



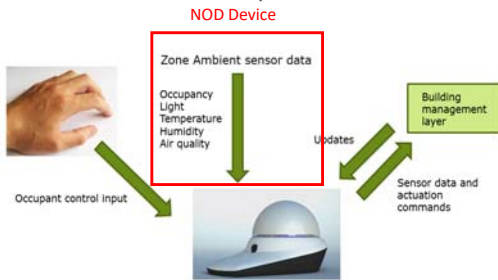
MOEEBIUS NOD Low Power WSN for BMS using Energy Harvesting



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1. What is MOEEBIUS?

- Many buildings currently use resources inefficiently
- MOEEBIUS intends to improve this using a smart Building Management System
- The NOD Device Provides the environmental feedback using ultra low power sensors
- Indoor solar energy harvesting was chosen to extend the life of the NOD battery



1. MOEEBIUS System Overview

2. NOD Device

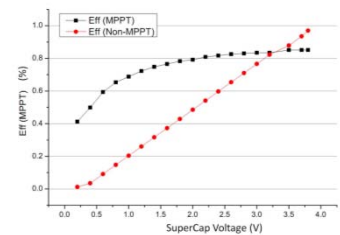
- Feedback regarding the ambient Lighting, Temperature, Humidity, Occupancy, levels of CO2 and Volatile Organic Compounds
- Fitted with Wi-Fi, Bluetooth & 868 MHz communications for compatibility
- Sends data back to an online application, a mobile device or can be easily read on the front screen



2. MOEEBIUS NOD Design and sensor Feedback

3. MPPT PV Energy Harvester

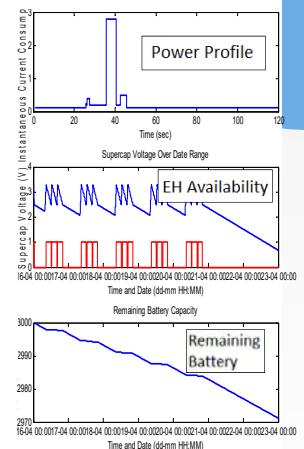
- Energy harvesting circuit uses a switched capacitor topology to track the maximum power point of the PV cell to within $\pm 4\%$
- Uses regular fractional open circuit voltage samples as reference point
- Intended to operate at office desk lighting levels (200-800 Lux) using amorphous Silicon (AM1816) PV cell
- At a nominal office light level of 400 Lux this can supply $519\mu\text{W}$ to the NOD ($\eta=73.6\%$)



3. Energy Harvester & Graph of Efficiency vs. Supercap Voltage

4. Future Work

- To maximize utility of the energy harvester, NOD power consumption must be minimized
- Lifetime power availability model has been developed which will identify methods by which power may be reduced
- At NOD power consumption of 1mW , battery lifetime can be extended by 29.5% due to Energy harvesting, and at $275\mu\text{W}$ the NOD would be self-sufficient assuming 12 hours of lighting a day at 400 Lux



4. Energy Model plots for the NOD

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