# P4 meets 5G

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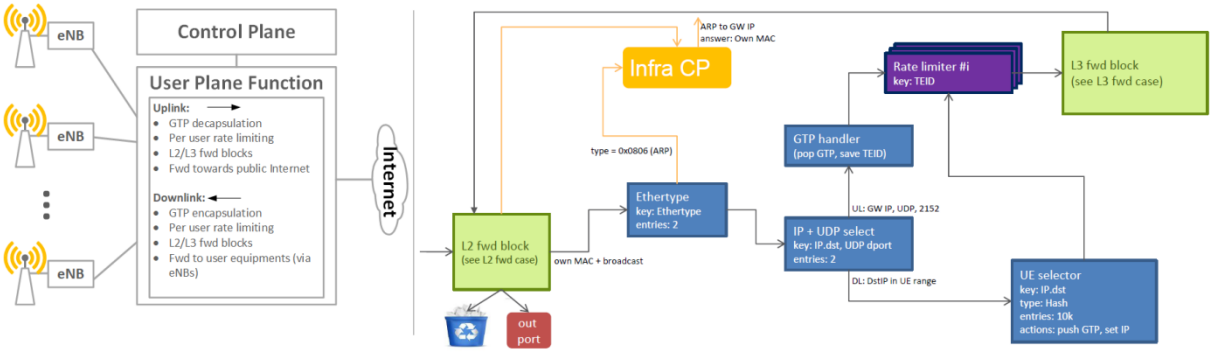
In this demo, we show the new capabilities of the open source P4 compiler called T4P4S-16 [1,2] (pronounced as "tapas") developed by our research group at ELTE [5]. Its new features (including the support of P4-16) will be demonstrated through a complex telecom use case, namely a 5G UPF (user plane function). The user plane function handles the critical data plane processing of packets between radio access network consisting of user equipments (UEs) and eNodeBs (eNBs), and the data network (e.g. Internet). The 3GPP specification [3,4] defines a wide set of functionalities associated with the UPF, including access control, **GTP-U tunnel encapsulation/decapsulation**, **bearer lookup**, service data flow (SDF) mapping, per-flow QoS, guaranteed bit rate, **maximum bit rate**, **forwarding of packets to/from packet data network**, etc. This demo has two main goals: 1) demonstrating how a simplified 5G UPF pipeline can be implemented in P4-16; 2) showing the performance of the switch program generated by the T4P4S-16 compiler under realistic traffic loads.

## Demo scenario

The functionalities implemented in P4-16 and the logical building blocks of the 5G UPF packet processing pipeline are detailed in Figure 1a and 1b, respectively. In this demo, we will 1) show how the switch operates with emulated uplink and downlink traffic belonging to end users where the number of users will be varied, 2) introduce the new features of T4P4S-16 and 3) demonstrate the packet processing performance of the generated switch program (with DPDK back-end) under realistic emulated traffic with various load levels and table sizes. During the demo, a simple web interface will display the important metrics like the ingress and egress traffic rates (total and per user), number of users, number of CPU cores used, processing delay, etc. in real time. The demo experiment will be carried out in our remote testbed consisting of a switch node and a tester node generating realistic test traffic with two 10Gbps links between them (playing the role of uplink and downlink).




a) b)

**Figure 1**: a) A simplified network topology with traffic movement through an UPF. b) High level description of the UPF pipeline.

## References

[1] T4P4S-16, url: https://github.com/P4ELTE/t4p4s/tree/t4p4s-16
[2] P. Vörös, D. Horpácsi, R. Kitlei, D. Leskó, M. Tejfel, S. Laki: „T4P4S: A Target-independent Compiler for Protocol-independent Packet Processors", IEEE HPSR 2018, June 17-20, Bucharest, Romania [Accepted paper]
[3] 3GPP site: http://www.3gpp.org/news-events/3gpp-news/1930-sys_architecture
[4] Agiwal, Mamta, Abhishek Roy, and Navrati Saxena: "Next generation 5G wireless networks: A comprehensive survey.", IEEE Communications Surveys & Tutorials 18.3 (2016): 1617-1655.
[5] P4@ELTE project site: http://p4.elte.hu/

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