Table of Contents

Meetings and Minutes.............................................................................................................................1
Conferences and Workshops..................................................................................................................2
Meetings (Status Reports)........................................................................................................................2

Table of Content.................................................................................................................................................2

Subjects for Studies............................................................................................................................................2
  HEP reference workloads in containers..................................................................................................2
  SPEC CPU 2017.....................................................................................................................................3
  Spectre, Meltdown.................................................................................................................................3
  HS06.......................................................................................................................................................4
  DB12.......................................................................................................................................................4
  KV...........................................................................................................................................................4

Resources Available to Run Benchmarks........................................................................................................4
  CERN......................................................................................................................................................6
  Other sites that would like to join...........................................................................................................7

Recipes to Run Experiment Workloads..........................................................................................................7

Passive Benchmark............................................................................................................................................7

Actions List
  2017-03-10
  2017-04-19
Subjects for Studies

HEP reference workloads in containers

• Dedicated page link

SPEC CPU 2017

• Compare HS06 and SPEC CPU 2017 scores
  ♦ Correlation between SC17 and HS06
    ◊ Very high correlation, measured on 7 different Intel CPU models
    ◊ Not all scores are independent
    ◊ Results reported here
  ♦ Studies at the micro-code level (Trident)
    ◊ ref

• Compare SPEC CPU 2017 with HEP jobs
  ♦ Initial comparison based on grid jobs ref
  ♦ Need to identify HEP reference workloads

Spectre, Meltdown,

• Evaluate performance effect of the patches
  ♦ Several independent measurements performed, embracing WLCG workloads and HS06
  ♦ All confirm that the performance degradation is within 1%-5%
  ♦ ref
  ♦ L1TF: effect within 2% (ref)

HS06

• Shall HS06 be still run in 32-bit or in 64-bit (-m32 Vs -m64)
  ♦ Discussion started in the mailing list. Motivations
    ◊ New architectures can be only tested in 64-bit
    ◊ The experiment applications are in 64-bit
    ◊ Scattered studies have reported a ratio of 20% among -m32 and -m64. Is this ratio constant for all CPU models?
  ♦ Results reported in here
  ♦ Conclusions:
    ◊ HS06 score would change of ~15% moving from 32 to 64 bits
    ◊ Factor is different for different CPU models, but within 5%
    ◊ A change of the official procedure is not justified

• HS06 variation with OS
  ♦ Results reported in here
  ♦ Conclusions: variations within few percent

• HS06 correlation with Experiment workloads
  ♦ HS06 doesn't scale anymore (in new Intel CPU models) with simulation workloads.
  ♦ Lack of "magic boost" seen for experiment applications.
    ◊ Recent reports from LHCb and Alice
  ♦ What's the situation for Reconstruction workloads?
What's the situation for Atlas and CMS workloads?

♦ Status:
  ◊ Alice and LHCb workloads not scaling anymore with HS06 (a.k.a. Haswell magic boost)
  ◊ Independent studies still show agreement within 10% for Atlas and CMS workloads

DB12

♦ DB12 boost in Haswell and Broadwell
  ♦ Investigated by M. Guerri. Reason found to be due to the better branch prediction
  ♦ pre-GDB
  ♦ notebook

♦ DB12 variation with different OS and python versions
  ♦ Is DB12 affected by different python or OS versions, on the same CPU model?
  ♦ Studies here

♦ DB12 performance with SMT ON/OFF
  ♦ Respect to HS06 DB12 doesn't seem to benefit from SMT enabled respect to the 20% seen in HS06
  ◊ Studies on VMs benchmarking full HW node
    • Plot showing the Relative performance of DB12, WSN, KV and HS06 across different VM configurations. The performance of VM-83A is used as reference
    • Full presentation
  ◊ Tables here

♦ DB12 Vs multi-core jobs performance
  ♦ Is DB12 well correlated with the execution time of multi-core jobs, such as the ones running in ATLAS and CMS?

KV

♦ KV double peak effect
  ♦ Investigated by M. Guerri. Is related to different performance of the first core of a dual-socket server respect to all the other cores.
  ♦ pre-GDB
  ♦ CERN internal note: Profiling CPU-bound workloads on Intel Haswell-EP platforms

♦ Reduce initialization time for KV
  ♦ the athena applications runs in ~2 mins to process 100 single muon events, but the initialization time (sw-mgr application) can take up to 3 additional minutes. Can initialization be reduced?
    ◊ A slim implementation of the KV benchmark is available in Docker container
      • To run docker run -it --rm
gitlab-registry.cern.ch/giordano/hep-workloads:atlas-kv-bmk-v17.8.0.9
      • gitlab repository
      • Further details described in this talk

♦ KV License
  ♦ Atlas code is now in github with Open Source licence
Resources Available to Run Benchmarks

GridKa has reconfigured its compute farm to enable special benchmarking tasks:

- An open issue is the correlation of static benchmark results (like HS06, or DB12-at-boot) with applications, depending on the number of configured job slots. Therefore there are several flavors of worker nodes, for instance:
  - Intel Xeon E5-2630v4 (Broadwell, 10-core, Hyperthreading enabled):
    - 20 job slots (1.0 slots per physical core)
    - 32 job slots (1.6 slots per physical core)
    - 40 job slots (2.0 slots per physical core)
  - Intel Xeon E5-2630v3 (Haswell, 8-core, Hyperthreading enabled):
    - 24 job slots (1.5 slots per physical core)
    - 32 job slots (2.0 slots per physical core)
  - Intel Xeon E5-2665 (Sandy Bridge, 8-core, Hyperthreading enabled):
    - 16 job slots (1.0 slots per physical core)
    - 24 job slots (1.5 slots per physical core)

- The static benchmark scores are available to all batch jobs (submitted to either arc-1-kit.gridka.de, arc-2-kit.gridka.de, or arc-3-kit.gridka.de) using the machine job features (MJF):
  - $JOBFEATURES/hs06_job: HS06 score available to the job
  - $JOBFEATURES/db12_job: DB12 score available to the job
  - $JOBFEATURES/allocated_cpu: number of single-core job slots provided to the job

- Manfred Alef at KIT can provide static benchmark scores afterwards; please send a CVS (or Excel or ODF spreadsheet) file which contains at least the worker node hostnames and the individual performance (events/s) of the jobs

CERN

A number of resources can be made available for testing, based on bare metal servers or whole node VMs. Access, based on ssh public key, can be provided on demand.

* List of available resources (this list can change following the needs of Tier-0 resources)

<table>
<thead>
<tr>
<th>Type</th>
<th>CPU model</th>
<th>OS</th>
<th>N cores</th>
<th>N machines</th>
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</thead>
<tbody>
<tr>
<td>Bare-metal</td>
<td>Intel(R) Xeon(R) CPU E5-2650 v2 @ 2.60GHz (Ivy Bridge)</td>
<td>SLC6.8</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>VM</td>
<td>Intel Xeon E5-2630v3 (Haswell)</td>
<td>CC7 - x86_64</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>VM</td>
<td>Intel Xeon E5-2630v3 (Haswell)</td>
<td>SLC6 - x86_64</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>VM</td>
<td>Intel(R) Xeon(R) CPU E5-2630 v4 @ 2.20GHz (Broadwell)</td>
<td>SLC6 - x86_64</td>
<td>40</td>
<td>2</td>
</tr>
</tbody>
</table>

Other sites that would like to join

*TBD: please describe the kind of resources available, the configuration and how it's possible to access them*
Recipes to Run Experiment Workloads

Collect here the information about how to run experiment workloads. Possibly, provide instructions and setup (VM/containers, access from cvmfs) in order to allow execution by other members of the working group.

• ALICE
  ♦ Contact person
  ♦ Version of the experiment application (details about compiler flags)
  ♦ Event Generation
  ♦ Simulation
  ♦ Digitization
  ♦ Reconstruction

• ATLAS
  ♦ Contact person
  ♦ Version of the experiment application (details about compiler flags)
  ♦ Event Generation
  ♦ Simulation
  ♦ Digitization
  ♦ Reconstruction

• CMS
  ♦ Contact person
  ♦ Version of the experiment application (details about compiler flags)
  ♦ Event Generation
  ♦ Simulation
  ♦ Digitization
  ♦ Reconstruction

• LHCb
  ♦ Contact person
  ♦ Version of the experiment application (details about compiler flags)
  ♦ Event Generation
  ♦ Simulation
  ♦ Digitization
  ♦ Reconstruction
**Passive Benchmark**

- A method to compare server performance using the experiment job information
- Responsible: Andrea Sciaba (andrea.sciaba@cernNOSPAMPLEASE.ch)
- Description of the approach and results at pre-GDB and WG meeting
- Some results:
  - Speed factor \( k \) Vs HS06 correlation for ATLAS T0 jobs:
  - Data required to run the passive benchmark

<table>
<thead>
<tr>
<th>Quantity</th>
<th>CMS variable</th>
<th>ATLAS Grid jobs variable</th>
<th>ATLAS T0 variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU time</td>
<td>CpuTimeHr</td>
<td>cpuconsumptiontime</td>
<td>cpuTime</td>
</tr>
<tr>
<td>Number of events in job</td>
<td>KEvents</td>
<td>nevents</td>
<td>nevents</td>
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<tr>
<td>Job status</td>
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<tr>
<td>Job type</td>
<td>TaskType</td>
<td>processingtype</td>
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<tr>
<td>Site name</td>
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<tr>
<td>Task</td>
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<td>jeditaskid</td>
<td>taskid</td>
</tr>
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<td>CPU model</td>
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<td>cpuconsumptionunit</td>
<td>machine.model_name</td>
</tr>
</tbody>
</table>
Actions List

2017-03-10

- For the site representatives: to fill the information in this section
- For the experiment representatives: to fill the information in this section
- For Andrea Sciaba': to fill the information in this section

2017-04-19

- WLCG workshop: preparation of topics for discussion

-- ManfredAlef - 2016-06-03