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Multi-agent Traffic Load Balancing by Agents with Two-Layer Control Plane

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This study addresses traffic load balancing (TLB) problem in Computing Centric Network (CCN) –an open, software-defined virtualized infrastructure that integrates distributed computing with high-speed data networks (DTN). Distributed TLB methods based on Multi-agent reinforcement learning (MARL) are quite perspective due to faster decision making and its adaptability to dynamic network traffic fluctuations. Despite the existing approaches such as Multi-agent routing using Hashing method (MAROH) showed better results than traditional approaches like ECMP and UCMP, and comparable results to centralized method, there are still too many inter-agent communications that slow down decision making and degrade channel bandwidth utilization efficiency.

Our key contribution is a two-layer MARL control plane, where agents may act based on its previous experience, stored in local memory, or communicate to make coordinated action. The proposed approach was implemented as an enhancement for MAROH. Experiment results showed that this approach reduces inter-agent communications by 80% while improving the objective function (sum of deviations from average link utilization) by 30%.

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