ILLINOIS TECH

College of Computing

Network Profiling and Traffic Analysis for FABRIC users

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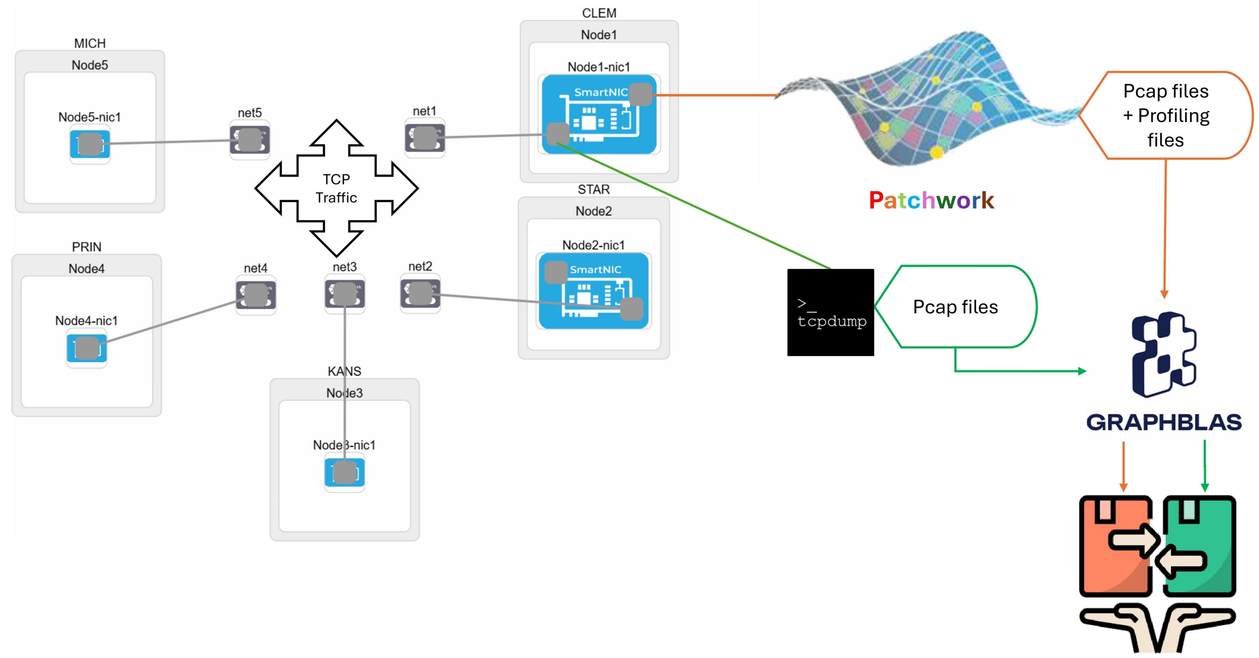
Introduction

The ability to profile and analyze traffic is essential for both security and performance management. Understanding traffic flows helps prevent congestion and enforce network and security policies where required.

This experiment introduces a collaboration between Patchwork (a network profiler) and GraphBLAS (a tool that can build a network traffic matrix). By utilizing FABRIC, Patchwork single-user mode and GraphBLAS, this research explores innovative profiling techniques that a FABRIC user can leverage to accurately classify traffic communication patterns.



Motivation

The team's main motivation is to develop and provide accessible, advanced tools for network profiling and traffic analysis, enabling testbed users to see their experiments' network profiles in a controlled environment.

Results

This experiment shows that Patchwork can listen to and capture network traffic while we perform an experiment.

- Patchwork results:

```
Run compress_tld
all_packet_traces_2025-03-02_21-26-12
CLEM/all_packet_traces_2025-03-02_21-26-12/
CLEM/all_packet_traces_2025-03-02_21-26-12/CLEM_node0_packet_trace.tgz
CLEM/all_packet_traces_2025-03-02_21-26-12/startup_log.txt
```

- GraphBLAS results:

  For Patchwork pcap

```
(fabric-jupyter) vaneshi@DESKTOP-P
pcap file is 72010990 bytes
Done: 337984 packets.  (inf pps)
```

  For tcpdump pcap

```
(fabric-jupyter) vaneshi@DESKTOP-PA
pcap file is 478525562 bytes
Done: 22477 packets.  (inf pps)
```

```
10.129.134.2 10.136.5.2
0.0.0.0 0.0.0.0
10.129.134.2 10.136.5.2
0.0.0.0 0.0.0.0
10.129.134.2 10.136.5.2
0.0.0.0 0.0.0.0
10.129.134.2 10.136.5.2
0.0.0.0 0.0.0.0
10.129.134.2 10.136.5.2
0.0.0.0 0.0.0.0
10.129.134.2 10.136.5.2
0.0.0.0 0.0.0.0
10.129.134.2 10.136.5.2
0.0.0.0 0.0.0.0
10.129.134.2 10.136.5.2
0.0.0.0 0.0.0.0
```

Approach

Patchwork can run in the background while an experiment is conducted on FABRIC. Here, the experiment "Running GraphBLAS on FABRIC" is chosen: a network with 5 nodes is created, where Node 1 is the iPerf server and Nodes 2–5 are the clients. GraphBLAS is installed on Node1. TCP traffic is sent from Nodes 2–5 to Node 1 and captured by tcpdump. The pcap file is then fed into GraphBLAS to build a traffic matrix.

Integrating Patchwork with the experiment: This involved the following steps

- Build the network topology with Node 1 and Node 2 having smart NICs and Nodes 3–5 having basic NICs.
- Build GraphBLAS on Node 1.
- Run Patchwork in Single-User mode: it is configured to mirror and listen to the server port in Node 1.
- Resume GraphBLAS experiment: start tcpdump and iPerf test to capture pcap files.
- Collect output from Patchwork and tcpdump, and run GraphBLAS on the pcap files obtained.

Future Work

Dynamic scaling of resources could be implemented to improve performance and flexibility. A software release will be available to the public.

Acknowledgement

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