Intelligent SDN based Traffic (de)Aggregation and Measurement Paradigm (iSTAMP)

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- **Network Measurement**

  Fine-grained traffic flow measurements provide essential information that is central to network design, operation, management, accounting and security.

- **Software Defined Networking**

  Software Defined Networking (SDN) separates control plane from the data plane, enabling capability to dynamically control and re-program network switches. With the recent advent of SDN, adaptive and efficient implementation of passive and active network monitoring can be controlled dynamically at run-time.

- **iSTAMP**

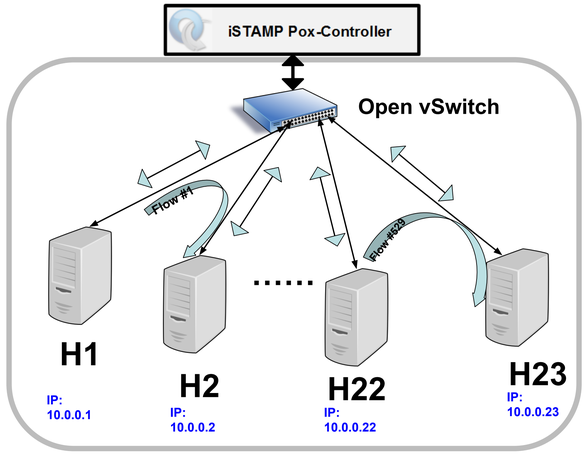
  Under the hard constraints of limited available resources (e.x. TCAM entries), we proposed an intelligent SDN based Traffic (de)Aggregation and Measurement Paradigm (iSTAMP), to optimally use the available TCAM entries for better estimation accuracy via an efficient compressive sensing inference technique.

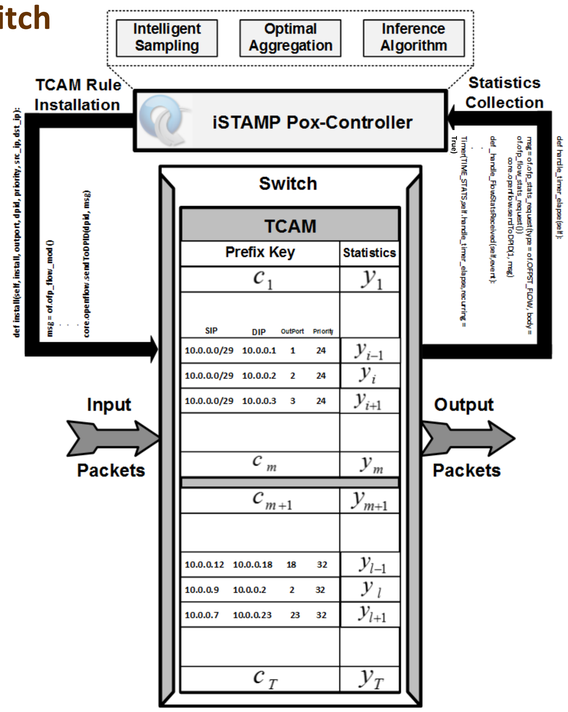
  iSTAMP leverages OpenFlow to dynamically partition the TCAM entries of a switch or router into two parts for:

  1) optimal aggregaton measurements: well-compressed aggregated measurements that can lead to the best estimation accuracy via network inference process
  2) per-flow measurement of the most rewarding flows: an intelligent sampling algorithm to sample the most informative traffic flows

- **Implementations and Demonstrations on GENI platform**
  - **Centralized controller with single switch**

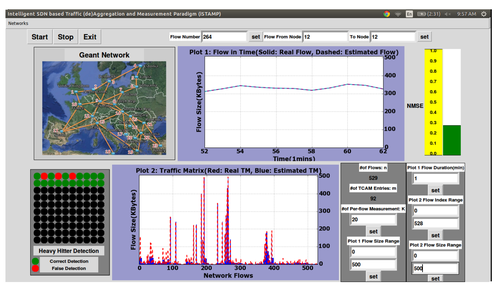
Real traffic traces of Geant network is fed into our simulator to evaluate the performance of iSTAMP on GENI platform. We use Open vSwitch (OVS) as an OpenFlow switch



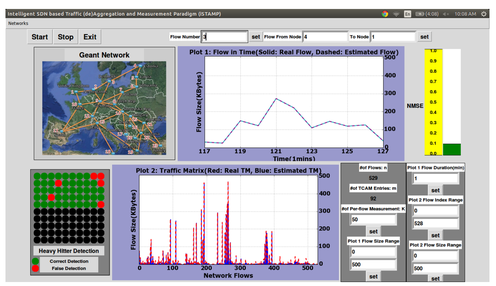


- **Simulation Results**
  - **Centralized controller with single switch**

Centralized implementation of iSTAMP for Geant network on GENI platform with real traffic traces.



n=529, m=92, K=20



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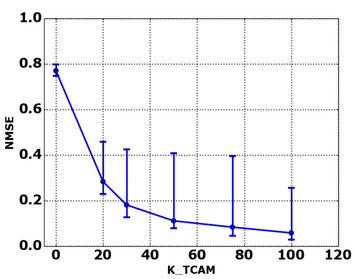
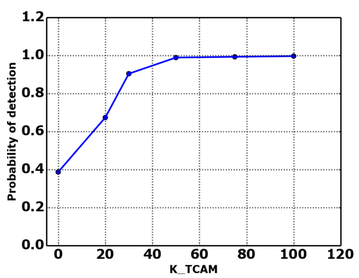
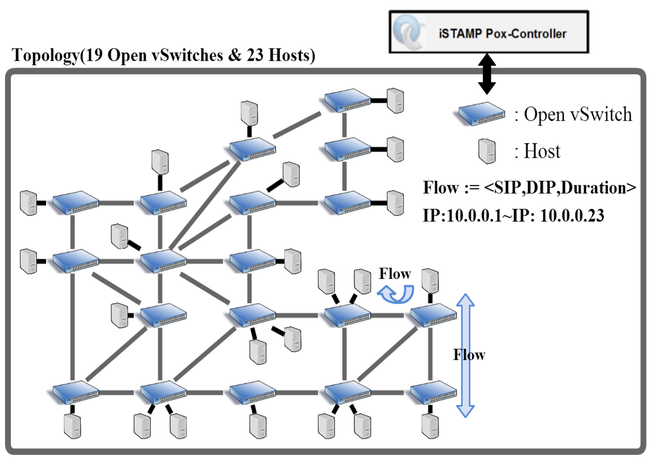




- K_TCAM: number of TCAM entries available for per-flow measurements
- NMSE measures the accuracy of traffic matrix estimation
- P^{d}_{HH} (average probability of detection) quantifies the accuracy of Heavy Hitter (HH) Detection.

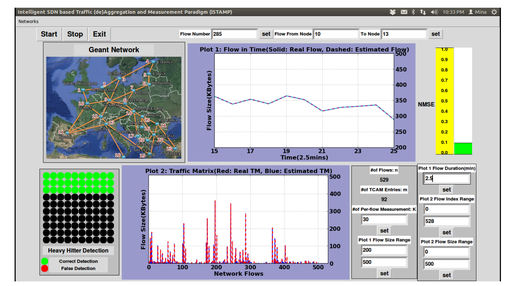
- **iSTAMP: Decentralized Implementation in Mininet**

Decentralized model of GEANT network is considered to demonstrate the performance of iSTAMP, where real traffic of 23 nodes are routed by 19 SDN switches



K	0	20	30	50	75	100
NMSE	0.5576	0.3466	0.2589	0.1693	0.0929	0.0721
Pd	0.7027	0.7399	0.7543	0.8283	0.9626	0.9786

- Flow Size Estimation—Average Normalized Mean Square Error (NMSE)
- Heavy Hitter Detection—Probability of Detection (Pd) (Threshold:0.5%)



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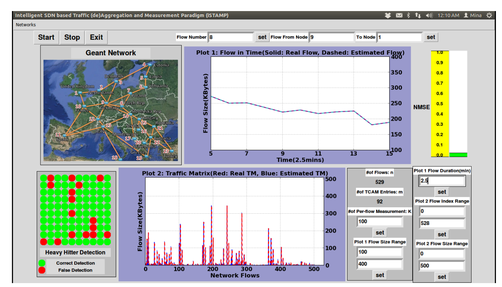

n=529, m=147, K=100