# Experiment 1 – Performance

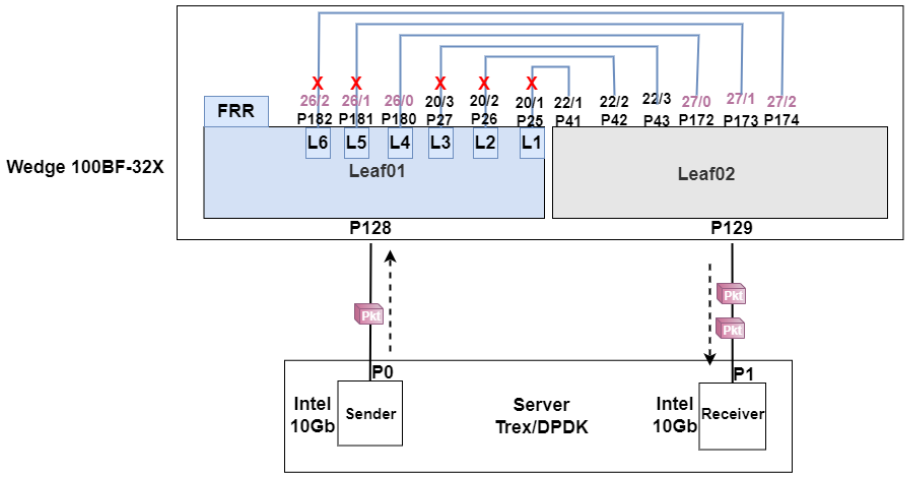
Equipment used in the experiment:

1 x Tofino Wedge 100B-32X:

➔ Bf-Sde-9.9.0;

1 x Server Trex/DPDK:

➔ 1 x Intel Xeon CPU D-1518 - 2.20GHz, 62GB RAM;
➔ 2 x Nic Intel Ethernet Connection X552 10GbE SFP+;
➔ version v2.82 @ STL;
➔ SO: Ubuntu 16.04.1 – kernel 4.15.0-142-generic;




Scenario 01: Network topology applied in experiments 01 (Pkts Recirculation)

## Experiment 01: Evaluation of packet recirculation during FRR recovery.

The objective of this experiment is to evaluate the amount of packets that are recirculated during events of 1, 3, and 5 simultaneous failures in RESISTING. For this purpose, three types of unidirectional UDP packet flows were generated, with different packet sizes and transmission rates:

- Large packets: 1514 bytes, with rates of 100Mbps, 1Gbps, 5Gbps, and 9Gbps;
- Medium packets: 814 bytes, with rates of 100Mbps, 1Gbps, 5Gbps, and 9Gbps;
- Small packets: 114 bytes, with rates of 100Mbps, 1Gbps, 5Gbps, and 9Gbps.

It is important to emphasize that these flows were generated unidirectionally, meaning there was no return of the generated packets. Additionally, all transmission rates were evaluated for each packet size. The experiment aims to analyze packet recirculation during FRR recovery, and the results obtained will be presented and discussed in the article.

Each packet flow was transmitted through interface P0 and received by interface P1 of the same Trex server for 10 seconds. The packet flows were initiated with the failures (1, 3, or 5) applied to the switch, and the traffic capture/Wireshark functionality of Trex was enabled. Then, the first packets of each simulated flow passed through the FRR recovery mechanism and recirculated within the switch. The packets that were recirculated during the FRR operation were marked with the **Source Mac 00:00:00:00:00:00** for identification in the pcap file log.

The recirculated packets utilize the internal 100Gbps link of pipeline 0 or 1 (depending on the port and pipeline mapping) of the switch. The internal link provides lower latency and higher throughput compared to the approach of a dedicated external link between physical ports of the switch.

Each packet recirculates twice within the switch. The first recirculation triggers the FRR mechanism and updates the operational ports in the registers. The second recirculation allows for a new packet forwarding within the switch after recovery.

For example, in the simulation of the large packet flow (1514 bytes) for 10 seconds at a transmission rate of 100mbps and simulation of 5 simultaneous failures, the experiment generated a total of 82346 packets, and only 6 packets were recirculated during the multiple failure and recovery events. After each simulation execution, the recirculated packets were counted and documented in the table below:

| Packet size | Total packets | Rates | Failures | Recirculated packets |
|---|---|---|---|---|
| 1514 | 82346 | 100Mbps | 5 | 6 |
| 1514 | 823452 | 1Gbps | 5 | 6 |
| 1514 | 4117260 | 5Gbps | 5 | 6 |
| 1514 | 7411068 | 9Gbps | 5 | 6 |
| 1514 | 82346 | 100Mbps | 3 | 4 |
| 1514 | 823452 | 1Gbps | 3 | 4 |
| 1514 | 4117260 | 5Gbps | 3 | 4 |
| 1514 | 7411068 | 9Gbps | 3 | 4 |
| 1514 | 82346 | 100Mbps | 1 | 2 |
| 1514 | 823452 | 1Gbps | 1 | 2 |
| 1514 | 4117260 | 5Gbps | 1 | 2 |
| 1514 | 7411068 | 9Gbps | 1 | 2 |
| 814 | 152812 | 100Mbps | 5 | 8 |

| | | | | |
|---|---|---|---|---|
| 814 | 1528118 | 1Gbps | 5 | 8 |
| 814 | 7640592 | 5Gbps | 5 | 8 |
| 814 | 13753042 | 9Gbps | 5 | 8 |
| 814 | 152812 | 100Mbps | 3 | 5 |
| 814 | 1528118 | 1Gbps | 3 | 5 |
| 814 | 7640592 | 5Gbps | 3 | 5 |
| 814 | 13753042 | 9Gbps | 3 | 5 |
| 814 | 152812 | 100Mbps | 1 | 2 |
| 814 | 1528118 | 1Gbps | 1 | 2 |
| 814 | 7640592 | 5Gbps | 1 | 2 |
| 814 | 13753042 | 9Gbps | 1 | 2 |
| 114 | 1059323 | 100Mbps | 5 | 31 |
| 114 | 10593221 | 1Gbps | 5 | 31 |
| 114 | 52966102 | 5Gbps | 5 | 31 |
| 114 | 95339027 | 9Gbps | 5 | 31 |
| 114 | 1059323 | 100Mbps | 3 | 19 |
| 114 | 10593221 | 1Gbps | 3 | 19 |
| 114 | 52966102 | 5Gbps | 3 | 19 |
| 114 | 95339027 | 9Gbps | 3 | 19 |
| 114 | 1059323 | 100Mbps | 1 | 6 |
| 114 | 10593221 | 1Gbps | 1 | 6 |
| 114 | 52966102 | 5Gbps | 1 | 6 |
| 114 | 95339027 | 9Gbps | 1 | 6 |

Packet Recirculation Table During Application of Failures (1, 3, and 5).