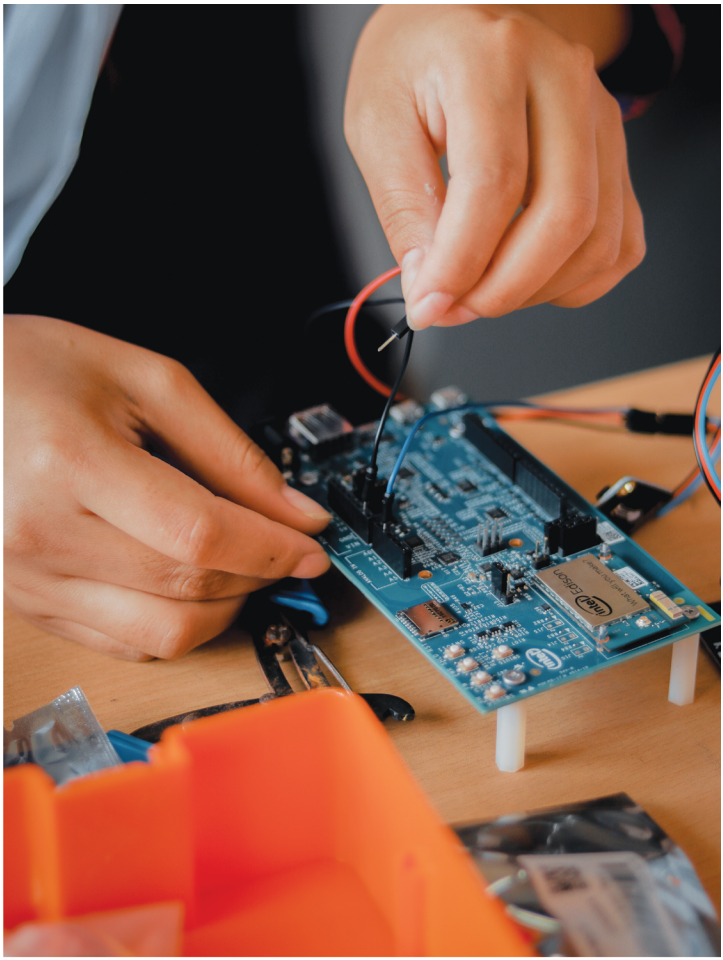

Research Centre for Internet of Things (IoT)

(Intel Intelligent System Lab)

AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY
(An Constituent College of Vinayaka Mission's Research Foundation)

VINAYAKA MISSION'S RESEARCH FOUNDATION
(Deemed to be University under section 3 of the UGC Act 1956)

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DEPARTMENT OF CSE

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PAIYANOOR – 603 104

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Research Centre for Internet of Things (IoT)
(Intel Intelligent System Lab)

About the Centre

The Research Centre for IoT –Intel Intelligent System Lab was founded in January 2018 at Aarupadai Veedu Institute of Tech- nology to accelerate R & D activities in the field of Internet of Things (IOT). The Center was supported by Intel FICE in pro- viding start-of-art training to the students and Faculties of AVIT in the Field of IOT. Recently, FICE & UC Berkeley Innovation Acceleration Group jointly organized the Micro Accelerator Program to students of our college.

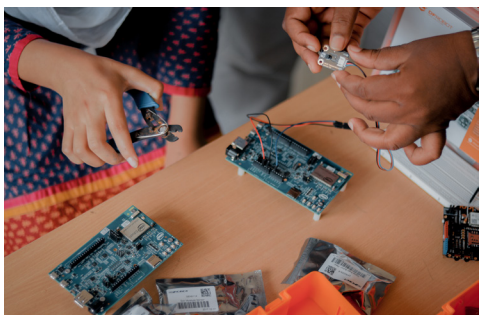
Figure 1: Intel Intelligent System Lab

Memorandum of Understanding (MoU)

- MoU between AVIT & Intel Technology India Private Limited was signed on 30th November 2017
- MoU signed with UC Berkeley – IAG and FICE Education Private limited on 6th February 2019.

Number of Computers : 30

- The computers with the following configuration, Lenovo V520 Slim Tower Desktop with Gen7 B250/15- 7400, 30G 4C/8GB, DRR4/I, TB/ Internal Speaker and 21.5" Think Monitor.



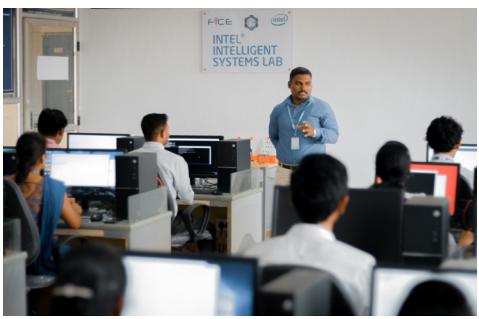


Figure 2: State-of-Art IoT Training in the Research Centre

Other Equipment Available

S.No	Item
1	Intel Edison and Ardino Break out kits
2	GPRS shields
3	Bread boards
4	Phi hong switching power supply[12v]
5	DE21-150 development and education board
6	AWG USB top cables
7	Zebronic SD USB card readers
8	LCD displays
9	LCD keypad shields
10	LCD back packs
11	Ada fruit ultimate GPS
12	PULSE sensors
13	Spark fun single lead heart rate monitor
14	Spark fun block for Intel A Edison
15	Spark fun barometer pressure sensor
16	16GB SD cards
17	Magnetic micro USB cable 1-2
18	ADXL 345 breakouts
19	Sensor interface wires
20	I/O expansion shields
21	Start kit for Edisons
22	27 PCS sensor sets
23	IEI technology corp boxs

Workshops / Training Program Conducted

- UC Berkeley–FICE Innovation Lab & Micro Acceler- ator Program for 5 days between 9th to 13th October 2018.

- Intel College Excellence Program for 4 days between 05-02-18 to 08-02-18.

Publications

S.no	Authors Name	Paper Title	Published Journal
1	Jaichandran R. Rajaprakash S. Amit Kumar Verma Abhishek Sinha Pankaj Kumar Singh	Smart Energy Meter for Computing Energy Cost Based on Consumers Cat- egory and Tariff Rates	International Journal of Engineering & Technology, 7 (3.1) (2018) 86-89
2	Jaichandran R. Somasundaram K. Bhagyashree Basfore Menaka I.S Uma S.	Prototype to Help Visually Impaired Person in Reading Printed Learning Materials using Raspberry PI	International Journal of Engineering & Technology, 7 (3.1) (2018) 82-85

Patents Filed

S.no	Faculty Name	Patent Titled	CBN no/ Application number	Date / Status
1	Jaichandran R	Prototype to Monitor and Display Energy Units Consumed With Period of Consumption and Energy Cost	Application no: 201841036209 CBR No : 2752	26-09-18 / Applied

Grants Received

S.No	Project Title	Funding Agency Name	Amount	Year
1	Structured Monitoring of Building using IoT	Tamil Nadu State Council for Science and Technology	Rs. 7500	2019

Details of Participation in AICTE-ECI-ISTE Chhatra Vishwakarma Award 2018

The project titled "IoT based Smart Energy Meter using Cloud Service" developed in the research center was selected as regional winner (South Zone) in AICTE-ECI-ISTE Chhatra Vishwakarma Award 2018. The project is exhibited at Nation Level Convention held at New Delhi on 20th and 21st January 2019. Hon'ble Vice President of India, Sri M. Venkaiah Naidu is the chief guest for the event.

Figure 3: AVIT Team Members in the National Convention of AICTE-ECI-ISTE Chhatra Vishwakarma Award 2018 at AICTE Headquarters, New Delhi.

Details of the Project Presented in AICTE-ECI-ISTE Chhatra Vishwakarma Award 2018

Project Title:

IoT based Smart Energy Meter using Cloud Service

The project titled "IoT based Smart Energy Meter using Cloud Service" developed in the research center was selected as regional Winner (South Zone) in AICTE-ECI-ISTE Chhatra Vishwakarma Award 2018. The project is exhibited at Nation Level Convention held at New Delhi on 20th and 21st January 2019. Hon'ble Vice President of India, Sri M. Venkaiah Naidu is the chief guest for the event.

Mentor Name : Dr. R. Jaichandran, HOD/CSE

Team Members :

1. Mr. Cris Mathew, B.E (CSE)-IV year Student
2. Mr. Fayaz Alam, B.E (CSE)-IV year Student
3. Mr. Velmurugan S, B.E (ECE)-IV year Student

Problem Statement

- Most of the electricity boards in India collects energy meter readings manually.
- A person visit consumer's home/ field periodically to collect information such as units consumed, period of consumption, and enters it in server for generating electricity bills.
- Manual monitoring of energy meter reading particularly in rural areas consumes lot of time, human efforts, and may lead to errors.

- In the proposed system energy meter is connected with internet to control and monitor consumer's daily/monthly energy usage.

Scenario Description

- Most of the existing IoT energy meter only transmits the energy consumed details to the server without computing the cost of the energy consumed.

- Therefore it is necessary to develop a smart energy meter for computing consumers energy cost based on consumers category and tariff rates.

- For example, let us consider Tamil Nadu Electricity Board (TNEB) consumer category and Tariff Rates shown in table 1.

Consumer Category		**Number of units Consumed (NUC)**	**Energy Cost per unit (in Rs)**	**Fixed Cost (in Rs)**
Domestic	A	(NUC 0 and NUC 200)		
		0 -100 units	0	0
		101-200 units	1.50	20
	B	(NUC 201 and NUC 500)		
		0-100 units	0	30
		101-200 units	2.00	
		201-500 units	3.00	
	C	(NUC > 500)		
		0-100 units	0	50

Table 1.: TNEB Consumer ategary and Tariff Rates

Solution

- Proposed system computes energy cost based on tariff rates of TNEB domestic consumer category shown in table 1.

- Proposed system monitors energy consumed by a consumer and sends to the microcontroller for processing. Microcontroller computes energy cost by multiplying units consumed with energy cost per unit based on the tariff rate of the consumer.

- Consumer data such as energy consumed detail and energy cost are sent to server through Wi-fi.

- Cloud servers are used to store consumer's data based on hourly/daily/monthly energy usage and cost.

Flow Diagram

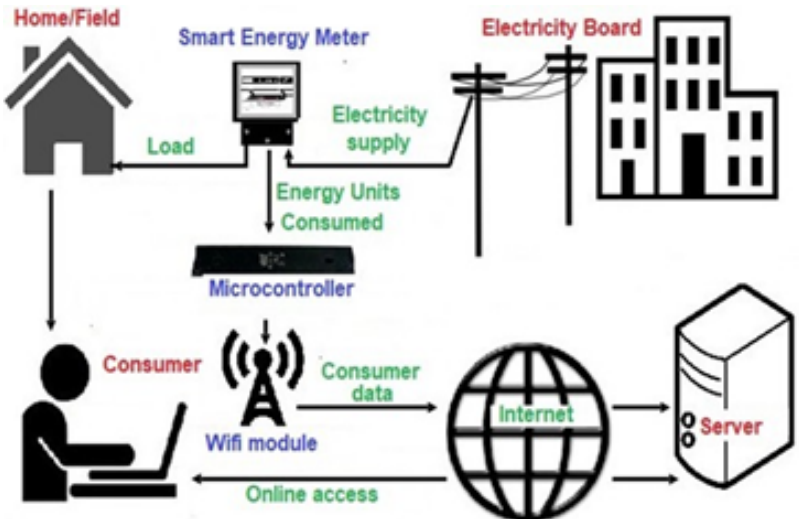


Figure 4: Overview of IoT based Smart Energy Meter using Cloud Service

Prototype Picture

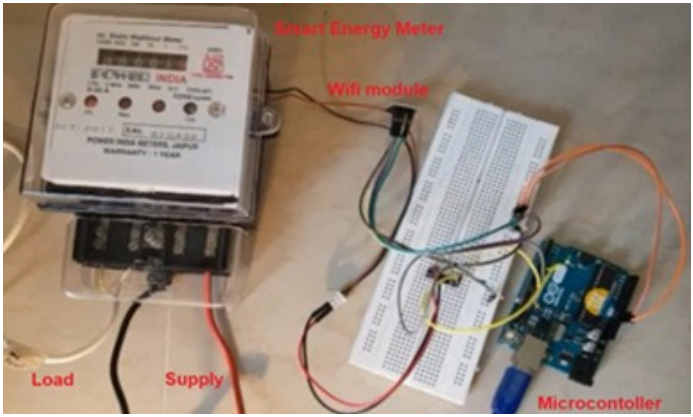


Figure 5: Prototype of IoT based Smart Energy Meter using Cloud Service

Graphs

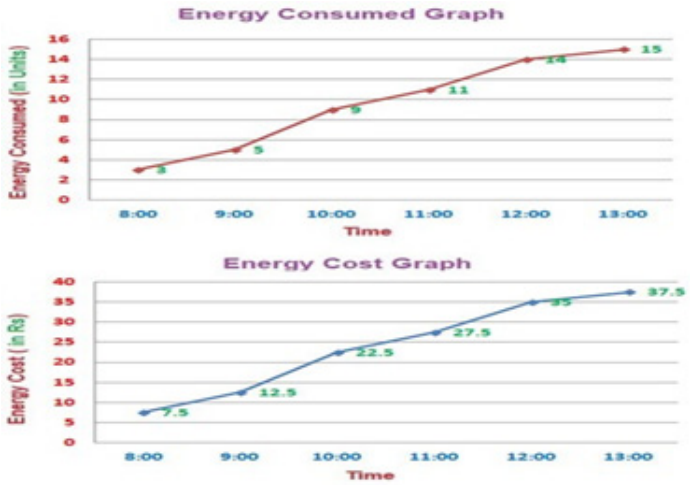


Figure 6: Energy consumed graph & energy cost graph of IoT Energy Meter

- Users can view their energy consumption details in real-time using smart phones / Personal Computers.

- Able to take readings even when the energy meter is not physically accessible. (E.g. Consumer's Gate / Door locked).

- Decentralization of calculation tasks helps reduce energy consumption in the long run.

- In villages, mostly homes are scattered and takes a lot of time to visit physically all the houses for noting down the energy meter readings.

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