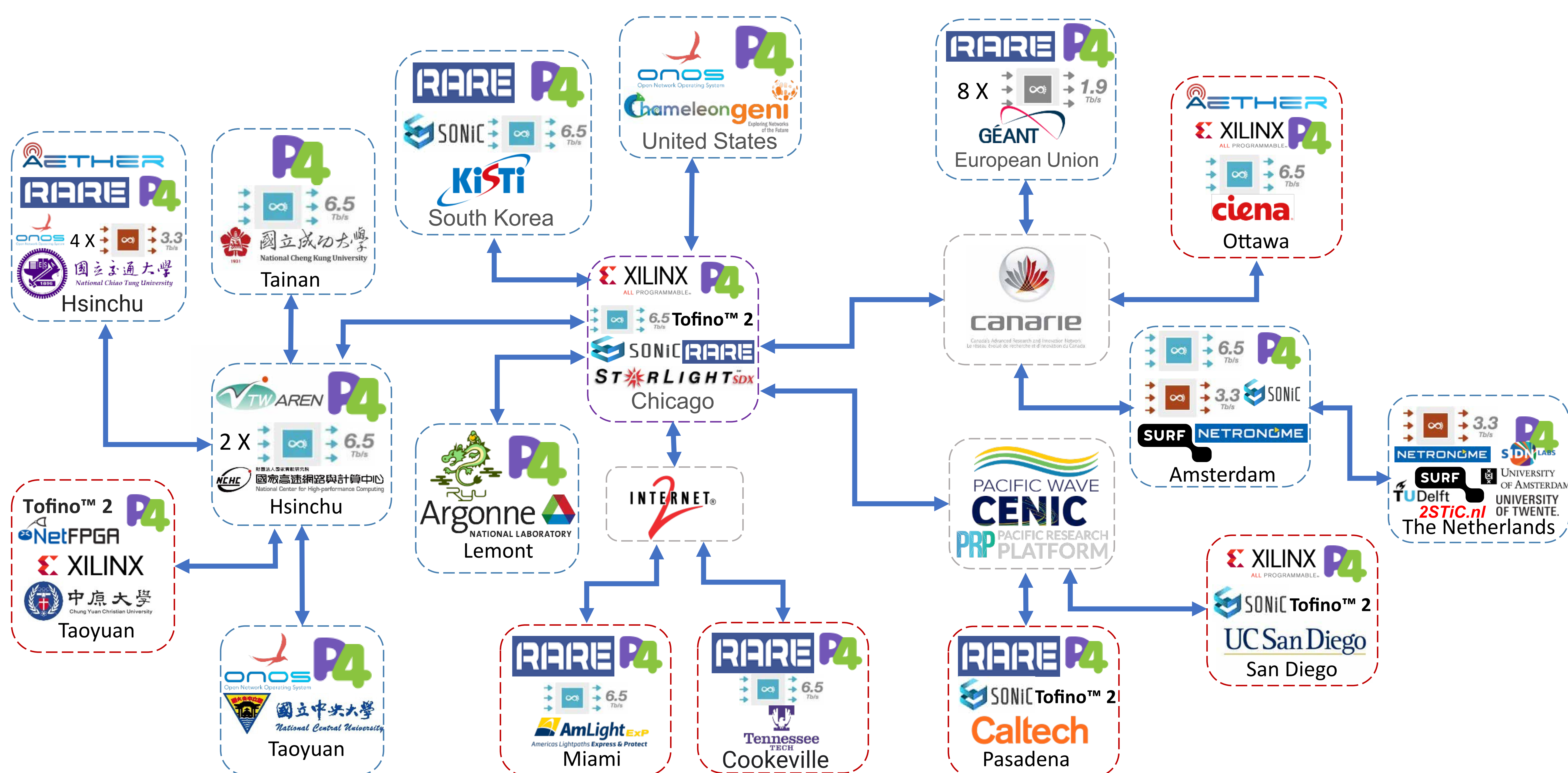


StarLight SDX P4 Testbed and International P4 Experimental Networks

Selected P4 Research Projects

International P4 Experimental Networks (iP4EN)

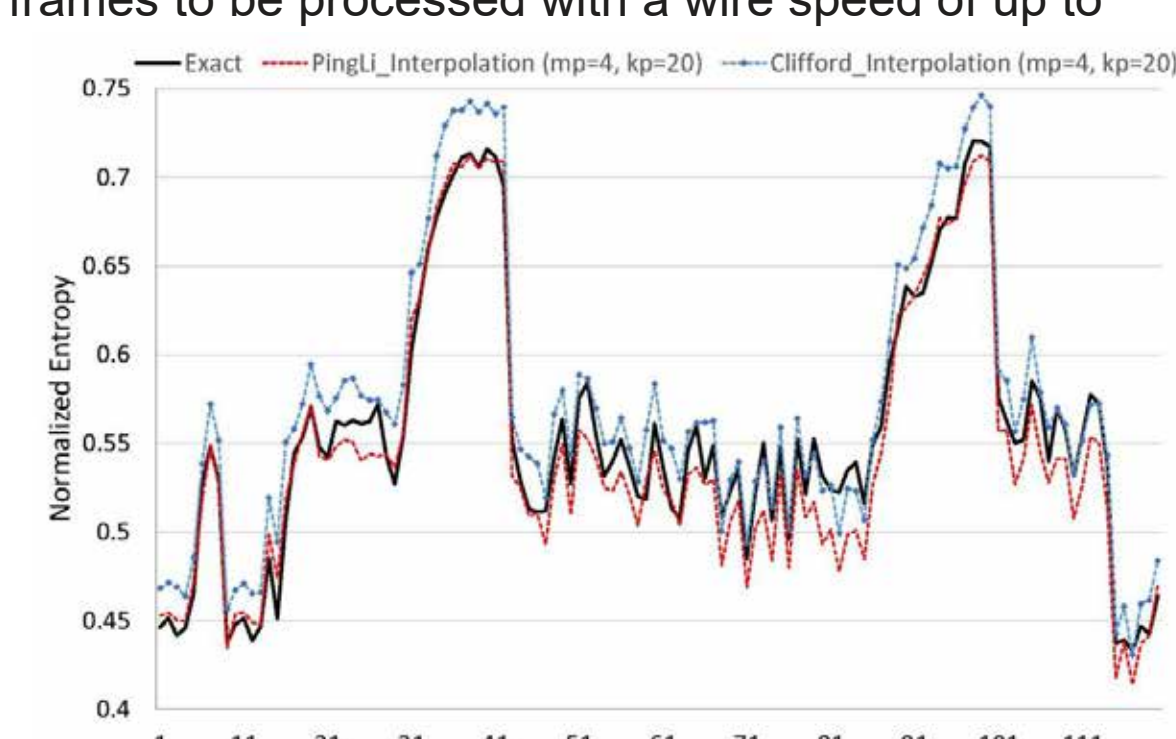


Real-Time Anomaly Detection with Entropy

The empirical entropy of the network flow attributes is an essential measure for identifying anomalous network traffic. However, computing the exact entropy values for high-speed networks in real time is computationally expensive. Accordingly, the present study replaces the complex computations of existing stable random projection methods for entropy estimation with a simple table lookup procedure. Notably, the size of the lookup table is reduced through a piecewise linear interpolation heuristic in order to facilitate the implementation of the proposed scheme in resource-constrained pipeline environments. The proposed architecture enables entropy estimation to be performed using both the Log-Mean Estimator (LME) method and the New Estimator of Compressed Counting (NECC) algorithm reported in the literature. The feasibility of the proposed approach is verified empirically using both real-world network traffic traces and synthetic data streams. Moreover, the practical applicability is demonstrated via stream-based implementation in the programmable data planes of the NetFPGA-Plus framework and a Tofino P4 switch, respectively. The results indicate that the proposed tabulation-based entropy estimation scheme allows minimum-sized Ethernet frames to be processed with a wire speed of up to several hundred gigabits per second.

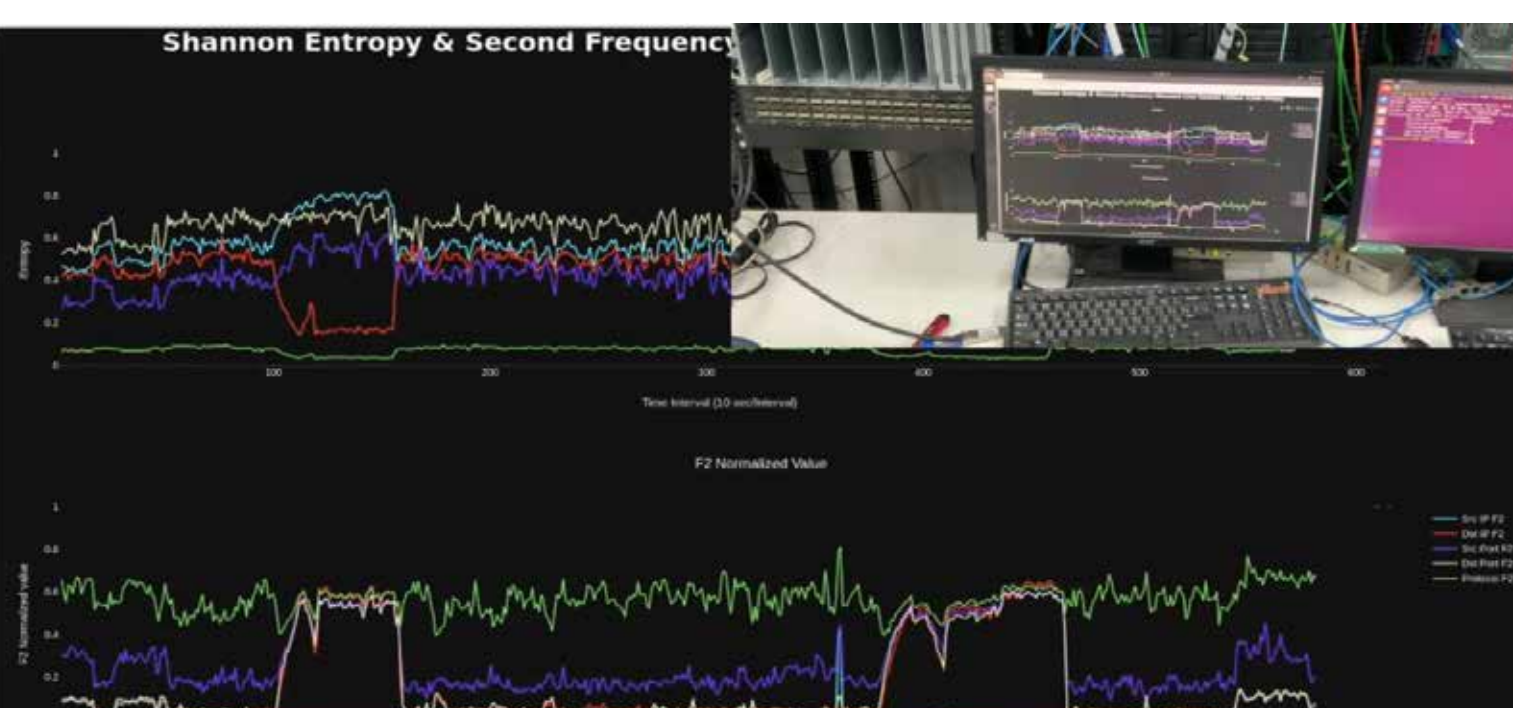
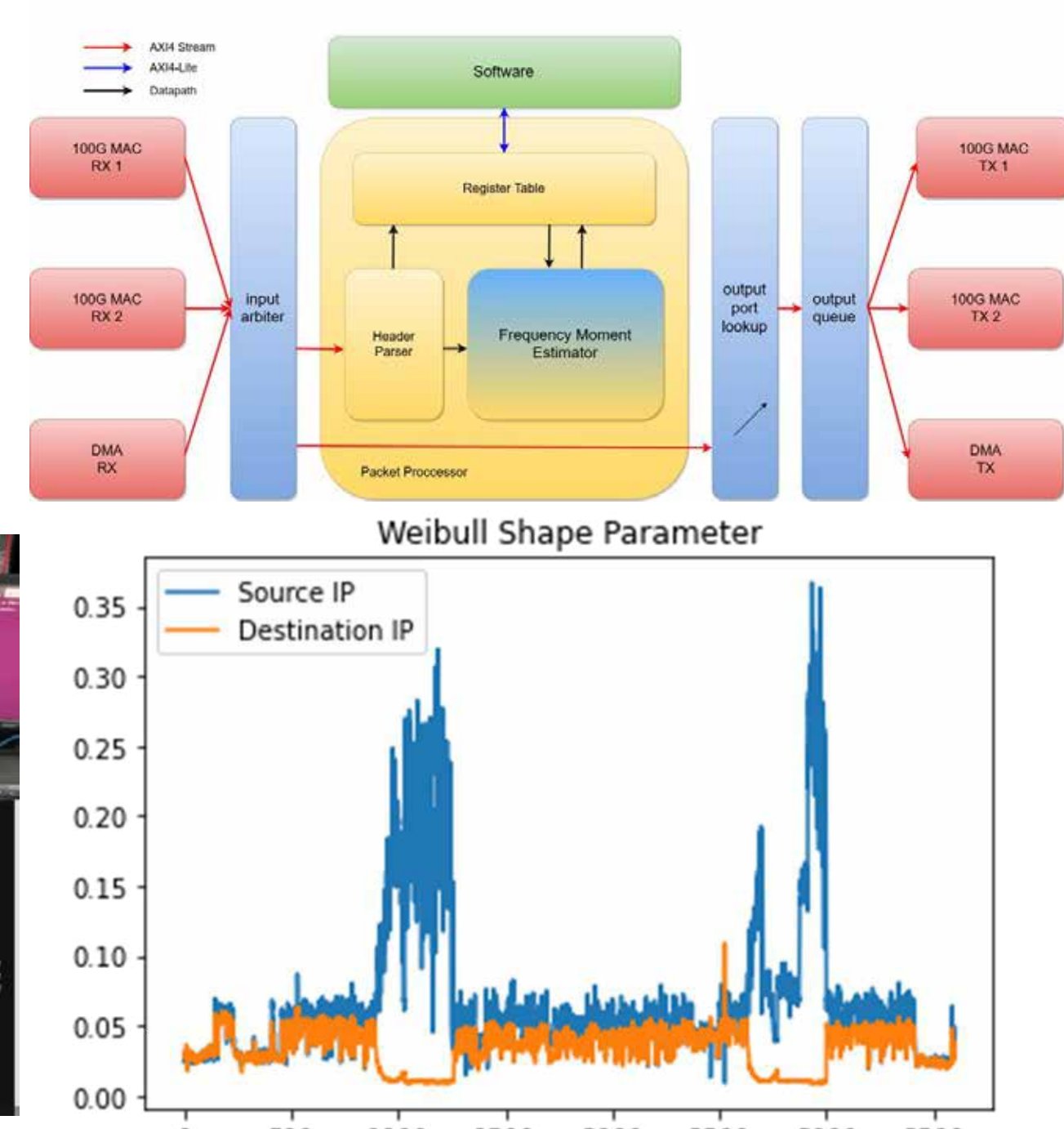
"Tabular Interpolation Approach Based on Stable Random Projection for Estimating Empirical Entropy of High-Speed Network Traffic" IEEE Access, 27 September 2022, Y. Lai, et al.

"Sketch-based Entropy Estimation: a Tabular Interpolation Approach Using P4", Y. Lai, et al EuroP4 2022 workshop, CoNEXT 2022



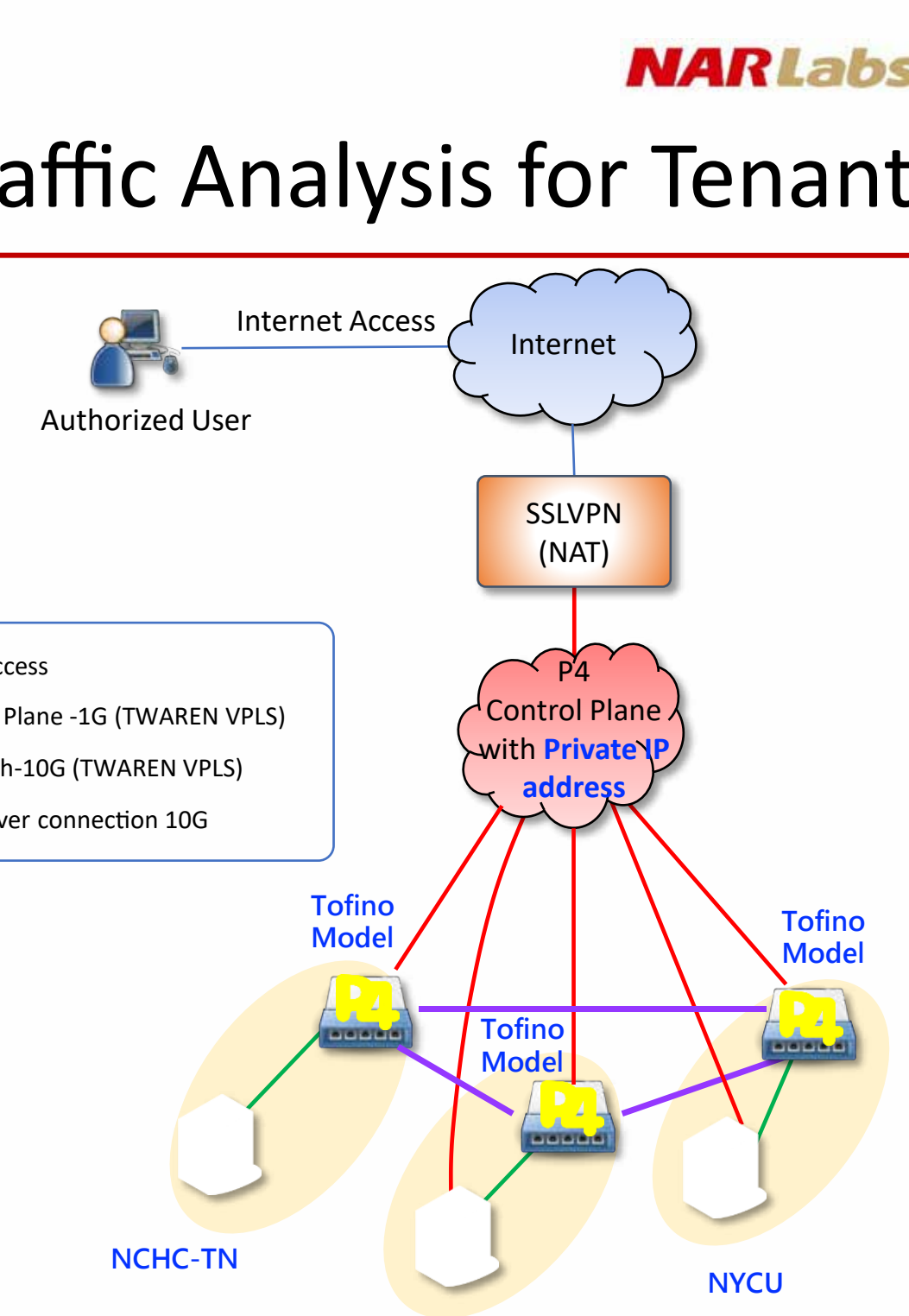
Real-Time Anomaly Detection with Frequency Moment Estimation

Frequency moments serve as crucial metrics in the analysis of network traffic and in identifying irregular patterns. However, executing real-time, online computations remains a challenging task. We present an implementation of the Frequency Moment estimation utilizing the 100Gbps Xilinx Alveo U200 acceleration card of the NetFPGA-PLUS platform. We further showcase its applications in scan anomaly detection and parameter estimation for the Weibull model of flow length distribution.

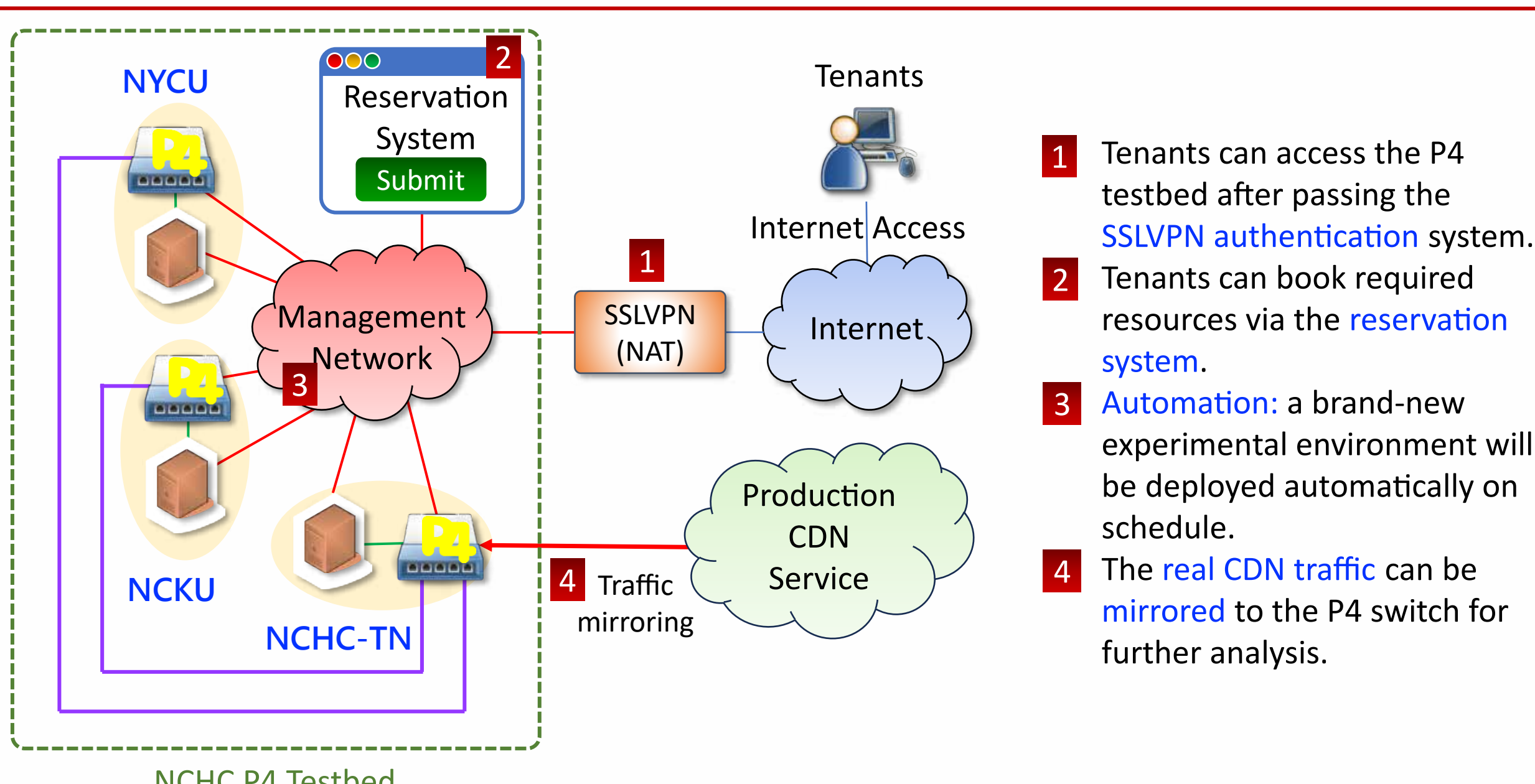


P4 Testbed Automation with Real Traffic Analysis for Tenants

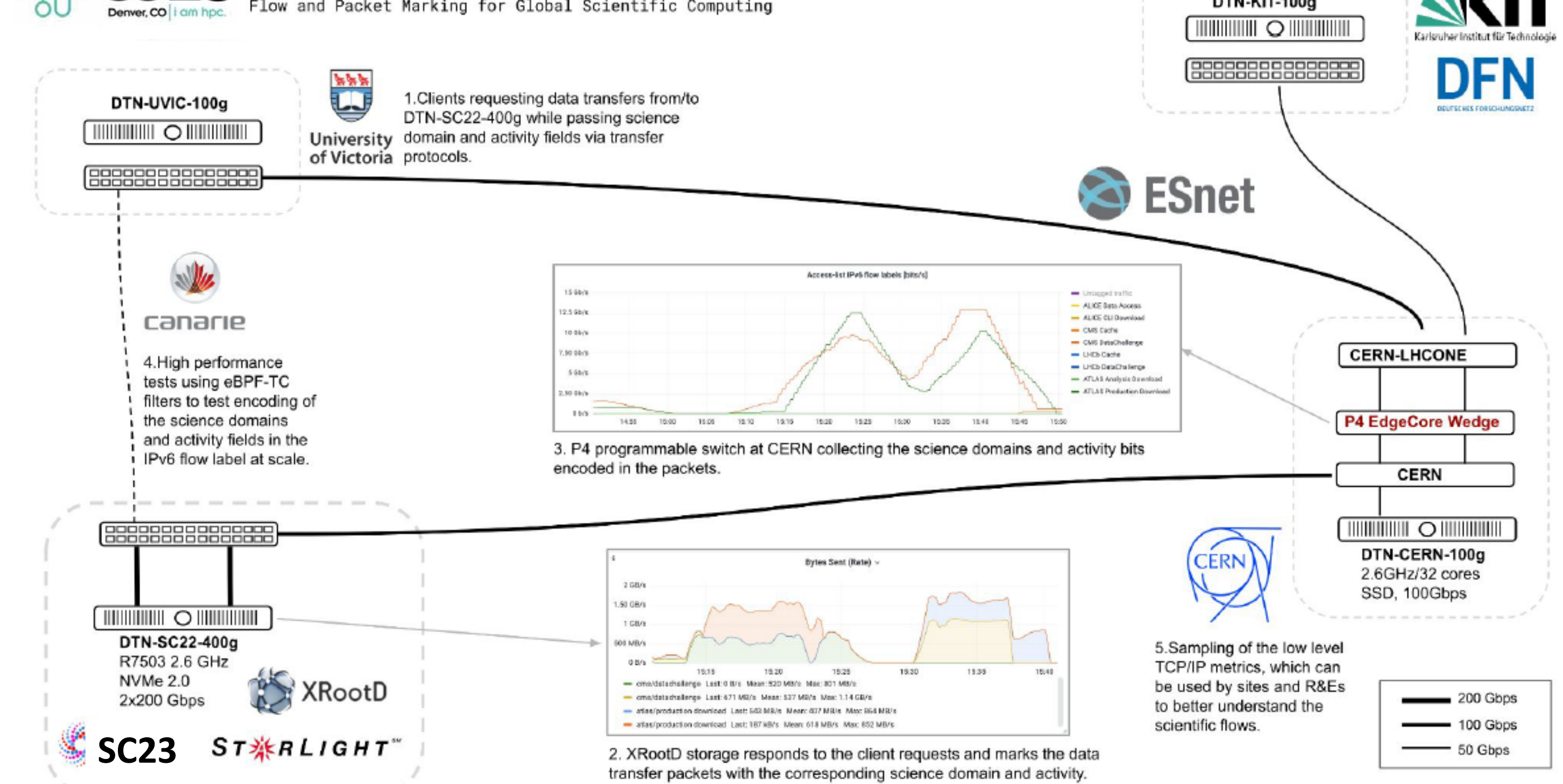
- To boost research and experiment activities of programmable switch technology in Taiwan, TWAREN deploys a P4 network testbed based on hardware Tofino P4 switches.
- Users can access the testbed by passing through SSLVPN authentication system. After booking required resources via the reservation system, the testbed will perform the automation by allocating a brand-new experimental environment for the user on schedule.
- In addition, real traffic of CDN service operated by our team can be mirrored to the P4 switch for users to investigate and analysis.



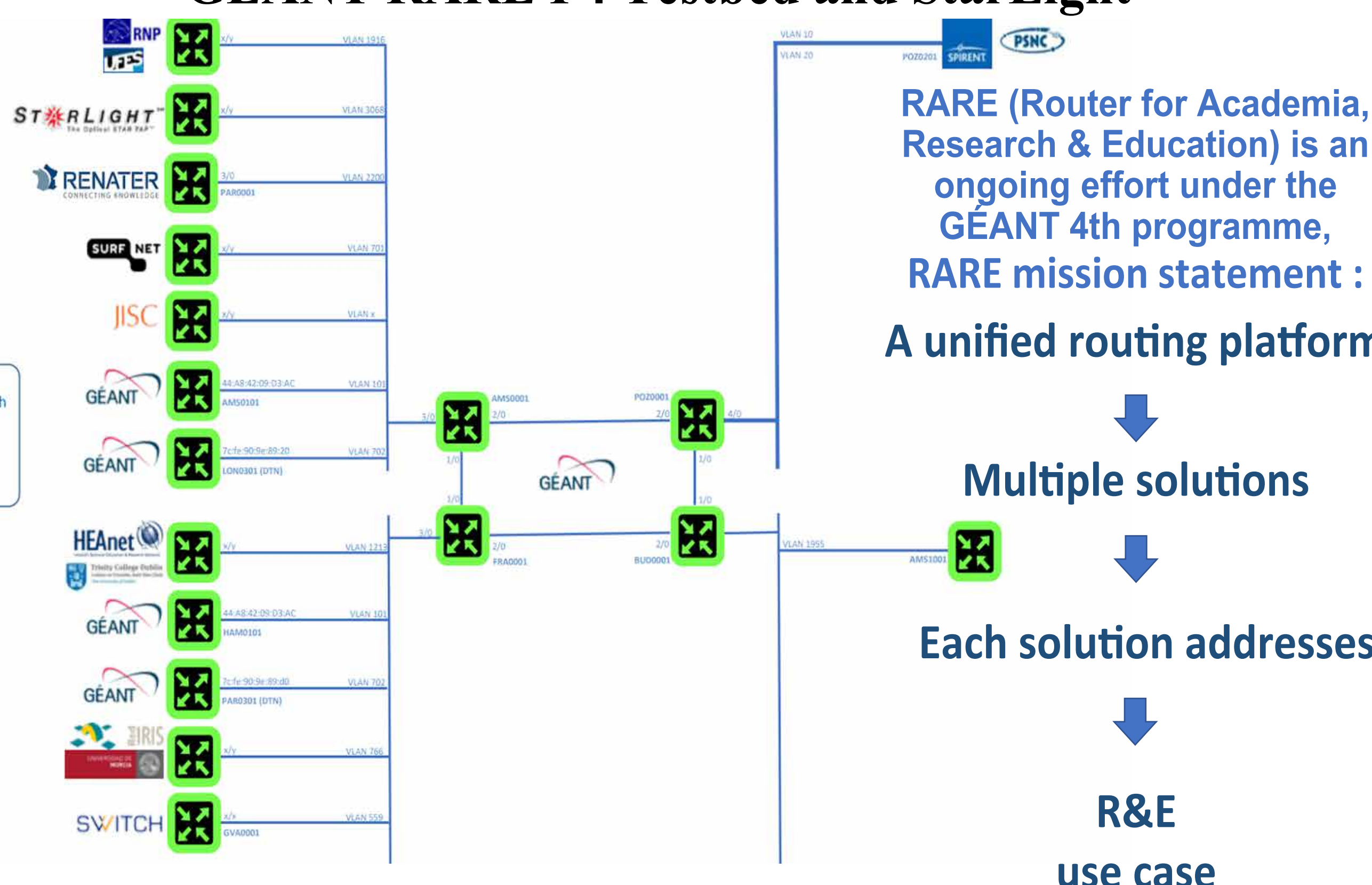
P4 Testbed Automation with Real Traffic Analysis for Tenants



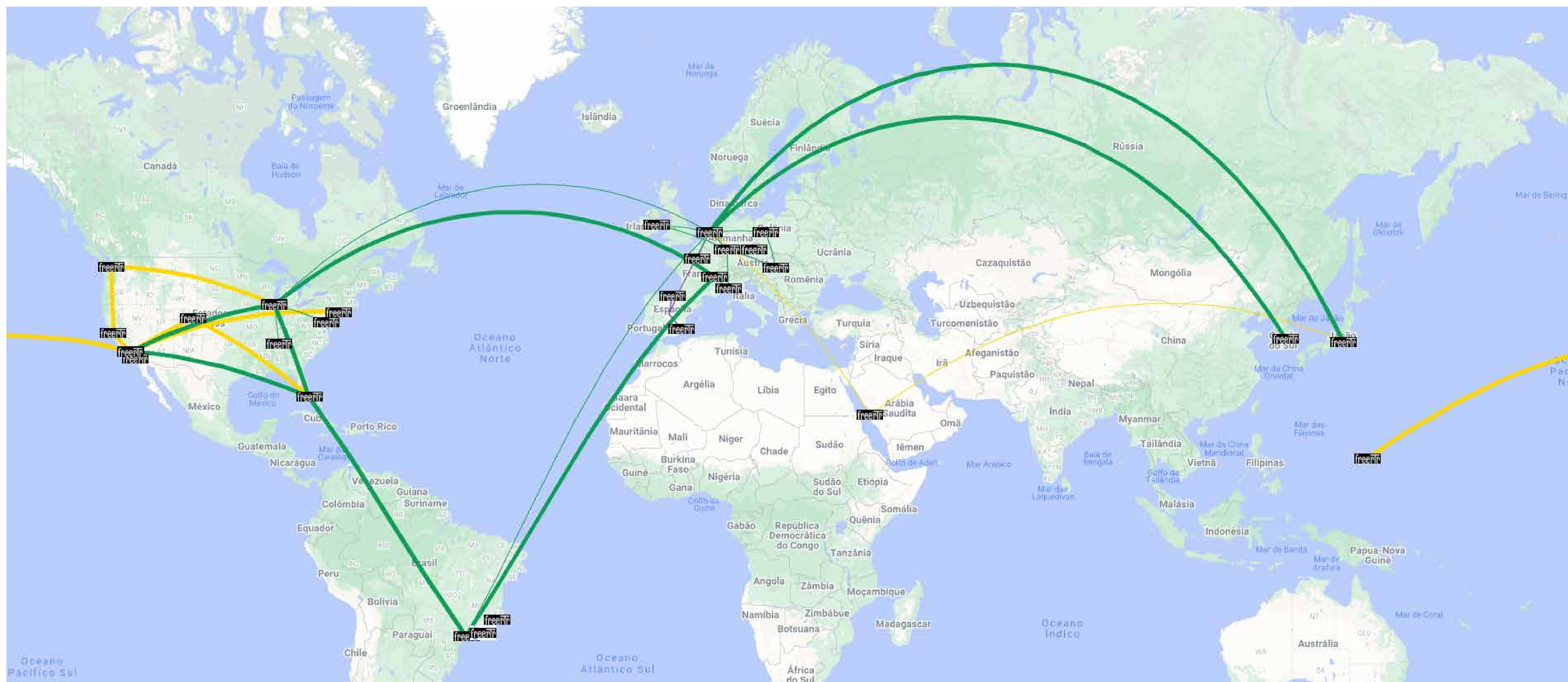
SC23 scitags.org



GEANT RARE P4 Testbed and StarLight



Global P4 Lab



Source: Marcos Felipe Schwarz (RNP)