Software Defined Everything

M. N. O. Sadiku[1], S. R. Nelatury[2], S.M. Musa[1]

[1]College of Engineering, Prairie View A&M University, Prairie View, TX 77446
[2]School of Engineering and Engineering Technology, Pennsylvania State University. Erie, PA 16563-1701

Abstract Software defined everything (SDE) is part of the IT software-driven technologies such software defined networking (SDN), software defined storage (SDS), software defined data center (SDDC), and software defined security (SDS). The shift to software affects essentially any organization that leverages technology. This shift is causing physical items in our daily life to be become software-defined. This paper presents a brief introduction to software defined everything.

Keywords software defined everything, software defined anything, software defined something, software defined networking, software defined environment, software defined data center

Introduction

The IT world is gradually moving towards a software-defined future. Software defined everything (SDE or SDx) represents a deliberate shift in the telecommunication industry, whereby networks and services are regarded as stacks of interacting software. It appears that IT suppliers want to move away from hardware dependence to a more dynamic platform of software functionality. SDE provides the decoupling of software from specific hardware platforms [1].

SDE introduces flexibility and enables IT departments the capability to automate all their IT provisioning and management entirely through software. SDx can be regarded as any physical item or function that can be performed as or automated by software. Typical examples of SDx include apps on mobile devices, Internet of Everything devices, and self-driving cars.

Sde Features

Software defined everything is an umbrella term that includes:

- *Software defined networking* (SDN): A network architecture to make network devices programmable. SDN addresses the failure of the traditional networks to support the dynamic, scalable computing and storage needs of today's applications [2].
- *Software defined computing*: With software defined computing, technology functions are moved to a virtualized infrastructure, thereby presenting computing infrastructure as pools of virtual and physical resources.
- *Software defined environment*: In an SDE environment, storage, data center infrastructure, and network management are automated by intelligent software rather than by hardware.
- *Software defined data centers* (SDDC): This is one in which all elements of the data center infrastructure (networking, storage, CPU, and security) are delivered as a service. Control of the data center is automated by software. Basically, SDDC consists of three core components: network virtualization, server virtualization, and storage virtualization [3].

- *Software defined storage* (SDS): This refers to computer data storage software that is independent of the underlying hardware [4]. Software is decoupled from hardware. SDS allows you to leverage existing storage solutions such as SAN and NAS on any industry standard hardware.
- *Software defined security*: This is a new approach to improve security within software defined networking environment. Because SDS is entirely software-based, security policy is elastic and security is available on demand [5].

These are important building blocks of software defined everything. SDE infrastructure includes software-defined compute, storage, data center, WAN, etc

Issues with SDE

Does SDE improve anything? Does it contribute to security, scalability, performance, and manageability? SDE answers some of our networking problems, but it introduces new ones. SDE world is a part of the answer, not the answer itself [6].

As our dependence on technology continues to grow, the technical problems faced by organizations change as well. Due to the forces of globalization, the dynamics of competition are changing. Organizations are likely already behind and companies are not taking advantage of these next-generation technologies. Cultural change in any organization is difficult since a lot of people have a fear of change.

The proliferation of SDE has blurred traditional boundaries across the board and caused confusion and disruption. Boundaries are blurred between who is an enterprise and who is a service provider. SDE has been regarded by some as disrupting business model in networking industry.

Conclusion

The Software defined everything world is rapidly evolving. Some link the emergence of a SDE approach to the Internet of Things (IoT), and also as an extension of the bring your own device (BYOD) movement. The scope of a software-defined everything initiative can be daunting. It potentially can affect every desktop, data center, server, and network device. Although the technical and market parameters of software defined everything are still shaping up and the technology continues to improve, the world of SDE is here to stay. In order to be well prepared for the future, one needs to understand the forces driving the rise of SDE.

References

[1]. C. Longbottom, "Throwing more software into the mix," *Computer Weekly*, January 2015, pp. 14-16.
[2]. M. N. O. Sadiku, M. Tembely, and S.M. Musa, "Software-defined networking concepts," *Journal of Scientific and Engineering Research*, vol. 3, no. 5, 2016, pp. 92-94.
[3]. "SDDC - software-defined data center,"
     http://www.webopedia.com/TERM/S/software_defined_data_center_SDDC.html
[4]. "Software-defined storage." *Wikipedia*, the free encyclopedia.
     https://en.wikipedia.org/wiki/Software-defined_storage
[5]. M. N. O. Sadiku, A. E. Shadare, S. Koay, and S. M. Musa, "Software-defined security," *International Journal of Engineering Research and Advanced Technology*, vol. 2, no. 10, Oct. 2016, pp. 13-17.
[6]. J. Mortleman, "Why 2015 won't be the year of software-defined everything," *Computer Weekly*, January/February 2015, pp. 12- 14.

About the Authors

Matthew N.O. Sadiku is a professor at Prairie View A&M University, Texas. He is the author of several books and papers. He is an IEEE fellow. His research interests include computational electromagnetics and computer networks.
Sudarshan R. Nelatury is an associate professor at Penn State University, The Behrend College, Erie, Pennsylvania. His teaching and research interests lie in electromagnetics and signal processing.

Sarhan M. Musa is a professor in the Department of Engineering Technology at Prairie View A&M University, Texas. He has been the director of Prairie View Networking Academy, Texas, since 2004. He is an LTD Spring and Boeing Welliver Fellow.