How Often Should I Slice My Network?

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ABSTRACT

Future mobile networks will use a virtualization tool called *Network slicing* to support the expected myriad of data traffic of the 5G paradigm. This poster illustrates its implications quantifying the efficiency gains with reconfigurable allocation strategies of different kinds of resources, from radio access to the core of the network, at different timescales.

KEYWORDS

Network slicing; resource management; network efficiency

1 INTRODUCTION

Current trends in mobile networks point that operators will cope with service heterogeneity by means of virtual instances (*i.e.*, slices) of the network with: (1) dedicated resources allocated; (2) customized Quality of Service (QoS) guarantees and network Key Performance Indicators (KPIs). Operators can adopt different strategies, having slices reach specific depth in the network architecture (due to business strategies, or QoS requirements of the services). Nowadays, a variety of solutions have been proposed for the dynamic allocation of resources across network slices [3]. However, their implications in terms of efficiency of network resource utilization require a deep analysis about the reconfiguration intervals.

2 METHODOLOGY

We evaluate the efficiency of resource allocation in a sliced network by considering a realistic case study in a large metropolis, of several millions of inhabitants, situated in Europe. Service-level measurement data was collected by a major operator with a national market share of around 30% over three months in 2016. We leverage its real-world traffic demands to define network levels under a wide range of reconfiguration time intervals τ. We associate antenna sites to the number of nodes $\mathcal{N}_\ell$ at network level ℓ as described in Table 1.

Note: The data set preserves user privacy in compliance with applicable regulations.

ℓ		1	9	12
Traffic per node		5	300	2334
$\mathcal{N}_\ell$	Metropolis	422	8	1

Table 1: Normalized average mobile traffic per node serving a reference urban region at network level ℓ.

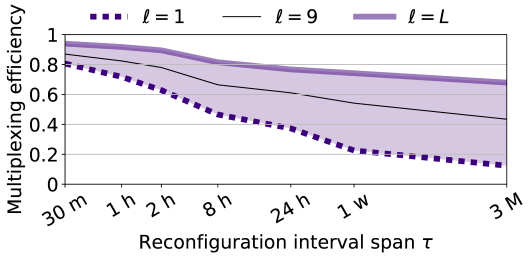

Figure 1: Efficiency of slice multiplexing versus τ.

3 RESULTS AND CONCLUSIONS

We analyze resource multiplexing efficiency in a sliced network from a perspective of equipment to be deployed to meet the instantaneous demand in Figure 1. This relates to the capital expenditure (CAPEX) incurred by the mobile network operator, typically hardware and infrastructure costs. We highlight the following takeaways:

Dynamic resource assignment must be rapid. Substantial gains will only be attained if the virtualization technologies enable a fast enough re-orchestration of network resources. Artificial intelligence and machine learning are promising techniques to accomplish this [1, 2] and are being brought into the network management landscape by standards [2].

Aggregating services is beneficial. Aggregating similar services into the same slice increases the system efficiency significantly, yet this comes at the price of losing the ability to provide a customized treatment to each service.

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