

# Energy Cost and Efficiency on Edge Computing: Challenges and Vision

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## Abstract Introduction

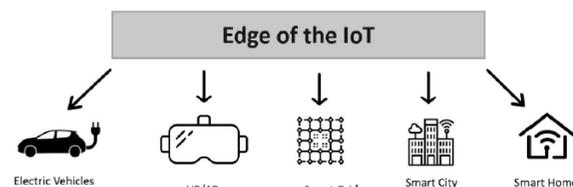
Internet of Things (IoT) is a constantly evolving phenomenon as the number of devices owned by the regular user is increasing at a rapid rate. These devices are used for various reasons such as social networking, monitoring, performing complex operations and with the increase of advanced technologies, they demand more energy to perform such tasks. Cloud computing enables these communications to seamlessly perform complex tasks in a cloud environment but utilizing these resources properly to perform at the best is the key. In this paper, Energy efficiency and effective functioning of the devices that run on the cloud has been thoroughly analyzed and we have presented the strengths and weakness of various researches in each area.

## Research Question(s)

Our goal is to identify the energy efficient techniques for the Edge computing IoT devices involving many nuances, we have tried to investigate the best possible solutions. Some of the research questions that we have posed in this paper are:

- What are best Hardware modules energy efficiency techniques that are applicable for IoT devices
- Software applications and the best possible solutions for Edge computing
- Offloading techniques for the IoT devices that has to run on the 5G networks
- Case studies for each Smart devices category has been researched and detailed presentation of the findings

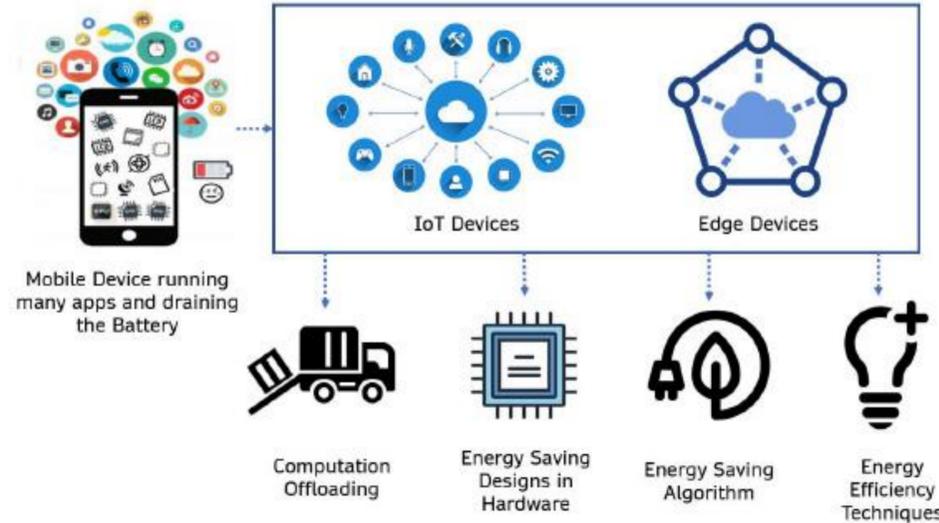
## Architecture of cloud edge systems



## Method

Energy efficiency influenced by many aspects of the device, this paper describes the direct and indirect factors affecting the Energy consumption and various proposed techniques to achieve the energy efficiency, we have categorized these into four sections

1. Hardware
2. Software
3. Offloading



## Case Study

Detailed study of the Energy saving techniques and the concerned challenges in applying those techniques has been relatively checked for the Smart grid, Smart homes, Smart cities and Electric vehicles of the Smart devices ecosystems which share the Edge computing highly in their implementation and are benefitting from the implementation.

## Results

We have discussed the merits and the fallbacks of the proposed research on specific energy saving techniques on each area, this has helped to compare the best suitable options for each scenario as there is no one size fits all solution because we are not dealing with a lot of homogeneous products.

## Future work

Edge computing's important trait of communicating with nearby nodes has security vulnerability and it exposes to security threats due to the less secured nodes which doesn't support enough secured mechanism that edge computing requires for the data protection, we would extend our research into security aspects of the IoT Devices and Edge computing combined.

## Conclusions

There are many ways the energy efficiency can be achieved to the smallest of the details to the IoT devices hardware, software as well as its supporting technology (offloading techniques, wireless networking) surrounding the Edge computing techniques. We have summarized the advantages and the performance gains from theoretical and practical observations and discussed the possible challenges for each categories with a detailed case studies on Smart homes, Smart grids and Electric vehicles industries in the present environment and future technological advancements.

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## References

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