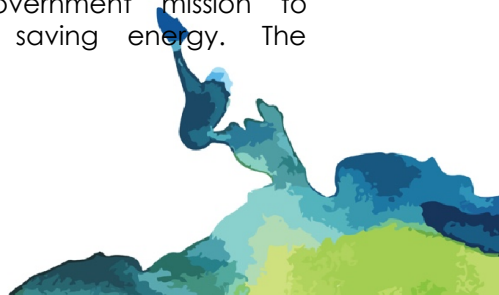


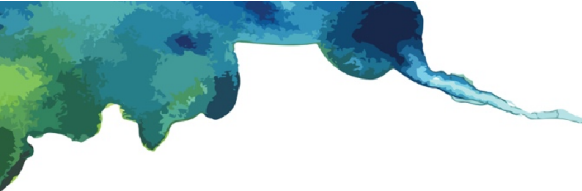
# IoT Enabled Relay Network for Designing An Energy Efficient Highway Lighting System

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**Highlights:** The objective of this project is to discuss about Internet of Things (IoT) enabled Relay Network for designing an energy efficient highway lighting system. This system is to encourage the nation to reduce the usage of energy consumption in highway lighting system. By using light sensor and proximity sensor, it will detect the light intensity and the movement of the vehicles through the lamp post. The controller that controlled the system is Arduino Uno. In order to reduce the energy consumption, the selection of device that been used in this system is chosen based on the usage of energy consumption itself. This concept will reducing the energy consumption used as it is one of hot issue in this global. The system works as light intensity and proximity sends the data captured by the sensors to the Arduino Uno and it transmits the data to Light Emitting diode (LED) to switch on the light. Then, XBee Module will transmit the data to next lamp post. The data received on first lamp post will be used to switch on the LED. The main objective of this project is to design and develop a prototype model that can reduce energy consumption by using light intensity and proximity from the vehicles. Besides, it is to support government mission to encourage more people in saving energy. The





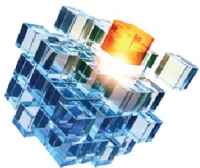
experimental results revile the effectiveness of the proposal.

**Key words:** *IOT, Relay Network, Smart Light, Zigbee, Energy Efficiency, Arduino*

### **Introduction**

Energy issues are an important factor in the functioning of our economy and infrastructure. There are many types of energy used in this world wide. One of the big consumption of energy is electric energy (APA, 2014). Electric and electronic devices consume electric energy to generate output such as light, heat and motion. During this operation, some part of energy which is depending on electrical efficiency is consumed in unintended output. As in this era of global warming and diminishing, the amount of energy consumption should be taken more seriously. There are many ways to help preventing or reducing global warming. To help reducing this global warming issue, we can start from our highway lighting system because it uses more energy on light energy consumption.

Due to that, by using IOT Enabled Relay Network for Designing an Energy Efficient Highway Lighting System, it will reduce energy consumption. In this system, LED or Light-Emitting Diode light bulb is used to save more energy rather than using CFL and Incandescent light bulb (Lighting, 2016). It also use sensors and ZigBee protocol to transmit data through the XBee Module attached on lamp poles along the highway. This system can be used to reduce more energy consumption and help the client to get low bill for electricity usage. If we can reduce this energy consumption, later it will continue to the industry and city itself. By reducing this energy consumption, it will reducing the global warming

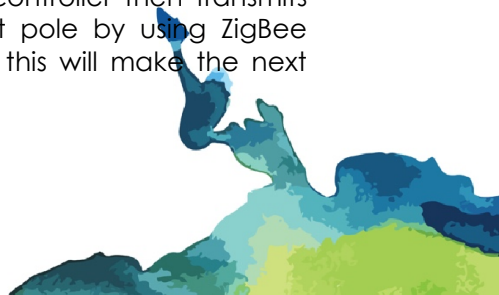


and green house effects too. Therefore in this case, the best way to reduce energy consumption is by using IOT Enabled Relay Network for Designing an Energy Efficient Highway Lighting System.

### **Content**

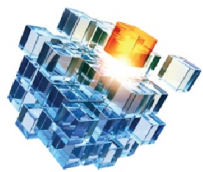
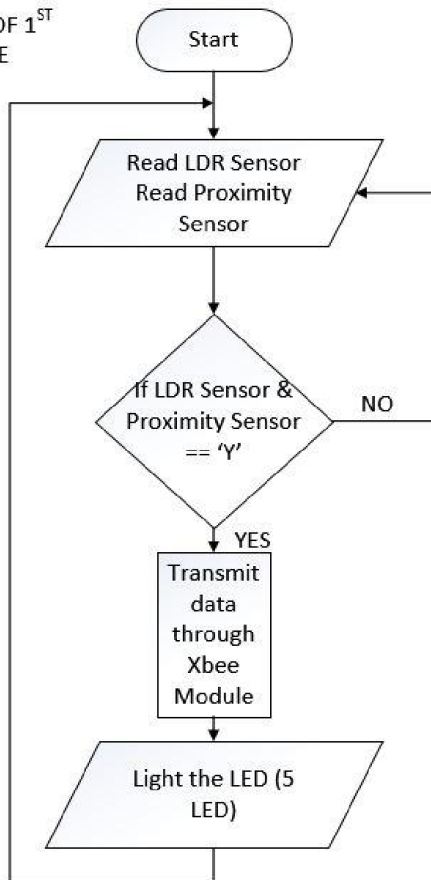
Description of the innovation:

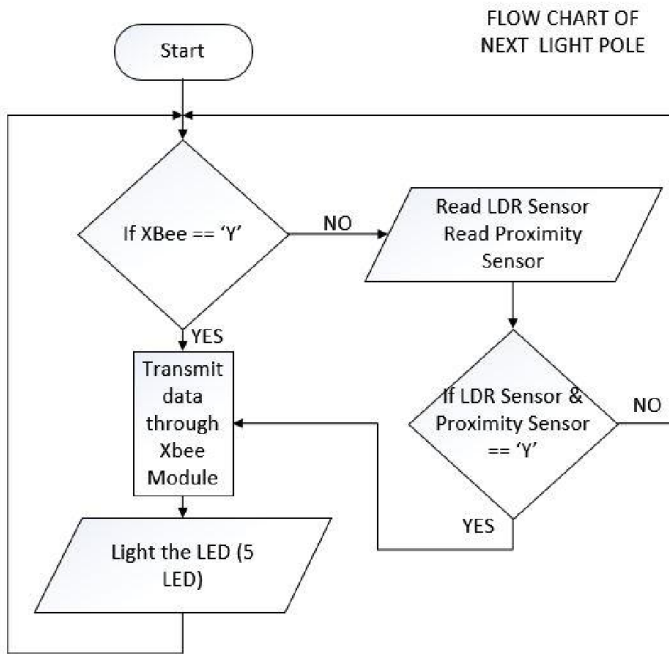
Nowadays, energy consumption has been a very popular issue. There are many ways to reduce energy consumption in our daily life. One of the ways to reduce energy consumption is by using IOT Enabled Relay Network for Designing an Energy Efficient Highway Lighting System. When we want to install the system, we need to find the best features for the system. As the technology continues to advance, the light system is quickly becoming more sophisticate. Light technology is the most important feature for this system. If the light technology used is consume much energy, there will be difficult for the system itself to reduce energy (Energy, 2016). For this system, we should take note that all the features used must be reducing the energy. The light technology should be bright enough to light up the place it taken and use a small amount of energy. We should apply the light technology along the highway. This system will be function as the sensor detects the light intensity. Generally, the light technology purchased is enable to work with the sensor. The sensor should be capable to operate with light intensity. As a small amount of light intensity is detected through sensor, the big amount of light will be produced through light source. Throughout this technology innovation, the system is connected to the sensor that can detect light intensity. Both this light source and sensor are being controlled by a controller. The controller then transmits the data from first pole to next pole by using ZigBee protocol through XBee Module, this will make the next



pole light up the bulb itself without using sensor on the pole itself. By doing this, all this innovation is absolutely helps the industry or generation to reduce energy consumption.

FLOW CHART OF 1<sup>ST</sup>  
LIGHT POLE





### Why are they important to community?

IOT Enabled Relay Network for Designing an Energy Efficient Highway Lighting System is reducing the energy consumption of highway lighting system. This new method cut cost for highway lighting system and it also make the system towards to green country. By reducing energy consumption, it helps to reduce global warming too.



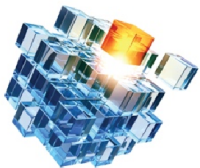


### **Advantages of the innovation towards computing future and community:**

The advantages of IOT Enabled Relay Network for Designing an Energy Efficient Highway Lighting System are it reduces the energy used for highway lighting system. By using this new method, it can reduce the energy consumption and save the costs. Based on the experiment, if the busyness of road is 10%, it will save until RM 193.54 per month. If 40%, it will save until RM 129.02 per month. For 70%, it will save around RM 64.51 per month (TNB, 2014). This method proves that the busyness of highway street affects the cost of highway lighting system. Besides that, the sensors used are also from low cost product and it will last longer (Automation, 2016). In addition, the module used to transfer ZigBee protocol is XBee Module. This XBee Module can transmit data around 100 meters (Baker, 2005) and it can reduce redundancy of network by using this protocol, rather than using another wireless protocol such as Bluetooth and IEEE 802.11 (Kinney, 2003). In future, this system will help to reduce energy consumption of the city itself and save the world from global warming.

### **Commercial value:**

For IOT Enabled Relay Network for Designing an Energy Efficient Highway Lighting System, it has the commercial value as it will be make as a product. This system will be collaborate with light-produced industry to build the device on lamp pole where it contains the sensors and XBee Module on it. This system or product can get high value in market as it will be used at rural areas, in order to reduce energy consumption. Besides that, this product will not cost much as it helps a lot in reducing energy consumption in future.



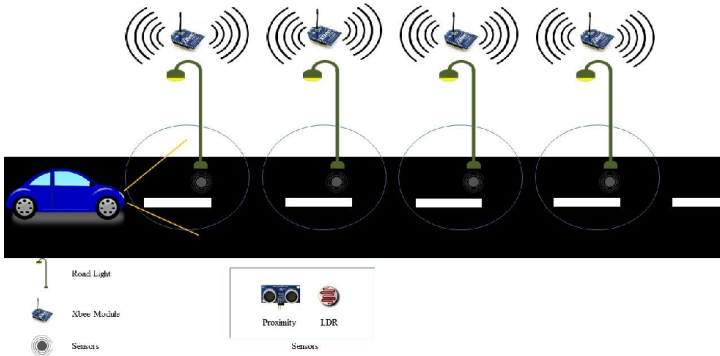


Figure 1: Architecture of IOT Enabled Relay Network for Designing an Energy Efficient Highway Lighting System

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