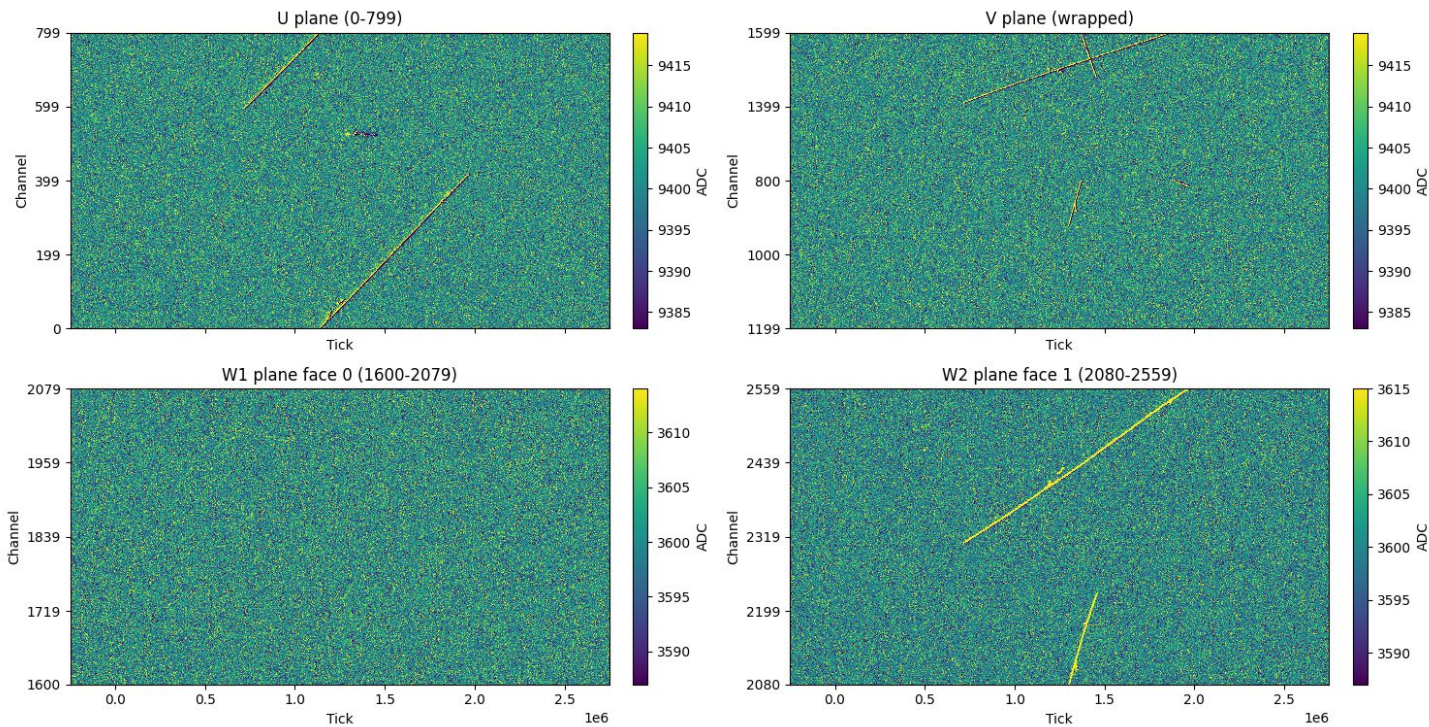
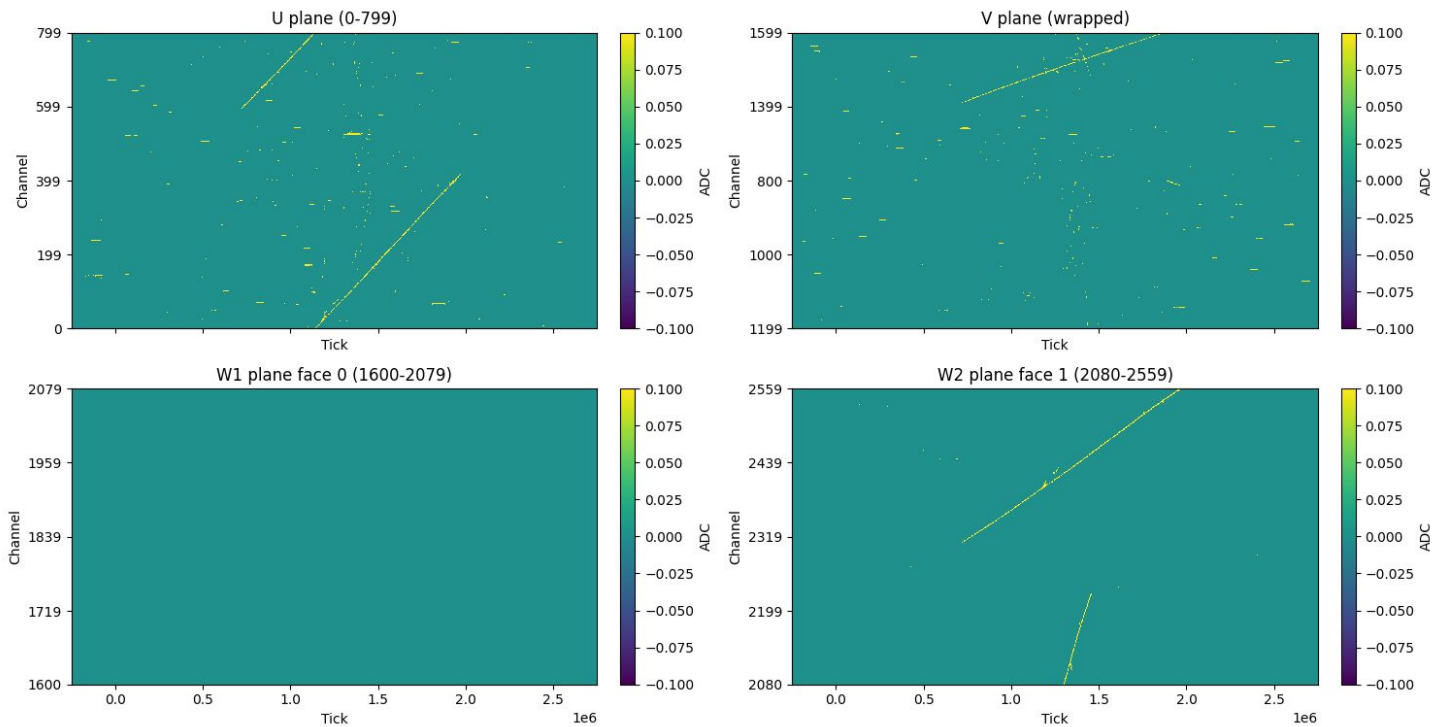


DUNE SPNG Updates

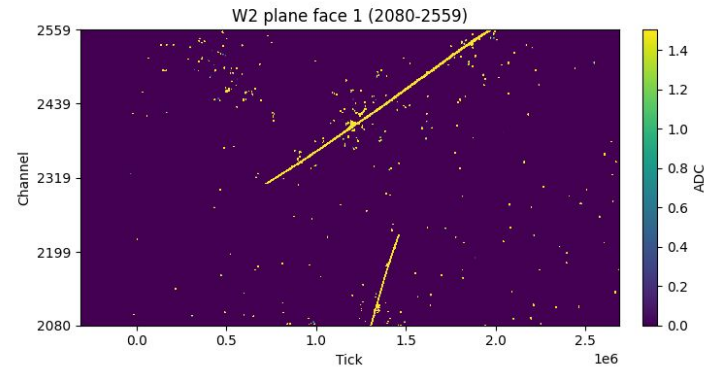
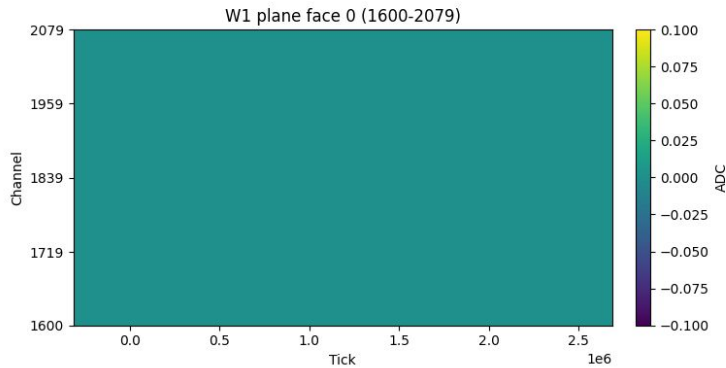
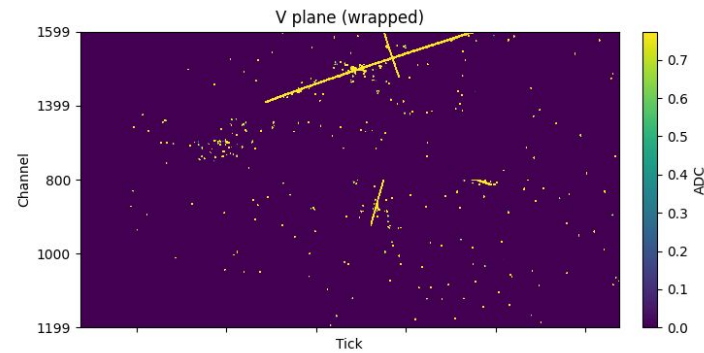
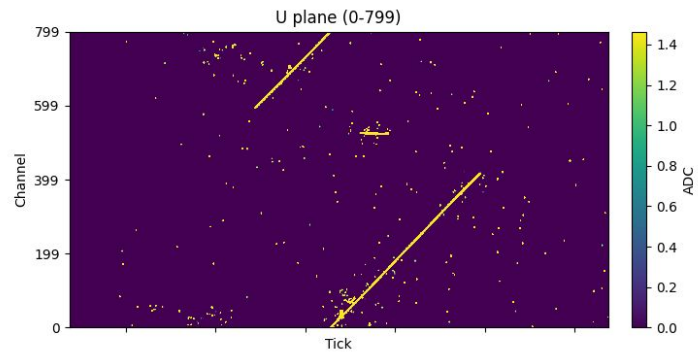
April 10 2026



Input to the inference (Dense Waveform frame data)
Physics simulation with drift, diffusion and noise

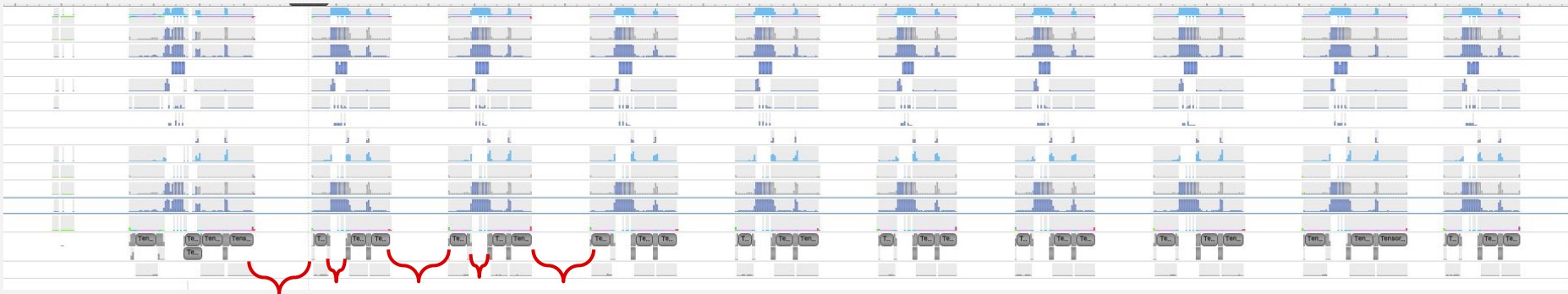


ROIs from DNNROI and ROIs applied on filtered dense data



Truth Signal (Depo Flux Splat) \rightarrow Depositions on wire converted into Signals directly

Improving the Profiling



- Missing Gaps in annotated Profiling.
- Was missing information

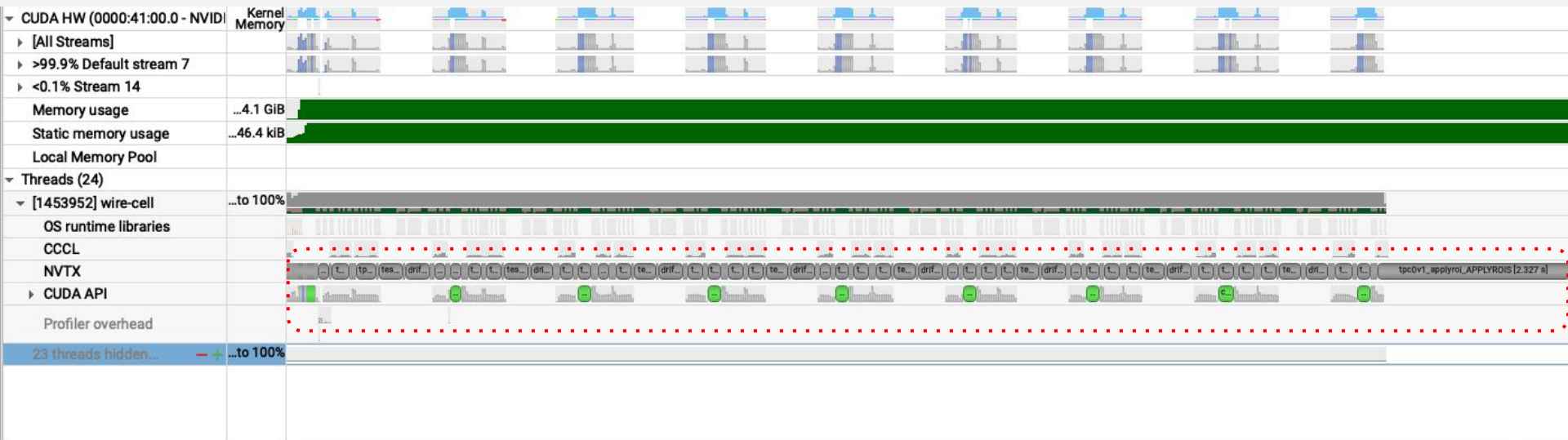
Full Coverage

```
// this bool indicates exception, and is probably ignored
bool Graph::execute()
{
    auto nodes = sort_kahn();
    l->debug("executing with {} nodes", nodes.size());

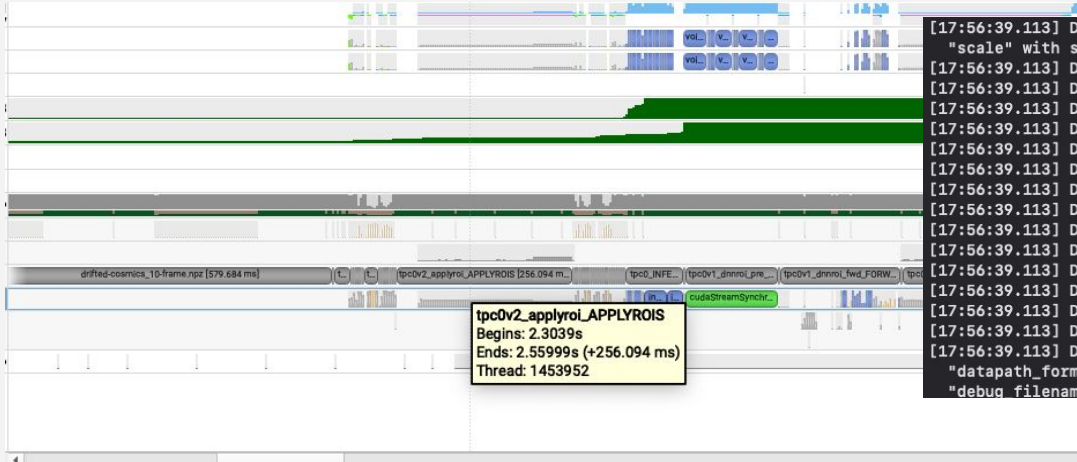
    while (true) {
        int count = 0;
        bool did_something = false;

        for (auto nit = nodes.rbegin(); nit != nodes.rend(); ++nit, ++count) {
            Node* node = *nit;
            NVTX_SCOPED_RANGE((node->instance_name()).c_str());
            auto core = std::clock();
            auto wall = std::chrono::high_resolution_clock::now();
        }
    }
}
```

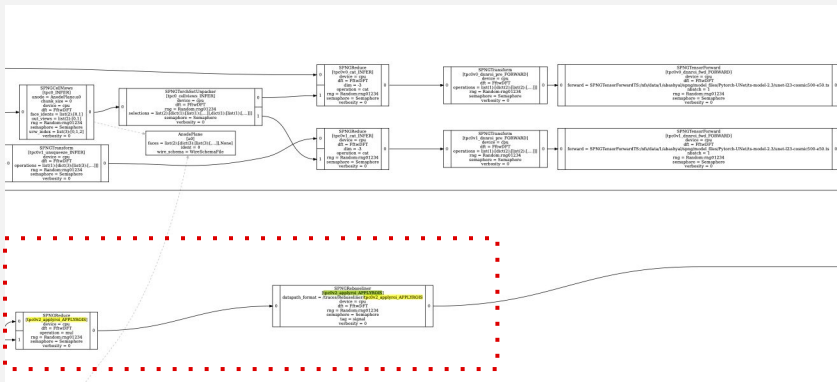
Added in PGrapher/Graph.cxx



Unique names based on node instances



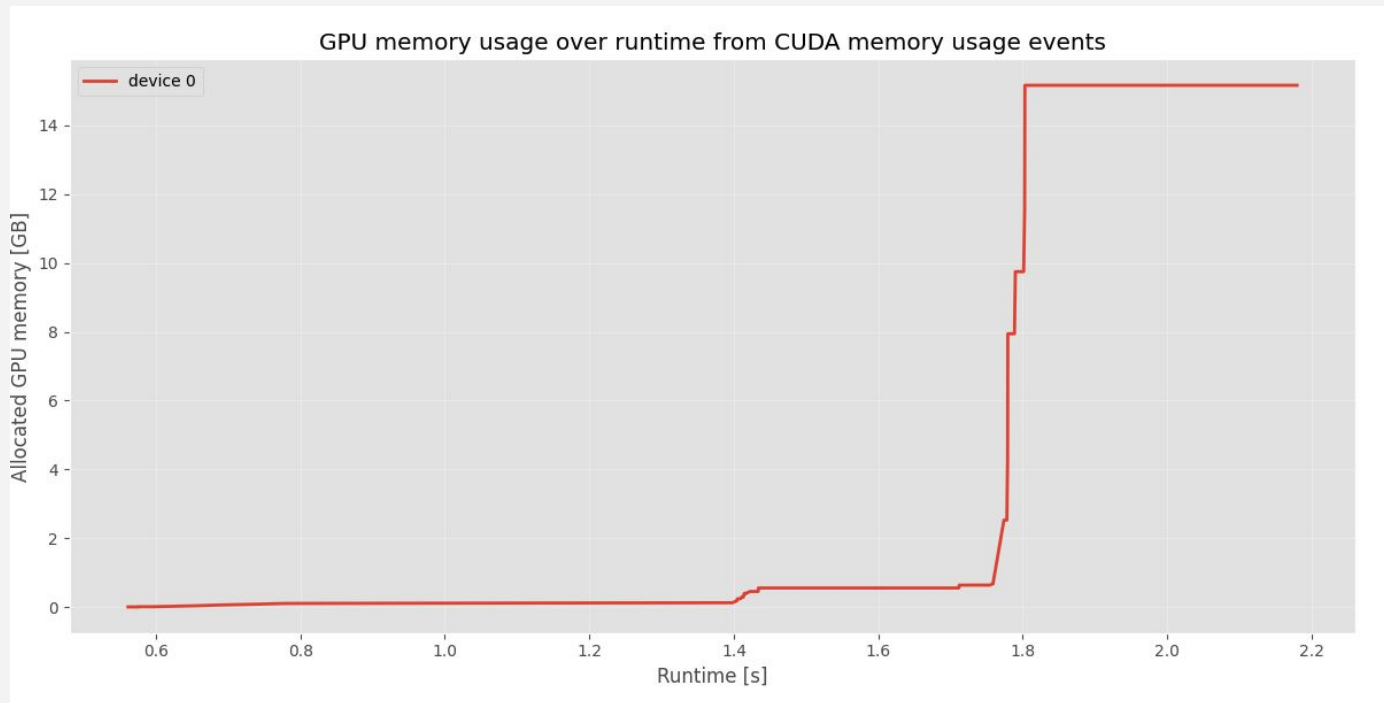
```
[17:56:39.113] D [ spng ] <Transform:tpc0v1_scale_dnnroi_dense_INFER> Applying transform operation  
"scale" with scalar=0.00025 and ndims=0  
[17:56:39.113] D [ main ] configuring component: "SPNGReduce": "tpc0v0_applyroi APPLYROIS"  
[17:56:39.113] D [ spng ] <Reduce:tpc0v0_applyroi APPLYROIS> fanin multiplicity: 2  
[17:56:39.113] D [ main ] configuring component: "SPNGRebaseliner": "tpc0v0_applyroi APPLYROIS"  
[17:56:39.113] D [ main ] configuring component: "SPNGReduce": "tpc0v1_applyroi APPLYROIS"  
[17:56:39.113] D [ spng ] <Reduce:tpc0v1_applyroi APPLYROIS> fanin multiplicity: 2  
[17:56:39.113] D [ main ] configuring component: "SPNGRebaseliner": "tpc0v1_applyroi APPLYROIS"  
[17:56:39.113] D [ main ] configuring component: "SPNGReduce": "tpc0v2_applyroi APPLYROIS"  
[17:56:39.113] D [ spng ] <Reduce:tpc0v2_applyroi APPLYROIS> fanin multiplicity: 2  
[17:56:39.113] D [ main ] configuring component: "SPNGRebaseliner": "tpc0v2_applyroi APPLYROIS"  
[17:56:39.113] D [ main ] configuring component: "SPNGReduce": "tpc0v0_cat_INFER"  
[17:56:39.113] D [ spng ] <Reduce:tpc0v0_cat_INFER> fanin multiplicity: 2  
[17:56:39.113] D [ main ] configuring component: "SPNGReduce": "tpc0v1_cat_INFER"  
[17:56:39.113] D [ spng ] <Reduce:tpc0v1_cat_INFER> fanin multiplicity: 2  
[17:56:39.113] D [ main ] configuring component: "SPNGTransform": "tpc0v0_unsqueeze_INFER"  
[17:56:39.113] D [ spng ] <Transform:tpc0v0_unsqueeze_INFER> Transform config: {  
  "datapath_format": "",  
  "debug_filename": ""
```



Profiler Overhead

- Total Profiler Overhead: 0.29 seconds (run time)
- Total Profiling Duration: 14.89 seconds (run time)

Memory usage

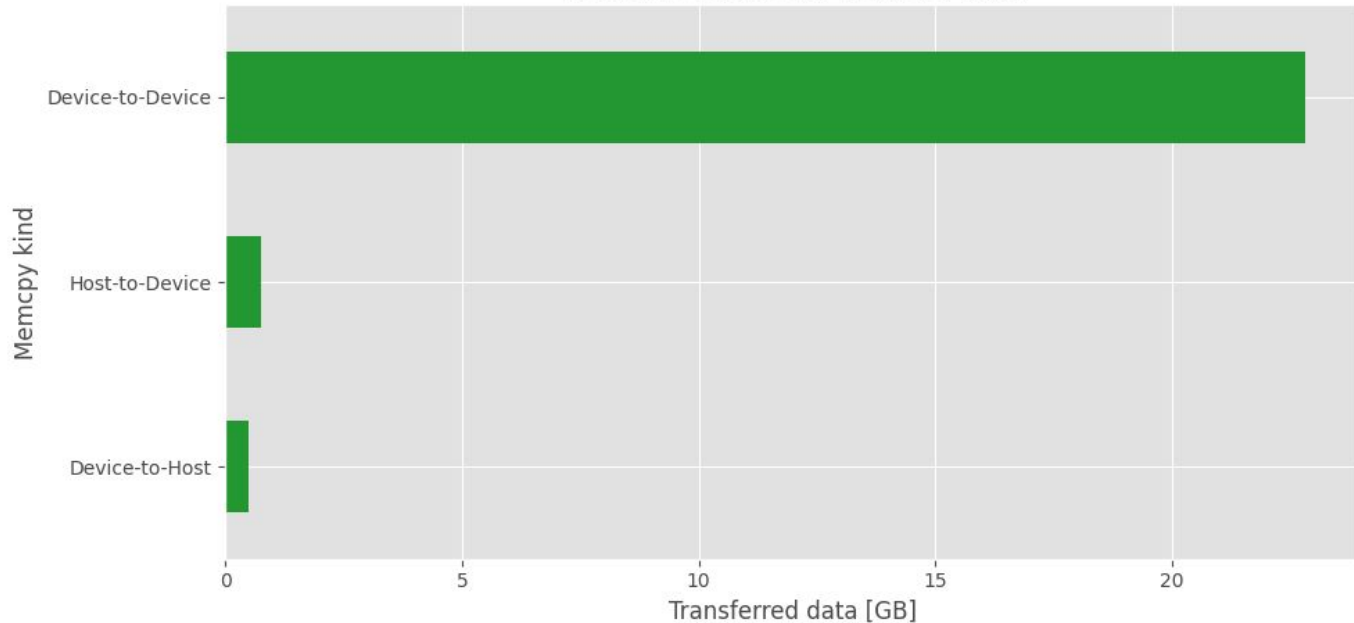


~ 14 GB out of ~23 GB

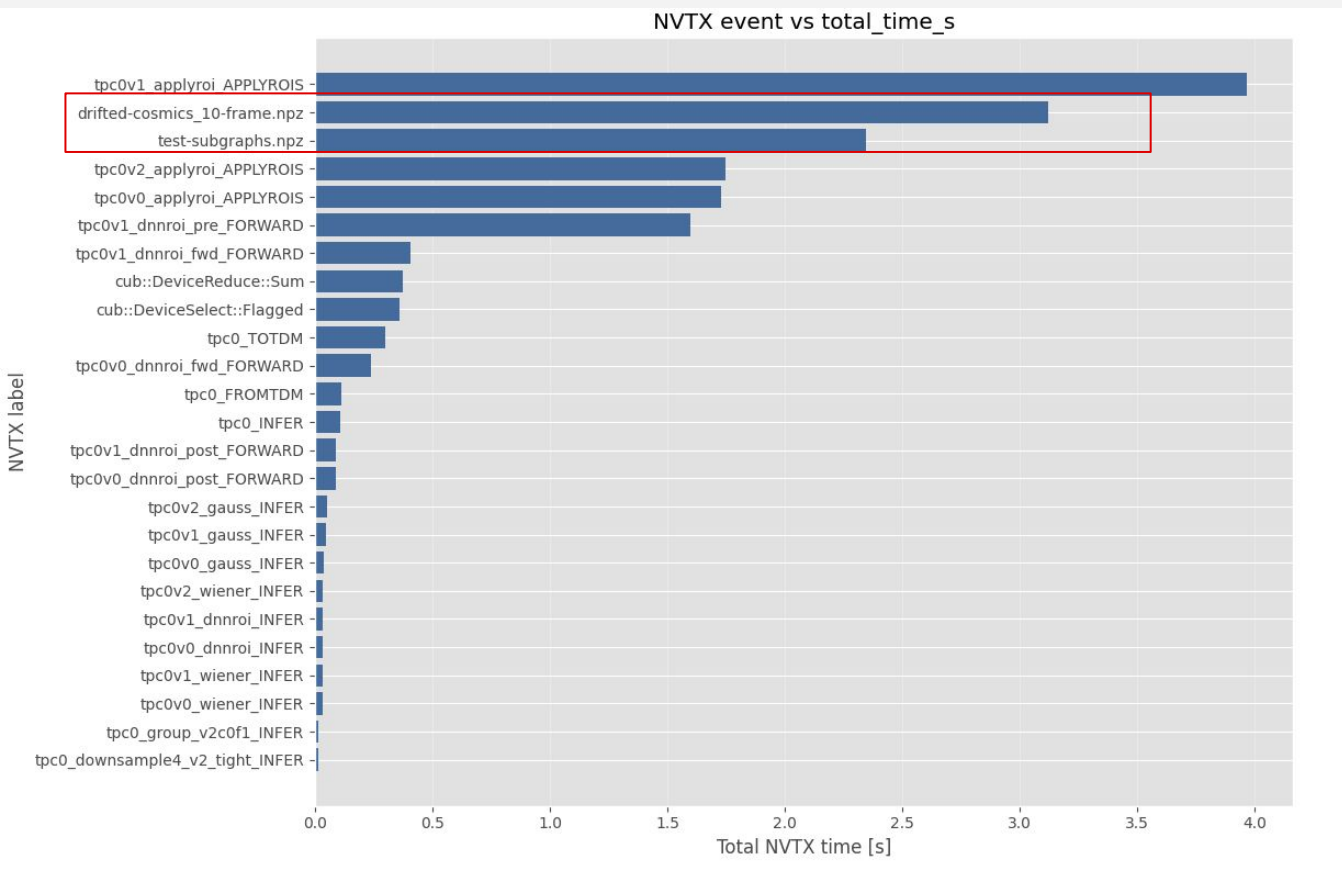
Data Transfer during Application Run time

	copy_kind	device_id	copies	total_gb	total_time_s	effective_gbps
0	Device-to-Device	0	61715	22.820	0.090	253.000
1	Host-to-Device	0	333	0.740	0.040	18.000
2	Device-to-Host	0	198225	0.493	0.191	2.000

Memcpy volume by transfer kind



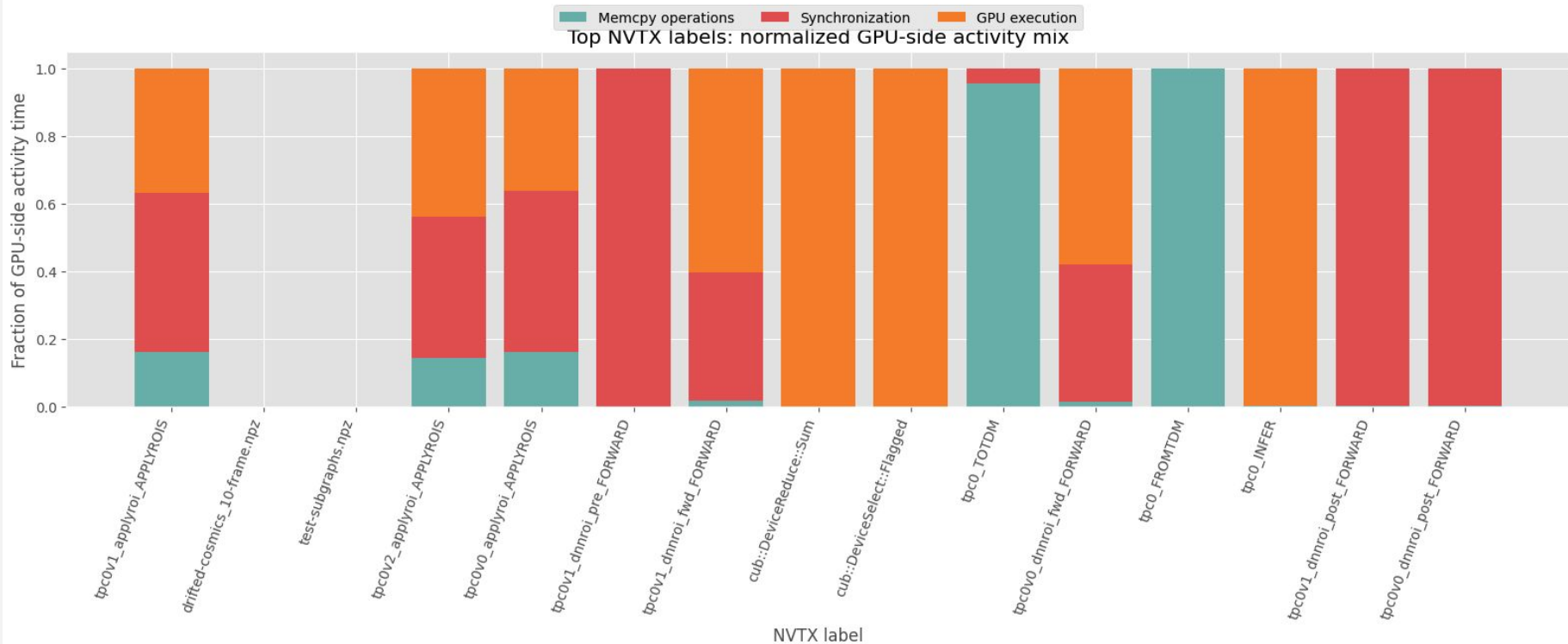
Total run time (according to profiler) for nodes



Nvtx timer is the cpu side timer (start of annotated code, end of annotated code)

How long do the reading writing wire-cell node stays during application run time?

Looking at underlying actions happening in the gpu



```

[15:34:17.477] D [ pgraph ] *****Finished processing nodes 61*****
[15:34:17.477] D [ pgraph ] Now Processing node test-subgraphs.npz 0
[15:34:17.477] D [ pgraph ] Now Processing node tpc0_FROMTDM 1
[15:34:17.477] D [ pgraph ] Now Processing node tpc0_bypass 2
[15:34:17.477] D [ pgraph ] Now Processing node tpc0_pack3_signals 3
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v2_applyroi_APPLYROIS 4
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v2_applyroi_APPLYROIS 5
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v2_gauss_INFER 6
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v1_applyroi_APPLYROIS 7
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v1_applyroi_APPLYROIS 8
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v1_gauss_INFER 9
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v0_applyroi_APPLYROIS 10
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v0_applyroi_APPLYROIS 11
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v0_gauss_INFER 12
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v1_unbin4_ROIS 13
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v1_dnnroi_roi_FORWARD 14
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v1_dnnroi_post_FORWARD 15
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v1_dnnroi_fwd_FORWARD 16
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v0_unbin4_ROIS 17
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v0_dnnroi_roi_FORWARD 18
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v0_dnnroi_post_FORWARD 19
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v0_dnnroi_fwd_FORWARD 20
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v1_dnnroi_pre_FORWARD 21
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v1_cat_INFER 22
[15:34:17.477] D [ pgraph ] Now Processing node tpc0v1_unsqueeze_INFER 23
[15:34:17.478] D [ pgraph ] Now Processing node tpc0v0_dnnroi_pre_FORWARD 24
[15:34:17.478] D [ pgraph ] Now Processing node tpc0v0_cat_INFER 25
[15:34:17.478] D [ pgraph ] Now Processing node tpc0v0_unsqueeze_INFER 26
[15:34:17.478] D [ pgraph ] Now Processing node tpc0v2_unbin4_ROIS 27
[15:34:17.478] D [ pgraph ] Now Processing node tpc0v1_scale_dnnroi_dense_INFER 28
[15:34:17.478] D [ pgraph ] Now Processing node tpc0v1_rebin4_dense_INFER 29
[15:34:17.478] D [ pgraph ] Now Processing node tpc0v0_scale_dnnroi_dense_INFER 30
[15:34:17.478] D [ pgraph ] Now Processing node tpc0v1_rebin4_dense_INFER 31
[15:34:17.478] D [ pgraph ] Now Processing node tpc0v1_dnnroi_INFER 32
[15:34:17.478] D [ pgraph ] Now Processing node tpc0v0_dnnroi_INFER 33
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_cellviews_INFER 34
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_INFER 35
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_cellviews_INFER 36
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_initrois_INFERf2 37
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_cross_v2_INFER 38
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_downsample4_v2_tight_INFER 39
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_initrois_INFERf1 40
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_cross_v1_INFER 41
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_downsample4_v1_tight_INFER 42
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_initrois_INFERf0 43
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_cross_v0_INFER 44

```

	start_s	end_s	duration_ms	nvtx_label
0	0.797	0.797	0.019	test-subgraphs.npz
1	0.797	0.797	0.002	tpc0_FROMTDM
2	0.797	0.797	0.002	tpc0_bypass
3	0.797	0.797	0.002	tpc0_pack3_signals
4	0.797	0.797	0.002	tpc0v2_applyroi_APPLYROIS
5	0.797	0.797	0.002	tpc0v2_applyroi_APPLYROIS
6	0.797	0.797	0.002	tpc0v2_gauss_INFER
7	0.797	0.797	0.002	tpc0v1_applyroi_APPLYROIS
8	0.797	0.797	0.002	tpc0v1_applyroi_APPLYROIS
9	0.797	0.797	0.002	tpc0v1_gauss_INFER
10	0.797	0.797	0.002	tpc0v0_applyroi_APPLYROIS
11	0.797	0.797	0.002	tpc0v0_applyroi_APPLYROIS
12	0.797	0.797	0.002	tpc0v0_gauss_INFER
13	0.797	0.797	0.002	tpc0v1_unbin4_ROIS
14	0.797	0.797	0.002	tpc0v1_dnnroi_roi_FORWARD
15	0.797	0.797	0.002	tpc0v1_dnnroi_post_FORWARD
16	0.797	0.797	0.002	tpc0v1_dnnroi_fwd_FORWARD
17	0.797	0.797	0.002	tpc0v0_unbin4_ROIS
18	0.797	0.797	0.002	tpc0v0_dnnroi_roi_FORWARD
19	0.797	0.797	0.002	tpc0v0_dnnroi_post_FORWARD
20	0.797	0.797	0.002	tpc0v0_dnnroi_fwd_FORWARD
21	0.797	0.797	0.002	tpc0v1_dnnroi_pre_FORWARD
22	0.797	0.797	0.002	tpc0v1_cat_INFER
23	0.797	0.797	0.002	tpc0v1_unsqueeze_INFER
24	0.797	0.797	0.002	tpc0v0_dnnroi_pre_FORWARD
25	0.797	0.797	0.002	tpc0v0_cat_INFER
26	0.797	0.797	0.002	tpc0v0_unsqueeze_INFER
27	0.797	0.797	0.002	tpc0v2_unbin4_ROIS
28	0.797	0.797	0.002	tpc0v1_scale_dnnroi_dense_INFER
29	0.797	0.797	0.002	tpc0v1_rebin4_dense_INFER
30	0.797	0.797	0.002	tpc0v0_scale_dnnroi_dense_INFER
31	0.797	0.797	0.002	tpc0v0_rebin4_dense_INFER
32	0.797	0.797	0.002	tpc0v1_dnnroi_INFER
33	0.797	0.797	0.002	tpc0v0_dnnroi_INFER
34	0.797	0.797	0.002	tpc0_cellviews_INFER
35	0.797	0.797	0.002	tpc0_INFER
36	0.797	0.797	0.002	tpc0_cellviews_INFER
37	0.797	0.797	0.002	tpc0_initrois_INFERf2
38	0.797	0.797	0.002	tpc0_cross_v2_INFER
39	0.797	0.797	0.002	tpc0_downsample4_v2_tight_INFER
40	0.797	0.797	0.002	tpc0_initrois_INFERf1
41	0.797	0.797	0.002	tpc0_cross_v1_INFER

```

[15:34:17.478] D [ pgraph ] Now Processing node tpc0_dnnroi_inference_INFERf2 49
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_dnnroi_inference_INFERf1 50
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_dnnroi_inference_INFERf0 51
[15:34:17.478] D [ pgraph ] Now Processing node tpc0tpc0_group_v2c0f0_INFER-tpc0_group_v2c0f1_INFER 52
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_group_v2c0f1_INFER 53
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_group_v2c0f0_INFER 54
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_group_v1c2f1f0_INFER 55
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_group_v0c2f1f0_INFER 56
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_groups_INFER 57
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_bypass 58
[15:34:17.478] D [ pgraph ] Now Processing node tpc0_TOTDM 59
[15:34:17.478] D [ spng ] <FrameToTdm:tpc0_TOTDM> frame tensor datapath: /frames/100/frame
[15:34:17.478] D [ spng ] <FrameToTdm:tpc0_TOTDM> ntirs=800 ntraces=2560 nrows=800 ncols=6000 nchid2row=800
[15:34:17.484] D [ spng ] <FrameToTdm:tpc0_TOTDM> ntirs=800 ntraces=2560 nrows=800 ncols=6000 nchid2row=800
[15:34:17.491] D [ spng ] <FrameToTdm:tpc0_TOTDM> ntirs=480 ntraces=2560 nrows=480 ncols=6000 nchid2row=480
[15:34:17.495] D [ spng ] <FrameToTdm:tpc0_TOTDM> ntirs=480 ntraces=2560 nrows=480 ncols=6000 nchid2row=480
[15:34:17.506] D [ spng ] <FrameToTdm:tpc0_TOTDM> my device is: cuda
[15:34:17.506] D [ pgraph ] *****Finished processing nodes 61*****

```

44	0.797	0.797	0.002	tpc0_cross_v0_INFER
45	0.797	0.797	0.002	tpc0_downsample4_v0_tight_INFER
46	0.797	0.797	0.002	tpc0v2_wiener_INFER
47	0.797	0.797	0.002	tpc0v1_wiener_INFER
48	0.797	0.797	0.002	tpc0v0_wiener_INFER
49	0.797	0.797	0.002	tpc0_dnnroi_inference_INFERf2
50	0.797	0.797	0.002	tpc0_dnnroi_inference_INFERf1
51	0.797	0.797	0.002	tpc0_dnnroi_inference_INFERf0
52	0.797	0.797	0.002	tpc0tpc0_group_v2c0f0_INFER-tpc0_group_v2c0f1...
53	0.797	0.797	0.002	tpc0_group_v2c0f1_INFER
54	0.797	0.797	0.002	tpc0_group_v2c0f0_INFER
55	0.797	0.797	0.002	tpc0_group_v1c2f1f0_INFER
56	0.797	0.797	0.002	tpc0_group_v0c2f1f0_INFER
57	0.797	0.797	0.002	tpc0_groups_INFER
58	0.797	0.797	0.002	tpc0_bypass
59	0.797	0.797	0.002	tpc0_TOTDM
60	0.797	1.376	578.588	drifted-cosmics_10-frame.npz