A Novel IoT Architecture based on 5G-IoT and Next Generation Technologies

Topic Summary:

The IoT architecture is a fundamental way to design the various elements of IoT, so that it can deliver services over the networks and serve the needs for the future. Internet of Things (IoT) technology has a wide variety of applications and use of Internet of Things is growing so faster.

Depending upon different application areas of Internet of Things, it works accordingly as per it has been designed/developed. But it has not a standard defined architecture of working which is strictly followed universally. The architecture of IoT depends upon its functionality and implementation in different sectors. Still, there is a basic process flow based on which IoT is built. A four-layer architecture is the standard and most widely accepted format. They are 1) Sensing Layer, 2) Network Layer, 3) Data Processing Layer and 4) Application Layer.

Ideas from the Author:

In this paper the authors deal with the IoT architecture that is best suited for the upcoming technology rich world or also called as the 'Industry 4.0'. According to the author the current structure of IoT is not best suited for the 4.0 revolution as the data generation and data transmission will be on a very high scale as compared to the current generation. So some modifications and advancements in the IoT architecture is recommended by the author.

This paper contains five sections such as the review of the current IoT architecture, technologies that enable IoT, new proposed architecture and finally the comparison between the current IoT architecture and the proposed IoT architecture.

1. Introduction:

   Firstly in the introduction section the importance of IoT in the tech industry is mentioned. This article is motivated by the future requirements of network architectures to entertain billions of IoT devices. In this paper, the authors design an eight-layer architecture, which benefits from new technologies such as 5G.

2. Literature Review:

   Several existing IoT architectures are reviewed in this section such as Three Layer Architecture, QoS-Based Architecture, S-IoT Architecture, CloudThings Architecture, SDN-Based Architecture, etc.

   Nowadays, most of these architectures are implemented in industry or smart cities. Although these architectures are suitable for the moment, they will not be promising anymore in the sense of reliability and performance due to future challenges, and thus they will require being re-examined.

3. New Technologies Enabling IoT:

    These technologies have not been originally designed for the IoT, but they can involve in the next generation IoT applications such as new services of smart cities and autonomous vehicles. To address such upcoming requirements, these technologies are to be embedded in the proposed architecture.

    Nano-Chips, Millimeter Wave, Heterogeneous Networks (Het-Net), Machine Type Communication (MTC), etc. makes IoT more strong and powerful. The use of these mechanisms in the future can help IoT architecture more compact.

    Until now, these technologies all together are not compatible with current IoT architecture. Therefore, it is required to design a new architecture based on these technologies. In the next section, we show how these technologies contribute to the proposed IoT architecture.

4. The New Proposed Architecture:

    The architecture consists of eight interconnected layers with two-way data-exchange capability. The technologies with completely separate functionalities are embedded in different layers for ease of analysis, scalability, and modularity.
    The **Physical layer** consists of wireless controllers and sensors. Next comes the **Communication layer** with two sub layers. In **Edge Computing Layer** the data is edge processed followed by the **Data Storage Layer**. The **Management-Service Layer** consists of three layers. The **Application Layer** and **Process Layer** comes next. The last layer is the **Security Layer** which provides security to the whole architecture.

5. Comparisons between the proposed architecture and the existing architectures:

    With the integration of 5G and the IoT, many other technologies such as MTC and WNFV could take a part in next-generation IoT architectures. The appropriate combination of these technologies can create a more comprehensive structure, which meets the listed requirements of next-generation IoT applications.

    The next generation IoT applications and their services, such as smart factory and smart city, require special attributes, as follows: Support of Variety of data types, Support a high number of customers and demands, Agility, Flexibility, Robustness of connection, Low Latency Reliable Communication. The current IoT architectures with their communication and networking technologies suffer from providing the above requirements.

My Views:

In this paper, a novel architecture, which considers the future requirements of new IoT applications and their generated data, has been proposed. In addition, it presents a new

model that benefits from new technologies such as device-to-device (D2D) communication, the 5G communication network, Machine-Type Communication (MTC), Wireless Network

Function virtualization (WNFV), Wireless Software Defined Networks (WSDN), Mobile Edge Computing (MEC), and Mobile Cloud Computing (MCC). The architecture is modular, efficient, scalable, reliable, simple, and it is able to support high application data demands. Indeed, the proposed architecture is able to meet the needs of the next generation IoT applications and assist IoT experts to design more efficient and scalable IoT systems.

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