A Study on Software Defined Networking

[1.] *SarabjeetKaur,* [2.] *Dr. NeenuJuneja,* [3.] *KrishanTuli*
[1]*(Assistant Professor, CBSA, CGCLandran, mca.sarabjeet@gmail.com)*
[2]*(Assistant Professor, CBSA, CGCLandran, mca.neenujuneja@gmail.com)*
[3]*(Assistant Professor, CBSA, CGC Landran, mca.krishantuli@gmail.com)*

Abstract
The digital society is creation of widespread internet usage,almost everything is connected and is accessible from anywhere. Still the previous IP networks are complex and tough to manage. It is difficult to configure the network according to predefined set of policies, and to reconfigure it to respond to faults, load, and changes. To make it even more complex, current networks are also vertically integrated: the control plane and data plane are wrapped together. Software-defined networking is an emerging technology that changes the state of affairs, by breaking vertical integration, differentiating the network's control logic from the routers and switches, which led tonetwork control centralization, and introducing the ability to program the network.

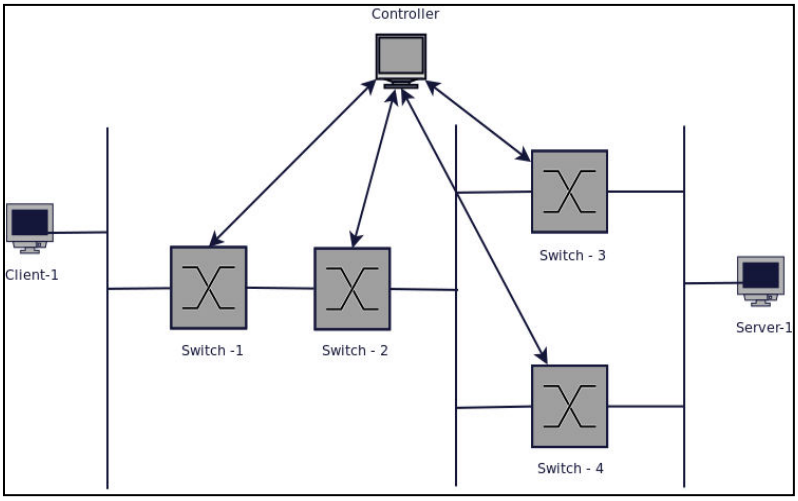
Keywords: Software Defined Network, Openflow, switches.

I INTRODUCTION

The separation of concerns, introduced between the definition of network policies, their implementation in switching hardware, and the forwarding of traffic, is key to the desired flexibility: by breaking the network control problem into tractable pieces, Software Defined Network makes it easier to create and introduce new abstractions in networking, simplifying network management and facilitating network evolution. In this paper, we present a comprehensive survey on Software Defined Network. We start by introducing the motivation for Software Defined Network, explain its main concepts and how it differs from traditional networking, its roots, and the standardization activities regarding this novel paradigm.

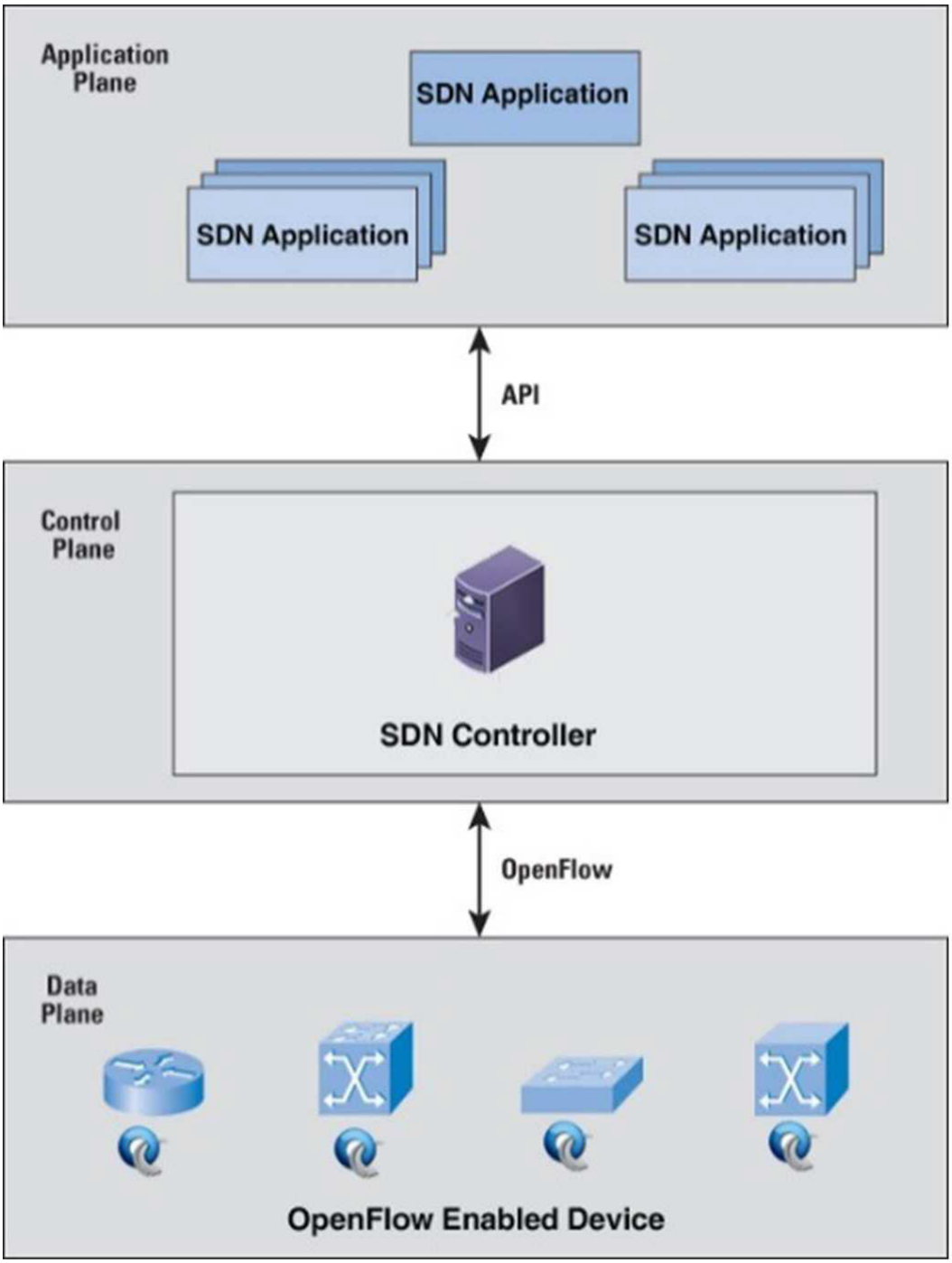
II SDN

Next, we present the key building blocks of an Software Defined Network infrastructure using a bottom-up, layered approach. We provide an in-depth analysis of the hardware infrastructure, southbound and northbound application programming interfaces (APIs), network virtualization layers, network operating systems (Software Defined Network controllers), network programming languages, and network applications. We also look at cross-layer problems such as debugging and troubleshooting. In an effort to anticipate the future evolution of this new paradigm, we discuss the main ongoing research efforts and challenges of Software Defined Network.



In particular, we address the design of switches and control platforms - with a focus on aspects such as resiliency, scalability, performance, security, and dependability - as well as new opportunities for carrier transport networks and cloud providers. Last but not least, we analyze the position of Software Defined Networkas a key enabler of a software-defined environment.
The pull of Software-Defined Networking (Software Defined Network) is magnetic. There are few in the networking community who have escaped its impact. As the benefits of network visibility and network device programmability are discussed, the question could be asked as to who exactly will benefit? Will it be the network operator or will it, in fact, be the network intruder? As Software Defined Network devices and systems hit the market, security in Software Defined Network must be raised on the agenda.

Both the security enhancements to be derived from using the Software Defined Network framework and the security challenges introduced by the framework are discussed. By categorizing the existing work, a set of conclusions and proposals for future research directions are presented.Techno-economic drivers are creating the conditions for a radical change of paradigm in the design and operation of future telecommunications infrastructures.



In fact, Software Defined Network, NFV, Cloud and Edge-Fog Computing are converging together into a single systemic transformation termed "Softwarization" that will find concrete exploitations in 5G systems. The IEEE Software Defined Network Initiative has elaborated a vision, an evolutionary path and some techno-economic scenarios of this transformation:

specifically, the major technical challenges, business sustainability and policy issues have been investigated. This white paper presents:
1) an overview on the main techno-economic drivers steering the "Softwarization" of telecommunications;
2) an introduction to the Open Mobile Edge Cloud vision (covered in a companion white paper);
3) the main technical challenges in terms of operations, security and policy;
4) an analysis of the potential role of open source software;
5) some use case proposals for proof-of-concepts; and
6) a short description of the main socio-economic impacts being produced by "Softwarization".

Along these directions, IEEE Software Defined Networkis also developing of an open catalogue of software platforms, toolkits, and functionalities aiming at a step-by-step development and aggregation of test-beds/field-trials on Software Defined Network-NFV-5G. This will prepare the ground for developing new ICT ecosystems, thereby improving the quality of life and facilitating the development of the new digital economy.

Cloud services are exploding, and organizations are converging their data centers in order to take advantage of the predictability, continuity, and quality of service delivered by virtualization technologies. In parallel, energy-efficient and high-security networking is of increasing importance. Network operators, and service and product providers require a new network solution to efficiently tackle the increasing demands of this changing network landscape.

Software-defined networking has emerged as an efficient network technology capable of supporting the dynamic nature of future network functions and intelligent applications while lowering operating costs through simplified hardware, software, and management. In this article, the question of how to achieve a successful carrier grade network with software-defined networking is raised. Specific focus is placed on the challenges of network performance, scalability, security, and interoperability with the proposal of potential solution directions.Software Defined Networking (Software Defined Network) is an evolutionary approach to network design and functionality based on the ability to programmatically modify the behavior of network devices. Software Defined Networkuses user-customizable and configurable software that's independent of hardware to enable networked systems to expand data flow control. Software Defined Network is in large part about understanding and managing a network as a unified abstraction. It will make networks more flexible, dynamic, and cost-efficient, while greatly simplifying operational complexity. And this advanced solution provides several benefits including network and service customizability, configurability, improved operations, and increased performance.

There are several approaches to Software Defined Network and its practical implementation. Among them, two have risen to prominence with differences in pedigree and implementation.

This paper's main focus will be to define, review, and evaluate salient approaches and use cases of the OpenFlow and Virtual Network Overlay approaches to Software Defined Network. OpenFlow is a communication protocol that gives access to the forwarding plane of a network's switches and routers. The Virtual Network Overlay relies on a completely virtualized network infrastructure and services to abstract the underlying physical network, which allows the overlay to be mobile to other physical networks. This is an important requirement for cloud computing, where applications and associated network services are migrated to cloud service providers and remote data centers on the fly as resource demands dictate.

II CONCLUSION

This paper has discussed how and where Software Defined Networkcan be applied and implemented, including research and academia, virtual multitenant data center, and cloud computing applications. Specific attention will be given to the cloud computing use case, where automated provisioning and programmable overlay for scalable multi-tenancy is leveraged via the Software Defined Network approach.

References

1. Guo Z, Su M, Xu Y, Duan Z, Wang L, Hui S, Chao, H. Jonathan. Improving the performance of load balancing in software-defined networks through load variance-based synchronization. Communications and Networking in the Cloud 2014; 68(0):95–109.

2. Kobayashi M, Seetharaman S, Parulkar G, Appenzeller G, Little J, van Reijendam J, Weissmann P, McKeown N. Maturing of OpenFlow and Software-defined Networking through deployments. Computer Networks 2014; 61:151–75.

3. Azodolmolky S, Wieder P, Yahyapour R. SDN-Based Cloud Computing Networking. ICTON 2013.

4. Rubio-Loyola J, Galis A, Astorga A, Serrat J, Lefevre L, Fischer A, Paler A, Meer H. Scalable service deployment on software-defined networks. IEEE Commun. Mag. 2011; 49(12):84–93.

5. Levy Y, Ellis TJ. A Systems Approach to Conduct an Effective Literature Review in Support of Information Systems Research. Informing Science Journal 2006; 9:181–212.

6. Webster J, Watson RT. Analyzing the past to prepare for the future: writing a literature review. MIS Quarterly 2002; 26(2):xiii–xxiii.

7. Caraguay ALV, Lopez LIB, Villalba LJG. Evolution and Challenges of Software Defined Networking. IEEE Communications Magazine 2012.

8. Patouni E, Merentitis A, Panagiotopoulos P, Glentis A, Alonistioti N. Network Virtualisation Trends: Virtually Anything Is Possible by Connecting the Unconnected. IEEE SDN for Future Networks and Services (SDN4FNS) 2013.

9. Casado M, Koponen T, Shenker S, Tootoonchian A. Fabric: A retrospective on evolving SDN. ACM HotSDN 2012.

10. Monteleone G, Paglierani P. Session Border Controller Virtualization Towards "Service-Defined" Networks Based on NFV and SDN. IEEE SDN for Future Networks and Services (SDN4FNS) 2013:1–7.

11. Gelberger A, Yemini N, Giladi R. Performance Analysis of Software-Defined Networking (SDN). IEEE 21st International Symposium on Modeling, Analysis & Simulation of Computer and Telecommunication Systems (MASCOTS) 2013:389–93.

12. Lara A, Kolasani A, Ramamurthy B. Network Innovation using OpenFlow: A Survey. IEEE Communications Surveys & Tutorials 2014;

13 (1):493–512. 21. Akyildiz IF, Lee A, Wang P, Luo M, Chou W. A roadmap for traffic engineering in SDN-OpenFlow networks. Computer Networks 2014; 71:1–30.

14. Galis A, Clayman S, Mamatas L, Rubio Loyola J, Manzalini A, Kuklinski S, Serrat J, Zahariadis T. Softwarization of Future Networks and Services - Programmable Enabled Networks as Next Generation Software Defined Networks. IEEE SDN for Future Networks and Services (SDN4FNS) 2013.

15. Costa-Requena J. SDN integration in LTE mobile backhaul networks. IEEE ICOIN 2014:264–9.

16. Raza MH, Sivakumar SC, Nafarieh A, Robertson B. A Comparison of Software Defined Network (SDN) Implementation Strategies. Procedia Computer Science 2014; 32:1050–5.

17. Varghese, B., et al.: Challenges and opportunities in edge computing. In: IEEE InternationalConference on Smart Cloud (SmartCloud). IEEE (2016)

18. Mach, P., Becvar, Z.: Mobile edge computing: a survey on architecture and computationoffloading. IEEE Commun. Surv.Tutorals, 19(3), 1628–1656 (2017)

19. Jammal, M., et al.: Software defined networking: state of the art and research challenges.Comput. Netw. 72, 74–98 (2014)

20. Wang, C., et al.: Computation offloading and resource allocation in wireless cellular networkswith mobile edge computing. IEEE Trans. Wirel. Commun. 16, 4924–4938 (2017)

21. You, C., et al.: Energy-efficient resource allocation for mobile-edge computation offloading.IEEE Trans. Wirel. Commun. 16(3), 1397–1411 (2017)

22. Plachy, J., Becvar, Z., Strinati, E.C.: Dynamic resource allocation exploiting mobilityprediction in mobile edge computing. In: 2016 IEEE 27th Annual International Symposiumon Personal, Indoor, and Mobile Radio Communications (PIMRC). IEEE (2016)