A Survey on Wireless Software Defined Networks

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Abstract—A Wireless Sensor Network (WSN) consists of numerous devices able to collect information from the situations. Software-defined networking (SDN) is a wide term that is connected to different approaches to network design. Software Defined Networking guarantees to significantly diminish the unpredictability of system arrangement and administration. In WSNs, SDN can reach an advanced latent, as it provide functions that can allow a better association between base station and forwarding nodes. Smart management using SDN promises a solution to some of inherent problem in WSN. With SDN, system administrators can run their base all the more effectively.

Software defined wireless network (SDWN) can be utilized as a part of situations where an extension of the wired system is fundamental, through a remote system framework keeping the premises and firsts arrangements connected to the wired SDN, without greater changes in existing topology. The benefits of SDN appear to command the overheads procured in all remote framework circumstances attempted thusly.

I. INTRODUCTION

A Wireless Sensor Network (WSN) comprises of numerous wireless hubs ready to gather data from the scenarios such as temperature, pressure, sound, light and so on. The remote association permits the production of Ad hoc system. Software Defined Networking (SDN) guarantees to significantly diminish the unpredictability of system arrangement and administration and additionally to make the presentation of advancement in the system operations conceivable. In WSNs, SDN can reach advanced latent, as it provides functions that can allow a better association between base station and forwarding nodes. Complication of sensor network management can be radically simplified with SDN. With the increased flexibility amplified by introducing SDN in sensor network, new routing protocols can be engaged.

SDN principles can also be included in Wireless Mesh Networks (WMN) produced by openFlow switches. WMN may promote from flexibility and the simple management provided by SDN concept. The utilization of a united system controller and the capacity to setup subjective courses for information streams make SDN an invaluable device to send fine-grained development building estimations in Wireless mesh networks. Performance of Programming Characterized Systems administration (SDN) can minimize various wellsprings of deterrent additionally other framework inefficiencies which in return improves performance. SDN can give remote grid frameworks critical trouble altering systems, controller redundancy, and unobtrusive supplies which helps in it being efficient and leads to efficiency. The short coming in software defined network is that does not have language interpretability.

Software-defined networking is a wide term that is connected to different approaches to network design. Generally, packet-switched networks have comprised of nodes running distributed protocols to route packets. With SDN, system administrators can run their base all the more effectively, supporting a quicker sending of new administrations while empowering key tricks. SDMWN can be utilized as a part of situations where an extension of the wired system is fundamental, through a remote system framework keeping the premises and firsts arrangements connected to the wired SDN, without greater changes in existing topology or execution misfortunes.

The rest of the paper is as follows: Section 2 discusses the existing techniques for testing network protocols. A thorough analysis of the reported techniques is presented in Section 3. Section 4 concludes the paper.
II. TECHNIQUES/APPROACHES DISCUSSED

This paper discusses some approaches to WDSN and their comparative analysis is done on the basis of certain parameters like security, flexibility, performance, efficiency etc. Security and architecture are major areas of concern of this paper. To enhance security and susceptibility to attack of network protocols, following methodologies are discussed in paper.

A. Software Defined Wireless Networks: Unbridling SDNs

Executions of the SDN answers for customary wired systems have considered speed as the real execution measure. For sure, it is important to ensure that SDN hubs can execute exchanging operations at line rate. Fulfillment of such need has been paid as far as low adaptability in the meaning of the standards pointing out the streams. The new requirements which have been considered in the design of SDWN are: SDWN must support duty cycles, SDWN must support in-network data aggregation, SDWN must support flexible definition of the rules. There are a few different clear new necessities that must be fulfilled, which we won’t particularly break down for space requirements.

B. Software-Defined Networking Paradigms in WirelessNetworks: A Survey

A significant part of the examination in wireless SDN so far has concentrated on IEEE 802.11 systems. Maybe this needs to do with the way that system gadgets are not as nearly attached to the structural planning as it is on account of cell systems. In any case, with the pervasiveness of superior quality feature content, there is extensive enthusiasm from cell organizations in offloading information movement to Wi-Fi systems at whatever point conceivable. Consequently, SDN endeavours in Wi-Fi and cell are not so much disengaged from one another. There has been some work likewise on IEEE 802.16 (Wimax) systems, including an exhibition of the handover in the middle of Wi-Fi and Wimax on Open flow Wireless [yap et al. 2010]. There is a continuous push to apply SDN in remote backhauling system concentrating on IEEE 802.16 [IEEE 2013], however it is late and just starting to be considered.

C. An Architecture for Software Defined Wireless Networking

Programming Defined Networking (SDN), described by an acceptable partition of the control and information planes, is being received as a novel standard for wired systems administration. With SDN, system administrators can run their base all the more effectively, supporting a quicker sending of new administrations while empowering key tricks, for example, virtualization. An SDN-like methodology connected to remote versatile systems is shown, that will not just profit from the same gimmicks as in the wired case, yet additionally will power on the different gimmicks of versatile arrangements to push enhancements considerably further. Main functions are defined which should be supported by mobile SDN architecture. Interfaces, key benefits of SDN and its challenges in mobile networks are studied and analysed. This system programming may be information plane programming giving system capacity virtualization (NFV), or control-plane programming giving concentrated system administration - programming characterized systems administration (SDN). It is normal that these compositional changes will pervade organizes as far reaching in size as the web center systems, to metro systems, to big business systems and as colossal in usefulness from met parcel optical systems, to remote center systems, to remote radio access systems.


The key issue the RAN explains is figuring out how best to utilize and oversee constrained range to accomplish this integration. In a thick remote sending with versatile hubs and restricted range, it turns into a midcult errand to distribute radio resources, manage interfaces and parity stack between cells. Generally, the radio access system has been dealt with as an accumulation of base stations, each to a great extent settling on autonomous control plane choices on radio layer with some detached dispersed coordination. Current radio access systems use conveyed conventions to sanction handovers and oversee obstruction. While these conventions perform fine in scanty organizations, they will be not able to effectively handle quickly becoming portable traffic and the desiccation of base station arrangements. To represent this altering course of the portable space, we have proposed a product defined incorporated control plane for radio access arranges that digests all base stations in a neighbourhood geological region as virtual huge base station included a focal controller and radio elements.

E. A Survey of Software-Defined Wireless Networks

Programming Portrayed Frameworks organization is a critical reflection, and it assistants understand various loads when joined with remote frameworks. The general preferences of SDN make a strong controversy: it can run on about any dealer apparatus, can give fine-grained control of the framework, and has unparalleled accommodation. In thick remote frameworks, the dealer apparatus change is intrinsically imperative, in light of the fact that these bits of apparatus are sent on such a sweeping scale. To be free from dealer lock-in facilitates a colossal burden for a business. Correspondingly, SDN can minimize various wellsprings of deterrent additionally other framework inefficiencies, by allowing Apps to arrange with each other. Correspondingly, these benefits are amazingly imperative to frameworks without much
system. SDN can give remote grid frameworks critical trouble altering systems, controller redundancy, and unobjectionable supplies. The comfort it can give system less frameworks is particularly imperative, as generally these framework heads are resource obliged and don’t have a generous number of delegates. Really assorted remote frameworks have different needs. In any case, SDN is versatile enough that it can give productive quirks while keeping up those needs. It truly is an essential technique, and will continue making waves in the domain of frameworks organization.

F. Wireless Mesh Software Defined Networks (wmSDN)

In this paper combine Programming Portrayed Structures association (SDN) models in Remote Cross section Systems (WMN) formed by Open stream switches is proposed. The utilization of a united system controller and the capacity to setup subjective courses for information streams make SDN an invaluable device to send fine-grained development building estimations in Wmns. In any case, brought together control may be hazardous in multi-skip radio systems structured by thing gadgets (e.g. Remote Social event Structures), in which focus point division and system break are not remarkable occasions. To endeavor the aces and moderate the cons, our structure utilizes the standard Openflow united controller to fashioner the controlling of information improvement, while it utilizes a scattered controller focused around OLSR to course: i) Openflow control advancement, ii) information improvement, if there should be an occasion of focal controller bewilderment. We executed and endeavored our Remote Network Programming Depicted Structure (wmsdn) showing its congruity to a development laying out utilization case, in which the controller premise uniformities earnest improvement among the Web sections of the cross fragment. However basic, this utilization case licenses displaying a conceivable usage of SDN that updates client execution concerning the sample of a standard cross segment with IP sending and OLSR controlling. The wmsdn programming gadget stash is structured by Open vswitch, POX controller, OLSR daemon and our own specific Bash and Python scripts. The tests have been done in a mirroring environment in light of Linux Compartments, Ns3 and Center instruments.

G. Filling the Gap Between Software Defined Networking and Wireless Mesh Networks

In this research paper an expansion to Openflow based Programming Characterized Systems, including new messages to the convention, new activities for the stream table, new headers based in the IEEE 802.11 Macintosh casing, and a base architectures equipment particular giving, accordingly, a real similarity between the situations that will be arrived at are discussed. The trials demonstrate that a SDMWN can be utilized as a part of situations where an extension of the wired system is fundamental, through a remote system framework keeping the premises and firsts arrangements connected to the wired SDN, without greater changes in existing topology or execution misfortunes. As show in the past, the expansion SDMWN fill hole between the SDN and the WMN, giving the fundamental definitions also executions to handle accurately IEEE 802.11 edge. Additionally, the results introduced demonstrate the propose reasonability keeping the nature of a voip bring over a WMN utilizing SDN.

H. Smart Wireless Sensor Network Management Based on Software-Defined Networking

In this paper the use of software defined networks in wireless sensor network for smart management is proposed. Smart management using SDN promises a solution to some of inherent problem in WSN. A general framework for software defined wireless sensor network is also proposed where the controller is implemented at the base station. Introducing SDN in WSN can help in tackling few difficult problems in WSN such as energy saving and network management.

III. ANALYSIS DESCRIPTION

Table 1 shows the evaluation criteria for wireless software defined network. Table 2 shows the results of analysis of evaluation parameters defined in evaluation criteria in table 1. We have surveyed nine techniques and used eleven parameters for their evaluation.

Analyses of Table 2 reveal the testing technique used in different research papers. It is seen that all researchers have used different techniques in their research papers. Analyses show that in almost everytechnique performance is discussed except Comparetti, Wondracek, Kruegel andKirda [3]. Performance is about less resource utilized by the system. Performance is considered as a prior parameter in every technique.

In almost everytechnique flexibility is discussed except Adam Drescher[5], Estahani[7]. Flexibility is about that System is flexible/dynamic enough to contain room of improvements for future enhancement(if needed). This parameter is of great importance for future work.

Almost in all techniques security is kept at a very high level except for Costanzo Salvatore [1]and Comparetti [3]
as no security criteria is specified in these techniques. Security is a major issue in wireless sensor network.

Testability is defined in some techniques except for Costanzo Salvatore [1], Comparetti [3] Andrea Detti [6], Claudio Pisa, Gante Alejandro [8] as they have not specified any tests or testing criteria in their techniques.

Language Interpretability is discussed in only one technique Andrea Detti, Claudio Pisa, Stefano Salsano, Nicola Blefari-Melazzi [1] which shows the limitation of techniques as Language Interpretability is all about translation into other languages for real time implementation. If this parameter is not considered in future than real time implementation can become difficult.

IV. CONCLUSION

SDN can reach at latent level if it is introduced in WSNs. SDN opens numerous axes in the system configuration space. The expanded channel variability and the idleness delicate nature of key system parameters, for example, power designation in a channel, builds the unpredictability of the configuration space.

SDN principles can also be included in Wireless Mesh Networks (WMN) produced by openFlow switches. WMN may promote from flexibility and the simple management provided by SDN concept. General construction modeling of SDWN alongside some of its most important configuration and usage details is displayed. Software Defined Networking (SDN) has appeared as a new concept that highly increases the network management flexibility through simple but powerful abstractions.

A generic architecture is also proposed in order to extent the network management flexibility of SDN to the WMN in a more complete way.

REFERENCES


TABLE I: EVALUATION CRITERIA FOR WIRELESS SOFTWARE DEFINED NETWORK

<table>
<thead>
<tr>
<th>Evaluation Parameters</th>
<th>Meaning</th>
<th>Possible Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimization</td>
<td>System shows perfection and effectiveness in a defined domain</td>
<td>Yes,No</td>
</tr>
<tr>
<td>Performance</td>
<td>System utilizes less resource and Response time for end users is short</td>
<td>Yes, No</td>
</tr>
<tr>
<td>Generalized</td>
<td>System is generalized enough to customize or not</td>
<td>Yes, No</td>
</tr>
<tr>
<td>Feasibility</td>
<td>Whether it is possible to develop a system at a reasonable cost.</td>
<td>Yes, No</td>
</tr>
<tr>
<td>Security</td>
<td>Proposed technique is able to detect and correct errors</td>
<td>Yes, No</td>
</tr>
<tr>
<td>Efficiency</td>
<td>The ability of a system to place as few demands as possible to hardware resources, such as memory, bandwidth used in communication and processor time</td>
<td>Yes, No</td>
</tr>
<tr>
<td>Language interpretability</td>
<td>Translation into other languages for real time implementation.</td>
<td>Yes, No</td>
</tr>
<tr>
<td>Ease of use</td>
<td>The ease with which people of various backgrounds can learn and use the software.</td>
<td>Yes, No</td>
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<tr>
<td>Flexibility</td>
<td>System is flexible/dynamic enough to contain room of improvements for future enhancements (if needed)</td>
<td>Yes, No</td>
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<tr>
<td>Reliability</td>
<td>System is working properly till the time that is given</td>
<td>Yes, No</td>
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<tr>
<td>Testability</td>
<td>Proposed design is tested or not.</td>
<td>Yes, No</td>
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</table>

TABLE II: ANALYSIS OF PARAMETERS FOR WIRELESS SOFTWARE DEFINED NETWORK

<table>
<thead>
<tr>
<th>S#</th>
<th>Techniques</th>
<th>Optimization</th>
<th>Performance</th>
<th>Flexibility</th>
<th>Testability</th>
<th>Security</th>
<th>Reliability</th>
<th>Language Interpretability</th>
<th>Ease of use</th>
<th>Generalized</th>
<th>Efficiency</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Costanzo Salvatore, Galluccio Laura, Morabito Giacomo, Palazzo Sergio (2012).</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
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<td>2</td>
<td>Jagadeesan, Krishnamachari Bhaskar (2014)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
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<td>3</td>
<td>Comparetti, Wondracek, Kruegel and Kirda (2009)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
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<td>No</td>
<td>Yes</td>
<td>Yes</td>
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<td>4</td>
<td>Aditya Gudipati, Daniel Perry (2014)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<td>Yes</td>
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<td>5</td>
<td>Adam Drescher (2014)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
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<td>6</td>
<td>Andrea Detti, Claudio Pisa, Stefano Salsano, Nicola Blefari-Melazzi (2013)</td>
<td>Yes</td>
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<td>No</td>
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<td>Yes</td>
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<td>7</td>
<td>Esfahani, Kacem, Mirzaei, Malek and Stavrou (2012)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>8</td>
<td>Gante Alejandro, Mohamad Aslan, Matraway Ashraf (2014)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
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