CDAC
The Supercomputing People

02-03

ANNUAL REPORT

CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTING

CONTENTS

Overview

Born in 1988, with a mandate to indigenously develop state-of-the-art, scalable high performance supercomputers, the Centre for Development of Advanced Computing (C-DAC) has, today, traversed its boundaries to become an acknowledged Information Technology force. The decade and a half of its extensive as well as its progressive R&D initiatives have brought the country into the league of only a few supercomputing nations, and has established C-DAC as a power house of R & D in advanced Information Technology.

The energy that has driven C-DAC, right since its development of India's first generation supercomputer- PARAM 8000 to the present fourth generation supercomputer - PARAM Padma, has only been fuelled by its commitments and mission objectives. The mammoth number crunching supercomputer with the ability to perform a trillion operations per second has marked PARAM Padma as India's fastest supercomputer. This achievement has not gone unnoticed by the international IT community. On June 23, 2003, PARAM Padma also became the 171st fastest supercomputer in the world. Ranked by the organizers of the annual International Supercomputing Conference, the list is the only one to be recognized globally. Also, this is the first time that an Indian developed supercomputer has made it to the coveted list testifying to India's supercomputing prowess.

And the saga continues. With this world ranking, C-DAC stands tall and proud of its achievements, and an enlarged C-DAC is born that looks ahead at the opportunities and benefits that need to be realized. Three like-minded societies under the Department of Information Technology (DIT), namely the National Centre for Software Technology (NCST), Electronics Research and Development Centre of India (ER&DCI) and Centre For Electronics Design & Technology of India (CEDTI), Mohali have been merged under the C-DAC banner with effect from December 16, 2002 to jointly pursue and realize the advanced IT development needs of the nation. This has not only reinforced the mission and vision of

C-DAC, but also presents to the world a reinforced institution with the technological and human expertise to surmount any challenge. Accordingly, C-DAC has enhanced its vision to emerge as **the premier R&D Institution for the research, design, development and deployment of world-class scientific electronics and IT solutions for economic and human advancement.**

To meet the vision objectives, the new strengthened C-DAC has initiated steps to realize the goals of tomorrow. In this direction, a new R&D agenda was chalked out, envisioning proficiency in specialized technology areas through the setting up of Centres of Excellence to excel in specific areas. The designated Centres of Excellence will conduct and lead the R&D in the core technology areas with other C-DAC centres as contributors to the cause as complementary efforts. The goal is to develop expertise in specific technology areas so as to enable the transition of C-DAC into a single source of cutting edge technologies and solutions.

C-DAC has already positioned itself as a successful provider of e-Governance solutions, more specifically for select citizen centre applications, Thus, C-DAC, over the years, has diversified its activities, transferring the expertise it acquired and technologies it developed to further develop and deploy advanced Information and Communication Technology (ICT) based solutions in the key sectors of economy. At the same time, it has maintained a balance between developing strategic technologies needed in the country for self-reliance, and using skills so developed, to commercialize its technologies and products to address the various requirements.

A significant focus of C-DAC in this context has been in developing effective tools, frameworks and solutions that enable users to deploy computers based applications in Indian Languages across various social sectors.

The diverse technologies that C-DAC has dealt with are High Performance Computing (HPC), Natural Language Processing (NLP), Artificial Intelligence (AI), e-Learning, Multilingual Multimedia Computing, Geomatics, Cyber Security, Real Time Systems and Software, Data Warehousing, Data Mining, Digital/ Broadband Wireless Networks, Scientific Modeling & Visualization. At the same time, the various sponsored projects and contracts undertaken are in the areas of Financial Modeling, Telemedicine, Intelligent Information Retrieval, Machine Translation, Network Security, e-Learning, Fault Tolerant and Industrial Computing Systems. The key sectors addressed by C-DAC are Finance, Healthcare, Power, Steel, Defence, Telecom, Agriculture, Industrial Controls, Broadcasting, Education and e-Governance.

Technical Activities

C-DAC's range of activities are broadly divided in the areas of

- **RESEARCH & DEVELOPMENT**
- **SPONSORED / CONTRACT PROJECTS**
- **BUSINESS OPERATIONS**
- **EDUCATION & TRAINING**

RESEARCH & DEVELOPMENT

C-DAC's drive in the pursuit of R&D has manifest itself in numerous developments and breakthroughs during the financial year. In keeping with the agenda, C-DAC has not only fulfilled its action plan, but also managed to conform to its timelines while delivering on its objectives. In this role, C-DAC has dealt with diverse technology areas.

Given below is a description of C-DAC's R&D activities undertaken during the year.

High Performance Computing

Hardware Technology

C-DAC Pune's Hardware Technology Development Group (HTDG) was involved in the design, development and deployment of India's first Terascale Supercomputer **PARAM Padma** particularly in the areas of System Area Network (PARAMNet-II), VLSI design of C-DAC's Communications Coprocessor (CCP-III), Device Driver Development, Industrial Design and Packaging and Reconfigurable Computing System (RCS).

PARAMNet – II

C-DAC has forged a decade of hardware technology development expertise, in the state-of-the art areas of VLSI Design, High Speed Networking and Digital System Design to develop the next generation high performance System Area Network (SAN), PARAMNet-II, with speeds of 2.5 Gbits/Sec full duplex supporting multiple software interfaces like Virtual Interface Architecture (VIA) and Active Messages (AM).

PARAMNet-II is the prime interconnect fabric for connecting Compute Nodes, File Servers and Graphics Nodes in C-DAC's range of parallel computing systems, and more recently in the PARAM Padma.

PARAM Padma has used 12 PARAMNet-II switches connected in two level configurations to form a 64-node CLOS network.

The industrial design & packaging of PARAM Padma offers flexibility to scale from a system with a few nodes to systems having a large number of nodes. The PARAM Padma enclosure has been designed taking into consideration the environment; electromagnetic compatibility and heat transfer requirements of high performance computing sub-assemblies. It is a 19 inch 38 U standard rack with shielded cable trays and accessories for housing Compute Nodes, File Servers, Network Switches and Cables.

The making of PARAM Padma, an interactive multimedia presentation was designed and developed to explain the architecture of the Terascale Supercomputer and covering the research and development efforts of C-DAC in this project.

PARAMNet-II Packaging

The lessons learnt during the design of the earlier Fast-Ethernet packaging was put to good use in the PARAMNet-II packaging. Presently the PARAMNet packaging is a compact mechanical dimension (19" rack mountable) with Ultra thin chasis of 1U height

Reconfigurable Computing System

As a part of the Reconfigurable Computing System (RCS) initiatives at C-DAC, the first successful reconfigurable hardware has been developed, to enable the mapping of a wide variety of compute intense algorithmic routines.

Development of an experimental PC cluster computing environment based on ATM Network

This project involved the design and setting up of a scalable ATM based PC cluster computing environment for simulation of sonar system design and performance analysis for National Physical & Oceanographic Laboratory (NPOL), Kochi. The 155 Mbps ATM NIC with UTP interface, developed by C-DAC, Thiruvananthapuram, is used in the nodes. CORBA middleware technology has been provided in the nodes so that the simulator can be configured easily for different modeling requirements. Network Management Software is also provided for monitoring the network. The PC cluster network has been successfully set up at NPOL, Kochi.

C-DAC Multimedia Kiosk

The C-DAC Multimedia Kiosk was designed especially for e-Governance applications, and has been installed at the office of the Ministry of Communications and Information Technology, National Museum and others.

The Application Specific Integrated Circuit (ASIC) Group, at C-DAC, Thiruvananthapuram, has been active in the design of high complexity ASICs and ASIC based products. This centre has concentrated on the development of ASIC embedded designs, computer hardware products using Digital Signal Processing, development of Microprocessor and Microcontrollers, development of test vectors and Intelligent Battery Management.

System Software

The ISO 9001 : 2000 certified Systems Software Development Group (SSDG) of C-DAC, Bangalore addresses the performance and usability challenges through High Performance Computing and Communication (HPCC) Software – a high performance flexible software environment, which adheres to the established and emerging standards in parallel and distributed computing.

C-DAC's HPCC software supports Fortran 77/90 and C languages and is available for Solaris, Linux and AIX computing clusters with the PARAMNet System Area Network. Highlights of this year include the development of a Parallel File System (PFS), Automatic Parallelizing Compiler (PCF90), Resource Management System (RMS), DIViA (Debugger with Integrated Visualizer and Analyzer) and the KSHIPRA communication substrate on the PARAM Padma running the AIX operating system.

KSHIPRA and C-MPI

For parallel applications to scale on large clusters, the HPCC base software provides low overhead communication, optimized Message Passing Interface (MPI) and a Parallel File System (PFS). The HPCC software KSHIPRA communication substrate provides lightweight communication primitives on the PARAMNet conforming to Virtual Interface Architecture specifications.

PARMON

A large computing cluster like PARAM Padma requires tools to manage the system effectively. The system management tool PARMON enables the cluster administrator or user to monitor activities and resource utilization of various components of the cluster. The WebPARMON component enables remote monitoring over the Internet. Currently, PARMON is available on PARAM Padma and is being enhanced to include more features like PARAMNet-II monitoring, system utilization reporting and so on.

PARMON–
An Unified Cluster Monitoring System

C-DAC's Parallel File System (C-PFS)

A part of the High Performance Storage System (HPSS) development, C-PFS is a cluster based file system that provides high I/O throughput. Targeted initially at the PARAM 10000 platform, C-PFS was delivered on PARAM 10000 in the last quarter of 2002. Subsequently, the system was ported to PARAM Padma and C-DAC's Intel Linux clusters. The port retains the entire set of features such as adaptive prefetching, flow control, large data structure optimization - as the original deliverable on PARAM 10000. The product has been benchmarked against BTIO (CFD application kernel), b_eff_io (synthetic benchmark) and 3D migration seismic application, and has been found to improve the I/O performance of the programs compared to the native NFS based I/O subsystem.

Fortran90 Compiler

The HPCC software provides an integrated Fortran program development environment, which includes Fortran90 compiler, Fortran77 to 90 converter, debugger, source browser, profiler and project manager.

The Fortran compiler is a highly optimizing Fortran90 and FORTRAN77 compiler, fully ANSI X3.9:1978 and ISO/IEC 1539:1991 compliant, supports double precision arithmetic and is available on Solaris, Linux and AIX platforms.

PCF90 - Automatic Parallelizing Compiler for Fortran

PCF90 is the offshoot of a research project sponsored by the Department of Science and Technology (DST), Govt. of India under an Integrated Long Term Programme (ILTP) with the Institute of Systems Programming, Moscow, Russia. PCF90 is a scalable automatic parallelizing compiler that locates implicit parallelism in sequential programs and generates parallel executables for SMP architecture.

DIViA (Debugger with Integrated Visualizer and Analyzer)

It is an advanced portable and flexible parallel debugging environment. Besides conventional logical debugging extended to parallel debugging, DIViA correctness debugger also facilitates visual and message debugging. DIViA performance debugger detects communication bottlenecks and quantifies the performance in terms of both computation and communication to assist the user in fine tuning the parallel application.

DIViA – An Integrated Parallel Program Debugging Environment

Resource Management System

C-DAC's PARAM series of supercomputers are large clusters of high performance workstations interconnected through low-latency, high bandwidth communication networks. The major challenge for system administrators is to allocate the processing capacity available in the locally distributed system to facilitate its maximum usage. The Resource Management Software (RMS) manages, monitors and analyzes the workload on the nodes in the cluster and unites the nodes for efficient execution and management of programs.

System Engineering & Networking and CTSF

The system engineering and networking enables operation and management of C-DAC's Terascale Supercomputing Facility (CTSF) and also for managing the network and computer facility of C-DAC. As a part of the mandate for the Third Mission, the CTSF has been established at C-DAC Knowledge Park housing the PARAM Padma and was formally inaugurated by the Hon'ble Minister of Disinvestment, and Communications & Information Technology, Dr. Arun Shourie.

Subsequently C-DAC set up a task force to participate in the Top 500 project to benchmark the PARAM Padma cluster for a ranking into the Top 500 list of supercomputers of the world (www.top500.org). During this exercise the various hardware and software configurations were extensively tested and finally

tuned to achieve a performance of 532GF using 62 nodes of P630 and PARAMNet II interconnect. This is the first time that an effort of enlisting PARAM Padma on the Top 500 list was successfully completed. This milestone achievement gave C-DAC later in June 2003 a very respectable rank of 171 among the top 500 supercomputers deployed in the world.

Scientific and Engineering Computing Applications on PARAM :

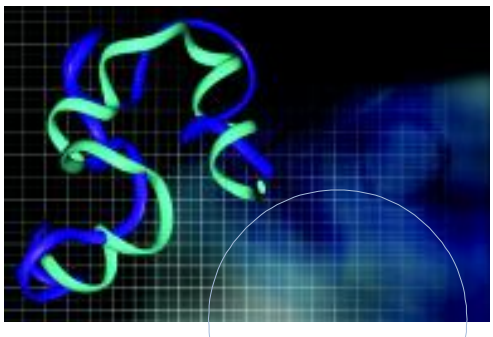
Various scientific and engineering applications in the areas of bioinformatics, seismic data processing, weather forecasting, structural mechanics and evolutionary computing are ported and benchmarked to examine the scalability and performance improvement of PARAM Padma.

Evolutionary Computing

An industrial project was taken up for optimization of IC Engine performance using genetic algorithms.

As part of this project, real coded genetic algorithms and micro genetic algorithms for optimizing the input parameters for the IC Engine output characteristics have been implemented.

Protein Structure Prediction



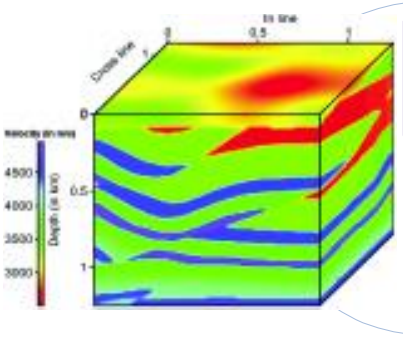
A new method has been developed based on the hypothesis that, protein evolves step by step in terms of a few amino acids at a time.

The data parallel version of the protein structure prediction code has been ported on PARAM Padma and its performance has been measured.

Seismic Data Processing

The Seismic Data Processing research activities are funded by industry and governmental agencies. These include:

Seismic Waveform Inversion



Funded by the Oil & Natural Gas Corporation (ONGC), the primary objective of this project is to develop and parallelize 2D model-based seismic waveform inversion algorithm based on Genetic algorithm and GLI techniques for estimating the material properties of the earth. The developed codes will be used to process the real data sets of the ONGC.

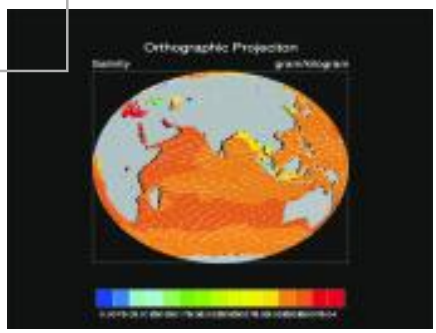
Seismic Prestack Migration and Velocity Analysis

The primary aim of this Dept of Science & Technology (DST) funded project is to develop and parallelize prestack migration algorithms to generate image gathers. This project also aims at developing algorithms to carry out velocity analysis based on prestack migrated image gathers that will run on PARAM Padma.

Computational Atmospheric Science

The Computational Atmospheric Science activity pertains to high performance computing meteorological and environmental applications.

Climate System Model



C-DAC's Climate System Model (CCSM) software is based on a framework that divides the complete climate system into component models connected by a coupler. It has individual component models, atmosphere, land, ocean, and sea-ice. Under this activity the Climate System Model has been ported on the PARAM Parallel Computing Systems. This model can be used to carry long simulations (~100year) of earth's climatic system and various parametric & modeling studies.

Environmental models

The increasing environmental pollution is a major concern for the ecological balance and the health status of the biosphere. Numerical modeling and simulation of man-made changes to the ecosystem is thus becoming increasingly important to governmental, environmental and health agencies. A decision support system using air quality model, GIS and a database system for pollution forecasting on PARAM is being developed.

The group participated in the INTERNATIONAL VEHICLE EMISSIONS MODEL project field study conducted by CE-CERT - University of California at Riverside And Global Sustainable Systems Research (GSSR), USA.

Ocean model

The work in this area is related to the porting and development of parallel software for prediction of atmosphere-ocean variations. PARAM Padma is being used for ocean simulation using MOM4 model

Regional forecast model – MM5

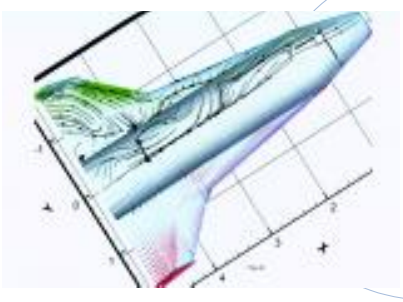
This is a limited-area, nonhydrostatic, terrain-following sigma-coordinate model used to simulate or predict mesoscale atmospheric circulation. This model was ported on PARAM Padma. The regional daily forecasts with fine resolution (~ 1km) with 3-5 nesting were carried out on PARAM Padma, for the Pune, Bangalore and Delhi region.

Porting and parallelization of medium range weather forecasts using T126 and T170 models on PARAM Padma were also undertaken.

Computational Fluid Dynamics

Computational Fluid Dynamics (CFD) is an area in which the governing equations for fluid flows and energy are solved in a discrete form on computers.

The following projects were completed during the period under review.



- Simulation of Fluid Flow and Heat Analysis of 3D Circular Cavity
- Development of Parallel Navier Stokes Solver
- Hypersonic Flow Simulation of RLV (Reusable Launch Vehicle)
- Plume Trajectory Analysis of Ship Deck
- Engine Simulation and Performance Optimization

Computational Structural Mechanics

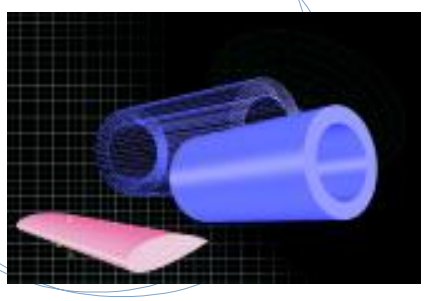
A collaborative project with Indian Institute of Sciences (IISc) Bangalore, on 'Development of Parallel Finite Element Code for Fracture Mechanics Problems in 2-D and 3-Dimensional Structures', was undertaken. The 2-D Fracture Mechanics parallelization has been completed with iterative solver in geometric and material nonlinear analysis. The benchmarking on PARAM 10000 and PARAM Padma has been carried out and a good scalability has been observed.

Another collaborative project with IIT-Mumbai on 'Stress Analysis of FRP Structures Using Higher-Order Shear Deformation Theories on Parallel Machines' was undertaken. The general flat element is incorporated in the software, enabling it to solve complex geometries. The software also incorporates thermo-mechanical stress analysis. The parallel direct and iterative solvers have been interfaced and benchmarked on the PARAM platform.

FEMCOMP version 2.0 was used for the stress analysis of layered composite structures. The finite element model resulted into over 8,60,000 variables. The analysis was successfully carried out on PARAM Padma.

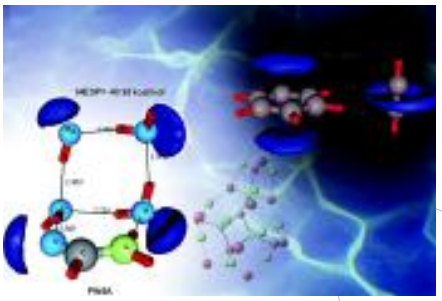
The INTEGRA Phase I project was completed. The project aims at the development of a platform independent, integrated environment for full simulation comprising Preprocessor, Analysis and Postprocessor. It is based on 3D graphics using JAVA3D API. In Phase I major preprocessor functionalities like modeling and meshing of surface of revolution, Boolean operations and transformation operations have been completed.

In collaboration with Russian-Indian Centre for Advanced Computing Research, Moscow, the FE based nonlinear formulation for thin shells were ported on PARAM Padma, and extensive benchmarking was carried out. Based on the findings, a research paper entitled 'Nonlinear Stability Analysis in Thin-Walled Structures on Parallel Computer' was published and presented in the HPC Asia 2002 conference held at Bangalore, India during December 16-19, 2002.



Quantum Chemistry

Two new Critical Point (CP) finding algorithms have been developed and of these one has been ported and benchmarked on the PARAM Padma.



A linear scaling method for treating one-electron properties of large molecular systems at ab initio level has been developed. The present development aims at providing a linear scaling implementation of electronic structure calculation using any of the standard programs such as GAMESS, INDMOL. Efforts are also underway to improve sequential GAMESS, which is among the most popular quantum mechanics program that is freely distributed to academic and research institutions.

Bioinformatics

The Bioinformatics team at C-DAC is engaged in the development, porting and optimization of codes on PARAM Padma, which are being utilized for sequence and structure analysis, metabolic pathway reconstruction and also for studying regulatory mechanisms.

Molecular Modeling on PARAM

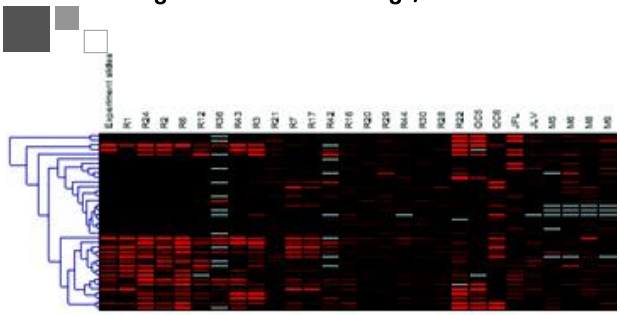
The detailed structure and dynamics of many biomolecular systems at the molecular level are difficult to discern by conventional methods. Molecular modeling programs like AMBER and CHARMM are widely used to carry out Molecular Dynamics (MD) simulations. Codes like AMBER, CHARMM and GROMACS have been ported on PARAM Padma and optimized.

Biomolecular Docking Codes

Biomolecular interactions are the core of all regulatory and metabolic processes that together constitute the process of life. To study the same, Biomolecular docking codes like FTDock and DARWIN have been ported and optimized on the PARAM Padma.

Ab-initio methods

Quantum chemical methods describe molecular geometry in terms of minimum energy arrangement of nuclei and electrons. These methods find various molecular properties and stable conformations. In molecular biology, these methods play an important role in finding active sites of drugs, stable and alternative conformations of proteins, nucleic acids or drug molecule, and also help in obtaining parameters for molecular mechanics type potential energy function. Codes like MOPAC and NWChem are used for this study and have been ported on the PARAM Padma.



Various analysis tools have been developed for genome sequence analysis and sequence analysis codes like BLAST, FASTA, Smith-Waterman and CLUSTAL have been ported on the PARAM Padma.

Gene finding

Presently the most widely used gene finders for eukaryotic genome are HMMgene and Genscan. Glimmer is widely used for microbial gene prediction. All the above tools have been ported on PARAM Padma.

A significant goal in the post-genome era is to relate the annotated genome sequence to the physiological functions of a cell. The in silico reconstruction of metabolic pathways is an essential tool for the functional assignment of predicted genes. Pathway reconstruction based on sequence information using comparative genomics methods require high-end computation as algorithms like SSEARCH are being used for building ortholog group tables. The pathway analysis tools have been ported on PARAM 10000 for reconstructing metabolic pathways of higher organisms. In silico metabolic pathway reconstruction, metabolic pathway comparison, pathway based analysis of expression data using software such as **Pathway Tools** and **KEGG** system, and metabolic pathway engineering are the major goals of porting the codes on PARAM Padma.

Microarray Data analysis on PARAM

Microarray, a high-throughput expression technique, is an important tool for monitoring and analyzing gene expression profiles of thousands of genes simultaneously. Various computational methods have been developed to identify such significant elements in the upstream regions. **MEME** (Multiple EM (Expectation Maximization) for Motif Elicitation) is one such tool for detecting motifs in a set of DNA or protein sequences. The method requires huge memory and CPU capacity and becomes highly compute intensive while detecting motifs in a larger dataset.

Problem Solving Environment (PSE) on PARAM

High Performance Computing facilities like PARAM can be effectively used for huge sequence database searches and for realistic molecular simulations. A **PSE (Problem Solving Environment)** provides the user a complete, integrated environment for a specific application. The PSE's for molecular modeling codes viz. AMBER & CHARMM, and sequence analysis codes viz. Smith-Waterman & FASTA are under development. The Java programming language (Java 2.0) was chosen to develop the PSE primarily because of its portability across platforms and its web tool capabilities like Java Server Pages (JSP) and Servlets (J2EE Architecture). Some other important features of the PSE, which is developed on PARAM, are multiple session handling, persistence state, and visualization capabilities.

Cyber Security

C-DAC's R & D initiatives in Cyber Security encompass a diverse range. These include :

Event Tracking System

Event Tracking System (ETS) is a Windows based software system capable of monitoring the network resources for events. Capturing such events and initiating user-triggered responses are helpful in preventive maintenance of the network. The system can capture events and propagate it to one or more management consoles.

Adaptive Intrusion Detection Analysis and Response System

Primarily, the aim of this project is to pursue research on the prediction/pre-incident detection and recovery and reconstitution for systems-of-systems. The integration of the firewall along with the Intrusion Detection System (IDS) is evolving so as to make the IDS more effective and towards the direction of Intrusion Prevention System (IPS). Also, incorporating standardisation principles wherever applicable and as per suggestions of organizations like IETF is proposed.

Network Security project

C-DAC, Hyderabad completed a Network Security project for the Defence Research Development Laboratory (DRDL) labs, Hyderabad. As part of this project a feasibility study for providing LAN / WAN security for one of their networks was carried out and pilot implementation of the encryption algorithm deployment security solution was undertaken.

Network Security "Design and Development of a Transparent Solution for Securing Networks and Systems"

This project aims at development of a transparent security solution integrated into the TCP/IP implementations of Windows and Linux Operating Systems. Establishing a Network Security Concept Lab is another objective of this project.

Intrusion Detection System

This Project aims at building a real-time system that will detect intrusions and abnormalities and vulnerabilities in a network, constantly monitoring the incoming traffic. The system would be signature based, with its attack detection based on statistical patterns obtained from the logs.

Web Services and Security

The project aims at developing components of a framework for Web Services, which address security issues, authentication, authorization, privacy, trust, confidentiality. C-DAC, Mumbai has integrated the specifications expressed by the confluence of technologies - SOAP, WSDL, XML Digital Signatures, SSL, XKMS and SAML. The focus is also on security for extended enterprise software solutions.

Embedded Systems

C-DAC's efforts in the arena of embedded systems have led to many far-reaching developments. These include :

Set-Top Box

Set-Top Boxes (STB) act as a gateway between a user's television and the telephone, satellite, terrestrial or cable feed. The STB receives encoded and/or compressed digital signals from the signal source, like satellite, TV station, cable network and so on. and decodes and/ or decompresses those signals, converting them into analog signals displayable on the television. A Conditional Access System (CAS) comprises of a combination of scrambling and encryption to prevent unauthorized reception.

A MPEG 2/DVB standards compliant Digital Set-Top Box, which enables the viewers to access a wide range of signals like Digital Transmission, Direct to Home through Satellite and Direct to Home through Cable, has been developed. The Set-Top-Box enables decoding and decrypting of signals of all these modes of transmission. For the decryption of pay channel signals the CAS is being integrated with the system.

The product named **'D-View'**, developed by C-DAC, Noida has the following three versions

- D-View 1- for Digital Terrestrial Transmission (DTT)
- D-View 2 - for Direct to Home through Satellite (DTH)
- D-View 3- for Direct to Home through Cable

Standard Indigenous Call Centre Equipment And Application Software With Multilingual Capabilities.

C-DAC, Noida has developed a robust low cost solution for establishing Call Centres by small and medium scale industries. It offers major cost benefits as it eliminates the need of buying expensive EPABX systems.

The system provides Telephony features like receiving, making, transferring, and distributing calls. Integration with Internet based Applications like E-mail, Chat and so on, have also been provided. At the application level, there are screens for Agents, Package for the Administrator to monitor calls, and reports and logs for Call Centre MIS.

The system is based on a Soft Switch developed on a Dialogic Hardware Card. It consists of a core Call handling program running at the Server. As a call lands, the Call Handling Software picks up the call and plays the IVRS. The Caller interacts with the IVRS and if required gets transferred to an Agent for manual assistance.

Tele TV Conferencing on Conventional Telephone Lines

A PSTN video phone for Tele TV conferencing on conventional telephone lines with features like Self View window, On Screen Displays, Remote View Window, Vivid Video Quality, Full Screen Displays, Camera Zoom / Tilt has been developed by C-DAC, Noida The system is standardized and compatible with similar video phones available internationally. The product is called '**D-Eye**'.

Development of HRG (Hemi-spherical Resonator Gyro) Electronics Checkout System using DSP

A Memorandum of Understanding (MoU) has been signed by C-DAC with ISRO Inertial Systems Unit (IISU), Thiruvananthapuram for the design and development of a Hemispherical Resonator Gyro (HRG) Electronics Checkout System using DSP. The scope of the project involves the design and development of an electronics system based on DSP with interfacing circuits for Hemispherical Resonator Gyro (HRG).

UTCS TOT

The Urban Traffic Control System (UTCS) is a Microprocessor based Road Traffic Signaling system with fixed time and demand actuated control. The UTCS was developed in-house at C-DAC, Thiruvananthapuram and successfully field tried at Pattom Junction, Thiruvananthapuram and Senadutt Police Chowky Junction, Pune. Two, Transfer of Technology (ToTs) have been signed for the system.

ASIC Design Contract for VSSC

On Board Computer (OBC) developed by C-DAC Thiruvananthapuram a functional replica of the Enterprise On Board Computer, with a bit slice processor, Manchester encoder decoder, memory interface, system interface and serial input/ output interface was implemented in a pair of FPGAs. Enterprise OBC is a versatile and general-purpose real time mission computer designed by ISRO to meet the on-board computational requirements of the Inertial Guidance System in satellite launch vehicles, PSLV and GSLV.

Development of 8051 Microcontroller IP core

The ER8051 is an 8-bit micro controller synthesizable IP core. Designed by C-DAC, Thiruvananthapuram for embedded control application, it is a full functional 8-bit controller compatible with the industry standard Intel 8051 family of microcontrollers. This macrocode-free synthesizable core is specifically designed for reusability. The ER8051 serves software and hardware interrupts, provides an interface for serial communications, and a timer system.

Ongoing Projects

Development of RISC Processor Core

The ER902 IP Core is a 32-bit Microprocessor, which will be developed using one of the industry standard hardware description languages, VHDL. This Core will be a functional equivalent of the industry standard RISC processors. This will be a portable and reusable product, which can be used as a primitive for future developments and applications.

Intelligent Battery Management and Charge Control System for Unattended Solar Photovoltaic Installations

The project involves the design & development of an Intelligent Battery Management System to monitor and control all battery management functions in unattended Solar Photo Voltaic installations powering sensitive electronic loads such as DAS, RMUs, and so on.

The product developed will be able to ensure Peak Power Transfer from the SPV modules to the battery, ensure fast, full and optimum charging of the battery depending upon its chemistry, calculate state of charge of the battery, provide compensations for temperature, charge rate, state of charge and ageing of battery. It will also have a provision for sending the Battery status and parameters to a remote host.

Digital Programmable Hearing Aid

The DHA-1 is a low cost, highly featured Digital Hearing Aid using indigenously developed ASIC technology. Using sophisticated Digital Signal Processing (DSP) techniques, the product offers superior and stable amplification characteristics over a wider dynamic range.

Design Development & Validation of Test Vectors

This project was taken up for developing test vectors for the five VHDL based designs developed by the VSSC namely LAT, LATBAR, PRISM, MIFL & XSECON, implemented in Actel FPGAs. This activity is a part of the quality assurance of ASIC/ FPGA devices designed by VSSC, ISRO, for launch vehicle applications, so as to ensure that they conform to the rigid requirements of space applications.

The objectives are the design of test strategy for maximum node coverage for the VHDL based designs implemented in ACTEL Field Programmable Gate Arrays (FPGAs), Design of test vectors for full function testing & maximum fault coverage, and installing & demonstrating the working of test vectors on HP82000 IC Tester at VSSC.

Real Time Systems and Software

The Real Time Systems and Software initiatives of C-DAC covered the following areas

Real time OS with TCP/IP

A Real Time Operating System with TCP/IP protocol stack has been designed and developed to enhance the processing capabilities of Remote Terminal Units (RTUs) for industrial applications developed by C-DAC, Thiruvananthapuram. The project involved the development of a real time kernel, development of various device drivers for devices on the RTU, and a TCP/IP stack suite for web enabling the RTU. A Real Time application using the above facilities was also implemented.

Vehicle Tracking & Fleet Management System (VTFMS)

The VTFMS developed at C-DAC, Thiruvananthapuram reports the current location of a vehicle enabling a computer to plot its position on a map. The VTFMS system consists of a Vehicle Mount Unit (VMU) and a base station. The VMU consists of a GSM transceiver and a GPS responsible for the longitude and latitude of the place. The base station consists of a GSM module, which receives the data sent by the VMU and passes it on to the computer, which then plots the position on a map.

The VTFMS has been successfully field tested on the VOLVO transport buses of the Kerala State Road Transport Corporation (KSRTC), Thiruvananthapuram and trucks belonging to the VSSC.

Distributed Process Automation Objects for SCADA Applications using CORBA Technology

The project covered the development of a platform independent distributed computing system, using the CORBA technology and the creation of a distributed SCADA system using CORBA middleware.

Network management based on mobile agents

Managing vital network components in Real-Time is becoming more complex with existing client/ server and distributed management systems. These architectures impose significant amount of bandwidth usage while managing the network.

The mobile agents' capability of moving to remote network components and their ability to perform the assigned tasks in remote network components got more attention in performing real-time network management and monitoring. Work in this direction is in progress at C-DAC, Thiruvananthapuram.

General Purpose Graphing Tool

Simple Network Management Protocol (SNMP) based Real-Time data graphing tools have been developed by C-DAC to enable

- Single monitoring interface for all devices and software irrespective of the vendor,
- SNMP based remote polling,
- Support for asynchronous polling of network resources,
- Use of expressions comprising of data variables to plot values,
- Multiple aggregating functions using RRD as backend database and
- Viewing of graphs using popular web browsers.

Design, Development & Field demonstration of Mobile Remote Terminal Units

The project aims at the design and development of a compact MRTU with a Real Time Operating System. Its hardware features include a GSM and GPS interface, USB support, Ethernet port and so on, built around a powerful processor. The firmware features consists of a RTOS, waveform capture and analysis and GSM support. The software development is being done on an evaluation board based on an ARM core.

Data Acquisition System for Durgapur Power Ltd

C-DAC, Thiruvananthapuram has implemented its General Purpose Control System (GPCS) for a Data Acquisition System at Durgapur Power Ltd. This is a network SCADA system that can be used for the real-time monitoring and control of process by power industries. The entire system has been successfully installed and commissioned at Durgapur Power Ltd and is monitoring over 250 critical parameters.

Development & Demonstration of Intelligent SCADA in Retrofit Automation

The project aims at the development of an Intelligent SCADA for Retrofit Automation in Power Plants. It comprises of intelligent process controllers with wireless communication, development of SCADA software and an optimization system using conventional and intelligent system technologies.

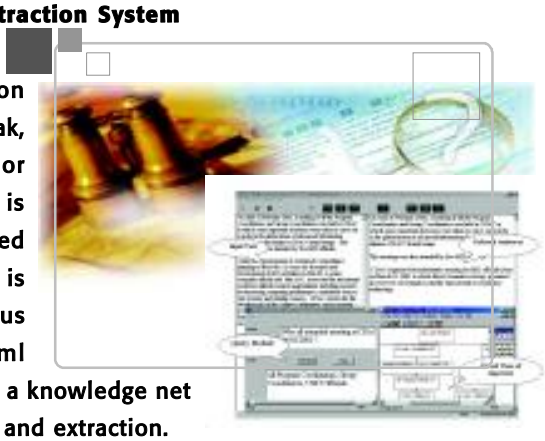
Development of Layered Modeling And Simulation Architectural Framework for DARPAN System (SAFDS)

This work aims at building a Layered Modeling and Simulation Architectural framework for the Darpan System (SAFDS) of NPOL, Kochi. As part of the project, a general purpose simulator framework using CORBA middleware for sonar system design and performance analysis is being developed. The project is in an advanced stage of completion and will be commissioned at NPOL, Kochi shortly.

Multilingual and Multimedia Computing

In the quest to proliferate the benefits of Information Technology to the society, C-DAC's multilingual and multimedia initiatives are as follows

ANVESHAK : An NLP based Information Retrieval and Extraction System



The Natural Language Processing (NLP) based Information Retrieval System developed by C-DAC, Pune called Anveshak, automates the process of retrieval of desired documents or information from a plethora of stored data. The system is based on NLP technology which requires a specially designed sub-grammar for parsing the text, a knowledge-net, and is supported by a search engine. It accepts inputs in various formats such as word documents, rich text formats, html documents from open source and so on, and stores them in a knowledge net and a data base specifically designed to enable easy access and extraction.

The NLP-based technology is versatile and extendable to various user domains such as banking, agriculture, railways, finance and investigating agencies.

GyanNidhi: Multilingual parallel corpora

GyanNidhi developed at C-DAC, Noida is a collection of Multilingual Parallel Corpus in most of the Indian languages stored in a XML encoding format. The Indian Languages Parallel Corpus will be used for

developing and improving various NLP products like translation systems, spell checkers, statistical analysis of languages and language learning tools. About 5 lakh pages in different languages have been already digitized along with books from various institutions like the National Book Trust India, Sahitya Academy, Navjivan Publishing House and Sri Aurobindo Ashram.

Dware Dware Gyan Sampada: Mobile Digital Library

The activity undertaken at C-DAC Noida aims at digitizing and providing non-copyrighted books available freely on the Internet to people in rural and remote areas by using computing technologies. Two mobile vans are fitted with a Dish Antenna for Internet connection, Laptop computers, Laser printers, paper cutters and automatic bookbinders. The vans move from place to place, where the general public, students and so on are allowed to download the books of their choice, print, bind and carry them free of cost. The project was initially undertaken on a pilot basis. Encouraged by the success of the pilot project, it will be launched nationally.

Design & Development of Conversational Guides – CBT

This is a multimedia based Web Compatible CD which contains dialogues from various spheres of life. The diverse information has been classified under various topics and sub-topics with sound/ animation effects. It is a self-learning toolkit with voice output for understanding correct word pronunciation and to serve as inter-language conversational guides.

Chitraksharika: OCR for Devanagri

Chitraksharika is a tool developed at C-DAC, Noida to convert optically scanned images of printed material into computer processable data files, based on a technology developed by ISI Kolkata. The software supports images via TWAIN interface and provides auto image segmentation, de-skewing, detection of text, table & pictures. It also incorporates image-editing features, embedded spell checker for Hindi and can save text & scanned images in different formats.

GLib: Gaming Library

C-DAC, Mumbai has developed a high-level game programming library (Glib) which supports features such as camera description, collision detection, scene-graph management and many other features invaluable to game programmers. Features of the GLib include: 3D Models & Animations, Collision Detection, Lighting, Audio/Video Playback, Basic Windowing Support, Multiplayer and Network support classes.

CLIR: Cross Lingual Information Retrieval

Given that much of the information resources available on the web is in English, making this information accessible to the Indian community requires effective cross-lingual information retrieval systems. This project builds on the existing work in the area of machine translation and information retrieval at C-DAC, Mumbai. The proposed framework will allow users to phrase their queries in Hindi, have them translated to English, use an existing search engine to search the web, locating documents in English and have the

selected documents translated to Hindi. It provides an effective solution to address a major aspect of the digital divide in a predominantly multilingual country such as India. An initial prototype with a look-up based query translation and based on ManTra English-Hindi machine translation system is nearing completion.

Don: Multilingual domain names

Considering the pluralistic multilingual society of India, considerable effort is underway in localizing the available content and to develop localized content for consumption of the larger population. This requires the ability to represent the domain names in local languages. Against this backdrop, a framework for multilingual domain names and the necessary software based on international standards and the latest innovations in computer technology have been developed.

The software tools which were designed, developed and tested at C-DAC, Mumbai as part of the project are:

a. **Siddhi**: A simple database engine for Indian languages.

b. **Shabdsagar**: This tool can be used to build a web based Indian language (currently Marathi) lexicon and to display it in a sorted order.

c. **Shabdkosh**: This is a web-based tool to retrieve the most appropriate entry from the lexicon in Indian languages written in Devnagri for a given word.

d. A **Devnagri keyboard** was simulated for web input through the mouse or the existing ASCII Keyboard.

e. Work on a **general-purpose multilingual web-based editor** to generate Indian Language documents is in progress.

Vedic Sanskrit Standardization and encoding

Vedic Sanskrit includes multi-tier usages of diacritic marks of complex compositions, above, below and on the sides of the characters. Therefore, Vedic Sanskrit text demands on adequate range of characters as well as the essential rules to compose exhaustive syllabic range of consonants and conjuncts.

A Vedic encoding scheme that follows a uniformly additive approach for composing all possible syllabic compositions for text and speech has been developed at C-DAC, Bangalore and Mumbai and has been evolved to reflect the traditional phonological concern of the Sanskrit language.

Xqueeze: A Compact and Fast Parsing Encoding for XML

The Xqueeze project attempted to formulate a binary encoding that is similar to XML in flexibility and generality, while being more compact and faster at the same time. The key features of Xqueeze that make it unique are:

- Ability to generate and parse documents with or without schema,
- Support for all XML constructs, except comments,
- Native support for XML namespaces,
- Sequential streaming of documents and
- Wide support for various encodings and character sets

Amongst the other language technology tools on which work progressed are:

- Vartalaap: A multilingual communication tool that includes an online chat client and server
- BharateeyaOO.o Localization & Internalization of OpenOffice products suite

ManTra: English-Hindi Human-Aided Machine Assisted Translation Tool

The system is being extended to support compound-complex sentences and is expected to be completed shortly. Extensions to handle modalities are in progress.

Vasistha is an instructional content design and delivery framework for use in e-learning scenarios. It provides dependency based content organization, learner oriented flow control, and so on. The system has now been enhanced to support the Learning Object Model.

Bengali Text to Speech (TTS) Synthesis

A complete unlimited vocabulary of TTS for Bengali has been developed at C-DAC, Kolkata using the Epoch Synchronous Non Overlapping Add (ESNOLA) technique with very high intelligibility and phonetic clarity in the synthesized speech.

Courseware preparation for Computer Science for Higher Secondary students

C-DAC, Kolkata has completed the development of an Interactive Multimedia-based courseware of Computer Science for students of the Higher Secondary board. The aim of the project is to help the students and teachers to have an in-depth and intuitive understanding of this quickly evolving subject. An in-house developed Integrated Design Environment (named: Ekalavya) enables such educational interactive multimedia content creation to be cost effective and affordable in India. Moreover, Ekalavya supports Indian languages to enable teaching in vernacular languages.

Vedic Word Processor

A Vedic word processor developed at C-DAC, Bangalore used to key-in Rigveda and Yajurveda text is extended to handle Samaveda content with the inclusion of Grantha script. Also transliteration is provided between Vedic-Devnagri and Vedic-Grantha so as to enable the user to view RigVeda and Yajurveda in Grantha as well. Efforts are underway to include Vedic-Roman to address the needs of foreign scholars. A Global phrase search with feature like accented search, script dependent search are some value additions to this word processor.

Indian languages on Mobile Handset

C-DAC's, GIST at Pune has developed a "Total Solution" for enabling mobile handsets with Indian languages. This includes inputting of the Indian language text through the limited keys available on the mobile handsets allowing the user to send- receive SMS/eMail messages in Indian languages conveniently.

The foot print of the solution is extremely small, wherein it can be easily embedded into the mobile sets, handheld devices and other hardware platforms. The solution has been provided to major MNC's manufacturing mobile hand sets.

World's first Open Type Bengali Portal Deutsche Welle

The first Bengali Open Type portal, based on GIST Technology was integrated in the online service of DEUTSCHE WELLE [DW], a German International Broadcasting Service. C-DAC's GIST facilitated the expansion of DW-WORLD.DE/Bengali by developing a special Open-type Font suitable for the complex nature of the DW-Online framework.

Chitrankan – Indian Language OCR : Documentation made easy, Digitally

C-DAC's GIST had earlier developed Chitrankan- the first OCR (Optical Character Recognition) system for Devnagri, which enables archiving of Indian Language content in electronic form through OCR. The product features were enhanced by the addition of the Training Module and optimization of algorithms to increase speed and accuracy. The product was tested through the STQC labs, Delhi and an accuracy level of 98.7 % was achieved.

Documentation made easy, digitally

Standardization

C-DAC's GIST has been synonymous with the standards in Indian language applications on computers and other electronic media. As GIST evolved, it helped in establishing standards as the need was felt from time to time.

In keeping with the continuing efforts in standardization, C-DAC has hosted font standardization meetings as a part of the MAIT language technology consortium with support from the Department of Information Technology. Standardization with 4 scripts viz. Devnagri, Gujarati, Punjabi, Bengali were undertaken and the Devnagri standards are being published in the TDIL magazine. Perso-Arabic standards were also developed / designed & published on website & TDIL Magazine.

Java Framework Architecture (JFA)

(JFA) Java Framework Architecture is a 100% Java GUI Toolkit enabled by C-DAC, Gist for Indian scripts. It consists of a set of Java components and supporting classes, which enable the creation of content in Indian scripts. The scripts supported are Assamese, Bengali, Devnagri, Gujarati, Kannada, Oriya, Punjabi, Malayalam, Tamil, Telugu and English. These components were supplied for use in the Digital Library project undertaken at C-DAC, Bangalore.

GISTOraTools

C-DAC's GIST has developed GISTOraTools, which is an add-on application development tool for Indian languages. This is a generic solution for applications, which requires data conversion, prior to storing into the database. The conversion functions are written on the database side thereby freeing the developer of

the responsibility of developing code for the conversion in his application. This has been developed as an Oracle specific component.

iplugin

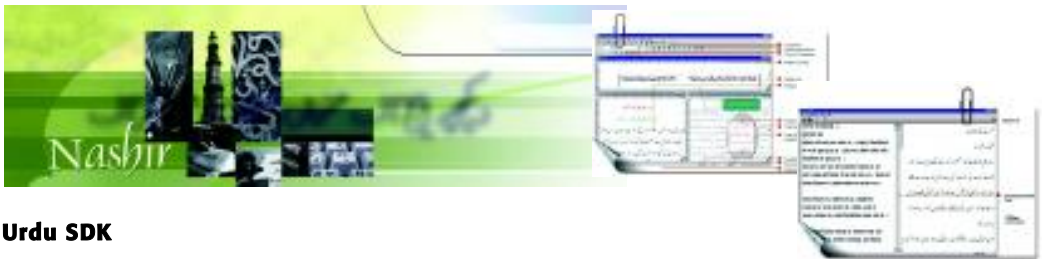
With the proliferation of web based applications and development environments, the *i*plugin tool earlier developed at C-DAC, Pune was further enhanced to provide support for platform independent server side components. Java based multilingual components capable of being deployed on any server side platform viz. Linux, Solaris, Windows were developed. The client side components of *i*plugin were enhanced to facilitate easier usage and deployment thereby proliferating its usage among developers.

Linux Based Mail Client

To proliferate the usage of multilingual technologies on Linux, a desktop based mail client for Linux platform was added to the suite of GIST communication tools. This application facilitates composing and editing of mails in Indian languages. The user can send, view and receive mails with content in Indian languages. Features such as support for IMAP and SMTP, folder management, address book are provided along with support for multiple user identities and preferences. This application is compatible with popular Windows based mail client applications

Nashir

Urdu Nashir developed at C-DAC, Pune is a page layout software for Perso-Arabic scripts. Nashir provides support to both the Naskh and the calligraphic Nastaliq scripts for creating good quality publications in Urdu text, brochures and documents. Nashir has all the features of contemporary page layout packages. Linguistic tools such as spellcheckers for Hindi, transliteration from Hindi to Urdu are the salient features unique to Nashir.



Urdu SDK

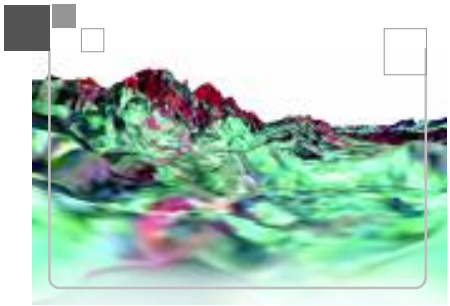
To proliferate the usage of Perso Arabic script, tools for applications environments were developed at C-DAC, Pune. These included ActiveX components, transliteration utilities and spellcheckers for Urdu.

Video Works

C-DAC's GIST group at Pune has developed applications for the broadcast medium. As part of this, SPOT MPEG playout station was developed, keeping in mind automation of broadcast studios. Here the user is provided with a facility to create playout sequences for television channels. The system provides the capability of unmanned execution, error recovery and fault tolerance. This system was demonstrated at two major media events – Broadcast India (BI) at Mumbai and Broadcast Engineers Society (BES) at New Delhi.

The Multiprompter product was given the added capability of supporting prompting for Urdu language to support another official language of India. Urdu News telecasts from channels like ETV have been effectively utilizing this product.

Geomatics



The multi-disciplinary expertise and skills at C-DAC enables the exploration of the following highly specialized R&D areas in Geomatics

- Automatic Image Exploitation (Content based image retrieval, Multi sensor data fusion, Change detection, Information extraction and Feature detection)
- National Spatial Data Infrastructure (Standards and Delivery mechanisms)
- Disaster Management Information System (Hazard-zonation and Interferometry)
- Terrain Dynamics
- Urban Infrastructure

Open Source Software

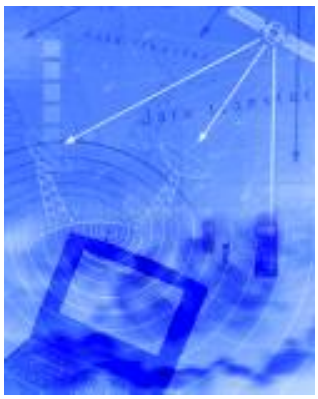
Open Source (sometimes called "Free Software") is a development methodology where the developer of a project makes the source code for the project publicly available. The movement for open source software today has large support from many IT professionals and institutions spread across many countries.

The open source movement is often equated with the usage of Linux. Linux being a fully open source and free operating system provides an easily accessible and powerful base for large-scale software development distributed internationally, and hence continues to be the lead item in the open source category.

NASMON – Network And System MONitoring

Addressing scalability, flexibility and adaptability in a Network Management System is of vital importance in huge heterogeneous networks. NASMON addresses these issues by segregating different functionalities of a Network Management System providing various levels. Apart from managing the network and system components, NASMON, as the name implies, provides ways to include the application component to manage the system-based applications as well as user-defined applications. NASMON is an open Network Management System that shall not be limited by the scope, number, topology, capacity and complexity of the network.

Digital Broadband/Wireless Networks



The following specific activities were undertaken in this area during the year:

Echo Sounder for River RECCE

This is a single frequency echo sounder being developed at C-DAC, Thiruvananthapuram for Bharath Electronics Ltd, Bangalore, as part of an instrumentation system for River Reconnaissance purpose.

Development of Signal Noise Simulator

The Signal Noise Simulator is a real time signal/noise simulation system that generates realistic underwater acoustic signals for usage in testing active and passive sonars. It combines the power of parallel processing technology with the latest Digital Signal Processors to bring out a signal stream with a throughput of 3 million simulated data points per second. The development work in this area is being undertaken at C-DAC, Thiruvananthapuram under a specific contract.

Digital Data Recorder

This project aims at developing a rugged system for recording, archiving and replaying of high speed data received through two fiber optic cables from an underwater transducer array. The incoming data rate could be up to 25 Mbaud. The data, after proper conditioning, are stored in SCSI Hard Drives, and can be archived by transferring to DVDs. The stored or archived data can be replayed at any time. Data received for 5 hours at this rate can be stored in the SCSI drive before archiving to DVDs. The system was developed at C-DAC, Thiruvananthapuram for Naval Physical and Oceanographic Laboratory and will be manufactured by Bharat Electronics Ltd, Bangalore.

Bluetooth RS232 Module

RS232 is a widely used standard for communications between industrial, medical and scientific apparatus. Many industrial, medical and scientific devices are used to collect data in the field. Results are then downloaded to a computer for analysis over a RS232 link. The user has to carry around an RS232 cable, or perhaps more frequently, search for one when they return to base. A wireless alternative would make these devices easier to use.

Bluetooth RS232 Interface Module is an ideal replacement for RS232 connection with a convenient wireless link, improving mobility and convenience. Compared to other wireless technologies, Bluetooth is low cost and consumes very little power. Several users can easily connect and disconnect to a wireless Bluetooth RS232 connection at distances of at least 20m – far longer than a RS232 cable. Built in security – including strong (128bit) encryption is available that enables data to be protected from unauthorized eavesdropping.

Bluetooth MP3 Player

This product, developed at C-DAC, Thiruvananthapuram, enables the user to play MP3 music stored in a server PC using a remote PC. The Bluetooth MP3 modules connected to each PC enables the user to play the MP3 music wirelessly using the Bluetooth Technology.

Bluetooth USB Dongle

The Bluetooth USB Dongle developed by C-DAC, Thiruvananthapuram is an external adapter that can be connected to any PC with a USB port such as a notebook computer and desktop PC for creating an instant network between the PCs. This will enable the PCs to transfer files between the PCs. It also allows a user to browse folders in the remote PC. The USB Dongle is designed for enabling Bluetooth wireless connectivity and networking for Laptop and Desktop PC's using Bluetooth wireless technology and further provide short to mid range mobility.

The operations defined are file manipulation operations such as browsing the file system of another PC, copying files from one PC to another PC and manipulating objects (files and folders) on another Bluetooth device.

Bluetooth HeadSet

This device implements the Headset profile in the Bluetooth Profiles Specification V1.1.

The Bluetooth Headset is a device that can be used to communicate with a Cell phone without the use of a cable. This device offers a safe, hands free, way to make and receive calls when it is not convenient to hold a mobile handset.

IP Telephony

The IP telephone conforms with the speech transmission part of H.323 international standard of International Telecommunication Union (ITU). As per this standard, the entity called **Gatekeeper** does the **Zone management** for IP phones and gateways entities in a particular LAN. An **H.323 media Gateway** is the interface entity between two different type of networks (eg: PSTN & LAN) and is also categorized as end point-type device.

Basically, all end-points (IP phones and media Gateways) in a particular network **zone** register with the Gatekeeper for that particular LAN zone. This is called the **registration** process.

Different LAN **zones** may be connected by Internet Gateways. The Gatekeeper is involved for **Registration** and **call signalling** function based on how the gatekeeper is configured.

This partnership project developed at C-DAC, Thiruvananthapuram provides an indigenous solution for IP telephone for corporate LAN/WAN use. The customer M/s. Indian Telephone Industries, Banglore was also the development partner for this project. Three working prototypes along with technology documents were delivered to the customer in the year.

TETRA Base Station

TETRA Hand-held Radio

TETRA is a Digital PMR Standard developed by European Telecommunications Standards Institute (ETSI). It is an open standard, which offers interoperability of equipment and networks from different manufacturers.

TETRA hand held mobile radio is single module designed to meet the compact size and weight requirement. The radio software is upgradeable at the user site with a GUI and makes it possible to add optional features later.

Physical package design for products like IP Telephone, Bluetooth modules/dongles and TETRA Handheld Radio has been done using 3D design packages.

Tetra Base Station is a major and prestigious project jointly undertaken by C-DAC, Thiruvananthapuram and BEL, Bangalore. Having successfully developed the technology for the Tetra Mobile Radios, the work was extended so as to develop fully indigenous Tetra technology for mobile communications. Tetra Base station consists of a Base Transceiver Station (BTS), Base Station Controller (BSC) and a Main Switching Centre (MSC). Each MSC can be interfaced with 4 BTSs in a Tetra Network.

ICT for Agriculture, Healthcare and Education to address the Digital Divide

A major effort to bridge the digital divide in India and the neighboring regions through the use of ICT has been initiated by the Development Gateway Foundation (DGF) in collaboration with the Government of India.

DGF has identified the Centre for Development of Advanced Computing (C-DAC) as the Project Implementing Agency and the Indian Institute of Technology, Bombay (IIT-B) as the first collaborating institution to set up the DGF R&T Centre in India.

To begin with, the applied research efforts at the Centre will focus on - Internet, Language and Speech technologies and use these research solutions in developing cost effective, scalable and usable end-to-end solutions to address specific identified requirements in the Healthcare, Education and Agriculture sector. In building the solutions, the Centre will draw upon existing strengths and experiences of organizations carrying out work in these areas, and adapt/ integrate these with its own research and development. An ICT portal at the Centre will provide information on activities, events, resources and research programmes at the Centre.

Healthcare

Computerization of Healthcare Departments

The Department of Health and Family Welfare (Thiruvananthapuram) has taken initiatives to improve the quality of health services by IT enabling the institutions under the Department of Health using the state of the art technologies. Computerization of the Department of Health and Family Welfare was undertaken to initiate the process on a turnkey basis by C-DAC, Thiruvananthapuram.

The first phase involves the computerization of the five Health Directorates, namely the Directorate of Health Services (DHS), Directorate of Medical Education (DME), Directorate of Indian Systems of Medicine (DISM), Directorate of Ayurveda Medical Education (DAME) & Directorate of Homoeopathy (DH) and the computerisation of Thiruvananthapuram Medical College Hospital.

Hospital Management System

The Hospital Management System handles Patient Registration, Consultation Management, Admission and Discharge, Birth Registration, Inventory Management and Billing of medicines, Investigation Requisitions, Result Entry, Inpatient Management, Electronic Case Sheet, Theatre Scheduling, Dietary Kitchen, IP Billing, Claim Generation and Settlement of Sundry Debtors, Inventory Management and Issue of items in general stores, Personnel, Payroll Processing, Statutory Recoveries, Budgets and Accounts, Financial accounting, Financial Statements, Staff Payments and MIS Reports. The system has been installed at a private hospital in Thiruvananthapuram.

CancerNet

CancerNet is a Telemedicine project implemented at the Regional Cancer Centre (RCC), Thiruvananthapuram It includes a backbone computer network at the Regional Cancer Centre for its activities across Kerala. The system provides telemedicine services in cancer detection, treatment, pain relief and patient follow-up at RCC and its nodal centres.

Knowledge Management

The following Prototypes have been developed under this project at C-DAC, Mumbai:

- Client and Server for Web Page Annotation: It allows a user to annotate any resource on the web that can be viewed with a browser (html pages, images, PDF docs and so on).
- Viksha: a knowledge-enabling device for a relational database.
- VXMLizer: (Visual XMLizer). A tool that assists in automatic conversion of unstructured data to XML format. It can work with major document formats like Microsoft Word & PDF.
- IDeA – Intelligent Desktop Assistant. This project was carried out jointly with Intelesoft Technologies Pvt. Ltd. Bangalore. A proof-of-concept prototype was developed to demonstrate intelligent support for decision-making in the context of a workflow system.

To sum up, the Centre would address the area of applied research in ICT leading to useable products and solutions complete with education & training requirements for its intended beneficiaries.

Education

Online Learning and Assessment

The Prototypes developed under this project are

- Abhiyanta: A distributed system for question bank management and question paper generation.
- SLATE: A students learning and testing environment for programming skills.
- ITSDS: An intelligent tutoring system for teaching data structures.
- IMS (Instructional Management System). This prototype was developed to serve as a reference implementation of the IML (instructional Markup Language) specifications proposed by the IMS global consortium

CASE Tools development

ER Diagrammer: A tool for modelling the design of a database using Entity Relationship Diagram. Enhancements were made in the feature set of this tool. The tool was developed on Microsoft Windows 2000 platform.

Doubly fed Slip Ring Induction Motor Drive

This project has established the potential of double inverter fed wound rotor motor in the field of variable speed drive applications. In high power and high performance application areas like rolling mill, cement mill, earthmovers, cranes, traction drives, escalators and so on, this drive offers very attractive performance over conventional drives.

Development of 70KW drive and AC motor for Battery Powered Vehicles

The Electric vehicle is the best solution to counter the environmental pollution caused by the huge number of petrol and diesel vehicles. It is a major step towards the concept of zero emission vehicles.

Remotely operated Mobile Platform

A vehicle for carrying various types of payloads, which can be operated from a remote control station, has many applications. It can be used in automated production floors for moving materials between work stations; or for carrying monitoring equipment into environments, which are hostile to human health
The machine is controlled by commands sent over a wireless LAN in standard RS 232 format. The vehicle is highly maneuverable and capable of turning completely round within its own maximum horizontal dimension. Video cameras on board can be used to pilot the vehicle.

Network Integration of Power Electronics Systems for Automated Process

The Proposed Project can network "n" number of Processes containing different Power Electronics Systems in Automated Process. Presently three different processes are networked.

SPONSORED / CONTRACT PROJECTS

C-DAC's expertise in the diverse range of advanced computing technologies has been deployed for several projects sponsored by the Ministries and Departments of the Government. A glimpse into these is provided here for projects sponsored at the various C-DAC Centres.

A comprehensive list of projects is presented below, which highlights some of the key projects funded by the Department of Information Technology, Ministry of Communications & Information Technology and other Ministries / Departments are given here.

Projects Sponsored by the Department of Information Technology (DIT), Ministry of Communications & Information Technology (MCIT)

- Adaptive Intrusion Detection Analysis and Response System
- Compact PCI Industrial Computer
- Digital Library for Indian Heritage
- Country Gateway
- Preparation of Promotional Video Films on e-Governance Activities (I)
- Preparation of Promotional Video Films on e-Governance Activities (II)
- Goa Online: e-Governance
- Establishment of Kofi Annan India-Ghana Institute of Information Technology
- Centre for Electronics Governance Cell
- Design and Development of Component based Functionality to e-Learning Tools
- Design and Development of a Transparent solution for Securing Networks and Systems
- Application of Image Processing Techniques for Improved Feature Extraction in Echocardiography related to Cardiac Diseases
- Integrated Automation of Tea Processes
- Development of Isolating Tools for Steganographic Images
- Design and Development of CORDIC based array processors for implementation of a PC based Color Doppler Ultrasonography System
- Development of Annotated Speech Corpora for 3 Indian Languages (Bengali, Assamese & Manipuri)
- Smart Card based Computerization of Accounts for Small Business Enterprises for the Handheld Devices
- Speech System for Handicapped
- Development of Telemedicine Technologies and its implementation
- Setting up of National Resource Centre for Online Learning at NCST
- Localization of Linux and Java and Development of Open Type Fonts for Indian Languages – Phase II
- Interactive cable set top box for entertainment & internet services Phase-I (ongoing) and Phase II (CAS based on Linux)

- Development of technology for Tele TV conferencing through conventional telephone lines
- Knowledge Resource –Parallel Corpora
- Integration of OCR for selected Indian languages
- Hand Held scanner based Hindi and English text reading machine for the visually impaired
- TDIL Portal and language technology
- Mobile Digital Library
- Creation of Digital Library of Books in the President House
- Development of Annotated Speech Corpora for 3 Indian languages (Hindi, Marathi & Punjabi)
- Test Bed for Translation Support System
- Digital Archiving for preservation of rare manuscripts and old magazines from mid 19th century to 1950
- Establishing centres for Digital Archiving and creation of rare knowledge pertaining to Ayurvedic Medicine
- Development of Core Network Security Technologies
- Web-Based Technical Analysis in Equities, Bonds, Debt Instruments and Derivates Trading
- Content Development for Indian Languages (COIL net) for the promotion of Hindi in Information Technology
- Resource Centre for Indian Language Technology Solutions - Perso-Arabic
- Development of Telemedicine Technologies
- Setting up of Telemedicine and Tele-education Facilities in Kerala
- Setting up of Telemedicine facilities in two state level hospitals in the North-Eastern states
- Next generation HPC technology and applications
- ATM based plant-wide Networking for Bhilai Steel Plant
- TETRA Base Station
- Custom Power Devices
- Digital Programmable Hearing Aid
- Distribution Automation System for Thiruvananthapuram city- Phase II
- Parametric Sub-Bottom Profiler
- Resource Centre for Computer Forensics
- Development of RISC Processor Core
- Vector Controlled Induction Motor Drive for Hybrid Electric Vehicle
- Resource Centre for Malayalam Language Technology solutions
- Network Integration of Power electronics systems for automated process
- Design Development & Field demonstration of Mobile Remote Terminal Units
- Development & Demonstration of Intelligent SCADA in Retrofit Automation
- Watermarking Digital Audio & Setting up of a Resource Centre for Digital Rights Management System
- Development of rugged DGPS with Sub-meter accuracy for marine applications
- Natural Language Processor for Intelligent Tutoring System
- Intelligent Battery Management and Charge Control System for Unattended Solar Photovoltaic Installations

Projects Sponsored by the Development Gateway Foundation (DGF)

- Research & Training Centre – ICT for Addressing the Digital Divide

Projects Sponsored by the Department of Science & Technology (DST)

- Pre-Stack Migration & Velocity Analysis
- Joint Development between C-DAC & ICAD in Seismic Data Processing (ILTP/A-8.13 project)
- CD-ROMs on the Life & Works of Ramanujan
- Short term Orientation Course on Application of GIS in Earthquake
- Microzonation & Risk Assessment of the Landslide Affected Areas
- Parallelization of Coupled Ocean-Atmosphere General Circulation Model (ILTP/A-8.7)
- Joint Development between C-DAC, NCMRWF, INM and I-CAD in Computational Atmosphere Sciences (ILTP/A-8.10)
- Parallel Climate Model Using PARAM 10000
- Performance Improvement of Shell & Tube Exchangers
- Joint Development between C-DAC, VSSC & ICAD in Computational Fluid Dynamics (ILTP/A-8.12)
- Setting up of Russian-Indian Centre for Advanced Computing Research (ILTP/A-8.9)
- Seismic Travel Time Tomography by real-coded parallel genetic algorithm

Projects Sponsored by the Department of Official Languages (DOL), Ministry of Human Resource Development (MHRD)

- RSVP, SANSK-NET
- Sarthi-2 (Pilot scale production of 50 PCs. of Sarthi-2)
- Learn Official Language (Prabodh, Praveen & Pragya) on the World Wide Web
- Computer Assisted Translation System for Administrative Purposes - CATS - Phase 3 (Server Ver)
- Intelligent Tutoring System for Hindi at Pragya Level Windows Version
- Learning Hindi Prabodh, Praveen and Pragya through South Indian Languages

Projects Sponsored by the Department of Bio Technology (DBT)

- Creation of High Performance Molecular Infrastructure for Biotechnologists

Projects Sponsored by Snow and Avalanche Study Establishment (SASE), Defence Research and Development Organization (DRDO)

Study of equilibrium line attitude of dry/wet snow for understanding crevasse pattern using optical and active microwave remote sensing data with advanced image processing technique

Projects sponsored by the Department of Information Technology (DIT)

Ultrasonic Imaging System

This project aims at developing reusable hardware and software modules for use in systems based on Ultrasonic Imaging Technology. This involves development of DSP Boards, Signal Conditioning Boards, DSP algorithms for beam forming and imaging and graphics software for data presentation.

Grid Interactive UPS System

The Grid Interactive UPS system, or a Dynamic Power Manager UPS System, eliminates the drawbacks of the existing traditional UPS – Double Conversion and Single Conversion UPS. High reduction in energy waste, harmonic current reduction, optimum utilization of installed capacity, reactive power compensation and high system availability make this new generation technology ideal for Online power protection for mission–critical servers, Mainframe computers, Data centers, critical medical applications and so on.

Resonant Mode SMPS Power plant

DC power plants are extensively used in Telecommunication and Railways as float rectifiers and battery chargers. The existing power plants are thyristor-based converters with inherent limitations of poor power factor at the input, large size and lower efficiency. The resonant mode SMPS power plant being developed will minimize the above limitations

Vector Control Induction Motor Drive for Hybrid Electric Vehicle

The Hybrid Electric Vehicle (HEV) offers eco-friendly mass transportation for India's metros. The HEV is powered in series by a downsized diesel engine (with lower power) and a battery pack.

This is a joint development project with M/s. Ashok Leyland, Chennai and is funded by the DSIR and DIT together.

ATM based plant-wide Networking for Bhilai Steel Plant

Department of Information Technology (DIT), and Steel Authority of India Limited (SAIL), New Delhi launched a major joint project for setting up an ATM (Asynchronous Transfer Mode) based Plant Wide Networking at Bhilai Steel Plant (BSP).

The network is now in place and has been handed over to BSP and is being used extensively. HMMS and FIMS applications at SMS, BBM and MM have been implemented. RSM and WRM applications are being commissioned.

Telemedicine

Mercury

A funded project, titled "Development of Telemedicine Technology", has enabled C-DAC to develop Telemedicine Technology. The developed Telemedicine System has been installed for field trials at All India Institute of Medical Sciences (AIIMS), New Delhi, Sanjay Gandhi Post Graduate Institute (SGPGI), Lucknow and Post Graduate Institute of Medical Education & Research (PGIMER), Chandigarh.

The Telemedicine Network commissioned in 2002 between the three sites mentioned above was formally inaugurated on November 24, 2002, at the First National Conference of Telemedicine Society of India.

Clinical Trials are being conducted on the commissioned Telemedicine network.

The deliverable of the project has also been productionized and was launched as Mercury, an Integrated Telemedicine Solution, at C-DAC's 14th Foundation Day. Mercury version 2.0 was also released and installed at the three sites.

As part of this project, C-DAC has developed a protocol for communication among different Telemedicine systems. To promote interoperability of various Telemedicine Systems with minimal effort, C-DAC has also developed an ActiveX Software Development Kit (SDK), called the ActiveX for Communication in Telemedicine Systems (ACTS). The SDK facilitates easy integration of any Telemedicine System with Mercury, Further, C-DAC is a part of the Technical Working Group for development of Standards & Recommendations for Practice of Telemedicine in India, and is contributing with its rich experience in the development of Telemedicine Systems.

Sanjeevani

Another Telemedicine software developed as a part of the project – was set up at the three hospitals, namely, PGIMER, Chandigarh, AIIMS New Delhi and SGPGI Lucknow, for training and clinical trials.

Speech System for Handicapped

Modifications suggested by the Steering Committee for this system are in progress.

Compact PCI based Industrial Computer

The Compact-PCI based computer employs such features as hot swap of intelligent input/output modules to automate process control systems resulting in the reduction of "down time" of the system preventing huge losses due to shutdown of plant/processes. It is web enabled over CORBA middleware.

Fault Tolerant MPI (FTMPI)

Most of the parallel program applications are long running in nature. Standard platforms for parallel programs, like MPI, do not address fault tolerance issues. To remove this deficiency, FTMPI had been designed and developed in C-DAC.

The FTMPI features include transparent recovery from process failure and node failure, support for process migration, consistent checkpoint files and client -server QT based GUI.

Financial Modeling

A project on "Web-based Technical Analysis in Equities and Debt Instruments" undertaken by C-DAC was delivered successfully. The BourseAnalyzer framework developed in an earlier project was used as an effective vehicle to implement and deliver this project. The focus of this project was on performing technical analysis on price and volume data of stocks, bonds/debt instruments and derivatives contracts of leading companies.

Sanskrit Sambhashanam Portal

This is a jointly implemented project by C-DAC's National Multimedia Resource Centre and the Department of Sanskrit and Prakrit Languages, University of Pune.

The objective of this project is to introduce Sanskrit language and literature to the large cross section of people.

Vidyakash Project: National Resource Centre for Online Learning

This three-year project has been sponsored, to build up human and technological infrastructure, expertise and competence to offer online education.

As part of the project, a number of novel technologies have been developed to enhance e-Learning effectiveness. These include Vasishta – content design and delivery system with traffic light based navigation, hierarchical content organization, support for learning object, Sandesh – automated query handling; Chaatra – qualitative feedback for students and faculty; and Vyasa – generative testing.

Application of Image Processing Techniques for Improved Feature Extraction in Echocardiography related to Cardiac Diseases

After an extensive literature survey and close interactions with Cardiac Surgeons, various clinical features to be extracted out of echo-cardiograph images had been identified (along with the mathematical modeling for extractions). Based on those algorithms, software modules are being developed in this project in the general category of image enhancement by noise cleaning, Motion mode (M-mode) display and Extraction of LV boundary.

Integrated Automation of Tea Processes

On successful completion of the System Design, the ongoing multi-institutional project has entered the crucial Implementation Phase. While IT and automation components are being mobilized, the building construction of the Model Tea Factory at Tocklai, Jorhat, Assam is also progressing. The project is jointly sponsored by the Council of Scientific and Industrial Research (CSIR), Ministry of Commerce and the Department of Information Technology (DIT), Government of India.

Development of Isolating Tools for Steganographic Images

Steganography is a technique of hiding messages within an innocuous container. The present project aims at developing a complete software package with different steganalysis tools covering online detection, offline analysis and statistical performance analysis. The project is significant for biometric applications.

Design and Development of CORDIC based array processors for implementation of a PC based Color Doppler Ultrasonography System

The aim of the project is to improve the features of existing Color Doppler Ultrasonography machine

using PC add-on cards processing signals already made accessible by existing Ultrasonography systems. The project is being carried out in association with the Indian Institute of Technology, Kharagpur.

Advanced Power Plant DAS-MIS

The System-integration for plant-wide networked-solutions with Ethernet-compatible High performance Data Access Systems (DAS) technologies for data collection from the plant sensors and supervisory Software-modules (using Industry-standard Bridge-VIEW Technology of National Instruments, USA) has been completed. The project is sponsored by Durgapur Projects Ltd (DPL), Govt. of West Bengal alongwith the Department of Information Technology (DIT), Government of India.

Design and Development of Component based functionality to e-Learning tools

A project "Design and Development of Component based functionality to e-Learning tools" involves the development of component based functionalities to e-Learning framework and tools. A course on "Core Competency in Software Process Management" is being offered through the e-Learning mode. This course is ported on the e-Learning environment (eSikshak) developed at C-DAC, Hyderabad under this project.

Custom Power Devices

The Custom Power concept is a technological solution to the poor power quality presently encountered in factories, offices and homes. The major modules of custom power devices such as STACOM and Unified Power Quality Controller (UPQC) are developed under this project.

This technology development project was taken up in association with Indian Institute of Sciences (IISc), and Central Power Research Institute (CPRI) Bangalore.

COIL Net Project (Content Creation of IT Localization Network)

As part of this project C-DAC's GIST group will be involved in Core Technology Development for the promotion of Hindi in Information Technology in the areas of Open Type, Unicode based fonts for Hindi, ISCII / UNICODE search engine, Java tools for Hindi, Fonts plugins for supporting various browsers, Enhanced Transliteration tool, Dictionary Development Tool and Training on GIST SDK/iPlugin tools.

Digital Library (DL)

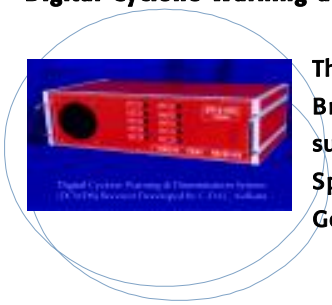
The Digital Library project aims at the development of technology, tools and products for the preservation and dissemination of Indian art, culture and its rich heritage through the use of modern digital technology.

Deliverables towards this project include providing technology and infrastructure for building a Digital Library of Indian Heritage. Tools like the Digital Library Application Suite (DLAS) and the Dynamic Data Entry Wizard (DDEW) to manage and host contents of the DL project have been designed and developed. The DL group is also customizing DLAS with multilingual option to support contents from Indian Heritage Group in Sanskrit.

Another project undertaken in this area, was to develop a Mobile Digital Library to enable standards in village schools and other beneficiaries to download books of their interest, print and copy, and also browse through the Internet by providing online connectivity through V-SAT.

The **SANSK-NET** (Networking of Sanskrit Institutes) project 2nd phase started in January 03, and content creation of classical Sanskrit texts is in progress.

Digital Cyclone Warning and Dissemination System (DCWDS) Receiver



The various features of DCWDS Receiver developed are Digital Sound & Data Broadcast, L-band operation and MPEG decoding. The receiver has been successfully developed, tested and delivered to the sponsoring authorities Viz. Space Application Centre (SAC), Ahmedabad of the Department of Space, Government of India.

OTHER PROJECTS :

A collaborative research with Indian Institute of Technology (IIT), Mumbai for environmental science research on building capacity in India to use reliable assessment tools for climate change is being undertaken. This research is funded by the Ministry of Human Resource Development. Using high performance infrastructure, regional climate study to examine the aerosol forcing to simulate aerosol chemistry and dynamics is being carried out on C-DAC's PARAM Padma.

Seismic Traveltime Tomography

Seismic Traveltime Tomography is a high-resolution geophysical tool, which can be used to reconstruct a velocity model of the Earth's subsurface using propagation times of wavefields. This project is aimed mainly at the development of an efficient and robust two-dimensional seismic travel time tomographic inversion scheme using a real coded genetic algorithm. The developed scheme will be parallelzed on the PARAM series of supercomputers. The project is funded by the DST under the "Fast Track Project" scheme.

Digital Sound Recording Assisted Verbatim Transcription & Audio - Video Web Casting of Rajya Sabha Proceedings

C-DAC is developing an Audio Recording System for Rajya Sabha Proceedings to be deployed at the Rajya Sabha. This is an Intranet-based web-enabled solution for reporters at the Rajya Sabha to listen to the ongoing proceedings inside Rajya Sabha as well as the archived files.

Web-based LILA Hindi series

Web-based versions of LILA Hindi PRABODH, LILA Hindi PRAVEEN and LILA Hindi PRAGYA courses for the Department of Official Language (DOL), Ministry of Home Affairs are presently being developed.

The CD versions of these courses are already available. These are Intelligent Self-Tutoring Systems for learning Hindi, especially designed for Government departments, Banks, Public Sector Undertakings and

Corporate employees. These packages are also useful for other non-Hindi speaking people who wish to learn Hindi from the basic to the advanced stage.

Web-based LILA-Hindi Prabodh, Praveen and Pragya through Regional Languages

This is the extension of Web-LILA technology through the medium of five Indian languages, viz. Gujarati, Bengali, Telugu and Tamil, and is currently being designed and developed.

MANTRA Rajya Sabha

MANTRA Rajya Sabha is being developed for the Rajya Sabha Secretariat as a tool to translate some specified documents like daily parliamentary proceedings such as Bulletin, List of Business, Papers to be laid and Synopsis. It is a part of an automation system beginning with the text input in the system, the operation of Mantra tool by the translator, the assistant editors, and senior editor levels, the publication unit and web unit.

The first stage of operation being over, eight officers and officials were invited to C-DAC, Pune for hands-on training and conducting user trials. In the second phase the system was tried in the Rajya Sabha. Mantra's architecture is available in two different flavours – Distributed MANTRA architecture and Centralized MANTRA architecture.

Sarthi

A low cost audio visual aid for teaching Indian languages for adult literacy was completed. As part of this, 50 systems of **Sarthi-2** (Pilot scale production level) were delivered to the National Literacy Mission in March 2003 and field trials are in progress. This project was sponsored by the Ministry of Human Resource Development (MHRD).

Language Learning

A multilingual portal for the Department of Official Language (DOL) was developed. This contained multilingual components such as – multilingual local search engine, multilingual e-mail feedback form and multilingual virtual office application.

European Commission project

The European Commission awarded a project titled "Indian Language Communication Tools" to C-DAC's GIST Group at Pune. This phase of the project was intended as to gather information regarding multilingual developments in the areas of optical character recognition, speech technologies, and search technologies. The phase also included the study of various research activities being done in India and Europe. A study tour of Europe was organized as part of this project, and an international conference (IEMCT) was organised in Pune, inviting participants from Europe and India working in multilingual speech, optical character recognition and search applications. The project was completed with the submission of a report.

CD-ROM on Life and Works of Srinivasa Ramanujan, the Mathematical Genius

C-DAC's National Multimedia Resource Centre has worked on a project titled 'Multimedia CD ROM on Life & Works of Srinivas Ramanujan the Mathematical Genius' in close consultation with the Institute of Mathematical Sciences (IMSc), Chennai. Under this project sponsored by the Department of Science & Technology, Govt. of India, C-DAC was entrusted with the responsibility of multimedia software development, content digitization and integration.

Resource Centre

C-DAC, GIST was awarded the project to act as the Resource Centre for development of tools & technologies for Perso-Arabic Script. The project is slated to be completed by September 2003.
Under this project, the GIST group added to its gamut, of language tools, the Semitic scripts – Urdu, Sindhi, and Kashmiri. The calligraphic styles of Naskh and Nastaliq were brought to the computers for the first time in the form of the word processor Nashir and SDK components for Urdu. Linguistic technologies for Urdu such as spellcheckers and transliteration were designed and developed.

Under this project standards were also evolved for Perso-Arabic family & published for expert comments on Web site www.parc.cdacindia.com was launched which supported Naskh as well as Nastaliq .

The Project was part supported by the National Council for Promotion of Urdu Language (NCPUL), MHRD along with the DIT.

Integrated Watershed Development Project (IWDP) addresses the problem of degradation of Himalayas to restore the productive potential of the Shivalik ranges spread over the state of Haryana, Himachal Pradesh, J&K, Punjab and Uttaranchal and enhance sustainable economic development in the region. The major components of the project include: forestry, horticulture, soil conservation, water resource development, livestock management and rural road development to increase marketability.

C-DAC was appointed as a consultant to the Watershed Development Council of IWDP-Hills II under the Ministry of Agriculture. As a consultant for IWDP, C-DAC is responsible for providing assistance to the various participating teams in the matters related to Information and Knowledge management using appropriate IT tools (including GIS) at an overall coordination level.

Considering the importance of natural hazards mitigation in North Eastern Region, the Department of Science & Technology, Government of India (DST), under its Jai Vigyan Technology Mission, has taken up various projects covering different areas. It has awarded a joint project to Wadia Institute of Himalayan Geology (WIHG) and C-DAC on 'Microzonation and risk assessment of the landslide affected areas between Banderdewa – Gohpur in Itanagar Capital Complex, Arunachal Pradesh, using GIS and Remote Sensing Techniques'. In continuation of the ongoing project and to share the experience, C-DAC and WIHG organised an **Orientation Course** for the personnel involved in projects sponsored by DST.

Snow & Avalanche Study Establishment (SASE) of the DRDO has awarded a project to C-DAC on Study equilibrium line altitude (profile) of dry/wet snow for understanding crevasse pattern using reflectance in case of optical and backscatter in case of active microwave remote sensing data with advanced image processing techniques.

Setting up of Development Gateway Foundation (DGF) Research and Training Centre

The DGF is an independent non-profit institution of the World Bank having a number of countries as members. India is one of the founder members of the Foundation. The main focus and objectives of the Foundation is to reduce the already widening gap of Digital Divide and to support sustainable development through the use of Information and Communication Technology (ICT) in developing countries across the world. As a part of this, the DGF has agreed with the Government of India to set up a Research and Training Centre of the Foundation at C-DAC, Bangalore in its Electronics City Centre operating as a Centre of Excellence for Research and Development in Software Technology and related areas of ICT. The R&D Centre was formally inaugurated on on September 26, 2002 and the development and applied research activities have since commenced.

Some of the objectives of the Centre are to carry out applied research and developments in ICT, specially tailored to three domain areas namely, Healthcare, Education and Agriculture. The initial focus to achieve this will be to carry out focused applied research in major technology areas namely, Internet, Language and Speech Technologies. The developed technologies and solutions shall be deployed as pilot test solutions in selected areas to critically gauge the effectiveness and impact of these solutions. Further specific programme for information dissemination and education and training in use of the developed ICT solutions and technologies will be undertaken. IIT Mumbai is the principal collaborator in this programme to develop solutions in the research areas of Internet Technologies and Database Access Technologies.

The whole programme is budgeted at an outlay of US $ 4 million spread over 3 years, and is funded by the World Bank through the Department of Information Technology. A Board of Directors chaired by the Secretary, Department of Information Technology and members has been set up by the Ministry to steer and monitor the project.

ADVANCED TECHNOLOGIES LEADING TO BUSINESS SOLUTIONS

C-DAC's R & D activities and the technical skills and resources have been utilized effectively to address the economic, educational, scientific and other business section. The projects completed, sectors addressed and activities underway at various C-DAC centres are mentioned here.

C-DAC, Thiruvananthapuram (C-DAC (T))

Airport Accounts & Payroll Management System (AAPMS)

The AAPMS is an integrated applications package for computerizing the Revenue, Expenditure, and Payroll and Financial Accounting activities of the Airport Authorities of India. The system is being built around the ORACLE RDBMS on Windows NT platform. The application modules are developed using Delphi and ASP. The package has been successfully installed at the Thiruvananthapuram airport.

Area Traffic Control System (ATCS) Study

The ATCS is a feasibility study jointly carried out by Pune Municipal Corporation and C-DAC(T). The aim of the study was to identify corridors and intersections in Pune city for the implementation of ATCS and to estimate the benefits and return on investment based on the trials at Pune. Six corridors involving 38 intersections were identified for the ATCS implementation. With an investment of Rs.597.68 lacs for the development and implementation of the system in Pune, the return on investment was calculated as about Rs.5.0 crores in the first year.

Technical Support for Project Akshaya

Akshaya - is an endeavor to 'Bridge the Digital Divide' and propel Kerala as India's foremost knowledge society.

The project Akshaya proposes to impart basic/functional e-Literacy to one member of each of the 65 lakh families in the state. The programme will aim at opening up the minds of the students to the immense possibilities and benefits of ICT and then to make facilities available to render their learning useful and reap the benefits..

The project is being implemented in Malappuram district as a prototype, and is being prepared to be replicated in other districts in the next phase, leading to more than 550 Akshaya centres in the district, each centre catering to 800 families on an average.

C-DAC, (T) has been appointed as a consultant to various Government Departments of the State of Kerala for their IT requirements, and also has been recognized as a Total Solution Provider for e-Governance by the Government of Kerala.

DIAMOND

DIAMOND - **D**emocratic (information) **I**nfrastructure for (state) **A**dministration through **M**ulti **O**bjective **N**etwork **D**epository, is the acronym used for State Information Infrastructure for e-Governance in Kerala.

The scope of the project is to set up an e-Governance Centre at Thiruvananthapuram, run appropriate applications from the e-Governance Centre, develop a rapid application development tool for e-Governance and set up broadband connectivity between the Centre, Secretariat, Vikas Bhavan, Public Office and Kerala State IT Mission.

A Rapid Application Development (RAD) tool for e-Governance will be developed as part of the project. The RAD tool can be used to design, develop and deploy web applications and web reporting in different languages

Management Information System for Integrated Child Development Services

Integrated Child Development Services (ICDS) is designed to promote holistic development of children under six years, through the strengthened capacity of communities and improved access to basic services at the community level, which was initially launched by the Government of India in 33 blocks as a pilot project in 1975. The programme is designed to reach disadvantaged and low income groups, for effective disparity reduction, and provides an integrated approach for converging basic services for improved childcare,

early stimulation and learning, health and nutrition, water and environmental sanitation - targetting young children, expectant and nursing mothers and women groups.

Implementation of the ICDS Scheme in Kerala is entrusted to the Department of Social Welfare, Government of Kerala. Under this contract, the scope of MIS development for ICDS covered Monitoring and reporting health and nutrition status of children, women and adolescent girls at 24000 Anganwadi centres of 163 blocks, Monitoring and performance evaluation of women empowerment initiatives, technical consultancy for Hardware procurement and a three layer network to be designed at Anganwadi Block, District and State HQ levels.

The development is based on free software.. The Block level design has been completed and is ready for pilot implementation.

Filter Bed Automation

C-DAC, Thiruvananthapuram successfully completed the contract for Kerala Water Authority (KWA), which involved system design, development and implementation of Data Acquisition System (DAS) for Filter Bed Automation of Plant no. III of the Aluva Water Treatment Plant. The design, development and implementation of the Filter Bed Automation System involved acquiring of filter bed parameters and controlling flow through the beds and advising appropriate time upon which the manual back – wash is to be carried out. The system considers 50 input – output signals from twelve filter beds.

The system was completed and inaugurated on August 15, 2002. The benefits of the system includes better diagnostics, safe filtered operation, better quality of water, and better productivity. The total project cost is Rs 49.5 lakhs and payback period is just one year.

Contract consultancy services were offered to DCM, Swaraj Automobiles, Tata libert, H P Vidhan Sabha and so on.

Learning Resource Centre For Medical College, Thiruvananthapuram

The Learning Resource Centre (LRC) at Medical College, Thiruvananthapuram is a state-of-the-art resource centre at the college library premises and was set up on a turnkey basis for the Kerala Medical Graduates (AKMG) a non profit organization of physicians and dentists of Kerala (India) origin practicing in Canada and the United States of America. The LRC is an effort to make timely information available to doctors, post graduates and undergraduates on the latest medical and surgical techniques and technologies and functions as a dedicated facility attached to the Medical College Library.

IT enabling of the Department of Co-operation, Government of Kerala

The first phase of implementation covers the Office of the Registrar of Cooperative Societies and Jt. Registrar (General) in the District of Thiruvananthapuram.

The system includes modules such as Societies Registration and Information, Correspondence, Establishment and Payroll, Service book of employees, Budget and Statistics and Management Information system.

Management Information System for Travancore Titanium Products Ltd. (Ongoing), Library Information System for VSSC, Trivandrum. (completed) Bhilai Steel Plant Automation (done by STDC, Kochi), Submitted proposals for Labour Department and Kerala Toddy Workers, Welfare Federation (KTWWF)

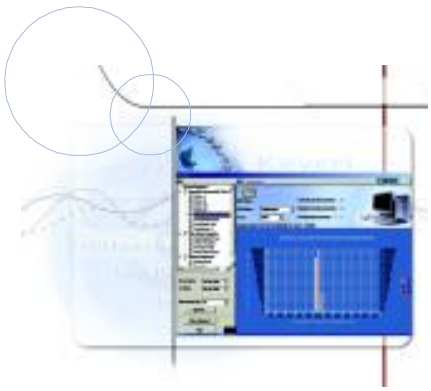
C-DAC, Pune

Business operations of the C-DAC Pune group ranged from projects in networking, e-Governance and so on to projects in High Performance Computing. The sectors covered included education, government, R&D as well as projects in Public Sector Units.

Amongst the major networking projects, was the successful commissioning of the Campus wide network for CWPRS valued at about Rs 1 cr. The contract by the Election Commission of India for voter quarry system on the web on a large data base in various Indian Languages was also successfully completed.

e-Governance

e-Governance refers to the IT-enabling of Government services, so that the common man receives the government services faster and better at a lesser cost.



e-Governance Activities in C-DAC received a major fillip in this year. The following projects were initiated / completed during the year :

A major project i.e. **KAVERI for the computerization of the Department of Registration and Stamps, Government of Karnataka** was initiated in this year. This is the second state after Maharashtra, which has gone in for a customized turn key statewide solution. The task involves development of the complete application software to be deployed at 220 offices in 27 districts of the state.

The OMMS for the Pradhan Mantri Gram Sadak Yojana was developed for deployment in 30 State capitals during the year, facilitating the monitoring of the progress of the work of construction of rural roads throughout the country.

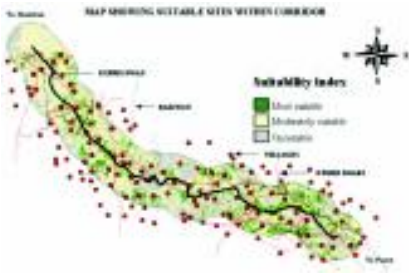
The computerization of the Legislature Secretariat, Maharashtra Legislature was completed successfully during the year and the entire application is fully operational.

The System Requirement Study and Process Reengineering for the Public Works Department of the Government of Punjab and Government of Tripura was completed successfully during the year.

The successful **deployment of the ProSEED** application software was completed during this year for the Maharashtra State Seed Corporation Ltd.

The Office of the Chief Electoral Officer of the State of Maharashtra appointed C-DAC as the state level agency to provide the consultancy for the computer based processing of the data for the elections as per the guidelines issued by the Election Commission of India.

GIS based Knowledge Corridor



In the wake of global development of Information Technology (IT), the Maharashtra Government has the taken initiative to develop a **"Knowledge Corridor"** along the newly developed Mumbai-Pune expressway. The Maharashtra Industrial Development Corporation (MIDC), which is a Special Planning Authority for the development of the 'Knowledge Corridor' assigned consultancy to C-DAC for developing a GIS based information system of the entire corridor for the development of various 'knowledge based industries'. C-DAC implemented the project which envisaged developing baseline spatial information for entire corridor along Mumbai-Pune express way at coarser scale, developing detailed spatial information for specific clusters and providing suitable sites for locating various knowledge based industries such as IT, biotechnology, leisure, tourism, corporate offices and meditation centers.

Disposal of solid hazardous waste

To promote industrial clusters, the MIDC is providing state-of-the-art industrial sites to attract foreign investments. To aid the process, C-DAC has implemented a pilot project for identification of suitable sites for **disposal of solid hazardous waste** (SHW) from the industrial area of Shendre in Aurangabad using Geomatics technologies. Based on the norms specified by CPCB, two suitable sites were identified in the MIDC area.

Assessment of forest ecosystem dynamics and relationship between structural & functional aspects of ecosystem vis-à-vis social factors

C-DAC has submitted a proposal in this area to Asia Pacific Network (APN). It aims at studying the structural (biodiversity) and functional (biomass) aspects of the ecosystem and their interrelationship. Impact of socio-economic element will be modelled as disturbance gradient (based on principles of landscape ecology) over a specified interval of the time.

Data Centre for National Institute of Oceanography (NIO)

C-DAC has assisted the National Institute of Oceanography (NIO) in the development of a data centre encompassing setting up of infrastructure, selection of spatial analysis and visualization tools, security policy for accessing and collating of different types and formats of data as centralized repository.

The **Pune Municipal Corporation** has awarded a contract to C-DAC for the preparation of fresh land-use maps, including new maps of hilltop and hill-slope zones of the area in 23 fringe zones. The work covers acquisition of air-photo and processing them along with the existing maps from Survey of India (SOI).

The **National Mineral Development Corporation (NMDC), Hyderabad** has sponsored a project at C-DAC for study of an area in Chitradurga District using multi-spectral and panchromatic data. The scope included preparation of geological and structural maps at 1:50,000 scale, demarcation of alteration zones, establishing drainage patterns and identification of potential blocks of gold mineralization. In the second phase, an exhaustive study has been carried out in the potential blocks using finer resolution satellite data, and detailed geological and structural maps at 1:25,000 scale have been prepared. Potential blocks of gold mineralization have been demarcated as the result of the investigation.

Portfolio Management System

C-DAC bagged a global contract for developing a **Portfolio Management System** for the State Investment Corporation, Mauritius. C-DAC progressed on the development of the system, named AssetAnalytics, as an integrated solution that focuses on the various dimensions of portfolio management, by enabling users to construct, monitor and manage financial portfolios.

AssetAnalytics offers readymade and automatic solvers based on OLAP (On-Line Analytical Processing) techniques, and the results of multi-dimensional analyses are presented in a cogent manner through textual and graphical reports.

Telemedicine

C-DAC is working towards deployment of the developed Telemedicine software, and is formulating proposals with the State Government of Kerala to deploy Telemedicine Network in the state.

C-DAC has entered into a MoU with Apollo Telemedicine Network Foundation (ATNF), wherein C-DAC will provide its telemedicine solution and Apollo will provide super-specialty health services, implementation services and operations & management services. C-DAC & Apollo together have proposed setting up of Telemedicine Services in the North Eastern states.

A major repeat contract order was received from the Power Grid Eastern Region for upgradation of the existing COPS SCADA system at Kolkata.

A Power System Automation Project for Bhilai Steel Plant (BSP) of the Steel Authority of India (SAIL), is jointly being executed by C-DAC.

C-DAC's GIST group bagged some prestigious contracts for software products and solutions. These cover - Department of Atomic Energy for ISM Office, Central Bank of India for LEAP Office, Standardization at IT@School, Kerala , Standardization of LEAP Office at Govt of Jharkhand, Standardization of LEAP Office at BSNL, Karnataka Circle, Standardization of LEAP Office at Syndicate Bank, Standardization of ISM at Pondicherry Survey Department.

To leverage on the reach and popularity of the television broadcast medium, GIST developed the MPEG playout application called SPOT (Seamless Playout for Telecast). Automation systems were enhanced to provide support for multilingual prompters, tickers.

A pilot project was under taken by the C-DAC, GIST Group for translation of the documents from Russian to English language.

C-DAC, Noida

C-DAC Noida was appointed as the preferred technology partner for the Northern Railways for application software development and business process engineering. Under this assignment, it has developed major systems for the Northern Railways, which included :

Integrated Transaction Accounting System (ITAS)

The system has been successfully implemented in ITAS at 7 Workshops and various Divisions of the Northern Railway. Based on the success of the phase 1 and 2 of the project, a Work order for ITAS implementation & customization for **North Western Railway** at H.Q Jaipur has also been received.

Civil Engineering Management Information System (CEMIS)

The system has been developed and implemented for Northern Railways at HQ, Baroda House & Delhi Division. The Material Management Information System module of CEMIS has also been implemented at Secunderabad, Bhusaval and Bikaner Divisions.

Security Management Information System (SMIS)

The system has successfully been developed and implemented at HQs and various divisions of Northern, Central and Southern Railways.

Personnel Management Information System (PMIS)

The system has been developed and implemented at the HQ (Baroda House) and Delhi Division of Northern Railway.

Human Resource Management for ITDC

An integrated application package to take care of the various needs of the HR Development Department of ITDC, was developed and implemented.

Inventory and Sales Management System for India Tourism Development Corporation (ITDC)

An integrated system covering Sales, Purchase, Costing, Indent, Inventory, MIS, Exception Reports for the ITDC duty free shops at various International Airports was taken up for implementation on a turnkey basis. The project is nearing completion, and is also extended to applications for Tax Free and Duty Paid shops.

Financial Accounting and Payroll System for Hospital Services Consultancy Corporation (HSCC)

HSCC, a public sector unit takes up turnkey projects to set up big hospitals across the country. The reference package developed for the HSCC comprised of Financial Accounting, Voucher Entry System, Day Books, General Ledger, Trial Balance, Balance Sheet, Profit & Loss Account, Cost Center Reports, Payroll, Income Tax, MIS.

Human Resource Management for HSCC

An integrated application to address the needs of HR development of the HSCC, covering Recruitment, Employee Joining, Probation, Transfer and Deputation, Increments, Annual Confidential Reports, Leave Management, Promotion, Emoluments and Entitlements, Disciplinary Details, Property Returns, Post Based Roster, Training, MIS Reports and so on. was developed and deployed.

Loan Accounting System for Apex Corporation of National Finance Development Corporation. (NFDC)

A Loan Accounting & MIS system is under development for the five Apex Corporations of NFDC viz. National Backward Classes Finance & Development Corporation (NBCFDC), National Minorities Development & Finance Corporation (NMDFC), National Scheduled Classes Finance & Development Corporation (NSFDC), National Handicapped Finance & Development Corporation (NHFDC), National Safai Karamcharies Finance & Development Corporation (NSKFDC),

IT Infrastructure Management and Services

C-DAC is providing IT infrastructure management services to the Greater Noida Authority, Noida Authority and Press Trust of India (PTI). A news Room Automation System was also developed for the PTI.

A major system integration and networking project for the School of Planning and Architecture, New Delhi was undertaken and completed successfully.

C-DAC, has been also offering services such as, DialUp (PSTN) , DialUp Leased line (wired) , Leased line (wireless) , VPN services , Website hosting , Website designing , Mail services , FTP Server space and Data base hosting

GIS / Geomatics

C-DAC bagged an order from the Delhi Development Authority for developing a GIS based Land Management Information System. The project involves land records automation, acquisition and utilization of land and vectorization and digitization of maps. All these modules are fully integrated through GIS stream for ease of usage. The system has been developed and implementation is in progress.

Decision Support System for AICTE

A study for a GIS based Decision Support System for All India Council for Technical Education, New Delhi was undertaken.

C-DAC, Kolkata

Billing Application Software for Kolkata Telephones

C-DAC developed a comprehensive billing software for Kolkata Technologies. The developed software serving above 1.5 Million subscribers and taking care of WLL Billing, DIAS Billing and various other perfective and enhancement jobs were successfully completed as required by Kolkata Telephones.

C-DAC Mohali

Project: DC drive for Trident group, Sponsored by: Trident Group (Pvt. Ltd.),
Project: Electronic Control Panel for Diesel Generators, Status: Field trials in progress., Sponsored by: Meera & Co, Ludhiana

C-DAC, Bangalore

C-DAC, Bangalore successfully implemented the **Municipal Corporation e-Governance suite for Karnataka Urban Infrastructure & Finance Corporation (KUI&FC).** A major order for software development from the Directorate of Collegiate Education (DCE), Directorate of Technical Education (DTE) and SCERT from Kerala Government was also received by C-DAC, Bangalore.

Indian Art Preservation

The Indian Art Preservation Research Project was initiated together will Hewlett-Packard Labs, India. The aim of the Project is to initiate a philanthropic effort aimed at the preservation and subsequent dissemination of India's national art treasures. The project has been conceptualized as a three-way collaboration between Hewlett-Packard (represented by HP Philanthropy and HP Labs in Palo Alto, USA and India), Centre for Development of Advanced Computing – C-DAC (represented by the Digital Library group in Bangalore) and the Department of Culture – DOC, Govt. of India (represented by National Gallery of Modern Art (NGMA) – New Delhi).

C-DAC Mumbai

Calypso, A Distributed Control System for INSTAR

The Calypso system allows its users, who are mostly Aerospace Engineers from ADA Bangalore, to carry out various analysis tasks in a network transparent manner. It supports features like job pipelining, monitoring and control of job progress, an easy to use interface and customization of job execution. The software makes use of n-tier architecture composed entirely of public domain components. To carry out many tasks with minimum overhead to the network, it uses innovative protocols to communicate between Calypso services. Entire tracking, visualization, control and management of complex jobs spanning entire ADANET can be done by sitting at a single client machine with a web-browser. The project is supported by Aeronautical Development Agency (ADA), Bangalore.

Mumbai University Certificate Project

This project involved processing, automatic generation and printing of the Mumbai University Degree Certificates in bilingual format (Marathi and English). In the reporting year, more than 70,000 certificates have been created.

Mulyaankan: Data Mining System for Discrepancy Detection

Mulyaankan is a data mining application developed for the Department of Valuation (DoV), Customs for detecting discrepancies in import records. It has now become part of the NIDB (National Import Database) project of the Customs Department. Mulyaankan was presented in the conference of Customs Departments of Commonwealth Nations The work is now nearing completion.

Collaborative Projects with Fraunhofer Institute of Computer Graphics, Germany

C-DAC, Mumbai has been an invited partner in a number of development projects initiated at the Fraunhofer Institute of Computer Graphics, Germany. These involve a large R&D component in front-line areas such as image compression. Some of the major activities undertaken are listed below.

- EMBASSI Project at ZGDV, Darmstadt: The EMBASSI project has been initiated to develop a suite of technologies that assist common people in interacting with consumer devices in their daily life. It addresses the need for developing simpler user interfaces for complex and feature-rich devices. The promising software agents and multi-modal, natural, user-oriented and non-intrusive user interfaces form the key technologies in EMBASSI architecture. C-DAC participated in the development of the Context Management System of the project.
- 3D Geometry Compression: Computer-supported co-operative CAD systems require rapid Real Time exchange of large and complex geometric models across the workstations of the cooperating engineers/ designers. 3D geometry compression and decompression algorithms were implemented into the cooperative CAD system for rapid exchange of polygon mesh models.
- Visualization of city models using Java3D: Geometric information of urban heigh-fields captured by remote sensing satellites is used to create coarse city models for visualization and mapping. As a part of this project, Java3D based software was developed for interactive visualization of the city models.

Bed Form Characteristics with Varying Discharge Intensities and Depth Flow

A PC based laboratory-automation solution to study sediment-movements and river bed-forms in a mobile bed condition was developed. The integrated system supports a propeller-type water-current meter and a servo-based falling rod bed sensor that are housed on a motorized carriage. A Virtual Instrumentation based Software package monitors sensor movements and collects and presents all the research data. The project is sponsored by the River Research Institute, Government of West Bengal.

Micro Processor based Excitation and load control Module for Diesel Locomotives

Under a contract for BHEL the excitation and load control module was designed to operate in conjunction with a suitable brushless type alternator and wodward make EGP3 / EG1PC type fuel actuators mounted on diesel engines. The control system regulates the alternator excitation on a particular speed notch, in such a way as to maintain constant KW output from alternator and thereby constant HP from diesel engine even with varying current output fed to traction motors. Additionally engine speed on any particular notch shall be constantly maintained from full unloading to loading.

Eurostack I

The Eurostack 1 contract from M/S Securicor Wireless Technology (SWT), UK is for the development of a protocol stack for TETRA- the ETSI standard for professional mobile communication. The stack is capable of supporting Voice and data communication in Trunked Mode and voice communication in Direct Mode operation. The scope also covers the development of Peripheral Equipment Interface to the Mobile Station, based on AT commands.

The design has been implemented using SDL (Specification Description Language) and is being tested in the TETRA Radio of M/s Niros Telecommunication A/S, Denmark.

Eurostack II

The Eurostack II contract is another prestigious project from M/s Software Radio Technologies (SRT), UK. The project aims at the development of a TETRA protocol stack software for Mobile Station (MS) which allows MSs to transfer IP Packet data between an attached Terminal Equipment (TE – e.g. Laptop) and any IP network including Internet, through Tetra network infrastructure. In addition to the packet data support, existing Tetra V+D protocol stack has to be upgraded to be compliant to the latest Tetra Interoperability Profile (TIP- 3) published by TETRA MoU.

EDUCATION & TRAINING

C-DAC's education and training programmes are designed to build and mobilize skilled human resources in advanced Information Technology areas to serve the needs of the IT sector and its in-house requirement of diverse development projects.
Its education and training programmes received a boost following the merger of ER&DCI, NCST and CEDTI (Mohali) with C-DAC. The diverse range of courses offered by the centres of C-DAC are detailed here.

C-DAC, Mohali carried out the following education & training courses :

- **M.E. in EPDT (Electronic Product Design & Technology)**

- The 25th Silver Jubilee **"Technical Entrepreneurship Development Programme"** as a sponsored project of the Deptt. of Science and Technology, New Delhi and two **Entrepreneurship Development Programmes** for the VRS employees of Central Public Sector Undertakings under the sponsored CRR project of the Deptt. of Public Enterprises, Ministry of Heavy Industries and Public Enterprises were co-ordinated by C-DAC, Mohali.

- Two **Entrepreneurship Counseling Camps** at HMT, Pinjore and Panchkula to initiate entrepreneurial career planning among the central PSU employees were organized. These were sponsored CRR projects of the Deptt. of Public Enterprises, Ministry of Heavy Industries and Public enterprises.

The other full fledged courses included

- International advanced courses sponsored by the **M**inistry of **E**xternal **A**ffairs under the **S**pecial **C**ommonwealth **A**frican **A**ssistance **P**lan and **I**ndian **T**echnical and **E**conomic cooperation programme (ITEC-SCAAP)

- Advanced Course on Multimedia and Web Design Technology and courses covering

Networking and CADD Engineering, Repair and Maintenance of Telecom Equipment & Computers, Bio-Med Course for WHO Fellow (Sponsored by World Health Organization) and Bio-Medical Equipment Technology and Maintenance (one student sponsored by a NGO from Nepal), Hardware Electronics And System Design, Application & Programming of PLCs and Drives, Enterprise Networking & System Maintenance Engg.

C-DAC Hyderabad initiated three new courses :

- **Diploma in Embedded Systems Design Course (DESD)**

The centre has established the Embedded Systems Design Lab with AVR, ARM & DSP kits. The course covers RT Linux, COS, Device drivers and porting of OS on to different hardware platforms. The Centre has successfully completed the training of two batches of students.

- **Advanced Diploma in Bioinformatics (ADB)**

The Advanced Diploma in Bioinformatics course was initiated jointly with Indian Institute of Chemical Technology (IICT), Hyderabad as part of a MoU. The MoU also proposed to explore applications of Public Health Control & High Performance Computing with IICT.

- **Diploma in Internetworking & System Administration (DISA)**

The centre has also successfully initiated the Diploma course in the area of Internetworking & System Administration.

C-DAC, Bangalore (Electronics City Centre)

C-DAC, Bangalore, (EC) offered the Full-time Post-Graduate Diploma in Advanced Software Technology (FPGDST) and Post- Graduate Diploma in Software Technology (PGDST).

C-DAC, Noida Post Graduate Degree Programmes

The education and training activities at C-DAC, Noida are categorized as -

- The Post Graduate programme M.Tech.-(IT) with IIT Roorkee was continued. The first batch of 60 students passed out during the year 2002-03.

- Approval has also been obtained for starting the M.Tech (Computer Science) Programme in affiliation with the GGS Indraprastha University. The first batch is scheduled to commence from the academic year 2003-04.

- The first batch of MCA students passed out with 100% results.

- C-DAC, Noida also continued the Post Graduate Diploma Programmes in Advanced Software Design & Development (PGDASDD), VLSI (PGDVLSI) and Diploma in System & Database Administration (DSDA).

- In addition to the above, a number of professional programmes in current technologies were conducted during the year. These included Oracle Data Warehousing, Enterprise Resources Planning (ERP) modules, People Soft (HR), Enterprise Network Management System and so on.
- Customized Corporate Training Programmes were organized for Indian Air Force, National Informatics Centre, Department of Agriculture, Ministry of Agriculture, Central Soil & Materials Research Centre, Ministry of Water Resources, Department of Fertilizer and Department of Official Language.

C-DAC, Pune

The Advanced Computing Training School (ACTS) with its Resource Centre at Pune conducted the following courses:

- **Diploma in Advanced Computing (DAC)**

The Diploma in Advanced Computing course, prepares graduates for the software industry and provide them with higher value skills in tools and methodologies of software development.

- **Diploma in Information Technology (DIT) and Advanced Diploma in Information Technology (ADIT)**

These Diploma courses in Information Technology cater to the needs of Students, Teachers, Executives, Government Employees, Businessmen, Professionals, Housewives, Senior Citizens and all those who want to make intelligent use of computers. The course incorporates emerging trends in Information Technology and the requirements of the modern software based society

- **Diploma in VLSI Design (DVLSI)**

ACTS, in association with C-DAC's Hardware Development and Engineering Group, offers nationwide Diploma in VLSI Design Course.

- **Diploma in GeoInformatics (DGI)**

The Diploma in Geoinformatics aims to provide conceptual knowledge on GIS and related fields, and hands-on training in GIS, digital image processing, digital photogrammetry, digital cartography, GPS and RDBMS. The course contents have been designed keeping in view the emerging trends in the field of Geoinformatics and the emerging needs of skilled manpower.

- **Graduate Diploma in Emerging Information Technologies (GraDE IT)**

GraDE IT provides the user the option of choosing one or more of the several Diploma or Certificate courses that suit his/her requirement. The flexible structure of the programme allows the students to choose and complete the courses of their choice according to their convenience. A unique credit system also allows the students to leverage their existing computing knowledge and to continually upgrade their skills at a speed convenient to them.

- **Multimedia, Graphics and Computer Arts Courses**

ACTS, in association with C-DAC's Multimedia Creations Team, offers various courses in the field of Computer Arts viz. Diploma in Advanced Computer Arts and Diploma in Multimedia Creations.

- **HIYAKU-IT JTP**

The Hiyaku-IT Japanese Training Program (IT JTP) has been jointly developed by C-DAC and M/S Softbridge Solutions of Japan, to train and groom experienced Indian software developers by imparting advance Japanese language skills and Japanese cultural knowledge to be effective and successful in a Japanese IT work environment.

- **Maharashtra State Certificate course in Information Technology (MSCIT)**

This course have been offered through an Authorized Training Centre (ATC's) of C-DAC in the state of Maharashtra to address the specific requirements in the State Government and others.

- **e-Learning Initiatives**

Among the various Learning Management Systems developed in C-DAC are e-Sikshak and eVidyapeeth.

e-Shikshak is a e-Learning tool developed at C-DAC, Hyderabad.

eVidyapeeth is C-DAC's component-based and scalable "e-Learning Infrastructure Suite" developed at Pune. It is designed with a vision to transform the internet into a powerful environment for teaching and learning.

Evaluator is an Online Examination System to handle thousands of student registrations and testing and processing of results. It has a built-in facility for adaptive testing engine as well as security for distributed applications.

Learning Management System is the delivery engine for courseware, live class sessions, discussions, examinations & quizzes and student tracking.

ERP and Publisher are add-ons to the eVidyapeeth Suite for a complete automation of a University enterprise, ranging from registrations, examinations, fee administration, inventory management, grants administration, placement services and so on.

IT Enabled Services

The Educational Technology group of ACTS carried out the Pre-selection process of Software Engineer Trainees for ICICI Infotech Ltd successfully through an on-line examination.

PACE – (Programme for Advancing Computer Education)

With an objective of proliferating the use of Indian languages on the computer, GIST cameup with the PACE training programme, which was managed by the Implementing Agencies and State coordinators.

To keep pace with the developments, completely new procedures and guidelines were reestablished, which helped in stabilizing the activity and its growth. Today, PACE offers a variety of course options using the multilingual platform thus making it a unique programme.

PACE had a network of 400 centres in the year 2002-03 and also conducted the School Computer examination programme, with a view to proliferate multilingual technologies at the grass root level by conducting exams in IT (inclusive of Multilingual technologies) for school students as per school board syllabus.

C-DAC, Mumbai

- **Long-Duration Software Education Programmes**

C-DAC, Mumbai conducts a number of very popular education programmes in software technology and related computer science at the post-graduate level. Participants enroll in these programmes, based on their performance in a nation-wide written CST examination.

- **Distance Education Programme (DEP) with IIT Bombay**

C-DAC Mumbai has worked closely with the Kanwal Rekhi School of Information Technology (KReSIT), IIT Bombay in planning, designing and developing a distance education programme based on synchronous lecture mode.

- **Post-Graduate Diploma Courses**

The following post-graduate diploma courses were conducted during the year :

  - Post Graduate Diploma in Internet Technology (PGDIT)
  - Post Graduate Diploma in Software Technology (PGDST)
  - Full-Time Post Graduate Diploma in Software Technology (FPGDST)
  - Advanced Post Graduate Diploma in Software Technology (APGDST)

- **Short-Duration Professional Education Programmes**

These are full-day courses, typically of one or two week duration with equal emphasis on concept level sessions and on hands-on technology acquisition sessions. These are attended by different segments of the software and IT industry. Professionals from government and academic institutions also attend some of these courses.

- **Competence in Software Technology (CST) Examination**

The Competence in Software Technology (CST) Examination was held on January 19, 2003 at 15 venues. The total number of candidates who took the CST-2003 examination at all the 14 centres was 5365. Candidates who took the CST-2003 were able to utilize their scores for seeking admission to the M.C.A. courses.

COMPUTER EDUCATION & TRAINING PROGRAMME (CE&T)

This programme has three main streams namely (a) In-house Training Programme (b) Outsourcing CE&T through licensing. (c) Training Programme for Instructional Engineering Staff

- **In-house Training Programmes**

The In-house training programme streams are Basic Computer Proficiency Programme compressing the Post Graduate Diploma in Computer Applications (PGDCA) and Integrated Management Programme in Information Technology (IMPRINT) Courses, Education in High-end Platforms covering IBM Mainframe & Oracle Platforms, Skill Development Programmes and Formal Computer Education Programmes.

Outsourcing CE&T through licensing

Under licensing, ACETC (Authorized Computer Education & Training Centre Programme) and Quality Improvement Programme for Instructional Engineering staff have been initiated.

C-DAC Mumbai operates a special scheme of educational affiliates in which it establishes close links with partnering institutions for running their post-graduate educational programmes.

Specific education and training courses conducted were :

- **Interactive Multimedia Content Creation course at Berhampur**

A 6-week training programme on Multimedia was organized jointly with Berhampur Integrated Software Cooperative Society Ltd (BISL), at Berhampur, West Bengal during August, 2002.

- **Executive Training on Security**

An "Executive Training on Security" programme was organized in association with Electronics Regional Test Laboratories, East (ERTL, East) and Jadavpur University during September, 2002. Participants from the sponsoring Agencies, the Department of Information Technology (DIT), Government of India attended this training programme.

- **Working Conference on Virtual Instrumention (VI) of National Instrumentation, USA**

A 2-day working conference with hands-on experience was held at the Centre in December, 2002 on "Virtual Instrumentation".

- **Teachers Training programme for Vidya Vahini project**

A Teacher's Training Course under the Vidya Vahini project of the Department of Information Technology (DIT), Government of India is continuing at the Centre since December 30, 2002.

C-DAC, Thiruvananthapuram

The ER&DCI Institute of Technology (ERDCI IT) was established in the year 2001 and started the MCA programme with the due approval from AICTE. The Institute is located in the campus of C-DAC Thiruvananthapuram.

The ER&DCI Institute of Technology is affiliated currently to the Cochin University of Science and Technology.

Currently the Institute runs two batches of sixty students each for the MCA programme (3 years course – six semesters). The first batch had begun during 2001 – 02 academic year and the second batch has begun during the academic year 2002 – 03 and the intake has been sixty students as approved by AICTE. This apart, the Centre runs specialized training programmes on IBM Mainframe, VLSI design and Software technologies.

Seminars on Network Security

C-DAC conducted a one-day National Seminar on Network Security "Enterprise Suraksha-2002" on December 12, 2002. The objective of this seminar was to bring together the security solution providers and user agencies to share the current scenario in the area of enterprise network security. Around 50 participants from various organizations like CAIR Bangalore, ITC Kolkata, SBIICM Hyderabad, ICS Hyderabad, HCL Chennai, CETE Hyderabad, DRDL Hyderabad, MagnaQuest Hyderabad, Jadavpur University Kolkata, APTS, Hyderabad, Globarena Hyderabad, ECIL Hyderabad attended this seminar.

Two e-Learning workshops were conducted. The first one-week workshop on **"e-Learning through Web Technologies"** was conducted during July 8-12, 2002. In this workshop emphasis was on eLearning technologies, tools, Standards, Collaborative learning and content creation using editors like FrontPage, Interdev and Flash. The second one-week workshop on **"XML in eLearning"** was conducted from August 5-9, 2002. This five-day workshop covered the various aspects of XML, use of XML in e-Learning tool development and in e-Learning standards (SCORM).

Consultancy

C-DAC has been retained as a Consultant to a number of State and Central Govt agencies, Universities, Banks and other public sectors, venture capital firms and software companies. The nature of consultancy extends from setting up of Wide Area Networks, Specialized banking applications, Campus wide Local Area Networks, Computerization of Stock Exchanges and setting up of large heterogeneous computer networks, Design and integration, conducting feasibility studies for Power Plants and so on.

Technology & Infrastructure Services & Facilitating Activities

Human Resources Development

HR interventions remained focused towards organizational requirements and continued to move ahead & fulfilled the mandate of providing member friendly, transparent and open culture with an environment conducive to research as planned for the year 2002-03.

The HR interventions during the year, involved setting up of a new appraisal process, conducting Employee Satisfaction Survey and so on. Refresher Training remained a focused area for employee development. A total of 925 C-DACians were trained through 104 internal & external training programmes, both technical and soft skills.

C-DAC strongly believes that in addition to the employee, his/ her spouse is also an important member of the organization. As such, the HR welcomed a total of 32 newly weds to C-DAC by organizing newly weds events in the form of social get togethers at Pune, Delhi and Bangalore during the year.

A long felt need of the C-DAC members was fulfilled when HR released its first comprehensive **Employee Manual** as a compendium for reference incorporating various employee related policies, procedures and processes.

As a follow up of the Vision and Mission interventions held in 2001, C-DAC evolved its core values through brain storming sessions during 2002-2003 with its various members.

The HR, through C-DAC's developed and customized HRIS Modules for various HR systems, is ensuring CMM compliance and has come out well in the first such internal audit conducted in-house by the Software Engineering team.

Despite the annual attrition rate hovering around 9 to 12 %, C-DAC has ensured retention of its critical manpower and almost all the projects were delivered on time. Currently the HR is actively involved in the post merger integration process trying to complete the major task of integrating approximately the 2000 human resources of the three merged societies with the mainstream of C-DAC.

Technical Affiliate Scheme

C-DAC's National PARAM Supercomputing Facility (NPSF) within the Pune University campus in the Science & Technology Park provides supercomputing facilities to industries, research and academic institutes in India that need such a facility to process their diverse compute intensive applications. The PARAM 10000 installed at NPSF is one of the two supercomputing facilities in India set up by C-DAC.

The other and more recent one set up by C-DAC is called C-DAC's Terascale Supercomputing Facility (CTSF) and is located at C-DAC's Knowledge Park in Bangalore. The facility houses C-DAC's latest PARAM Padma, a terascale supercomputing system. Secured remote assess facility is available both at NPSF and CTSF for those users who wish to use the PARAM system remotely by establishing adequate connectivity bandwidth as per their requirement.

Several internal as well as external users including those from the Institute of Computer Aided Design (ICAD), Moscow, Satyam Computer Services Ltd., Pune, Indian Institute of Chemical technology (IICT), Hyderabad, Indian Institute of Technology (IIT), Kanpur, Indian Institute of Technolgy (IIT), Delhi, Tata Institute of Fundamental Research (TIFR), Pune, National Centre for Medium Range Weather Forecasting (NCMRWF), Delhi, Indian Institute of Topical Meteorology (IITM), Pune, National Chemical Laboratory (NCL), Pune, Institute of Mathematical Sciences (IMSc), Chennai and some of the departments of Pune University have availed of the facility during the year.

A Technical Affiliate Scheme has been created at C-DAC, Mumbai for promoting co-operation with software houses, manufacturers, R&D establishments and major users of Information Technology.

Database of Software Professionals (DSP)

Database for Software Professionals (DSP) compiles career information about all candidates who take C-DAC Mumbai's Competence in Software Technology (CST) examination. This database is accessible over the Internet for companies looking for assistance in recruitment.

DNS Activities

C-DAC, Mumbai is the Domain Registrar for the country code top level domain ".IN" for India. Domain Name registration activities are supervised by the Internet Management Group (IMG), a committee formed by order of the Govt. of India.

Quality Initiatives and Knowledge Management

Enterprise Knowledge Portal for C-DAC, Thiruvananthapuram

C-DAC has created a Knowledge Management Cell to create a database on its knowledge products, regular follow up of information on patents/ copyrights in the related areas, organization of Patent search activities and Workshops.

An internally supported project aiming at the creation of an Enterprise Wide Information Portal in C-DAC, Thiruvananthapuram to promote a collaborative and knowledge sharing culture among the employees of the organization was taken up. Development of a Knowledge Repository regarding the Research and Development activities of C-DAC, Thiruvananthapuram to encourage the employees to improve their productivity and the quality of their services is a primary goal of this development.

Quality initiatives

It is noted that C-DAC was first among the R&D institutions of the DIT to acquire the ISO quality certificate for its software development activity.

Keeping in view the diverse activities in C-DAC, it was understood that the two well established international standards viz. ISO 9001 : 2000 and CMM shall be implemented to bring out overall quality improvement in C-DAC. Accordingly it was decided that the groups involved in software development shall follow CMM methodology and groups involved in hardware, firmware, production, purchasing, system administration, corporate communications shall follow ISO 9001 : 2000 methodology.

As the first step the Software Engineering Process Group (SEPG) was formed for CMM implementation and the Quality group for ISO 9001 : 2000 implementation. A detailed study of existing processes in C-DAC was done and the processes were mapped against respective standards. The process manuals for groups were written down and reviewed in detail. To add strength to the reviews, assistance was taken from external agencies viz. KPMG for CMM processes and STQC for ISO 9001 : 2000 processes. After much deliberation the process manuals were finalized, formally approved and released during the months of September and October 2002. Immediately following that, the various groups started practicing these manuals in projects undertaken by them. This practical experience threw more light on the processes and are being fine tuned further.
Training was imparted to select people from various groups. A five days course on CSQP, a two days course on ISO 9001 : 2000 internal auditors training, a three days training course on Project Management techniques deserve mention.

At this stage the implementation activities have gathered momentum and shall continue and lead to CMM and ISO 9001 : 2000 certifications.

IPR Applications filed

C-DAC attaches significant importance to the knowledge products that it creates and protects for commercial exploitation. The following specific Patents/ Copyrights were filed during the year.

- Copyright has been filed for the Software titled "SAMPADAK" – "Punjabi Word Processor with Spell Checker under MS-Windows" in the name of CEDTI, Mohali (Now C-DAC, Mohali).
- A patent on "A method for strategy independent optimization of a multi-objective function of a portfolio containing at least one investment" has been filed both in India and the USA
- Copyright has been applied for the BourseAnalyzer software
- Copyright has been applied for the AssetAnalytics software

Altogether, 5 Patents, 35 copyright, 52 Trademark and 4 Design registrations were submitted by C-DAC during the year.

Hindi Cell

With a view to strengthen the usage of Hindi particularly in IT, C-DAC developed tools and technologies using natural language processing. Downloads of some of the newly introduced packages are available at http://www.cdacindia.com. C-DAC centres also introduced various administrative forms and literature in Hindi.

Library

The C-DAC Libraries are well equipped and automated. At C-DAC, Pune, the Library functioning is performed using the Library Management Package – Libsys.
Apart from regular activities like procurement of books, subscription to journals, circulation of books and journal issues, binding, processing and circulation of softwares and so on, reference service is provided to the staff with the help of the Libsys database, online searches and Inter Library Loan.

Special activities of the Library include an e-clippings service, Knowledge Management Repository and an Index to the Electronics Information Planning (EIP) journal of the DIT.

Customization of the Library software package includes reminder on e-mail, return receipt on e-Mail, separate Linux server for web OPAC, web based library catalogue, e-resource facility and so on.

IT related news items from daily newspapers are sent daily by e-mail to over 500 C-DAC and DIT members. The Vruttanta software was introduced for easy compilation and search of news items.

KM software 'Kalpataru' is a information repository with categorized tree structure. It is a platform for sharing and contributing information, innovation & ideas within C-DAC.

Index to content pages of DIT journal – 'Electronics : information and planning' for the period 1973-2000 is available on a CD.

The C-DAC, Pune Library plans to share and extend the existing resources to the Libraries of newly merged C-DAC centres.

The **C-DAC, Mumbai, Library** has one of the best collections in the field of Computer Science. The total library collection now consists of 13500 documents and the library now subscribes to approximately 200 periodicals along with a subscription to ACM's Digital library.

Vigilance, Grievances and Liaisons

As per the directives of the Government, a vigilance officer oversees the vigilance related issues at all the centres of C-DAC. Senior members have also been nominated to function as Grievance officer & Liaison officers for reserved category members.

Conferences Organized

HPC Asia 2002

C-DAC and ACS (Advanced Computing and Communications Society) of India formally organized HPC Asia 2002, the 6th International Conference / Exhibition on High Performance Computing in the Asia Pacific Region during December 16–19, 2002 at Bangalore. The conference received a tremendous response from the Industry and academia and provided a forum for the exchange of ideas and trends in HPC by international experts. The exhibition provided an opportunity for participants to showcase their products and technologies. C-DAC's PARAM Padma, the next generation high performance scalable computing cluster with a peak computing power of one Teraflop was also showcased at the exhibition.

International Conference on Knowledge Based Computer Systems (KBCS-2002)

C-DAC, Mumbai has been organizing the KBCS series of bi-annual conferences in Artificial Intelligence for nearly a decade now.

This time the conference received over 200 research papers from India and abroad, from which about 50 were selected for presentation based on careful blind refereeing. The conference was held with three-way parallelism during December 18-21, 2002 at the newly setup R&D campus at Navi Mumbai. ICON-2002, the first international conference on natural language processing was also held in parallel with KBCS'2002 together catering to over 200 delegates.

International Conference on Online Learning, Vidyakash-2002

As part of the ongoing Vidyakash project funded by the DIT, an international conference on online learning – the first international event in this area in India was organized by C-DAC. The conference was held during December 15-17, 2002 at the newly established R&D campus of C-DAC at Navi Mumbai.

Workshops, Seminars & Exhibitions

Following Workshops/ Seminars were organized by C-DAC in its specific areas of interest

- A four days workshop '**Gyanaudyog**' was organized during April 7-10, 2002. The workshop was inaugurated by Shri. Rajeeva Ratna Shah, the then, Secretary, DIT. Housewives, students and women interested in entrepreneurship using IT applications participated in this workshop. They were given hands on training related to various aspects of using computers in Hindi.
- A National Workshop on Custom Power Devices was organized at the Indian Institute of Science (IISc) Bangalore on June 13, 2003.
- A workshop and training programme was conducted on Application of CFD simulation in industries during June 24 – 28, 2002.
- A four-days workshop on "Parallel Computing – Optimizing Performance of Parallel Programs (PCOPP-2002)" was conducted at Pune in June 2002 for the benefit of scientists and engineers working in the area of parallel processing. The main objective of this workshop was to deal with important issues in the performance of parallel programs for large-scale scientific and engineering applications.
- A workshop on **Genetic Algorithms for Bioinformatics** was conducted on August 16, 2002 in Pune.
- An **OCR (Optical Character Recognition for Indian Languages) Meet** was organized at C-DAC, Noida during September 5–7, 2002.
- In October 2002, C-DAC conducted a Parallel Processing workshop at the Indian Institute of Technology (IIT), Delhi, which was attended by about 30 participants.
- A series of IPR Awareness Programmes were conducted during the year inviting experts to deliver lectures on various aspects of IPR and Knowledge Management in R & D institutes.
- Organized "Career Options – 2002" at Chandigarh.
- A workshop on **"Business Development through IT for Hosiery and Knitwear Industry" at Ludhiana,** under a jointly sponsored project of the Small Industries Development Bank of India (SIDBI) and the State Bank of India
- A workshop on **"Cyberpreneurship Development" at Shimla** for the benefit of STD/PCO operators under the jointly sponsored project of the DIT and Small Industries and Development Bank of India (SIDBI)

Exhibitions

- Participated in ELITEX 2002, a Conference & Exhibition organised by the DIT, Govt of India in New Delhi.
- Participated in the Exhibition at Indian Science Congress held during January 2002.
- Participated in Bangalore IT.com during October 28-30, 2002.
- Participated in Entrepreneurs TechKnow held at Kolkata during November 2002.
- Participated in the India International Trade Fair held during November 2002.
- Participated in the Exhibition at Patna Book Fair held during December 2002.

Communication & Promotional Matters

Recognizing the imperatives and the necessity of communication for enhancing its brand image and building its brand equity, C-DAC has established mechanisms for the management and creation of communications policies, setting up of plans in line with organizational policies and reforms, and strategies for the defining of the overall brand perception.

C-DAC seeks to communicate effectively the initiatives and achievements of the organization, to infuse confidence and enhance the corporate identity of the organization in a bid to create understanding and build support for its objectives, policies and actions. In its internal publics, it covers all C-DAC members spread across the country, DIT and others who have a direct interaction with the organization. The external publics draws into its fold its clients, associates and members of the general public who may or may not have any relation to C-DAC, but could benefit from C-DAC or its activities.
Under this protocol, C-DAC's communication activities involve core areas like Media Relations, Public Relations, Employee Relations, Advertising, Brand Management, Corporate Identity Management, Creating Brochure/ Literature/ Publications, Event Management, Web content and all other activities that constitute a part of the communication process.

C-DAC, being a scientific society, values itself as an organization with its responsibilities transferring benefits of scientific developments to the society and the community within which it exists and perseveres to succeed. It harbors the belief that communication to be effective and successful, has to keep in mind the relevance of the environment in which it communicates and to whom it communicates, to fulfill the ultimate aim of its communication.

C-DAC CONNECT

C-DAC Connect is a semi technical house magazine of C-DAC, currently into its fourth year. Published quarterly, the magazine seeks to assimilate an equal mix of technical articles and topics along with articles of general interest. The magazine has been conceived to serve the varied reading palates of C-DAC members as well as readers external to the organization. It symbolizes the spirit of networking and camaraderie, inherent in each and every member of the organization and captures the effervescence and endeavors of the institution through news, events, initiatives, breakthroughs and achievements.
The year has seen C-DAC Connect cover in-depth and far reaching articles on technical issues like e Learning systems, Grid Computing, Legal protection of software, Storage Area Networks, High Performance Computing, Natural Language Processing, while also providing interesting and captivating content in the form of interviews, member profiles, news, product showcase and so on.

It is a constant effort by the Editorial team of C-DAC Connect led by Shri R K Arora, Executive Editor to maintain the balance in the editorial content to cater to and satiate the interests of the readers, and at the same adhere to the quality standards of C-DAC.

C-DAC Connect epitomizes the mission, vision and values of the organization in both its content and design and as such, is a reflection of how the organization is known and accepted by its publics. It is the voice of C-DAC, unwavering and strong, poised to deliver on its objectives- Information, Knowledge and Entertainment.

C-DAC Connect is one effort to bind members and their families, and provides an opportunity to share knowledge, ideas and achievements.

AWARDS

- **"KARAMSHEEL UDYAMI"** Awards for C-DAC, Mohali promoted Entrepreneurs on the completion of Silver Jubilee EDP
- Coordinators Shri Deepak Rana (PRO) and Shri Harpinder Singh have been awarded **"TROPHY INITIATOR"** by the Secretary, Technical Board of Punjab and Director General CEDTI, New Delhi
- PC Quest Users Choice Award for the sixth successive year for iLEAP
- The Project of the computerization of the processes of the Department of Registration and Stamps, Government of Maharashtra, received the Best Software Application on e-Governance. This award has been instituted by the CSI & Nihilent Technologies
- The website developed for the Public Works Department, Government of Maharashtra received the award for the Best Website on e-Governance.
- The paper titled "KAVERI - 100% Automation at Sub Registrar's Office" jointly authored by Mr. D. Satyamurty, IAS, IGR, Karnataka and Mr. Mujib Shaikh, Team Coordinator, C-DAC received the Gold Medal in the Practitioner's Track at the 6th National e-Governance Conference held at Chandigarh in October 2002.
- Shri S.K. Das Mandal and Smt. B. Pal, from C-DAC, Kolkata, won the first position at the Eastern Zonal Competition for young IT professionals held by Computer Society of India with their research works in Bengali Text to Speech (TTS) Synthesis. Later, representing the Eastern Zone, Shri S.K. Das Mandal received the National Award of the same competition (i.e. young IT professionals held by Computer Society of India) held at Mumbai in March 2003 presenting the same research works.
- Pride of India award at Indian Science Congress where C-DAC's Business Development group hosted a stall
- Display of PARAM Technology at HPC Asia and PARAM Padma award for significant contribution to CTSF.
- Society for Technical Communications, India Chapter, Merit Award to C-DAC's Corporate Identity Manual and GraDEIT Brochure.

Technical Publications

- Mr. Ravinder Singh Zandu, Sr. Design Engineer, presented a paper on "Technology Development for Indian Languages facilitates e-Governance", at the 6th National Conference on e-Governance organized by the Govt. of Punjab at Chandigarh on October 24-25, 2002.
- Sanjay P. Sood & J.S. Bhatia "eHealth accentuates eGovernance", paper presented at 6th National Conference on eGovernance, October 24-25, 2002 at Chandigarh, India.
- Development of Telemedicine Software - Sanjeevani", First Annual Conference of Telemedicine Society of India, October 22-24, 2002 at Lucknow, India.
- Sanjay P. Sood & R.S. Khandpur, "Challenges in Development of an Integrated Telemedicine System in a Developing Country - The Indian Experience", Telemedicine & Telecare International Trade Fair at Luxembourg.
- Sanjay P. Sood, J.S. Bhatia & Dr. Neena Chowdhry, "Correctional Telemedicine in India", Telehealth02, Teleconference organised by Association of Telehealth Service Providers (ATSP) in USA.
- Sanjay P. Sood & J.S. Bhatia, Delivering State-Of -The-Art Health Care to Developing Countries using Telematics : The Issues", ICT2002, International Conference on Health Telematics, at Regensburg, Germany.
- Paper on **"Development of RS232 based indoor communication system using Infrared Pointers"** has been accepted for publication in **AMSE Journal, France**. Ravinder Singh Zandu and Ravi Juneja.
- Sanjay P. Sood , "India telemedicine venture seeks to improve care, increase access" Telemedicine Today (an international magazine on eHealth, published from USA) in October/November 2002 issue.
- Sanjay P. Sood, "Telemedicine on the right track in India", as a Contributing Editor for Asian Hospital and Healthcare Management – Official Journal of Asian Hospital Federation.
- A paper on Novel Software for Spell Checking of Hindi Text, by Shri Karunesh Kr. Arora, was presented at SNLP-COCOSDA held at Hua Hin, Thailand during 9-11 May 2002.
- A paper titled VISHLESHIKA authored by Dr. S S Agarwal, Consultant, and Shri Karunesh Kr. Arora and others was presented during the workshop on 'Spoken Language Processing' held at TIFR, Mumbai during January 9-11, 03.
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- "Bioinformatics Applications on PARAM 10000: Performance study and Problem Solving Environment" CH.Janaki, P.V.Jithesh, Sameer Ingle and Rajendra Joshi. (2002), presented in HPCAsia2002.
- "Motif detection in Arabidopsis using artificial intelligence technique: Correlation with gene expression", paper accepted in the 1st Indian International Conference on Artificial Intelligence to be held in Hyderabad (Dec 2003).
- Invited Talks by Dr.Rajendra Joshi, at Tutorial at HPCAsia2002,
- Invited talk at Indo-US Biotechnology workshop, Biotech Summit 2003, Pune, organized by Indo-American Chamber of Commerce.
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- Chaudhury A., Akuli A. & De S. 'Internet-based Instrumentation with Multimedia Features – Some Development for Technical Education' International Conference on Multimedia Technology and its Applications, Agra, January 2003
- Sengupta S. 'Computer Assisted Pedagogy: An ER&DCI, Calcutta Approach' Vidyakash-2002, Mumbai, December 2002.
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CULTURAL EVENTS

The Centres of C-DAC organized a number of cultural programmes and get-togethers with a view to strengthen the camaraderie amongst members and their families.

These events included C-DAC Noida's Annual Technical festival "Techkriti 2002" during October 24 –25, 2002 and a mega cultural programme on October 26, 2002 at Indra Gandhi Kala Kendra, Noida.

- A cricket match "Global-11 Vs C-DAC-11" between international participants and C-DAC Mohali
- C-DAC Annual Sports Day – 2003 at Mohali
- A Cultural Programme "DEEPFEST" on the eve of Diwali at Mohali
- **Inaugurated "CHILDREN PARK"** for C-DAC Staff Colony at Mohali
- Celebration of Technology Day at C-DAC, Pune, Mohali & Bangalore
- Badminton Tournaments in February 2003 at C-DAC
- In September 2002 Carrom tournaments were conducted in C-DAC
- A Drawing competition for various age groups amongst the school going children was held on 15 August, 2002 at C-DAC
- A Family Fun Day for C-DACians and their family members was held in January 2003 at C-DAC
- C-DAC Pune Sports Day

Acknowledgements

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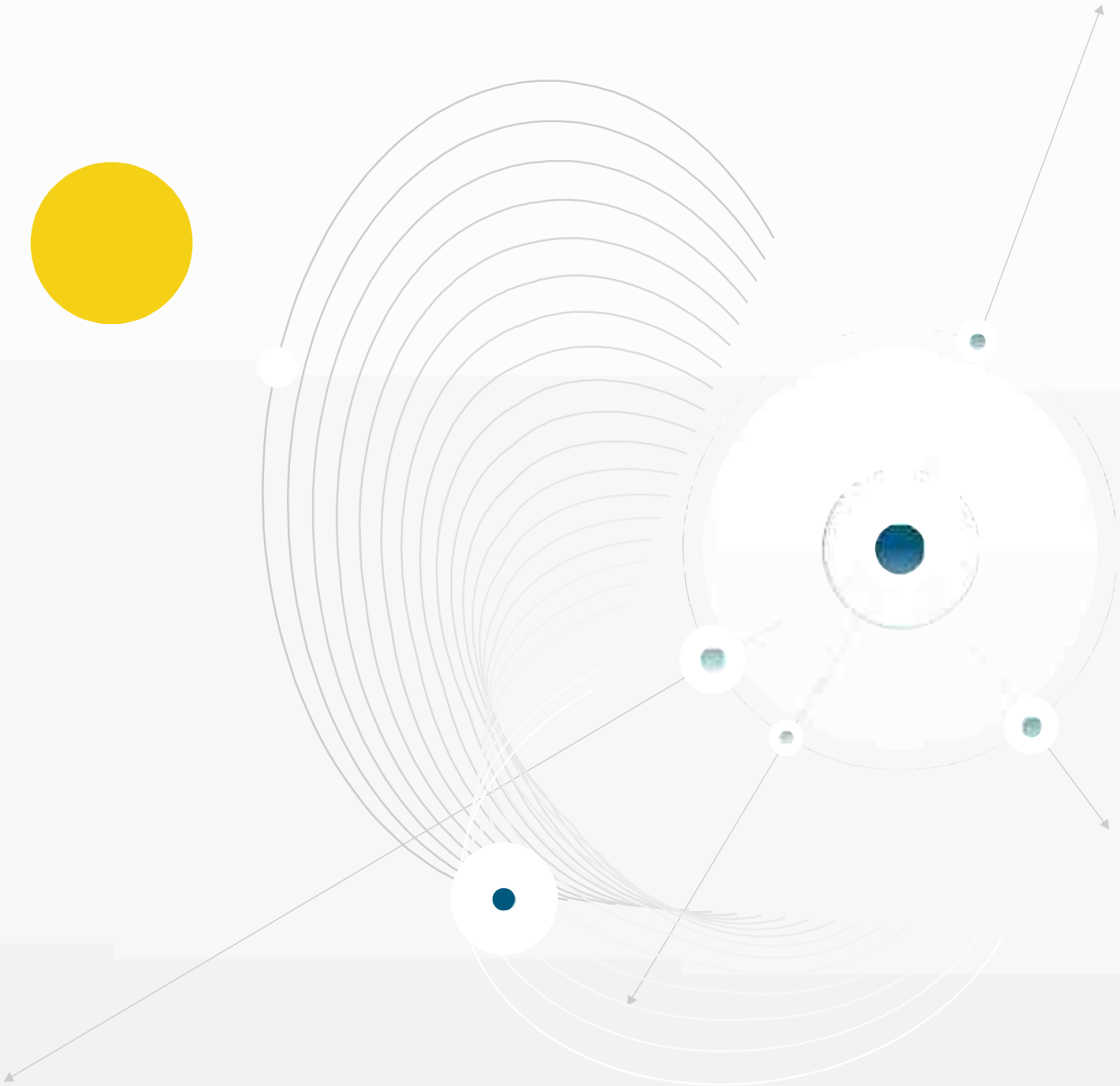

CDAC
CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTING
A Scientific Society of the Ministry of Communications and Information Technology Government of India

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●New Delhi ●Noida ●**Pune** ●Thiruvananthapuram