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Web of Things for Energy Management in a Smart Grid Connected Industrial


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ABSTRACT:

This paper describes a Smart Grid architecture implemented with the help of Web of Things .Web of Things comprise of a set of Web services provided on top of a number of Internet enabled Embedded devices .The Web browser on any computer can act as an interface to the services provided by these Web of Things. The Embedded devices are ARM11 Processor based devices with Ethernet capabilities. CMSIS Real Time Operating System is used for process control on each of these embedded devices. LwIP Protocol Stack is implemented on top of each of these devices so that IP connectivity can be established. The Web interfaces provide us real time information on each of the energy meters that are installed on site and communicate to the Embedded Internet devices using MODBUS communication protocol. Real Time energy source scheduling, energy source selection, power connection and disconnection are some of the services that are provided to an on-line authenticated user. The Embedded Systems lab Infrastructure at the TIFAC CORE for 3G/4G Communication at National Institute of Science and Technology was used for the hardware testing of the embedded modules. We were greatly helped by the Software developers at NIST Technology Consultancy Services in designing the web applications and interfaces for our Web of Things architecture.

Keywords: ***Raspberry Pi processor, AT89S52 controller, humidity sensor, Gas sensor, Display unit.***

I. INTRODUCTION:

Increases in recent times in electricity costs and in associated emissions of greenhouse gases are having an impact on societies to adopt business and lifestyle strategies based on sustainability practices. The emergence of the smart grid facilitates both suppliers and consumers of electricity in reducing carbon footprint and improving the reliability and efficiency of electricity generation, distribution and utilization. The smart grid unifies recent developments in the electrical power area with those in information and communication technologies (ICT) to bring to bear changes to business practices and life styles of consumers. The smart grid recognizes the distributed nature of electricity industry and the unifying power of the ICT. Traditional power grids consist of (i) large-scale electricity generators that are located within easy reach of energy resources, (ii) highvoltage transmission lines to bring bulk electricity to load centres that are close to loads, such as industries, cities, townships etc., and (iii) lower voltage distribution networks which in turn distribute electrical power to smaller consumers of electricity. Unlike such traditional power grids, smart grids have distributed energy generation that encompasses both centrally-located large-scale generators with ratings of 100's of megawatts (MWs) and many geographically

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distributed smaller generators of widely varying sizes from 10's of MWs that use fossil fuels and renewables to a few kilo watts (kW) that may be solar photo voltaic (PV) panels mounted on the roof of a small house.

II. SYSTEM ARCHITECTURE:

2.1 BLOCK DIAGRAM:

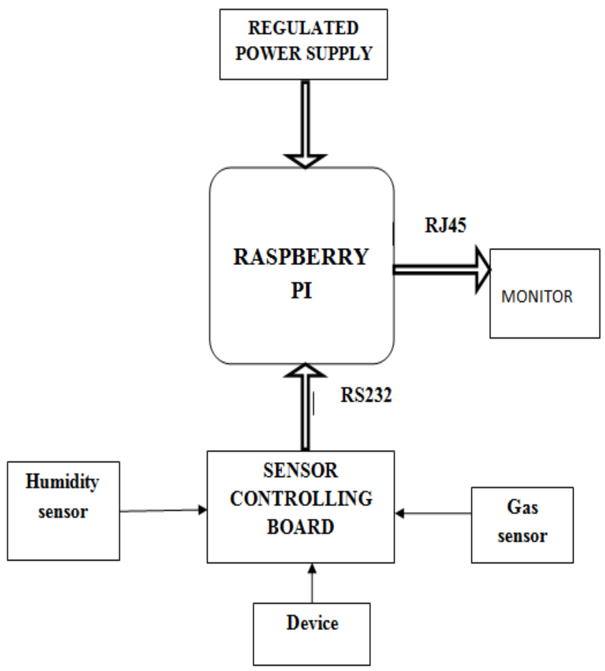

Figure-1: Block diagram of project

2.2 EXISTING METHOD:

THE SMART GRID is an intelligent power generation, distribution, and control system. The proposed system is helpful in collection and analysis of real time data along with the control of electrical loads for energy reduction. emphasizing the importance of the communication infrastructures required to support device control and data exchange between the various domains which comprises the smart grid. Our proposed scheme is implemented with a ETHERNET protocol.

2.3 PROPOSED METHOD:

In proposed system we extend our data transmission to IOT so that the relevant parameters are monitored controlling through Ethernet. This is very useful in the case when the user is moving in industrial area. Along with the data monitoring devices is also controlled based on the values.

III. HARDWARE IMPLIMENTATION:

3.1 RASPBERRY PI PROCESSOR:

The Raspberry Pi board contains a processor and graphics chip, program memory (RAM) and various interfaces and connectors for external devices. Some of these devices are essential, others are optional. It operates in the same way as a standard PC, requiring a keyboard for command entry, a display unit and a power supply. The Raspberry Pi board is a miniature marvel, packing considerable computing power into a footprint no larger than accredit card. It's capable of some amazing things, but there are a few things you're going to need to know before you plunge head-first into the bramble patch.

3.2 AT89S52 CONTROLLER:

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the indus-try-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory pro-grammer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue

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functioning. The Power-down mode saves the RAM con-tents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

3.3 HUMIDITY SENSOR:

Humidity is a term for the amount of water vapor in the air, and can refer to any one of several measurements of humidity. Formally, humid air is not "moist air" but a mixture of water vapor and other constituents of air, and humidity is defined in terms of the water content of this mixture, called the Absolute humidity. In everyday usage, it commonly refers to relative humidity, expressed as a percent in weather forecasts and on household humidistats; it is so called because it measures the current absolute humidity relative to the maximum. Specific humidity is a ratio of the water vapor content of the mixture to the total air content (on a mass basis). The water vapor content of the mixture can be measured either as mass per volume or as a partial pressure, depending on the usage.

3.4 GAS SENSOR:

Figure-2: Gas sensor

DESCRIPTION

MQ2 flammable gas and smoke sensor detects the concentrations of combustible gas in the air and outputs its reading as an analog voltage. The sensor can measure concentrations of flammable gas of 300 to 10,000 ppm. The sensor can operate at temperatures from -20 to 50°C and consumes less than 150 mA. Connecting five volts across the heating (H) pins keeps the sensor hot enough to function correctly. Connecting five volts at either the A or B pins causes the sensor to emit an analog voltage on the other pins. A resistive load between the output pins and ground sets the sensitivity of the detector. Please note that the picture in the datasheet for the top configuration is wrong. Both configurations have the same pin out consistent with the bottom configuration. The resistive load should be calibrated for your particular application using the equations in the datasheet, but a good starting value for the resistor is 20kΩ.

IV. RESULTS:

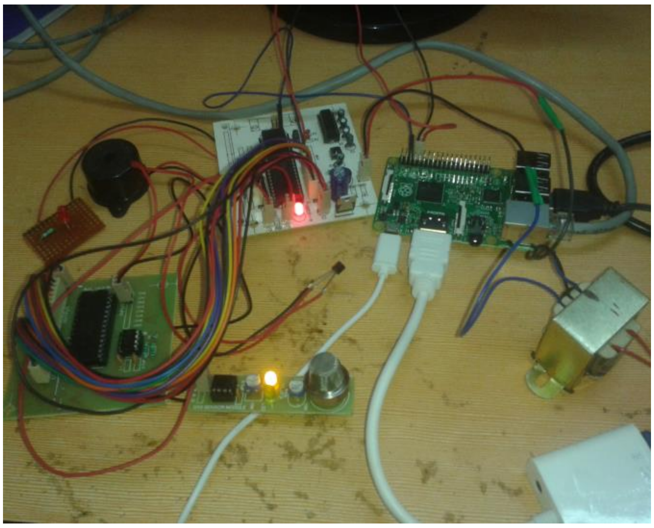

Figure-3: Hardware Implementation

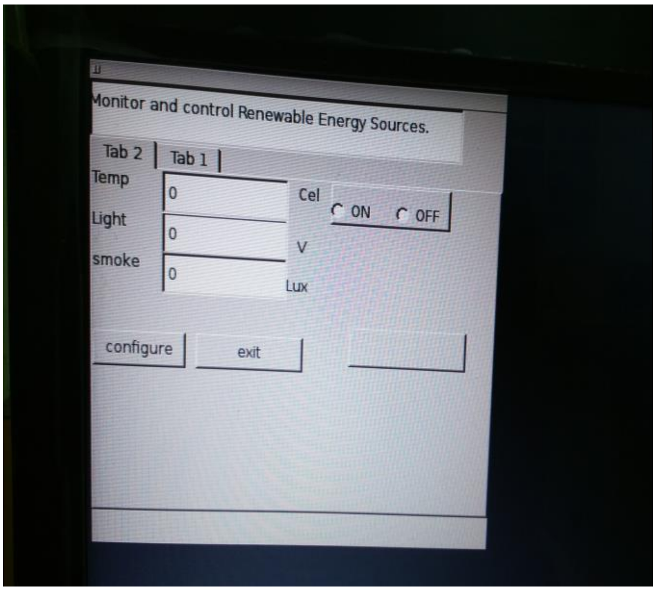

Figure-4: Simulation Results (1)

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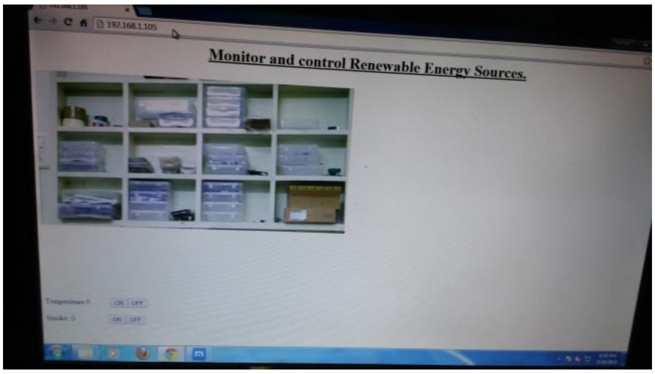

Figure-5: Simulation Results (2)

V. CONCLUSION

The designed system is easy to implement and very customizable according to needs. It provides very effective techniques of using our renewable energy resources which would otherwise have been underutilized. Finally it gives a very effective method for implementing green energy concept on a larger scale .The integration of Web of Things with existing power grid architecture will provide us numerous opportunities for improvements in our energy saving techniques.

VI.REFERANCES

[1] Dhananjay Singh, Gaurav Tripathi, Antonio J. Jara ”A survey of Internet-of-Things: Future Vision, Architecture, Challenges and Services” 2014 IEEE World Forum on Internet of Things (WF-IoT) 978-1-4799- 3459-1/14.

[2] Saswat Mohanty, Bikash Narayan Panda, Bhavani Shankar Pattnaik “Implementation of Web of Things based Smart Grid to Remotely monitor and control Renewable Energy Sources”2014 IEEE students’ conference on Electrical, Electronics and Computer Science.978-1-4799-2526-1/14.

[3] ARM. "LPC-2129/2148 Datasheet, "keil.com. [Online]. Available at http://www.keil.com/dd/docs/datashts/philips/lpc21xx_ds.pdf[Accessed:Aug.27, 2013].

[4] Neoway M660 AT Command Sets data sheet “www.wless.ru/files/gsm/Neoway/Neo_M660_AT_Command_Sets_V1.2.pdf”.

[5] Nourai, A., & Kearns, D. (2010). Batteries included. IEEE Power and Energy Magazine, March, 49-54.

[6] Xinghuo, Y., Cecati, C., Dillon, T., & Simoes, M.G. (2011). The New Frontier of Smart Grids. IEEE Industrial Electronics Magazine, 5(3), 49-63.