techzine

C-DAC R&D DIGEST

APRIL 2024 – JUNE 2024
VOLUME 1, ISSUE 5

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

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Message from **Director General**

I am delighted to see that fifth issue of Techzine R & D Digest of C-DAC is getting released. Heartfelt congratulations to the Corporate R&D team for this achievement. I extend warm greetings to all who have shared their inputs for this issue.

Current issue of Techzine focuses on "Future of Mobility: Automotive and Transportation". The future of mobility is dynamic and multifaceted, driven by technological advancements, regulatory changes, and evolving consumer expectations. Collaboration across industries and stakeholders will be crucial in shaping a sustainable and efficient future of automotive and transportation.

Techzine has made a significant impact within C-DAC and among stakeholders, including MeitY. I am immensely proud of our team's remarkable work and their dedication to excellence.

Together, we are fostering a culture of innovation that values collaboration, creativity, and relentless pursuit of excellence. We hope to inspire others to join us on this journey of Techzine, to share their knowledge and expertise, and to contribute to the collective advancement.

I encourage Techzine R&D Digest to leverage multidisciplinary research initiatives and collaborations, urging everyone to focus these activities toward nation-building.

Message from **Editorial Board**

We are pleased to see that all four issues of Techzine have helped to proliferate the research, development activities of C-DAC and their successful deployment/usage across various Ministries including MeitY, academia, research institutions, industries and other stakeholders.

This issue of Techzine is dedicated to "Future of Mobility: Automotive and Transportation" having articles focusing on C-DAC's solutions & its achievements in the area of mobility and the Autonomous Tractor for Indian Farming conditions and application.

Each issue of our Techzine seeks to showcase the incredible work being done by C-DAC scientists, researchers and innovators at all the C-DAC centres. We extend our warmest greetings to all of you, our esteemed readers and contributors.

Thank you for your continued support, and we look forward to embarking on this journey with you.

IDEAS TO ACTION

NEW MEITY PROJECTS

IDEAS TO ACTION

1

Name of Project: BharathDB

CI: Dr. Ethirajan D
Scientist F, C-DAC Chennai

Co-CI: Shri V Solai Murugan
Scientist E, C-DAC Chennai

Collaborators: IITM and IITM Pravartak

Brief Description:

Bharath DB Pg is a secured database solution designed for high availability, suitable for deployment on both on-premises and cloud platforms. It is tailored for commercial and government enterprises, offering robust features such as cloud support, high availability for business continuity, data security and protection, geospatial capabilities, graph database support, and native Indian language support. This enterprise-grade database ensures reliability and scalability, making it ideal for diverse and critical applications.

NEW MEITY PROJECTS

IDEAS TO ACTION

2

Name of Project: Vikaspedia 2.0

CI: Ms . Vijaya Lakshmi B
Scientist F, C-DAC Hyderabad

Collaborators: Multiple development stakeholders covering government, academic, industry and Civil Society Organisations

Brief Description:

Vikaspedia 2.0 seeks to promote an AI-augmented digital ecosystem to leapfrog the availability and accessibility of digital information in Indian languages, thereby empowering citizens and driving digital transformation. Through collaboration with diverse stakeholders, Vikaspedia harnesses technology, capacities, and knowledge enablers to efficiently create and disseminate e-information, fostering a dynamic digital environment.

NEW R&D PROJECTS
(EXTERNAL FUNDING)

IDEAS TO ACTION

3

Name of Project: SoUNDS Mk2 R4 Portable-CAS

CI: Shri Harikrishnan C. S.
Scientist E, C-DAC Thiruvananthapuram

Co-CI: Ms. Parvathy S. R.
Project Manager, C-DAC Thiruvananthapuram

Collaborators: Centre for Advanced Systems (CAS), DRDO, Hyderabad

Brief Description:

SoUNDS is a Non-Destructive Testing and Evaluation system that utilizes sonic and ultrasonic frequencies to analyze materials. Using SoUNDS, users can measure the velocity of a sonic-ultrasonic wave propagating through a test specimen, and quantify the attenuation of the wave within the material. This system enables the detection of internal flaws in test specimens, as well as the study of the characteristics of materials under examination. The 'SoUNDS Mk2 R4', the fourth iteration in the SoUNDS series, incorporates features specifically designed for use in Non-Destructive Testing activities in areas handling explosives. This unit adheres to stringent safety requirements, allowing it to obtain the necessary clearance for conducting ultrasonic inspections on solid motor segments, which contain explosive solid propellants. The system has been customized specifically for the Non-Destructive Testing of solid motor segments used in missiles. This project focuses on the development activities of the SoUNDS Mk2 R4 system, to be delivered to the Centre for Advanced Systems (CAS), DRDO, Hyderabad.

Name of Project: SoUNDS Mk2 R5-VSSC RO IPRS

CI: Ms. Nimmy Mathew
Scientist F, C-DAC Thiruvananthapuram

Co-CI: Shri Harikrishnan C. S.
Scientist E, C-DAC Thiruvananthapuram

Collaborators: VSSC Thiruvananthapuram

Brief Description:

SoUNDS is a non Destructive Test (NDT) and Evaluation system, optimized for porous and composite materials where conventional high frequency ultrasonic NDT systems will not be useful. SoUNDS can be used for study and analysis of certain material properties and for detecting flaws in the material by measuring the propogation of sound wave in the material. The low frequency operation of SoUNDS makes it useful in situation where common high frequency NDT system cannot be used. This project is aimed for carrying out the development activities of SoUNDS Mk2 R5 the advanced portable Acousto Ultrasonic NDT system, for VSSC Thiruvananthapuram.

IDEAS TO ACTION

New R&D Projects (External Funding)

NEW R&D PROJECTS
(EXTERNAL FUNDING)

IDEAS TO ACTION

5

Name of Project: A Study of AI-Driven Solutions in Agriculture: Trends, Challenges, and Prospects

CI: Dr. Balwinder Singh
Scientist E, C-DAC Mohali

Co-CI: Shri Chetan Manchanda
Principal Technical Officer-I, C-DAC Mohali

Funding Agency:

Department of Science and Industrial Research, DSIR under Ministry of Science and Technology

Brief Description:

This project aims to comprehensively study existing research initiatives, evaluate technical and infrastructure readiness for AI adoption, and investigate the challenges and opportunities in data-driven agricultural practices. This research will specifically focus on monitoring, controlled processes, prediction, and logistics. Additionally, it will also examine current policies and regulations governing AI usage in agriculture to identify impediments to its adoption.

NEW R&D PROJECTS
(EXTERNAL FUNDING)

IDEAS TO ACTION

6

Name of Project: Upgradation and Implementation of eDAS over Zonal Railways

CI: Shri Mehanathen N
Scientist E, C-DAC Chennai

Co-CI: Mrs. Kambham Radhika
Scientist F, C-DAC Chennai

Collaborators: Railtel

Brief Description:

This project is to design, develop and implement the electronic drawing approval system (e-DAS) software across Zonal Railways. C-DAC will also provide a dashboard and Management Information System (MIS) to monitor the overall workflow.

NEW R&D PROJECTS
(EXTERNAL FUNDING)

IDEAS TO ACTION

7

Name of Project: Establishing Security Operation Centre (SOC) at National Skill Development Corporation (NSDC)

CI: Shri John N
Scientist E, C-DAC Chennai

Co-CI: Shri Gokul S
Scientist E, C-DAC Chennai

Collaborators: National Skill Development Corporation (NSDC)

Brief Description:

This project is for establishing a Security Operation Centre (SOC) for National Skill Development Corporation (NSDC). As part of the project C-DAC will deploy SIEM, SOAR and integrate Threat Intelligence solution. C-DAC will also deploy resources to monitor and manage the SoC.

NEW R&D PROJECTS
(EXTERNAL FUNDING)

IDEAS TO ACTION

8

Name of Project: Student Life Cycle Management System (SLCMS), AIIMS Bhubaneshwar

CI: Shri Anuj Kumar Jain, Scientist F, C-DAC Noida

Co-CI: Shri Gaurav Singh, Project Manager, C-DAC Noida

Collaborators: All India Institute of Medical Sciences, Bhubaneswar

Brief Description:

Student Life Cycle Management System (SLCMS) is a web application that manages the entire student journey from admissions through alumni, within a health education institute. It brings all the departments working in isolation in a single platform, facilitating coordination among them. It can significantly improve efficiency, reduce administrative burdens, and enhance the overall student experience within a medical college. It comes with a mobile application which offers several benefits to students, enhancing their educational journey and overall experience. Overall, a well-designed student life cycle mobile app enhances the educational experience by improving efficiency, fostering collaboration, and supporting student success throughout their academic journey.

PROGRESS PULSE:

A PERFORMANCE DASHBOARD

IPR PORTFOLIO

To create awareness and increase the Intellectual Property Rights (IPR) footprint across C-DAC, the 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 2024)				Quarterly IPR portfolio of C-DAC (April 2024 to June 2024)			
	Patents	**Copyrights**	**Trademarks**	**Designs**	**Patents**	**Copyrights**	**Trademarks**	**Designs**
Applied/Filed (Pending)	55	2	14	0	3	0	7	0
Granted/Registered	103	171	20	0	5	5	0	1
Total	**158**	**173**	**34**	**0**	**8**	**5**	**7**	**1**

CHIPS TO STARTUP (C2S)

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. 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 licenses), chip fabrication support, prototype design using FPGA boards, etc.

C-DAC Bangalore is Programme Coordination Institution for overall implementation of the programme. 100 Institutes, 13 Startups /MSMEs have been selected based on Call-For-Proposals. Various FPGA boards identified and recommended by the CEPC were procured and distributed to all participating institutes under C2S Programme.

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, Siemens, Xilinx, Ansys and Keysight EDA Tools) 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.

CHIPS TO STARTUP (C2S)

ChipIN Support Center Web-Portal has been enabled for Participating Institutions to make use of the support ticket system in order to streamline ChipIN support requests. All EDA Tool vendor interactive sessions recordings, documentation was shared to the C2S institutions through ChipIN Cloud.

RTL to GDS-II Digital IC design flow was established with Cadence and Siemens EDA tools for SCL 180nm. Conducted 5-day IEP on Digital ASIC Design using 180nm PDK in Hybrid mode with the participation of 83 (In person) members from various C2S participating institutes to get trained on the aspects of Digital design.

A tutorial session titled "Digital and Analog/Mixed-Signal ASIC Design Flow with SCL 180nm PDK" has been presented in VLSID 2024, Kolkata.

MAJOR PROJECT PERFORMANCE/ STATISTICS

Design Linked Incentive Scheme (DLI)

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. As per the approval accorded by Cabinet, DLI Scheme is being implemented by C-DAC.

The Design Linked Incentive (DLI) Scheme shall offer 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 over a period of 5 years.

The Scheme strengthens Startup and MSMEs for semiconductor design thereby facilitating indigenization and import substitution with value addition in electronics sector in the next 5 years.

Application Status		
DLI Applications	Proposals	
	Product Development Linked Incentive	EDA Tools Access Request
Proposals Received	41	32
Evaluation Ongoing	8	4
Proposals Approved	13	28
Proposals Rejected	20	0

Design Linked Incentive Scheme

Design chips in India, for the world !

PROGRESS PULSE:
A PERFORMANCE DASHBOARD

MAJOR PROJECT PERFORMANCE/ STATISTICS

Approved Applicants for Fiscal Support under DLI Scheme (PDLI)		
Applicants	**Fiscal Support Committed (Cr)**	**Fiscal Support Disbursed (Cr)**
Vervesemi Microelectronics	13.53	-
Fermionic Design	4.1390	-
DV2Js Innovation	3.415	.15
Morphing Machines	10.244	-
Netrasemi Pvt. Ltd.	15	2.475
Calligo Technologies	14.755	.9216742
Aheesa Digital	15	1.7026542
Saankhya Labs	11.383	2.1642861
Sensemi Technologies	15	-
GreenPMU	4.84	-
WiSig Networks Pvt. Ltd.	12.6778	-
Total	**119.9838**	**7.413615**

Design Linked Incentive Scheme

Design chips in India, for the world !

MAJOR PROJECT PERFORMANCE/ STATISTICS

Applicant Name	Funding from other sources	Fund received (Rs. In Lakh)	Achievements
Netrasemi Pvt Ltd	Investor Funding	800	Tape out planned for August 2024
Green PMU Semi Pvt Ltd	WxBunka Foundation, Japan	6.5	Tape out done in Feb' 2024
Morphing Machines	VC (Speciale Invest)	2300	
Calligo Tech.	Investor Funding	115	Received the 1st version of fabricated design in March' 2024
SenseSemi Tech.	VC	80	
WiSig Networks	VC	Committed	Tape out expected in Sept 2024
Incore Semiconductors	VC (Sequoia Capital	2400	

Design Linked Incentive Scheme

Design chips in India, for the world !

PROGRESS PULSE:
A PERFORMANCE DASHBOARD

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/offline based on Aadhaar authentication to government and private agencies. C-DAC utilizes service of Unique Identification Authority of India (UIDAI) for on-line authentication and Aadhaar eKYC service. e-Hastakshar service supports both One Time Password (OTP)/ToTP and Biometric (Fingerprint/IRIS/Face) based modes of authentication for leveraging eKYC service of UIDAI. eHastakshar apk is available on Google Play Store and GOV.IN AppStore.

More than 16.53 Cr e-Signs have been offered by C-DAC till June 2024. More than 235 Government agencies are leveraging C-DAC's eSign service on production level. Several key new agencies, National Crime Records Bureau (NCRB), Institute for Plasma Research, Gujarat, Cotton Corporation of India Limited, International Financial Services Centres Authority with existing key agencies Employees Provident Fund Organization, National Informatics Centre, Centre for eGovernance, Karnataka are leveraging eSign on production level.

eSigns offered by C-DAC	
July 2016 to June 2024	April–June 2024
16.53 Cr	1.53 Cr

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, IVRS, CBS, LBS, apps. 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 4900 accounts of government departments and agencies with over 6010 cr+ transactions are integrated with Mobile Seva platform.

Mobile Seva platform		
	April 2012 to June 2024	**April 2024 to June 2024**
Accounts of Dept/Agencies integrated	4900	73
No of Push SMS Transaction	6010 Cr	146 Cr

MAJOR PROJECT PERFORMANCE/ STATISTICS

FutureSkills PRIME

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 beneficiaries 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. 18.60 Lakh candidates have signed up on the FutureSkills PRIME portal: www.futureskillsprime.in. Around 7.56 lakh candidates have enrolled for Foundation/Deep-Skilling/ Bridge and non-aligned courses out of which, around 3.08 lakh candidates have completed the courses. 11468 Government officials from Central/State Government Offices/Departments/ PSUs trained across the Nation and 2367 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 Course is as below:

FutureSkills PRIME Report				
	Dec 2019 to June 2024		April 2024 to June 2024	
Sign Ups	18.60 Lakhs		0.68 Lakhs	
	Enrolled	Certified	Enrolled	Certified
Government Officials Training	6710	5426	5	80
Training of Trainer	1861	1596	0	0
Bridge Course	28016		5040	

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A Meity - NASSCOM Digital Skilling Initiative

MAJOR PROJECT PERFORMANCE/ STATISTICS

Information Security Education and Awareness (ISEA) Project Phase –III

ISEA Activities	January 2024 to June 2024	April,24 to June,2024
Generating highly skilled & certified Cyber Security Professionals - CISOs	3rd Phase of ISEA started from January 2024 and selection of Institutions are under progress. Course Frame work, reading and lab materials were under development	Various training and certification program on Level-1: ICS Security Engineer Courseware": "Sector-Specific Operational Technology (OT) / Industrial Control System (ICS) Security" were conducted. More than 100 CISO team members/ officers (Deputy CISO/CISOs) were trained from various critical sector organizations at National level.
Strengthening Research and Education	**3rd Phase of ISEA started from January 2024 and selection of Institutions are under progress.**	
Grooming students towards products & solutions development in Cyber Security	3rd Phase of ISEA started from January 2024 and selection of Institutions are under progress.	
Cyber Aware Digital Naagriks (Mass Awareness) • **Cyber Hygiene, Security & Privacy** • **Role based awareness, progression pathways** • **Mass Awareness**	As part of "National Awareness Campaign on Information Security Education and Awareness (ISEA) Program – Phase III a total of - 45 Awareness workshops / Training were organized by covering 18,358 participants.	As part of "Cyber Aware Digital Naagrik (Mass Awareness Program) under Information Security Education and Awareness (ISEA) Program – Phase III a total of 19 Awareness workshops / Training were organized by covering 3,178 participants.

PROGRESS PULSE:
A PERFORMANCE DASHBOARD

MAJOR PROJECT PERFORMANCE/ STATISTICS

eSanjeevani

eSanjeevani-National Telemedicine Service is an innovative, indigenous, cost-effective, cloud and microservices architecture based real-time telemedicine system developed by C-DAC as per the requirements and workflows outlined by MoHFW. eSanjeevani is implemented in two variants: 1. eSanjeevani-AAM Ayushman Arogya Mandirs (a provider-to-provider telemedicine platform): It enables the access of quality and specialized health services to rural and isolated populace in assisted mode. 2. eSanjeevaniOPD (a patient to provider telemedicine platform): it empowers citizens to access health services in the confines of their homes through smartphones or laptops etc.

As the world's largest telemedicine implementation in primary healthcare, eSanjeevani has already catered to over 263 million patients. This digital health innovation is operational across India through 1,26,202 Ayushman Arogya Mandirs (AAM) functioning as spokes, supported by 15,902 hubs and 422 online OPDs. A dedicated workforce of more than 2,14,906 doctors, super-specialists, and numerous health workers serve as telemedicine practitioners as of June 30, 2024. The platform has established its presence across all States and Union Territories in India, promoting equitable healthcare access and advancing Universal Health Coverage (UHC) through digital health equity. Its exceptional scalability and resilience have made eSanjeevani a cornerstone of the India Stack Global initiative, setting a benchmark for digital health solutions worldwide and showcasing India's leadership in innovative healthcare technologies.

eSanjeevani Usage Report				
	Nov 2019 to June 2024		April 2024 – June 2024	
	Total Tele-Consultations	Registered Doctors	Total Tele-Consultations	Registered Doctors
eSanjeevaniAB-HWC	251,899,478	71258	35,921,574	10075
eSanjeevaniOPD	11,433,349	3515	302,461	650
eSanjeevani (Overall)	263,332,827	74,773	36,224,035	10,725

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 for 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 Report: National		
Particulars	No. of Patient Visited	
	Till Jun 2024	Apr 24- Jun 24
e-Sushrut for AIIMS (15 No's)	2,40,56,119	27,91,713
e-Sushrut PAN Railways HMIS	**3,66,36,396**	**42,03,895**
SAIL BSL e-Sushrut HMIS	7,11,677	1,35,667
HMIS-NHM UP	**1,70,72,699**	**33,04,857**
HMIS- DGME UP	1,10,01,362	23,02,248
Punjab	**4,41,95,956**	**70,40,196**
Telangana	2,34,26,020	39,52,616
Odisha	**4,41,21,383**	**39,26,798**
NIMS HMIS Hyderabad	41,39,862	2,17,380
HMIS Maharashtra	**1,40,34,367**	**17,66,086**
IGIMS Patna	7,86,191	3,07,031
HMIS TN	**6,64,952**	**5,61,891**
HMIS HP	3,89,416	2,92,245
SAIL RSP e-Sushrut HMIS	**1,56,340**	**90,451**
Goa State	18,12,182	2,30,544
GIMS	**6,13,197**	**74,051**
Arunanchal Pradesh	14,78,053	2,06,262
Sikkim	**5,41,261**	**1,87,171**
NHPC	2,00,139	29,142

MAJOR PROJECT PERFORMANCE/ STATISTICS

Blood Bank Management System- eRaktKosh

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. eRaktKosh is integrated with various state-wide blood bank solutions & has become a single data repository for management of data regarding blood availability, blood-related products, blood donation camps, donor repository etc.

eRaktKosh		
	Year 2017 to June 2024	April 2024 to June 2024
Total Blood Bank Registered	4,193	53
Total Govt Blood Bank Registered	1,265	16
No of Active Blood Banks	3,223	3,223
No of Camp Conducted	1,24,063	12,804
No of Donor Registered	60,16,260	3,38,818

MAJOR PROJECT PERFORMANCE/ STATISTICS

eAushadhi 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.

eAushadhi (DVDMS) - Coverage across India along with Procurement and Issue Details for Drugs

Sl.no	Institutions	January 2023 to June 2024 (Amount in Crore)		April 2024 to June 2024 (Amount in Crore)	
		Procurement Value	Distribution Value	Procurement Value	Distribution Value
A. States Implementation					
1	Andhra Pradesh	1676.11	1122.83	111.51	137.80
2	Assam	553.00	59.94	80.00	6.53
3	Bihar	980.71	927.88	165.29	162.73
4	Gujarat	717.95	827.33	160.14	110.22
5	Himachal Pradesh	170.00	161.00	23.00	22.00
6	Jharkhand	42.61	65.00	8.00	10.00
7	Madhya Pradesh	952.55	729.31	163.20	115.23
8	Maharashtra (PHD & DMER)	845.98	703.28	58.26	112.23
9	Punjab	5816.26	6847.98	408.3	1429.2
10	Rajasthan	3231.35	2868.01	642.96	464.52
11	Telangana	859.46	770.51	83.74	90.11
12	Uttarakhand	73.83	72.03	12.63	10.05
13	Uttar Pradesh	1484.33	1002.82	203.22	178.68

MAJOR PROJECT PERFORMANCE/ STATISTICS

eAushadhi (DVDMS) - Coverage across India along with Procurement and Issue Details for Drugs					
Sl.no	Institutions	January 2023 to June 2024 (Amount in Crore)		April 2024 to June 2024 (Amount in Crore)	
		Procurement Value	Distribution Value	Procurement Value	Distribution Value
B. Union Territories (UT) Implementation					
1	Jammu and Kashmir	586.72	465.62	48.65	116.98
2	Puducherry	76.25	72.76	49.7	14.39
3	Lakshadweep	535.11	457.49	0	452.78
4	Chandigarh	0	2.48	0	2.48
C. Centralized / National Implementations					
1	DGAFMS- Ministry of Defence (Army, Navy, Airforce and subsidaries)	580.04	505.242	34.29	104.785
2	Central Medical Services Society-MoHFW	3382.55	1498.07	570.52	415.34
3	Dept of Family Planning -MoHFW	102.63	365.52	555.24	188.74
4	National Tuberclosis Elimination Programe-MoHFW	724.73	4309.97	5.21	228.71
5	Medical Stores Organization-MoHFW	286.10	418.64	53.99	50.70
D. Other Implementations					
1	Directorate of Medical Insurance-Govt of Andhra Pradesh	60.24	7.08	0	0.7732

MAJOR PROJECT PERFORMANCE/ STATISTICS

IPDMS 2.0, Integrated Pharmaceutical Database Management System 2.0

National Pharmaceutical Pricing Authority (NPPA) was constituted vide Government of India Resolution dated 29th August, 1997 as an attached office of the Department of Pharmaceuticals (DoP), Ministry of Chemicals & Fertilizers to independently monitor and regulate the pricing of drugs (including medical devices), monitoring their prices and to ensure availability and accessibility of medicines at affordable prices.

IPDMS 2.0, Integrated Pharmaceutical Database Management System 2.0: An integrated responsive web-based application having integrated functional flow for drugs and medical devices price monitoring and regulation has been designed and deployed as IPDMS version 2.0.

The Integrated Pharmaceutical Database Management System 2.0 and Pharma Sahi Daam 2.0 were inaugurated during the celebration of NPPA's silver jubilee foundation day on August 29, 2022 by the Honourable Union Health Minister, Sh. Mansukh Mandaviya.

The detailed usage of IPDMS is as follows-

MAJOR PROJECT PERFORMANCE/ STATISTICS

Integration Pharmaceuticals Database Management System, IPDMS 2.0 National Pharmaceuticals Pricing Authority, (NPPA)		
Activities done by Pharma/ Medical Devices Companies & NPPA	Till June 2024	April 2024- June 2024
Total Companies (Drugs & Medical Devices) Registered in the IPDMS 2.0	1520 (1358 - Drugs, 162 - Medical Devices)	62 (50 - Drugs, 12 - Medical Devices)
Number of Manufacturing Unit verified by the companies	3,765	50
Number of Drugs verified by companies	**47,576**	**2,217**
Medical Devices Plant Registered	433	8
Medical Devices Registered	**48,469**	**9,401**
Quarterly Stock Collection	15,516	4,285
State Pricing Monitoring Resource Unit (PMRU) registered.	**31**	**0**
Form-I (Application for Price Fixation) Submitted	407	84
Form-II (Submission of Revised Prices) Submitted	**13,283**	**4,712**
Form-III (Quarterly Return) Submitted	35,901	7,288
Form-IV (Discontinuation of Production) Submitted	**104**	**20**
Form-V (Price List) Submitted	59,056	9,308
Form – VI (Medical Devices) Submitted	**33,816**	**4,092**
Complaints Registered through Web and Mobile Apps	4,893	769
Legal Cases Registered for Overcharging	**622**	**130**

The Ceiling and Retail Price calculations of drugs with defined overcharging workflows linked with 30 state PMRUs have been automated and implemented in IPDMS 2.0 application. Individual can verify ceiling price and register overcharging complaints through mobile apps.

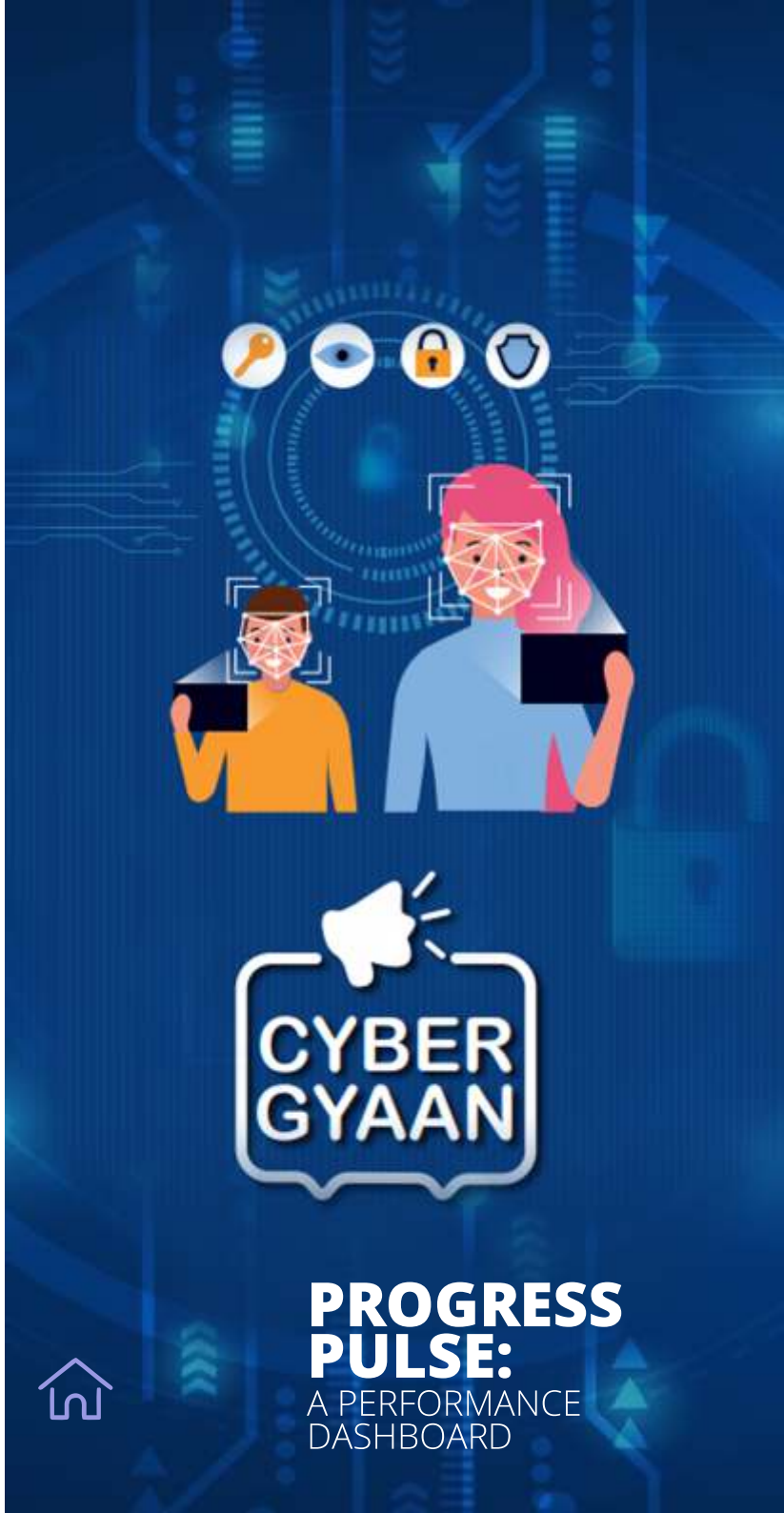
MAJOR PROJECT PERFORMANCE/ STATISTICS

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. This initiative now extends its opportunities to government engineering colleges across the entire nation for student onboarding.

State	Feb 2022 to June 2024	April 2024 to June 2024
Uttar Pradesh	760	368
Haryana	276	221
Gujarat	213	174
Assam	212	60
Kerala	111	111
Arunachal Pradesh	109	34
Meghalaya	88	48
Tripura	78	54
Mizoram	73	28
Manipur	70	57
Sikkim	9	4
Nagaland	3	1
Grand Total	2002	1160



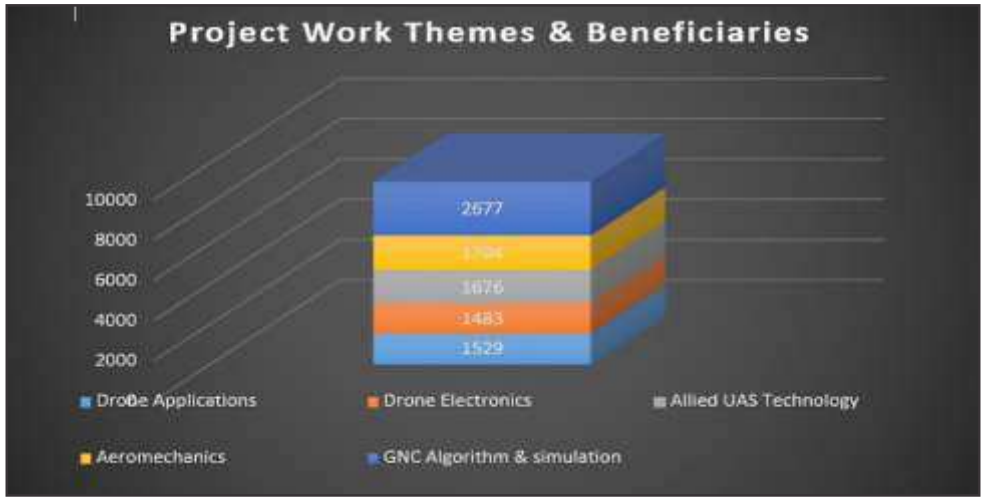
MAJOR PROJECT PERFORMANCE/ STATISTICS

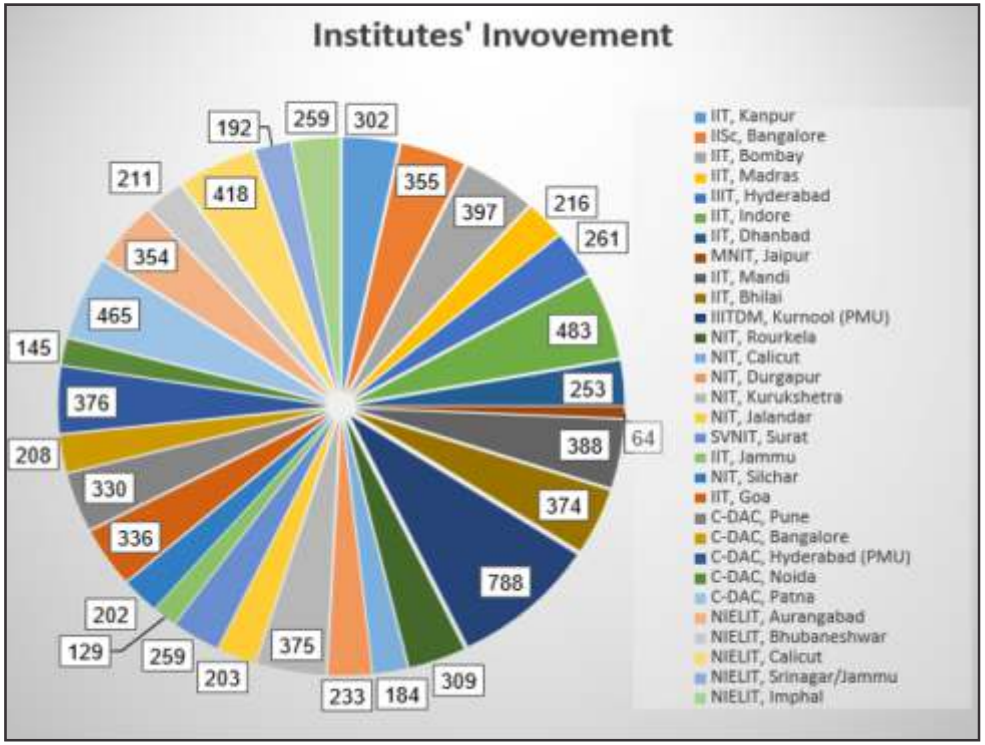
SwaYaan: Capacity Building for Human Resource Development in Unmanned Aircraft System

Project 'SwaYaan: Capacity Building for Human Resource Development in Unmanned Aircraft System' is led by C-DAC Hyderabad and IIITDM Kurnool as the Programme Management Unit (PMU) to develop a UAS/Drone Ecosystem across the Nation. The project is implemented in a hub-and-spoke model through 30 institutions including IISc Bangalore, IITs, IIITs, NITs, C-DAC, and NIELIT Centres. Under the project, the overall target is to train 45,000+ 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. over a period of 5 years.

As on date, overall, 352 activities have been conducted across India as part of various Academic programs, Research & innovation activities, Trainings/Workshops and other Knowledge sharing initiatives to train 9069 participants thereby expediting the spirit of the Nation towards becoming a Global Drone Hub by 2030.

Program Name	Activity: 2022-2024			Participants: 2022-2024		
	Sept 2022 - March 2024	April 2024 – June 2024	Total	Sept 2022 - March 2024	April 2024 – June 2024	Total
FDP	11	2	13	276	50	326
Workshop	7	0	7	556	0	556
Bootcamp	140	41	181	5311	1491	6802
PG-Diploma	5	0	5	17	0	17
POC	40	36	76	177	212	389
M-Tech	1	0	1	11	0	11
Minor Degree	3	0	3	66	0	66
Retrofitting Electives	44	0	44	838	0	838
IPR-Paper	14	6	20	41	18	59
IPR-Patent	2	0	2	5	0	5
Total	267	85	352	7298	1711	9069


Project Work Themes & Beneficiaries
10000
8000
6000
4000
2000
2677
1529
1483
1676
Drone Applications
Drone Electronics
Allied UAS Technology
Aeromechanics
GNC Algorithm & simulation


Institutes' Invovement
302
355
397
216
261
483
253
64
388
374
788
309
184
233
375
203
259
129
202
330
208
376
145
465
354
211
418
192
259
IIT, Kanpur
IISc, Bangalore
IIT, Bombay
IIT, Madras
IIIT, Hyderabad
IIT, Indore
IIT, Dhanbad
MNIT, Jaipur
IIT, Mandi
IIT, Bhilai
IIITDM, Kurnool (PMU)
NIT, Rourkela
NIT, Calicut
NIT, Durgapur
NIT, Kurukshetra
NIT, Jalandar
SVNIT, Surat
IIT, Jammu
NIT, Silchar
IIT, Goa
C-DAC, Pune
C-DAC, Bangalore
C-DAC, Hyderabad (PMU)
C-DAC, Noida
C-DAC, Patna
NIELIT, Aurangabad
NIELIT, Bhubaneshwar
NIELIT, Calicut
NIELIT, Srinagar/Jammu
NIELIT, Imphal


PROGRESS PULSE:
A PERFORMANCE DASHBOARD

TECH ROLLOUTS

SYSTEM/ PRODUCT/ SERVICES LAUNCH/ RELEASE

TECH ROLLOUTS

SYSTEM/ PRODUCT/ SERVICES LAUNCH/ RELEASE

C-DAC, Thiruvananthapuram has installed and commissioned the SoUNDS – Sonic Ultrasonic Non-Destructive Test System at L&T Defense Systems, Coimbatore on June 20, 2024. SoUNDS is an indigenous technology for non-destructive testing of porous materials, rocket propellants, honeycomb structures, composites, bond strength evaluation and thermal tiles.

On June 19, 2024, Shri Ramalinga Reddy, the Karnataka Minister of Transport and Muzrai, inaugurated a new command and control center for Vehicle Location Tracking System (VLTS) and passenger safety developed by C-DAC, Thiruvananthapuram at the Karnataka Office of the Commissioner for Transport at Bengaluru.

TECH ROLLOUTS

SYSTEM/ PRODUCT/ SERVICES LAUNCH/ RELEASE

2024 Web Portal designed and developed by C-DAC Patna was launched during June 15-16, 2024 at Rajbhavan, Bihar by Hon'ble Governor of Bihar, Shri Rajendra Vishwanath Arlekar.

Release management of applications used by Election Commission of India (ECI)in conducting the general election 2024 and War room support on counting day by C-DAC Thiruvananthapuram.

TECH ROLLOUTS

SYSTEM/ PRODUCT/ SERVICES LAUNCH/ RELEASE

C-DAC Hyderabad in collaboration with Blockchain For Productivity Forum organized the 4th International Conference on Unlocking Potential of Blockchain, Metaverse & Web3: Opportunities & Challenges for Accelerating Use Cases Towards Viksit Bharat at IIIT Hyderabad on June 14, 2024.

C-DAC's toolkit for SNOMED CT (CSNOtk) v8.0 with few features and enhancements was released May 03, 2024 during Users Meet Summer 2024.

TECH ROLLOUTS

SYSTEM/ PRODUCT/ SERVICES LAUNCH/ RELEASE

C-DAC Hyderabad organized Training and Placement Officers & Faculty Meet on June 21, 2024 to sensitize academic Institutes about opportunities for students & faculties.

C-DAC Patna organized a symposium titled "Symposium on Artificial Intelligence for Citizen-Centric Services and Sustainable Economy" at the Bihar Chamber of Commerce & Industries (BCCI) in Patna.

INTERNATIONAL OUTREACH

INTERNATIONAL OUTREACH

Inauguration of India – Vanuatu Centre of Excellence in IT (IV-CEIT) at Vanuatu Institute of Technology (VIT) Port Vila

India – Vanuatu Centre of Excellence in IT (IV-CEIT) at Vanuatu Institute of Technology (VIT) Port Vila being setup by ICD, C-DAC Delhi with the financial assistance from Government of India was inaugurated on June 11, 2024 by Hon'ble President of Vanuatu, Mr. Nikenike Vurobaravu along with H.E. High Commissioner of India to New Zealand (accredited to Vanuatu), Ms. Neeta Bhusan and Centre Head, CEIT, Mr. Mukesh Babu.

Visit of Delegation from Vietnam

Delegation from Department of Information Technology (DIT), Ministry of Public Security, Government of Socialist Republic of Vietnam led by Major General, Duong Van Tinh, Director General visited C-DAC, Delhi on May 14, 2024.

INTERNATIONAL OUTREACH

Special Telemedicine Training Programme

C-DAC, Mohali, wrapped up a specialized Telemedicine Training programme during April 8 -12, 2024 designed for the Philippines. This programme, titled "Putting India's Telemedicine Health Care Model to Work during Disasters and Pandemics in the Philippines," was part of the India-U.S. Triangular Development Partnership (TriDeP) project.

AWARDS

AWARDS

5th ET Government PSU Leadership & Excellence Awards 2024

e-BIS platform developed by C-DAC Noida received the honor at the "ET Government PSU Leadership & Excellence Award" ceremony held in New Delhi on June 21, 2024. The award was presented by Dr. Jitendra Singh, Hon'ble Minister of State for Science & Technology.

Emerging Technology Solution of the Year at Indian Education Awards 2024

C-DAC Patna's innovative gamified assessment platform, GLAMS (Gamified Learning and Assessment Management System), has been honored on June 19, 2024 at Chandigarh with the prestigious "Emerging Technology Solution of the Year" award at the Indian Education Awards 2024, organized by Entrepreneur Magazine.

BACKEND
SQUAD

Department of Information Security Assurance (DISA)

- All the C-DAC centers are in the various stages of implementation, the process of updating the asset register, preparation of the risk treatment, and implementing the controls are ongoing.
- Internal audit of ISMS 27001 is in progress.
- C-DAC Patna ISA coordination committee meeting was held on April 23, 2024.
- CISG meeting was conducted to review the hosting guidelines on April 15, 2024.
- Training on 'UIDAI Information Security Policies & Secure Code Practices', was arranged for ASA-AUA and ePramaan project team members along with the CISO team on April 25, 2024.
- Technical awareness session on Malware detection and threat intelligence on April 24, 2024 with Prof. Vijay Varadharajan, Global Innovation Chair Professor in Cyber Security at the University of Newcastle, Australia.

INSPIRING INSIGHTS ON NEW FRONTIERS

FUTURE OF MOBILITY: AUTOMOTIVE AND TRANSPORTATION

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Shri Ramneet Singh Chadha
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Background

Transport is an important economy enabler. An efficient transport system is the need of the hour. It not only provides ease of commute to the citizens but also acts as a catalyst to economic activities, thus, enhancing prosperity and liveability. Our cities are growing at a phenomenal pace.

The density of private vehicles in the country is increasing, the effects of which can be felt on the road with the ever-increasing traffic problems like pollution, congestion, traffic jams, citizen's health issues, road rage and accidental deaths etc. Our country incurs a huge loss of precious foreign currency due to heavy dependency on import of fuel/petroleum products and technology import. With the ever-increasing traffic and vehicle ownership it is pertinent to look at public transport sector policies, comprehensively and holistically for making it accessible, comfortable and convenient to commute and travel.

Government has to strengthen the public transport ecosystem, therefore, the Government of India has taken multiple initiatives to boost the public transit ecosystem including "One Nation, One Card" initiative, boost to Metro Rail Operations, Incentives for Modernising PTOs, PM e-Bus Sewa etc. which are being explained in subsequent sections.

C-DAC has played a pivotal Role in this strategic journey of "One Nation, One Card" and indigenisation of ticketing systems in India by designing and developing transit Specifications (like NCMC Specifications (Part IV-VII), QR Ticketing Specifications) and readily customizable product portfolios like AFC, CAFC, ITMS, QR Ticket Generator, NCMC based Parking Solutions & Mobile App solutions for public transport operators. NCMC Specifications (Part IV-VII) were released by MoHUA on May 11, 2020 & QR Ticketing Specifications on April 19, 2021 for Nationwide Adoption to all the stake holders.

FUTURE OF MOBILITY: AUTOMOTIVE AND TRANSPORTATION

Public Transport in India:
Public Transport in India is fragmented and is under the control of various agencies at Center/state/city/municipal corporations. Nonetheless, Public Transport plays a key role in the development of any developing nation and our Government is committed to strengthen the same. Generally, major challenges faced by Public Transport Operators in India are:

i. Cash handling.
ii. Revenue Leakage and cash reconciliation.
iii. Import of technology and transit systems.
iv. Multiple systems to be maintained.
v. Cost of Equipment and dependency on foreign vendor. Because of dependency on foreign vendors, we were losing control on our basic infrastructure and technology involved.
vi. Flow of Foreign Currency outside the country.

In order to avoid the vendor lock-in and create an open loop affordable interoperable system, a need was felt to develop an indigenous AFC system under the 'Make in India' initiative.

Initiatives by Government of India and Related C-DAC Product Portfolio:
Various initiatives have been taken by Government of India to promote public transport. Some of these are:

National Common Mobility Card (NCMC) by MoHUA:
With a view to overcome the challenges faced by Public Transport Operators (as described above) and realizing the objectives of Smart City along with dream of "One Nation One Card" by Government of India, MoHUA entrusted C-DAC with the task of standardization and development of interface specifications for the NCMC ecosystem and QR Ticketing Eco-System followed by development of Automatic Fare Collection System for Metro & Bus operators.

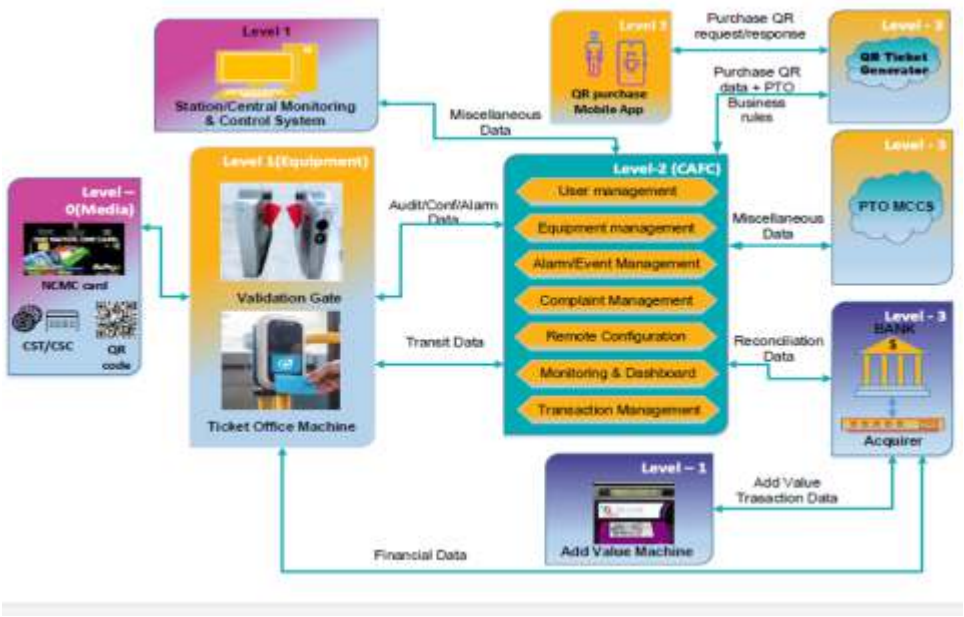
NCMC Ecosystem Comprises of 7 Parts:
NPCI: Card specifications (qSparc) including Card-Validation Terminal Interface (Part I- III)
C-DAC: Interface specifications of Automated Fare Collection Systems (Part IV to Part VII)

i Part-IV : Transit Service
ii. Part-V : Terminal to AFC Backend Communication Interface
iii. Part-VI : AFC Ecosystem to Acquirer Interface
iv. Part-VII: Gate to Terminal Interface

To support the above initiatives and in line with NCMC & QR Specification, C-DAC has developed the below Product Lines using cutting edge technologies:

AFC (For Metro Operators)
C-DAC's AFC solutions are Vendor and Bank Agnostic, designed specifically for Indian conditions where heavy footfall are the norms. It is the State of the Art, Scalable, Modular, Highly Secure, NCMC and QR Compliant AFCS with deployment at customer premises. Our AFCS supports multiple ticketing options like NCMC card and QR coded tickets. Single or multiple journey QR coded tickets for an individual or a group may be purchased through our Mobile App "Travel Mozo". Our AFCS can be quickly customised as per the requirements of the metro operators. CDAC AFCS offers near real time monitoring, customized reports and strategic business analytics along with support of multiple payment modes: NCMC card and QR coded tickets. CDAC AFC supports Bidirectional Configurable Gates to handle traffic and special situations along with Configurable Alarms and Centralized Fault Monitoring capabilities.

FUTURE OF MOBILITY: AUTOMOTIVE AND TRANSPORTATION



Layered Architecture of CDAC's Automatic Fare Collection System

Projects:

Bengaluru Metro Rail Corporation Limited (BMRCL):

C-DAC has successfully implemented its AFC on two gates each at Mysore Road & Baiyappanahalli Metro stations in Namma Metro (BMRCL), Bengaluru.

Chennai Metro Rail Project (CMRL):

Recently, on 21st November,2023, CMRL has awarded C-DAC, Implementation of NCMC & QR ticketing based AFC Back Office System for 60 gates at 30 stations of Chennai Metro Rail Limited (CMRL). This project is under design and implementation phase and will be live soon.

The said project is collective serendipity for both the stakeholders-C-DAC & CMRL. On one hand, for C-DAC, it will enable an opportunity of long-lasting competitive advantage in the arena of Automatic Fare Collection Systems and will pave the path for AFC business with Multiple Metro Operators. On the other hand, for CMRL, it will alleviate the perennial challenge of:

i. Reliability & Dependency on foreign vendors
ii. Managing huge expenses on implementation, maintenance & support costs and issues being faced by CMRL and government currently

Our solution/approach is conducive for promoting "Make-In-India" initiative and growth of innovation.

CAFC (For Bus Operators)

As per MoHUA's directives, C-DAC has developed its NCMC and QR Compliant Centralized AFC System to cater Vendor & Bank Agnostic Centralized Automatic Fare Collection (CAFC) for Bus Transport operators. The operators can plug to the Centralized AFC system developed and maintained by C-DAC and hosted on C-DAC Datacentre. The elasticity of the Centralized architecture supports the expansion of small (transport) operators' business around electronic ticketing.

FUTURE OF MOBILITY: AUTOMOTIVE AND TRANSPORTATION

QR Ticketing:

C-DAC's QR Ticketing has following advantages:

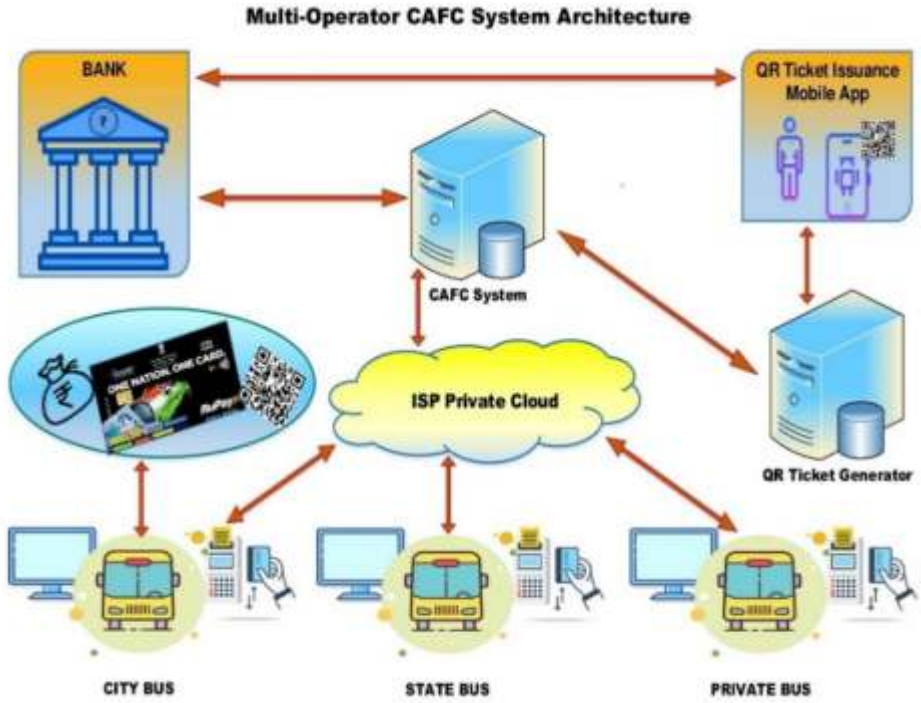
i. QR as an independent fare media
ii. Multi-modal Integrated Ticketing – A step towards Mobility as a Service
iii. Seamless settlement of funds for all stakeholders – PTO, PSP, App Provider, TG Service Provider
iv. Seamless Data Exchange
v. Indigenous System – Make in India

C-DAC's QR Ticketing System has flexible architecture that can be in a completely distributed fashion or in a fully centralized model. The QR codes are securitized with Digital Signature ensuring non-repudiation and operators can also choose to encrypt their own tickets with their existing security algorithms. Tickets generated on mobile can be used for online/offline Validation.

C-DAC's QR Ticketing offers multi-modal multi-operator Integrating ticketing and offers commuter to purchase tickets at their convenience, reduce crowd in peak hours and is particularly useful in the pandemics by offering contact less e-ticketing solution.

QR Ticketing Modules/Solutions for various PTOs:

i. Complete solution
ii. QR Ticket Generator
iii. TravelMozo – C-DAC Mobile App
iv. TOM Application – Paper QR tickets
v. Customizable Web-based App (on demand)
vi. Standard APIs to interface with PTO's AFC System, PSP, third party apps.



Centralized Automatic Fare Collection System

Major Modules of CAFC System

i Depot Operations Management (DOM)
ii Ticketing Management on ETIMs
iii Revenue Management
iv Online Reservation System
v Customer Mobile APP

FUTURE OF MOBILITY: AUTOMOTIVE AND TRANSPORTATION

NCMC based Parking Systems

CDAC's cost effective "NCMC Payment Application Solution" has enhanced CMRL's Parking System to the next generation open loop interoperable systems. CDAC and CMRL has indigenously designed, developed and deployed the complete solution which is secure, modular, and scalable. It has been integrated with CMRL's existing AFCS software solution. Key advantage of the deployed solution is:

i. Seamless integration of NCMC cards
ii. No major changes to PTO's existing Parking/Ticketing App and Backend System.
iii. Smooth transition to leverage the benefits of NCMC

Recently, C-DAC has got the workorder from SBI, Mumbai to integrate NCMC based parking solution in CMRL existing parking solution. C-DAC has integrated the NCMC Payment APIs in CMRL Parking App (in record time) which was launched on 21st February,2024, at CMRL Headquarter in Chennai in a major event by Shri. M.A. Siddique, I.A.S., Managing Director of CMRL in the gracious presence of Shri. E. Magesh, Director General of C-DAC, Shri Vivek Khaneja, Executive Director, C-DAC Noida, Shri Rajesh Kumar Kushwaha, Associate Director, C-DAC Noida and other high level dignitaries.

NCMC Test tool:

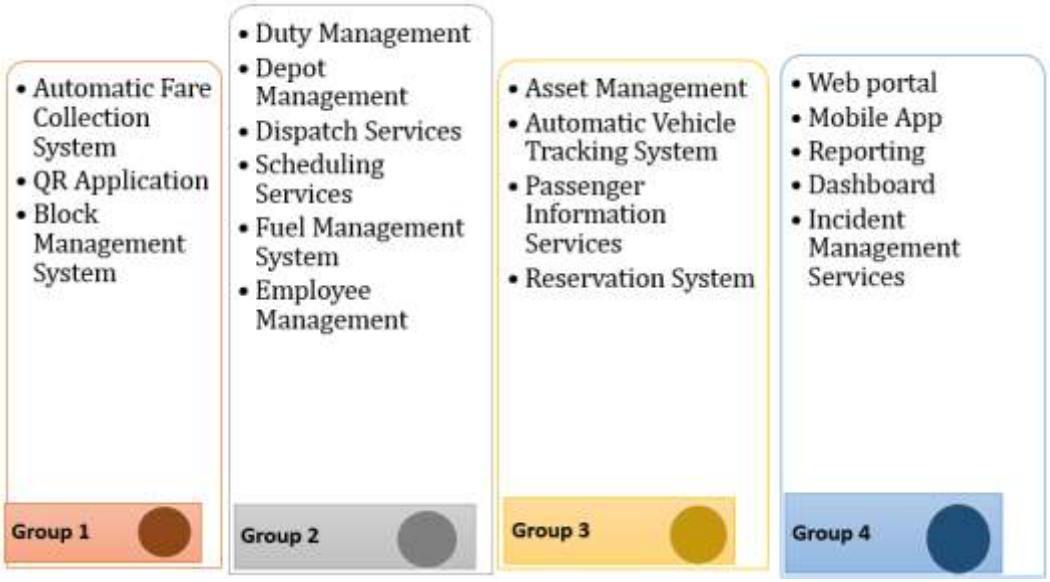
Besides educating various stakeholders on NCMC, C-DAC has also developed a test tool to help PTOs in checking the compliance of software deployed by vendors against NCMC Interface Specifications Released by MoHUA. C-DAC's test-tool is currently deployed at STQC facilities in Delhi and Bangalore for testing and certification purpose of NCMC components including Validation Terminal, Mechanical Gate, AFC Backend, and Acquiring Interface, in accordance with the said NCMC Interface Specifications. CDAC has trained and handed over its NCMC compliance validation test-tool to STQC.

FUTURE OF MOBILITY: AUTOMOTIVE AND TRANSPORTATION

ITMS Product Portfolio:
In today's rapidly evolving urban landscape, efficient transportation systems are crucial for economic growth, environmental sustainability, and quality of life. The advent of Integrated Transit Management Systems (ITMS) represents a significant leap forward in managing Public Transport Eco-system.

ITMS is an advanced application designed to revolutionize urban mobility. It integrates various components, including Automatic Vehicle Location Systems (AVLS), Passenger Information Systems (PIS), and fare collection mechanisms. By providing real-time data and intelligent decision-making tools, ITMS empowers users to make informed travel choices.

C-DAC's ITMS solutions represent a paradigm shift in urban transportation. By harnessing technology, scalability, and strategic planning, ITMS contributes to smarter, safer, and more efficient transit ecosystem. As cities continue to grow, embracing ITMS becomes essential for sustainable mobility.



FUTURE OF MOBILITY: AUTOMOTIVE AND TRANSPORTATION

Business Potential and Future Trends

After recommendations by MoHUA, NCMC has become the essential requirement of every PTO whether Bus or Metro operations and is part of every tender. Many PTOs have implemented or in the process of implementing and many more are yet to implement NCMC and QR Compliant Automatic Fare Collection Systems along with ITMS and Integrated Web/Mobile Solutions. In more than 15 cities, Metro Rail is either operational or in state of "Under-construction" while an equivalent number is also under considerations for new modes of operations like Metro Rail, Metrolite or Neo Metro etc.

Currently, around 80 State Road Transport Undertakings (SRTU) / SPVs under municipal Corporations are jointly operating approximately 1,50,000 buses and providing affordable and safer mobility to about 70 million passengers. Around 10,000 buses will be procured under PM e-Bus Sewa Scheme which will be equipped with NCMC.

Although, the early scope of NCMC initiatives was State/City Buses and Metros, it is now time to extend the scope to other modes of transportation like Urban & Sub-urban Railways & other modes like e-buses, auto-rickshaws, taxis/cabs etc. Infact, some of the major stations are under modernization and have floated requirement of NCMC in their RFP. More than 1200 Railway Stations will be modernized in Amrit Bharat Station Scheme.

Also, it is being realized that commuters are looking for affordable and efficient tools and/or platforms who can enhance commuter life by integrating multiple services like transit, payment & informational services. For transit it can be end to end seamless journey including last mile connectivity by integrating multi-modal, multi-operator journeys including real time updates on traffic, transport availability and option to choose vehicle/route/fare of his/her choice through his/her favourite journey planner to Unified ticket purchasing/settlement/cancellation and reconciliation at the convenience of mobile app/digital platform. Such platforms offer "Mobility As A Service (MAAS)" similar to entertainment service providers, for example, Netflix etc. With its NCMC, QR & ITMS Product portfolio, C-DAC is equipped to cater to the any of the above requirements.

FUTURE OF MOBILITY: AUTOMOTIVE AND TRANSPORTATION

Summary:

C-DAC has augmented its related product lines in last few years and is trying hard to bag some projects in the schemes of modernization of PTOs and PM e-Bus Sewa.

Indigenization and Digitization are the foundation stones of the "Atma-Nirbhar Bharat" and have significant contribution in growing GDP of our country. These initiatives provide not only saves foreign currency but also provides job opportunities, reduces dependency on foreign vendors and promotes innovation and FDI in the country. One such initiatives by Government of India is NCMC. NCMC has promoted indigenization and digitization, uniform standard interfaces for vendor and bank agnostic transit solutions, saving precious foreign currency for PTOs and ease of commute to millions of commuters by providing seamless payment for multi-modal, multi-operator journey.

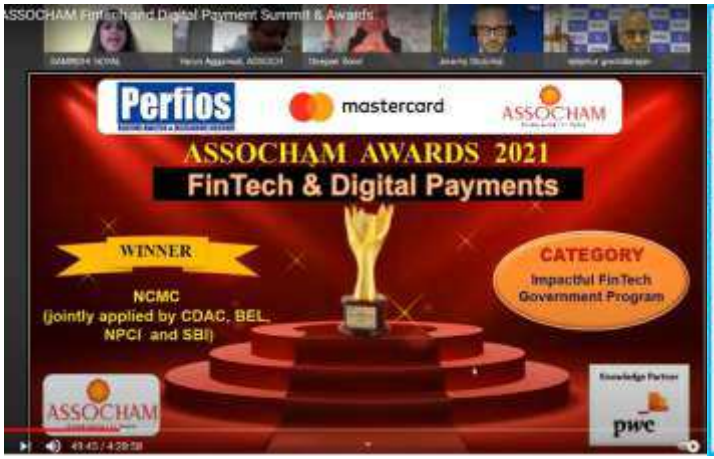
In line with the above, C-DAC has developed some of the major products like AFC for Metros and CAFC & ITMS Product Portfolio for Bus Transport Operators, QR Ticketing System and Mobile App with advanced journey planner and provides unified Multimodal, Multi-operator journey.

Our solutions can produce bespoke dashboards, business analytics and insights that enable users to track, evaluate, and report on key performance indicators and other metrics in accordance with PTO and other stakeholders, such as relevant Ministries for policy formulation, execution, and oversight. All the major components are modular which can be integrated with third party systems or can be taken in toto and can be quickly customized as per business requirements. C-DAC is in touch with various Ministries and PTOs to enhance and proliferate its product line for various schemes.

C-DAC's Credibility Examples:

Letters by Hon'ble MoHUA regarding:

i. Interface Specification of National Common Mobility Card (NCMC) Ecosystem (Part IV-VII) dated May 11,2020.
ii. Specifications for QR ticketing System for Transit Applications Version 1.1 dated April 19,2021.
iii. Letter to Chief Secretaries: NCMC and QR code Implementations for ticketing in State Road Transport Undertakings/Corporations dated 13.12.2022.
iv. Office Memo to CDAC: NCMC and QR code Implementations for ticketing in State Road Transport Undertakings/Corporations dated 13.12.2022.
v. ASSOCHAM AWARDS (Fintech & Digital Payments) in 2021



Joint winner CDAC, BEL, SBI & NPCI for NCMC for Fintech & Digital Payments

A-TRACT: THE AUTONOMOUS TRACTOR FOR INDIAN FARMING CONDITIONS AND APPLICATIONS

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Shri Lijo Thomas
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The Digital revolution is making its presence in human life, touching almost every aspect of the way humans think, live and work. The agriculture industry is also experiencing significant influences of digitization with a gradual shift in culture, whereby farmers have moved from manual farming to highly mechanized methods, thus optimizing the use of the labour force for higher skilled and better productive purposes. Autonomous Navigation is yet another direction of digitization that is seeking to provide accurate positioning, ease of operations and guidance in farmer fields and is strengthened by various hi-tech electronics and information technologies like robotics, IoT, AI and ML.

Operational Architecture of Autonomous Navigation in Tractors:

There are 3 operational architectures that are popularly employed for autonomous navigation in tractor systems. These pertain the degree of automation allowed in the tractor:

- Remotely Operated Tractors,
- Pre-defined Contour based Tractors and
- Fully Autonomous Tractors

In remotely operated tractors, a vehicle operator controls the vehicle movements remotely by establishing a reliable wireless communication path between the operator's vehicle control device and the vehicle. A remote vehicle operator, position sensors and a reliable wireless communication path is required to navigate the vehicle in the field. In the pre-defined contour-based tractor, the contour/navigation path is communicated wirelessly to the vehicle. Thereafter, the vehicle performs its operations in the pre-defined path and returns to its source. This vehicle assumes that the path provided for its traversal is free from obstacles. The fully autonomous tractor is an extension of the pre-defined contour-based tractor in that it performs real-time obstacle detection and path planning in real-time, without user intervention.

A-TRACT: THE AUTONOMOUS TRACTOR FOR INDIAN FARMING CONDITIONS AND APPLICATIONS

The Need for Undertaking Autonomous Tractor Development in India

a) **Shortage of Skilled Manpower:** While the tractor is a versatile field vehicle, popularly used in the Indian context for various farm operations like tilling, sowing, weeding, and transportation, operating it in the field effectively is becoming a tough proposition for the Indian farmer because of the skill levels required for the job. It is very difficult to ensure that qualified operators are available, and also to ensure that those operators have enough consistent work throughout the season. Therefore, an autonomous solution would help alleviate some of the labour shortage strains that are currently experienced in this industry.

b) **Improving Operational Performance:** An Autonomous Tractor will improve the field operations and performance within the field, as compared to a human operator. Moreover, autonomy can guarantee a fixed performance metric unlike humans which may be subjective owing to varied skill levels. It may also lead to better utilization of the farmer's resources by reducing the spending on Labour for continuous field operations.

c) **Cost Reduction:** From a technology affordability standpoint, autonomous tractors are not financially viable to the Indian farmer, as of today. The major concern for achieving autonomy from an Indian context, however, has to do with the cost of the technology to make it viable. Popular estimates for the autonomous technology cost are close to 100% over the cost of the tractor. The system components required for autonomous navigation are currently sourced as kits from global vendors and integrated into the system, thereby increasing costs. Indigenous development of the system components will ensure that the project achieves a significant cost reduction of up to 50% of the existing costs

A-TRACT: THE AUTONOMOUS TRACTOR FOR INDIAN FARMING CONDITIONS AND APPLICATIONS

Considering the cost factor and technology viability, C-DAC and IIT Palakkad have initiated a R&D project jointly with the Farm division of Mahindra & Mahindra Ltd. (M&M), with funding support from MeitY and M&M. The project envisages the design and development of a SAE J3016 Level 3 autonomous tractor with a scalable and robust design with the following subsystem components:

a. Autonomous Controller for Tractor Systems (ACTS)
b. Auto Steer System
c. Auto Braking System
d. Auto Implement Lift System
e. Geo Fencing, Dynamic Path Planning Algorithms and Motion Control
f. Automated Traversals: Straight line and Simple Turn, Headland Turn and Skip Passing
g. User Interface & Safety Features

The high-level architecture of the A-TRACT System components are shown in the figure below:

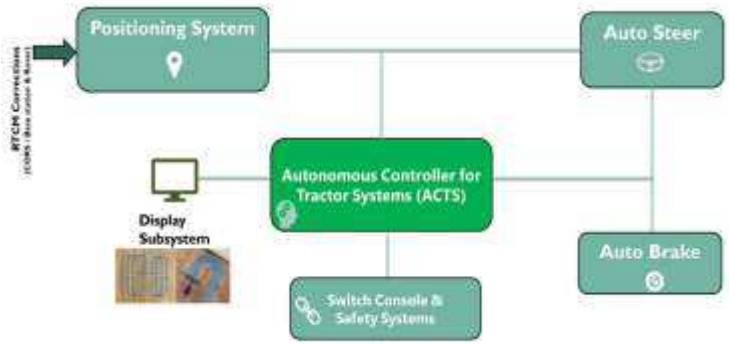

Fig.: A-Tract High-level System Architecture

The scope also includes developing a dynamic model of the tractor (motion system) and analysis of the system under different operating conditions (terrain and farm application). The system prototyping and field testing of the developed system components will be carried out in a 25 HP and 75 HP 4WD power steering tractors for vineyard farm application use case - pesticide spraying and land compaction applications and in potato farms to demonstrate the pesticide spraying and land compaction applications. The proposed autonomy function will lead to achieve Pre-defined Contour based Tractors and will be taken up further to include obstacle detection and other functionalities to achieve fully Autonomous Tractor solution.

Envisaged outcomes of the project include:

- Indigenous auto-grade compliant electronic hardware, robust and scalable software, retrofit mechanical systems in compliance with tractor standards, dynamic path planning and motion control algorithms, and a fluidic user interface
- Achieving on field accuracies of < 1 inch and < 6 inches for different agricultural use cases
- Delivering a viable product with production cost of additional 1 lakh per tractor for autonomy functions

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