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Vehicle-Assisted Device-to-Device Data Delivery for Smart Grid

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Abstract:
Smart grid (SG) has recently attracted much research attention from both the power and communication fields. SG refers to a modernized and advanced power system that aims to monitor and deliver electric power consumption information in a more efficient and reliable manner by incorporating state-of-the-art communication, computing, and control technologies into the traditional power grid. A smart grid management system in a vehicle (train) is necessary to be organized by integrating services, thereby reducing the workload. In vehicles such as trains grid can be utilized by manual switching.

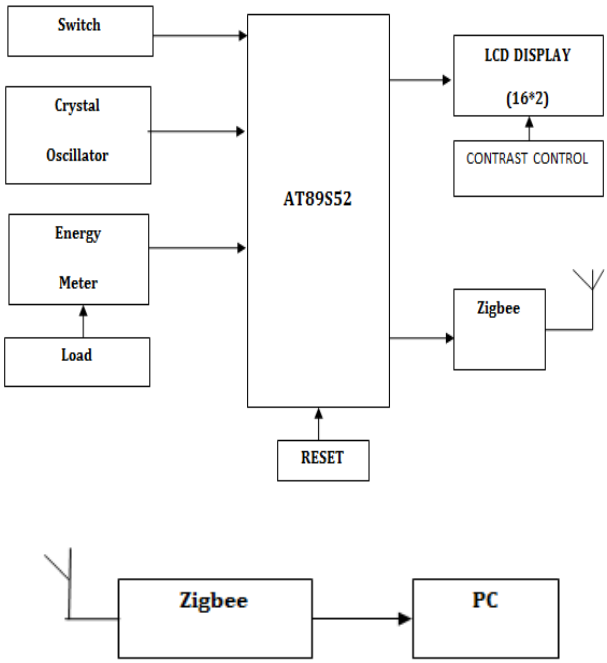
This conventional manual switching method has to be overcome by an easier method of switching. This can be done using an advanced switching method like a remote control for electrical appliances.

Existing method

In this project electricity consumption by the user i.e. Units consumed in that meter will be sent to PC using zigbee module and also 16X2 LCD is provided to read units available.

Whenever there is a change in count value / units in the meter gets changed, these values are displayed on LCD. Here we are using zigbee for the purpose of communication.

Block Diagram



Draw back

Zigbee can be implemented with shorter distance only. The above mentioned process can be implemented only at household.

Proposed method

Here we are using a technology known as Internet of things (IoT), in which we can wirelessly operate appliances by communicating IoT module with the controlling system. In train, consumed units information

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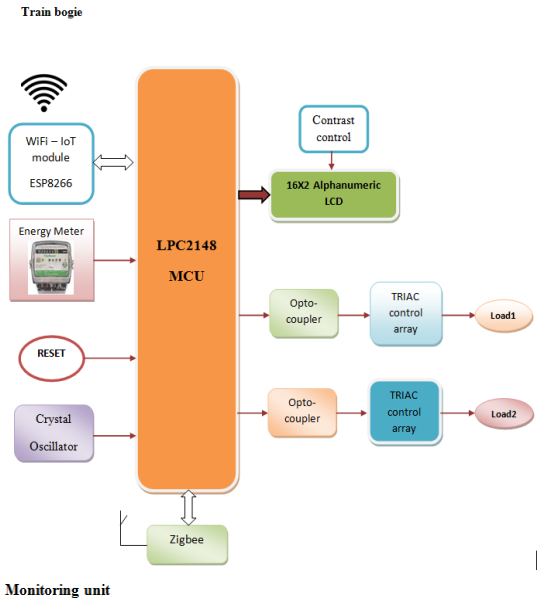
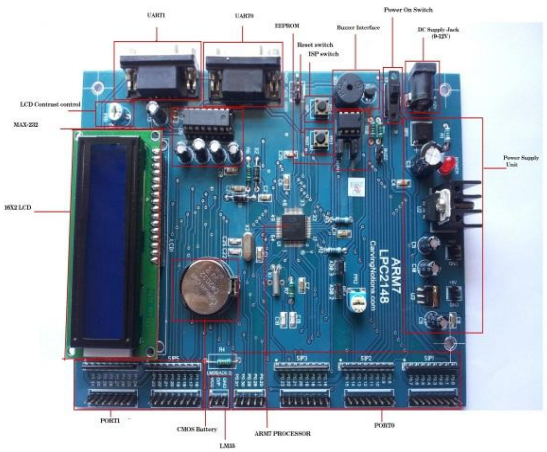
is sent to the authorized system i.e to train bogie which consists of monitoring unit using Zigbee communication thus forming network. The received information is displayed on LCD and uploaded to the web server using IoT from the receiver to view the information using internet thus it forms a Wide network. The main system of the project is ARM7 LPC2148 microcontroller to which all input outputs are interfaced.



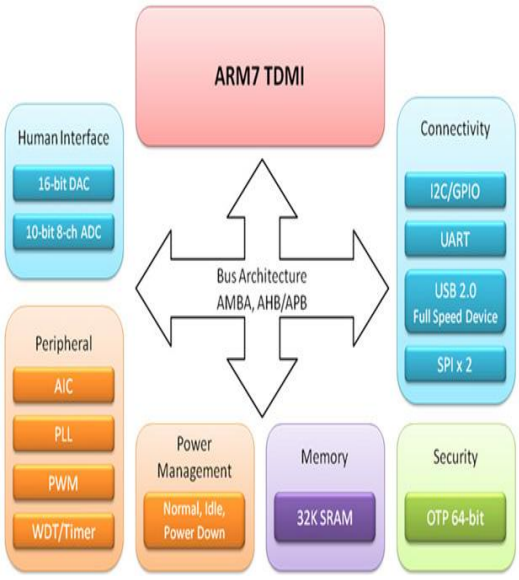
Hardware modules

LPC2148 controller

The **LPC2148** are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory.



A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT,PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.



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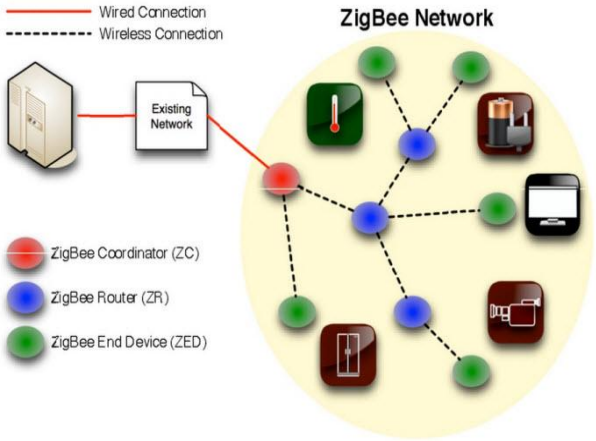
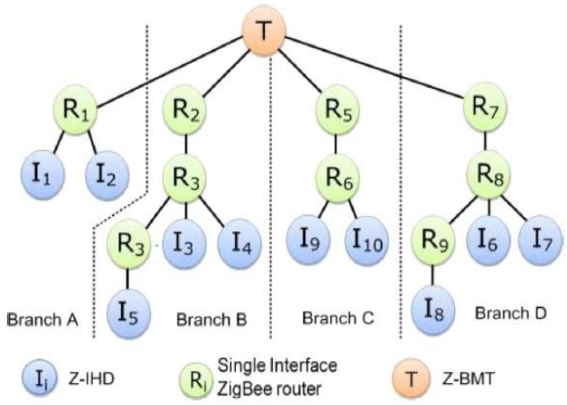
Zigbee



It is the wireless device for transmitting and receiving purpose or simply it called as Transceiver. Zigbee is based on the IEEE802.15.4 protocol. The range of the Zigbee is covered as 100m. It range is 10 times better than bluetooth device so it can be more preferable one in wireless device. The data rate is very low for transmission while using this device.



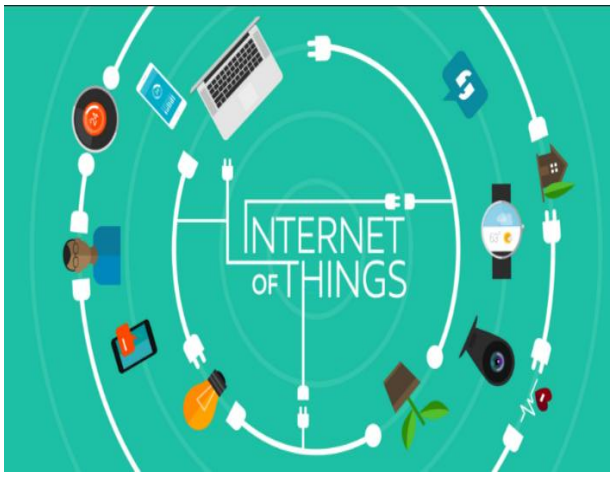
ZigBee floor network tree.

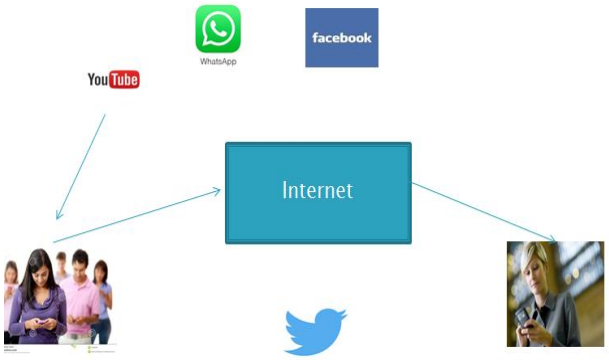
Grid

The term grid usually refers to a network, and should not be taken to imply a particular physical layout or breadth. Grid may also be used to refer to an entire electrical network, a regional transmission network or may be used to describe a sub network such as a local utility's transmission grid or distribution grid.

Internet of things

Internet is helping people to communicate each other using different applications





Internet of things helps the things to communicate each other using IoT module

ESP8266EX

- The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.

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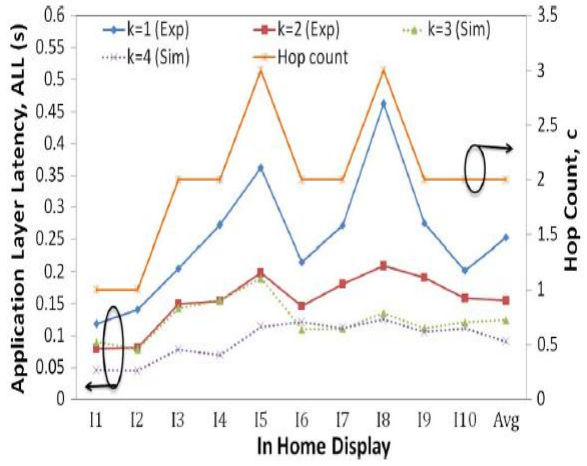
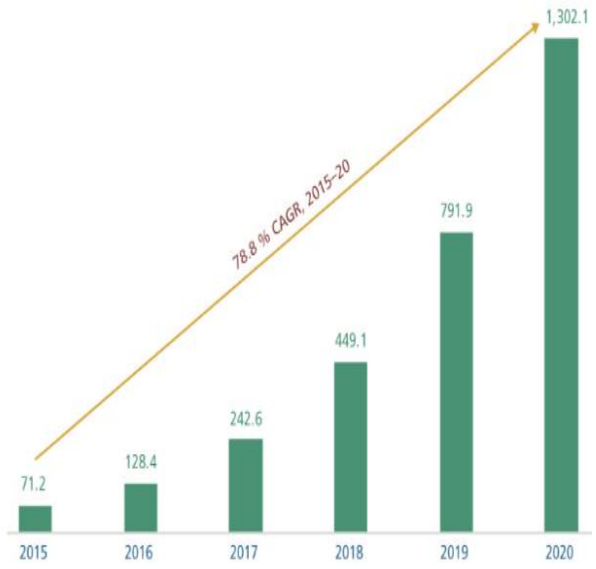
PERFORMANCE EVALUATION

The performance evaluation is divided into two parts: ZigBee mesh floor (horizontal communication) network and BN (vertical communication).



ALL and c of $I_1 - I_{10}$ for k = 1–4 and n = 1.

Potential growth in worldwide IoT sensor deployments for CRE (2015–20), millions



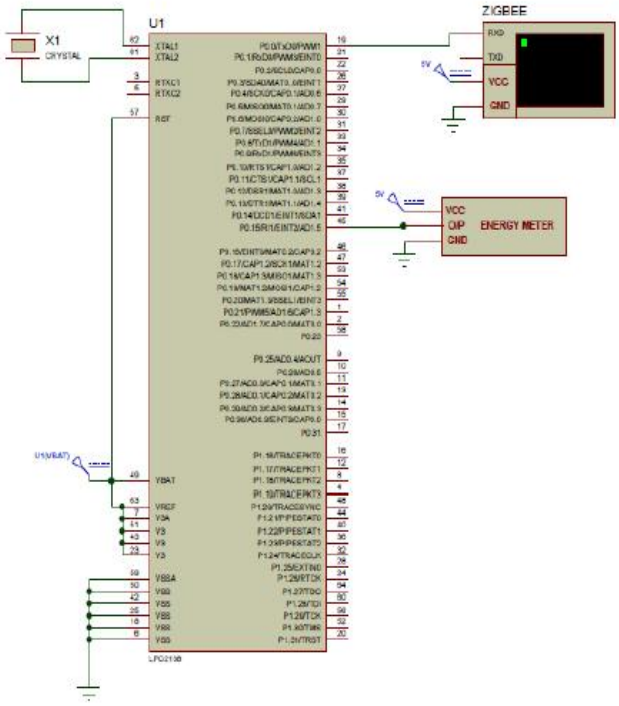
SOFTWARE DETAILS

Keil compiler

Keil compiler is a software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.

Results

Simulation Results



ADVANTAGES:

- Ease of maintenance
- Accessing the data from other place
- Less power consumption
- Very faster communication

APPLICATIONS:

- Industrial Automation
- Weather stations
- Agricultural

Conclusion

To facilitate efficient deployment of metering for existing system this concept is very helpful using LPC2148 and Zigbee.

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