UNIME

Edge Computing For Big Data Analysis

Abstract

Smart city has been defined during the 21st century as a model relies on the 4th industrial revolution and applies the new technologies of industry 4.0 such as cloud computing, Internet of things, Big Data analysis, Machine Learning algorithms and many others. The following parts of this showcase declare an under-studying research at Messina university for a new launched technology by industry 4.0 named “Edge Computing ” and put on the table the current existing challenges of smart cities’ services and how can be solved using this new technology.

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Introduction

Industry 4.0 recently has launched many technologies, enabling smart cities' applications from providing better infrastructures and interconnected networks in order to satisfy the asked requirements on one hand and on the other hand to provide services for citizens in a higher level of reliability, security and efficiency. It becomes clear the critical role of Big data analysis in smart cities' applications starting from processing a vast amount of data in order to take actions when are needed or to create patterns that can be useful for prediction purposes in the future. Usually, analysis solutions are implemented with a centralized cloud where data is saved and processed. However, Cloud solutions is facing continuously new challenges due to the high need of new technologies that can serve when real time actions are needed that's why Edge Computing new technology appeared.

Challenges

Millions of IoT devices are connected to each other, exchanging and generating data in order to provide smart services for citizens. Most of these services rely on cloud computing technology that starts to struggle in satisfying the required quality of smart services, due to some technical limitations such as risk overloading network and long latency in responding to messages.

> *Enhance the quality of smart city services for a higher level of citizen's life*

Also its limited bandwidth with the pressure of the massive amount of data occupied the network, which could have a bad impact on time sensitive applications. In order to solve the aforementioned problems, researchers at Messina university have started to study the advantages of replacing cloud computing with edge computing technology and to propose a system architecture for a specific application "smart Pole" for giving faster response to citizens and enabling real time actions.

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How will solve the problem?

Researchers at the university of Messina are in progressing to provide the state of the art for a smart pole application which can be considered the backbone of smart cities since many type of sensors can be installed for different purposes ,ex: temperature, pollution, light,…

The proposed architecture is mainly consist of three parts:

- **Front-end**: where sensors and actuators are installed to catch events, collect data and receive actions.

- **Near-end:** which does PC, laptop, server and Router. In this part, most of data computation, processing and storing processes happen. It allows better performance and faster response beside taking actions in real time which is not available using cloud technology.

- **Far-end:** where cloud servers exist to receive selected data from the Near-end that need big data mining, big data management and machine learning algorithms for predictive purposes in the future.

Since smart pole is one point where many smart services can be launched, then we can expect the huge amount of collected data from the city and with different structures. By using the new technology of Industry 4.0 “Edge Computing” it becomes possible to transfer processing data from a centralized cloud to many local clouds on the edge network that are closer to end-users.

Consequentially a faster response can be provided to citizens and a real-time action becomes an applicable solution using this technology since data doesn’t need to wait some time to pass the network, to be received by the traditional cloud, processed and then send the actions. Everything can be done and processed on the edge without any delay for critical smart applications “Self-driving cars”.

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