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CDAC

Annual Report

2010-2011

CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTING

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Governing Council

(As on 31st March 2011)

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Ministry of Communications and Information Technology

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Indian Institute of Science, Bangalore

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Dr. U. R. Poharkar
Secretary, Governing Council, C-DAC and
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Overview

The year 2010-2011 has witnessed C-DAC strengthening its R&D competence and portfolios in line with the national and international trends, and requirements. While significant progress was seen in all the existing thematic areas, a number of new directions were also established. Major achievements and milestones achieved in each of the Thematic Areas are discussed in this report. A few select developments are outlined below.

With the addition of 200 TB of storage, the PARAM 'Yuva' system is now ready to support significant number of external users. The launch of village-level weather information accessible over the Web for villages in some states is an important step to extend the reach of high performance computing to public at large. Significant progress has also been made in planning the road map for HPC – towards Peta and Exa FLOP Computing - areas where one is expecting to see sea-change in the approach to high performance computing itself. With reference to India's initiative in the Grid Computing, significant progress has been made in moving most of the Garuda partners to India's National Knowledge Network (NKN). C-DAC has made significant R&D investment in the area of cloud computing, particularly in scientific computing aspects and in addressing the security concerns. The strong interaction between grid and cloud approaches is the current trend that will also govern future roadmap in these two areas at C-DAC.

The consortia projects in the Multilingual Computing space have helped consolidate scattered research and development efforts to build usable solutions in areas such as optical and handwritten Character Recognition, Machine Translation, etc. C-DAC has been an active partner/ leader in most of these consortia and also in evaluation of systems produced in the language technology area. In the area related to speech technology relevant to Indian languages, Hindi speech to text - Shrutlekhan Rajbhasha (श्रुतलेखन राजभाषा) and text to speech - Pravachak Rajbhasha (प्रवाचक राजभाषा) systems have been built by C-DAC. These technologies along with the machine assisted translation systems are being explored by C-DAC for speech to speech translation.

Completion of the National Mission on Power Electronics Technology (NaMPET) project has been a significant milestone, establishing power electronics as an important thrust area for C-DAC, and spawning a larger number of academic and industry collaborations. A number of technologies such as front-end converters and UPS systems have been developed and transferred to industry under this project.

Significant adoption of the Indian Linux distribution (BOSS) in the government sector and its educational variant (EduBOSS) in the education sector has been a positive step in building the Indian FOSS eco-system. C-DAC has also built strong forays into e-inclusion with projects in the area of enhancing accessibility of desktop environments for the differently-abled, specialized technology intervention for their education, etc.

C-DAC conducted a number of awareness programs on information security, for different types of target audiences across India during the year. A significantly more accurate finger print recognition engine was developed and released,

which may be of value to projects like UID and security applications. With the concerns of data piracy and forensics becoming more important, several projects have been carried out at C-DAC including malware prevention systems, USB pratirodh, cyber forensics etc.

The Ubiquitous Computing resource centre project has opened several opportunities in this area, and C-DAC is now expanding its reach to many more applications in areas of Agriculture, Health, Transportation, Green Computing, etc. Technologies such as activity based lights, interactive mirror, ubiquitous agriculture etc. are prototyped by C-DAC under the ubiquitous computing activity.

C-DAC has developed a range of products and solutions for better health care services. These include Hospital Information System (HIS), Systems and Solutions for Telemedicine and Tele-education, Decision Support Systems (DSS) for Oncology and Ayurveda, and Software Libraries for Medical Systems and Standards.

C-DAC has been playing active role in international collaboration in the area of ICT, jointly with the Ministry of External Affairs. During 2010-11, the Indo-Syria centre for IT at Damascus was launched formally, the India-Belarus Digital Learning centre in ICT at Belarus become operational and India-Seychelles centre of excellence in ICT at Mahe, and India-Tanzania centre of excellence in ICT was inaugurated.

C-DAC has completed various projects for training people of specific categories including SC/ ST, women, North-East, minorities etc. The development of Shruti Drishti, a Computer Aided Text-to-Speech and Text-to-Braille System for Visually Impaired has been completed. Digital programmable hearing aid is currently undergoing field trials with few reputed hospitals and institutions across the country. Some of the other achievements of C-DAC in Social Welfare projects are: IT based CAD Centre for Creative Design & Development by Artisans/ Weavers of Tripura, Assam and Arunachal Pradesh, Deployment of Healthcare Knowledge System in the North-East States for promoting Public Health Awareness and Education, Capacity building through IT enabled content delivery for Master Trainers under GOI Missions for Mass Literacy in West Bengal, Digital Library Project for old and heritage libraries of West Bengal.

A number of projects have commenced in the North East region, under the North East support programme. These span introduction of high technologies like HPC, enhancing local competencies such as handicrafts through use of IT, better management of natural calamities such as floods, building e-villages, etc. C-DAC is working with a number of local partner institutions in North East for these projects.

The year has also seen a number of events that C-DAC spearheaded in emerging areas, a large number of publications in the national and international fora, and a number of awards in various thematic areas.

Annual report for the year 2010-11 is an attempt to compile the accomplishments and major activities during the year.

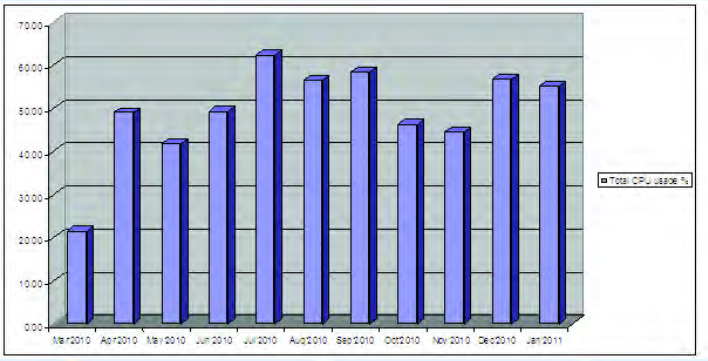
Technical Areas

High Performance Computing and Grid Computing

C-DAC's HPC programmes were focused towards creating an eco-system to derive full benefits from HPC systems to address grand challenge problems and advancing Fundamental Science, Research and Industrial competitiveness. During the year, C-DAC continued to evolve research and development work towards building infrastructure and collaboration in National Grid Computing Initiative (Garuda). It also continued its efforts towards developing and porting applications on PARAM Yuva. These include Disaster Management, Bio-informatics, Computer Aided Engineering (CAE), Computational Fluid Dynamics (CFD), etc.

PARAM Yuva

PARAM Yuva, the Supercomputing System with 54 TF/s compute power is being used extensively by the research community consisting of external and internal users. The usage statistics and a partial list of the external users is given below.



Usage of PARAM Yuva for the period Mar 2010 - Jan 2011

Name	Institution	Description
Prof. D. G. Kanhere	University of Pune	Ab Initio electronic structure investigation of novel low dimension materials
Dr. Mrinalini Deshpande	University of Pune	Theoretical study of structural, electronic and magnetic properties of Nonmaterial
Prof. S. V. Ghaisas	Department of Electronics, University of Pune	Investigation of structural and optical properties of semiconducting materials in various forms
Dr. Sachchidanand Tripathi	IIT Kanpur	Simulation of thunderstorm and to study the microphysical properties
S. Ukesh Kumar	VNIT, Nagpur	Distribution of prime and composite numbers to find the next record prime
Prof. S. R. Gadre	University of Pune	Work on linear scaling techniques for ab initio treatment of large molecules and molecular clusters.
Amit Thakur	Zeus Numerix, IIT Bombay, Mumbai	Simulation project, IGCAR
Dr. Shubha Verma	IIT- Kharagpur	Aerosol modeling project sponsored by DST
Mr. Shrikant Mantri	National Agri-Food Biotechnology Institute (NABI), Mohali	To develop similar type of wheat single nucleotide polymorphism (SNP) as that of Bread Wheat
Dr. Vaishali Shah	Interdisciplinary School of Scientific Computing, University of Pune	Ab initio investigations on nano-biomaterials and ternary alloys
Dr. Mahendra Verma	IIT Kanpur	Magneto hydrodynamics (MHD) turbulence studies of liquid metals and dynamo
Dr. Vijay Kumar	Dr. Vijay Kumar Foundation, Gurgaon	Ab initio studies of materials : Nanostructures, defects, surfaces and bulk metallic glasses
Prof. Dipankar Bhattacharya	IUCAA, Pune university campus, Pune	Understanding of how matter accretion onto a neutron star may distort its strong magnetic field, and then spread over the stellar surface.

Table 1 : Partial list of external users of PARAM Yuva

C-DAC HPC Resource Management Engine (CHReME)Weather Research Forecast (WRF) Portal

Weather Research Forecast is a well-known model in atmospheric domain and widely used in scientific research. It is designed to be a flexible, state-of-the-art atmospheric simulation system that is portable and efficient on available parallel computing platforms. C-DAC HPC Resource Management Engine (CHReME) Weather Research Forecast (WRF) Portal is an integrated solution with Weather Research and Forecasting application execution interface. It guides users through the entire cycle of execution of WRF viz WRF Pre-Processing (WPS), execution and post processing. The portal addresses the user requirements ranging from beginner level to expert level in the weather domains.

CHReME WRF portal has been successfully deployed at NCMRWF Noida, Center of Excellence in Information & Communication Technology (CoEICT), Dar-es-Salaam Institute of Technology, Tanzania and Enterprise Incubator Foundation (EIF), Republic of Armenia.

ONAMA-V2

ONAMA is an integrated software and hardware solution for Technocrats and Engineers, providing them a comprehensive package for gaining in-depth understanding of HPC. ONAMA comprises a well selected set of parallel and serial applications and tools spanning across multiple engineering disciplines.

ONAMA-V2 provides a layer of abstraction to the user by simplifying and reducing the efforts required for porting an application onto the Linux cluster. It uses TORQUE as the Resource Manager integrated with MAUI as the Cluster Scheduler for optimizing the cluster resource utilization. The Application Execution Model introduced in V2 is an intuitive GUI-based execution utility that allows the execution of the desired engineering & scientific applications either in sequential or parallel mode on Linux clusters with phenomenal ease. The Application Execution Model allows the end user to further customize the existing algorithm and execute it.

Deployment of ONAMA-V2 is in progress at Swami Ramanand Teerth Marathwada University, Nanded and Vishwakarma Institute of Technology, Pune.

Collaborative Efforts

National Agri Biotechnology Institute (NABI), Mohali

NABI is an autonomous Institute of the Department of Biotechnology, Ministry of Science and Technology, Government of India, at Mohali, Punjab. The objective of collaboration with C-DAC is the applicability of HPC to catalyze transformation in Agri-food sector for creation of a globally rewarding and sustainable Biotechnology-based enterprise. Innovative solutions in primary and secondary agriculture including high-end food processing are being targeted.

C-DAC is deploying a High End HPC system along with parallel scalable storage and is providing support for porting & parallelization of scientific application software like MPI BLAST, PCAP, SOAP Denovo, GPU-BLAST, bioCLC, ABYSS etc. HPC services also comprise computational scientists support at NABI.

Indian Institute of Tropical Metrology (IITM), Pune

Under a MoU between IITM & C-DAC, the institutes are working towards a common goal of improving Ocean-Atmosphere Climate System of Weather and Climate Forecasts, where IITM is using its domain expertise whereas C-DAC is providing expertise in High Performance Computing & Parallel Programming. C-DAC provides HPC support services in parallelization and porting of applications like Climate Data Operators (CDO) package, WRFV3 on CUDA machine, OpenMX, MM5, PyNGL and PyNIO python package, FES TIDAL Model, etc and other in-house custom codes. C-DAC is customizing code related to parameterization (moisture physics) in MM5. This will result in improvement of surface precipitation and assist in subsequent comparison with satellite observations. Software for enhancing the quality control of ARGO ocean data is also being developed.

Indian National Centre for Ocean Information Services (INCOIS), Hyderabad

INCOIS has a mission to provide the best possible ocean information and advisory services to the Society, Industry, Government and Scientific community through sustained ocean observations and constant improvement through systematic and focussed research. C-DAC has collaborated with INCOIS to provide support services and application porting/parallelization for the HPC system and the entire support infrastructure. Currently, the activity of parallelization and achievement of optimized scale-up of Tsunami-N2 code is in progress.

Vehicle Research and Development Establishment (VRDE) Ahmednagar

C-DAC has provided technical consultancy to VRDE for setting up a state-of-the-art Integrated Simulation Lab to facilitate development of Futuristic Infantry Combat Vehicle (FICV) along with the rigorous practice of system engineering of their virtual prototype. A critical component of the facility is the HPC cluster and the Virtual Reality Centre, where test runs can be conducted and the real life case scenarios can be simulated. Additionally, guidelines for Disaster Recovery and associated data center have been provided.

National Thermal Power Corporation (NTPC), Greater Noida

C-DAC has partnered with NTPC to provide HPC solutions for the NTPC Energy Technology Research Alliance (NETRA) program. These HPC solutions are cost-effective, optimal and facilitate ongoing research on Climate Change, Waste Management and New & Renewable Energy sources. Various parameters such as job size, job complexity, number of concurrent users, scalability of CFD software, performance of the system, cost-effective analysis w.r.t software and hardware, etc. were evolved during the consultancy to arrive at the most appropriate solutions.

National Atmospheric Research Laboratory, Gadanki

NARL, one of the premier atmospheric research organizations in the country, has established a HPC facility along with supporting infrastructure in collaboration with C-DAC. This facility will be used in real time environments for weather forecasting and simulation for the Department of Space, Govt of India.

Bharathiar University, Coimbatore and Department of Chemistry, University of Pune

HPC facilities have been established by C-DAC to cater to the specific Departments/ Projects required at the University/ Departments.

Enterprise Incubator Foundation (EIF), Republic of Armenia

EIF, Armenia collaborated with C-DAC with a vision of developing effective information and communication technology infrastructure to enhance technological advancement and thereby transition to knowledge economy. C-DAC is establishing a PARAM based HPC System at EIF which will be used for Scientific Research and Parallel programming in the area of Bioinformatics, Computational Fluid Dynamics and Finite Element Analysis. PARAMNet-3 SAN was deployed as part of C-DAC's HPC solution to Armenia.

National Botanical Research Institute (NBRI), Lucknow

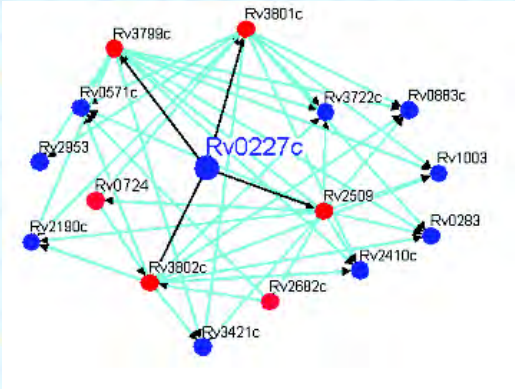
The MoU between NBRI and C-DAC caters to the HPC enabled application needs of NBRI where development of innovative production technologies for new plant sources of commercial importance is an important activity. C-DAC is providing a HPC facility along with associated data center. C-DAC HPC services include porting and parallelization of Scientific applications like MPIBlast, PCAP, ClusterW-MPI, MrBays, Glimmer etc.

HPC Applications

Comparative genomics of mycobacterium

Comparative genomics of 21-mycobacterial genomes with a focus on genes involved in biosynthesis of cell envelope components was carried out using metabolic pathway context and sequence similarity tools. Functionally linked genes were also predicted using phylogenetic profiling. The results provide an insight into survival of these species in varied

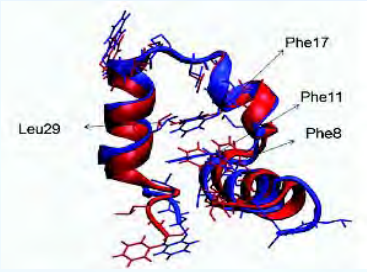
environments. Gene-specific motifs like 'DLLAQPTPAW' of ufaA1 gene, novel functional linkages such as involvement of Rv0227c in mycolate biosynthesis; Rv2613c in LAM biosynthesis and Rv1209 in arabinogalactan peptidoglycan biosynthesis; loss of functionality due to frame-shifts (eg. upgB in MTbCDC), missing signal sequences (eg. lprJ in MboAF) and domain truncation (upgB in MBoTokyo and MBoBCG) and variations in functional annotations (eg. lprJ in MTbCDC) were detected in this study. These predictions correlate well with the available mutant and coexpression data. It also helped to arrive at a minimal functional gene set for these biosynthetic pathways that complements findings using TraSH. The manuscript detailing the above work has been published in PloS One 2011.



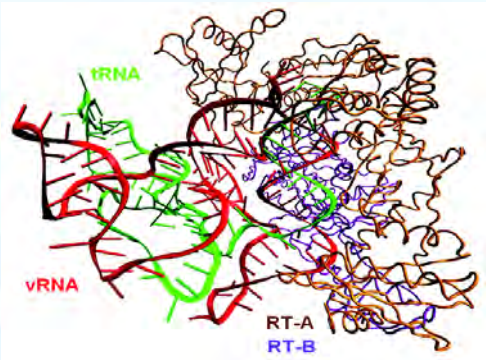
Functional linkages of hypothetical protein Rv0227c with genes involved in mycolate biosynthesis

Protein Folding Simulations

Protein folding can be defined as the understanding of how a newly synthesized polypeptide is able to fold to its native structure passing through various phases. The most optimum path through these phases is what defines the protein folding pathway. Mimicking this activity in-silico, requires a large amount of computational power and time even for folding proteins. Hence advanced molecular simulation techniques play an important role. Villin and EnHD protein have been studied using REMD for few tens of microseconds on PARAM Yuva and Biogene which has helped to capture various folding events. The work has been published in reputed international journals. Various other fast folding proteins are under the study using advanced methods like Replica Exchange Molecular Dynamics, CGMD or the mixture of CGMD and REMD. The long simulations of fast folding proteins in the microseconds time scale are being carried out at C-DAC.



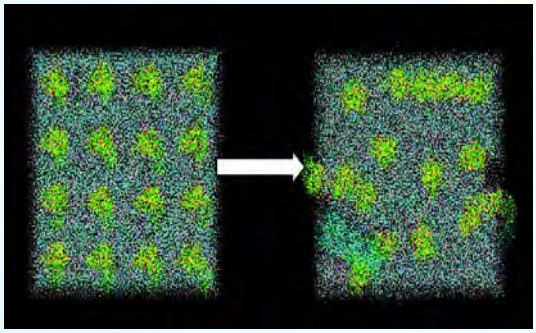
Protein Folding Simulations



Structure of Antisense Molecule

Coarse Grained Molecular Dynamics (CGMD) simulations

CGMD is an advanced technique in which large bio-molecular systems consisting of a few million atoms can be simulated through reduced representations like United Atom or Bead models and simulation time in terms of micro-seconds can be achieved conveniently. The study on the folding events of Engrailed Homeodomain has also been performed using CGMD. A similar approach has also been applied to represent and simulate the GPCR protein â2 Adrenergic Receptor, embedded in a lipid bilayer, the system size of which exceeds one lakh atoms.



Folding events of Engrailed Homeodomain

BBSRC project

Genome and functional annotation of 5 Salmonella serovars Typhimurium, Choleraesuis, Dublin and Gallinarum strains of defined virulence in each of three food-producing animal hosts known to infect farm animals and human was carried out. Genome annotation was carried out using an in-house developed pipeline viz., GENOPIPE which includes a uniform protocol for annotation of closely related organisms thereby removing discrepancies due to use of varying protocols. It includes delineation of training data set for gene prediction, gene prediction using the de-novo HMM models via GLIMMER, prediction of tRNAs by tRNASCAN-SE, identification of orthologs/paralogs using the bi-directional best-hit strategy, multiple sequence alignment of orthologs using MPI version ClustalW, detection of Single Nucleotide Polymorphisms (SNPs) / insertion deletions (indels), demarcation of unique protein sequences (with reference to the given genomes), and functional annotation using similarity search against UniProt-KB. Genome sequences have been deposited in GenBank and are available online (Accession ID: CP002487-CP002490, CM001062-CM001063, CM001151-CM001152, CM001153-CM001154). The work has been published in Journal of Bacteriology.

Collaboration with University of Surrey

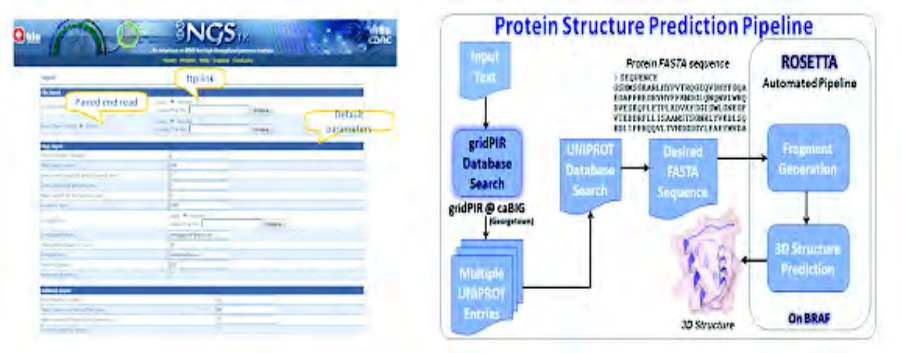
Objective of this work was to annotate M. leprae TN in the context of metabolic pathways for the construction of a genome scale metabolite network model. Genes included in GSMN-TB were obtained and their orthologs from M. leprae TN were mapped along with their metabolic pathway information. The metabolic pathways reconstructed in-house using Pathway Tools version 14.0 were used to fill the missing links in GSMN- TB. Comparison of the metabolic pathways of both M. leprae and M. tuberculosis H37Rv revealed the non-functionality of many redundant pathways in M. leprae. Orphan reactions whose removal makes network non-feasible were retained. A model was constructed of M. leprae replication in the host cells by mapping M. leprae genes onto GSMN-TB model, inactivating one reaction at a time encoded by genes, which appear to have non-functional M. leprae counterparts. Once an inactivated reaction was found to be essential a transport gate was added for the product of that pathway.

caBIG (Cancer Biomedical Informatics Grid, NIH, USA)

The BRAF caBIG® collaboration seeks to promote the exchange of information, knowledge, and know-how towards forging a concerted effort by bringing together research community. It will create a large consortium of determined individuals, groups, and organizations for finding an answer for Cancer.

C-DAC in collaboration with caBIG has developed a grid-enabled web-based automated pipeline, ProtStruct, for ab initio prediction of protein structures with an emphasis on cancer related proteins. ProtStruct has been deployed on the

Bioinformatics Resources & Applications Facility (BRAF) hosted at C-DAC, Pune. The upstream component of the pipeline retrieves a protein sequence (according to user input) from the gridPIR service of caBIG. The retrieved sequence is then fed to the prediction pipeline. At its core ProtStruct uses the ROSETTA prediction algorithm for determining the 3D structures. The graphical user interface of the pipeline enables the user to choose various control parameters like which secondary structure prediction algorithms to use, number of iterations, number of output structures, uploading NMR constraint files etc. Once submitted, the jobs get distributed over multiple processors on BRAF, which highly reduces the prediction time. The resultant output comes in the form of predicted structures in PDB format and parsed energy log files which can be downloaded by the user. All the file transfers are secured over the network by SFTP. JMol has been integrated within the pipeline to provide a visual inspection of the predicted models. This pipeline provides a hassle-free high throughput structure prediction platform. Java has been used for coding the entire pipeline with Struts, AJAX and Hibernate framework. The upstream gridPIR searching module parses XML results using SAX parser; the GUI has been built using JSP.

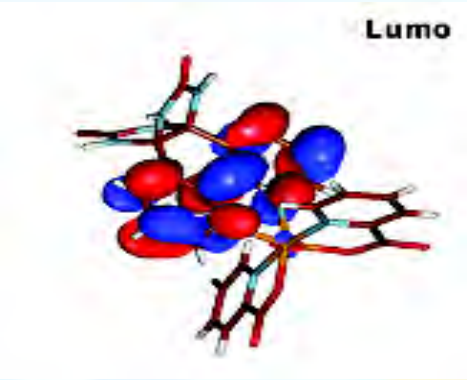


Pipeline for NGS Genome Assembly

A pipeline for NGS genome assembly and analysis viz., NGSTK has been developed such that the raw reads (from Illumina or SOLiD) are mapped on to reference genome by MAQ. Downstream analysis for detection of SNPs, indels and consensus sequence calling is carried out using SAMtools. The jobs get distributed over available multiple processors on Biogene. Since a parallel execution strategy for this pipeline has been implemented, the time for read alignment has reduced significantly.

Modelling of Anti-Cancer Metal Complexes

This work is being carried out in collaboration with University of Pune. Various metal complexes are of great interest and they pose to be potential drugs for the treatment of cancer. These complexes bind to DNA through various modes like intercalation or groove binding. Molecular modeling and quantum studies have been performed to understand their way of binding and stability. Various metal complexes of cobalt, ruthenium and copper have been studied. Such modelling studies would give structural insight in the design of anti-cancer drugs. The work has been published in reputed international journals.



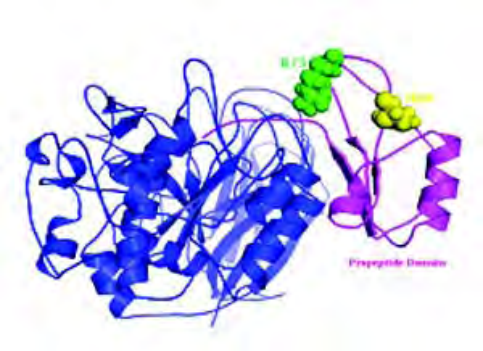
Structural design of anti-cancer drugs

Work on GPCR proteins with IIT Madras

A collaborative project between C-DAC and Indian Institute of Technology (IIT) Madras was initiated in February 2009. The main idea of this collaboration was to provide computational support to the experimental work carried out at IIT, Madras. The research group at IIT, working on a human G Protein Coupled Receptor (GPCR) protein called OA1 (Ocular Albinism type 1 protein), looks to have an insight into the structural aspects and activation mechanism of the protein which can be helpful in explaining their experimental findings. Since obtaining a crystal structure of OA1 is very difficult, as it is an intracellular GPCR, C-DAC planned to predict its structure in order to have a structural insight into its mechanism of action. To elucidate these phenomena in-silico, initially homology modeling was used to predict the structure of OA1 after exhaustive primary and secondary structure analysis. Following this, a docking study was performed with an endogenous ligand of OA1, L-DOPA and an antagonist dopamine, using the Schrödinger software suite. The predicted apo-OA1 structure and those along with the ligands (a total of 3 systems) were then subjected to MD simulations in order to get an insight into the activation mechanism of OA1. All the 3 systems were simulated for 15 ns each after inserting the protein into POPC bilayer and solvating with SPC water, using GROMACS on the PARAM-Yuva machine.

Work on Furin complexes with OHSU, USA

A collaborative project between C-DAC Bioinformatics group and Oregon Health & Science University (OHSU) was initiated in December 2009. The main idea of this collaboration was to provide computational support to the experimental work carried out at OHSU. The research group at OHSU, working on a couple of serine proteases called Furin and PC1 and their mutants, has shown through experimental studies that the propeptide domain of Furin acts as a pH sensor, by exhibiting higher fluctuations at pH6 as compared to normal pH conditions, whereas PC1 does not. To elucidate this phenomenon in-silico, a set of ten MD simulations were performed for 10 nanoseconds using NAMD on Biogene cluster at C-DAC. The simulation results have shown the same enhanced fluctuation of Furin at pH6 which is in line with the experimental data. However, experimental studies have shown that PC1 gains this activity if its propeptide domain is replaced with that of Furin, in other words, the pH sensor property of Furin can be transferred to PC1 through protein engineering. This transfer of pH dependent activity was also demonstrated by simulating Furin-PC1 complexes, at two different pH conditions and the results seem to agree quite well and thus augment the experimental works performed at OHSU.



Simulation of Propeptide Domain

Anvaya: Workflow for Computational Genome Analysis

Anvaya, which literally means 'logical connectivity', is a workflow application, capable of executing complex computational genome analysis, by making optimal utilisation of the computing environment. It is a high-throughput genome analysis workflow environment, consisting of bioinformatics tools loosely tied together in a co-ordinated system, along with 'Rules Engine' to define logical connectivity. Anvaya is a stand-alone client-server workflow environment that brings frequently used analysis pipelines to user's desktop. Real-time status monitoring, the ability to re-enter the workflow and reconfigure strategies and ability to exploit a parallel environment allowing users to run multiple genomes at one go, increases the research productivity. Pre-defined workflows aid researchers to address questions pertaining to understanding host-specificity to infer the gene-set involved in pathogenicity. Anvaya thereby offers an entire solu-

tion for comparative genomic analysis, which is known to play a vital role in identifying targets for drug development to combat numerous emerging and re-emerging diseases that are posing threat to human and livestock.

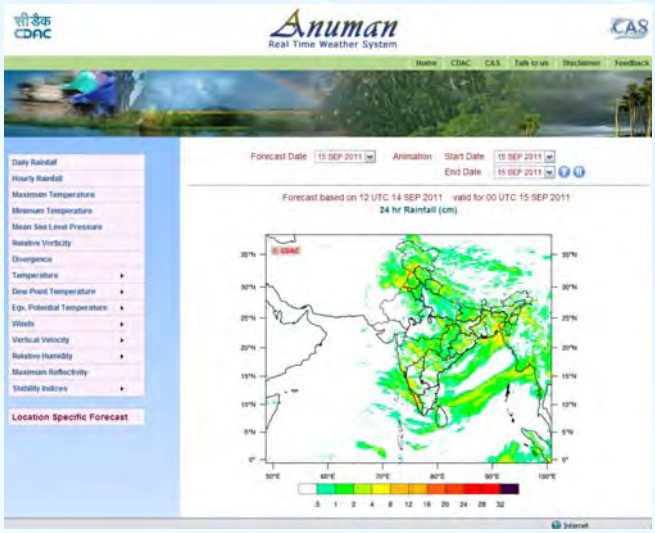
Anvaya

bioUtils portal

During “Accelerating Biology” Symposium, C-DAC released a portal named “bioUTILS”. bioUTILS provides an interface over BRAF to custom tools and parsers developed in-house. The custom tools serve as a wrapper around one or more standard tools, or are tools with new functionality not available in standard tools and used routinely in Bioinformatics analysis. Custom parsers help to automate data-flow between several standard tools that hitherto, required manual intervention.

Real Time Weather forecasting System (RTWS) : Anuman

Real Time weather forecasting is important for weather scientists, operational meteorologists for aviation or transport industry as well as decision makers. C-DAC has developed an automated workflow for real time weather simulations: “Anuman”. The tool provides high-resolution weather simulations and weather forecast products useful as a decision support for various user communities. The product can be accessed through: http://rtws.C-DAC.in/



Anuman

Real Time Weather Forecast

This service provides 72 hour weather forecast information at block level for over 31,000 stations spread across six states (Assam, Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra and Tamil Nadu). Weather parameters covered areSky condition, Temperature (Max & Min), Relative Humidity, Wind speed, Wind direction and Chance of rainfall (%). Farmers, agricultural research and extension professionals and others interested in weather information could benefit from this initiative. This is available through the India Development Gateway portal InDG.

Validation of location specific forecast

Developed the forecast verification environment to evaluate the capabilities and limitations of the weather forecast system. The forecast validation is done for the weather parameters such as Maximum and Minimum Temperature, Wind speed, Pressure and Rainfall at the 200 synoptic locations of IMD covering whole India with the observations. The forecast verification method include both measure-oriented methods like Mean-Bias or Mean-Error (ME), Root-Mean-Square-Error (RMSE) , Pearson's correlation coefficient (CC) and standard deviation and distribution- oriented methods like bias score (BIAS), false alarm ratio (FAR), probability of detection (POD), and true skill score (TS).

Data Assimilation in Real Time Weather forecasting System

Near real time assimilation experiments to check the impact of additional observational data on mesoscale model forecast with Four Dimensional Data Assimilation (FDDA) and Variational Assimilation techniques. Conventional Automatic weather stations Buoy & Radiosonde Observations and satellite observation like Ocean sat-2 and MODIS temperature and humidity profile observations has been assimilated in WRF-ARW model successfully.

Seasonal forecast

Extended range prediction of Indian summer monsoon (ISM) using a high resolution National Center for Environmental Prediction (NCEP) T170/L42 global model using ensemble members is operational from the year 2005 onwards. The seasonal monsoon forecast of the year 2010 is shared with Indian Meteorological Department as a part of India's official monsoon forecast.

NCEP T170L42 model based Experimental Seasonal Monsoon Prediction at CDAC for the year 2010

(Based on 10 member ensemble of initial conditions from 1st May to 10th May 2010)

Rainfall (mm/day)	June	July	August	September	JJAS
Ens1	6.37	7.53	7.43	5.35	6.68
Ens2	4.89	7.73	7.1	6.92	6.67
Ens3	6.89	8.89	8.09	5.49	7.36
Ens4	5.93	8.46	5.98	5.11	6.38
Ens5	6.86	8.46	7.9	6.94	7.55
Ens6	6.98	8.24	8.11	6.63	7.5
Ens7	8.84	7.66	6.88	6.67	7.51
Ens8	5.6	7.93	8.01	6.33	6.99
Ens9	8.57	9.03	7.56	4.65	7.47
Ens10	9.39	8.43	7.45	5.96	7.81
EnsMean (5 member)	6.19 (4.2 %)	8.21 (5.7 %)	7.3 (11.9 %)	5.96 (9.3 %)	6.93 (7.8 %)
EnsMean (10 member)	7.03 (18.4 %)	8.24 (6 %)	7.45 (14.2 %)	6.01 (10.3 %)	7.19 (11.8 %)
Model Climatology	5.94	7.77	6.52	5.45	6.43

seasonal monsoon forecast of the year 2010

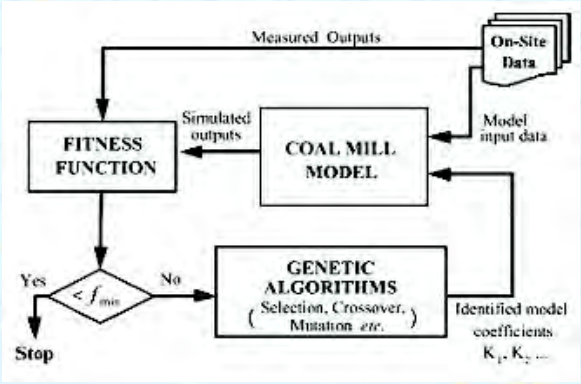
Hybrid GA-SVM & ACO-SVM for simultaneous feature extraction and classification for process engineering & Chemo & Bioinformatics Applications

Parallel Version of the Ant Colony Optimization (ACO) algorithm was developed. This study implements parallelization of Ant-Miner for classification rules discovery. Ant-Miner code is parallelized and optimized in a cluster environment by employing master-slave model. The parallelization is achieved in two different operations of Ant-Miner viz. discretization of continuous attributes and rule construction by ants. For rule mining operation, ants are equally distributed into groups and sent across the different cluster nodes. The performance study of Parallel Ant-Miner (PAM) employs different publicly available datasets. The results indicate remarkable improvement in computational time without compromising on the classification accuracy and quality of discovered rules. Dermatology data having 33 features and musk data

having 168 features were taken to study performance with respect to timings. Speedup almost equivalent to ideal speedup was obtained on 8 CPUs with increase in number of features and number of ants.

Coal Mill Model using Evolutionary Computation Techniques

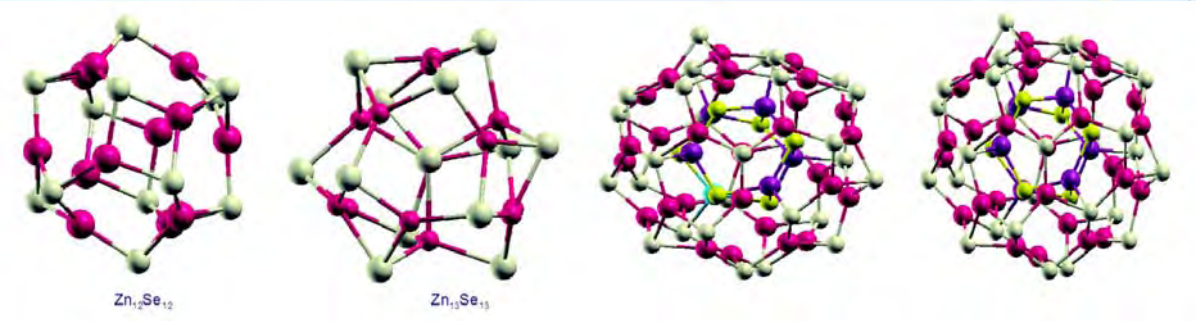
This project involves a model for a Coal Mill in a Thermal Power Plant using Evolutionary Computation Technique. It mainly consists of four parts: a) Genetic Algorithms, b) Mathematical Model of Coal Mill, c) Online data set and d) Fitness Function. Genetic Algorithms based working model for single segment coal mill system is implemented in Java and C language and delivered successfully. Troubleshooting and fine tuning of the overall coal mill model is done and tested for the field data.



Schematic diagram of identification of model parameters

ZincSelenide quantum dots simulations

The aim is to study the optical and magnetic properties of Zinc Selenide (ZnSe) clusters from the first principle calculations. Optimization of the bare and passivated geometries of (ZnSe)n (n=1,34) and calculation of its optical absorption spectra has been done. The calculation of the optical properties of large sized ZnSe clusters and comparison with experiments has been completed. Magnetic properties of Mn doped ZnSe clusters are being studied. The research work has applications in blue LED and biological cell imaging for detecting cancerous/non-cancerous tissues. The computational complexity of the algorithms is $O(n^3)$, where n is the number of electrons in cluster.



a) Stoichiometric undoped (ZnSe)n n=12, 13. b) One Mn doped (ZnSe)34: Mn substitutes inner Zn site

Simulations using Stochastic Simulation Algorithm (SSA)

We have implemented SSA to simulate the dynamics of single file diffusion of point particles in one dimension confined to a box. The mean square displacement and the probability distribution of the position of the tagged particle at different times were calculated from the time series generated by simulations. This was undertaken as prelude to study actin based cell motility.

Dynamics of lattice polymers

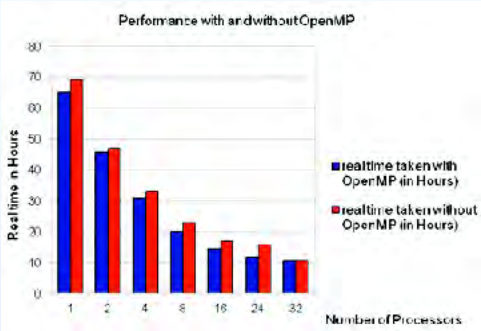
We have implemented the dynamics of the self-avoiding walk (SAW) as well as bond fluctuation model (BFM) on a square and cubic lattice in two and three dimensions respectively for a homopolymer. Several compact structures,

classified by the number of non-bonding contacts with the neighboring sites were obtained for a polymer of a given length. This model is useful to study coil to globule transition in polymers. Using this implementation, one can calculate the free energy for this model with WLA (with BARC, Mumbai).

Parallelization of coupled cluster codes

Two types of coupled cluster codes were parallelized, namely, non-relativistic CC code and relativistic CC code in collaboration with NCL, Pune and IIAP, Bangalore.

The benchmarking of these codes on Xeon Cluster using different compilers (gcc and intel) have been performed. The benchmarking of both the CC codes on PARAM Yuva also has been done. Interaction with Center for Material Science and Technology has been initiated and we are looking forward to study different properties of ZnS nanoclusters.

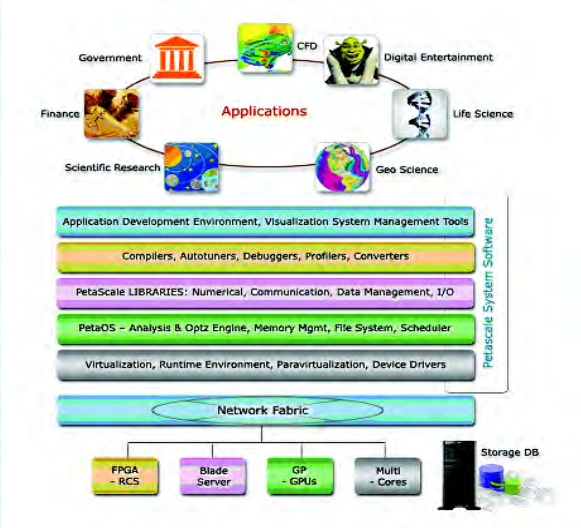


Performance of the Coupled Cluster Code

Petascale Computing & Exascale Computing software development

This is part of the major Petascale computing initiative of C-DAC for which a proposal is under active consideration of DIT.

The objective of this project is to address Petascale Computing System Software challenges. The Petascale software may require a complete redesign of applications, libraries, and algorithms to reach the level of parallelism needed to fully utilize the hardware capabilities.



Petascale Architecture and System Software Stack

Power Optimization of High Performance Computing Systems and Facilities

This inter-center project will be done across Pune, Thiruvananthapuram, Bengaluru and Chennai centers of C-DAC. This project aims at investigating technologies for optimizing power utilization and increasing data-center efficiency and

consists of the following four components:

a. Power equipment for HPC systems and facilities.
b. Energy conservation in supercomputing facilities through optimized cooling, lighting and power monitoring of the nodes of HPC systems.
c. Self-managing system software for HPC systems and facilities.
d. Power-aware scheduling for HPC systems.

The outcome of this project will be technologies and directions for future HPC facilities.

Reconfigurable Computing Systems (RCS-IV)

Keeping in mind the latest paradigm in space saving servers having 1U sizes, a small form factor RC card was designed. Testing and deployment of a low-profile RC-IV card successfully completed. It is a small form factor, high performance Reconfigurable Computing based hardware accelerator for speeding-up applications. This compact RC based solution is deployed in 16 nodes (1U size) of a 1TF cluster. This unique supercomputing environment saves power and space; it works under MPI & VARADA™ system software designed by C-DAC. Based on the configuration and application, RC enabled node delivers performance comparable to hundreds of CPU cores.

Garuda Grid Project

Total registered Garuda users at present are 319 and total host organizations are 61. Specific achievements in this current, operational phase of Garuda are given below.

In order to increase the users and various domains, a number of groups and virtual communities are formed in different application domains such as Atmospheric Sciences, Material Sciences, Bioinformatics, etc. To facilitate these teams with the specific needs of tools on Grid, Virtual Organization Memberships (VOMs) were deployed on the Grid.

In continuation of the previous Indian Grid Certification Authority (IGCA) certifications, we have issued a total of 344 certificates.

Integration of Garuda Grid with Cloud

The basic objective is to harness the computational storage and network resources of Garuda, National Grid computing initiative to offer Cloud services, without interrupting the existing grid environment activities. The resources when idle in Grid environment will be utilized for offering Cloud services and idle resources offering Cloud services will be utilized for grid computing.

This mapping between the Grid computing environment and Cloud services will lead to an efficient offering of Cloud services and Grid environment and will indirectly lead to Green IT and better ROI for grid service providers.

Private cloud environment is established with open source tools in C-DAC and value added components are developed, customized and integrated in to the cloud. Grid environment is established using open source tools similar to that of Garuda. Development of Prototype for the cloud grid integration is ongoing.

Collaborative Class Room under Garuda

A collaborative learning management application has been developed especially for grid environment with the following features.

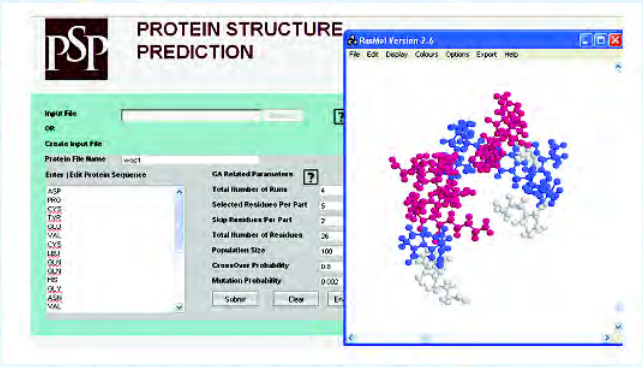
- Real time Audio / Video based Virtual Class Room (Web / Multicast)
- Real time Audio / Video based Group Discussion (Web)
- Federated Identity Management for single sign on across various CCR deployments
- Interoperable Assessment Engine
- Course Delivery
- The application is accessible on http://180.149.48.114/ccr

Collaborative e-Learning Services

Garuda Grid Middleware and tools stack version1.2

Garuda Grid Middleware and tool stack consists of Grid Meta-scheduler, Security Infrastructure, Information System, Data Management, Job Execution, Accounting and Monitoring, Garuda Access Portal (GAP); GSRM, PSE for PSP; AGSG etc. Some of the major components are briefly explained below:

- **GARUDA Storage Resource Manager (GSRM):** GARUDA Storage Resource Manager is a peer to peer data grid solution for SOA based GARUDA. It is an interoperable and optimal data management solution. GSRM adheres to OGF standards.
- **Problem Solving Environment (PSE) for Protein Structure Prediction:** Protein Structure Prediction (PSP) is one of the most challenging tasks of computational structural biology & chemistry. PSP is expressed as the prediction of protein tertiary structure from primary structure. PSP application uses Genetic Algorithms (GA) for structure prediction. PSP is accelerated by performing distributed jobs on Garuda resources.
- **Automatic Grid Service Generator:** Automatic Grid Service Generator (AGSG) is a tool to generate grid services from given application. Grid Services are Web Services with improved characteristics & services and adheres to the Open Grid Services Infrastructure (OGSI) specification.
- **GARUDA Access Portal:** GARUDA Access Portal provides a web interface for submitting jobs to Grid GARUDA and for monitoring those jobs. It also supports viewing the resources available in the grid environment.
- **GARUDA Grid Monitoring Tool,Paryavekshanam:** Paryavekshanam is a web-based, automated, 24 x 7 monitoring tool deployed in GARUDA Grid to increase the reliability, usability and manageability.



PSE for Protein Structure Prediction

KEPLER Workflow on GARUDA

Kepler is a software application for analyzing and modelling scientific data. Using Kepler's graphical interface and components, scientists with little background in computer science can create executable models, called "scientific workflows," for flexibly accessing scientific data and executing complex analyses on this data.

Open Source Dug Discovery

Open Source Drug Discovery (OSDD) is a CSIR-led global initiative funded by Govt of India. The OSDD method tries to collaboratively aggregate the biological and genetic information available to scientists for use to hasten the discovery of drugs for tropical infectious diseases like malaria, tuberculosis, leishmaniasis, etc. GARUDA grid provides an unprec-

edented e-Infrastructure for OSDD applications. State-of-the-art HPC clusters are provided to run drug discovery problems with NKN connectivity to select OSDD centers.

Development of Analytical tools for large scientific knowledgebase in Grid computing environment

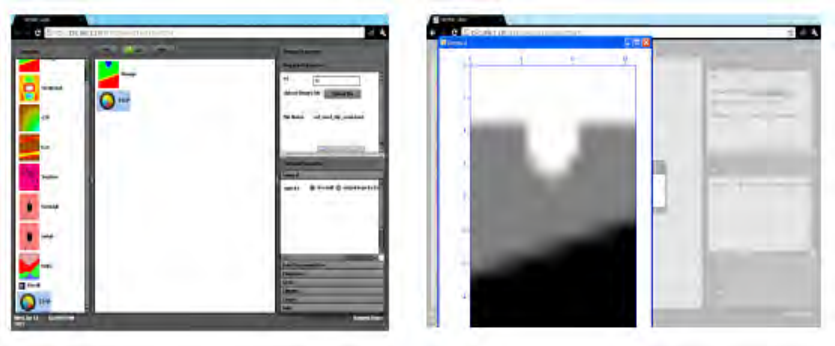
This project is funded by DIT. C-DAC has developed Ancient Indian Scientific Knowledgebase with browse andsearch features online. Pandulipi Samshodhaka Manuscript Editor is developed to preserve and process manuscript, supporting both ISCII and Unicode data support. Analytical tools such as Noun & Verb analysis and generation, Euphonic combinations, Veda vikruties and Syntactic analysis modules have been developed.

Design and Development of Security Assessment System for Grid Environments

The objective of this project is to design and develop a security assessment system for grid environment. To be aware of the threats and vulnerabilities in the GARUDA institutes, the team is pursuing research with respect to grid security and vulnerability assessment. A solution called SAS is being developed in an incremental way, and pilot deployments are being carried out.

Seismic Applications under Garuda Project

Seismic Applications under Grid Garuda project includes a portal “SeismicUnix” for generating and executing work-flow using seismic unix commands and SeismicTomographic Inversion “Seistom” application.Status- A portal SeismicUnix is under development.



Seismic Unix Portal

Taxogrid Product

TaxoGrid is a unique ‘first-of-its-kind’ phylogeny pipeline over a grid. The pipeline performs the steps of database searching for identification of orthologous genes, multiple sequence alignment of the orthologus genes and reconstruction of phylogenetic trees using parsimony and maximum likelihood methods. Simultaneous execution of the pipeline incorporating data-parallelism and MPI-based binformatics tools ensures high speed up hitherto, a magnanimous task owing to its serial nature. TaxoGrid is built over grid environment, which uses globus as
grid middleware based on ‘Service Oriented Architecture’, along with gridway metasheduler for job management. The phylogeny pipeline is implemented as a web-service over grid thereby providing ease of availability and reusability. A web-portal has been developed using flex technology, which provides an easy-to-use interface and hides the complexities associated with grid systems from the users.

Taxogrid

Other Applications

As part of Grid GARUDA project we have also initiated projects with other agencies such as:

- Middleware for Online Remote Visualization of Weather Applications with IISc, Bangalore
- Grid-enabled aerosol modelling system for climate change studies with IIT, Bombay
- End Point Security for Grid Garuda
- We are also working on EU-India grid for interoperability. EU-India grid acts as bridge across European and Indian e-infrastructures to foster evolution in these regions and to ensure sustainable scientific, educational and technological collaboration.

Cloud Computing

C-DAC has initiated a number of R&D activities in the fast emerging area of cloud computing.

- Scientific Cloud computing Research for HPC Applicationsincluding System Software & Middleware Architecture for Scientific Cloud, Large Data Transactions Handling capability on Cloud, Virtualizations, Licensing Issues, etc.
- Cloud middleware and system software development for Scientific computing.
- Investigate Storage infrastructure for Scientific Cloud: Large Data Transactions Handling capability on Cloud
- Investigate Security issues, Security Standards and Security solutions for Scientific Cloud.
- Scientific Applications such as Turbomole, CCSD, Phylogeny Service as SaaS on Cloud Computing Platform

India Microprocessor Development

C-DAC was entrusted with a major National Initiative on Feasibility Study for development of India Microprocessor by DIT, GoI. C-DAC was asked to prepare a Feasibility study report for development of India Microprocessor with an identified Study team and well known experts in areas of Microprocessor design. The Feasibility Study report covering present status at National and international level, the architecture issues, possible features for the design, architecture models, operational models etc. has been submitted to the Ministry.

Multilingual Computing

Speech Technologies

Speech-based Access for Agricultural Commodity Prices in Six Indian Languages (ASR Consortium project)

The objective is to implement and deploy a speech based system using which any user can get prices of agricultural commodities by speaking over telephone/mobile. Such systems would provide excellent value-addition to the already existing website http://www.agmarknet.nic.in/ managed by the Ministry of Agriculture, since no computer, reading or writing skills are required for the proposed system. One possibility is to deploy such systems in Kisan call centres as an aid or assistant to human agents. In all, six systems will be built, one for each language. The languages covered are Bengali, Hindi, Assamese, Marathi, Tamil, and Telugu.

Universal Speech Translation Advanced Research (USTAR)

The Universal Speech Translation Advanced Research Consortium is an international collaboration research group established with the goal of developing a universal network-based speech-to-speech translation system. Currently, there are 14 countries, covering 15 different languages (including English) in the group. The collaborative research is oriented to perform real-time, location-free, multi-party communication between speakers of different languages.

As part of this research group, C-DAC is developing Automatic Speech Recognition, Statistical Machine Translation and Speech Synthesis systems for Hindi language. The baseline systems have been integrated in the overall system and modules are being tuned for working demo during Olympics 2012.

Text To Speech Systems for Indian Languages (TTS-IL)

Text To Speech Systems for Indian Languages (TTS-IL) is a consortium based project sponsored by the Department of Information Technology, MC&IT, Government of India starting from April 2009 to December 2011. Primary goal of this project is to develop TTS systems for Indian languages (in the first phase for Hindi, Bengali, Marathi, Telugu, Tamil and Malayalam) using open source Festival Speech Synthesis engine. This is headed by IIT Madras and other members of this consortium are C-DAC, IIIT Hyderabad, IIT Kharagpur and STQC DIT.

Syllable based unit selection technique adopted by the consortium,gives more natural speech compared to the existing TTSes in Indian languages till date.
TTS systems in these 6 Indian languages have been developed and integrated with NVDA and ORCA screen readers. Training programs for the Visually Challenged persons in the vernacular using NVDA and ORCA at different sites across India are now being conducted.

Testing and evaluation of the system is being carried out by C-DAC and STQC jointly. GIST QA has evolved the initial draft of testing strategy, benchmarking and evaluation strategy for text to speech system.Test data was collected from the web and text books for all six languages supported by TTS.

Text To Speech for Mobile

Our main focus is to develop speech synthesis for all 22 Indian languages on the handheld and mobile platform. Speech synthesis has long been a vital assistive technology tool for people with visual impairments or reading disabilities to listen written text on a personal computer.

The current approach uses Tri-phone as a large unit instead of Diphone to reduce concatenation cost. New algorithm selects units based on their concatenation weight so that automatic transitions between units are available for better smoothing. This is more natural and highly intelligible with reduced engine size. However, database and rule file sizes are increased. Other work includes:

- Study of Fujisaki Model for Declarative intonation and simulating it for declarative and interrogative sentences.
- Implementation of pitch modification algorithm
- Implementation of automatic pitch detection
- Implementation of automatic calculation of accent and phrase command for generating F0 contour.
- Implementation of TD-PSOLA for Pitch and Duration modification
- Implementation of Phase Vocoder for time scaling without pitch calculation.
- Pattern Elimination or Repetition :Time Domain

An enhanced tool for corpus generation has also been built.

Text to Speech on Handheld and Mobile Platform

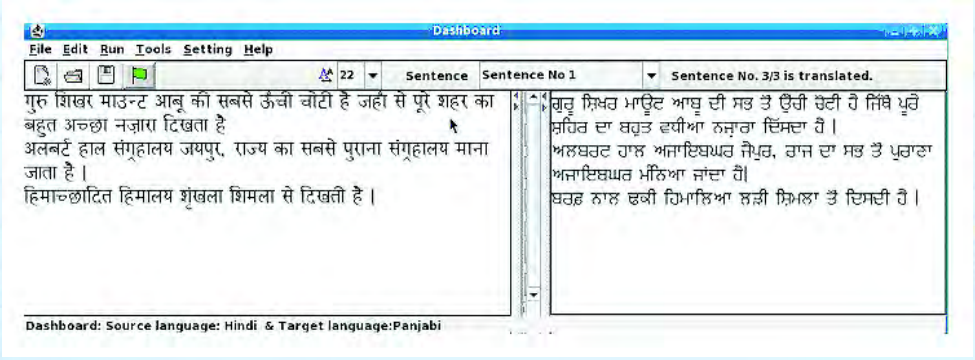
Machine Translation

Development of English to Indian Language Machine Translation System based on AnglaBharati Technology (Phase-II)

Based on the Language Technology frame work prepared by DIT, mission mode project titled English to Indian Language (Bangla, Malayalam, Punjabi and Urdu) was taken up in phase I for adapting Anglabharati Technology for these language pairs. Phase-II has been taken for improvisation in English to Bangla, Malayalam, Punjabi and Urdu systems developed in Phase I and also for developing English to Telugu, Nepali, & Assamese Machine Translation Systems using the approach developed during Phase I. C-DAC have developed English to Bangla and Malayalam Machine Translation System in Phrase-I and now developing English-Assamese Machine Translation System in Phrase-II.

Machine Translation System- Indian Language to Indian Language

SAMPARK is an Indian Language to Indian language Machine Translation system. The project was undertaken in a consortium mode under the aegis of TDIL, DIT. As a consortium member, C-DAC was involved in developing Hindi-Punjabi bi-lingual system, which has been launched by Hon'ble former President of India, Dr. APJ Abdul Kalam at the WWW2011 Conference, Hyderabad.



SAMPARK

Evaluation of Machine Assisted Translation projects

After detailed research and consultation with subject experts, C-DAC along with STQC, Delhi evolved the testing, benchmarking and evaluation strategies for various consortia projects viz. EILMT, ILILMT, and AnglaMT. This testing strategy was also discussed with all the respective consortia leaders and finalized. The Beta (final) level testing has been carried out by C-DAC for AnglaMT and IL-ILMT machine translation projects and feedback is being submitted to consortia and DIT.

For EILMT machine translation system, three rounds for alpha level testing and one Beta (final) level testing was carried out and all the feedback reports were submitted to consortia and DIT.

Optical Character Recognition (OCR) and Online Handwritten Character Recognition (OHCR)

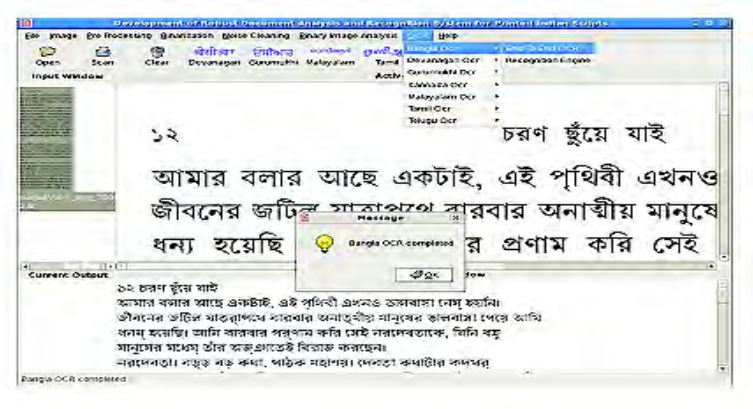
Bangla Online Handwritten Character Recognition System (Hasta Lekha)

The system can recognize all alphanumeric characters and clusters used in Bangla Handwriting. It takes online pen tablet data as input. Output is stored in Unicode file format. It has editing facility. It is compatible with Windows XP Tablet PC Edition Development Kit 1.7. &supports Visual C++ environment. Possible application areas are On-line form processing, text entry for S.M.S through Mobile, Note taking purposes, E-Learning s/w, Language Learning Tool, etc.

Optical Character Recognition (OCR)

A consortia project for development of robust document analysis and recognition system for Printed Indian Scripts was taken up with IIT Delhi as the Lead Agency. C-DAC, as a consortium member, was assigned the role of a system integrator for Indian language OCRs- Devnagari, Bangla, Tamil, Kannada, Telugu, Malayalam, and Gurumukhi.

The Centre has delivered a set of APIs bundled as dynamic libraries for each of the modules developed by the respective consortium members. The other work undertaken includes development of performance evaluation modules which gives a confusion matrix for character level accuracy, rpm package and release.



Indian Language integrated OCR

Recognizing the commendable work undertaken by the consortium, DIT has now sanctioned the phase –II of the integrated OCR for Indian Languages.

Information Retrieval

Cross Lingual Intelligence Access:Sandhan

The project was aimed at creating a portal where the user enters a query in one Indian language (source language) and the search results are presented in the language of the query and also in the language in which the information originally resided.

The project was implemented by a consortium of academic and research institutions including C-DAC and industry partners. The languages incorporated are Bengali, Hindi, Marathi, Punjabi, Tamil and Telugu. Test results have been

quite encouraging and the consortium was awarded to carry out the second phase to broaden the domain to cover Health and general domain also.

Sandhan

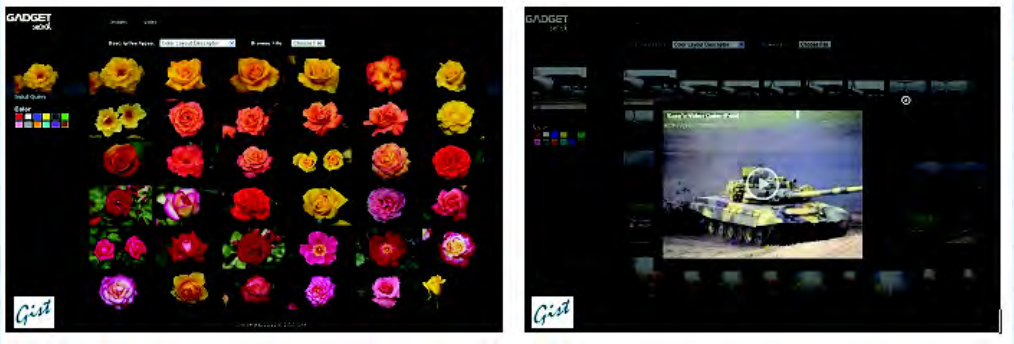
Phase-II of the project has started in September 2010. The Phase-II includes three new languages: Assamese, Oriya and Gujarati; and Healthcare as a new domain.

Video Search

Video search technology uses content analysis to automatically extract the information describing the recorded material. Extracting information can be as simple as detecting video scene changes and selecting the first frame of the scene as a representative frame. A more complex process involves extracting text from film titles, analyzing the audio track, making a semantic interpretation of activities, recognizing cast and assigning meaning to particular segments of the video. The GISsearch can be based on several inputs such as a scene, image, text, dialogue, a video clip, etc. The search system will be able to give the output information as a time code or generate the descriptors to build a MPEG-7 stream so that, the desired frame can be accessed directly.

Additions during 2010-2011 include:

- Search based on Texture features.
- Describing image/frame segments in terms of region location & search.
- Web application for multimedia (images/video) search.
- Search result refinements based on colour, dimensions and in terms of face/non-face.
- Video decoding using parallel processing clusters.



Video Search

Utilities

Multi-script Auto Recognizer and Sorter (MARS)

This prototype system takes as input various language script image files and recognizes the script within these image files in order to classify/sort them onto different language bins. MARS currently supports learning of new scripts through

SVM and recognition of images of the learned scripts through the trained SVM. The accuracy of the system is around 70 % when the system was trained with seven scripts (Chinese, Devanagri, English, Japanese, Kannada, Russian, Urdu).

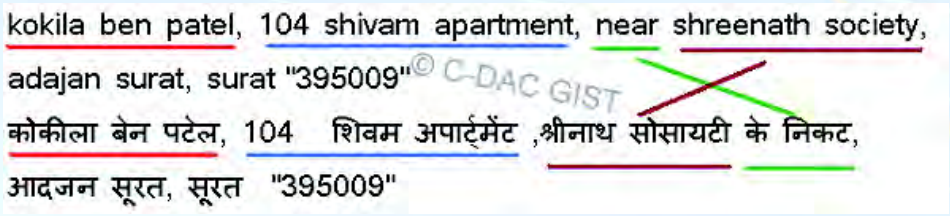
Enhanced Transliteration Engine API

A new transliteration engine termed as the Enhanced Transliteration involves a complex mix of technologies such as Hamming Distance, Clustering algorithms, and HMM's to ensure the best possible prediction. The engine deploys a combination of different components such as the homophone engine, word splitter, suffix dictionaries and high frequency look-ups as well as the tried and tested rule based transliteration engine for giving a much higher degree of accuracy for transliteration. The engine can be used for transliterating Names/ Demographic data from English to Indian Languages. It can also be used for on the fly conversion at the time of capturing demographic data. Different components of engine make it possible to handle the typos, variants and composite words. The region wise high frequency dictionary along with the core rule based transliteration engine makes it very powerful in terms of accuracy of the transliterated output.

- Transliteration accuracy upto 85% in the case of common names and surnames.
- Statistical Weightage rules give the closest possible suggestion
- Supports 15 Indian Languages in which the data is normally found
- Available in API format, it can be easily integrated with client application.

Address Processing API

Address processing library handles the address string in Indian way of writing the addresses, e.g. the address "near f in Hindi. The complexity of the addresses increases with the long address strings. Address preprocessing works on top of Name transliteration. It currently supports English to Indian language address translation/transliteration only.



Transliteration

GIST-NameScape

GIST-NAMESCAPE is a developer suite for generating name variants and sound alike. It can handle a large number of cases and find different names and address variants. Different spellings of a given name are identified. It is useful in case of spelling error or when name and surname are written together. It maps such a spelling error to its correct form. Names with numerological flavors are also accommodated-it resolves all such numerological variants. It is driven by heuristics and efficient homophone engine. The areas of application of this language enabled technology are many: Public distribution System, Election Commission, The Income Tax Department, Passport and Visa offices, the Financial sector including Banks, Insurance and Credit companies, Mobile Phone Providers, etc.

Gist Namescape

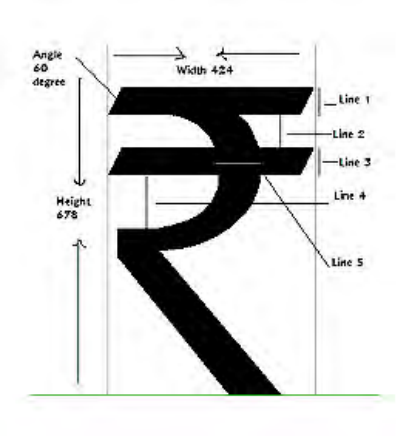
Design aspect ratio for Rupee symbol

C-DAC undertook extensive research on the Rupee symbol. Following are the weight specification of 'Rupee symbol'.

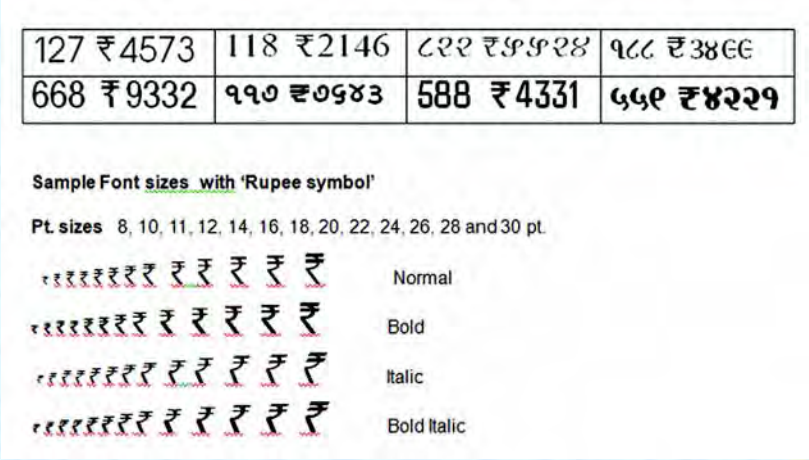
Normal

- Height - 678 pixels; Width - 424 pixels. (62% of height)
- From left side symbol shouldn't have any space. (Default space will come after sentence)
- To right side of the 'Rupee symbol' space should be there, it should be minimum ¼th of the total width of symbol if symbol width is 424 pixels,then with space it should be approximately 548 pixel)
- Upper and lower horizontal bar stroke width - 60pixel. (Approx. 9% of the height)
- Distance of two horizontal bar - 75pixel. (Approx. 11% of the height)
- Distance between the Strike-out bar (Second bar from the top) and the curve of the base line of the rupee or the top point of the curve of the Rupee - 120pixel. (18% of the height)
- Round stroke - 84pixel.(12% of the height)
- Angle of diagonal bar stroke - 60 degree.

Similar specifications have been worked out for bold format also. To blend with the decorative patterns and design of Indian languages, various designs need to be explored for the Rupee symbol (Aesthetics of Font). Various embedding of the symbol for numerals are given below.



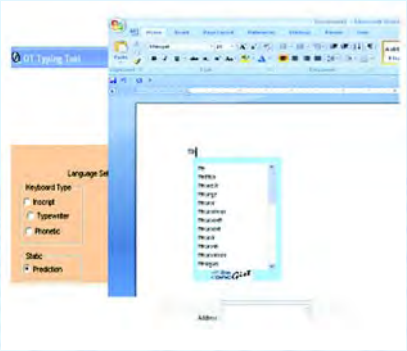
Rupee symbol with stroke dimension



embedding of the symbol for numerals

iWriting

This tool was developed to help data entry operators. User needs to type only two initial character of the word, and then with the help of mouse he/she can choose from the list of words starting from those two characters. If the word is not found, user needs to type it once, next time it will appear in the list automatically. It can be easily integrated in C-DAC's Typing Tools. It is unicode enabled and supports all languages.



iWriting

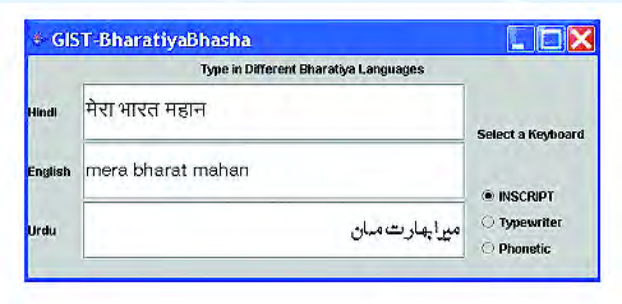
IDN Floating Keyboard

C-DAC contributed in creating floating keyboard for ease of typing for web based applications. Under IDN phase III, keyboards are, now, available for the languages including Bodo, Dogri, Maithili, Manipuri, Santali Ol Chiki, Santali Devanagari, Urdu, Sindhi, Kashmiri, Sindhi and Devnagari.

These language keyboards based on INSCRIPT layout, contains characters according to policy document of IDN for respective languages. Keyboards are implemented in JavaScript and provided with 3 font size option as Small, Medium and Large. Typing mechanism is through mouse click on floating keyboard as well as through physical keyboard. Keyboards are designed to get integrated with other web pages as per requirements.

GIST- IMF

GIST-IMF is a product in the form of a library that enables Indian language O.T typing on Java swing editable components. Supported layouts for typing are INSCRIPT, Typewriter and Phonetic. Platforms supported include Windows and Linux(Fedora, Ubuntu, Cent OS). RTL Support has also been provided.



GIST- IMF

North East Language Development

Under the ageis of TDIL DIT, basic linguistic resources are being created inAssamese-Bodo-Manipuri-Nepali,the four major (official) languages of the north east region of India. It is aimed at bringing these languages on the digital map and reap the fruits of IT revolution in the country by developing tools and technologies for these languages. spellchecker, language corpus and MAT word list are nearing completion.

Establishment of Indian language Technology Proliferation & Deployment Centre

Under the TDIL Programme of the Department of Information Technology (DIT), Indian Language Technology Proliferation & Deployment Centre (ILTP-DC) was set up as a unifying platform for decision-makers, users, domain researchers, linguists as well as computational experts. The primary objective of the ILTP-DC is to promote the usage of Indian languages across multiple verticals, and boost R and D in language technology by providing potential researchers with the necessary tools and resources. It will act as a repository for all the excellent research work carried out by premier research institutions in India.

TDIL Portal

Following systems are deployed at ILTP-DC servers:

English to Indian Language Machine Translation System (EILMT System) : Language pairs available are English to Hindi, English to Marathi, English to Bengali, English to Urdu, English to Oriya, English to Tamil

English to Indian Language Machine Translation System (AnglaMT system): Language pairs available are: English to Bengali, English to Malayalam, English to Urdu, English to Punjabi.

AnglaMT System

Sampark (Indian Language to Indian Language Machine Translation System) Team: Language pairs available are: Hindi to Punjabi, Punjabi to Hindi, Telugu to Tamil, Urdu to Hindi

Sampark

Applications

Text reading System in Mizo Language

Development of Mizo Text reading system for visually challenged people of Mizoram. A scanned Mizo-document will be fed to the Mizo-OCR system integrated with the Mizo Text-to-Speech Synthesis system for generating corresponding voice output in Mizo language.

Shruti-Drishti – Advanced Technology for Visually Impaired using a Novel Approach of PicDhwani (PIcture and Character Visualization though Sound)

The main objective of PicDhwani project is to develop a prototype for training software to teach C-DAC-NISAL Language (C-DAC's Non-Invasive Sound Accessible Lemmatization Language). It will be used to teach the blind students, which is a tool that will enable blind people to recognize a few English characters.

PicDhwani is all about converting a digital picture to sound for blind people to visualize image. In PicDhwani digital image is taken (from Mobile camera) one pixel at a time and each pixel is converted to sound (Dhwani) by training software/tool installed into mobile handset. This information is used by blind person to create a mental image through the medium of sound just like naturally sighted human beings use eyes to create a mental image. The format of picking pixels from an image in PicDhwani is like reading English text one by one. Starting from the top left corner to the top right corner, then next row left to right and so on until the last row is reached.

The Project has been sponsored by Department of Information Technology, Ministry of Communications and Information Technology, Government of India in March 2011. The project is in the initial stage of development.

Visually impaired Women Empowerment through Shruti Drishti - An Integrated Text-to-Speech [TTS] & Text-to-Braille [TTB] System

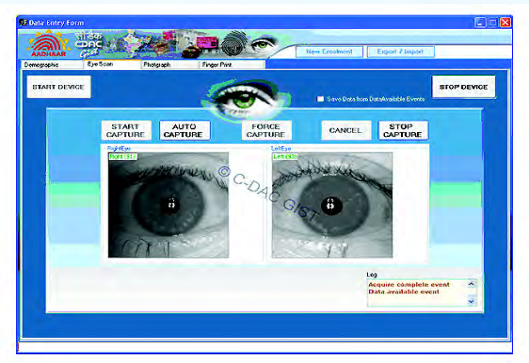
Shruti Drishti is "An Integrated Text-to-Speech [TTS] & Text-to-Braille [TTB] System for the Visually Impaired" using the Information Extraction and Retrieval techniques. Shruti Drishti is a web page browser developed for visually impaired users. Shruti Drishti software has been deployed successfully at 40 Visually Impaired Women Schools across India with the associated hardware/software along with support and training under the Project "Visually Impaired Women Empowerment through Shruti Drishti". The Project was completed in September 2010.

Voice based Internet Browsing System in Hindi, Tamil & Urdu language for Education and Health Domains

The system assists individuals and Visually Impaired persons for voice enabled searching, providing user Interface to query in Hindi, Tamil & Urdu language in voice form. The search results are presented to the user in the query language and retrieval of search relevant result from semantic index in textual form will be read out using Text to Speech technique. The project has been sponsored by Department of Information Technology, Ministry of Communications and Information Technology, Government of India on March 2011. The project is in development stage.

UID Content Creation Software

- Complete package for collecting Demographic and Biometric data of residents
- Developed to cater to the complexity of Transliteration from English toIndian Languages
- Ensuring completeness of entered data
- Bilingual User Interface
- On screen keyboard to expedite content creation
- Data carry forward in case of data entry of members of same family



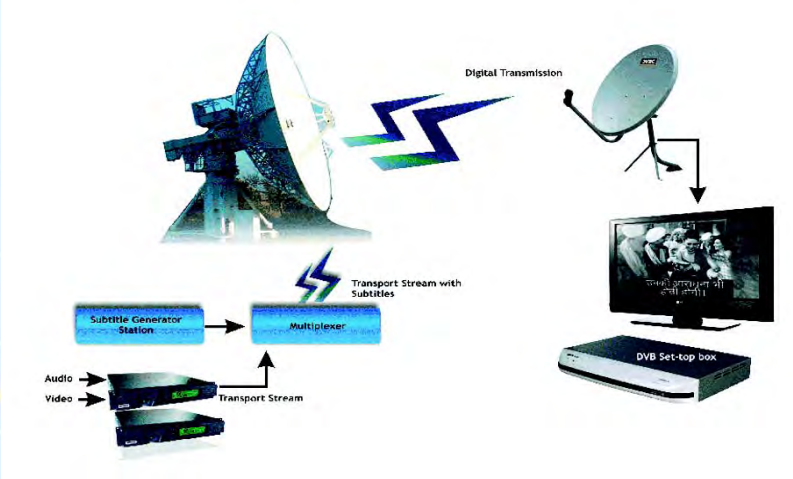
UID Content Creation Software

LIPS Live Subtitling System

LIPS Live Subtitling system was launched at the 23rd C-DAC Foundation day. It was then successfully deployed for six SD and HD channels of the prestigious Star TV Network and fetched business worth Rs. 39 Lakhs in 2010-11.Major up-gradation of Studio equipment such as Prompter and CG systems worth Rs. 23 Lakhs at major satellite broadcaster from Hyderabad has been undertaken.

DVB Subtitling

Objective of DVB subtitling project is to design, implement and offer a complete solution for online DVB Subtitle Generator to generate DVB compliant subtitle streams for DTH Platform. Development of subtitle generator which encodes an output as a transport stream fully compatible with any professional IRD as well as commercial STB with DVB subtitle compliance is done. Multiple languages DVB subtitles testing on different live setup is done.Currently the work on DVB Subtitling system as a real time data inserter station is going on, using this broadcaster can send logos, emergency messages and local alerts.



DVB Subtitling

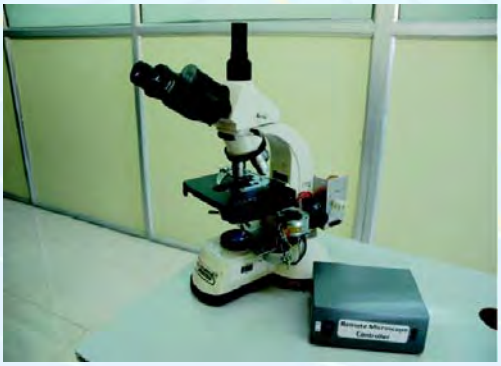
Professional Electronics

Remote Microscope Controller

This indigenously developed product enables a pathologist to control a clinical microscope from any part of the world. A small controller unit attaches to modified digital camera and an internet connected PC. With suitable software and knowledge of password you can view the microscope images and control the microscope.

Salient Features –

- Precise control of slide position.
- Fine adjustment of the magnification
- Programmable step size
- Windows compatible user friendly GUI.
- Simultaneous display of acquired microscope image
- Control via internet, LAN or VPN
- Password protected access



The controller unit with Microscope

Black box

Black Box developed earlier, has been commercialized, by making the system more compact, low-cost and power efficient. It is required to be made easily installable in vehicles and sufficiently reliable for the purpose of investigations, and we need to add-on the facility of knowing exact location of vehicle w.r.t time using GPS.

Design & development of control system for climate controlled greenhouse used in agri-research

Greenhouses are glass or plastic roofed structures where plants are grown. These are playing an increasingly important role not only in protected cultivation but also as a desirable alternative to using climate controlled chambers for various types of scientific studies on plants. National Agri-food Biotechnology Institute (NABI) Mohali, a scientific organization of Department of Biotechnology (DBT) has joined hands with C-DAC in developing an indigenous technology for climate controlled greenhouses.

RFID Based File Tracking System(ePrahari)

RFID based File Tracking System is under development to control and manage File System. It centrally manages what document you have, where they are, who uses them, and all access history associated to the document. ePrahari can be used as a way to improve the management of important documents and files in industries like banking, insurance, medical, legal, and government where the loss of such files can cause severe problems.

RFID Based Attendance System

RFID based attendance system (version 2) is being developed. In this version, RFID Based Access Control is being incorporated along with existing attendance system. Additional memory for access ID storage and algorithm for speedy matching of Ids are being developed.

SMS Based Device Control System

This system is under development, for Controlling and Monitoring of devices i.e. Lights, Music System or other electrical / electronic appliances in offices / home etc. for various time saving and manual effort preserving tasks that can be accomplished via SMS . This system will make office / home automation easy to control and monitor when a user is not at office/ home by sending an SMS which in turn controls the devices attached to system and the reply via SMS is sent back to the user.

400 HZ Inverters for Airborne Applications

The objective of the project was to develop 400 Hz Static Inverters with improved features, for MI17 Helicopters to replace the existing imported Rotary Inverters, as an initiative for indigenization of Power Electronics systems for Indian Air Force.

Two types of 400 Hz Static Inverters were developed to replace the existing Rotary Inverters on one- to-one basis. PO-500A, 400 Hz Single phase output and PT-200TS, 400 Hz Three phase output Static Inverters were developed, fabricated and tested to demonstrate the functionality. Preliminary type tests were conducted. The development conforming to MIL standards, packaging, thermal engineering, size, weight etc, and EMI issues were the major challenges in this development. The home-grown 400 Hz Inverters technology developed by C-DAC will help Indian Air force to procure these inverters from indigenous sources.

AC Drive with Sensorless Vector Control

Indigenous technology for two types of AC Motor Drives – Single-to-Three Phase in the 0.25 Kw to 2.2 Kw range and Three-to-Three Phase in the 0.5 Kw to 30 Kw range – using Sensorless Vector Control technique has been developed. The technology does away with the speed sensors found in the conventional Variable Voltage and Variable Frequency (VVVF) drives to regulate the drive speed. The control software calculates the actual speed of the machine using Field Orientation Control for the speed loop feedback. The technology finds applications in the control of industrial Pumps, Fans, Compressors, etc.

Acoustic Thermal Profiler

Maps the temperature distribution inside the furnace/boiler using acoustic pyrometry. Acoustic pyrometry provides a practical approach for the on-line continuous measurement of gas temperature and velocity in hostile furnace and stack environments. The non-contact instrument technique provides average line-of-sight measurements between the acoustic transmitter and the receiver.

Active Front End Rectifier

The voltage source inverter connected to grid through interconnecting impedance provides better overall power factor, has substantially smaller filter requirements, and inherent regeneration capabilities. Active Front End Rectifier (AFE) reduces the power loss and harmonics in the line supply. The control algorithm of the AFE is implemented on a DSP based digital Controller and the technology has been successfully transferred to M/S Amara Raja Batteries Pvt. Ltd.

The technology for power factor correction and low frequency current harmonic elimination in static power conversion systems, finds applications in Telecom Power supply, UPS, AC-DC Power Supplies, AC Motor Drives etc.

Autonomous Remote Access Device for Remote Diagnostics and Monitoring

C-DAC has designed a flexible architecture based, portable Autonomous Remote Access Device (ARAD), which meets the expert-involved remote diagnostics and monitoring requirements of process control, SCADA and other varied applications.

Hardware features

- XSCALE PXA270 processor with 64MB RAM and 64MB Flash
- 3.5” TFT Display with Touch Screen
- QWERTY keypad
- SD Card, USB and Ethernet Interface

Software Features

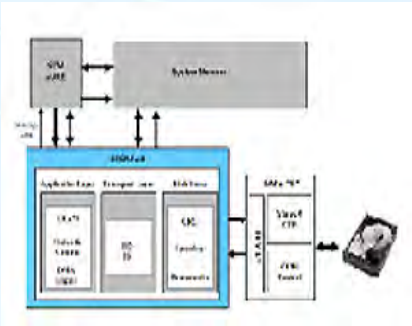
- Linux OS (Kernel 2.6.9)
- QT graphical environment
- Virtual QWERTY keyboard and handwriting recognition keyboard
- Software utilities
    - RMU switching application for Distribution Automation
    - Linux command terminal
    - Calculator, Spreadsheet etc.

Autonomous Remote Access Device

Design and development of a SATA II IP core

Serial ATA (Serial Advanced Technology Attachment) is a computer bus technology primarily designed for transfer of data to and from Hard Disk Drives (HDD).

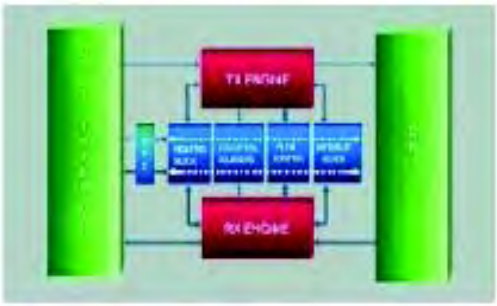
‘ERSATAII’ IP, developed by C-DAC handles data movement between system memory and SATA device. ERSATAII is a single-port Serial ATA-II Host controller. It is designed to provide minimal host overhead and host-to-device latency. The IP core supports both Serial ATA Generation 1 and 2 with the transfer rates of 1.5 Gbps (150MBps) and 3.0 Gbps (300MBps) respectively. The core has been designed as a virtual component using VHDL targeting ASIC/FPGA designs.



ERSATAII’ IP

Design and Development of Gigabit Ethernet MAC IP Core

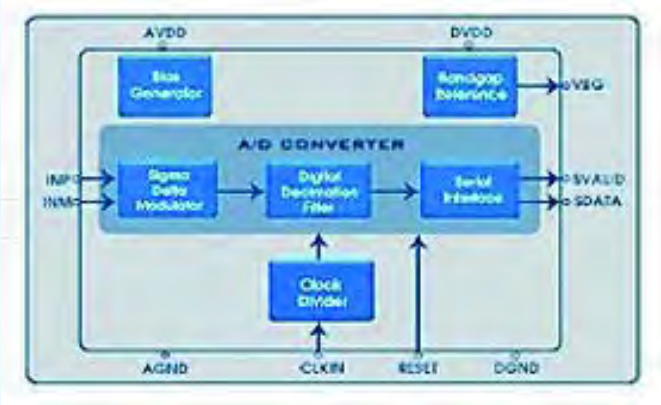
Ethernet is the world’s pervasive networking technology. Gigabit Ethernet offers 1000 Mbps raw bandwidth that is 100 times faster than Fast Ethernet. The Gigabit Ethernet MAC (GMAC) IP Core, developed by C-DAC, is an intellectual property core for the Gigabit Ethernet media access controller for ASIC embedding using Verilog HDL. The GMAC IP Core is designed and developed in accordance with the IEEE 802.3-2005.



Gigabit Ethernet IP Core

ERAD810 is a fully differential sigma-delta ADC designed in CMOS technology. The internal switched capacitors eliminates the external sample and hold amplifier and 256 times over-sampling minimizes the requirements of anti-alias filter. ERAD810 achieves an SNR of 87 dB in the 0-8 KHz band. The converter operates from a single 3.3 V

supply. The digital decimation filter provides linear phase and a narrow transition band that properly digitizes 8 KHZ signals at 16 kHz sampling frequency.



Sigma Delta ADC IP Core

Development of Portable Medical Electrical Safety Analyzer

C-DAC developed indigenous technology for a Portable Medical Electrical Safety Analyser (MEDSAFE) for on-site electrical safety testing of equipment in hospitals and other health care delivery environments. C-DAC collaborated with SCTIMST (Sree Chitra Tirunal Institute of Medical Sciences and Technology, Thiruvananthapuram) for the development and field trials. The project was jointly funded by DIT and SCTIMST.

Routine electrical safety testing of medical equipment in hospitals is mandatory since patients will not be able to respond to shocks and even minute currents passing through vital parts of their body (like heart) can be fatal for them. Also, doctors and other clinical staff who are using a vast variety of electro medical equipment are prone to the danger of electrical shock hazards from those equipment. The MEDSAFE developed by C-DAC helps the clinical engineers to verify the electrical safety of medical equipment quickly and easily.

These types of costly equipment are imported by hospitals in India. Now Indian industries can take up this indigenous technology and manufacture low-cost equipment so that more hospitals in our country can afford such systems.

Echo Sounder Version 4

C-DAC developed the state-of-the-art DSP-based Echo Sounder engine with LAN Option, Touch-screen based PC GUI, Electronic charting and storage. The system caters to EMI/EMC MIL requirements. The Dual channel Echo Sounder could achieve better accuracy, modularity and testability compared to conventional models. The main applications areas include Depth Charting and Surveying of sea floor.

Full Spectrum Simulator

Provides both off-line and real-time simulation capabilities at an affordable cost and is easily configurable for custom applications. The system gives emphasis on Hardware-in-Loop (HIL) feature for Power Electronics and Power Systems with Simulation in SEQUEL (A Solver for circuit EQuations with User-defined Elements) environment. The simulator is the outcome of the joint development by IITB and C-DAC, under the NaMPET Mission project.

Indigenous TETRA Handset

TETRA Hand Set is a mobile digital radio designed as per the ETSI standard for PMR (Professional Mobile Radio) users. This radio has two modes of operation: communication through TETRA network and Direct radio-to-radio mode.The product is an off-shoot of the DIT-sponsored TETRA project undertaken earlier by C-DAC. The Handset is built with two Encryption co-processors for TETRA Air Interface and End-to-End Encryption (EEE). C-DAC is providing the interface to the co-processors. CAIR Bangalore is developing the EEE software and porting it in to the radio.Objective of this project was to make an indigenous radio platform suitable for developing and porting the EEE software.

Major features are:

- Low cost (less than half the cost of TETRA radios available in the market)
- Miniature in size and weight
- Long battery life (more than 8 hours of operation)
- Both V+D and DMO mode in single radio
- Clear and encrypted mode operation

Industrial Colour Sensing System

The Industrial Colour Sensing System (iCoss) is a handheld unit capable of identifying and measuring different colours. The system can be used for Reflective as well as Refractive materials by attaching interchangeable sensor modules. Unlike the traditional Colour Sensors, which give only a "match/no-match" output condition, this system is designed with sophisticated and stable algorithms for outputting both RGB and CIE-L*a*b* values. The system finds many applications, especially in the paper industries and water treatment plants.

National Mission on Power Electronics Technology (NaMPET)

NaMPET, the national mission programme was launched by the Department of Information Technology (DIT) under Ministry of Communication & Information Technology, Government of India. This five year programme was implemented for facilitating Research, Development, Deployment and Commercialization of Power Electronic Technology by enhancing the indigenous R&D expertise and infrastructure in the country. Premier Academic Institutes and Industries of Power Electronic Systems in the country participated in this programme. Programme started on 29th October 2004 and completed on 31 August 2010.

Twenty projects were developed under the umbrella of NaMPET, of which eleven were fully funded by NaMPET, four fully funded by external agencies, and the remaining five were jointly funded. Out of the total project value of Rs. 2159 Lakhs, Rs 1227 lakhs (about 57%) came from user industries/institutions (NMRL, MoP, Railways, M/s. Electrohms, M/s. Amararaja, M/s. Caterpillar etc.), and the remaining (43%) from NaMPET mission fund.

National Power Electronics Infrastructure, comprising C-DAC and eleven academic institutes (IIT Bombay, IIT Kanpur, IIT Kharagpur, Anna University Chennai, IISc Bangalore, BESU Kolkata, IIT Delhi, NIT Trichy, NIT Rourkela, RIT Kottayam, BIT Ranchi), was built and commissioned. This provides a common platform for sharing technical information and for translating the conceptual and futuristic designs into well-engineered products and systems.

The NaMPET website (www.nampet.org) was launched in January, 2005. The website is continuously being updated with new information related to Power Electronics. The members get access to technical papers, design details, information on latest trends in Power electronics, data base of experts in this field and much more. About 130 Industries, 230 Academic Institutions, 260 Professionals and 650 students are currently registered in the site. With more than 67,000 hits, the Website is presently placed at the first page of International search results in Google search engine for a key word of "Power Electronics".

Technology on Front-end Converter and UPS systems were commercialized through industries. Indian Railways joined hands with Ministry of Power and NaMPET in the development of systems like Vehicle Control Unit, Train Control Network, and Auxiliary Converter. STATCOM for Neutral Current Compensation in IT Parks and Dynamic Voltage Restorer for Textile mills were excellent examples of the application of R&D efforts for solving nagging industrial problems.

Futuristic technology developments like Full Spectrum Simulator (FSS), Universal Front-end Controller for Distributed Generation (DG), UltraCapacitor and Matrix Converter were developed under NaMPET programme, in close collaboration with premier Academic institutions like IISc and IITs.

Full Spectrum Simulator

The technologies developed need to be proliferated in order to reap the benefits of the efforts and funds already put in the various activities of NaMPET. And this can be effected only through the next phase of NaMPET. Understanding the potential of the team efforts from C-DAC and it's partners from Academic institutes and industries, agencies like Institute of Plasma Research (IPR) and Naval Material Research Centre (NMRL) have approached C-DAC for partnering in their major R&D efforts in the field of High Voltage/High Power supply, Power Conditioners for fuel cells of power rating of the order of 300kW etc. This tempo needs to be sustained and sponsored projects like these would form an important part of the activities in NaMPET phase2, the proposal for which is under active consideration of DIT.

Remotely Operated Submersible

This project was intended to be basic technology development project. The project envisaged the design and construction of an underwater ROS, which can be controlled by a pilot located above water. The Pilot's Control Station (PCS) is connected to the Underwater Submersible Vehicle (USV) by an Umbilical Tether Cable (UTC) to carry power and commands from control station to USV and video pictures and data from USV back to the PCS.

The Underwater Submersible Vehicle (USV) is designed to have positive buoyancy, and hence will float at water surface when vertical thrust is not applied. The USV can be made to dive underwater and hover at a particular depth using the vertical thruster. All maneuvering in the horizontal as well as vertical directions are effected using five vectored bi-directional underwater thrusters. The vehicle is capable of moving in forward, backward, port, and starboard directions, while floating as well as in the immersed conditions. It is also capable of rotation in clockwise and anticlockwise directions in the horizontal plane. The vehicle has an AUTO mode, in which it will maintain the set heading in horizontal plane, even if an external force, like underwater current, changes the heading.

The prototype models developed fulfilled all the major objectives intended, viz. underwater vehicle maneuverability, video capture, and payload requirements.

Underwater Submersible

Smart Card Technologies and Products

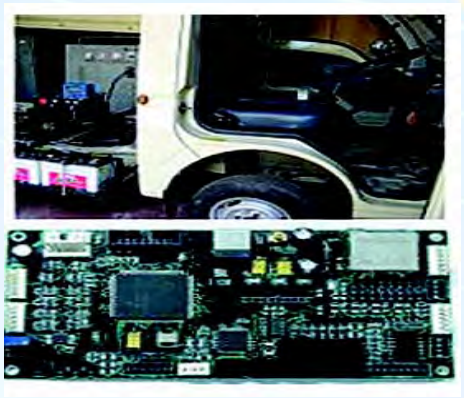
The eSmart Reader is a contact-less smart card reader which is capable of transferring data between ISO 14443A standard-compliant smart card and a PC via USB/UART interface. The reader can read from or write to the card memory which can be programmed for read and/or write operations. eSmart reader has data retention up to 10 years

and has a 5000 swipes storage capacity. Smart Access Plus is a complete attendance management cum access control solution for enterprises. eSmart Reader and Smart Access Plus find application in a wide range of systems like Access control Systems, Attendance Management Systems, Canteen Billing Systems, Ticketing Systems etc.

Study, Simulation and Development of Devices for parallel Hybrid Electric Vehicle

C-DAC developed a number of sub-systems for Parallel Hybrid Electric Vehicle applications. These sub-systems include devices such as Propulsion Motor with an internal combustion engine interface for mechanical parallel operation, Linear Actuator based Fuel Controller, Electrical Pedal Sensor, Bi-directional Controller for Battery Bank, AC-drive for Propulsion Motor Controller, CAN based Driver Information Display etc. Advanced Modeling Environment for Simulation (AMESim) from M/S Imagine was extensively used for modeling and simulation in an attempt to arrive at optimum power plant driveline combinations, eliminating unnecessary vehicle builds. The sub-systems were tested for Parallel HEV operations using Tata Ace LMV. The project team is planning further enhancements to the Motor-ICE mechanical coupling to make it more stable in running operations for extended periods.

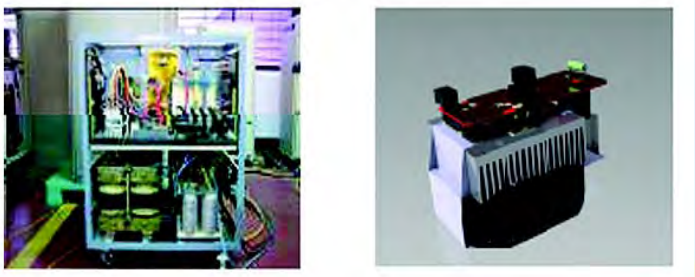
Hybrid Electric Vehicles use electric power from a battery bank in conjunction with a conventional internal combustion engine (ICE) and a propulsion motor. The propulsion components can be arranged either in parallel or series configurations. In a parallel hybrid vehicle, both the electric system (motor) and the ICE are connected mechanically in parallel to the drive wheels. The electric motor provides supplementary power when the vehicle is accelerating or climbing steep grades. The development will lead to efficient environmental friendly public transportation systems which can meet the stringent emission norms in the coming years.



Sub-systems for Parallel Hybrid Electric Vehicle

Shunt Hybrid Active Filter

Shunt Hybrid Active Filter technology combines a tuned series LC filter with a lower rating shunt active filter for compensating harmonic currents in a distribution network. The LC filter is tuned for the major harmonics in the load and the active filter dynamically compensates the harmonic current present in the load. By combining the passive and active filter technology, more effective harmonic compensation is achieved with lesser cost/kVA. The capacitance of the filter is selected such that the grid voltage gets dropped across it. So the inverter needs to generate comparatively small voltage corresponding to the harmonic current required by the load.



Active Filter Converter Stack

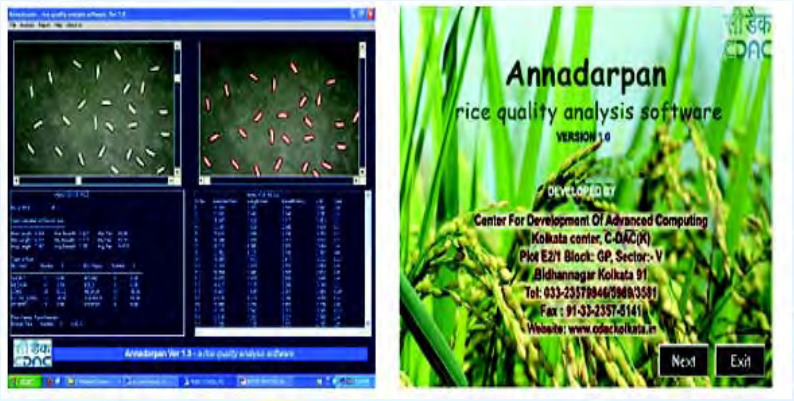
Digital image processing in Tasar Sericulture

Digital image processing system based on web camera with colour analysis software has been developed for colour characterization of Reeled, as well as Spun Yarn of Tasar Silk. This system would serve very well to Silkworm seed production centers and tasar yarn producers.

Colour Analysis for Tasar Silk

Development of Electronic Vision system for rice quality measurement

Electronic vision system named “ANNADARPAN” based on digital camera along with E-Vision software has been developed for measuring physical parameters such as grain or kernel length, breadth, area and perimeter of aromatic rice. It will be beneficial for quality control lab and rice grower, exporter etc. It will also help to accelerate rice-concentrating research.



Electronic Vision System “Annadarpan”

Integrated automation system for black tea manufacturing at Kamalpur tea factory, Tripura

High-end IT – based systems and solutions with integrated automation for critical unit operations at Kamalpur tea factory is being installed. Introduction of appropriate process control and automation for each of the processes and orchestrating them in an integrated and supervised manner may be greatly beneficial towards improvement of productivity, efficiency, energy saving and quality of the manufactured Black tea.

SCOSTA Compliant Smart Card Solution

C-DAC has developed a one card solution based on SCOSTA smart card operating system initiated by Govt. Of India for University Campus Application. The system is designed to use both contact and contact less Smart Card having 32KB memory. One Card Solution with the aim of helping education campuses to successfully undertake an end–to-end campus computerization initiative. Smart Campus Card Framework comprises a suite of applications that cover all aspects of functioning of an educational institution.This single card is capable of storing Personal Details and Photgraph, FingerPrint Template, Medical Details,Library and other Application Transaction Detail.

An Enrollment application in .NET (C#) has been developed by which initializes the blank SCOSTA Smart card with the required file system for storing the data on the card for issuance to the students. A custom DLL has also been devel-

oped for the interaction with the PC/SC compliant Smart Card Reader. This application can be integrated with any type of Webcam, Fingerprint Scanner and Card Reader. This makes the application easily deployable at the client side. For Security purposes, the application is combined with biometric verification to access the data in the Smart Card making the data more secure.

Secured Energy Monitoring, Accounting and Web based Reporting Solutions

These are a suite of data acquisition, monitoring and reporting solutions being used by Madhya Gujarat Vij Company Ltd (MGVCL) to monitor the power flows and to utilize real time generation efficiently and effectively so that stable zonal grid can be maintained. The solution includes Load forecasting tool to predict the load statistically and a diagnostic and monitoring tool for diagnosis and monitoring of the whole SCADA system.

Distributed Energy Trading Model for Short Term Open Access

This solution developed with Open source tools comprises online submission of request for energy trading, processing, Interfacing with scheduling and other subsystems. The distributed Short Term Open Access (STOA) software is used by all the five regional load dispatch centers (NRLDC, SRLDC, ERLDC, WRLDC, NERLDC) in our country.

STOA Application Processing Listing Screen

Porting of COPS to Linux - Linux based C-DAC Open Process Solutions (COPS)

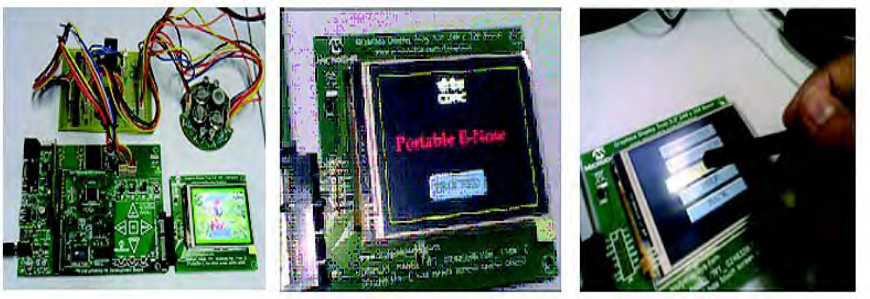
C-DAC Open Process Solutions (COPS)Linux is a web based SCADA (Supervisory Control and Data Acquisition) solution to depict process control UI and HMI (Human Machine Interface) on web. The various components are Tag Configuration module, Data receiving module, Data Archival Module, web based HMI module and reporting module.

SCADA & Secured Energy Trading Systems

Data Acquisition System will acquire real time measure and data adapting to third party protocol. After data acquisition, the data will be transferred to Human Machine Interface (HMI) for visualization using single line diagrams, tabular diagrams, trend charts etc. Various modules in the system are Adaptable report generator for generating various technical and resolution reports, Load forecasting tool using Heuristic load forecasting model and Diagnostic tool for diagnosis of entire SCADA system.

Development of Handheld Electronic Nose

Handheld Electronic Nose is a portable artificial olfaction system based on a 16-bit PIC Microcontroller platform with an effective GUI interface, which is applicable as an Industrial PDA for Tea Quality Assessment Device based on its aroma.



Handheld Electronic Nose

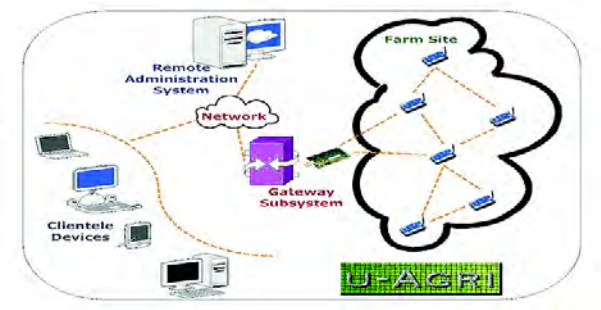
Ubiquitous Computing

Establishing National Ubiquitous computing Research Centre

Adaptive Framework for WSN Applications:

The Adaptive Framework for WSN Applications (AFWA) is a middleware developed above TinyOS to abstract the WSN application developer from low level intricacies of the Operating System. A generic API is provided to the application developer enabling him to wire various system Components like Network Communication, Security and Time Synchronization with the application. By using AFWA, the WSN application developer is abstracted from the inner details of each of the System Components thereby facilitating rapid prototyping of WSN applications. AFWA is developed as a plugin to the Netbeans IDE and is available as an Open Source Tool. It was released during the Ubicomp 2010 workshop at C-DAC Chennai and has been thereafter distributed to interested users including academics and industry.

- Aware Home Artifacts like Activity based lighting, Interactive mirror are integrated using publish subscribe model of Context Aware Framework.
- Context Aware Framework developed at C-DAC integrated with U-Learning application and released in Elitex 2011 at Delhi.
- 8 Patent Applications have been filed for Aware Home artifacts namely: Activity based Lighting, Smart Kitchen Cabinet, Smart Bed and Interactive Mirror.
- Three applications namely, Ubiquitous Agriculture (u-Agri), Smart Parking (SPARK) and Intelligent Intrusion Detection System (In2DS) were developed and deployed. The applications were based on Wireless Sensor Networks.
- U-Agri is developed for Pest Forewarning of Groundnut crops. WSN, integrated with micro-climate sensors within the crop canopy like temperature, humidity, leaf wetness etc, facilitated modeling the growth life cycle of pest and diseases, thereby aiding pest forewarning. The system is deployed at CRIDA Hayatnagar Farmlands and ANGRAU Research Farms, Anantapur.



System Architecture of U-Agri

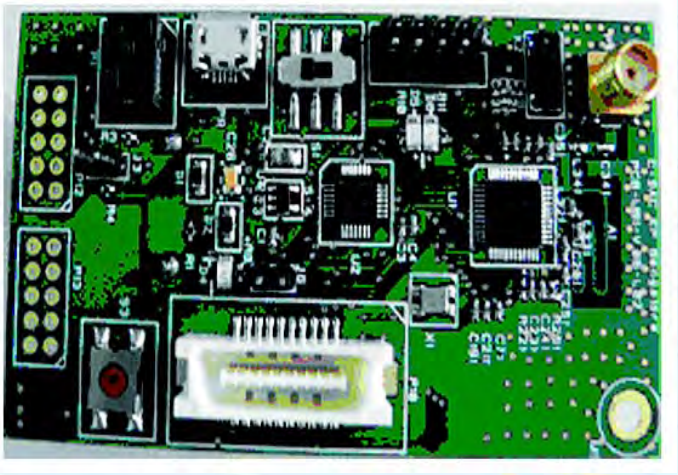
- SPARK integrates sensors for vehicle detection within parking infrastructures and provides real-time guidance information to commuters in finding vacant parking lots within the infrastructure. The system supports multilevel parking infrastructures and also features online and mobile based parking reservation. SPARK is currently deployed at the Greater Hyderabad Municipal Corporation Parking Complex at Hyderabad and is generating user interests. The system won awards in the Citizens for City Contest and e-India 2010.
- In2DS, deployed at C-DAC, Hyderabad JNTU Campus integrates the WSN with surveillance systems thereby enabling event based surveillance. The WSN detects the presence of movement within restricted environments and triggers the surveillance cameras to capture the event and generate alarms & notifications.

Development of membrane based sensor

A base polymer, e.g., polyethylene, will be formed into a membrane or film for taste sensing electrode. These membranes will be further functionalized by chemical reaction with suitable reagents for the purpose of recognizing the chemical components as electrolyte or non-electrolyte for water as well as for tea. Taste sensing response for analyse (tea liquor/ drinking water) will be measured using the membrane electrode as prepared in terms of membrane electrode potential (vs. concentration) using suitable electrodes and high precision digital multi-meter.

Completion of Establishment of Ubiquitous Computing Research Centre for hardware design

As part of this, completed design and development of variants of wireless communication modules for sensor networks (WSN), named as Ubi Motes targeting low power, ultra power and high range application domain needs, sensor interface board etc. These motes are deployed in several applications like U-agriculture, Smart Parking Systems etc. MAC IP core compliant to IEEE 802.15.4 and integration with soft processor core, PHY device for wireless personal area networks is successfully completed.



Ubimote

Wireless Sensor Network lab kit for academic and R&D on sensor network and application: The kit contains wireless communication modules compliant with IEEE 802.15.4 wireless personal area network, sensor board, programmer, and software modules. The kit could serve as a platform for developing, testing and analyzing sensor network, communication protocols, and applications.

This has been released and Launched by the Honourable Minister for Communications & Information Technology, during ELITEX 2011

Software Technologies including Free and Open Source Software

Implementing e-Forms Application through State Portal and SSDG in the State of Jammu & Kashmir

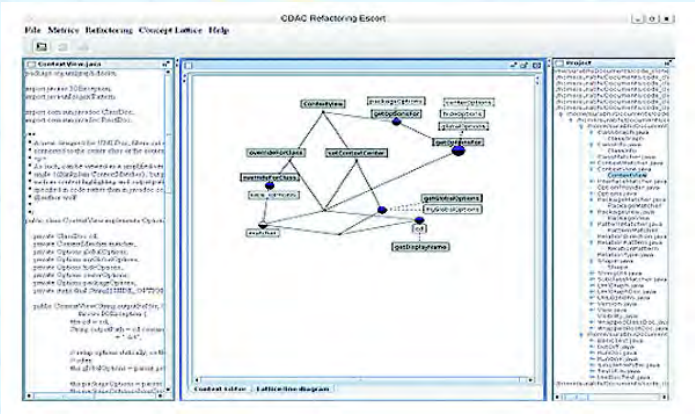
This project has been formulated under the National e- Governance Plan (NeGP) to fulfill the vision of providing easy and convenient services to the citizens through remote access primarily through Common Service Centres (CSCs). The project enables citizen to submit form online for the Government services. Subsequently, citizen can also check the status of his/her application online. These submissions and status tracking can be done through the CSCs or through the State Portal directly.DIT, State of J&K, has selected C-DAC as the implementing agency for this project.

C-DAC will be responsible for creating and implementing the e-Forms for 30 services of eight different departments in the State of J&K. The State Portal is envisioned as the Informative, interactive, integrated and trusted service delivery channel for all the Government to Citizens (G2C) and Government to Business (G2B) Services of the State and its constituent departments. The portal will have Content Management System built in to publish content on the portal. The SSDG act as hub / (standards-based messaging switch) for all the interactions and seamless interoperability across service seekers (the citizen and businesses) and various service providers (Government Departments) and even among Government Departments. C-DAC will also provide hardware infrastructure for State Portal, SSDG, and minimum computing infrastructure required at the department offices. The pilot launch with a few services is expected in October 2011.

Decision Support for Automated Refactoring (DSAR)

Refactoring Escort is the tool developed under this project. Refactoring techniques are used to improve the quality of the object oriented software without changing the observable behavior of the software. There are many refactoring suggested by multiple researchers, mainly Martin Fowler. Application of some of the refactoring is possible through tools like Eclipse Plug-in. However, what to refactor is not yet guided automatically. Refactoring Escort tries to bridge this gap, by suggesting various refactoring based on the static analysis of the source code.

Along with refactoring suggestions, Refactoring Escort also computes various property metrics and generates concept lattices for all the classes in the given source. One such concept lattice which can provide fair idea about the class cohesion is shown in Figure 58 below.



Refactoring Escort

e-Forms Engine

Department of Information Technology (DIT) has undertaken a major initiative to develop electronic forms (e-Forms) for citizen services with high citizen outlook and orientation. This initiative aims to replace existing manual systems of paper based forms with e-Forms as the primary data gathering interface. e-Forms will be a single repository of online forms for various government services.

Once the submission of e-Form is done to the state portal, the e-Form data will be routed by State e-Governance Services Delivery Gateway (SSDG) to the Centralized Department Server (CDS) where information filled by citizen will be stored. Department services will pull the information from the CDS and after processing, will submit response to State Portal via SSDG. Citizen will get periodic status update on State Portal. For generating the e-Forms on State Portal, C-DAC's e-Form Engine (Fulcrum) technology was proposed.

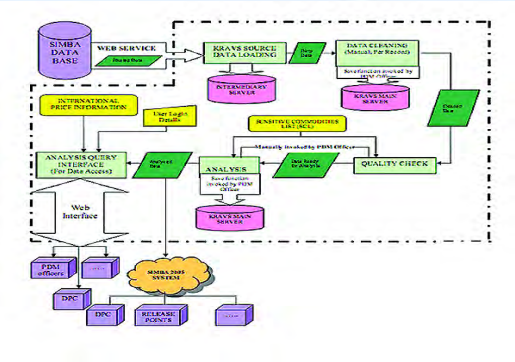
Following are the advantages of Fulcrum, the e-forms solution being developed over other tools:

- It is a very user friendly tool. Users have the option to drag and drop the fields in order to create new forms or modify the existing forms.
- The forms generated by the engine are supported by all popular browsers.
- The forms created by Fulcrum are lightweight and hence require less memory footprints and therefore can also be accessed from any remote village.
- Validation of form data can be achieved dynamically without writing any additional code. Most common validations are covered at the time of form generation.
- Fulcrum also assists application to have server side validation by providing schema of form generated.

Four (4) regional workshops have been conducted across the country. The Fulcrum Workshops was attended by participants of different Government departments from neighboring States. The key beneficiaries of the workshop included State officials from Department of IT, e-Mission Teams, IT Implementation agency, NIC, Nodal officials from other Government departments. The one day regional workshops were jointly organized by C-DAC and Wipro Ltd.

Kenya Revenue Authority Valuation System (KRAVS)

KRAVS is a web based data analysis and decision support system designed to assist Kenya Revenue Authority, Kenya in detecting discrepancy in import valuation. It acts as a repository for all the import data in the country and performs statistical analysis on it. It has an extensive data querying capability with support for graphical outputs. KRAVS has been developed by C-DAC in consultation with Directorate General of Valuation, Mumbai for Kenya Revenue Authority, Kenya.The system has been deployed at Kenya Revenue Authority and is operational since June 2010.



Functional Architecture of Kenya Revenue Authority Valuation System (KRAVS)

KRAVS is completely developed on FOSS environment using FOSS tools and libraries. We have also provided the complete source code of the system to KRA, with full documentation.

Intelligent Advisory System for Farmers (IASF)

IASF is an intelligent advisory system for farmers, particularly for those in the North-East region of India. The project was started in June 2010 with the help of agricultural experts from Manipur and Meghalaya and it will cover all the eight states of NE region of India. The project is sponsored by DIT, Govt. of India.

At present, IASF supports 4 major farming activities, Crop Selection, Weed Control, Pest Control, and Disease Control. A farmer can ask a question related to the above farming activities and the system searches for a possible solution from a large database containing collection of useful cases. If the system finds a reasonable solution, the solution is provided to the farmer. Otherwise, an expert has to provide solution to the question. Then IASF will forward the solution to

the farmer using a convenient medium. Now the question with the new solution provided by the expert becomes a new case for IASF. This new case is used by IASF for similar questions in future. It means IASF is a self-learning system by acquiring new problems and corresponding solution.

Work is in progress to localize the system into Manipuri and other NE languages, and to enrich the portal with discussion forum, multimedia, etc.

National e-Gov Service Delivery Gateway (NSDG)/ State e-Gov Service Delivery Gateway (SSDG)

A messaging middleware is the backbone of e-Governance in India envisaged by Department of Information and Technology (DIT). NSDG is envisaged for mainly central govt. services and SSDG is to be used for the state wide services. So far Up E-District has achieved 1 Lakh transactions through NSDG. E-Biz, MCA21, TMR are various services that are about to complete their integration with NSDG. UID, CCTNS and Passport seva are also to be integrated with NSDG.

SSDG became an important activity this year. SSDG is now deployed at Tamil Nadu, Goa, Uttar Pradesh and Himachal Pradesh states. Consultancy has been provided to sates of Karnataka and Pondicherry for adoption of SSDG. The Boss distribution of Linux has also been customized with SSDG stack. Two workshops were conducted for guiding the deployment of SSDG, and integration of services and portal with SSDG.

SSDG Installer Software was developed by C-DAC for simplifying the task of SSDG deployment by Implementation Agencies.

Graph Mining Tool (GMT)

C-DAC developed Pruthak, a graph mining tool prototype based on the unified framework proposed for graph mining and analysis of extracted substructures. The tool provides preprocessing, frequent substructure discovery, dense substructure extraction and visualization techniques for graph representation of data. We conducted study on the DBLP dataset for mining and analyzing substructures using this tool. The study results have demonstrated the intended correctness and usability of the tool. The tool prototype was made available for download at C-DAC Mumbai website.

National Resource Centre for Free/Open Source Software NRCFOSS Phase-II

Cloud test bed has been setup at C-DAC Chennai. Applications like PIS and Moodle has been ported. A New Stack of Software to develop/deploy SaaS based applications has been completed. The stack includes Grails Framework, PostgreSQL, and Plugins that enables Multi-tenacy, Security and RBAC.

Migration analysis done on Kerala Cloud Project under the MOU between C-DAC, IIITM-K & Kerala State IT Mission for feasibility study of their application. Sample application - SPARK - is deployed in Cloud environment for proof of concept phase. The application is tested and performance is found to be satisfactory and performance can be fine-tuned on cloud enabling the application.

BOSS Linux for Netbooks: Basic distributed version of NetBOSS has been ported on a sample Samsung Netbook Device, Drivers for Wi-Fi and touch screen were compiled and installed, Boot time reduced from 45 seconds to 30 seconds

NRCFOSS Portal enhanced to include repository of e-Governance & Scientific applications with search capability.

BOSS Linux Support Centre Project

- EduBOSS ver 1.0 – Tamil was released during the Tamil Internet Conference in Coimbatore during June 2010
- EduBOSS 2.0 – an up-gradation of EduBOSS 1.0 was released during Elitex 2011. EduBOSS 2.0 feature latest

kernel updates, Gnome updates and new tools.

- EduBOSS Linux is being deployed in 90000 Systems in Punjab.
- BOSS Linux ver 4.0 released in Pondicherry by Hon'ble Minister of State, Communications & IT, Govt. of India. Features Linux kernel 2.6.32-486, Open Office 3.2 and Gnome 2.30.
- Organised FOSS Forward workshops across the country, to promot FOSS adoption.
- Approx. 46,000 machines of all Govt. upper primary schools (i.e. 4,965 schools) have been deployed completely on EduBOSS Linux (March 2011) in Punjab.
- BOSS manual translated and printed in regional language (Punjabi) was also distributed to the respective teachers for their reference.
- Punjabi Books from class 6th to 12th are prepared on EduBOSS Linux according to the guidelines and syllabus provided by the PICTES.
- In December 2010, Punjab EDUSAT Society (PES) published a tender to procure approx. 90,000 nodes with shared computing devices. After the approval of high-level committee under the chairmanship of Hon'ble Chief Secretary, Govt. to Punjab, an order is placed to swap EduBOSS Linux in the same tender where Microsoft was a party earlier.
- MoU has been signed with Directorate of School Education, Haryana for providing support, training & updates for five years on EduBOSS Linux.
- The Haryana School Education has also undergone the same process of preinstalled EduBOSS Linux in all Senior Secondary Schools and approx. 58,000 nodes are being installed in 2,637 schools of Haryana.
- An official approval for replacement of existing 5,000 windows desktop machines with EduBOSS in various schools of Haryana has been sanctioned in October 2010.
- Designing & compiling books from class 6^{th} to 12^{th} on EduBOSS in Hindi is in progress.
- Around 2000 successful implementations are completed within 90 institutes/academic colleges/Universities among different states.
- BOSS Linux deployed for preparation of Village Committee Electoral Roll (Bengali only) for Tripura Tribal Area Autonomous District Council Election 2011 conducted during Feb 2011.
- Indian Navy has given order for Customisation of Secure BOSS Linux to Indian Navy. Indian Army evinced keen interest in BOSS Linux deployment in Army offices. MOU darft submitted.
- In this year workshops had been conducted at Guwahati (Assam) and R.N. Mukherjee Hall (Kolkata) as a National Awareness Programme by C-DAC family.

CBSE Project

This project which started this year, involves

- Building a repository of e-learning resources for Math, Science and social science subjects. Tutorial/modules content will be made interesting and meaningful with appropriate visualization of the content followed by animation, pictures and voice over. The content will be available in multiple formats like CDs, DVDs, USBs and hard copies.
- Customized EduBOSS distribution for CBSE school requirements with relevant utilities and learning resources on few selected topics initially relevant to ICT.
- EduBOSS lab equipped with relevant hardware, software resources and tools.
- Trainers training for CBSE teachers at the locations identified by CBSE spread across all regions. Approx. 5000 teachers shall be trained.

Enhancing Accessibility for FOSS Desktops

As the penetration of information and communication technologies is reaching beyond the upper strata of society, a number of concerns are becoming significant. The disabled people are a major category of concern. This includes the visually impaired (fully or partially blind), hearing impaired, mentally challenged, people with cognitive disabilities (memory loss, etc.) and cerebral problems, etc. Some amount of work has been done in adapting standard speech synthesis and

recognition tools to address the needs of the visually impaired. However, little attention has so far been given to the vast variety of other disabilities.

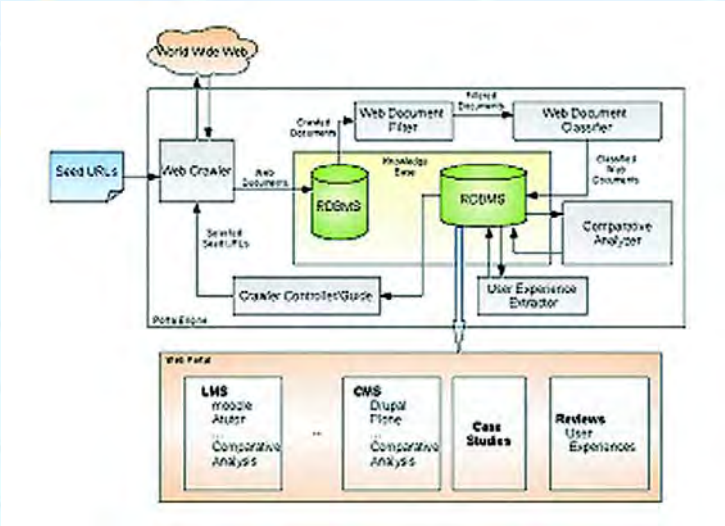
Activities so far:

- Predictive Text Entry System integrated to Linux desktop
- Screen-reader based Desktop
    - Enhancements to open source screen reader ORCA
    - Making PDF documents more accessible
    - Work on enhancing structural navigation on FOSS desktop and Open Office word processor is going on.
- Solutions for physical and cognitive disabilities
    - Mouse and hand gesture based input mechanisms
    - Desktop for cognitively disabled

Building a Knowledge Bank for FOSS in Education

Given the abundant availability of FOSS tools to support educational activities, an institution/teacher has to take lot of efforts to select software for adoption. One has to spend days looking for different software, their reviews, comparisons, user experiences, etc. Effective respositories go a long way, in alleviating this kind of problems. If such problems are reduced, then the institutions/teachers can reap the benefits of FOSS much more seamlessly.

This project provides a generic portal framework for knowledge repository which is based on intelligent approaches like information retrieval and machine learning among others. The repository contains web documents automatically classified into various classes like, LMS, CMS, etc.It also contains user experiences for different classes, and comparative analysis of various tools belonging to respective classes. The portal also has features like specialized search engine, collaboration facility for community supported content updates, and linkages with recognized forums for dynamic updates.



Architecture for Knowledge Repository for education

Multimodal Interface

The proposed system extends the user interface by offering users the choice of speech, digital pen (for hand written), and camera [for gesture input]in addition to the conventional input devices of keyboard and mouse for interacting with the system. A PoC has been developed through which user can control the screen cursor through finger gesture (which will be captured via web-cam) and can also issue command through speech. The system is targeted to Spastic and disabled population. We have been discussing with Spastic Society of Karnataka, (an NGO working for the empowerment of Spastic People) for collecting the requirements.

India Development Gateway (InDG) - Phase II

India Development Gateway (InDG) during its Phase I established a multilingual platform with information, products and services on five identified verticals. The objectives of Phase II are to expand the scope of InDG in terms of the information, products and services delivery to the rural communities. Under the project, C-DAC completed the following:

- Content in 2 more languages (Assamese & Kannada) included in the multilingual portal (www.indg.in)
- Conceptualized & piloted 3 value added services (Weather Forecast, Vyapar & Ask An Expert)
- One multimedia product on "Nutrition & Health" developed in 6 languages and made available for public use.
- Experimented the concept of 'State Resource Groups' on pilot basis to ensure the dynamic and localized content development.
- 'Average Daily Hit Rate' of the www.indg.in portal increased from 2630 users (March 2010) to 4460 users (March 2011). Over 13350 page views daily across 8 languages. Total 23600 farmers are getting Market Information through SMS, daily 900 CDs on 'Nutrition & Health' distributed through National Institute of Nutrition, Hyderabad. About 600 VLEs (CSC operators) trained by InDG team on various ICT modules.

Buyer-Seller Platform (Vyapar):

This online platform provides opportunity for the community to exchange information regarding the products and services required to buy, sell, rent or availing consultancy. It has been made available for public use in 5 languages (Hindi, Telugu, Kannada, Marathi and English) and being piloted in selected districts through Common Service Centres. Buyer Seller Platform successfully piloted in 2 CSC clusters (Madhya Pradesh & Andhra Pradesh).

Ask An Expert:

This online platform attempts to provide expert solutions in selected subjects like Agriculture, Health, Nutrition, RTI and education. It is made available in 6 languages and expert answers also provided in local languages. A customised 'Ask An Expert' product has been developed in Telugu for Department of Agriculture, Government of Andhra Pradesh and is being utilized by the department for providing expert solutions to farmers.

KSPB Weather Portal

Developed a web based portal (Kaalavastha) to provide weather prediction for Kerala State Planning Board (KSPB) which will help them for planning and management of various agricultural activities. The portal gives weather information of next three days for the Agro ecological units of Alapuzha district in Kerala state. Kaalavastha portal presents daily weather forecast of temperature, humidity, wind speed and direction, rainfall and chance of rainfall for the zones viz. Southern Coastal Plain, Onattukara sandy Plain, Kuttanadu, Pokkali Lands and South central laterite of Alapuzha district. It is available at: http://rtws.C-DAC.in/kaalavastha/

Web based Portal "Kaalavastha"

Video Summarization

Video summarization aims at providing an abstract of a video. The objective of this project was to create a shorter video clip that maintains the semantic content of the original video stream. The implementation uses Java platform to break a video into frames, compare the image frames for similarity, delete similar frames retaining only the relevant ones and

then recreate the video from the selected frames to form the shortened video stream. A sample 9/11 surveillance video was taken and summarized with reasonable acceptance results.

National Study Report on Digital Preservation Requirements of India

C-DAC successfully completed and delivered the National Study Report on Digital Preservation Requirements of India. The report is presented in two volumes as under:

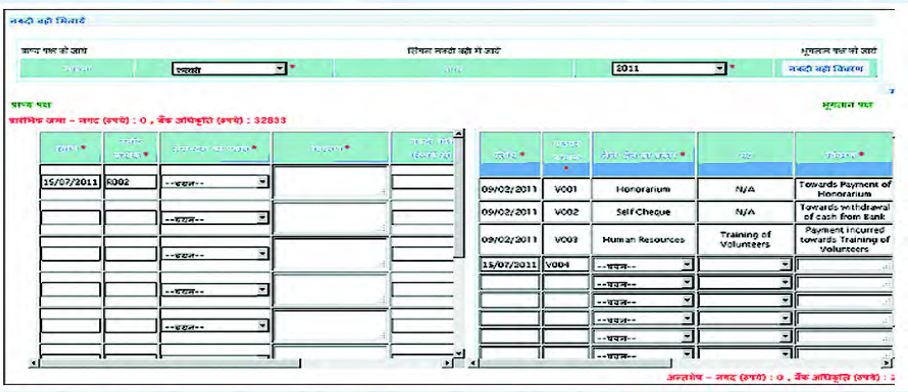
- Volume-I Recommendations for National Digital Preservation Programme of India
- Volume-II Position Papers by the National Expert Group Members

The report includes an overview of international digital presentation projects, study of legal imperatives, various technical standards, and the consolidation of recommendations given by the national expert group which included archivists, technologists and stakeholder representatives of 30 organizations from diverse domains such as e-governance, government records, audio, video and film archives, cultural heritage, health, science and education, insurance and banking, law, etc. It specifies the short term and long term action plans with specific R & D projects to be initiated under the National Digital Preservation Programme of Department of Information Technology.

Fund and Accounts Management System (FAMS) for Saakshar Bharat Mission Scheme for Adult Education

Saakshar Bharat Mission scheme launched by the Prime Minister aims to promote and strengthen Adult Education, especially for women, by extending educational options to those who have lost the opportunity to formal education or have crossed the standard age for receiving it. National Literacy Mission Authority (NLMA) is involved in planning, implementing and monitoring this scheme.

Fund and Accounts Management System (FAMS) is web-based system that aims to manage and monitor the fund flow from NLMA to the programme-implementing units. FAMS follows the mercantile system of double entry accounting based on NLMA accounting guidelines. FAMS will produce all the accounting reports such as Cash Book, Bank Book, Ledgers – Credit and Debit, Cheques issued and Bank Reconciliation Statement. FAMS will cater to the officials in implementing the Saakshar Bharat scheme at State, District, Block and Gram Panchayat comprising almost 2 lakh users.At the end of each month, a Trial Balance, an Income and Expenditure account, and a Balance Sheet for each Gram Panchayat (GP), Block Panchayat (BP), District Panchayat (DP) and the State Literacy Mission Authority (SLMA) are generated.



Fund and Accounts Management System (FAMS)

The Indian Regional language support feature brings an impact on implementation of the project at ground level, as users can view data in their own language. As the user logs-in to the FAMS system, he/she can view the interface in his/her State's regional language, apart from English and Hindi.

Generic Works Management Framework

Taking note of the emphasis laid in the 11th five year plan on the creation of infrastructure and monitoring the quality of expenditure of projects covered under various schemes of the central and state governments, C-DAC undertook an effort to develop a generic framework to track and monitor the physical progress of such projects. This effort has culminated into a comprehensive web based solution based on the centralized architecture known as the Works and

Accounts Management information system (WAMIS). This system covers the entire lifecycle of a typical construction project work right from its inception to its completion. The system is work flow enabled and comprises various building blocks in the form of modules as described below:

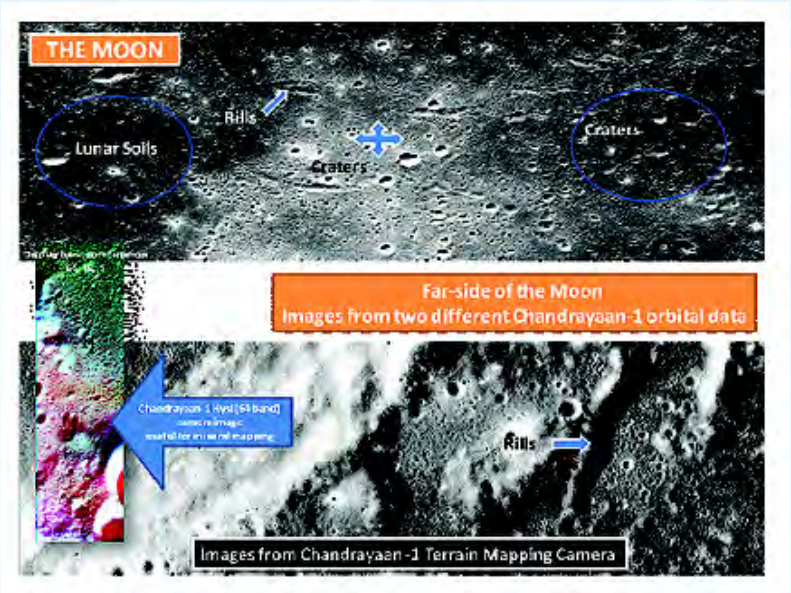
- Budget Preparation and Management-This module captures the entire budgeting process including demand for grants, Budget sanction, Allocation of funds, Release on the basis of LoC, Re-appropriation of Funds and Surrender of funds.
- Works Management and Billing – This module covers topics such as administrative approvals, technical sanctions, generation of contractor's bills on the basis of recorded measurements based on the SoR.
- Accounts Management System -This is a voucher based accounting system that captures all the account transactions of a typical office. This system is based on the CPWA code, which has been prescribed for various engineering departments for accounting purposes
- MIS- A comprehensive MIS has been developed in the form of dashboard that gives an analytical view of the physical and financial status of the various projects undertaken by the department and compiled for all the office of the department.

Morphometric Analysis of part of South Pole Lunar Craters, using Chandrayaan-1 TMC data

Study Area: South Pole-Aitken Basin of the Moon

Project Highlights

a) Chandrayaan-1 data analysis
b) Generation of Digital Elevation Model (DEM) /3D model for the Lunar Surface
c) Morphometric analysis of Lunar Crater for understanding micrometeorite impact & impact tectonics



Images from Chandrayaan -1 Terrain Mapping

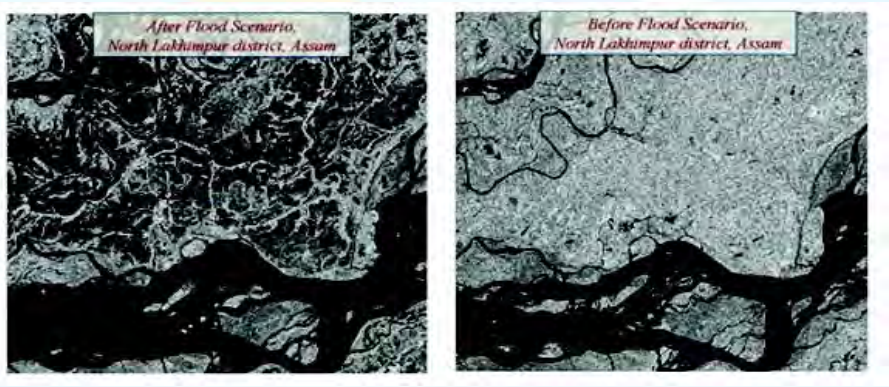
Near-Real Time Flood Monitoring in the Brahmaputra Valley Using Microwave Remote Sensing

Study Area: North Lakhimpur,Assam

Project Highlights

- Mathematical transformation and thresholding-based microwave data analysis for automatic extraction of inundated areas
- Developing a system for analysing microwave data to derive flood related information for the end user to operate in near-real time.

- Probabilistic flood inundation maps for various discharge levels
- Comprehensive, unified and timely data for post flood disaster management in the form of a Flood Response System (FRS)



Near Real Time Flood Monitoring System

Identification of Potential Iron ore Mineralized Zones

Study Area: Parts of Bellary, Chitradurga and Tumkur districts of Karnataka

Project Highlights

- Preparation of lithology maps and extraction of contours
- 3D visualization of the study area to better understand the topography
- Identification of potential Iron ore mineralized zones based on RS & in situ data to aid further Geological investigations

Comprehensive Spatial Decision Support System (SDSS) for Forest Management-Bodoland Territorial Areas District (BTAD)

Study Area: Bodoland Territorial Areas District

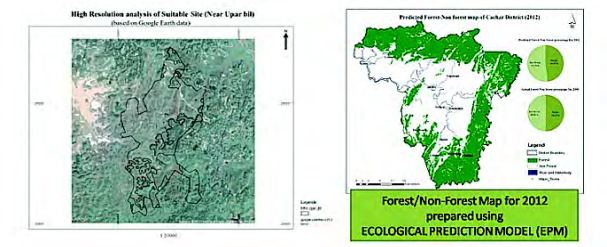
Project Highlights

- Forest working plan automation
- Interactive forest village rehabilitation planning
- Carbon pool calculator
- Joint forest management
- Habitat suitability analysis
- Identification of encroachment areas
- Forest crime analysis
- Comprehensive SDSS- ARANYA

SDSS for Forest Management

Multicriteria Spatial Modeling for Identification of Potential Afforestation/Reforestation Sites for Claiming 'Carbon Credits' and Analysis of Futuristic Landuse Dynamics

Study Area: Kamrup & Cachar Districts, Assam



GIS based Predictive Modeling

Project Highlights

- Identification of potential afforestation/reforestation sites for generation of carbon credits considering eligibility, climatic, ecological and biodiversity criteria
- GIS based predictive modeling for future forest cover estimation

Biodiversity Characterization at Landscape Level using Satellite Remote Sensing and GIS

Study Area: Bihar, Maharashtra (Including Western Ghats), Central India

Project Highlights

- Identification of biodiversity hot-spots using principles of landscape ecology and geo-informatics
- Preparation of vegetation-type maps and biodiversity characterization
- Identifying areas for conservation prioritization based on analysis of biological richness (calculated by taking social, biological, terrain and field datasets into consideration)

Glacier Lake Management Information System

Study Area:Sikkim

Project Highlights

- Identification and classification of glacier lakes in the Sikkim Himalayas
- Real time monitoring of the selected glacier lakes for developing preparedness and resilience in case of Glacier Lake Outburst Flows (GLOFs)
- Installation of field sensors on a pilot basis at potential hazardous lakes for deriving flood related information for damage assessment
- Development of geo-informatics technology based Glacier Lake Management Information System

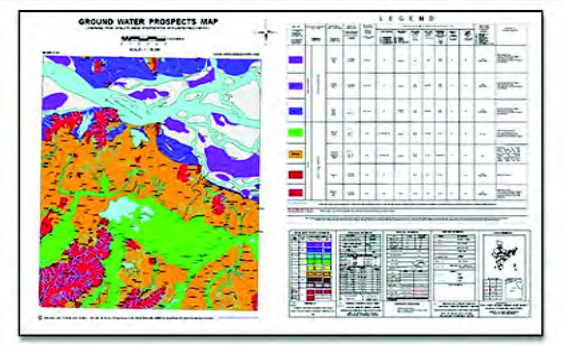
Glacier Lake Management Information System

Groundwater Prospect Mapping using Remote Sensing Data for Rajiv Gandhi National Drinking Water Mission

Study Area: Western Parts of Assam

Project Highlights

- Groundwater Prospective Mapping at 1:50,000 scale
- Maps showing ground water potential zones and tentative locations for constructing recharge structures
- Identified groundwater resource for non-covered (NC) and partially covered (PC) habitations to bring them under drinking water supply scheme (ARDSS-Norm)



Groundwater Prospect Mapping

Feature Enhancements in the IPR portal

The IPR portal (http://ict-ipr.C-DAC.in) was enhanced and some additional features were added to the portal, as listed below.

- Patent Alert Service: An alert is sent to the registered members on the portal through mail, when a patent application is published in either of the identified IPC classes. User can select from the four categories of the ICT sector, the patents of which he/she wants to receive as a part of the service.
- Discussion forum was added to the portal which would provide a platform for discussing any IPR related issues.
- Users can post any IPR related news/events on the portal and after verification it will be published on the website.
- The users registered in the portal can view/search the profile of all the registered members of the portal.
- IPCID (Automated International Patent Classification Identifier) tool was developed and integrated in the portal. This tool is designed to assist the user to categorize the patent abstract according to IPC (International Patent Classification) system. This will help the user in narrowing down the Prior art search results.

Digital Library for North Eastern States

The North Eastern Region of India is famous for cultural heritage and rich flora and fauna. There are several libraries having thousands of rare and heritage books including local language manuscripts / literature pertaining to diverse fields, which are very important for archival and preservation for posterity. DIT, Govt. of India has decided to preserve all these heritage books available at North Eastern states through digitization process within next two years. C-DAC has been entrusted this challenging job.

A digital content repository and retrieval system with OAIS solution will also be set up at each of the North East States for their digitized books along with the main repository at C-DAC, Kolkata as a central hub.

Digitization of Rare materials available with Visva-Bharati:

Visva-Bharati, a central university and an institution of national importance founded by the Nobel Laureate Shri Rabindranath Tagore is under the Ministry of HRD, Govt. of India. It holds rare collection of books, manuscripts, journals, paintings, gramophone records etc.,a treasure associated with the poet and the painter that is gifted to our national heritage. For dissemination of this rich heritage collections to the world and also its long-term preservation for our future generation, C-DAC has been entrusted with the responsibility to digitise and microfilming of these rare materials. The project is being sponsored by Raja Rammohun Roy Library Foundation (RRRLF), a cultural society under the Ministry of Culture, Govt. of India. The objective of the project is to preserve the materials by digitising and microfilming the heritage books, hand written journals, bound periodicals etc available with the Rabindra Bhavana, Kala Bhavana and Sangeet Bhavana of Visva-Bharati. A web-based Digital Repository cum Retrieval system (D-World) based on OAIS is being developed using Open Source Software Technology. It would archive and retrieve the digitized data. A Heritage Portal is also to be developed for dissemination of digitized data.

Digital Library of Rare and Copyright Free Resources

A major activity of the Digital Library Initiative of DIT, MC&IT, Govt. of India is being implemented through a Regional Mega Scanning Centre, established in C-DAC, Kolkata since 2005. The work involved is digitization of Rare and Copyright free Books & Manuscripts of Eastern and North-Eastern part of the country. Under this Initiative the 2nd Phase work is going on and as of now, over 26 Million pages have already been digitized from over 65,000 Rare and Copyright Free Books by installing Overhead Book Scanners at different libraries of West Bengal. Recently, DIT has sanctioned another project extending the digital library activities for all North Eastern states of the country. The 2nd Phase Ongoing Project in this technology area of Content Creation, Storage and Access is progressing as per schedule. The aim of this project is to create a portal of Heritage Books and Manuscripts of India, which will foster creativity and free access to all human knowledge. As a first step in realizing this mission, it is aimed to create the Digital Library with a free-to-read, searchable collection of one million books, predominantly in Indian languages, available to everyone over the Internet. This portal will also become an aggregator of all the knowledge and digital contents created by other digital

library initiatives in India. The result will be a unique resource accessible to anyone in the world 24x7, without regard to socioeconomic background or nationality. Those books have already uploaded in the website and available in the http://www.dli.ernet.in

Beej Prabandhan Project

C-DAC has designed and developed a software solution named “Beej Prabandhan” – a Web based Supply Chain Management software to facilitate National Seeds Corporation (NSC) with its 150 geographically distributed offices. The workflow enabled “Beej Prabandhan” solution comprises different modules for production planning & control, sales and marketing, inventory management, quality control and financial management.The system is web-enabled, developed in data-centric architecture using J2EE as a front end over Oracle 10g AS and Oracle 10g as a database.

Design and Development of website using Web 2.0 tools for Public Diplomacy Division of MEA, Govt. of India

Social media enabled website for Public Diplomacy Division of Ministry of External Affairs, India platform provides information regarding India’s latest news, events, etc. We have used Web 2.0 tools for this and also connected with different social networking sites. Subscription for latest uploads is also provided to users. Website was launched by the Foreign Secretary of India, Ms. Nirupama Rao.

- MEA’s PD Division received the prestigious India eGov 2.0 Award 2010 (Editor’s Choice) for the most innovative use of Social Media and Web 2.0 tools in government.
- MEA’s PD Division received the prestigious Gov2.0 Award-2011 for Exceptional Achievement in Gov 2.0, for being the first central ministry to propagate and use social media extensively.

e-Recruitment as a Service

The e-Recruitment at C-DAC Mohali takes care of the extremely sensitive & confidential work involving lacs of applications waiting to fill up available posts. A full transport system is ensured and the criteria given by the recruiting agency is strictly adhered to.

C-DAC conducts all tests in a totally secure and confidential manner. The test is supervised & conducted at various test venues systematically with the help of trained invigilators and with external observer to ensure transparency for the test, OMR sheets are used whose accuracy is extremely high.

Around 25 recruitment requirements have been serviced through this effort during the last year, spanning agencies such as Rashtriya Madhyamik Siksha Abhiyan, Punjab; NRHM, SCERT, Punjab; Punjab Health System Corporation; etc.

Bharat Operating System Solutions as Embedded RTOS

Bharat Operating System Solutions Embedded RTOS, is an Embedded Real Time Operating System based on the Linux kernel for the ARM processors. This is a full featured Linux based OS developed by C-DAC and provides support for deterministic event response and better memory efficiency.

Major Features are

- Standard Linux kernel 2.6.22
- Supports ARM CORTEX processor
- Minimum memory footprint
- Real time response time in the order of hundred micro seconds
- Monolithic kernel architecture
- POSIX Compliant
- Supports multitasking and multithreading
- Inter-task communication and synchronization
- Dynamic memory allocation
- High level of user configurability

- Prioritized and nested interrupt handling
- Less context switching and event latency time
- Quick and easy installation
- QT based Graphical User Interface (GUI)

SreeSakthi Portal and MIS for Kudumbashree Mission, Kerala

C-DAC has deployed an Integrated Management Information System and a Portal for Women's Empowerment, through Information compilation, dissemination, and Self Learning, and for monitoring the activities of Kudumbashree Mission in Kerala at the State, District and CBO (Community Based Organization) levels. The Portal provides a common platform for all women in the Kudumbashree network in Kerala, for learning the legal, social and cultural aspects of Gender Empowerment.

The MIS functions implemented include:

1. General information
2. CBO Information
3. MicroFinance
4. MicroEnterprise
5. Samagra Schemes
6. Collective Farming
7. SJSRY Schemes
8. Urban Community Development Programmes
9. Social Empowerment Schemes
10. Plan and Expenditure

The Portal Functions include:

1. Samvadavedi – Discussion Forum
2. Anubhavangal – Experience Sharing by Different groups
3. Padana Sahayi – Theme creation and Dissemination
4. Aneweshanam – Consultation on Legal, Health, and Social issues
5. Vijaya Gatha – Success Stories
6. Varthapathrika – News letter
7. Training Materials
8. Training Calendar
9. Photo Gallery
10. Feedback
11. Activity Calendar

Web based Bharateeya Embroidery

The project titled Bharateeya Embroidery will cover all the embroidery techniques and embellishments used in Indian embroidery, and provide design libraries and eLearning modules for each of these techniques. C-DAC recently released a window based Library of Designs (Ver.1.0: Phulkari). It contains more than 500 designs of Phulkari – the embroidery technique from Punjab. Rich colors and bold patterns created using the bright unspun silk floss yarn are the hallmarks of this technique. Besides, there are a variety of styles of Phulkari for different occasions and purposes.

Bharateeya Embroidery

Cyber Security and Cyber Forensics

Malware Prevention System

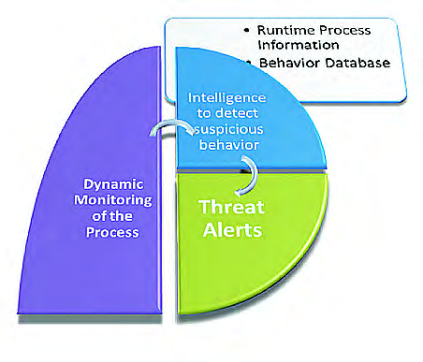
Design and Development of Malware Prevention System is an R&D project funded by DIT for a period of 3 years. As part of this project anti-malware solution is successfully developed for Windows as well as Linux operating systems. Behaviour model of application is captured and later it is enforced on every end-system whenever the application is executed. In case of any deviations from the captured behaviour, they are blocked. This solution, enforced at runtime for preventing the malicious behavior, is successfully developed and field-tested.

Network Abhigam niYantrAN (NAYAN)

NAYAN addresses the access control and authentication requirements of end systems. NAYAN controls the access to different network services at the end system level, protecting internal network from rapidly propagating threats and network misuse.

Malware Resist

Malware Resist addresses the malicious software issue using behaviour based detection technique. This solution eliminates the need for constantly generating and updating the new malicious software signatures.



Malware Resist

USB Pratirodh

USB Pratirodh is a software solution which controls unauthorized usage of portable USB storage devices like pen drive, external hard drives, cell phones, iPods and camera. Only authenticated users can access the removable storage media. This works on Linux and Windows operating systems

Cryptanalysis: Novel Intelligent Techniques and Algorithms

Cryptanalysis is the art of deciphering encrypted communications/data without knowing the keys/password. The current phase of the project will develop a password recovery tool to recover passwords from encrypted MS Office, PDF, WinZip and WinRAR files. This tool will use sophisticated algorithms like Markov Model, Probabilistic Context Free Grammar, etc. for password generation and develop an optimised product using GPUs and FPGA-based hardware engines. Further, it has been planned to enhance the special purpose hardware to 2^60 DES equivalent cipher text-only attack (worst case) within 13 days / 256 AES cipher text-only attack (worst case) within a week.

Development of Security Solutions for SCADA Systems

This project addresses three major threats associated with Supervisory Control and Data Acquisition (SCADA) systems: Denial of service attacks, phishing attacks and malware attacks. The proposed countermeasures include SCADA protocol hardening, operating system hardening and patch management.

Many of the SCADA protocols do not support any kind of cryptography; sniffing communications on the network is possible if the attacker succeeds in intruding into the network. An attacker could learn all the data and control com-

mands while listening to the traffic and could use these commands later to send false messages. An attacker can also tamper with the data transmitted over the network and thereby compromise its integrity.

A project was undertaken, which involved development of

- Cryptographic Key Management System: Key management module deals with SCADA data encryption/decryption to provide the data integrity and authentication. This will constitute MTU acting as a key distributing agency as well as an encrypting and decrypting device for message exchange on one end and RTUs having a corresponding bump in the wire device for encryption and decryption for each message sent or received respectively.
- Security Information Event Management (SIEM): This module will provide the intrusion detection/prevention capabilities to handle the SCADA traffic based on rules and anomaly, event correlation engine, and deep packet inspection.

Four patents have been filed so far as part of this project.

Counter Terror Tracking System (CTTS)

Counter Terror Tracking System is a planned system for managing information of criminals / terrorists / accused in an efficient manner. This application facilitates users / department officers with more sharable and consistent information which can be utilized to identify or track the criminal as well as to recognize history, series of crimes committed, current status and other parameters related to the criminal.

Dynamically Configurable Honeynet System

The Dynamically Configurable Honeynet System is designed for attack data collection, threat analysis, network/host log monitoring. As a part of this, an automated malware collection mechanism is developed based on the file system state changes monitored and an automated mechanism is developed for dynamic analysis of malware binaries. Behaviour-based detection mechanism for IRC bots and development of honeynet-based mechanism for IRC botnet C&C servers detection have been carried out. Research is being continued for malicious Web Server detection and HTTP kind of botnets/ P2P botnets.

Biometric Identification Module

C-DAC developed a robust algorithm for fingerprint enhancement, extraction, identification and storing, and implemented the same on an embedded hardware. The module has a False Acceptance Rate of less than 0.001% and a False Rejection Rate of 1.0 %. A Biometric Access Control System was also developed, as part of the project, by combining the finger print identification module with a smart card reader.

Cyber Forensics & Digital Analysis Centre for Kerala Police

A state-of-the-art training lab with interactive learning facilities has been set up for Kerala Police at Thiruvananthapuram. Most of the prominent cyber forensics tools developed by C-DAC, have been deployed at the centre. The Centre has facilities for seizing, authenticating, acquiring, analyzing and documenting digital evidence from computer storage media and computer network, mobile phone, PDA, smart phone etc. The centre will also facilitate the law enforcing agencies to get their officers trained in cyber forensics investigations.

Design and Development of Enterprise Forensics System, Advanced Cyber Forensics Tools and Virtual Training Environment Facility

A project was undertaken to pursue research in cyber forensics areas like disk forensics, network forensics, device forensics, enterprise system forensics, live forensics, etc., and to indigenously develop tools in these areas to help law enforcement agencies (LEAs) to effectively curb the cyber-crime menace. Other objectives of the project were providing training on cyber forensics and technical support to LEAs for seizing, acquiring and analyzing cases involved in cyber-crimes. 150 cyber-crime cases had been analyzed and reports were submitted to various courts, cyber cells and intelligence agencies.

Virtual Training Environment for providing practical sessions in cyber forensics training was set up. More than 30 training programmes (basic and advanced level) on cyber forensics were conducted targeting LEAs such as the State Police, IB, CBI, Forensics Science Laboratory, Defence and Income Tax and Revenue Intelligence.

Following cyber forensics tools were designed, developed and commercialized under this project.

1	CyberCheck V 4.0	Cyber forensics analysis software
2	Enterprise Forensics System V 1.0	Forensics for enterprises and corporates
3	MobileCheck V 1.0	Mobile phone forensics tool
4	WinLift V 1.0	Live Windows forensics tool
5	F-DaC V 1.0	Forensics Data Carver
6	F-RAn V 1.0	Forensics Registry Analyzer
7	F-TEx V 1.0	Forensics Thumb nail viewer
8	TrueBackWin	Forensics seize/acquisition on Windows
9	TrueBackLin	Forensics acquisition on Linux
10	TrueImager V 2.0	High speed hardware forensics imager
11	TrueBackBridge V 1.0	Hardware to seize/acquire computer hard disks without opening the computer
12	TrueTraveler V 1.0	Portable forensics hardware/software tool kit

Cyber Forensic Tools

All of the indigenously developed cyber forensics tools were deployed at various law enforcement agencies in the country, for controlling cyber-crimes.

- 42 copies of cyber forensics tools, developed at Regional Centre for Cyber Forensics (RCCF), were supplied to IT Centre at Damascus, Syria, set up by Ministry of External Affairs, India.
- MCTE (Military College of Telecommunication Engineering), MHOW (Military Headquarters Of War) placed an order for Cyber Forensics tools and training.
- RCCF participated in the Cyber Forensics Challenge organized by the Cyber Crime (DC3) cell of the US Department of Defence and was ranked 12 among non–US participants.

Setting up of Cyber Analysis Cell within NIA

The objective of the project was to set up a Cyber Analysis Cell within NIA having facilities for seizing, authenticating, acquiring, analyzing and documenting digital evidence from computer storage media and computers at the NIA HQ, New Delhi.

C-DAC, with its rich experience in setting up of forensics labs, at many places, successfully established a model centre at NIA, with a collection of state-of-the-art cyber forensic tools developed by C-DAC as well as other prominent organisations.

Bharatiya Automated Fingerprint Identification System (Bharatiya AFIS)

C-DAC's Bharatiya AFIS refers to a family of Software Development Kits (SDKs) and Systems to offer a much improved accuracy and high-performance fingerprint identification for government agencies. The products will be in full compliance with the international standards such as ISO/IEC 19794-2:2005, ISO/IEC 19794-4:2005, ANSI INCITS 378-2004, ANSI/NIST–ITL 1-2007, ILO-SID. The high precision will be achieved with the help of fingerprint's Level III features (pores, ridge contours and edgeoscopic features) which will work in tandem with Level I (pattern) and Level II (minutiae) features to significantly narrow down the search results. In order to capture Level III features, 1000 ppi sensor will be used.

The BharatiyaAFIS Suite offers features including

- Both Verification (1:1) and Identification (1:N) Services.
- 360 Degrees Rotation (Fingerprint Placement).
- Three imprints for Enrollment for much improved accuracy (in all conditions).

- Fingerprint Image input: Raw Image, BMP, JPG, PNG, and TIF, Image Compression.
  Patents filed (Provisional Filing)
- Minutiae-based Fusion Matcher and Fingerprint Authentication System.
- A Robust AFIS (Automated Fingerprint Identification System) based on Cascaded Quality Checks and Multiple Feature Sets at Three Levels.

Discussions are in progress with UIDAI for use of this solution for their biometric requirements.

Design and Development of a Hardware based Network Intrusion Prevention System

As a part of this project, research related to content matching, hardware-based packet analysis and multicore-based parallel packet processing is carried out. Additional emphasis is given to the performance testing of the solution and a prototype network intrusion prevention appliance is developed and deployed at C-DAC.

Research and Development in Network Measurements and QoS to build Self-Managed Network Solution

As a part of this project, research related to QoS, measurement, flow analysis, event correlation and statistical network analysis is carried out and a solution called Advanced Network Management Solution is developed. It is deployed in ERNET Backbone and C-DAC.

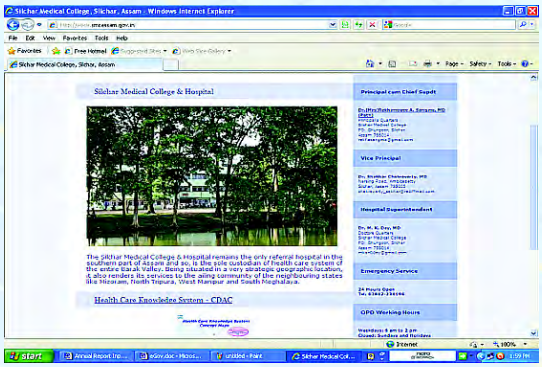
Dynamic Network Firewall

Dy NeF (Dynamic Network Firewall) is a dynamic network firewall for grid environment that supports the dynamic nature of grid and protects it from network intrusions. Our architecture provides host-based access privileges to hosts within the virtual communities, and utilize these privileges for configuring the network firewall dynamically.

Health Informatics

Deployment of Healthcare Knowledge System in the North-East States for promoting Public Health Awareness and Education

The objective of the project is to promote health awareness and IT-enabled health education in all the eight North-East states of India on creating health awareness resources through deployment of Concept Maps based Healthcare Knowledge System, a health awareness and education software developed by C-DAC. The scope of this knowledge engineering project includes knowledge representation / modelling activities like new concept maps creation and integration to the existing software, knowledge graphs layout modification after health knowledge acquisition and health knowledge update from NE local doctors followed by porting the software on the NE state government health department websites and by setting up kiosks at various health centers / CICs of eight NE states.



Healthcare Knowledge Solution

Knowledge acquisition from North-East Doctors and update of concept maps is being carried out. The software has already been ported on the Silchar Medical College website in Assam, Guwahati Medical College, Agartala Government Medical College (Tripura), Tripura Medical College, Directorate of Health Service – Shilong- Meghalaya, North Eastern Indira Gandhi Regional Institute of Health & Medical Sciences- (GOI)- Mawdiangdiang - Shilong- Meghalaya etc.

Healthcare Knowledge System- Concept Maps

This software product hasbeen deployedat (1) National Institute of Health & Family Welfare, Govt. of India, New Delhi, (2) Goa Medical College, Goa (3) Navodaya Medical College, Raichur, Karnataka, (4) Ramakrishna Mission Hospital, Itanagar, Arunachal Pradesh and (5) Kerala Government Rural Health Mission etc.

“AROGYA ONLINE”- Computerization of SMS Hospital, Jaipur and its Replication

Encouraged by the successful rollout of the Hospital Information Management System (HIMS) at SMS Hospital, a 2500+ bed tertiary care medical college hospital in Jaipur, the Govt. of Rajasthan and RajCOMP have signed two Tripartite Agreements with C-DAC under the “AROGYA ONLINE” project. The agreements envisage replication of the HIMS implemented at SMS Hospital in 6 Associate Hospitals and 15 District Hospitals in the State. These Agreements were signed in the presence of the Hon’ble IT & Communications Minister of the Govt. of Rajasthan.

Tripartite Agreement with Govt. of Rajasthan and RajCOMP under the “AROGYA ONLINE”

HIMS on Build-Own-Operate-Transfer (BOOT) Basis

In its endeavor to proliferate the HIMS for the benefit of the public at large, C-DAC has entered into an agreement with Guru Gobind Singh Government Hospital, Delhi for implementing the system on BOOT basis. Under the project, C-DAC will provide the hardware/software and implement and manage the system at their premises at its own cost for a period of five years. During this period C-DAC will charge the hospital only for the services they use.

This model is taken up on a pilot basis and if found viable, will be offered to other hospitals in the country. This can be a boon for the hospitals, which face resource crunch, in computerizing its operations without having to incur any expenses on hardware/software and implementation.

PGIMER-HMIS Project

PGIMER-HMIS Project is an ambitious healthcare project including installation of 3600 points LAN/WAN spread across 14 different hospitals and super specialty buildings, setting up of a high-end data centre, supply/installation of required hardware, online UPS solution across the campus involving laying of about 1.5 lacs meters of electrical wire, software development for 17 modules catering to almost all the activities of PGIMER, user training and facility management for 5 years.

The data centre and other infrastructure required for the project have been created/installed. The design and development of all the 17 modules have also been completed. These are being deployed progressively. The registration module is currently handling about 4000 patients per day.

eSanjeevani

eSanjeevani, is a web-based comprehensive telemedicine solution. eSanjeevani extends the reach of specialized healthcare services to masses in both rural areas and isolated communities. Besides enhancing quality of medical services and addressing issues pertaining to uneven distribution and shortage of infrastructural as well as human resources, eSanjeevani aims to make healthcare services equitable by bridging the digital divide that exists between the urban vs. rural, rich vs. poor, etc. eSanjeevani can also be used to provide medical education to interns, people across various Common Service Centres(CSCs), etc.

e-Sanjeevani telemedicine technology was showcased to the US President Barack Obama during his visit to India by Shri Sachin Pilot,Hon'ble Minister of State, Communications and Information Technology, Govt. of India from Kanpura Gram Panchayat, Ajmer Rajasthan.

A telemedicine facility was launched at CHC Phagi, Jaipur, Rajasthan by Shri Sachin Pilot, Hon'ble Minister of State, Communications & Information Technology, Govt. of India.

Swasthyabaadi: Health portal

Swasthyabaadi health portal is a service provider in the field of healthcare and ICT. It provides information about various diseases, symptoms, drugs, supplements, tests, procedures, etc. This portal will educate people about the patterns of various common diseases that are lethal in nature. The concept of Swasthyabaadi is fast catching-up in rural India where people from any part of the country can get knowledge of medical treatment.

Development and Pilot Implementation of Rural Healthcare Delivery System through Telemedicine using ICT

C-DAC developed and implemented a resource sharing, sustainable, scalable and integrated Rural Healthcare Delivery System through Telemedicine using ICT. The system has been successfully deployed at the identified primary care hospitals in Malappuram District, Kerala.

The system facilitates the selected PHCs (Primary Health Centre), CHCs (Community Health Centre), BPHCs (Block PHC), Taluk Hospitals, and the District Hospital to have expert consultation with the specialty hospitals. In addition to

tele-consultation, the network is extensively used for case discussions; follow up consultations, and for conducting awareness classes and CME (Continuing Medical Education) programmes for doctors, nurses and other paramedical staff.

Telemedicine using ICT

e-Dhanwanthari

The distributed version of e-Dhanwanthari software, designed and developed by C-DAC, is running on the Fault Tolerant Servers (eHealth Server with operating system-based fail-over clustering mechanism) and also on the machines at the peripheral healthcare centres. e-Dhanwanthari facilitates Teleradiology, TeleECG and Telepathology functions and also helps maintain a centralized repository of Electronic Medical Records of patients.

Development and Pilot Implementation of Rural Health Management Information System

The mobile phone based application mCARE developed by C-DAC, enables health workers to use smart phones for capturing data from field and thus to analyze public health data from grass root level. The collected data is transferred to a central server for secure storage, report generation and analysis. The application is fully developed using open source technologies and can be deployed on any smart phone which runs on Windows Mobile Operating System. Such a comprehensive mobile phone-based public health information system, which collects all health related data from the grassroots level, is the first of its kind in India.

mCARE has been successfully implemented at 20 locations (PHCs/CHCs/BPHCs) at Tirur Taluk of Malappuram district, Kerala. The system has demographic details of around 7 lakh population in the central server.

Mobile Tele Oncology unit for Malabar Cancer Care Society

Sanjeevani is a comprehensive system for the Management of Cancer at the State/National level. It is the first Mobile Tele-oncology implementation in India, expected to cut down patient visits to cancer hospitals by at least 30%. The system provides telemedicine services for early cancer detection, follow up consultation, treatment of cervical cancer and awareness building to rural masses, at five northern districts of Kerala.

Sanjeevani comprises a Mobile Tele Oncology unit with satellite communication link, advanced diagnostic and treatment equipments, telemedicine infrastructure, software for Electronic Health Record, e-Health Card for patients etc.

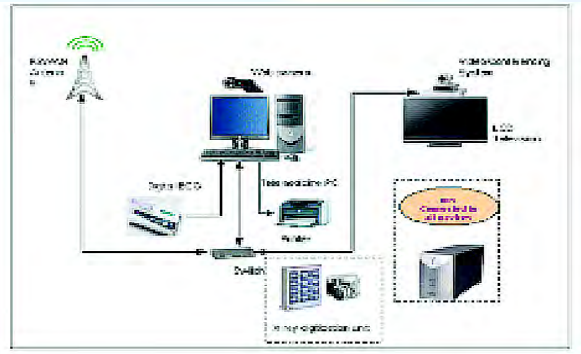
43 cancer detection camps were conducted in Kannur, Kasaragod and Wynad, till August 2010, using Sanjeevani. 4242 people were examined in the camps and 104 cancer cases in the initial stage and three full blown cases were identified. 35 women were given treatment in Sanjeevani itself and others were referred to specialist centers for treatment.

NRHM Telemedicine for General Hospital, Trivandrum and MCC, Kannur:

The project established telemedicine facility at General Hospital, Thiruvananthapuram and Malabar Cancer Centre, Thalassery and brought them under the Rural Telemedicine Network Kerala, which now consists of 39 hospitals including specialty medical centres.

Major features:

- Sharing of existing connectivity (KSWAN) for linking the hospitals.
- Centralized patient repository for the State of Kerala.
- Accessing CME (Continuing medical Education) programs broadcast from the Medical college Hospitals on the network.



System Architecture at Govt. Hospital, Trivandrum and Malabar Cancer Centre, Thalassery

Proof of Concept for a Medical Investigation Camera for Endoscopy

C-DAC successfully developed a proof-of-concept Medical Investigation Camera for Endoscopy (MICE). The MICE system comprises a MICE Capsule, MICE Recorder, and a MICE Image Acquisition System. MICE Capsule is a battery powered image capturing wireless device which includes an LED array, CMOS Image Sensor and transceiver circuitry interfacing an antenna. The MICE Capsule captures the images from the gastrointestinal tract and transmits it outwards wirelessly.

Features:

1. QVGA (320 x 240 pixels) resolution colour image
2. ISM band wireless transmission of image frames
3. Image transmission rate of 7 frames per minute
4. Automatic image quality adjustments for low light conditions.

MICE Recorder receives and stores images transmitted by the MICE Capsule. An array of eight transceivers, which can be externally aligned within the transmission range, ensures uninterrupted reception of images transmitted by the MICE Capsule. The images stored are later transferred to a PC (Image Acquisition System) via a high speed USB link.

MICE is a low cost and simplified solution for a complicated procedure having no side effects like bleeding, as it uses the normal peristaltic movement of the gastrointestinal wall. MICE is highly effective in detecting diseases such as Crohn's disease, gastric ulcers, colon cancer etc. of the gastrointestinal tract.

Medical Investigation Camera for Endoscopy (MICE)

Rural Telemedicine Network Kerala

As part of this project, the existing telemedicine centers were revitalized and the telemedicine facility was extended to more hospitals in Kerala. All the 35 telemedicine centres, owned by Govt. of Kerala and established under various projects like ISRO-GOK Telemedicine System, Telemedicine Kerala, ONCONET Kerala and Rural Telemedicine, were

made fully functional. New Telemedicine centres were setup at Taluk Hospital Cherthala, Alappuzha (Dist) and W&C Hospital, Thycadu, Trivandrum (Dist). Video conferencing facility was implemented at 23 selected centres. End-user as well as Site Administrator training was imparted to the personnel concerned at all the centres.

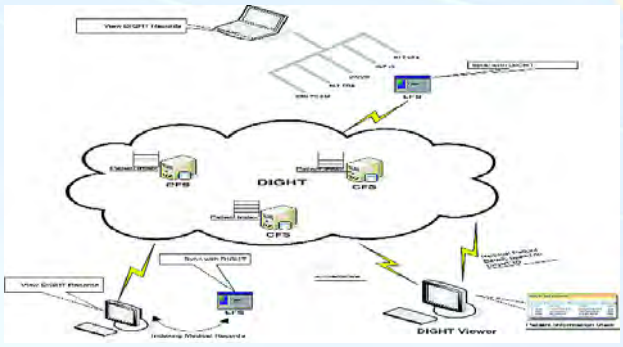
The overall usage level of the system throughout the State steadily improved and the System usage statistics rose from 1449 in 2009 to 2920 in 2010.

Setting up of Telemedicine Network (Phase-III) in Odisha

The objective of the project is to setup Telemedicine network consisting of three Telemedicine Referral Centres (TRC) and 22 Remote Telemedicine Centres (RTC) for people of Odisha. The project is conceived as phase-III extension of telemedicine network in state of Odisha. The project started in May 2010 under Build-Operate-Transfer (BOT) model. Currently, Build phase is in progress during which activities like site preparation, and setting up of telemedicine environment are involved. The telemedicine sites are prepared and C-DAC's MercuryTM Web Telemedicine (MWT) Solution is being installed. The team members from C-DAC conducted training for the staff at the telemedicine sites for setup and usage related activities of telemedicine solution.

Technology Development for Building Distributed, Scalable, and Reliable Healthcare Information Store

The objective of this project is to architect and develop technology / mechanisms / framework that can be used to build a distributed, scalable, and reliable healthcare information store system that can have a single EHR (Electronic Health Record) for every individual of a nation in the area of Medical Informatics. The project is in its third year of execution where concrete development towards the architecture of the network is underway. The team at Centre for Development of Advanced Computing (C-DAC), Pune has done comprehensive study and analysis of various such initiatives taken by other countries, standards and frameworks to identify best suitable design for Indian environment. Active collaboration with Swedish Institute of Computer Science (SICS) is resulting in the development of this framework towards successful completion.



Distributed Reliable Healthcare Information Store System

Cancer-care & Research Tools as Hosted Application and Integration with caBIG

The objective of the project is to augment cancer care programs in country by providing established tools over Garuda GRID and promote collaboration between caBIG user community in US and medical community in India. The project aims at porting selected caBIG tools in use in cancer care in US and other countries to provide hosted infrastructure over GARUDA framework to Indian user community. The project started in April 2010 and is of two years duration. The team is working on identifying various components at View, Business Logic and Database level and re-architecting the solution to enable it making use of Grid environment through Grid Services infrastructure.

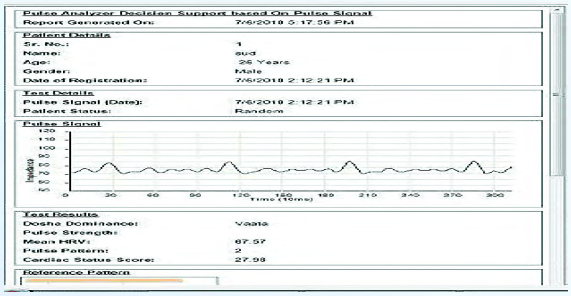
Instrumentation assisted Decision Support System for Pulse Examination & Diagnostics

This was a collaborative project between C-DAC, Bhabha Atomic Research Centre (BARC, Mumbai) and Indian Institute of Technology (IIT, Mumbai). The aim of this project was to provide scientific validation of ancient science of healing. Decision Support System (DSS) was built with on-line-analytical-processing applications having an interface to a medical instrument, which simulates Pulse examination as described in Ayurveda, focused on its key aspects.

An instrument captured physiological variability of pulse signal, which was the input for computational models for disease diagnosis. Pulse patterns were studied using data mining techniques based on mathematical/statistical models. The trends from Pulse data were analyzed and rules were formed by correlating pulse signals generated by the

instrument. On-line analyses with non-invasive technology were integrated for diagnostics and preventive and curative health-management specific to some diseases.

The applications address the complexity of systemic functions in healthy and disease states of individuals with respect to their specific natural physical constitutions. Key diagnostic variables of Ayurveda (Dosha Dominance and pulse strength) were attempted with high level of sensitivity. Automated detection of pulse morphology patterns based on the correlations amongst the major deflection points in the pulse waveforms, using numerical methods were studied. The pattern analysis revealed correspondence between a disease and the pulse morphology pattern/s with special focus on Diabetes Mellitus (DM) and Ischemic Heart Disease (IHD).



Pulse Examination and Diagnostics by using DSS

Integrative Health Informatics via Mobile Technology (I-HIMT)

I-HIMT is mobile-based healthcare solution, addressing health-specific requirements of a common man. These are ranging from emergency services to basic health indices.

- Emergency Service: - In case of emergency situation, application will help user to get person's primary health information like blood group, disease history etc. It will be displayed on user's mobile screen, Alert message could be sent to immediate relative or family physician
- Primary Care – Brief information about common health complaints as per age group, gender
- Find Blood Donor – Facility to generate self-blood donor's database on mobile handset with search utility.
- First Aid - Guidelines about certain emergency conditions
- Health Calculators - Application will help user to know about various health indices like Body Mass Index and Waist Hip Ratio.
- Alerts during Pregnancy- User can calculate the expected delivery date and will get alerts for every month regarding important things to do during pregnancy period
- Immunization Schedule: Alerts about immunization schedule
- My Health Diary – comprised of set of reminders like Medicine, Appointment reminders along with the facility to store family health records.
- Location based services: - Application provide assistance to locate nearest health service providers

These applications would help to create awareness within the society about basic health parameters, disease out breaks as well as educate people about preventive measures need to be adopted for a particular epidemics.

iCare@Home

iCare@Home is a Decision Support System with a knowledgebase of integrative (Allopathy, Ayurveda, Homeopathy, Yoga) medicine to address the healthcare needs of a common man and health workers. It is a health educational tool, which can be deployed on personal computers (Desktops, Laptops) or at KIOSKs (Touch Screen). It can be used at home, clinics, hospitals, healthcare centres, PHC, public places and schools. iCare@Home educates user about promotive health and disease prevention.

Disease Risk Predictor

Education and Training

Open Source Walk-in e-Learning Laboratory

C-DAC has setup an open source walk-in e-Learning laboratory which includes e-Learning standard compliant solutions like Learning management systems (LMS), Learning content management systems (LCMS), Video Streaming Servers, Content authoring tools and tools to create media elements such as animations, audio, and video clips. Through this lab one can get exposed to various open source solutions and their usage, so that they can setup such an environment at their premises with minimal effort.

Design of quality assessment tool for e-Content

A conceptual framework has been developed. Quality parameters including sub parameters for eContent evaluation have been identified and reporting mechanism has been designed. A detailed project proposal has been submitted to NMEICT for approval. Prototype tool implementation is in progress.

eSikshak Release 2

eSikshak is a multilingual e-Learning framework based on component based architecture developed by C-DAC. eSikshak supports SCORM compliant courses, QTI conformant assessment and provides features like Course organizer, Collaboration, Query handler, Short Messaging Service, Personal space and Wiki. E-Sikshak has been deployed at Rice Knowledge Management Portal, Directorate of Rice Research (DRR), Hyderabad, India; College of Air Warfare (CAW), Hyderabad, India and Belarus Hi Tech Park, Minsk, Belarus.

U-Sikshak

The Union Minister for Human Resource Development and Communications and Information Technology, Shri Kapil Sibal released U-Sikshak at ELITEX-2011, in New Delhi on April 04, 2011. U-Sikshak is a ubiquitous learning application that is aimed at blending ubiquitous computing, web and grid technologies. The system allows learner to access education flexibly and seamlessly with right content, at right time, in right way using right device. The system enables the learner to access the content using any mobile device like tablet PC, smart phones, netbooks etc.

Design and Development of a Framework for Adaptive Instruction

Main Research Objective are as following

- To develop an open source Framework for Adaptive Instruction (FAI) to deliver instruction in personalized manner
- To propose a specification for instructional markup language for FAI to enable large scale interoperable content creation

Comprehensive Study Report on existing work in Adaptive Instruction has been completed. Prototype implementation of FAI and Design of Adaptive Instruction Markup language completed. Development of Adaptive Content for one subject of sixth standard and one subject of IT is going on.

Design and Development of SMS based school monitoring and accreditation system for Centre for British Teachers (CfBT)

School accreditation and monitoring was done traditionally by manually collecting reports from different schools and sending them to the monitoring authorities. Based on the collected statistics, grading was allocated to the schools. We have developed a system where reports can be sent in the form of SMS directly to the concerned authority. Our system consists of server with a database and an SMS gateway that collects the information from the SMS received and generates statistics in the form of graphs. These graphs are later analyzed and depending on the statistics, grading and monitoring for the respective schools is done. This eases the way of manually collecting, which is prone to errors and slow. This system is currently deployed at CfBT Hyderabad and real time data is being collected from last 3 months for the district of Ananthapur, Andhra Pradesh.

e-Learning application for Disaster Management

C-DAC has undertaken a project for the National Institute of Disaster Management (NIDM). The aim of the project was to create an e-Learning portal and develop/deploy effective and user friendly e-Learning courses in various areas of Disaster Management. Some of the courses developed under this project are soon to be rolled out by NIDM.

NIDM Web Portal

National Online Examination System

Development of a National Online Examination System (NOES) within India was a NASCOMM recommendation which, Department of IT, Ministry of Communication and Information Technology is realizing through C-DAC. The endeavour was to design and develop a robust, fault tolerant, secure, scalable and adaptive system through which examinations can be delivered on an “on demand” basis in selected examination centers spread across the country.The Online examination system, developed using open source enterprise application development frameworks, automates all the processes of an examination right from registration till the publishing of the results.

In 2010-11, various modules pertaining to administration and monitoring of Online Examination have been incorporated into the system. C-DAC hosted the National Online Examination System as a service during the year and conducted online examination for recruitment in Government organizations like ERNET and CCA. DOEACC has been using this system for conducting CCC (Certificate in Computer Competency) examination across the country. In 2010-11 DOEACC, has introduced an on-demand version of the CCC Examination through the National Online Examination System.

TARKSHYA

TARKSHYA, Technology for Development of Rare Knowledge Systems for Harmonious Youth Advancement, is funded by NMEICT, MHRD, to develop online course material comprising three courses of Veda, Shastra and Manuscript processing. Reference material and application program demo, illustrations, etc. are linked with the application.http://ihg.C-DACb.in/ihg

TARKSHYA

Adaptable e-Learning Accessibility Model for the Disabled

This is an e-Learning project started this year, first of its kind providing an Indigenous Solution for the cognitively disabled falling under the spectrum of Autism Spectrum Disorder (ASD).

Parikshak-II - A Framework for Automated Grading & Analysis of Software Programs

Parikshak-II is a system for automated grading of software programs written in various programming languages. Need for the system is justified by various issues arising due to tedious manual grading of programming assignments/tests conducted in educational organizations & corporates. Relevant pedagogical ideas related to teaching/learning programming will be incorporated in the proposed system. The system will address concerns raised by web-based grading tools to ensure reliability & security. The system will also provide facility to existing Learning Management Systems, Testing Tools & Course management systems to enhance their capabilities. These tools can use the system's API to incorporate the functionalities of the proposed system. Parikshak-II will be available for use as a standalone system and also as a hosted service on the web. The system development is in progress.

Certificate course in Hindi

Certificate course in Hindi (code named as Praveshika) is an online e-learning package developed for Central Hindi Directorate [CHD], M/o. HRD, Government of India.

Various kits and books of the correspondence course are transformed into attractive multimedia based content with the support of audio, video, images, interactive GUI, etc.

It has features like audio/video streaming, Record & Compare facility, incremental Grammar, exhaustive Exercises, etc. The audio-video interface displays the text, its pronunciation and a running video-clip alongside the text on the screen. The record and compare utility enables the learner to record their pronunciation and compare it with the standard voice contained in the software.

The Certificate course in Hindi was launched by Honorable Shri Kapil Sibal, Minister of Human Resource Development, Government of India on 29th September, 2010 during the Golden Jubilee celebrations of Central Hindi Directorate.

Launching of Certificate Course in Hindi

Online Examination System for Hindi Prabodh, Praveen and Pragya based on LILA Technology

Online Examination System for Hindi Prabodh, Praveen & Pragya based on LILA Technology is developed for Central Hindi Training Institute [CHTI], a sub-ordinate office of the Department of Official Language [DOL], Ministry of Home Affairs, Government of India.

On behalf of CHTI and DOL, C-DAC has already conducted 7 online exams (through Internet) for Hindi Prabodh, Praveen and Pragya. Candidates from New Delhi, Navi Mumbai, Chennai and Bangalore centers appeared for these exams during the year 2010-11.

Capacity Building for IT Skill for Economically Weaker Women / SHG's / Local Youths

Women / SHG's / Local Youth of Purba Medinipur District of West Bengal are to be educated on the State-of-the Art IT–based Tools & Technologies. The infrastructure, to train the Master Trainers will be developed (under the Guidance of

Local Government / NGO) at district Head Quarter, directly by C-DAC. The Trained Trainers organized in the form of Self-Help Group as well as the general mass, to empower them with upgraded skills and techniques to internalize multifaceted usage of IT as an integral part of their day-to-day vocation as well as different services of E-Governance activities within the district. This kind of IT-oriented topping up of knowledge & skills is expected to empower them to develop new practices and ideas, which would add value to their everyday-living and to encourage themselves to enter the IT era. Additionally, it is expected that this will also usher in a few brand new forms of sustainable employment generation in and around the regions. The project is also being done at Tripura.

Development of Cyber Forensics Training Facilities in the States of Sikkim, Meghalaya, Tripura & Assam

This project is funded by Department of Information Technology, Government of India. The objectives of the Project are to develop and establish State- of-the-Art Cyber Forensics Training Facilities in four states of North Eastern India for the Law Enforcement Agencies, to develop Course materials for various Cyber–forensic training modules and to conduct training programs in the field of Computer Forensics for Police, Judicial Officers, Network Administrators, Students, etc. The deliverables of the project are to train 600 candidates in the first year and 600 candidates in the second year in the four NE states, physical facilities for training in the four N.E. states and "Training Modules" for four levels of training i.e. Awareness Level, Beginner Level, Intermediate Level and Advanced Level. Along with the course content development Cyber Forensics laboratory facilities have been created in Assam and Tripura."Awareness level training" has been conducted in four North Eastern states. Beginner level training has been conducted in Assam and Tripura. The project has created significant impacts in the North Eastern states and has generated positive media responses.

Information Security Education and Awareness (ISEA) Project

Awareness Program on Information Security (April, 2010 – April, 2011)	30 Workshops
One Semester Certificate Course in Information Security	03 Programs

ISEA awareness Training

Other Training Programme Organised

- 3-days training programme in schools on EduBOSS Linux usage has been organized in batches in all the districts of Punjab for computer teachers. Approximately 6,600 teachers were trained within 3 months from Dec 01, 2010 – Feb 27, 2011.
- A 5-days training programme was organized for 100 Punjab Police Department personnel on BOSS Linux in October 2010.
- A 3-days training programme was organized for 50 NIC personnel on BOSS Linux in October 2010.
- 4-days training session was organized in December 2010 where 60 faculty members of Haryana School Education Department were trained on BOSS Linux.
- A workshop was organized for the awareness and promotion of BOSS Linux on Feb 22, 2011 at Hotel Shivalik View, Chandigarh to address various officials from Punjab, Himachal and Haryana State.

Diploma Programme

- Diploma in Embedded Systems Design (DESD) - 140
- Diploma in System Software Development (DSSD) - 89
- Diploma in Advanced Business Computing (DABC) - 95
- Diploma in Advanced Computing (DAC) - 42
- Advanced Course in Bio informatics - 24

C-DAC Hyderabad has launched two new online courses in the areas of Linux System Programming and Linux Kernel Programming & Device Drivers.

A new course Diploma in Integrated VLSI & Embedded Systems Design (DIVESD) was launched in the month of August 2010. This course gives an understanding of both Embedded Systems & VLSI. VLSI and Embedded systems are unique fields, but having a relationship and hence for a system developer it is very important to have sound knowledge in hardware as well as software. Keeping this aspect in view, the DIVESD course is designed with emphasis on both areas, so that the students can face challenges in the design and development in embedded systems and VLSI designing.

Admission statistics for the year 2010-11 in the various ACTS programmes is as given below:

Sr. No.	Name of the course	August 2010	February 2011
1	DAC - Diploma In Advanced Computing	1027	1042
2	WiMC - Diploma in Wireless and Mobile Computing	82	137
3	DVLSI - Diploma In VLSI Design	35	46
4	DACA - Diploma In Advanced Computer Arts	67	26
5	DGi - Post Graduate Diploma In Geo-informatics	7	0
6	DESD - Diploma In Embedded Systems Design	47	40
7	DSSD – Diploma in Software System Design	35	33
8	Preparatory Course for Diploma in Advanced Computing (PreDAC)	270	560
9	Diploma in IT Infrastructure, Systems and Security (DITISS)	40	44
10	Post Graduate Diploma in Healthcare Informatics. (DHI)	5	0
11	Diploma in Integrated VLSI and Embedded System Design (DIVESD)	63	87

Admission Statistics for 2010-11 for Training Programmes

- 63 students of VelTech University completed the one year Internship and Research & Dissertation work at C-DAC, Pune with the different groups of C-DAC as part of their second year M.Tech. Programme.

Training for the students from Minority Communities

To empower the students belonging to the minority communities, the Ministry of Minority Affairs, Government of India took a major initiative to offer job oriented training programmes through empanelled agencies. Under this scheme, Centre for Development of Advanced Computing (C-DAC), trained 2200 students from the minority communities. This programme has been successfully launched at 31 locations and 15 states across India. The objective of the scheme was to assist students belonging to the minority communities by way of special coaching/training for jobs in the private sector as per the emerging trend of employment in the private sector.

Corporate Training

C-DAC offers various specialized training programmes for corporate and organized sector. C-DAC is working with the Indian Army since 1999 and has signed MoU for offering IT training programmes to the Army personnel. Over 1500 personnel are getting trained every year in 16 different courses designed for Indian Army. Similar training initiatives are carried out for Indian Navy.

ACTS has signed the MoU with Southern Command for conducting IT training programmes for their Personnel of different units.

The other corporate training programmes conducted during the year 2010-11 are as included:

- PCMC: Trained 24 participants in Advanced Diploma in Information Technology
- Western Air Command : Trained 30 participants in System Administration
- MSC Bank : Trained 30 participants on Basic IT skills

MoU signing with Southern Command

UIDAI Empanelment as Training provider

C-DAC has been empanelled by the Unique Identification Authority of India as a Training provider to the Enrolment Agencies staff for generating the UID number. C-DAC ACTS faculty members attended the Master Trainers programme conducted at Hyderabad and New Mumbai. A total of 10 Master Trainers got trained for training the Enrolling agencies' staff. Training for a batch of 40 personnel was conducted at Bangalore.

TechSangam

Under the Tech Sangam initiative, C-DAC has signed MoU for conducting various high-end IT courses in following three institutions:

- NJR Techno India, Rajasthan
- SABER Institute of Technology for Girls Sabarkatha, Gujarat
- Laljibhai Chaturbhai Institute of Technology, Mehsana, Gujarat

New additions in the ATC Network

Four more Authorized training Centres (ATCs) i.e. NETCOM Sikar, Lakshya Bhubaneshwar, Orlando Academy Indore and Mashtishka Indore were added to the ACTS ATC network in the year 2010-2011.

Setting up of Centre of Excellence in ICT at Seychelles, Lesotho, Belarus, Turkmenistan, Armenia, Vietnam

Agreements between MEA & C-DAC have been signed for setting up of Centre of Excellence in ICT at Seychelles, Lesotho, Belarus, Turkmenistan, Armenia and Vietnam. C-DAC has provided complete consultancy for setting up of Centre and installation of required infrastructure (hardware & software) for running the Centre. The master Trainers from Armenia, Belarus and Turkmenistan have been trained. The master trainers from Seychelles, Vietnam and Lesotho are undergoing the training at C-DAC ACTS Pune. C-DAC is playing a supportive role initially for 6 months by deputing faculty members at the respective countries; thereafter the centre will be fully managed and run by the Government.

C-DAC ACTS Team has successfully installed e-Learning Software in IT Centre at Belarus and Seychelles. This software will also be installed at Vietnam.

Setting up of India-Tanzania Centre of Excellence in ICT

The India-Tanzania Centre of Excellency in ICT (ITCOEICT) is to promote development of Information and Communication Technology in the United Republic of Tanzania. To achieve this objective, ITCOEICT is offering variety of Diploma and Certificate courses that have been derived from the rich R&D background of C-DAC for its Advanced Computing Training Schools (ACTS). The proposed courses target the students from varied background who aspire to make a successful career in the ICT industry. Eight participants from Tanzania were trained on advanced IT courses at ACTS-Pune & Hyderabad for 6 months. One resident engineer in HPC and 2 experts from ACTS were also deputed at Tanzania for a period of six months for centre coordination & course delivery.

Multilingual Training

GIST PACE during financial year 2010-11, has trained approx. 32000 students covering the aspects of multilingual computing and solutions along with the existing market technologies.

International Collaboration

Over the years, C-DAC has acquired necessary expertise, strength and technical resources by implementing, supervising and managing international cooperation projects in Ghana, Uzbekistan, Tajikistan, Myanmar, Tanzania, Belarus, Lesotho, Seychelles, Syria, Grenada and Dominican Republic. Ministry of External Affairs (MEA) has appointed C-DAC as the project-implementing agency for setting up Excellence Centre in Saudi Arabia, Armenia, Vietnam and Turkmenistan and the project implementation is in progress. In addition to these, MEA has appointed C-DAC as an implementing agency/ consultant for setting up of talent development centre in Cambodia, IT infrastructure of CESUS in Armenia, computer labs in 72 schools of Tavush region in Armenia, High Performance Computing facility in Vietnam, tele-medicine network in Armenia, secure communication network for Montenegro and PAN CIS e-network to connect Central Asian countries to India for tele-medicine, tele-education and e-learning. The following projects were active during the current year.

India – Syria Centre for IT at Damascus

Agreement between MEA and C-DAC for Track A – Cyber Security was signed on Aug 26, 2010 and for Track B&C – IT on Jun 07, 2010. India-Syria Centre for IT (ISCIT) in Damascus is to offer advance IT courses on two tracks. Supply and installation of IT infrastructure and courseware is complete and training has been imparted. ISCIT was inaugurated by Hon'ble Prime Minister of Syria on Dec 29, 2010 and is operational since then. The deputation of 5 C-DAC experts for 2 years for training is done already. ISCIT has so far trained more than 300 students in Track A, B & C courses.

India - Belarus Digital Learning Centre in ICT (DLC-ICT) at Minsk, Belarus

Agreement between MEA & C-DAC was signed on December 22, 2009. Supply and installation of IT infrastructure and courseware at central site in Minsk and four Regional Centres in Belarus is completed. DLC-ICT is connected to Regional Centres in Belarus through leased lines and is imparting advanced IT education through e-learning. Training of 8 participants from Belarus in India for 6 months has been completed. DLC-ICT is operational since Feb 2011

India - Seychelles Centre of Excellence in ICT at Mahe

Agreement between MEA & C-DAC was signed on March 22, 2010. Supply & installation of IT infrastructure and course ware and training of 4 participants from Lesotho in India for 6 months on C-DAC courses has been completed. ISCEICT has been inaugurated by Hon'ble President of Seychelles on March 2011 and is operational since then. ISCEICT is imparting advanced IT education using e-learning.

Seychelles Centre of Excellence in ICT at Mahe

Centre for IT at St. George's Grenada

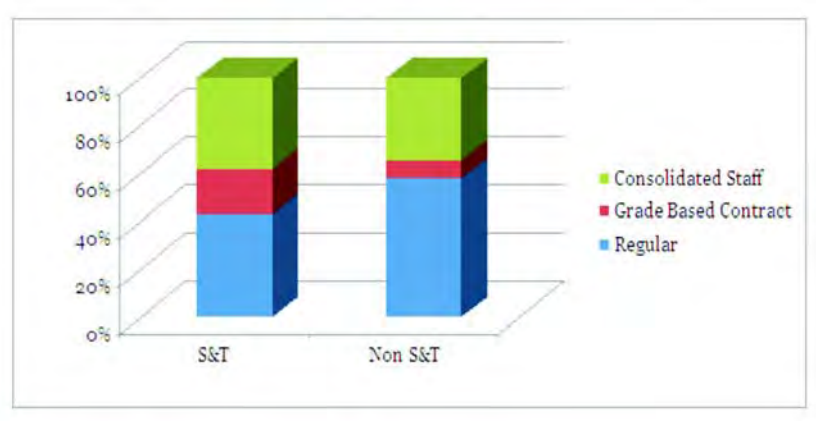
Agreement between MEA &C-DAC was signed on Oct 21, 2010. IGCIT in St. George's Grenada is imparting IT education. Supply & installation of IT infrastructure and courseware is completed. IGCIT is operational since March 2011.

Resources, Facilitation Services and Initiatives

Human Resource Development (HRD)

C-DAC has approximately 3000 employees working at its all the centres. There are three categories of employees, i.e. those who have been recruited against i) Regular vacancies, ii) Grade Based Contract against projects and iii) on contractual terms on consolidated salary.

Following chart shows the manpower position of C-DAC in the form of a bar-chart:



HRD – The Guiding Principles

At C-DAC human resources implies knowledge, skills, creative abilities, talent, aptitude, values and beliefs. For C-DAC to be dynamic, growth-oriented and amenable to changing, HRD plays an important role. At C-DAC it is believed that to be dynamic, it should possess active, innovative and creative human resources. C-DAC created an enabling culture by encouraging employees to use their initiative, take risks, experiment, innovate and make things happen. At C-DAC HRD played a key role in shaping the human resources to align with C-DAC's goals.

The focus of the Corporate was towards responding to the demands of C-DAC in attracting and retaining the finest talent needed for attaining the institutional goals. Another important task was maintaining an employee friendly, transparent, conducive and professional work climate to facilitate the efforts of its members.

Major Activities undertaken by HRD during the year under report:

HRD intervention through training programs helped the employees of C-DAC to rejuvenate and invigorate the intellectual resources and to act as catalysts in the fulfilment of the objectives of the institution.

Based on the feedback received from the employees and the senior managers of the institution, the customized training programme, 'Fast Forward: Towards Taking Ownership', was suitably modified during the year and a new series of the training events was conducted. The objective was to encourage learning in individuals through pragmatic consideration of the underlying theories and their practical application to scale greater heights in their professional life. This intervention of HRD helped rejuvenate and invigorate the intellectual resources of C-DAC and acted as a catalyst in attaining

C-DAC's objectives. These training events were conducted for the middle level Technical and Non-technical employees to derive benefits.

HRD at C-DAC strived to develop and instil a few important characteristics on the employees, viz.

- The overall perspective which would help the employees view the institution in its entirety and understand the organization position in the environment in which it operates.
- Development of Analytical and integrative skills leading to accurate definition of problems, generation of creative solutions and timely implementation of the entrusted job.
- Technical and functional skills which comprise of professional competence in discharge of duties.
- Integrity which can be defined as personal ethics that makes conscientious and competent managers and true and ethical professionals.
- Ability to acquire a holistic approach coupled with inner merit, transforming each employee into a leader with vision, deep sense of ethics and responsibility.

Identifying, recognising and rewarding key contributions made by the employees, opportunities for foreign tours and honouring employees who demonstrated their commitment and efforts etc. are the ways chosen by the C-DAC to recognise and appreciate.

The other activities undertaken during the year are as follows:

- External and in-house trainings, symposia, technical and management trainings.
- Felicitating CDAC employees who have completed 10 years / 15 years / 20 years/ 25 years of continuous service with C-DAC.
- Recruitment across various technical and non-technical posts by way of Direct Recruitment / Transfer absorption / Deputation / Campus Interviews/Special Recruitment Drives for the reserved category posts.
- Performance Appraisals, Probation Clearance, Contract Review (Contract Extension, Termination,] and Increment etc.).

C-DAC believes in creating human capital that are innovative, responsive, trustworthy, creative and efficient and the HRD continues to be an instrument in achieving this goal.

Legal and Intellectual Property Rights (IPR)

1. The work of Project entitled "Web based patent analysis and management system" sanctioned by IPR Division DIT, New Delhi is in progress as per schedule. The 3rd PRSG Meeting has reviewed the work and expressed its satisfaction over the progress.

2. Similarly, project entitled "Establishment of Patent Search Centre to be implemented by C-DAC, Pune" is now receiving encouraging response from end users.

3. Apart from drafting/ vetting several contracts/ MOUs, the legal/ IPR group also organized IPR awareness programmes on patent search at different centres i.e. at C-DAC, Pune and Chennai. Such awareness/ sensitization talks/ lectures generally result into filing of patent/ copyright/ trademark applications.

4. During the year Mr. R.Y. Deshpande, Head – Legal was invited to deliver lecture/talk on IPR, cyber law etc. at

- ILS Law College,
- Modern College,
- MIT College of Engg., Pune,
- NITTER
- American Centre

5 Information regarding number of applications filed and registrations received under patent, copyright, trade-mark and RTI may please be obtained from Mr. Pownikar who has already been requested by us to provide the information.

Memorandum of Agreement (MoA)

- C-DAC signed Memorandum of Agreement (MoA) with M/s. Live Line Electronics Kolkata for the development of Double Conversion UPS technology for Online UPS System with 3 phase Input and Single phase output, suitable for 5KVA -100 KVA range, with Electronics paralleling.
- ToT agreement signed by ECIL, Hyderabad for the Vehicle Tracking System Ver 2.0, developed by C-DAC.
- C-DAC signed MoU with Defense Electronics Application Laboratory (DEAL), DRDO for the joint development of Software Defined Radio Technology (SDR).
- C-DAC signed an Agreement with Trinity Comnet Pvt. Ltd., Bangalore for the Technology Transfer of Distress Call Response Management System (DCRMS), developed by the Centre.

Intellectual Property

- C-DAC Received patent for Area Traffic Control System (ATCS) software entitled “A Method for Synchronizing Heterogeneous Road Traffic and System thereof”. Inventors: Shri V.Muralidharan and Shri P. Ravikumar, Patent no: 239258.
- An Indian Patent, bearing Patent No.243383, has been granted to C-DAC for an invention titled “A device for the measurement of residual chlorine used as a disinfectant in drinking water”. Inventors: Shri George Pereira, Dr. Rominus Valsalam, Shri V. Muralidharan and Shri M. Suraj.

Patents Filed

- Patent filed for “A Wireless Imaging System for Viewing the Internal Surface of a Narrow Passageway” as part of MICE project (Medical Investigation Camera for Endoscopy) Inventors: R. Ravindra Kumar, Biju C. Oommen, Kadar A A, K S Arun Nath and Hafsal M.
- A System and method for determination of Pulse Strength (Indian Patent No. 720/MUM/2010)

IPR

- During the current financial year C-DAC has processed 73 Copyright applications for Indian Language tools and technologies.

Library and Information Centre

C-DAC has well equipped and automated libraries attached to Pune, Juhu & Kharghar Mumbai, Thiruvananthapuram, Noida, Mohali, Knowledge Park & Electronics City Bangalore, Hyderabad and Kolkata centres. These libraries cater to the needs of members and students of different courses run by C-DAC.

C-DAC Libraries are actively participating in the MCIT Library Consortium. Under this consortium, IEEE Digital Library containing complete IEEE and IEEE literature has been subscribed for organization-wide access. User Awareness Programs for E-Resources were held for the benefit of members at various locations in the month of August 2010.

Library at Pune Headquarters coordinated the activities in this relation.
In the financial year 2010-11, the libraries at Mumbai & Electronics City Bangalore added bout 350 books and subscribed to around 75 print periodicals and 12 e-journals.

Pune Headquarters library added about 310 books and subscribed to 115 print periodicals.

Thiruvananthapuram Centre library subscribed to 110 print periodicals. It has a collection of over 21,000 books. The library caters to over 900 staff and 400 students.

Mohali Centre library houses around 16,500 books and subscribed to over 100 printed national and International journals.

NOIDA Centre library holds a collection of more than 20,000 volumes and subscribed to 84 periodicals. The library is spread across 580 sq m and it has a sitting capacity of 300 members.

Invited Talks

- "Electronic methods of Tea Quality Measurement" in the National Conference organized by the Tea Research Association (TRA) as part of their Centenary Celebrations, by Dr. Nabarun Bhattacharyya.
- Keynote speech titled" Career in Scientific Technology Sector - The gender issues in Indian Context" in the Fourth International Symposium on " Developing Women World Leaders in ICT. The cases in India, Korea and Japan", on 23rd of Sept, 2010 at Tokyo, by Ms Soma Mitra.
- Dr. Amit Chaudhuri delivered Keynote Speech on the topic "Challenges of using Information Technology for the Masses with special reference to Cyber Security and Cyber Crime" in the National Seminar on Impact on Emerging areas of Science & Technology on the development of Society, on 6th February, 2011.
- Dr. Amit Chaudhuri delivered invited lecture on "VI based SCADA and security issues" in the National Conference on Instrumentation and Control NATCONIC-2011 held on 6th-7th January 2011.
- Invited lecture on "Human Aura based computing system for Health care Applications" in the National Conference on Pro-Nature Therapy 2011 at IRIIM, Howrah, Kolkata, by Mr. Ashok Bandyopadhyay.
- Invited lectures on Cyber Forensics and Information Security in Central Detective Training School, by Mr. Jayanta Parial.
- Invited lectures on Email Forensics and Email proceedings in Central Detective Training School, by Mr. Anupam Chanda.
- Invited lectures on Concept of Internet and Network Basics in Central Detective Training School, by Mr. Saubhik Datta.
- Invited lecture on BOSS at Guwahati University, by Mr. Anupam Chanda.
- Invited lecture on FOSS Based Network Infrastructure at ISM, Dhanbad, by Mr. Jayanta Parial.
- Dr. Pradeep K. Sinha delivered lecture on "ICT infrastructure for 21st Century Healthcare" during 6th International Conference of Telemedicine Society of India (Telemedicon'10), Bhubaneshwar, November 14-16, 2011.
- Gaur Sunder, "Technology Enabled Health Science Education" During 6th International Conference of Telemedicine Society of India (Telemedicon'10), Bhubaneshwar, November 14-16, 2010.
- "Applications of Artificial Intelligence and Machine Learning for identification of Gene and Protein functions" at KIIT University, Bhubaneshwar, Orissa on September 4, 2010.
- "Applications of Support Vector Machines" at National Conference on Emerging Trends in Soft Computing on 1st February 2011 at Wadia College, Pune.
- "Applications of Support Vector Machines in Chemo & Bioinformatics" at International Conference on Modelling, Optimization and Computing, October 29, 2010 at NIT Durgapur, West Bengal.
- "Applications of Support Vector Machines for identification of Gene & Protein functions" at Pant Agricultural University, Pant Nagar, U.P. on 26th October 2010.

- "Opto-magnetic properties of Zinc Selenide quantum dots" at Prof. J. R. Chelikowsky's group, University of Texas, Austin, USA (28 March 2011).
- "Global Coordination between Information, Technology and Hindi" by Mr. Karimullah Shaik at Power Grid Corporation of India Ltd, Nagpur on 13 August, 2010.
- "Online Training and Examination" by Mr. Karimullah Shaik at Central Hindi Training Institute, Department of Official Language, Ministry of Home Affairs, New Delhi on 16 December, 2010.
- "eGovernance and Rajbhasha Hindi" by Mr. Karimullah Shaik at Department of Higher Education, M/o. HRD. (held in Goa) on 10 January, 2011.
- "Development of Hindi Software - Present and Future" by Mr. Karimullah Shaik at Mahatma Gandhi Antarrashtriya Hindi Vishwavidyalaya, Wardha (Maharashtra) on 13 January, 2011.
- "Reconfigurable Computing for Application Acceleration" by Yogindra Abhyankar in the workshop on Next Generation Application Challenges on PARAM-Yuva, ICC Towers SB Road, Pune, Maharashtra, India. Feb 11 2011.
- "Geo-informatics in Agricultural Application" by Sandeep Srivastava in DST sponsored workshop "Remote Sensing and GIS application in natural resource and disaster management at Symbiosis Institute of Geo-informatics, Pune " held at from 21 Feb to 26 Feb 2011.
- "Remote Sensing and Geographic Information System (GIS) for Geological Application" By Dr. Manoj Khare in DST sponsored workshop "Remote Sensing and GIS application in natural resource and disaster management at Symbiosis Institute of Geoinformatics, Pune" held from 21 Feb to 26 Feb 2011.
- "Application of GIS in Water Resources" by V. Sivakumar at National Water Academy (NWA), Central Water Commission, Ministry of Water Resources, Govt. of India, Pune-Sinhagad Road, Khadakwasla, Pune - 411 024 on 17.6.2010.
- "Overview of Chandrayaan-1 Mission & applications" by V. Sivakumar at National Water Academy (NWA), Central Water Commission, Ministry of Water Resources, Govt. of India, Pune-Sinhagad Road, Khadakwasla, Pune - 411 024 on 02-12-2010.
- "Chandrayaan-1 Mission and data Analysis" by V. Sivakumar at National Water Academy (NWA), Central Water Commission, Ministry of Water Resources, Govt. of India, Pune-Sinhagad Road, Khadakwasla, Pune - 411 024 on 12-05-2011.
- Dr. Rajendra Joshi delivered a talk on "Protein folding studies using Replica Exchange Molecular Dynamics" at Shivaji University, Kolhapur during March 4-5, 2011.
- Dr. Uddhavesh Sonavane delivered a talk on "Study of Antisense PNA targeted to primer template complex of HIV-1 and Effect of modified bases present in the tRNALys3" at Shivaji University, Kolhapur during March 4-5, 2011.
- Dr. Rajendra Joshi delivered a talk on "Accelerating Biology" during PARAM Yuva workshop on February 25-26, 2011.
- Dr. Uddhavesh Sonavane delivered a talk during the "workshop on Quantum Chemistry in Structural Biology" at Jawaharlal Nehru Institute (JNU), New Delhi during January 2-5, 2011.
- Dr. Uddhavesh Sonavane delivered a talk on "Bioinformatics Activities" in "Refresher Course" at Chemistry Department, University of Pune, Pune on December 22, 2010.
- Dr. Uddhavesh Sonavane delivered a talk during "Indo Russian Workshop on High Performance Computing in Science & Technology" at Pune University Campus, Pune during November 17-19, 2010.
- Dr. Rajendra Joshi delivered a talk in "2nd Meet on Cancer Biomedical Informatics Grid" at ICC Tower, Pune during December 9-10, 2010.
- Dr. Rajendra Joshi delivered a talk on "Bioinformatics Activities" on 29th October 2010 during Indo-SWISS meeting at DIT, New Delhi.
- Sunitha Manjari and Ruma Banerjee were invited to take lectures on "Comparative Genomics" to PG students of Bioinformatics Center, University of Pune, Pune during October - November 2010.
- Dr. Rajendra Joshi delivered a talk on "Bioinformatics Activities" on 29th September 2010 during Indo-SWISS

meeting at DIT, New Delhi.

- Dr. Rajendra Joshi delivered a talk on “Accelerating Biology: Clusters, Grids, Clouds & beyond” during a Biotech show “Bangalore India Bio 2010” at The Lalit Ashok, Bangalore on 3rd June 2010.
- “C-DAC HPC Trends and Activities in India” at HPC Advisory Council European Workshop Hamburg, Germany (May 2010) by Abhishek Das.
- “Challenges in Research and HPC” at HP-CAST 14 (HP Consortium for Advanced Scientific and Technical Computing users group) Hamburg, Germany(May 2011) by Narayan Kulkarni.
- “C-DAC & HPC Grids in India: Trends & Challenges” at HP-CAST 15 (HP Consortium for Advanced Scientific and Technical Computing users group) New Orleans (November 2010) by Deepu C.V.

Research Papers Published

- Annie Joyce.V, Senthil Kumar and Bindhumadhava,“Accessibility Adaptability Model for the Disabled”, The 2010 International Conference on e-Learning, e-Business, Enterprise Information Systems, and e-Government (EEE’10) of WORLDCOMP 2010, Monte Carlo Resort, Las Vegas, Nevada, USA, July 12-15, 2010.
- Janaki Chintalapati, M. Arvind, S. Priyanka, N. Mangala and Jayaraman Valadi, “Parallel Ant-Miner (PAM) on High Performance Clusters”, SEMCCO, Chennai, India Publisher in Computer Science, Swarm, Evolutionary, and Memetic Computing Lecture notes in Computer science, 2010, Vol. 64466/2010, 270-277, Dec. 17-18, 2010.
- Karuna, Harikrishna M, Mangala N, Janaki Ch, Shashi S. and Subrata C, “Python based Galaxy Workflow integration on GARUDA Grid”, International Conference on Scientific Computing with Python, SciPy.in-2010 Press Release Dec. 13-18, 2010.
- Usha Rani Edara, Subramanian. N, Monika Dwivedi and Anjali Sinha, “SAS:A System for Security Assessment in grid environment”, IEEE International Conference on Internet Multimedia Systems Architecture and Applications (IMSAA-2010) in the proceedings of “IEEEXplore, Bangalore ISBN : 978-1-4244-7931-3, 15th-17th December 2010.
- Ramesh Naidu Laveti, Mohit Ved, S. Janakiraman and B. B. Prahlada Rao, “Digital filters in climate models”, International conference on System Modelling, Optimisation and Advanced process automation (SYMOPA - 2010), Thiruvananthapuram, , pp 151—157, Dec. 16-19, 2010.
- Preeti Malakar, Vijay Natarajan and Sathish Vadhiyar, “An Adaptive Framework for Simulation and Online Remote Visualization of Critical Climate Applications in Resource-constrained Environments”, IEEE/ACM Supercomputing Conference, SC 2010, New Orleans, USA Nov. 2010.
- Manavalan, Subrata Chattopadhyay, Mangala and Yalamanchili S.Rao, “Emerging trends of Computational Grid based Near Real Time/Real Time Flood Assessment and Forecasting Models”, IEEE International Conference on Emerging Trends of Engineering Technology (ICETET-2010), Goa, Nov.19-21, 2010.
- R.Manavalan, Subrata Chattopadhyay, Mangala, Sundararajan and Kishor Gupta, “Grid based Real Time Collaborative System”, IEEE International Conference on Parallel and Distributed Grid Computing (ICPDGC-2010).
- Asvija B., Shamjith K.V., R Sridharan and Subrata Chattopadhyay, “Provisioning the MM5 meteorological model as Grid Scientific Workflow”, 2010 International Conference on Intelligent Networking and Collaborative Systems, Thessaloniki, Greece, Nov. 24-26, 2010.
- Payal Saluja, Prahlada Rao B.B., Shashidhar V., Paventhan A. and Neetu Sharma, “An Interoperable & Optimal Data Grid Solution for Heterogeneous and SOA based Grid- GARUDA”, 24th IEEE International Parallel & Distributed Processing Symposium, HPPC Workshop, ATLANTA (Georgia) USA, April 19-23, 2010.
- Ramesh Naidu Laveti, Mohit Ved, S. Janakiraman and B. B. Prahlada Rao, “Digital filters in climate models”, System Modelling, Optimisation and Advanced Process Automation (SYMOPA - 2010), Trivandrum, India, Dec.16-19, 2010.
- Prashant Bendale, Gaur Sunder and Pradeep Sinha, “Integration Model for Existing EHR Systems to Proposed National Distributed Electronic Health Record Store”, 6th International Conference of Telemedicine

Society of India (Telemedicon'10), Bhubaneshwar, November 14-16, 2010.

- Dipak Chaudhari, Gaur Sunder and Pradeep Sinha, "Migrating Singly Hosted Web Application to Grid", 6th International Conference of Telemedicine Society of India (Telemedicon'10), Bhubaneshwar, November 14-16, 2010.
- Manisha Rathi, Gaur Sunder and Pradeep Sinha, "Model and Process Interoperability between Clinical Standards", 6th International Conference of Telemedicine Society of India (Telemedicon'10), Bhubaneshwar, November 14-16, 2010.
- Shailendra Narwariya, Gaur Sunder and Pradeep Sinha, "Web-Based Telemedicine in Disconnected Environment", 6th International Conference of Telemedicine Society of India (Telemedicon'10), Bhubaneshwar, November 14-16, 2011.
- Astha Rai, Gaur Sunder and Pradeep Sinha, "Packaging and Modularity in C-DAC's Medical Informatics SDK for DICOM", 6th International Conference of Telemedicine Society of India (Telemedicon'10), Bhubaneshwar, November 14-16, 2010.
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- Diwakar Mani, "RDBMS based Lexical Resource for Indian Heritage: the case for Mahabharata", 4th International Symposium on Sanskrit Computational Linguistics, SCSS/JNU, New Delhi, 10-12 December, 2010.
- S. P. Nanavati, V. Sundararajan, S. Mahamuni, S. V. Ghaisas and V. Kumar "Magnetic properties of Mn doped zinc selenide clusters: First principles calculations", American Physical Society (APS), Dallas, USA, March 21-25 March 2011.
- Ramesh Sanap, V. Sundararajan and V.K.Jayaraman "Hybrid Taguchi - Genetic Algorithms Assisted Support Vector Machines for Robust Classification", 5th International Symposium on Design, Operation and Control of Chemical Processes (PSE Asia 2010) Singapore, July 25-28, 2010.
- Janaki Chintalapati, M. Aravind, N. Priyanka, S. N. Mangala and V.K.Jayaraman, "Parallel Ant Miner (PAM) on High Performance Clusters", International Conference on Swarm, Evolutionary and Memetic Computing, Chennai (SEMCCO 2010) Dec. 16-18, 2010.
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- Prakash S. Shelokar, Achal K. Garg , Vijayraghavan Sundararajan , Bhaskar D. Kulkarni and Valadi K. Jayaraman, "Multiobjective Classification model Selection using Ant Colony Optimization", SYMOPA 2010 International Conference on System Modelling optimization and advanced Process Optimization, Tiruvananthapuram, Dec. 16-19, 2010.
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- Ashish Shelar, Himanshu Chedda, Harshvardhan Khare and V.K.Jayaraman, "Prediction of Galactose binding Proteins using Support Vector Machines", International Conference on Recent Advances in Bioinformatics, Bhubaneswar, September 3-5, 2010.
- R. Natarajan, Shreyas Karnik and V.K.Jayaraman, "QSPR Prediction of Surface Tension of Organic Liquids", QSAR 2010, 14th International Workshop on Quantitative Structure – Activity Relationships in Environmental and Health Sciences, Canada, May 24 – 26 2010.
- K.Joshilraj, Vidyavati, S.Nayak and V.K.Jayaraman "SVM based Hybrid Intrusion Detection System with various feature Selection Algorithms", National Conference on Computational Engineering: Modeling, Simulation

and Optimization Defence Institute of Advance Technology, Pune.

- Nayana Ramachandran, C. Venkateshwari and V.K.Jayaraman, "Prediction of N Myristolysation Substrate Protein using Support Vector Machines and Random Forest Classifiers", International Symposium on Accelerating Biology -2010, Pune, Dec. 15-17, 2010.
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- Devesh Sharma, "Supporting OFED over Non-InfiniBand SANs In IEEE/ACM", International Symposium on Cluster, Cloud and Grid Computing (CCGrid 2010)", Australia, May 2010.
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- Saurabh Chamotra, Raj Kamal, Rakesh Sehgal and J.S.Bhatia, "Data Diversity of a Distributed Honeynet based Malware Collection System", International Conference on Emerging Trends in Networks and Computer Communications (ETNCC 2011) an IEEE sponsored conference.
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- Vijay Kumar and Manjit Kaur, "Design and Implementation of an All Digital PLL (ADPLL) IP Core on FPPA", Recent Trends in Mobile and Embedded Technology, Mobile and Embedded Technology Conference (MECON-10), Amity University, Uttar Pradesh.
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Awards and Recognitions

- "Special Recognition Award" was received for Smart Parking solution (SPARK), at Citizens for City contest organized by the Foundation for Futuristic Cities at Hyderabad.
- C-DAC bagged the Jury Choice award in eIndia 2010 for eParking solutions (SPARK), it was also accredited with 3rd position in the people choice award in 'ICT Enabled Municipal IT Initiative of the year' category being held in Hyderabad during August 4-6, 2010.
- "Best Excellence Award" of Government of Sikkim received by C-DAC for its pioneer initiatives in using "IT for Poverty Alleviation Program for Handicrafts and Handloom section development"for the year 2010.
- C-DAC was awarded the second prize by the Town Official Language Implementation Committee, for its outstanding performance in Official Language in September 2010.
- "Valued Customer Award was given by CPRI Bangalore to C-DAC for Sponsored Research & Development" for the year 2009-10. This award was presented to C-DAC based on the successful implementation of number of R&D projects, namely STATCOM for IT Park, DVR based Voltage Source Stabilizers for Process Industries, and Full Spectrum Simulator.
- Cloud Computing Test bed for Kerala State Data centre bagged the Best Jury award under Cloud Computing initiative at e-World 2011 summit held at Delhi during August 1-3, 2011. This test bed was part of joint consortium between C-DAC, IIITMK and Kerala State IT Mission.
- Intel India Embedded Challenge Award 2011 in Rural IT e-Governance and citizen services category was given for Portable Electronic Nose (PEN) developed by C-DAC. The application of this device for tea industry.
- C-DAC received FICCI Annual Award 2009-10 for 'Excellence in Science, Technology and Technological Innovation' in recognition of the outstanding work in the area of Integrative Health Informatics for its product Cure@Home.
- C-DAC, Thiruvananthapuram was selected as one of the Finalists for the "NASSCOM Social innovation Honours 2011" under the category "ICT lead Innovation in Government Depts./Body". NASSCOM Social Innovation Honours 2011 is a unique platform aimed to foster innovation in social development using ICT within the organizations and individuals. The award was based on the Mobile Telemedicine Project- 'Sanjeevani'.
- C-DAC, Thiruvananthapuram received type approval certificate for the production of Power Supply Card for Mirage up to the year 2015 from CEMILAC (Centre for Military Airworthiness and Certification).
- C-DAC, Trivandrum won third prize in the Hindi Quiz Competitions held in connection with the Joint Hindi Fortnight Celebrations 2010, under the auspices of Town Official Language Implementation Committee, Thiruvananthapuram.
- Two Members from C-DAC Hyderabad got an opportunity to undergo Advanced Training in Information Security at CMU, Pittsburgh, USA for a period of 2 weeks during Oct 2010 under ISEA programme.
- Shri Jayanta Parial has been appointed as an advisor to CID, West Bengal Police for cyber-crime and cyber forensics related cases.
- Dr. Amit Chaudhuri has been included in IT Committee of Bengal Chamber of Commerce and in the Technical Expert Committee of State Book Bureau, Govt. of West Bengal.

Conferences and Events Organized

- Roadshow on e-Security Products was organized on 20th Apr 2010. During this event Malware Resist, NAYAN (Network Abhigham niYantrAN) and USB Pratirodh were launched and evaluation copy of the security software was given to various state and central government organizations.
- e-Suraksha Practical Approach – 5-day training programme during March 28th to April 2nd 2011
- Annual Seminar of C-DAC Noida Technologies (ASCNT 2011) is an Annual event organized by C-DAC, Noida to showcase its products/solutions/technologies and share its research/ field experiences in its niche areas. Continuing the trend, ASCNT-2011, the forth in the series, was organized during 24-25 March, 2011. A total of 30 technical papers in areas like Ubiquitous Computing, Quality Improvement, Health Informatics, Speech & Natural Language Processing, e-Governance and e-Learning were presented during the seminar.

Dr. N. Vijayaditya releasing the proceedings of ASCNT-2011

- Fifth GARUDA Partners Meet was organized on 20th and 21st May 2010 by C-DAC Knowledge Park, at Clarks Exotica Resort - Bangalore. The event was inaugurated by Prof. S. V. Raghavan, Scientific Secretary, Office of the Principal Scientific Advisor to Government of India, in the presence of Dr. C. M. Murali Krishna Kumar, Advisor (ICT), Planning Commission; Dr. P.S. Dekhne, Scientific Consultant to PSA to GOI; Shri Rajan T. Joseph, Director General, C-DAC; and Shri S. Ramakrishnan, Former Director General, C-DAC. Nearly 140 members from GARUDA Partner Institutions, NKN teams (NBRI, CDRI, IGCAR, ICAR Research Complex for North Eastern, NIC), Academic Institutions and C-DAC Centers participated in this meet.
- Garuda Boot Camp was organized at the Institute of Mathematical Science (IMSc) Chennai, on 8th& 9th July 2010, at the National Centre for Radio Astrophysics (NCRA), Pune on September 23rd& 24th, 2010, at University of Hyderabad on 23rd& 24th November 2010 and on 28th& 29th December 2010 at Malabar Christian College, Calicut.
- Weather and Climate modelling – Computational needs of present and future: Roundtable meeting on 18th February 2011. This is VOMS meeting of GARUDA to understand the computational requirements of the weather and climate community in India. Domain experts working in various organizations namely IISc, NCMRWF, TIFR, IIT-Chennai, Tamil Nadu Agricultural University, NAL and CMMACS attended the meeting and provided perspectives on the present and future computational needs.
- One day seminar on “Microcontrollers and Applications” was conducted on July 3, 2010
- C-DAC Kolkata celebrated the National Technology Day (NTD) in its seminarHall on Tuesday 11th May, 2010. The Chief Guest, Dr Alok Chatterjee, the State President of Indian Medical Association delivered the Keynote Speech on NTD, and released the “Health Care Knowledge System” Software, a product developed by C-DAC Kolkata.
- C-DAC Kolkata successfully co-ordinated and participated in the 14th National Expo organized by Central Calcutta Science & Culture Organization for youth, at Ambarabati Maidan, Sodepur, Kolkata between 3 -8 September 2010.
- INTERSPEECH conference 2010 was held at Makuhari, Tokyo, Japan from 26th September 2010 to 30th September,2010. C-DAC, Kolkata together with the University of Tokyo hosted a stall at INTERSPEECH 2010, show casing the product “Bangla TTS System and its Prosody Control based on Command Response Model

for F0 Contour Generation". It was well appreciated by the speech community. Some of the international universities and multinational companies also expressed their desire to have collaborative projects with C-DAC Kolkata.

Interspeech Conference 2010 at Tokyo, Japan

- C-DAC, Kolkata is implementing a project on "Cyber Forensics Training and Development of Technical Facilities" sponsored by Department of Information Technology, Government of India, in four North Eastern States of India , namely Tripura, Assam, Meghalaya and Sikkim. Seminars for awareness level training were organised at Shillong and Guwahati in October, 2010 and at Agartala, Tripura on 24th of November 2010.

Cyber Forensics awareness Training

- National Seminar On "Integrated Electronic Nose & Vision (ENV) System for Quality Estimation of Basmati Rice" held on 31st January 2011 at C-DAC, Kolkata.

Shri Narendranath Dey, Hon'ble Minister of Agriculture and Consumer Affairs, observing the Live Demonstration in the national seminar

- MEDIMAGE 2010: C-DAC Participated in the Symposium on perspective on Perception and Diagnostics held at IIT Delhi during 10-12,December, 2010.
- One Day FOSS Forward Seminars was held on 14th March 2011 at Guwahati & 28th March 2011 at Kolkata.
- A seminar on "Cyber Forensics" was held at C-DAC, Kolkata on 16th July 2010. Over 90 participants from Police, Army, BSF etc. attended.
- Seminar on "Implementation of Guidelines for Government Websites" on May 8, 2010 at C-DAC Mohali
- "Role of Electronics" – A Panel discussion was convened by DEC Division, C-DAC, Mohali on 18th of March 2011. It was chaired by ED C-DAC and various eminent persons from the agriculture sector were invited for sharing their ideas and knowledge in this field.
- A training on 'Implementation of Quality systems procedures (QSPs)' for improving compliance to ISO 9001:2008 at C-DAC, Mohali was organized and conducted on 25th Feb, 2011 at conference room C-DAC, Mohali.
- C-DAC, Thiruvananthapuram organized "ASSOCHAM Series of Seminar on Tax Deduction" at Hotel Residency, Coimbatore on 21st July 2010
- C-DAC, Thiruvananthapuram conducted Training on "ESD Programme" on 6th December 2010
- POP-Nationwide PKI Awareness Programme:The objective of this project is to carry out awareness programme in the field of Public Key Infrastructure across the country. Various events such as One day symposia, Two day workshops and Three day training programmes were conducted as a part of this initiative.
- Presentations for Hindi software and products at the DOL Regional seminar at Visakhapatnam, Goa, Shimla and Gangtok
- Invited and hosted a talk by Dr. Dhabaleswar K. (DK) Panda, Professor of Computer Science, Ohio State University, USA on "Evolution of HPC Interconnects in Next 5 Years and Their Role in Peta/Exa Scale Systems".
- Invited and hosted a talk by Dr. Pavan Balaji, Assistant Computer Scientist, Mathematics and Computer Science Division, Argonne National Laboratory, USA on the topic "Will the Existing Programming Models Evolve for Exascale Systems or Die".
- Launched the INDG Portal in EU India international conference in Hyderabad during 4-6 August 2010 organized by Department of Information Technology, Govt. of India.
- Telemedicine Society of India (TSI) in association with S. C. B. Medical College, Cuttack, Odisha, India and C-DAC organized the 6th National Congress, "Telemedicon 2010", during November 14-16, 2010 at Bhubaneshwar, Odisha.
- Training on Online Examination System for Hindi Prabodh, Praveen and Pragya: Nodal Authorities at C-DAC, Pune on 28 May, 2010
- NLP Orientation Programme for the students of North Eastern Hill University [NEHU], Shillong at C-DAC, Pune on 14 – 20 January 2011
- "Applicability of HPC in Agriculture" for Indian Agricultural Statistics Research Institute (IASRI) and select scientists of ICAR laboratories across India (February 2011)
- "HPC Applications in various domains", Enterprise Incubator Foundation (EIF), Armenia (February 2011).
- "Next Generation Application Challenges in PARAM YUVA" for Government, Research and Educational Verticals, Pune (February 2011)
- "Advanced Parallel Programming Techniques on Large Clusters" for senior scientists of HUT, Vietnam at C-DAC, Pune (April 2011)
- "PARAM Usage and its Applications" at Dar-Es-Salaam Institute of Technology, Tanzania.
- "Proliferation of C-DAC HPC Activities and ONAMA in Academia" for Silicon Institute of Technology, Orissa Engineering College, Kalinga Institute of Industrial & Technology, etc. in Orissa.
- Bioinformatics group of C-DAC organized a three-day symposium titled 'Accelerating Biology' at Pune during December 14-16, 2010. The symposium aimed at creating awareness about the High Performance Computing and Grid Computing applications in Bioinformatics, and provided a forum for researchers to exchange views on the subject. It also seeks to improve the understanding of related problems faced by the Bioinformatics

industry and derive scientific solutions for them.

- Various events comprising workshops, meeting and training sessions were organised as a part of spell-checker building work for the 4 NE languages in Pune and in the north east region.
- C-DAC organized one national level workshop in association with the United Nations Project Office on Governance (UNPOG), Korea on e-Government at the NDMC Convention Centre, Jai Singh Road, New Delhi on 28th February and 1st March 2011.
- C-DAC in association with STQC had also organized a Technical Workshop on "Security concerns in e-Procurement Systems.

Workshops organized

- Under Information Security Awareness initiative, 237 workshops were conducted in 42 cities spanning 24 states. Total no. participants 8634 (Includes teachers, parents, NGOs, school children, college students, etc).
- Organized "Virtualization Technologies and Cloud Computing" workshop on 21st Aug 2010.
- 2-day workshop on Digital Learning technologies, conducted in association with JNTU, Hyderabad in February 2011
- 14 orientation workshops jointly with SRG members for Government officers, NGOs, teachers etc. on InDG project. Nearly 1500 people were sensitized.
- 2 state level multi stakeholders' workshops in Kerala and Gujarat were held and 200 people were sensitized on InDG project.
- 30 Community level workshops were organized for 600 rural people on InDG in Karimnager district of Andhra Pradesh with the help of CSC operators.
- 3 state level Capacity building workshops were organized for CSC operators in Andhra Pradesh, Madhya Pradesh and Himachal Pradesh
- An Industrial Liasoning Workshop on IT-Technopreneurship was organized in Noida in the month of January, 2011 for identifying and developing Entrepreneurial partners for the purpose. A large number of SMEs participated.
- A workshop organized under the aegis of IT Consultancy Clinic (ITCC) a joint initiative of C-DAC and DSIR. It was inaugurated by Shri Ajay Kumar I.A.S., Joint Secretary, DIT

Shri Ajay Kumar, IAS, Joint Secretary, DIT inaugurating workshop under IT Consultancy Clinic

- Workshop on "Indian Smart Grid - Premise & Perspective" was jointly conducted by Intel &C-DAC on 11th March 2011, Bangalore.
- The GARUDA Grid Operations & Administration (GGOA) workshop was conducted on during 17th -18th March 2011 at Knowledge Park, Centre for Advanced Computing (C-DAC), Bangalore
- One day Workshop on "Virtualization Technologies and Cloud Computing" was conducted on August 21, 2010
- One day Workshop "UbiComp India 2011" was conducted on Feb. 26, 2011
- A National Workshop on Cloud Computing was conducted on May 21, 2011
- A Workshop on "Android and its applications" was conducted on May 26-27, 2011

- A five day workshop on 'Software Development Life Cycle & Project Management Workshop' was held in C-DAC Kolkata during 17th - 21st January 2011 as per Quality Improvement Program & Implementation of ISO 9000. The course was anchored & conducted by scientists from C-DAC, Bengaluru.
- C-DAC, Kolkata, along with Birsa Agricultural University (BAU), Ranchi jointly organized a two-day Workshop on "IT-enabled Services for strengthening. Research-Extension-Farmer-Market Linkage" on January 7-8, 2011 at BAU, Ranchi, as a part of the project "Web-enabled Access of Agricultural Information through PC and Mobile Devices" (WEAAI).
- C-DAC, Kolkata organized two-day workshop jointly with Cognitive Science department, Jadavpur University on 1st and 2nd June, 2010 on National Program on Perception Engineering
- Workshop on Honeynet Technology – Attack Data Capture &analysis done at NITTTR Chandigarh.
- 4th National Workshop on "Telemedicine Today & Tomorrow" at C-DAC Mohali on 23rd Dec, 2011.
- Technikriti – workshop on Technology Transfer at C-DAC Mohali on 9th May 2010.
- National Workshop on Business Intelligence and Data Warehouse – Tools and Techniques, December 1-4, 2010, at C-DAC Kharghar, Mumbai
- One Day Workhop on Machine Learning on February 19, 2011 at Ramrao Adik Institute of Technology, Nerul, Navi Mumbai.
- An International Workshop on "Large Scale Biometric Identity Management Systems" (L-BIMS 2011) was jointly organized by C-DAC Mumbai (Biometrics Division) and IIT Gandhinagar on 20th and 21st Jan. 2011, which brought together experts and stakeholders from government, industry and academia to discuss challenges and solutions which can help in making Large Scale Biometric Identity Management Systems successful.
- A one-week workshop-cum training program on Natural Language Processing [NLP] was organized by C-DAC, Pune for North Eastern Hill University [NEHU], Shillong during 14 – 20 January 2011.
- One day workshop on Forest Environment and sustainability trends (FEST) with ISG Pune chapter and Symbiosis Institute of Geo-informatics.
- "WMO Inter-Regional CLIPS training Workshop on Urban Climatology, held at IITM, Pune during 6-10 Sept 2010.
- SASCOF-1 (South Asian Climate Outlook Forum) at IITM Pune. This workshop highlighted objectives and proposed activities of the 'Monsoon Mission.
- AOGS2010 - 7th Annual Meeting and Geosciences World Community Exhibition at Hyderabad during 5 - 9 July 2010
- Workshop on "Towards the era of probabilistic prediction: from days to decades" at New Delhi.
- Indo-Russian Workshop on "High Performance Computing in Science and Technologies", Pune, Nov 2010
- "Parallel Programming Workshop" for faculty from Colleges and Departments of Bharathidasan University, Tiruchirappalli (August 2010)
- International workshop on "High Performance Computing and it's challenges", Hanoi University of Technology (HUT), Vietnam (December 2010)

ISEA WORKSHOPs

Looking at the growing importance of Information Security, Department of Information Technology has identified this as a critical area. Information Security Education and Awareness (ISEA) Project was formulated and launched for a period of five years. One of the activities under this programme is to widely generate information security awareness to children, home users and non-IT professionals in a planned manner. C-DAC Hyderabad was assigned the responsibility of executing this project by Department of Information Technology, Ministry of Communications and Information Technology, Government of India. As part of this activity, C-DAC, Hyderabad has to prepare the Information Security awareness material, coordinate with Participating Institutes (PIs) in organizing the various Information Security awareness events.

ISEA Workshop held at National Defence Academy (NDA), Pune on 25 th February 2011

ISEA Workshop, DAV Public School, Aundh at Pune on 18th-19th October, 2010

- SCIENCE DAY HELD FROM 27.02.2011 TO 06.03.2011 AT PANCHVATI, PASHAN ROAD, PUNE - Free language Fonts and Tools CDs were distributed. 4 Day training workshop was also organized for local residence and senior citizens including a lecture on Computers Past Present and Future by Mr. Mahesh D. Kulkarni.

Important Visitors and Delegation

- Delegation from Uzbekistan: A six-member delegation from Uzbekistan, led by H.E. Mr. M. Sangilov, Deputy Director General, Uzbek Agency for Communication and Information visited C-DAC, Noida on 24th January 2011. The visiting delegation had a fruitful discussion on possible collaboration with C-DAC in IT Research & Education. The team was in the country on the invitation of Govt. of India for attending the Joint Working Group on IT.
- Delegation from NICT Japan: A three-member delegation from NICT Japan, led by Prof Satoshi Nakamura, DG, Keihanna Research Laboratories visited C-DAC on 12th May 2010 to have discussions on Universal Speech Translation Advanced Research (U-STAR). The delegation interacted with the research team and reviewed the work being undertaken by C-DAC under the U-STAR project.
- Delegation from Denmark: Prof Michael Carl, Copenhagen Business School, Denmark paid a visit on November 16, 2010. He had extensive discussions on collaborative research project on “human-machine interaction in translation”, aimed at studying the human translation process and integrating it with the machine translation process.
- The Hon’ble Union Minister of State for Communications & Information Technology, Shri Gurudas Kamat visited C-DAC on March 17, 2010.
- Shri Shashi Kant Sharma, IAS, Secretary, DIT, MCIT, Government of India visited on October 28, 2010. He inaugurated a mobile Computing Lab.
- Dr. Vijay P. Bhatkar, Chairman, ETH Research Lab and Founder Executive Director, C-DAC visited the centre

on 31st March 2011. GARUDA Access Portal (GAP) was launched.

- Visit of NICT, Japan delegation on 11th May 2010 headed by Mr. Tatsuya Yamazaki, National Institute of Information and Communications Technology (NICT) and officials for possible collaboration of common areas of interest.
- Researchers from Swedish Institute of Computer Science (SICS), Kista, Sweden including Prof. Dr. Seif Haridi, Dr. Jim Dowling, Ms. Monica Winge, Mr. Sixten Bjorklund visited C-DAC on the occasion of "Workshop on Technology Development for Building Distributed, Scalable and Reliable Healthcare Information Store".
- Delegates from KACST, Saudi Arabia and delegates from NICT, Japan visited C-DAC.
- Shri Sachin Pilot, Honourable Minister of State for Communications &Information Technology visited the PARAM Yuva facility.
- Dr. Laxmikant Kale, Professor of Computer Science, University of Illinoisat Urbana-Champaign, USA visited the HPC group.
- Dr.B.C.Harinath, Director, JBTDRC, Wardha has visited Bioinformatics group on March 11, 2011 to discuss the Bioinformatics analysis of a diagnostic gene responsible for tuberculosis.
- Senior scientists of IASRI, New Delhi visited Bioinformatics group on February 8, 2011 to get an overview of the activities.
- Michael Watson and Emily Richardson of Roslin Institute, UK visited Bioinformatics group on December 13, 2010 to discuss the progress of the BBSRC project on Salmonella.

Dr. Pramodini Devi, Chief Investigator Manipuri Language, Ms. Manimala, Manipuri Language Expert and Mr. Ravikumar Ragam, Linguist, C-DAC attending the Bodo Spell-checker workshop at C-DAC, Pune chaired by Shri. Mahesh Kulkarni

- The Certified Localisation Professional Training Programme course was organized by the Institute of localisation Professionals (TILP) jointly with C-DAC, GIST, Pune and the University of Limerick under the patronage of the TDIL programme of DIT. A total of 20 participants from all over India participated in the training. The training consisted of an online training for 4 weeks followed by hand-on session.

Mr. Jasjit Singh welcoming TILP trainer in presence of Shri Ravi Shanker, Additional Secretary, DIT, Govt. of India and Smt. Swaran Lata HoD, TDIL DIT

- A team of around 35 programmers from DTE (Directorate of Technical Education, Mumbai) visited GIST labs on 16-03-2011. It was done on the request from the DTE team. The team was briefed about "National Roll Out

Plan" and other GIST products and services.

- GIST team which worked on the Delhi Tourism website development with Ms. Sheila Dixit – Hon. Chief Minister of Delhi
- 9th TAMIL INTERNET CONFERENCE 2010 held at Coimbatore from 23rd to 27th June, 2010.Hon. Deputy C.M. Govt of Tamil Nadu, Thiru. M. K. Stallion at the stall.

Thiru M. K. Stallion, Dy. C.M. of Tamil Nadu at 9th TAMIL INTERNET CONFERENCE 2010

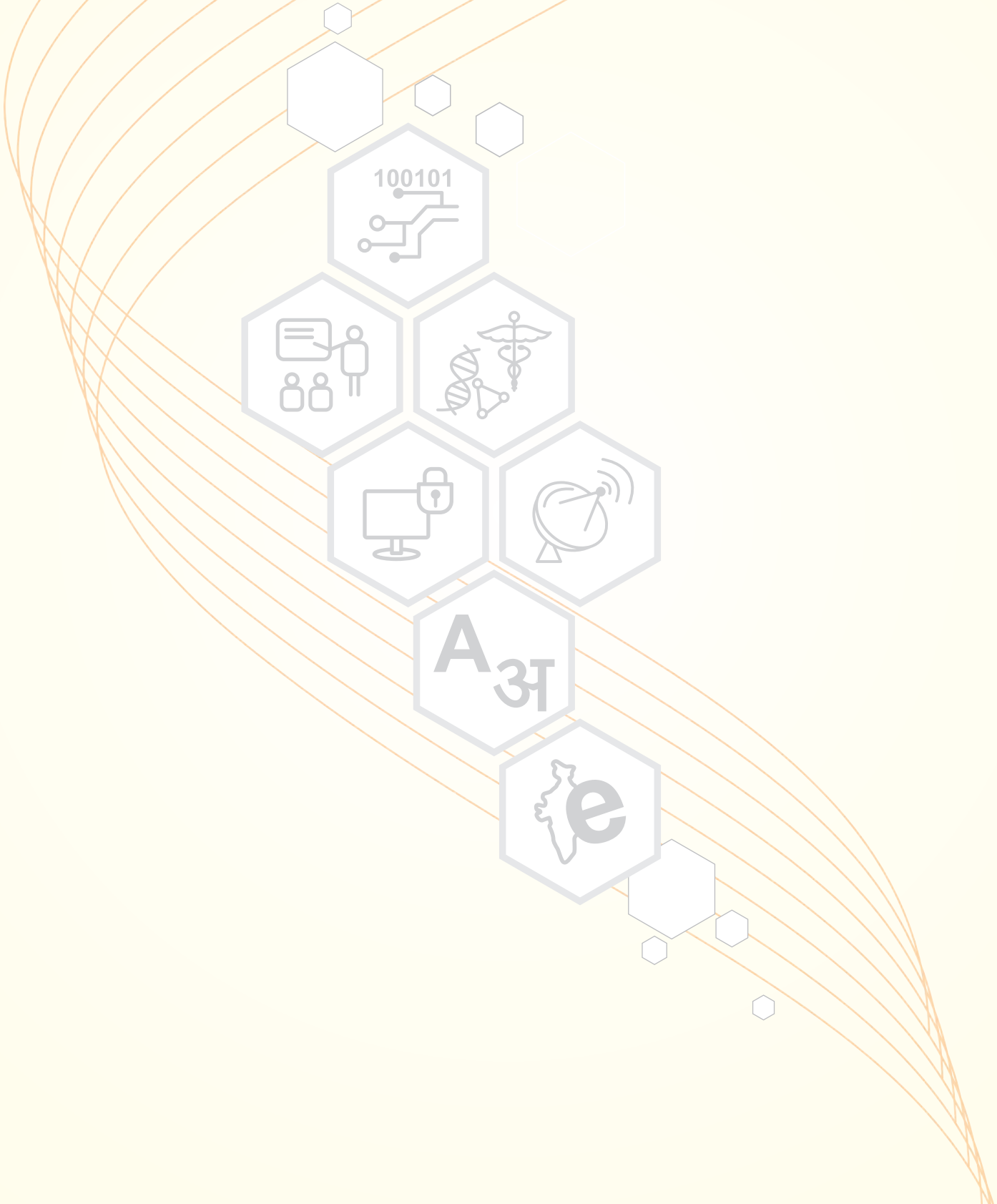
Mr. Mahesh D. Kulkarni, addressing the Mohali IDN conference in presence of Shri. J. S. Bhatia, Smt. Tulika Pandey, Additional Director DIT, Shri Ravi Shanker, Additional Secretary, DIT, Govt. of India and Dr. Govind, Senior Director, DIT and CEO of NIXI

- The AGIS'10 International Conference was organized on the 6th & 7th December, 2010 at Clarion Collection, New Delhi. The conference was aimed at information sharing and localization, especially in the official languages of India, which would ensure societal and economic growth.
- C-DAC Participated in the Town Official Language Implementation committee conducted by Corporation Bank, Mangalore in March, 2011. All TOLIC members from Central Govt, PSU's and Banks attended the meet. The GIST Rajbhasha Report Generation Software was showcased and later demonstrated to the participants.
- Organized GIST Technology Seminar at Kolkatta in August'11 which was attended by 70 dignitaries from various PSU, state government & central government offices.

Financials

Visit of Shri R Chandrashekhar IAS, Secretary,
Department of Information Technology, Ministry of Communications and IT, Government of India
at National PARAM Supercomputing Facility of C-DAC, Pune

Inauguration of 'India-Syria Centre of Excellence for Information Technology' by the Prime Minister of the Syrian Arab Republic H.E. Eng. Mohammad Naji Otri in the presence of Syrian Minister for Communications and Technology H. E.
Dr. Imad Sabouni, Ambassador of India to the Syrian Arab Republic, H.E. V. P. Haran, Director General, C-DAC Mr.Rajan T Joseph, Director of India-Syria Centre of Excellence for Information Technology
Dr. Nabil Hamed and other senior officials.



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