



PAWR Project Office

CoreX: Next-G Cellular Core Network for Emerging Applications

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Next-generation cellular networks demand low-latency, high-reliability control-plane operations to support emerging applications. Existing 5G core designs suffer from high procedure completion times due to multi-hop network function interactions, message serialization bottlenecks, and inconsistent operations caused by tightly coupled core network functions. These issues largely arise because 5G was not built for applications that need strict guarantees on latency and performance. It has evolved from legacy 3G and 4G LTE systems, which were originally designed for voice calls and web traffic. We present *CoreX*, a clean-slate cellular core network design optimized for emerging applications. *CoreX* draws inspiration from Function-as-a-Service platforms and consists of three key components: a centralized orchestrator that coordinates procedure execution and monitors task progress; stateless, fully independent Worker Functions (WFs), each executing a specific unit of work, such as authentication or IP allocation; and a highly available, versioned database that centralizes session state and ensures consistency across distributed components. By decoupling WFs and enabling speculative execution, *CoreX* reduces dependencies between network functions, accelerates control-plane operations, and allows WFs to scale independently or be replaced without disrupting ongoing procedures. Our evaluation results demonstrate that *CoreX* substantially improves control-plane performance. Compared to a vanilla 5G core, *CoreX* reduces median procedure completion time up to 10.4 $\times$.