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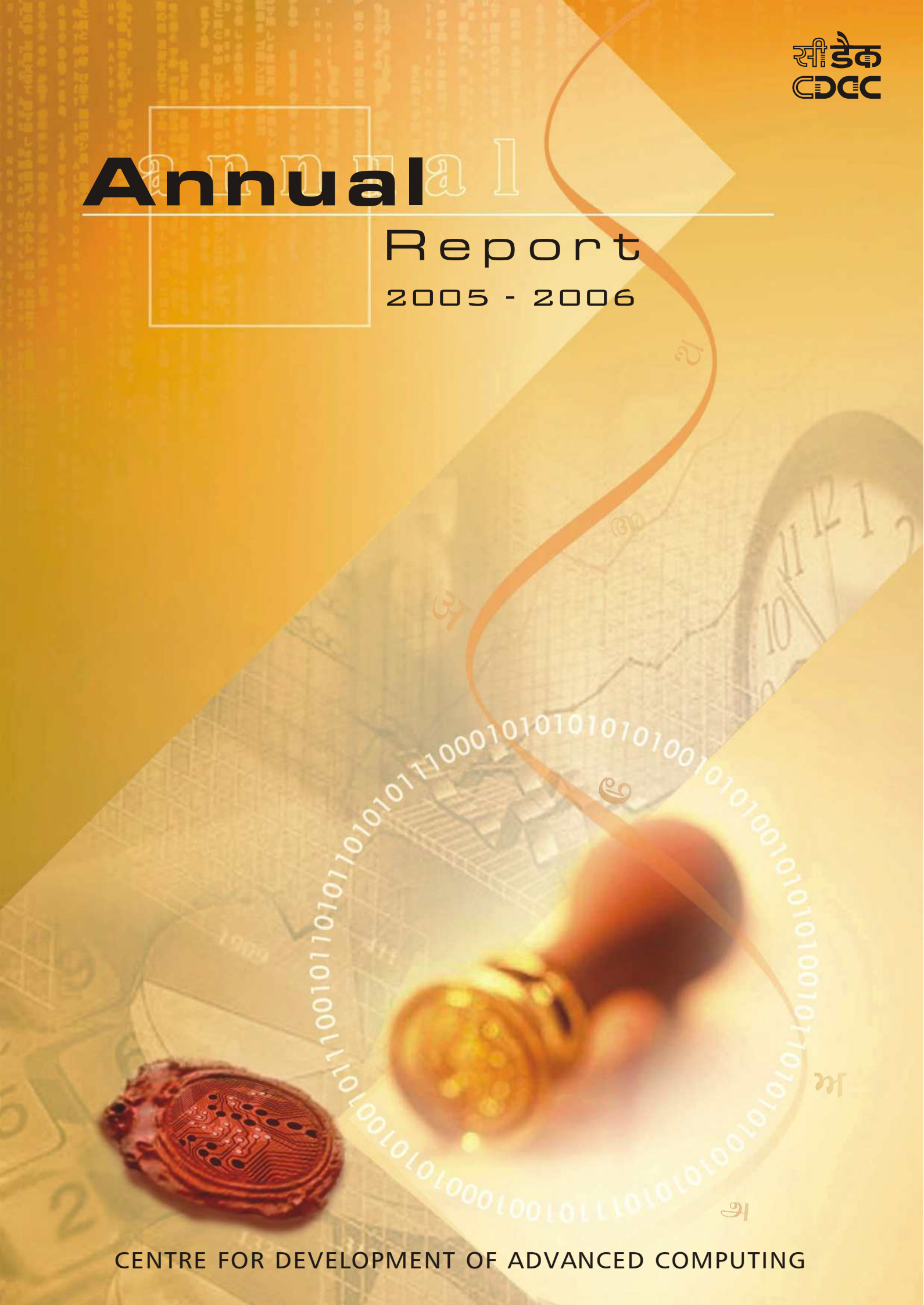
CDAC

Annual Report

2005 - 2006



CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTING

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Secretary, Governing Council C-DAC,
Registrar, C-DAC

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Overview

Centre for Development of Advanced Computing (C-DAC) is the premier R&D organization of the Department of Information Technology (DIT), Ministry of Communications & Information Technology (MCIT) for carrying out R&D in IT, Electronics and associated areas. As an established national institution for high-end R&D in IT and Electronics area, C-DAC continues to constantly innovate and leverage its expertise to develop and deploy IT and electronics products and solutions for larger societal and economic benefits of the nation.

The core technology areas that C-DAC deals with include High Performance Computing and Grid Computing, Multilingual Computing, VLSI and Embedded Systems, Real Time and Control Systems, and Professional Electronics, Software Technologies, Cyber Security and Health Informatics. More than a decade and a half of R&D effort of C-DAC in these areas has resulted in several enabling technologies, which form the core of C-DAC's technical strength. These have been further used by C-DAC to develop a wide range of products and solutions, many of which have been successfully deployed and are in use in many key sectors of the economy.

This report highlights the major activities carried out by C-DAC during the year in the areas mentioned above. The highlights of the activities are:

- In **Grid Computing**, C-DAC built the proof of concept National grid computing program and initiative, Garuda, connecting 45 premier research and academic institutions in India spanning 17 cities at 10/100 Mbps. This program progressed significantly to demonstrate the concept of consolidating computing, storage, software and other resources across the centers; and provide the infrastructure and problem-solving environment with heterogeneous resources for users from different disciplines to use the resources most suitable to their applications. Several enabling tools and technologies including domain-specific user interface, grid middleware components and grid monitoring and management tools were deployed on this infrastructure. Development and prototypes of Natural Disaster Management and Bioinformatics applications demonstrated on this infrastructure were progressed. These applications are categorized by intensive computing and data access requirements.

- In **High Performance Computing.** C-DAC completed development of 5 Gbps System Area Network and the design and simulation of next generation RCS card. C-DAC also commissioned a customized configuration of its PARAM Padma System at NCMRWF, New Delhi for its dedicated use in Weather Forecasting applications. Several HPC applications were also run on CTSF and NPSF systems.

- In **Multilingual Computing**, C-DAC launched free CDs containing Indian Language software fonts and tools in respect of Tamil, Hindi and Telugu languages during the year, for the benefit of large scale use and developer community. It also worked towards preparing similar CDs for other Indian languages such as Punjabi, Urdu, Marathi and Malayalam. It also developed more than 500 open type fonts for various Indian languages. Other activities in this area during the year included machine translation systems for administration and finance domains, Hindi teaching software through Bangla language, OCR for professional Malayalam script, enabling Indian languages, development of annotated speech corpora for Indian languages, development of innovative visual input aid for Indian languages, etc.

- In the area of **Professional Electronics**, C-DAC developed and deployed several electronic equipment and solutions in the sectors of Power Electronics, Agri Electronics, Automotive Electronics, Defence, Entertainment and for the disabled. These included SCADA based power distribution and control systems, various types of special purpose intelligent processor boards, area traffic control systems, under water range systems, digital programmable hearing aid, motorized wheel chair, acoustic land mine detector, set top box for TV and electronic nose for tea quality assessment.

- In the area of **Information Security and Networking**, C-DAC set up National Resource Centers for Cyber Forensics and Steganography at its Thiruvanthapuram and Kolkata centers respectively. It also developed tools and technologies for providing better system security including intrusion detection system, print document security toolkit, and security solutions for UDP applications.

- In the area of **Broadband and Wireless Networking**, C-DAC set up a wireless sensor lab at its Hyderabad centre. It also developed various technologies for TETRA digital mobile radio including base station receiver, advanced hand portable mobile radio, base band embedded software solutions and encryption technology for TETRA system. Other activities in this area included QOS experiments and lawful interception of VoIP traffic.

- In the area of **Software Technologies**, C-DAC has set up a National Resource Center for Free and Open Source Software at its Chennai centre in collaboration with AU-KBC. It has also developed and deployed several software products and solutions in the sectors of Indian Heritage Preservation, Public Health, Geomatics and e-Governance. A few examples of such systems were – Jatan: Virtual Museum Builder, Jatan: Pocket PC Application, Supply Chain Management System for Small and Medium Enterprise (SME) sector, Smart Card Access and Accounting System, Airports Accounts Management System, GIS enabled Systems (for Vehicle Tracking, Land Management and District Planning), e-Learning. C-DAC also strengthened Kofi Annan Institute set up earlier at Ghana.

- In the area of **Health Informatics** C-DAC has developed Telemedicine solutions and deployed the same at Orissa, Himachal Pradesh and North East; HIS systems at Sewagram and other locations; various information systems for Health Directorates at Thiruvanthapuram and Cancer Care System at hospitals in Kerala.

Through its **Education and Training** programmes, C-DAC continued to actively contribute towards the nations growing demand for trained IT professionals. During the year, it continued to offer its Diploma/ PG Diploma courses in Advanced Computing, Software Technologies, Enterprise System Management, Geomatics, VLSI Design, Digital Multimedia and the Program for Advanced Computer Education (PACE). It also introduced a few new formal high-end training programmes including M.Tech. Programmes in IT, VLSI Design and Computer Science & Engineering.

In addition to the technology development initiatives, this year has seen continuous improvement in C-DAC's manpower and other resources, facilitation services and other initiatives. It executed a project on IPR watch, commanded a strong professional team of 2500 regular, contract, project members at the year-end, made improvements in its library services and participated in various national and international conferences and events. During the year, it also bagged many awards and recognitions for its commendable job in both technical and non-technical areas.

Technical Activities

HIGH PERFORMANCE COMPUTING AND GRID COMPUTING

High Performance Computing (HPC) activities in C-DAC involve the design and development of HPC systems, development of system software and tools for effective utilization and management of these systems, optimization and support of various types of applications on these systems, and building and managing National Supercomputing Facilities for the end users of these systems. The key activities carried out during the year in this area are briefly described below.

System Area Network (SAN)

SAN is one of the key indigenously designed components of the PARAM series of HPC systems of C-DAC. During the year, C-DAC completed the development, testing and benchmarking of the 5Gbps SAN. It showed good overall system performance after which the team started work towards the design and development of PARAMNet-III (a 10Gbps SAN). PARAMNet-III is targeted to have speeds of 10Gbps full duplex with support for standard software interfaces, including Direct Access Protocol Library (DAPL). The message latency expected is of the order of 5 µsec. The basic switch will be a 48 port switch based on back plane rack design approach designed around Xilinx Virtex4 devices and Fulcrum 2232 chip. It will have PCIe (Express) host interface and multiple 10Gbps link interfaces. Industrial design and packaging of this rack-based 48 port switch is a major design effort covering ergonomics, aesthetics, thermal and EMI/ EMC design. Currently, the design, verification and testing at sub-module level are in progress.

Reconfigurable Computing System (RCS)

RCS is a new paradigm to accelerate the application performance in HPC systems. Instead of pushing for high-end general-purpose processors in a system, it allows hardware to be tuned at algorithmic level for applications speed-ups.

C-DAC has developed a RCS card with 6 Million logic gates compute engine. It has Redhat Linux based driver support. A hardware library of the Smith-Waterman algorithm for bioinformatics search application has been designed, ported and tested successfully on this RCS card. Encouraging benchmark results showing speed-ups of 25-30 times against a purely software solution have been obtained. The same card has also been supplied to the Real Time System Group (RTSG), Bangalore for the Cryptanalysis application under the POC Grid Garuda project.

System Software and Tools

The HPCC software suite provides the core system software and tools required to address the performance, usability and manageability challenges of HPC systems. It encompasses a wide range of system level software such as device drivers, file systems, lightweight protocols, compilers, profilers and debuggers. Some of the significant developments carried out in this area during the year include the following:

- Porting of the Program Development Environment and the Message passing libraries to AIX 5.3 (32bit).
- Porting of the Fortran 90 Integrated Development Environment (F90IDE) to AIX 5.3 (32 bit). The F90IDE provides the complete development environment consisting Fortran 90 compiler, debugger, Fortran 77 to 90 converter, editor and browser.

- Porting of the Debugger Integrated with Visualizer and Analyzer (DIViA) to AIX 5.3 (32 bit). Porting of this tool to AIX5.3 (64 bit) is under progress.
- Porting of C-MPI on AIX 5.3 (32 bit). C-MPI is a high performance implementation of MPI on cluster of multiple processors (CLUMPS). Development of C-MPI (64 bit) work is in progress.

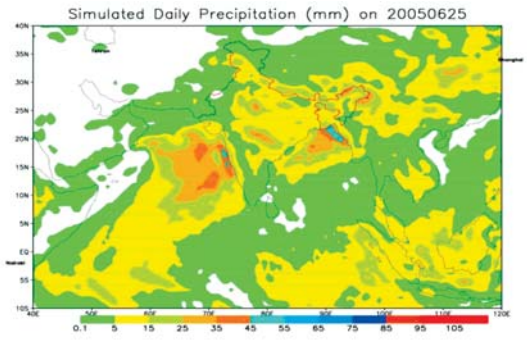
Scientific and Engineering Applications

As part of its initiatives in the area of Scientific and Engineering Applications, C-DAC has demonstrated effective use of HPC systems in various disciplines of Science and Engineering including Atmospheric Science, Fluid Dynamics, Structural Mechanics, Seismic Data Processing, Earthquake Engineering, Bioinformatics, Genetic Algorithm and Materials Modeling. It also interacts closely with the domain experts in these areas including those from academia, research organizations and industries. Some of the key activities carried out during the year in this area are described below.

Computational Atmospheric Sciences (CAS)

As a part of the Extended Range Monsoon Prediction Experiment (ERMP) of the Department of Science and Technology, Government of India, C-DAC made seasonal runs for the months of June, July, August and September 2005 using NCEP, Global T170L42 Spectral Model. The forecast Sea Surface Temperature (SST) of the NCEP Coupled Forecast system was used for the seasonal prediction.

Tropical cyclone Agni is a rare category tropical cyclone, which originated very close to the equator (~ 0.7^0N). To examine the role of large and mesoscale atmospheric features in the genesis of Agni, a high-resolution simulation was carried out using Weather Research and Forecasting Model (WRF), version 2.0.3.1. The analysis of the simulated heat and moisture fluxes along with the analysis of the large and mesoscale parameters was completed.



Simulated Daily Precipitation using T170L42

In a DST sponsored project, an assessment of the skill in predicting the Indian Summer Monsoon rainfall on a seasonal scale, of the different Atmospheric General Circulation Models (AGCMs) used in the country to generate such predictions has been carried out. Six models have been ported on the PARAM Padma system with 20 years climatology runs.

A configuration of PARAM Padma machine has been commissioned at National Centre for Medium Range Weather Forecasting (NCMRWF) under a joint project by DST and DIT. Support and continuing research in mesoscale meteorology is in progress.

Computational Fluid Dynamics (CFD)

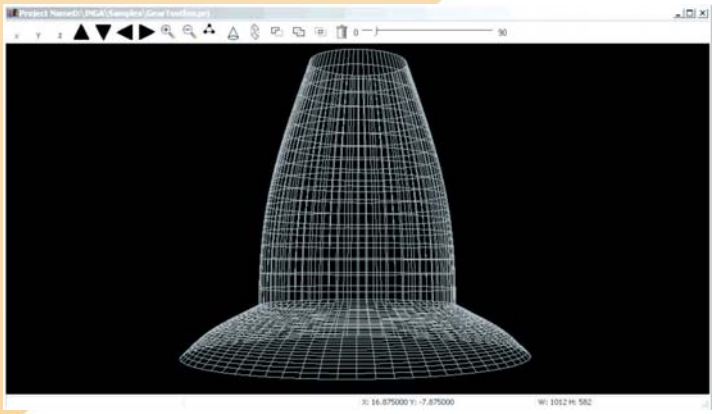
A DST funded project on “Performance Improvement of Shell & Tube Heat Exchangers” has been completed. The aim of the project was to analyze the thermal performance of a shell and tube heat exchanger having segmented baffle and helical baffle using CFD technique. The results have been compared qualitatively with published results.

The CFD team also interacted with and conducted training programmes on PHOENICS software at a number of potential user organizations of this software like National Institute of Technology, Trichy, Thaigarajar College of Engineering, Madurai, Indian Institute of Technology, Roorkee and Indian Institute of Technology, Guwahati.

Computational Structural Mechanics (CSM)

A general purpose parallelized, Monte Carlo based software for stability analysis of structural systems has been developed and validated. Moreover, the development of parallel GA and an interface with analysis solver code was done and test runs on PARAM Padma were carried out.

The structural mechanics software, FRACT3D, was also demonstrated on Reconfigurable Computing Systems and a research paper was presented at the HPC Asia 2005 conference held at Beijing. An in-house GUI software for modeling and visualization of engineering structures was completed and version 1.5 (beta) released.

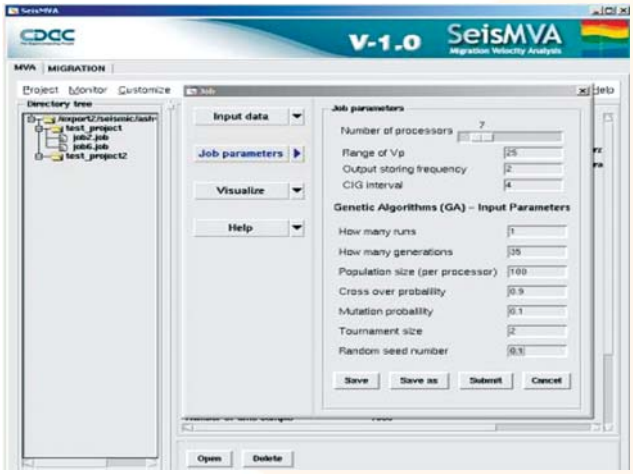


Gear Tooth Model

In a joint project with IIT-Mumbai, SGSITS-Indore and IIT-Guwahati, a general purpose COMPOSIT material structural analysis software development was continued with the addition of new analysis features.

Seismic Data Processing (SDP)

A DST funded project on Seismic Pre-stack Migration and Velocity Analysis was completed. Development and parallelization of velocity analysis algorithm based on pre-stack migrated image gathers, fine-tuning and real data testing of Seismic Full Waveform Inversion (INVWAV) and Seismic Travel Time Tomography (SEISTOM) are in progress. Development of GUI is in progress for all the Modeling and Migration codes developed earlier, so that they can be accessed from one platform and in a user-friendly way.



Screen for MVA Job parameters

Bioinformatics

The Bioinformatics team has been concentrating on some of the major areas of research like Molecular Modeling, Genome Analysis, BRAF and Grid Computing.

In the area of Molecular Modelling, the activities carried out during the year include Protein Folding of villin head pience up to 200 nanoseconds simulations; Peptide Nucleic Acids Conformational study; Molecular docking and structure based drug design; Molecular dynamics of receptor ligand systems; and Modelling of inorganic complexes binding to DNA.

In the area of Genome Analysis, the activities carried out during the year include Gene prediction and annotation of five mycobacterium genomes, Microarray data analysis of Arabidopsis and promoter study; and execution of the DBT funded project “EST analysis of mosquito genome” in collaboration with National Centre for Cell Science.

Genome Grid Portal for Smith-Waterman Application

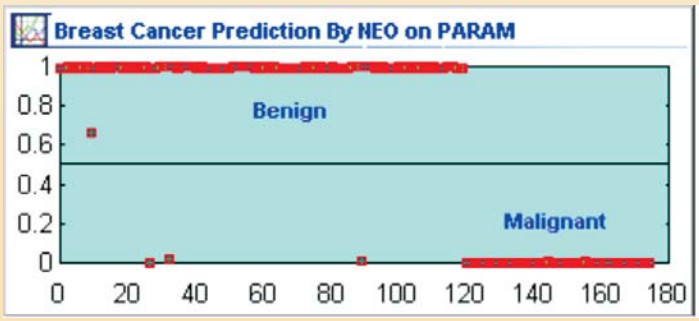
As a part of the Bioinformatics Resources and Applications Facility (BRAF), Phase-II activity, an MOU with Jubilant Biosys, Bangalore, has been signed to carry out work on molecular modeling of ligands. Under the BRAF programme, new features were added to problem solving environments and support was given to scientists from IITs and CSIR labs in using AMBER and CHARMM packages.

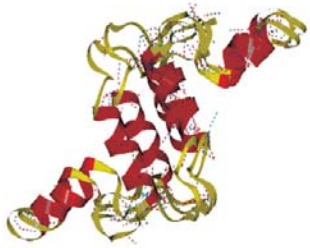
Efforts are continuing to build the Genome Grid software for bioinformatics applications. It provides an easy to use interface for biologists, by hiding the intricacies associated with accessing the heterogeneous systems in the grid environment setup across cities. This uses Globus as middleware and different local job managers like Torque, Loadleveler etc. for job submission. It is built using 3-tier J2EE architecture that makes it portable and easily maintainable.

Evolutionary Computing (EC)

In collaboration with National Chemical Laboratory, Gene expression programming technique and Genetic Algorithms (GA) have been used to evolve kernel function of a support vector machine (SVM). This effort is aimed at improving classification accuracies. In another activity, Protein structure prediction using GA has been implemented to get a better structure for villin head piece. This was also ported on to a grid test bed at ICTP, Italy. Monte Carlo method has been used to study the polymerization of Amyloid b-peptide, which is responsible for Alzheimer’s disease.

Simulation of Robotic Arms and Job processing in a 3D Environment with real-time constraints has been done and visualized. A tool called Neural Evolutionary Optima (NEO) has been developed to train Artificial Neural Networks by Evolutionary methods like Genetic Algorithms. NEO works in sequential as well as parallel mode and has a wide variety of applications in real time pattern recognition and classification problems.





Polymerization of Amyloid b-peptide

Computational Materials Modeling (CMM)

In collaboration with the Department of Physics and Electronic Sciences, University of Pune, a project has been initiated to make theoretical study for the experimentally observed optical spectra of ZnSe quantum dots using ab-initio codes CPMD and PARSEC. In collaboration with NCL, coupled cluster singles and doubles (CCSD) code has been parallelized and tested for the case of Ozone molecule.

The Theoretical Chemistry Group of the University of Pune with C-DAC's support made extensive revisions of the MTA algorithm for optimization of large molecules with significant contribution for multiple schemes for estimating energy and a few more techniques for evaluating energy and its derivatives.

Apart from algorithm development, study of various forms of cyclodextrins and their interaction with water has also been made. Many of the calculations for obtaining low-energy structures are first performed using MTA and then optimized using standard GAMESS, enabling large savings in computational resources utilized.

Supercomputing Facilities – NPSF and CTSF

The two National Super Computing Facilities established by C-DAC are the National PARAM Supercomputing Facility (NPSF) at Pune and C-DAC's Terascale Supercomputing Facility (CTSF) at Bangalore. NPSF houses the PARAM 10000 system launched by C-DAC in 1998 and CTSF houses the PARAM Padma system launched by C-DAC in 2003. Several users have made use of these facilities for processing their applications. Secured Remote Access Facility is available both at NPSF and CTSF for users. These facilities are extensively used by the technical affiliates and for sponsored projects from research organizations.

With the commissioning of the PARAM Padma system at CTSF, Bangalore, several NPSF users have migrated their applications from the PARAM 10000 system to the PARAM Padma. At present, the PARAM 10000 system is mainly used for application development (code parallelisation, compilation and debugging) and for conducting hands-on sessions during training, seminars and workshops. It is also used as grid nodes for GARUDA. In order to reinforce, the computing power of NPSF, a new cluster was recently commissioned. This cluster was built, commissioned and added to the existing resources of NPSF during the year. The cluster has 16 nodes of dual intel xeon processors, 48 GB memory, 4 terabytes of SAN based storage, 10 terabytes of backup and operates with the Linux operating system.

Looking at the increasing demand of computational power, C-DAC initiated the setup of a grid infrastructure across the country. This infrastructure will help various users from across the nation to access the computational power available at various supercomputing centres such as the NPSF and the CTSF. A grid lab was established across four C-DAC centres including those at Pune, Bangalore, Hyderabad and Chennai. The grid lab interconnects a cluster each from these four centres and is used by C-DAC's R&D team to test their tools and technologies developed for the grid infrastructure, before deploying it on the main grid. The CTSF and NPSF are part of this infrastructure, while at Chennai and Hyderabad, new XEON Clusters have been commissioned.

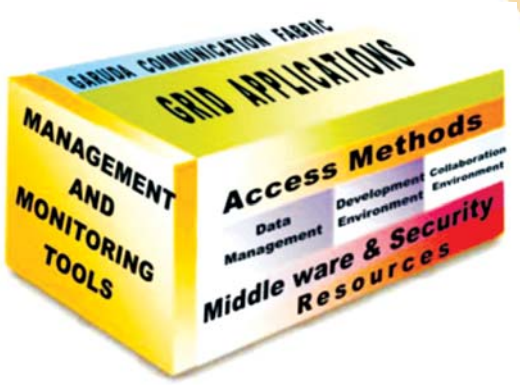
GARUDA- India's National Grid Computing Initiative

GARUDA is a collaboration of science researchers and experimenters on a nationwide grid of computational nodes, mass storage and scientific instruments that aims to provide the problem solving environment by integrating the technological advances required to enable data and compute intensive applications. GARUDA is anchored by C-DAC through funding by DIT. GARUDA aims at strengthening and advancing scientific and technological excellence in the area of Grid and Peer-to-Peer technologies.

In order to achieve the project objectives, GARUDA brings together a critical mass of well-established researchers from 45 research laboratories and academic institutions who have formulated an ambitious programme of activities.

GARUDA Architecture

The major components of GARUDA include aggregation computing resources; high-speed network fabric which provide low latencies; middleware including security mechanisms to support seamless distributed computing and access mechanisms; tools to support program development, collaborative environments, data management and grid monitoring and management. Access portals and specialized problem solving environments provide a seamless user interface to the Grid.



GARUDA Component Architecture

GARUDA Resources

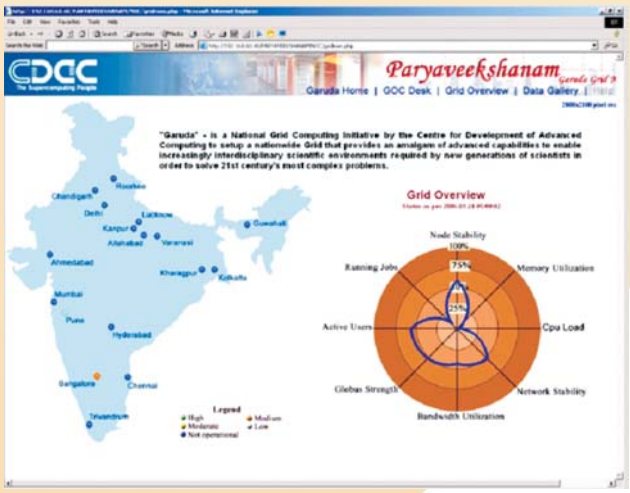
In the initial phase, the PARAM Clusters at C-DAC locations in Bangalore, Pune, Hyderabad and Chennai have been interconnected to power the Grid. This provides a heterogeneous resource environment with clusters based on AIX, Solaris and Linux environments. The PARAM clusters have PARAMNet interconnect and C-DAC's HPCC software.

GARUDA Communication Fabric

The GARUDA network is a Layer 2/3 MPLS Virtual Private Network (VPN) connecting the partner institutions at 10/100 Mbps with stringent quality and service levels. The network supports a peak total backbone throughput of 2.43 Gbps across 17 cities covering 45 research and academic institutions in the country.

GARUDA Monitoring and Management

A dedicated Grid monitoring and management centre has been established at Bangalore, which helps in managing and monitoring all the components in the Grid. State-of-the-art display walls and advanced software like Paryavekshanam, developed at C-DAC, help in effectively monitoring the health and utilization of various components of the Grid. A mobile agent framework for monitoring the Grid resources and also for automatic update of software releases is being explored.



GARUDA Grid Monitoring and Management Tool

Grid Monitoring and Management Centre

GARUDA Middleware

The resource management and scheduling in GARUDA is based on the deployment of industry grade schedulers in a hierarchical architecture. At the cluster level, scheduling is achieved through Load Leveler for AIX platforms and Torque for Solaris and Linux clusters. At the Grid level, the Moab scheduler from Cluster Resources interfaces with the various cluster level schedulers to transparently map user requests onto available resources in the Grid. To enable data oriented applications, GARUDA provides integrated but distributed data storage architecture by deploying the Storage Resource Broker (SRB) from Nirvana.

Program Development Environment (PDE) enables users to carry out an entire program development life cycle for the Grid. The GARUDA portal, which provides the user interface to the Grid resources, hides the complexity of the Grid from the users. It allows submission of both sequential and parallel jobs and also provides job accounting facilities.

GARUDA Applications

Natural Disaster Management and Bioinformatics applications that are characterized by intensive computing and data access requirements are being targeted in the proof of concept phase of GARUDA.

MULTILINGUAL COMPUTING AND ALLIED AREAS

C-DAC has pioneered the Research and Development in Indian language computing and created a niche for itself in developing and popularizing the use of Indian languages on computers and established its credentials as an organization to reckon-with in the area of multilingual computing technologies. The specific areas, which C-DAC targeted, are publishing and printing, word processing, office automation suites, electronic mail, linguistic resources, machine translation, text to speech, speech recognition, language learning, broadcast and multimedia content in Indian languages.

Release of language software Fonts and Tools for free

The ultimate goal of multilingual computing is to ensure that the technology reaches the common man at his doorstep in his own native tongue so that he feels more at-home working with computers. In this direction, Ministry of Communications and Information Technology's Language Technology mission had initiated the release of free software tools and fonts in Indian languages. C-DAC spearheaded the activity of consolidating the tools from various players and developed localized versions of free and open source software for integration in the free CDs. The CD containing tools and fonts for Tamil, Hindi and Telugu was launched in April, June and October 2005 respectively in the presence of Thiru Dayanidhi Maran, Honourable Union Minister of Communications & IT. The Tamil software was released by Kalaignar Thiru Karunanidhi, Honorable Chief Minister of Tamilnadu. Smt. Sonia Gandhi, Chair Person of United Progressive Alliance, released the Hindi software tools and fonts. Dr. Y.S. Rajasekhara Reddy, Honorable Chief Minister of Andhra Pradesh released the Telugu software tools. Software tools and fonts CDs for Punjabi and Urdu are awaiting release.

Hindi Software CD

The language software tools and fonts CDs are distributed free of cost through various channels. For this C-DAC has developed an Indian language portal www.ildc.in through which a user can request CDs, download tools, register on website and provide feedback. The tools, fonts and software developed by various commercial, academic, C-DAC Centres and Resource centres for different languages has been made available for download. The user of this portal is provided with tools in different Indian languages with an interface in the local language. The FAQ and solutions to common problems encountered are disseminated through the website as well.

C-DAC had developed a collaborative portal for Indian language computing (www.janabhaaratii.org.in/portal) and also a site for Free Open Source Software (FOSS) resources in language computing. The resources were developed by the community of developers, which will be made available to the community of users.

Multilingual Research and Development activities

Various Research and development activities have being carried out specific to multilingual computing and related areas at various C-DAC centres, they are: standardization, linguistic resources and tools development, Text to Speech, OCR, machine translation, handwritten text recognition, search engines, prediction dictionaries, language support for mobiles and embedded devices, broadcast medium, speech and natural language processing, application localization, language learning and many more.

Under the localization activity C-DAC had undertaken localization of various Open Source software such as Open Office, Browsers, email client, Multi Protocol messenger, Content management system, Operating system. Currently localized version of the above in Urdu, Marathi, Malayalam, Oriya, Assamese, Punjabi, Tamil, Kannada Gujarati are completed while work is in progress for rest of the languages.

Various research projects undertaken in the area of multilingual computing and communications included the development of Open Type fonts for all the scheduled 22 Indian languages, Rajyabhasha Information Technology Application development Programme (RITAP), Content COIL Net project, W3C, IPR watch, Indian language computing - National Rollout plan and INCITE project with European Commission.

MANTRA – Machine Assisted Translation System for Administrative and Finance Domains

C–DAC launched its Machine assisted Translation system – MANTRA for Administrative and Finance domains at the hands of Shri Shivraj V. Patil, Hon'ble Union Minister for Home Affairs, Government of India on September 14, 2005. The development of the system was sponsored by Department of Official Language **(**DOL), Ministry of Home Affairs, and Government of India. The software is available on http://www.mantra-rajbhasha.cdac.in/mantrarajbhasha

MaTRa - English-Hindi Machine Translation System

C-DAC is engaged in enhancing the translation capabilities of the system by incorporating mechanisms for fragment translation, and strategies to make the system more robust. The lexicon was enhanced in quality and quantity resulting in better translation. The pre-processor was enhanced with machine learning techniques such as artificial neural network, handling of quoted entities and identification of abbreviations, salutations, floats and dates. During the year BLEU/NIST scores for MaTra improved from 0.0377/ 2.1261 to 0.0534/3.1494. The current user evaluation is 65%. Preparation of a comprehensive evaluation corpus was also completed.

TestBed for Evaluation of English-Hindi Translation Support System

Evaluation of translation systems is of interest to everyone involved in the translation process. However, the evaluation of machine translation quality is complex. The TestBed is an evaluation framework, which consists of Test suite and Evaluation criteria under which different lexical and structural categories are identified, approx. 4000 sentences with covering variety of lexical and structural components collected, manual translation of each sentence done by three different translators, objective queries associated with each sentence have been framed which are asked by the evaluator and used to calculate the score to rank the system in the scale of 0-1., subjective feedback queries associated with System, Grammatical Category and Sentence level has been framed and finally evaluation formulas are being framed.

Language Learning and Proliferation Activity

Continuing its development and deployment of language learning software on the Internet, C–DAC successfully launched its LILA (Learn Indian Languages through Artificial Intelligence) Hindi teaching software through the Bangla language. The three Hindi courses Prabodh, Praveen and Pragya can now be learnt on the Internet by selecting Bangla as the medium of instruction. The packages were dedicated to the Nation by Shri Shivraj V. Patil, Hon'ble Union Minister for Home Affairs, Govt of India in the presence of Shri Manik Rao Gavit, Hon'ble Minister of State for Home on September 14, 2005 to mark the Celebrations of Hindi Divas. The project was sponsored by the Rajbhasha Vibhag (DOL), Ministry of Home Affairs, Government of India. The packages can be accessed online at the website http://lilappp.cdac.in .

LILA Hindi Prabodh on Mobile Phones

C–DAC launched its LILA (Learn Indian Languages through Artificial Intelligence) Hindi Prabodh for Mobile Handsets through Multi Media Cards (MMC) to teach Hindi through the English language. The MMC has the latest (revised) courseware for Hindi Prabodh and has been incorporated with all the multimedia facilities. LILA Hindi Prabodh on Mobile Phone was launched on September 14, 2005.

Launching of the software "LILA Hindi Prabodh" on Mobile Phone

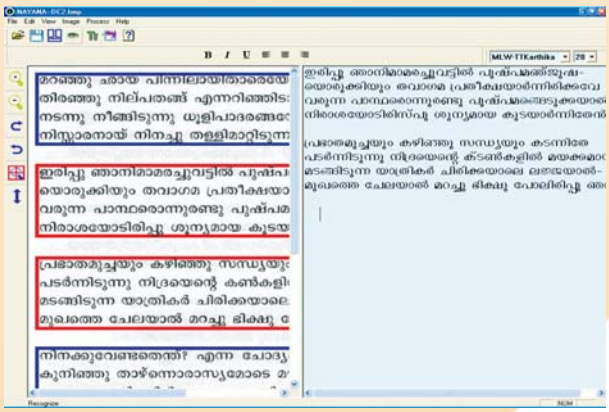
MoU with Department of Language

C-DAC's success in the area of domain specific Machine Translation and the language teaching software LILA, has led the Department of Language, Ministry of Home Affairs to enter into an MoU with C–DAC for a new project "Language Application Tools for Rajbhasha" in the Year 2005 for the development of:

- MANTRA–Rajbhasha for Machine Translation systems for various other domains viz., Agriculture, SSI, Healthcare, IT and Education
- Pravachak–Rajbhasha for Hindi Speech Synthesis
- Shrutlekhan–Rajbhasha for Hindi Automatic Speech Recognition and
- LILA–Rajbhasha for teaching Hindi Prabodh, Praveen and Pragya through various Indian Languages viz., Bangla, Assamese, Manipuri, Oriya, Marathi, Nepalese, Gujarati, Punjabi, Kashmiri, Bodo, Kannada, Malayalam, Tamil, Telugu and Hindi

Optical Character Recognition (OCR) System for Traditional Malayalam Script

The project was aimed at the design and development of an Optical Character Recognition (OCR) system for printed documents with traditional Malayalam script. This was required since all the Malayalam books published before the 1980s are in the traditional script. There are approximately 1000 characters in the old Malayalam script some of them having very small differences in the grapheme level which poses complexities in development of a accurate system for recognition of such a character. Feature extraction and compilation for purpose of recognition is completed.



Optical Character Recognition (OCR) for Malayalam

Hindi and Bangla On-line Handwriting Recognition (OHR) System development

The objective was to develop an adaptive method for On-line Hindi and Bangla handwritten text recognition to spread the use of Hindi and Bangla as input language for direct online handwritten documentation for different input devices. Typical applications for on-line handwriting recognition are Tablet PCs, Pen Tablets with stylus, small hand-held devices (e.g. PDAs), Mobile-phones etc.

A demo model of a basic Hand Printed Isolated Character Recognition System for Hindi and Bangla was developed. It can handle a pen tablet or a mouse as an input device. Alphabets as well as numerals can be recognized (with limited no. of variations of handwriting patterns).

Uniform Input Scheme

C-DAC has created maps/tools to have a uniform interface across all platforms. It was found that those familiar with usual QWERTY keyboard prefer phonetic input scheme to Inscript. Thus various maps were designed for Indian languages and integrated with the system to work at command level, with editors (like yudit and kwrite), with browsers like Mozilla and with text processing packages like OpenOffice.org

Innovative Visual Input aid for all Indian languages:

The majority of the Indian masses are not familiar with the inputting methods in Indian languages. The Indian Language IT applications will proliferate at a faster rate, if an easy input mechanism is provided on top of IT applications. To achieve the same, C-DAC had initiated a joint effort with FTK, Israel to bring out an innovative input mechanism using the expertise of C-DAC in Indian language technologies and FTK's image processing technologies. FTK's Virtual Inputting Method will be bundled into various products.

Postgresql Extension To Support Indian Language Text Manipulation

Postgresql is open source software and is comparable with any commercial RDBMS software. The main objective of this in-house project is to provide support for handling Indian Language text and provide an easy to use interface for inputting the text and report formats. It covers functions to convert scripts from one Indian language to another, provides, sort and Indian text processing features. Currently this is available for Hindi language.

Affordable Computing In Rural Environment

C-DAC has developed a diskless workstation to work with Indian Languages. A multilingual framework for creating and maintaining localization resources for Hindi, Marathi, Gujarati, Bangla and Malayalam has also been developed.

Development of Annotated Speech Corpora for Selected Indian Languages

The annotated speech corpora was developed in different languages - Hindi, Assamese, Bengali, Marathi, Manipuri, Punjabi, Malayalam, Kannada, Telugu and Tamil. The objective of the text corpora design is to construct a minimum but sufficient speech corpus to generate high quality synthesized speech. In the module, 1000 most frequent words had been selected which covers approximately 50% of speech. In addition, most frequently clustered words also had been taken into its original form thus covering a major portion of the total clustered words.

All monetary and temporal expressions with the limited set of words, a vocabulary of unique 250 words was created. The list covered words related to digits, days, months, years, time, quantitative units, and currency etc. The type of sentences influences the prosodic patterns. Therefore a set of about 1000 prosody rich sentences was created with the help of linguists. This set contains sentences reflecting anger, joy, and sadness, question type sentences, negative, command, exclamations etc.

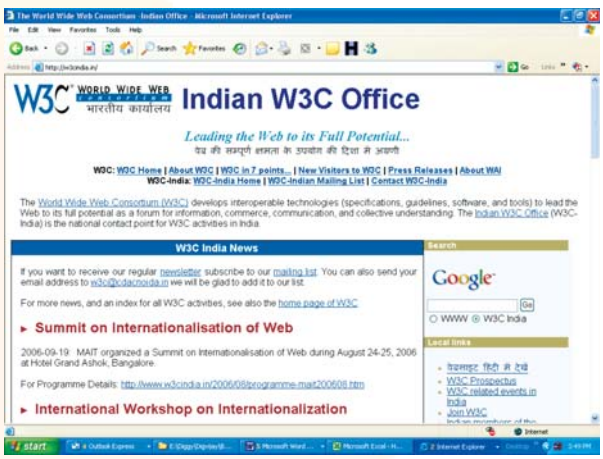
Hindi Speech Corpus creation for ELDA (European Language Distribution Agency), France

The scope of the project included development of Annotated Speech Corpora for Hindi by 2000 people. Recording of speech corpora in various environments like home / office, moving vehicle, public place, street etc. by speakers having Hindi as the first language using GSM network was done. The speech corpora covers Hindi speech prompts spoken by people from different dialectal regions and age groups. The tasks included designing a set of machine readable phonetic alphabet set, development of phoneme rich and balanced sentences and words, training on transcription software, infrastructural setup by ELDA, annotation / transcription of recorded speech, documentation on recording, identification of persons, transcription guidelines etc. and validation and integration. The MoU had been signed between C-DAC and ELDA, and the work has commenced.

Internet and Web Technologies – Indian Languages and Internationalization

Many organizations the world over are involved in devising standards for the IT industry to provide inter-operability. Many are still in development stage. The aim of this project was to study the standards and create expertise in the respective areas for the representation of South Indian Languages on the World Wide Web. The focus was on addressing the internationalization / localization issues and ensuring suitability of the W3C recommendations in these areas with respect to South Indian languages. The tasks defined under the project were: character encoding issues, locale specific data, standards on internationalizing domain names, text formatting issues, language identification, fonts and rendering, indian language tag set, and speech synthesis grammar.

C-DAC had taken membership of W3C. C-DAC is also a member of the Internationalization Working Group of W3C. A web site has been developed for W3C India office (http://w3cindia.in) to proliferate awareness about W3C so that the Indian industry and research institute participation will increase in evolving web standards for future. The W3C Indian office has been set up at Noida and activities are carried out jointly by Noida, Pune, Kolkata centers.



Website of Indian W3C Office

Angla-Bangla Software Development

Under the project, the English to Bangla dictionary had been checked and completed. The Longman series was tested using the Angla-Bangla system. The CD is ready to be released for both Linux and Windows.

IDN for IN Registry – Implementation for Tamil, Malayalam, Urdu, Hindi and Marathi

This project involves study of the requirements for the IDN registry, preparation of the required documents for IDN registration and provide support to the Registrars for the implementation of IDN for Tamil, Malayalam, Urdu, Hindi and Marathi for the IN domain. The variant tables for these languages are made and few sample websites will be implemented and demonstrated in January 2007.

Document Access Across Languages (DAAL)

DAAL was an attempt to reflect the English web content in Indian languages. A prototype with good functionality is ready. Query refinements with via spell check and disambiguation features were added. The Hindi-English Transliteration system was also integrated to transliterate proper names or unknown query terms. Improved concordance translation and document translation, due handling of fragment translation and strategies to make the translation engine more robust were also addressed. A bi-lingual concordance feature was added, so that a person who knows English (though not very well) can manage to get a fair idea even if the translation fails. Common terms of diseases were added to the lexicon, as the focus is the Health domain. A minimalistic user manual is also available via Setu's page. The system was demonstrated to the Secretary, DIT and an NGO named Vacha.

Speech technologies

Design and Development of Hand Held Scanner based Hindi and English Text Reading Machine for visually impaired persons **-** The project was implemented jointly by C-DAC and CSIO Chandigarh with an objective to develop a hand held Optical Character Recognition (OCR), speech synthesis software for Hindi and English which will be useful to visually impaired persons to read and listen to normal printed texts from books. Under this, isolated word recognition for Hindi was developed. The system uses word based acoustic model and can identify isolated words from a known dictionary only. Also under the Speech Interface to email client - PINE initial experiments were quite successful. The focus is now on enabling speech recognition in Mozilla, a popular open source browser.

Indian Language Solution for different Applications

C-DAC has consolidated its strengths in localization of Operating system and application specific solutions in local languages. It has also addressed internationalization and has focused on customized solutions over the packaged product and to enable G-2-C applications, banking application, e-governance applications, mobile devices and printers.

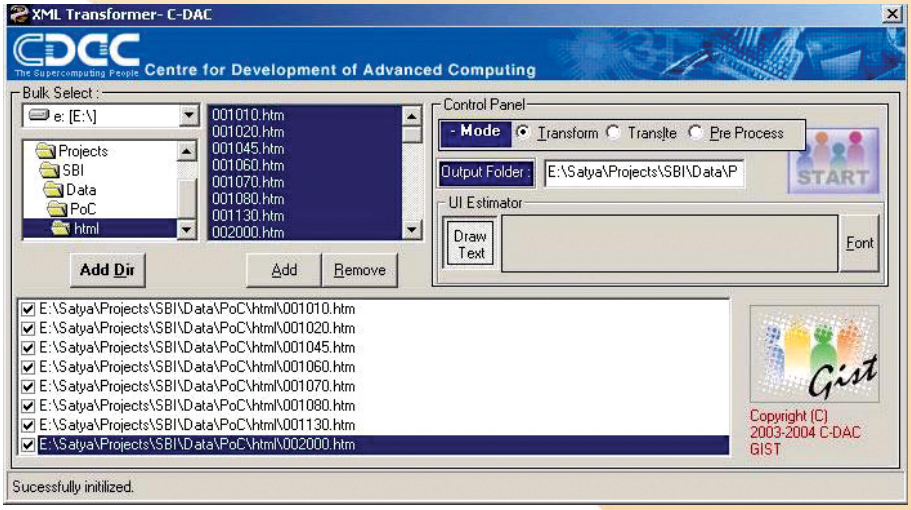
C-DAC also provided solutions to the various software applications of other organizations like TCS, CMC. Following are some application areas addressed by C-DAC during this year:

Universal Banking project at State Bank of India

A solution for generating reports in Hindi through the BankMaster software was provided by C-DAC to the State Bank of India (SBI). The SBI uses the BankMaster software for Total Banking Management (TBM) application. The solution enables generation of 200 types of formatted reports relating to the bank's internal working and correspondence with clients, in DOS environment. 9000 branches of SBI and its associate banks will use the solution.

Enabling Core Banking software at State Bank of India

C-DAC has collaborated with TCS to enable the FNS software for implementing the core banking application at SBI's domestic branches in Hindi. TCS has undertaken the customization of the FNS software and its implementation across its branches for SBI. A successful pilot project was carried out at Churchgate Branch Mumbai to test the solution. The solution will be used over 3000 branches of SBI and its associate banks.



Core Banking

Enabling Integrated Establishment Services (IES) in Hindi for Reserve Bank of India

IES was an enterprise level web based application developed by CMC for the personnel department of the Reserve Bank of India. C-DAC has provided a software solution for enabling the application in Hindi. The solution comprises of data entry in a number of web based data entry screens, storage of data and generation of reports as a web page, on the fly using Crystal Report Application Server. The solution has been implemented over 13 regional offices of the Reserve Bank of India.

Rajbhasha Information Technology Application Promotion Programme

The project was envisaged to develop the localized versions of some existing applications and develop guidelines for the localization process through example. The project was sponsored by the TDIL (Technology Developments in Indian Languages) group of the DIT under the RITAP (Rajbhasha Interface to IT Applications). The implementation of the localization of the Trains Enquiry System has been done jointly by C-DAC along with Central Railway Information system (CRIS).

Also undertaken the localization of the website AGMARKNET. Here, the commodity and Mandi data of AGMARKNET was converted in most of the Indian languages (Hindi, Tamil, Telugu, Punjabi, Bangla, Assamese and other languages) along with the translation of the static pages of the Mandi profile, grades and standards, commodity profile, research studies into Hindi was carried out. This was followed by a series of training programme on the usage of localization framework and tools for website localization

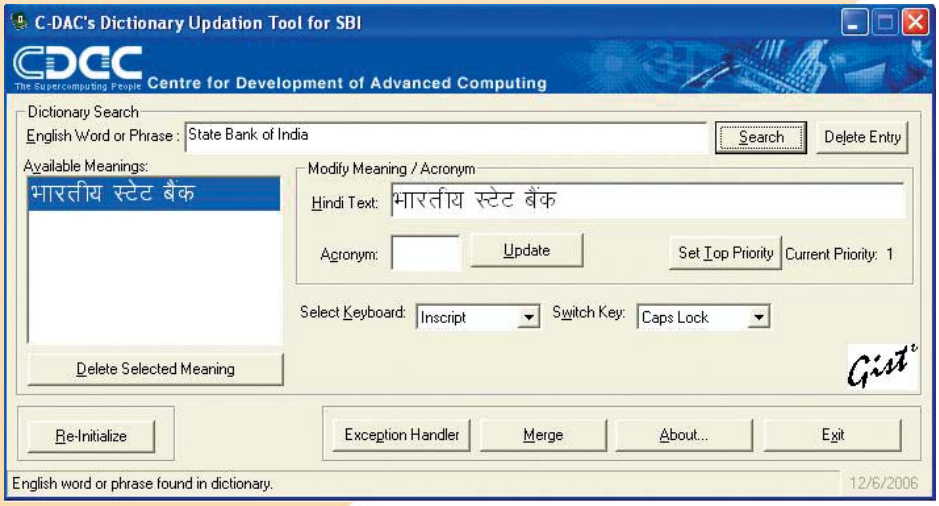
Under the new scope of this project 'Customization of Angla Bharti Machine Aided Translation system for DIT domain has been done. The analysis of various reports of this domain was done and the system has been adapted to this domain by enriching lexicon and multi-word unit databases.

State Police Control Room Computerization with interaction in Devnagari

C-DAC was engaged in the development and implementation of a computerized system for the Maharashtra State Police Control Room to enable the creation of their daily bulletin chart and analysis chart in Marathi.

Electricity Bills Generation in Marathi - MSEB

A software solution for generating electricity bills in Marathi was provided by C-DAC to the Maharashtra State Electricity Board (MSEB). The solution uses forms 6i as front end and Oracle on Linux, HP UNIX and Windows at back end. The solution is being used at 400 billing stations of MSEB spread all across the state of Maharshtra.



Dict Tool

File Tracking system in Gujarati- Government of Gujarat

A software solution provided by C-DAC was implemented with the File Tracking System of the General Administration Department of the Government of Gujarat. 25 departments of the Government of Gujarat will use the solution. The solution comprises of data entry on web-based forms, storage of data and generation of reports on the fly.

CM Online - Gujarat, Jharkhand

A portal for interaction of the common man with Chief Ministers of Gujarat and Jharkhand was designed in Gujarati and Hindi respectively, using the tools offered by C-DAC. The application involved online filing of a complaint and its tracking.

New channels - NDTV, CNBC Television 18, Star Plus

A software solution provided by C-DAC is being used by news channels like NDTV, CNBC Television 18 for content creation in Indian languages, displaying it on video applications and on the Web. Customized display fonts were developed to suit their requirements

Information Kiosk software for BPCL

A software solution was provided to BPCL for enabling their information kiosks installed across North India. The information kiosk allows the customer to apply for gas connection, book for gas supply and related information.

Some of the prestigious contracts bagged for packaged products such as ISM V5 were Inflibnet – Library Network, Government of Gujarat, Department of Atomic Energy, Govt of Jharkhand, Syndicate Bank, State Bank of Tranvecore, IT@ School, Information Kerala Mission, Agmark, Individual Market Yard Project- Andhra Pradesh, Inspector General of Registray- Karnataka, MSEB, MTNL – Mumbai, North Eastern Railway, District Collectorates of Maharashtra, Nuclear Power Corporation, Heavy Water Board, Automatic Energy Regulatory Board, India Rare Earth Ltd.

sify.com

Web based e-mailing solution with iPlugin with Java Suite for e-mail in 11 regional Indian Languages having LINUX as Server and PHP as Scripting Language. Users can send and receive mails in regional languages. On screen iPlugin Floating keyboard typing mechanism has been provided for ease of web-user.

Enabling Epson Dot-Matrix Printers in Indian languages

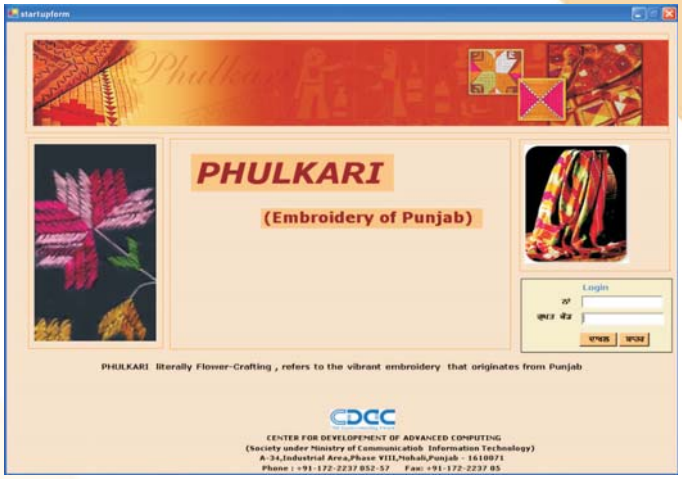
BitMap fonts in ten Indian scripts were developed to suit the specific printer requirements of Epson Dot-Matrix Printers by C-DAC.

SONY Ericsson

Hindi UNICODE fonts in bdf formats were provided to Sony Ericsson for enabling their mobile handsets.

Multilingual Software for Fashion Designing (Phulkari)

The aim of this project was to develop an integrated package for both amateur and professionals involved in industry of Fashion Designing. This software will be available in two languages Punjabi and English. The user can browse the whole software in Punjabi language and the English text can be seen on mouse over state. One can use the existing motifs to create new patterns and check the preview of how the garment will look like even before the scissors are set on it. The demo version for Phulkari (Embroidery technique from the State of Punjab) is almost ready.



Phulkari

Digital Library

C-DAC was nominated as one of the Mega Centres for Digital Library for catering to the digitization needs of libraries in Delhi and other northern states. The objective of this project was to digitize 14 Million Pages of rare books, manuscripts, magazines etc. for putting on the web. For this work, the centre had collaborated with various leading institutes and libraries such as ICCR, IARI, Gurukul Kangri Vishwavidyalaya, Hardwar, BITS, Pilani, Association of Indian Universities etc. apart from work already done at Nagari Pracharini Sabha Varanasi, Kumaun University Nainital, GB Pant University, Pantnagar. As the data in physical form was digitized, the tools and utilities required for its optimal use were developed that would help in managing, searching and maintaining the digitized information better.

Tools such as “Cross Language Information Retrieval (CLIR)” had been developed for people in India who generally know more than one language and the first version of the Text Summarization system based on statistical analysis had been developed for Hindi, which would help in summarizing text related to scientific papers and the news domain. The other tools for Digital library such

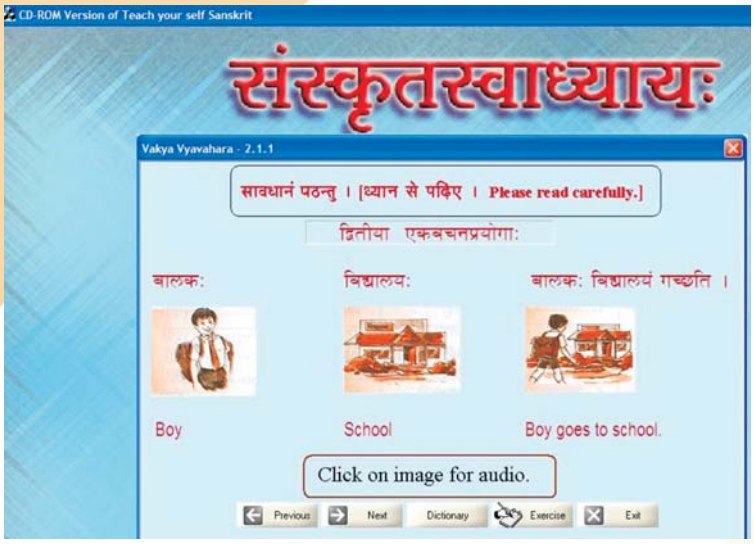
as Multilingual Crawler for Hindi, Punjabi and Marathi, Digital Library with workflow had also been attempted. More than 5.6 Million pages from 14 thousand books had been digitized and are ready for hosting on the Internet.

Core Technologies for Digital Library (with focus on Bengali and Assamese)

C-DAC had worked on the development of an OCR with Workflow. Multimedia Authoring Tools had been developed in the areas of preparing multi-modal educational materials, event documentation etc. The linguistic resource creation and basic language processing tools for Automatic Search Indexing Tools were under development; the text summarization in Bengali would follow. For Folk Songs Search and Retrieval, two hundred and fifty Bangla Folk Songs ('Baul Songs') have been recorded on both audio and video. The folk song singers / performers are from different districts of West Bengal and also from neighboring states. The Meta data of these songs have also been prepared.

Free Sanskrit Contents and Tools CD Release

C-VYASA developed by C-DAC along with all application programs had been sent to the TDIL Language Lab at the DIT, for preparing a Sanskrit Contents and Tools CD for free public release. These are undergoing final testing before release.



Tutor for Sanskrit Tool

Digital Library project of Indian Heritage

Creation of content continued as a trial portal covering contents of original treatises on: RigVeda, YajurVeda, SamaVeda, Koshas, Shiksha, Vyakarana, Kalpa (Srauta Sutra), Bhagavad Gita, Dravida gathas and so on, with browsing and searching options in Indian scripts and Vedic contents with accent-markers.

Indix2

Indix2 was a GNU/ Linux Operating system enabled for Indian Languages. Under IndiX, C-DAC has demonstrated and implemented Indic shaping architecture, Indic text handling library, Indic script handling using OpenType fonts, and migrated these components into the open source software GNU/Linux and X11 (XFree86). Unicode has been used to conform to Internationalization. Many internationalized applications in GNU/ Linux can now work with Indian languages without recompilation or modifications. The developed components are Indic enabled windowing software; Indic support in text mode applications; Basic text processing API and Indic locale in GNU/ Linux format.

The system has been released in the public domain. The software is available on the Internet for free download and use (http://www.ncst.ernet.in/projects/indix).

Matrubhasha

Matrubhasha was a Unicode and MBROLA based software solution for Text-to-Speech Synthesis (TTS) in Indian languages. Matrubhasha aims at building a framework, which could be used by a software developer to incorporate speech capabilities (in Indian languages) into the software. The use of the Unicode text enables the TTS engine to recognize multiple Indian languages in the same document. Currently, the language implementation encompasses seven Indian languages for TTS - Hindi, Tamil, Kannada, Telugu, Bengali, Marathi and Gujarati.

The tools developed under this project caters to 3 categories of users:

- End-users: Matrubhasha provides Pravakta, an extensive plug-in framework for OfficeSuites and Browsers (Microsoft Office, OpenOffice, Internet Explorer and Mozilla Browser)
- Software Developers: Bhaashan API is available in the major languages like Java, C, C++ and COM
- Linguists: Various language and speech modeling tools like Uchharak, Bhavna and Anuvaachak aid in the rapid development of speech synthesis components.

Matrubhasha fundamentally provided a Rule-Based TTS system for Indian languages. For Speech TM Synthesis, Matrubhasha used MBROLA - a speech synthesizer based on concatenation of diphones, which had been developed by the TCTS lab of 'Faculte Polytechnique de mons' (Belgium). It took a list of phonemes as input, together with prosodic information (duration of phonemes and a piecewise linear description of pitch), and produced speech samples on 16 bits (linear), at the sampling frequency of the diphone database used.

Matrubhasha

Participation in Committees on Technology Development in Indian Languages (TDIL)

C-DAC activities in general had been inspired by the TDIL program of the Department of Information Technology, Govt. of India. C-DAC took active part as a convener of the Committees on Technology Development in Indian Languages (TDIL) and the Sub-Committee on TDIL. The main focus of the committee was to understand different activities undertaken by the TDIL programme of the DIT, similar work done by other government semi-government sectors and also work done by different small scale and medium scale industry, towards the development of language technology. Based on this understanding, the Committee had to propose and recommend a Roadmap for Technology Development. The Committee had successfully completed the report and the Government of India has approved the report.

PROFESSIONAL ELECTRONICS, VLSI AND EMBEDDED SYSTEMS

Development and Delivery of Quartz Electronics Checkout System using DSP based Controller

The project involved the design and development of an electronics system based on DSP with interfacing circuits for Quartz Hemispherical Resonator Gyro (HRG). C-DAC had earlier developed the Electronics checkout system for Metallic HRG developed by ISRO Inertial Systems Unit (IISU). C-DAC designed the necessary interface electronics circuits, including front-end, Anti-nodal & Nodal signal processing circuits for signal input to DSP. Tuned amplifier for HRG pick off excitation, VCO & dividers and buffers for actuation of HRG etc., were incorporated in the total system and was interfaced with DSP. The design of critical circuits like pre-amplifier stage and 16-bit ADC stage was done and successfully tested with the Quartz HRG.

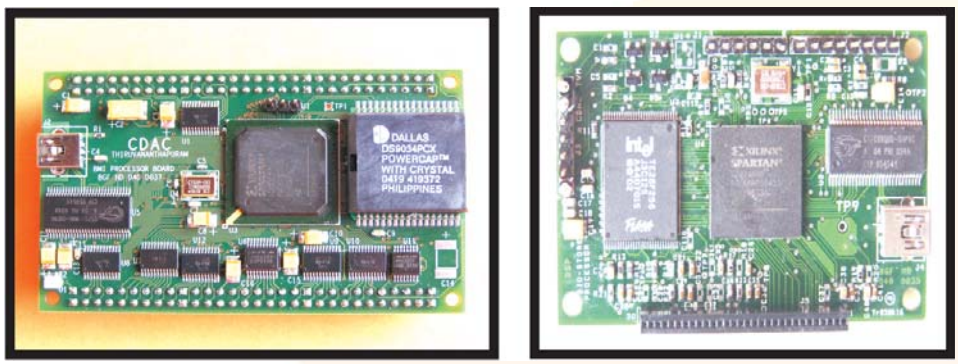
Enhancement of THICS SCADA with Networking Software for BARC

This project was done for BARC, Mumbai. It involved extending the Control and Monitoring features of THICS SCADA package of C-DAC, already running at BARC, to other windows based consoles connected on Ethernet network. The existing THICS (Transputer based High performance Control System) package runs on Windows 98 operating system and the consoles to which the control and monitoring features have been extended, are loaded with Windows XP operating system. Features like MIMIC, Alarm display, Tag display, Reports have also been extended to the other consoles using networking software. This project enhances the capabilities of C-DAC 's GPCS SCADA system by providing industry standard OPC (OLE - Object Linking and Embedding - for Process Control) features for easy data exchange among heterogeneous systems.

GPCS (General Purpose Control System) is an indigenously designed, low cost, state-of-the-art system for automation and control of process and power industries. GPCS has all features found in an imported SCADA system. A major advantage for end users is the support service available for it from C-DAC.

Bio-Medical Instrumentation (BMI) Intelligent Processor Board

This board was developed for replacing BARC's existing 8086-based SBC (Single Board Computer), with an 88mm(L) x 54mm(W) 32-bit RISC Processor based System-on-Chip board using the ER902 RISC Processor core developed by C-DAC . It interfaces the Biomedical Instruments (such as ECG) with a PC for centralized patient DAQ and biomedical analysis. The highly compact board can also be used in standalone mode for other data acquisition and processing applications, with its RISC architecture and powerful 32-bit instruction set. Technology transfer of the system has been effected, along with handing over of five BMI Intelligent Processor boards to the client.



BMI Intelligent Processor Board

Development of Bio-Store Processor Board

This board has been developed for use in Holter monitoring of ECG in an ambulatory patient. It interfaces with an analog front-end, which acquires biological signals from the body. The signals are amplified by the front-end card and fed to the bio-store processor board, which records these signals for a period of 24 hours. The unit has four modes of operation - Check, Start, Stop and Transfer. During Check mode, the unit checks whether the electrodes are properly connected and signals from the three channels are displayed on the LCD screen. In the Start mode, the signals have to be sampled and stored in the memory. Data storage stops when the unit enters the stop mode. The stored data is transferred to the PC for further analysis during the Transfer mode through a USB interface. This board can also be used for monitoring of blood pressure, cardiac output etc.

Digital Voltmeter and Digital Hydrometer for Lead Acid Battery Testing

This project for developing a Digital Voltmeter and Hydrometer for Lead acid battery testing, was successfully completed and handed over to Dhawami Power Systems Pvt. Ltd.(DPSPL), on an exclusive basis.

Area Traffic Control System and its Implementation

Area Traffic Control System (ATCS), with junction controllers having autonomous ability of operating vehicle actuated sensors, fully adaptive to Indian conditions, is a viable solution to tackle the traffic congestion problems in urban areas. This system has a model-based optimizer with innovative man machine interface (MMI) and reporting functionality and compatible traffic controllers installed at the junctions. The model software running on dual redundant servers in a central location acquires information from 38 junctions over appropriate MAN like fiber optic / leased line and computes optimum split time, cycle time and off set time for each junction and sends them down to the junction controllers. The system is under field trial in the city of Pune.

Digital Programmable Hearing Aid

The Digital Programmable Hearing Aid is a very low-cost hearing aid with technologically advanced features, customizable and reprogrammable, to address the needs of the hearing-impaired millions in our country. Prototype field trials using FPGA (Field Programmable Gate Array) have reported high success. A million-gate SoC ASIC will soon be fabricated; product engineering is in progress. The prototypes are currently undergoing field trials at All India Institute of Speech and Hearing (AIISH), Mysore.

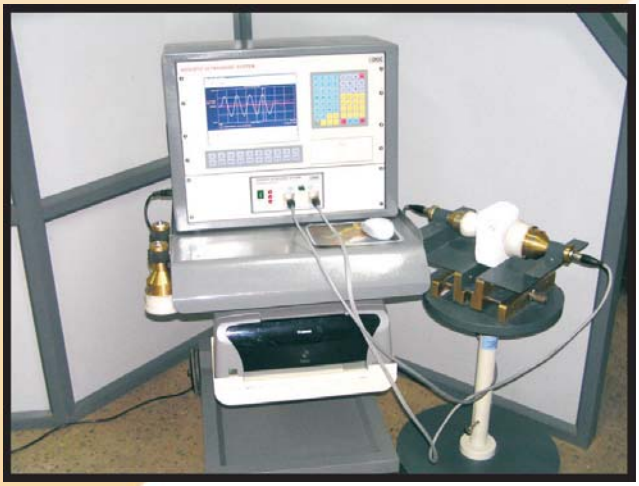
Advanced Static VAR Compensator

The conventional VAR compensation scheme implemented using capacitor bank was not able to support varying loads. The Power Factor was not maintained at the required level and the life of the capacitor lasted for only about 6–10 months, necessitating frequent replacement of the capacitor banks. C-DAC solved these problems by configuring and installing its Advanced Static Var Compensator (ASVC) at the Hindustan Latex plant.

300 kVAR ASVC

Acousto-Ultrasonic System (AUS)

Acousto-Ultrasonic System (AUS) is a PC based Non Destructive Test (NDT) and Evaluation System, optimized for ceramic materials where conventional high frequency ultrasonic NDT systems will not be useful. It can be used for study and analysis of certain material properties and for detecting flaws in the material by measuring the velocity of an acoustic wave through the material and the attenuation of the wave in the material. Its low frequency operation makes it useful in situations where common high frequency NDT system cannot be used. The entire system is mounted in a movable trolley with UPS support for easy transportability within the shop floor.



Acousto-Ultrasonic System

Automatic Meter Reading System

The Automatic Meter Reading (AMR) system consists of the Energy Metering Unit (EMU), Data Concentrator (DC) and the Host computer. This is a multi-stage network system, which uses Power Line communication and PSTN/ GSM/ Radio link to transfer meter reading to the central monitoring station (substation), from the consumer's premises. This communication is done between EMUs and the DCs and between DCs and the Host computer system at the substation. The medium used are Power Line GSM or Radio Link respectively. The system is also used for additional value added services like energy management and flexible tariffs. The system is under final stages of testing.

Ethernet MAC IP Core

Ethernet is the less expensive popular high speed LAN alternative. Ethernet can transmit and receive data at speeds of 10 Mbps up to 300 feet. The proposed Ethernet uses a bus or star topology and supports Fast Ethernet mode (10/100 Mbits/sec data rate). This dual speed MAC transmits and receives data between a host processor and an Ethernet network. The main function of the MAC is to ensure that the Media Access rules specified in the 802.3 IEEE standards are met while transmitting a frame of data over Ethernet. This development is now in the testing stage.

Radiation Monitor Electronics

The RADMON is an 8051 Microcontroller based board used for radiation monitoring applications, fully implemented as a System-on-Chip (SoC) on FPGA using our in-house designed Intellectual Property Cores. Besides the 8-bit Microcontroller IP, it integrates a Real Time Clock (RTC), serial ports and an Ethernet interface along with ADC/DAC analog front-end functions. This board, developed for BARC for replacing their existing hardware design, with an FPGA based design, is being evaluated by the customer.

Contactless Smart Card Products Using E-Smart Engine

Based on the successful development of the E-Smart Contactless Smart Card Engine, harnessing RFID and Near Field Detection technology, C_DAC has developed a range of hardware products - SmartAccess, SmartAccess Plus, SmartCanteen, Smart Attendance, compatible with ISO14443 standards.

SMARTACCESSPlus is a versatile cost-effective solution for the automation of employee attendance recording and access control at the work place, for small organizations where access and attendance are considered the same. It comprises a card reader which records the time of arrival and departure of each employee, and a user friendly Windows© based software package for downloading the recorded card data to a central server through the regular Ethernet interface. The embedded software within the system provides a highly versatile menu, enabling different modes of access through which the Administrator can set various entry conditions to activate the door lock solenoid. SmartCanteen is a system for office environments for employees availing canteen facilities as per predefined eligibility criteria. Smart Attendance is used for large organizations to monitor attendance, seamlessly integrating with the existing network and office automation system

A range of models, battery operated, wall mounting, single- and dual-side controlled, standalone and PC interfaceable have been developed, with common features such as highly secure bi-directional communication, dual authentication, etc. Transfer of Technology has been effected to two manufacturers for commercialization, along with their value added software packages.

SMARTACCESSPlus

National Mission on Power Electronics Technology (NaMPET)

The objective of the “National Mission on Power Electronics Technology” is to launch a National level effort in strengthening Power Electronics Technology in order to make India a dominant global player in this area by the next four to five years time. This programme will facilitate Research, Development, Deployment and Commercialization of Power Electronics Technology, by ensuring participation of academics, R&D and industry.

A National Steering Committee comprising of eminent experts from different agencies and institutes in the country guides the activities of NaMPET. Academic institutes play a major role in formulating the futuristic projects. R&D centres and the industries will translate these technologies from research level to the manufacturing stage. Proper infrastructure upgradation in the Nodal Centre and the academic institutes is a major activity of this programme. Another objective of this programme is to implement sponsored projects, either fully funded or partially funded by the industries. One important effort will be to attract contract R&D work from abroad. Infrastructure facilities at the Nodal Centre will have test facilities for Power Electronics systems, Development platforms for the member industries, and other facilities to enable regular interaction with the industries and academic industries, including short-term training courses.

A number of projects are being developed under this mission, with close co-operation with industries and academia.

Power Supply Card for Mirage Aircraft

The Power Supply Card is being developed indigenously as a one to one replacement for the Mirage Aircraft. The unit meets MIL standards for airborne electronic equipment for operation primarily in piloted aircraft, performance, power quality, reliability, environmental, EMC, Vibration etc. Also it conforms to the form factor, shape, weight, and I/O interface of the existing unit.

The Power Supply Card is an integral part of the on board control circuits and supplies highly regulated, isolated DC voltages from the available aircraft power supply. All ground level tests have been completed and is now waiting for the clearance from Airforce authorities, for in-flight test.

Power Assisted Bicycle

Motor assisted pedal cycles are two wheeled vehicles in which the human rider provides the primary motive force while the motor is engaged only to augment the human effort. It is conceived as a conventional human powered bicycle with an auxiliary add-on system for motor assist. The rider of the vehicle pedals the cycle just as when using a conventional human powered bicycle. The force exerted by the rider is sensed by the system and the motor augments the rider's effort. The threshold at which the assist system comes into play, can be pre-set to match the user. As the tractive force exerted by the rider exceeds a set limit, tension sensor gives signals to threshold detector and actuates the motor for assistance. Prototype development has been completed.

PV Inverter with Utility Interconnection

This system converts solar power into electrical energy and pumps it into the grid. The power output is 1KVA and is suitable for household application. The system uses two schemes for the conversion.

The first scheme is a 230V/50HZ single-phase inverter, switching at high frequency and transferring power to grid with maximum power point tracking (MPPT). In the second scheme, stand-alone facility is also added with the help of battery. The system can supply household loads and the excess power, if any, can be fed to grid. In this scheme a new topology is selected for inverter design to enable compact design. A high frequency link inverter is used along with a DC/ DC converter and battery. A new control scheme is used to reduce the switching losses.

CAN Based Embedded Controller for Automotive Application

The Controller Area Network (CAN) protocol has found wide acceptance in automotive in-vehicle applications due to its high performance, low cost and configuration flexibility. This development leads to more electronic controls in vehicles. In applications like Hybrid Electric Vehicle, a number of electrical systems with embedded controllers are functionally interconnected. In the near future it is to be expected, that more and more systems, operated by mechanical or hydraulic power, like brakes, valves, gear shift, steering etc., in conventional vehicles, will be replaced by electrically driven devices. The advantages of these systems are, high potential for improved functionality and controllability, low power consumption etc. Another important feature is that additional controllers can be added without changes in existing hardware. This becomes necessary because there is a continuous demand from customer side for safety, functionality and luxury features, which can be effectively incorporated with CAN based distributed control. Once the hardware and algorithms are developed, the technology can be extended to fields like industrial control, buildingautomation and control of medical equipments etc. The development has been completed and the activities for Technology Transfer are in progress.

Electronic Paralleling of UPS Systems

The present technology in most of the indigenous UPS systems adopts paralleling using passive components and switchgears, or through a sluggish control of the phase angle and amplitude. This method limits the flexibility, reliability and efficiency of the systems. The paralleling is achieved by instantaneous correction of active and reactive power by field-oriented control using Digital Signal Processor based powerful control algorithms. Also paralleling with grid will enable the UPS systems to cater to supply loads with inrush currents. This technology is now ready for transfer.

Motor Wheel Chair Version 2

The first version of the motor wheelchair developed by C-DAC had one limitation. It was rather hard to control on down-hill runs on a ramp. So, though it did perform flawlessly in all other respects, it could not be released for production. Recently, the National Institute of Orthopaedically Handicapped (NIOH), Kolkata became interested in the motor wheelchair. So a new version has been designed with a revolutionary new differential gear mechanism (165/DEL/2005), which will give accurate steering under all conditions. The mechanism also makes the electronics much easier. The testing of the prototype has been completed. Webel Mediatronics of Kolkata has expressed interest in manufacturing the machine.

Devices for Parallel Hybrid Electric Vehicle

Hybrid vehicles use an electric motor and a bank of high-voltage batteries in conjunction with a conventional internal combustion engine (ICE). The components are arranged either in parallel or series configurations. In a parallel hybrid vehicle, both the electric motor and the ICE are connected mechanically to the drive wheels. The electric motor provides supplementary power when the vehicle is accelerating or climbing steep grades. Parallel HEVs don't need generators as compared to series HEV and have lower mass and better highway efficiency. They have the added benefit of redundant drive power, meaning the car can still be driven if one of the power systems fails. Parallel vehicles require a complicated torque and power sharing system and a multi-speed transmission. C-DAC has developed a propulsion system for series HEV with M/s Ashok Leyland for HMV and is currently developing series HEV for Three Wheeler application with M/s Kerala Automobiles Ltd.

Parametric Sub-Bottom Profiler (PSBP)

The Parametric Sub-Bottom Profiler (PSBP) is a Deep-Sea Parametric echo sounder with depth range of 10,000m and a penetration of 100m below bottom, and used for Oceanographic Explorations.

For sounding higher depths as well as to penetrate the sub bottom, very low frequencies at higher power levels are to be employed. Again, a very narrow beam width is preferable for better spatial resolution of bottom as well as accurate depth measurements. This in turn necessitates much bigger transducer arrays and very high power transmitters. The main advantage of the parametric technology over the conventional echo sounding technology is the use of smaller transducers to realize lower frequencies. For e.g., when parametric technology is implemented to generate a 4 KHz signal of 4° beam width using a 33 KHz transducer array of the same beam width, the transducer size required is approximately 8 times smaller. This system is currently in the final stages of testing.

Harbor Security System

Harbor and ports face security challenges in the form of terrorist or enemy intruders, entering the secured area underwater. Present intruder detection mechanisms cannot detect an individual diver. Using ultrasonic sounding and detection techniques an underwater area can be constantly monitored for intruders.

Ultrasound scanning using narrow, and very powerful beams (to reach across hundreds of meters), imaging and pattern recognition

to detect an intruder and to reject fish etc, digital signal processing to reject ambient noise effects and to extract information from the sounding data etc are the key developments involved in PC based embedded system design. The technology is ready for demonstration to potential customers.

Installation of Under-Sea Submarine Cable at Balasore

The scope of the contract was to set up a fully operational Fiber Optic Submarine Cable System (FOSCS) between the communication centers at Main Launch Centre and Island Launch Centre, at Dhamre, in Balasore District, Orissa.

This project was awarded to C-DAC by M/s Integrated Test Range (ITR), Chandipur, a unit under the DRDO, based on the successful deployment of the main FO Cable at Goa for the Underwater Range Complex Project in 2003. As part of this project, the centre had developed an indigenous technology for plough-burying marine cables below the seabed. One of the salient features of the technology is its ability to operate in very shallow water. The efficacy of this technique was proven again in this project, where we have successfully plough buried a 15 km submarine cable two meters below the sea bed in an area where the sea-bottom is quite uneven, the undercurrents are very high, and the water depth varied between 1.5 meters to 15 meters. The laying operation lasted just one day.

Acoustic Land Mine Detector

The United Nations estimates that 26,000 people are killed or maimed each year by land mines. An estimated 60-100 million landmines are buried in over 60 countries, mostly in unknown locations. The most commonly used land mine detection are metal detectors that work by measuring the disturbance of an emitted electromagnetic field caused by the presence of metallic objects in the ground. Most modern antipersonnel mines are made out of plastic or wood with very few metal parts in them, so the metal detector cannot detect them. Newer methods of mine detection (like ground penetrating radar, infrared, X ray imaging) rely on imaging and very often cannot differentiate a mine from rocks and other debris.

The system being developed by C-DAC uses a Seismo-acoustic land mine detection and discrimination technique, which does not depend upon the material from which the mine is fabricated whether it is metal, plastic, wood or any other material... This product is now in the final stages of testing.

Magnetic Sensor for Under Water Magnetic Range Applications

Operational stealth can be considered a measure of the ability of a ship (surface ship, submarine, or other naval vehicle) to operate undetected against specific threats in designated mission areas. It is highly desirable for ships to embark on assigned missions with a degree of stealth that provides a necessarily low level of vulnerability to detection, classification, and localization by threat sensors. Underwater Ranges are meant for Ranging of ships to measure and control its signature. Magnetic Sensors are used for Magnetic signature measurement of ships /submarines with metal hull.

The Magnetic Sensor consists of a sealed enclosure (electronics and instruments integrated inside) that is resistant to seawater and microorganism attack. Each sensor assemblies are capable of withstanding continuous immersion in seawater up to a depth of 35 meters. Non-magnetic materials are to be used wherever possible in the construction of the sensor. The technology assimilation in magnetic sensor development meant for underwater ranging application is the main idea behind this project. A proto model has been developed and its functional testing has been carried out.

Dual DSP Board-6

This board was designed for use in a weapon system developed by the Naval Science and Technological Laboratory, Vizag. C-DAC has been supplying these boards to NSTL through the Technology Promotion Centre. This board is designed with 5 powerful SHARC DSP, ADSP21062 Analog Devices.

Direct to Home Set Box Prototypes

This is an in-house post project development job that has been done to test and to promote the DTH technology developed by C-DAC. About 50 sets of DTH boxes were made and installed for field-testing at various locations. The feedback received is encouraging. Required modifications in the embedded software as per the feedback have been implemented. The technology has been optimized to match the Indian Manufacturing Industries requirements. The technology has already been transferred to ECIL Hyderabad for mass production. ECIL has set-up a line for providing of DTH boxes. Market testing of their boxes is completed. The boxes will be launched during the festive season.

Browser based, Open Standard Interoperable Open Source Set Top Box

India has a very huge market for the Set Top Box technology but it requires proper focus and standardization. Industry estimates indicate that there are more than 3.5 million consumers in the four metros. In cases of rollout of CAS, the real problem of interoperability will emerge out of this since broadcasters and MSO's will deploy their STB with difference CAS systems. Further, to achieve interactivity with their consumers they will be using different middleware. To resolve these anticipated issues, C-DAC, Noida has conceived this project with the following objectives:

- To evolve technology standards so as to provide Set Top Box designs which are interoperable, either based on simulcrypt CAS or using CI model.
- To provide Set Top Box design for two-way communication with features like backend recording (PVR), simultaneous record and play, pause / rewind / forward facility, PIP, etc. with facility to tune with two separates transponders simultaneously.
- Internet browsing on T.V. to enhance Internet penetration.

The investigative work of various designs available in different countries, available chip set solutions, integration of CAS and bill of quantities for common design have been completed.

OFDMA based Broadband Wireless Band Access for Rural Connectivity

The objective of this project, funded by the Department of Science & Technology, is to provide the wireless broadband connectivity in villages where wired communication is not easy. The software defined mobile radio & base station has already been developed. This technology allows wireless video, audio and data communication. The present technology effectively communicates over a distance of 10Kms & at high data rate up to 54 Mbps. Further research to enhance the distance and data rate for connecting more nodes within the same network is being conducted.

Integrated Security Device for Tracking & Data Acquisition and Setting up Auto ID Lab in India

In this project, C-DAC is working on the development of RFID based high-end Reader system, which reads passive tags and is integrated with GPS and GSM modules suited for many applications. To provide a viable solution, a right mix of hardware and application software is being used. Once the microprocessor receives information about each tag, via the reader module, the embedded software does the rest of the data processing.

The parcel tracking system will automate the mail delivery process of the postal system and will enhance the visibility of the parcels during the transportation between post offices and hence enable faster delivery. The exact movement of the parcels will be tracked using the RFID technology. The proposed system will provide the security of the parcels or postal bags during the transportation automatically. The developed technology will be based on EPC Gen 2 standards. Thus it will be an efficient & fully automatic system.

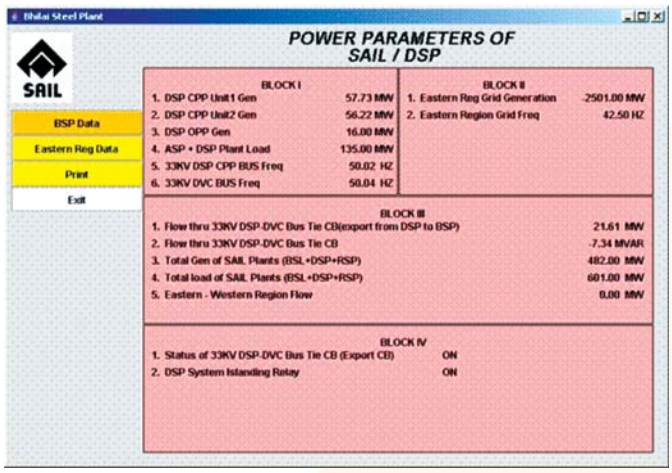
Mini SCADA (COPS) for Power Grid Corporation of India Limited (PGCIL), Patna

The Mini SCADA (COPS) acquires online data from the Unified Scheme Remote Telemetry Unit via RS-232 serial line. The Data Capturing System and the RTU communicate using IEC 870-5 protocol. The data is validated and then made available for display and archival purposes. The processed data is presented on the MMI display for the operators. The features supported on the system are Single Line Diagrams (SLDs), tabular diagrams, trend curves, bar charts and pie charts. The processed data is stored for report generation and historical analysis purposes. The system has been tested and installed at the customer site.

Single Line Diagram in MMI

Gate-way system at Bhilai Steel Plant (BSP) for Bi-directional Power Parameters Exchange between BSP and SLCC, SAIL, Kolkata

The data is collected in Gate-way system from the Power Control Monitoring (PCM) System at BSP. The collected data is locally displayed and the filtered data is sent to SLCC, Kolkata for an integrated display. The Eastern Region Grid related data is sent from SLCC, Kolkata to BSP display for monitoring purpose. The bi-directional communication takes place on a satellite communication using standard protocols.



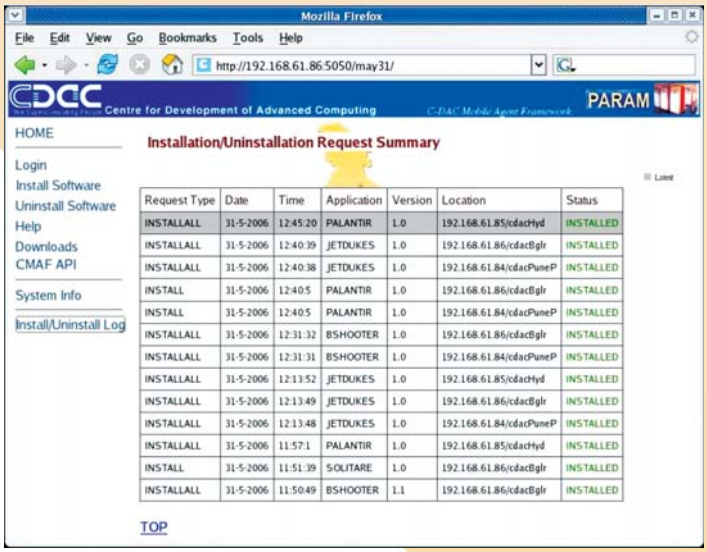
Power Parameters of SAIL / DSP

C-DAC Mobile Agent Framework (CMAF) for the Grid – Prototype implementation

A Mobile Agent framework was developed to address the manageability and soft Quality of Service (QoS) of distributed applications and to provide a framework for developing high confidence systems.

As a proof of concept, the framework was used to address the need for remote software installation and upgrade in “GARUDA” the

C-DAC grid initiative. A Web Server was added to the framework, which runs a web-based User Interface for accepting installation and upgrade requests.



Remote Installation Request Summary Screen

Smart-card based Tiny Business Solution

The "Smart-card based Tiny Business Solution on Handheld Devices (Simputer)" has been completed. The same solution is being now ported on a Mobile Device (Nokia 6600). The target activities are as follows:

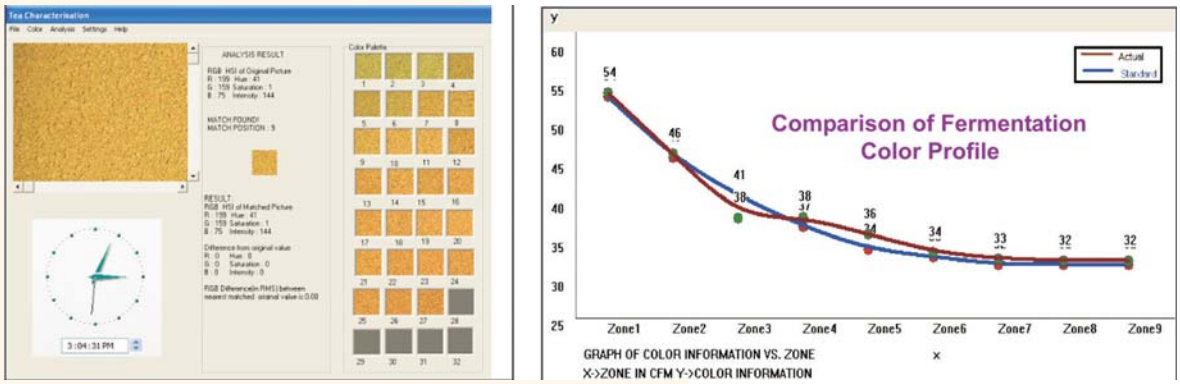
- Development of the Client part of the application for Nokia 6600 (i.e. on Symbian OS)
- Development of the Tunnel using SMS / GPRS of GSM
- Implementation of Thread / RMI for Client/Server interaction management

Development of E-Vision System

C-DAC is engaged in developing image-based solutions for

a) End Point Detection of Fermentation by monitoring tea leaf colour

An Image processing based e-vision system has been developed to detect the end point of fermentation using a suitable color matching algorithm backed-up with the soft-computing technique. During training of the software, a color-palette /image database is required to be created with taking color images of the leaf with various stages of fermentation process. During fermentation process, leaf image at any stage can be compared against these to estimate the remaining time for fermentation.



E-Vision System For End Point Detection Of Fermentation

b) Mimicking Visual Inspection of Tea Taster by Electronic Means

Tea Testers assess the quality of the processed tea by measuring grain size, appearance, and liquor color, infusion and flavor in a subjective manner (in a 1 to 10 scale). E-vision system captures the images of various tea samples for analysis using color matching / soft-computing technique to provide a color index value (like tea tasters' score) more precisely and reliably.

c) Quality Estimation (Tea Gradation) of Manufactured Tea at Drier Mouth

Instant estimation of manufactured tea grade at Drier-mouth is one of the desirable requirements for quality tea production. It is very difficult to find out percentage of tea grade at Drier output at any moment of time. An innovative image processing based solution has been developed to determine the percentage of various tea grades at Drier-mouth output as an estimation of consistency in quality tea production.

Being physical and non-invasive, this e-vision solution is accurate, reliable; low cost which may be very convenient for tea-planter/ taster as well as the entire tea industry.

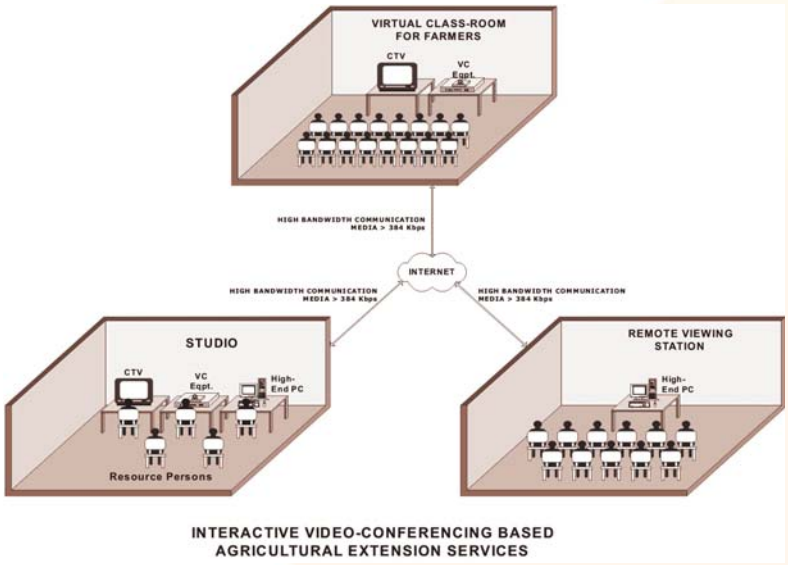
ICT-anchored Agricultural Extension System

An ICT based agricultural extension system has been developed and demonstrated for the mandarin growers in Darjeeling hills in North Bengal. The system consists of interactive multimedia contents in Hindi highlighting the ideal farming practices

1. Transplantation of young saplings in the farmer's land
2. Common Plant Diseases
3. Insects and parasites

The content was presented by an expert (as Knowledge Resource Person or "Guru") to a group of interested distant farmers using the Video-Conferencing technology over an Interactive Session using 2-way Audio / Video.

In the scaled-up deployment mode each Knowledge Resource Person will be able to train a large number of farmers (reported up to 2,000) assembled in a number of geographically dispersed Groups. Since, such extensional services are required only infrequently (say, once a week for two hours), the same infrastructure can be simultaneously used for extension services of different Agricultural / Horticultural / Animal Husbandry products in a time division manner as per worked out schedules.

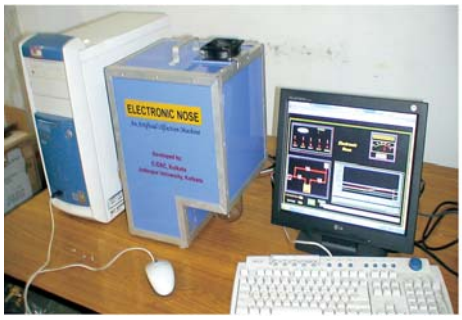


Interactive Video-Conferencing Based Agricultural Extension Services

Development of Electronic Nose for Tea

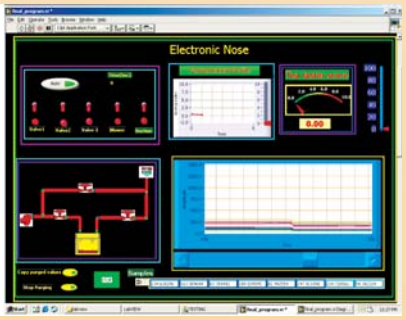
C-DAC has developed a special Electronic Nose that has been successfully used to monitor volatile emission pattern in the black tea fermentation process over a passage of time. Through prolonged experimentation with various clones, fermentation processes and climatic variations, it has been established that smell changes during the process may be reliably detected repeatedly by Electronic Nose. Even the smell peaks during so called “First Nose” and “Second Nose” may also be clearly detected with this new smart instrument.

The Electronic Nose is also capable of sensing the volatile compounds of the finished tea sample and reliably predicts Tea Taster like scores with a high degree of accuracy. Neural Network based Soft Computing Techniques have been used to tune a near accurate co-relation smell print of multi-sensor array with that of Tea Tasters’ scores.



Electronic Nose

Sensor Array



Olfaction Software

INFORMATION SECURITY AND NETWORKING

End System Security Solution for UDP Applications

C-DAC is currently working on a R&D project titled “ Design and Development of an End System Security Solution for UDP Applications” funded by the DIT which involves design and development of a transparent security solution for UDP applications. Since there is no reliability and connection setup for UDP applications, developing the transparent security solution for UDP applications is a challenging task. Pluggable user authentication and the role based access control features are planned in this solution.

Resource Centre for Cyber Forensics

C-DAC has released Version 3.0 of its CyberCheck suite for Cyber Forensics analysis. The Centre is currently involved in establishing a Resource Centre of Excellence in Cyber Forensics at C-DAC, Thiruvananthapuram, by carrying out advanced research in the emerging area, enhancing the capabilities of indigenous tools CyberCheck, TrueBack and EmailTracer developed by C-DAC, and developing new tools and capability/capacity building which would act as a facilitator in preparing, enhancing, accelerating and sustaining cyber forensic expertise among Law Enforcement Agencies in the country.

Enterprise wide Intrusion Detection System (E-IDS)

As a part of the DIT, MCIT, Govt. of India funded project, C-DAC had earlier developed a software system N@G, an hybrid Intrusion Detection System with both signature and anomaly detection capabilities.

The system is functional and currently being pilot-tested at various locations of C-DAC and other key Network Operation Centres across the country.

DIT, has funded the further efforts to carryout Research and Development to evolve the enterprise wide intrusion detection system taking into consideration threat profiling, event correlation, incident handling and response mechanisms. As a part of the E-IDS project, C-DAC developed a MOLAP based Alert Analyzer. The analyzer was based on MDDB architecture and PHP based front end. This alert analyzer was then deployed at various installations of N@G NIDS across the country.

CommGateway, for OTOMS

C-DAC worked on a project funded by the One To One Marketing Solutions Pvt. Ltd., for IOCL. One To One marketing Solutions (India) Pvt. Ltd (OTOMS) is managing a Loyalty Points programme for Indian Oil Corporation Limited (IOCL), called the 'IOC Xtra' programme. Under this, a new POS terminal and a new POS-backend communication protocol are being implemented. The POS terminals are being provided by Schlumberger, with the corresponding software being developed by Axalto Cards and Terminals. The application that implements the business logic by interaction with the backend database is being developed by OTOMS. A Communication Gateway software code name "CommGateway" is being developed by C-DAC to act as a bridge between the above mentioned terminals and the backend.

Print Document Security Toolkit

The project was to develop a solution for security of printed documents at low cost and provide the same on the user's desktop without any special printing equipment or special paper. It provides document security by putting text data with special pattern in the background that is almost invisible to the naked eye, but if the document is photocopied, then the hidden text will be visible on the photocopied document. The data to be hidden is dynamically generated by the software based on user input. The product is integrated with MS-Word for ease of operation and usability. The project has been successfully completed and the technology is available in product form on a CD-ROM called 'CDAC-Shield'**.** The product was launched by Thiru Dayanidhi Maran, Honorable Minister for Communications and IT, Govt of India during ELITEX-2005.

Storage Securing Device with Intrusion Detection

The objective of the project is to prevent undetectable tampering and/ or modification/ deletion of stored data in a storage device. The storage solution aims primarily to provide point in time data recovery, using techniques like comprehensive versioning. Comprehensive versioning is a technique that can be utilized to create version for every change of time. These techniques are in line with the "Continuous Data Protection" paradigm, which aims towards "Zero-Data-Loss".

Conventional storage protecting systems, which are mostly based on snapshots, may be inadequate in some situations (for e.g. where file level recovery is needed. In a typical snapshot system, data between two snapshots may also be lost). Thus development of techniques to address these deficiencies, which are prevalent in the conventional data recovery solutions, is imperative.

Under a project sponsored by the DIT, a prototype of such a technique on qmail (Mail Server) has been developed. The software comprehensive versioning module has been placed with the qmail server. A closed user group has been made of about 10 users who can use the mail server. The user(s) can recover files from the mail server even after permanent deletion of the file. The approach is also on the lines of "ILM Best Practices in data recovery for Email" provided by the Storage Network Industry Association (SNIA).

National Resource Centre for Steganography

The project aims at the development of Steganographic isolating tools for different media (video, audio, text and fax) and Technical Support (in terms of technology and / or tools, training and hand-holding) for law enforcement agencies.

An integrated software tool, StegoCheck v2.0 has been developed. It uses different algorithms for detection, extraction and

reconstruction of the hidden message as well as password (if present). The algorithms are signature and statistical analysis based. The software analyses image, audio and text file to detect and extract steganographic content. Each detection algorithm is designed to work on specific image formats. The software provides facilities to run an automatic session where a number of different file formats as input and checks the formats, which matches its requirements discarding the rest. The software then detects stego files, if present and tries to extract the embedded message in some cases, e.g. steganography done using tools like Pretty Good Envelope and Camouflage in case of GIF, Secure Engine, Camouflage and JSteg in case of JPEG, Secure Engine, Camouflage and Hide4PGP in BMP, Camouflage and Hide4PGP in WAV, WbStego and Snow in TXT.

BROADBAND, WIRELESS AND INTERNET TECHNOLOGIES

Wireless Sensor Networks Lab

C-DAC has setup a Wireless Sensor Networks Lab at its Hyderabad Centre to work on routing and localization algorithms deployed on these networks. The Centre is also developing a library that would be used as components in Ubiquitous Computing Systems for transmitting data, audio and video over wireless.

The Embedded Team at the Centre made a project proposal on “Wireless Sensor Network Application Research and Development Lab (WISARD)”. The team has put-in dedicated efforts in carrying out a study on various protocols, algorithms and simulator tools etc and they have consolidated their learning in the form of the following documents:

1. A survey of Routing Algorithms for Wireless Sensor Networks
2. A survey of Localization Algorithms for Wireless Sensor Networks
3. General description and applications of Mica board sensors
4. Application Program Interfaces for Wireless Sensor Network tools

Compact TETRA Base Station Receiver

C-DAC has developed a field deployable multi-carrier TETRA Base Station to cater to the needs of professional mobile users like Army, police, fire force etc. This equipment is a compact version with a capability to support four carriers resulting in 15 operating channels for voice and data communication. TETRA or Terrestrial Trunked Radio is a European Standard for Professional mobile radio communications. The communication between two Base Stations is through an IP network and a LAN or WAN can be used for interconnecting Base Stations. The BS uses soft switching architecture avoiding the need of a central switch.

Compact TETRA Base Station Receiver

Encryption Technology for TETRA System

C-DAC has completed its development of an Encryption technology, adhering to the recommendations and guidelines of the Security and Fraud Prevention Group (SFPG), for TETRA Mobile Radio.

TETRA is now the accepted first choice for global Mobile Radio Technology for professional and public safety users. C-DAC has already developed the technology for TETRA Digital Mobile Radio. Along with BEL, C-DAC is now developing the Handheld Radio and Base Station for this system. Since the Army has selected TETRA as the standard for their tactical communication, the security aspect of the Radio System has become very relevant today.

Advanced Hand Portable TETRA Mobile Radio

C-DAC has released Version 5.0 of its Hand Portable Tetra Mobile Radio. This project makes use of the latest OMAP processor comprising of ARM core and DSP core with embedded software. It also uses the latest RF front-end for communication. The mobile has security feature like encryption and authentication along with packet data capability.

Lawful Interception of VoIP Traffic

C-DAC has completed the development of a system for the Lawful Interception of Voice Over IP Traffic. This system is capable of interception VoIP traffic in a network for monitoring purpose, based on the target rules specified by monitoring agencies.

The LIVoIP system consists of two functional components. The Law Enforcement Interception Facility (LEIF), which is deployed at the premises of ISP and the Law Enforcement Monitoring Facility (LEMF), which is deployed at the premises of the Law Enforcement Agency (LEA). Transfer of data from LEIF to LEMF is through a data network. The captured packets are send to the remote monitoring locations for receivable playback & analysis.

QoS-NET: Indian QoS Network Project (IQNET)

The objective of the project is to establish a nationwide QoS Network Testbed to support multiple networked services/applications over a wide area. The project is funded by the Department of Information Technology, MCIT, Govt of India. This is a combined initiative by C-DAC, ERNET, IISc, IITc, IITd, IITb, IITk and IITg. Future QoS aware communication Network will support a broad variety of services. Among these, some will have strict QoS requirements; for example, real-time applications such as VoIP, interactive video, distance learning etc.

To enable the support of QoS in IP networks various models like RSVP-IntServ, Diffserv, MPLS & Traffic Engineering would be tried out to support QoS.

Nationwide Measurement Initiative (PingER)

Actively participating with Stanford University Linear Accelerator Center (SLAC) in the PingER (Ping End-to-end Reporting) project and thereby contributing towards performance measurements for the Research and Education Networks in the Internet community. PingER monitors end-to-end performance of Internet links. The project involves monitoring connectivity of different hosts by a number of other monitoring sites, and generating reports and analysing the measurements obtained.

The Bangalore Electronics City centre is currently a monitoring node carrying out measurements for various IPs and this has been quite effective and the results were shared in the recent CHEP 2006 conference held at TIFR, India.

Planet-Lab Initiative

PlanetLab's main purpose is to serve as a testbed for overlay networks. Research groups can request a PlanetLab slice in which they can experiment with a variety of planetary-scale services, including file sharing and network-embedded storage, content distribution networks, routing and multicast overlays, QoS overlays, scalable object location, scalable event propagation, anomaly detection mechanisms, and network measurement tools.

C-DAC is actively participating in this initiative and experiments based on the JXTA based peer-to-peer V-CAN API developed by C-DAC.

QoS Experiments

(a). VoIP. C-DAC has set-up the VoIP testbed along with IIT-B, IIT-K and IISc, which is currently operational using the open-source Asterix software, and the QoS experiments are being carried out.
(b). E-Learning. Along with IISc, C-DAC has set-up the Mutlicast based E-learning experiment testbed for carrying out various QoS treatments for e-Learning. C-DAC has installed the IOD (Instruction on Demand) software of IISc for this purpose.
(c). Automatic QoS Provisioning. C-DAC is developing a policy based network management system in order to enable automatic QoS provisioning.

SOFTWARE (INCLUDING OSS / LINUX), MULTIMEDIA, GRAPHICS AND DATABASE TECHNOLOGIES

Supply Chain Management for SME Sector

The design and development of an affordable Supply Chain Management for SME sector is a two-year R&D project taken up by C-DAC and IIIT, which is funded by the DIT, Government of India. The objectives of this project are to develop affordable Supply Chain Management system for SME sector and study & implementation of Supply Chain Reference Model (SCOR) standards. The identified functionalities under this project are Inventory Management, Sales, Procurement, Manufacturing, Shipping & Receiving, Accounts and Work Flow Management System. The projects importance has been identified at the National level due to its focus on SMEs. A few modules of the developed system, namely Sales & Inventory modules, have been installed at identified industries for field trial.

JATAN: Virtual Museum Builder

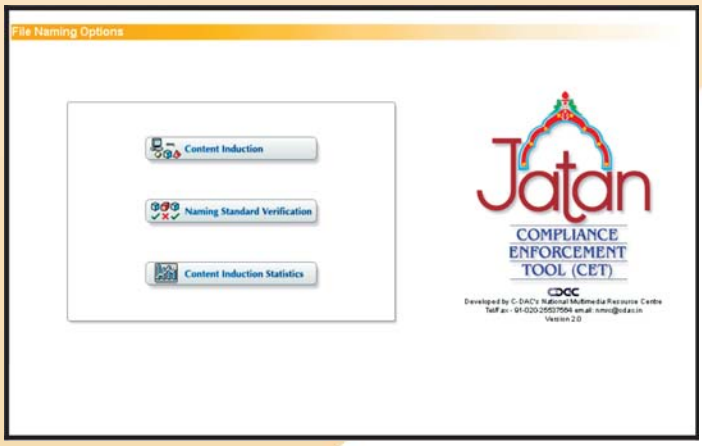
JATAN is a specialized digital library system developed by C-DAC for museums. It is now provided with a new user interface. Several new features have been developed such as auto-scroll feature for viewing large images, statistical indicators, improved security measures, subscription management, multimedia object sorting, synonym based search, etc. A proposal has been conceived and submitted to GRID enable this application.

Two-day training programmes were conducted for the staff members of the Raja Dinkar Kelkar Museum, Pune and the Prince of Wales Museum, Mumbai where JATAN system has been deployed. Raja Dinkar Kelkar Museum has successfully integrated over 3000 museum records using this system.

JATAN: Compliance Enforcement Tool (CET)

JATAN: Compliance Enforcement Tool (CET) has been developed to complement the main product JATAN: Virtual Museum Builder, which is a specialized digital library system for Indian museums. JATAN: CET is designed to verify the compliances of digital content

and facilitate the process of fixing the problems. The digitizers and auditors are able to work in synchronization to achieve quality. The system also provides insightful statistical information and helps in reducing the potential errors. Thus it enhances the overall quality and productivity of digitization efforts in museums. This tool is designed for those involved in digitization, museum records preparation and data entry.



JATAN CET

JATAN: Pocket PC Application

The usage of mobile computing devices like Pocket PC is increasing rapidly. This application extends the usage of JATAN system from the Intranet environment to Pocket PC devices via wireless networking. The museum visitors can connect their Pocket PC with JATAN Server using wireless network. The JATAN system authenticates the visitor based on his subscription type. After authentication, the visitor can access the information about various museum antiquities through the Pocket PC. The intuitive interface of this application helps visitors to fetch the requisite information in lesser time. This application helps the visitors in identifying the most popular objects in the museum. It strengthens the business of JATAN: Virtual Museum Builder further by helping the museums through enrichment of services and additional revenue generation through sale of replicas, photographs, posters, etc. Currently the functional prototype of this application is being tested.

JATAN Pocket PC Application

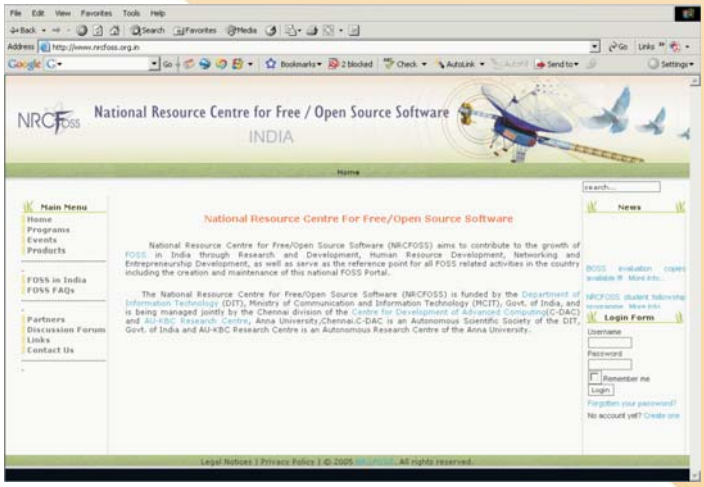
Setting up of National Resource Centre for Free/Open Source Software

The National Resource Centre for Free/Open Source Software (NRC-FOSS) is a programme of the Department of Information Technology, Ministry of Communications & Information Technology, Government of India. C-DAC and AU-KBC Research Centre, Chennai, are jointly implementing the programme at Chennai. The programme is being implemented in two parts, Part-I: Product Development is the primary focus area of C-DAC and Part-II: Human Resource Development is the primary focus area of AU-KBC Research Centre. The NRC-FOSS portal (www.nrcfoss.org.in) has already been developed and hosted. The development of an Indian version of Linux for desk tops is currently under testing and the beta version will be released next year.

The deliverables of NRC-FOSS programme at C-DAC are:

1. Integrated Service Oriented Architectural framework and security services for e-Governance (porting of 3 applications)
2. Desktop Computer for Indian languages for Schools and F/OSS related services
3. Linux / RT Linux enhancements, Middleware for embedded systems
4. Device driver development
5. Testing & development services for all India efforts in F/OSS for such products including their feature enhancements for uploading to National F/OSS database.
6. Development of National F/OSS Resource Portal and develop the eco system for large scale F/OSS adoption in the country
7. Provide information and advise on F/OSS issues and deployments in e-Governance, Health and Agriculture sectors
8. Demonstrate the use of F/OSS within SME environments
9. Indian version of Linux for e-Governance domain

The center has come into operation with a core group and associated infrastructure.



NRC-FOSS Portal

Smart Card based Access Control and Accounting Facility for LRC Thiruvananthapuram

C-DAC completed the implementation of the Smart Card based Access control and Accounting facility for the Learning Resource Centre at the Medical College, Thiruvananthapuram. The Centre has also set up a similar facility at the Medical College, Kozhikode.

The Smart Card Access and Accounting Facility (SCAAF) is a client/server system for the management of Learning Resource Center (LRC) at Medical College. Members with a valid Smart Card account can logon into any of the client stations and use all available resources of the centre. After use, when the user logs out, the system records the usage time statistics and deducts the corresponding usage charges from the Smart Card account of the member. This accounting information will be updated on the card when the user places the card in the reader, after use of the system. The user will be able to access the system until the balance amount in the card reaches the minimum balance fixed by the centre authorities. The users can also avail of the facility of booking a convenient time slot for using the Resource Centre, in advance. The smart card provides security and protection against unauthorized access to the system resources.

IT Audit of KSEB's Billing Software Packages

This project is to conduct a thorough IT Audit of the LT Billing Software Packages developed by KSEB, namely 'JYOTHY' and 'IDS'. The following points were examined with respect to the packages viz. Adequacy of the software to cover the various billing, accounting and consumer service functionalities of a Section office, Suitability for use at Corporate level for Distribution Section computerization, Security aspects, Backup facilities, Scalability, Facilities for remote maintenance, Arrangements for Hardware maintenance, Adequacy of documents like User manual, Training materials etc. and General Recommendations. The role of C-DAC was to conduct an IT Audit of these LT Billing packages, supplied by KSEB, and submit the Audit Reports.

Project Management Application Suite for R&D Organizations

The project seeks to design and develop a comprehensive Project Management Application suite that takes care of the common problems faced by organizations involved in application oriented research and development activities**.** At present, there is a need for an IT solution which can track the various project management processes adopted by the organizations, during the development and during the post-installation support period as well.

The package is basically Project Portfolio Management cum Business Activity Monitoring Package specifically tailored to the needs of R&D organizations. It has the following modules:

1. Document Manager
2. Purchase Tracker
3. Project Tracker
4. Customer Support
5. Customisation and Installation

Magnetic Modeling Software

The project is an attempt to develop a software package, which can characterize magnetization of war ships using the data of magnetic anomalies created by the ship on the earth's magnetic field. The magnetic complexity of the vessel can be defined as a set of analytical formulas. This will involve multi-pole description of the bulk sources of magnetism to describe the observed field at the sensor depth as the ship traverses an open range. An analytical solution to multiple problems can be extremely difficult to arrive at, but numerical methods can be used to generate solutions for the problem yielding results of acceptable accuracy. This project aims at such a solution. The model is created from the data collected by Magnetometers (sensor) while the ship passes over an array of sensors deployed on the seabed (Range). The track of ship with respect to the sensors will be obtained using differential global positioning systems.

Inventory Management System (DPIMS) – Delhi Police

Delhi Police Inventory Management System (DPIMS) is a web-based system. This system is developed on Work Flow basis. Information would be made available on real time basis at all levels across Delhi Police. Automatic projection of yearly demand of various items and requirement of various items at each District/Unit is automatically calculated. There would be transparency and accuracy in the process as the data saved at one level can be shared at all the required levels without any delay and tampering of data. Better planning and cost reduction can be achieved as the required information is readily available at all the required levels and there will not be any dependency at different levels for information sharing. Dispatch of information through post / couriers will be eliminated which will speed up working and decision making and will also be cost effective. There will be a single point data entry to facilitate data sharing at required levels, which will speed up working and reduce chances of errors as the data entered at one level need not be entered again at other levels. Validation checks will be there in the computerized system to prevent any unauthorized transaction. The application design is flexible and is easily upgradeable to add any additional modules in the future. This system will provide On-line help of policy instructions (Standing Orders) for all the P & L departments. The application software is menu driven and user-friendly for data entry and queries. All the office orders / covering letters / reports will be generated from the system for all the departments and few exception reports of discrepancy will also be generated. The development work of the above project was started in November 2005.The project is now under deployment.

WOTR Game Project

The project funded by the Watershed Organization Trust – Ahmednagar aims to reduce the time required to create awareness of watershed management techniques and their benefits by involving the users in creative and meaningful activities related to their own environment. It involves the creation of an interactive game for simulation of watershed management and development.

Vidwan - Web Based Expert System Framework

Vidwan is an expert system shell running on stand-alone Windows/DOS operating system, using which expert systems on various domains can be developed. The web-based version of Vidwan is being developed, with which users can develop and use expert systems on the web. The development of the inference engine and client interface has been completed.

Referee Assignment For Conference Tool Using GA

Papers submitted to a conference go through a refereeing process. For thisreferees have to be assigned papers based on the domain of papers and the domain expertise of the referees. An additional constraint of the number of papers a referee agrees to referee is also to be considered while allocating the papers to referees. A GA based system for allocating papers to referees is being implemented. Apart from providing a useful tool for conference organizers, the system is being used to study genetic algorithms for such optimization problems.

Veda

Veda is a Question Banking and Testing system. The system is being developed using Java. The first stage of the project was to create a question bank and the ability to show a student a quiz paper. The second stage, which is ongoing currently, will enable a student to take a complete exam.

Marathi Tutor

Marathi Tutor is an Intelligent Tutoring System (ITS) to teach colloquial Marathi. In addition to teaching the language, the system also acts as “teacher” who guides the flow of the entire courseware to the student. This web-based system aims to enable the user to read / understand newspapers, converse at public places (restricted domains), etc. in Marathi. This activity is part of the constructive learning environments initiative of the educational technology unit.

Parikshak

Parikshak is a program grading system. It has been used for conducting MGPTs. It was a stand-alone system. It has been made web services enabled so that it can be interoperable with different client programs. Also this will enable C-DAC to provide program grading as a service. It is also being ported to Fedora Core 3.

CARES

It is a database system currently used for maintaining PGDST and FPGDST student records. Apart from student personal details, it maintains records of their evaluations and fees related details. It also, provides feedback analysis interface which is useful to generate graphical representation of comparative analysis of PGDST centers based on the feedback given by PGDST students after every Mid-Module and End-Module quiz.

Sandesh

Sandesh is an automatic email response system that is useful for an online learning environment. Any queries posed by the students to the faculty (via mail) is first screened by Sandesh. Sandesh then checks if any other student has raised a similar query earlier. If so it forwards the response to the student, else forwards the mail to the faculty for him to respond. The response from the faculty also goes via Sandesh so that it can store the question and response in its data. The system has been implemented for responding to free-text queries. Mails with a few fixed subject lines are processed. A technical report has been prepared based on the system.

Content Markup Language (CML)

CML is an attempt to derive generic, CMS-independent teacher friendly way to specify content, using a minimal set of computer / CMS dept jargon. Through analysis of relevant content, a draft version of the mark up language has been designed along with its associated DTD in XML. A translator was implemented for translating CML content to Vasistha, which is a CMS developed in-house at C-DAC. A translator for an open-source CMS, Drupal, is being written.

Virtual Classroom

"Virtual Classroom" facilitates live presentations over the Internet (webinars). A presenter can conduct a presentation and participants can attend it over the web. The presentation slide transitions, whiteboard and other resources are shared among the participants. Participants can ask queries with the 'Hands up' facility, communicate with built-in chat etc. An initial version has been implemented as a MCA project.

Framework Subjective Evaluation

This system assists teachers in conducting and evaluating examinations containing subjective questions. It helps teachers create subjective questions. It also provides students with an interface to answer such questions. Then it helps evaluators to evaluate the student answers. Several facilities have been provided to enhance the consistency and comfort levels for the various users of the system.

Innovation Portal

Innovation portal is a platform where people can post their innovative ideas, products or technology and analyze and build on other's ideas, and also post problems requiring innovative solutions. The development phase I which covers the setting up of the software required for the portal and updation of static information on the website has been completed.

The Department of Science and Technology, Govt. of India, CII (Confederation of Indian Industry) and Innovators are the lead stakeholders for the Innovation Portal.

Student Project

Student Project is a framework where anybody can post a project idea, which can be explored as a project by the students of BE / ME / MCA etc. Students who are interested to do projects on any idea can register for it and mentors can monitor those projects.

Features like posting new project ideas, posting comments on project ideas, facility to form a project group and registering for a project idea, uploading project documents, source code, etc, administration and monitoring the project groups, etc. have been implemented. The portal is now open to registered users.

Moodle Localisation

Moodle is a very promising open source Learning Management System that implements technology-enhanced learning. The localisation of teacher, student and some part of admin interfaces of Moodle in Hindi has been completed. The files are available for download on the OSSRC website (http://www.ossrc.org.in/).

FLOSSWORLD

FLOSSWORLD is a European Union funded project involving 17 institutions from 12 countries spanning Europe, Africa, Latin America and Asia, to undertake a worldwide study on the impact of select issues in the context of Free/ Libre Open Source Software (FLOSS). Comprehensive efforts to complete a sustainable eco-system are in progress through establishment of trans-national projects, resource centres, and other collaborative efforts. As part of the project, the following efforts have been undertaken:

1. Localisation of the survey questionnaires to adapt it to suit Indian environment.
2. Collected contact information of people in the sectors of education, government, employers and developers.
3. Organised a 2-day regional workshop at C-DAC, Mumbai. The participants for the workshop included people from various

sectors like education, government, employers, localisation, etc., from different states in India, who are involved in FOSS activities. Representatives from Malaysia and a delegate from Iran also participated in the workshop.

HRDBARC Website

The system is operational for the last three years. C-DAC is responsible for maintaining the system and any modifications required are carried out as per BARC's requirements. The system is designed to automate the process for the recruitment of candidates for DAE's various training schools.

DPS Website

An MoU was signed to develop the web site for the purchase and stores department of the DAE. The website was designed according to their requirements and is bilingual – English and Hindi.

IGCAR Website

IGCAR website for online recruitment was developed similar to the HRDBARC website and candidates and IGCAR staff could use the site for 2006 recruitment.

Metric Tool For Software Engineering

For big projects, measuring the base metrics and analyzing the development based on the base metrics is crucial. A tool has been developed to analyze UML models for calculation of various metrics. This tool takes XMI file, which is a standard way of importing / exporting UML models across CASE tools.

CRIS and Directorate of Planning, Statistics and Evaluation, Panaji-Goa

The system was developed last year to automate and assist the process of recruitment and was deployed at CRIS and the Goa Directorate. The forms allow applicant to fill their details. Applications were processed and various reports were generated according to the clients' requirements. The OMR sheets were processed for selection of candidates.

VLSI Website for SMDP-II

This website on VLSI will be made available to the Resource Centres and the participating institutes in the SMDP-II Project of the Ministry of Communications and Information Technology, Govt. of India. The website would be highly interactive and contain information on ongoing and past projects relating to VLSI, their abstracts, and the current status of each ongoing project, group discussions, learning resources for lecturers and students, open source software for download, other software for the VLSI community, information on the India Chip Program, and so on. It is a five-years research project, with the website launch set to take place in mid 2006. The project was received in the financial year 2005-06.

Software Package for Department of Sainik Welfare - SENANI

The web-solution consists of a series of data entry forms, which are used to enter information about ex-servicemen, ex-servicemen widows, civilian and in-service personnel for efficient working of welfare schemes. The software also provides various search / query options to manipulate the database. Report generation for complaint details or for a series of complaints by any person regarding welfare schemes, has also been made available.

The customized software has all the necessary functionalities required to satisfy user specified queries. The data is manually fed into forms and every record is stored in the database for later use.

SENANI Web Solution

Multilingual Software for Fashion Designing (Ver. 1)

The aim of this project is to develop an integrated package for both amateur and professionals in Fashion Designing industry. This software will be available in two languages Punjabi and English. The user can browse the whole software in Punjabi language and the English text can be seen on mouse over state. One can use the existing motifs to create new patterns and check the preview of how the garment will look like even before actually beginning the process. The demo version for Phulkari (embroidery technique from the State of Punjab) is almost ready.

Geographical Indications Registry (GIR) Web Portal

Geographical Indications Registry (GIR) web portal provides the public the option of submitting the application for registration online without the need to visit the office physically. Online help is also provided to assist the public to fill the application online. The application details are collected through the web portal and the payment is also collected online using various modes such as credit card, debit card etc.

The GIR workflow software automates the workflow of the entire office. It is a web-based solution that tracks the application submitted, processing at various stages and completion of registration. The application status is monitored in various section of the office at various stages of the application. The various sections in the office include the Cash Section, Consultative Group formation section, Examination Section, Journal, Opposition Section, Registration Section, Renewal Section, Agent Section, and opinion Section.

GIR Login Page

Maintenance of Subscriber Billing & Payment Accounting of Calcutta Telephones

C-DAC is implementing a new module for Broadband Billing and continues to work to perfect the billing system. C-DAC is primarily responsible for the Annual Maintenance (Corrective) of the Billing System.

Development of Software For Face Identification

The project envisages the development of a complete face identification / recognition system and creation of facial database covering different ethnic groups of Indian population. The final face recognition software is proposed to have three hierarchical stages of recognition. The first level of recognition is based on Principal Component Analysis (PCA) and has already been realized. The development of the other two modules for biometric feature-based recognition are presently ongoing.

GEOMATICS

Tracking System Ver 2.0

C-DAC has completed the development of an enhanced version of its Vehicle Tracking System. The system consists of a Vehicle Mount Unit and a Base Station Unit. The Base Station Unit is interfaced to a PC. The Vehicle Mount Unit employs a GPS (Global Positioning System) receiver to identify the location of the vehicle and transmit the information to a base station over the network using GSM modem / MSS / GPRS / CDMA. The Base Station Unit consists of communication equipment for reception of messages from Vehicle Mount Unit. The Base Station Software collects the information and logs onto a database. Web based plotting software uses this information from the database and the position of vehicle is mapped on to a raster map. This information is then made available either on the LAN or the Web for online display and reporting.

Production Sharing Contract Monitoring System for Directorate General of Hydrocarbons

The Production Contract Sharing Monitoring System (PSCMS) for DGH (Directorate General of Hydrocarbons) has been designed to store, analyze & retrieve the details of contracts awarded to different companies for exploration and production of oil / gas from the designated area, known as Block. The system stores the details of exploration carried out, production for calculation of estimated reserves. This evaluates the commerciality of any area. The system also caters to the need of storage & analysis of quarterly / annual expenditure for the purpose of calculation of profit, royalty etc.

The system performs various activities like - Maintenance of Block / Field details with its status, maintenance of contract signed with the contractor with date wise activities and subsequent amendments, maintenance of details of commerciality, generation of various user defined reports etc., performs various validity checks on the inputs entered by the user, and maintains an audit trail of insertion and updation. The project has been completed and implemented.

Production Contract Sharing Monitoring System

Advancement of Platform Independent GIS Application with Map Model on Web GIS

In this project, design & development of low cost GIS tools for the following have been taken up:

- Thematic mapping
- Spatial & Non Spatial Analysis
- Map Viewing
- Multi-Layered and Multi Leveled Mapping.
- Web GIS Application for the Internet & Intranet.
- Compatibility with other software.

The product named as **Geo Carte** has been tested for other products developed by NIC and intended to be utilized for district level GIS planning.

NELP5 Bid Evaluation System

A Bid Evaluation package was designed and developed for Directorate General of Hydrocarbons (DGH), Ministry of Petroleum & Natural Gas, Govt. of India. This package has been deployed and the bids were invited for awarding the exploration of natural resources related to Hydrocarbons.

Decision Support System for District Planning

A district being the main entity within the state, has to handle various activities like education, health, transportation, irrigation and power. A Decision Support System was configured to manage formulation and flow of information within the District and from District to State level. This activity required integration of data from various departments within the district, analyzing the data and planning. The GIS based Decision Support System developed by C-DAC provides the IT framework for information handling, leading to planning activities in respect of education, health, roads, irrigation and power etc.

Educational Institute Monitoring System for AICTE

C-DAC undertook a project from the AICTE for designing and developing an integrated system for monitoring the educational institutions all over India, coming within the purview of AICTE, The system has been designed to integrate various activities / parameters pertaining to technical institutions. The system, which is Browser based, makes a graphical representation for appropriate decision-making and information search to the common public. Various required reports for different purposes can also be generated by the system along with thematic maps.

HEALTH INFORMATICS

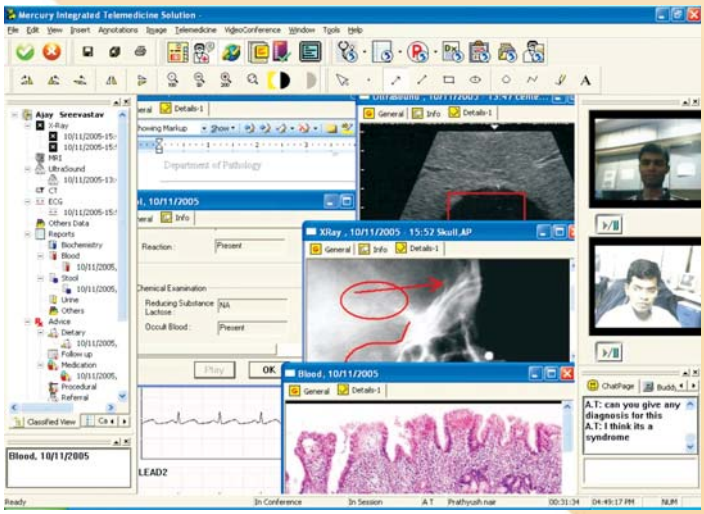
Development of Telemedicine Technology and its Implementation

The DIT funded project 'Development of Telemedicine Technology' being implemented by C-DAC, was granted an extension with enhanced scope. Implementation work was taken up to upgrade the existing sites at the All India Institute of Medical Sciences (AIIMS), New Delhi, Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGIMS), Lucknow, and Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh.

As the enhanced scope required a satellite site to be setup with each of the super-specialty sites, three new sites were raised at Medical Colleges at Shimla, Cuttack and Rohtak. The new linkages built are SGPGIMS & S.C.B Medical College (Cuttack), PGIMER

& Indira Gandhi Government Medical College (Shimla) and AIIMS & Post Graduate Institute of Medical Science (Rohtak). While the Telemedicine setup at the original three super-specialty centers are working as Telemedicine Referral Centers ('Specialist-Side'), the new Telemedicine setup at three Medical Colleges at Shimla, Cuttack and Rohtak are functioning as Remote Telemedicine Centers ('Patient-Side').

Each of the sites under the project was upgraded with latest technology updates. Under the project, C-DAC has deployed its indigenously developed Integrated Telemedicine Solutions - Mercury™ and Sanjeevani.



Mercury™

Setting up of Telemedicine & Tele-education Facilities in Kerala

The project is funded jointly by the DIT, MCIT, and by the Govt. of Kerala, C-DAC and the Indian Institute of Information Technology and Management Kerala (IIITM-K) are jointly implementing the project. C-DAC is required to make the network operational.

The objective of the project was to setup identified Tele-Health Services in the State of Kerala viz, Tele-Consultation and also Tele-Education tuned for Continuing Medical Education (CME) in the state. Under the project the three super-specialty hospitals viz, Sri Chitra Tirunamal Institute of Medicine Science & Technology (SCTIMST), Regional Cancer Centre (RCC) and Thiruvananthapuram Medical College (TMC) has been setup as Telemedicine Referral Centers (TRCs).

The Remote Telemedicine Centers (RTCs) are being set up at Neyyatinkara, Quilandy, Mavelikkara, Malappuram and Wayanad. Out of these, two sites are already operational. These RTCs will be equipped with Clinical Equipment like ECG Machines, Video Microscopes, etc. The TRCs under the project is providing remote specialist support to RTCs. Mercury™, C-DAC's Integrated Telemedicine Solution is deployed under the project.

Setting up of Telemedicine Facilities in two States in North East India

The project is funded by the DIT and is being jointly implemented by the C-DAC and Apollo Telemedicine Networking Foundation (ATNF). The objective of the project is to setup Tele-Consultation Services in the two states of Sikkim and Mizoram in North East India. The Namchi Government Hospital, Sikkim is functional and is connected to the super-specialty Apollo Hospital at Delhi. The Aizwal Government Hospital in Mizoram has also become operational and was inaugurated in October 2005.

The Telemedicine Centers in Sikkim and Mizoram are equipped with Clinical Equipment like ECG machine, Ultrasound machine (Color Doppler), Digital Microscope & Camera, Electronic Stethoscope, Pulmonary Function Test machine, HP Monitor, Glucometer, etc. Mercury™, C-DAC's Integrated Telemedicine Solution has been deployed under the project.

Inauguration of the Telemedicine Centre at Aizawl, Mizoram

Computerization of Health Directorates

C-DAC has completed the project for computerising all the five Directorates under the Department of Health (Directorate of Health Services, Directorate of Homoeopathy, Directorate of Indian Systems of Medicine, Directorate of Medical Education and Directorate of Ayurveda Medical Education).. Training is also given to the Directorate staff. The system is capable of providing accurate, relevant and up-to-date information on institution infrastructure, vacancy positions, budget provision, utilization and allocation expenditure balance, file status, pending files etc.

The application software comprises Employee Records module for HR management, Baseline data module for Institution Infrastructure Management, Budget Monitoring module for Budget allocation, Appropriation & Utilization tracking, File Tracking module for inward & outward correspondence tracking and an Office MIS module for enquiry & reporting. The software development for this project is done keeping in view the requirements for extending the system to the lower level institutions in future. The Application is developed as a three-tier system, based on the MVC architecture. The implementation is done using Java Beans, JSPs and Servlets. Apache Tomcat is used as the Application Server, and Oracle 9i is used as Database server. The Database and Application Servers are hosted in the Linux Enterprise Server OS.

Budget Allocation and Monitoring System at the Department of Health

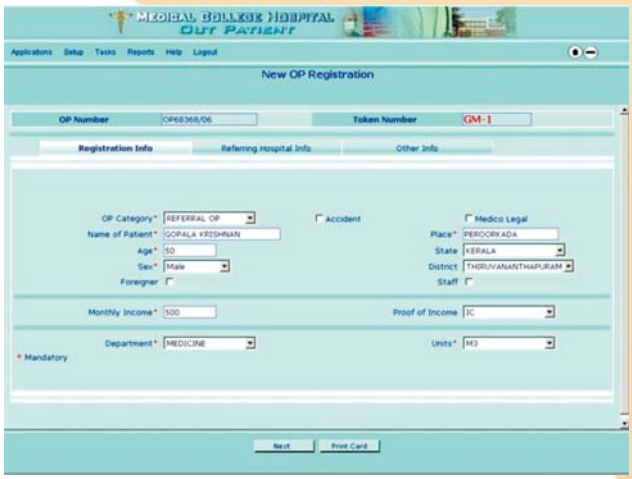
Computerization of Medical College Hospital, Thiruvananthapuram

C-DAC has completed the project for Computerization of Medical College Hospital, Thiruvananthapuram. This was a pioneering Project in IT enabling of Government Sector Hospitals in India.

The project involved setting up the required Hardware and Software infrastructure comprising of Campus wide Network (250 node with Fiber Optic back bone) and Software solution for Patient Care & Administrative functions for Thiruvananthapuram Medical College Hospital, which is one of the largest hospitals in Kerala.

The software applications developed for the Medical College Hospital are OP Management Module (for Out Patient Registration, Queue Management & Report Generation), IP & Ward Management module (for Patient Admission, Discharge, Transfer, Printing of Passes, Ward Census, Ward Registers and Case Sheets), Lab Management module (for Investigation Requisitions, Results Entry and Printing), Resource Scheduler Module (for scheduling of theatres, facilities etc), Staff Scheduling Module (Duty Posting, Scheduling, Attendance and Leave entry), Pay ward Reservation Module (Pay ward Booking, Allotment, Receipt printing) and an Enquiry Module (Patient details, Doctors availability, Room Availability etc.). Software application is functional in 35 wards, 9 ICUs, 5 Operation theatres, 10 Labs, 9 OP Counters, Casualty, IP admission counter etc

The software is configured as a web oriented Application in Java with Servlets, JavaBeans & JSP and Oracle 10g Database as back end. Model View Controller (MVC) architecture is used for software development.



Computerized System at Medical College Hospital, Thiruvananthapuram

ONCONET – Cancer Care for Rural Masses

C-DAC has successfully completed the implementation of ONCONET Project. ONCONET is a comprehensive telemedicine solution for Cancer Treatment and Follow-up at the Regional Cancer Centre, Thiruvananthapuram and its Peripheral Centres. ONCONET attempts to arrange a virtual super-specialty environment spear-headed by Regional Cancer Centre, Thiruvananthapuram for its early cancer detection and cancer eradication programmes, exploiting the advanced technologies and latest trends in the industry. It includes a 'Remote Expert Consultation System' with a powerful Video Conferencing System, which provides uninterrupted and qualitative online interaction between oncologists at RCC and doctors/patients at the five nodal centers. About 3090 follow-up Consultations, 1998 awareness/screening programmes and 949 early cancer detection sessions have been conducted using this facility till last year.

ONCONET

The system uses TEJHAS, a fully integrated Telemedicine enabled Java based Hospital Automation Software automates all the departments of the Regional Cancer Centre and it includes modules like OP & IP Management, Consultation, Surgical Oncology, Resource Scheduling, Investigation, Nuclear Medicine, Radiation Oncology, Chemotherapy, Pharmacy, Cash & Billing, Central Stores, Purchase, Blood Bank, Radiology, Engineering, C.S.S.D, Enquiry, MIS, Masters. Tele-pathology and Tele-radiology systems, which provides capture, online sharing, transmission, storage and retrieval of Cytology and Radiology images at remote centres and enables consultation with expert pathologists at the RCC. The Learning Resource Centre for Oncology provides cancer related information to clinicians, researchers, health planners, health workers, administrators and patients services of ONCONET.

Hospital Management System

In the health care domain, C-DAC has completed a suite of HIS and PACS system. Research is being carried forward for integrating telemedicine with HIS / PACS so as to offer a comprehensive solution in healthcare. The HMIS is built on a framework that covers the following areas:

- Clinical Services: Front Office, Registration, Emergency, Central Admission, Patient Routing, Appointment and Scheduling, Lab Services, Out-Patient Management, In-Patient Management, OT, Surgery Scheduling, Pharmacy, Blood Bank, Diet & Kitchen, CSSD.

- Support Services: General patient enquiry, Linen, Sanitation, Security, Transport, Bio-Medical waste management.

- Back Office Services: Administration, Human Resource Management, Stores, Inventory, Purchases, Library Management, Billing, Financial Accounting System and Maintenance (equipment / infrastructure)

- Man-Machine Interface Services: Bio-medical equipments, Barcode devices, Bio-metric devices, mobile computing, smart-tags, Telephony devices and IVRS.

The health care solution complies with the following standards:

- HL-7
- HIPAA
- DICOM
- SNOMED
- ICD - 10K

It has been able to commercialize / deploy the technology in the following hospitals:

- Sanjay Gandhi Post-Graduate Institute of Medical Sciences, Lucknow
- Guru Teg Bahadur Hospital, Delhi
- Central Hospital, Northern Railway, New Delhi
- Govind Ballabh Pant Hospital, Port Blair
- General Hospital, Chandigarh
- Mahatma Gandhi Institute of Medical Sciences, Sevagram (Wardha)

Regional Institute of Medical Sciences (RIMS), Imphal

The main constituents of the turnkey solution for RIMS includes setting up of data center, providing Advanced Hospital Information Medical System (HIMS) Application interfaced with the Picture Archival Communications System (PACS) solution. The HIMS being implemented at RIMS consists of 20 modules falling into three main categories namely Patient Care, Support Services and Back

Office. The PACS solution enables the integration of all imaging modalities, across the departments based on the DICOM 3.0 standard. This system aims at achieving a comprehensive workflow with optional multi-level authorization and process flow.

Indira Gandhi Medical College (IGMC), Shimla

The Department of IT, Shimla, Himachal Pradesh availed the services of C-DAC for the computerization of the IGMC Hospital, Shimla. The scope of work includes development and implementation of eleven major modules like Registration, Emergency Services, Out Patient Department, Blood bank, Investigation, Operation Theatre, Billing, Enquiry, Pharmacy, IN-Patient Department etc.

EMR Solution

An Electronic Medical Record solution integrated with the existing hospital management system of Sankara Eye Centre, Coimbatore is under development. The exploration of existing open source solutions and initial project requirement gathering has been completed.

Identification of Feature Points in Cephalograms

Cephalometry is the scientific measurement of the dimensions of the head. In orthodontics, a cephalometric analysis performed on a lateral skull X-ray, or cephalogram, reduces anatomic structures to landmark points supposed to indicate shapes and relative locations of curves. In the first phase of the project, the manual approach is used to identify landmark points and their measurement on the cephalograms. Investigations into automatic landmark recognition using different image processing techniques is being implemented. The task is a difficult one due to the complexity and variability of the images.

Cephalometric Analysis

Ayusoft

Ayusoft is a Decision Support System for Ayurveda. The primary objective is to develop an authentic, interactive and intelligent software system to assist medical practitioners and researchers to apply fundamental principles of Ayurveda to the fullest possible level in their clinical practice and research activities.

AyuSoft offers a suit of applications namely:

- Constitution Assessment and Diet & Lifestyle Advice
- Disease Diagnostics and Treatment
- Personal Information Management System
- Multimedia based Encyclopedia
- Search Engine with digitalized Samhitas
- Multidimensional Analytical Tool for on-line analytical processing

AyuSoft is developed as a range of products viz. **Shrink-wrapped products**, **Intranet Solution, and Internet Solution.** The targeted end-users are hospitals, practitioners, Researchers, Students. The system had rigorous field-trials wherein many hospitals, research institutes and physicians participated in the activities.

This project is jointly undertaken by C-DAC, Interdisciplinary School of Health Science, Pune University, Dept. of Ayurveda, Pune University and Jnana Prabodhini, NGO, Pune.

AyuSoft

E-GOVERNANCE AND ICT FOR ADDRESSING THE DIGITAL DIVIDE

India Development Gateway (InDG)

C-DAC is implementing the prestigious National Level Project "India Development Gateway (InDG)". This project is to work in the domain of rural and social development. The gateway will feature Verticals in the focus areas of Health, Primary Education, Agriculture, Rural Energy and e-Governance and will also have two frontline Strategic Service Units (SSUs) in the area of e-Governance and Agriculture. InDG project will target specific country needs and catalyze the use of Internet and Other ICT tools for e-Governance, e-Business, e-Collaboration and Knowledge sharing among development shareholders.

Setting up of Indo – Uzbek Centre for Information Technology at Tashkent, Uzbekistan

C-DAC signed a MoU with the Ministry of External Affairs (MEA), Government of India on March 14, 2005 for establishment of "Indo – Uzbek Centre for Information Technology" at Tashkent, Uzbekistan. C-DAC has been chosen as the implementing agency by the Government of India to execute the work. C-DAC is providing all the hardware like Computers, Printers, Servers, Networking Equipment, Video Conferencing Equipment, etc. and technical consultancy and assistance required for setting up of the Centre. C-DAC will also train around 1000 aspirants on various computer technologies namely DIT, ADIT, DBC, DWT and DIL in Tashkent and 8 of their participants have successfully completed the DAC course in Pune. These 8 members will eventually train other aspirants in Tashkent after C-DAC hands over the Centre to the Government of Uzbekistan.

Setting up of Indo – Tajik Centre for Information Technology at Dushanbe, Tajikistan

C-DAC signed another MoU with the Ministry of External Affairs (MEA), Government of India on March 14, 2005 for establishment of "Indo – Tajik Centre for Information Technology" at Dushanbe, Tajikistan. C-DAC has been chosen as the implementing agency by the Government of India to execute this work. C-DAC is providing all the hardware like Computers, Printers, Servers, Networking Equipment, etc. and technical consultancy and assistance required for setting up of the Centre. C-DAC will also train around 2800 Teachers & Government officials on various computer technologies namely DIT & ADIT and 8 of their participants have undergone the DAT course in Delhi, India. These 8 members after completing the DAT course will eventually train other aspirants in Dushanbe, Tajikistan after C-DAC hands over the Centre to the Government of Tajikistan.

Setting up of Ghana –India Kofi Annan Centre for Excellence in IT at Accra, Ghana

C-DAC had signed a MoU with MCIT for setting up of Ghana – India Kofi Annan Centre for Excellence (KACE) in IT at Accra, Ghana. Under this programme, the necessary training & infrastructure has already been created and the Community Information Centres (CIC) are being created which will be connected to Ghana – India Kofi Annan Centre for Excellence in IT at Accra, Ghana through VSAT by C-DAC. C-DAC is providing all the hardware like VSAT Antenna (Centre & Remote), RFT, Voice Cards etc. and technical consultancy and assistance required for setting up of the VSAT connectivity between CIC & KACE.

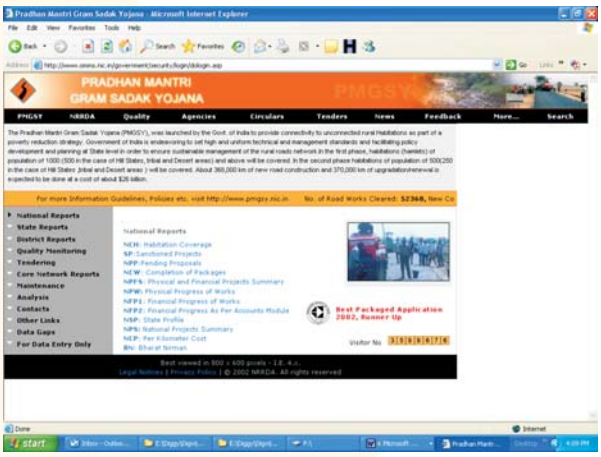
Centre for e-Governance (CEG) at Department of Information Technology, Ministry of Information Technology, Government of India, New Delhi

The centre showcases the best practises in e-Governance and showcases the software that has been deployed in the country. The centre also conducts various workshops during the year on topics related to e-Governance. The Delhi centre of C-DAC is managing and running the centre.

OMMS Application for PMGSY

Pradhan Mantri Gram Sadak (PMGSY) is a nationwide rural road programme by Ministry of Rural Development (MRD), Government of India to connect unconnected habitations by all-weather roads. Presently over 50,000 road works are in various stages of execution in 28 States and 6 Union Territories.

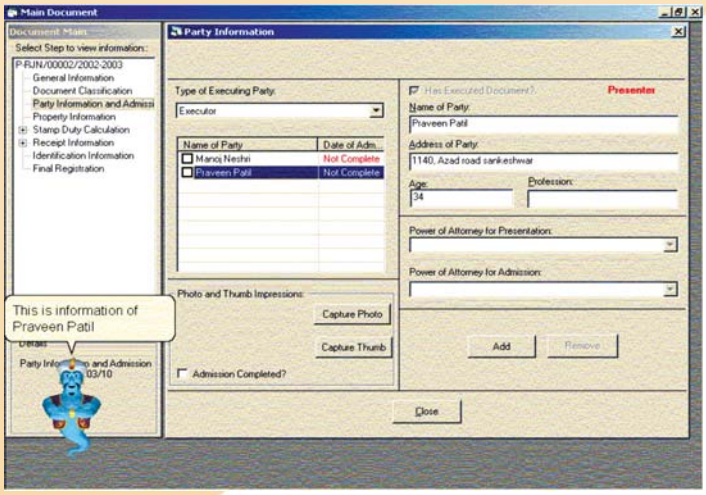
In order to effectively monitor the entire programme and bring about improved efficiency, accountability and transparency in implementation, a web enabled application software - Online Management and Monitoring System (OMMS), has been developed by C-DAC. The application software has been made available to the various users through the PMGSY website- www.omms.nic.in. This site contains special sections for Citizens and Government officials through which they have been provided access to relevant information.



OMMS Application on PMGSY Website

KAVERI

The KAVERI applications suite is devoted to take care of the entire registration process inclusive of necessary report generation and property valuation. Utmost precaution has been exercised to leave the 80-year-old 5-step procedure of registration undisturbed for the benefit of end users who have adopted it wonderfully for keeping this age old and time proven methodology intact. The KAVERI software has been developed for the Stamps and Registration Department of the Govt. of Karnataka.



KAVERI Registration

SARITA

C-DAC has designed software - SARITA for the Department of Stamps and Registration, Maharashtra that allows documents to be scanned, processed and archived in 30 minutes.

GAURI

The GAURI applications suite covers the entire registration process inclusive of single, composite documents and necessary report generation. The application suite allows documents to be scanned, processed and archived in 20 minutes. The GAURI software is being developed for the Registration Department of the Government of Goa.

MLS

MLS Application Suite (MAS) is a suite comprising of 12 different Application Software Systems developed for various Branches/ Sections in Maharashtra Legislature Secretariat. These application software systems work in an integrated manner to automate core business procedures being carried in Maharashtra Legislature Secretariat, Vidhan Bhavan, Mumbai and Nagpur.

Personnel Information Management System for Naval Dockyard, Viskhapatnam and Mumbai

This product suite is aimed as a key e-governance solution for the Indian Navy. This is an enhancement to the previous one of client-Server architecture, and is implemented in a 3-tier architecture. The suite consists of basic employee information, payroll, leave administration, travel claim, transfer and promotion and pension and retirement benefits, recruitment, data transfer to other databases for the use by the Naval Head Quarters modules. The entire application suite contains modules that cover the information of a Naval employee during his / her entire service tenure.

The PIMS software trials including integrated testing have been completed and the software has been installed and accepted for online usage for the Yard.

Budget Management System (BMS)

BMS has its use in the Naval Dockyard, Mumbai. The web based application is a handy yet powerful tool to keep track of budgeted money flow in the dockyard. Users can forecast the department's expenditure for a particular financial year. Depending on the request received, the administrator of the system can make the necessary allotments.

Human Resource Management System

This system is aimed as a powerful tool to manage the information related to the employees of C-DAC spread across India. This system consists of basic employee information, payroll, leave administration, travel claim, transfer and promotion and pension and retirement benefits, recruitment, HR training, reviews.

Public Works Department

Workflow enabled applications have been developed to cater to the needs of various functional wings of the Maharashtra Public Works Department. Works Management Suite (for Civil & Electrical Wings), GIS based Road Information System, Employee Information Suite, Accounts and Stores Management System, Mechanical Inventory and the PWD Website (www.mahapwd.com) are some of them. All these applications operate over the statewide WAN covering over more than 250 offices located in 100 campuses spread across the state of Maharashtra and linked through dedicated 64 Kbps lease lines. The WAN is also VoIP enabled.

Chhattisgarh State Electricity Board (CSEB)

C-DAC has been appointed as a Total Turn key Solution Provider (TTSP) for the CSEB. C-DAC is required to provide its services with regards to SAP-ERP implementation, Network Information Management System (NIMS) implementation, imparting IT education to CSEB employees, Hardware and Network consultancy required for computerization of various activities of the CSEB.

Madhya Pradesh Road Development Corporation

The Madhya Pradesh Road Development Corporation (MPRDC) is an autonomous body created under the Madhya Pradesh State Government to implement the construction and improvement of state highways in the state of Madhya Pradesh. The state Government along with international and national funding agencies is funding the projects under regular works and public private partnership. Approximately 12,000 km of the state highway is being improved / constructed / maintained by the corporation.

In order to effectively manage and monitor the projects, C-DAC is in process of developing a web-based application that brings about transparency in implementation, improved efficiency and accountability.

The application shall be used by the stake-holders involved in the programme. Various analysis and reports shall be provided which will benefit the decision makers and the management to monitor the progress and take timely action.

Land Management System

This application addresses the activities carried out by a corporation engaged in industrial development. It is an effective tool that captures the land allotment process, which encompasses various stages like allotment, transfer, mortgage, surrender etc. of land. Some of the functional modules of this are, acknowledgment of application, receipt of application, reminder of notice, reports etc. The application is fully GIS enabled. The system has been developed for the Maharashtra Industrial Development Corporation (MIDC). The browser based system is also being developed for all types of plots like residential / shed / gala allotment.

PWD Goa

The project involves development of web based workflow enabled applications for the functional wings of the department. The duration of the project is 18 months and currently the project is in the execution phase. The overall scope of the project involves:

- Consultancy for Hardware Procurement and Installation
- Consultancy for System Software Procurement and Installation
- Consultancy for Networking of Offices
- Development of Application Software
- Development of a Web Portal
- Training of Staff

System Study for Automation of Army Command Headquarters.

It includes Client Interaction, Manpower management, Software Quality Management, Project Management, System Study and requirement collection, Analysis of requirements, Designing framework, database and system, preparation of Operational Concepts Description (OCD) / System & Sub System Specifications (SSS) / Interface Requirement Specifications (IRS)/ User Requirement Specifications (URS) / Software Requirement Specifications (SRS) / Vision document / Supplementary Specifications / Stake holder requirements / Use Case Model / Activity Diagrams / Sequence Diagrams using RUP standards.

Design and Maintenance of Website for Special Manpower Development Programme in VLSI Design (SMDP II)

This project is being carried out at C-DAC, Delhi and Mohali. A proposal amounting to Rs. 50 Lakhs was submitted and approved by the DIT.

Police Head Quarters (Madhya Pradesh), Bhopal

C-DAC has been working with the Madhya Pradesh Police Head Quarters (PHQ) for 5 years and has supplied servers & has installed Campus Wide Networking at the PHQ (Madhya Pradesh), Bhopal. C-DAC has already executed 2 phases under this project and provided connectivity to all their offices in and around Bhopal under LAN and WAN. The warranty and support is in progress and C-DAC has received the order for the 3rd phase under which C-DAC will connect 51 offices of the Madhya Pradesh Police spread over 21 locations in Madhya Pradesh. This will amount to networking 954 additional nodes that will cover the complete Police department of Madhya Pradesh.

Aid Management Platform (AMP) – An e-Governance Solution for Aid Management

The Aid Management Platform (AMP) is a web-based e-governance solution that helps streamline the way developing countries and their donors plan, monitor and report on international aid flow and activities. AMP enables Governments and donors to share consistent, timely and accurate aid information for improved decision-making and budget planning. It reduces costs associated with data collection, processing, management, and reporting of aid information, thereby leading to more efficient and transparent processes for aid management.

AMP is being developed by a joint team of the Research & Training Centre of DGF in India at the Centre for Development of Advanced Computing (C-DAC), Bangalore, and the Development Gateway Foundation (DGF) with guidance from the Government of Ethiopia, UNDP, OECD and the World Bank.

BharateeyaOO

The BharateeyaOO project was initially conceptualized to bring Open Office into Indian languages. Today BharateeyaOO.o is not only involved in indianizing Open Office but is also engaged in the localization of famous Opensource productivity tools like Firefox, Thunderbird, Columba and Gaim. These tools can be deployed across all major platforms. A key aim of the project is to reach out to the masses by supporting both Indian and international languages, thereby dissolving language barriers and physical boundaries.

The project was born out of the need to recognize the inaccessibility of applications to non-English speaking users. An application independent of natural language constraints would not only broaden its user-base across domains, but would further the dissemination of information. This is particularly true in countries like India, where diverse languages are spoken. Here, the multilingual feature is at a premium and assumes significance in rural areas, where the regional language is the basic language of communication.

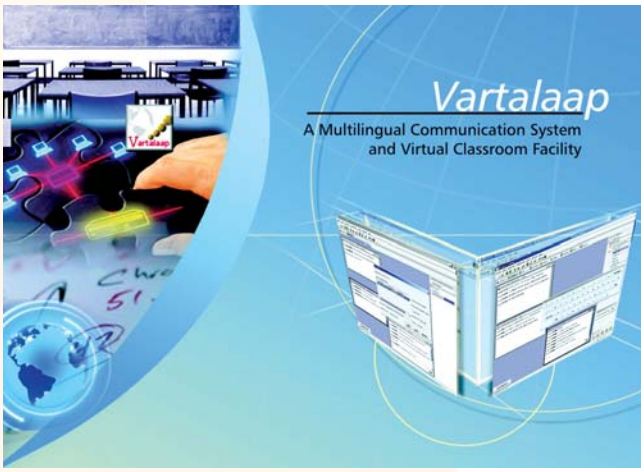
ECKO

ECKO is a framework for building and nurturing E-communities. It is a web-based software system to create and manage a platform for people belonging to a geographical location to create, share and disseminate information on their own among them, thereby enabling the formation and evolution of an E-Community. ECKO helps to capture information from various sources, and provides them in an easy-to-use and understandable format to the users. This information can then be used to build knowledge repositories across various domains and would also help in making useful inferences.

ECKO is built using open source software (PHP, MySQL, APACHE). It comes with a localization framework that allows ECKO to be configured in any language and any dialect. It also packs features for communication in the form of E-mail, and chat, providing local information in the form of various services like agricultural market information, bullion information and so on and also includes generic services like building content repositories. ECKO also eases the workload on the administrator by providing a well-packaged system that is easy-to-install, configure and manage.

Vartalaap

Vartalaap is a software solution that caters to the online communication needs of people in their local language. Vartalaap enables online interactive text communication between one-to-one and one-to many users using an intuitive graphical interface. The Vartalaap Virtual Classroom Facility provides a unique combination of tools well suited for conducting online tutorial/consultancy sessions. The Virtual Classroom Facility will assist teachers to reach a wider group of students who may be physically / geographically distributed. It can also be used to conduct online meetings in an e-governance setup.



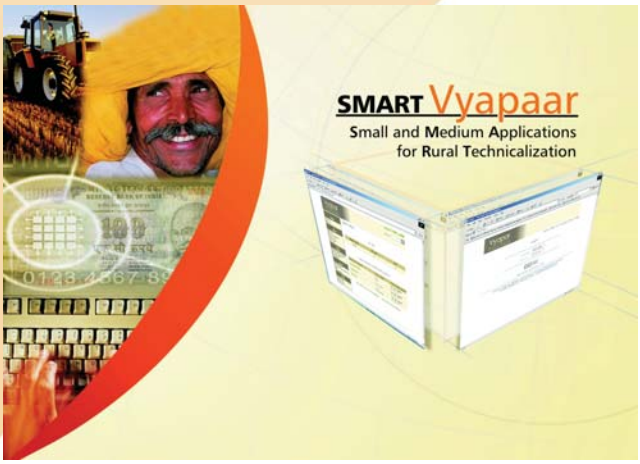
Vartalaap

Vyapar

Vyapar is the first initiative of the SMART project. Vyapar is conceptualised as an online trading centre that caters to the requirement of people scattered in a very limited geographical area and provides a platform for the rural community to sell/buy products/services.

Vyapar provides a common on-line meeting ground for villagers to trade and post information about their goods, products and services. The objective being to bring the buyer and seller together on an equal platform for all transactions. Sellers post their item details in the system, which are viewed by people residing in other villages. Interested buyers can contact the seller.

This application provides a mechanism to initiate the sell/buy transactions, to negotiate through discussion threads, and product modeling under a particular category with a defined set of attributes. Vyapar supports localization to any other language by providing an interface for translation. Vyapar also provides advertisement support for product and services.



Vyapar

e-Forms

e-Forms is an innovative, easy-to-use, powerful tool for creating forms on-the-fly for data collection. Both local and remote personnel can use the tool for their specific needs through the inter/intra-net.

e-Forms provides an intuitive interface for quick data collection with minimum effort by understanding the user's need and the nature of the data. The tool provides a mechanism to generate reports that assist in the meaningful analysis of collected information. Evolving from a healthcare project, as a tool, e-Forms does not limit itself to any specific domain and is very generic.

DAAL

A large part of the content on the Internet is confined to English and other non-Indian languages. Moreover search engines such as Google and Altavista through which information is usually accessed, do not provide any facility to search for English documents through Indian language queries. Although a few search engines offer screen layout and static text in Hindi, the querying and results retrieved are still in English. This makes the information on the Internet largely inaccessible to an overwhelming majority of Indians, given that not even 10% of the population is fluent in English. There is also a cross section of people in India with a basic knowledge of English, but are unable to formulate search queries based on it.

Enabling Indian-language based access to the vast information repertoire of the Internet, is a crucial challenge in resolving this digital divide. This necessitates a system that enables users to use their own language to pose queries and access documents, which may be in a language unfamiliar to the user community. C-DAC has christened it as 'Document Access Across Languages (DAAL). In the Indian setting, C-DAC is interested in providing access to English documents through queries in Indian languages.

Gnopernicus

Gnopernicus is part of the GNOME Accessibility Project. It is a screen reader and magnifier and it enables users with limited vision, or no vision, to use the Gnome 2 desktop and Gnome/GTK+2 applications effectively. By providing automated focus tracking and fullscreen magnification, Gnopernicus aids low-vision Gnome users. Its screen reader features allow low-vision and blind users to access the standard GTK+2 and Java-based GUI applications via speech and braille output. By leveraging Gnome 2's built-in accessibility framework, Gnopernicus makes interacting with applications more efficient for these users and enable use of the Gnome 2 desktop for some users who otherwise would have no access to Gnome.

Gnopernicus is one of the Gnome Assistive Technology Projects. Besides the focus tracking there is more functionality that should help the user: many key-mapped functions organized on layers. There are layers for navigation, mouse, magnifier, speech and Braille devices. With the NumLock on, the user can modify different settings depending on the chosen layer. Gnopernicus' user friendly and configurable interface allows a wide range of customisations.

Natak-3D

Natak-3D is a tool that lets the user create three-dimensional plays. With drama editor the user (instructor/director) can design and set up one or more scenes of a play using three dimensional actors (with animations and dialogues) and props. A drama created in the Editor is saved as a script (XML) file. This file can be loaded and played as an animated movie in the Natak-3D Viewer. Apart from being useful and entertaining medium of education at elementary school level, NATAK 3D can be effective even in adult yet educationally underprivileged communities, can also be used in kiosks and other community information centres to deliver educational and informational messages to the rural audience. NATAK 3D can also prove to be a useful medium for self-learning. It can be used in collaborative environments to observe the process of creation of a story/plot, selection of characters and role-play. NATAK 3D can also be used to study effective behaviour.

Pradarshani

Pradarshani is a platform for showcasing the products of a producer and a medium for a buyer to communicate with the producer. Registered producers can post their product details using their on-line account and buyers can browse Pradarshani and place orders for products that meet their requirement. The Pradarshani administrator moderates all the process of uploading content and the communication between the producer and the buyer. Pradarshani supports localization to any other language by providing an interface for translation. Vyapar also provides advertisement support for product and services.

IT Implementation of Kerala Toddy Board Activities

C-DAC has completed the implementation in all the district offices and head office of the Board. This is the first e-governance application in the state, which is fully localized in Malayalam

The Kerala Toddy Welfare Board is the first Welfare Fund Scheme in Kerala, introduced for the welfare of workmen in toddy tapping and distribution. This is the biggest welfare board in Kerala State. The board has about 52,000 members. The current project is developed in java for the linux platform and with regional language support in Unicode. .

Kerala State Wide Area Network (KSWAN)

The Government of Kerala has implemented the backbone for the State Information Infrastructure (DIAMOND), with the support of the Department of IT, Government of India. As part of the project, a State Information Backbone and a State E-Governance Data Center has been set up. The State Information backbone extends from Thiruvananthapuram to Kozhikode, with Network aggregation centers at Thiruvananthapuram, Kochi and Kozhikode. The project KSWAN envisages extending connectivity to all district headquarters and blocks in Kerala. Setting up Points of Presence (POP) at district headquarters and block, and managing and maintaining the network are also part of the project.

Computerization of Telecom Regulatory Authority of India (TRAI)

The computerization of TRAI covers almost all the existing functions and activities performed by different divisions of the Authority including Fixed, Converged, Mobile Network, QOS, Economic, Broadcast & Cable, Financial Analysis Division and General Administration & Financial Divisions.

The application is browser based with a 3-tier architecture, which is capable of performing operations like centralization of scattered data, maintenance of periodically updated data in specified formats, quick referencing, generation of detailed and summary-level views/reports, etc. Depending on the level of access to be provided to different profiles of users, the updated and consistent information from the database will be accessible over Intranet.

Telecom Regulatory Authority of India

e-Governance Project for Forensic Science Laboratory (FSL) Mumbai

Forensic investigations form a crucial part of any criminal investigation. In a majority of cases, clinching evidence is provided by the meticulous analyses carried out by the Forensic Science Labs. The enormous amount of data collected and information painstakingly gleaned is recorded and preserved for scrutiny whenever required by the investigating authorities and the honorable courts.

The software developed by C-DAC, Noida electronically documents virtually all aspects of Case Management starting from Case Receipt to Case Disposal and includes Personnel Management System, Financial Management System and Store & Purchase Management System. It also incorporates a full-fledged Laboratory Information Management System, to collate various analytical data (tables, graphs, reports, etc.) generated by sophisticated instruments, with specific crime records and court references. Powerful search tools and reporting features are included in the suite**.** The design also ensures that future requirements are easily incorporated into the software without the need for major restructuring and re-writing of the code.

Case Management Software at Forensic Science Laboratory, Mumbai

Payroll Management System for Delhi Transco Limited (DTL)

This system generates salary of all DTL employees, as per Govt. rules with CDA & IDA, after receiving the bill from the Bill Section. The system maintains various masters and generates various reports for billing, Income tax assessment, Form 16, Schedules, Trial Balance etc.

Payroll Management System for Delhi Transco Limited

Integrated Transaction Accounting System (ITAS) – Northern Railways

The ITAS, capable of handling all accounting functionalities of Indian Railways was developed and deployed by C-DAC at the Northern Railway Headquarters / Divisions and other zonal railways / offices. The system was maintained and upgraded with additional functionalities like Account Current Merging and RAR merging during the year by C-DAC. Currently, the ITAS at all the locations of North-Western Railways are under maintenance by C-DAC.

Civil Engineering Management Information System (CEMIS) – Northern Railways

The system was developed for the Indian Railways and implemented at Northern Railways. This system has 3-tier architecture and fulfills all the requirement of the Civil Engineering Department of the Indian Railways. This system facilitates the planning of track renewal till disposal of scrap material.

Encouraged by the success of the implementation in Northern Railways, the same is being replicated at Southern, Central and South Western Railways Headquarters and their divisions. The system is being maintained by C-DAC and used at all the above locations.

Security Management Information System (SMIS) – Northern Railways

It is an on-line management information system developed for the Railway Protection Force and has been successfully implemented at the Northern Railways. After successful running of the system in the Northern Railways, the same has been deployed in Central, Southern, West Central and South Western Railways. These systems keep track of arms and ammunition, stores, establishment matter of employee, crime records and miscellaneous crimes details.

Personnel Management Information System (PMIS) – Northern Railways

It is a web-based application, meeting the requirements of the personnel department of the Indian Railways. It manages the career event of employees starting from induction to superannuation. The 1st phase has been completed and implemented at Northern

Railways Headquarters, Delhi Division and it is under maintenance since Nov. 2005.

In the 2nd phase of the project, development of modules covering employment regulation, staff grievances, policies, dak and file management, welfare activities etc. has been completed and completion certificates have been received. The Phase-II application has been implemented and integrated with Phase-I at Northern Railways HQ and Delhi Division. It is now under maintenance with C-DAC.

An improved version of the PMIS namely – "Centralized Personnel Management Information System" is currently under development. It has been designed in accordance with the Data Centric Concept. This has to be implemented in the Northern Railway.

Website for DIT, Ministry of Communications & Information Technology, Govt. of India

A website for the Department of Information Technology, Ministry of Communications and Information Technology, Govt. of India was designed in accordance with the World Wide Web Consortium Guidelines. The key features of the site are ease in accessibility of information, reduced depth of information, and enhanced interactivity. The site is based on a Content Management System, which will give more authority and freedom to the Content Managers, who will update their web-pages by themselves.

EDUCATION AND TRAINING

Industry inputs indicate that only a small percentage of fresh graduates coming out of various engineering colleges are meeting the requirements of industry. It is a well-known fact that there is an excellent potential for employment opportunities in ICT sectors. C-DAC has been in forefront of offering a number of bridge courses to enhance the skills in different focus areas like advanced computing, embedded systems, system software development, VLSI design, network security, ERP, main frames, multimedia, GIS etc. Some of the C-DAC centers are also having a MoU with local Universities to offer M.Tech level programs.

One of the mission statements of C-DAC is: "To share our vast reservoir of experience for education and knowledge enrichment in the field of Information technology". C-DAC offers training in all its centres. Advanced Computing Training Schools (ACTS) of C-DAC are located at Pune, Bangalore, and Hyderabad. ACTS school also has a network of Authorized Training Centres (ATC's) in India to scale-up in numbers to meet the needs of industry.

C-DAC centres focused to design, develop and implement finishing courses in their areas of expertise. Mumbai, Pune, Hyderabad, Noida, Mohali are presently acting as resource centres in designing and launching the courses at various C-DAC centres. Mumbai is resource centre for Software Technology; Pune is resource centre for Advanced Computing, VLSI design, Multimedia; Hyderabad is resource centre for embedded systems, system software development, Cyber security; Mohali has its expertise in PC maintenance and Medical equipment training; Noida is a resource centre for ERP training; Thiruvananthapuram is a resource centre for Mainframes. These resource centres take the responsibility of steering these courses in other C-DAC centres or ATCs. All these courses are well accepted by industry, which is evident from the on-campus placements by industry from C-DAC's training centres.

C-DAC is offering various specialised training programmes for corporate and organised 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 8000 personnel are getting trained every year in 16 different courses designed for Indian Army. Similar training initiatives are carried out for Indian Navy.

A new Post Graduate Diploma Course in Wireless and Mobile Computing has been introduced to focus on specializations in the IT sector at ACTS, Pune centre. The focus is to develop software developers for mobile computing applications.

C-DAC participated in the Information Security Education Awareness (ISEA) program of DIT in formulating the syllabus for different courses to be offered by resource centres and participating institutes. Three of C-DAC's centres are also identified as participating

institutes. Under the ISEA programme, members of the Centre were trained at TIFR, IISC, CMU-USA for Master Trainers in the area of Information Security, who would in turn help in PI and Government officers training.

C-DAC introduced a new course on “Diploma in Systems Software Development (DSSD)” on March 24, 2006 to meet the industry needs with basic and advanced modules in system software development. This course is being offered as part of ISEA programme six month course with e-Security as focus at systems level programming. This course covers windows and Linux internals, e-security, grid computing modules. The course is initiated at Hyderabad centre.

Around 6000 students appeared in diploma in embedded systems design (DESD) common entrance test. The embedded team at the Hyderabad Centre conducted a two-day Faculty Orientation Programme on the DESD course for the technical members who are involved in the DESD training programme at their respective nine C-DAC centres during December 2005. A new module has also been added to the course on Wireless Embedded Systems with a focus on Wireless Sensor Networks (WSN) and Ubiquitous Computing (UC).

Around 1997 students underwent training at the Thiruvananthapuram centre. The centre also achieved a very high placement record for its students with a large number of trainees being offered jobs at leading IT institutions.

The three-year MCA program, started in 2000-01 at the Noida centre has been a success with the students aspiring to do their MCA. The MCA students have developed the Library Information Management System and Attendance Recording System in use at the Noida centre. The MCA III Year students also published two research papers in national seminars based on their work for Biometric devices. Total twelve research papers were presented in various National and International conferences by the MCA division. The MCA Division also organized a National level Paper contest to nurture innovative ideas and productize them for masses. In addition to the existing M.Tech (CSE) and MCA programmes, approval for two new M.Tech programmes in VLSI and IT was obtained and classes commenced during the year 2004-2005, were continued during the year 2005-2006. The Noida Centre has also started M. Tech (Language Technology) programme in affiliation with Mahatma Gandhi Antrarashtriya Hindi Vishwavidyalaya, Wardha.

Various Diploma and PG Diploma courses such as PGDASDD, VLSI, DSDA, GIS etc. were continued during the year at the Noida centre and a new PG Diploma course PGDEVD was introduced. The centre has also introduced a one-year Post Graduate Diploma in Software Enterprise Management (PGDSEM).

The Kolkata centre will conduct a one year Post Graduate Diploma on Localization under Burdwan University, West Bengal. The centre will also offer a M. Tech in Courseware Engineering and Post Graduate Diploma in Multimedia in Distance Multi-modal mode with Jadavpur University. Under the DIT ISEA programme, the Kolkata centre has also been selected as a participating institution.

The CNIE team at the Mumbai centre introduced a new training programme in the domain of Security, NeSyS. The course functioned as a module of the APGDST program that used to be conducted by NCST.

The Mumbai centre also organized the Competence in Software Technology (CST) examination on January 29, 2006. Around 6177 participants appeared for the examinations.

Around 25,000 students have also been trained under the Programme for Advancing Computer Education (PACE) of C-DAC GIST through short-term basic computer awareness programmes to Post Graduate level covering all aspects of multilingual computing (Certificate, Diploma, Advanced Diploma and Post Graduate Diploma). The PACE programme has also been extended to training projects for various state governments such as the Home Department and Gujarat Administration Department, Gujarat, Coal Mines Provident Fund Commission, Dhanbad and so on. Approximately 1000 government employees have been trained in the current year. Other departments where the PACE programme has rendered its services include

- Development Department, Gujarat
- Education Department, Gujarat
- Agriculture Department, Gujarat

- District Medical Health department, Kollam
- Janakeeyasuthranam projects for Panchayats / Municipalities of Kerala

C-DAC thus is carrying-out its training programs which are unique, industry specific on one end and also providing training in local language technologies and to government officials in some key sectors like e-governance applications, e-security, GIS etc. C-DAC has got a brand image for its postgraduate courses offered, specifically for graduates from various disciplines. It is also one of the key areas of revenue generation for the C-DAC centres.

Corporate Programmes

Specialized, customized National level Corporate Training Programmes were organized for various clients like the Department of Language (DOL), Army Headquarters, Ministry of Agriculture, Food Corporation of India and so on. Bangalore centre conducts corporate training in the area of embedded systems tailor made to industry needs.

Human Resource Development for Language Technology

Recognizing the demand for skilled manpower in speech and language technology, fulfilling the needs of the IT localization industry and understanding the semantic and syntactic structure of Indian languages, a Post Graduate Degree programme in Language Technology has been initiated in collaboration with Mahatma Gandhi Antrarashtriya Hindi Vishwavidyalaya, Wardha. Students have been already enrolled for the course and first semester has started.

E-Learning Initiatives

C-DAC, Mumbai is the centre of excellence in e-Learning. The centre continue to provide training in the areas of instructional design and using e-Learning tools to the academic and R&D community. C-DAC, Pune uses e-Vidyapeeth to offer on-line examination and also to offer Pre-DAC courses.

C-DAC, Noida has developed an in-house, customized based learning management system (LMS) contents have been developed for web deployment in many hi-tech professional areas. A number of students pursing engineering degree and professional from the industry have benefited from the e-learning initiatives.

C-DAC, Hyderabad has released the product e-Sikshak an e-Learning framework during ELITEX India exhibition in the year 2005. SCORM compliant content for e-Learning course “Cyber Security” is developed. Presently e-Sikshak is being used by Indian Law Institute to offer a course on IPR over Internet. C-DAC is offering Courses on Cyber security and Software process management over Internet on e-Sikshak framework. A number of students pursing C-DAC courses, engineering degrees and professionals from the industry have benefited from the e-learning initiatives.

Release of e-Sikshak software by Hon’ble Union Minister of Communications & IT, Thiru Dayanidhi Maran

Along with IISc, C-DAC, Electronics City, Bangalore has set-up the Mutlicast based e-Learning experiment test bed for carrying out various QoS treatments for e-Learning.

Marathi Tutor

Marathi Tutor is an intelligent tutoring system (ITS) to teach colloquial Marathi. In addition to teaching the language, the system also acts as "teacher" who guides the flow of the entire courseware to the student. This web-based system aims to enable the user to read/understand newspapers, converse at public places (restricted domains), etc in Marathi. This activity is part of the constructive learning environments initiative of the educational technology unit.

Sandesh

Sandesh is an automatic email response system which will be useful for online learning environment. Any queries posed by the students to the faculty (via mail) will be first screened by Sandesh. Sandesh will check if a similar query is asked by any other student before. If so it will forward the response to the student else will forward the mail to the faculty for him to respond. The response from the faculty will also go via Sandesh so that it can store the question and response in its data

Moodle Localisation:

Moodle is a very promising open source Learning Management System which implement technology enhanced learning. The localisation of teacher, student and some part of admin interfaces of Moodle in Hindi have been completed. The files are available to download on the OSSRC website (http://www.ossrc.org.in/).

Mumbai centre organized the following training programs for the teachers:

- e-learning resource through open source workshop at DAV Public School, Delhi on 10 Jan 2006.
- A two day Moodle learning management system training workshop was organised at Jawahar Navodaya Vidyalaya, Mothuka, Faridabad, Delhi 11-12 Jan 06.
- A one-day Moodle learning management system training workshop was organised at Goa Institute of Management at Raibunder, Goa on 27th Feb 2006. The event was organised in partnership with CII-Shiksha.
- A two-day Moodle learning management system training workshop was organised at BARC Jr. College, Mumbai on 1st March 2006.

C-DAC, Noida has developed an in-house, customized based learning management system (LMS) contents have been developed for web deployment in many hi-tech professional areas. A number of students pursing engineering degree and professional from the industry have benefited from the e-learning initiatives.

A two day National Seminar on e-Learning and e-Learning Technologies (ELELTECH India 2005) was successfully conducted with the participation of eminent speakers from all over the country by the Hyderabad centre during August 8-9, 2005.

Release of the workshop proceedings at the ELELTECH 2005 National workshop during August 8-9, 2005 held at Hyderabad

Consultancy Services

Government of NCT of Delhi

C-DAC was appointed as an Apex Consultant to the Government of NCT of Delhi, during the year 2004-2005, and continued to extend consultancy services during the year 2005-2006 on the following lines:

- Formulation of Roadmap for IT Implementation in various departments of DIT, NCT of Delhi
- Formulate metadata model for DIT, NCT of Delhi and other departments of NCT of Delhi.
- Formulation of IT security policies in respect of applications.
- To propose standards for programming documentation.
- To propose methodologies for back up and recovery.
- Formulate requirements posed by various departments of NCT of Delhi.
- Understand existing IT solutions/applications, if any and suggest whether to expand the application or modify or discard or revamp totally.
- Handhold departments to make the users understand the utilities of IT solutions in respect of their departments.

ERP Consultancy Programmes

C-DAC undertakes the following activities pertaining to ERP:

- Consultancy for Implementation of ERP
- Implementation of ERP
- Corporate Training on ERP

The ERP programme at C-DAC is aimed at upgrading skills of working professionals in the area of Human Resource, Material Management, Production Planning, Financial Accounting, Sales and Distribution, Project Systems, Business Application Development and System Administration.

It has a strong team of ERP consultants with different technical / functional backgrounds with vast industry experience. In addition to the regular programme, customized corporate training for HCL, Dakshin Haryana Bijli Bitran Nigam, Xansa, NIIT, TCS, Infogain, Samtel, PWC has been carried out successfully. During this year, 212 participants from industries/ PSUs/ academia/ govt. sectors have been trained

C-DAC is equipped with leading ERP Application software like SAP R/3(4.6c /4.7), SAP new dimensional products, PeopleSoft, Oracle, Microsoft Navision.

Industry Facilitation Services

C-DAC has been consistent in its efforts to facilitate the industry by way of providing technology, products and services, Internet facilitation services like dialup, leased line, VPN services, website hosting, etc. During the year 2005-2006, C-DAC emerged as a preferred destination for these services.

OTHER CONSULTANCY PROJECTS

Consultancy services to MCD

C-DAC has been appointed as a consultant to MCD for design and development of e-procurement system and establishment of data centre.

Consultancy Services to National Thermal Power Corporation (NTPC)

Consultancy services were provided to NTPC to develop a software system for quality inspection procedures with respect to various equipment and materials procured for consumption in different thermal plants across the country. Based on the consultancy provided, a robust and secure system christened WINDSOR'x' has been developed in-house by NTPC and deployed successfully. NTPC is in the process of patenting the product.

C-DAC looks to emerge as a Centre of Excellence, integrating Research and Education in frontier areas of ICT. To achieve this vision, C-DAC has taken many steps for strengthening the education and training services and for offering post graduates degree/ diploma programmes.

Multiple Servers of the following clients, operating in heterogeneous environment have been collocated in C-DAC, IDC:

- Municipal Corporation of Delhi
- Palcom Web India Pvt. Ltd.
- ACL Wireless Pvt. Ltd.
- Netica Solutions India Expo Mart

Services towards requirement study, specification planning, evaluation of offers, expert opinion, software development, hardware procurement, inspection of IT related equipment, etc. were provided to

- Corporation Bank, Head Office, Mangalore
- National Institute of Design, Ahmedabad
- Pidilite Industries, Mumbai

Resources, Facilitation Services and Initiatives

LEGAL AND IPR

The year witnessed significant progress on the IPR Watch Project ("Providing e-Prompt to concerned Indian Parties the watch reports on National and International IT-Patents C-DAC, Pune") funded by the Department of Information Technology. The PRSG appreciated the work done by the Group in association with the GIST Group and has approved the continuation of the project beyond December 31, 2005 for a period of 6 months with additional funding for the extended period. The project will close on July 4, 2006.

The main activity of the project was to analyze patent applications in particular ICT and associated areas including hardware, software and communication technology published in the Indian Patent Office Journal.

During the year, IPR clinics were held at C-DAC, Pune and a Special Session on Copy Rights was held for the GIST Group. Invited talks were delivered at the i) Indian Institute of Information Technology, Allahabad in a National Seminar, ii) ILS Law College, Pune, iii) Agharkar Research Institute, Pune and iv) Modern College, Pune.

In addition, the Knowledge Management Cell in consultation with the IPR Group facilitated 2 copyright applications. C-DAC also received 6 Patent Registration, 21 Trade Marks Registration, and 12 Copyrights Registration Certificates during 2005-06.

HUMAN RESOURCES

During the financial year 2005-06, the Human Resources Development Team at C-DAC continued its endeavor to accomplish C-DAC's organizational vision and mission. The HRD team remained focused on the organizational requirements and fulfilled the mandate to provide a member friendly, transparent and conducive work environment for C-DAC members.

C-DAC commanded a strong professional team of **2500** regular, contract and project members by the end of the year.

CULTURAL AND WELFARE ACTIVITIES

C-DAC encouraged congenial work environment amongst its employees. Cultural activities are periodically held in all the centres to include Foundation Day Celebrations, Sports competitions, cultural and social evenings, local festivals etc. Large number of employees takes active part in such functions to help improve the social bond amongst the employees and their families.

Republic Day Celebrations at Pune

C-DAC CONNECT

A semi-technical house magazine 'C-DAC Connect' was published quarterly. The magazine covered topics on technical and other matters and rendered an opportunity to its employees to show the talent. The magazine symbolised the spirit of networking and camaraderie inherent amongst the employees.

LIBRARY AND INFORMATION CENTRE FACILITIES

C-DAC has well-equipped and automated libraries attached to the Head Office and Thube Park at Pune, Knowledge Park and Electronics City at Bangalore, Juhu and Kharghar at Mumbai, as well as its other centres in Noida, Mohali, Kolkata, Hyderabad and Thiruvananthapuram.

A MoU to participate in MCIT Library Consortium has been signed. Under this Consortium, IEEE Digital Library, containing complete IEEE & IEE literature and ISO/IEC Standards on Information Technology, has been subscribed for organization-wide access. A User Awareness and Orientation Programme was organized for the members on July 18, 2005 at Pune and on December 21, 2005 at Juhu, Mumbai. Staff members from local DIT organizations also participated in the programme . This was followed by a presentation on E-Granthalaya library management software for local librarians.

The Pune centre library offers current awareness services especially on Grid Computing, Supercomputing, Telemedicine and E-Governance. Special activities of the Library include Web-enabled Newspaper Clipping Service (E-clippings) on IT related news items. The Library is imparting this service on a daily basis since August 1999. The complete searchable archive of E-Clippings is available on the website.
The Mumbai centre has its main library at Juhu, which has an exhaustive collection of print and electronic resources. It also subscribes to the ACM Digital library. The centre has 160 Individual subscribers and Institutional subscribers to its in-house publication "Vivek - a quarterly in Artificial Intelligence".

The C-DAC Library at Kharghar is enhancing its collection in the field of online and distance learning and Open Source Software besides other computing subjects.

The C-DAC Library at Nariman point also has a small collection of books on Computer Science as reference books.

The Library at Electronics City, Bangalore has a good collection in the field of Software Engineering besides other computing subjects. This library and the Library at Thube Park, Pune adopted the E-Granthalaya library management software.

The Thiruvananthapuram centre has a well-equipped library (Technical Information Centre) catering to the needs of scientists, engineers, supports staff and students. The Library is automated using the library management software WEBLIBMAN, developed by the Thiruvananthapuram centre.

The Mohali Library has been rendering reference, referral and reprographic services.

CONFERENCES / EVENTS ORGANIZED

- An AERMOD – dispersion modeling training by the United States Environmental Protection Agency (USEPA) was hosted by C-DAC, Pune during March 2005
- Three one-week training programmes on "e-Suraksha – A Practical Approach in Network Security" were conducted by C-DAC, Hyderabad during May 16–20, 2005, November 21–25, 2005 and March 20–24, 2006.
- Release of Hindi Software Tools and Fonts was organized by C-DAC, Noida at Vigyan Bhawan, New Delhi on June 20, 2005.
- A two-day National Seminar on e-Learning and e-Learning Technologies (ELELTECH India 2005) was conducted by C-DAC, Hyderabad during August 8-9, 2005.
- A Workshop and Training Programme on Advanced CFD Training in Aerospace Applications was conducted at C-DAC, Bangalore during August 8-10, 2005
- A two-day International Conference on Web Technologies was organized by C-DAC, Noida during November 2005.
- A Workshop on "Research Trends in Computational Biology" was organized by C-DAC Pune during November 24-25, 2005.
- A one-day workshop on Open Source Software for Healthcare was organized by C-DAC, Mumbai on December 6, 2005.

- The GARUDA / GRID Partners Meet was organized by C-DAC, Bangalore during December 12-13, 2005
- A one-day National Workshop on Wireless Sensor Networks was conducted by C-DAC, Hyderabad on December 29, 2005.
- A two-day FLOSSWORLD Regional Workshop was organized by C-DAC, Mumbai during January 12-13, 2006.
- A Seminar on "Bluetooth Technology" was organized by C-DAC, Noida in collaboration with Man & Tel Co. Ltd., Korea on January 16, 2006.
- A one-day Indo-Italian Workshop on "Using IT for Preservation & Promotion of Cultural Heritage" in association with the University of Udine, Italy was organized by C-DAC, Pune
- A Grid Technologies Workshop was organized by C-DAC, Bangalore in collaboration with CERN Geneva Team at Bangalore on February 20, 2006.
- Awareness Raising Programmes were organized by C-DAC, Pune under the INCITE project funded by European Commission at Pune on February 27-28, 2006 and at Mumbai on March 2-3, 2006

PARTICIPATION IN CONFERENCES / WORKSHOPS

- CSIR workshop on Open Source held at Pretoria, Johannesburg during April 19-21, 2005
- BangaloreBio held at Bangalore during April 22-24, 2005
- ELITEX 2005 held at Delhi during April 25-26, 2005
- Asia-OSS symposium held at Colombo, Sri Lanka during September 5-8, 2005
- 2nd International Training course on Functional Genomics Applied to Insect Vector of Human Diseases held at the Centre for Bioinformatics and Applied Genomics (CBAG), Mahidol University, Bangkok, Thailand during September 19-30, 2005
- International Conference of XVIII-th General Assembly of International Union of Radio Science (URSI GA-2005) held at Vigyan Bhavan, New Delhi, India during October 23-29, 2005
- Association of Exploration Geoscientists (AEG) Conference during November 16-19, 2005
- Advisory Committee Meeting of W3C, held at Montreal, Quebec, Canada on November 29, 2005
- FOSS.in held at Bangalore during November 29- December 2, 2005.
- National Conference on Fluid Mechanics & Fluid Power (NCFMFP) during December 15-17, 2005 at Osmanabad, Maharashtra
- 12th Annual IEEE International Conference on High Performance Computing (HiPC 2005) held at Goa during December 18-21, 2005
- Workshop on "Role of combustion diagnostics in modeling, design and control" conducted by Jadavpur University, Kolkata, during January 2-3, 2006
- 93rd Science Congress held at Hyderabad during January 3- 7, 2006.
- International Workshop on "Thermal Management of Electronic System" held at the Indian Institute of Science, Bangalore during January 9-10, 2006
- SPG 6th Conference and Exposition on Petroleum Geophysics held at Kolkata during January 9-11, 2006
- Petrotech – 2005 Conference at Delhi during January 16-19, 2005
- Computational Approaches to Materials Science-2006 (CAMS-06) at the Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India during January 18-21, 2006
- ICTP/INFM Democritos workshop on "Porting Scientific Applications on Computational Grids", held at Abdus Salam International Centre for Theoretical Physics, Trieste, Italy, during February 6-17, 2006
- Workshop on "Mastering body language for effective communication skills & high impact presentation" conducted by Life Zone training at Chennai during February 7 – 8, 2006
- Linux Asia Conference and Expo 2006 held at the India Habitat Centre, New Delhi during February 8-10, 2006
- Workshop on Image and Speech Processing (WISP) held at Chennai in February 2006
- "Test Bed for Translation Support System" workshop held at Noida, Delhi during March 8-10, 2006
- IndiaSoft 2006 held at Chennai Trade Centre, Chennai during March 20-21, 2006
- Indo-US Workshop on HPC in Atmospheric Science at NCAR, USA
- Supercomputing Conference (SC 2005) held at USA and HPC Asia 2005 held at China
- International Conference on Information Systems Security (ICISS) organized by Jadavpur University in Kolkata
- Cyber Security Seminar organized by CERT India at New Delhi
- ISEA training programme at Carnegie-Mellon University

AWARDS / RECOGNITION

Karnataka Valuation and e-Registration (KAVERI) – Recipient of the CSI Nihilent e-Governance Award 2004 for the Best e-Governance Project in the country

C-DAC's pavilion bagged the award for the best-designed pavilion at the exhibition out of 120 stalls set up at the 93rd Science Congress held during January 3- 7, 2006

"Computer Society of India Trophy – Regional 1st Runners-up – East, Regional Competition for Young IT Professionals 2005, for the paper entitled "Stego Check - a State-of-the-art Steganalysis Software for Steganographic Images" during the competition held at Science City, Kolkata on November 26, 2005

PAPERS PUBLISHED

This year C-DAC has contributed 107 papers to the research community, out of which 30 papers have been published in International Conferences and 30 others have found their place in leading national conferences, workshops and seminars. C-DAC has also contributed to several international journals with 14 papers having been published. These include

1. Goutam Kumar Saha - "Parsing Bengali Text- an Intelligent Approach," ACM Ubiquity, Vol. 7(13), 2006, ACM Press, USA .http://www.acm.org/ubiquity/views/pf/v7i13_parsing.pdf
2. Goutam Kumar Saha - "Low-cost, Fault Tolerance Applications," IEEE Potentials, Vol. 24 (4), 2005, IEEE Press, USA http://ieeexplore.ieee.org/xpls/absprintf.jsp?arnumber=1549757
3. Goutam Kumar Saha - "The EB- Anubad Translator: A Hybrid Scheme," International Journal of ZUS, Vol. 6A(10), 2005, RPC http://www.zju.edu.cn/jzus/2005/A0510/A051007.pdf
4. Sanjay P. Sood, J.S. Bhatia – "Development of telemedicine technology in India: "Sanjeevani" – an integrated telemedicine application", Journal of Postgrad Med, 2005;51:308-311
5. Mohit Dalvi, Gufran Beig, Uday Patil, Akshara Kaginalkar, C. Sharma and A.P. Mitra, - "A GIS based methodology for gridding of large-scale emission inventories: Application to carbon-monoxide emissions over Indian region", Atmospheric Environment, 40 (16) May 2006, p. 2995-3007
6. Smita Ghosh, Archika C. Barve, Anupa A. Kumbhar, Avinash S. Kumbhar, Vedavati G. Puranik , Prasanna A. Datar , Uddhavesh B. Sonawane ,Rajendra R. Joshi – "Synthesis, characterization, X-ray structure and DNA photocleavage by cis-dichloro bis(diimine) Co(III) complexes", Journal of Inorganic Biochemistry 100(3) 2006, p. 331-343
7. J. Venkata Ratnam and Krishna Kumar - "Sensitivity of the Simulated Monsoons of 1987 and 1988 to Convective Parameterization Schemes in MM5", Journal of Climate, Vol. 18, No. 14, 2005, p. 2724-2743
8. J. Venkata Ratnam and E. A. Cox - "Simulation of monsoon depressions using MM5: sensitivity to cumulus parameterization schemes" Meteorol Atmos Phys, DOI 10.1007/s00703-005-0160-9 (2006)
9. S Janakiraman, Ravi S Nanjundiah and P N Vinayachandran – "Simulations of the Indian summer monsoon with a coupled ocean-atmosphere model on PARAM Padma" CURRENT SCIENCE, Indian Academy of Sciences; Volume 89, Number 9, 10 November 2005, pp 1555 – 1562
10. Katre Dinesh - "Multimedia Education: Current Trends and Future Potential" Sampada Special Issue on Education, Maratha Chamber of Commerce, Industries and Agriculture, July 2005, pp. 27-29
11. Katre Dinesh - "Designing the teacher like behavior of e-learning system: a case study of Indian scripts typing tutor" I-manager's Journal of Education Technology, Vol. 2, No. 3, Oct.-Dec. 2005, p.60-65
12. Manoj Khare, Ashok Kaushal, Sandeep K Srivastava and Krishna Kant – "Get real, pick sites for flood forecast", Geospatial Today, Sep.-Oct. 2005, p. 49-51
13. Vikas Kumar, D. Gangacharyulu, R.G. Tathgir - "Thermal Performance Evaluation of Heat Pipe Heat Exchangers under Natural Convection" International Journal of Heat Exchangers, Vol. VIII, Issue 1, 2006
14. Yakushev, V.L. and Shah, M.S.. 'Simulation of Non-linear Stability Analysis in Thin Walled Structures on Parallel Computers', Int. J. of Computer Applications in Technology, Vol. 24, No.4, 2005, pp218-225

Launch of Free Tamil Software Tools and Fonts

Launch of Free Hindi Software Tools and Fonts