

# Chapter 10

## Network Virtualization: Network Resource Management in Cloud

**Kshira Sagar Sahoo**

*National Institute of Technology Rourkela, India*

**Ratnakar Dash**

*National Institute of Technology Rourkela, India*

**Bibhudatta Sahoo**

*National Institute of Technology Rourkela, India*

**Mayank Tiwary**

*C. V. Raman College of Engineering, India*

**Sampa Sahoo**

*National Institute of Technology Rourkela, India*

### ABSTRACT

*Cloud computing is a novel paradigm which relies on the vision of resource sharing over the Internet. The concept of resource virtualization, i.e. hiding the detail specification of the resources from the end users is the key idea of cloud computing. But the tenants have limited visibility over the network resources. The Network-as-a-Service (NaaS) framework integrates the cloud computing services with direct tenant access to the network infrastructure. The Network virtualization (NV) is such a platform that acts as a mediation layer to provide NaaS to tenants. NV supports the coexistence of multiple virtual networks, which is the collection of virtual nodes and virtual links on the same underlying physical infrastructure. Prior to set up a virtual network in an NV Environment, resource discovery and resource allocation are the primary job. In this chapter, we have discussed on basic NV architecture, surveyed the previous work on the resource allocation along with ongoing research projects on network virtualization.*

### INTRODUCTION

The term virtualization means it is the creation of a virtual version of the actual one, such as an operating system, a server, a storage device or network resources. Anyone who uses computers, video games, cell phones, PDAs, or the Internet, it means virtualization is being used.

Virtualization is an old but very popular technique for resource sharing like CPU, memory, storage and almost all other system resources. Fundamentally, virtualization is an abstract concept that hides

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hardware details. It refers to the technologies designed to provide a layer of abstraction between computer hardware systems and the software running on them. By providing a logical view of computing resources, rather than a physical view, virtualization technology provides numerous benefits to the industries and end users. The most common thing in the various virtualization method has generally divided a single piece of hardware into two or more segments. Each segment operates as its own independent environment.

Recently, virtualization has moved its trend from server virtualization to network virtualization. Server virtualization is a decade ago popularized technology. Server virtualization also termed as host or computer virtualization. It is a masking method of server resources, including the identity of physical server being used, processors, and operating system for the server uses. The server administrator uses an application which divides one physical server into multiple isolated virtual environment. These virtual environments sometimes known as a guest, instance or emulation. This server virtualization is a key enabler of cloud computing. It has been more popularize due to numerous benefit of it, among them sustainability of computing resources, on-demand provisioning, flexible management, reliability management etc.

The most common usage of this technology is in Web servers. Using virtual Web servers is a popular way to provide low-cost Web hosting services. Instead of demanding a separate computer for each Web server, dozens of virtual servers can co-reside on the same computer. Network Interfaces are virtualized in server virtualization, but ignores any kind of virtualization of the network devices, such as switches and routers.

The network virtualization decouples the network infrastructure from its provided services and it allows many isolated virtual networks to share the same physical network infrastructure. Similar to VMs in server virtualization, the virtual networks can be deployed on demand and resource are dynamically allocated which maximizes the reusability. Each virtual network gets the functionalities ranging from simple connectivity to performance guarantee and new protocol provisioning.

In this article we are emphasizing on the architecture, design goal, resource allocation in network virtualization and current research projects on network virtualization.

## **CONCEPT BEHIND VIRTUALIZATION AND ITS BENEFITS**

The concept of virtualization has been used since the sixties when the time sharing concept was introduced. Later, M44/44X Project had started from the IBM Watson Research Centre. Testing of timesharing was the main subject of this research. Then after the virtual machine monitor (VMM) came, which had the ability to create multiple virtual machines (VM). A VM is a self-contained operating environment that performs as if it is a distinct computer. It is also termed as a “guest” that created and run within another computing environment referred as a “host”. At a particular time multiple VMs can run within a single host. Each instance of VMM have capable of running its own operating system. After four decades, industries are generalizing the fundamental technologies of virtualization where they are managing the resources in a more efficient way and provide services to the customers.

The virtualization mechanism provides a number of benefits to the service providers and everyday users. Some important benefits are described below.

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