment of Automatic Speaker Recognition and North-East Language Identification System

Automatic Speaker Recognition System has been developed for conversational speech data that has the capabilities such as (a) Automatic Segmentation to detect different segments of speech of multiple speakers, (b) Language Identification to identify spoken languages automatically from North-Eastern states and (c) Speaker Recognition towards validating the diarized speech data.



Speaker Recognition System

Translation Workbench for English to KokBorok and Bangla

Developed system is a MAT based Workbench to assist professional translators for quick translation of different texts written in English to Bengali and KokBorok. To enable users with their preferences/corrections for future modifications of the translation various features including Translation Workbench, Personal Translation Memory, Global Translation Memory, Named Entity and Constant marking facility, modules like Personalized Translation Memory (PTM), Global Translation Memory (GTM) have been incorporated. The system has been installed at Womens' College, Tripura.

Speech-to-Speech MAT based Dialogue System from Hindi to Indian Languages

Under the Speech to Speech (S2S) translation initiative, Hindi S2S system has been developed. As part of MAT, developed Malayalam Morph Analyzer, Malayalam Morph Synthesizer, Malayalam-Hindi Lexicon containing 1990 words, Hindi-Malayalam parallel corpus – Sentences and Malayalam-Hindi Transliteration. As part of Speech developed components for isolated word recognition system for Flight Information, web interface for speech corpus collection and web based limited vocabulary speech translation Interface supporting five languages.

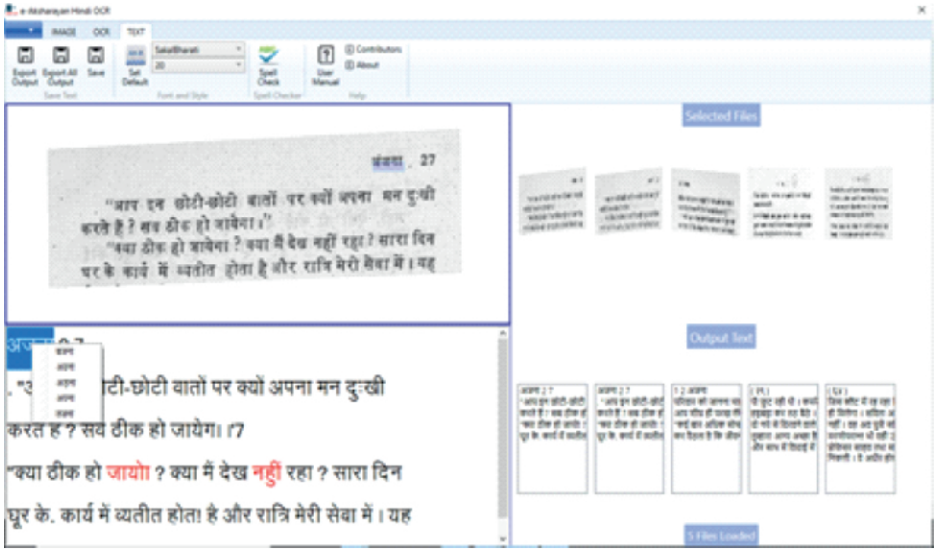
Speech Corpora

Created for Indian Languages covering Hindi, Bengali and Indian English to support various speech solutions like Automatic Speech Recognition Systems and Text to Speech Systems for Indian Languages.

Language Tools

e-Akshrayan - Indian Language OCR

e-Aksharayan is an Indian language OCR standalone software bundled with pre-processing and post-processing algorithms providing end-to-end solution and supports Assamese, Hindi, Bangla, Tamil, Malayalam, Kannada, Gurumukhi and Oriya languages. E-aksharayan was released at Bhashantara: The Symposium for Indian Languages Technology Industry, on July 2018.



e-Akshrayan - Indian Language OCR

LILA Hindi Pravah on Mobile (Android and iOS) and Web platforms

LILA Hindi Pravah is a Web & Mobile based intelligent self-tutoring system for Hindi specially designed for people who are interested to learn Hindi. Instructional medium of languages includes English, Assamese, Bodo, Bangla, Gujarati, Kannada, Kashmiri, Malayalam, Manipuri, Marathi, Nepalese, Odia, Punjabi, Tamil and Telugu. The system was launched by Hon'ble Vice-President of India Shri Venkaiah Naidu during the Hindi Divas Samaroh function on 14th September, 2018 at VigyanBhavan, New Delhi.

LILA Hindi Pravah on Mobile (Android and iOS) and Web platforms

Translation Memory Based English to Hindi & vice-versa Translation System ()

"Kanthasth" is a Translation memory system that allows a translator to re-use the already translated segments while translating a new file, either through complete match or partial match. Language database gets continuously enriched with each subsequent use of the system for translation purpose. This system is made available to all by Department of Official Language, Ministry of Home Affairs, and Government of India. The system was launched by the Shri Kiren Rijijuji, Hon'ble Minister of State for Home Affairs, Government of India, on 20th August, 2018.

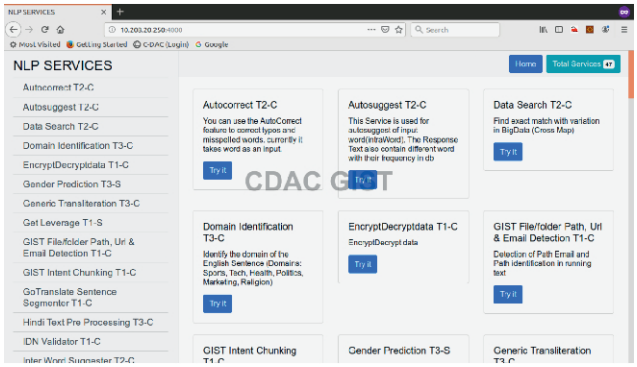
Translation Memory- कंठस्थ

Hindi to English Machine Translation System (HE-MAT) for judicial domain

As part consortia-based project, C-DAC has developed web-based Machine Translation (MT) System from Hindi to English language for Judiciary. This system is enriched by various tools and engines such as Neural Machine Translation, Input Format Extractor, Morphological analyser (MA), Part of Speech tagger (PoS), Named Entity Recognizer (NER) and Post Processing Tools.

Cloud based NLP Services

Developed AI and ML based cloud based Natural Language Processing (NLP) services under one umbrella.



Cloud based NLP Services

Cloud NLP services offers various services such as Spellchecker, Sentence Similarity, Transliteration, Auto-complete, Synonym, Named Entity Recognition, Gender prediction, Text compression, Intent Chunking, Synonyms, Sentence Analysis and Sentence on web.

Enhanced Transliteration Engine for 19 Indian Languages

Transliteration engine both forward transliteration (i.e. English to Indian Language) as well as reverse transliteration (i.e. Indian Language to English) has been developed. Supported languages are Assamese, Bengali, Bodo, Gujarati, Hindi, Kannada, Konkani, Maithili, Malayalam, Manipuri, Marathi, Nepali, Oriya, Punjabi, Santhali, Sindhi, Tamil, Telugu and Urdu. As rule-based transliteration systems has limitations, C-DAC has also developed deep learning-based transliteration solutions.

Auto-Complete of words for Indian Languages

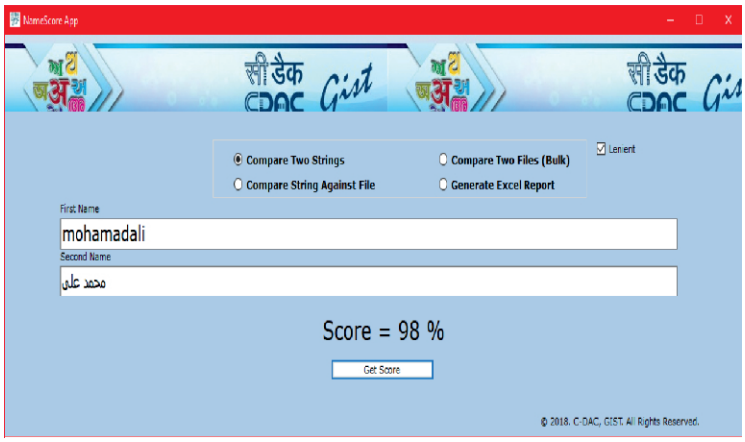
A new engine for Auto-Completion of words in English as well as Indian Languages has been developed for all scheduled Indian Languages including the alternate scripts. The engine provides suggestions to the user as (s)he is typing text in his or her language.

Gender Identification from textual names

Developed system for that can identify gender from the textual name entered in English which is very useful when one is filling online forms. The performance of this module is 84% on million names.

NameScore for Urdu

Towards solution for de-duplication, C-DAC has developed a tool called NameScore for getting the similarity score between 2 names, where the names may contain one or more of first name, middle name, surname, salutations, information like 'son of', 'wife of', initials, aliases, etc. The closer the match, higher the score. The tool is capable of doing cross-lingual comparison of names.



NameScore for Urdu

NameSearch for all Indian languages

Developed tool for real-time searching of a name in a large database. It is especially more challenging when both English and Indian languages have to be searched at the same time. A mechanism has been developed to achieve this cause of finding names variants in both English as well as Indian languages.

Malayalam Spell Checker: Akshara

Developed Malayalam spell checker which can identify the spelling mistakes and give suggestions for the spelling. It is a hybrid spell checking system making use of FST algorithm and dictionary-based approach for spell checking. Tool was launched by Shri. A. K. Balan, Kerala Cultural Minister on March 8, 2019.

Document & Workflow Management System for Social Forestry Department

Developed Web based bilingual (English and Marathi) document management system to manage textual documents/data throughout their lifecycle, right from inception stage through creation, review, storage and finally disseminate all the way to their destruction. The system supports English and Marathi languages.

Transliteration solution for NRC Assam

The National Register of Citizens (NRC) is the register containing names of Indian Citizens. C-DAC has provided English to Assamese, Bangla & Bodo transliteration solution for NRC Assam portal (https://www.assamnrcdraft.com/) for collection of citizen details.

Development of Text to Speech System (TTS) in Indian languages - Phase II

C-DAC has developed Small foot print TTS running on android based mobile platforms and improved the quality of earlier system by incorporating stress intonation and duration modeling. The same has been integrated with open office and internet browsers through SAPI compliant TTS and is customized both for visually challenged persons and persons with cerebral palsy.

Implementation of Scheme for IT Solution for Sufal Bangla along with Sufal Bangla Project Management Unit, Govt. of West Bengal

C-DAC is engaged in the implementation of Scheme for IT Solution for Sufal Bangla to help the farmer's get premium price and have rational share in consumer's price, by way of mobile app and website. Activities include, IT support from quality Control Laboratory, setup of new Quality Control Laboratory, infrastructure structure support at different Sufal Bangla stores (moving / fixed) for central monitoring system.

The overall system has evolved as One Stop Solution including Web based platform for data entry for pricing, receiving, dispatching, stock, accounting, asset management, online order booking & home delivery (APP based) etc.

Modernization of Traditional Knowledge Digital Library along with CSIR-TKDL Unit

Developed software tools for digitizing and providing access to the traditional medicinal knowledge of Indian Systems of Medicine viz. Ayurveda, Siddha, Unani, Sowa Rigpa and Yoga in five international languages with the help of modern ICT Technologies.

Integration of 13 Indian language TTS systems with screen readers

C-DAC along with IIT Madras is engaged in the integration of Indian Language TTS for Microsoft Windows, Linux and Android platform to address the accessibility issue for visually challenged people. Deployment of TTS as API/Integration as web services with 50 Govt Websites has been carried out

Printed Text Image to Editable Format for books in Odia Virtual Academy

Carried out development and implementation of ODIA OCR for ODIA Virtual academy for Odisha Government at Bhubaneswar.

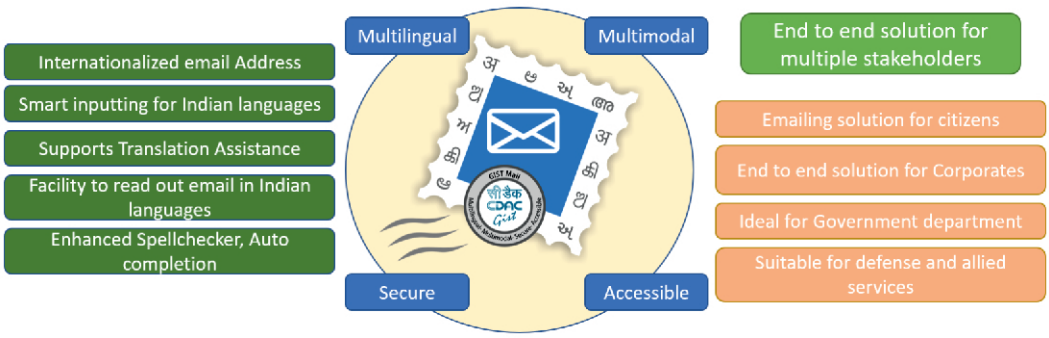
Language Translation of SWAYAM courses

C-DAC in association with IIIT Hyderabad, is developing system for language translation to generate multi-lingual subtitled and transcripted versions of video lecture available through SWAYAM portal. This involves transcribing the video with English text, translation of English text to - Hindi, Bengali and Gujarati.

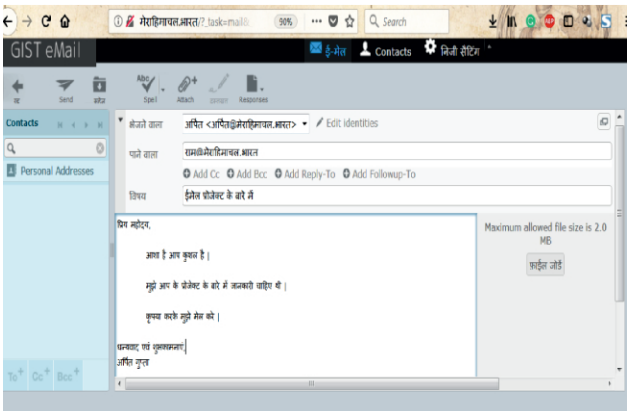
GIST-Mail: An E-mail Solution from the pioneers of IDNs in India

https://www.gistmail.in/or https://जिस्टमेल.भारत

C-DAC has been a pioneer in the area of Internationalized Domain Names in India and participated in the ICANN forums and working groups to ensure that Indian language nuances vis-à-vis IDNs have been properly addressed by the various Registry implementations as well as all the registries coming under the NewgTLD program. C-DAC has come up with its very own implementation of an E-mail solution that is born compliant with the Internationalized E-mail requirements. Compatible with Various E- Mail clients on Mobile and Desktop such as Thunderbird, popular email server having support.



Features of Gist Mail



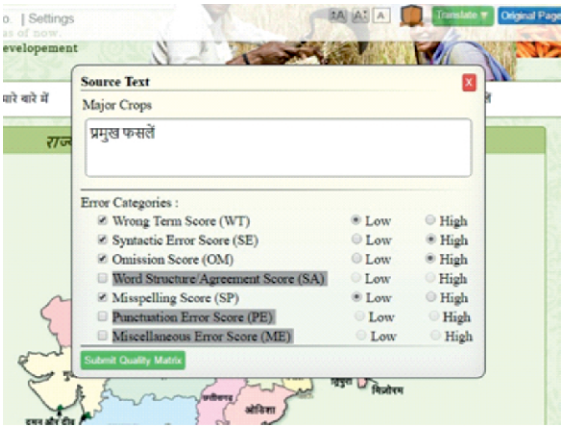
Gist Mail

Localization of the Brownfield Projects of Government of Andhra Pradesh.

Deployment of C-DAC's Go-Translate Localization Framework, Transliteration services from www.gisttransserrver.in, Keyboards, GIST-Namescape tool for name comparison for Govt. of Andhra Pradesh has been carried out. The framework is now hosted in AP data centre / equivalent. It has been integrated in 100+ Andhra Pradesh State Government portals including the Chief Minister's Dashboard.

Machine Translation evaluation Quality Metric

The final draft standard on "Machine Translation Acceptance" (version 7.0) vetted on prepared 100 sentences benchmark test data. This exercise was carried out for English to Hindi for various translation systems for tourism and health domain, with the help of 2 evaluators.



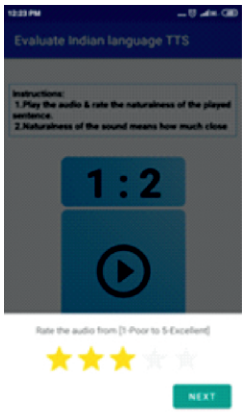
Machine Translation evaluation Quality Metric

Testing and Benchmarking Solutions and Services

C-DAC is carrying out Testing and Benchmarking of TDIL Funded Project Outcomes such as Morphological Analyzer Test Data, development of testing tools for TTS, evaluation of synthetic speech for android, development of standards for Machine Translation Acceptance, ILCI Text corpus Evaluation, TTS Male and Female voices evaluation and Speech Based Access for Agricultural Commodity prices (ASR).

Login screen

Evaluation screen



Rating screen

Assistive Solutions for differently-abled

Speech based Assistive Aids in Bangla for Visually Impaired People of Tripura

Towards assistive technological aid in local vernacular and the empowerment of the visually impaired section of the society, C-DAC has developed speech-based solutions such as Automatic speech recognition in Bangla and Bi-lingual Talking Keyboard.

Speech recognition or voice recognition system, allows users to issue commands and enter data using their voices rather than using a mouse or keyboard. Voice recognition systems use a microphone attached to the computer, which can be used to create text documents, browse the Internet and navigate among applications and menus by voice.

Bi-lingual onscreen talking keyboard is used to type both Bangla and English text along with Bangla pronunciation facilities to help visually challenged people to prepare the desired document with minimal effort and error.

e-Learning solution for specially-abled students

e-Learning Tool based on Indian Sign Language using Parts of Speech is a unique application software developed in collaboration with Eastern Regional Centre (ERC) of Ali Yavar Jung National Institute of Speech & Hearing Disabilities (AYJNISHD), Mumbai where commonly used English word's meaning and its usage in a sentence in the form of different parts of speech are demonstrated using Indian Sign Language.

ISL Grammar Guide

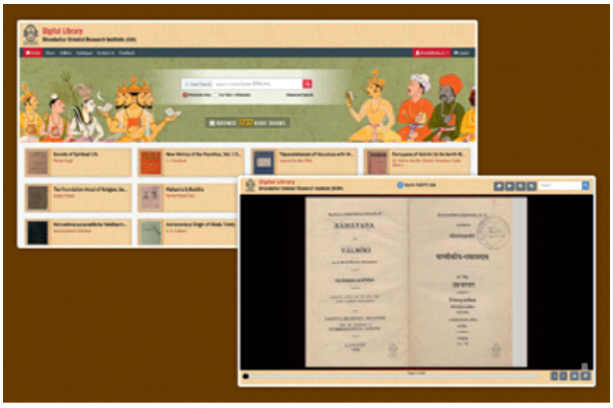
Digital Preservation and Heritage Computing

Museums and Archives in North East states

Deployed JATAN Virtual Museum Builder, DIGITĀLAYA (डिजिटालय) software and DARSHAK Mobile App for various museums and archives in the north east states. Mobile Tourist Guide App supported by crowd sourcing framework, north east heritage portal providing coverage to heritage monuments, arts and crafts and a SMART Museum pilot comprising of interactive exhibits is being currently developed.

DIGITĀLAYA (डिजिटालय): e-Library and Archival System

C-DAC has designed and developed the rare books digital library of The Bhandarkar Oriental Research Institute (BORI), Pune which is powered by DIGITĀLAYA (डिजिटालय): e-Library and Archival System. BORI digital library uses Large Scale Data Processing (LSDP) setup on cloud has been used to process the rare-books for noise-removal, OCR, image resizing, thumbnail generation and image water-marking as part of ingest process.



e-Library and Archival System

Digitization of Old Records including Repository & Retrieval System

C-DAC is engaged in developing solution for preservation of old documents and digitization of 6 lakhs pages from key records/documents for IIM, Kolkata. The search engine supports Extended Dublin-Core based Metadata standard. The data can be accessed either locally through any computer connected in the same network or through the Internet if required in later stage.

Solution for Rail heritage document centre

Digitization of rarest of rare Rail documents, Paintings, Drawings which will add high heritage value to Indian Railways has been carried out for National Rail Museum and Rail Museum Tiruchirapalli along with National Rail Museum and Rail Museum Tiruchirapalli.

Professional Electronics, VLSI and Embedded Systems

C-DAC's expertise in the design, development and implementation of VLSI Systems, IoT solutions, microprocessor, microcontroller and DSP hardware and software technologies is powering various national level initiatives/projects and has large scale commercial potential. Primary areas of focus under Professional Electronics include Smart System Solutions, VLSI and embedded systems, Security and Surveillance, Medical Electronics, Agri-Electronics, Industrial Automation Systems, Advanced Wireless Communication Systems, Power Electronics, Strategic Electronics and Intelligent Transportation Systems.

National Level Initiatives

Microprocessor Development Programme (MDP)

The project "Microprocessor Development Programme" has been approved by MeitY and being executed by C-DAC over two phases. Phase-I of the project has been completed, which involved microarchitecture design, development and verification of the 64-bit quad core processor comprising of 64-bit superscalar out-of-order RISC-V processor core with FPU, L1 Caches, MMU, Coherent Interconnect, Interrupt controller and L2 Cache. The 64-bit quad core processor has also been validated on an FPGA platform, Linux booted and benchmark programs, image processing applications viz. face detection, object detection, etc. have been executed.

Phase-II of the project involving design, implementation and fabrication of SoC ASIC based on the 64-bit Processor targeting embedded applications is in progress. A full ecosystem including hardware boards, device drivers and software will also be made available.

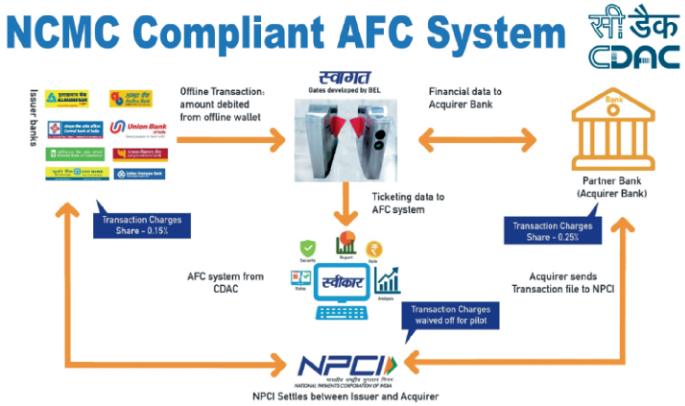
Emergency Response Support System (ERSS)

Emergency Response Support System (ERSS) is an initiative of Ministry of Home Affairs, Government of India, to implement an integrated system that provides a common platform to receive distress signals in the form of voice, message, email, panic signal etc. and to dispatch to various services like Police, fire rescue and health. The common single number 112 is designated for this purpose.

C-DAC has completed implementation of ERSS in Himachal Pradesh, Nagaland, Punjab, Andhra Pradesh, Uttarakhand, Kerala, Uttar Pradesh, Madhya Pradesh, Telangana, Tamil Nadu, Gujarat, Mumbai, Rajasthan, Dadra Nagar Haveli, Daman & Diu, Andaman & Nicobar Islands, Jammu & Kashmir, Puducherry, Lakshadweep and Chhattisgarh and shall be implementing in additional states/UTs. The ERSS/112 India App developed by C-DAC has been released by Shri Rajnath Singh, Hon'ble Union Minister of Home Affairs on February 19, 2019.

Sweekar – Automatic Fare Collection System (AFC)

Automatic Fare Collection System (AFC) and Validation Terminal is designed as an interoperable fare management system which provides a solution to the passengers / commuters while transit in all kind of transportation. The Automatic Fare Collection system - Swagat (Gate) and Sweekar (Software for control, fare collection and settlement with banks) has been jointly developed by C-DAC and Bharat Electronics Limited (BEL) with support from Delhi Metro Rail Corporation (DMRC), National Payments Corporation of India (NPCI) and State Bank of India (SBI) under the guidance of Ministry of Housing and Urban Affairs (MoHUA). This is India's first indigenously developed payment Ecosystem for transport. The system being developed has been deployed in DMRC across few stations for field trials. Shri Narendra Modi, Hon'ble Prime Minister launched the National Common Mobility Card (NCMC) based AFC System, internationally at the Vastral Gam Metro Station in Ahmedabad on March 4, 2019.



NCMC Compliant AFC System

Intelligent Transportation Systems

PeSCo - ITS Solution for Pedestrian Safety Enhancement

C-DAC has developed Pedestrian Safety Enhancement Controller (PeSCo), an accessible controller which gives variable green signal timings for the pedestrian walk based on pedestrian demand. PeSCo is capable of identifying the category of pedestrian demanding for green signal through different input devices viz. Pushbutton Switch, RFID tags and Smart Canes using Ultrasonic (US) transceiver as a navigational aid for visually challenged. When a demand is received, pedestrian green time is executed as appropriate for the input device and the category of pedestrian. Visual and audio indications are provided to the pedestrians to wait for their signal and updated with the appropriate slot for safe crossing. Pedestrian safety enhancement controller, PeSCo is a 32-bit microcontroller-based, accessible controller having distributed architecture. It consists of a Controller and Sensor Unit (CSU), and Sensor Unit (SU).

PeSCo

Smart System Solutions

SPK- Smart Post Kiosk

C-DAC has developed Smart Post Kiosk (SPK) for the purpose of enabling the public to post their speed post and registered documents from anywhere in the country round the clock and thus eliminating the need to approach a post office. This product shall enable India Post to serve 24x7 booking of speed post and registered post services. This is a self-serviced kiosk which has an easy touch-based user interface. Weight of the item to be posted and tariff will be calculated automatically and the user will get a provision to pay online using any mobile application. The article will be stored for dispatching after successful payment and an acknowledgement receipt will be issued. A dash board is developed for the administration and can be used to verify the status of the kiosk at any time.

Smart Post Kiosk

Smart Energy Performance Monitoring for Airport Terminal Buildings in India

C-DAC in collaboration with IIT Roorkee is developing a Research Framework and performance monitoring protocol for Energy & Indoor Environmental Quality (IEQ) evaluation in airport terminal buildings of India. The system shall support capabilities such as characterize real-time energy consumption, Scenario Analysis through Calibrated Simulations and Smart monitoring and control.

IOT Solutions and Sensing

Systems and Solutions for Smart Cities, using Internet of Things

The overall aim is to develop technologies and solutions that can be incorporated in cities, to render it smarter. Prototype solutions will be demonstrated as part of the project. Initially it is planned to address 4 major application services for the city, namely

a) Smart Utilities: Waste Management Systems, Water Distribution Systems and Electrical Distribution Systems
b) Smart Mobility: Smart Transportation Management Systems and Emergency Services
c) Smart Environment: Air and Noise Pollution and City-Wide Surveillance Networks
d) A cloud-based framework: To standardize sensor data input and serve as a host for data analytics and user dissemination.

GLOWSENS - Global and local water quality monitoring by multimodal sensor systems

GLOWSENS carries out analysis on water bodies using big data generated from small analytical devices. This high throughput data acquisition may serve as the auxiliary data bank that can be useful for applications in health and environment. Interactive and high throughput approach to instrumentation may enable to conduct the experiment such as change in water pollution level in case of an earthquake, solar or lunar events involving multinationals.

SWISS - Safe Water Index Sense using biochemical Sensor

'SWISS' is an innovative system towards real-time monitoring of aquatic environment by detecting series of contaminants through Biochemical Sensory Array Device (BSAD). This integrates multiple modules in a single platform including Sample Module (SM) and Analysis Module (AM). The 'Sample Module' comprises of sample collection and its pre-treatment whereas 'Analysis Module' includes biochemical sensory module to enable detection of hazardous heavy metals (Lead, Cadmium, Zinc, Copper). Further Analysis Module shall contain real-time data processor, transfer and alarming system whenever some critical value exceeds the pre-defined threshold value. The instant "Water Health Index" can be displayed, and an elaborate result can be shared with the stakeholders through the network.

Forest Fire Detection in India's North East States

Solution to monitor and detect forest fire in real time with the help of wireless senor network and drone in the fire prone regions of the North Eastern states is being carried out for forest area of Mizoram state. It shall monitor forest environment 24/7 using Wireless Sensor Network, detect outbreak of forest fire using drones and disseminate the information in real time to forest officials (mitigation team) to act promptly. The implementation site has been identified and preliminary study has been carried out for setting up the Wireless sensor network and deploying drones to detect fire in the area.

Security and Surveillance

Solutions for Bureau of Civil Aviation Security (BCAS)

C-DAC and Electronics Corporation of India Ltd. (ECIL) have developed the centralized Biometric Access Control System for BCAS which is first of its kind to automate the pan India processes of Airport Entry Permit (AEPs). The security of various Smart Cards including Authority Cards, AEPs and Access Control reader module is controlled through a Key Management System developed by C-DAC. The Ministry of Civil Aviation (MoCA) has launched the Biometric Access Control System for issuance of biometric enabled smart card-based AEP on January 18, 2019 at Safdarjung Airport, New Delhi.

Visitor Flux Monitoring System

C-DAC has developed a Visitor Flux Monitoring system. The system is currently ready and likely to get deployed at Shree Somnath Trust and Mahalaxmi Temple. The Visitor Flux Monitoring system apart from providing feedback to re-organize / re-route the crowd, takes into consideration the crowd behaviour as well. The system monitors the crowd behaviour to detect a set of abnormal/suspicious activities and carries out head count towards effective crowd management.

Agri-Electronics

CT-VIEU – A Conveyorised Machine Vision Solution for Quality Estimation of Dry Red Chilli

CT-VIEU is a computer operated, conveyorised system based on machine vision solution for appearance-based quality analysis of dry red chilli. The system comprises of a hopper with automated vibratory spreader, a conveyor belt and electro-mechanical arrangements to control the speed of the conveyor and a vision inspection unit. Image analysis techniques have been implemented within the software to analyse the quality parameters of dry red chilli sample. An interface has been developed to transfer the quality analysis data to the remote server to display in the National Agriculture Market (eNAM) website.

CT-VIEU

Total of 10 Units have been deployed at various locations including Agricultural Produce Market Committee (APMC), Hubli, Karnataka, Tamil Nadu State Agricultural Marketing Board, Chennai and Agricultural Market Committees at different parts of Andhra Pradesh.

Apple^{Sense} – An Integrated system for quality analysis of Apple

Apple^{Sense} is a system for quality inspection of Apple fruit based on acoustic sensing and digital image processing technologies. System comprises of two compartments, namely acoustic compartment and vision compartment. In acoustic compartment, microphone has been placed just behind the sample holder. When a Teflon hammer hits apple, generated sound signal is captured using the microphone. This sound signal is analysed and features are extracted from which the firmness of the apple is calculated. Vision compartment has a low-cost camera which captures the images of apple surface and perform size, shape and colour analysis.

Apple^{Sense}

Vision Software

Digitally Inclusive and Smart Community (DISC)- Agriculture

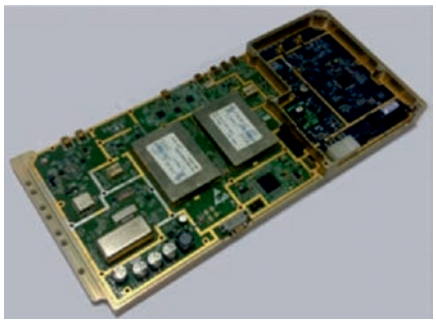
As a part of Digital India initiative, DISC-Agriculture has developed and implemented various solutions such as agri quality instruments, e-auction system and automated green house. Developed weather information and agri-advisory services have been deployed in selected states supporting regional languages.

Meeting of Hon'ble Minister E&IT on 4th August 2018 with C-DAC Kolkata Officials

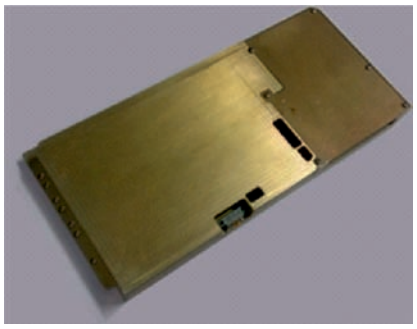
Advanced Wireless Communication System

Wideband RF module at V/UHF band (VUHF TXRX)

Wideband RF Transceiver module is designed for Software Defined Radio (SDR) applications and is capable of operating in the frequency range of 2 MHz to 2 GHz and supports frequency hopping up to 500 Hops per second. This product is the result of a completely indigenous and in-house design and development. Further, a customized version of the Wideband RF Transceiver was supplied to DRDO in March 2019.



Wideband VUHF Transceiver



Fully assembled unit with shield

Industrial Automation

Real-Time Energy Assessment System for effective Grid Management

C-DAC has developed and implemented the Real Time Energy Assessment solution (REAL) project across various states of North East Region namely Assam, Manipur, Meghalaya, Arunachal Pradesh, Mizoram, Nagaland, Tripura. TARA (Transmission of Aggregated data for Real time Access) GSM devices were designed and developed for implementing the Real Time data acquisition. The solution acquires Availability Based Tariff (ABT) meter data from substations and transmits it to the control centre for real time monitoring, deviation settlement and billing.

Power Electronics

National Mission on Power Electronics Technology (NaMPET)

NaMPET Phase-II has been successful in establishing a good network of Power Electronics community including Academic institutes, Industries, R&D institutions and Power electronics professionals in the country. The knowledge base of Academia and the R&D expertise are effectively utilized for commercialization of technology through industries. Several technologies have been developed for Power quality, Embedded Control and Smart Grid etc. Eight Technologies were commercialized by transferring the technologies to fifteen Industries and two Academic institutions. NaMPET Phase-III is approved by MeitY which shall focus on "New horizon in Power electronics", "Deployment of NAMPET technologies" and "Application oriented development".

Software Technologies including FOSS

C-DAC carries out development and deployment of various software solutions in the areas of e-Governance, Free and Open Source Software (FOSS), E-Learning and Social Development etc. under Software Technologies Including FOSS thematic area. Details of activities carried out by C-DAC during the year in this thematic area are given below.

e-Governance

e- Governance Platforms and Frameworks

e-Pramaan: A National e-Authentication Service along with Aadhaar

e-Pramaan (https://epramaan.gov.in/) is a uniform standard based national e-authentication service developed by C-DAC to authenticate users of various Government services in a safe and secure manner for accessing services through desktop as well as mobile. It provides various authentication mechanisms such as password based, OTP based, digital certificate based and biometric (fingerprint) based. Another major component of e-Pramaan is Aadhaar Ecosystem. C-DAC is ASA – AUA/KUA of UIDAI to provide Aadhaar services and is compliant to UIDAI's latest API and specifications. During the year, 59 departments were integrated and 2.36 crores transactions were completed as part of this initiative. A total of 231 departments have been integrated and 8.6 crores transactions have been completed as part of this initiative till March, 2019.

eSangam: e-Governance Services Integration Framework

eSangam is a Service Oriented Architecture (SOA) based constellation of National and State eGovernance Service Delivery Gateways. eSangam (NSDG) is a Mission Mode Project under NeGP and is currently in its second phase that started on July 7, 2015 for a five-year duration. eSangam being a middleware, facilitates service integrations and message exchange between integrated departments. PoC of integration of UMANG platform with eSangam for J&K services was carried out during the year. Total transaction count for various eSangam related services during the year was 1,34,38,978.

Mobile Seva: A National Mobile Governance Platform

As part of government's m-Governance initiative, Mobile Seva centralized infrastructure platform was created by C-DAC for enabling Government departments to offer the public services through mobile devices across various mobile-based delivery channels such as Short Message Services (SMS), Voice / Interactive Voice Response System (IVRS), Unstructured Supplementary Service Data (USSD) and mobile applications (m-Apps). A total of around 4200 Government departments and agencies across the country have integrated their services with Mobile Seva platform. Mobile Seva Platform provides Appstore which hosts mobile applications developed for govt. departments. The AppStore currently hosts over 987 mobile applications of various state and central government departments. Their applications can be downloaded and installed on a mobile phone free of cost by any person.

Field Testing and Device Certification of Biometric Devices for Aadhaar Authentication

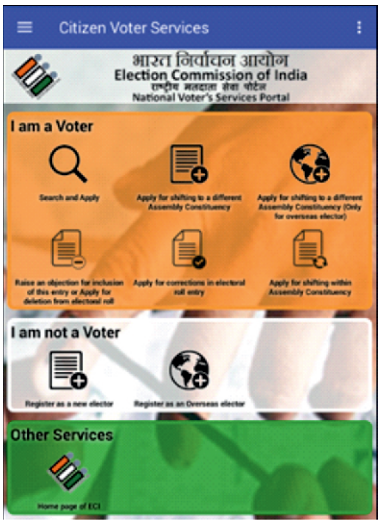
C-DAC in collaboration with STQC has been carrying out field-testing of Biometric devices for Aadhaar authentication. As part of the certification procedure of biometric devices for Aadhaar authentication, all participating devices need to prove acceptable False Reject Rate (FRR) under field conditions. Four rounds of Field Testing have been done on 5000 live Aadhaar holders per round with over 132 biometric devices (Fingerprint and Iris) where each device certification is against the sensor's make/model, SDK and Vendor. C-DAC is also carrying out FRR testing of the biometric devices under the "Provisional Certification of Biometric devices Scheme of STQC". Testing of four devices (Fingerprint and Iris) has already been completed at C-DAC Mumbai premises under the supervision of STQC officials over a human test population of size 100.

e-Governance Applications and Services

National Roll out of e-Services of Election Commission of India (ECI)

National Voters Services Portal (NVSP) developed by C-DAC assists voters and provides information related to elections, polling booths and electoral rolls. During the year, NVSP including ERO-Net was migrated on VMWare and the same has been made live. ERO-Net caters to various forms filled by citizens either online or offline and provides a decision support workflow and system for ECI officials. Development, testing, deployment and launch of ERO-Net platform for several States was completed during the year. An android based application has been developed to carry out form processing operations by Electoral Registration Officers (ERO), Assistant Electoral Registration Officers (AERO) and supervisor for various form types such as Form 6 for registration of new voter or due to shifting from AC, Form 6A for registration of overseas voter, Form 7 for

deletion or objection in electoral roll, Form 8 for Correction of entries in electoral roll and Form 8A for transposition within Assembly. PwD application has also been designed and developed for PwDs (Persons with disability) to request for voter facilitation. Security features have been added for Citizen Voter Services App and the app has been uploaded on m-gov application store. Open Source Support Ticket System, OsTicket is used to provide helpdesk support.



Citizen Voter Services App

Unified Portal for EPFO

C-DAC has developed a unified portal for Employees' Provident Fund Organization (EPFO) that caters to different processes of the establishment life cycle such as registration of establishments, registration of members, handling their various types of claims, which include transfer claims, advance and settlement claims and filing of returns by exempted establishments etc. The member services offered include, facility to file various claims online, view EPF passbook details etc. The EPFO back office users extensively use the Unified Portal for their day to day operations. During the year, portal was enhanced with various features including Common ECR filing from Shram Suvidha link enabled at unified portal, Claim submission at district offices and Integration with DBT Bharat Portal. Rs. 1.51 lakh crore were received as remittances against 96,89,345 remittances. 17,63,172 online transfer claims and 5,29,451 e-nominations were received during the year. 1,69,360 establishments have been registered, 2,78,37,455 members have been enrolled and Rs. 97,126.5 crore have been disbursed to beneficiaries.

OMMAS integration with Public Fund Management System (PFMS)

Online Management, Monitoring and Accounting System (OMMAS) for Pradhan Mantri Gram Sadak Yojana (PMGSY), an initiative of Ministry of Rural Development, Government of India and developed by C-DAC, is operational in all the states since 2002. Public Fund Management System (PFMS) is a financial management platform started by the office of the Controller General of Accounts, Ministry of Finance with the Planning Commission. PFMS leverages a unique interface with the Core Banking System (CBS) of banks to provide real-time reporting of banking transactions. During the year, Integration of OMMAS with PFMS was carried out and all PMGSY Programme Fund payments are now being processed through the PFMS system. The payments are being directly credited to the beneficiaries (Contractor) bank account. During the year, a total of 58,258 payments amounting to Rs. 150.63 crores were processed from OMMAS through the PFMS system. The integration helped in reduced delays in payments and facilitated electronic transfer of benefits.

Electronic Forms application through State Portal and SSDG for State of J&K

C-DAC is engaged in an initiative for the state of Jammu and Kashmir that enables citizens to download forms and submit applications electronically through a common gateway. The e-forms are made accessible to the citizens through the state portal. The submitted e-forms are then routed through State Service Delivery Gateway (SSDG) to respective field offices of the concerned department responsible for providing that particular service. During the year, 19 Government to Citizen online services of seven departments were launched on State Services Delivery Gateway (SSDG) by Sh. Satya Pal Malik, Hon'ble Governor of Jammu and Kashmir. With this, a total of 26 services have been launched. Direct Benefit Transfer of over 5,00,000 cases has been achieved through the developed services of Integrated Social Security Scheme and National Benefit Schemes from Social Welfare Department, J&K. Online submission of over 25,000 cases are submitted for implemented Post-Matric Scholarship Scheme for SC/ST/OBC/PCP and Pahari Speaking people in J&K during the year.

Kaveri - Khajane II integration Solution for Remittances

The Karnataka Valuation and e-Registration (KAVERI) remittance solution developed by C-DAC integrates with the KHAJANE II (an integrated financial management system of Government of Karnataka) to provide an end to end system level integration by doing away manual intervention for remittances and enabling online reconciliation. Receipts generated in KAVERI using various payment modes are submitted to KHAJANE remittance service to generate challans. The system automatically updates DD/ Cheque clearance status in KHAJANE and also updates the reconciliation status in KAVERI system. Remittance feature is for receipts generated for Document Registration, Marriage Registration, Firm Registration, Other Receipts, Online Encumbrance Certificate (EC) and KAVERI II Firm Registration services. Its key features include automatic updating of the status of challan without human intervention, no requirement of manual reconciliation and no need of verification of challans at multi levels, identification of duplicate DDs and generation of audit reports etc.

Kaveri Online Services G2G Integrations

KAVERI Online service is a web-based application of Department of Stamps & Registration, Government of Karnataka that provides interface to the citizen to enter details and book appointment for document registration and also provides facility to search for required Index and registered copies. Portal was enhanced with various G2G integrations during the year. Bangalore 1/Karnataka 1 Citizen Service Centre integration is to deliver digitally signed copy of Encumbrance Certificate (EC) and Certified copy (CC) of registered document as a part of the Sakala services Act. Maulya Mobile application Karnataka State Remote Sensing Applications Centre (KSRSAC) department integration is to provide web service of property valuation and stamp duty calculation to KSRSAC department to display location/area wise calculated guidance value and market value of property. Udyog Mitra portal eBiz Karnataka integration is to share property records and buyer seller details. eAashti (Electronic Property) for Urban Development Department integration is to provide web service to share scanned copy (Certified copy) of the Registered Document.

e-Hastakshar – C-DAC's eSign Service

As part of Government's Digital India Initiative, C-DAC has developed e-Hastakshar – C-DAC's eSign service that facilitates instant signing of documents online by citizens in a legally acceptable form. Using this, an Aadhaar holder can electronically sign a form/document anytime, anywhere, using device such as PC or Laptop or Mobile. Through e-Hastakshar, C-DAC offers hassle-free fully paperless citizen services and convenience to users. C-DAC utilizes service of Unique Identification Authority of India (UIDAI) for on-line authentication and Aadhaar eKYC service. During the year, C-DAC eSign service was migrated to newer version of software as per Controller of Certifying Authority (CCA) and UIDAI specifications. e-Hastakshar service supports both One Time Password (OTP) and Biometric (Fingerprint) based modes of authentication for leveraging eKYC service of UIDAI. C-DAC's eSign service has been integrated by several Government and private agencies for various applications. As on March 31, 2019, more than forty-five lakh signatures have been offered for various agencies.

Electronic Project Proposal Management System (e-PPMS)

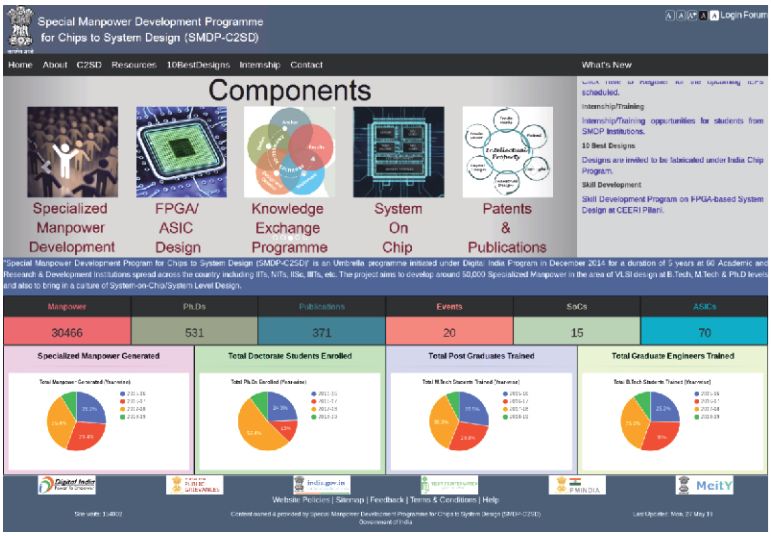
C-DAC has developed a solution called electronic Project Proposal Management System (e-PPMS) to manage the life cycle of funded research projects, enable researchers to make online submission of proposals, carry out technical evaluation of proposals, financial approvals and tracking of status of proposals etc. e-PPMS system for Indo-French Centre for the Promotion of Advanced Research (IFCPAR / CEFIPRA) was fine-tuned as per CEFIPRA's requirements during the year resulting in transformation of the complete Proposal Management workflow from manual operations to paperless management. Approximately 1500 proposals have been submitted and reviewed under various schemes of CEFIPRA. ePPMS for Indian Council of Medical Research (ICMR) hosts over 20,000 proposals on the system and over 17,000 users. Around 4000 proposals were submitted and reviewed under the various schemes during the year. ePPMS has also been implemented for 16 schemes of Science Engineering and Research Board (SERB). SERB has received approximate 65,000 Project Proposals online and also has over 9,000 experts and more than 11,000 institutes registered in this online system.

Wood Based Industries Licensing System

C-DAC has developed a web-based solution to automate the process of issuance of Wood based Industries (WBI) licence that helps manage the applications related to a new unit, renewal of an existing unit, change of ownership and relocation of a unit to an applicant. The applicant in requirement of a new WBI License can submit the application online to the State Level Committee along with all the necessary documents and can apply for different machinery types such as saw, veneer, plywood, boiler, chipper etc. During the year, e-Sign has been integrated at various levels for scrutiny and approval of the eligible applications. e-Lottery with eSign has also been integrated for draw of lots for eligible applications.

Web Portal and Discussion Forum for SMDP-C2SD Institutions

C-DAC has designed and developed a web-based project dissemination portal for Special Manpower Development Program for Chips to System Design (SMDP-C2SD) institutions, facilitating online submission of developed design package to Chip Centre for MPW (Multi Project Wafer) runs enabling fabrication through Semi-Conductor Laboratory (SCL). Developed web portal is being used as a project monitoring tool for technical as well as financial data management, taking out different types of reports, user management, etc. The portal was deployed at Government cloud Meghraj and made available since June 2018. C-DAC has also designed and developed a web-based discussion forum for SMDP-C2SD institutions facilitating online discussion on various issues such as Technical, Financial, Administrative, etc. related to the project.



Special Manpower Development Programme for Chips to System Design (SMDP-C2SD)

Project Management Information System

C-DAC has designed and developed a Project Management Information System (PMIS) for effective and timely execution of projects and maintenance of various records. This is a role based, open source, intranet application that includes bug tracker, correspondence register, activity tracker, localized reports in Hindi, report generation facility as per organizations' quality management standards and many more. The Unique Selling Point of PMIS is the manpower utilization rate and details of project wise engagement of the manpower.

ABS-MS (Access Benefit Sharing – Monitoring System)

A system for monitoring of the Indian bio-resources accessed with and without approval of National Biodiversity Authority (NBA) has been developed. Key components include Master database management, Text mining, Big Data Analytics etc. This initiative is part of a technical cooperation between India and Germany and is commissioned by the Federal Ministry for Economic Cooperation and Development (BMZ) under the Indo-German Biodiversity Programme. This was implemented by C-DAC in partnership with Ministry of Environment, Forests and Climate Change (MoEFCC) NBA and Deutsche GesellschaftfürInternationale (GIZ).

Support and Maintenance of Compulsory Registration Scheme (CRS) Portal

CRS Portal supports online submission of application for registration by manufacturers form all over world and automates all the stages of issuance of Registration Certificate by BIS. During the year, C-DAC carried out support and maintenance of the portal which was developed earlier on the basis of inputs received from MeitY and BIS officials. Utilization of the CRS portal is very high and is in use by various stakeholders. Total 11,492 users (excluding BIS officers) are using the portal, total 14,696 licenses have been granted under 32 Indian standards and total 2420 renewal requests have been received from the portal.

Kerala Road Network Map using Open Source Platform

C-DAC designed and developed a Map Platform and API using open source technologies and integrated Vehicle Tracking System of Kerala Motor Vehicle Department (KMVD) with the Map Platform. This platform has been deployed at State Data Centre, Kerala. Major modules of Map Platform include rendering module, editing module and API service modules. The rendering module provides the tile images for map view in Vehicle Tracking system. The API service module provides geocoding, reverse-geocoding, routing etc. This platform can be replicated for other states where vehicle tracking system is deployed.

Free and Open Source Software Solutions (FOSS)

BOSS Linux

Bharat Operating System Solutions (BOSS) GNU/Linux has been developed by C-DAC for enhancing the use of Free/Open source software throughout India. During the year, BOSS 7.0 was released with updates on GNOME and KDE versions, latest stable kernel with peripheral and printers support and LibreOffice with pdf plugin support. The release includes compilation with Kernel 4.9 and Libreoffice 6.0. Both the 32 and 64-bit variants have been made available with Unified Extensible Firmware Interface (UEFI) support and additional security features have been added. There were around 15 lakhs deployments of the latest BOSS version under Tamil Nadu Free Students Laptop Scheme.

EduBOSS

EduBOSS-4.1 is the latest Educational variant of BOSS GNU/Linux Operating System developed by C-DAC in collaboration with teachers. It is a full-featured, user-friendly Linux operating system having educational applications useful for primary and higher level schools. It facilitates creation of interactive teaching material. The major updates in EduBOSS GNU/Linux 4.1 from the previous release include chromium-browser, firefox, fontconfig, gimp, gnome-sudoku, imagemagick, linux-image, mysql-5.5, openjdk, openssl etc. During the year, EduBOSS was deployed in Directorate of Technical Education (DOTE) Tamilnadu.

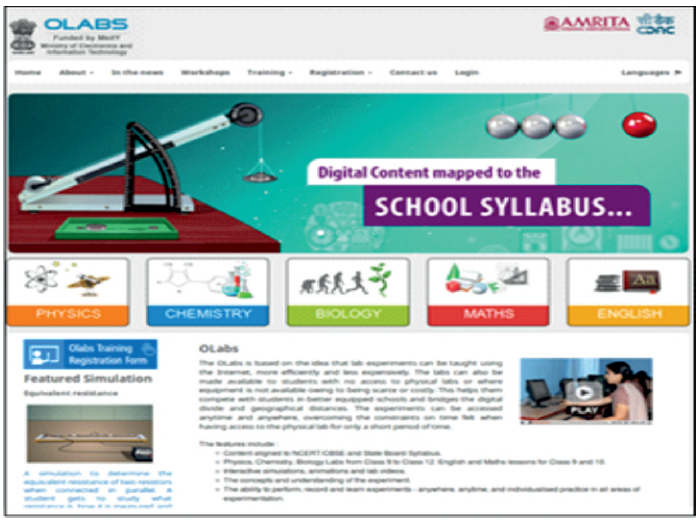
Customized OpenDDS with Support Tools

To ease the development and hide the intricacies involved in developing Data Distribution Service (DDS) based applications, C-DAC has customized and developed new tools that abstract the internals of DDS and provide support for the developers from the installation phase to testing phase of applications. Its key features include OpenDDS Installer/Uninstaller Tool, Configuration Tool for configuring OpenDDS applications, Configuration Tool to configure Quality of Service (QoS) policies of DDS, Tester Tool for testing DDS applications, monitor tool for monitoring DDS applications and data samples, Modeling Tool to develop OpenDDS applications and meaningful log generation.

E-learning

Rollout of Online Labs for Schools

C-DAC in collaboration with Amrita University has developed Online Labs (OLabs) covering experiments of Physics, Chemistry, Maths, Biology and English for classes 9th -12th. Olabs is available in English, Hindi, Marathi, Malayalam, etc. During the year, C-DAC conducted 65 workshops and trained 1,344 teachers from 393 schools covering 11 States. A total of around 27,933 teachers covering around 8,385 schools have been trained.



Online Labs

eBasta

It is a framework to make the school books accessible in digital form as e-books. During the year, around 1,344 teachers from 393 schools have been oriented in using eBasa technologies. Total 2848 books have been published on the portal from 14 State Boards, NCERT, CBSE and a few private publishers. 5,389 eBasta downloads and 1,38,452 eContent downloads have taken place so far. Total 5,996 teachers from around 2,070 schools have been oriented in technologies including eBasta.

Megh-Sikshak

Megh-Sikshak is an advanced Learning Management System (LMS) which provides flexibility for customisation, scalability and high availability for offering various e-learning services without the need for hardware and software resources at end user premises. C-DAC is implementing Megh-Sikshak for offering online courses for training police officers of Kerala State and is also providing support and maintenance of Megh-Sikshak for Maharashtra Police Academy (MPA), Nasik.

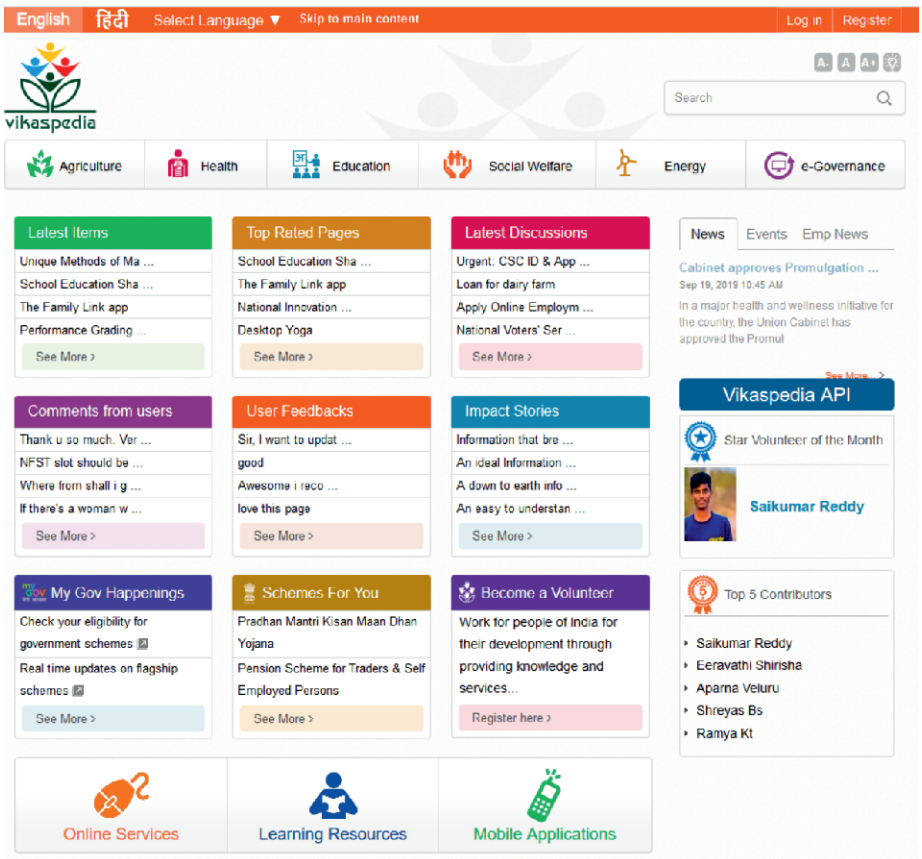
ICT for Social Development

Proliferation of e-Saadhya in NE schools

C-DAC has developed e-Saadhya, an adaptable and accessible e-Learning software framework for mild autistic and mild mentally retarded children. It has special educator environment, where teacher/parent can create and personalize different types of lessons, quizzes, songs, videos, games etc. based on child's interest. The system was deployed in schools identified across 5 States (Assam, Meghalaya, Nagaland, Manipur and Tripura) and trainings were provided to the identified teachers. A national workshop on e-Saadhya was also conducted at Bethany Society, Shillong on March 22, 2019 for around 66 participants from different States.

Vikaspedia

Vikaspedia is a multilingual, multi-sectoral knowledge portal developed by C-DAC to empower poor and under-served communities through provision of information, products and services in all 22 scheduled languages of the country, besides English. During the year, ePEN mobile app has been developed as part of Vikaspedia's initiative for aspirational districts and it provides teacher attendance monitoring and networking platform for primary schools of Narmada district, Gujarat. A citizen centric android based mobile app on Siddha has been developed in partnership with National Institute of Siddha, Chennai. 300 outreach workshops were held at various levels (block/district/state) across 17 states/UTs during the year. About 14,500 first level service providers were trained on digital information access and sharing in Indian languages in collaboration with various government institutions. About 30 aspirational districts of six States were covered in the process. About 80 lakh citizens were reached through various ICT media to promote government schemes across the country.



Vikaspedia

Cyber Security and Cyber Forensics

Advancements in ICTE has enabled wider adoption of ICTE by various sectors including smart cities, critical sectors, health, government, LEAs and mobile based citizen services etc. Realizing the same, C-DAC continued its R&D efforts in Cyber security and Cyber Forensics addressing various challenges pertaining to identity management, proactive threat analysis, security validation and testing and wide scale awareness events across the country. Some of the significant activities including solutions, product, tools developed under this thematic area during the year are listed below:

Identity & Access Management

Seafarers Identity Document (SID) Issuance System

C-DAC has developed SID Issuance System in collaboration with Directorate General of Shipping. SID is an essential travel document for all Indian seafarers similar to passport for those who want to travel abroad. SID cards are based on contactless smart card technology and include facial biometrics. The SID card follows the same standards (ICAO Doc 9303, Latest standard, 2015) as mentioned for e-Passport by International Civil Aviation Organization(ICAO) and International Labour Organization (ILO). A web portal has been developed and key features of SID issuance system include online application, online payment, online appointment, data collection, verification, issuance and dispatch.

Face Recognition System

C-DAC has developed V-Scan Face Recognizer which is a powerful computer vision Face Recognition Software tool that detects and identifies persons of interest from an input video clip. Backed by Artificial Intelligence Engine it facilitates face detection, face identification and generates reports regarding target face occurrences in input videos. The system has various capabilities such as, analysis of recorded video to identify faces, count number of faces, compare multiple videos and tag faces for storing any descriptions etc. C-DAC's solution has been deployed at key client location in Gujarat and discussions are being carried out for deployments in Maharashtra.

Cyber Forensics

Cyber Forensics Tools

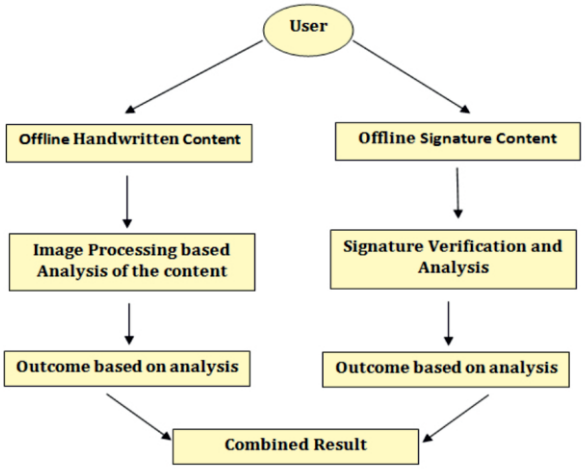
C-DAC as part of its Resource Centre for Cyber Forensics (RCCF) continued to carryout deployments of its Cyber Forensics tools like TrueImager, SimXtractor, True Traveller, CyberCheck, Win-Lift and MoblieCheck. Based on the same, it has setup Cyber Forensic Analysis Laboratory for Kerala state. Also, C-DAC carried out the Periodic monitoring and auditing of the availability and performance of KSWAN under Kerala State IT Mission.

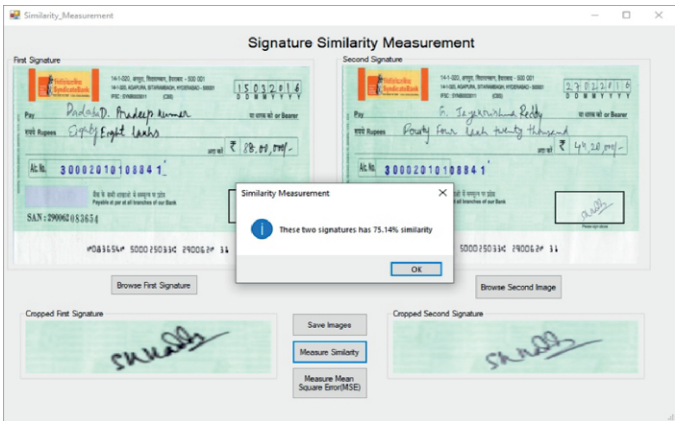
AI Based Digital Forensic Platform

C-DAC has developed AI based Tool Boxes for separate language forensic targets which uses Digital Text and has two major components viz. Disk Content Analyser and Email Content Analyser. Authorship Attribution is a module of Language Forensic Toolbox, which identifies / validates author from a given unknown query textual input. It utilizes cutting edge Computational Forensic Linguistic techniques analysing stylometric features extracted from the input text and AI techniques to compare the given text with previously collected suspects' texts. Email Content Analyser, analyses the email contents to identify who is the author of the email. It also uses Machine Learning Techniques to identify offensive mail or threat mail by analysing the content of an email.

Digital Forensic Platform

C-DAC has developed an investigation platform for verifying the questioned documents with handwritten analysis and signature analysis. This platform helps the investigators who often need to examine or verify the authenticity of a document that could be used as evidence in court or aid in an investigation. The developed system has the following benefits: Automated Writer Verification and Signature Analysis, User-Friendly Interactive Interface, Interactive choice of attributes and prediction algorithm, Visualization of Writer Specific Attributes for Comparative Analysis, Similarity Analysis between known and questioned documents of the suspected person, AI-enabled system to identify the genuineness of a Forensic Handwritten Document/Signature on Suicide Note and User-Friendly Interactive Interface for forensic lab staff or police investigators.





Signature Similarity Measurement

Proactive Threat Analysis

COPS SPADE (SCADA Protocol Anomaly Detector)

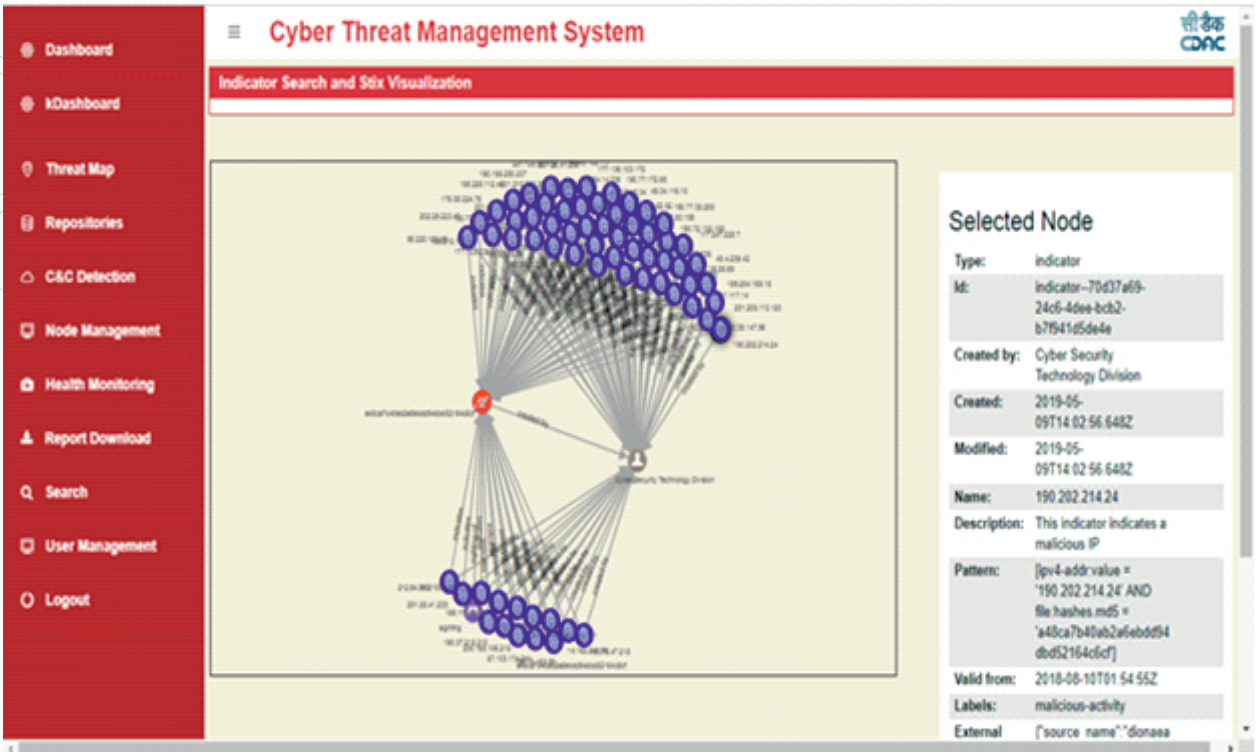
C-DAC's COPS SPADE (SCADA Protocol Anomaly Detector) is a passive security monitoring solution targeting at the security of remote terminal units (RTU). SPADE actively detects anomalous communication (between RTU and master) and works on deep packet inspection (DPI) and deep content inspection (DCI) based analytics engine. Analytics engine is based on white-listed rules and modelled specifically for IEC-60870-5-104 based SCADA systems. Along with the white-listed rule sets, the solution includes field (sensor / actuator values) data correlation with network data. SPADE can detect known and unknown zero-day attacks on the SCADA systems effectively such as attacks on RTU such as DoS, malfunctioning of RTU/master and brute-force attacks. COPS SPADE is field tested at Karnataka Power Transmission Corporation Limited (KPTCL), Bangalore.

High Speed Traffic Flow Generator

C-DAC is developing High speed traffic flow-based solution towards real-time threat detection and analysis. Traditionally flow data has been sampled considering high traffic rates, however, for cyber defense analysis, un-sampled flow records are required. Key challenges being addressed include, creation of a network baseline at high traffic rates, effective monitoring, methods to accurately gather, techniques to process, compare and analyse network behaviour in near-real-time.

Cyber Threat Management System (CTMS)

Cyber Threat Management System (CTMS) is a framework comprising of four modules namely Capturing, Collection and Enrichment, Analysis and CTI generation and Threat Intelligence Portal. The developed system automates the cyber threat intelligence generation process, starting from, attack data capturing, filtering, collection storage, analysis and extraction of threat intelligence. The dissemination of the cyber threat intelligence will be done through a portal which supports multiple sharing standards along with modes such as RESTful API, direct download from dashboard etc.



Cyber Threat Management System

Security Testing

Security Testing and Validation Methodologies for Cryptographic Module

The validation of cryptosystems as per the specification is one of the important requirements to meet the desired grading, correct implementation of the crypto algorithms used, compliance of the hardware/software with the design, compliance of the protocols used for communication, key management etc. To validate the cryptosystems, C-DAC has established a lab infrastructure in-line with international standards and built processes & operational procedures. A Vendor web application has been developed in order to capture vendor requirements.

Information Security Services

As a CERT-In empanelled organization, C-DAC continues to offer Vulnerability Assessment and Penetration Testing (VA/PT), security testing and auditing services for government and private organizations. C-DAC is actively involved in carrying out Network VA/PT, Web Application Penetration Testing & Mobile Application Penetration Testing, e-Sign Compliance Audit services, Audits for Aadhaar compliant services etc. During this year, C-DAC has carried out security audits for various government and private agencies and has executed a total of 351 Security audit projects and issued safe to host certificates.

Information Security Education & Awareness (ISEA)

Information Security Education & Awareness (ISEA) Project Phase II - National Level Awareness Campaign: The Campaign is being implemented through 52 institutes / Technical universities divided into three categories for academic activities viz. Information Security Research & Development Centre (ISRDCS-4), Resource Centre (RC-7) and Participating Institutes (PI – 41). 29,932 formal / non-formal programs and 13,044 short term coursed were conducted. Under Government Officers training 8,365 members were trained in Cyber Security, Cyber Law and Cyber Acts, Information & Network Security, Network & Web Application Security, Deploying Virtual Training Environment, Computer Security & Viruses, Cyber Security & Cyber Forensics, Advanced Cyber Forensics, Computer Malware Viruses & Hacking, Secure Coding Practices in Java JEE & Android, Android Security & Hacking, Information Security etc. Total 836 awareness workshops were conducted covering 95,161 participants, since it's initiation.

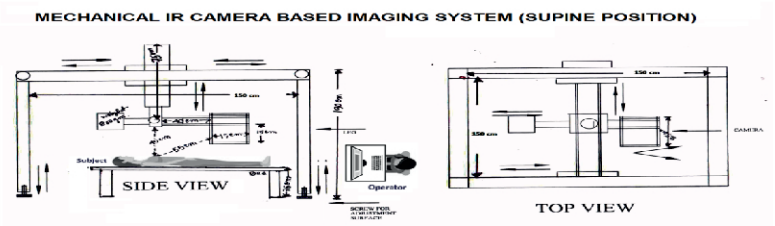
Health Informatics

C-DAC continues to develop core technologies, applications and solutions, turnkey projects in the domain of Healthcare Informatics. Being a core competency area, its tools, technologies, solutions and deployment operations across the country has greatly benefited the medical practitioners, hospitals, vendors, and the citizens of India. The activities carried out by C-DAC during the year in this thematic area are given below.

Healthcare Solutions

Karkat Nirnay Yantra - A Virtual Instrumentation System

A Virtual Instrumentation System for early detection of breast cancer has been developed using Infrared Thermal Imaging based integrated methodology. The system uses motorized IR camera-based image capturing mechanisms with a detection software, which performs image processing and applies Machine Learning (ML) techniques to identify the cancer affected zone. The system is being validated at Cachar Cancer Hospital, Assam.



Karkat Nirnay Yantra

Integrated Mobile-based Surveillance System for Malaria (MoSQuIT)

As a part of Indian Council of Medical Research (ICMR) and Ministry of Electronics and Information Technology (MeitY), Government of India supported initiative, C-DAC has developed MoSQuIT solution to maintain surveillance on malaria in a group / community through screening, detect changes in trends / distribution to initiate investigative / control measures, improve knowledge through Continuous Medical Education and community awareness, ease drug inventory flow and measure effectiveness of anti-malaria program and vector surveillance. The solution augments the Malaria surveillance program under NVBDCP, in collaboration with Regional Medical Research Centre (RMRC) of Indian Council of Medical Research (ICMR), Dibrugarh, Assam. The solution has been deployed at Ambassa, Dhalai district, Tripura (Indo-Bangladesh Border); Udalguri district and Baksa district, Assam (Indo-Bhutan Border); and Changlang district of Arunachal Pradesh (Indo-Myanmar Border).

Online Drug Information and Monitoring System

This is an online solution for use of Food & Drug Administration (FDA), Punjab for tracking and monitoring of mental health related drugs. The solution tracks drug prescription, drug availability at each chemist, authenticating the patient/user of drug and monitor effective usage of drug by indicated patient. It allows FDA to tightly control supply and delivery of mental health related drugs. The patient can check the system to identify the nearest chemist who may stock the prescribed drug. An audio/video of the online system has also been prepared for purpose of awareness among patients, chemists and drug inspectors.

Development of Computer Aided Detection System for Mammograms

A solution has been developed for early detection and computer-aided design (CAD) based screening of breast cancer. The solution highlights the lesion detected on the breast mammogram alerting the radiologists to carefully assess the suspected area. The solution allows technicians to screen-out cases marked as 'NORMAL' and access the cases marked 'REVIEW' for further analysis of specialist radiologist. The solution supports Breast Imaging, Reporting and Data System (BI-RADS) standard reporting.

Tuberculosis Treatment Adherence System using ICT and Mobile Technology (mDOTSplus)

Developed a mobile based solution for systematic and continuous treatment monitoring of tuberculosis (TB) patients in collaboration with Regional Medical Research Centre, Indian Council of Medical Research (ICMR). Tuberculosis Screening, Diagnostic and Treatment adherence System using ICT and Mobile technology helps improve treatment adherence in TB patients using ICT & mobile technology. The system assists in early detection of patients who missed treatment dose for immediate action for Tuberculosis treatment. This has been deployed in Regional Medical Research Centre/ Indian Council of Medical Research, Dibrugarh, Assam.

Diabetic Retinopathy Identification Software for Timely Intervention (DRISTI)

Developed solution for automatic Detection of Diabetic Retinopathy from Retinal Images taken from Fundus Camera. The solution automatically classifies images as Non-DR or Suspicious-DR on a scale of 100. The screening efficiency is being reduced and the system can detect possible lesions like exudates, cotton- wool-spots, haemorrhage and tiny blood spots, dot, blot, flame – micro aneurisms – which are the early signs of diabetic retinopathy. An associated software Retinal Image Annotation and Grading (RIAG) allows ophthalmologist to assess, annotate, diagnose and grade retinal images for Diabetic Retinopathy. An Automated Real Time Retinal Image Quality Notifier is also developed that quantifies retinal image quality and notifies the user about quality of the image captured.

Development of e-Sanjeevani with integrated Video Conferencing System for PAN India rollout

A project has been granted by Ministry of Health & Family Welfare (MoH&FW), Government of India to upgrade the solution for use at Health and Wellness Centres (HWCs) being operationalized under Ayushman Bharat Scheme / PMJAY / National Health Protection Scheme of Govt. of India. This project is for redesigning the workflows of e-Sanjeevani as per the guidelines for telemedicine at HWCs under Ayushman Bharat Scheme.

Operationalisation, Maintenance and Upgradation of MyHealthRecord

A project has been granted by Ministry of Health & Family Welfare (MoH&FW), Government of India to upgrade and maintain the MyHealthRecord system (along with its Web and Mobile apps) with new features and advancements including new integrations, update, security audits for continuous vulnerability management and integration of new devices and wearables.

Deployments of Drugs and Vaccine Distribution Management

The e-Aushadhi solution has been selected for deployment at State of Arunachal Pradesh. The solution was previously selected by other States like Sikkim (analysis completed), Bihar, Manipur (26 institutes live), Meghalaya (67 institutes live), Jharkhand, Himachal Pradesh and Uttar Pradesh. It is also being deployed at department/agencies namely Medical Stores Organization (MSO), Ministry of Health & Family Welfare. The solution is in line with deployment at other states in country to provide a complete supply chain management system for drugs and to bring transparency in generic drug delivery to patients free of cost. The major outcome is to ease the Management, Monitoring and Functioning of the Drug Procurement, Testing and Distribution together as a Supply Chain from District/ Corporation Level to Local Level.

Design & Development of an Indigenous Adverse Drug Reactions Monitoring System (ADRMS)

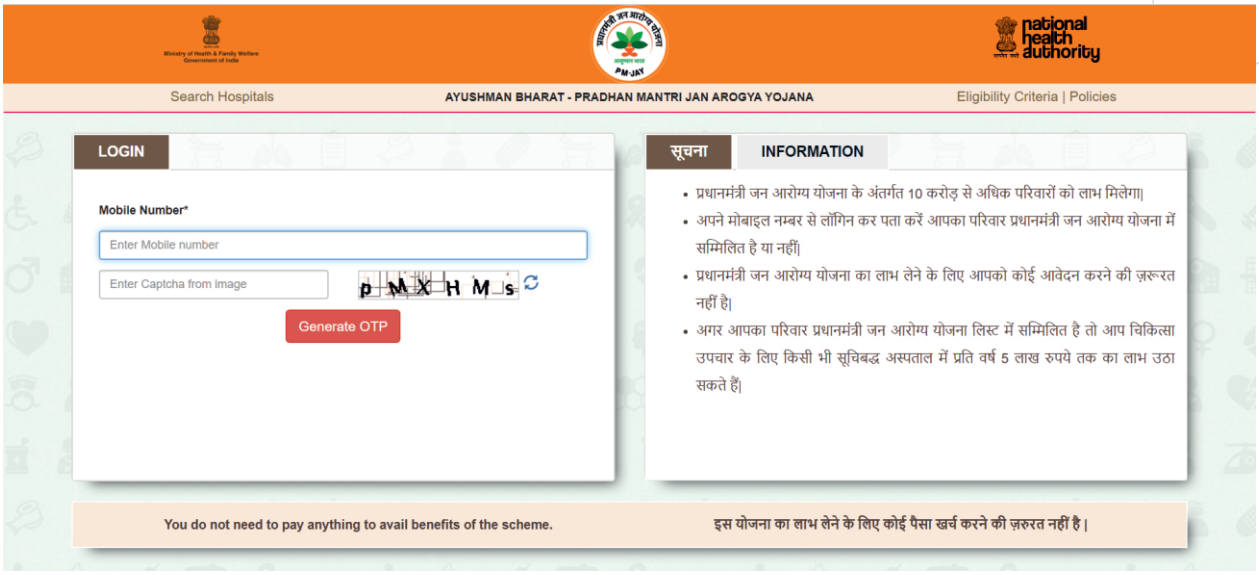
Developing software for Pharmacovigilance for Adverse Drug Reactions (ADR) reporting, Data mining, Analysis for signal detection and risk benefit assessment of marketed drugs in India. The solution will collect drug safety data correlated with genomics characteristics of Indian population. It will allow online reporting of ADR cases by consumer, medical practitioners and 210+ ADR centres across India. The project is funded by Indian Pharmacopeia Commission (IPC), MoH&FW, Government of India.

Implementation of Lab Automation Software for Indian Pharmacopeia Labs

Developing and implementing a Lab Automation Software for Indian Pharmacopeia Commission Labs for testing of samples of various medical products. The solution will allow online submission and re-request for testing, forwarding request from SUGAM (online licensing portal of Central Drugs Standards Control Organisation), allow configurable workflow for online receipt, allocation, testing, and compilation of test results and generation of final reports along with online tracking and MIS reports. The project is funded by Indian Pharmacopeia Commission (IPC), MoH&FW, Government of India.

"Am I Eligible" Search Portal for Beneficiary Identification System

C-DAC has delivered a Search services to National Health Authority (NHA) to facilitate online searching of family members and beneficiary's data (approx. 57 crore entries) covering 36 States and UT's of India. The features of the service include phonetics search, auto-suggestion, regions / numerological variants, name splitter and sequence, trimming, etc. to provide ease to use search under Ayushman Bharat, a National Health Protection Mission (AB-NHPM). The project is funded by National Health Authority (NHA).



Ayushman Bharat, a National Health Protection Mission

Advanced Epilepsy Research (AER)

Developing Machine Learning (ML) models with support from AIIMS, New Delhi and University of Delhi to identify novel drug targets in epilepsy patients. About 43 different features are being assessed to build the model using five different Machine Learning algorithms resulting in accuracy of more than 80% in current model. Deep Learning (DL) algorithms and ensemble models will be further used to potentially increase the accuracy of predicting novel targets. The project is funded by office of the Principal Scientific Advisory (PSA), Government of India.

Health Information Systems

Strengthening of ONCONET-India Project in Kerala

As a part of Ministry of Health & Family Welfare (MoH&FW), Government of India initiative C-DAC is engaged along with RCC, Trivandrum in ONCONET – India with five Early Cancer Detection Centres across Kerala. C-DAC is upgrading Sanjeevani software with digital mammography features and carrying out replacement of old medical equipment. The program covers six northern districts of Kerala to upgrade facilities available in telemedicine centres and mobile telemedicine bus with latest communication technologies (4G), equipment, Comprehensive EMR and Telemedicine Software, Cancer screening software, web-based Video-conferencing software and automated breast cancer detection software etc. The project revitalized the Telemedicine facilities in all the telemedicine centres and made them functional for providing Tele-consultation facilities to patients at distant places and also at patients' doorsteps using Mobile Telemedicine facility.

Mobile Oncology System for Cancer Control activities in the state of Karnataka

The aim of the project was to develop a full-fledged mobile vehicle with Digital X-Ray Unit, Colour-doppler Ultrasound Unit, blood cell counter, Hematology analyser, among other equipment for conducting cancer screening in Karnataka State. Doctor and a medical assistant can travel in the air-conditioned mobile unit. It can be operated using electrical power from the locality as well as an onboard Generator. Medicines can be dispensed to the needy patients after consultation from in-built medicine storage units. The project was supported by Bharat Electronics Ltd., Bangalore.

Student Management System & HMIS Upgradation

A project has been granted by Kasturba Health Society, Wardha to upgrade some of the existing modules of the HMIS already operational at Mahatma Gandhi Institute of Medical Sciences (MGIMS), Sevagram for streamlining patient care delivery and development of few new modules to streamline inventory management along with Student Management System to streamline the operations of the Medical College Activities through the Student Lifecycle Management System (SLCMS). The upgrade is expected to ease the management, monitoring and functioning of hospital and hence increase the efficiency of patient care delivery as well as student engagement.

Deployment of e-Sushrut HMIS at AIIMS Patna, Raebareli and Manglagiri

Deployment of e-Sushrut Hospital Management Information System is being carried out at new All India Institute of Medical Sciences (AIIMS) Hospitals at Patna, Raebareli and Manglagiri to streamline the process of patient care delivery by incorporating and integrating the computerized clinical information for improved hospital administration and patient healthcare. The solution targets compliance with EHR Standards for India 2016 standards set notified by the Ministry of Health and Family Welfare, Government of India.

C-DAC e-Sushrut Patient Wallet

C-DAC has developed a Patient Wallet working with its e-Sushrut HMIS solution. The Mobile app provides a generic interface for registered patients to allows them to selectively pay for prescribed healthcare services and procedures without having to wait in long queues at the billing counters. The Wallet is integrated with payment gateways to support all forms of digital payments and also has a concept of "wallet balance" that can be recharged as required. The app closely aligns with national healthcare objective of Digital India goal (by enabling digital payments) and also empowers citizens to independently control their medical expenses.

Healthcare Standards

C-DAC's Medical Informatics Software Development Kit (SDK)

C-DAC's Medical Informatics Standards Software Development Kit v1.0 for Continuity of Care Document (CCD) is an implementation of HL7 / ASTM Continuity of Care Document (CCD) Release 1 standard in healthcare applications. CCD R1 is an XML-based standard which provides a "snapshot in time" constraining a summary of the patient's clinical, demographic and administrative data. It is useful in electronically transferring Patient Health / Discharge Summary between different health systems making them interoperable, reducing error in record and ensuring quick data assimilation among different health systems. The SDK is distributed as free and open source software under Apache v2.0 License and is available for download through C-DAC website.

C-DAC's Medical Informatics Software Development Kit (SDK)

The solution is an implementation of National Electrical Manufacturers Association's (NEMA) Digital Imaging and Communications in Medicine (DICOM) PS3.0-2015c standard. The latest version of SDK adds support for Media Storage profiles for operations and roles and services. It also has updated support for Content Mapping Resource using Systematized Nomenclature of Medicine -Clinical Terms (SNOMED CT terms). The Security profiles have also been newly added among other improvements and fixes. The object-oriented API library can be used by Medical device manufacturers, application developers, system integrators and researchers for medical IT standards compliance, interaction, or handling of waveform / imagery / radiological files/data. The SDK is distributed as free and open source software under Apache v2.0 License and is available for download through C-DAC website.

C-DAC's SNOMED CT Toolkit (CSNOtk)

C-DAC's SNOMED CT Toolkit (CSNOtk) v5.0 is an open-source, free-to-use specially designed toolkit for easy access and rapid integration of SNOMED CT® medical vocabulary in healthcare applications. This toolkit enables clinicians and researchers to find out relevant SNOMED CT® codes with their synonyms, fully specified names and different types of relationship between concepts. C-DAC, Pune has released v5.0 of toolkit with more features during year 2018-19. CSNOtk is available from C-DAC under Apache License v2.0 as free and open source software.

Education and Training

C-DAC's Education and Training group has been developing the skilled resources as part of Skill India initiative through its Post Graduate Diploma as well as Post Graduate Degree awarding programmes for its internal human resources needs of Research and Development activities as well as IT industry. These skill enhancement ICT training courses are imparted by C-DAC in its training centres as well as Authorised Training Centres spread across India.

C-DAC Education and Training division is involved in the following activities:

1. Industry Specific Post Graduate Diploma programmes
2. Industry - Academia Collaborative formal education programmes
3. Corporate training programmes
4. TechSangam – Industry Academia Collaborative programme
5. IT Skill Development Programmes
6. International initiatives
7. Development and deployment of technologies for Education and Training

Industry Specific Post Graduate Diploma Programmes

C-DAC Advanced Computing Training School (ACTS) has trained and placed students in 11 Post Graduate Diploma Courses (NSQF level 8 course) through a network of over 30 C-DAC training centres and Authorized Training Centre's located in pan India.

C-DAC offers eleven Post Graduate diploma courses in the following domain

1. Post Graduate Diploma in Advanced Computing (PG-DAC)
2. Post Graduate Diploma in Mobile Computing (PG-DMC)
3. Post Graduate Diploma in Embedded System Design (PG-DESD)
4. Post Graduate Diploma in IT Infrastructure System and Security (PG-DITISS)
5. Post Graduate Diploma in System Software development (PG-DSSD)
6. Post Graduate Diploma in Big Data Analytics (PG-DBDA)
7. Post Graduate Diploma in Internet of Things (PG-DIoT)
8. Post Graduate Diploma in VLSI Design (PG-DVLSI)
9. Post Graduate Diploma in High Performance Computing System Administration (PG-DHPCSA)
10. Post Graduate Diploma in Biomedical Instrumentation and Health Informatics (PG-DBIHI)
11. Post Graduate Diploma in Geo-informatics (PG-DGi)

During the year, C-DAC has trained 6,234 students in Post Graduate Diploma courses inducted through the national level C-DAC Common Admission Test (CCAT). Over 80% of these trained and certified students are placed in the leading IT and Electronics companies through the National Common Campus Placement Programmes (NCCPP).

Formal Education Programmes in Collaboration with Universities

C-DAC collaborated with Sandip University, Nasik, MIT-World Peace University (MIT-WPU), Pune, Sathyabama University, Chennai, Vellore Institute of Technology (VIT), Chennai and Manipal University, Jaipur for jointly conducting various Masters programmes in different technologies.

Vellore Institute of Technology, Chennai

MIT – World Peace University, Pune

Following programmes are running under collaboration:

- M.E./M.Tech (Advanced Computing and Data Sciences)
- M.E./M.Tech (Embedded and IoT)
- M. Tech (High Performance Computing)
- M. Tech (Artificial Intelligence and Machine Learning)

As part of collaboration 33 students completed dissertation work at C-DAC, Pune.

IT Skill Development Programmes

CoE in Capacity Building, Skill Development and Research & Development at North East Region

C-DAC conducted the training of over 174 North-Eastern students in the areas of Big Data Analytics, Big Data Technologies, Network Security, Internet of Things (IoT), High Performance Computing (HPC) and Cyber Forensics and Cyber law at Assam Engineering College, Guwahati, Assam as part of this project funded by Ministry of Electronics and IT (MeitY).

C-DAC has also conducted five days workshops on Emerging Technologies, Innovation, Incubation and Entrepreneurship Development at various reputed educational institutes in North-East India including Assam Engineering College (Guwahati, Assam), NIT Silchar (Silchar, Assam), NASEC (Shillong, Meghalaya), NIT Agartala (Agartala, Tripura) and Gauhati University (Guwahati, Assam) where over 200 participants have been trained on concepts of IPR, Digital Marketing, Big Data Technologies & Analytics, Machine Learning, Artificial Intelligence, IoT, Cloud, Cyber Forensics, Cyber Security, Information Security, Entrepreneurship, Start-ups, Industry 4.0 and trends. The entrepreneurs shared their experiences with the participants about their startup initiatives and encouraged them to create more companies, start-ups with the new ideas which are available with them.

NASEC, Shillong, Meghalayala

"CoE to Conduct High End Training Programs" at C.V Raman College of Engineering, Bhubaneswar

C-DAC has been conducting high end training programs and certificate courses as part of its project with C.V Raman College of Engineering, Bhubaneswar since March 30, 2016. C-DAC is conducting Diploma in IT Architecture course which is of duration three years (three terms) and is integrated with B.Tech program from second year till fourth year. First batch of the course started in July, 2016 and was completed in May, 2019.

Free Coaching Scheme for Minority candidates

C-DAC conducted Certificate Course in Network Security for 31 Minority candidates at C-DAC's Authorized Training Centre, Patna as part of project funded by Department of Bihar State Minorities financial Corporation Ltd., Patna and Government of Bihar. The students have undergone the practical training in the areas of advanced technologies for the duration of six months. Training and Proficiency in Computer Application and Allied activities to the candidates belonging to Scheduled Castes/ Scheduled Tribes/Others Backward Classes and Minorities of Himachal Pradesh. C-DAC conducts employment-based training to under privileged sections of society as part of the scheme funded by Directorate of SC, OBC and Minorities, Government of Himachal Pradesh. Placement assistance shall be provided to 70% students.

PMGDISHA

C-DAC continues to participate in PMGDISHA program as assessment & certifying agency. PMGDISHA is a central government's initiative of digital literacy program in the country. The aim of the project is to make at least one person in each household digitally literate to interact with digital world such as digital payment and e-government services. C-DAC centres have started this operation since November, 2017 and examined more than 3.33 lakh citizens across the country till March, 2019.

Development and Deployment of Technologies for Education and Training

Indian Air Force (IAF) Online Examination System

C-DAC is using Comprehensive Recruitment System for Indian Air Force with its indigenously developed series of solutions using latest technologies to bring more transparency, convenience and security in their recruitment processes. In the complete recruitment process, there are different modules as Website, Registration, Question Authoring, Pre-Exam, Post-Exam, Exam Execution and Management and Result Processing.

All the above-mentioned solutions were developed by C-DAC and can be customized for all other examination worldwide. Using this software, C-DAC has conducted recruitment process for more than 12 Lakh candidates in the year 2018 -19.

Process Automation for Competitive Exams (PACE)

PACE focuses on various competitive exams such as GATE, JAM and AIIMS. It carries out automation of various stages such as candidate registration, online application filling, application scrutiny, exam centre allocation, admit card generation, result processing (answer-key verification, answer-key challenge, Question complexity identification and various statistical information), scorecard generation, choice filling, application scrutiny for admission, seat counselling. The system handles approximately 13 lakh applicants every year. PACE has been used for GATE (past 6 years), JAM (past 5 years) and AIIMS for 2 years.

PACE System carried out the following activities for 2018- 2019:

- IIT (Indian Institutes of Technology), since 2013-2019
- IISc (Indian Institute of Science), since 2013-2019
- AIIMS (All India Institute of Medical Sciences), since 2017-2019
- NBE (National Board of Examinations), Delhi, 2017-2019

C-DAC's Mission Mode Programmes and Roadmap

Under the guidance of Director General, C-DAC has prepared Roadmap document at corporate level encompassing 28 thrust areas segregated into Core Research, Applied Research, Applications and Services. These 28 thrust areas were converged into 11 streams / programmes, headed by Executive Director(s) & DG. Five Mission Mode Programmes were carved out these 11 streams as below

- M1- Exascale Computing
- M2: Microprocessor and Quantum, Computing
- M3 AI and Language Computing
- M4: IoE, Dependable and Secure Computing
- M5: GenNext Applied Computing

C-DAC has organized 3 days "Tech Conclave" with participation from Industry, Academia and Government bodies, inviting eminent personalities / domain experts covering all the above mission areas.

A Technology show was also organized having theme based stalls with participation from Industry, startups along with PAN C-DAC technologies. The same was open for general public, students, researchers, working professionals, Industry and government officials.

The learnings from "Tech Conclave" as well as "Tech Show" helped to further refine the proposed Mission Mode programmes. In order to realize the set goal, DG CDAC constituted the following teams for each Mission

- "ReseArch and developMent Planning (RAMP)" Teams - focusing towards preparation of RFP for various projects to be undertaken in future by respective centres.
- Mission Samiksha Teams – for Mentoring, Consolidating, Reviewing and Monitoring of Mission activities towards firming up the roadmap.

A total of 121 RFPs were received from PAN CDAC, which were reviewed by Centre Heads and Mission Samiksha Teams.

Inputs / comments were received from Mission Samiksha members regarding submitted RFPs on the following aspects

- To perceive the novelty and innovativeness in the RFP
- To see if the RFP is state-of-the-art and its relevancy
- To check for the coverage of key references and relevant activities by the RFP
- To comment on the mentioned timelines and effort required in the RFP
- To identify the commonalities between various RFPs that are potential candidates of C-DAC Stack

Similarly, inputs / comments on the RFPs were received from Centre Heads on the following aspects regarding

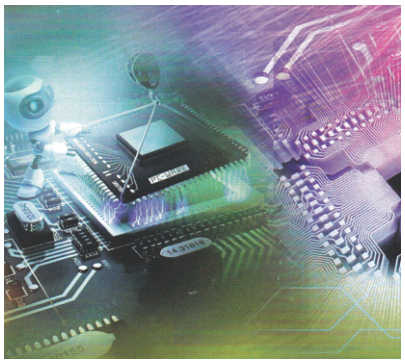
- Centre's prior expertise in the specific area with respect to this RFP
- List of Scope/Sub-Components/Activities to be contributed by your Centre along with the key persons identified
- Scope of contribution towards the RFPs

- Director General along with corporate heads reviewed activities of all the centres and more specifically evolving the Mission Mode Programmes towards achieving high impact / outcomes.
- Individual Mission Documents are getting evolved covering the inputs received via RFP, expertise, future activities and milestones.

C-DAC's Mission Mode Programmes

Exascale Computing

Key elements of Exascale Computing include HPC Systems Design, HPC interconnect & network design, HPC System Software & Middleware, devising special purpose computing and addressing challenges pertaining to power consumption and reliability. On the Exascale application front, C-DAC is engaged in multiple scientific and engineering domains like Weather Prediction, Computational Biology, Molecular Dynamics, Aerospace Engineering, Seismic Analysis, Nano Science, Astrophysics, Financial Simulations, Big Data Analytics to name a few.



Microprocessor and Quantum Computing

C-DAC, with its expertise, is designing and implementing a series of microprocessors, ecosystem and the associated IP along with the SoCs targeting various application domains. Requirements of stakeholders in strategic areas of Government, Industry and User Organizations are taken into considerations. Quantum Computing is gaining traction and advancements in materials science and computer science is enabling the same towards reality. This could have huge impact for bio-informatics, strategic sector, AI and in addressing various grand challenge problems.

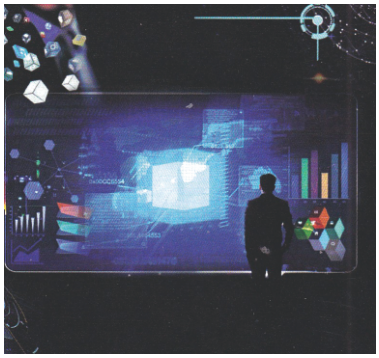
Artificial Intelligence and Language Computing

Language Computing is the most key aspect to realize the Digital India Vision of India. C-DAC has been pursuing pioneering research in Language Technology dissolving the language barriers. In the realm of AI, C-DAC's activities envisaged can be broadly categorized into Big Data Analytics with Machine Learning, Chatbots/personal assistant in Indian Languages with domain specificity, ICT solutions for societal applications, Linguistic and NLP resource creation for 22 major Indian languages including transfer lexicon, speech corpora, annotated discourses, heritage computing and digital preservation.

IoE and Dependable and Secure Computing

C-DAC has devised the Comprehensive Cyber security Strategy through a three-pronged approach involving, innovative defence mechanisms, novel deterrence methods and effective response & recovery. Focuses on various challenges including Malware analysis & End-systems, IoT, SCADA, Cloud & Virtualization, Threat Analysis, Digital Forensics, Steganography, High-speed packet processing, Hardware security, Cryptographic algorithms and post quantum cryptography. C-DAC shall customize Blockchain Technology to meet the requirements of specific application domains.

GenNext Applied Computing



GenNext Applications for various sectors like Smart cities, Health Informatics, Agriculture, Education, Energy, Banking & Finance, Strategic sector and e-Governace shall leverage capabilities from Geographic Information System, Decision Support System, Image processing, Blockchain, AI/ML/DL and effective & intuitive visualization and User Interface. Towards Interoperability and seamless integration, depending on application context and domains, implementation of specific standards are required to be incorporated according to the respective domains.

Resources, Facilitation Services and Initiatives

International Collaborations/Initiatives

1. Collaborated with CardiaCom Inc, Hungary for Development of Base station, Master & Slave RF communication devices, RF protocol stack and mobile app for Atractor Ltd.
2. Collaborated with Concordia Institute for Information Systems Engineering, Concordia University, Canada for Joint research, development and training in Cloud Computing and IoT.
3. With support from Ministry of External Affairs (MEA), C-DAC extends its expertise in ICT to collaborating nations and nurtures their ICT centres. During the year, the following activities were carried out as part of this initiative:
   - Completed installation and commissioning of IT infrastructure and delivery of courseware and reference books to National Institute of Posts, Telecommunications and Information Communication Technology (NIPTICT), Cambodia and Institute of Information & Communication Technology (IICT), Lao PDR under project, "Setting up of Centre of Excellence in Software Development and Training (CESDT) in Cambodia, Lao PDR, Myanmar & Vietnam and appropriate accreditation to training courses by C-DAC"
   - Completed 15 months of IT training at Centre of Excellence in IT at Technopark Casablanca, Morocco under the project, "Setting up of Centre of Excellence in IT at Technopark Casablanca, Morocco"
   - Completed ICT training workshops in the areas of e-Learning and Ubiquitous computing at CEIT in Cairo under the project, "setting up of Centre of Excellence in IT at Al Azhar University Cairo, Egypt"
   - The entire IT hardware and software at CARICOM Secretariat in Guyana and Offices in Barbados & Jamaica was delivered & installed under the project, "Upgrading the existing IT Infrastructure and associated software at the CARICOM Secretariat, Guyana and its associated offices in Barbados & Jamaica".
   - The installation of entire IT Hardware and software was completed and Course Material and Reference books were dispatched under the project, "India – Papua New Guinea Centre of Excellence in IT (CEIT) at Port Moresby".
   - The installation of entire IT Hardware and Software for setting up of CEIT – Guyana, delivery of Reference Books and Course Material has been completed and three training courses have been started under the project, "India – Guyana Centre of Excellence in IT (CEIT) at Guyana".
   - Completed the installation & commissioning of IT Infrastructure at CEIT and Course Materials and Reference Books are delivered. C-DAC e-Mentor and LILA has been deployed at CEIT. Master trainers from Fiji National University got trained under the project, "India – Fiji Centre of Excellence in IT (CEIT) at FNU in Suva".
   - Ministry of External Affairs (MEA) and C-DAC signed an Agreement on December 14th 2018 for setting up of NexGen CoE IT at Hashemite Kingdom of Jordan under the project, "Setting up of Next Generation Centre of Excellence in IT at Jordan".
   - Agreement between C-DAC and AITI-KACE for establishment of FOSS lab, Quality Assurance lab, e-Learning studio, IoT lab and development of cloud infrastructure under the project, "Capacity building in Research, Development & Innovation in ICT & Electronics through AITI-KACE by C-DAC".
   - A 'Declaration of Intent' was signed between C-DAC and Tashkent University of Information Technologies (TUIT), Uzbekistan for cooperation in the area of capacity building in ICT sector under the project, "Accreditation of Jawaharlal Nehru India Uzbekistan Centre for IT (JNIUCIT) As International Authorized Training Centre of C-DAC".
4. Collaboration with Technical University of Denmark for Biosensors and Bioelectronics for Knowledge and technical sharing
5. Collaboration with World Health Organization (WHO) for Design, Development and hosting of Information Sharing platform for South East Asia National Drug & Medical product Regulators

Patents

Patents Awarded

1. "System and Method for Tag Authentication and Data Security", Inventors: Chandan Maity Sanjat Kumar Panigrahi, Patent No.: 303630, Application No.: 1923/DEL/2010
2. "A Method of Construction of Unit Vector Using Single Grid Voltage", Inventors: Subhash Joshi T. G., Aby Joseph, Unnikrishnan A. K., Patent No. 298635 granted ranted under Sr. No. 044106117 dtd. 09.07.2018.
3. "System and Method for Compression and Decompression of Text Data". Inventors: Mahesh Kulkarni, Ajay Lohokare, Umesh Vithalkar, Swapnil Belhe, Vinodkumar Pache, US Patent granted no. 10,063,864 B2. Date of grant : 28/08/2018.

Patents Filed

1. "Method and System for authenticating a user using a Personal Authentication Device (PAD)", Inventors: Sreekanth Sarala Narayan, Nobby Varghese, Vaibhav Pratap Singh, Gopinath P, Uttam Kumar, Kaushik Nanda, Indu Sasidharan, Karthika Venkatesan, Haribabu P., Patent No. 201841024339 with Indian Patent Office
2. "An Automatic Carbon Sequestration Estimation System and method to estimate the amount of sequestrated CO2", Inventors: Vaibhav Pratap Singh, Haribabu P, N. Sarat Chandra Babu, Bindhumadhava B S, G L Gangaprasad, Patient No. 201911004661 with Indian Patent Office
3. "A System and method for preserving the privacy of the Participating Entities in Digital payment", Inventors: Dr. Balaji Rajendran, Anoop Kumar Pandey, B. S. Bindhumadhava, Flied with Indian Patent Office, Application No.201841044873
4. "Apparatus for Detection of Carbohydrate Metabolism Disorder Through In-situ Human Alveolar Breath Pattern Analysis", Inventors: Alokesh Ghosh, Hena Ray, Tarun Kanti Ghosh, Angshuman Chakrabarty, Rabinranath Kanjilal, Partha Sarathi Biswas, Nabarun Bhattacharyya, Filed with Indian Patent Office, Application No. 201831045646
5. "An Apparatus for Multi-crop quality Assessment and a method thereof", Inventors: A. Akuli, A. Pal, T. Dey, G. Bej, S. Majumdar, N. Bhattacharyya, Patent Application No. 201731047390
6. "Bio-inspired Controller for Finding Disjoint Paths in Software Defined Networks", Inventors: Ananthalakshmi Ammal, Sajimon, Aneesh Kumar, Dr. Vinod Chandra, Patent Application No. 201841017231

Copyrights

Copyrights Awarded

1. "AppleVision – A vision sensing technology for quality analysis of apple", Inventor : G. Bej, V. K. Palakurthi, A. Pal, T. Dey, S. Majumdar, N. Bhattacharyya, S/W Copyright Registration No. SW-10747/2018 dated 24.05.2018
2. "AppleSense – An acoustic sensing technology for quality analysis of apple", G. Bej, V. K. Palakurthi, A. Pal, T. Dey, S. Majumdar, N. Bhattacharyya, S/W Copyright registration No. SW-10755/2018 dated 25.05.2018
3. "Implementation technique applied for 3D Kirchhoff Depth Migration v2.0", Richa Rastogi, Abhishek Srivastava, Ashutosh Londhe, granted Copyright SW-10328/2018.
4. "Three Phase Smart Meter Enclosure", Sreejith G. S., Ajay Krishnan M., Granted Copyright vide Regn.No.SW-12130/2019 dated 24/01/2019
5. "Single Phase Smart Meter Enclosure", Ajay Krishnan M, Sreejith G.S., Granted Copyright vide Regn.No. SW-12131/2019 dated 24/01/2019
6. "MDMS Application for AMI Single Phase Three Phase Smart Meter Source Code", Priya S., Jiju K, Dhanyamol S., Aritha G., Granted Copyright vide Regn. No. SW-12249/2019 dated 22.2.2019
7. "Single Phase AMI Smart Meter Firmware Including DLMS Protocol Stack Software", Jiju K., Priya S., Indu Lekshmy J. I., Parvathy K., awarded copyright vide Regn. No. SW-12212/2019
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Copyrights Filed

1. "Single Phase Smart Meter Software", Jiju K., Priya S, Indu Lekshmi J. I., Parvathy K. S., Filed copyright application No. 196/2019-CO/SW
2. "Three Phase Smart Meter Software", Jiju K., Priya S, Indu Lekshmi J. I., Parvathy K. S., Filed copyright application No. 336/2019-CO/SW
3. "USBMS – Ultrasonic Solid propellant Burn Rate Measurement System", Sindhu R., Rajesh K. R., Suresh P., Haneesh Sankar T. P., Harikrishnan B., filed copyright application No. 1567/2019-CO/SW
4. "GWALS Microcontroller", Sindhu R., Dayakar N., Haneesh Sankar T. P., filed copyright application No. 1647/2019-CO/SW

Awards/Recognitions

1. During 11th WHC, on August 20, 2018, Dr. Hemant Darbari, Director General, C-DAC, received "Vishwa Hindi Samman", at the hands of Honorable Minster for External Affairs Government of India, late Smt. Sushma Swaraj in the presence of his Excellency Acting President of Mauritius, Shri Paramasivum Pillay "Barlen" Vyapoory and other dignitaries for contribution of C-DAC in the field of Hindi Language Computing, Research and Development, proliferation and various deployments at national and international level.

2. "Portable Olfactory Diabetes Detection Device" received award at Health Hack Innovation Contest 2018 at Kolkata on May 10, 2018.

3. "National Implementation of Web based Geographic Information System for Pradhan Mantri Gram Sadak Yojana" received SKOCH Award 2018 under the category "Technologies for Growth" at Delhi on December 22, 2018.

4. "Mobile-based Surveillance Quest using IT (MoSQuIT)", to address the challenges malaria poses to the Indian health system, especially in remote rural areas received Global South e-Health Observatory Awards at eHealth Conference at Lavaur (France)on on July 2, 2018.

Events/Conferences

1. India's First Indigenously Developed NCMC Compliant Payment Eco-system for transport 'Sweekar' (AFC System) and 'Swagat' (Gate) was launched by Shri Narendra Modi, Hon'ble Prime Minister on March 4, 2019 at Ahmedabad.

Launch of India's First Indigenously Developed NCMC Compliant Payment Eco-system for transport 'Sweekar' (AFC System) and 'Swagat' (Gate)

2. Mobile and Web application – Lila Hindi Pravah developed by C-DAC was launched by Shri Venkaiah Naidu, Hon'ble Vice-President of India in presence of Shri Rajnath Singh, Hon'ble Home Minister; Shri Hansraj Gangaram Ahir, Hon'ble MoS for Home Affairs; Shri Kiren Rijiju, Hon'ble MoS for Home Affairs during the Hindi Divas Samaroh function on September 14, 2018 at Vigyan Bhavan, New Delhi.

Launch of Mobile and Web application – Lila Hindi Pravah

3. PARAM Shrestha with a computing power of 100 TF and 200 TB of high-performance storage under build approach of NSM was inaugurated during 32nd Foundation Day of C-DAC.

Inauguration of PARAM Shreshta system

4. The technology transfer of C-DAC Field Programmable Gate Array (FPGA) board was done on January 21, 2019 between C-DAC Noida and M/s Anshuman Tech Pvt. Ltd. Pune in a meeting chaired by Shri Ajay Prakash Sawhney I.A.S., Secretary, MeitY.

Technology transfer of C-DAC Field Programmable Gate Array (FPGA) board

5. The Centre of Excellence in Information Technology (CEIT), Casablanca, the flagship project of India-Morocco Economic Cooperation was inaugurated on May 07, 2018. The Virtual unveiling of Plaque for Inauguration of CEIT was done from India by H.E. Mr. M. J. Akbar, Hon'ble Minister of State for External Affairs, Government of India, and from Morocco by H.E. Ms. Rakiya Eddarhem, Hon'ble Secretary of State to the Minister of Industry, Investment, Trade and the Digital Economy, in charge of Foreign Trade, Government of the Kingdom of Morocco in presence of senior officials from MEA, Govt. of India.

Inauguration of Centre of Excellence in Information Technology (CEIT), Casablanca

6. C-DAC signed MoUs with Biju Patnaik University of Technology (BPUT), Government of Odisha and Centurion University of Technology and Management (CUTM), Odisha for deployment of C-DAC PARAM Shavak HPC, DL GPU and VR solutions along with training in C-DAC certified Courses. The MoUs were signed by Dr Hemant Darbari, DG, C-DAC and Prof C R Tripathy, VC, BPUT for BPUT and Prof Haribandhu Panda, VC, CUTM for CUTM in presence of Shri Naveen Patnaik, Hon'ble Chief Minister of Odisha, Smt Usha Devi, Hon'ble Minister, SD&TE department during Odisha Skills 2018 on April 29, 2018 at Bhubaneswar, Odisha.

Signing of MoU between C-DAC and BPUT and CUTM, Odisha

7. Dr. Hemant Darbari, DG, C-DAC signed MoU with BSMFC, Department of Minority Welfare, Government of Bihar in presence of Shri Nitish Kumar, Hon'ble Chief Minister of Bihar, Shri Sushil Kumar Modi, Hon'ble Deputy Chief Minister, Shri Vijay Kumar Sinha, Hon'ble Minister, Labour Resources Department, Shri Anjani Kumar Singh, Chief Secretary, Shri Dipak Kumar Singh, Principal Secretary, Labour Resources Department, Government of Bihar at India Skills Bihar 2018 at Patna on April 20, 2018.

Signing of MoU between C-DAC and BSFMC

8. Intent of Cooperation was signed between C-DAC and ATOS India Pvt Ltd on December 15, 2018 at New Delhi in presence of His Excellency Mr. Jean-Yves Le Drian, Minister of Europe and Foreign Affairs France, Mr. Ajay Sawhney, Secretary, MeitY, Dr. Hemant Darbari, DG CDAC and Mr. Pierre Barnabe, CEO, ATOS, Mr. S A Kumar, Director, HPC, MeitY, Dr. Ajai Garg, Director, ICD MeitY, Mr. Arvind Bajaj, Senior VP, ATOS and senior officials.

Intent of Cooperation between C-DAC and ATOS India Pvt. Ltd.

9. Training to handhold the users of Central Drugs Standard Control Organization (CDSCO) for software implementation at CDTL (Central Drug Testing Laboratory) Chennai during March 26-30, 2019.
10. National workshop to proliferate e-Saadhya at RAISE- North East- Bethany society, Shillong on March 22, 2019 in collaboration with RAISE-North East.

National workshop to proliferate e-Saadhya at RAISE- North East- Bethany society, Shillong

11. International Conference on Internet Research and Engineering (ICIRE 2019) at Bangalore on March 4-5, 2019 to gather Internet and Cyber Network professionals to exchange the latest developments that are gaining momentum in the ever growing global infrastructure of Internet.

International Conference on Internet Research and Engineering (ICIRE 2019) at Bangalore

12. One day Symposium on "Blockchain Enabled Smart Grid Market" at C-DAC Knowledge Park, Baiyappanahalli, Bengaluru on February 22, 2019. The objective of the Symposium was to discuss the need and importance of Blockchain in energy sector, understanding Smart Energy Contracts using Blockchain, how Blockchain enhances the trustworthiness and integrity of transactive energy data, Transactive energy applications using Blockchain. This symposium was technically supported by Ministry of Power (MoP) - National Smart Grid Mission (NSGM) and Power System Operation Corporation (POSOCO), IEEE Bangalore Section and IEEE Power & Energy Society.

One day Symposium on "Blockchain Enabled Smart Grid Market" at C-DAC Bangalore

13. Training on "Network and Web Security" to members at CR Rao AIMSCS during February 18-22, 2019.
14. Ayurveda Development Therapeutic Program (ADTP) Symposium at C-DAC Pune on February 8, 2019 in collaboration with Ministry of AYUSH and Open Health Systems Laboratory (OHSL).
15. Accelerating Biology 2019: Towards Thinking Machines at IISER, Pune during February 5-7, 2019

Accelerating Biology 2019

16. Showcase of C-DAC solutions in Vibrant Gujarat 2019 Global Trade Show at Gandhinagar, Gujrat during January 18-22, 2019.

17. Workshop on ICT and Forensic Linguistics at IIT Patna on January 11-12, 2019

Workshop on ICT and Forensic Linguistics at IIT Patna

18. 2nd ISEA International Conference on Security & Privacy 2018 during January 9-13, 2019 at Malaviya National Institute of Technology Jaipur (MNIT), Jaipur in collaboration with IIT Jammu and IIITM Kota.
19. National Seminar on "IoT Inspired Food Safety & Residue Detection" to disseminate and highlight the developed technologies and solutions to all the stakeholders and scientists of Indian Agriculture at Kolkata on December 18, 2018 in collaboration with R.D. Tata Trust, Birla Institute of Technology & Science, Pilani, Goa and Jadavpur University, Kolkata.

National Seminar on "IoT Inspired Food Safety & Residue Detection" at Kolkata

20. International conference on Exascale Computing (SCEC2018) during December 13-14, 2018 at Delhi.
21. NRCeS Users' Meet - Winter 2018 at AIIMS, New Delhi on November 28, 2018.
22. National Workshop on "5G: The Next Generation Wireless Technology" at C-DAC Mohali on November 14-15, 2018 to bring experts from industry, academia and research to exchange their vision as well as encourage innovative cross-domain studies, research, early deployment and large-scale pilot showcases that address the challenges of 5G.

23. Meeting of the Fifth Technical Advisory Committee (TAC), C-DAC was held at C-DAC, Pune on November 03, 2018 under the chairmanship of Padma Bhushan Dr. Vijay P. Bhatkar, Founder Chancellor & Chief Mentor, Multiversity Chancellor, Nalanda University.

Meeting of the Fifth Technical Advisory Committee (TAC)

24. Big Data Analytics Workshop for knowledge sharing at Indian Space Research Organization, Vikram Sarabhai Space Centre, Thiruvananthapuram during October 9-11, 2018.
25. NERS training Program for the participants of various Govt. departments of Nagaland at Kohima, Nagaland during October 8-12, 2018.
26. Workshop on "Digital India and Information Security" for Promotion and Awareness at Centre for e-Governance (CeG), Ministry of Electronics and IT (MeitY) on September 26, 2018.
27. Three days workshop on Speech based Assistive Aids in Bangla for Visually Impaired People of Tripura at IVH (Boys & Girls) School, Narsingarh, Tripura during September 25-27, 2018 in collaboration with Social Welfare and Social Education (SW&SE) Department, Govt. of Tripura to train the students and teachers regarding how visually challenged people can use the computer by means of software specially designed for them.
28. Dr. Hemant Darbari, DG, C-DAC addressed at the inauguration of "Underwater Domain Awareness" during the presence of Dr. Subash Bhamre, Hon'ble Minister of State for Defence and Prof. (Dr.) Nitin R. Karmalkar Vice-Chancellor, SPPU on August 25, 2018 at Savitribai Phule Pune University.

Inauguration of "Underwater Domain Awareness at SPPU

29. DG C-DAC R&D Award ceremony was conducted on August 15, 2018 at C-DAC Pune. C-DAC Kolkata won the award for the project titled "Development of Third Eye – A hidden gadget for perimeter security".

DG C-DAC R&D Award ceremony on August 15, 2018 at C-DAC Pune

30. Stake holders meeting on establishing centre of excellence in cyber security at Hyderabad on July 13, 2018 with 50+ organizations from Govt. Companies / start-ups / industry / academia in collaboration with MeitY.

Stake holders meeting on establishing centre of excellence in cyber security at Hyderabad

31. MoU between C-DAC and Society for Electronic Transactions and Security (SETS), Chennai was signed on 11th July 2018 at New Delhi to leverage capabilities and expertise through collaborations for providing Cyber Security solutions.

Signing of MoU between C-DAC and SETS, Chennai

32. Inauguration of 1st Online Auctioning of Manipur Black Aromatic Rice (CHAK - HAO) under Mission Organic Value Chain Development North East Region at Directorate of Agriculture, Imphal, Manipur on May 18, 2018 in collaboration with NERAMAC Ltd (DoNER).
33. Awareness Programs on "Internet Protocols and Standards" at Bangalore, Chennai, Maddur, Thiruvananthapuram and Bhubaneshwar during the year to make people aware about IETF, Internet Draft Writing and the Work done by IIREF.
34. Regional Seminar on e-CHARAK for Central, Southern, Northern and Western region at various places during the year to build capacities of Medicinal and Aromatic stakeholders on use of e-CHARAK platform in collaboration with National Medicinal Plants Board, Ministry of AYUSH.
35. Total of 65 Workshops have been conducted on "ICT for schools" and "Training on Online Labs" for 1344 teachers from 393 schools across 11 states (Maharashtra, Madhya Pradesh, West Bengal, Gujarat, Rajasthan, Assam, Manipur, Nagaland, Arunachal Pradesh, Kerala ad Uttar Pradesh).
36. Celebration of 32nd Foundation Day of C-DAC

Celebration of 32nd Foundation Day of C-DAC

37. Technology Conclave at C-DAC Pune

Technology Conclave at C-DAC Pune

Technology Conclave at C-DAC Pune

38. International Yoga Day 2018 at C-DAC

International Yoga Day 2018 at C-DAC

39. Commemoration of 150th Birth Anniversary of Mahatma Gandhi

Commemoration of 150th Birth Anniversary of Mahatma Gandhi

Research Papers/Publications

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2. Swapnil Shrivastava, Supriya N Pal, N. Sarat Chandra Babu, Sudhanshu Raman, Milindra Pratap Singh, "A Tool Prototype for Privacy Preserving Distributed Data Mining and Analytics", CiiT International Journal of Software Engineering and Technology, Vol 10, No. 8, 116-121, 2018.
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4. Vijayalakshmi B, "Gender and ICT – An Indian perspective", ASCI Journal of Management, Vol 47 No. 1 (Spl), Special Issue on Accelerating Change: Strategizing for Gender Equality by 2030, 24-31, 2018.
5. Santosh Sam Koshy, Venkata Srikanth Sunnam, Prateek Rajgarhia, Kathiresan Chinnusamy, Durga Prasad Ravulapalli, Sarada Chunduri, "Application of the internet of things (IoT) for smart farming: a case study on groundnut and castor pest and disease forewarning", CSI Transactions on ICT, ISSN 2277-9078, Springer, Volume 6, Combined 3-4, Pages 311-318, 2018.
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14. Singh Gurmohan; Raj B.; Sarin R. K., "Fault-Tolerant Design and Analysis of QCA Based Circuits", IET Circuits, Devices & Systems, Vol 12, Issue 5, 638-644, 2018.
15. Divya; Kaur Manjit; Singh Gurmohan, "Performance Analysis of CNFET Based 6T SRAM", COJ Electronics & Communications, Vol. 1, Issue 2, 1-9, 2018.
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61. Mayank Maurya, Hitesh Pahuja*, Balwinder Singh, Varun Chhabra and Suresh Jambagi, "Design and realization of novel solar panel with improved efficiency", Proceedings of ICAET, IJCA, Sangrur, 571-575, 2018.
62. Singh Gurmohan; Sarin R. K.; Raj B., "Reliability Aware Design and Performance Analysis of QCA Based Exclusive-OR Gate", Proceedings of 2nd International Conference on Communication, Computing and Networking, Springer Nature Singapore Pte. Ltd, NITTER, Chandigarh, India, 1-7, 2018.
63. Varun Aryan Chhabra, Rajnish Kaur, Changanamkandath Rajesh, Akash Deep, "Facile and Efficient Nanofabrication of Brown Graphene Quantum Dots", Conference on Emerging Devices and Smart Systems (ICEDSS), IEEE, Mahendra Engineering College, Tamil nadu, 149-151, 2018,
64. Sakshi Saini, Balwinder Singh, Hitesh Pahuja, Varun A. Chhabra, "Design and Analysis of Priority Encoder with Low Power MTCMOS Technique", 8th International Conference on Cloud Computing, Data Science & Engineering (Confluence), IEEE, Amity University, NCR, 550-555, 2018.
65. Amita Kumari, Balwinder Singh, Hitesh Pahuja, Suresh G. Jambagi, Varun Aryan Chhabra, "Design and Performance Analysis of Operational Transconductance Amplifier Using FinFET", 8th International Conference on Cloud Computing, Data Science & Engineering (Confluence), IEEE, Amity University, NCR, 544-549, 2018.
66. Atish Shankar Ghone, et al., "Automatic Pause Boundary and Pause Duration Detection for Text-to-Speech Synthesis System in Indian Languages", Proceedings of 15th International Conference on Natural Language Processing (ICON-2018), 15 to 18 December 2018, NLP Association of India (NLPAI), Punjabi University, Patiala, India, 28-34, 2018.
67. Abhishek Gangwar, E. Fidalgo, E. Alegre, V. González-Castro, PhishFingerprint, "A Practical Approach for Phishing Web Page Identity Retrieval Based on Visual Cues", Applications of Intelligent Systems (APPIS) 2018, Gran Canaria, Spain, 2018.
68. Abhishek Gangwar, Akanksha Joshi, Padmaja Joshi, R. Ramachandra, "DeepIrisCodes: Learning Deep-IrisCodes from scratch for Segmentation-Robust Visible Wavelength and Near Infrared Iris Recognition", arXiv, 2018.
69. Priyesh Ranjan, Sumit Soman, Amit Kumar Ateria, Praveen K Srivastava, "Streamlining Payment Workflows Using a Patient Wallet for Hospital Information Systems", IEEE 31st International Symposium on Computer-Based Medical Systems (CBMS 2018), IEEE, Karlstad, Sweden, 339-344, 2018.
70. Paramveer Singh, Siddharth Srivastava, Astha Rai, A S Cheema," Study of real time face recognition using few shot recognition techniques", 3rd International Conference on Contemporary Computing and Informatics (IC3I), IEEE, Delhi, 1-6, 2018.
71. Rekha Saraswat, Arti Noor, V.K. Sharma, Zaid Iqbal, "Cyber Ranges: The future of Cyber Security", ICEIT Conference on Advances in Mobile Communications, Networking and Computing -2019, ICEIT, India International Centre (Annexe), New Delhi, 2019.
72. Neha Bajpai, Arti Noor, V.K. Sharma, Ashish Sharma, "RANSOMmod: A Robust Approach for Ransomware Detection for mobile devices using Machine Learning", ICEIT Conference on Advances in Mobile Communications, Networking and Computing -2019, ICEIT, India International Centre (Annexe), New Delhi, 2019.
73. Preeti Chhikara and Sanjay Ojha, "Efficient Security in Cloud Storage for Dropbox", American International Journal of Research in Science, Technology, Engineering & Mathematics, International Association of Scientific Innovation and Research (IASIR), C-DAC Noida, 79-82, 2018.
74. Ishleen Kaur, Neha Bajpai, "Software Test Optimization by Fault Prediction: A Systematic Literature Review", Proceedings of 5th International Conference on"Computing for Sustainable Global Development, BVICAM, A-4, Paschim Vihar, 4920-4923, 2018.
75. Shubham Gupta, Rahul Johari, Kalpana Gupta, "C^3T: Cloud based Cyclic Cryptographic Technique and it's comparative analysis with classical cipher techniques", SPIN 2018- XPLORE COMPLIANT CFP18SPJ-ART 978-1- 5386-3045- 7, IEEE Xplore Digital Library, ASET, Amity University, Noida, Sec-125, 2018.
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77. Vineet Jha, Ravi Payal, "Design and Implementation of Polar Code Folded Encoder Architecture and Successive Cancellation Decoder on FPGA", National Conference on Information Technology, Electronics and Management (NCITEM-2018), July 26-27, 2018, American International Journal of research in Science, Technology, Engineering and Mathematics, C-DAC Noida, 21-17,2018.
78. Sneha Potghan, R. Rajamenakshi, Dr. Archana Bhise, "Multi-Layer Perceptron based Lung tumor classification", Proceedings of 2nd International conference on Electronics, Communication and Aerospace Technology (ICECA 2018), IEEE, Coimbatore, India, 499-502, 2018.
79. Suresh Kumar Sharma, Manisha Mantri, Gaur Sunder, "Mental Health in Digital India-EHR Perspectives", Proceedings of 18th National Conference of Indian Society of Psychiatric Nurses (ISPNCON 2019), ISPN, Tezpur, Assam,60-63, 2019.

80. Bhagyashree S. Shelke, K. C. Waghmare, Anil Kumar Gupta, Amarjeet Sharma, "Survey on Heart disease Prediction Algorithms", IJRECE, Vol 7, Issue 2, 2019.
81. Mandeep Kaur, Sanjay S. Kadam, "A novel multi-objective bacteria foraging optimization algorithm (MOBFOA) for multi-objective scheduling", Applied Soft Computing, Vol. 66, 183-195, 2018.
82. Ashish Lingayat, Ranjana R. Badre, Anil Kumar Gupta, "HORIZON, A Web-Based User Interface for Managing Services in open stack: An introspection", 9thICCCNT2018, July 10-12, 2018, IISC, Bengaluru IEEE – 43488, 2018.
83. Anil Kumar Gupta , Amarjeet Sharmay, Sumedh Salvi, Ashank Saini, Nishad Tardalkar, "Permutation Algorithm Analysis and Updation", 5th International Conference for Convergence in Technology (I2CT), IEEE, Pune 2019.
84. Ashish Lingayat, Ranjana R. Badre, Anil Kumar Gupta, "Performance Evaluation for Deploying Docker Containers on Baremetal and Virtual Machine", Proceedings of the International Conference on Communication and Electronics Systems (ICCES 2018), IEEE, Coimbatore, 2018.
85. Mohan Labade, Vikas Kumar, Mangesh Chaudhari, "A Conjugate Heat Transfer CFD Model of Cold Plate used in High End Computing Server", Twelve International Conference on Thermal Engineering: Theory and Applications, February 23-26, 2019, Gandhinagar, India, SVP Petroleum University, Gandhinagar, India, 2019.
86. Srisai Meher and Vikas Kumar, "Pollution Dispersion around a Building using OpenFOAM", 7th International and 45th National Conference on Fluid Mechanics and Fluid Power (FMFP) December 10-12, 2018, IIT Bombay, Mumbai, 2018.
87. Popat Bangar, Chetan Khare and Vikas Kumar, "Development of Sensor for Measurement of Various Parameters in Data Centre", 7th International and 45th National Conference on Fluid Mechanics and Fluid Power (FMFP) December 10-12, 2018, IIT Bombay, Mumbai, 2018.
88. Vinaya Sivanandan, Amol Wagare and Vikas Kumar, "Development of 3D Navier-Stokes Solver for CFD on GPU", International Conference on Advanced Computing (ICoAC) Conference, Dec 13-16, 2018, Anna University, Chennai, India, 2018.
89. Suyash Srivastava, Lokesh Sharma, Vijeta Sharma, Ajai Kumar, Dr. Hemant Darbari," Prediction of Diabetes Using Arti cial Neural Network Approach", Engineering Vibration, Communication and Information Processing, Springer, Singapore, Manipal University, Jaipur, 679-687, 2018.
90. Jain, P., Bhavsar, R. P., Kumar, A., Pawar, B. V., Darbari, H. and Bhavsar, V. C., "Tree Adjoining Grammar based Parser for a Hindi text-to-scene conversion system", Conference proceeding of 4th International Conference for Convergence in Technology (I2CT). DOI: 10.1109/I2CT.2018.8529491, IEEE Xplore Digital library, Pune, 1-7, 2018.
91. Shashi Pal Singh, Ajai Kumar, Dr. Hemant Darbari, "Deep neural based name entity recognizer and classifier for English language", IEEE Xplore Catalog no is CFP17CCU-ART, Electronic ISBN: 978-1-5386-0615-5, Print on Demand (PoD) ISBN: 978-1-5386-0616-2, 241-246, 2018.
92. Shashi Pal Singh, Ajai Kumar, Hemant Darbari, Shubhi Vaish, "Fuzzy Approach towards English-Hindi Translation", Advanced Computing and Communications Society, Vol. 1, ISBN No.: ISBN 978-93-5321-421-0, 34-39, 2018.
93. Ajeesh, Nevin Samuel, Nisha R.N., "Reconfigurable controller for power electronics", NCITEM, C-DAC Noida, 2018.
94. Libin T T, Anu Ann Thomas, Basil Baby, Mithuna Chandran O, Sreenadh S, S Krishnakumar Rao, Biju C. Oommen, "Design and implementation of RISC V ISA based in-order dual issue super scalar processor", RISC V summit Santa clara, California, USA, 2018.
95. Libin T T, Anu Ann Thomas, Basil Baby, Mithuna Chandran O, Sreenadh S, S Krishnakumar Rao, Biju C. Oommen, "VAJRA64: A Superscalar RISC V Microprocessor", NSC 2018, VSSC, Trivandrum, Kerala, 2018.
96. Jerry Daniel J, Lijo Thomas, Senju Thomas Panicker, Shalu R, Jacob T Mathew, Berlin Vince Joe V S, "Safety Alert Systems using Dedicated Short Range", 4th International Conference on Control, Communication and Computing, Trivandrum, Kerala, 2018.
97. Arun Kumar K A, "ARM-FPGA Implementation of a Partially Reconfigurable OFDM-MIMO Phy-Link", IEEE xplore, 288-292, 2018.
98. Santhoshkumar S, "Geographical Information System based Crime Analysis and Mapping Techniques in Public Safety Management", International Conference on Networks, Image and Security- Proceedings, 2019.
99. KalaiSelvan A, "Crime Prediction with Computational Intelligence", ICCIIOT 2018, NIT, Agartala, 2018.
100. George Thomas, Pournami S Chandran, Deepak Rajasekharan, Dr. Alexander G and Sasi P M, "Image Processing Assisted GIS for Traffic Enforcement Using Vehicle Tracking System", IEEE RAICS 2018, 2018.
101. Navya J S, Mr. Ullas B, Ms. Rajasree S, "Non-Invasive fall detection system for Parkinson's disease", International Conference on Control, Communication and Computing, IEEE Xplore, College of Engineering Trivandrum, 2018.

Invited Talks

1. Mangala N, "Parallel Computing", Symposium on Upcoming Technologies, Jain University, Bangalore, 24 May 2018.
2. Mangala N, "HPC Solutions for Aerospace", CSI Conference on IT in Defence, Taj Vivanta, Bangalore, 12 January 2018.
3. Arunachalam B., "Introduction to Message Passing Interface", AICTE sponsored Workshop on - HPC for Science and Engineering, Tyagarajar College of Engineering, Madurai, 6 February 2019.
4. Haribabu P, "IoT Protocols, Challenges and applications", First International Conference on Technological Advances & Applications in IoT, Data Analytics, Big Data & 5G, U R Rao Satellite Centre, Bengaluru, 13-15 December 2018.
5. Vaibhav Pratap Singh, "IoT Usecases", Entrepreneurial Workshop, Assam Engineering College, Guwahati, 6 February 2019.
6. Utkarsh P Mankad, "Mobile Applications in Agriculture", Information and Communication Technologies for Agricultural Extension, State Agricultural Management and Extension Training Institute (SAMETI) - South, UAS, Hebbal, Bengaluru, 11 October 2018.
7. Dr MohanaSundaram, "ICT for precision agriculture", Information and Communication Technologies for Agricultural Extension, State Agricultural Management and Extension Training Institute (SAMETI) - South, UAS, Hebbal, Bengaluru, 11 October, 2018.
8. Utkarsh P Mankad, "Augmented Reality Learning Ecosystem", AR/VR Workshop, CIET, NCERT Campus, New Delhi, 10 January, 2019.
9. Rajesh Kalluri, "Time series forecasting using LSTM networks", Workshop on Deep Learning, PSG College of Technology, 24 January, 2018
10. Rajesh Kalluri, "Trusted boot and firmware protection", STQC Training, C-DAC, Bengaluru, 9 August, 2018.
11. Rajesh Kalluri, "SCADA security aspects in power Transmission and Distribution Networks", Cyber Security Awareness program for Power System Operation, Institution of Engineers (India), Kochi, Kerala, 18 July, 2018.
12. Rajesh Kalluri, "SCADA Security aspects in Electrical Transmission and Distribution System", Integrated approach for Cyber security in Power Sector, Institution of Engineers (India), Tamilnadu State Centre, Chennai, 28 November, 2018.
13. Swapnil Shrivastava, "Big Data Analytics and Cyber Security", Women in Information Security organized by Target India and DSCI, Bangalore, 12 June 2018.
14. Swapnil Shrivastava, "Privacy Preserving Techniques for Big Data: Need, Techniques and Challenges", ACM-W India Celebration of Women in Computing (AICWiC), Bangalore, 29 Jun 2018.
15. Swapnil Shrivastava, "NoSQL Databases: Flavors" and Design" and "Business Analytics", Faculty Development Program on "Cognition and Big Data Analytics", 25 July 2018.
16. Swapnil Shrivastava, "A few Big Data Security and Privacy initiatives in Indian Context", ACM Kolkata Chapter, University of Kolkata, 12 November 2018.
17. Supriya N. Pal, "Big Data Analytics for IoT Applications", IETE INTERNATIONAL CONFERENCE INDIA-2018 (IICI-2018) on IoT, BigData Analytics & 5G, UR Rao Satellite Centre (URSC), ISRO, Bengaluru, 15 December 2018.
18. Swapnil Shrivastava, "Big Data Security and Privacy", IETE INTERNATIONAL CONFERENCE INDIA-2018 (IICI-2018), IETE Bengaluru, 13 December 2018
19. Swapnil Shrivastava, "Big Data Analytics in IoT and Agriculture", National Seminar on Food Safety and Residue Detection, Kolkata, 18 December 2018.
20. Ramesh L Naidu, "Deep Learning Algorithms and Applications", 7th National Conference on Emerging Technologies and its Applications in Computers – ETAC19, PSG College, Coimbatore, 29 March, 2019.
21. Dr. N. S. Sreekanth, "ICT for Education Future Technological Perspective", Three-Days work shop on Inclusive Education, Northern Command HQ, Indian Army, Udhampur, Jammu and Kashmir, 28-30 March 2019.
22. Dr. N. S. Sreekanth, "Artificial Intelligence", Three-Days Residential Camp, Workshop on Artificial Intelligence & Its Applications, Even organized by State Institute of Educational Technology, Govt. of Kerala, and Central University of Kerala, School of Mathematics Kerala, 15-17 February 2019.
23. Karthika V, "e-Saadhya for Special Education", Digital Inclusion Summit, Visakhapatnam, 14-15 March 2019.
24. R. S. Patil, "Parallelizing cryptographic and cryptanalytic Algos", Parallel Programming Training for Cryptanalysis, C R RAO Institute, Hyderabad, 3 May 2018.
25. Mervin J and R. S. Patil, "RSA, AES and TDES CMVP Validation Pseudo Random Number Generator – design and Validation to FIPS 140-2 Level-2", Crypto Module Validation Programme Training, Indian Institute of Science, 25-26

September 2018

26. Dr. Balaji Rajendran, "IoT Security Protocols", Two Day Workshop on Internet of Things at CMR Institute of Technology, Bangalore, CMR Institute of Technology, Bangalore, 24 August 2018.
27. Dr. Balaji Rajendran, "DNS and TLS in IoT Environment", IIESoC's IoT & Security Event at MS Ramaiah Institute of Technology, Bangalore, MS Ramaiah Institute of Technology.
28. Dr. Balaji Rajendran, "Digital Signatures and Public Key Infrastructure", Invited talk at MES Degree College, Bangalore, MES Degree College, Bangalore, 26 September 2018.
29. Dr. Balaji Rajendran, "Application & Data Security using Public Key Infrastructure: Digital Signatures, PKI, TLS", CISO Deep Dive Training, Under Cyber Surakshit Bharat Initiative, Hotel Royal Orchid, Bangalore, 14-17 November 2018.
30. Dr. Balaji Rajendran, "IoT Security Protocols", First IETE International Conference India (IICI 2018), Satish Dhawan Auditorium, UR Rao Satellite Centre, ISRO Campus, Bengaluru, 2018.
31. Dr. Balaji Rajendran, "Establishing Trust Through PKI", Invited Lecture for ISRO Scientists, Antariksh Bhavan, ISRO Head Quarters, Bengaluru, 1 March 2019.
32. Dr. Balaji Rajendran, "IoT Security Protocols", Invited Talk for participants of University of Applied Sciences, Wurzburg-Schweinfurt, Germany as part of India Gateway Programme (IGP), Christ University, 2 March 2019.
33. Dr. Balaji Rajendran, "Internet Protocol Standards", Intelligent Computing and Signal Processing (IntelliSig 2019), Central University of Kerala, Kasargod, 8-9 March 2019.
34. Jitendra Kumar, Development of Internet Standard and its Maturity Level, IEEE workshop on "Development of Internet Protocol and Standards", Nagarjuna College of Engineering and Technology, 20 July 2018.
35. Ramesh L Naidu, "EEG seizure detection and prediction using Deep Convolutional Recurrent Networks and Autoencoders", HPC-AI Workshop, organized under HiPC-2018, Bangalore, 16-12 December 2018.
36. Janaki C. H., "Data analytics for Life science and Health applications", National Conference on Big Data and Intelligent Computing, Indian Academy Degree College, Hennur Bangalore, 23 March 2019.
37. Kailash S, "Cloud Computing with Free and Open Source Tools and Industry 4.0", Training programme on Cloud Computing, National Productivity Council, Chennai, 12 October 2018.
38. K Vijay Kumar, "Big Data Technologies – An Introspection", National Seminar - IQAC, Sathyabama University, 7 February, 2019.
39. L R Prakash, "Cyber Threats in Modern Industry", Cyber security course and Internet of Things –Talk for TN Electricity Board, TANGEDCO –Chennai, 26 October, 2018.
40. Chaithanya and Vamsi, "Android Security and Reverse Engineering Android Applications", One Week Workshop on Cyber Security, VNIT Nagpur, 11 July 2018.
41. Sandeep and Sai Gopal, "Malware Analysis", Cyber Security Course, CR Rao Institute, 29 October 2018.
42. Sai Gopal, "Blockchain Technology", One day Workshop on Blockchain Technology, G. Narayanamma Institute of Technology & Science (for Women), Hyderabad, 10 December 2018.
43. Mahesh U Patil, "Blockchain Technology", National Workshop on "Blockchain Technology, Platforms and Security", SETS Chennai, 12 October 2018.
44. Lakshmi Eswari, "Blockchain Use case: Property Record Management", International Workshop on Blockchain Technologies, VJTI Mumbai, 5 March 2019.
45. Lakshmi Eswari, "Trends in Endpoint Security", National Workshop WORTICS 2018, SETS Lab, Chennai, 30 June 2018.
46. T. Sampath, "ICT tools for prioritizing Agri research problems - m-PRIORITIZE as a case", Training programme for Agriculture Research Scientists, National Academy of Agricultural Research Management (NAARM), Rajendranagar, Hyderabad, 16 August 2018.
47. T. Sampath, "eCHARAK as a networking platform for MAP stakeholders", Workshop on Medicinal Plants, Mysore University, 01 October 2018.
48. B. Vijayalakshmi, "Vikaspedia – knowledge management initiative for social development", Training on Agriculture Knowledge Management, National Institute of Agricultural Extension Management (MANAGE), Hyderabad, 14 November 2018.
49. B. Vijayalakshmi, "e-CHARAK – a platform for forward-backward linkages in MAP sector", Workshop on "Strengthening forward – backward linkages for sustained supply of quality medicinal plants to industry through profitable cultivation", M. S. Swaminathan Research Foundation, Chennai, 27 November 2018.

50. B. Vijayalakshmi, "ICT interventions in Agriculture", Training programme for Agriculture Research Scientists, National Academy of Agricultural Research Management (NAARM), Rajendranagar, Hyderabad, 13 December 2018.
51. B. Vijayalakshmi, "Social Media for Knowledge Management - Vikaspedia initiative as a case", Training programme on "Social Media for effective sharing of Agricultural Knowledge", National Institute of Agricultural Extension Management (MANAGE), Hyderabad, 17 December 2018.
52. T. Sampath, "Mobile as a platform for information sharing in regional languages", Training programme on ICTs for empowering farm women, National Academy of Agricultural Research Management (NAARM), Rajendranagar, Hyderabad, 04 February 2019.
53. T. Sampath, "eCHARAK as a networking platform for MAP stakeholders", Workshop on Strengthening Buyer- Seller Linkages for Profitable Cultivation of Medicinal Plants in Telangana, University of Hyderabad, 05 February 2019.
54. B. Vijayalakshmi, "Opening Access to Agricultural Knowledge: Worldwide Developments and Vikaspedia", International Training Program on "Computer Applications in Agriculture", National Institute of Agricultural Extension Management (MANAGE), Hyderabad, 20 February 2019.
55. Shubham Chandrakar, "eCHARAK as a networking platform for MAP stakeholders", Workshop on Networking Buyer-Sellers of Medicinal Plants Sector, State Forest Research & Training Institute, Raipur, 21 February 2019.
56. M. Kumar, "Mobile Seva - M Governance initiative GOI", Six Days Residential Training Programme on " Digital Transformation Essentials (DTE), APHRDI, Bapatla, Andhra Pradesh, May 28, 2018.
57. M. Kumar, "Next Generation e-Learning and Mobile Learning", E-Learning and ICT for Teaching & Learning, UGC HRD Centre, JNTU Hyderabad, 03 August, 2018.
58. M. Kumar, "Mobile Apps – Hands on Experience", ICTs for Effective Knowledge and Extension Delivery, Extension Education Institute (EEI), Rajendra Nagar, Hyderabad, 7 August, 2018.
59. M. Kumar, "Mobile App Development", e-Extension in Agriculture and Allied Sectors, MANAGE, Rajendranagar, Hyderabad, 18 September, 2018.
60. M. Kumar, "e-Ustad- An e-Learning Platform for Indian Police", 36th National Symposium for Heads of Police Training Institutes, Central Academy of Police Training (CAPT), Bhopal, 27 September, 2018.
61. M. Kumar, "IT Initiatives of C-DAC", Three Day programme on "IT for Effective Office Management", APHRDI, Bapatla, Andhra Pradesh, 16 November, 2018.
62. M. Kumar, "M-Learning and MOOCs platform", One-week short term course on "MOOCs, e-Content Development & Open Educational Resources", UGC HRD Centre, JNTUH, Hyderabad, 8 January, 2019.
63. M. Kumar, "M-Learning and Android Apps for Agriculture", International Training Program (MANAGE FTF ITT) on "ICT Applications in Agricultural Extension Management", MANAGE, Rajendranagar, Hyderabad, 21 March, 2019.
64. Anoop Kumar, "Optical Interconnect Roadmap of NSM program", Workshop on Silicon Photonics for High-Speed Optical-Interconnect as part of 4th International Conference on Emerging Electronics, Royal Orchid, Bangalore, 19 December 2018.
65. S. V. Srikanth, "Internet of Things (IoT) in Agriculture and Allied Sector: Case presentation", Application of RS and GIS in Agricultural Development, MANAGE, Rajendranagar, Hyderabad, 20 August 2018.
66. S.V. Srikanth, "IoT Idea to Prototype to Product (I-P-P)", REFRESHER PROGRAMME on "ARTIFICAL INTELLIGENCE BASED INTERNET OF THINGS", CBIT Hyderabad, 29 November 2018.
67. S.V. Srikanth, "IoT Idea to Prototype to Product (I-P-P)", FDP program on System Design Aspects in IoT, JNTUH College of Engineering Hyderabad, 30 June 2018.
68. S.V. Srikanth, "A Walkthrough IoT: Architecture, Protocols, Applications & Idea to Prototype", IoT and Applications, Sri Vasavi Engineering College, Tadepalligudem, Andhra Pradesh, 11 August 2018.
69. S.V. Srikanth, "A Walkthrough IoT: Architecture, Protocols, Applications", Emerging Technologies, Tirumala Engineering College, Andhra Pradesh, 10 November 2018.
70. Tapas, "Artificial Intelligence & Machine learning as Emerging Technology", Thematic Workshop on Emerging technologies in e-Governance, HCMRIPA, Jaipur, 11 January 2019.
71. Santosh Sam Koshy, "IoT in Agriculture: A Case Study on Groundnut", National Dialogue on AI and IoT Applications in Agriculture, NAARM, 01 June, 2018.
72. Santosh Sam Koshy, "IoT in Agriculture: A Case Study on Groundnut", National Workshop on AI in Agriculture: Status and Challenges, ICAR-IASRI, 30-31 July, 2018.

73. Santosh Sam Koshy, "HARITA-PRIYA", Smart Village Workshop, NIRD&PR, 22 and 23February, 2018.
74. Santosh Sam Koshy, "IoT in Agriculture: Case Studies in Pest and Disease Management", One day workshop on IoT Design and Applications, ECIL, 06 October 2018.
75. Santosh Sam Koshy, "IoT in Agriculture: Case Studies in Pest and Disease Management", ICAR sponsored winter school on ICT interventions for Agricultural Development, ICAR-NAARM, 06 December 2018.
76. Dr. Hena Ray, "Sensor and Sensing System", IEEE Symposium, Meghnad Saha Institute of Technology, 14 August 2018.
77. Dr. Nabarun Bhattacharyya, "ICT Applications for Agriculture and Environment", Heritage Institute of Technology, Electronics and Communications Engineering Department, 8 February 2019.
78. Dr. Souvik Pal, "Agri Environment Electronics: An Overview", Faculty development program on "Development of Smart Sensor Technology towards Electronic Applications", Sri Jayachamarajendra College of Engineering, JSS Science and Technology University, Mysuru. Electronics and Communications Engineering Department, 6 February 2019.
79. Dr. Souvik Pal, "Biosensor: An Overview", Faculty development program on "Development of Smart Sensor Technology towards Electronic Applications", Sri Jayachamarajendra College of Engineering, JSS Science and Technology University, Mysuru. Electronics and Communications Engineering Department, 6 February 2019.
80. Subhankar Mukherjee & Dr. Souvik Pal, "Nanomaterials in Biosensing and Field-portable Biosensors: An Overview", Workshop on "Recent Trends on Remediation of Contaminated Water bodies and Soil", Environment and Water (CREW), National Institute of Technology Durgapur, 25 – 29 March 2019.
81. Dr. Nabarun Bhattacharyya, "IoT enabled Multimodal Sensor Systems and Water Quality Monitoring", Workshop on "Recent Trends on Remediation of Contaminated Water bodies and Soil", Environment and Water (CREW), National Institute of Technology Durgapur, 25-29 March 2019.
82. Amitava Akuli, "Application of Digital Image Processing Technology in Agriculture" delivered during one day seminar on "Emerging Technologies in Computer Science", One day seminar on "Emerging Technologies in Computer Science, Adamas University, Barasat, Kolkata, 8 September, 2018.
83. Amitava Akuli, "Digital Image Processing and Its Application in Agriculture", Refresher Course on "Advances in Instrumentation and Automation: Role of ICT", Dept. of IEE, Jadavpur University Kolkata, 14 December, 2018.
84. Amitava Akuli, "Application of Digital Image Processing Technologies in Agriculture for Quality Estimation of Agro Produces", Two-day Workshop on "Emerging Technologies and Applications in Electronics and Information Technology", Techno India College of Technology (TICT), Kolkata, 21 - 22 February, 2018.
85. Amitava Akuli, "ICT in Agriculture – Recent Trends and Applications", One day National Seminar on Trends & Applications of ICT in Agriculture (TRACT), Monotel, Saltlake, Kolkata, 13 March, 2018.
86. Amitava Akuli, "ICT applications in Agriculture", One day workshop on "New trends and application in IT and Electronics", National Council of Science Museum, 23 April, 2018.
87. Alokesh Ghosh, "Trends in Warehouse Environment Monitoring and e-Assaying of Agricultural Commodities", International Conference, Indian Institute of Food Processing Technology, Thanjavur, 26 July 2018.
88. Alokesh Ghosh, "Design of a Processor", IEEE Symposium, Techno International Batanagar, 17 August 2018.
89. G.K. Saha, "Online Auction System", TRACT 2018 National Seminar, Kolkata, April 2018
90. Dr. Amit Chaudhuri, Multi-Modal Machine Translation (with reference to English-Bangla-KokBorok), International Symposium on "Linguistic Ecology and Language Technology", Jadavpur University, Kolkata, 21 June, 2018.
91. Dr. Amit Chaudhuri, "Cyber Forensics, Technologies, Challenges and AI", Lecture at NIT, Tripura, 15 March, 2019.
92. Dr. Amit Chaudhuri, "Aura Measurement", Lecture at IRIIM (Indian Research Institute for Integrated Medicine), 1 March 2019
93. Dr. Amit Chaudhuri, "Electronics and Telecommunication Engineering in the Context of Emerging ICT Challenges", Department of Electronics, Jadavpur University, Jadavpur University, Kolkata, 18 August, 2018.
94. Asok Bandyopadhyay, "Information & Cyber Security", Invited lecture at Supreme Foundation Group of Colleges, Mankundu, West Bengal as part of ISEA program, Mankundu, West Bengal, 4 August, 2018.
95. Asok Bandyopadhyay, "Information & Cyber Security", Invited lectures at ONGC, Shivasagar and ONGC, Nazira units, Dibrugarh, Assam as part of ISEA program, Dibrugarh, Assam, 2 August, 2018.
96. Smt Barnali Pal, İnformation Security, invited lecture in exeBIT program organized by Laksmipath Singhania Academy, Kolkata, August, 2018.

97. Dr. Amit Chaudhuri, "Cyber Security and Cyber Forensics", A Technical Seminar in ADAMAS University, Kolkata, 24 November, 2018.
98. Abhishek Hazra, "Biometric and Its application in security domain", A Technical Seminar in ADAMAS University, Kolkata, 24 November, 2018.
99. Dr. Amit Chaudhuri, "Techno-linguistic Challenges on Cyber Forensics and Our Research Initiatives", ICTFLING 2019 workshop, IIT Patna, 11 January, 2019.
100. Dr. Aparupa Dasgupta, "Application of Discourse Relations in Deception Detection", ICTFLING 2019 Workshop, IIT Patna, 12 January, 2019.
101. Barnali Pal, "RST guided Deception Detection: A Machine Learning Approach Leveraging Discourse Features to Validate Truthfulness of Text", ICTFLING 2019 workshop, IIT Patna, 12 January, 2019.
102. Bibekananda Kundu, "Artificial Intelligence in Digital Forensics-Some Developmental Case Study", Lecture on "Artificial Intelligence in Digital Forensics-Some Developmental Case Study", Kolkata, 29 January, 2019.
103. Dr. Amit Chaudhuri, "Cyber Forensic, Forensic Linguistics and AI", Lecture on "Cyber Forensic, Forensic Linguistics and AI" at MAKAUT Kolkata, 4 February, 2019.
104. Asok Bandyopadhyay, Awareness on Cyber Security, Lecture on Awareness on Cyber Security for Naval Personnel, Portblair, 19 February, 2019.
105. Jaspal Singh, "Signal Conditioning Techniques", Seminar on "Automation & Robotics", NITTTR, Chandigarh, 25-29 June, 2018.
106. Dr. Varun A Chhabra, "Application of Nano science and technology in the real world", KMV Jalandhar, 16 February 2018.
107. Dr. Varun A Chhabra, "Futuristic trends of Nano Electronics", Chitkara University, Himachal Pradesh, 22 March 2018.
108. Dr. Hitesh Pahuja, "Electronic Product Design", Industrial Academic Interaction, CGC Landran, Punjab, 29 March 2019.
109. Sweta Suhasaria, "Fourth Round of Field Testing and Device Certification of Biometric Devices for Aadhaar Authentication", First Workshop on FRR Testing, STQC Directorate, New Delhi, 09 April 2018.
110. Dr. M. Sasikumar, "Behavioural data: opportunities and challenges", International conference on "Future cities", Pillai's college at Panvel, 22 January 2019
111. Dr. M. Sasikumar, National Sahodaya Conference, Ambedkar University, Lucknow., 22 November 2018
112. Dr. M. Sasikumar, "Data analytics for predictive policing", National police training symposium, Central academy of police training, Bhopal, 27 September 2018.
113. Dr. M. Sasikumar, Keynote on AI, and a session on learning analytics, Faculty development program on AI, Deep learning and Machine learning, Prestige college of engineering, Indore, 10 July 2018
114. Dr. M. Sasikumar, "Artificial Intelligence", IETE/IEEE meet, Doordarshan Kendra at Worli, 17 May 2018.
115. Siddharth Srivastava, "Deep Learning & Image Processing, Modular Course", Vignan University, Guntur, Andhra Pradesh, 7-12 March 2019.
116. Kumar Bhaskar, "TERP and DSR", National Summit on Digital Judiciary, Dehradun, 06 May, 2018.
117. Kumar Bhaskar, "e-SafeT – Temperature Data Logger", National Seminar on "IoT Inspired Food Safety & Residue Detection", Kolkata, 18 December, 2018.
118. Rishi Prakash and Payal Saluja, "SEARN Information Sharing Platform & learning from India's effort to strengthen regulatory system through e-Governance Initiatives", 2nd World Conference on Access to Medical Products-Achieving the SDGs 2030, Pravasi Bhartiya Kendra, New Delhi, India, 10 October 2018.
119. Rishi Prakash and Payal Saluja, "SEARN Information Sharing Platform", 2nd Annual Regulators Conclave for Central and State Regulatory Authorities, Kasauli, Himachal Pradesh, 23-24 August 2018.
120. Karunesh Arora, "Natural Language Processing in Agriculture, Artificial Intelligence (AI) in Agriculture: Status and Prospects", ICAR, NASC Complex, New Delhi, 31 July 2018.
121. Sunita Arora, "Natural Language Processing in Information Security", Cryptology and Information Security (CIS 2018), SAG, DRDO, New Delhi, 10 August 2018.
122. Dipankar Ganguly, "Natural Language Processing & Cryptography", Cryptology and Information Security (CIS 2018), SAG, DRDO, New Delhi, 10 August 2018.
123. Sunita Arora, "Natural Language Processing & Cryptography", Cryptology and Information Security (CIS 2018), Indira Gandhi Delhi Technical University for Women (IGDTUW), 4 January 2018.
124. Sunita Arora, "Natural Language Processing in Localization (Hindi)", Hindi Rajbhasa Meeting, OIDB, Noida, 13 March 2018.

125. Dr. Arti Noor, "Impact Assessment of Skill Development–ESDM", Consumer Electronics and Appliances Manufacturers Association (CEAMA), New Ashok Nagar Metro Station, New Delhi 110 096, 26 February 2018.
126. Dr. Arti Noor, "Electronics System design using C-DAC educational Board", Short Term Course on "System Design Using IoT", YMCA University of Science and Technology Faridabad, 08 March 2018.
127. Dr. Arti Noor, Keynote address "Latest Trends in Design of Linear Integrated Circuits", FDP on "Recent Advances in Linear Integrated Circuits", ABESEC, Ghaziabad, 04 June 2018.
128. Dr. Neha Bajpai, "Cyber Security Attacks and its Prevention", Cyber Security Awareness, All India Radio, Delhi, 15-03-2019
129. Sahidul Islam, "HPC use in weather modeling & Weather forecasting technique using HPC", SERB training School on "Numerical Modelling and Forecasting of Desert Storms and Cloud Burst (NUMCLOUDS)" Department of Atmospheric Science, Central University of Rajasthan, Kishangarh, Ajmer, 20 February 2019.
130. Akshara Kaginalkar, "ICT in climatology (through skype)", National Seminar on ICT Application in Changing Face of Agriculture, Birsa Agriculture University (BAU) Ranchi, 19 January 2018.
131. Sahidul Islam, "Micro level weather forecast for Jharkhand, India", National Seminar on ICT Application in Changing Face of Agriculture, Birsa Agriculture University (BAU) Ranchi, 19 January 2018.
132. Akshara Kaginalkar, "ICT and Agri-meteorology", National Seminar on "Trends & Applications of ICT in Agriculture (TRACT)" in Changing Face of Agriculture, Hotel Monotel, Kolkata, 13 March 2018.
133. Sahidul Islam, "Real Time Weather forecast technology", National Seminar on "Trends & Applications of ICT in Agriculture (TRACT)" in Changing Face of Agriculture, Hotel Monotel, Kolkata, 13 March 2018.
134. Dr. Sanjay Kadam, "Deep learning for object recognition", Meet on uGMRT–MIGHTEE: Joint exploration of the deep radio sky with MeerKAT and the uGMRT, the pathway to the SKA, NCRA, Pune, 2-6 April, 2018.
135. Dr. Manish P. Kale, "Climate Information for the Changing Forest Fire Regimes in India", Twelfth session of South Asian Climate Outlook Forum (SASCOF- 12), Pune, Indian Institute of Tropical Meteorology, Pune, 19-20 April 2018.
136. Dr. Sanjay Kadam, "Parallel Image Processing Lectures and Lab session", 5-day Workshop in HPC, VNIT, Nagpur, 14-18 May 2018.
137. I. Prabu, "Defence Technologies – A Future View", Defense officials visit to Pune, C-DAC, Pune, 21 May 2018
138. Dr. Sanjay Kadam, "HPC Architectures", MPI programming, OpenMP and MATLAB, Advanced Meteorological Training Course (AMTC), Meteorological Training Institute, IMD Colony, Pashan, Pune, 13-22 June 2018.
139. Dr. Manish P. Kale, "Computational Biodiversity/Eco-informatics", Two-day Workshop on Future Prospects of Space Technology in Applications of Forest and Environment, Space Application Centre (ISRO), Ahmedabad, 27-28 June 2018.
140. Dr. Manish P. Kale, "Landscape level Biodiversity Characterization – A Geomatics perspective", National workshop on Biodiversity and Remote Sensing, Department of Botany, M S university of Baroda, 06 October 2018.
141. Murugesh Prabu, "Disaster Management – Floods", Refresher Course on "Environmental Studies", The Department of Environmental Science, Savitribai Phule Pune University, 29 November 2018.
142. Shruti Koulgi, "Extensively parallel conformation generation and optimization algorithm for building ranked small molecule library", Alumni conference on "Recent Trends in Bioinformatics", National Centre for Cell Sciences (NCCS), Pune, 4-6 January, 2019.
143. Vinod Jani, "Understanding folding landscape of Engrailed Homeo-Domain protein using Molecular simulation studies", Alumni conference on "Recent Trends in Bioinformatics", National Centre for Cell Sciences (NCCS), Pune, 4-6 January, 2019.
144. Suresh Kumar Sharma, "Mental Health in Digital India-EHR Perspectives", Proceedings of 18th National Conference of Indian Society of Psychiatric Nurses (ISPNCON 2019) at Tezpur, Assam, 15-17 February, 2019.
145. Amit Saxena, "Monte Carlo Processing on a Chip (MCoaC)– preliminary experimentations toward the realization of optimal-hardware for TOPAS/Geant4 to drive discovery" in the "Third Geant4 International User Conference", Bordeaux, France, 29-31 October, 2018.
146. Mr Vivek Gavane, "Artificial Neural Network (ANN) and relatives innovative fields", Symbiosis Institute of Technology, Pune, 6 April 2018.
147. Shailendra Singh Narwariya, "An Introduction to Telemedicine", Proceedings of 7th Annual Conference of The Telemedicine Society of India (TSI), Odisha Chapter (Oditelecon 2018), Keonjhar, Odisha, 22 April, 2018.

148. Gaur Sunder, "Digital Health IT: Building Interoperable Systems", Proceedings of 7th Annual Healthcare Transformation Summit and Awards 2018, Hyderabad, 18 May, 2018.
149. Gaur Sunder, "Role and Scope of IoT in EHR ", Proceedings of Life Science and Innovation Forum, NASSCOM CoE-IoT, Bengaluru, June 19, 2018.
150. Asheet Nath and Gaur Sunder, "Transforming Healthcare Paradigm through Technology: Importance of eHealth & mHealth", Proceedings of Andhra Pradesh Health Festival, Visakhapatnam, 20-21 June, 2018.
151. Gaur Sunder, Manisha Mantri and Achyut Patil, "Standardizing Electronic Health Records", Workshop to review Health IT System of State/UT, MoHFW, New Delhi, 28 and 31 August, 2018.
152. Yogindra S Abhyankar & Amit Saxena, "Monte Carlo Processing on a Chip (MCoaC)– preliminary experimentations toward the realization of optimized hardware for TOPAS/Geant4 to drive discovery", Third Geant4 International User Conference, Bordeaux, France, 30 October, 2018.
153. Ashish P. Kuvelkar, "Introduction to HPC and its applications", An Introductory Course on High-Performance Computing in Science and Engineering, IIT Kanpur, 25 February, 2019.
154. Ashish P. Kuvelkar, "Development of HPC aware manpower under National Supercomputing Mission", EDUHIPC-18: WORKSHOP ON EDUCATION FOR HIGH-PERFORMANCE COMPUTING Under HiPC 2018 conference, Radisson Blue, Bengaluru, 18 December, 2018.
155. Priyanka Jain, "Artificial intelligence and cognitive learning", Fifth International Conference for Convergence of Technology (I2CT 2019), Hotel Gateway (Taj), Pune, India, 30 March, 2019.
156. Priyanka Jain, "Role of artificial intelligence in teaching children with learning difficulties", MilunSare Jana, Seminar organized by Dr. Shanta Vaidya Memorial Foundation, YASHADA, Baner Road, Pune, 6 October, 2018.
157. Mahesh Bhargava and Lovey Joshi, "High Performance Computing Devices (HPC) for Natural Language Processing (NLP) Applications", NVIDIA Developer Connect 2018, IISER, Pune, 17 September 2018.
158. Mahesh Bhargava, "AI-ML-DL, DIAL 2018", IIT Dharwad, 6 October 2018.
159. Mahesh Bhargava, Pavan Dhote, Dr. Krishnanjan Bhattacharjee and M Swathi Mithran, "Natural Language Processing Applications Using Machine Learning & Deep learning", C-DAC Faculty Development Program, NIT Agartala, 2 November 2018.
160. Shashi Pal Singh, "Tools and technology developed for Hindi Languages", The Mahatma Gandhi Institute, Royal Road Moka, Mauritius in collaboration with Ministry of External Affairs at विश्व हिन्दी सचिवालय, 21-24 August 2018.
161. Shashi Pal Singh, "Scientific Lectures in field of AI, NLP and DNN", Sharda University, School of Engineering and Technology, Faculty Development Program, Sharda University, Plot No. 32-34, Knowledge Park III, Greater Noida, Uttar Pradesh, 22 September 2018.
162. Shashi Pal Singh, "Hindi Tools and technology developed for Hindi Languages and Kanthasth-Rajbhasha", Hindi Pakhwada, Indian Railways Mumbai, Mumbai Central, Mumbai, Maharashtra, India, 05 September 2018.
163. Shashi Pal Singh, "Tools and technology for Hindi Language", Basic training program for working in Hindi on computers, Central Hindi Training Institute, Department of Official Language, Home Ministry, Pune, 17 October 2018.
164. Dr Atiur R. Khan, "NLP and Supervised and unsupervised methods of morphological analysis with respect to FSA", National Workshop on Advances in Computing, 2019., Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon, 20 February 2019.
165. Dr Sudhir K Mishra, "Natural Language Processing and Artificial Intelligence", National Workshop on Advances in Computing, 2019, Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon, 20 February 2019.
166. Vainateya Koratkar, "Multilingual Digitization Image Processing, NLP and Information Retrieval case", National Workshop on Advances in Computing, 2019, Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon, 20 February 2019.
167. Dr Sudhir K Mishra, "Classification and Analysis of Hindi Verbs for development of Computational Module", National Seminar on Computational Linguistics and Indian Language Computing, Shivaji University, Kolhapur, 11-12 October 2018.
168. Kapil Mehrotra and Manish Kumar Gupta, "Recent Advances in Image Processing", National Workshop on Advances in Computing, 2019, School of Computer Sciences, Kavayitri Bahinabai Chaudhari North Maharashtra University, Jalgaon, 21-22 February 2019.

169. Ajeesh A., "High Speed Reconfigurable Power Electronics Controller", Valia Koonambaikulathamma College of Engineering & Technology (VKCET), Parippally, Kollam, 10 April 2018.
170. A. Saravana Kumar, "Recent trends in Power electronics and Drives", College of Engineering, Trivandrum, 18 June 2018.
171. Brijesh P, "Implementation of Microgrid for Indian Villages", TOCH Institute of Technology, Ernakulam, 05 July 2018.
172. A. Saravana Kumar, "Distributed Generation and smart Grids", Muthoot Institute of Technology, Ernakulam, 24 July 2018.
173. Brijesh P, "Implementation of Microgid, Federal Institute of Science and Technology (FISAT), Angamaly, 28 July 2018.
174. Dr. P Ravikumar, "Adaptive Traffic Control Systems - Implementation Challenges and Physical Internet - Transforming Logistics", Workshop on Real-time Applications of Intelligent Transportation Systems, College of Engineering Trivandrum, 13 December 2018.
175. Dr. P Ravikumar, "Towards Smartening up the Logistical and Transport Sector, Smart Education in Smart Cities, 5th Management Summit, Mascot Hotel, Thiruvananthapuram, 4 July 2018.
176. Dr. P Ravikumar, "Trends in Logistics", Institution of Engineers, Thiruvananthapuram, 19 September, 2018.
177. Dr. P Ravikumar, "Emerging Technologies - Physical Internet, Rethinking Smart Mobility", Traffic InfraTech Expo, Bombay Exhibition Centre, Mumbai, 27 October 2018.
178. Gopan George, "TARANG- AN Affordable feature rich Hearing Aid", Empower 2018, Assistive Technology Conference, Sonipat, 25 October 2018.
179. Jayan V, "Malayalam Computing", Workshop on "Malayalam Computing", Department of Malayalam, University of Kerala, Kerala University Campus, Karyavattom, 20 December, 2018.
180. Saravana Kumar A. and Ajeesh A, "Power Converters for grid connected SPV plant", The FDP programme organized by EEE Department, Sanitgits College of Engineering, Kottayam, 06 December 2018.
181. Mohammed Ajlif A, "Smart Power Management for DC Nanogrid based building", IEEE Recent Advances in Intelligent Computational System, Mascot Hotel, Trivandrum, 09 December 2018.
182. Mohammed Ajlif, "Battery Management System for DC Nanogrid", National Power system Conference (NPSC 2018), NIT, Trichy, 15 December 2018.
183. Ramesh P, "Intelligent Green Energy Management Systems (i-GEMS) for Smart City Applications", Workshop on IoT Platforms for Smart Cities, C-DAC, Bangalore, 08 November 2018.
184. Ramesh P, "Design, Control and Implementation of Energy Harvester Interface for Net Zero Energy Building Environment", IEEE-PEDES 2018 conference, IIT Mumbai, 18-21 December 2018.
185. Ananthalakshmi Ammal R, "Cybercrimes and Digital Forensics", 42nd National Systems Conference NSC 2018, Vikram Sarabhai Space Centre, Thiruvananthapuram, 27-29 Dec 2018.
186. Ananthalakshmi Ammal R, "Digital Forensics A Practitioners perspective", ISACA Trivandrum Chapter, ISACA, Thiruvananthapuram, 19 December 2018.
187. Ananthalakshmi Ammal R, "Challenges in Digital Forensics", IDSA-BIMSTEC Workshop, Institute for Defence Studies and Analyses (IDSA), New Delhi, 5-7 December 2018.
188. Saravana Kumar A., "Power Electronics for Renewable Energy Applications (PEREA 2019) ", FDI programme, Government College of Engineering, Kannur, 17 January 2019.
189. Saravana Kumar A., "Power electronic Technology, its applications and control (PETAC-2019)", KTU sponsored FDP programme, College of engineering, Vadakara, 18 January 2019.
190. Lijo Thomas, "IETF participation: Experiences and Contributions", Awareness Program on Internet Protocols and Standards, College of Engineering, Thiruvananthapuram, 11 August 2018.
191. Lijo Thomas & Shalu R, "IETF contribution through Collaborative Research Project on IIoT", International Conference on Internet Research and Engineering (ICIRE 2019), C-DAC, Bengaluru, 04 March 2019.
192. Lajitha C S, "Design of a Novel IEC61850 based Merging Unit for Substation Automation", International Conference on Control, Communication and Computing (IC4) conducted College of Engineering, Trivandrum, The Central Residency, Trivandrum, 7 July 2018.
193. Byju N B, "Basics of Digital Image processing techniques", Workshop on Digital techniques in NDE of aerospace components by ISNT Thiruvananthapuram Chapter, VSSC, Thiruvananthapuram, 29 June 2018.

194. Arun Kumar K A, "ARM-FPGA Implementation of a Partially Reconfigurable OFDM-MIMO Phy-Link", 2018 International CET Conference on Control, Communication, and Computing (IC4), College of Engineering, Trivandrum, 05 July 2018.
195. Santhoshkumar S., "Geographical Information System based Crime Analysis and Mapping Techniques in Public Safety Management", International Conference on Networks, Image and Security, Noorul Islam Centre for Higher Education (NICHE), NI University, Kumaracoil, Kannyakumari dist.,
196. Hiron Bose, "Darkweb", Techfest, Rajadhani College of Engineering, Nagaroor, Trivandrum, 18 January 2019.
197. Hiron Bose & Dhanya V S, "Embedded Systems and IoT", Technical Feast, Lourde Matha College of Engineering, Kuttichal, Trivandrum, 22 March 2019.
198. Balan C, "Mobile Forensics and challenges", Cyber Forensics workshop, Forensic Science Laboratory, Chennai, 26 September 2018.
199. Balan C, "Cyber Forensics and Challenges", FDP, Maulana Abdul Kalam Azad University of Technology, Kolkata, 26 March 2019.
200. Balan C, "Cyber Crimes and Cyber Forensics", Tech Fest, Heera College of Engineering, 06 March 2019.

Human Resource Development

HRD team in C-DAC formulates HR policies in line with the organization's vision. HRD ensured that the right facilitation is extended to the core functions to meet their goals in the interest of the organisation and that of the Nation at large.

HRD function, being one of the most sought-after internal service provider and strategic partner, have always strived to support the organization in its meaningful sustenance and qualitative growth. C-DAC being an organization built upon its knowledge base and innovation capabilities drive its success through the competency of its employees, deriving synergic collaboration across all corners of C-DAC and outside. The HRD function takes a queue from this insight and delivers quality services to its stake holders

Initiatives of HRD department during the year 2018-19 are:

1. **CAKES:** Launch of online version of C-DAC Accelerated Knowledge Enhancement Scheme (CAKES) – 3 SLICES successfully completed.
2. **Welcome Kit with onboarding process** - Welcoming new members to C-DAC in a positive way.
3. Continuous development of Human Resources fostering their engagement by imparting training to employees both S&T and Non S&T.

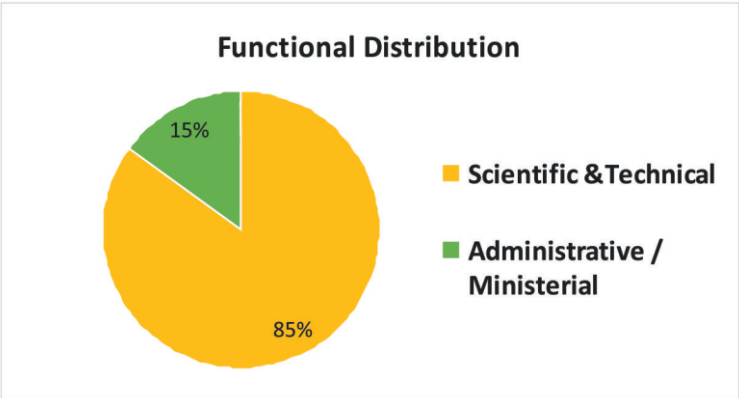
Some initiatives on card:

1. **Leader Speak:** An expression of our Leaders/Senior officer to influence and shape the way our employees feel and think. This will motivate and inspire the juniors to move for action.
2. **Meet the Masters:** To invite eminent personalities from the field of technology to give a small motivational talk (15-20 minutes) for our employees. These talks shall be recorded and videos will be released.
3. **Knowledge Sharing tie ups with organization:** For sharing best practices in the field of technology with other similar organizations.
4. **Leadership Coaching and Succession Planning:** To train and guide such senior officers to groom them to perform well in their new role. Such training shall give a new perspective and focus to the officers. This will help to identify and developing employees to fill the responsibilities of roles within the organization.
5. **C-DAC internship Scheme:** To allow young talent from premiere educational institutes like IIT/NIT and C-DAC institutes to be associated with C-DAC for R&D in emerging areas of C-DAC's interest as part fulfilment of their academic course. The organization will gain fresh perspectives on emerging areas and problem solving.

Manpower Distribution:

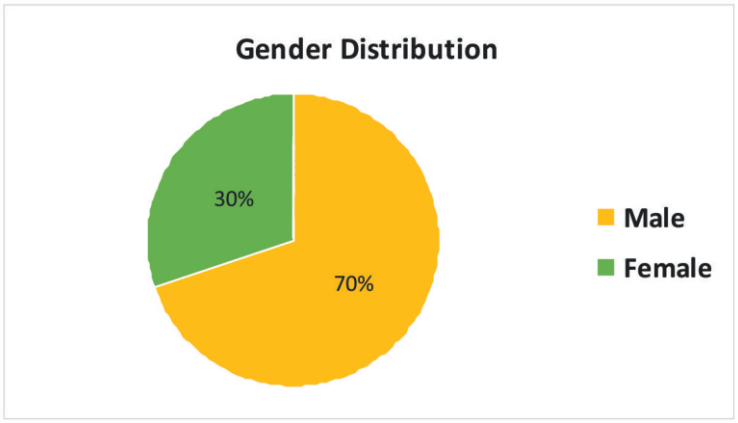
Functional Distribution :

C-DAC has 2799 employees as on March 2019, spread across 11 centres and Corporate Office. The functional composition of the workforce is as shown below:



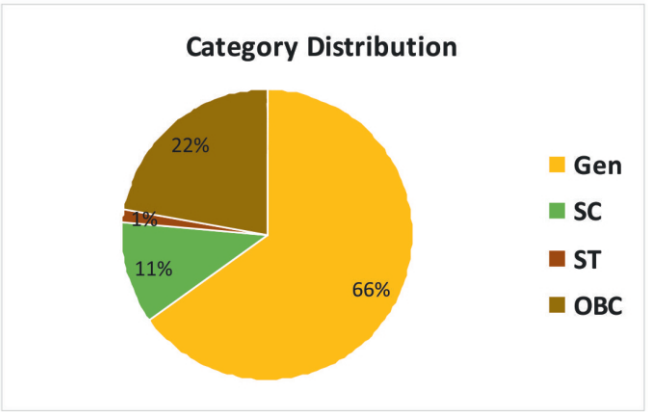
Gender Distribution:

C-DAC has been paying due attention to gender equality in employment. Female employees account for 30 percent of the total C-DAC workforce which is comparable with national average in the sector. The proportion of women in the senior executive positions also is encouraging in C-DAC.



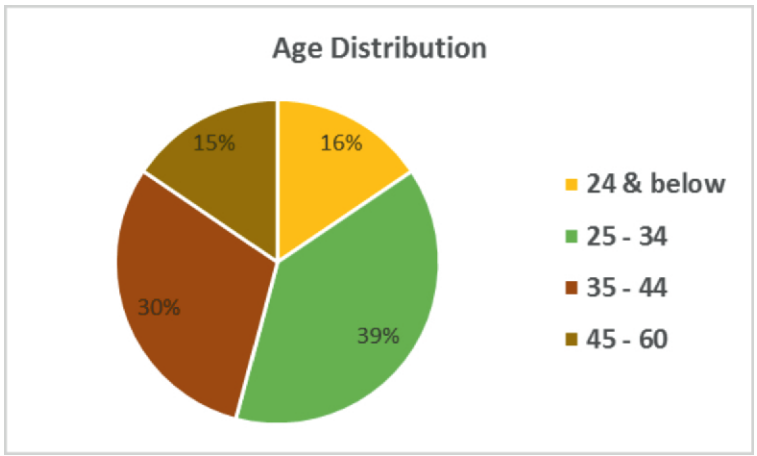
Category Distribution:

As a law-abiding model employer, C-DAC has ensured adequate representation of Scheduled Caste (SC), Scheduled Tribes (ST) and OBC members. C-DAC obliges the national priority in fair terms and has significant representation of the reserved categories. It is pertinent to note that Group A S&T positions are exempted from the purview of reservation orders.



Age Distribution:

Since C-DAC always retained itself in the growth and expanding track, it retains an impressive age distribution among its employees. 55 percent of the employees are below the age of 35 years.



Legal

Legal Cell plays a crucial role in the smooth and effective functioning of C-DAC. Its key activities are as follows:

- All Centres of C-DAC and Corporate Office has a Legal Cell, which take up all the Legal issues relating to employees of C-DAC, vendor and other parties.
- During the financial year (April-2018 to Mar-2019) approx. 13 Court cases were dealt at various CATs, High Courts, Tribunals, Courts, and Arbitrators etc. These cases are mostly related to service matters of C-DAC various Centres.
- In the above court cases, Corporate Legal Cell with the help of Advocate/Legal Consultant prepares the Draft replies/legal documents based on facts provided by the concerned divisions (Centres), rules, regulation and bye laws of C-DAC. Legal Cell takes necessary action as per the advice of MeitY and decisions of various Courts / Tribunals. During the financial year (Apr-2018 to March-2019) more than 32 Draft Reply prepared/vetted by the Corp Legal Cell and were given to different Centres of C-DAC for filling the same before various Tribunals/Courts.
- Legal Cell of Corporate Office also provides Legal Opinion on various Legal issues. During the financial year, more than 13 Legal Opinions were given to different Divisions/Centres of C-DAC.
- In addition to above, Legal Cell also Draft/Vet various MOU/Agreements to be signed with various stake holders. During the year (Apr-2018 to March-2019), more than 58 documents were vetted/drafted by the Legal Cell.
- Corporate Legal Cell coordinates with MeitY, Advocates and Centres for the court cases and provides valuable inputs supported by relevant judgments pronounced by various courts of India.

RTI

C-DAC is a Public Authority as provided in section 2(h) of the RTI Act. Request for information under RTI Act can either be filed at any of the locations of C-DAC or can be submitted online through the portal rtionline.gov.in. Mandatory disclosures as per the guidelines of section Sec 4(1)(b) have been published in the RTI module on C-DAC's website. The same is updated on monthly basis.

During the financial year 2018-19, total 295 applications were received which were duly processed.

Details related to the Vigilance Cases

During the year 2018-19, 2 complaints have been disposed off and factual reports have been submitted for 3 complaints. These complaints were mainly related to financial and process irregularities in training programme, misuse of funds, irregularities in tender process, obtaining employment against ST quota without having any tribal background and setting stringent pre-qualification criteria for a tender.

Outreach Initiatives

Towards wide scale proliferation of technologies, solutions and services, C-DAC has evolved strategy by way of announcing Intent of Association (IOA) and Expression of Interest (EoI) for collaborative innovation and channel partners respectively. The same is implemented with approval from the CDAC's Governing Council. The details are as given below:

Intent of Association (IOA) for Collaborative Innovation

The objective of IoA is to pool resources with organizations in ICTE areas for Collaborative Innovation. Such entities with their expertise in related areas should be poised to explore new avenues jointly. The interested agencies should be suitably equipped to co-create along with C-DAC and provide the requisite resource (finances) for proposed solutions research. Once the collaborative R&D shapes up based on the strengths of each party into a product/solution, the revenue will be shared based on present valuation of the technology and value added to it for making commercial product/solution.

In order to meet the stated objective, C-DAC invited proposals from the Companies (including private limited companies, PSUs, MSMEs and start-ups), R&D institutions (comprising academia, research institutes, R&D organizations and companies), Firms, Partnership Firms, Trusts and Societies working in niche technologies in India and having requisite expertise in R&D/contract research for doing collaborative innovation. Many organizations applied through this channel and the proposals are under active consideration.

Expression of Interest (EoI) for Channel Partners

The objective of the EoI is to empanel suitable organizations as Channel Partners, in order to enhance the footprint of C-DAC by way of increased deployment/sale/outreach of its products/solutions /services/technologies categorized under various thematic areas given below as an indicative reference:
High Performance Computing, Cyber Security & Cyber Forensics, Health Sector, Professional Electronics, Agriculture, e-Governance Solutions, Language Computing Solutions, Education & Training, Operating Systems

In order to meet the stated objective, C-DAC invited expression of interest for empanelment of Channel Partners, who have adequate experience and carried out similar type of work, for wide scale deployments of solutions, system integration, customization, liaising with public/private entities, business development & promotion, sales & support, collaborative application oriented R&D, etc. C-DAC has received proposals towards the same & were evaluated for possible empanelment.

Financials

INDEPENDENT AUDITOR'S REPORT

To,
The Members,
Center for Development of Advance Computing,
C-Dac Innovation Park, 2nd Floor, Panchavati,
Pashan, Pune-411008

Report on the Consolidated Financial Statements

Opinion

We have audited the accompanying Consolidated financial statements of **Center For Development of Advance Computing (C-DAC)** (Hereafter referred as "C-DAC") which comprise the consolidated Balance sheet as at March 31, 2019 and the consolidated Income and Expenditure Account and consolidated Receipts and Payments Accounts for the year then ended, and summary of significant accounting policies and other explanatory information (hereinafter referred to as "the consolidated financial statements") in which are incorporated the Returns for the year ended on that date audited by the Centre auditors of the Centre's of the C-DAC located at (Bangalore, Chennai, Delhi, Hyderabad, Kolkata, Mohali, Noida, Thiruvananthapuram).

In our opinion and to the best of our information and according to the explanations given to us, and based on the consideration of reports of the Centre auditors on separate financial statements of the Centre's referred to in the Other Matters paragraph below, the aforesaid consolidated financial statements give the information in the manner so required to the extent applicable and give true and fair view in conformity with the accounting principles generally accepted in India, of the state of affairs of the C-DAC as at March 31, 2019, and its surplus and its receipts and payments for the year ended on that date.

Basis for Opinion

We conducted audit in accordance with standards on auditing issued by institute of Chartered Accountants of India. Our responsibilities under those Standards are further described in the Auditor's Responsibilities for the Audit of the Consolidated Financial Statements section of our report. We are independent of the C-DAC in accordance with the Code of Ethics issued by the Institute of Chartered Accountants of India (ICAI) together with the independence requirements that are relevant to our audit of the consolidated financial

statements under the provisions of the Act and the Rules made there under, and we have fulfilled our other ethical responsibilities in accordance with these requirements and the ICAI's Code of Ethics. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion on the consolidated financial statements.

Management's Responsibility for the Consolidated Financial Statements

The C-DAC's management is responsible for the preparation of these consolidated financial statements that give a true and fair view of the consolidated financial position, consolidated financial performance and consolidated receipts and payments of the C-DAC in accordance with the accounting principal generally accepted in India.

The respective management of the Centre's included in the C-DAC are responsible for maintenance of adequate accounting records, safeguarding the assets of the C-DAC, for preventing and detecting frauds and other irregularities, selection and application of appropriate accounting policies; making judgments and estimates that are reasonable and prudent; and design, implementation and maintenance of adequate internal controls, that were operating effectively for ensuring the accuracy and completeness of the accounting records, relevant to the preparation and presentation of the consolidated financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, the respective management of the Centre's included in the C-DAC are responsible for assessing the C-DAC's ability to continue as a going concern and using the going concern basis of accounting unless management either intends to liquidate the C-DAC or to cease operations, or has no realistic alternative but to do so.

The respective management of the Centre's included in the C-DAC Consolidated Financial Statements are also responsible for overseeing the financial reporting process of the C-DAC Centre's.

Auditor's Responsibilities for the Audit of the Consolidated Financial Statements

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Standard on Auditing (referred as SAs) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

As part of an audit in accordance with SAs, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate

UDYEN JAIN & ASSOCIATES FIRM NO. 116330W

to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal controls.

- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.

- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the ability of the C-DAC to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the consolidated financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's However, future events or conditions may cause the C-DAC to cease to continue as a going concern.

- Evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

- Obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the C-DAC to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the audit of the financial statements of such entities included in the consolidated financial.

Materiality is the magnitude of misstatements in the consolidated financial statements that, individually or in aggregate, makes it probable that the economic decisions of a reasonably knowledgeable user of the financial statements may be influenced. We consider quantitative materiality and qualitative factors in (i) planning the scope of our audit work and in evaluating the results of our work; and (ii) to evaluate the effect of any identified misstatements in the financial statements.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

We also provide those charged with governance with a statement that we have complied with relevant ethical requirements regarding independence, and to communicate with them all relationships and other matters that may reasonably be thought to bear on our independence, and where applicable, related safeguards.

We did not audit the Standalone financial statements of Eight (8) Centre's included in the C-DAC. The financial statements of these Centre's have been audited by the Centre

auditors whose reports have been furnished to us, and our opinion is based solely on the amounts and disclosures in the report of such Centre auditors.

Emphasis of Matter

Financial Reporting Framework - The C-DAC being scientific society having its own financial reporting framework including disclosure of notes to account. The accounting policies which are adopted by C-DAC are as per accounting standard except 1.1 and 4.2 of Schedule 17 to the Consolidated Financial Statements.

Further to above, we draw attention to note 17 to Schedule 18 to the Consolidated Financial Statements where Management of C-DAC is of the opinion that C-DAC being a scientific society and not a listed company and therefore the reporting requirements as per Accounting Standard 3 on Cash flow statement, Accounting Standard 17 on Segment Reporting, Accounting Standard 18 on Related Party Disclosures and Accounting Standard 26 in respect of Intangible Assets are not applicable to them.

Our opinion is not modified in respect of these above matters.

Other Matters

(a) We did not audit the Standalone financial statements of Eight (8) Centre's included in the C-DAC whose financial statements reflect total assets of Rs. 636.36 Crores as at March 31, 2019 and total revenues of Rs.262.91 Crores for the year ended on that date, as considered in the respective standalone financial statements of the Centre's. The financial statements of these Centre's have been audited by the Centre auditors whose reports have been furnished to us, and our opinion is based solely on the amounts and disclosures in the report of such Centre auditors.

(b) Balance of Debtors, Creditors, Current Assets, Loans & Advances and Current Liabilities are subject to confirmation and further reconciliation. The extent of adjustment that may arise and their effect on accounts is not ascertainable at this stage.

(c) **Merger of Societies with C-DAC** - We draw attention to note 1 to Schedule 18, where the Assets, Liabilities and Other obligations at the book value as on December 15, 2002 are merged in C-DAC in respect of the societies viz. Electronics Research And Development Centre at Kolkata, Noida, Thiruvananthapuram, National Centre for Software Technology Mumbai, and Centre For Electronics Design And Technology of India, Mohali, due to merger of these Societies in C-DAC as per the Government of India orders. The process for transfer of title deeds of Immovable properties in the name of C-DAC of the above Centre's is under process. No liability towards expenses such as stamp duty, taxes and other expenses (if any) is provided for. The same will be accounted for in the year of payment if any

Our opinion on the consolidated financial statements above and our report on Other Requirements below, is not modified in respect of the above matters with respect to our reliance on the work done and the reports of the Centre auditors.

Report on Other Requirements

Based on our audit and on the consideration of the report of the Centre auditors on separate financial statements, referred in the Other Matters paragraph above we report, to the extent applicable, that:

(a) We have sought and obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit of the aforesaid consolidated financial statements.

(b) In our opinion, proper books of account relating to preparation of the aforesaid consolidated financial statements have been kept and proper returns adequate for the purposes of our audit have been received from the Centre's not visited so far as it appears from our examination of those books, returns and the reports of the auditors.

(c) The reports on the accounts of the Centre offices included in the C-DAC audited by Centre auditors have been sent to us and have been properly dealt for preparing this report

(d) The consolidated Balance sheet, the consolidated Income and Expenditure Account and consolidated Receipts and Payments Accounts Statement dealt with by this Report are in agreement with the relevant books of account maintained for the purpose of preparation of the consolidated financial statements received by us from the Centre's not visited.

(e) Reporting on the adequacy of Internal Financial Control Over Financial Reporting of the C-DAC and the operating effectiveness of such controls, is not applicable.

(f) With respect to the other matters to be included in the Auditor's Report, in our opinion and to the best of our information and according to the explanations given to us:

i. The consolidated financial statements disclose the impact of pending litigations on the consolidated financial position of the C-DAC.

ii. The C-DAC did not have any material foreseeable losses on long-term contracts including derivative contracts.

iii. There were no amounts which were required to be transferred to the Investor Education and Protection Fund by the C-DAC and its Centre's incorporated in India

For Udyen Jain & Associates,
Chartered Accountants
Firm Registration No.116336W

Sandeep Soni
Partner
M. No. 124971
UDIN: 19124971AAAAAY4524

Place:Pune

Date: September 19, 2019

Centre for Development of Advanced Computing, Pune
CONSOLIDATED ANNUAL ACCOUNTS 2018-19

CONSOLIDATED BALANCE SHEET AS AT 31st March 2019

Amount in ₹

Particulars	Schedule	2018-19	2017-18
CORPUS/CAPITAL FUND AND LIABILITIES			
Corpus/Capital Fund	1	32056,98,850	30581,43,692
Reserves and Surplus	2	27269,16,043	22963,44,138
Earmarked and Endowment Funds	3	24978,53,175	18945,26,908
Secured Loan from Bank		-	20,00,000
Current Liabilities and Provisions	4	30887,72,720	17536,92,140
Total		**115192,40,788**	**90047,06,878**
ASSETS			
Fixed Assets			
Acquired out of Own Funds	5	3479,33,556	3354,21,352
Acquired out of Grant in Aid	6	19224,59,014	17764,16,599
Acquired out of Project Grants	7	8044,57,030	5199,27,540
Investments-Others		5,05,000	-
Current Assets, Loans & Advances	8	84438,86,188	63729,41,387
Miscellaneous Expenditure		-	-
Total		**115192,40,788**	**90047,06,878**
		-	-
Summary of significant accounting policies	17		
See accompanying notes forming part of financial statements	18		

CA Raghu Bhargava
Director Finance

Sunil Misar
Registrar (I/C)

Dr. Hemant Darbari
Director General

AS PER OUR REPORT OF EVEN DATE
FOR AND ON BEHALF OF
M/S. UDYEN JAIN & ASSOCIATESFirm Registration No.116336W
CHARTERED ACCOUNTANTS

Sandeep Soni
Partner (M.No.124971)
UDIN : 19124971AAAAAN5662
Place : Pune , Date : 19-Sept-2019

Consolidated Income and Expenditure Account for the year ending 31st March 2019

Amount in ₹

Particulars	Schedule	2018-19	2017-18
INCOME			
Income from Sales/Services	9	26333,24,637	13320,83,221
Grants/Subsidies	10	10013,13,084	6516,27,686
Fees/Subscription	11	8720,05,834	8782,57,455
Interest Earned	12	1906,94,713	2111,05,507
Other Income	13	56,50,225	187,04,276
Prior Period Income		21,05,908	35,597
Increase/(decrease) in stock of Finished Goods and Work-in-progress	14	2196,46,522	(16,43,107)
TOTAL (A)		**49247,40,923**	**30901,70,635**
EXPENDITURE			
Establishment Expenses	15	29110,72,879	20918,22,070
Other Administrative Expenses	16	18536,73,962	10810,11,009
Prior Period Expenses		188,55,732	124,28,768
Depreciation (corresponding to Schedule 5)		422,48,646	340,35,307
TOTAL (B)		**48258,51,219**	**32192,97,154**
Transferred to / (from) Balance of Mission Grants		-	-
BALANCE BEING SURPLUS/(DEFICIT) CARRIED TO CORPUS/CAPITAL FUND		**988,89,704**	**(1291,26,519)**
Summary of significant accounting policies	17		
See accompanying notes forming part of financial statements	18		

CA Raghu Bhargava
Director Finance

Sunil Misar
Registrar (I/C)

Dr. Hemant Darbari
Director General

AS PER OUR REPORT OF EVEN DATE
FOR AND ON BEHALF OF
M/S. UDYEN JAIN & ASSOCIATESFirm Registration No.116336W
CHARTERED ACCOUNTANTS

Sandeep Soni
Partner (M.No.124971)
UDIN : 19124971AAAAAN5662
Place : Pune , Date : 19-Sept-2019

Centre for Development of Advanced Computing, Pune
CONSOLIDATED ANNUAL ACCOUNTS 2018-19

Amount in ₹

Particulars	2018-19	2017-18
Schedule 1 - Corpus/Capital Fund		
Balance as at the beginning of the year	30581,43,692	32372,70,211
Add: Surplus as per Income & Expenditure Account	988,89,704	(1291,26,519)
Less : Own contribution to Core / Projects and Other Adjustments / Transfers	(486,65,454)	500,00,000
Balance as at the year - end	**32056,98,850**	**30581,43,692**
Schedule 2 - Reserves and Surplus		
1. Capital Reserve :		
As per last Account	22963,44,138	18945,86,521
Addition during the year	6706,40,824	6068,81,916
Less : Deductions during the year	2400,68,919	2051,24,299
Total	**27269,16,043**	**22963,44,138**
Schedule 3 - Earmarked/Endowment Funds		
1. Balance of Core Grants		
a) Opening balance of the funds	-	-
b) Additions to the Funds		
I) Donations/Grants	10000,00,000	6550,00,000
II) Income from Investments made on account of funds	-	-
III) Other additions (C-DAC Contribution and Other Income)	61,61,255	42,022
Total (b)	10061,61,255	6550,42,022
Total (a)+(b)	10061,61,255	6550,42,022
c) Utilization/Expenditure towards objectives of funds		
I) Capital Expenditure		
Fixed Assets	47,69,705	33,73,739
Others	-	-
Total I	47,69,705	33,73,739
II) Revenue Expenditure		
Salaries, Wages and Allowances etc.	9440,50,187	5767,91,581
Componants, Consumables and Other Direct Expenses	13,70,430	9,40,967
Travel	84,11,838	61,06,324
Contingencies, Overheads and Other Administrative Expenditure	475,59,095	678,29,411
Total II	10013,91,550	6516,68,283
Total (c)	10061,61,255	6550,42,022
Net Balance as at Year - End (a+b-c) Total 1	-	-
Projects wise Allocated Core Grant Projects (Details as per Annexure 1)		
d) Opening balance	443,97,112	(2,20,956)
e) Additions to the Funds		
I) Donations/Grants	(3,13,513)	2650,00,000
II) Income from Investments made on account of	1,15,220	(1,82,998)
III) Other additions (C-DAC Contribution and Other	(472,14,924)	508,53,000
Total (e)	(474,13,217)	3156,70,002
Total (d)+(e)	(30,16,105)	3154,49,046

Centre for Development of Advanced Computing, Pune
CONSOLIDATED ANNUAL ACCOUNTS 2018-19

Amount in ₹

Particulars	2018-19	2017-18
f) Utilization/Expenditure towards objectives of		
I) Capital Expenditure		
Fixed Assets	1784,34,570	1743,98,212
Others	-	-
Total I	1784,34,570	1743,98,212
II) Revenue Expenditure		
Salaries, Wages and Allowances etc.	207,31,704	431,17,573
Componants, Consumables and Other Direct Expenses	45,95,003	144,47,684
Travel	90,55,034	70,31,776
Contingencies, Overheads and Other Administrative Expenditure	110,12,199	289,01,633
Total II	453,93,940	934,98,666
Total Expenditure (f)	2238,28,510	2678,96,878
g) Refund / Transfer and Other Adjustments	58,58,121	31,55,057
Net Balance as at Year - End (d+e-f-g) Total 2	(2327,02,736)	443,97,112
Core Grant Balance as at Year - End (Total 1 + Total 2) Total 3	(2327,02,736)	443,97,112
2. Grants for Funded Projects (Details as per Annexure 2)		
a) Opening balance of the funds	18446,03,972	21162,16,500
b) Additions to the Funds		
I) Donations/Grants	27456,72,538	15767,52,001
II) Income from Investments made on account of funds	989,60,574	753,72,211
III) Other additions (C-DAC Contribution and Other Income)	440,10,959	531,26,548
Total (b)	28886,44,071	17052,50,760
Total (a)+(b)	47332,48,043	38214,67,260
c) Utilization/Expenditure towards objectives of funds		
I) Capital Expenditure		
Fixed Assets	4875,05,199	4303,99,257
Others	-	-
Total I	4875,05,199	4303,99,257
II) Revenue Expenditure		
Salaries, Wages and Allowances etc.	8271,46,054	7384,63,711
Componants, Consumables and Other Direct Expenses	2113,71,609	3119,47,519
Travel	717,96,445	638,89,193
Contingencies, Overheads and Other Administrative Expenditure	2079,87,179	3251,55,373
Total II	13183,01,287	14394,55,796
Total (c)	18058,06,486	18698,55,053
d) Refund / Transfer and Other Adjustments	2027,69,850	1070,08,235
Net Balance as at Year - End (a+b-c-d) Total 4	27246,71,707	18446,03,972
3. Employee and Other Funds:		
As per last Account	55,25,824	51,14,647
Addition during the year	5,36,236	4,84,348
Less : Deductions during the year	1,77,856	73,171
Total (5)	58,84,204	55,25,824
Grand Total (Total 3+ Total 4+Total 5)	**24978,53,175**	**18945,26,908**

Annexure 1 of Schedule 3 **Projects wise Allocated Core Grant**

(Attached to and forming an integral part of Balance Sheet)

Amount in ₹

Sr.No.	Name of the Project	Opening Balance	Grants Received During the year	Interest Earned	Other Income & CDAC's Contribution During the year	Capital Expenditure	Salary, Wages Allowances etc.	Componants, Consumables and Other Direct Expenses	Travel	Contingencies, Overheads and Other Administrative Expenditure	Total Expenses	Refund / Transfer & Other Adjustments	Closing Balance
1	Building Fund	(87,57,923)	-	-	(467,50,885)	1748,24,696	4,39,500	-	-	111,10,611	1863,74,807	(58,07,879)	(2360,75,736)
2	North East Projects	450,48,064	(82,86,755)	1,15,220	(4,64,039)	19,12,633	119,88,351	45,95,003	86,05,214	(7,27,711)	263,73,490	66,66,000	33,73,000
3	C-DAC Silchar	81,06,971	79,73,242	-	-	16,97,241	83,03,853	-	4,49,820	6,29,299	110,80,213	50,00,000	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	**443,97,112**	**(3,13,513)**	**1,15,220**	**(472,14,924)**	**1784,34,570**	**207,31,704**	**45,95,003**	**90,55,034**	**110,12,199**	**2238,28,510**	**58,58,121**	**(2327,02,736)**

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Centre for Development of Advanced Computing, Pune
CONSOLIDATED ANNUAL ACCOUNTS 2018-19

Annexure 2 of Schedule 3 **Funded Projects**
(Attached to and forming an integral part of Balance Sheet)

Amount in ₹

Sr.No.	Name of the Project	Opening Balance	Grants Received During the year	Interest Earned	Other Income & CDAC's Contribution During the year	Capital Expenditure	Salary, Wages Allowances etc.	Componants, Consumables and Other Direct Expenses	Travel	Contingencies , Overheads and Other Administrative Expenditure	Total Expenses	Refund / Transfer & Other Adjustments	Closing Balance
1	**Bangalore Centre**												
	MeitY Projects	(91,91,874)	953,46,494	13,68,826	1,63,000	133,73,507	303,02,257	85,06,916	53,48,908	96,89,409	672,20,997	69,31,525	135,33,924
	Other Agency Projects	28,08,021	12,90,000	1,05,153	-	4,40,134	13,26,428	13,56,297	1,89,668	1,98,674	35,11,201	1,12,665	5,79,308
	Total Bangalore Centre	(63,83,853)	966,36,494	14,73,979	1,63,000	138,13,641	316,28,685	98,63,213	55,38,576	98,88,083	707,32,198	70,44,190	141,13,232
2	**Chennai Centre**												
	MeitY Projects	(390,00,650)	471,93,667	-	-	-	72,01,987	1,28,926	1,54,224	1,19,051	76,04,188	28,56,424	(22,67,595)
	Other Agency Projects	-	-	-	-	-	-	-	-	-	-	-	-
	Total Chennai Centre	(390,00,650)	471,93,667	-	-	-	72,01,987	1,28,926	1,54,224	1,19,051	76,04,188	28,56,424	(22,67,595)
3	**Corporate Office**												
	MeitY Projects	(2,75,000)	2,75,000	-	-	-	-	-	-	-	-	-	-
	Other Agency Projects	-	285,00,000	-	-	-	-	-	-	-	-	-	285,00,000
	Total Corporate Office	(2,75,000)	287,75,000	-	-	-	-	-	-	-	-	-	285,00,000
4	**Delhi Centre**												
	MeitY Projects	26,37,667	121,08,784	-	-	-	47,83,729	12,27,577	-	10,70,000	70,81,306	-	76,65,145
	Other Agency Projects	1130,47,376	931,98,356	-	-	-	92,46,884	531,15,576	40,39,231	32,30,531	696,32,222	-	1366,13,510
	Total Delhi Centre	1156,85,043	1053,07,140	-	-	-	140,30,613	543,43,153	40,39,231	43,00,531	767,13,528	-	1442,78,655
5	**Hyderabad Centre**												
	MeitY Projects	1202,44,539	1559,93,000	37,48,835	245,48,522	545,88,990	472,79,145	13,80,373	30,85,216	213,17,319	1276,51,043	643,82,541	1125,01,312
	Other Agency Projects	435,37,147	1385,79,000	16,00,851	-	165,15,532	180,92,308	2,54,883	4,86,084	17,49,833	370,98,640	1,24,326	1464,94,032
	Total Hyderabad Centre	1637,81,686	2945,72,000	53,49,686	245,48,522	711,04,522	653,71,453	16,35,256	35,71,300	230,67,152	1647,49,683	645,06,867	2589,95,344
6	**Kolkata Centre**												
	MeitY Projects	23,34,358	677,22,709	2,92,710	-	25,29,928	323,69,358	89,46,845	105,70,680	23,17,000	567,33,811	10,20,526	125,95,440
	Other Agency Projects	87,32,962	767,73,760	47,309	-	4,18,507	255,76,674	124,83,525	38,96,056	30,01,467	453,76,229	28,467	401,49,335
	Total Kolkata Centre	110,67,320	1444,96,469	3,40,019	-	29,48,435	579,46,032	214,30,370	144,66,736	53,18,467	1021,10,040	10,48,993	527,44,775
7	**Mohali Centre**												
	MeitY Projects	7,01,641	377,49,320	8,58,676	-	57,40,922	132,39,342	34,08,784	13,34,486	18,93,500	256,17,034	7,33,967	129,58,636
	Other Agency Projects	59,57,188	208,44,986	2,20,677	4,87,333	10,47,632	59,07,685	17,89,652	5,14,928	52,46,858	145,06,755	48,38,132	81,65,297
	Total Mohali Centre	66,58,829	585,94,306	10,79,353	4,87,333	67,88,554	191,47,027	51,98,436	18,49,414	71,40,358	401,23,789	55,72,099	211,23,933
8	**Mumbai Centre**												
	MeitY Projects	1161,44,836	728,09,948	21,05,032	-	-	319,10,287	106,69,846	12,01,321	1,76,146	439,57,600	393,18,659	1077,83,557
	Other Agency Projects	62,15,114	-	-	-	-	5,46,347	-	445	59,94,751	65,41,543	-	(3,26,429)
	Total Mumbai Centre	1223,59,950	728,09,948	21,05,032	-	-	324,56,634	106,69,846	12,01,766	61,70,897	504,99,143	393,18,659	1074,57,128
9	**Noida Centre**												
	MeitY Projects	(5,02,661)	391,78,087	3,81,440	-	5,18,056	154,85,293	85,82,267	9,80,674	27,51,459	283,17,749	(1,581)	107,40,698
	Other Agency Projects	13,66,907	43,11,079	-	3,62,800	8,78,468	245,40,380	399,69,231	45,48,045	114,20,374	813,56,498	-	(753,15,712)
	Total Noida Centre	8,64,246	434,89,166	3,81,440	3,62,800	13,96,524	400,25,673	485,51,498	55,28,719	141,71,833	1096,74,247	(1,581)	(645,75,014)
10	**Pune Centre**												
	MeitY Projects	3048,06,092	7592,14,309	298,42,947	13,000	712,44,548	3296,93,202	100,68,170	181,31,268	468,00,863	4759,38,051	420,94,674	5758,43,623
	Other Agency Projects	8746,80,072	7005,68,348	526,68,118	3,77,942	1920,75,079	1154,00,997	12,85,322	66,04,911	226,26,464	3379,92,773	356,98,029	12546,03,678
	Total Pune Centre	11794,86,164	14597,82,657	825,11,065	3,90,942	2633,19,627	4450,94,199	113,53,492	247,36,179	694,27,327	8139,30,824	777,92,703	18304,47,301
11	**Thiruvananthapuram Centre**												
	MeitY Projects	2350,91,988	3450,86,000	43,58,000	171,83,362	1121,57,250	986,42,055	382,02,958	75,45,240	523,40,780	3088,88,283	44,09,496	2884,21,571
	Other Agency Projects	552,68,248	489,29,691	13,62,000	8,75,000	159,76,646	156,01,696	99,94,461	31,65,060	160,42,700	607,80,563	2,22,000	454,32,376
	Total Thiruvananthapuram Centre	2903,60,236	3940,15,691	57,20,000	180,58,362	1281,33,896	1142,43,751	481,97,419	107,10,300	683,83,480	3696,68,846	46,31,496	3338,53,947
	Total MeitY Projects	**7329,90,937**	**16326,77,318**	**429,56,466**	**419,07,884**	**2601,53,201**	**6109,06,655**	**911,22,662**	**483,52,017**	**1384,75,527**	**11490,10,062**	**1617,46,231**	**11397,76,312**
	Total Other Agency Projects	**11116,13,035**	**11129,95,220**	**560,04,108**	**21,03,075**	**2273,51,998**	**2162,39,399**	**1202,48,947**	**234,44,428**	**695,11,652**	**6567,96,424**	**410,23,619**	**15848,95,395**
	Grand Total	**18446,03,972**	**27456,72,538**	**989,60,574**	**440,10,959**	**4875,05,199**	**8271,46,054**	**2113,71,609**	**717,96,445**	**2079,87,179**	**18058,06,486**	**2027,69,850**	**27246,71,707**

Amount in ₹

Particulars	2018-19	2017-18
Schedule 4 - Current Liabilities and Provisions		
A, Current Liabilities		
1. Trade Payables (For Goods and Others)	6226,42,934	5269,41,952
2. Advances Received		
a) Advances Received from Parties	11816,28,503	4097,36,681
b) Fees Received in Advance	12,000	874,20,390
c) AMC Charges Received in Advance	-	-
d) Other Income Received in Advance	742,80,631	812,41,265
3. Statutory Liabilities		
a) Members CPF Recovery Payable	442,84,333	133,51,632
b) Members VPF Payable	58,71,003	16,30,053
c) Members CPF Loan Recovery Payable	3,311	3,311
d) Members Benevolent Fund Payable	10,88,854	12,63,904
e) Members CGEIS/Group Insurance Payable	36,315	29,133
f) Members Other Recoveries Payable	6,44,918	4,23,639
g) C-DAC's Contribution to CPF Payable	570,52,135	187,63,141
h) Gratuity Payable	1423,18,825	701,43,845
i) Leave Salary and Pension Contribution Payable	2028,04,047	2271,09,665
j) Members Income Tax Payable	918,92,369	123,31,328
k) Tax Deducted at Source Payable	121,13,265	137,18,849
l) Profession Tax Payable	3,41,474	2,39,720
m) General Sales Tax / VAT Payable	-	-
n) Central Sales Tax Payable	-	-
o) Works Contract Tax Payable	-	-
p) Service Tax Payable	220,16,411	208,89,694
q) Local Body Tax Payable	-	-
r) CGST Payable	91,03,544	16,80,175
s) SGST Payable	91,09,526	16,80,175
t) IGST Payable	503,45,585	256,51,637
u) UTGST Payable	-	-
v) Reverse charge GST Payable	11,220	1,43,781
4. Other Current Liabilities		
a) Unpaid Salaries	159,14,157	52,86,276
b) Library Deposits Payable	91,450	2,49,450
c) Other Security Deposits Payable	299,81,041	211,91,877
d) Earnest Money Deposit Contractors Payable	141,87,736	145,57,260
e) Retention Deposit Contractors	129,77,138	107,61,201
f) Refund of Course Fees Due	10,78,515	12,70,615
g) ATC's & Others Share in Fees Payable	37,61,915	124,73,934
h) Other Current Liabilities	2686,26,610	609,56,887
Total (A)	28742,19,765	16411,41,469
B. Provisions		
1. Others (Specify)		
a) Provisions / Accrued Liabilities for Expenses	2145,52,955	1125,50,671
Total (B)	2145,52,955	1125,50,671
Total (A)+(B)	**30887,72,720**	**17536,92,140**

Schedule-5 FIXED ASSETS Acquired out of own funds
(Attached to and forming an integral part of Balance Sheet)

Amount in ₹

		Gross Block						Depreciation					Net Block	
Sr. No.	Particulars	Cost/Valuation as on beginning of the year	Additions During the Year			Deletion/ Adjustments During the Year	Cost/Valuation as on end of the year	Depreciation as at beginning of the year	Depreciation Written Back	Depreciation Rate	Depreciation for Current Year	Total Depreciation up to the year end	WDV (Closing)	WDV (Opening)
			On or Before 30th September	After 30th September	Total Additions during the year									
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Land													
	a) Freehold	321,67,475	-	-	-	-	321,67,475	-	-	0%	-	-	321,67,475	321,67,475
	b) Leasehold	1714,34,805	3,80,909	-	3,80,909	-	1718,15,714	195,25,507	-	0%	6,97,292	202,22,799	1515,92,915	1519,09,298
2	Building													
	a) On Freehold Land	91,18,277	-	-	-	-	91,18,277	49,72,900	-	10%	4,14,538	53,87,438	37,30,839	41,45,377
	b) On Leasehold Land	1089,53,874	-	-	-	-	1089,53,874	831,58,983	-	10%	25,79,490	857,38,473	232,15,401	257,94,891
	c) Ownership Flats/Premises	397,26,295	-	-	-	-	397,26,295	316,89,691	-	10%	8,03,660	324,93,351	72,32,944	80,36,604
	d) Superstructures on Land not belonging to the entity	147,34,869	-	-	-	-	147,34,869	131,27,139	-	10%	1,60,773	132,87,912	14,46,957	16,07,730
3	Plant, Machinery and Equipments	675,99,620	1,88,266	31,53,100	33,41,366	-	709,40,986	513,61,953	-	15%	29,36,855	542,98,808	166,42,178	162,37,667
4	Vehicles	165,62,756	8,55,163	26,11,352	34,66,515	14,75,856	185,53,415	104,11,740	13,33,104	15%	14,21,215	104,99,851	80,53,564	61,51,016
5	Furniture & Fixtures	938,16,121	11,79,405	20,39,477	32,18,882	6,45,541	963,89,462	687,47,689	4,35,771	10%	28,07,758	711,19,676	252,69,786	250,68,432
6	Office Equipments	393,48,724	3,91,963	50,96,140	54,88,103	11,17,830	437,18,997	262,60,324	9,58,304	15%	27,62,547	280,64,567	156,54,430	130,88,400
7	Air Conditioning Equipments	345,18,718	7,24,777	3,28,199	10,52,976	90,000	354,81,694	274,85,357	77,198	15%	12,11,029	286,19,188	68,62,505	70,33,361
8	Computer Peripherals	3504,30,633	147,12,840	198,11,483	345,24,323	7,75,137	3841,79,819	3254,93,081	7,74,669	40%	237,84,561	3485,02,973	356,76,845	249,37,551
9	Electrical Installations	558,24,110	44,55,677	29,36,928	73,92,605	46,799	631,69,916	447,53,896	30,788	10%	18,44,681	465,67,789	166,02,127	110,70,214
10	Electronic Tools & Lab Equipments	82,20,288	-	82,767	82,767	-	83,03,055	61,19,729	-	15%	3,27,499	64,47,228	18,55,827	21,00,559
11	Library Books	156,65,680	1,54,972	63,047	2,18,019	4,62,194	154,21,505	153,51,840	4,60,591	40%	2,12,101	151,03,350	3,18,155	3,13,840
12	Copyright Know-how	66,950	-	-	-	-	66,950	64,850	-	25%	525	65,375	1,575	2,100
13	Other Fixed Assets	63,14,317	5,50,264	1,15,580	6,65,844	1,589	69,78,572	50,85,638	1,221	15%	2,84,122	53,68,539	16,10,033	12,28,679
	Total	**10645,03,512**	**235,94,236**	**362,38,073**	**598,32,309**	**46,14,946**	**11197,20,875**	**7336,10,317**	**40,71,646**		**422,48,646**	**7717,87,317**	**3479,33,556**	**3308,93,194**
	Capital Work-in-progress	**45,28,158**	**10,62,044**	**-**	**10,62,044**	**55,90,202**	**-**	**-**	**-**		**-**	**-**	**-**	**45,28,158**
	Grand Total	**10690,31,670**	**246,56,280**	**362,38,073**	**608,94,353**	**102,05,148**	**11197,20,875**	**7336,10,317**	**40,71,646**		**422,48,646**	**7717,87,317**	**3479,33,556**	**3354,21,352**
	Previous Year	**10509,07,391**	**90,72,888**	**389,13,190**	**479,86,078**	**298,61,799**	**10690,31,670**	**7265,42,510**	**269,67,500**		**340,35,307**	**7336,10,317**	**3354,21,352**	**3243,64,881**

Schedule-6 FIXED ASSETS Acquired out of Grant-In-Aid
(Attached to and forming an integral part of Balance Sheet)

Amount in ₹

		Gross Block						Depreciation					Net Block	
Sr. No.	Particulars	Cost/Valuation as on beginning of the year	Additions During the Year			Deletion/Adjustments During the Year	Cost/Valuation as on end of the year	Depreciation as at beginning of the year	Depreciation Written Back	Depreciation Rate	Depreciation for Current Year	Total Depreciation up to the year end	WDV (Closing)	WDV (Opening)
			On or Before 30th September	After 30th September	Total Additions during the year									
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Land													
	a) Freehold	49,04,850	-	-	-	-	49,04,850	-	-	0%	-	-	49,04,850	49,04,850
	b) Leasehold	167,45,711	-	-	-	-	167,45,711	24,84,961	-	0%	2,09,771	26,94,732	140,50,979	142,60,750
2	Building													
	a) On Freehold Land	2226,35,715	-	-	-	43,20,000	2183,15,715	999,30,256	11,70,720	10%	119,55,618	1107,15,154	1076,00,561	1227,05,459
	b) On Leasehold Land	1327,01,184	-	-	-	-	1327,01,184	1008,14,965	-	10%	31,88,621	1040,03,586	286,97,598	318,86,219
	c) Ownership Flats/Premises	33,41,269	-	-	-	-	33,41,269	29,32,585	-	10%	40,868	29,73,453	3,67,816	4,08,684
	d) Superstructures on Land not belonging to the entity	-	-	-	-	-	-	-	-	10%	-	-	-	-
3	Plant, Machinery and Equipments	930,62,048	-	-	-	-	930,62,048	764,67,137	-	15%	24,89,237	789,56,374	141,05,674	165,94,911
4	Vehicles	105,60,869	4,550	-	4,550	5,52,083	100,13,336	93,54,089	5,41,610	15%	1,80,128	89,92,607	10,20,729	12,06,780
5	Furniture & Fixtures	1316,23,731	-	-	-	67,15,684	1249,08,047	874,10,916	22,07,206	10%	39,70,434	891,74,144	357,33,903	442,12,815
6	Office Equipments	539,79,069	23,700	1,07,109	1,30,809	7,38,871	533,71,007	435,67,184	7,02,182	15%	15,75,901	444,40,903	89,30,104	104,11,885
7	Air Conditioning Equipments	487,32,765	-	46,07,592	46,07,592	16,000	533,24,357	407,34,782	13,323	15%	18,90,436	426,11,895	107,12,462	79,97,983
8	Computer Peripherals	12724,98,658	10,93,451	25,77,965	36,71,416	1500,42,082	11261,27,992	12570,82,799	1490,77,018	40%	69,80,080	11149,85,861	111,42,131	154,15,859
9	Electrical Installations	756,82,954	1,93,948	-	1,93,948	110,41,958	648,34,944	496,54,861	29,96,514	10%	18,17,662	484,76,009	163,58,935	260,28,093
10	Electronic Tools & Lab Equipments	1011,25,718	6,89,741	1,30,441	8,20,182	-	1019,45,900	843,24,994	-	15%	26,43,135	869,68,129	149,77,771	168,00,724
11	Library Books	399,17,676	10,120	12,661	22,781	-	399,40,457	398,39,905	-	40%	40,221	398,80,126	60,331	77,771
12	Copyright Know-how	4,40,660	-	-	-	-	4,40,660	4,40,634	-	25%	7	4,40,641	19	26
13	Other Fixed Assets	71,50,128	22,997	-	22,997	-	71,73,125	59,74,858	-	15%	1,79,741	61,54,599	10,18,526	11,75,270
	Total	**22151,03,005**	**20,38,507**	**74,35,768**	**94,74,275**	**1734,26,678**	**20511,50,602**	**19010,14,926**	**1567,08,573**		**371,61,860**	**17814,68,213**	**2696,82,389**	**3140,88,079**
	Capital Work-in-progress	14623,28,520	616,17,789	1288,30,316	1904,48,105	-	**16527,76,625**	-	-		-	-	16527,76,625	14623,28,520
	Grand Total	**36774,31,525**	**636,56,296**	**1362,66,084**	**1999,22,380**	**1734,26,678**	**37039,27,227**	**19010,14,926**	**1567,08,573**		**371,61,860**	**17814,68,213**	**19224,59,014**	**17764,16,599**
	Previous Year	35080,51,109	592,13,624	1275,23,301	1867,36,925	173,56,509	36774,31,525	18638,12,974	83,91,536		455,93,487	19010,14,926	17764,16,599	16442,38,135

Schedule-7 FIXED ASSETS Acquired out of Project Grants
(Attached to and forming an integral part of Balance Sheet)

Amount in ₹

		Gross Block						Depreciation					Net Block	
Sr.No.	Name of the Project	Cost/Valuation as on beginning of the year	Additions During the Year			Deletion/Adjustments During the Year	Cost/Valuation as on end of the year	Depreciation as at beginning of the year	Depreciation Written Back	Depreciation Rate	Depreciation for Current Year	Total Depreciation up to the year end	WDV (Closing)	WDV (Opening)
			On or Before 30th September	After 30th September	Total Additions during the year									
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Bangalore Centre Project Assets	3225,60,792	43,94,859	94,18,782	138,13,641	9,037	3363,65,396	2864,78,206	-		141,42,411	3006,20,617	357,44,779	360,82,586
2	Chennai Centre Project Assets	916,33,737	-	-	-	-	916,33,737	791,32,786	-		24,29,958	815,62,744	100,70,993	125,00,951
3	Corporate Project Assets	-	-	-	-	-	-	-	-		-	-	-	-
4	Delhi Centre Project Assets	15,72,623	-	-	-	-	15,72,623	15,65,621	-		1,143	15,66,764	5,859	7,003
5	Hyderabad Centre Project Assets	1908,76,870	216,90,120	494,14,402	711,04,522	-	2619,81,392	1775,43,621	-		324,43,302	2099,86,923	519,94,469	133,33,249
6	Kolkata Centre Project Assets	241,99,698	-	29,48,435	29,48,435	-	271,48,133	186,70,569	-		33,91,022	220,61,591	50,86,542	55,29,129
7	Mohali Centre Project Assets	964,79,949	-	59,27,154	59,27,154	-	1024,07,103	828,77,633	-		55,65,896	884,43,529	139,63,574	136,02,316
8	Mumbai Centre Project Assets	3057,27,467	-	-	-	-	3057,27,467	2753,48,759	-		76,26,616	2829,75,375	227,52,092	303,78,708
9	Noida Centre Project Assets	947,18,659	8,78,468	5,18,056	13,96,524	70,720	960,44,463	738,79,493	70,718		42,08,576	780,17,351	180,27,111	208,39,166
10	Pune Centre Project Assets	5530,74,924	306,73,253	504,71,024	811,44,277	-	6342,19,201	4833,22,545	-		596,46,750	5429,69,295	912,49,907	697,52,379
11	Thiruvananthapuram Centre Project Assets	6030,39,088	480,28,422	801,05,474	1281,33,896	70,130	7311,02,854	2851,37,035	10,520		734,51,385	3585,77,900	3725,24,954	3179,02,053
	Total	**22838,83,807**	**1056,65,122**	**1988,03,327**	**3044,68,449**	**1,49,887**	**25882,02,369**	**17639,56,268**	**81,238**		**2029,07,059**	**19667,82,089**	**6214,20,280**	**5199,27,540**
	Capital Work-in-progress	**-**	**-**	**1830,36,750**	**1830,36,750**	**-**	**1830,36,750**	**-**	**-**		**-**	**-**	**1830,36,750**	**-**
	Grand Total	**22838,83,807**	**1056,65,122**	**3818,40,077**	**4875,05,199**	**1,49,887**	**27712,39,119**	**17639,56,268**	**81,238**		**2029,07,059**	**19667,82,089**	**8044,57,030**	**5199,27,540**
	Previous Year	**18579,65,294**	**3269,20,034**	**1034,79,223**	**4303,99,257**	**44,80,744**	**22838,83,807**	**16076,16,907**	**31,91,451**		**1595,30,812**	**17639,56,268**	**5199,27,540**	**2503,48,387**

Amount in ₹

Particulars	2018-19	2017-18
Schedule 8 - Current Assets, Loans and Advances		
A. Current Assets		
1. Inventories :		
a) Stock in trade		
Finished Goods	2194,90,775	24,46,760
Work-in-progress	1,42,124	1,50,440
Raw Material	20,95,756	17,15,677
b) Stock of Course Material	27,49,050	5,18,305
2. Sundry Debtors		
Trade Receivables	13688,19,679	10003,98,431
Less: Provision for Bad and Doubtful Debts	2531,37,579	2340,16,712
	11156,82,100	7663,81,719
3. Cash balances in hand (including cheques/drafts and imprest)	99,475	1,28,121
4. Bank Balances		
a) With Scheduled Banks		
On Deposit Accounts (includes margin money)	45435,84,097	37101,48,566
On Savings/Current Account	17921,25,476	14426,86,000
b) Funds/Goods in Transit	1,04,054	86,071
5. Post Office-Savings Accounts	316	5,722
Total (A)	76760,73,223	59242,67,381
B. Loans, Advances and Other Assets		
1. Loans		
a) Staff	67,84,825	82,16,364
b) Other (Specify)	-	-
2. Advances and other amounts recoverable in cash or in kind or for value to be received		
a) On Capital Account	259,24,000	359,24,000
b) Prepayments (Advances to Suppliers)	866,51,259	830,23,674
c) To Employees	94,48,829	64,00,995
d) To Others	56,51,527	59,22,637
3. Income Accrued		
a) On Investments from Earmarked/Endowment Funds	-	-
b) On Bank Deposits	863,69,114	743,87,819
c) Others		
I) Course Fee Receivable	2,05,475	8,38,688
ii) Receivable from Guest House Receipts	-	7,540
iii) Other Grants Receivables	2283,80,000	-
4. Claims Receivable		
a) Insurance Claims Lodged but not received	-	-
b) Cliams due but not received	6,25,354	6,25,354
c) Excise Duty paid under Protest	-	-
d) Income Tax Deducted at Source	1316,55,932	764,32,468
e) Sales Tax / VAT Paid Under Protest	-	-
f) Sales Tax / VAT Refund Due	3,48,811	2,61,790
g) CGST Receivable	30,54,308	11,12,106
h) SGST Receivable	30,61,162	13,47,487
i) IGST Receivable	98,42,227	48,17,404
j) UTGST Receivable	-	-
k) Reverse Charge GST Receivable	14,738	-
l) Input Tax Credit GST Receivable	-	32,680
m) GST Paid on Advance Receipt	139,87,702	178,31,143
n) Receivable from PF Trust	-	-
o) Other Receivables	560,82,084	69,44,453
5. Prepaid Expenses		
a) Insurance	14,31,956	4,70,727
b) Other Expenses	103,49,740	74,20,047

Amount in ₹

Particulars	2018-19	2017-18
6. Deposits (Assets)		
a) Telephone Deposit	12,54,187	12,10,913
b) Lease Rent Deposit	430,31,066	428,20,028
c) Other Deposits	265,53,106	258,18,453
d) Security Deposit	124,44,248	431,31,557
e) Excise PLA Deposit	-	-
f) Excise Under D3 and 57F3	-	-
g) EMD / Tender Deposit	46,61,315	32,39,831
7. Differed Expenses		
a) Unutilised Modvat / Cenvat	-	4,35,849
b) Differed Expenses on Projects	-	-
Total (B)	7678,12,965	4486,74,007
Total (A+B)	**84438,86,188**	**63729,41,387**

Schedule 9 - Income from Sales/Services

1. Income from Sales		
a) Sale of Finished Goods	3316,75,092	2309,22,741
b) Sale of Raw Material	-	-
c) Sale of Scraps	4,81,705	5,53,195
2. Income from Services		
a) Software Development Charges	4806,20,025	4154,29,333
b) Others (Specify)	-	-
AMC Charges Received	147,01,214	318,94,863
Consultancy Charges / Service Charges	17014,09,867	5876,38,248
TOT Fees Received	260,72,000	79,26,800
Royalty Received	26,34,890	133,00,736
Data Charges	757,29,844	443,56,555
3. Inter Unit / Inter Branch Sales / (Purchases)	-	60,750
Total	**26333,24,637**	**13320,83,221**

Schedule 10 - Grants/Subsdies
(Irrevocable Grants & Subsdies Received)

1. Central Government	10000,00,000	6550,00,000
2. Others (Specify)		
a) C-DAC's own Contribution and Other Adjustments	60,82,789	1,425
3. Less : Amount utilised for Capital Expenditure in the current year transferred to Capital Reserve	47,69,705	33,73,739
Total	**10013,13,084**	**6516,27,686**

Schedule 11 - Fees/Subscriptions
(Accounting Policies towards each item are to be disclosed)

1. Entrance Fees	-	-
2. Course Fees	7968,12,744	7534,10,019
3. Corporate Training Fees	125,32,717	63,72,352
4. Annual Fees/Subscriptions	131,25,481	51,81,746
5. Authorization Fees	-	-
6. Others (Specify)	-	-
a) Virtual Centre Processing Fees	-	-
b) Admission Cancellation Fees	40,32,407	32,02,059
c) Examination Fees	274,54,816	965,44,078
d) Late Fee	48,638	44,447
e) Registration Fees / Project Fee	15,05,836	14,31,799
f) Students Hostel Fees	164,93,195	120,70,955
TOTAL	**8720,05,834**	**8782,57,455**

Amount in ₹

Particulars	2018-19	2017-18
Schedule 12 - Interest Received		
1. On Term Deposits		
a) With Scheduled Banks	1705,35,028	1930,98,708
2. On Savings Accounts		
a) With Scheduled Banks	193,80,466	170,65,472
3. On Loans		
a) Employees/Staff	7,79,219	9,41,327
Total	**1906,94,713**	**2111,05,507**
Schedule 13 - Other Income		
1. Profit on Sale/Disposal of Assets		
a) Owned Assets	(1,61,410)	(4,33,054)
b) Assets acquired out of grants, or received free of cost	-	-
2. Exports Incentives Realized	-	-
3. Fees for Miscellaneous Services	8,05,419	47,27,611
4. Miscellaneous Income	50,06,216	144,09,719
Total	**56,50,225**	**187,04,276**
Schedule 14 - Increase/(Decrease) In Stock of Finished Goods & Work-In-Progress		
a) Closing Stock		
Finished Goods	2194,90,775	24,46,760
Work-in-progress	1,42,124	1,50,440
Raw Material	20,95,755	17,15,677
Loose Tools	-	-
Course Material Stock	27,49,050	5,18,305
b) Less : Opening Stock		
Finished Goods	24,46,760	26,88,960
Work-in-progress	1,50,440	52,970
Raw Material	17,15,677	21,93,075
Loose Tools	-	-
Course Material Stock	5,18,305	15,39,284
Total (a-b)	**2196,46,522**	**(16,43,107)**
Schedule 15 - Establishment Expenses		
a) Salaries & Wages	20186,25,606	14706,63,841
b) Allowances & Bonus		
Awards & Prizes	1,88,205	2,69,323
Bonus	-	37,14,281
Canteen Facility	356,60,953	345,22,466
Hire Charges - Contractual Services	1202,63,911	660,01,198
Lease Rent for Employees Quarters	-	124,89,263
Leave Travel Concession	206,41,426	63,19,321
Medical Reimbursement	1044,02,503	808,31,277
Members Medical & Accident Insurance Expenses	5,49,290	3,16,952
Misc. Allowances and Other Reimbursements	154,50,577	147,11,552
Staff Recruitment Expenses	30,19,024	26,84,969
Staff Training Expenses	19,09,400	8,52,991
Transfer & Relocation Expenses	1,76,338	1,80,589
c) Contribution to Provident Fund	1927,13,843	1325,48,851
d) Staff Welfare Expenses	59,54,636	47,29,060
e) Expenses on Employees Retirement and Terminal Benefits	-	-
Gratuity	2666,09,663	764,99,934
Leave Encashment	745,46,956	1335,84,866
Leave Salary & Pension Contribution	502,59,456	500,00,000
f) Others	1,01,092	9,01,336
Total	**29110,72,879**	**20918,22,070**

Amount in ₹

Particulars	2018-19	2017-18
Schedule 16 - Other Administrative Expenses		
a) Purchases	4275,23,400	1259,22,967
b) Direct Expenses		
Consumables	180,22,654	177,77,847
Design and Development Charges	5,01,674	2,51,800
Excise/Custom Duty/Service Tax Paid	41,53,472	8,51,001
Freight and Handling Expenses	1,11,260	1,25,287
Labour Charges	1,200	66,03,819
Liquidated Damages	2,13,750	-
Material Insurance Expenses	1,22,395	23,621
Octroi	-	-
Other Packing Charges	1,23,470	49,056
Royalty and Support Fees	-	-
Software Development Consultancy Charges	41,99,352	39,33,673
Technical Service Charges	4450,60,751	148,18,421
Warehouse Charges	1,03,200	3,18,400
c) Expenses on Courses		
Advertisement Expenses	83,65,250	70,06,999
ATC's Share in Fees	2151,20,677	1973,45,570
Awards & Prizes	24,376	1,01,491
Campus Interview Expenses	19,32,006	40,20,173
Course Material Production Expenses	402,08,259	287,02,750
Data Entry & Scanning Expenses	-	-
Examination Expenses	41,74,782	702,94,052
Faculty Members Expenses	327,57,705	215,69,424
Other Course Related Expenses	726,01,692	941,73,161
Printing of Forms & Prospectus	2,13,628	-
Students Hostel Expenses	50,67,997	2,11,930
d) Administrative Expenses		
Administrative Charges on Provident Fund	72,56,174	54,68,603
Asset Hire Charges	23,44,249	8,38,313
Auditors Remuneration	12,29,451	16,90,138
Bank Charges and Commission	13,92,530	17,14,999
C-DAC's Contribution to Funded Projects	218,36,871	1,67,598
Cultural Program Expenses	9,00,651	6,70,314
Development Contracts and Spon. Project Expenses	80,26,847	47,58,087
Electricity, Power and Water Charges	772,23,805	1100,46,135
Entertainment/Hospitality Expenses	15,37,463	69,95,580
Foreign Exchange Fluctuation	(4,42,072)	1,84,249
Gifts and Presentation	4,53,304	6,08,093
Insurance	16,49,577	14,86,897
Interest Paid	33,10,066	35,55,036
Irrecoverable Balances Written-off/(Written-back)	(2,40,735)	11,76,278
Legal & Professional Charges	139,83,970	115,61,123
Miscellaneous Expenses	16,14,206	58,29,118
Office Expenses	81,00,565	136,47,367
Postage, Telephone & Communication Charges	169,38,417	173,48,772
Printing and Stationery	77,41,583	77,92,237
Provision for Bad and Doubtful Debts/Advances	211,60,856	276,48,653
Rent, Rates and Taxes	412,72,982	412,63,518
Sales Tax	-	21,18,958
CGST Paid	4,99,716	1,92,917
SGST Paid	14,495	1,92,917
IGST Paid	-	11,11,429
UTGST Paid	-	-
Reverse Charge GST Paid	-	91,618
Service Hire Charges	1220,31,192	914,45,525
Subscription of Periodicals & Newspapers	21,15,901	16,99,009
Tender Expenses	44,872	1,31,501
Training Expenses	8,04,737	24,21,709
Transit Quarter & Guest House Expenses	28,06,552	31,09,241
Transportation Charges	1,01,160	83,260
Vehicles Hire, Running and Maintenance	77,44,555	112,26,748

Amount in ₹

Particulars	2018-19	2017-18
e) Repairs and Maintenance		
Air Conditioning Equipments	73,34,485	47,84,362
Building	104,03,158	73,92,211
Computers	51,57,337	58,54,555
Electrical Fittings	196,33,776	150,42,196
Furniture and Fixtures	11,81,145	13,66,955
Garden Maintenance	19,23,862	14,88,574
Lab Equipments	1,54,787	9,85,589
Office Equipments	22,26,469	12,67,694
Other Assets	31,59,392	27,26,903
f) Travelling and Conveyance Expenses		
Inland Travel Expenses		
Director	39,11,931	24,26,242
Members	1268,96,175	515,03,731
Others	29,26,844	20,55,753
Foreign Travel Expenses		
Director	7,43,325	-
Members	33,25,088	46,41,114
Others	-	-
Conveyance Expenses	-	-
g) Selling Distribution and Business Promotion Expenses		
Advertisement Expenses	12,93,015	20,58,018
Expenses on Exhibition, Seminars/Workshops	47,58,345	36,61,628
Distribution Expenses	13,98,780	8,65,258
Product Literature & Brochures Expenses	-	-
Other Sales Promotion Expenses	31,89,158	5,12,844
h) Corporate Office Expenses	-	-
i) Other Expenses	-	-
Total Other Administrative Expenses	**18536,73,962**	**10810,11,009**

Schedule 17: Significant Accounting Policies:

1. Accounting Convention

The financial statements are prepared under the historical cost convention C-DAC follows Mercantile System of Accounting and recognizes Income and Expenditure on Accrual basis except otherwise stated, and the following items, due to their peculiar nature are recognized otherwise:

1.1. The course fees of Diploma in Advanced Computing and other Courses commencing before the end of financial year and the duration of which falls beyond the financial year are recognized entirely in the year under audit. In respect of these courses, entire expenditure of course material and agreed proportionate share of the Authorized Training Centers (ATCs) is also accounted for in the year under audit.

1.2. Bonus is accounted for on Cash Basis.

1.3. Expenditure incurred on incomplete Software Development Projects is expensed out in the year of incurrence.

2. Revenue Recognition

2.1. Sales are recognized as net of Trade Discount, Sales Returns, GST and Excise Duty, but including Central Sales Tax & VAT.

2.2. Software Development Charges are recognized on the basis of Terms of Individual Contract and / or as per Phases of completion.

2.3. The income in respect of Annual Maintenance Contract is recognized on accrual basis and as per the terms of individual contracts entered into with parties.

2.4. Income in respect of consultancy charges/service charges is recognized on accrual basis and on the basis of terms of individual contracts entered into with the parties.

2.5. Grants in aid received from the government are treated as income to the extent of net of capital expenditure incurred during the year.

2.6. Interest and other miscellaneous incomes are accounted for on accrual basis.

3. Fixed Assets

3.1 Actual cost of fixed assets acquired is accounted for as per the terms of purchase order; any recovery is netted off to the cost of the asset and all expenses directly attributable to the acquisition and installation of the fixed assets are capitalized.

3.2 Fixed Assets are stated at Cost less Accumulated Depreciation.

3.3 Direct Material Cost with respect to major Fixed Assets developed in-house is capitalized along with manpower and Overhead costs. The Manpower and Overhead costs are charged on basis of man-days spent on the development of Assets as ascertained by the Management. Cost of prototype incurred in the process is charged to Revenue.

3.4 Costs incurred on Assets, which are in process of acquisition, or installation or development is treated as Capital WIP.

3.5 Fixed Assets created out of Sponsored Project Grants and lying at project site are not capitalized and shown as consumables under revenue expenditure.

4. Depreciation

4.1. The ownership of assets acquired out of Mission Grants & Sponsored Projects Grants rests with the respective funding agencies. However, depreciation is charged on the WDV basis on all assets including on those acquired out of Mission and Sponsored Project Grants. The Written-Down Value of the said assets is represented by an equivalent amount of Capital Reserve.

4.2. All additions to Fixed Assets are fully depreciated irrespective of the date of acquisition. Depreciation is charged at the rates prescribed by the Income Tax Act 1961.

5. Inventory Valuation

The inventories are valued and certified by the Management as under –

5.1. Components, Raw Materials and Loose Tools in stock are valued at cost or net realizable value whichever is lower.

5.2. Work in Progress and Finished Goods are valued at cost.

5.3. Course Material stock is valued at landed cost. The course material, which is outdated due to change in the syllabus, is shown at nil value.

6. Deferred Expenditure on Projects

The expenditure incurred on incomplete business projects for which income is to be recognized in the ensuing period is deferred.

7. Foreign Currency Transaction

7.1. Transactions denominated in foreign currency are accounted at the exchange rate prevailing on the date of transaction and difference between the date of transaction and payment/receipt are accounted for as income or expenditure as the case may be.

7.2. Current assets and current liabilities denominated in foreign currency are converted at the exchange rate prevailing as at the year-end and the resultant gain/loss is adjusted to revenue account. Contingent liabilities denominated in foreign currency are converted at the exchange rate prevailing as at the year-end.

8. Retirement Benefits

Retirement benefits in respect of Provident Fund, Pension Fund, Gratuity and Leave Encashment has been provided for on accrual basis.

9. Other Policies

All other Accounting Policies are generally consistent with normally accepted accounting practices.

CA Raghu Bhargava	**Sunil Misar**	**Dr. Hemant Darbari**
Director Finance	Registrar (I/C)	Director General

For Udyen Jain & Associates, Firm Registration No.116336W
Chartered Accountants

Sandeep Soni
Partner (M.No.124971)
UDIN : 19124971AAAAAY4524
Date : 19-Sept-2019
Place: Pune

Schedule 18: Notes to Accounts

1. Merger of Societies with C-DAC

The Assets, Liabilities and Other obligations at the book value as on December 15, 2002 are merged in C-DAC in respect of the societies viz. Electronics Research And Development Centre at Kolkata, Noida, Thiruvananthapuram, National Centre for Software Technology Mumbai, and Centre For Electronics Design And Technology of India, Mohali, due to merger of these Societies in C-DAC as per the Government of India orders.

The process for transfer of title deeds of Immovable properties in the name of C-DAC of the above centres is under process. No liability towards expenses such as stamp duty, taxes and other expenses (if any) is provided for. The same will be accounted for in the year of payment if any .

2. Capital Commitment

Capital Commitments not provided for ₹8,528.92 Lakhs (Previous year ₹2,793.77 Lakhs).

3. Sponsored Projects

Balance of Core Grant Projects as per Annexure 1 of Schedule 3 to the Balance Sheet includes unutilized grants amounting to ₹33.73 Lakhs (Previous year ₹531.55 Lakhs) and ₹2360.76 Lakhs (Previous year ₹ 87.58 Lakhs) grants receivable on account of expenditure incurred in anticipation of release of grants on projects.

Balance of unutilized Funded Projects grants as per Annexure 2 of Schedule 3 to the Balance Sheet includes unutilized grants amounting to ₹30444.50 Lakhs (Previous year ₹21655.79 Lakhs) and ₹3,197.79 Lakhs (Previous year ₹3209.73 Lakhs) grants receivable on account of expenditure incurred in anticipation of release of grants on projects.

4. Contingent Liabilities

4.1. Against Bank Guarantees: ₹1,626.46 Lakhs. (Previous year ₹1,884.24 Lakhs)

4.2. Against Letter of Credit ₹Nil Lakhs. (Previous year ₹Nil Lakhs)

4.3. Against Liquidated Damages: ₹2.14 Lakhs (Previous year ₹Nil Lakhs)

4.4. Against Sales Tax: ₹77.69 Lakhs (Previous year ₹77.69 Lakhs)

4.5. Against Service Tax: ₹123 Lakhs (Previous year ₹Nil Lakhs)

4.6. Sales Tax / VAT Assessments are completed up to financial year 2013-14 for Bangalore, Noida & Pune, 2016-17 for Chennai, 2017-18 for Mohali & Thiruvananthapuram. No assessment is pending for Corporate, Delhi, Hyderabad, Kolkata & Mumbai centres.

4.7. Cases related to staff at various centres are pending at various levels for which liability cannot be assessed.

5. Statutory Liabilities

The entire income of C-DAC is exempt u/s 10(21) being a scientific research association notified u/s 35(1)(ii) of the Income Tax Act, 1961. Hence no provision for income tax has been made.

6 Foreign Currency Transactions

6.1 **Imports:** Total Rupee value of imports (CIF) during the year is as follows:

(₹ in Lakhs)

Centre	Raw Material / Components	Capital Goods	Total
Current Year	391.49	819.51	1211.00
Previous Year	352.69	380.85	733.54

6.2 **Expenditure in foreign currency for Travel:** ₹ 54.45 Lakhs. (Previous Year ₹ 35.35 Lakhs.)

6.3 **Other Expenditure in foreign currency**: ₹77.78 Lakhs (Previous Year ₹9.42 Lakhs.)

6.4 **Earnings in Foreign Exchange:** Total Earnings in Foreign Exchange during the year are as follows.

Currency	Current Year	Previous Year
US Dollars	560.00	9,250.00
Euro	0	0
Total Value in ₹ (In Lakhs)	0.36	5.91

7 Remuneration to Statutory Auditors (Including Branch Auditors)

(₹ in Lakhs)

Particulars	Current Year	Previous Year
Audit Fees (Exclusive of GST)	3.19	3.56

8 Interest received on grants is treated as liability. Expenses on the core/sponsored projects are charged to respective project and not routed through Income & Expenditure Account.

9 Fixed Assets: The depreciation on the assets purchased out of grants is debited to Capital Reserve.

10 Current Assets and Current Liabilities

a. Balances of Debtors, Creditors, Receivables and Payables are subject to adjustments, writing off and confirmation and reconciliation from parties.

b. The amount outstanding for more than three years has been provided for as Bad and Doubtful Debts except the amount realized till date & the amount realizable from the existing customers. In the opinion of Management the said provision is adequate.

c. Out of debtors outstanding for more than three years for ₹2,763.44 Lakhs (Previous year ₹2,502.83 Lakhs) a provision of ₹2,531.37 Lakhs (Previous year ₹2,340.16 Lakhs) has been made up to 31st March,2019. Provision for ₹232.07 Lakhs (Previous year ₹162.68 Lakhs) has not been made {Mumbai ₹85.19 Lakhs (Previous year ₹104.49 Lakhs), Noida ₹85.67 Lakhs (Previous year ₹22.25 Lakhs) and Mohali ₹61.21 Lakhs (Previous year ₹Nil) Pune ₹Nil (Previous year ₹35.94 Lakhs)} as they are for ongoing projects / parties and the management of the C-DAC is of the opinion that the same will be realized shortly.

Age wise Analysis of Sundry Debtors is as follows:

(₹ In Lakhs)

Centre Name	Less than 6 months	More Than 6 months	More Than 1 year	More Than 2 years	More Than 3 years	Total
Bengaluru	66.31	2.68	1.96	4.74	164.18	239.87
Chennai	129.18	71.56	0.00	0.00	13.74	214.48
Delhi	253.72	0	0	0.02	120.45	374.19
Hyderabad	110.89	51.27	10.80	0.00	0.00	172.96
Kolkata	380.82	25.49	69.91	0	32.98	509.20
Mohali	114.53	424.42	11.89	1.85	81.27	633.96
Mumbai	761.57	24.89	150.9	116.93	470.31	1524.60
Noida	2182.89	187.58	533.2	177.27	730.43	3811.37
Pune	2268.24	379.9	845.24	57.17	1100.18	4650.73
Thiruvananthapuram	59.62	853.98	572.59	20.74	49.9	1556.83
Total	6327.77	2021.77	2196.49	378.72	2763.44	13688.19
Previous Year	4040.03	1719.49	873.58	868.05	2502.83	10003.98

11. Accounting of grants is made on accrual basis. The Core Grants (net off capital expenditure) & expenditure related to Core Grants is routed through Income & Expenditure account.

12. Physical Verification

Physical verification of Fixed Assets/ stores except Thiruvananthapuram has been carried out during the year. Reconciliation of some of the centers is in progress.

13. Internal Audit / Internal Control Systems

C-DAC has an internal control system, which is commensurate with the size and financial transactions. Internal audit is being conducted by external auditors during the year.

14. Employee Benefits

Employees benefits with respect to Gratuity and Leave encashment has been paid/provided as per provisions of Accounting Standard I5 Employee Benefits except as given in notes to accounts of centres .

15. Lease Obligations

Lease rent of ₹351.45 Lakhs for various premises are debited under the various heads of Income and Expenditure Account for the period under audit as per the Accounting Standard 19 Leases.

16. Impairment of Assets

As per Accounting Standard 28 Impairment of Assets, fixed assets are reviewed for impairment and there is no impairment of assets during the year, as the carrying amount of the assets are less than the realizable value.

17. Other Discloser Requirements

The Management of C-DAC is of the opinion that C-DAC being a scientific society and not a listed company and therefore the reporting requirements as per Accounting Standard 3 on Cash flow statement, Accounting Standard 17 on Segment Reporting, Accounting Standard 18 on Related Party Disclosures and Accounting Standard 26 in respect of Intangible Assets are not applicable.

18. Advances paid to employees include ₹1.76 Lakhs as advances paid to Director General (Previous Year ₹Nil Lakhs).

19. Centre Specific Notes

19.1 Delhi Centre

No liability has been provided for in respect of civil suit of recovery for ₹322.98 Lakhs filed by M/s IBILT Technology Ltd in DIPP's IPO Project with an outlay of ₹ 2340 Lakhs, since the case is under examination with Hon'ble High Court, Delhi.

19.2 Hyderabad Centre

No provision was made towards service tax of ₹15.98 Lakhs and penalty of ₹100 per day for the year 2004-05. CESTAT has made decision in favor of CDAC. Being grieved by the order Service Tax Department has gone in Appeal against the CESTAT order to Hon'ble Supreme Court for which decision is pending.

19.3 Mohali Centre

No Provision was made in books of account for penalty imposed by the Service Tax department of ₹90.50 Lakhs till date as appeals have been filed with Appellate Tribunal for Customs, Excise and Service Tax, Chandigarh and Commissioner of Central Excise (Appeals) Ludhiana which are pending. Provision of demand of ₹220 Lakhs of service tax and interest is provided for in books of accounts.

19.4 Mumbai Centre

19.4.1 The Law Secretary cum Appellate Authority has given an award for increase in the rent from 01-04-1995 till the date of vacation of premises(01-11-2013) of Air India located at Nariman point, Mumbai, for an amount along with interest at the rate of 6% till 30-06-2017 is ₹2,311 Lakhs and the Interest at the rate of 12% p.a. from July 2017 onwards for which no provision has been made in the books of accounts as the case is with Hon'ble High Court, Delhi.

19.4.2 As per the actuarial valuation, total outstanding liability in respect of Pension Fund is ₹3219 Lakhs, against which ₹2,412 Lakhs has been provided in the books of accounts (Fund Value ₹930 Lakhs plus cumulative provision ₹1,482 lakhs) as on 31st March 2019. Provision for ₹ 807 lacs has not been made due to short receipt of Grant in Aid.

19.4.3 Conveyance Deed for the office and residential buildings in Mumbai has not been executed by the Bombay Housing & Area Development Board (BH&ADB), though the Centre has made the payment towards the acquisition of the said assets. The possession for the office building and the residential buildings has been obtained from BH&ADB from 1st April, 1986 and 1st June, 1986, respectively.

19.5 Pune Centre

19.5.1 Activities of ACTS, Pune are shifted from Bio-Informatics Building, Pune University Campus to Thube Park, Shivajinagar, Pune, in 2004-2005 and then to NSG-IT park, Aundh, Pune in 2008-09. Some of the fixed assets could not be shifted to this premises with the WDV of ₹ 3.14 Lakhs and ₹ 26.28 Lakhs respectively as on 31st March 2019.

19.5.2 "Memorandum of Understanding" (MOU) or "Leave and License Agreement", as the case may be, entered into with University of Pune and Small Industries Development Institute (SIDI) regarding transfer of rights to use and develop immovable properties viz. Main Building, NPSF Building and assets therein respectively are not registered.

19.5.3 Funds belonging to CDAC Employees Benevolent Fund funds are not separately invested as on 31st March 2019.

19.5.4 No provision is made for the Advances to employees of ₹9.45 Lakhs against various claims, which will be booked during the financial year 2019-20. Since most of the claims will directly be debited to the Projects / Grants.

19.5.5 The hardware items for super computer under NSM Mission is procured and installed at IIT, Varanasi and accordingly the Cost of ₹1821.75 Lakhs is provided in the books of accounts and taken as a capital WIP. As per NSM Mission and agreement/MOU with IIT, Varanasi, the machine will be transferred to IIT, Varanasi as per obligation of the project.

19.6 Thiruvananthapuram Centre

19.6.1 Advances includes the amount paid to M/s. Eworkz, Los Angels, USA, ₹25.41 Lakhs for the supply and installation of a LCD based video wall system at police control room Kochi and the customs duty paid to clear the consignment. Since the Indian agent of the party has not come forward for the installation of the system, Centre has taken action to recover the advance through legal recourse.

19.6.2 Land on which the main building at Vellayambalam of the Centre is situated is on lease from Government of Kerala, but no lease deed has been registered so far and the land has not been assigned in favor of C-DAC's name. In the absence of specific demand, lease rent has not been provided in the books of account.

19.6.3 As per actuarial valuation, the total outstanding liability as on 31st March 2019 in respect of terminal benefits (Gratuity/EL) of Staff is ₹2355.89 Lakhs, against which ₹1177.94 Lakhs has been provided in the books of accounts, which is 50% of actual provision required. Less provision made is due to short receipt of Grant in Aid, enhancement of statutory limit of gratuity.

20. Liabilities relating to Members CPF, VPF, Gratuity, Leave salary and Members Income Tax payable have been increased in FY 2018-19 compared to FY 2017-18 due to distribution of 7th CPC arrears in the month of March 2019.

21. The consolidated Balance Sheet and consolidated Income & Expenditure account are prepared based on the Audited Annual Accounts received from the centres.

22. Centre wise Financial Performance and Centre wise details of Assets and Liabilities, Income & Expenditure is attached as Annexure 18 (A) and 18 (B). The details of assets procured and expenses incurred from NE funds received for Silchar Centre is given in Annexure 1 of schedule 3.

23. Current year figures from audited financial statements of Centre's are regrouped wherever necessary in preparation of consolidated financial statements. Previous year's figures are regrouped, rearranged and reclassified wherever necessary.

24. Figures in the Financial Statements are rounded off to nearest Indian rupees.

CA Raghu Bhargava	**Sunil Misar**	**Dr. Hemant Darbari**
Director Finance	Registrar (I/C)	Director General

For Udyen Jain & Associates, Firm Registration No.116336W
Chartered Accountants

Sandeep Soni
Partner (M.No.124971)
UDIN : 19124971AAAAAY4524
Date : 19-Sept-2019
Place: Pune

Annexure 18(A): FINANCIAL PERFORMANCE OF C-DAC FOR THE FINANCIAL YEAR 2018-2019

(Attached to and forming an integral part of Balance Sheet)

Amount in Lakhs

S.No	Particulars	Total	Bangalore	Chennai	Corporate	Delhi	Hyderabad	Kolkata	Mohali	Mumbai	Noida	Pune	TVM
A	**OPENING BALANCE**												
(i)	**Grant -in- Aid: Core Grant Projects**	**443.97**											
	GIA General	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Core Grant Projects	443.97	143.03	0.00	203.91	(250.62)	(207.40)	99.39	21.83	0.00	0.00	(306.01)	739.84
(ii)	**Grant for Sponsored Projects**	**18446.04**											
	MeitY	7329.91	(91.92)	(390.01)	(2.75)	26.38	1202.45	23.34	7.02	1161.45	(5.03)	3048.06	2350.92
	Other Agencies	11116.13	28.08	0.00	0.00	1130.48	435.37	87.33	59.57	62.15	13.67	8746.80	552.68
B	**RECEIPTS & INCOME**												
(i)	**Grant -in- Aid**	**9996.87**											
	GIA General	10000.00	1027.29	326.24	750.00	165.02	313.85	420.60	475.40	645.39	705.89	3220.00	1950.32
	Core Grant Projects	(3.13)	(51.68)	95.86	(104.67)	0.00	0.00	72.77	(21.15)	0.00	0.00	5.84	(0.10)
(ii)	**Grant for Sponsored Projects**	**27456.72**											
	MeitY	16326.77	953.46	471.94	2.75	121.09	1559.93	677.23	377.49	728.10	391.78	7592.14	3450.86
	Other Agencies	11129.95	12.90	0.00	285.00	931.98	1385.79	767.74	208.45	0.00	43.11	7005.68	489.30
(iii)	**Revenue Earnings**	**35053.29**											
	Training	17304.95	1053.69	98.15	0.00	0.00	451.46	21.93	930.57	483.68	1886.20	12165.67	213.60
	Commercial	17748.34	230.51	977.07	0.00	61.31	368.36	1163.01	399.68	2097.15	4379.09	3252.79	4819.37
(iv)	**Interest, Other Income & C-DAC Contribution**	**(409.39)**											
	GIA General	61.61	0.00	0.00	61.27	0.00	0.00	0.00	0.75	0.00	(1.19)	0.00	0.78
	Core Grant Projects	(471.00)	(9.64)	0.00	1.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(462.51)
		1429.71											
	MeitY Spon Projects	848.64	15.32	0.00	0.00	0.00	282.97	2.93	8.59	21.05	3.81	298.56	215.41
	Spon. By Other Agencies	581.07	1.05	0.00	0.00	0.00	16.01	0.47	7.08	0.00	3.63	530.46	22.37
		4180.99											
	Training	1004.63	155.20	3.70	27.97	0.00	84.74	0.94	190.09	1.59	292.59	163.58	84.23
	Commercial	3176.36	20.21	0.00	33.14	136.13	85.24	93.95	30.69	10.47	340.49	46.30	2379.74
	TOTAL (A+B)	**96598.20**	**3487.50**	**1582.95**	**1257.77**	**2321.77**	**5978.77**	**3431.63**	**2696.06**	**5211.03**	**8054.04**	**45769.87**	**16806.81**
C	**REVENUE Expenditure**												
(i)	**Expenditure from Grant-In-Aid**	**10467.85**											
	GIA General	**10013.91**											
	Establishment Expenses	9440.50	1027.29	326.24	589.68	165.02	266.84	352.17	438.91	398.77	705.89	3219.37	1950.32
	Other Administrative Expenses	573.41	0.00	0.00	220.12	0.00	47.01	22.13	37.34	245.44	0.00	0.59	0.78
	Core Grant Projects	**453.94**											
	Establishment Expenses	207.32	34.76	61.62	0.00	0.00	0.00	83.04	0.33	0.00	0.00	22.57	5.00
	Other Administrative Expenses	246.62	46.93	34.24	0.00	0.00	0.00	22.15	0.35	0.00	0.00	162.07	(19.12)
(ii)	**Expenditure on Sponsored Projects**	**13183.01**											
	MeitY Total Expenses	**8888.57**											
	Establishment Expenses	6109.07	303.02	72.02	0.00	47.84	472.79	323.70	132.40	319.10	154.85	3296.93	986.42
	Other Administrative Expenses	2779.50	235.45	4.02	0.00	22.98	257.83	218.35	66.37	120.47	123.14	750.00	980.89
	Other Agencies Total Expenses	**4294.44**											
	Establishment Expenses	2162.39	13.26	0.00	0.00	92.47	180.92	255.77	59.08	5.46	245.40	1154.01	156.02
	Other Administrative Expenses	2132.05	17.45	0.00	0.00	603.85	24.91	193.81	75.51	59.95	559.38	305.17	292.02
(iii)	**Other Revenue Expenditure**	**38245.38**											
	Training Total Expenses	**15518.94**											
	Establishment Expenses	4738.24	949.26	37.31	0.00	0.00	218.95	5.57	564.89	418.58	803.63	1109.09	630.96
	Other Administrative Expenses	10780.70	573.38	40.84	(184.88)	0.00	251.50	15.96	384.48	214.23	891.53	8520.77	72.89
	Commercial Total Expenses	**22726.44**											
	Establishment Expenses	14931.98	231.82	709.15	39.23	198.87	148.51	1019.63	566.08	1810.73	3408.92	3267.62	3531.42
	Other Administrative Expenses	7794.46	140.75	435.25	(151.43)	88.44	213.48	456.79	130.27	509.41	595.02	792.08	4584.40
	TOTAL C	**61896.24**	**3573.37**	**1720.69**	**512.72**	**1219.47**	**2082.74**	**2969.07**	**2456.01**	**4102.14**	**7487.76**	**22600.27**	**13172.00**

Annexure 18(A): FINANCIAL PERFORMANCE OF C-DAC FOR THE FINANCIAL YEAR 2018-2019

(Attached to and forming an integral part of Balance Sheet)

D	**CAPITAL Expenditure**												
(i)	**Expenditure from GIA for Core R&D**	**1832.05**											
	GIA General	47.70	0.00	0.00	1.47	0.00	0.00	46.30	(0.10)	1.18	(1.19)	0.04	0.00
	Core Grant Projects	1784.35	0.02	0.00	0.00	612.13	(156.24)	16.97	0.00	0.00	0.00	518.12	793.35
(ii)	**Expenditure from GIA for Sponsored Proj.**	**4875.05**											
	MeitY	2601.53	133.73	0.00	0.00	0.00	545.89	25.30	57.41	0.00	5.18	712.45	1121.57
	Other Agencies	2273.52	4.40	0.00	0.00	0.00	165.15	4.19	10.48	0.00	8.78	1920.75	159.77
(iii)	**Expenditure from Own Funds**	**608.94**											
	Training	285.37	38.35	0.03	0.00	0.00	28.11	0.00	30.15	12.29	4.60	171.85	0.00
	Commercial	323.57	0.05	1.42	0.00	23.80	0.00	63.64	0.06	0.00	183.65	42.73	8.22
	TOTAL D	**7316.04**	**176.55**	**1.45**	**1.47**	**635.93**	**582.91**	**156.40**	**98.00**	**13.47**	**201.02**	**3365.94**	**2082.91**
E	**REFUND / TRANSFER OTHER ADJUSTMENTS**												
(i)	**From GIA for Core R&D**	**58.58**											
	GIA General	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Core Grant Projects	58.58	0.00	0.00	66.66	0.00	(58.08)	50.00	0.00	0.00	0.00	0.00	0.00
(ii)	**From Sponsored Projects**	**2027.70**											
	MeitY	1617.46	69.32	28.56	0.00	0.00	643.82	10.21	7.34	393.19	(0.02)	420.95	44.09
	Other Agencies	410.24	1.13	0.00	0.00	0.00	1.24	0.29	48.38	0.00	0.00	356.98	2.22
	TOTAL (E)	**2086.28**	**70.45**	**28.56**	**66.66**	**0.00**	**586.98**	**60.50**	**55.72**	**393.19**	**(0.02)**	**777.93**	**46.31**
F	**TOTAL Expenditure (C+D+E)**	**71298.56**	**3820.37**	**1750.70**	**580.85**	**1855.40**	**3252.63**	**3185.97**	**2609.73**	**4508.80**	**7688.76**	**26744.14**	**15301.22**
G	**Unspent Balance / Surplus / Deficit (A+B-F)**												
(i)	**Grant -in- Aid**	**(2327.03)**											
	GIA General	(0.00)	0.00	0.00	0.00	0.00	0.00	0.00	(0.00)	0.00	(0.00)	(0.00)	(0.00)
	Core Grant Projects	(2327.03)	(0.00)	0.00	33.73	(862.75)	6.92	0.00	(0.00)	0.00	0.00	(1002.93)	(502.00)
(ii)	**Sponsored Projects**	**27246.71**											
	MeitY	11397.76	135.34	(22.67)	0.00	76.65	1125.02	125.94	129.58	1077.84	107.41	5758.43	2884.22
	Other Agencies	15848.95	5.79	0.00	285.00	1366.14	1464.95	401.48	81.65	(3.26)	(753.15)	12546.03	454.32
(iii)	**Other**	**988.90**											
	Training	2790.64	(313.75)	23.70	212.85	0.00	65.75	1.34	171.29	(147.54)	483.63	2699.39	(406.02)
	Commercial	(1801.74)	(121.85)	(167.33)	145.34	(89.87)	91.61	(219.46)	(265.98)	(212.52)	715.64	(760.61)	(916.71)

Annexure 18(B):

CENTRE WISE BALANCE SHEET AS AT 31st March 2019

(Attached to and forming an integral part of Balance Sheet)

Amount in Lakhs

Particulars	Total	Bangalore	Chennai	Corporate	Delhi	Hyderabad	Kolkata	Mohali	Mumbai	Noida	Pune	TVM
CORPUS/CAPITAL FUND AND LIABILITIES												
Corpus/Capital Fund	32,056.99	2,335.60	(142.72)	1,369.93	2,062.22	2,466.86	1,831.93	3,865.13	(1,294.42)	12,607.15	5,359.38	1,595.93
Reserves and Surplus	27,269.16	564.76	144.75	11.07	2,669.62	1,678.67	353.70	246.61	298.40	556.88	11,354.14	9,390.56
Earmarked and Endowment Funds	24,978.53	143.17	(22.10)	318.73	580.64	2,596.87	527.45	211.24	1,075.98	(645.75)	17,355.76	2,836.54
Current Liabilities and Provisions	30,887.73	602.83	141.21	26.35	775.47	301.24	657.91	481.36	2,313.78	1,982.32	13,604.50	10,000.76
Branch & Divisions	(0.00)	354.72	458.70	(338.81)	(229.05)	32.65	(608.45)	(251.58)	(90.21)	246.03	192.22	233.78
Total	**1,15,192.41**	**4,001.08**	**579.84**	**1,387.27**	**5,858.90**	**7,076.29**	**2,762.54**	**4,552.76**	**2,303.53**	**14,746.63**	**47,866.00**	**24,057.57**
ASSETS	-	-	-	-	-	-	-	-	-	-	-	-
Fixed Assets												
Acquired out of Own Funds	3,479.34	502.81	10.26	-	237.39	71.40	120.85	152.04	44.94	1,064.63	1,165.38	109.64
Acquired out of Grant in Aid	19,224.59	207.31	44.04	11.07	2,669.56	1,158.73	302.83	98.37	70.88	376.61	8,619.88	5,665.31
Acquired out of Project Grants	8,044.57	357.45	100.71	-	0.06	519.94	50.87	148.25	227.52	180.27	2,734.25	3,725.25
Investments-Others	5.05	-	-	-	-	-	-	-	-	5.05	-	-
Current Assets, Loans, Advances etc.	84,438.86	2,933.51	424.83	1,376.20	2,951.89	5,326.22	2,287.99	4,154.10	1,960.19	13,120.07	35,346.49	14,557.37
Total	**1,15,192.41**	**4,001.08**	**579.84**	**1,387.27**	**5,858.90**	**7,076.29**	**2,762.54**	**4,552.76**	**2,303.53**	**14,746.63**	**47,866.00**	**24,057.57**

CENTRE WISE INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st March 2019

Amount in Lakhs

Particulars	Total	Bangalore	Chennai	Corporate	Delhi	Hyderabad	Kolkata	Mohali	Mumbai	Noida	Pune	TVM
INCOME												
Income from Sales/Services	26,333.25	327.19	977.07	-	61.31	393.93	1,162.99	1,064.34	2,097.15	5,042.64	10,361.93	4,844.69
Grants/Subsdies	10,013.13	1,027.29	326.24	809.81	165.02	313.85	374.31	476.25	644.21	705.89	3,219.95	1,950.32
Fees/Subscription	8,720.06	957.02	98.15	-	-	425.88	21.96	265.92	483.68	1,222.65	5,056.53	188.27
Interest Earned	1,906.95	167.04	3.70	61.10	133.59	169.65	94.90	213.13	3.17	584.21	194.13	282.33
Other Income	56.50	(0.92)	-	-	2.54	0.33	(0.01)	7.51	8.88	3.31	18.71	16.15
Prior Period Income	21.06	0.01	-	-	-	-	-	0.15	-	45.56	(24.66)	-
Increase/(decrease) in stock of Finished Goods and Work-in-progress	2,196.46	9.28	-	-	-	-	-	-	-	-	21.70	2,165.49
Total	**49,247.41**	**2,486.91**	**1,405.16**	**870.91**	**362.46**	**1,303.64**	**1,654.15**	**2,027.30**	**3,237.09**	**7,604.26**	**18,848.29**	**9,447.25**
EXPENDITURE	-											
Establishment Expenses	29,110.73	2,208.37	1,072.71	628.91	363.89	634.30	1,377.38	1,569.88	2,628.08	4,918.44	7,596.07	6,112.70
Other Administrative Expenses	18,536.74	684.49	473.72	(120.46)	78.95	495.27	455.01	479.51	885.78	1,329.30	9,171.81	4,603.35
Prior Period Expenses	188.55	-	0.44	4.27	-	0.19	-	33.94	68.87	5.33	42.13	33.38
Depreciation (corresponding to Schedule 5)	422.49	29.65	1.92	-	9.50	16.52	39.88	38.64	14.42	151.92	99.49	20.55
Total	48,258.51	2,922.51	1,548.79	512.72	452.34	1,146.28	1,872.27	2,121.97	3,597.15	6,404.99	16,909.50	10,769.98
Transferred to / (from) Balance of Core Grants	-	-	-	-	-	-	-	-	-	-	-	-
SURPLUS / (DEFICIT)	**988.90**	**(435.60)**	**(143.63)**	**358.18**	**(89.88)**	**157.36**	**(218.12)**	**(94.67)**	**(360.06)**	**1,199.27**	**1,938.79**	**(1,322.73)**

Consolidated Receipts and Payments for the year ended 31st March 2019

Amount in ₹ *Amount in ₹*

Receipts	2018-19	2017-18	Payments	2018-19	2017-18
I. Opening Balance			**I. Expenses**		
a) Cash on hand	1,28,121	4,14,006	a) Establishment Expenses	13974,42,878	11948,57,062
b) Bank Balances			b) Administrative Expenses	7249,65,840	4759,73,980
i) In Savings/Current Accounts	14426,85,999	14340,21,094	c) Payment made to Creditors for Goods and Others	19863,25,782	20593,16,068
II. Grants Received			**II. Payments made against funds for various projects**	1721,41,958	809,97,767
a) From Government of India	10066,74,701	5926,56,047	(Name of the Fund or Project along with the particulars of payment made for each project shown in separate schedule)		
b) Grant and Other Income Received for Projects	22218,24,950	15940,06,416	**III. Investments and Deposits made Progress**	39494,72,469	32773,30,261
III. Income from Encashment of FDRs	29961,35,977	32539,79,023			
IV. Interest Received			a) Purchase of Fixed Assets	222,10,472	176,30,165
a) On Bank Deposits	1593,99,157	1807,50,800	b) Expenditure on Capital Work in Progress	612,12,890	802,25,240
b) Loans and Advances	7,44,467	157,74,295	**V. Refund of Surplus money/loans**	20,00,000	40,00,000
V. Other Income (Specify)			**VI. Finance Charges (Interest)**	10,959	-
a) Previous years Income recovered	37,25,973	2,37,729	**VII. Other Payments (Specify)**	-	-
b) Advances Received from Customers	1208,18,079	2787,01,632	a) Deposit (Assets)	144,60,978	292,51,193
d) Fees/Subscription & Direct Income	11141,21,577	9008,82,532	b) Loans and Advances	2498,81,367	1698,55,583
e) Other Income	4844,01,401	4680,30,210	c) Previous years outstanding payments	13276,94,510	9633,86,056
f) Amount Received from Debtors	20790,55,485	9830,46,500	d) Prepaid Expenses	102,32,778	46,58,696
g) Loans and Advances Recovered	306,74,733	215,99,779	e) Branch and Divisions	23288,45,186	18126,86,961
VI, Amount Borrowed			f) Deposits (Liabilities) Refunded	2067,69,448	537,33,093
Branch and Divisions	24578,87,411	18671,62,597	**VIII. Closing Balance**		
Bank Loan	-	-			
VII. Any Other Receipt (Give Details)			a) Cash on hand	99,475	1,28,121
a) Deposits (Liabilities)	1276,14,435	754,53,585	b) Bank Balances		
b) Addition to Reserve Fund	-	-	i) In Savings Accounts	17921,25,476	14426,85,999
Total	**142458,92,466**	**116667,16,245**	**Total**	**142458,92,466**	**116667,16,245**
	-	-			

AS PER OUR REPORT OF EVEN DATE
FOR AND ON BEHALF OF
M/S. UDYEN JAIN & ASSOCIATES (FRN: 116336W)
CHARTERED ACCOUNTANTS

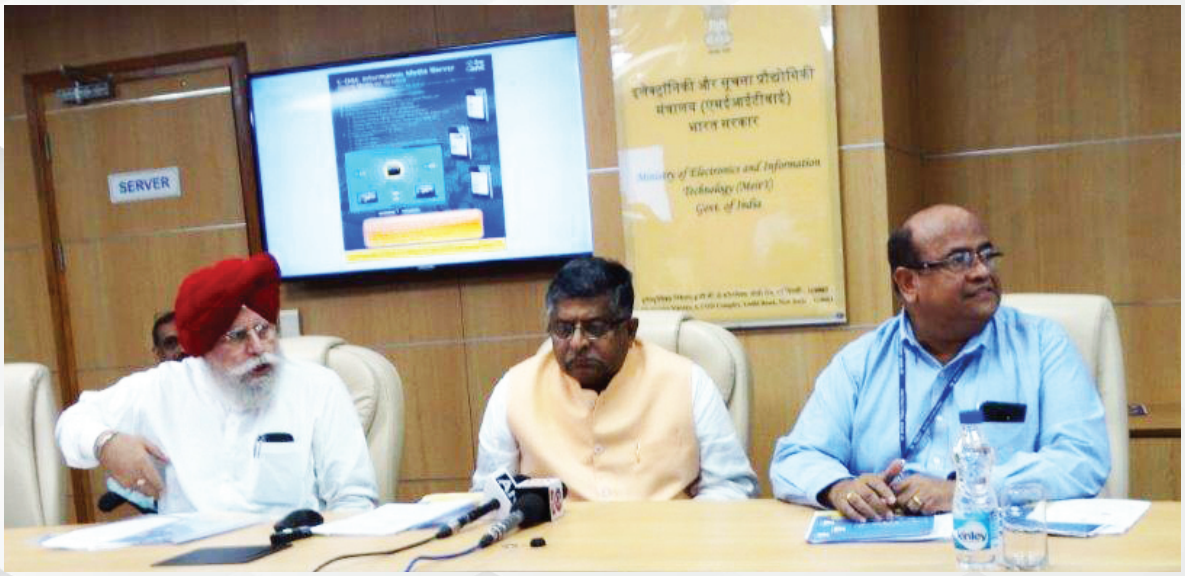
CA Raghu Bhargava
Director Finance
Pune

Sunil Misar
Registrar (I/C)

Dr. Hemant Darbari
Director General

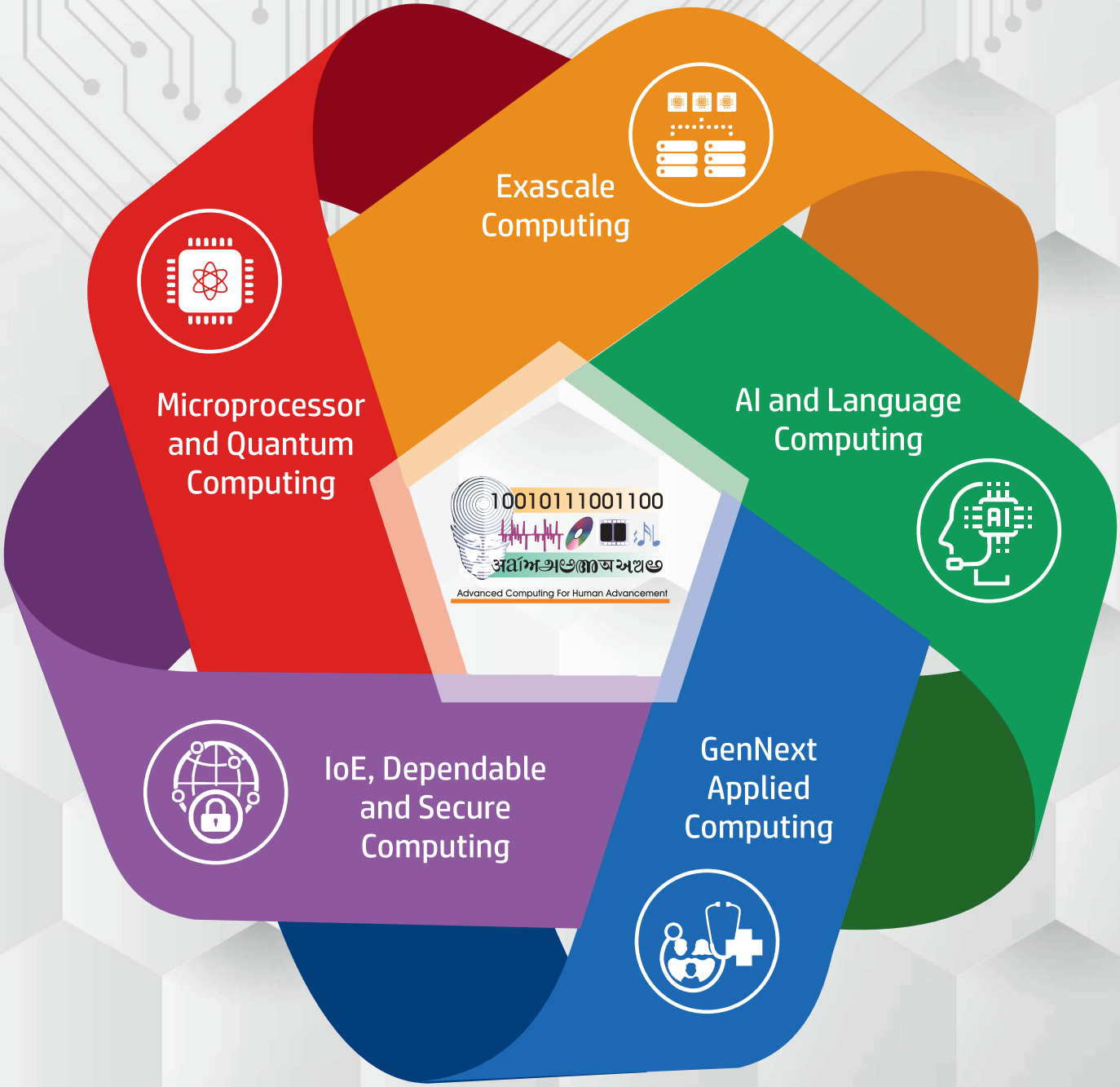
Sandeep Soni
Partner (M.No.124971)
UDIN : 19124971AAAAAN5662
Place : Pune , Date : 19-Sept-2019

1st Supercomputing System under NSM at IIT BHU – PARAM ShivaY was inaugrated by Shri Narendra Modi, Hon'ble Prime Minister on February 19, 2019



Shri Ravi Shankar Prasad, Hon'ble Minister E&IT and Shri S.S. Ahluwalia, Hon'ble Minister of State for Electronics and IT launched C-DAC Information Media Server (CIMS) for enhancing Good Governance on September 18, 2018 at Centre for e-Governance (CeG), Ministry of Electronics and IT (MeitY), New Delhi.

National Emergency Response Support System (ERSS) and the 112 App was launched by Shri Rajnath Singh, Hon'ble Home Minister for 16 States and Union territories on the February 19, 2019



Bengaluru ◈ Chennai ◈ Hyderabad ◈ Kolkata ◈ Mohali ◈ Mumbai ◈ New Delhi ◈ Noida ◈ Pune (HO) ◈ Silchar ◈ Thiruvananthapuram