

Paper Review: Applying NFV and SDN to LTE Mobile Core Gateways; The Functions Placement Problem

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Problems in NFV and SDN implementation



- **Increase in network load**
 - traffic needs to be offloaded to a datacenter
- **Increase in data-plane delay**
 - Virtualization adds to delay

Goals



- **VNF placement while minimizing network load (also SDN control overhead)**

- **The constraints:**
 - **Data-plane delay**
 - **Number of potential data centers**

Virtualized (V) or Decomposed (D) VNFs



- **LTE mobile core functions which involve both control and data-plane functions:**
 - **SGW – Serving Gateway**
 - **PGW – Packet Gateway**
- **Control-plane functions (LTE signaling/resource allocation)**
- **Data-plane functions (GTP Tunneling in PGW)**

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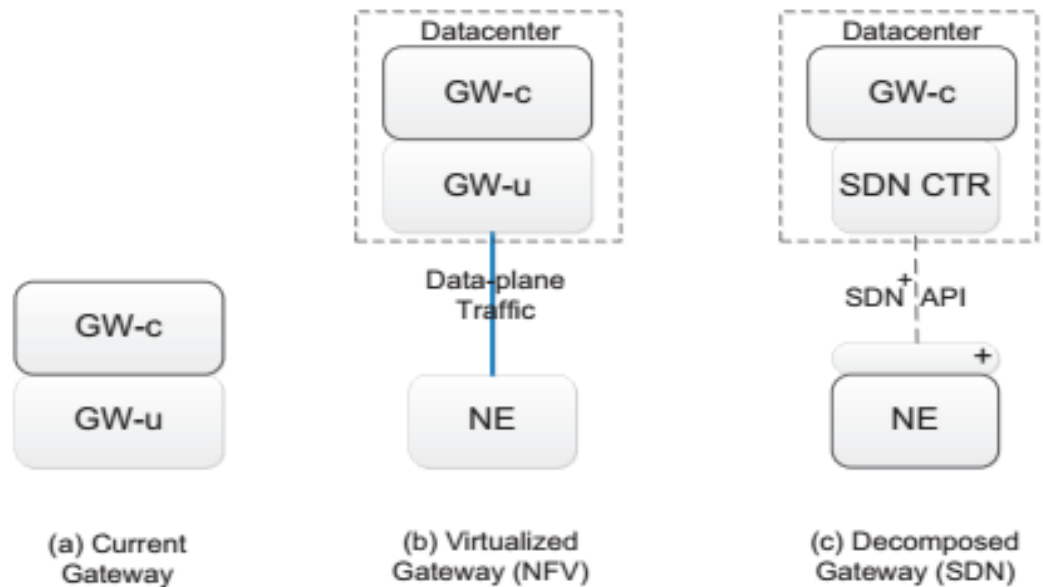


Figure 1: Mobile core gateways re-design

Mean Packet Processing Delay

Table 1: Mean packet processing delay

no. of Tunnels	10	100	1 K	10 K
bits/sec	1 M	10 M	100 M	1 G
packets/sec	83	830	8.3 K	83 K
Virtualized GW T_{proc}	$62 \mu s$	$83 \mu s$	$109 \mu s$	$132 \mu s$
Decomposed GW T_{proc}	$15 \mu s$	$15 \mu s$	$15 \mu s$	$15 \mu s$

Paths for traffic demand

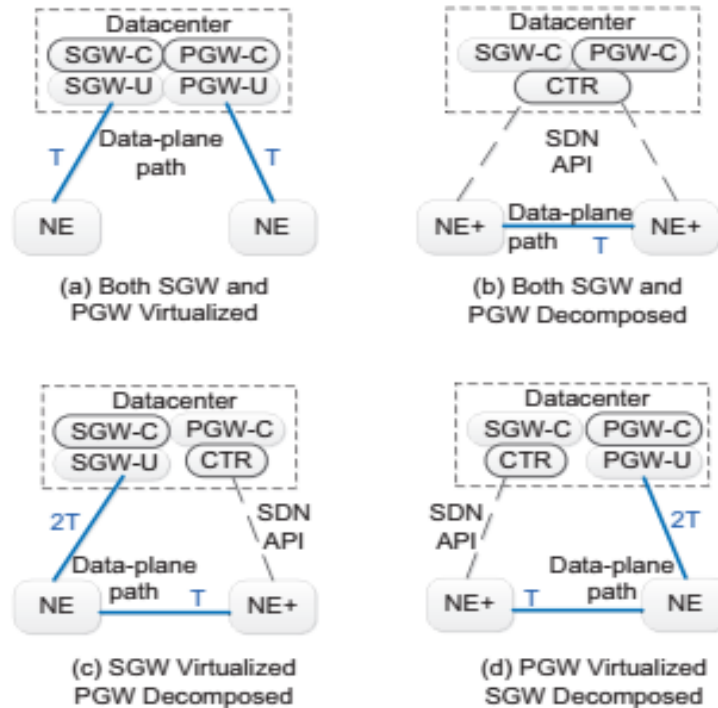


Figure 2: Alternative paths for data-plane demand between SGW and PGW, demand volume = T

Presumed Core Gateways (Topology)

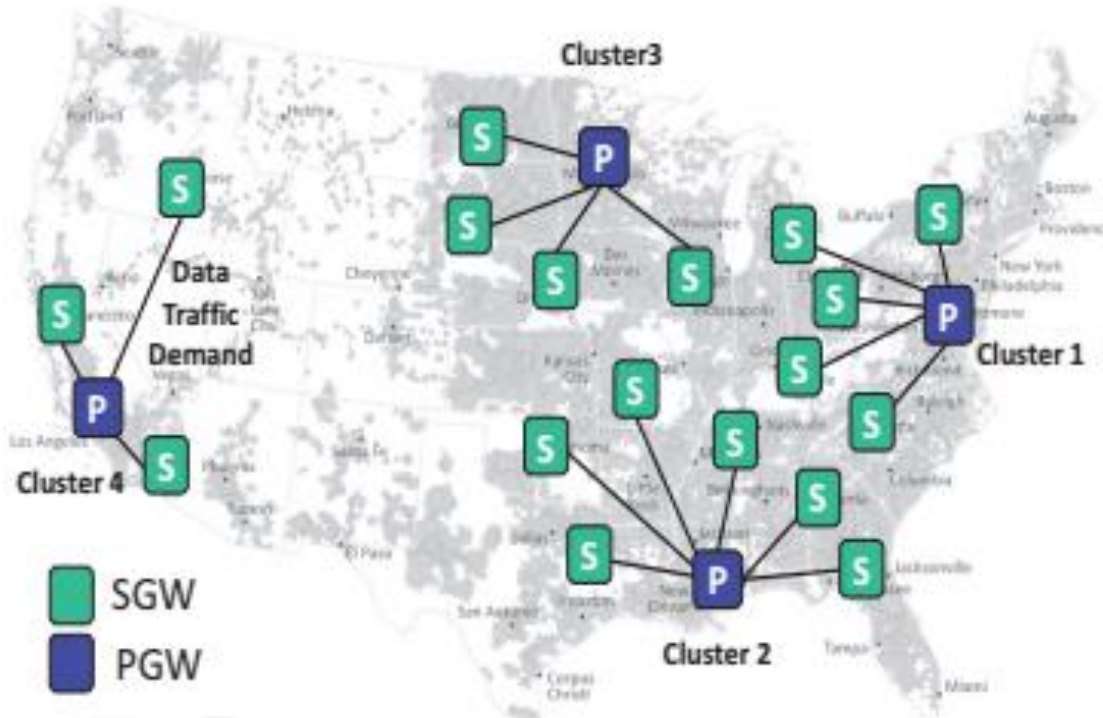


Figure 3: Presumed core gateways topology based on LTE coverage map in [15]

Results

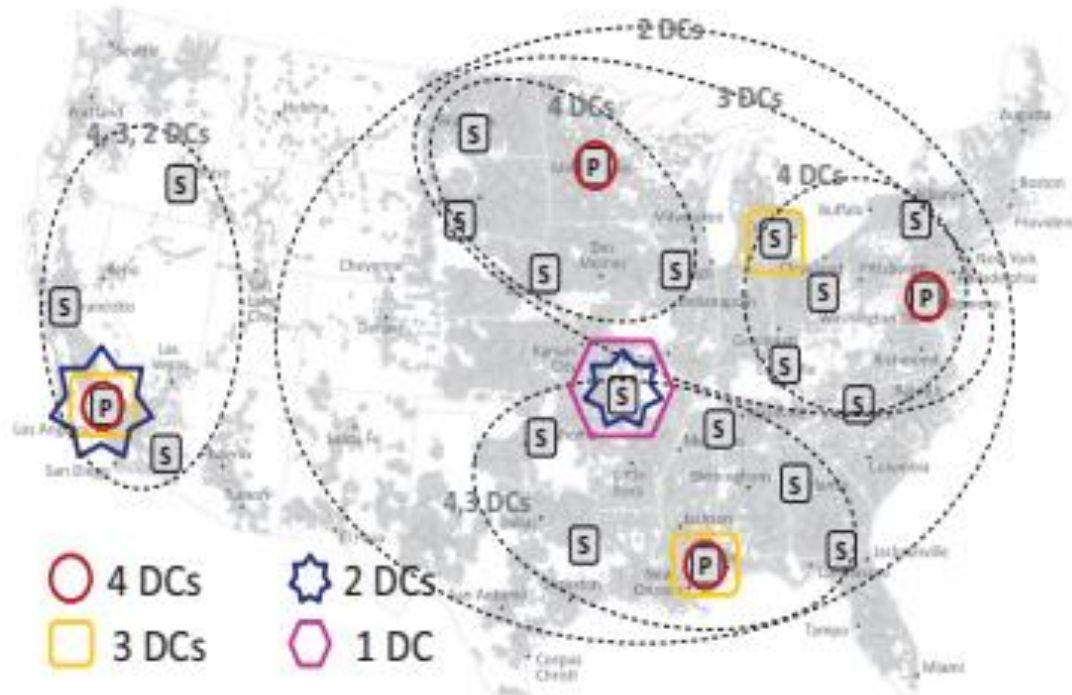


Figure 4: Datacenters location at $K = 4, 3, 2, 1$

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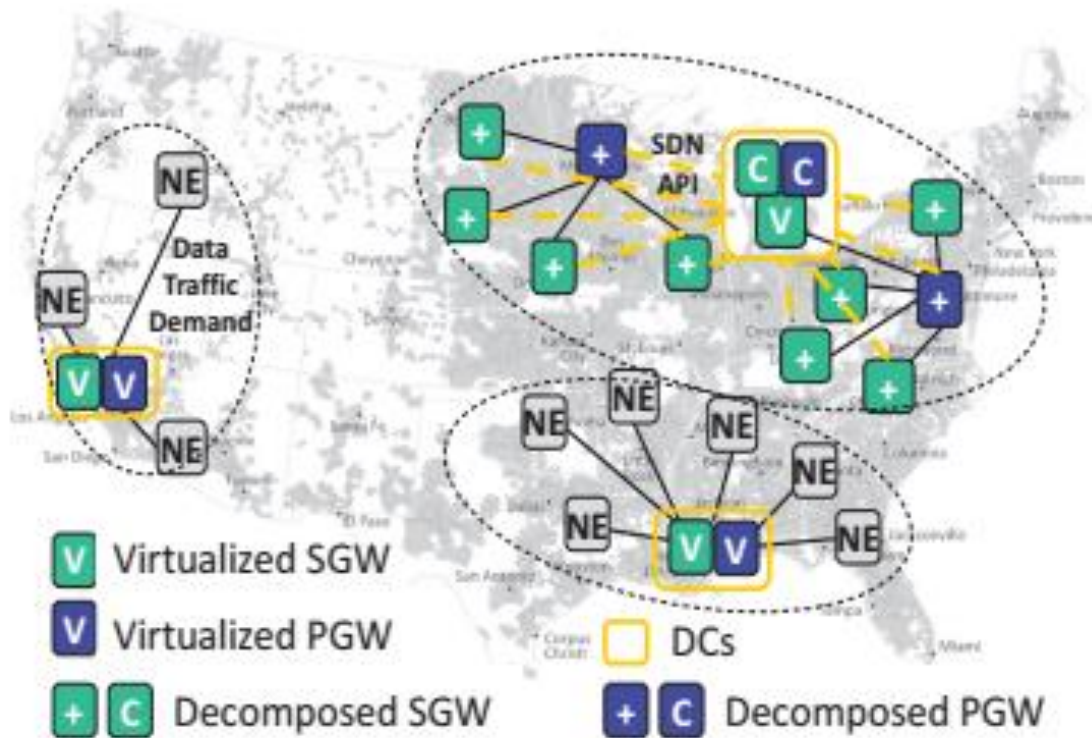
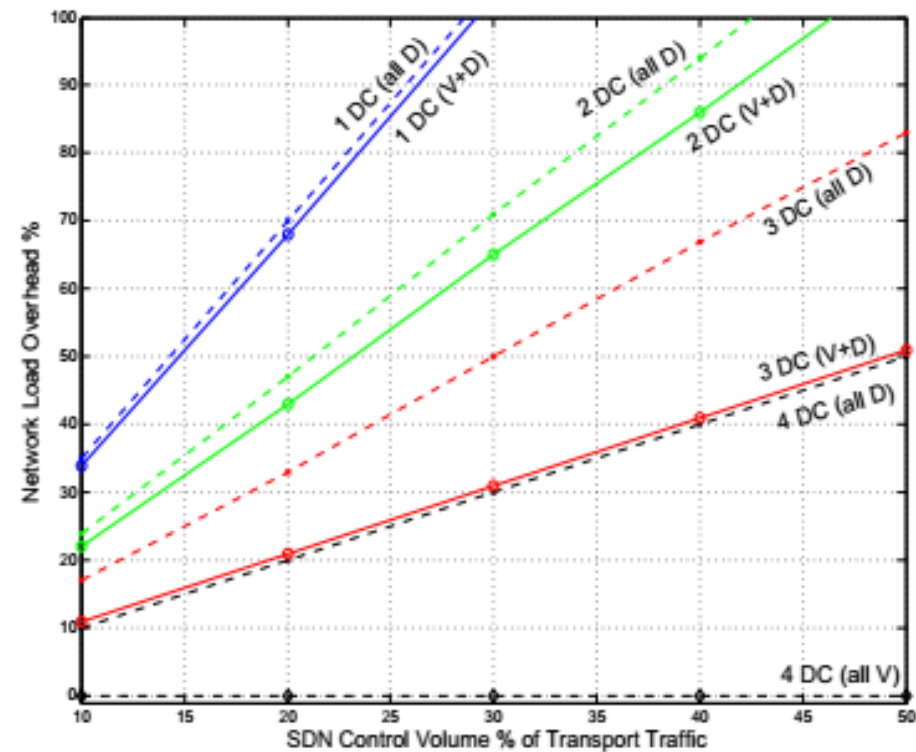
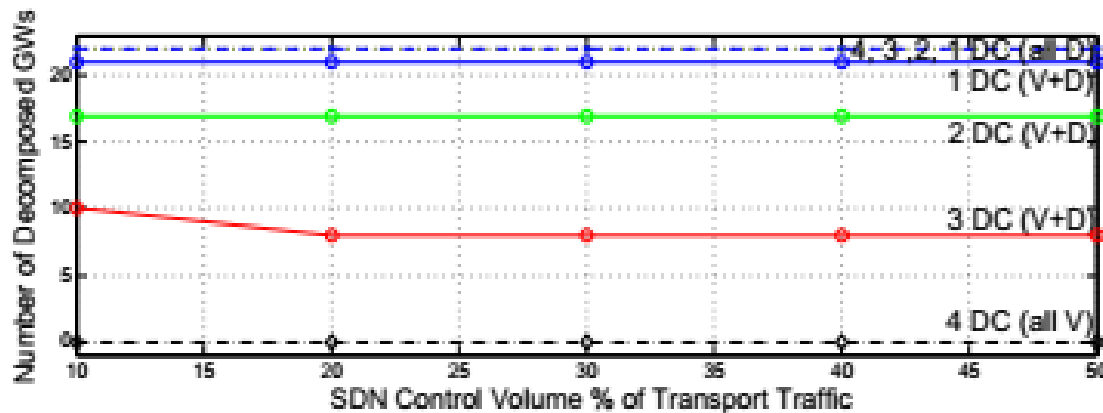


Figure 5: Functions placement at 3 datacenters with SDN control of 10% under 5.3 ms delay budget

Delay Budget - 5.3 ms

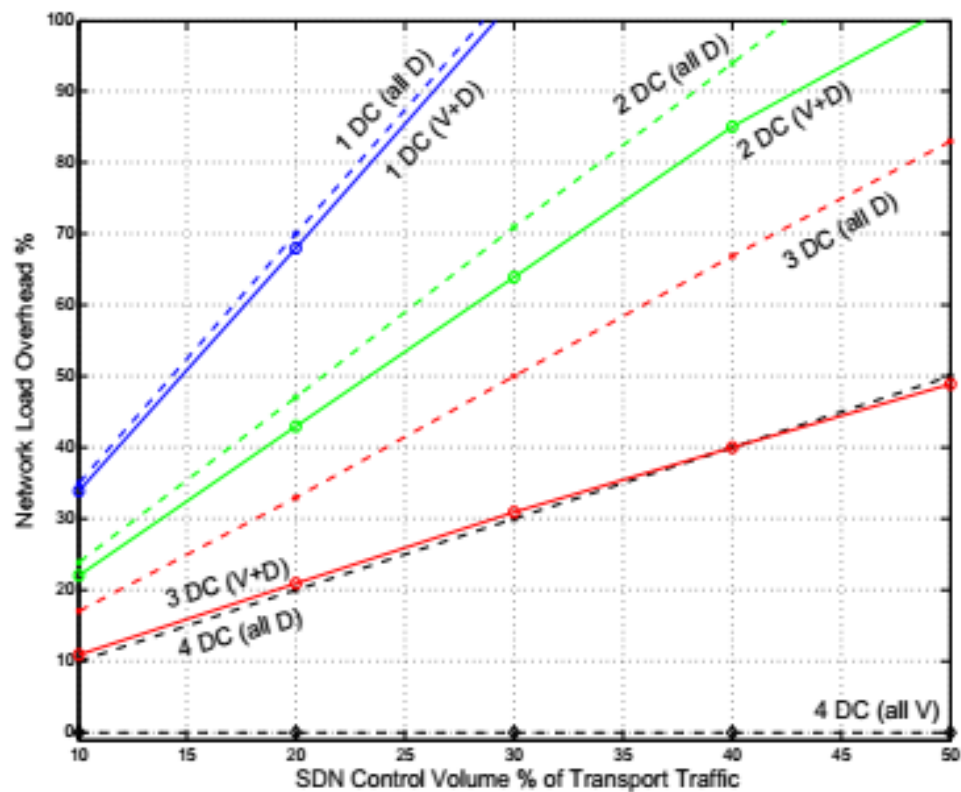


(a) Network Load



(b) Transport Network Elements

Delay Budget - 10 ms



(a) Network Load

