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5G core network load testing traffic generator: Emulating real-world traffic scenarios

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This paper introduces the Core Network Traffic Generator, a comprehensive performance evaluation and compliance testing tool for 5G core networks that addresses significant limitations in existing solutions. Our tool uniquely combines control plane and data plane traffic generation with high-precision performance metrics collection. Built on well-established projects, pycrate for protocol message handling and eBPF/BCC for kernel-level monitoring, it collects SCTP transport metrics with sub-microsecond precision—a capability absent in current tools. Key features include simultaneous emulation of gNodeB and multiple UEs, granular 5G procedure timing analysis, detailed SCTP performance visualisation, and automated compliance validation against 3GPP standards. Validated with major open-source implementations (Open5GS, free5GC, OAI) and proven in research publications, the system operates on commodity hardware and is available under the MIT license, offering an accessible yet powerful solution for both academic research and operational network testing.