**International Journal of Computer Engineering & Technology (IJCET)**
Volume 7, Issue 1, Jan-Feb 2016, pp. 54-61, Article ID: IJCET_07_01_007
Available online at
http://www.iaeme.com/IJCET/issues.asp?JType=IJCET&VType=7&IType=1
Journal Impact Factor (2016): 9.3590 (Calculated by GISI) www.jifactor.com
ISSN Print: 0976-6367 and ISSN Online: 0976–6375


# DESIGN OF INTELLIGENT DEVICE TO SAVE STANDBY POWER IN NETWORK ENABLED DEVICES

**Narayana Swamy .R**
Research Scholar
PRIST University, Thanjavur, Tamilnadu, India

**Dr. G. Mahadevan**
Principal
Annai College of Engineering and Technology,
Kumbakonam, Tamilnadu, India

## ABSTRACT

*Network connectivity is rapidly expanding to a range of new device groups that offer both wired and wireless network functionality. In 2012, 74% of Internet Protocol (IP) traffic and 94% of consumer Internet traffic originated from personal computers (PCs). By 2017, analysts predict that 49% of IP traffic and 39% of consumer Internet traffic will originate from non-PC networked enabled devices. For network enabled devices, the most appropriate method of energy consumption reduction would be the total disconnection reduced time of operation since they are used infrequently. Automatic Power cut-off and Reset Device is the device which will avoid the standby power consumption. device automatically cuts off the power supply to the appliance when it enters the standby mode. Completely cutting off the power in turn helps in overall power consumption and in turn reduces the electricity bills.*

**Key words:** IP; IOT; IOB; Network Enabled Device; Standby Power

**Cite this Article:** M. Dhanalakshmi and Anirban Basu. Energy Efficient Virtual Machine Assignment Based on Energy Consumption and Resource Utilization in Cloud Network. *International Journal of Computer Engineering and Technology*, **7**(1), 2016, pp. 54-61.
http://www.iaeme.com/IJCET/issues.asp?JType=IJCET&VType=7&IType=1

# 1. INTRODUCTION

IoT is based on ubiquitous network connectivity and its vision is "anytime, anywhere, by anyone and anything" Fig 1.1. Increased usage of Wi-Fi devices in home automation is due to the networked nature of deployed electronics devices and increasing rate of adoption of mobile computing devices (smart phones, tablets, etc.). Organizations are working on integrated technology which will enable single device control all electronic devices and appliances. The solutions are based on open platforms that employ a network of intelligent sensors to provide information about the state of the home [1], such as energy generation and metering, HVAC, lighting, security and environmental key performance indicators. This collected information is processed and displayed on touch screens, mobile phones, and 3–D browsers and can be later analyze various parameters like energy usage, temperature and lighting variations, building occupancy level. Mobile devices are used to control device functionality and ensure consumer access over the network.

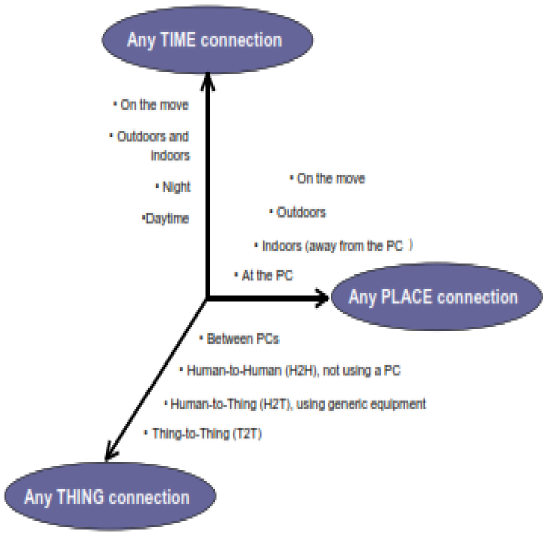


**Figure.1.1** Internet of Things [1]

The IoT gateways securely connect next generation intelligent infrastructure to the IoT. They integrate technologies and protocols for embedded control, networking, security and manageability on which third party applications can run. From the layers of a smart building Fig.1.2, there are many integrated services that can be seen as subsystems and are useful to provide the best conditions for the activities of the building occupants.

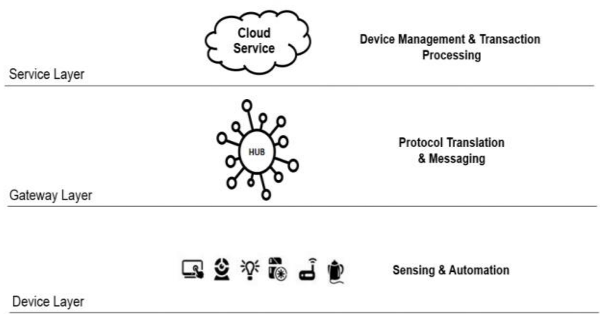


**Figure 1.2** Smart Buildings Layers


**Figure.1.3** Smart Building Services Taxonomy

Fig.1.3 presents the taxonomy of basic services. internet enabled devices within the building and with external entities, such as the electrical grid, simplifies building control Using the Internet together with energy management systems offers an opportunity to remotely access building’s energy information and control internet enabled devices through laptops or Smartphone. This has a huge potential for providing stakeholders feedback about energy consumption levels and the ability to act on that information. IBMS can be considered part of a much larger information system Fig.1.4. This system is used by occupants/owners/managers in buildings to manage energy consumption and energy procurement and to maintain buildings systems, based on the infrastructure of the existing Intranets and the Internet, utilizes the same standards as other IT devices. Due to Reduced cost and reliability of WSNs we see drastic transformation in building automation by making the maintenance of energy efficient, productive and healthy work spaces in buildings increasingly cost effective.

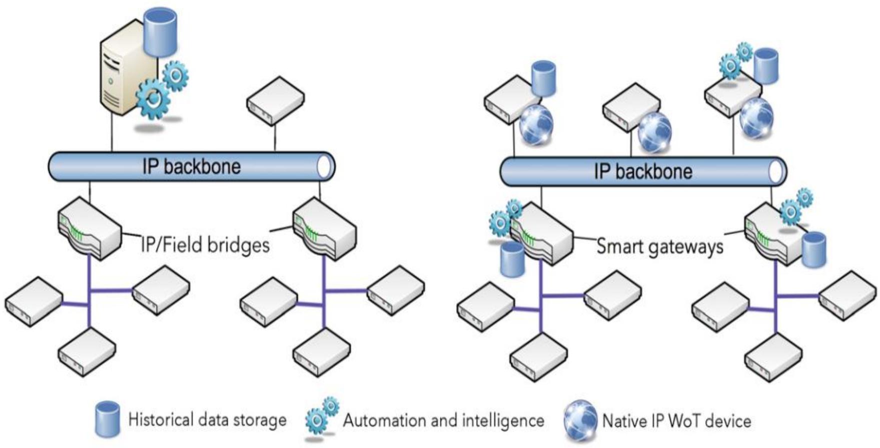


**Figure 1.4** Role distributions for a classical building automation system and for a Web-of-Things architecture.

# 2. NETWORK STANDBY

## 2.1. Newage of ICT

Network connectivity is rapidly expanding to a range of new device groups that offer both wired and wireless network functionality.

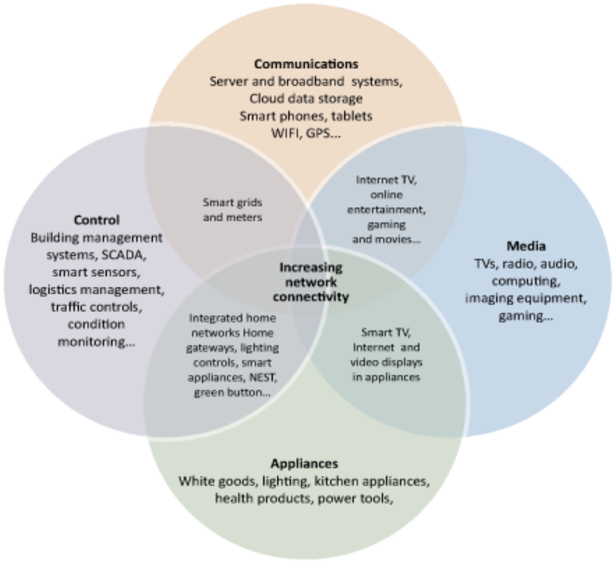


**Figure 2.1** New age ICT

In 2012, 74% of Internet Protocol (IP) traffic and 94% consumer Internet traffic originated from PCs. By 2017, analysts predict that 49% of IP traffic and 39% of consumer Internet traffic will originate from non-PC networked enabled devices. Most of the services outlined in Fig.2.1 are not new; Smart appliances and devices transcend existing functions and capabilities, and offer new ways of providing services simply by receiving and transmitting information that was previously not available, quantum leaps are being achieved from established technologies in service quantity, quality and controllability of normal activities. Network connectivity is expected to continue growing at exponential rates for decades to come, driven by four interrelated trends:

- Increasing global online population
- Increasing network traffic
- Increasing demand for online services, from both consumers and business
- Increasing number of devices online.

## 2.2. Energy Consumption

Energy consumption of network enabled devices (edge devices and user premise network equipment) exceeded 570 TWh in 2012, surpassing the electricity consumption of France. By 2013, this had already grown to 615 TWh, overtaking the electricity consumption of Germany and continues to grow at a rapid rate to almost 1140 TWh by 2025 exceeding the current electricity consumption of Russia and corresponding to 6% of current total final global electricity consumption. Most ICT energy demand is consumed in the form of electricity, Fig 2.2. Thus, standby power also has implications for the range of primary fuels used to generate electricity, as well as on electricity infrastructure. The electricity mix varies significantly from country to country, and changes over time [2]. To illustrate the relationship between electricity generation and fuel use, current ICT energy consumption corresponds to the annual electricity generated by 520 mid-size coal-fired power plants (500 MW), which together would require 728 MT of coal per year. A 500 MW conventional coal-fired power plant may cost over USD 1 billion to construct and will incur fuel, operating, maintenance and other costs for about 50 years. The savings potentials from mainstreaming energy efficiency considerations into the ICT ecosystem are considerable and growing at a rapid rate as these systems expand and connectivity spreads. Looking just at network enabled devices, implementation of best available technologies and solutions can result in global electricity savings of almost 740 TWh/yr by 2025. Approximately energy reduction potentials from improving the efficiency of network-enabled devices are assessed on a regional basis, reflecting the different drivers for growth in networked system power demand, Fig.2.3.

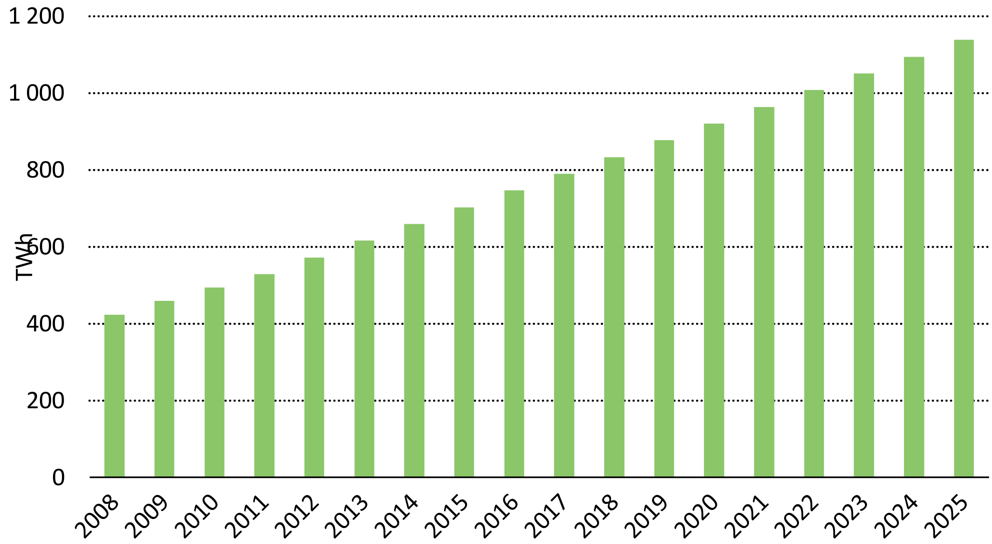


**Figure 2.2** Current and Projected Global Network Enabled Device Electricity Consumption.

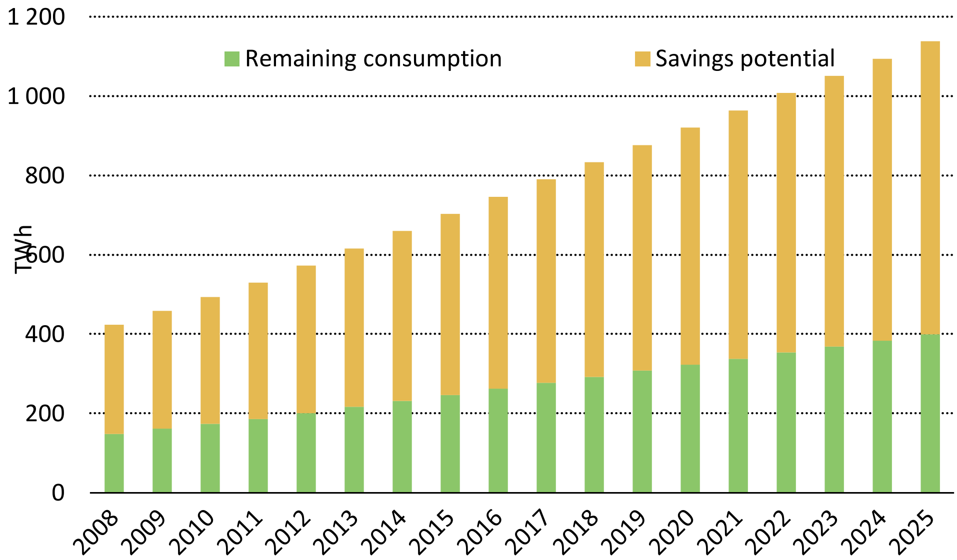


**Figure 2.3** Current and Projected Global Network Enabled Device Electricity Consumption and Savings Potential.

## 3. CUT-DOWN UNUSED LOAD

It is well known that energy is a function of power watts and time seconds. Therefore, the strategies to reduce parasitic power consumption would require either to reduce the total power consumed by any particular device or simply reduce the amount of time for which it is consuming electricity. Both these approaches would result in sufficient reduction in standby power consumption. The function of a particular type of device generally determines the most appropriate strategy. Among these, increasing the efficiency of the power supply watt consumption reduction would be the most effective strategy to reduce leaking electricity in a security system since the electronics must be powered all the time to monitor sensors. For some particular devices, the most appropriate method of energy consumption reduction would be the total disconnection reduced time of operation since they are used infrequently. APCRD (Automatic Power cut-off and Reset Device) is the device which will avoid the standby power consumption. APCRD automatically cuts off the power supply to the appliance when it enters the standby mode. Completely cutting off the power in turn helps in overall power consumption and in turn reduces the electricity bills, Fig 3.1. Reducing the power consumption worldwide helps in reducing the carbon dioxide emission by 1% i.e. helps in reducing the global warming.

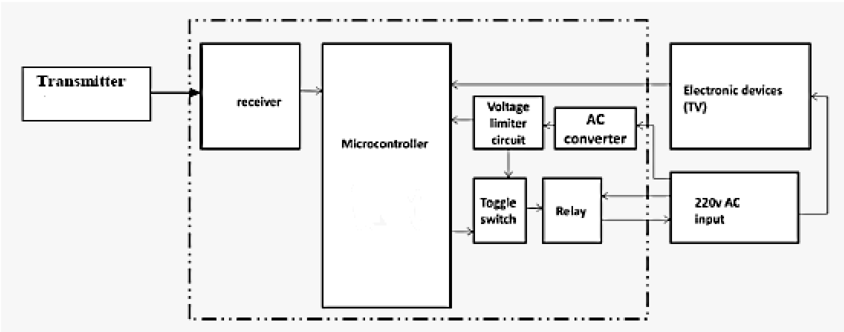


**Figure.3.1** Proposed System Block Diagram.

## 4. STANDBY CONSUMPTION AND POTENTIAL SAVINGS

In case of APCRD the reduction of standby energy consumption is 100% (261.3kWh), 0% For the Eco design and BAT cases as both require stock turnover and reduction is achieved only after replacement of the existing systems and both reach their maximum savings in 2025, reducing standby electricity consumption per household by an average of 77% and 80%, Fig.4.1.

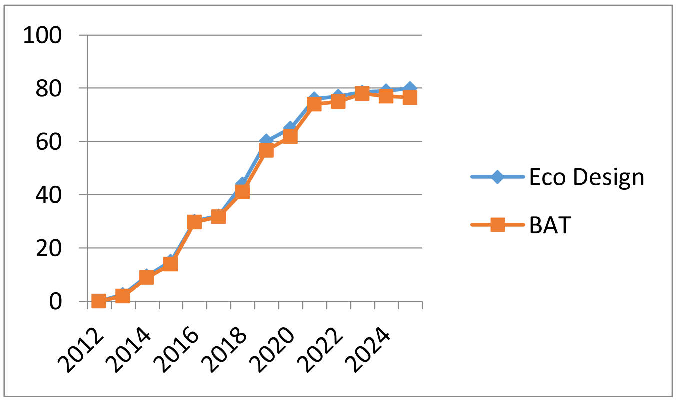


**Figure 4.1** Percentage of Energy savings between Eco design and BAT.

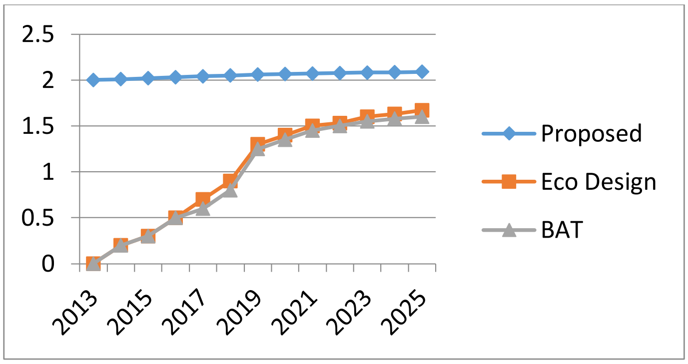


**Figure 4.2** Comparison of standby energy reduction of total households for the period 2013-2025.

Fig 4.2 shows, standby energy savings with the use of APCRD achieve the highest values compared with Eco design and BAT case. These savings gradually start growing for BAT and Eco design Directive. Higher economic benefits are associated with the use of standby reduction device Fig 4.3. The APCRD devices achieve the highest CO2 reduction followed by BAT and Eco design Fig 4.4. By applying all the above mentioned standby power minimization concepts, a significant amount of energy efficiency improvement is attainable. This, in turn, will minimize the overall power consumption per household or an industry and reduced energy demand. Another benefit in this process is the carbon emission reduction, which contributes to a green atmosphere and thus a green economy Table.4.1.

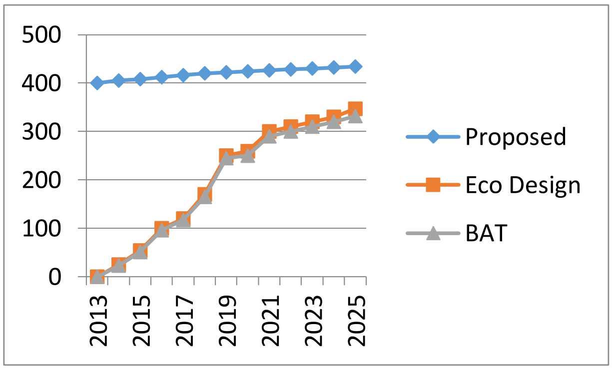


**Figure 4.3** Comparison of economic benefits of total households for the period 2013-2025.

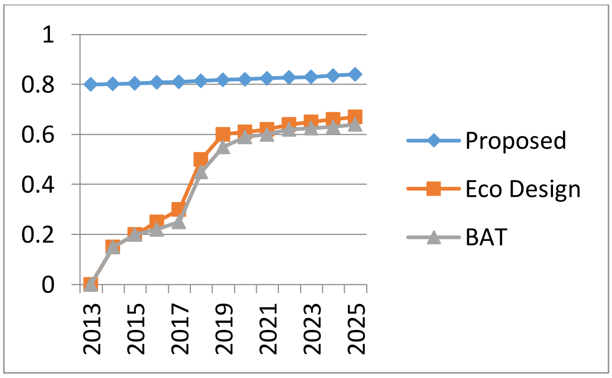


**Figure 4.4** Comparison of CO2 savings of total households for period 2013-2025.

**Table.4.1** Proposed System-Results of energy, CO2 savings & conomic benefits

| Results | Proposed | Eco design | BAT |
|---|---|---|---|
| Annual energy savings per hh in kWh | 261.3 | 0.04 | 4.74 |
| Annual energy savings of total hh for 2013 in TWh | 1.96 | 0.0003 | 0.04 |
| Energy savings for period 2013-2025 in TWh | 28.3 | 12.3 | 13.1 |
| Annual economic benefits per hh | 54.2 | 0.01 | 0.98 |
| Annual economic benefits for the year 2013 in Million | 408 | 0.06 | 7.4 |
| Total economic benefits for period 2013-2025 in billion | 5.47 | 2.55 | 2.71 |
| Annual CO2 savings per hh, in Kg CO2 | 104.5 | 0.016 | 1.896 |
| Annual CO2 savings of total hh in 2013, in Million tons CO2 | 0.78 | 0.000 | 0.014 |
| Total CO2 savings of total hh for period 2013-2025 in M tons CO2 | 10.54 | 4.91 | 5.22 |

## 5. CONCLUSION

Network standby consumption of existing appliance stock, BAT and standby consumption with standby reduction devices was measured. Network standby power consumption was analysed in order to investigate consumer behaviour and patterns, market penetration of appliances. Results of the effectiveness of the proposed system with respect to Eco design and BAT are compared, with a focus on the savings. Implemented successfully on any electronic device which enters into standby mode; it becomes one of the most feasible products to the user. The reduces standby power, which in turn reduces demand and in turn controls the supply which leads to economic benefits and reduction in $CO_2$.

## REFERENCES


[1] See ITU Internet Reports 2004: The Portable Internet, available http://www.itu.int/portableinternet/.

[2] A. Arnall, D. Parr, Moving the nanoscience and technology (NST) debate forwards: short-term impacts, long-term uncertainty and the social constitution, *Technology in Society*, Volume 27, pp.23-38, 2005.

[3] Jaykumar Jagani and Prof. Kamlesh Patel. An Enhanced Algorithm For Classification of Web Data For Web Usage Mining Using Supervised Neural Network Algorithms. *International Journal of Computer Engineering and Technology*, **5**(4), 2014, pp. 45-65.

[4] Prof. S.B. Javheri and Shwetambari Ramesh Patil. Attacks Classification in Network. *International Journal of Information Technology and Management System*, **4**(3), 2013, pp. 01-11.