



**CoE  
Establishment**



**Training**



**Placements**



**Entrepreneurship**

**Center of Excellence**

**UNICONVERGE TECHNOLOGIES**

**"CONVERGING UNIVERSE"**



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# CoE Objectives

Center of Excellence creating the ecosystem with skilled resources and innovation infrastructure. Our collaboration makes sure to achieve these objectives.

## Enabling Entrepreneurship

- Setting up Innovation Infrastructure.
- Collaborate with Industries.
- Get funding from Government for launching product under a startup.

## Innovation Solution Enabler

- Network with innovators in the country
- Connect with organizations looking for technology

## Create Ecosystem

- Events/ Seminars/ Workshops/ Meetups.
- Constantly work upon global technology trends.
- Create Network with Mentors, Angel investors, Accelerators, VCs etc.

# CoE Benefits



# Technologies Covered



# Predictive Maintenance

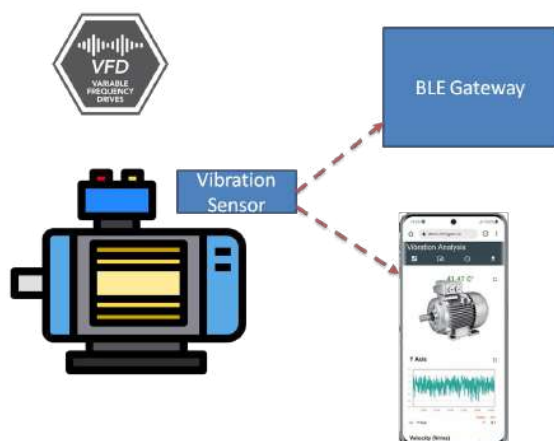
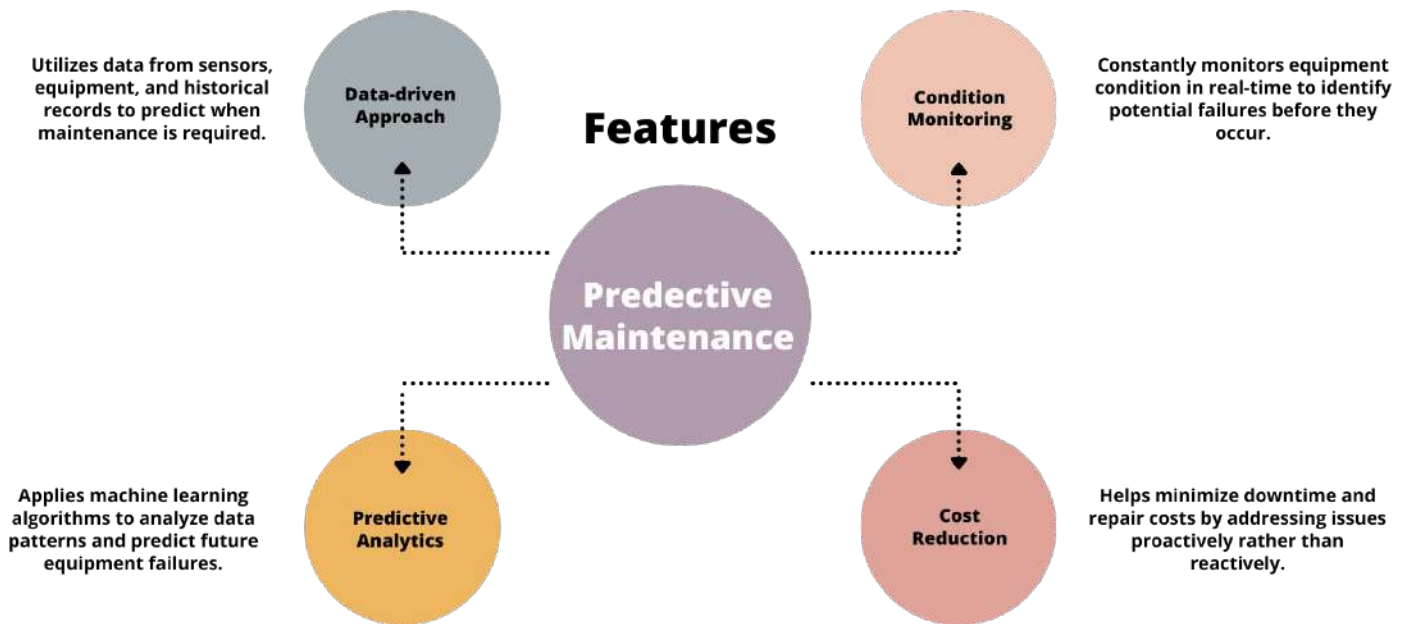
## Predictive Maintenance Demo Solution



Working model and setup for Predictive Maintenance consists of

- **A Motor**
- **VFD**
- **3 Axis vibration sensor**
- **Temperature sensor**
- **Touch Based HMI Display**
- Fully Functional Industrial web based monitoring software for doing **FFT analysis**,
- Running Custom Machine learning algorithms on sensor.

Data is sent to Predictive Maintenance Dashboard and Mobile App via **Bluetooth connectivity** using BLE Gateway.



# Industry 4.0 and IIOT Solution

## Industry 4.0

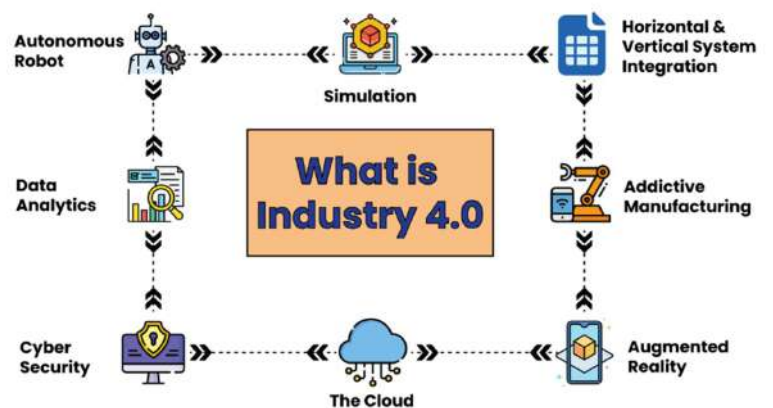
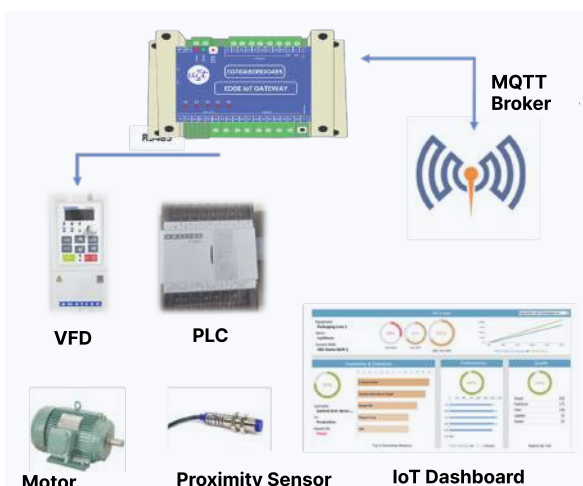


## Industry 4.0 and IIOT Solution

Industrial automation panel with

- PLC (Programmable Logic Controller),
- HMI (Human machine interface)
- VFD (Variable Frequency Drive)
- Edge IIOT Gateway
- Sensors and Actuators
- SCADA and web based IOT software

for learning various Industrial and IoT protocols like MQTT, MODBUS, OPC, TCP/IP, RS485

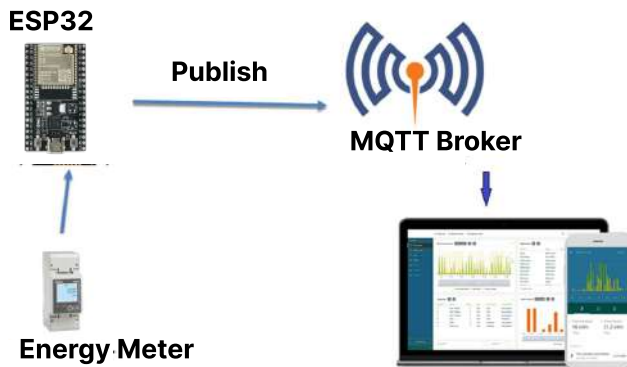


# Energy Monitoring Solution

**Problem Statement:** Energy consumption optimization is a problem across all the industries. The first step is to monitor it.



- Monitors critical parameters from multifunction meter
- Sends data to server via Wi-Fi communication using MQTT/HTTP
- Web dashboard for monitoring and analysis
- Facilitates efficient energy use
- Detects faults/blackouts



# Air Quality Monitoring Solution

**Problem Statement:** Air Quality is critical for human life so monitoring and taking corrective measures are very important.



- WiFi-based air quality monitoring node
- Measures real-time air quality, CO2 levels, PM2.5, and PM10 particulate matter
- Includes temperature and pressure sensors
- Incorporates humidity sensing capabilities
- Data transmission to web-based dashboard for monitoring
- Notification generation for timely alerts

# Image Recognition Solution



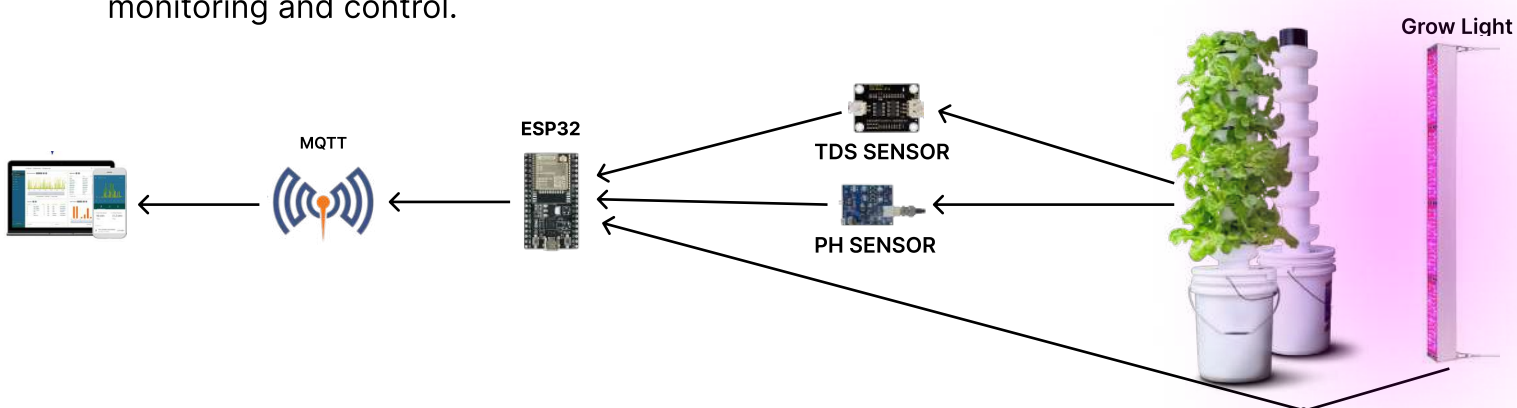
- Embedded Vision Development Kit
- NVIDIA CUDA support
- ARM A53 processor
- 7-inch Touch Display
- 2 MIPI CSI-2 inputs
- 2 integrated Image Signal Processors (ISP)
- NPU (Neural Processing Unit) Included
- Global Shutter HD Color Camera
- Ready to use with pre-installed Linux image
- Integrated V4L2 camera driver
- Linux-based OS with GUI support



# Smart Hydroponics System

**Problem Statement:** Hydroponic gardening needs better monitoring and control for healthier plants and higher yields.

- pH and TDS Sensors: Monitors water quality for optimal nutrient balance.
- Water Pump: Delivers water and nutrients with adjustable flow rates.
- Grow Light Control: Provides customizable lighting schedules for plant growth stages.
- User-Friendly Interface: Accessible via smartphone or web dashboard for real-time monitoring and control.



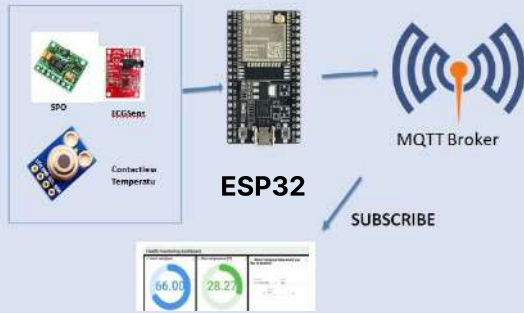
# Smart Healthcare Solution

**Problem Statement:** : Healthcare has always been highest priority for mankind. The smart healthcare includes monitoring of various vital parameters and tracking via cloud applications.

Smart HealthCare solution monitors critical parameter for human health like

- Body Temperature,
- SPO2 Levels,
- Heart Rate, and
- ECG.

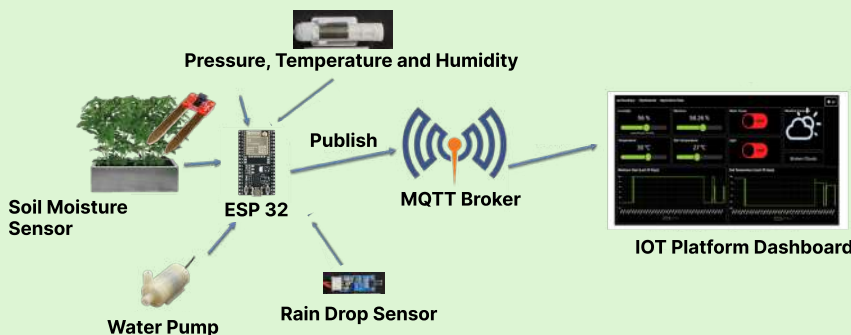
As healthcare is one of the key areas which can benefit from IOT, It's a great learning and development platform for the students wanting to design product in the health care sector. With Dashboard one can remotely monitor vital of patient using a internet connection.



# Smart Agriculture IoT Solution



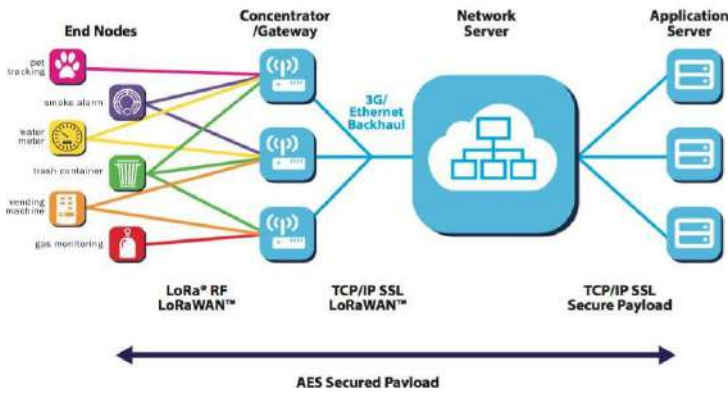
- Measures key parameters: Soil moisture, Humidity, Temperature, Weather Data
- Wireless control of Irrigation cycle
- Data monitoring on web platform
- Mobile app for Real-time updates and crop recommendations





# LoRaWAN CoE

## LoRaWAN Architecture



Most of the modern IoT LAN technologies use mesh network architecture. By using mesh network, the system can increase the communication range and cell size of the network. But, nodes in a mesh network have an additional responsibility of forwarding messages to other nodes, typically irrelevant to them. This affects the device battery life significantly. LoRaWAN uses star topology as it increases battery lifetime when long-range connectivity is used.

## What We Offer



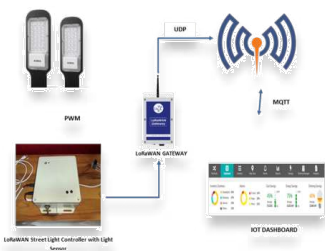
LoRaWAN Gateway



LoRAduino Development Board



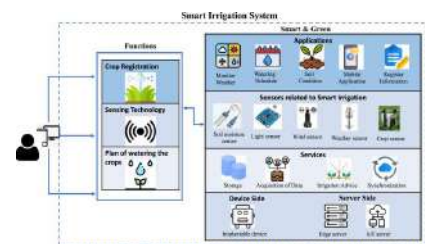
ESP32 Lora Development Board



Smart Street Light Solution



Smart Water Metering



Smart Irrigation Solution



Smart Warehouse Solution



Smart Assets Tracking Solution



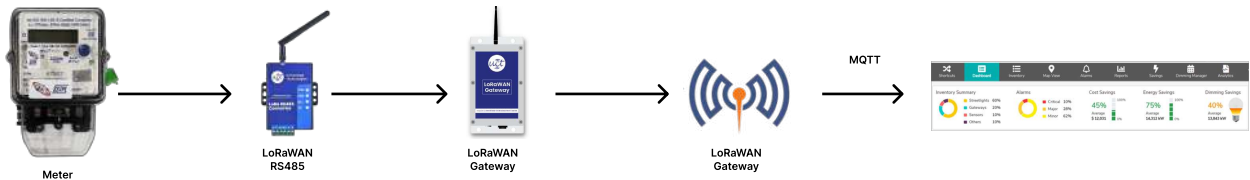
Smart Meter Reading Solution

# Smart Meter Reading Solution

**Problem Statement:** Efficient smart meter reading solution enabling real-time data collection, analysis, and consumer engagement for optimized energy management.



- Monitors critical parameters from multifunction meter
- Sends data to the server using MQTT/HTTP via the LoRaWAN RS485 converter.
- Web dashboard for monitoring and analysis
- Facilitates efficient energy use
- Detects faults/blackouts

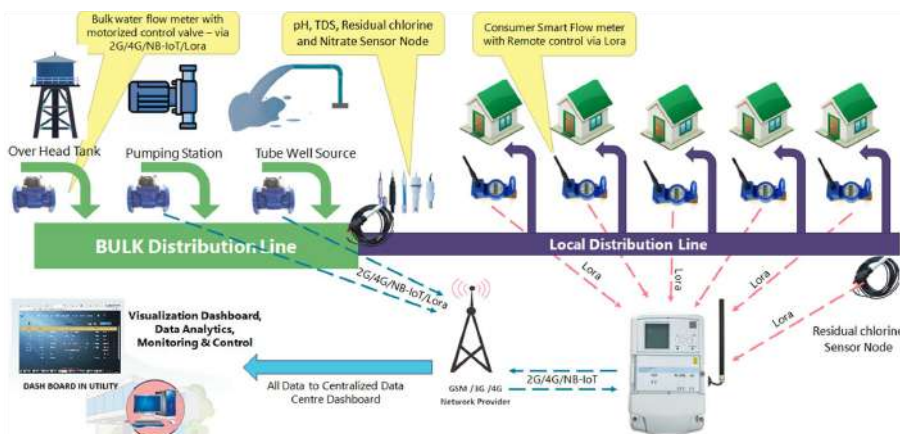


# Water Metering Solution

**Problem Statement:** Water conservation is must, so automatic metering is required for making smart cities, smart village, “Har Ghar Jal Yojna”.

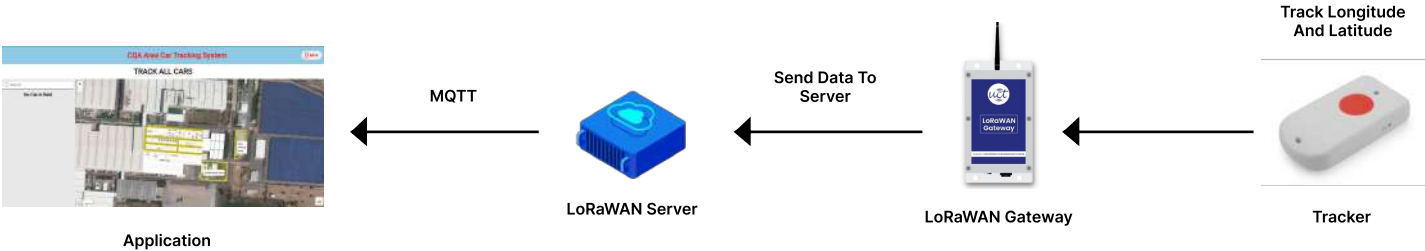


- LoRaWAN-based smart water metering system.
- Ultrasonic meters with RS485 interface.
- Data collection: Instantaneous flow, total consumption, leakage detection.
- Transmission via LoRaWAN Gateway.



# Smart Assets Tracking Solution

**Problem Statement:** Creating a Streamlined Smart Assets Tracking Solution for Enhanced Operational Efficiency and Resource Management.



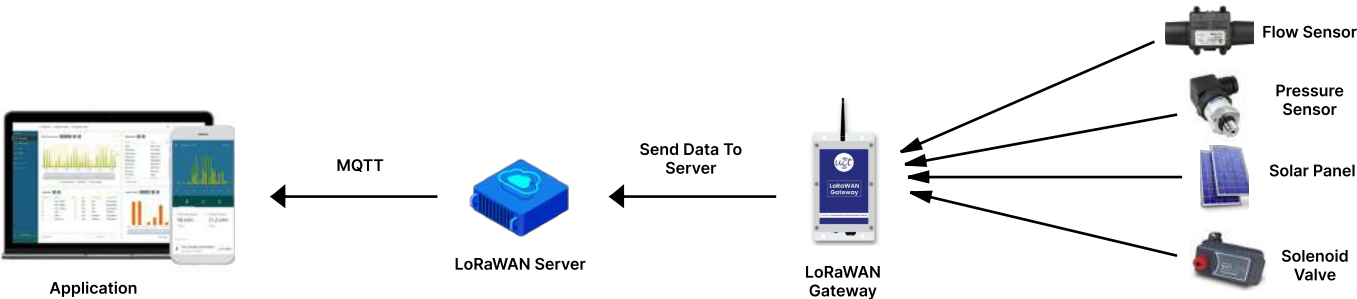
- LoRaWAN Gateway: Central communication hub receiving data from multiple LoRaWAN trackers over long distances.
- LoRaWAN Tracker: Devices attached to assets, using LoRaWAN protocol to send tracking data to the gateway.
- Regular/Real-time GPS Tracking: Continuous or periodic monitoring of asset locations using GPS technology.
- BLE Tracking: Uses Bluetooth Low Energy for short-range, indoor, or close-range asset tracking.
- WiFi Tracking: Tracks assets via WiFi signals, providing location data based on network access points.
- Data Visualization on Dashboard via MQTT: Transmits collected data to a dashboard using MQTT, enabling real-time asset location monitoring and visualization.

# Smart Irrigation Solution

**Problem Statement:** Enhancing agricultural productivity and sustainability by implementing a smart irrigation solution that optimizes water usage, minimizes waste, and promotes efficient crop growth.



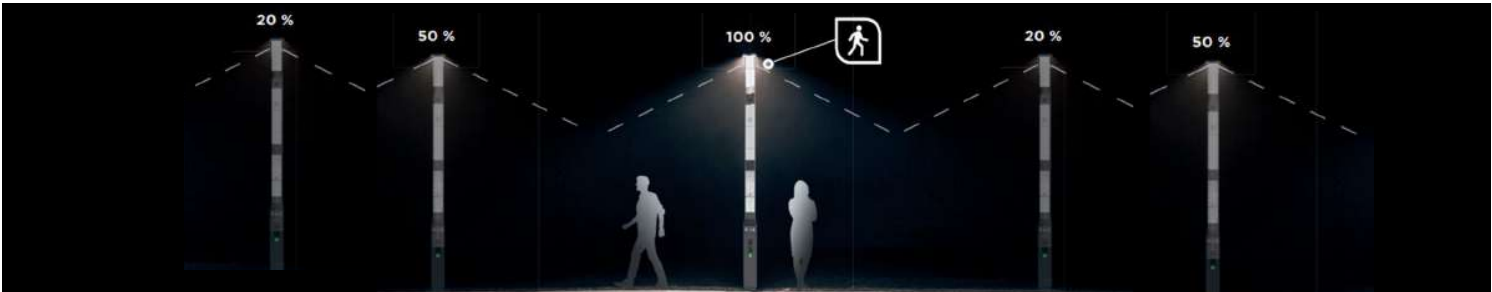
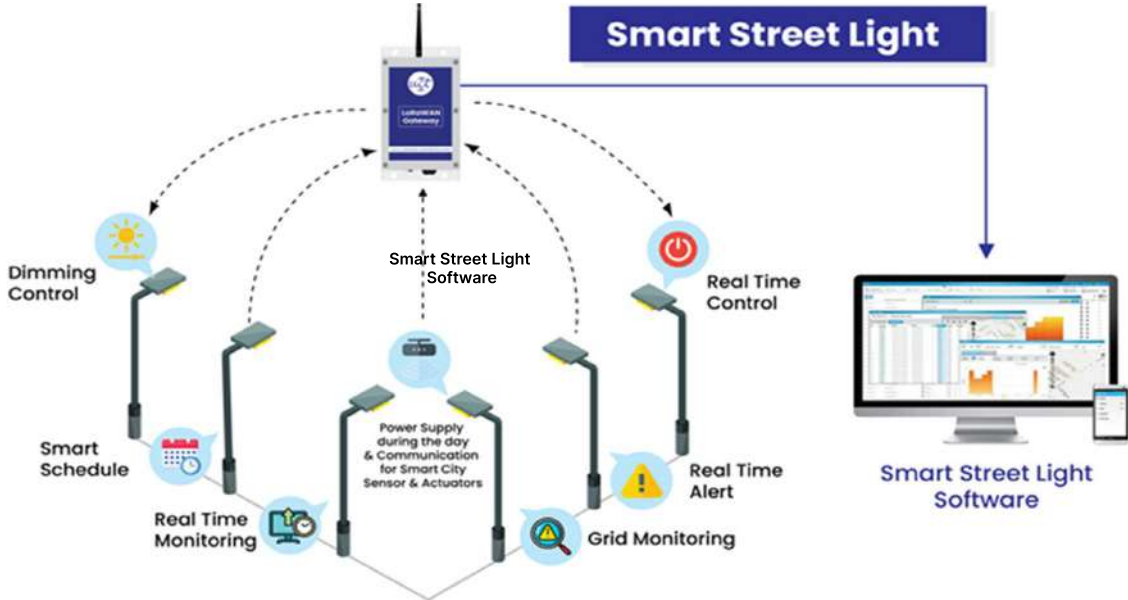
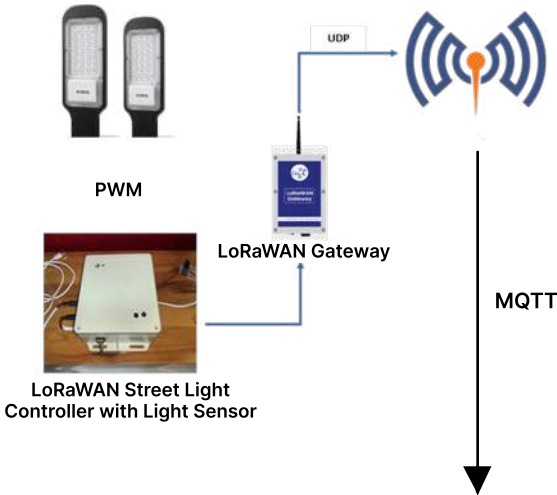
- Sensor Integration: Monitor flow and pressure for efficiency.
- Solar-Powered: Sustainable energy for operation.
- Remote Control: Manage valves and monitor remotely.
- LoRaWAN Connectivity: Long-range communication for remote access.



# Smart Street Light Solution

**Problem Statement:** Optimal and Efficient street lighting is now need of hour to save power, better control of malfunctioning of light, reduced carbon footprints.

- PWM (Pulse Width Modulation): Controls LED street light brightness.
- LoRaWAN Gateway: Collects data from street light controllers.
- LoRaWAN Street Light Controller with Light Sensor: Regulates street light operation based on ambient light levels.
- MQTT (Message Queuing Telemetry Transport): Facilitates communication between components.
- Dashboard: Provides a user interface for monitoring and managing the system.



# Our Lab Kits

## ConnectiFY IoT Development Kit



**Connectify** is a multiplatform IoT and Embedded Development Kit with interchangeable processor module to support the learning of students on legacy as well as modern embedded systems.

- 12 to 9 volts DC input with over voltage and short circuit protection
- 16\*2 LCD Display, EEPROM 16 Kb I2C interface
- 5V relay and Piezo buzzer, Motor Driver L293D
- RTC 1307 I2C interface
- 8 led with common cathode
- ADC 0808 with 8 multi turn trim pots
- Ethernet with SPI interface
- 8 bit DIP Switch, 4\*4 Hex keypad
- Bluetooth , XBEE
- USB to serial, RS232 to serial (half & full duplex mode)



Arduino  
Daughter Board



AVR  
Daughter Board



8051  
Daughter Board



ARM  
Daughter Board

## LoRAduino Development Board



- Arduino Uno
- MikroBus interface (for connecting multiple communication module option)
- LCD interface
- Sensor interface like
- Ultrasonic Sensor
- Temperature and Humidity Sensor
- Air Quality Sensor
- LDR Sensor
- Accelerometer and Gyroscope Sensor (MPU6050)
- Relay and Buzzer
- Motor Driver
- RS232
- LED's
- Switches and Buttons

## Raspberry Pi Learning Kit



- Broadcom BCM2711, Quad core Cortex-A72 (ARM v8) 64-bit SoC @ 1.8GHz
- 4GB LPDDR4-3200 SDRAM (depending on model)
- 2.4 GHz and 5.0 GHz IEEE 802.11ac wireless, Bluetooth 5.0, BLE
- Gigabit Ethernet
- 2 USB 3.0 ports; 2 USB 2.0 ports.
- 2 × micro-HDMI® ports (up to 4kp60 supported)
- 2-lane MIPI DSI display port
- 2-lane MIPI CSI camera port
- 4-pole stereo audio and composite video port
- H.265 (4kp60 decode), H264 (1080p60 decode, 1080p30 encode)
- OpenGL ES 3.1, Vulkan 1.0
- Micro-SD card slot for loading operating system and data storage
- 5V DC via USB-C connector (minimum 3A\*)
- 5V DC via GPIO header (minimum 3A\*)
- Power over Ethernet (PoE) enabled (requires separate PoE HAT)
- Operating temperature: 0 – 50 degrees C ambient

## NodeMCU Sensor Board



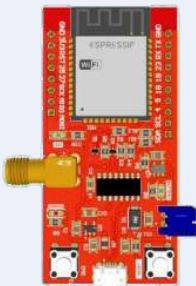
- NodeMCU
- Sensor interface like
- LDR Sensor
- Temperature and Humidity Sensor
- Air Quality Sensor
- Ultrasonic Sensor
- Accelerometer and Gyroscope Sensor (MPU6050)
- OLED Display
- LED, Switch and Push Button

## ESP 32 Board



- Support for DWIN HMI Display
- RS485 Interface Compatibility
- Supports 9V/12V inputs
- Dual-core processor: Xtensa LX6
- Dual-core 32-bit processor
- Clock speed: Up to 240 MHz
- Memory: 520 KB SRAM, 448 KB ROM, and external flash support
- Wi-Fi: 802.11 b/g/n
- Bluetooth: v4.2 BR/EDR and BLE
- GPIO: 34 programmable GPIO pins
- UART, SPI, I2C, I2S, and CAN
- ADC: 12-bit, 18 channels
- DAC: 8-bit, 2 channels
- PWM

## ESP32 Lora Development Board



- ESP32-WROOM-32 module - 16MB
- WiFi, BT+BLE microcontroller
- Integrated PCB antenna
- RFM95W LoRa modem
- Frequency range: 868/915 MHz
- Spread factor: 6-12
- SPI control interface
- SMA antenna connector for LoRa radio
- Reset and ESP32 pin0 buttons
- 14 GPIO ESP32 pin-breakouts
- Power and user LEDs
- CH340C USB-to-Serial interface
- Micro-B USB connector for power and programming
- All current consumption tested at 5V
- 170 mA when formatting SPIFFS in Gateway mode

## Google Coral Development board



A development board to quickly prototype on-device ML products. Scale from prototype to production with a removable system-on-module (SoM).

- CPU NXP i.MX 8M SoC (quad Cortex-A53, Cortex-M4F)
- GPU Integrated GC7000 Lite Graphics
- ML accelerator Google Edge TPU coprocessor: 4 TOPS (int8); 2 TOPS per watt
- RAM 1 or 4 GB LPDDR4
- Flash memory 8 GB eMMC, MicroSD slot
- Wireless Wi-Fi 2x2 MIMO (802.11b/g/n/ac 2.4/5GHz) and Bluetooth 4.2
- USB Type-C OTG; Type-C power; Type-A 3.0 host; Micro-B serial console
- LAN Gigabit Ethernet port

## LoRaWAN Gateway



- Commercial Grade Indoor LoRaWAN® Network Gateway
- Works on Semtech LoRa® Packet Forwarder
- Default Ethernet Back-haul, Automatic Fallback to WiFi
- Range up-to to 5 km Line of Sight
- Ambient operating Temperature -20 to 75 °C
- Suitable for small in-building Private LoRaWAN® Network

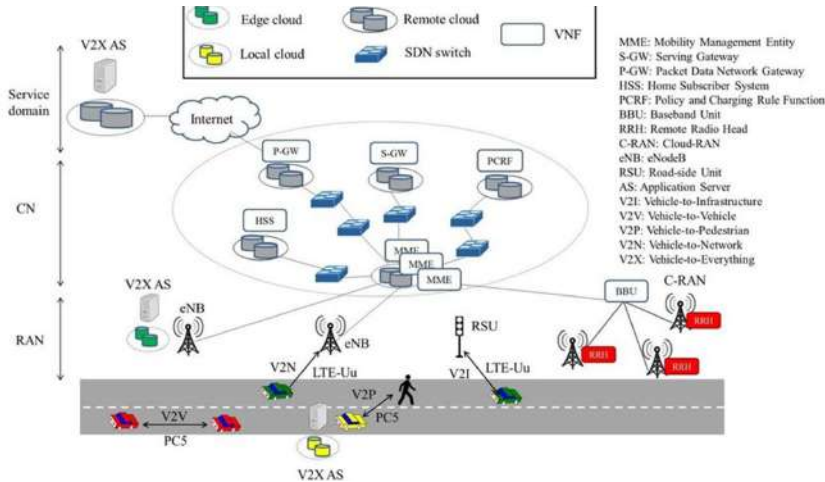
## LoRaWAN Server



- Dedicated IOT Server with all the required Software for data Acquisition, Data Visualization and analytics platforms preloaded along with sample applications

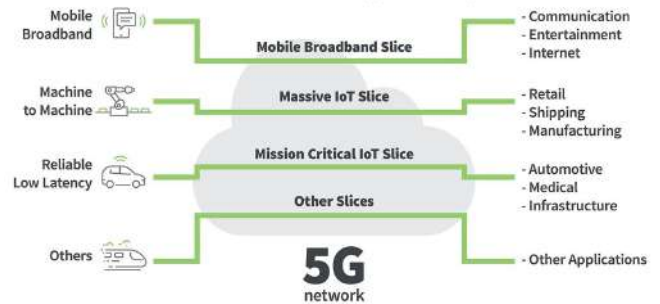
# 5G Center of Excellence

## 5G Architecture

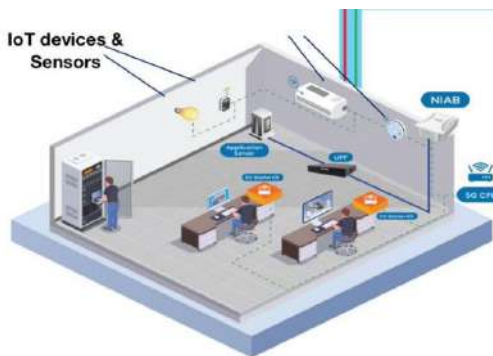


## 5G Network Slicing

5G network slicing enables service providers to build virtual end-to-end networks tailored to application requirements.



## 5G Usecase Lab Setup



**Industrial IoT Lab Setup**



**Healthcare Lab Setup**



**Agritech Lab Setup**

### OBJECTIVE :-

Addressing the skill requirement in modern wireless industry through 5G 4G/5G lab based networks.

- What comprises the wireless industry ?
- What type of jobs are present in the wireless industry ?
- Why is there is a skill-set gap ?
- What is the future requirements ?
- How can this skill-set requirement be addressed ?
- What does this product and associated services achieve ?
- Future roadmap ?
- Why advanced cellular technology skillset like 5G 4G and 5G ?

### Skill set GAP/RESEARCH:-

Skill gap arises due to:

- The skill requirement is high tech and esoteric.
- Lack of training programs to address the subject matter.
- Lack of dedicated hands on labs in universities for research purposes.

Lack of platform for research

- Practical platform for research in wireless cellular communication especially 4G / 5G and cellular Internet of Things are very costly.
- Lack of active platform for Masters thesis generation.
- Lack of active platform to perform post-doc research

### Bridging the divide:-

Skill sets addressed:

- Principles of digital communication and wireless communication.
- Understanding wireless standards like 5G 3GPP specifications of 4G and 5G.
- Different components of a 5G network from both the network as well as the mobile side.
- How security mechanism is used in a wireless communication.
- Network components used in a 5G network like gateways and other entities.
- Understanding of how a mobile communicates with a 5G network and its functioning.
- How to debug issues in a cellular network.
- Useful for research of advanced wireless communication like 5G-4G,5G,IOT.

## Our Deployments



NIT, Surat



NIT, Sikkim



Shoolini University  
HP



St Vincent College  
Nagpur



Jaypee Institute,  
Noida



NIT, Warangal



IIT, Indore



GCDW, Sopore



IUST, Awantipora



Delhi Technical University,  
Delhi

## What We Offer



Lab Setup



CoE Setup



Training and  
Upskilling



Internships



Placement Assistance



Corporate Networking



Entrepreneurship  
Opportunities



Exhaustive Learning  
Experience



User Guides



Hands-On  
Experiments With  
Reference code

## Our Collaboration



## Contact Us

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 +91-9205703472, +91-9741933559,  
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