SDN-based Virtual Network Topology Control with Fast-path/Slow-path Bayesian Attractor Model

Onur Alparslan, Shin’ichi Arakawa, Masayuki Murata

Introduction

- Traffic engineering in large IoT networks by estimating the traffic matrix is difficult
- Some IoT (Internet of Things) networks exhibit a limited set of network traffic matrix patterns
- We applied Bayesian Attractor Model (BAM) for identifying the current traffic pattern by using the utilization statistics of edge links
- Likewise in a brain, we employed a fast-path BAM for faster but low certainty identification, and a slow-path BAM for slower but high certainty identification
- Our Bayesian Controller solves congestion by identifying the traffic pattern and applying a precomputed Virtual Network Topology (VNT)

Architecture

- Possible traffic patterns are stored as Bayesian attractors
- Our Bayesian Controller receives the edge link traffic statistics from OpenDaylight Controller and tries to identify the traffic matrix by Bayesian Attractor Model
- Fast-path BAM has few attractors, so its identification is faster but its certainty is low. Slow-path BAM has many attractors, so it is slower but its certainty is higher.
- If a new traffic matrix is identified, Bayesian Controller applies the VNTs and routing tables designed for the identified traffic

Testbed

- The experiment results show that using fast-path and slow-path BAM together allows faster and reliable identification of the traffic pattern for solving the congestion and increasing the power efficiency by VNT optimization