INTRODUCE DYNAMIC SERVICE CHAINING BY USING SDN & NFV TECHNOLOGIES

The difficulties faced when implementing network services continue to present a challenge to organisations, both from an organisational perspective, as well as from a technical perspective. This document provides direction on how organisations can deal with the challenge of introducing service chaining and deploying critical network services by using the emerging technologies of Software Defined Networking (SDN) and Network Functions Virtualisation (NFV).

INTRODUCTION

The term "service chaining" is defined as a series of service functions, which a packet must flow through. In itself, service chaining is not an entirely new concept; the reason for its gaining popularity is due to advancements in technologies such as SDN and NFV, which allow for dynamic service chaining. Dynamic service chaining refers to software controlled service chains, where the traffic for a given flow is intelligently steered towards the appropriate network functions based on a number of labels, such as customer profile, service type and traffic patterns.

These advancements allow network operators to benefit from reduced Operational Expenditure (OPEX) and Capital Expenditure (CAPEX). In addition to this, these two technologies have the ability to generate new streams of revenue, as they provide the means for service providers to develop and deploy new services at a pace not achievable with traditional networking methods.

EVOLUTION OF SERVICE CHAINING

TRADITIONAL SERVICE CHAINING. Today, network services, also called "enablers", are typically deployed as hardware appliances, which are physically connected. These devices play a pivotal role in network operators achieving the security and performance they desire. Examples of such devices include the following:

- Firewalls
- Traffic Optimizers
- Network Address Translation (NAT) devices
- Web Proxies
- Load Balancers

These devices are used to support a variety of applications. In the static service chain model, all traffic will have to flow through each of the enablers, even though only a subset of these services may be required. This means that the various appliances implementing these services will have to have enough capacity to manage the full traffic pipe, even if they will just have to let the flow pass-through without processing it. This also means that each service function will have to have its own internal capability for deciding whether a traffic flow has to be processed or dropped.

There are several limitations to this approach:

- All services have to be designed with a pessimistic approach, building them for the maximum possible capacity.
- As the traffic requirements increase, all services will have to increase in capacity, regardless of their actual usage; this could mean that sometimes even discontinued or very low-usage services will have to be scaled-up.
- There is little to no granularity in how the traffic is labelled and in how services are applied to specific flows (i.e. no per-customer or per-application service labelling).

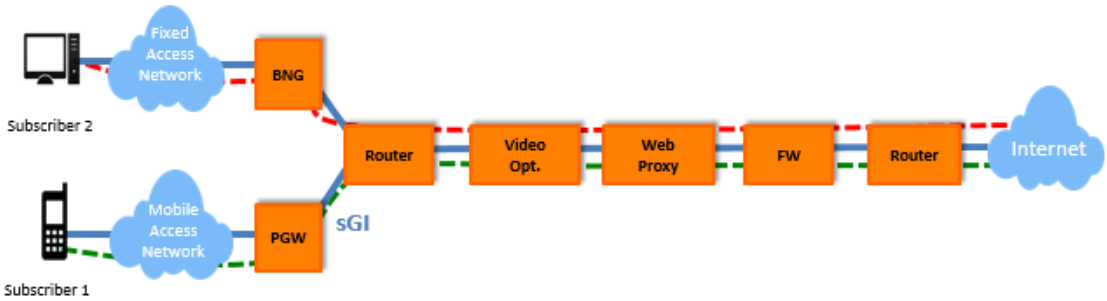

Figure 1: Example service function chain implemented by network operators today

In the example scenario illustrated in Figure 1, Subscriber 1 wishes to access video content on their mobile device. The user would simply need the video optimisation service, as well as basic firewalling. However, the user's traffic will have to traverse the entire chain. Adding to this, services must often be applied in a specific order, which implies the need for complex routing techniques and VLANs to ensure that this performed correctly. This example highlights the sub-optimal use of network and compute resources, as the entire service chain has to be traversed, regardless of whether this is required or not.

For a given service chain, which will be used to support a new application, the operator must first identify if existing appliances/topologies are able to cater for the application's needs. If not, a new topology must be considered; network devices must be purchased, physically connected and manually configured. This is a laborious and complex process, prone to inconsistent configurations and errors, which may delay the deployment of any new service. Adding to this complexity, operators must take into account traffic growth, which may only be required sometime in the future.

For instance, in the case where the application's user base grows or there are seasonal peaks where the application is being used more often, operators have to constantly overprovision their network to cope with traffic based on estimates, when in reality the volume of traffic may never actually reach the expected level.

DYNAMIC SERVICE CHAINING. With SDN and NFV however, physical devices are replaced by virtual machines, which accelerate an operator's time to market for a new service. The reason for this is that, in SDN, the centralised controller has a global view of the network, which allows for new service chains to be created by a simple change in policy associated with a flow.

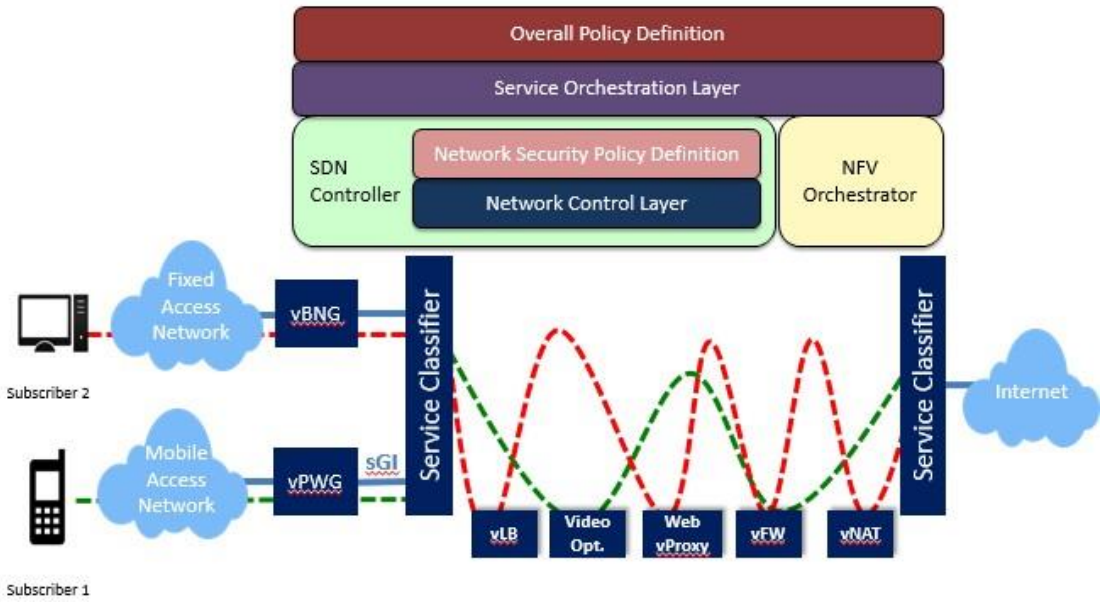

Figure 2: Example of dynamic service chain using SDN & NFV

As illustrated in Figure 2, when traffic arrives at the network gateways, it is now labelled by a dedicated classification device with the use of deep packet inspection (DPI). The traffic is then intelligently forwarded to the required services, based on the service identifier. The identifier itself can be derived from a field in the traffic such as: network service header (NSH), virtual local area network (VLAN), Source MAC Address (SMAC), or it can be directly programmed in the switch flow-tables. This allows for network and compute resources to be used more efficiently, as traffic only flows through the required services. The provider is thereby relieved from continuously having to over-provision the network.

As proof of this benefit, in a case study with a Tier-1 service provider. An SDN based service chaining solution allowed the provider to reduce capital expenditures for a service by 80%.

BENEFITS & OPPORTUNITIES

The following are benefits that operators can realise by leveraging dynamic service chaining in their organisation:

- **Reduced time to market:**
  - The SDN controller will configure each device thus eliminating inconsistent configurations when done manually.

  - New service chains can be created by simply defining the policy for a given subscriber. This offers operators much greater flexibility and control, as service chains can be fine-tuned with granularity. This ensures the appropriate level of service, based on the customer's contract.

- **OpEx reduction:**
  - **Network maintenance:** A subset of network traffic can be forwarded to live test environments, where newer versions of software can be tested thoroughly. This allows operators to quickly revert back to stable versions if required.

- **CapEx reduction:**
  - **Traffic optimisation:** The controller intelligently steers traffic only to the services that are required, helping providers to avoid overprovisioning their network, but scale-up and invest only based on real capacity needs.
  - **Hardware cost reduction**: Due to the virtualisation of network services, organisations no longer need to deploy specialised vendor appliances, but can rely on commodity hardware instead, thus unifying hardware purchasing models.

CONCLUSIONS

With the help of innovative implementations brought in by SDN and NFV, dynamic service chaining is set to change the way in which network operators deliver services to their subscribers, giving them an unprecedented agility to design, deploy, manage and upgrade each service specifically tailored to their individual customers' needs.

This will in turn result in a better user experience for the customers, as providers will be able to work closer to their needs. In addition, maximising the potential of the service delivery infrastructure will help operators in making every service profitable and valuable, thus enabling faster ROI and a whole new set of revenue opportunities.

SYTEL REPLY'S OFFERING

Through its distinct competencies, Sytel Reply assists clients in realising the benefits and dealing with the impacts of the disrupting technologies on their environments. Sytel Reply leverages real-world experience in SDN & NFV consulting for the TMT market, having worked with global Telco providers and established strong relationships with all major SDN vendors.

Through active collaboration with various vendors and , by forming partnerships with educational institutions, as well as performing internal research & development, Sytel Reply creates and supports innovative projects around new technologies, such as SDN & NFV.

Some of the more detailed offerings in the area of SDN & NFV include, but are not limited to, the following:

- SDN/NFV Requirements Definition
- Solutions Evaluation (including RoI, TCO)
- Architecture Design and Technical Consulting
- Security Assessments
- Proof of Concepts (PoCs) Design, Plan and Testing

Sytel Reply builds upon this knowledge and partners with its clients to define their strategy and identify the trajectory they should follow towards adopting these disruptive technologies, for future proofing their environments and their investments. Sytel Reply builds on the basis of understanding the customer requirements and selecting the optimal solution towards programmability, service agility, automation and openness in their networks, in a vendor agnostic way.

REPLY
SYTEL

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Sytel Reply, thanks to its in-depth competence and experience, boasts a team of highly skilled professionals with a mission to support clients in managing technology and business disruptions, which they are facing during business transformation and technology innovation programmes.

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