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AdaptiveOn: Proactive Scheduling for Deterministic Round-Trip Networking in 5G

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Emerging real-time applications (e.g., industrial control) increasingly demand low-latency and high-reliability wireless communications. Existing URLLC techniques, however, mainly focus on one-way link delay by using specified configurations and thus inefficiently realize deterministic round-trip latency at scale. In this poster, we propose AdaptiveOn, a new wireless networking framework, to support deterministic round-trip networking for network-initiated traffic in 5G. The key idea is to proactively allocate the uplink grants to UEs with sufficient transport block size (TBS), so that UEs can send turnaround traffic immediately, without going through the conventional uplink request-report-grant pipeline. By designing four integral modules (payload estimator, timing learner, MCS adapter, and temporal averager), AdaptiveOn substantially reduces the queuing, segmentation, and re-transmission delay in both uplink and downlink transmission.

We implement and evaluate AdaptiveOn on two realistic network testbeds, by using OpenAirInterface 5G RAN and Core with USRP B210 radios. The results show that AdaptiveOn can achieve sub-10ms RTT at p99 for 2 UEs with 1000B per 100ms traffic load, and it enables 2.8x (median) and 3.5x (p99) latency reduction as compared with vanilla5G.