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A Technical Survey on Software-Defined Network in Networking Environment

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ABSTRACT: Software-Defined Networking (SDN) could be a specification approach that permits the network to be intelligently and centrally controlled, or ‘programmed,’ exploitation package applications. This helps operators manage the full network consistently and holistically, in spite of the underlying network technology. Associate degree thorough survey was created with connection the need to handle the issues of network traffic, inability to scale, virtualization, and low-performance of current specification by adopting SDN, that decouples the network management and forwarding functions, therefore modify the network management to become directly programmable. Associate in Nursing analysis on the analysis undertaken by varied scientists showcased the importance of SDN and its advantages over the quality style.

KEYWORDS: OpenFlow, SDN architecture, SDN controllers, Software-defined networking.

I. INTRODUCTION

Software-Defined Networking (SDN) is Associate in nursing rising style that is dynamic, manageable, cost-effective, and convertible, making it ideal for the high-bandwidth, dynamic nature of today’s applications. This design decouples the network management and forwarding functions enabling the network management to become directly programmable and additionally the underlying infrastructure to be abstracted for applications and network services. The OpenFlow protocol could also be a foundational part for building SDN solutions. The goal of SDN is to allow network engineers and administrators to reply quickly to changing business requirements. Associate in nursing extremely software-defined network, a network administrator can kind traffic from a centralized management console whereas not having to the bit individual switches, and will deliver services to wherever they are needed among the network, whereas not relevancy what specific devices a server or different hardware components area unit connected to. The key technologies for SDN implementation area unit helpful separation, network virtualization and automation through programmability.

1.1SDN Programming Interfaces and Integration of Tools

SDN framework typically consists of the following main components-

Controllers:The “brains” of the network, SDN Controllers provide a centralized scan of the general network, and modify network directors to dictate to the underlying systems (like switches and routers) however the forwarding plane ought to be compelled to handle network traffic.

Southbound APIs:Software-defined networking uses southward APIs to relay data to the switches and routers “below.” OpenFlow, thought-about the primary ancient in SDN, was the first southward API and remains joined of the foremost common protocols. Despite some considering OpenFlow and SDN to be one at intervals constant.OpenFlow is exclusively one piece of the larger landscape.

Northbound APIs:Software-Defined Networking uses northward APIs genus to communicates with the applications and business logic “above.” These facilitate network directors to programmatically kind traffic and deploy services.

Openflow

OpenFlow is written as a communication protocol that is significantly accustomed provide access to the forwarding plane of a router. OpenFlow is degree open interface for dominant the forwarding tables in network switches, routers, and access points remotely. OpenFlow permits scalable datacenter networks, host quality, safer wireless networks, an excellent deal of energy efficient networks and new wide-area networks.

POX Controller

POX is degree open provide controller for developing SDN applications. it's a Python primarily based whole SDN controller and is transmissible from the Night controller. It provides degree economical as a result of implement the OpenFlow protocol that is that the actual communication protocol between the controllers and together the switches. fully whole totally different applications like hub, switch, load balancer, and firewall are run exploitation POX controller. To capture and see the packets flowing between POX controller and OpenFlow devices, Tcpdump packet capture tool is employed. OpenFlow protocol that is communication protocol is employed to hold out communication between the controller and together the switches.

Management of traffic

Another necessary vogue issue of SDN controllers is expounded to the strategy that traffic is managed. the alternatives relating to traffic management will have Associate in Nursing on the spot impact on the performance of the network, considerably in cases of giant networks composed of the many switches and with high traffic immeasurable able to divide the issues associated with traffic management into 2 categories; management roughness and policy event.

II. LITERATURE SURVEY

Kallol avatar Karmakar;VijayVaradharajan;SuryaNepal;UdayTupakula[1], presents a security design for IoT networks by investment the underlying options supported by software system-defined Networks (SDN). Our security design restricts network access to attested IoT devices. We have a tendency to use fine granular policies to secure the flows within the IoT network infrastructure and supply a light-weight protocol to certify IoT devices. Such associate degree integrated security approach involving authentication of IoT devices and enabling licensed flows will facilitate to shield IoT networks from malicious IoT devices and attacks.

MiquelGarrich;Francisco-Javier Moreno[2],studies open-source improvement package initiatives for offline designing and on-line provisioning and orchestration of SDN/NFV networks. With this goal in mind, we tend to initial specialize in open package (and framework) initiatives through a collection of realistic use cases that need improvement in multi-layer optical transport situations and ecosystems that mix transport with IT resources. The importance of a joint improvement of each network and IT domains is stressed, a replacement paradigm triggered by SDN/NFV technologies. we tend to discuss the theoretical limits to formula performances, and review obtainable ASCII text file frameworks for drawback modeling that modify the interaction with solvers. Finally, we tend to specialize in the Net2Plan open-source network designing tool, a Java-based package that fitly embraces the multiple options needed within the improvement of joint transport network and IT resource SDN/NFV ecosystems. Recent works supported Net2Plan square measure reviewed maybe its suitability for rapid algorithm prototyping, and for interaction with SDN/NFV-enabled networks.

DoaaHamdi;SamyGhoniemy;YasserDakroury[3],an increased photonic network-on-chip design referred to as (SD-PNoC) is given. The planned design supported a hybrid hardware-software approach, and a Software-Defined Management Orchestrator(SDMO) to separate the network management and information forwarding planes. This arranger has hosted on the higher hardware router as a virtual layer capable of dynamic management. It reconfigures information forwarding methods and permits dynamic execution of various algorithms in time period, because it scales the planned topology supported each application and therefore the network necessities. The projected SD-PNoC design, hierarchic communication protocols, and adapter management policies were enforced, simulated, and tested employing a tailored Phoenix-SIM framework within the OMNIT++ simulation setting.

adHeungseopAhn;SeungwonChoi;MarkusMueck;VladimirIvanov[4], addresses the way to reach economical programmability and code movability within the knowledge plane of a software-defined radio access network

(SDRAN). we have a tendency to assume a cloud RAN setting that builds on multi-vendor hardware parts. Recent literature on SDRAN knowledge plane indicates that code movability remains a problem in terms of economical execution of code, even though the code is abstracted from the underlying hardware. additionally, code interfaces usually vary across completely different hardware parts within the SDRAN knowledge plane, resulting in platform-dependent code management.

Catherine NayerTadros;Mohamed R. M. Rizk;Bassem Mahmoud Mokhtar[5], specialize in the demonstration that the LC-PD management plane design improves communication potency and therefore the Quality of Services (QoS) of running web services within the 5G mobile network. we have a tendency to use the Mininet-WIFI imitator in our simulation tests. Our conducted simulations show that using the LC-PD management plane design in 5G networks enhances the QoS of web services compared to different SDN implementations.

JianpingWang;GuohongGao;PeixinQu;WeiChen;Shujing Zhang[6], projected AN SDN-based multi-access edge computing framework for the transport networks. Within the projected resolution, 2 main algorithms area unit enforced. First, a fuzzy logic-based rule is employed to pick out the top vehicle for every evolved node B (eNB) collocated with road-side unit (RSU) for the aim of grouping vehicles supported their communication interfaces. Afterward, AN OpenFlow rule is deployed to update flow tables of forwarding devices at forwarding layers. additionally, a case study is conferred and evaluated exploitation the objectoriented standard distinct event network (OMNeT++) simulation framework which incorporates the INET framework-based SDN. Simulation results depict that the info dissemination based-SDN supported by multi-access edge computing over SDMEV will improve the latency necessities for V2X services.

Lionel Nkenyereye;LewisNkenyereye;S. M. RiazulIslam;ChakerAbdelazizKerrache;M. Abdullah-Al-Wadud;AtifAlamri[7], presents a clump mechanism supported SDN. Firstly, we tend to introduce the design of software-defined UASN named SD-UASN. Secondly, we tend to investigate hardware models of the underwater node and therefore the surface controller. Thirdly, we tend to outline the communication procedure of SDUASN, and implement the clump mechanism. Finally, we tend to perform simulations to verify the effectiveness of the projected mechanism. The results reveal that a trade-off of multiple constraints is achieved, and therefore the performance of the clump mechanism will be increased greatly. This work provides essential theoretical and technical support for software-defined UASNs.

SeunghyunYoon;Jin-HeeCho;DongSeongKim;Terrence J. Moore;Frederica Free-Nelson[8], developed AN attack graph-based MTD technique that shuffles a host's network configurations (e.g., MAC/IP/port addresses) supported its criticality, that is very exploitable by attackers once the host is on the attack path(s). to the present finish, we tend to developed a stratified attack graph model that gives a network's vulnerability and topology, which may be used for the MTD shuffling selections in choosing extremely exploitable hosts in a very given network, and determinative the frequency of shuffling the hosts' network configurations. A quantifiability Study of Software-Defined detector Networks”Renan C.

A. Alves;Doriedson A. G. Oliveira;Gustavo A. Nunez Segura;Cintia B. Margi[9], investigate vital parameters for Software-Defined Wireless detector Networks, like controller positioning, radio duty sport, variety of information sinks, and use of supply routed management messages. The results indicate that Software-Defined Networking is possible for Wireless detector Networks, presenting competitive information delivery magnitude relation whereas saving energy compared to RPL, the Routing Protocol for Low-power and lossy networks.

TryfonTheodorou;LefterisMamatas[10],propose VERO-SDN, AN ASCII text file SDN resolution for the IoT, delivery the subsequent novelties in distinction to the connected works: (i) programmable routing management with reduced management overhead through inherent protocol support of a long-range management channel; and (ii) a standard SDN controller and an OpenFlow-like protocol up the standard of communication in a very big selection of IoT eventualities through supporting 2 different topology discovery and 2 flow institution mechanisms. we tend to disbursed simulations with varied topologies, network sizes and high-volume transmissions with different communication patterns. Our results verified the strong performance and reduced management overhead of VEROSDN for different IoT deployments.

TaixinLi;HuachunZhou;HongbinLuo;ShuiYu”SERvice[11],propose services, a software system outlined framework for Integrated spaCe-tErrestrial satellite Communication, supported software system outlined Network (SDN) and Network operate Virtualization (NFV). we tend to 1st introduce the 3 planes of services, Management

Plane, management Plane, and Forwarding Plane. The framework is intended to attain versatile satellite network traffic engineering and fine-grained QoS guarantee. we tend to analyze the nimbleness of the house element of Sservices. Then, we tend to provides a description of the implementation of the epitome with the assistance of the Delay Tolerant Network (DTN) and OpenFlow. we tend to conduct 2 experiments to validate the practicableness of services and therefore the practicality of the epitome. additionally, we tend to propose 2 heuristic algorithms, particularly the QoS adjusted Satellite Routing (QSR) formula and therefore the QoS-oriented information measure Allocation seventeen (QBA) formula, to ensure the QoS demand of multiple users. The algorithms are evaluated within the epitome. The experimental results show the potency of the projected algorithms in terms of file transmission delay and transmission rate.

R. Li, Z. Zhao, Q. Sun, C.-L. I, C. Yang, X. Chen, M. Zhao, and H. Zhang, [12], discuss the mil applications in SDN-concept networks from 2 views, namely, the perspective of mil algorithms and the angle of SDN network applications. In terms of the mil algorithmic program perspective, we have a tendency to gift applications of mil ways in SDN-concept networks, followed by the classifications of mil methods; the common mil algorithms ar individually introduced. For the opposite facet, we have a tendency to concentrate on SDN network applications with mil algorithms. SDN-concept networks with mil ways can play a vital role all told aspects of future network construction and management, together with intelligent routing management, resource management, flow management, network security, etc. within the future, we'll conduct in-depth studies on the key challenges made public within the paper.

Van B. Djordjevic, Houman Rastegarfar [13], gift and eighteen judge OpenSDWN, a unique wireless local area network design supported a joint software-defined network and network functions virtualization approach. OpenSDWN exploits virtualization across the wired and wireless network and introduces datapath programmability to alter service differentiation and fine-grained transmission management, facilitating the prioritization of essential applications. OpenSDWN implements per-client virtual access points and per-client virtual middleboxes, to render network functions a lot of versatile and support quality and seamless migration. Moreover, OpenSDWN additionally will increase the safety of forthcoming wireless local area network HotSpot architectures by following a useful split approach. Finally, OpenSDWN also can be accustomed out-source the management over the house network to a democratic interface or to a web service supplier.

Julius Schulz-Zander; Carlos Mayer; Bogdan Ciobotaru; Raphael Lisicki; Stefan Schmid; Anja Feldmann [14], designed and projected modularized carrier-grade SDN controller in line with the characteristics of carrier-grade networks, partitioning the matter of dominant large-scale networks of carrier. The modularized design offers the system flexibility, quantifiability and stability. useful logic of modules and core modules, like link discovery module and topology module, square measure designed to satisfy the carrier's want. the effectiveness and high performance of the add this paper has been verified by the testing victimisation Cbench testing program. Moreover, the SDN controller we tend to projected has been running in China Telecom's Cloud Computing Key Laboratory, that showed the great results is achieved.

Feng Wang; Heyu Wang; Baohua Lei; Wenting Ma [15], presents the period of time Multipath Transmission Protocol nineteen (RMTP) that makes use of SDN for the regulation of multiple ways in DCN. The projected RMTP would choose the simplest path during a DCN and send majority of elephant flows on it link. the opposite remaining links will be used in parallel to transmit the rest of the information. RMTP was evaluated in Associate in Nursing SDN emulated setting and compared against existing DCN protocols. The paper shows that RMPT improves the transmission of huge knowledge in terms of turnout, packet loss and turnout throughout link failure by quite five hundredth.

Muhammad Junaid Anjum; Imran Raza; S. A. Hussain [16], propose a replacement design that disaggregates controller practicality and externalizes packet process, a crucial commencement towards migrating from a centralized, monolithic style to a localized microservice management plane design within which SDN controller functions area unit divided into a smaller, interconnected set. we have a tendency to argue that dividing a monolithic controller into smaller items has benefits.

C. Trois, M. D. D. Fabro, L. C. E. de Bona, and M. Martinello, [17], discusses and exposes the main points of the planning of a typical SDN controller supported our study of the many controllers. the stress is on interfaces as they're essential for evolving the scope of SDN in supporting applications with completely different network resources necessities. particularly, the paper review and compare the planning of the 3 controllers: Beacon, OpenDaylight, and Open Networking Operation System.



Doan B. Hoang;Minh Pham[18], hinge upon softwaredefined networking (SDN) technology and develop quick[a quick} restoration strategy with triggered precomputation (FR-TP) that achieves fast failure recovery with marginal resource overhead. Our work makes many contributions. we have a tendency to extend the controller practicality and OpenFlow protocol for software-defined elastic optical interdatacenter network architectures, thus on acquire the world network state info quickly and accurately.

Yu Xiong [19],present the FR-TP strategy ANd an associated trigger twenty mechanism to work out backup ways before a link failure happens. what is more, to boost the potency of path computation and information measure resource assignment, we have a tendency to construct a bedded auxiliary graph of spectrum window planes (SWP-LAG) employing a residual capability matrix to alter dynamically the breadth of the spectrum window planes (SWPs) to satisfy completely different service requests. Simulation results demonstrate that, compared with existing restoration ways, the planned FR-TP strategy combined with SWP-LAG reduces the recovery time by up to thirty.4% within the network topologies studied while not increasing the obstruction.

Salah, H.; Zimmermann, S., Cabrera G., J.A. [20], propose a concept referred the prevailing remote information integrity verification schemes ar principally supported the RSA and BLS signature mechanisms. The RSA-based theme has an excessive amount of machine overhead. The BLS signature-based theme must adopt a particular hash perform, and therefore the batch signature potency within the huge information atmosphere is low. Therefore, for the machine overhead and signature potency problems with these 2 signature mechanisms and conjointly a theme of knowledge integrity verification supported a brief signature algorithmic rule (ZSS signature), that supports privacy protection and public auditing by introducing a trustworthy third party (TPA).

IV. COMPARITIVE ANALYSIS

S.NO	TITLE	TECHNIQUES& MECHANISMS	PARAMETER ANALYSIS	TOOLS	FUTURE WORK
1	SDN Enabled Secure IoT Architecture	Lightweight ECC based Authentication	SECURITY	MATLAB	RWT Algorithm Can Be Used For Security Improvement.
2	Open-Source Network Optimization Software in the Open SDN/NFV Transport Ecosystem	Software-Defined Networking (SDN) and Network Function Virtualization (NFV)	Quality Of Transmission (QoT)	NET2PLAN AND OPEN STACK	Can Improve The QoT By Self Adjustment Of Bandwidth
3	A Scalable Software Defined Network Orchestrator for Photonic Network on Chips	Hybrid hardware-software approach, and a Software-Defined Management Orchestrator (SDMO)	network-on-chips performance, scalability, and resource utilization	OMNET++	Attack Can Be Avoid By HAA Algorithm
4	Data Plane Framework for Software-Defined Radio Access Network Based on ETSI-Standard Mobile Device Architecture	Software-Defined Radio Access Network	Proof of concept (PoC)	LTE FDD	Anomaly Can Detected And Plotted



5	Software Defined Network-Based Management for Enhanced 5G Network Services	Logically Centralized-Physically Distributed (LC-PD) controller management	Quality of Services (QoS)	OPEN FLOW	Can Compared With HDN & SDN Performance
6	Software Defined Network-Based Multi-Access Edge Framework for Vehicular Networks	multi-access edge computing, vehicular ad hoc network, fuzzy clustering.	Data dissemination,	OMNET++	Attack Can Be Avoid By HAA Algorithm
7	A Software-Defined Clustering Mechanism for Underwater Acoustic Sensor Networks	clustering algorithm	Quality Of Transmission (QoT)	OPENFLOW.	Anomaly Can Detected And Plotted
8	Attack Graph-Based Moving Target Defense in Software-Defined Networks	Moving target defense (MTD)	Hierarchical Attack Graph, Attack Path Prediction	OMNET++	Can Be do the Security Improvement
9	The Cost of Software-Defining Things: A Scalability Study of Software-Defined Sensor Networks	Collection Tree Protocol (CTP)	quality of transmission (QoT)	COOJA	Can Compared With HDN & SDN Performance
10	A Versatile Out-of-Band Software-Defined Networking Solution for the Internet of Things	IPv6 Routing Protocol for Low-Power and Lossy Networks (RPL)	End-To-End Delay Time And A Packet Delivery Ratio	OPENFLOW	Can Improve end to end delay By Self Adjustment Of Bandwidth
11	SERVICE: A Software Defined Framework for Integrated Space-Terrestrial Satellite Communication	QoS-oriented Satellite Routing (QSR) algorithm and the QoS-oriented Bandwidth Allocation (QBA) algorithm	Quality of Service (QoS)	LINUX	HAA Algorithm can be used for self bandwidth adjustment to improve the data transmission speed
12	A Survey of Networking Applications Applying the Software Defined Networking Concept Based on Machine Learning	Artificial intelligence, Machine learning	Controllability and security	MATLAB	Integration work of security, self bandwidth allocation for data security and latency
13	Physical-Layer Adaptive Resource Allocation in Software-Defined Data Center Networks	Adaptive modulation and coding	response to time varying traffic demand and signal quality conditions	MATLAB	Signal quality can be improved to reduce the data traffic

14	Unified Programmability of Virtualized Network Functions and Software-Defined Wireless Networks	Light virtual access points (LVAPs) abstraction,	Controllability and security	OMNET++	Controllability and security can be improved by Hybrid Adaptive algorithm
15	A Research on Carrier-grade SDN Controller	modularized carrier-grade SDN controller	Flexibility, scalability and stability	C PROGRAMMING LANGUAGE	Modularized carrier-grade signal can be improved to avoid data collision error
16	Real-Time Multipath Transmission Protocol (RMTP): A Software Defined Networks (SDN) based Routing Protocol for Data Centric Networks	Open Network Operating System(ONOS) ,hybrid approach	Response time,packet event,Load balancer	OPENFLOW	To speed up flow rule installation in external reactive based application.
17	Externalization of Packet Processing in Software Defined Networking”	Open Network Operating System(ONOS) q,hybrid approach.	Response time,packet event,Load balancer	OPENFLOW	To speed up flow rule installation in external reactive based application
18	On software-defined networking and the design of SDN controllers	Beacon, OpenDaylight and ONOS	scalability, high availability, and security	C++, MATLAB	The challenge is adopt a SDN controller that facilitates application innovation and opens up wider markets for vendors and service providers.
19	SDN enabled restoration with triggered precomputation in elastic optical inter-datacenter networks	fast restoration strategy with triggered precomputation (FR-TP)	spectrum window planes (SWP-LAG)	OPENFLOW	to improve the efficiency of path computation and bandwidth resource assignment
20	Stabilization and comparison of QoS and QoT by SDN and HDN over IoT network by adaptive sliding mode algorithm	ADAPTIVE SLIDE MODE ALGORITHM(ASMA)	QoS (Quality Of Service) Speed, Security. QoT (Quality Of Transmission)	MATLAB	QoS can be stabilized accurately. Network parameters can self calibrated with respect to QoS in fine manner

IV. CONCLUSION

This paper is a survey on the design problems for SDN, the difficulties in implementation and also the varied applications that square measure being designed for SDN. the foremost recent developments within the

networking domain, for example cloud, multimedia, mobile, and large information square measure exacting for additional dynamic management from service suppliers, additional convenient net access and additional information measure from users similarly. Thus, this new emerging design of SDN is taken into account collectively of the foremost promising solutions to satisfy these demands. when conducting an in depth survey on SDN, the idea of SDN in conjunction with its definitions are given in conjunction with its advantages in giving higher configuration and improved performance over the standard design. Moreover, temporary data of a number of the recent SDN applications and technologies has been provided when conducting this survey. the varied tools that are needed to create the testbed and controllers which will be used for SDN are with success listed out.

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