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**IoT Using Edge Computing  
rather than cloud computing**



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## **Introduction**

## Introduction

Not a long time ago, IoT happened to be the next big thing of the cyberworld, which established the connection between things and humans, using cloud as the base substrate. As IoT devices increased exponentially over the period of time, the shortcomings of this model started to expose like increased latency, bandwidth limitations, security concerns and increased operational cost.

Answers to all those concerns come in the form of “Edge Computing”. As the name suggests it refers to a system where computing takes place where data is produced i.e. right at the terminal point. It solves the above mentioned problems to a certain extent.



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**Why do we need edge computing?**

## Why do we need edge computing?

Particularly in IoT we need to ensure following parameters keep intact to make it perform flawlessly.

- **Low latency :**

A low-latency connection means a device can collect, send data to an edge deployment, complete computation at the edge itself, and retrieve the same in almost real time. The core idea is to decentralize the computation component.

- **Connection reliability :**

As IoT devices shift from cool gadgets to safety-critical infrastructure, a reliable connection is a necessity. Heterogeneous sensor environments, like smart cities or factories, which may use edge devices to detect any system anomaly. In such cases delay of

## Why do we need edge computing?

milliseconds can prove catastrophic and may lead to system failure. That delay can be due to network congestion or server overload.

- **Real time operations :**

As mentioned above, the response from the system has to be in real time, to ensure it, the system eliminates the situation by recording, storing and processing the data close to its source, which eventually reduces the delay time and improves the overall system throughput. As a result, data can be analyzed in real-time, without unwanted delays.

- **Data management :**

Sensors typically produce a ton of data, which needs to be analyzed before it can be put to use. There is no point sending that whole

## Why do we need edge computing?

chunk of data over to a centralized server; one has to be selective in what to send and what not to send.

It's better that only relevant data is sent and keep the rest of the data “at the Edge” . When you store and process most of the data “at the edge”, you don’t need much cloud storage. Addition to that, you can refine the data and backup only the relevant one.

- **Data security :**

Conventionally, IoT solutions are assumed to be a soft target for cyber attacks, edge computing can help to secure networks and improve overall data privacy.as the data is decentralized and distributed among the devices where it is generated, it’s a herculean task to compromise the whole network or all of the data with a single hit.

Why do we need edge computing?

- **Operational costs :**

From the above discussion one can easily deduce that Edge computing can be proved a very cost effective solution as it requires less infrastructure, bandwidth and cloud storage as compared to conventional cloud solutions.





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## **What is Edge computing?**

## What is Edge computing?

The essence is, instead of having a centralized, remote system to do all the computational stuff, the data is managed and stored locally, either on the device itself or at the nearest network storage from where it can be retrieved as per requirement. This approach is coined as IIoT i.e. Intelligent Internet of Things. This is achieved by 2 means either through edge computing or through fog computing.

Edge computing holds the intelligence, processing power and communication capabilities of an edge gateway directly into devices whereas fog computing, which happens to be a Cisco terminology, brings the intelligence at the local area network level and the device.

## What is Edge computing?

### Edge Computing Terms and Definitions

- **Edge :**

It changes from scenario to scenario basis e.g. in telecom, it could be a cell phone or cell tower, in the automotive, it could be a car and in the IT field, it could be a workstation or PDA.

- **Edge Devices :**

An edge device is something which produces data or through which information is collected and delivered. For example sensors.

- **Edge Gateway :**

It's a kind of buffer where edge computing processing is done.

- **Fat Client :**

It's a system in which most of the resources are installed locally in order to process data.



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How does it work?

## How does it work?

Edge-computing hardware and services help solve the problem of latency, high bandwidth usage, congestion and not to mention the cost by being a local source of processing and storage for many systems. An edge gateway can process data received from an edge device, and then send only the selective data back to the cloud, reducing bandwidth required. Or it can send data/instruction to the edge device depending on real-time application requirements.

Any potential electronic and communicating device can be used as an edge device, IoT sensor, PDA, laptop, latest smartphone, the security camera Edge gateways themselves can also be considered edge devices within an IIoT network.



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**Implementation of Edge computing  
(Case Studies)**

## Implementation of Edge computing (Case Studies)

Unlike conventional cloud based IoT, edge computing allows scaling IoT network as needed, without referring to the available storage. With a long list of benefits, edge computing really proved handy when it comes to real-time tasks. Some of the examples are:

- **Autonomous vehicles :**

Driverless Transportation is one of those use cases which highlights the importance of edge computing in IoT . A vehicle in motion simply cannot rely on a remote server to decide what to do if a pedestrian crossing the road right in front of it. The decision needs to be made immediately. Data processing has to be done on the spot, even if the internet connection is not there. Plus, vehicles (while on the road) need to communicate with each other more efficiently because there won't be overhead of sending data about accidents, weather conditions, traffic etc to the remote server first.

## Implementation of Edge computing (Case Studies)

- **Manufacturing :**

As we already know edge computing implies having most of the processing and storage elements of the IoT network closer to the points where the data is gathered from and where the actions are required. This implies distributing the IIoT's thinking and decision-making capabilities closer to the sensing and acting capabilities.

It can allow devices to gather critical information in remote sites where network connectivity is inconsistent. Data can be gathered and analyzed locally, with only critical information being transmitted back to the central network whenever connection is possible. This sort of combination of edge computing and industrial IoT devices will make it easier to streamline industrial processes, in order to make it a “smart” factory.



## Implementation of Edge computing (Case Studies)

Sensors can monitor the condition of machinery and equipment, speeding up or slowing down operations to optimize usage. Smart factories equipped with temperature, pressure and motion sensors can adjust lighting, cooling, and other environmental parameters to make the most efficient use of power. Predictive analytics can identify components failing in near future, ensuring replacement of the same with minimal loss of productivity.

Now matter whether a company is a giant of manufacturing or a new entrant, the decentralized nature of edge computing applications can reduce time and costs effectively. Such “smart” machines will be able to function without the assistance of a massive remotely located central data center running cloud-based applications.

## Implementation of Edge computing (Case Studies)

- **Supply Chain :**

Supply chain management processes happen to be less visible and more uncertain and always been a big challenge to tackle, especially with so many players & uncertainty involved being more and more dispersed globally.

- N number of factors in the supply chain may lead to a single possible outcome i.e. delay. To make the scenario even worse they are difficult to predict or control.
- Traffic delays are a very common excuse and sometimes actual cause of late deliveries and stock shortage.
- By making use of sensor-driven IoT solutions, the location and

## Implementation of Edge computing (Case Studies)

speed of vehicles can be tracked at almost real time, allowing for proper information sharing with all parties involved, and maintenance alerts can be given if required.

- **Healthcare :**

From all the applications of edge computing the most critical one lies within the domain of health monitoring and medical services. They can be used for keeping track of the patient's chronic conditions, allergies etc here they can become true life-saviours.

- For instance, a pulse monitor capable of analyzing health data independently, can instantly provide the necessary notification to alert caregivers when a patient needs their help.

## Implementation of Edge computing (Case Studies)

- Robot-assisted surgery is another use case for edge computing in healthcare, especially when every nanosecond can be the differentiator between life and death. These robots need to be able to analyze data on their own in order to provide assistance in surgery accurately, quickly and not to mention safely.

- **Utilities :**

### **Kitchen Temperature/Humidity Monitoring for Food Security**

Now- a - days the eating-out industry is urged to improve food consumables' safety and quality. Automation of temperature management tasks that have previously been done manually by employees can improve the overall work efficiency of employees and the quality of the consumables at the same time.

## Implementation of Edge computing (Case Studies)

Here we propose a temperature management solution that records the temperatures in the kitchen refrigerators and dining halls and then outputs the data measured with the temperature sensors as business form data.

If a temperature warning occurs, the proposed solution shoots the mail address that has been registered in advance on the service platform in the cloud, so that employees can be freed from their temperature monitoring task. Such procedures help to protect the food quality against failures of the kitchen equipments.



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## **Conclusion**

## Conclusion

The IT world is on the verge of a revolution thanks to the edge computing. Combined with a new generation of smart IoT edge devices, edge computing applications have the potential to completely transform the world in the coming decades to drive better efficiency and productivity while also controlling costs.



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## **About the Author**



## About the Author



RAjeev Singh is responsible for all aspects of the company's engineering product and software development activities. Leading 70+ multi technologies engineering team including Drone, Robotics, Artificial Intelligence, Machine Learning, Analytics, Web, App development (iOS, Android and Windows), Chatbot, IoT, Cloud-based application and Other Software. Being the VP of engineering my focus stands on structuring and operation of the product development, envisioning products requirements, streamlining its activities for delivering manufacturable designs maintaining the timeline and budget constraints as per agreed specifications.

- Robots : [https://www.youtube.com/watch?v=wCTLq\\_Y1cyw&feature=emb\\_logo](https://www.youtube.com/watch?v=wCTLq_Y1cyw&feature=emb_logo)
- Drone : [https://www.youtube.com/watch?v=YTFxaZps7PU&feature=emb\\_logo](https://www.youtube.com/watch?v=YTFxaZps7PU&feature=emb_logo)
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## **About MedRec Technologies**

MedRec Technologies is a London, UK based software development company. We have development facilities located in UK, USA, Europe, Middle East, Central and East Asia. Currently, we comprise of a team of over 70 + software engineers, technology consultants, creative designers and scientists with expertise in different technical domains. From Healthcare to Robotics, Finance to Autonomous mobility, Education to Manufacturing;

We are working on disruptive technologies such as Big Data Analytics, AI, Machine Learning, Deep Learning, Cognitive Computing, Internet of Things, Cloud, Security, SDN-NFV, RPA, Blockchain etc.

We deliver these services across industry sectors such Automation and Robotics, Retail, Banking, Insurance, E-Commerce, Education, Manufacturing, Travel, Transport, Hospitality and Maintains etc.

Our highly qualified staff offer expert skills in project support. Our team spirit and the company's management proficiency are successfully combined with creativity, dedication, and a development culture to produce solid, effective technological results. Our commitment is to deliver high-performance and scalable products to industries.



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