**SCIPHI**

Score-P and Cube extensions for Intel Xeon Phi

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**Cube's KNL-Advisor:** VPU-related metrics

Operates on OpenMP parallel loops or manually instrumented loops

- **L1 Compute to Data Access Ratio:**
  - Judge suitability of an application for running on KNL
    
    `UOPS_RETIRED.PACKED_SINT / MEM_UOPS_RETIRED.ALL LOADS`
  
  - **L2 Compute to Data Access Ratio:**
  
    "Indicate whether the code is operating efficiently"

    `UOPS_RETIRED.PACKED_SINT / MEM_UOPS_RETIRED.L1_MISS_LOADS`
  
  - **Vector VPU intensity:**
  
    "Rule of thumb to see how well a loop is vectorized"

    `UOPS_RETIRED.PACKED_SINT / (UOPS_RETIRED.PACKED_SINT + UOPS_RETIRED.SCALAR_SINT)`

**Hardware counters needed:**

- `UOPS_RETIRED.PACKED_SINT, MEM_UOPS_RETIRED.ALL LOADS, UOPS_RETIRED.SCALAR_SINT, MEM_UOPS_RETIRED.L1_MISS_LOADS`

Four HWC needed, but KNL offers just two general purpose registers

- Automate multiple measurements with HWC configuration-file
- Automate measurements-merge and derived metrics calculation via Cube’s KNL-Advisor

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**HWLOC topology**

- **Layer consists of 2x4 hardware threads**
- **Use HWLOC library to query topology data**

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**Cube's KNL-Advisor:**

- **MCDRAM candidate metric**
  - Cache-unfriendly app benefits from MCDRAM only in high bandwidth situation (here CloverLeaf3D).
  - Identify code regions that contain data structures that potentially benefit from being allocated in MCDRAM

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**Record DDR/MCDRAM allocations**

- **Determine working set size per memory type:** if < 16GB: run entirely in MCDRAM
- **Track allocation functions:**
  - DDR: malloc/free, new/delete, etc.
  - MCDRAM: hbwmalloc API
    
    "provides leaks, heap memory high watermark, attributable to source"
  
  - Analyze callpath profile with Cube

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**Issues:**

- **Access to uncore counters need privileged access**
- **Candidates are code regions, user prefers data structures**