



## Embedded System Based Internet of Things for Smart Home/Office Appliances Control using Wi-Fi Technology

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### ABSTRACT

The positioned and the integration of embedded system ability, wireless sensor and network technology in the ubiquitous architecture has enhance the 6LowPAN communication platform. Such as compatibility, internetworking, energy savings and real-time data acquisition that are the shortcoming of the existing devices like X10, network time protocol (NTP) without feedback system incorporated for the network connectivity and message guarantee constraint. This paper review several works in the area of newly emerge smart technologies which based on IoT architecture and their protocols. It also illustrates an innovative embedded system based internet of thing architecture for remote system control in a smart home and office appliances (SHOA) using android based web apps and Wi-Fi technology. The internet protocol (IP) addresses are assigning to things for easy control and operation of domestic home appliances at a remote network, which aid interoperability and end-to-end communication between multiple appliances connected over the 6LowPAN network. HTTPPOST and HTTPGET command that support RESTful services used for ensuring packet transmission and receiver between the IoT gateway and the cloud database.

**Index terms:** *Embedded system, Home appliances, Internet of Things, IP Addresses, RESTful services.*

### 1 INTRODUCTION

The arrival of Internet of Thing (IoT) paradigm has transformed the world nature like nothing before in the locale of information and communication technology, which support the communication between human-to-things and machine-to-machine existence with a standard protocol. The global network known as the Internet has revolutionized the Information and Communication Technology (ICT) with the application of smart device like PDA, mobile phones, laptop computer, tablets and others like nothing ever in practices (Aliyu, et al., 2017). The (IoTs) has proved to be self-motivated network infrastructure that interconnect physical and virtual things together (Sundmaeker, et al., 2010). Therefore, IoT was developed from the convergence of wireless technology, micro-electromechanical systems (MEMS), embedded micro-chip and the Internet facilities for the standard configuration and to achieve the interoperable communication by employing intelligent interface system called (embedded system) to perfectly integrate things into a network (Ajao, et al., 2017).

The general improvement on the development of embedded micro-chip devices with interconnectivity facilities has led to the concept of the "Internet of Things" which requires a flourishing set of wireless connectivity options (such as Bluetooth, ZigBee, Z-wave, Wi-Fi etc) and wireless application protocols includes HTTP, MQTT, CoAP, 6LowPAN and others for the interoperability and better end-to-end communication between smart devices like wrist wearable health care devices, smart home applications, intelligent agriculture precisions and so on (Vance, A 2010).

All these smart embedded and intelligence devices in the IoT platform require scalability for constrain resources, efficient power management, security for data

storage and packet transmission with support of RESTful architecture for the integration of cloud services. The complexities and emerging standards for embedded system developers required to understand the designed for its IoT device for the successful connectivity and interoperable among things and the smart appliances in the network.

Embedded systems (ES) are electronic devices that incorporate microcontroller chip within their implementations to simplify the system design and provide flexibility to perform tasks of removing the bugs, which allowing user modifications by adding new features or encoding the software that will control the devices.

Development of an IoTs architecture with embedded wireless system for multiple device monitoring purposes has advanced significantly in the last couple of years, since it added a new dimension to the world of ICT (Hilton, 2012). According to (Chike, 2014), projected that by the year 2020, the number of connected smart appliances are expected to grow exponentially and increases to 50 billion populations all over the world, and by the year 2019, the available IoTs based wearable devices will up to 780 million, while the accessible smartphones will be 2.2 billion devices.

Smart home automation is described as an intelligence device or Single-on Chip (SoC) embedded technology located within the residence to provide comfortable living, amenities, security and power efficiency to the people in the environment. The implementation of an intelligence devices for home/office environment will improved lifestyle of disable humans and elder one's that needed convenience and comfort. Therefore, the development of an embedded system based IoTs for home automation, control and monitoring is getting more attentions in the recent time. Different wireless technologies have been used for the proposed architecture and implementation of embedded system based home automation system like