

Internet and 5G Tussles and How To Mitigate Them by Re-engineering SPNP

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5G and Internet tussles

David D. Clark et al. "Tussle in Cyberspace: Defining Tomorrow's Internet" on tussles :

"Today, this is the way the Internet is defined—by a series of ongoing tussles. Different parties adapt its mix of mechanisms to try to achieve their conflicting goals, and others respond by adapting the mechanisms to push back. ...

The challenge facing Internet research and engineering is to recognize and leverage this reality – at minimum to accommodate it; if possible, to use it to strengthen the technical architecture. In other words, the technical architecture must accommodate the tussles of society, while continuing to achieve its traditional goals of scalability, reliability, and evolvability. This expansion of the Internet's architectural goals is a difficult, but central technical problem."

Multi-actor value chain of 5G and Internet services. Diverse, conflicting goals of stakeholders result in tussles:

Optimal Destination/End-point Selection by the Online Service Provider (OSP) without knowledge on the network, no business coordination to reach a mutually beneficial outcome.

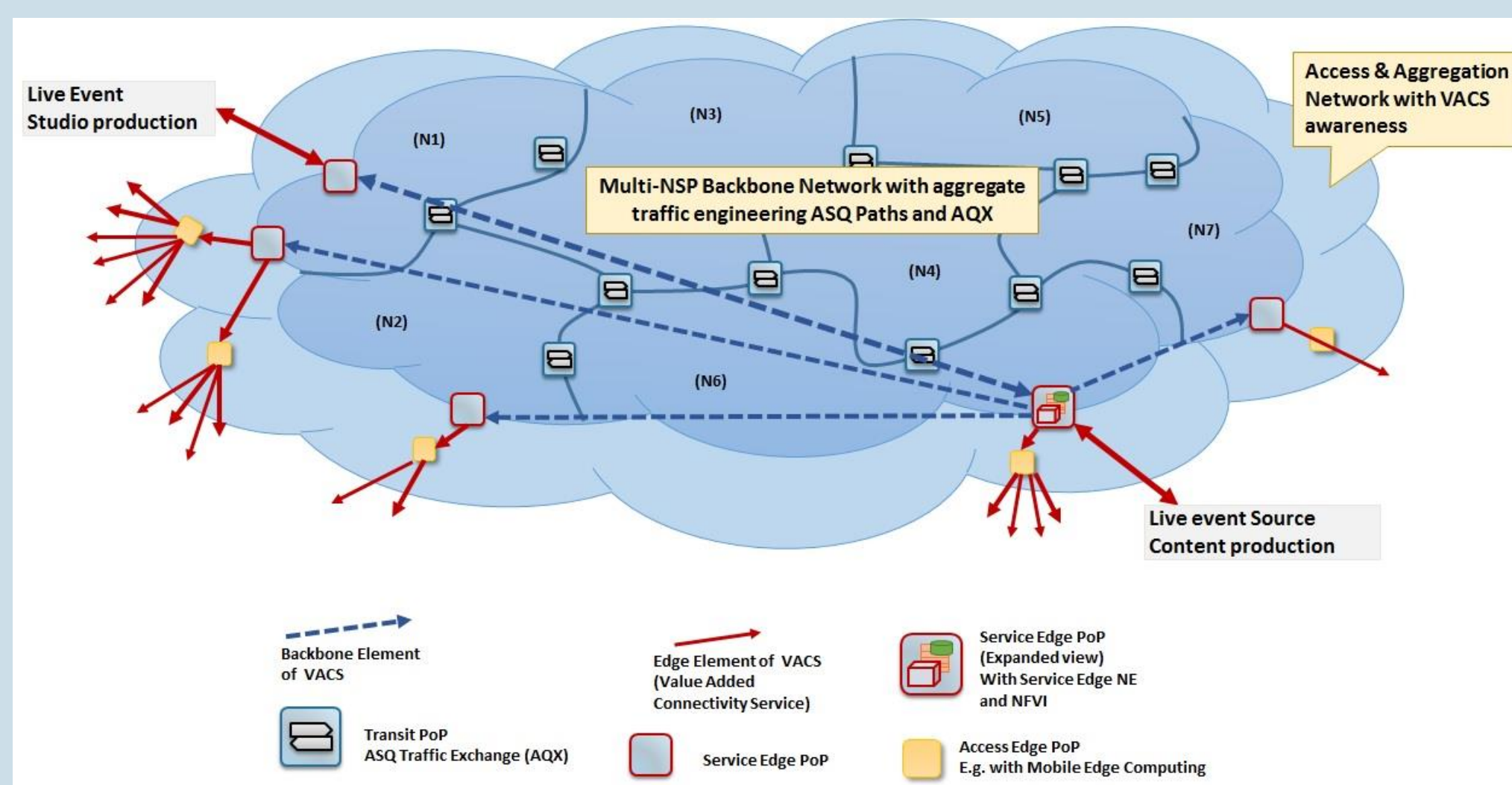
Intra-Domain Traffic Management by NSPs affect traffic flows generated by their 5G enterprise customers (Clouds, Service providers), whose business relies on providing the best QoS to their customers. No incentive-compatible SLAs or charging schemes for tussle resolution.

Inter-Domain Traffic Management by NSPs who care for QoS of their customers, and if not compensated, have an incentive to either ignore or degrade the QoS of inter-domain flows initiating from competitor NSPs.

Discrimination vs rational Traffic Management: An NSP may assign some OSP traffic to a lower priority class so as to provide better QoS to other preferred classes, e.g. NSP-provided IPTV without bearing the upgrade costs.

Information Asymmetry and Hidden Effort: NSPs do not disclose topology, load or monitoring information, rendering impossible for OSPs to deduce whether e.g. the delay experienced is due to network congestion or low effort by the NSP(s), since current SLAs neither reward the network performance nor allow information exposure.

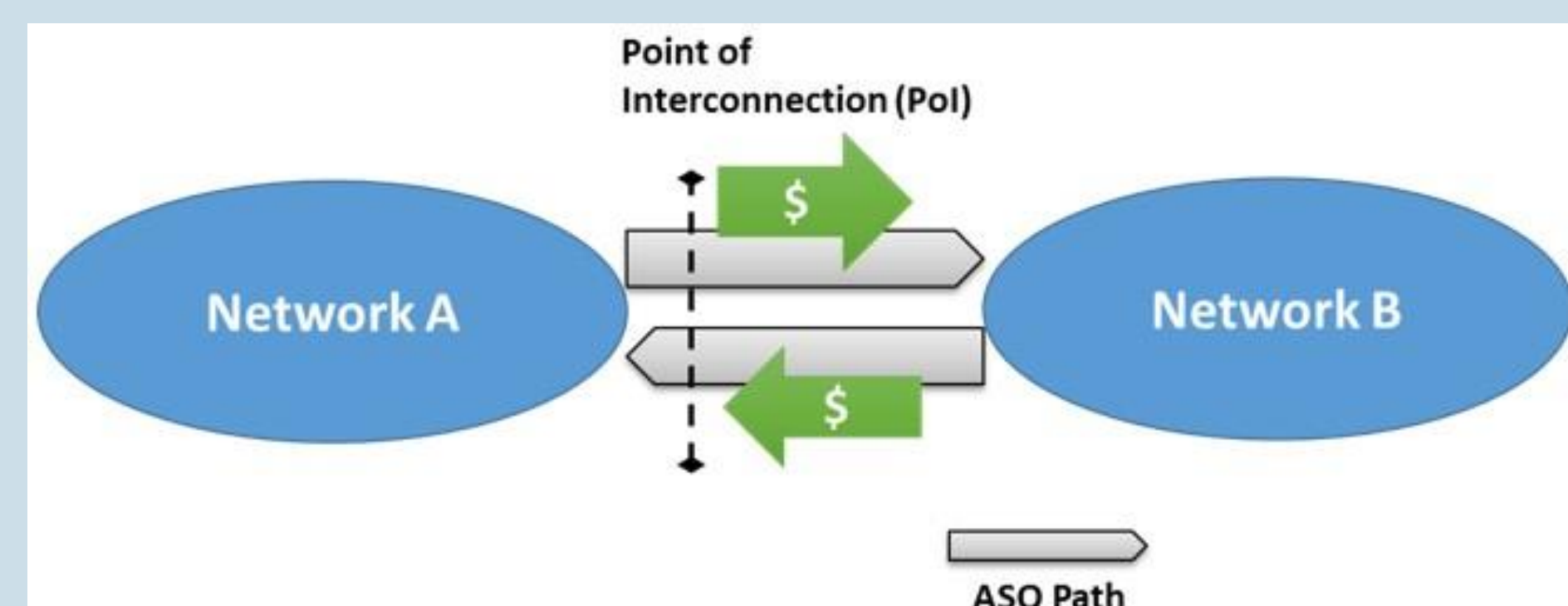
Example: IPTV



- Multiple stakeholders, different granularities: Core and Value Added Connectivity Services for heterogeneous service end-points (including mobile/roaming users)

Our Proposal

- Sending Party Network Pays with 95th percentile charging for 5G Network Infrastructure (Core and VACS) services
- SLA-based compensation, tussles mitigation



- NSPs exchange traffic over Assured Service Quality paths (ASQs) according to agreed SLAs. 95th percentile provides incentive for rational network usage (+ lower transit charge)

SPNP with 95th Percentile Charging for 5G Network Services and Tussles Mitigation

Simulation assessment in the context of DC-2-DC communication: incentives for traffic shaping of delay-tolerant traffic to both NSPs and OSPs, increasing network multiplexing efficiency. In the context of 5G and SDN networks we envision our proposal as a VNF, shaping when needed the traffic of multi-domain slices.

Optimal Destination/End-point Selection tussle is resolved since the ASQ buyer decides on the end points based on ASQ SLA of the 5G providers. Different unit prices for different regions reflect the different transit and service network costs.

The **Intra-Domain Traffic Management** and **Inter-Domain Traffic Management** and the **Discrimination** tussles are also resolved, due to the incentive compatibility of our charging proposal; no throttling is imposed, so as not to violate SLAs.

Information Asymmetry and Hidden Effort tussle is also resolved, because the service information is part of the SLA, while SLA monitoring to verify SLA conformance resolves hidden effort issues.

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