techzine

C-DAC R&D DIGEST

JULY 2023- SEPTEMBER 2023
VOLUME 1, ISSUE 2 - PART 1

IDEAS TO ACTION | PROGRESS PULSE: A PERFORMANCE DASHBOARD | TECH ROLL-OUTS | SIGNIFICANT CONTRIBUTIONS

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Message from **Director General**

I am pleased to see that second issue of Techzine R & D Digest of C-DAC is getting released. I congratulate the Corporate R&D team for the same as Techzine is enabling to proliferate the research and development activities of C-DAC across various Ministries including MeitY, academia, research institutions, industries and other stakeholders.

This issue of Techzine is being released in two parts; Part-I is focusing on significant activities & achievements during this quarter. Amongst this, one of the momentous contributions from C-DAC is towards launch of Chandrayan-III and Aditya-L1 Mission of ISRO. It is a proud moment for all C-DACians that we have contributed in national level space mission of India.

Part-II of the Techzine is focusing on report of Technology Advancement and Proliferation (TAP) Groups recently constituted for eleven Technology Verticals to evolve technical strategies, mission-based activities and programs, capability/performance enhancement measures, etc. of C-DAC. This report provides an overview of products/solutions developed/deployed in specific technology vertical, roadmap of R&D activities and IPR /ToT, etc. It will enable us to focus R&D activities of C-DAC in these identified technology verticals.

I wish Techzine R&D Digest may leverage multidisciplinary research initiatives & collaborations and appeal all to ponder upon and focus those activities towards contributing to nation building.

Shri Magesh Ethirajan

Message from
Editorial Board

We are happy to see that first issue of Techzine has helped to proliferate the research and development activities of C-DAC across various Ministries including MeitY, academia, research institutions and Industries and other stakeholders.

We are overwhelmed with the response from the teams across all C-DAC centres for providing their inputs for Techzine. While it was challenging for us to incorporate all the contents provided by the teams, we have tried our level best to normalize the same and cover contributions of all C-DAC centres in this issue.

We thank teams from all C-DAC centres for their cooperation and look forward for more innovative, technical, and research-oriented content for upcoming editions of Techzine.

Editorial Board

- Shri Pramod P. J., Head – Corporate R&D, C-DAC
- Shri Manoj Gopinath, Head M&C, Associate Director, C-DAC Pune
- Shri Shripad Shriram Kalambkar, Joint Director, Corporate R&D, C-DAC
- Shri Anant Kelkar, Manager, Corporate R&D, C-DAC
- Shri Sanjay Chakane, Admin Officer, Corporate R&D, C-DAC

IDEAS TO ACTION

NEW MEITY PROJECTS

IDEAS TO ACTION

1

Name of Project:
India Open Source Mobile Communication Network

CI: Shri Aneesh Kumar K. B.
C-DAC Thiruvananthapuram
Co-CI: Shri Sibi C Joseph & Shri Sajimon P. C.
C-DAC Thiruvananthapuram

Collaborators: IISc Bangalore and IIT Delhi

Brief Description: The overall objective of the project is to develop an industry grade open-source platform for 5G and beyond mobile communication networks. The development scope of C-DAC is to develop software components for 5G Core, Service Management and Orchestration Framework. It shall help to reduce the cost of deployment of private 5G Networks and its wider adoption.

NEW MEITY PROJECTS

IDEAS TO ACTION

2

Name of Project:
Building a state-of-the-art Reconfigurable Dataflow and Scalable Deep Learning Accelerator (RDFS_DLA) IP & Chip for AI, HPC & Edge Applications" under Chip to Startup (C2S) Programme

Collaborators:
SandLogic Technologies Pvt. Ltd. and
Inevitable Electronics Technologies Pvt. Ltd.

CI: Abhishek Tiwari
C-DAC Noida
Co-CI: Mr. Nagendra Singh
C-DAC Noida

Brief Description: Artificial Intelligence is transforming the ways humans and machines interact with each other. Usage of AI is proliferating across all industries and domains. The huge potential in Edge AI space is demanding for efficient and yet powerful low-cost hardware solutions for embedded applications. The project Reconfigurable Dataflow and Scalable Deep Learning Accelerator (RDFS_DLA) is a step in that direction. RDFS_DLA is a configurable hardware accelerator targeting inference operations in deep learning applications. It provides full hardware acceleration for deep learning by exposing individual building blocks that accelerate operations associated with the design flow. The ecosystem allows to generate the design files for DLA, irrespective whether is it for DLA IP for FPGA or DLA Chip. Deep Learning Accelerator IP and Chips with this can be utilized for AI, Computer vision and ML applications. The customer can integrate and deploy the RDFS_DLA IP and Chip in multiple ways as per the needs and requirements of the end application, existing devices, or systems.

NEW MEITY PROJECTS

IDEAS TO ACTION

3

Name of Project: Development of Digital Dentistry Solutions

CI: Shri Subodh P.S.
C-DAC Thiruvananthapuram
Co-CI: Shri Deepak R.U.
C-DAC Thiruvananthapuram

Collaborators:
- Centre for Dental Education & Research, AIIMS, New Delhi
- IIT-Madras

Brief Description: The objective of the project is to develop indigenised and cost effective solutions for Digital Dentistry which can streamline clinical workflow of dental procedures and benefit patients and clinicians alike. The project intend to indigenise Medical Imaging devices such as Cone Beam Computer Tomography device, Intra Oral Scanner, Extra Oral Scanner and Virtual Treatment Planning Systems

NEW MEITY PROJECTS

IDEAS TO ACTION

4

Name of Project: Framework for Secure Software Development and Capacity Building in Secure Software Development Life Cycle (SSDLC) for Master Trainers by C-DAC, Hyderabad and IIT, Bhilai

CI: Shri N. Satyanarayana, C-DAC Hyderabad
Co-CI: Dr Amit Kumar Dhar, IIT Bhilai

Brief Description: Following security relevant practices right from the beginning of the project requirement analysis till its implementation phase will not only ensure secure software development but also reduce the risk of escalation of project timelines and the budget. Recognizing the importance of capacity building in SSDLC area, C-DAC Hyderabad and IIT Bhilai joined hands together to offer a certification course on Secure Software Development Life Cycle with the following objectives:

- Design and develop SSDLC course with C-DAC and IIT experts
- Collaborate with IITs/Start Ups/Other C-DAC centres to proliferate SSDLC practices
- Ensure course review through feedback/expert consultation mechanism through premier academic/industry members
- Organize seminars/workshops on SSDLC practices to sensitize its importance
- Sustain the project initiative through delivery partner mechanism beyond the project period.

The course will be launched shortly. Participants from Industry, Government and Academia are expected to enrol for the course for certification. Certification will be provided if the participant secures minimum 65% pass criteria.

5

Name of Project: Establishment of Testing Facility for Software Controlled Measuring Instruments at Regional Reference Standard Laboratories

CI: Shri Jerry Daniel J.
C-DAC Thiruvananthapuram
Co-CI: Shri Anish S.
C-DAC Thiruvananthapuram

Funding Agency: Dept. of Consumer Affairs, Legal Metrology Division

Brief Description: The Legal Metrology department envisages establishment of an advance testing facility for testing the software-controlled measuring instruments at their Regional Reference Standard Laboratories (RRSLs) based on OIML D31 standard. The OIML D31 standard specifies the general requirements applicable to legally relevant software-related functionality and security in measuring instruments and gives guidance for verifying the compliance of an instrument with these requirements. This project aims to provide test procedures and software test tools for the evaluation and verification of software requirements of measuring instrument as per Examination level A of OIML D 31 (2019) standard.

IDEAS TO ACTION
(External Funding)

6

Name of Project: Supply of Indigenous Engine controller for helicopters

CI: Shri Shibu R. M.
C-DAC Thiruvananthapuram
Co-CI: Shri Rajesh R.
C-DAC Thiruvananthapuram

Funding Agency: Hindustan Aeronautics Limited (HAL), Bengaluru

Brief Description: Chetak is a two-tonne shipborne, utility helicopter which has been in service with the Indian armed forces since the early 1980s. The helicopter forms the backbone in major roles of all four services namely Army Aviation, Air force, Navy and Coast Guard. The single-engine helicopter is powered by Artouste IIB turboshaft engine. The start, stop and ventilation sequence of the engine has been controlled by an analog component called control unit. More than 50 pre-mature failures were reported since 2013. In order to enhance reliability and maintainability and to eliminate the existing problems, C-DAC is developing a microcontroller-based control unit termed as Indigenous Engine Controller (IEC) to control start, stop and vent sequence of engine. IEC is certified by stringent Centre for Military Airworthiness and Certification (CEMILAC).

IDEAS TO ACTION
(External Funding)

7

Name of Project: Technique and Toolkits for OS Hardening

CI: Shri Mahesh Patil
C-DAC Hyderabad
Co-CI: Shri M. K. Chaithanya &
Shri D. Mohna Vamsi
C-DAC Hyderabad

Funding Agency: Ministry of Defence, DRDO,
Scientific Analysis Group, Government of India,
New Delhi.

Brief Description: The overall project objective is to develop toolkit for evaluating the Hardening features provisioned on Android. The sub-objectives include:

- Design & Development of Technique for Validation of Android OS Hardening at Application & API Framework Layer.
- Design & Development of Technique for Validation of Android OS Hardening at Hardware Abstraction Layer for Critical Resources & Sensors.
- Design & Development of Technique for Validation of Android OS Hardening at Kernel Layer.
- Design of Decision & Inference Model for Validation of Android OS Hardening at Application & API Framework Layer, Hardware Abstraction Layer & Kernel Layer.
- Performance Optimization & Experimental Validation of Integrated Solution for Validation of Android OS Hardening for Different Variant of Android Smart Devices & Android Versions.

IDEAS TO ACTION
(External Funding)

8

Name of Project: Speed switch for Garrett Engine of Dornier Aircraft-76 units

CI: Shri Shibu R. M.
C-DAC Thiruvananthapuram
Co-CI: Shri. Rajesh R.
C-DAC Thiruvananthapuram

Funding Agency: Hindustan Aeronautics Limited (HAL), Bengaluru

Brief Description: The speed switch unit senses the engine RPM (Revolution Per Minute) using an engine-mounted tachometer and it generates two switched outputs, one corresponding to 10% RPM and another corresponding to 50% RPM.

IDEAS TO ACTION
(External Funding)

9

Name of Project: Development of Customised Power Quality Solutions

CI: Ms. Manju A. S.
C-DAC Thiruvananthapuram
Co-CI: Shri Saravana Kumar A.
C-DAC Thiruvananthapuram

Funding Agency: Trinity Energy Systems Pvt. Ltd., Vadodara

Brief Description: The project involves development of customised power quality solution for M/s Trinity Energy Systems Pvt. Ltd. for commercial production and installation. The technology being developed is classified as a custom power solution for electrical utility companies and industry for ensuring the quality of electrical power. This is also called as STATCOM.

It is known that the efficiency of industrial activities depends on the power quality, as the disruptions of the distribution system will significantly affect the performance of electrical equipment. To ensure the proper functioning of electrical equipment it is important to mitigate the disturbances.

STATCOM technology will be very much suitable for IT parks, arc furnaces, Process industries, traction, hospitals, etc. to compensate for neutral current, unbalanced current, harmonic current, and reactive current present in the load.

IDEAS TO ACTION
(External Funding)

10

Name of Project: Design & Development of an Electronic Nose to detect the organic content in the soil using AI

CI: Dr. Balwinder Singh
C-DAC Mohali
Co-CI: Dr. Jaspal Singh
C-DAC Mohali

Funding Agency : IIT Mandi

Brief Description: Worldwide, "Green Revolution" has increased the agriculture production beginning in the late 1960s. As a result of it, new technologies were adopted, including high-yielding crop varieties and Conventional farming is concerned with producing crops using substances such as chemical fertilizers, pesticides, herbicides, genetically modified organisms, tillage-intensive methods, heavy irrigation, and the use of chemicals to enhance crop growth. Usage of these leads to unsolicited diseases such as cancer, brain tumor and prostate cancer. Organic farming is an approach that guarantees safe, healthy, environment-friendly & nutritious food. Therefore, this idea is to develop an Artificial Intelligence enabled embedded system consist of various gas sensors to work together as an Electronics Nose to detect the organic and inorganic contents of soils for farmers and guide them to use the correct amount of fertilizers, herbicides and pesticides.

IDEAS TO ACTION
(External Funding)

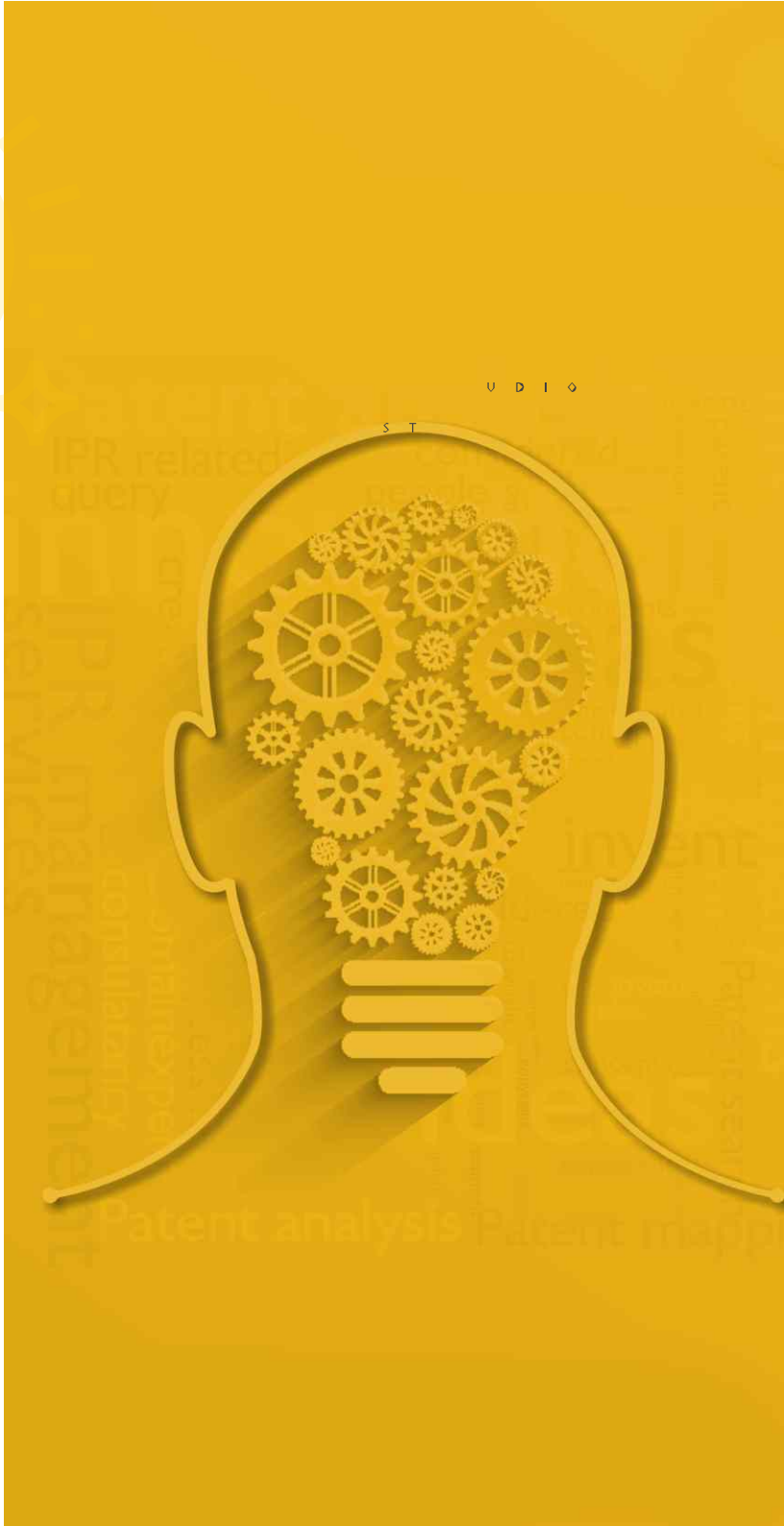
PROGRESS PULSE:

A PERFORMANCE DASHBOARD

IPR PORTFOLIO

In order to create awareness and increase Intellectual Property Right (IPR) footprint across C-DAC, Corporate IPR Cell has been established. Details of the IPR activities of C-DAC during this quarter are as below:

	IPR portfolio of C -DAC (Year 2013 to June 2023)			Quarterly IPR portfolio of C -DAC (July 2023 - September 2023)		
	Patents	**Copyrights**	**Trademarks**	**Patents**	**Copyrights**	**Trademarks**
Applied/Filed (Pending)	69	15	3	4	5	-
Granted/Registered	76	145	18	5	4	-
Total	**145**	**160**	**21**	**9**	**9**	**-**



MAJOR PROJECT PERFORMANCE/ STATISTICS

NATIONAL SUPER COMPUTING MISSION

Under National Supercomputing Mission, till now 15 HPC systems are operational across the nation with a cumulative compute capacity of 24PetaFlops. These systems have been helpful in providing computing resources for the modelling and simulation needs of scientists, faculties and research scholars from varied domain areas. 6800+ HPC users from 150+ institutes across the country have executed more than 85 Lakhs HPC jobs on the NSM systems.

Till date more than 19,500 manpower has been trained in the field of HPC ranging from Basic to Advanced level training.

Indigenously developed RUDRA servers are being manufactured by M/s VVDN Technologies Pvt. Ltd. within the country. The burn test of initial 100 servers was successfully completed at the factory.

In addition to the previous two TOT partners (M/s Kaynes Technologies Ltd and M/s VVDN Technologies Pvt. Ltd.) selected for manufacturing of RUDRA servers, M/s Avalon Technologies Ltd was also qualified for the same and their onboarding has been initiated.

NATIONAL SUPER COMPUTING MISSION

NSM-HRD Activities:

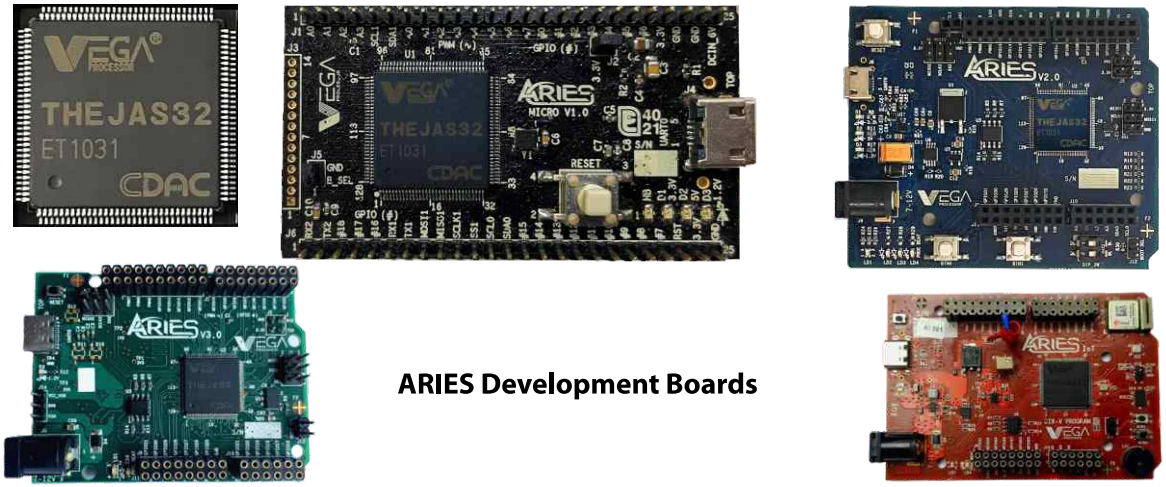
- The OneAPI AI Hackathon was concluded successfully in the month of July 2023 in collaboration with Intel.
- One week workshop on HPC basics was conducted at Delhi Technological University.
- At NIT Trichy a 5 days workshop was conducted on HPC and DL basics for faculties which also included demo and hands-on.
- Domain specific training was conducted in the area of Molecular Dynamics, Weather, CFD and AI in weather domains.

PROGRESS PULSE:
A PERFORMANCE DASHBOARD

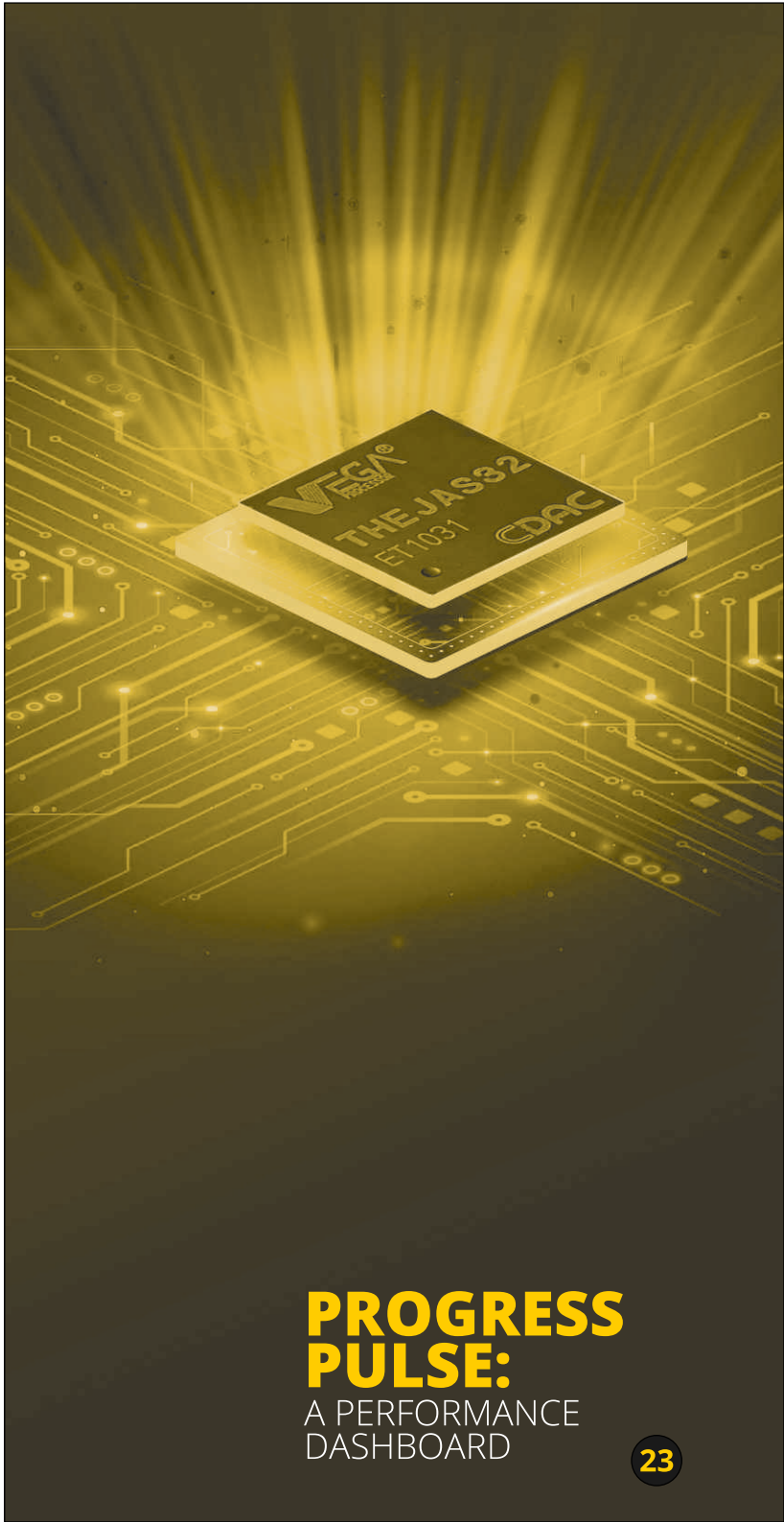
MAJOR PROJECT PERFORMANCE/ STATISTICS

Digital India RISC-V (DIR-V) Program:
As a part of DIR-V, C-DAC has designed and developed the VEGA series of microprocessors comprising of 32/64-bit Single/Dual/Quad Core superscalar Out-of-Order high performance processors based on RISC-V Instruction Set Architecture. The first VEGA microprocessor based SoC chip 'THEJAS32' is now available, which is a 32-bit 100MHz Single core SoC based on VEGA ET1031. A development platform based on THEAJS32 ASIC, named ARIES has also been developed comprising of five different boards viz. ARIES v2, ARIES Micro, ARIES IoT, ARIES v3 and ARIES DOT v1. These development boards are fully indigenous and "Made in India" products which are targeted for learning, embedded system design and IoT applications. The complete ecosystem for embedded system design comprising of Board Support Packages and SDK with integrated tool chain for development along with support documentation are also available.

C-DAC is actively engaging with startups, industry and academia for development based on VEGA series of Processors, IPs and SoCs. Towards proliferation of VEGA processors among academia and industry several workshops and hackathons have been conducted across India with around 2500 persons being trained.



ARIES Development Boards

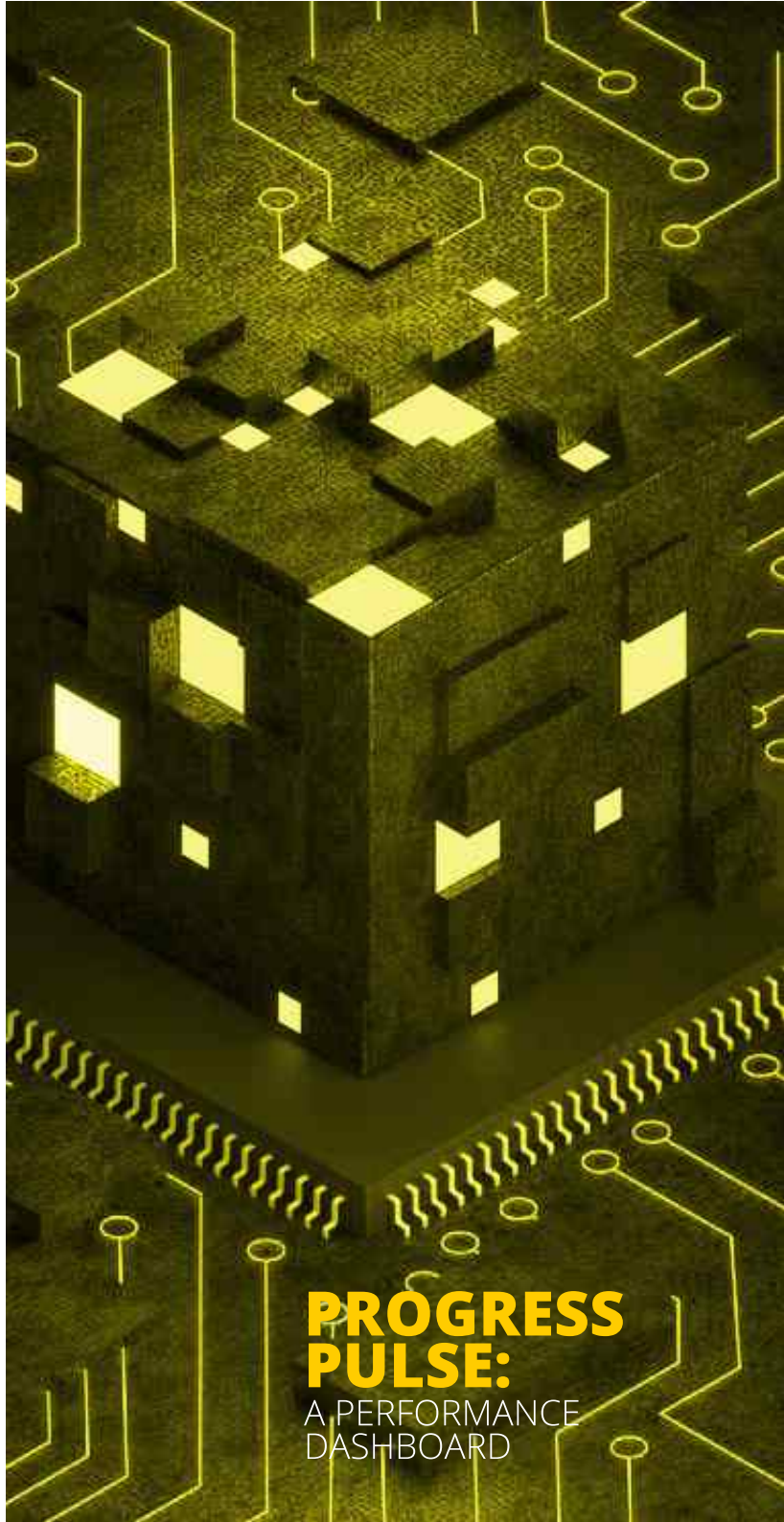


PROGRESS PULSE:
A PERFORMANCE DASHBOARD

MAJOR PROJECT PERFORMANCE/ STATISTICS

National Blockchain Framework (NBF) focuses on enabling Blockchain-as-a-Service and addresses the research challenges across various layers of the Blockchain stack. It includes security vulnerability assessment test suites for auditing smart contracts and Interoperability support between Hyperledger Fabric & Sawtooth Blockchain platforms. Apart from that a zero-proof knowledge module has been integrated with NBF platform at a smart contract level (e.g., tested with a sample Insurance based application) and provision for value added services like Interplanetary File System (IPFS) is provided under NBF stack for the purpose of storing actual content whose hash value can be stored in IPFS.

Docker images required for setting up Hyperledger Fabric network and deploying the smart contracts are hardened and are made available through a local docker registry. Docker images required for deploying the smart contracts on Hyperledger Fabric network are enhanced to support the DMZ environment. Design and development of blockchain enabled consent framework to support UIDAI attendance system, Blockchain enabled eStamp solution (BCStamps) for Security Printing and Minting Corporation of India (SPMCIL), Blockchain based Certificate Issuing Solution for National Police Academy are initiated and they are in progress. A portal for NBF has been deployed on NIC infrastructure and subjected to VAPT testing successfully.

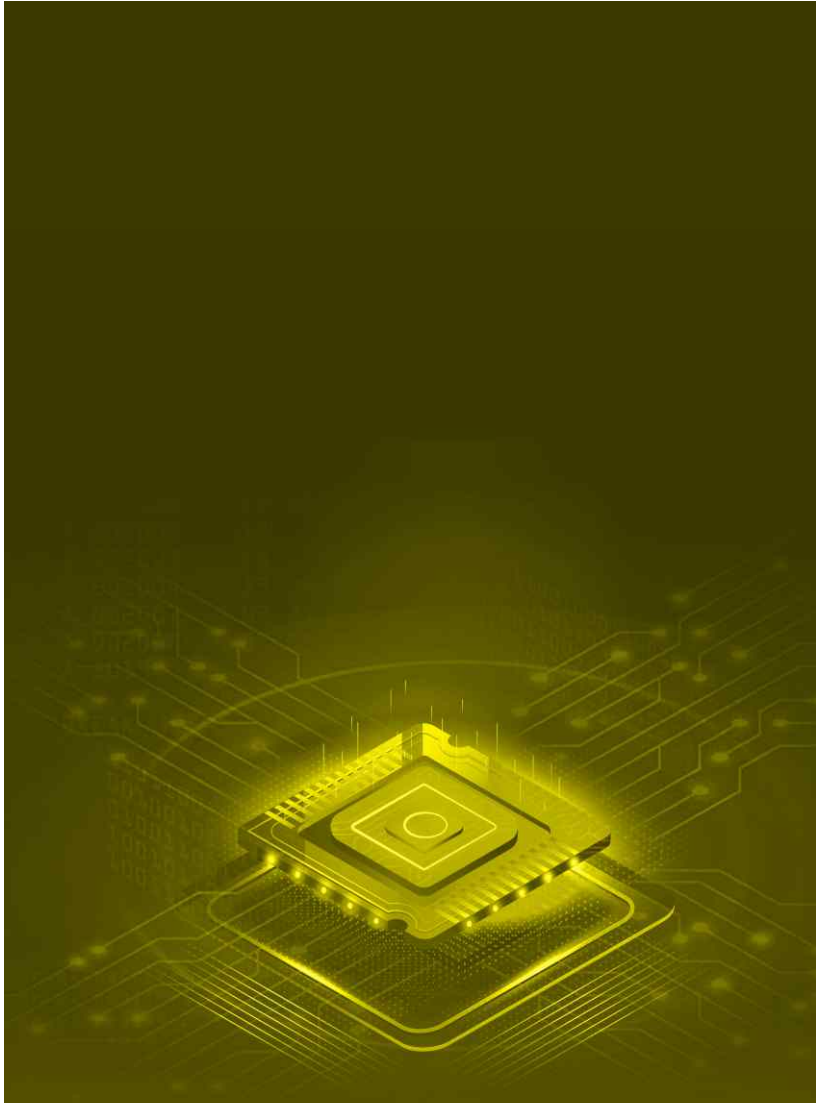


MAJOR PROJECT PERFORMANCE/ STATISTICS

Design Linked Incentive (DLI) Scheme: The Design Linked Incentive (DLI) Scheme aims to provide financial incentives as well as design infrastructure support across various stages of development and deployment of semiconductor design for Integrated Circuits (ICS), Chipsets, System on Chips (SoCs), Systems & IP Cores and semiconductor linked design with an aim to achieving significant indigenization in semiconductor and electronic products and IPs deployed in the country, thereby facilitating import substitution and value addition in electronics sector in the next 5 years. Target segment for the scheme covers Startups, MSMEs and Domestic Companies.

C-DAC is the Nodal Agency for implementation of the DLI Scheme. Till now three roadshows also have been organized by C-DAC & MeitY across the country in presence of Shri. Rajeev Chandrasekhar, Hon'ble Minister of State for Electronics & Information Technology and Skill Development & Entrepreneurship, Govt. of India aiming to stimulate the next-gen Semiconductor Designers, Promote the culture of Co-development and joint ownership of IPs with active industry participation and indigenously develop semiconductor chips for automobile, mobility, communication & computing.

As on September 2023, total 29 applications were received from Startups, MSMEs and Domestic Companies for various projects under this scheme. Out of which 7 applications have been approved.



MAJOR PROJECT PERFORMANCE/ STATISTICS

Chips to Startup (C2S) Programme: C2S Programme was initiated by MeitY from January, 2022 onwards with an aim to train about 85,000 specialized manpower over a period of 5 years in VLSI and embedded system design and leapfrog in ESDM space by way of inculcating the culture of System-on-Chip (SoC)/Reusable hardware IPs/System-level design at bachelors, masters and research-level and act as a catalyst for growth of Startups involved in fabless design.

C2S Programme of MeitY is the fourth phase (Phase-IV) under the Special Manpower Development Programme (SMDP) primarily aimed at developing specialized manpower in VLSI Design (successively at BE/BTech, ME/MTech, and PhD levels) as well as developing IPs/ASICs/SoCs/systems/sub-systems in academic/research institutes utilizing ASICs/ICs developed in-house for identified societal applications.

The programme envisages having about 100-120 nos. of participating institutions across the country that would be supported for developing proof-of-concept (PoC)/working prototypes/electronic systems at various TRLs by way of providing fiscal support and resources such as EDA tools (through remote access of EDA tools grid network), chip fabrication support, prototype design using FPGA boards, etc.

C-DAC Bangalore is Programme Coordination Institution for overall implementation of the programme. 90 Institutes, 13 Start-ups /MSMEs have been selected based on Call-For-Proposals.

ChipIN Centre has been established at C-DAC Bangalore to dedicate its services to semiconductor design community of the country. The facility acts as one-stop centre to provide semiconductor design tools, fab access, virtual prototyping hardware lab access to fabless chip designers from Startups/MSME and Academia. It is a common dedicated centralised cloud-supported design facility, not only hosting the EDA tools (from Synopsys, Cadence and Siemens) for the entire chip design cycle, but also provide aggregate services for fabrication of design at Indian foundries, for example, SCL foundry & overseas foundries and packaging. ChipIN Support Center Web-Portal (https://chipin.cdacb.in/) has been enabled for Participating Institutions to make use of the support ticket system in order to streamline ChipIN support requests.

MAJOR PROJECT PERFORMANCE/ STATISTICS

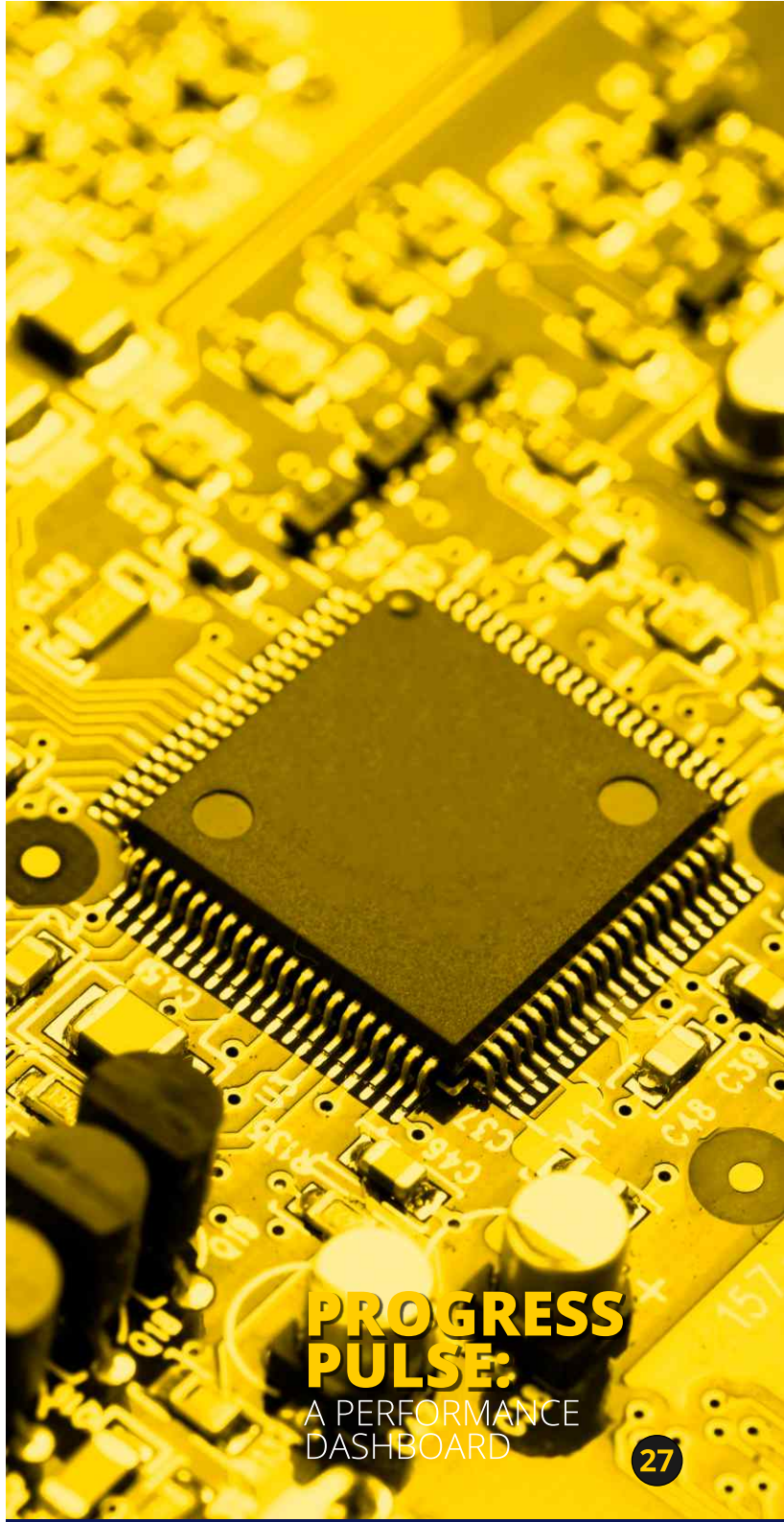
National Mission on Power Electronics Technology (NaMPET): NaMPET is a national-level R&D programme, promoting research, development, deployment, and commercialisation of Power Electronics Technology in India. The program seeks to strengthen the country's indigenous R&D expertise and infrastructure by fostering active collaboration among R&D institutions, academic institutions, and industries. C-DAC, the Nodal Centre for coordinating the activities of NaMPET, is fully involved in Phase III activities, concurrently transferring technologies developed in NaMPET Phase I and NaMPET Phase II. More than 20 academic institutions and about 30 industries are actively involved in technology developments and manufacturing as part of NaMPET. Significant technology developments are underway, focusing on comprehensive Electric Vehicle (EV) charging solutions, a Power Quality centre for Smart grids, Planar magnetic design for high-frequency applications, and advancements in Wide Band Gap (WBG) device-based converters and sensor technologies. Technology awareness is disseminated through various platforms, including NaMPET, MeitY, and C-DAC websites, as well as the NaMPET YouTube channel.

C-DAC Vehicle Control Unit (VCU) technology has crossed 100 crore worth production for Indian Railways and rated as one of the most reliable platforms in operation. Long term VCU handholding is proposed for another 5 years by Railways. Technology extension initiated for DPWCS and full CAB redundancy in VCU. Indigenous TCN controller development is initiated.

Smart Energy Meter (SEM) technology has been accepted by 8 Industries and M/s GEPDEC, Noida cleared all relevant IS certifications and stared pilot production. First SEM platform with DIR-V VEGA processor is developed and verified for functionality.

Commercial turnkey deployment of 1MegaWatt Power Plant and 48VDC powering for 5 storied building with C-DAC technologies are getting commissioned for ANERT and KDISC, first of the kind indigenous Power system real-time simulator being configured for IISc.

Power amplifier development for Sonar application initiated for NPOL, DRDO. High voltage (100kV) power supply for X-Ray will be a crucial development for medical sector.



MAJOR PROJECT PERFORMANCE/ STATISTICS

Emergency Response Support System (ERSS-112)

Emergency Response Support System (ERSS) is the vision of Govt. of India to launch a nationwide, unified emergency response system with a single emergency number '112', for all kinds of emergencies and distress calls from across the country. This intelligent system is focused at providing instant support to all the citizens of the country especially, women and children whenever they request help while facing extreme distress situations. The ERSS system is integrated with Police, Fire, Medical and Disaster management systems for providing emergency dispatch services to the person in distress. ERSS system also facilitates seamless integration with other emergency support services such as CHL-1098 and WHL-181.

C-DAC is the Total Service Provider (TSP) for Ministry of Home Affairs (MHA), Govt. of India for ERSS. The entire ERSS solution is developed indigenously by C-DAC, Thiruvananthapuram which include the whole set of emergency signal gateways, business processing layers, integrations layers, digital map modules and graphical user interfaces. All the algorithms behind the automated signal distribution, voice logging and signal processing are also developed by C-DAC.

ERSS has been launched first in 2018 and presently running in 28 States, including Delhi and Haryana. In August 2023, the work order for ERSS- Phase II was issued to C-DAC by MHA. In ERSS Phase II, the focus is on continual improvement introducing highly scalable and robust, mobile and web-based system, intelligently tuned to the field requirements of state police departments.

ERSS - 112		
Particulars	**Nov 2018 to June 2023**	**July 2023 to Sept 2023**
Operationalization of ERSS -112	28 States/UTs	-
Users for Mobile Data Terminal App for rescue vehicles	13,153	565
112 India Mobile App Users	11,57,715	54,776
ERSS Extension to Disaster Management	34 States/UTs	1 State (Maharashtra)

PROGRESS PULSE:
A PERFORMANCE DASHBOARD

MAJOR PROJECT PERFORMANCE/ STATISTICS

Strengthening Emergency Response through Seamless Integration with Child Helpline-1098 and Women Helpline - 181 Services.

Automation of Child Helpline-1098 (CHL), Automation of Women Helpline-181(WHL) and integration with ERSS-112 are two projects under the schemes - Mission Vatsalya and Mission Shakthi of Ministry of Women and Child Development (MoWCD), Govt. of India. These projects automate the helpline services of CHL -1098 and WHL -181 and integrate the systems with ERSS-112. C-DAC is the Total Service Provider (TSP) for MoWCD for CHL and WHL systems. A web-based solution for automating the CHL/WHL services is developed indigenously by C-DAC Thiruvananthapuram and is deployed in all the States/UTs where the new CHL/WHL system was installed during the period July-September 2023.

CHL -1098/WHL -1081 and Integration with ERSS -112	
Particulars	**July 2023 to Sept 2023**
Installation, Training and Operationalization of Child Helpline – 1098 system and integration with 112	31 States/UTs
Installation, Training and Operationalization of Women Helpline – 181 system and integration with 112	21 States/UTs

MAJOR PROJECT PERFORMANCE/ STATISTICS

Mobile Seva (Mobile Service Delivery Gateway)/ Mobile Seva Appstore: Mobile Seva platform is an innovative initiative aimed at mainstreaming mobile governance in the country. It provides an integrated whole-of-government platform for all Government departments and agencies in the country for delivery of public services to citizens and businesses over mobile devices using SMS, USSD, IVRS, CBS, LBS, apps and AppStore. It is a centrally hosted cloud-based mobile enablement platform, which allows the departments to expeditiously start offering their services through mobile devices anywhere in India, without having to invest heavily in creating their separate mobile platforms. Over 4695 accounts of government departments and agencies are integrated with Mobile Seva platform.

Mobile Seva platform		
	April 2012 -June 2023	**July 2023- September 2023**
Accounts of Dept/Agencies integrated	4,650	45
Number of Push SMS Transaction	5387 Crores	88 Crores
Number of apps	1358	204

मोबाइल सेवा

Mobile Seva

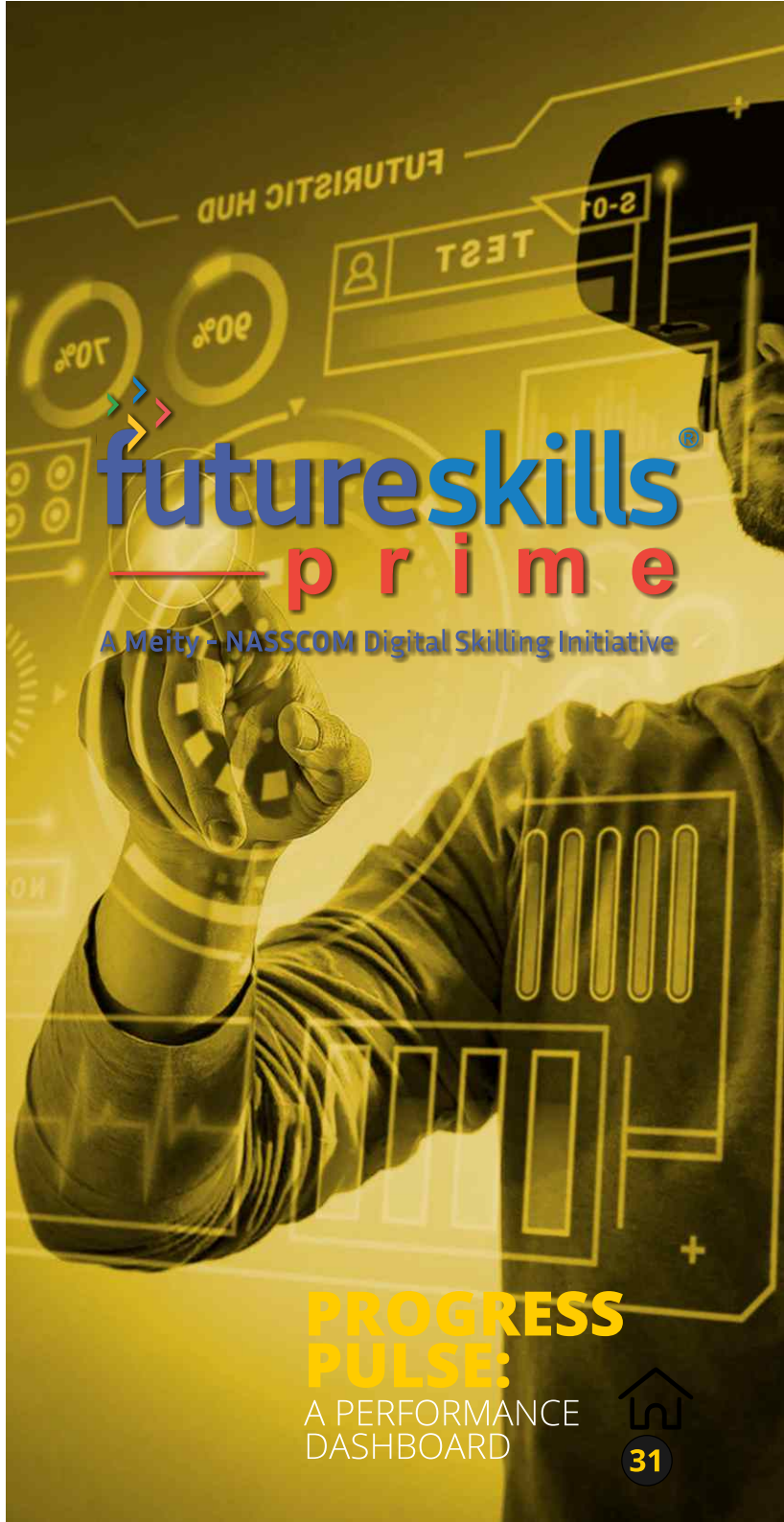
PROGRESS PULSE:
A PERFORMANCE DASHBOARD

MAJOR PROJECT PERFORMANCE/ STATISTICS

Future Skill PRIME: (Programme for Re-Skilling/Up-Skilling of IT Manpower for Employability)

MeitY and NASSCOM have jointly conceived the Programme titled, "FutureSkills PRIME, under the Champion Sector Service Scheme (CSSS). The Programme is envisaged to provide re-skilling/up-skilling opportunities to 4.12 Lakh IT Professionals of B2C beneficiaires in ten(10) emerging technologies: 3D Printing/Additive Manufacturing, Blockchain, Cyber Security, Internet of Things, Artificial Intelligence, Robotics Process Automation, Social & Mobile, Big Data Analytics, Cloud Computing and Augmented Reality/ Virtual Reality, through Resource Centres across the Nation by Hub-n-Spoke Model. 15.15 Lakh candidates have signed up on the FutureSkills PRIME portal: www.futureskillsprime.in. Around 6.40 lakh candidates have enrolled for Foundation/Deep-Skilling/ Bridge and non-aligned courses out of which, around 2.62 lakh candidates have completed the courses. 10466 Government officials from Central/State Government Offices/Departments/ PSUs trained across the Nation and 2087 Trainers trained under Training of Trainer Programme". The details of IT Professionals/Government Officials/Students trained by C-DAC Resource Centres in Government Officials Training Programme, Training of Trainer Programme and Bridge

FutureSkills PRIME				
	December 2019 to June 2023		July 2023 - September 2023	
Sign Ups	14,24,103		90,820	
	Enrolled	Certified	Enrolled	Certified
Government Officials Training	5,736	4,411	366	286
Training of Trainer	1,267	1,093	414	281
Bridge Course Registration	11,741		5,121	



MAJOR PROJECT PERFORMANCE/ STATISTICS

e-Hastakshar / e-Sign: As part of the Government's Digital India Initiative, C-DAC has developed e-Hastakshar – C-DAC's eSign service that facilitates instant signing of documents online based on Aadhaar authentication. C-DAC has commissioned and made operational a new DC for eHastakshar operations with a capacity of 10 Lakh eSign/day. More than 198 Government agencies are leveraging C-DAC's esign service on production level. Some of key agencies includes Employees' Provident Fund Organisation, National Informatics Centre, Centre for eGovernance, Karnataka, Central Ground Water Board, Ministry of Jal Shakti, Unique Identification Authority of India, Election Commission of India, Telecom Regulatory Authority of India, National Test House, Competition Commission of India, Central Soil and Materials Research Station (CSMRS), North Eastern Council Secretariat and Bhramaputra water board. More than 12.02 Crore e-Signs have been offered by C-DAC till September 2023

eSigns offered by C -DAC	
July 2016 to June 2023	July -September 2023
10,67,55,079	1,34,45,438

PROGRESS PULSE:
A PERFORMANCE DASHBOARD

MAJOR PROJECT PERFORMANCE/ STATISTICS

Cyber GYAN- MeitY has entrusted C-DAC Noida to implement the Project titled "Cyber Security Scenario based Self-Paced Learning Training Facility (Cyber GYAN) for SC, ST and Economically Weaker Section Under Graduate and Post Graduate students of Government Colleges of 8 North-Eastern States and 4 other States (Uttar Pradesh, Haryana, Gujrat and Kerala) of India.

The Project envisages to develop skilled manpower in the highly needed domain of cyber security to safeguard the critical infrastructure from cyber-attacks.

Number of Students Enrolled			
State	**Feb 2022 To June 2023**	**July to September 2023**	**Grand Total**
Assam	17	64	81
Uttar Pradesh		54	54
Meghalaya	16	4	20
Arunachal Pradesh	13	6	19
Tripura	12	2	14
Manipur	5	2	7
Mizoram	1	6	7
Sikkim	2	2	4
Nagaland	3		3
Haryana		1	1
Grand Total	**69**	**141**	**210**

MAJOR PROJECT PERFORMANCE/ STATISTICS

eSanjeevani: It is the National Telemedicine Service of Ministry of Health & Family Welfare (MoHFW), Government of India. Owing to its widespread and speedy adoption eSanjeevani has evolved into the world's largest documented telemedicine implementation in the primary healthcare. eSanjeevani – National Telemedicine Service is testimony to the fact that digital health has come of age in India. eSanjeevani has revolutionised primary healthcare in India by bringing health services to the masses in rural areas and isolated communities. It operates through 1,16,453 Health and Wellness Centres (HWCs) as spokes and over 15,816 as hubs. eSanjeevani boasts over 1,94,230 doctors, specialists, and health workers as telemedicine practitioners, operating in all states and union territories of India. It serves approximately 4,00,000 patients daily, with the capacity to handle up to 1 million patients per day. eSanjeevani is operational in all States/UTs across India. However, In Delhi, eSanjeevaniAB-HWC is not available.

eSanjeevani				
	Nov 2019 to June 2023		July 2023 - September 2023	
	Total Tele-Consultations	Registered Doctors	Total Tele-Consultations	Registered Doctors
eSanjeevani	132,713,614	46,959	31,301,611	7,570
eSanjeevani AB-HWC	122,329,931	43,379	3,10,37,097	4,604
eSanjeevaniOPD	1,03,83,683	3,580	2,64,514	2,966

PROGRESS PULSE:
A PERFORMANCE DASHBOARD

MAJOR PROJECT PERFORMANCE/ STATISTICS

Hospital Management System- e-Sushrut: e-Sushrut- C-DAC's Hospital Management Information System (HMIS) is a major step towards adapting technology to improve healthcare. HMIS incorporates an integrated computerized clinical information system for improved hospital administration and patient health care. It is integrated with ABDM Mile Stones and provides an accurate, electronically stored medical record of the patient. A data warehouse of such records can be utilized for statistical requirements and research. The real time HMIS streamlines the treatment flow of patients and simultaneously empowering workforce to perform to their peak ability, in an optimized and efficient manner.

e-Sushrut HMIS		
e-Sushrut HMIS Instances	**No. of OPD Visits Stamped**	
	Till June 2023	**July 2023 - September 2023**
e-Sushrut HMIS -AIIMS (15 No's)	130 Lakhs+	20 Lakhs+
e-Sushrut HMIS – PSU (PAN Railways, SAIL, NHPC)	200 Lakhs+	43 Lakhs+
e-Sushrut HMIS -State (UP, Punjab, Maharashtra, Telangana, Odisha, Goa, Arunachal Pradesh, Sikkim)	550 Lakhs+	160 Lakhs+

MAJOR PROJECT PERFORMANCE/ STATISTICS

Blood Bank Management System- e-RaktKosh : e-RaktKosh is a comprehensive IT solution to connect, digitize and streamline the workflow of blood banks. It has on-boarded more than 4000 blood banks on its platform. e-RaktKosh Portal is also extensively used by the citizens for requirements related to blood, blood banks' location identification, blood stock Enquiry, maintenance of donation repository, etc. e-RaktKosh is integrated with various state-wide blood bank solutions has become a single data repository for management of data regarding blood, blood-related products, blood donation camps, donor repository, etc.

e-RaktKosh		
	Year 2017 to June 2023	July 2023- September 2023
Total Blood Bank Registered	3916	113
Total Govt Blood Bank Registered	1225	16
No of Active Blood Banks	2812	3247
No of Camp Conducted	60,789	22,571
No of Donor Registered	33,88,330	6,48,830

PROGRESS PULSE:
A PERFORMANCE DASHBOARD

MAJOR PROJECT PERFORMANCE/ STATISTICS

e-Aushadhi - Drugs and Vaccine Distribution Management System (DVDMS): It is a web-based programme that manages the supply chain of pharmaceutical supplies such as medications, sutures, and surgical items needed by various Drug Warehouses/Drug Stores. The primary goal of DVDMS is to determine the pharmaceutical demands of the state drug programme and the MoHFW's national level programme for various drug warehouses/drug stores so that all necessary materials/drugs are always available to be given to patients/beneficiaries in the state without delay. This involves item classification/categorization, item codification, item quality control, and lastly issuing pharmaceuticals to patients, who are the end consumers in the chain. Currently, 22 States & UTs, 05 Central Programs and 01 Program under Ministry of Defence are using this application.

MAJOR PROJECT PERFORMANCE/ STATISTICS

e-Aushadhi - Drugs and Vaccine Distribution Management System (DVDMS)

Total Number of Drugs Issued			
Sl.no	State Name	January 2023 to June 2023	July 2023 to September 2023
		Qty.(in Crore)	Qty.(in Crore)
1	Rajasthan	383.47	257.87
2	Himachal Pradesh	31.25	18.34
3	Uttar Pradesh	300.57	256.56
4	Jharkhand	25.08	7.40
5	Puducherry	13.00	4.00
6	Lakshadweep	0.08	0.72
7	Andhra Pradesh	162.87	71.02
8	Telangana	122.99	45.02
9	Assam	6.00	5.00
10	Punjab	53.77	38.01
11	Uttarakhand	8.75	7.7
12	Bihar	171.69	80.99
13	MP	208.99	95.21
14	Gujarat	163.44	101.88
15	J&K	27.68	12.74
16	Maharashtra	96.33	51.83
17	DMER Maharashtra	5.2	3.34
18	Manipur	1.62	0.46
19	Meghalaya	0.34	0.42
20	Mizoram	9.36	2.87
21	Arunachal Pradesh	18.64	4.06
22	Nagaland	5.69	1.33
23	CTD -MoHFW	49.2	40.97
24	FPLMIS -MoHFW	17.3	12.53
25	MSO -MoHFW	60.32	49.46
26	CMSS Delhi	91.28	36.07

MAJOR PROJECT PERFORMANCE/ STATISTICS

SwaYaan - Capacity Building for Human Resource Development in Unmanned Aircraft System: Project 'SwaYaan is a Capacity Building for Human Resource Development in Unmanned Aircraft System' implemented by 30 institutions which includes IISc Bangalore, IITs, IIITs, NITs, C-DAC, and NIELIT. The hub-and-spoke model implemented in an RC/PI structure is led by C-DAC Hyderabad and IIITDM Kurnool as the Programme Management Unit (PMU). Under the project, the overall target is to train 46,785 candidates through various Formal, Non-Formal programs and Research Program such as MTech in UAS/Drones, Minor degree/Retrofitting courses in UAS/Drones, PG Diploma Program, Short term Skilling Courses, Innovation Challenge, Bootcamps, POC, National Workshops, International Conference, Open Online Courses, IPR (Paper and Patents) creation, etc. Currently the SwaYaan has conducted more than 107 UAS/Drone activities which includes 9 Faculty Development Programs (FDP), 52 Bootcamps, 3 workshops, PG Diploma in UAS/Drone, Proof-of-Concept implementation, and launch of MTech at IIT Kanpur with an overall participation of 2,799 candidates.

Program Name	Activity: 2022 -2023			Participants: 2022 -2023		
	Sept-June	July - Sept	Total	Sept - June	July - Sept	Total
MTech /Minor Degree	0	1	1	0	7	7
Research Activities (POC, IPR etc.)	33	7	40	124	35	159
Training Programs (FDP, Bootcamp etc.)	36	27	63	1438	956	2394
Conference/ Workshops/ Competitions	3	0	3	239	0	239
Total	72	35	107	1801	998	2799

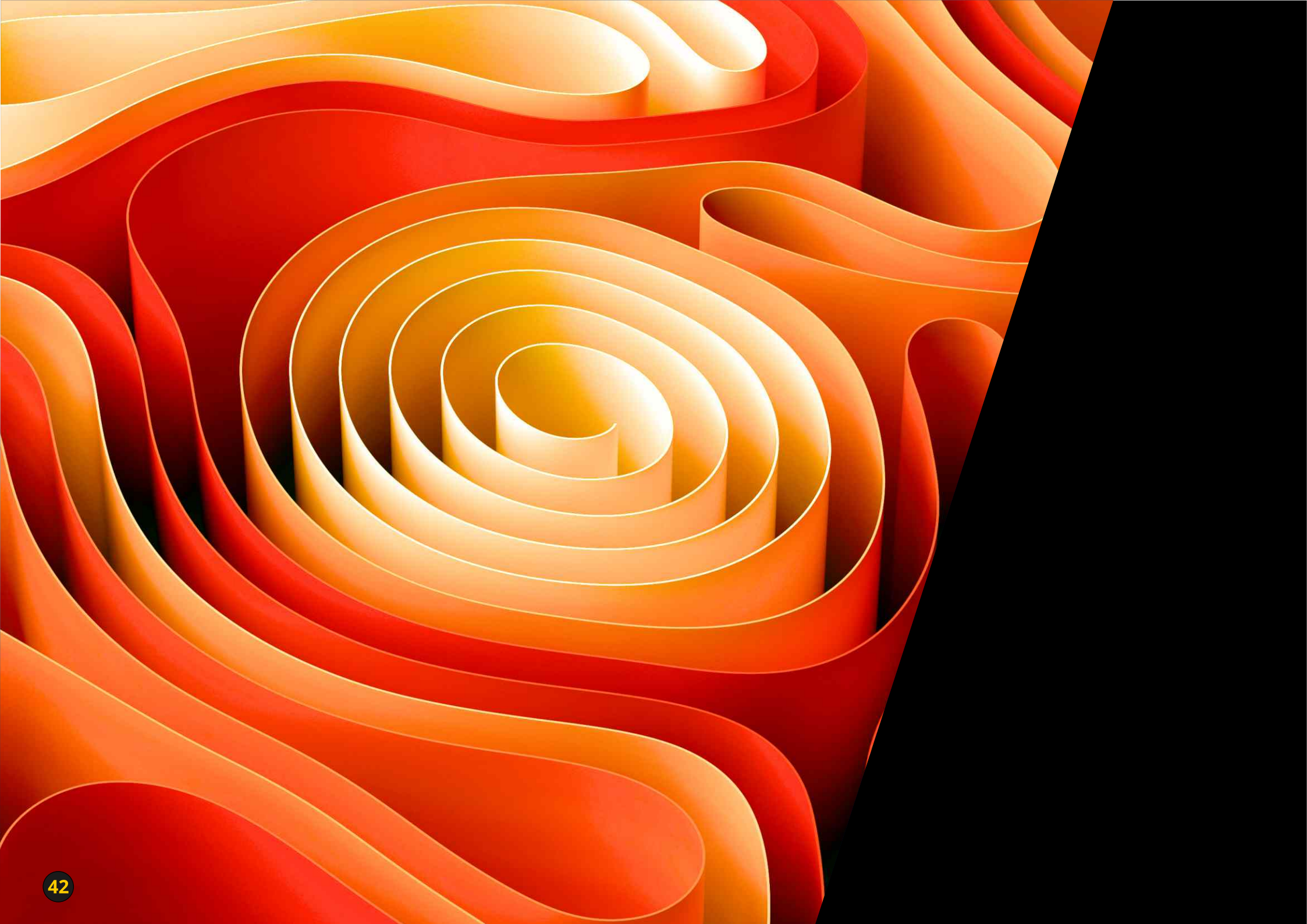
MAJOR PROJECT PERFORMANCE/ STATISTICS

Information Security Education and Awareness (ISEA) Project Phase II:
Ministry of Electronics and Information Technology (MeitY) approved a project entitled 'Information Security Education and Awareness (ISEA) Project Phase II' in 2014 with the objectives of capacity building in Information Security to address human resource requirements in the country, training of Government officials and spreading mass awareness through direct/indirect mode. Broadly, the project envisions promoting formal/non-formal education and training in the area of Information Security aimed at generation of human resources at various levels and spreading mass awareness on Information Security in the country.

PROGRESS PULSE:
A PERFORMANCE DASHBOARD

MAJOR PROJECT PERFORMANCE/ STATISTICS

Information Security Education and Awareness (ISEA) Project Phase –II		
ISEA Activities	**April 2015 to June 2023**	**July 2023 to September 2023**
	Total number of candidates	**Total number of candidates**
Academic Activities	3,75,835 candidates (including 2.85 lakhs candidates from five Technical Universities and affiliated colleges)	-
Government Officials Training	27,904 Government officials	• 54 Government officials from various Union Ministries / Departments have been trained as part of Generic Online Training in Cyber Security • 3 Awareness Workshops were organized by covering 1001 participants as part of Cyber Jaagrookta Diwas.
Awareness Activities	• 5.75 crore beneficiaries have been impacted through various activities under indirect mode • 3.18 lakh candidates (1519 workshops) • 1.24 lakh Teachers Trained	• 22,635 participants (19 Awareness workshops) attend the awareness workshops. **Stay Safe Online (SSO) campaign as part of G20:** • Number of posts done on Social/Digital Media: 12138 posts were posted. • Engagement through Social Media platforms: 13.51 Cr views/ impressions • Cyber Safe Challenges and its security (19,730 attempted, 11,849 certified) • Mobile and Mobile App Security (5,022 attempted, 2,995 certified)



TECH ROLLOUTS

SYSTEM/ PRODUCT/ SERVICES LAUNCH/ RELEASE

TECH ROLLOUTS

LAUNCH OF NATIONAL KNOWLEDGE PORTAL

Launch of the National Knowledge Portal at New Delhi by Hon'ble Prime Minister, Shri Narendra Modi on August 7, 2023, as part of the 9th National Handloom Day celebrations. This was developed by C-DAC Pune with funding from the National Institute of Fashion Technology (NIFT).

TECH ROLLOUTS

LAUNCH OF KANTHASTH-2 WITH E-OFFICE

Launch of Kanthasth 2.0 service with E-Office by Union Minister of State, Shri. Ajay Kumar Mishra and Rajya Sabha Deputy Chairman, Shri. Harivansh on September 14-15, 2023, at the Hindi Diwas Samaroh-2023 and Third Akhil Bhartiya Rajbhasha Sammelan in Pune, Maharashtra. Col. A.K. Nath (Retd.), Executive Director, C-DAC, Pune, was honoured for his outstanding contributions.

TECH ROLLOUTS

INAUGURATION OF PRODUCT DESIGN CENTRE AND LAUNCH OF GRAINEX VER1.0

Virtual inauguration of GrainEx ver 1.0 on July 10, 2023 by Shri Bhuvnesh Kumar, Additional Secretary, MeitY, in presence of Smt Sunita Verma, Group Coordinator, MeitY and other senior officials of MeitY.

TECH ROLLOUTS

LAUNCH OF INDIAN WEB BROWSER DEVELOPMENT CHALLENGE

Launch of Indian Web Browser Development Challenge in New Delhi on August 9th, 2023 by the Controller of Certifying Authorities (CCA), Shri. Arvind Kumar.

TECH ROLLOUTS

ISSUANCE OF SMART CARD ID TO HONOURABLE MPS (LOK SABHA AND RAJYA SABHA) UNDER THE PROJECT - "SMART CARD BASED ID AND ACCESS CONTROL IN NEW PARLIAMENT BUILDING"

Starting of Issuance of ID Cards for Honourable MPs (Lok Sabha and Rajya Sabha) under the project - "C-DAC ID & Access Control System" was made for New Parliament building. As part of project execution, Seed Card Ceremony was carried out in which Seed Cards were distributed by Shri Siddharth Mahajan, IAS, Joint Secretary, Lok Sabha to Senior Officials of Lok Sabha Secretariat on September 01, 2023. Complete solution has been developed based on SCOSTA PKI (BIS Standard IS16695) having C-DAC's indigenously developed Smart Card Operating System, Key Management System and Application therein. The ID Cards were issued by Lok Sabha Secretariat to all MPs in the Special Parliament Session during 18-22 September, 2023.

INTERNATIONAL OUTREACH

INTERNATIONAL OUTREACH

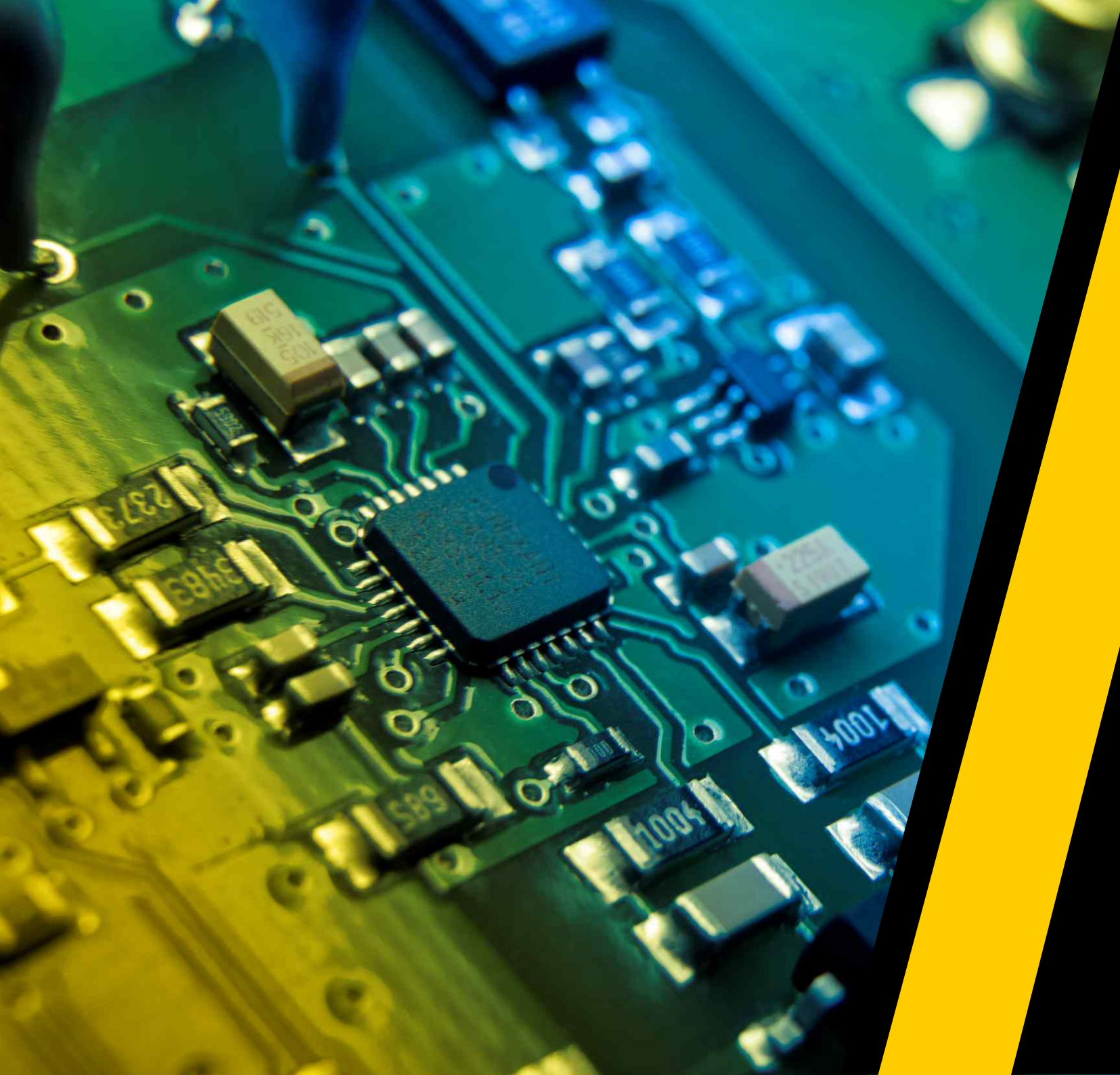
Visit of Trinidad and Tobago Delegation to C-DAC Noida

A technical mission from the Ministry of Digital Transformation of Trinidad and Tobago, led by the Honourable, Mr. Hassel Bacchus, Minister of Digital Transformation, visited C-DAC, Noida on August 08, 2023.

IT Course delivered in French Language

C-DAC, Delhi has started a 4-week Certificate Course in Data Science using Python for 15 participants from ITEC partner countries, namely Ethiopia, Niger, Madagascar, Mali, Kyrgyzstan, and Cote d'Ivoire. The course has been carried out from September 25, 2023 to October 20, 2023. This is the first time in the 60-year history of ITEC that an IT course is being taught in a foreign language in India.

SIGNIFICANT COLLABORATIONS



MoU with IIT Guwahati Research Park

On July 20, 2023, C-DAC Silchar and IIT Guwahati Research Park Foundation signed a MoU to establish a research and development (R&D) extension cell at IIT Guwahati. The objective of this partnership is to promote technological excellence in the North Eastern region.

MoU with IIT Roorkee

A Memorandum of Understanding (MoU) was signed between C-DAC and IIT Roorkee on 29th August 2023 to support each other's endeavours in delivery of Research activities, Academic programs and collaborative development in the field of AI/ML Models, Quantum computing and other Emerging Technologies.

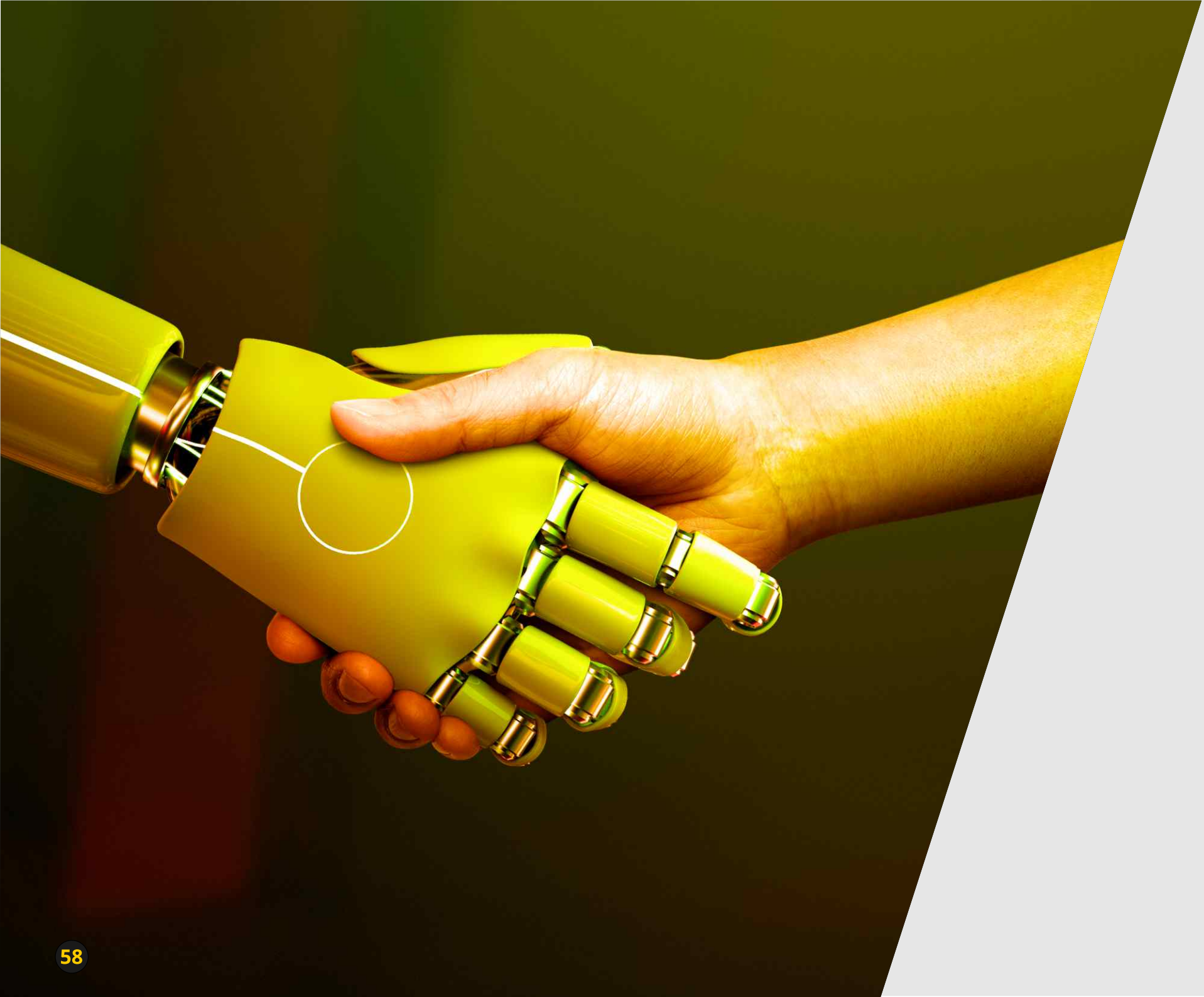
MoU signed with M/s. SandLogic Technologies Pvt. Ltd and Inevitable Electronics Pvt. Ltd. under C2S Project

MoU signed for Building a state-of-the-art Reconfigurable Dataflow and Scalable Deep Learning Accelerator (RDFS_DLA) IP &Chip for AI, HPC & Edge Applications" under Chip to Startup (C2S) Programme" with M/S SandLogic Technologies Pvt. Ltd and Inevitable Electronics Pvt. Ltd. on 28th August 2023.

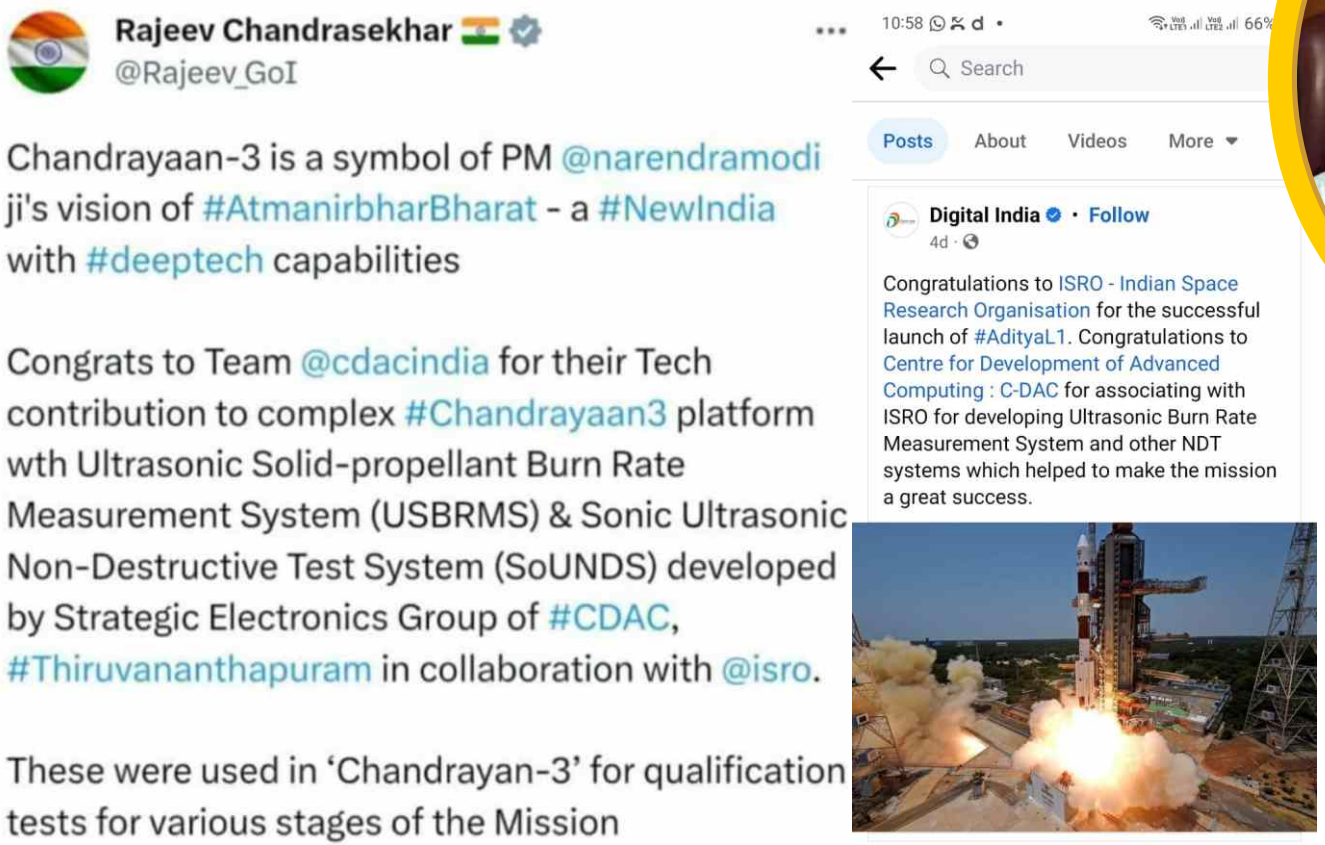
MoA signed between Jawaharlal Nehru Hospital & Research Centre, SAIL Bhilai, and C-DAC Noida

Memorandum of Association signed between Jawaharlal Nehru Hospital & Research Centre, SAIL Bhilai, and C-DAC Noida for the cutting-edge e-Sushrut HMIS. for revolutionizing Industrial & Occupational Health Services.

EVENTS



Role of C-DAC in Chandrayaan-3 and Aditya-L1



Shri Rajeev Chandrasekhar
Hon'ble Minister of State for Electronics & Information Technology and Skill Development & Entrepreneurship, Govt. of India

Implementation of Cyber Security Ecosystem for G-20 Summit

प्रदीप सिंह खरोला, आई. ए. एस. (नि.)
अध्यक्ष एवं प्रबंध निदेशक
Pradeep Singh Kharola, IAS (Retd.)
Chairman and Managing Director

इंडिया ट्रेड प्रमोशन आर्गनाईज़ेशन
(भारत सरकार का उद्यम)
India Trade Promotion Organisation
(A Government of India Enterprise)
Department of Commerce

No.CMD/ITPO/2023
September 13, 2023

Dear Sri. S Krishnanji

The G20 Summit was held at Bharat Mandapam on 9th and 10th September, 2023. A large number of agencies worked together in a coordinated manner to make this landmark event a great success. C-DAC and Cert-In played a very important role in ensuring safe and secure internet services during the event. I would like to place on record my thanks for all the help extended by you.

Yours sincerely,

with regards

(Pradeep Singh Kharola)

Mr. S. Krishnan
Secretary
Ministry of Electronics and Information Technology
Electronics Niketan
CGO Complex
New Delhi.

DG (CERT-In)

DG (CDAC)

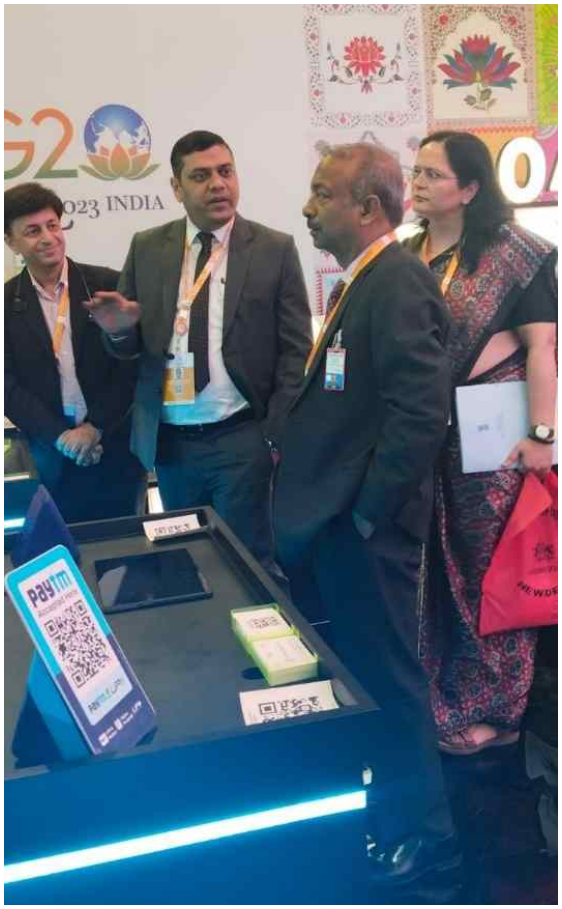
Office of Secretary, MeitY
Dy. No. 2457/14
Date 15-9-23

प्रगति मैदान, नई दिल्ली - 110001, दूरभाष: +91 11 23371100 / 23371909, ईमेल: cmditpo@itpo.gov.in
Pragati Maidan, New Delhi - 110001, Telephone: +91 11 23371100 / 23371909, Email: cmditpo@itpo.gov.in

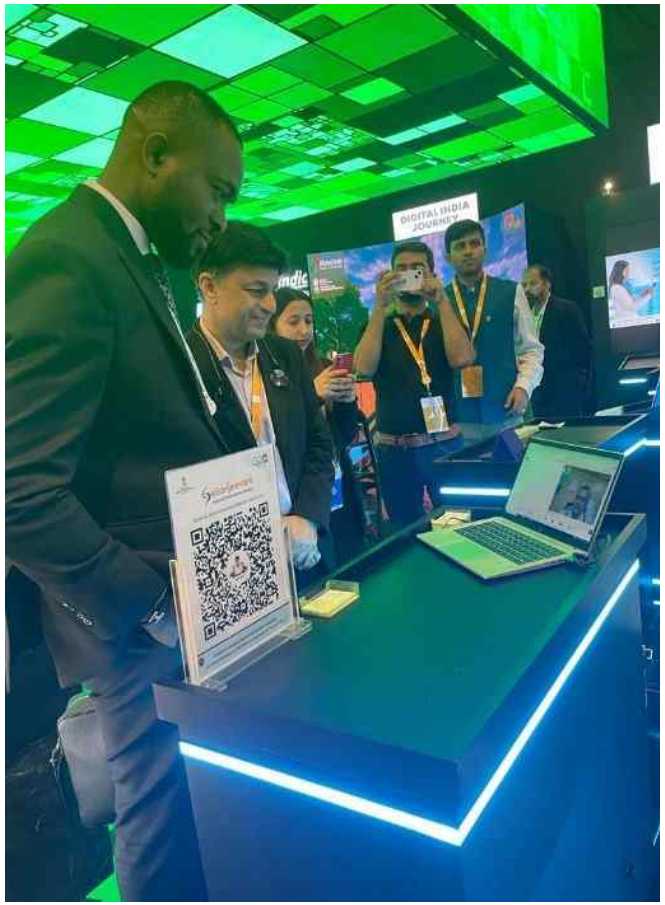
C-DAC played a vital role by establishing a comprehensive Cyber Security Ecosystem at Pragati Maidan, New Delhi, particularly at the newly inaugurated Bharat Mandapam and exhibition halls. This support helped to ensure secure infrastructure, communication, and internet connectivity for the G20 summit.

Showcasing of eSanjeevani - National Telemedicine Service at G-20

Hon'ble Prime Minister of Bangladesh, Ms. Sheikh Hasina witnessed the working of eSanjeevani



Shri. Amit Khare, advisor to Hon'ble Prime Minister of India with other senior officials of PMO



Dr. 'Bosun Tijani, Hon'ble Minister of Federal Ministry of Communications, Innovation and Digital Economy, Govt of Nigeria

Brainstorming Session on "Exascale Computing in Life Sciences"

Brainstorming session on "Exascale Computing in Life Sciences" was organised at C-DAC Pune on July 20, 2023 in presence of Padma Bhushan Dr. Vijay Bhatkar, Smt. Sunita Verma, Group Coordinator, MeitY, Govt. of India, Shri. E. Magesh, Director General, C-DAC and senior officials of C-DAC.

BACKEND
SQUAD

CISO DESK

ISO 27001 is being implemented in all centres of C-DAC through office of Chief Information Security Officer (CISO). As a part of the same, various activities are being carried out:

2nd ISASC meeting

The 2nd Information Security Assurance Steering Committee meeting was held on August 25, 2023, at C-DAC Hyderabad under the chairmanship of Director General C-DAC. All the stakeholders from 12 C-DAC centers were present in the meeting.

Smt. Lakshmi Eswari, Director, C-DAC Hyderabad in her welcome address emphasized the importance of information security in today's dynamic business landscape and highlighted the need for robust ISMS with C-DAC. ISASC team from 12 C-DAC centers presented a comprehensive overview of the ISMS implementation status to the Chairman, detailing the key components and objectives along with the proposed timeline for the ISMS certification. The chairman stressed the importance of proactive risk mitigation strategies to safeguard our information assets. The meeting recognized the need for comprehensive training and awareness programs for employees to foster a security-conscious culture.

TECHNOLOGY ADVANCEMENT AND PROLIFERATION (TAP) GROUPS

HIGH PERFORMANCE COMPUTING

Co-Chairman

Dr. S. D. Sudarsan
Executive Director
C-DAC Bangalore
sds@cdac.in

Technology Director

Shri Sanjay Wandhekar
Senior Director
C-DAC Pune
sanjayw@cdac.in

QUANTUM COMPUTING

Co-Chairman

Col. Asheet Kumar Nath (Retd.)
Executive Director
C-DAC Pune
asheet.nath@cdac.in

Technology Director

Shri Hari Babu P.
Associate Director
C-DAC Bangalore
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TECHNOLOGY ADVANCEMENT AND PROLIFERATION (TAP) GROUPS

To evolve technical strategies, mission-based activities and programs, capability/performance enhancement measures, guidelines and recommendations for effective advancement and proliferation of various multicentre initiatives, Technology Advancement and Proliferation (TAP) Groups have been constituted for 11 Technology Verticals. Director General (DG) C-DAC is the Chairman for all 11 TAP groups. For each technology vertical Co-Charman and Technology Director has been identified.

ARTIFICIAL INTELLIGENCE (AI)

Co-Chairman

Dr. M. Sasikumar
Executive Director
C-DAC Mumbai
sasi@cdac.in

Technology Director

Ms. Lakshmi Panat
Senior Director
C-DAC Pune
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STRATEGIC TECHNOLOGY
(INCLUDING EMERGENCY/DISASTER MANAGEMENT)

Co-Chairman

Shri Kalai Selvan A.
Director
C-DAC Thiruvananthapuram
kselvan@cdac.in

Technology Director

Shri Rajesh. K. R.
Scientist G
C-DAC Thiruvananthapuram
rajesh@cdac.in

TECHNOLOGY ADVANCEMENT AND PROLIFERATION (TAP) GROUPS

DIGITAL INDIA RISC – V (DIR-V)

Co-Chairman

Shri Vivek Khaneja
Executive Director
C-DAC Noida
vivekkhaneja@cdac.in

Technology Director

Shri Krishnakumar Rao
Scientist G
C-DAC Thiruvananthapuram
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SOFTWARE TECHNOLOGY
(INCLUDING CLOUD & BOSS)

Co-Chairman

Shri L. R. Prakash
Senior Director and Centre Head
C-DAC Chennai
lrprakash@cdac.in

Technology Director

Dr. Padmaja Joshi
Senior Director
C-DAC Mumbai
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TECHNOLOGY ADVANCEMENT AND PROLIFERATION (TAP) GROUPS

e GOVERNANCE

Co-Chairman

Shri Aditya Kumar Sinha
Director
C-DAC Patna and Kolkata
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Technology Director

Shri Rishi Prakash
Associate Director
C-DAC Noida
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HEALTHCARE & EDUCATIONAL TECHNOLOGIES

Co-Chairman

Shri V. K. Sharma
Director
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Technology Director

Dr. Sanjay P. Sood
Associate Director
C-DAC Mohali
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TECHNOLOGY ADVANCEMENT AND PROLIFERATION (TAP) GROUPS

CYBER SECURITY

Co-Chairman

Ms. P. R. Lakshmi Eswari
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C-DAC Hyderabad
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Technology Director

Ms. Rajasree S.
Scientist G
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AUTOMOTIVE AND COMMUNICATION TECHNOLOGY

Co-Chairman

Shri Jitesh Choudhary
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C-DAC Centre in Northeast
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Technology Director

Shri Krishnakumar S.
Scientist G
C-DAC Thiruvananthapuram
krishku@cdac.in

TECHNOLOGY ADVANCEMENT AND PROLIFERATION (TAP) GROUPS

POWER ELECTRONICS & RENEWABLE ENERGY

Co-Chairman

Mr. N. K. Jain
Senior Director and Centre Head
C-DAC Delhi
nkjain@cdac.in

Technology Director

Mr. Renji V. Chacko
Scientist G
C-DAC Thiruvananthapuram
renji@cdac.in

TECHNOLOGY ADVANCEMENT AND PROLIFERATION (TAP) GROUPS

INSPIRING INSIGHTS ON NEW FRONTIERS

C-DAC'S ASSOCIATION WITH ISRO FOR SPACE MISSION PROGRAMMES

Shri Rajesh K. R.
Scientist-G & Group Head,
Strategic Electronics Group,
C-DAC, Thiruvananthapuram

The space sector in India has grown manifold during the last two decades. Indian Space Research Organisation (ISRO) is the leading agency in India dealing with space research and technology development. India made history as ISRO's third moon mission, Chandrayaan-3, landed safely on the moon's unexplored south pole on 23rd August 2023. On 2nd September, ISRO successfully launched Aditya-L1 mission which carries seven payloads designed to study and observe different layers of the Sun. C-DAC is proud to associate with ISRO in developing and supplying indigenously developed products and technology solutions for qualification tests of various stages of the ISRO mission programs.

C-DAC is having a very cordial relationship with ISRO for the last 20 years. C-DAC has developed and deployed several custom-made products and technology solutions for various mission critical applications of the ISRO. ISRO has extensively used C-DAC products for prestigious missions like Chandrayaan-3, Aditya L1 etc.

Meeting of DG, C-DAC with Chairman, ISRO to discuss collaboration

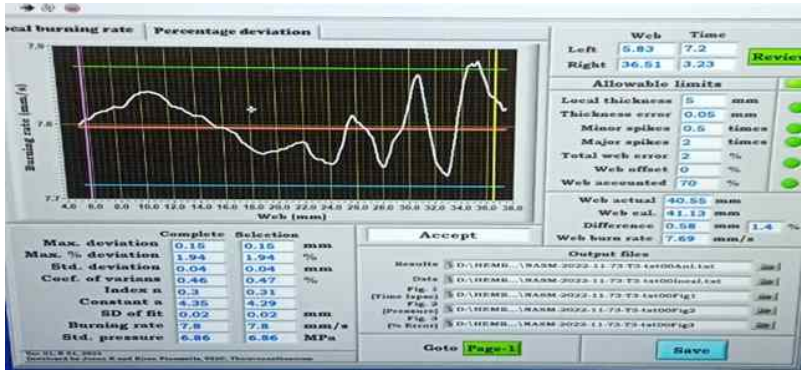
C-DAC team led by DG, C-DAC and Director, C-DAC, Thiruvananthapuram, had interacted with Chairman, ISRO in the backdrop of the recent Aditya-L1 mission launch, on 1st & 2nd September 2023 at Satish Dhawan Space Centre, Sriharikota (SDSC SHAR), on invitation from the Director, SDSC SHAR. An event was held to handover a high precision instrumentation amplifier, 'PRIAMP' designed and developed by Strategic Electronics Group of C-DAC, to Chairman-ISRO. The contribution of C-DAC in supporting ISRO for their mission programmes is well appreciated by the Chairman. He emphasised the need and importance of indigenisation of products/systems that are being used at various centres and laboratories of ISRO. He also instructed all the ISRO centres to identify such products/systems which can be indigenised in collaboration with institutions like **C-DAC.**

C-DAC products and technology solutions for ISRO mission programmes

C-DAC products and technology solutions are mainly used for qualification tests of various types of solid propellants, R&D of liquid propellants, High Precision Instrumentation Amplifier for static firing tests of rockets, Integrated Telemetry Test System, NDT systems for thickness measurement of booster stage rocket insulation layer and propellant inhibition layer, material bonding integrity testing of acoustic sound foam used in orbiter and lander modules, flaw detection of various components used in cryogenic unit and payload adapter unit, etc. Some of the major products developed by C-DAC in collaboration with ISRO are Ultrasonic Solid-propellant Burn Rate Measurement System (USBRMS), Sonic Ultrasonic Non-Destructive Test System (SoUNDS), Precision Instrumentation Amplifier (PRIAMP), Thermal conductivity Measurement System (TCMS) and the Integrated Telemetry Test Systems (ITTS). C-DAC has 9 IPRs and 2 international publications for the technologies developed for space sector applications.

Ultrasonic Solid-propellant Burn Rate Measurement System (USBRMS)

USBRMS system is an ultrasound technology-based system for measuring the burning rate of solid propellants. The system consists of high pressure-high temperature propellant burning test chamber and electronics for data acquisition, replay and analysis. The system works on the principle of ultrasonic technique by repeated measurement of the thickness of a burning propellant specimen. Burn rate measurement is an important ballistic property for precise prediction of trajectory of launch vehicles



Sonic-Ultrasonic Non-Destructive Test System (SoUNDS)

SoUNDS is a system for Non-Destructive Testing and Evaluation of materials, using Sonic and also Ultrasonic frequencies. Using SoUNDS, the user can measure the velocity of a sonic-ultrasonic wave through the test specimen, and the attenuation of the wave in the material. SoUNDS is being used for detecting internal flaws in test specimens, as well as for studying the characteristics of materials under test. It is specifically used by ISRO for thickness measurement of booster stage rocket insulation layer, propellant inhibition layer etc., bonding integrity testing of acoustic sound foam used in orbiter and lander modules. And also used for flaw detection of various components used in cryogenic unit and payload adapter unit.

Sonic-Ultrasonic Non-Destructive Test System (SoUNDS)

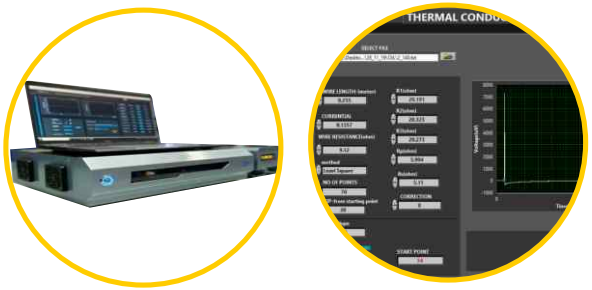
Precision Instrumentation Amplifier (PRIAMP)

The product PRIAMP is a high accuracy instrumentation amplifier for measurement of critical parameters like thrust, pressure, displacement, firing current among other parameters. PRIAMP is a mission critical equipment for Static Firing Testing of rockets, which was designed and developed based on the requirements provided by ISRO.

Precision Instrumentation Amplifier (PRIAMP)

Thermal Conductivity Measurement System (TCMS)

Thermal Conductivity Measurement System (TCMS) is an electronic system to measure the thermal conductivity of solid and liquid propellant specimens. The system functions on 'Transient Hotwire' technology where a copper/platinum wire is used as the primary sensor element for the thermal conductivity measurement. The TCMS is an electronic system for measuring the thermal conductivity by collecting nano-volt level signals from the hotwire sensor element. An excitation constant current source with micro-ampere level accuracy and stability also is part of the system which excites the hotwire sensor



Thermal Conductivity Measurement System (TCMS)

element. Primary application of the product is for the quality evaluation of various types of liquid propellants used in ISRO. The thermal conductivity of liquid propellant is an important parameter to determine its usability as fuel for various stages of the rocket propulsion.

Integrated Telemetry Test System (ITTS)

C-DAC, Thiruvananthapuram had developed an Integrated Telemetry Test Station (ITTS) for testing the Telemetry packages of the Launch Vehicles of Vikram Sarabhai Space Centre (VSSC), ISRO. This test station caters to the testing needs of Advanced Telemetry System (ATS) stacks used in different launch vehicles of ISRO such as PSLV, GSLV, LVM3 and ATV.

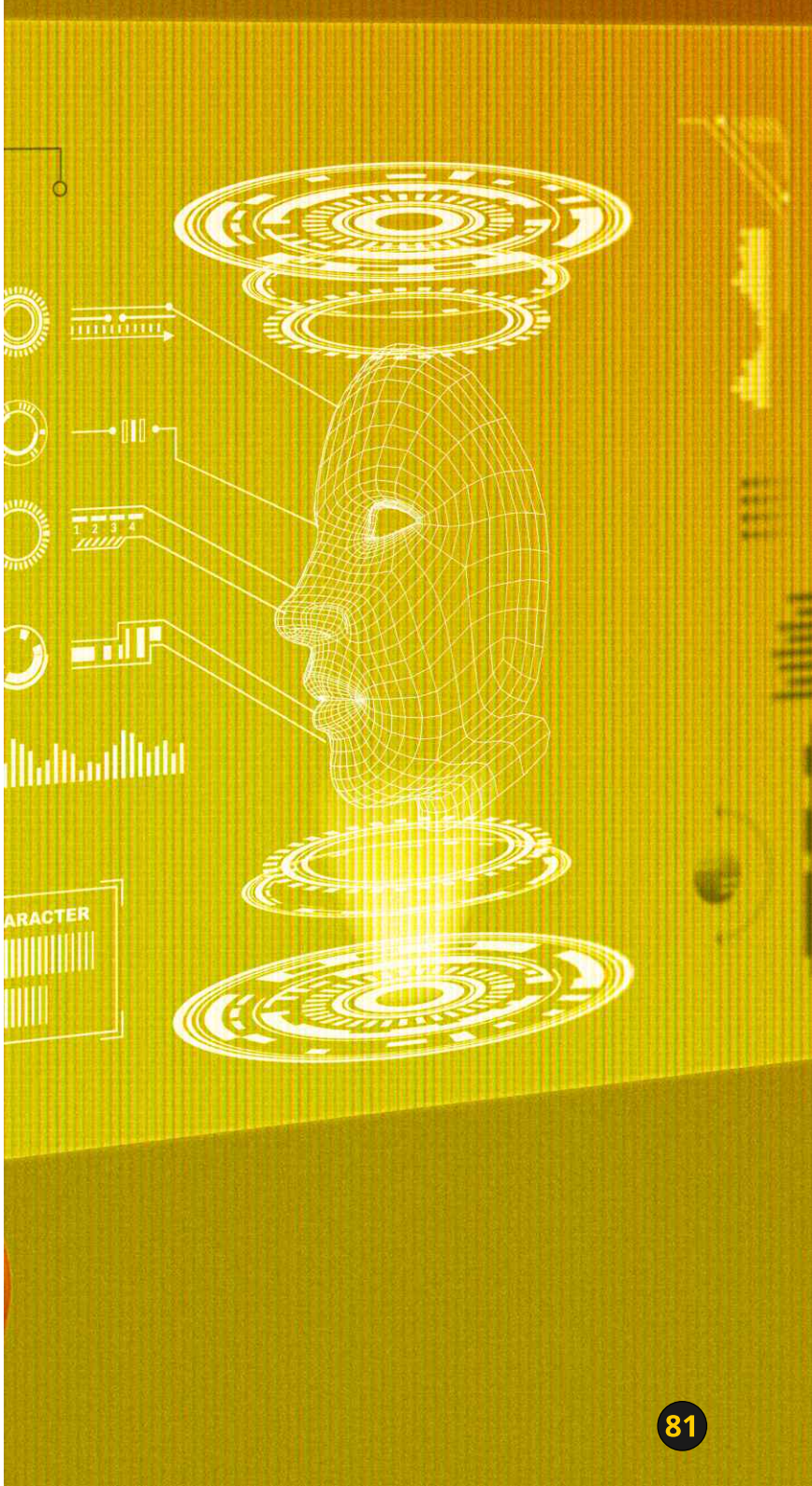
Future R&D with ISRO

Indian Space Policy made public on April 20, 2023 states that ISRO shall transit out from manufacturing operational space systems and focus its energies on research and development in advanced technologies. ISRO will focus primarily on the research and development of new space technologies and applications and on expanding the human understanding of outer space. C-DAC can start R&D on supporting systems required for mission programmes with the scope of indigenisation of equipment and systems. There is increased scope of joint development in multiple areas like HPC, AI systems, power electronics, robotics, control systems etc

Space technology has emerged as the hot favourite of many Indians after the historic achievement of Chandrayaan-3. As it is, the space sector has been witnessing a lot of dynamic changes. To enhance capabilities and improve the outcome, major players such as ISRO and NASA are using advanced satellite systems and have embraced new technology ranging from 3D printing to quantum computing to 5G, to enhance its capabilities. Apart from these, new

trends such as space robotics and smart propulsion are gaining significant traction. And also, Govt. of India, by its policies are promoting 'Make in India' for all the fields of technology. This is applicable to space sector also. C-DAC also can contribute significantly to space sector to support their R&D activities and routine launch programmes. Currently, many of equipments/systems that are in use at ISRO are imported from abroad. So, there are demand for indigenisation of these systems. The indigenisation process will bring advantages to the country in terms of cost, service support, technical know-how, obsolescence of parts, etc

Sl. No	Products and systems for future collaboration	Technology content and Application
1	Transient Burn Rate Measurement System	• R&D on solid propellants • High speed Burn Rate measurement by ultrasonics • No solutions exist worldwide
2	Burn Rate Measurement System for Hybrid Propellants	• Extending existing USBRMS to use for hybrid propellants with technical advancement with improved specifications
3	Bladeless Non -contact Acoustic Propellant Mixer	• R&D and manufacturing of solid propellants • Safety & quality advantages over conventional method
4	Acoustic Propellant Cutter	• R&D and manufacturing of solid propellants • Quality advantage in propellant shaping and cutting
5	Custom made electronics solutions for ISRO	• Customised product development for technology solutions • Development of mission -critical control systems, Signal conditioners, DAQ systems etc
6	Indigenisation of various products and systems for various space centres and laboratories	• Indigenisation of imported products and solutions that are currently in use • Advantages on technical & service support, obsolescence management etc. • Complete know -how useful for further customisation and improvement



TESTIMONIALS FROM **INDIAN SPACE RESEARCH ORGANIZATION**

"As part of the indigenization, we were in search of a capable team for the development of electronics and C-DAC Thiruvananthapuram took much interest in the development from basic design. They could develop a prototype system within a very short period of time for the elaborate field testing at VSSC. Later, they could supply 7 units of ultrasonic burn rate measurement systems after incorporating all the required aspects for user friendly operation complying all the stringent specification requirements and acceptance criteria put by VSSC for very accurate measurement of burning rate. Also, they could deliver sufficient number of units in time to VSSC. We acknowledge and appreciate all the efforts made by the C-DAC team for the design, development and supply of the custom-built electronic units. We received excellent support from C-DAC team for the installation, calibration and evaluation of the system at various test facilities of VSSC. We are happy to highlight that the system has completed two years of operation now at VSSC without any failures."

Dr. Jeenu R.
Group Director
SPCG/SPRE
VSSC, ISRO,
Thiruvananthapuram

"I am extremely glad to inform you that SoUNDS Mk2 R4 received the safety clearance certification from VSSC centre safety committee for inspection of solid motor segments, which indeed is a proud achievement. The successful realisation and application of this new system was indeed a great challenge to the scientific community of our country. The positive sprits, enthusiasm in development and the utmost sincerity shown by C-DAC team during every stage of our interaction have transited the concept and definition of our equipment to a reality. The seriousness with which C-DAC team had worked for realisation of the system and successful accomplishment of the goal is highly commendable. We would like to record our sincere appreciation for C-DAC team for the great efforts in this successful venture. Kindly convey hearty congratulations and sincere thanks to each and every member of C-DAC team. We look forward to your continued support and partnership in our future development efforts as well"

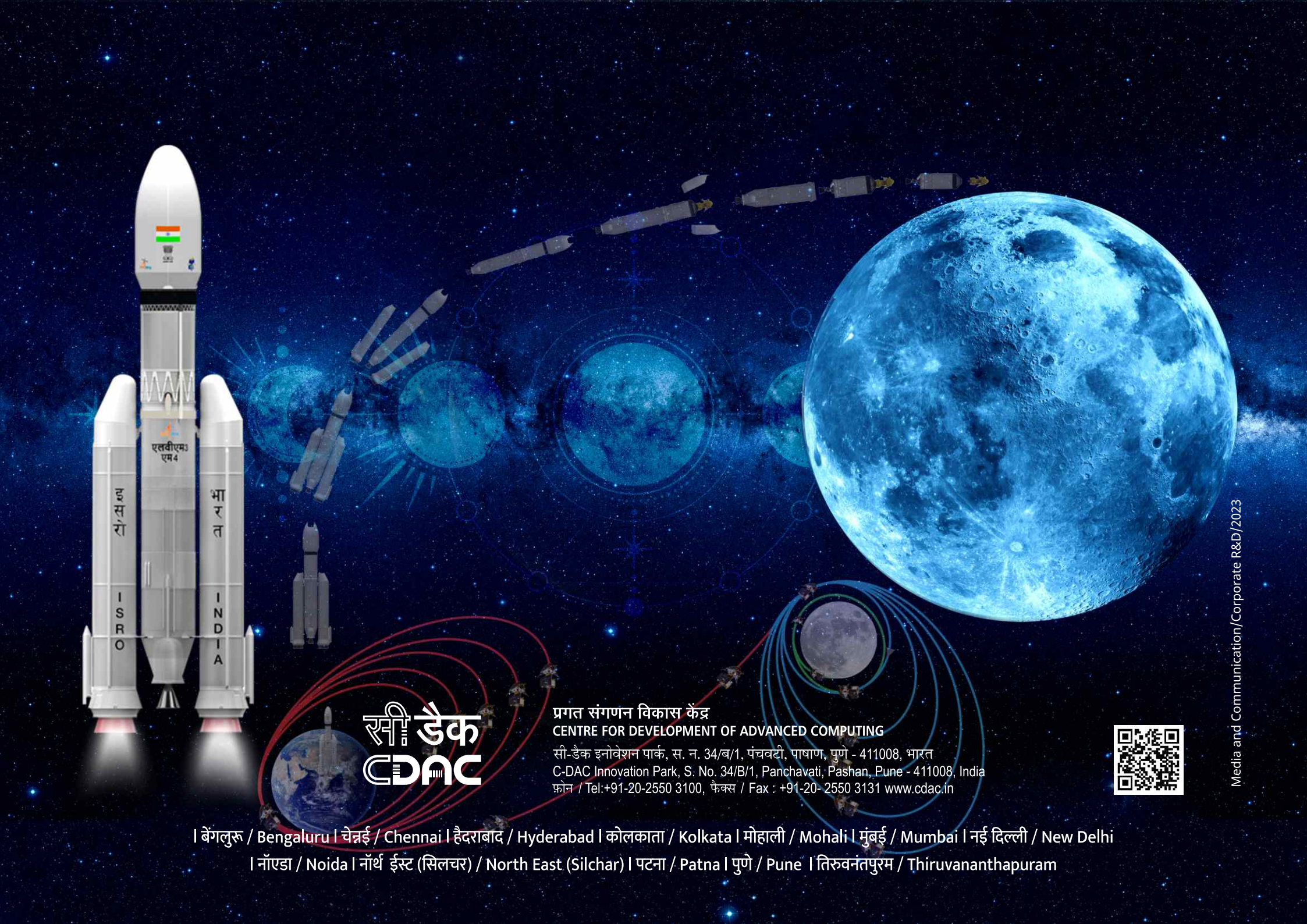
Shri V. K. Ravindran,
Head QDSM,
VSSC, ISRO,
Thiruvananthapuram

"We are glad to have an association with C-DAC for the indigenous development of the Precision Instrumentation Amplifier (PRIAMP), a mission critical equipment for the static firing testing of solid rocket motors. It is a significant achievement for both C-DAC and ISRO. We appreciate all the team members of C-DAC for the challenging task they undertook. We wish to have long-term association with C-DAC for similar research and development activities."

Dr. S. Sankaran,
CGM-SMP&ETF,
SDSC SHAR, ISRO,
Sriharikota

"We acknowledge and appreciate the effort made by C-DAC team for the development of TCMS Electronics Proto Unit. Also acknowledge the support given for successful completion of evaluations tests."

Shri Subhajayan K. P.
Head - TSCD,
VSSC, ISRO,
Thiruvananthapuram



सी डैक
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