Micro-services internal load balancing for Ultra Reliable Low Latency 5G Online charging system

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***Abstract*—Connection mesh plays an important role in microservice architecture and greatly influences system performance. 3GPP proposed a 1ms requirement for 1-way transmit activities on the 5G URLLC data plane. As a 5G component, our Online Charging System needs to manage sub-milliseconds operations. In this paper, we model the request flows in the mesh as a max flow problem with back-pressure. Inspired by the connection lib approach, we propose our connection library Microchassis. We select basic routing (front-pressure) methods including roundrobin (RR), least concurrent (LCC), and proposed two more routing methods using back-pressure flow control policy based on concurrent status (BCC) and back-pressure flow control policy based on throughput combined with concurrent status (BTC) for the library. Then we evaluate the performance and latency among four methods of Microchassis and validate our modeled formulas. Finally, we simulate the OCS architecture of the main charging flow and qualify it against the URLLC latency standard. The result shows that back-pressure strategies can maintain great QoS under extreme conditions, superior to the front-pressure algorithm family. BTC performed well in all cases with the highest throughput in the incident. Besides, BCC only shows its advantages on high throughput systems. Front-pressure strategies are better choices for internal well-managed service layers, and LCC is outperformed on RR.**

***Keyword*—Service mesh, Connection library, Internal load balancing, Benchmark, 5G, URLLC, Online-charging system**

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