Teaser: Beneficial interaction between Network Virtualisation and Cloud Computing?

Network Virtualization has gained an increasing prominence in networking and telecommunications fields in the last couple of years. Initially, the interest in network virtualisation was mainly pushed by Future Internet research initiatives, principally with the objective to find a platform on which novel Internet architectures could be experimented and evaluated without limitations or constraints, namely those associated with the traditional IP model.

Later on, it became clear that virtualisation could constitute a key component of next-generation Internet architecture itself, and not just as a mere platform for experimentation. Perhaps more importantly for network operators, it also became clear that network virtualisation could provide a number of short/medium term business advantages, with potential reduction of costs and increase of revenues, as an interesting tool from an operational point of view.

In the meanwhile, mostly driven by the deployment of IT applications to leverage the economy of scale and multi-tenancy, Cloud Computing has expanded to a much more diversified environment. Applications that show high degree of variable demand for resources fit the cloud computing model well. The advantages of running applications in the cloud are manifold: lower costs through shared computing resources, no upfront infrastructure costs, and on-demand provisioning of computing nodes to fit transient requirements. Virtualisation in the data centres has been a key enabler to allow the dynamic provisioning of computing resources to become a reality.

An aspect that has been so far overlooked is the fact that the cloud computing model relies on connectivity end-to-end and thus on the network in between the user and the cloud. As applications move to the cloud, more will be demanded from existing networks in terms of capacity (likely more data to be sent across network links), quality (low delay and constant jitter for interactive applications), security, and many more.

Clearly, cloud applications will demand a network that is more flexible. Since applications and entire cluster of servers can be relocated to another data centre all of the networking pipes need to be re-plumbed.

Before trying to merge these two concepts, Network Virtualization and Cloud Computing, one must realize that they have different aims and usages.

How to better embed different kinds of virtual servers, i.e. game servers, stream servers, voip servers, remote desktops, into the cloud in conjugation with the embedding of the virtual networks? What are the main constrains, regarding different types of services for different types of virtual networks?

How can Cloud Computing benefit from the use of Network Virtualization when dealing with virtual resource mobility, moving cloud resources from one physical spot to another, across different infrastructures of the same cloud provider or of different cloud providers? For different reasons, cheaper price, lower link delay, higher bandwidth, host with better specifications.

And what are the main concerns when talking of resource mobility, downtime of the cloud resource, overload of the physical hosts, who perform the migration operation, overload of the physical connection between the two hosts...

How can Virtual Networks benefit Cloud Computing regarding security between the users and the cloud or even between clouds, i.e. different clouds exchanging data among them?