"Grand Challenge on Intelligent Sensors & Solutions for E Mobility"
Centre of Excellence in Intelligent IoT Sensors, Kochi

Centre of Excellence in Intelligent IoT Sensors [CoE in IIoT Sensors] announces Grand Challenge for "Intelligent Sensors & Solutions for E Mobility".

1. Background

CoE in IIoT Sensors, is a pioneering initiative of Ministry of Electronics and Information Technology, Government of India and Government of Kerala along with Centre for Materials for Electronics Technology, Thrissur (C-MET) and Indian Institute of Information Technology and Management – Kerala, Trivandrum (Digital University of Kerala) as the implementation agencies and Maker Village & Kerala Startup Mission as the supporting partners. The application domains of the CoE will be developed with the support of industry partners, including startups at Maker Village, as well as those in the Kerala Startup Mission ecosystem.

The CoE has already completed its first two rounds of Grand Challenges in the domains of Robotics and Automation, Smart Cities, Disaster Management and Healthcare and announced winners under each domains. To accelerate economically viable technology development, CoE in IIoT Sensors is introducing its third Grand Challenge for the most profitable business case for Autonomous Vehicles / Smart EVs in India. The scope of the Grand Challenge is development of working Intelligent Sensors & Solutions for E Mobility applications and preparation of business case reports.

2. Aim

To conduct the IoT Grand Challenge which will produce accelerated output for the research topic "Best solution and business case for Intelligent IoT Sensor solutions for Intelligent Sensors & Solutions for E Mobility Applications". The winning participants will be incubated as startups in CoE in IIoT Sensors.

3. Autonomous Vehicles/ Smart EVs/ E Mobility - Grand Challenge Statement

Smart Electric Vehicles (EVs) and IoT-enabled Autonomous Vehicles (AVs) represent the future of transportation, offering a more sustainable, efficient, and convenient way to travel. These vehicles are equipped with a variety of advanced technologies, such as sensors, cameras, and software, that allow them to navigate and operate autonomously, making them safer and more efficient than traditional mode of transportations. Traditional internal combustion engine vehicles are a major source of air pollution and greenhouse gas emissions, contributing to climate change and other environmental problems. Smart EVs and IoT-enabled AVs, on the other hand, produce significantly lower emissions, as they are powered

by electricity rather than fossil fuels. Additionally, it can be programmed to optimize routes, reducing fuel consumption and emissions even further. Furthermore, these vehicles can greatly enhance the overall transportation experience and make it more convenient with IoT integration and connectivity.

Through this challenge, best solution with viable business case for Autonomous Vehicles/ Smart EVs will be established. Further, the solution will help to create economically viable technological products using the intelligent IoT sensor products being developed by the CoE in IIoT Sensors, Kochi.

Besides having the capability in developing relevant new technologies, the CoE in IIoT Sensors in the recent past has developed several technologies such as :

- Heat sensor using thermistor
- Thermal sensors
- Pressure sensors
- Battery charging monitoring using NTC thermistors
- pH Sensors
- Fire alarm using thermistor
- Smart digital thermometer for Industry 4.0
- Proximity sensors
- Vibration sensors
- Humidity Sensors
- Gas sensors

The challenge is divided into two parts:

A. Development of Intelligent IoT Sensor devices/hardware solutions using the devices described above or similar development of sensor technologies.

- The participants need to submit ideas, designs, product plans or prototypes of their proposed solutions.
- Participants need to submit and justify the expected Technology Readiness Level (TRL Level) of their end-product. (Refer to Appendix 1 for TRL Level definitions)

B. Preparation of business case for their solution.

- Participants need to submit and justify the current and expected Commercial Readiness Level (CRL Level) (Refer to Appendix 2 for CRL Level definitions)
- The business case may cover aspects such as potential target markets to enter size, competitive landscape, key players in the market, market needs & requirements at a level in line with the current CRL
- Business case should provide broad development milestones and proposed budget

1. Prize Money and funding

- Funding of up to Rs 15 lakhs and free incubation for 2 years

2. Eligibility Criteria

- The challenge is open for all Indian citizens

3. Implementing Agency

- The implementing agency will be the CoE in IIoT Sensors, Kochi.

4. Evaluation Methodology

- Internal Review: An Expert Panel (EP) will evaluate the proposals and will finalize 5 top teams.
- Interview: The EP will conduct interviews for top 5 teams and finalize the winner for the Grand Challenge Award.

5. Duration of Grand Challenge and Registration

- Submission last date: 31st October, 2023
- Internal Review result: 15th November, 2023 (Tentative)
- Declaration of winner: 30th November, 2023.(Tentative)
- Registration Link: https://www.iiotsensors.org/

6. Rule and Guidelines

a. All participants and team have to be eligible (See Eligibility Criteria) to participate.
b. During the Challenge, the Team Leader shall be considered as the Single Point of Contact for all engagements & communication by the CoE in IIoT Sensors. Furthermore, the Team Leader cannot be changed during the course of the Challenge.
c. The Team Leader and Team Members will be required to provide working E-mail IDs and Mobile numbers for the purpose of Registration/ Communication.
d. Teams shall maintain detailed documentation of their Idea, Prototype and Solution at all stages of the Challenge for reference and record purposes.
e. The right to summarily reject any change in team composition is vested with CoE in IIoT Sensors.
f. Any IPR if generated in the Grand Challenge shall be jointly owned by the CoE in IIoT Sensors and the contributing team through a separate MoU as per Indian Laws/ Rules.
g. The solution should not violate/breach/copy any idea/concept/product already copyrighted, patented or existing in this segment of the market. Legal liability of such infringement will be the sole responsibility of the applicant team.
h. Anyone found to be non-compliant of rules and guidelines face the risk of their participation getting cancelled.

i. All documents/ papers etc submitted in relation to the Grand Challenge is non-returnable and shall remain as the property of CoE in IIoT.
j. The number of teams to be finally selected and incubated or not to be selected at all is at the sole discretion of CoE in IIoT Sensors and no suggestions and disputes will be entertained.
k. For any dispute redress, Secretary (MeitY)'s decision will be the final.
l. The selected teams receiving funding through this challenge have to give their written consent to must be willing to be incubated in the CoE in IIoT Sensors.

Appendix 1

Technology Readiness Levels (TRL)

Technology Readiness Levels (TRL) are a method used to measure and assess the maturity of a particular technology

TRL is based on a scale from 1 to 9 with 9 being the most mature technology.

Level	Definition	TRL Description
1	Basic principles observed and reported	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties.
2	Technology concept and/or application formulated.	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies.
3	Analytical and experimental critical function and/or characteristic proof of concept.	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4	Component and/or breadboard validation in laboratory environment.	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include the integration of "ad hoc" hardware in the laboratory.
5	Component and/or breadboard validation in relevant environment.	The Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so

		it can be tested in a simulated environment.
6	System/subsystem model or prototype demonstration in a relevant environment.	A representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness.
7	System prototype demonstration in an operational environment.	Prototype near, or at, planned operational system. Represents a major step up from TRL 6, requiring the demonstration of an actual system prototype in an operational environment such as an aircraft, vehicle, or space.
8	Actual system completed and qualified through test and demonstration.	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental test and evaluations of the system in its intended weapon system to determine if it meets design specifications.
9	Actual system has proven through successful mission operations.	The actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.

Appendix 2

Commercial Readiness Levels (TRL)

Commercial Readiness Levels (CRL) is a framework for defining the spectrum of commercial maturity, from basic market research to full deployment.

CRL is based on a scale from 1 to 9 with 9 being the most commercial technology.

CRL	Description
1	Knowledge of applications, use-cases, & market constraints is limited and incidental, or has yet to be obtained at all.
2	A cursory familiarity with potential applications, markets, and existing competitive technologies/products exists. Market research is derived primarily from secondary sources. Product ideas based on the new technology may exist, but are speculative and unvalidated.

3	A more developed understanding of potential applications, technology use-cases, market requirements/constraints, and a familiarity with competitive technologies and products allows for initial consideration of the technology as product. One or more "strawman" product hypotheses are created, and may be iteratively refined based on data from further technology and market analysis. Commercialization analysis incorporates a stronger dependence on primary research and considers not only current market realities but also expected future requirements.
4	A primary product hypothesis is identified and refined through additional technology-product-market analysis and discussions with potential customers and/or users. Mapping technology/product attributes against market needs highlights a clear value proposition. A basic cost-performance model is created to support the value proposition and provide initial insight into design trade-offs. Basic competitive analysis is carried out to illustrate unique features and advantages of technology. Potential suppliers, partners, and customers are identified and mapped in an initial value-chain analysis. Any certification or regulatory requirements for product or process are identified.
5	A deep understanding of the target application and market is achieved, and the product is defined. A comprehensive cost-performance model is created to further validate the value proposition and provide a detailed understanding of product design trade-offs. Relationships are established with potential suppliers, partners, and customers, all of whom are now engaged in providing input on market requirements and product definition. A comprehensive competitive analysis is carried out. A basic financial model is built with initial projections for near- and long-term sales, costs, revenue, margins, etc.
6	Market/customer needs and how those translate to product needs are defined and documented (e.g. in market and product requirements documents). Product design optimization is carried out considering detailed market and product requirements, cost/performance trade-offs, manufacturing trade-offs, etc. Partnerships are formed with key stakeholders across the value chain (e.g. suppliers, partners, customers). All certification and regulatory requirements for the product are well understood and appropriate steps for compliance are underway. Financial models continue to be refined.
7	Product design is complete. Supply and customer agreements are in place, and all stakeholders are engaged in product/process qualifications. All necessary certifications and/or regulatory compliance for product and production operations are accommodated. Comprehensive financial models and projections have been built and validated for early stage and late stage production.
8	Customer qualifications are complete, and initial products are manufactured and sold.

	Commercialization readiness continues to mature to support larger scale production and sales. Assumptions are continually and iteratively validated to accommodate market dynamics.
9	Widespread deployment is achieved.