

Hardware Counters for non-Intel Systems

(and tools for Frontier)

AMD CPU Counters

- @Gruber (LIKWID)
 - the PFM hardware unit hasn't changed in years
 - IBS still works
 - some counters lie (important ones like vector ops and memory bandwidth)
 - even fixed counters are giving bad counts
 - Linux kernel settings can improve performance

https://www.amd.com/system/files/TechDocs/54945_3.03_ppr_ZP_B2_pub.zip

- Wishlist:
 - good contacts within AMD for CPU counters
 - public documentation on DataFabric events
 - top-down methodology with associated counter groups

AMD GPU Profiling

- HIP looks like CUDA
 - ROCm profiling interface looks like CUPTI
- HPCToolkit is looking to unify GPU profiling code
- Frontier Tools WG provides opportunity for requesting changes to tools APIs
 - send requests to Mike Brim (brimmj@ornl.gov)

POWER CPU Counters

- Grouping creates difficulties for profiling
- Cycle-based accounting (top-down) is oriented toward existing groups
 - See “CPI stack” in *POWER9 Performance Monitor Unit User’s Guide*

https://wiki.raptorcs.com/w/images/6/6b/POWER9_PMU_UG_v12_28NOV2018_pub.pdf

ARM CPU Counters

- No top-down equivalent behavior
- Counters
 - Good: instruction counts, branching, load/store
 - Bad: flops, memory accesses
- **Recommendation:** software prefetching helps performance significantly
 - could tools help add this?
- **Caveat:** Counter names may measure different things on different vendor implementations

NVIDIA GPU Profiling

- CUPTI is annoying, but still useful
 - NVIDIA wants to provide only metrics (not events)