A SYSTAMATIC REVIEW ON WIRELESS SENSOR NETWORK MANAGEMENT

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ABSTRACT

More and more people are getting interested in wireless sensor networks (WSNs) because of the Internet of Things (IoT). Deploying thousands or even hundreds of thousands of sensor nodes or actuators is likely in order for a number of real-world applications, including smart grids, smart farming, and smart health. It is essential that a competent WSN management system be included in order to effectively and efficiently manage the sensor network. There are problems inherent in establishing good conventional WSN management due to the intrinsic issues of WSNs such as sensor/actuator heterogeneity, application reliance, and resource limits. As the WSN becomes bigger, the challenge of managing it rises. The flexibility provided by Software Defined Networking (SDN) offers a potential option for flexible network administration in sensor networks in which the control logic is separate from the sensor nodes and actuators. Network-wide management protocols and applications may be deployed centrally, thanks to SDN-based management in WSNs. This article describes current research in conventional WSN management and presents details on SDN-based solutions for WSN management while highlighting the benefits of SDN. This study also analyses open research issues in devising SDN-based WSN configuration and administration techniques that are more flexible and simpler to use.

KEYWORDS: WSN, Sensors, Networking.

INTRODUCTION

WSNs, sometimes called sensor networks, are groups of sensor nodes that have both sensing and actuation (control) capabilities. Nodes in the system need to communicate through wireless communication to carry out the sensing activity, and at the same time they are also autonomous since some user-driven data collecting is feasible. This project has many sensors, motors, actuators, and radio communication [5,6]. IoT is required to monitor various items in applications including smart cities, smart health care, smart water networks, smart power grids, smart farming, and intelligent transport systems. Therefore, WSNs are an ever-important part of the IoT. Most wireless sensor nodes do not have tethers to power them, since they use just a minimal amount of energy. WSNs are very versatile, but they also provide a hurdle in terms of research as they are bound by both application-specific and resource-restricted design. use of WSNs has risen.

This places a restriction on the ways in which this technology may be employed, as the resource-constrained nature of the business dictates. Wireless sensor networks' fundamental drawback is connected to the sensor hardware's resource limitations: processor, memory, energy, and communication capabilities. This limits its use. Additionally, it is also important to address quality of service (QoS) for successful network functioning, especially when nodes expand to huge numbers. While many industrial and medical applications need both quality and dependability, this is particularly relevant in these industries, where efficiency and cost-effectiveness are especially crucial [16–19].

Additionally, these nodes must be able to analyse and manipulate data while also being able to dynamically adjust their duties. In order to have a repeatable process, nodes must be reprogrammable while operations are occurring. To perform a sensor job on a WSN, sensors that are now being utilised must be difficult to re-task with a new parameter that must be measured. They provide an example of 100 sensor nodes positioned in a lake to monitor a water quality parameter in Hu et al. [20]. In order to reprogram sensor tasks on an application-specific sensor network, sensors would have to be pulled out of the water and the embedded software in each sensor then reprogrammed. This strategy wouldn't be practical for WSNs of the required size. Vendors with integrated Over-the-Air Programming (OTAP) approaches use specialised data sensing and packet forwarding protocols, but they must also use a vendor-specific protocol for managing their device's storage and forwarding functions. Though the specific APIs used to interact with the WSN may be a problem, being acquainted with them may help. Reusing common features can speed the prototype and development of WSNs.

System self-healing techniques

System self-healing techniques are needed to help sustain the overall system. To adjust for different situations, for example, decreasing service quality when the energy supply is limited, the system should be able to alter the parameters. In this situation, using an existing constricted network band creates a difficulty with regards to the control and data packets. Network management is particularly difficult to implement on large-scale WSNs.

WSNs suffer from intrinsic difficulties that originate from the physical layer all the way down to the application layer as a network that provides both data forwarding and network management. On a small scale, because of established methods, this implementation is well-suited for WSNs that have limited range. However, when attempting to handle a long range and low power WSN at a big scale, it has a lot of flaws.

SOLUTIONS

Several solutions have been investigated and developed to tackle this issue with regards to managing WSNs, and some of these ways have used the notion of Software Defined Networking (SDN). SDN is a new leading networking architecture, especially in the data centre [22,23]. The traffic routing control plane and data packet forwarding plane are conceptually divided into two independent networks, called the control plane and data plane respectively. SDN was built to function with conventional wired and wireless networks, which means it has inherent challenges applying it to WSNs because of the limitations and limits inherent in the WSN design.

Software Defined Wireless Networks, often known as SD-WANs, provide the potential for enhanced management adaptability and flexibility via the use of software-defined networking to wireless sensor networking [(SDWSNs). Adding an application to the control plane is exactly the same as establishing an NMS. It also has the benefit of providing a centralised network visualisation which network managers desire. SDN allows regular WSNs to have advantageous features that are helping to fuel the creation and development of various SDN-based WSN applications. There has been a distinct lack of discussion on how SDN would better handle WSNs or how the SDN idea should be integrated.

WSN-based SDN management designs. Regardless of the planned scaling size of a network for distinct applications, proper management solutions should be built from the start. So far, most survey articles have dealt with generic SDWSN concepts; nevertheless, topics that are of utmost importance to the effectiveness of a capable WSN are still to be addressed.

CONCLUSION

This article evaluated the different approaches and methodologies for managing WSNs and their overall SDN-based management. While having diverse hardware in the network, the SDN paradigm has provided flexibility and simplicity into wireless sensor network management. A spotlight was placed on the many WSN real-world applications and how SDN will enhance their administration. However, because of the intrinsic features of WSNs, integrating SDN is much more difficult than intended.

Unlike data-centric WSNs, address-centric networks are distinct from networks that use location data. In addition, this article also explored the general SDN-based WSN network design and analysed the management strategies that assure efficient network operation. In the section on network management, a review of the various management classifications was done, such as managing the network configuration, topology, QoS, energy, security, network monitoring, and enabling technologies. Focused on SDN-enabled node hardware and software, the review also touched on each SDN-enabled feature and application.

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