

# Comprehensive approach to optimization of network resources in a virtual data center

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## 1 Abstract

Today, telecommunication networks are the basis for deploying various types of applications and services in data centers. The growing use of the cloud computing concept to provide access to applications and services every year increases the amount of converged network traffic. Physical network infrastructure of data centers do not always have time to opportunely adapt and scale existing solutions for the current tasks of the users. The main problem for data centers is a dynamically changeable structure of the circulating flow of network traffic. To improve the efficiency of using and scaling the existing architectures in the data centers, they use solutions based on the virtualization of resources. One of the complex solutions is the creation by using a software-defined infrastructure the virtual data centers. This solution is based on a software-defined network. But, existing approaches based on software defined-network don't provide enough flexible solutions, able to adapt to changes in traffic flows in real time. At peak load, this leads to an overabundance of traffic to specific physical network nodes which are not prepared to handle a large data flow.

For the efficient use of physical network resources necessary to carry out the monitoring and analysis of circulating traffic. This problem can be solved by using software and hardware solutions for monitoring objects and network resources of the data center.

In this paper are describes the development of an efficient algorithms for developed approaches for effective control of traffic flow in the virtual data center, based on the methods used in the data mining and machine learning to more accurately classify and identify flows of cloud applications and using network services for optimization of launch and deployment of applications and services in the virtual data center infrastructure using different placement methods. We propose an efficient algorithm for placing applications and services in the infrastructure of a virtual data center. The problem of optimization of placing service-oriented cloud applications by using the templates of virtual machines (VM) or containers with disabilities infrastructure virtual data center is reduced to the problem of packing in containers We also generalize the well renown heuristic and deterministic algorithms of Karmakar-Karp and Kor. We have developed an efficient algorithm to placing VMs by neural network optimization.

Our research has shown that static placement of containers on the physical nodes is not effective because it does not allow to redistribute the load quickly.

Placing applications based on virtual machines due to the flexibility of load balancing showed better results, but the load on the compute nodes has increased considerably due to the additional overhead associated with the use of VMs. The most effective placement of the study was the use of containers inside the virtual machines. It is possible to increase the density of application hosting and control services and applications in the virtual data center, as well as allowed to place containers and data services and network applications in close proximity to each other thereby reducing the response time of applications on users queries. Thus increase the efficiency of the system.