

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

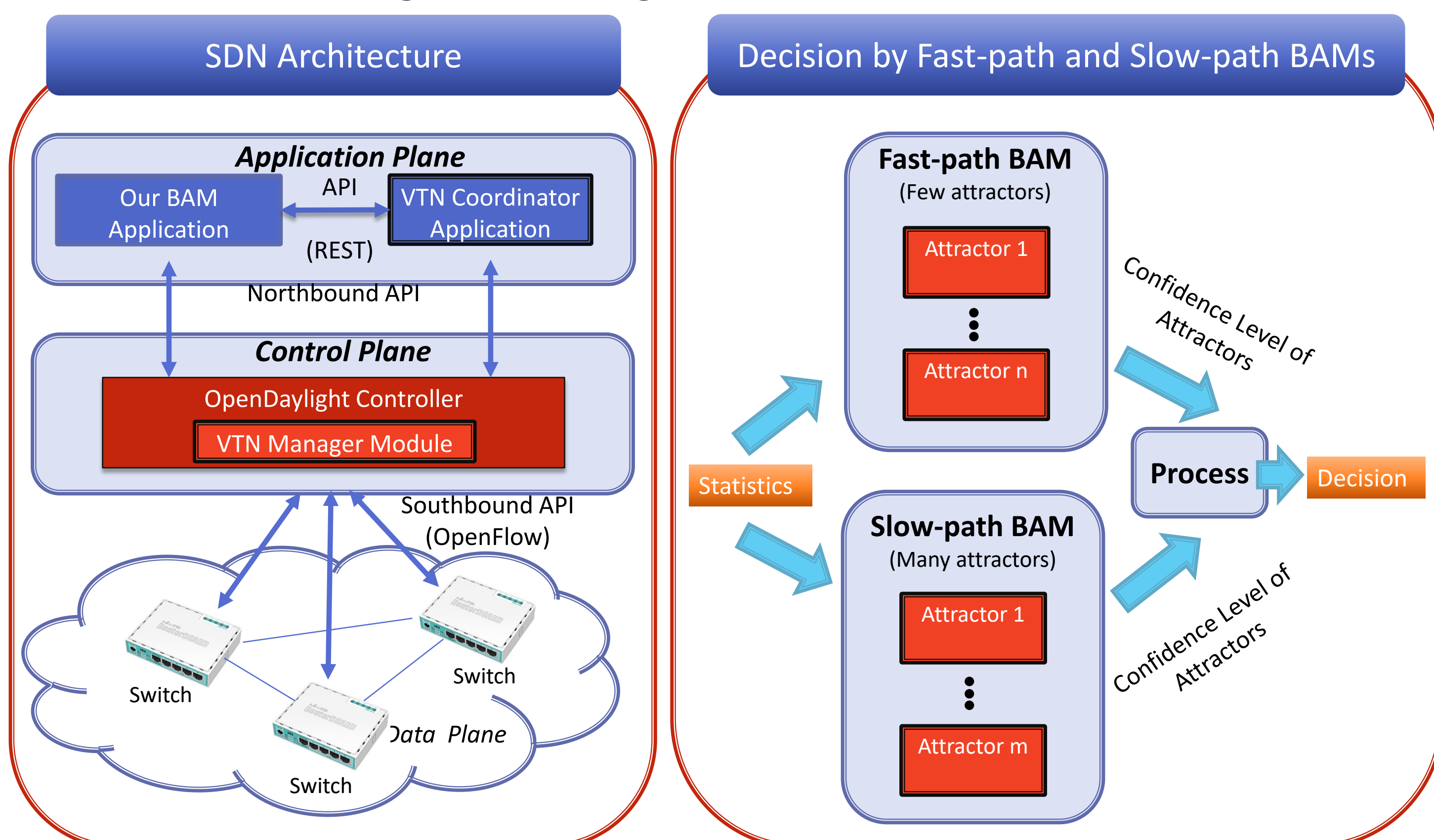
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Introduction

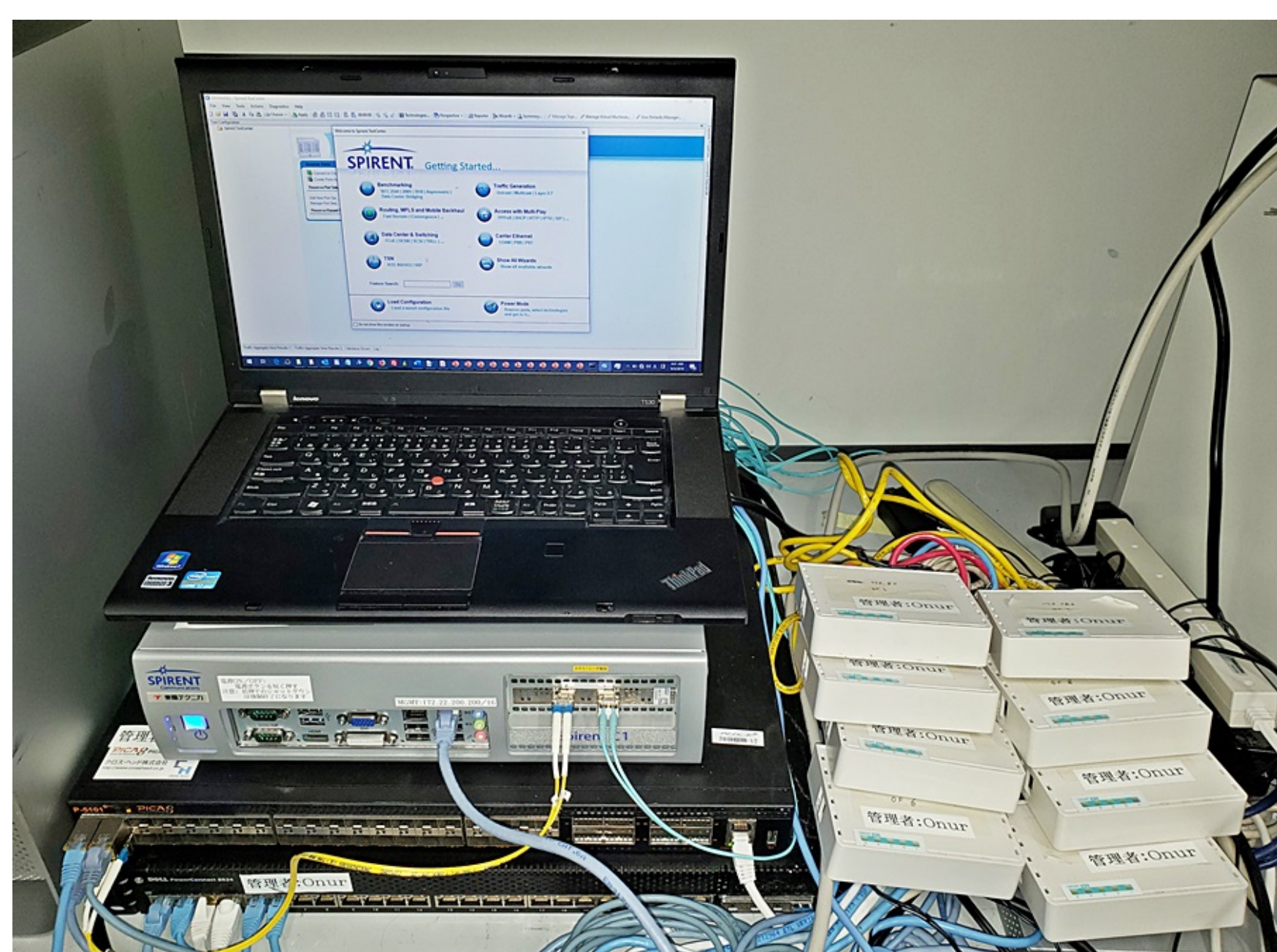
- Traffic engineering in large IoT networks by estimating the traffic matrix is difficult
- Some IoT (Internet of Things) networks exhibit a limited set of network traffic matrix patterns
- We applied Bayesian Attractor Model (BAM) for identifying the current traffic pattern by using the utilization 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

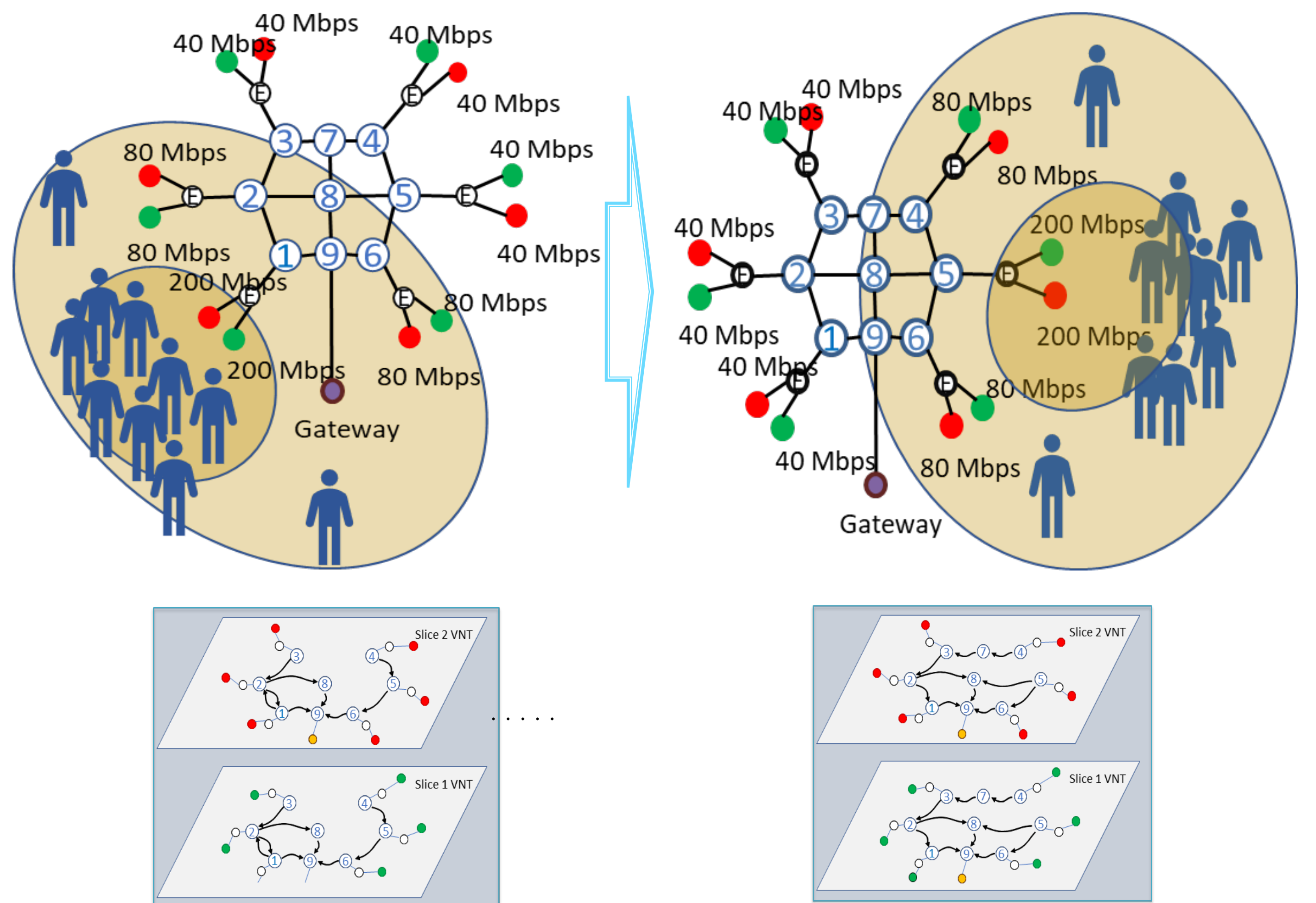
- Possible traffic patterns are stored as Bayesian attractors
- Our Bayesian Controller receives the edge link traffic statistics from OpenDaylight Controller and tries to identify the traffic matrix by Bayesian Attractor Model
- Fast-path BAM has few attractors, so its identification is faster but its 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



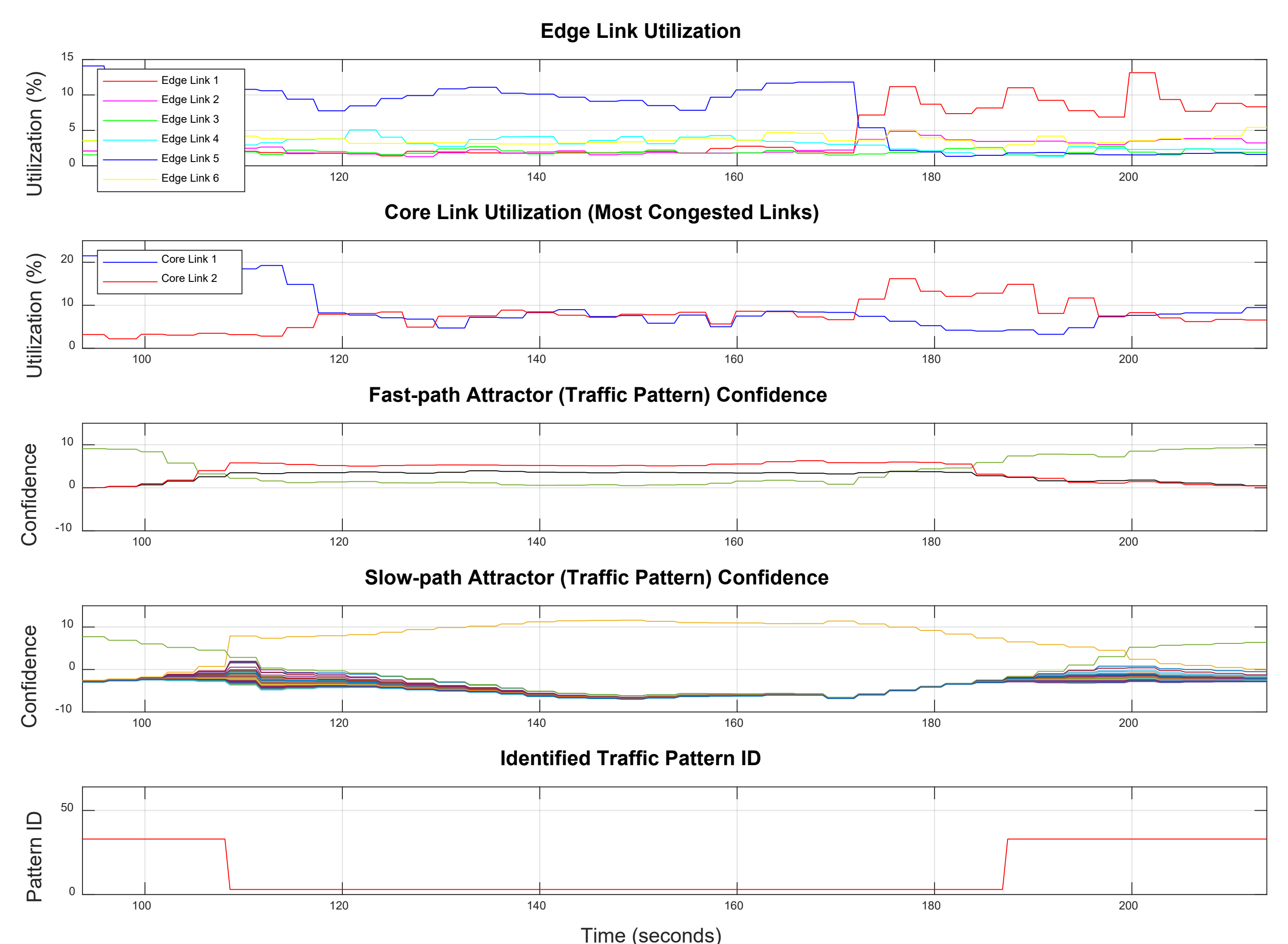
Experiment



Network Slice Configuration 1

Network Slice Configuration 5

- IoT Network for Surveillance
- Sensors at the edges send more data when there are people and movement nearby
- Emulated a scenario where people move between the edge of node 1 and 5 repeatedly
- 3 possible traffic patterns are stored as attractors in fast-path BAM. 64 possible traffic patterns are stored as attractors in slow-path BAM
- If the confidence level of a new attractor becomes the highest and its difference from second highest attractor passes a threshold in slow-path or fast-path BAM, that attractor is identified as the new result
- Fast-path BAM has high threshold, slow-path BAM has low threshold



- 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

連絡先

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