## Development of a WiFi Smart Socket and Mobile Application for Energy Consumption Monitoring

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## Abstract

In recent years, with the advancement of Internet-of-Things (IOT), there has been research into the development of smart sockets that are able to monitor the energy consumption of appliances. Some smart sockets can only monitor energy consumption while others include a controller which is able to make decisions to switch on/off the connected appliance without user interaction. This paper presents a first prototype of a smart socket based on an advanced 32-bit ESP32 Microcontroller Unit (MCU) which features an in-built Wi-Fi 802.11 b/g/n connection. The MCU was programmed and interfaced with devices to enable voltage, current, power and power factor measurement which are transmitted to a cloud-based server. A mobile application was also developed using the Blynk platform which enables display of the connected appliance through the MCU. It is hoped that this design will be a starting point towards embedding further improved features on the smart socket which will enhance efforts to improve energy efficiency of households.

Keywords: smart socket, energy efficiency, WiFi, IOT

## Introduction

Energy efficiency is becoming increasingly popular in this decade due to increased efforts globally to conserve energy usage. The latest report by International Energy Agency (IEA) states that the global energy demand in the year 2017 had increased by 1.9% as compared to the previous year and this was recorded as the fastest annual increase since the year 2010 [1]. This is due to strong economic growth that was outpaced by progress on energy efficiency. However, energy efficiency activities implemented worldwide since the year 2000 has caused an impact by preventing 12% more energy use in 2017 [1].

One of the key sectors for energy efficiency is in buildings and appliances. Policies are in place to ensure that new buildings implement energy efficiency. However, buildings built prior to the implementation of the policies are encouraged to be retrofitted in order to ensure energy efficiency. Some examples of retrofitting which can be done are the use of photovoltaics on rooftops and using energy efficient lighting as well as appliances. Unfortunately, retrofitting efforts can incur large upfront costs to the household owner. Thus, another possible method to improve energy efficiency is through monitoring of electricity consumption within the household. A typical household consists of many appliances that are connected to socket points throughout the house. In recent years, there has been advancement in the development of smart sockets or switches that are able to monitor the energy consumption of appliances.