Progress Report

Objective 1-1: Understand the eBPF runtime mechanism for both ARM and x86 platforms.

Objective 1-2: Integrate eBPF hooks with existing HPDF data streaming applications.

Objective 2-1: Encapsulate existing HPDF-H containerized applications into Kubernetes services.

Objective 2-2: Deploy the Kubernetes control plane on "nvidarm" and offload its network functions.

Objectives		Telemetry					Kubernetes			
		Obj 1-1	Obj 1-2	Obj 1-3	Obj 1-4	Obj 1-5	Obj 2-1	Obj 2-2	Obj 2-3	Obj 2-4
FY25	Q1 (Oct-Dec 2024)									
	Q2 (Jan-Mar 2025)									
	Q3 (April-June 2025)									
	Q4 (July-Sep 2025)									

Let's check if the service was created.

```
try:
    stdout, stderr = node1.execute("kubectl get service kubernetes-bootcamp")
    print(f"stdout: {stdout}")
    print(f"stderr: {stderr}")
except Exception as e:
    print(f"Exception: {e}")
```

```
NAME                  TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)    AGE
kubernetes-bootcamp   ClusterIP   10.111.180.18   <none>        8080/TCP   11s
```

```
$ sudo cat /sys/kernel/debug/tracing/trace_pipe
 node-1254811 [007] ..s1 8737831.671074: 0: Got IP packet: tot_len: 79,
 sshd-1254728 [006] ..s1 8737831.674334: 0: Got IP packet: tot_len: 79,
 sshd-1254728 [006] ..s1 8737831.674349: 0: Got IP packet: tot_len: 72,
 node-1254811 [007] ..s1 8737831.674550: 0: Got IP packet: tot_len: 71,
```

TELEMETRY

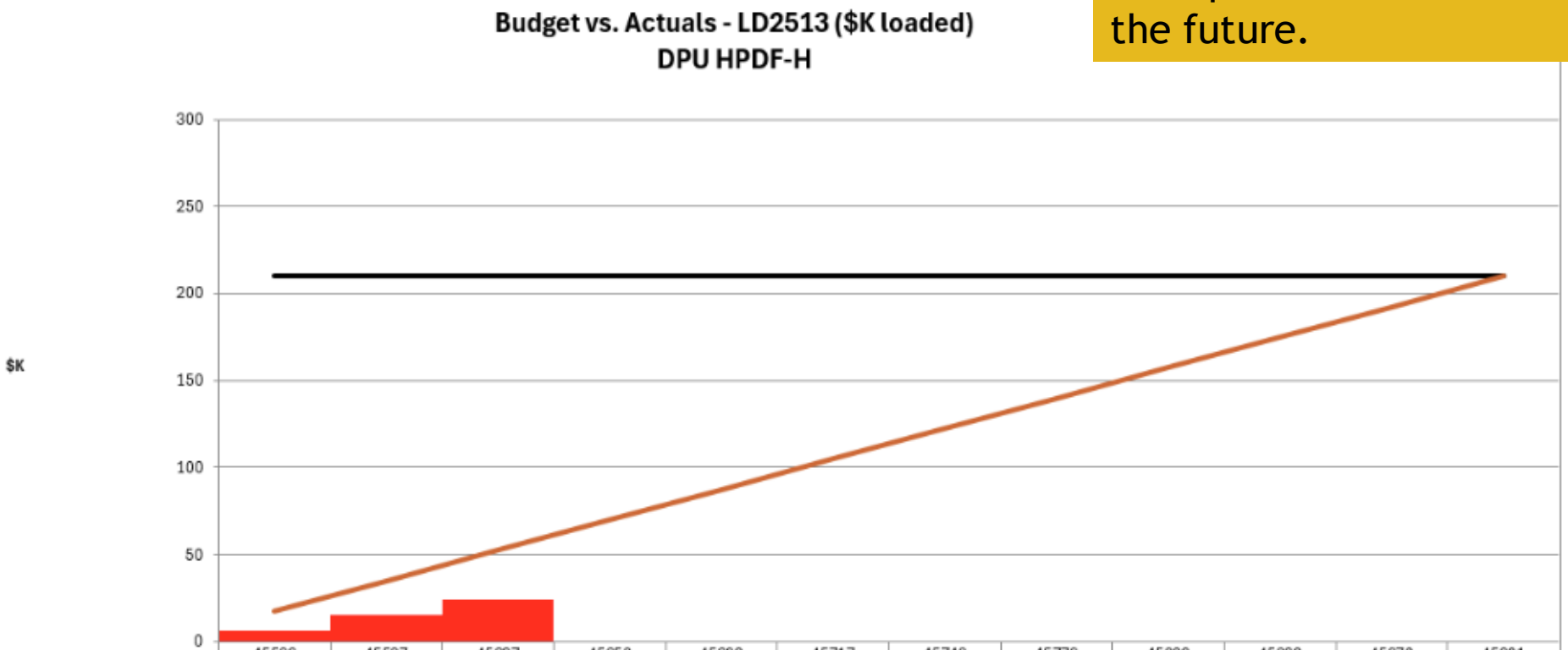
- Reproduce the below tutorial on a x86 RHEL Linux Kernel 4.8 machine (my labtop): https://eunomia.dev/en/tutorials/20-tc/#compilation-and-execution;
- Most recent SW on "nvidarm".

Fabric Testbed Notebooks:

- https://github.com/cissieAB/DPU_K8s/blob/main/FabricPortal_tests/kubernetes_simple.ipynb;
- https://github.com/cissieAB/DPU_K8s/blob/main/FabricPortal_tests/kubernetes_multi-nodes.ipynb

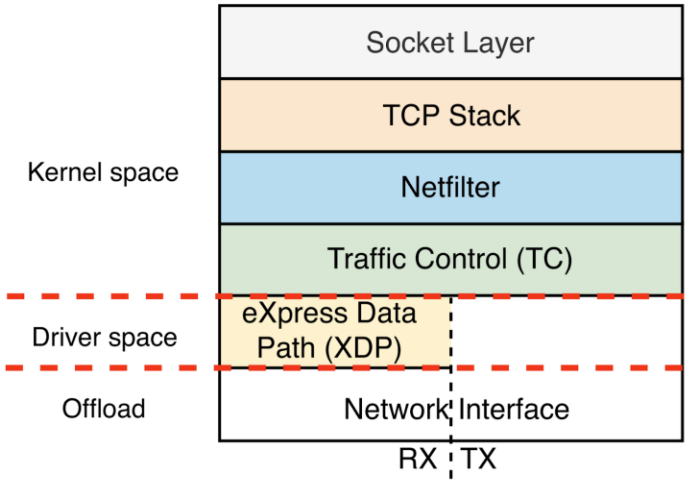
Financial Report

Will spend more hours in the future.



	45566	45597	45627	45658	45689	45717	45748	45778	45809	45839	45870	45901
YTD Spending	6	15	24	0	0	0	0	0	0	0	0	0
Pending	0	0	0	0	0	0	0	0	0	0	0	0
Open Obligations	0	0	0	0	0	0	0	0	0	0	0	0
Expenses	0	0	0	0	0	0	0	0	0	0	0	0
Labor	6	15	24	0	0	0	0	0	0	0	0	0
Funding	210	210	210	210	210	210	210	210	210	210	210	210
Projected Spending	18	35	53	70	88	105	123	140	158	175	193	210

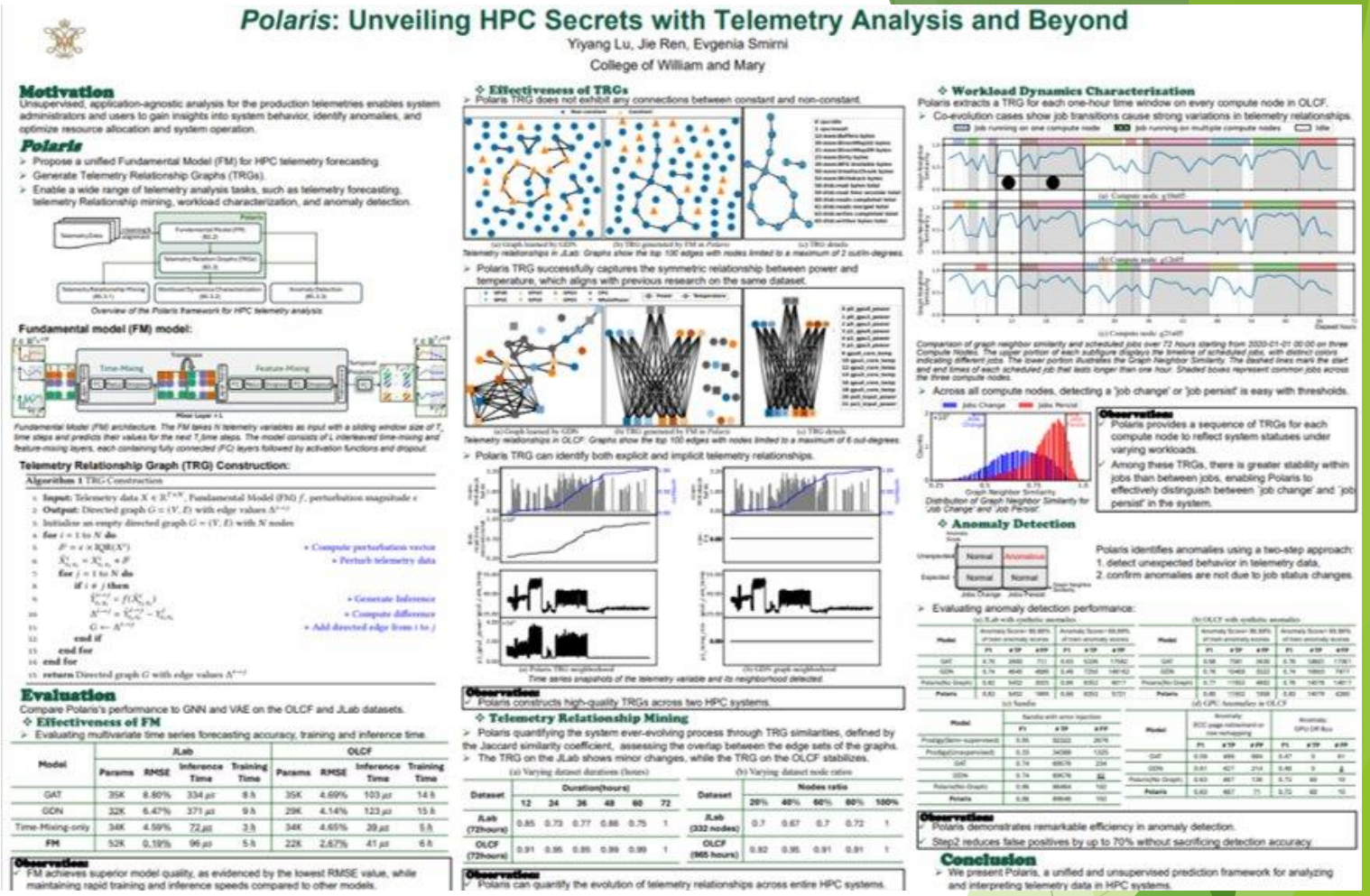
Backup - TC



TC (traffic control) vs XDP

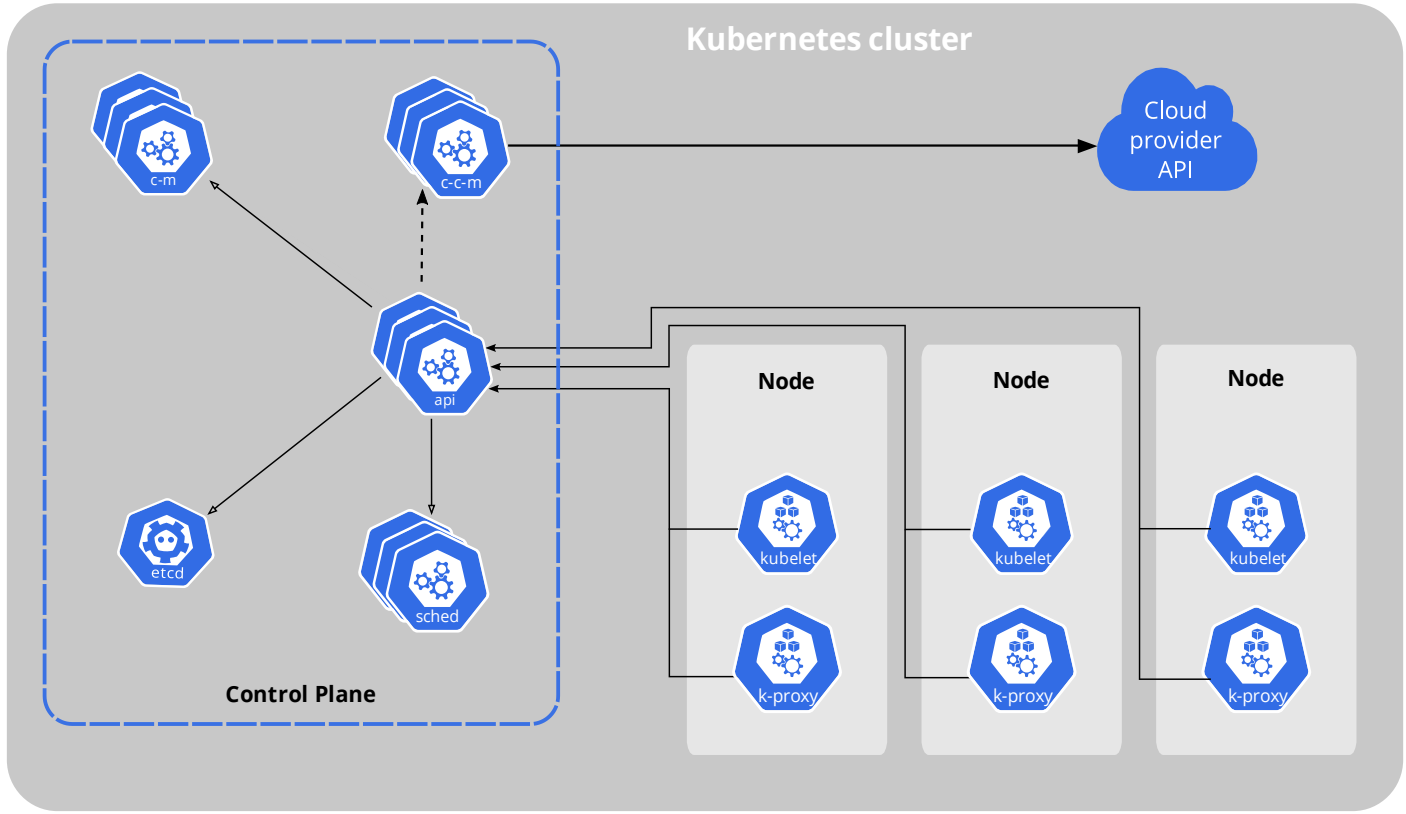
Thoughts & Challenges

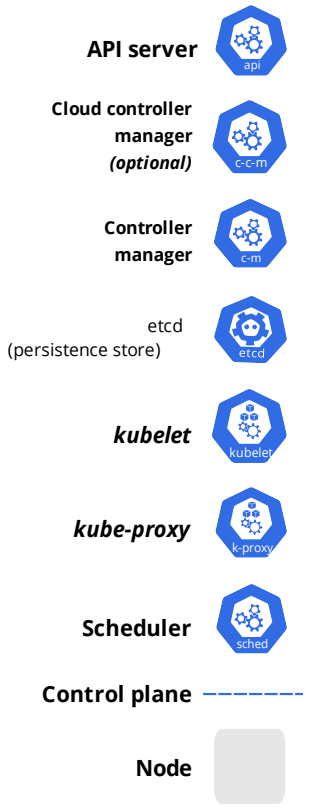
- TC is the right way to go if we need the outbound traffic statistics.
- `sudo` permission is required every where, which raised security issues.
- Real overhead measurement and evaluation.



- Unsupervised learning AI models
- Generate Telemetry Relationship Graphs (TRGs)
- Cluster anomaly detection
- JLab farm node-exporter data (1 min interval) and ORNL temp & power (1s interval, aggregated to 15s) data.

Backup - K8s





Thoughts & Challenges

- The behavior is not very stable on Fabric Testbed.
- Local control plane deployment on "nvidarm", with Cilium as the CNI.