SMART INDIA HACKATHON 2025

Problem statement and Team Details

- **Problem Statement ID – 25079**
- **Problem Statement Title – Software other than a circuit breaker that can be used to detect and turn off LT lines when the line breaks**
- **Theme – Disaster Management**
- **PS Category – Software**
- **Team ID – 97682**
- **Team Name – Team Oblivion$**

Team Oblivion

OUR SOLUTION

SMART INDIA HACKATHON 2025

- Since 2017, over 100+ lives lost due to faulty LT lines in Kerala. Villagers live in fear every rainy season.
- Current circuit breakers are non-smart, leaving villages unsafe and powerless.
- In rural India, Current manual fault detection can take hours, turning small faults into deadly hazards.
- Aging infrastructure, with weakened poles, increases the risk of failure.

❑ Challenge:

- Power cuts in rural areas stop water pumps, medical equipment and essential services.
- Manual fault detection takes hours, risking lives.

❑ Proposed Solution:

➢ **Software that detect LT line breakage and Isolate it.**

- We need hardware for detection.
- The hardware will send details of every pole where it is implemented to the software.
- Then if fault detected, the software will automatically isolate the faulty section, with the help of existing distribution switchgear or breakers that utilities already have.
- Cloud dashboard provides alerts for maintenance that will reduce the downtime.

❑ Main benefits:

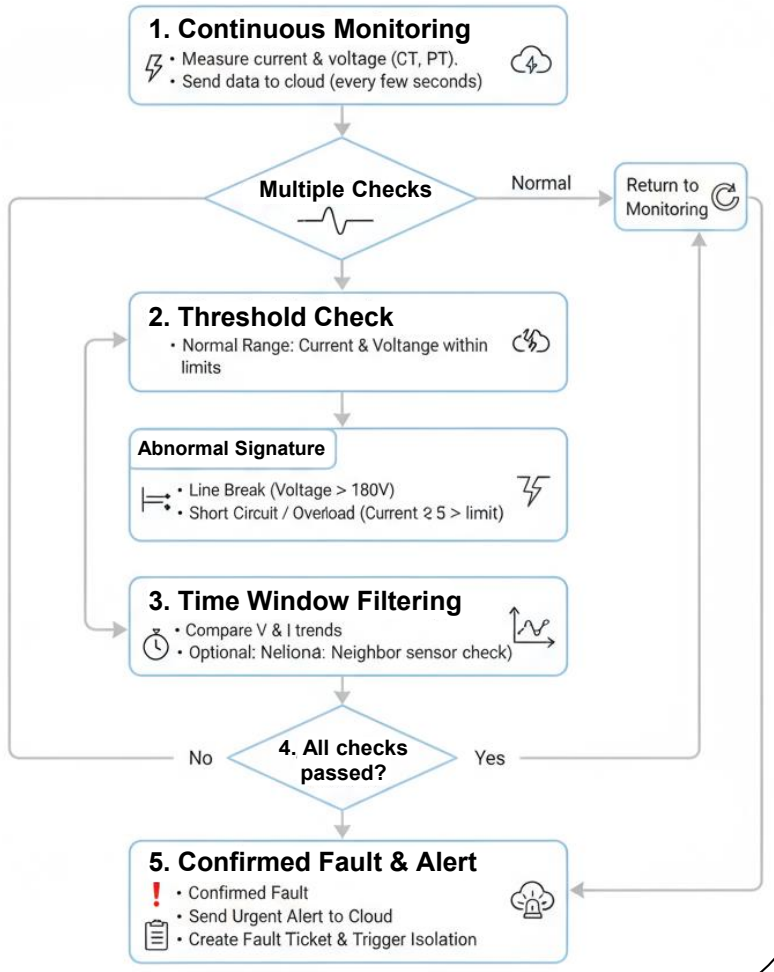
1. **Location identification**: Gives the information about point/area where the fault has occured to utilities.
2. **Detects fallen or broken LT lines** and **isolates** it to prevent electrocution.
3. **Predictive Maintenance**: Continuous data logging allows utilities to spot weak lines, reducing outages and repair trips.
4. **Works with existing infrastructure.**

Team Oblivion

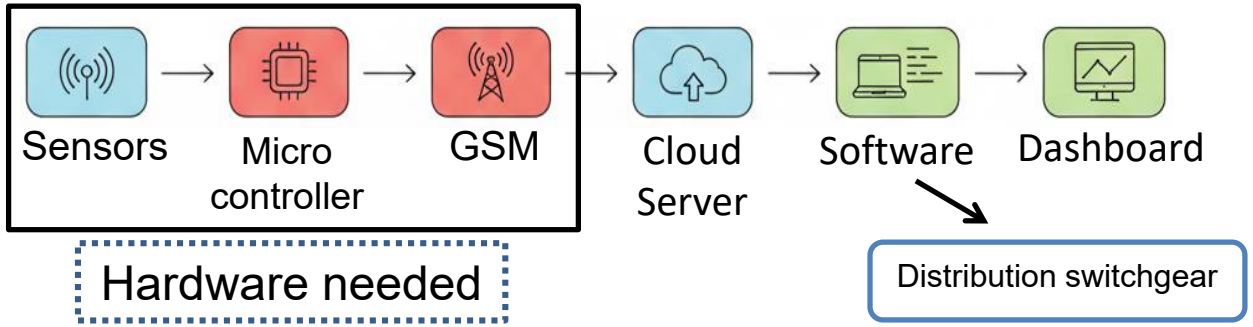
TECHNICAL APPROACH

SMART INDIA HACKATHON 2025

❑ Fault detection & Isolation:



❑ System Overview:



❑ **Hardware:** Microcontroller + CT/PT sensors + GSM

- GSM module sends the data in JSON packets like:

```
{
"pole_id": "P123",
"current": 2.5,
"voltage": 230,
"timestamp": "2025-09-22T12:30:00"
}
```

❑ **Software:** The system is built with Node.js backend, React.js frontend, MongoDB database, and AWS cloud for scalable processing and twilio for alerts.
It will already have internet access to collect the signals.

Team Oblivion

FEASIBILITY AND VIABILITY

SMART INDIA HACKATHON 2025

Feasibility Analysis:

Technical Feasibility

Deployable on existing poles without major infrastructure changes

Financial Efficiency

Reduces losses from power outages and manual inspection providing long-term cost savings to utilities

Market Relevance

Directly addresses rural LT line safety where delayed fault detection and high accident risk are common

Adoption Viability

Aligns with Digital India & Smart Grid Mission; utilities save on outage costs and patrolling

Sustainibility & Scalability

Modular nodes expand from one village to an entire grid; low maintenance ensures long-term viability

❑ Estimated Costing:

- **Software:**
  - ➢ Initial Build: ₹4.5 – 5.5 Lakh
  - ➢ Year-1 Ops + Maintenance: ₹2.3 – 3.3L
  - ➢ Total (Build + 1 Year Ops): ~₹6.8 – 8.8L
- **Hardware:** ₹1.9 – 2.9k of 1 unit
- **Labour cost:** ₹1.5 – 2L (It will vary)

Challenges & Solutions:

1. Significant initial investment that could be costlier for villages.
Solution: We are not applying the hardware on each pole. Instead we are applying on sufficient distant poles and junction poles that lowers the initial cost.

2. Sensor noise, transient current drops, or communication glitches can generate false line-break alerts.
Solution: Filtering false signals in software by analyzing current and voltage as parameters.

❑ Future Scope & Improvements:

- Use ML models on historical fault data to predict weak spots and forecast line failures before they occur (predictive maintenance).
- Mobile App for Field Technicians:
  Provide real-time fault alerts to technicians, location to speed up on ground response.

Team Oblivion

IMPACT & BENEFITS

SMART INDIA HACKATHON 2025

Impact on Target Audience

Rural Communities & Villagers

Immediate isolation of broken LT lines reduces electrocution, fire, deaths, and property damage.

Electricity boards / Utilities companies

Less manual patrolling and faster fault detection cut manpower and vehicle costs.

Field technicians & Maintenance teams

Exact fault location alerts save time, reduce blind trips, and ensure safe repair with isolation.

Benefits of the Solution

Social

Reduced outages improve quality of life, education, healthcare, and agricultural productivity in rural areas.

Economical

Reliable electricity boosts farming, small-scale industries, and rural businesses

Environmental

Minimizes repeated field visits, lowering fuel use and vehicle emissions

Unique Selling Proposition (USP)

Low cost & Scalable:

Open-source tech stack, making deployment feasible across large rural grids

Plug-and-Play:

Minimal changes to existing LT lines

Enable long term preventive Maintenance & Alerts

Reduction in fatalities due to electrocution

Revenue Streams:

1. **Maintenance & Support Services:** Ongoing income from periodic calibration, sensor replacement, and technical support contracts.
2. **Data Insights & Predictive Analytics (Future):** Utilities pay for advanced AI/ML predictive maintenance reports to plan grid upgrades and reduce breakdowns.
3. **Partnerships with Government Schemes:** Revenue through adoption under Digital India, NSGM, and Rural Electrification programs (subsidy + contracts).

Team Oblivion

PROTOTYPE & REFERENCES

SMART INDIA HACKATHON 2025

- IIT Kanpur's Smart Grid prototype under National Smart Grid Mission (NSGM) with partially funded cost shared by MoP (Ministry of Power) Rs.5.69 Cr..

https://www.nsgm.gov.in/en/sg-projects/IIT%20Kanpur

- How the ESP32 4G GSM LTE Send Data to Cloud without using WiFi !

https://www.youtube.com/watch?v=znGWGutRtd4

- What is Substation, How it works

https://www.nationalgrid.com/stories/energy-explained/what-is-a-substation#:~:text=When%20electricity%20is%20routed%20from,cables%20into%20buildings%20at%20240V.

- Electrocution deaths: Over the past 9 years (2017–2025), 111 people have died in Kerala due to faulty power lines (snapped or low hanging) according to KSEB data.

https://english.mathrubhumi.com/news/kerala/kseb-death-electrocution-compensation-et76azby