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A Novel Architecture of Software Testing based on SDN Hypervisor Technique for Big Data

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ABSTRACT: There is a lack of network standard skills in present networking landscape. There is an increase in data plane granularity, data plane separation and simplifies the network devices, even networking industry has experienced a renewal with Software-Defined Networking (SDN). The device performance is improve by the linearly protocol by using SDN controller. The SDN-based software testing architecture is the basics of hypervisor approach. The application layer is initially combined with network updates, security and Quality of service. Software Defined Network (SDN) is a main feature. By using data plane communication protocol, the protocol communication is simplified. The physical switch controls the network data plane and virtual switch. The performance and efficiency are the accurate results that are achieved. Therefore, processing, storage, acquisition of big data and transmission are highly possible by SDN. The operation and design of SDN has big data impact. Hence, this method shows better results interms of accuracy, efficiency, computational time and security.

KEYWORDS: SDN (Software Defined Network), Big Data, Security, Software Testing, Networking

I. INTRODUCTION

Due to their large volume and complex computation, big data applications (especially real-time or near-real-time applications) are not possible without networking support. [1].A novel method in networking Software-Defined Networking (SDN) has high interest in present days**.** For introducing network programming, forwarding plane will detaches the control plane to break vertical integration, which is the primary component of SDN.

The "network brain" by viewing a global network that allows SDN for logical centralization for decisions and feedback. It also simplifies the network optimization. The programmable packet forwarding devices are high accurate in data plane components during the controller the single entity represents control plane components in SDN [2]. In SDN, development and deployment applications are simplified by traditional networks. The network policies are enforced by the global view in SDN. The network infrastructure is novel phase for innovations that are introduced to represent SDN as main method for shifting the network evolution.

SDN and big data are two main roles that traditionally addressed in earlier works. Therefore, big data applications have an important effect on network method in SDN. Processing, transmission, collection of big data and storage are highly facilitated by many fine characteristics (such as ability to program the network, logically centralized control, separation of the control and data planes as well as global view of the network) [3]. As example, cloud data centers are processed by big data. In big data applications, Service Level Agreements (SLAs) are reached for various big data applications that allocating the resources dynamically in data centers for efficient performance in SDN-based data centers[4]. Big data is obtained by all the various layers (from application layers to physical) in SDN and it is logically centralized controller by global view of the network. The most important effect on the operation and design of SDN is a significant network application in bigdata. The traditional methods are not adequate in designing and optimizing the networks, so it becomes complex. The network efficiency is improved between various layers by sharing the data, which is learnt in cross-layer design in past experience. The analytical methods are influenced by big data analytics for obtaining information to advice the decisions that support in designing and operating of SDN. As a example, big data analytics is simplified for performing engineering traffic to enhance the efficiency of SDN in controller[5]. The proper network management around the cyber world has important revolution solutions in SDN over the internet and that increases the data in different applications. OpenFlow at Stanford University represents the ideas of term SDN. In SDN, OpenFlow is considered as the primary standardized protocol.

Decoupling of remote control plane is controlled by forwarding state in the data plane the network is referred as SDN. The real applications are developed in SDN protocol standards [6]. At present, SDN is unlimited for

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implementations for common term of the platform. The development and standardization of SDN is a non-profit consortium -Open Networking Foundation (ONF) and the following are the SDN definition: The applications are obtained by basic network infrastructure which is centralized logically. In network intelligence, the data and control planes are separated in SDN architecture.

For better efficiency results like energy consumption and low complexity designs in data center network architectures are used by SDN. To enhance the application performance for dynamic allocation of resources that collects the traffic information[7]. As network architectures and data center applications for application-aware networking in SDN have novel capabilities. As per SLAs for various applications in big data, which is normally processed in SDN-based data centers and data centers[8].

The scientific research (e.g., astronomy, high-energy physics and computational biology), networking (e.g., Internet of Things [IoT], Internet and cellular networks) and business (e.g., business-to-business transactions and business-to-consumer) are included by its generation of domains that are coupled in big data sources [9]. High Companies like Face-book, Google, Oracle, Microsoft and Amazon are developing big data projects [10]. Even Big data are useful in various applications like IoT-based applications, scientific research applications, healthcare applications and enterprise applications.

The National Science Foundation, National Institutes of Health and Defense Advanced Research Projects Agency (DARPA) and U.S. federal agencies are invested in big data research. Data processing models, data staging, distributed storage, data privacy and security supports the networks for big data to address the issues which are unsolved.

II. LITERATURE SURVEY

B. G. Assefa and O. Ozkasa, et.al [11] proposed a framework for traffic aware energy efficient routing for machine learning in SDN. The three primary phases of machine learning are Feature extraction, training, and testing. By using SNDlib the dynamic traffic trace and network methodology are used in real applications are observed many experiments on Mininet and POX controller (POX is a Python based open source OpenFlow/Software Defined Networking (SDN) Controller). Therefore, results for this method shows reduction of feature size as more than 65%, accuracy as 70% in energy efficient heuristics algorithm and its prediction for optimal parameters values with 25X speed.

Y. Cui, J. Song, M. Li, Q. Ren, Y. Zhang and X. Cai, et.al [12] proposed Relaxation Algorithm (RA) based on relaxation-rounding method to solve the issue it have to achieve ½ ratio approximately in least cases. A Heuristic Algorithm (HA) is designed for further comparison of RA with orders of three magnitudes for finding a near-optimal solution to speedup and solving the issues of big data accurately. Particularly, internet traffic and transmission delay is a desirable tradeoff and it is achieved by HA. For demonstration of System Center Configuration Manager (SCCM), the prototype based on Open vSwitch is implemented. In extensive trace-based simulation for SCCN achieves results in different network situations.

F. Estrada-Solano, O. M. Caicedo and N. L. S. Da Fonseca, et.al [13] described the issue of elephant flows scheduling. For elephant flows detection for Software-Defined Data Center Networks (SDDCNs) are merged with machine learning methods at controller side. Therefore, methods will provide low accuracy, low scalability, high detection time and heavy traffic. For accurately identifying elephant flows, this system demonstrates a novel method by Network Elephants Learner and anaLYzer (NELLY) at server side with low traffic overhead. By utilizing adaptive decision trees algorithms, NELLY achieves efficient and low categorization time.

H. J. Heo, N. Kim and B. D. Lee, et.al [14] multicast tree generation method is applied for reinforcement learning is proposed. The issues of this study are represented by Markov Decision Process (MDP) and it is achieved by SDN. The MDP with network context is represented in this analysis and also achieves learnt policies, which are operated for multicast routing

L. Yang, X. Liu, J. Cao and Z. Wang, et.al [15] described task from network flows scheduling and task placement are coordinated for method of joint scheduling. A SDN based online scheduling framework is developed for selecting the task placement for available bandwidth in SDN switches as well as it is allocated to bandwidth for data flow optimally. The trace-driven simulation uses the joint method for network bandwidth and also reduces 55% of job completion time.

S. O. Aliyu, F. Chen and Y. He, et.al [16] proposed SDN-based InterCloud environments for a novel adaptive (self-tuning) resource management technique. By externally or Partition Form Games (PFGs) as control mechanism in partner games the principles are used as adaptive control problem QoS-aware resource management modelling for Quality Of Service (QoS) policy control framework. For solving the multi-criteria optimisation issue the MDP anytime approach (Integer partition based) and dynamic programming is described for system dynamics in SDN-based InterClouds.

P. Rengaraju, S. S. Kumar and C. H. Lung, et.al [17] described that Media Access Control (MAC) filter is used firewall implementation of SDN. For MAC filtering firewall

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technique and IP filtering the average packet delay performance is compared. The outputs shows that IP filtering firewall performs low when compared with MAC filtering and security support (packet allow/deny) is same for both the methods.

A. Malik, R. de Fréin, M. Al-Zeyadi and J. Andreu-Perez, et.al [18] introduce Deep-SDN and it identifies a wide range of traffic applications accurately is new deep learning model for SDN. The described technique achieves 96% of accuracy, when compared with novel methods interms precision, f-measure, recall and accuracy as parameters.

F. Wang, H. Wang, B. Lei and W. Ma, et.al [19] for issue of controlling large-scale networks of carrier, the carrier-grade network is designed, proposed and resolved. The stability, scalability and system flexibility provides modularized design. To reach the expectation of carrier's needs, the links like topology, discovery for core and functional logic modules are proposed. C programming language is a fundamental language for improving the efficiency of the controller by utilizing multi-threads technique, stick-package processing and static memory allocation. The OpenFlow as better communication with OpenFlow-based switches are used. To manage high networks over east-west interface, a controller cluster management system is used.

A. Al-Jawad, P. Shah, O. Gemikonakli and R. Trestian, et.al [20] represents QoS by SDN for a policy-based management method. For present high-level policies the network state adapts SDN switches for underlying novel decisions. It is enforced dynamically and the active flows will monitor the QoS parameters by this method. By utilizing Neural Networks, the proposed method made a solution for identifying violation of flows that causes the network congestion. Two route management techniques are implemented for policy violation like rate limiting and rerouting. The implementation and evaluation of experimental testbed setup is described in this method. The QoS is enabled by the proposed (Policy-Based Network Management) PBNM-based SDN framework that performs the SDN in terms of delay, packet loss rate, and throughput.

III. Framework for Novel Architecture of Software Testing Based On SDN Hypervisor Technique for Big Data

In this section, framework for novel architecture of software testing based on SDN Hypervisor technique for big data is described. The network gear is the element in data plane for flows of users traffic. It is known as forwarding plane, which is utilized for interchanging. The forwarding plane supports user traffic to the next hop by a switching device directly. This data plane layer contains physical switch, virtual switch and network devices. The data plane communication protocol is produced by protocol's communication, which is same as the control plane. Ethernet and Internet Protocol (IP) are the protocols used by data plane to carry the functions.

The gateway layer is examined in this work. It is crucial for fusing software testing and SDN technologies together. The controller controls the gateway layer, and it evaluates the data packet to decide whether to pass it to the transport layer. The data will not be transmitted if it is determined that there is a security threat.

In this model, the conventional transport layer or application layer is moved forward to the gateway layer for data security assessment, categorization, and decision-making. Software-defined networks can be virtualized because of SDN network hypervisors. The virtualization of SDN is realized by SDN network hypervisors. It is also intercepts controls the path among tenant controllers with their respective virtual SDN. The edge devices are linked to hypervisors.

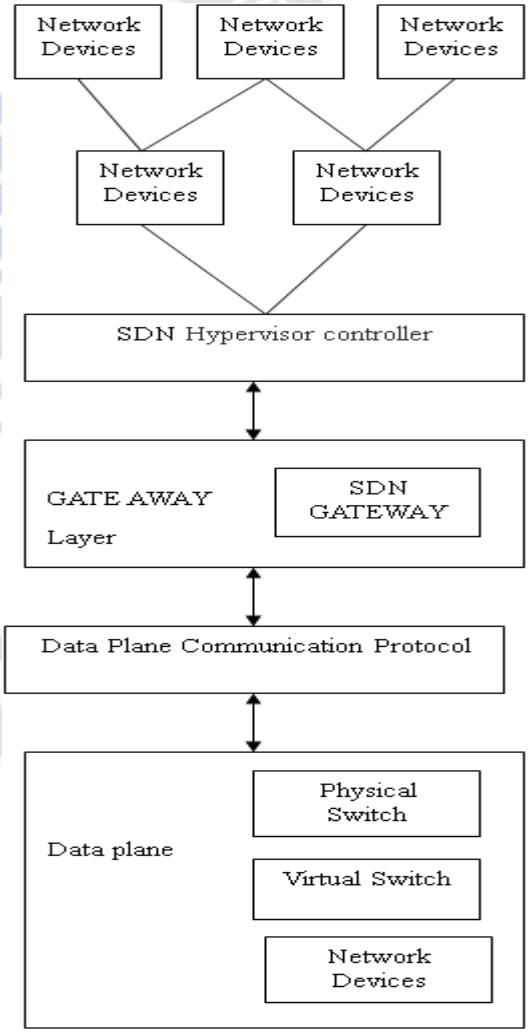

Fig.1: Framework for Novel Architecture of Software Testing Based on SDN Hypervisor Technique for Big Data

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For endless connectivity and communication is simplified in hardware networking. Every component or element is performs particular operation/ function in a network.

Network administrators are Traffic controllers that depend on network equipment like firewalls for monitoring as well as controlling traffic flows and routers for various subnets or segments in networking ,and the admins can blocks the unauthorized connection requests.

Networking equipment like routers will connect various networks by using unique protocols in connectivity. The data format translation of various protocol-based systems will enables the communication by same gateways

Subnets or distinct zones are divided by network equipment as main functionalities in segmentation. It also reduces cyberattack and damages by observing attacker's as they didn't damage the network.

IV. RESULT ANALYSIS

In this section, performance analysis of novel architecture of software testing based on SDN Hypervisor technique for big data is observed.

Table.1: Performance Analysis

Parameters	SDN	SDN Hypervisor
Accuracy	95.6	99.8
Efficiency	84.3	87.1
Computational Time	8657	7124
Security	91.2	94.4

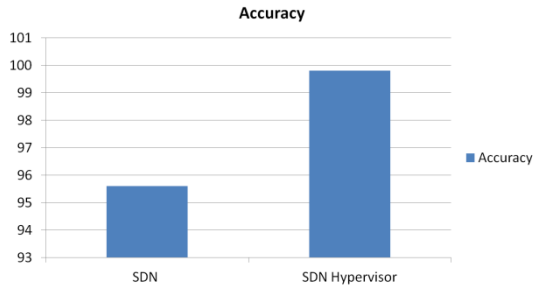

Fig.2: Accuracy Comparison Graph

In Fig.2, accuracy comparison graph is observed between SDN and SDN Hypervisor for novel architecture of software testing based on SDN Hypervisor technique for big data. SDN Hypervisor shows high accuracy.

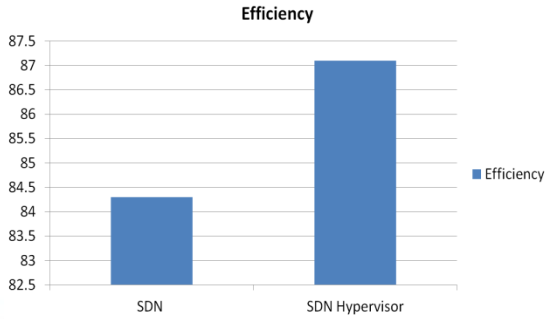

Fig.3: Efficiency Comparison Graph

Efficiency comparison graph is observed in Fig.3 for novel architecture of software testing based on SDN Hypervisor technique for big data between SDN and SDN Hypervisor. Higher efficiency is observed in SDN Hypervisor.

Computational time is high for SDN when compared with SDN Hypervisor in Fig.4 for novel architecture of software testing based on SDN Hypervisor technique for big data between SDN and SDN Hypervisor. Therefore, computational time is low for SDN Hypervisor.

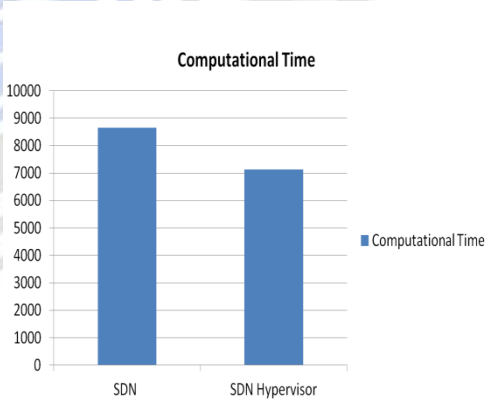

Fig 4: Computational Time Comparison Graph

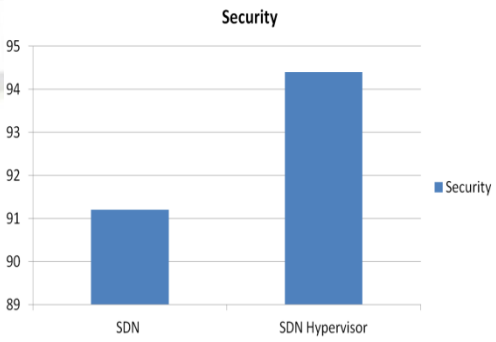

Fig 5: Security Comparison Graph

SDN Hypervisor shows high security. In Fig.5 security comparison graph is observed between SDN and SDN

Hypervisor for novel architecture of software testing based on SDN Hypervisor technique for big data.

V. CONCLUSION

New methods of SDN and bigdata have fundamental features. The main characteristics of SDN are (logically centralized controller, has an ability for programming the network, separation of the control and data planes, global view of the network, etc), which is having an advantage of bigdata applications in joint optimization, cloud data centers, scientific big data architectures, scheduling issues and data delivery will overcome by SDN based software testing architecture with Hypervisor technique. Security, network update and service quality are the main combinational application layers. By using data plane communication protocol, the protocol communication is simplified. The physical switch controls, the network data plane and virtual switch. The performance and efficiency are the accurate results that are achieved. Therefore, processing, storage, acquisition of big data and transmission are highly possible by SDN. The operation and design of SDN has big data impact. Hence, this method achieves better results interms of accuracy, efficiency, computational time and security.

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