

# Resource Allocation Policies in Future Multi-Agent based Virtual Networks

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**Abstract**—This proposal discusses management issues that arise in a future virtual internet controlled by multi-agents. How can we, even though the system is self regulating, control the system by using policies based on service level agreements (SLA)? How should policies be implemented within a multi-agent, and how should it behave in order to control resource allocation while providing a fair share of resources for the virtual networks running on a shared substrate [1]? This proposal tries to find some of these answers in adapting and extending Xen [2], so it may be fed abstract high-level policies, that implement bandwidth reservation and provide a stable and fair resource allocation scheme, which respects the given policies while distributing resources amongst virtual networks.

## I. INTRODUCTION

By analyzing recent work in multi-agent-, virtualization- and policy-research [3], we try to find the meta-process that translates the service level agreement between internet service provider (ISP) and customer to the control mechanism within a multi-agent [4], which in this proposal will be called a "behaviour". By focusing on bandwidth-reservations for virtual networks we intend to find out how this process might work in future virtualized networks. The fair distribution of resource allocation within these networks is not easy since beforehand it is not known how many networks will be concurrently running on the substrate network of the ISP, nor is it clear how many virtual routers are essentially running on the same substrate server.

## II. FUNDAMENTAL PRINCIPLES

By analyzing autonomic systems [5] we will try to find out in which manner high-level abstract policies [3] can be fed to the agents as they are being controlled by the various planes [6] within a complex system.

## III. CONTRIBUTION

In assessing the merits of autonomic virtual network management in order to solve the current problems of internet ossification, we must among other aspects, find a manner to govern these virtual networks (VN) on a common substrate network (SN). Just autonomy will not solve all scale-problems for the future internet. Other aspects include the algorithms [7] that help in the assignment of VNs on top of SNs. A substrate network provider (SNP) must be in full control of the VNs that run on its infrastructure. The proposed algorithms try to map the VN represented by a graph, on the common SN while

preserving connectivity of competing networks. The policies governing these algorithms within VNs merit research since these will form the human interface in order to stay in control. Not only must we find virtualization platforms that essentially form an operating system for the internet-core, but we must also define the interfaces that govern them. This research will try to solidify our knowledge about the principles at work to unite all techniques that are part of this orchestration.

One primary goal is to be able to reserve a certain amount of bandwidth as part of a service level agreement (SLA) between contractor and SNP. While writing up such a contract, the technical installation must be able to implement its various aspects. How can we control and propagate such aspects in a future distributed autonomous network? How does the system react in case of error or catastrophic events and how does the system recuperate from it, while respecting the various policies and guarantees that were fixed in the SLAs with the SNP customers?

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