Virtual Network Mapping on a Physical Substrate

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***Abstract*—Network virtualization has shown to be a promising base technology for the future internet, by allowing the creation of multiply independent virtual networks on the same physical network. One of the open issues that needs to be further analysed for the deployment of the technology is the virtual network resource allocation on the network substrate. Considering the requirements of the nodes and links of the network, the problem is NP-Hard, so it is intractable. The aim of this proposal is to present one effective, efficient and realistic solution for the virtual network mapping in the physical substrate problem.**

I. Introdution

One of the most important issues that is still open in the network virtualization approach is to determine how to allocate the nodes and links of a virtual network on the physical network [1] [2], which is called the virtual network mapping on the substrate network problem. Considering all the links and routers caracteristics the problem is NP-Hard, even considering the knowledg of all the virtual network requests before they arrive [2]. A lot of solutions based in heuristics [2], approximatives [1] and the reduction of constraints for this type of problems [3] [4] have been proposed.

Most of these proposals take restrictive assumptions to make the problem treatable, such as: (1) consider that all requests for the establishment of virtual networks are known in advance [3] [4], (2) assume that the substrate has infinite capacity, ignoring its specific characteristics [4] [5] and (3) individualize the virtual network topology [3]. The algorithms proposed so far can be classified into two major groups: (1) those who map virtual network on the substrate using greedy algorithms [4] and (2) those who use solutions based on shortest path routing (*shortest path*) or *multi-commodity flow* [1].

II. Goals

The aim of this work is to propose an algorithm for mapping virtual networks on the substrate network that would consider the substrate limitations and the requirements of virtual network requests. The algorithm should consider the resource heterogeneity, the existing functionalities of the substrate and the functional demands of the virtual network. The algorithm should take into account requests the arrive dynamicall and with a unknown form and it should establish the virtual network in a practical execution time.

The principal goals are:

- Compare the algorithms that have already been proposed;
- Implement an eficient algorithm that maps the virtual network onto a shared physical substrate
- Validate and evaluate the algorithm's performance

III. Metodology

The mapping problem is essencially a combinatorical problem. It is pretended to use the optimization theory to model the problem, for instance a problem with integer and real variables. The optimization problem will be embedded in a simulator, so it can generate dynamic requests and test the effectiveness of the algorithm in that environment. The few existing simulators for this problem will be evaluated and if another funcionality or facility is necessary it is intended to develop a simulator/emulator extending one of the existing ones, like CLICK [6] that executes together with ns-3.

IV. Expected Results

It is expected that this proposal develops an efficient algorithm that takes into acount realistic networks and that it may be implemented in real routers. If the goals are completely reached, the results will lead to a theorical advance in this area and will allow for technological innovation.

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