Chapter 18
Introducing Automation in Service Delivery Procedures: An Overview

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ABSTRACT

The combination of Software-Defined Networking (SDN) with Network Functions Virtualization (NFV) approaches is gaining momentum in the Industry as a new way of implementing, managing and controlling telecommunications networks. This chapter aims to go through SDN and lightly over NFV, presenting main characteristics and the standardization work on that technologies. SDN enables programming networks together with the ability to adapt to applications requirements and network dynamics. NFV aims at virtualizing network services by merging several network equipment types onto standard Information Technologies (IT) high volume virtualization technology (switches, servers and storage) located either in data centres, customer premises or network nodes. SDN and NFV interworking ambition is to bring on-demand resource provisioning, resource elasticity, among others with a centralized view of the overall network, able to automatically and dynamically honor service requirements.

INTRODUCTION

The Cloud Computing model began to be explored a few years ago and relies entirely upon basic distributed systems concepts (ITU-T, 2009). It was tackled for the first time in 1961 by John McCarthy, a computer scientist during a lecture under the celebration of the 1st centenary of Massachusetts Institute of Technology (MIT) foundation (Magoules, 2010). From a speech John McCarthy gave at MIT by that time he said: "If computers of the kind I have advocated become the computers of the future, then computing may someday be organized as a public utility just as the telephone system is a public utility… The computer utility could become the basis of a new and important industry." (Magoules, 2010). Cloud computing is, as mentioned above, based on the business model in which computational resources would be provided as a "Service". Providing computational resources or infrastructure as a service requires

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virtualization. As a matter of fact, virtualization is the technological basis of the Cloud.

Surprisingly enough, virtualization techniques were also first investigated in the 60s by IBM where large mainframe hardware was logically partitioned in order to take advantage of idle processing capability, allowing mainframes to execute multiple applications and processes simultaneously, thereby optimizing the investment.

In the 80s and 90s three important factors put the virtualization in standby:

1. Intel x86 architecture enabling the microprocessor mass market debuting with the IBM Personal Computer (PC) (Intel 8088),
2. Client-server paradigm, and
3. Desktop applications.

The widespread adoption of Windows and the emergence of Linux as server Operating Systems, in the 90s, established x86 servers as the industry standard.

From that time the use of a PC becomes a commonplace and sharing a computing resource among many users by means of multiprogramming and multi-tasking was no more an issue.

In the 90s, based on the x86 architecture, computers have the same underutilization problems as mainframes had in the 60s. Again, as before, why not taking advantage of all the computational power possible? Following this idea, VMware has created, in the 90's, a virtualization for the x86 platform to deal with underutilization and other issues, overcoming many challenges in the process. The result is a virtual machine that is equivalent to the host hardware and maintains complete software compatibility. VMware pioneered this technique and today is the leader in virtualization technology that is the technological basis of the Cloud.

By the same time appears the concept of Grid Computing, where computer resources from multiple domains are shared to achieve a common goal. One example was the scientific initiative called SETI@home (SETI staff, 2014) that uses computers (resources) connected via the Internet to search for extraterrestrial intelligence.

Service utility, grid computing, virtualization and a broadband Internet access have created the Cloud computing momentum where the IT resources are available on-demand using the pay-as-you-go model.

Adherence to mobile communications has caused an exponential increase in existing mobile devices and mobile users demanding for better quality of service. This implies to have, among other considerations, better content delivery and self-organized networks due to the dynamic change of assets. This also encourages the use of automation techniques for accelerating service provisioning, but also for better mastering network evolution and dynamically enforcing service policies. Software-Defined Networking (SDN) are among those techniques that have emerged based on the promise to improve the efficiency of the overall service delivery procedure by means of programmable, centrally controlled networks, thereby providing an easy way to deploy new services according to specific user demands, as well as tuning network policies and performance.

Driven by operational savings and CAPEX budget constraints, operators are moving from proprietary hardware solutions to a more generic computing environment. Foreseen savings brought by lesser needs to proceed with periodic hardware replacement and lower integration costs, but also to overcome hardware obsolescence sometimes aggravated by heterogeneous proprietary systems, elasticity based on Software, Platform and Infrastructure as a Service (SPIaaS) are as many requirements that further encourage the use of NFV techniques.

1. SDN AND NFV PERSPECTIVES

This chapter will present a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis that put in perspective the challenges and opportuni-

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