WLCG HEP-SCORE Deployment Task Force

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Future HEP Benchmarking (1)

- Need to replace HEP-SPEC06 (EOL of SPEC CPU 2006)

- WG of sites formed under HEPiX umbrella

  - Worked for ~ three years with participation by experiments

  - Considered SPEC CPU 2017 – rejected

  - Developed flexible scheme for benchmarking

  - Listed policy decisions to be taken by WLCG

  - Recent reports:

    - Domenico Giordano's report to MB 26-May-2020:
      https://indico.cern.ch/event/917098/contributions/3855129/attachments/2045174/3426154/WLCG-MB-26-05-2020-giordano.pdf

    - Domenico Giordano's report to HEPiX 13-Oct-2020:
      https://indico.cern.ch/event/898285/contributions/4034096/attachments/2121862/3571531/HEPiX-Workshop-13-10-2020-giordano.pdf

Future HEP Benchmarking (2)

- Result of the HEPiX benchmarking working group:
  - "HEP Benchmark Suite": Framework itself (automatising benchmark runs, ensuring structured delivery and storage of results)
  - "HEP Workloads": Collection of (mostly) HEP workloads for which it is desirable to obtain performance information
    - Rather dynamic – add improved workloads, new compilers/flags/OS, …
    - Sometimes called "the matrix"
  - "HEP Score": Single number based on a defined, stable combination of defined, stable reference workloads; prototype implementation ("HEP-SCORE20") using various LHC experiment workloads (from Run 2)
    - Good consistency with HEP-SPEC06

HEP-SCORE Deployment Task Force

- WLCG Management board discussed in May and July; decided to launch a task force

- Following summer and an intense autumn with workshop etc. activities, task force started in November; bi-weekly meetings since then

- Task force membership:
  - Experts on pledge etc. process / procurements
  - Experiment experts
    - Four LHC experiments
    - Belle 2, DUNE, LIGO/Advanced VIRGO(/KAGRA), JUNO/BES III etc.
  - Site experts
  - Some MB members

Task Force Members (2)

Name	Function	Name	Function
Tommaso Boccali	CMS	Jeff Templon	Nikhef
Simone Campana	WLCG	Andrea Valassi	LHCb
Domenico Giordano	Benchmarking WG	Ian Collier	STFC-RAL
Michel Jouvin	Tier-2s	Gonzalo Merino	PIC
Walter Lampl	ATLAS	Fazhi Qi	JUNO, BES etc.
Andrew McNab	DUNE	Oxana Smirnova	NDGF
Helge Meinhard	WLCG and Convener	Tony Wong	US Tier-1s
Bernd Panzer	CERN	Josh Willis	LIGO/Adv. VIRGO
Stefano Piano	ALICE	Manfred Alef	KIT and Benchmarking WG
Randy Sobie	Belle 2		

Task Force Topics

- Compute facilities at WLCG sites
  - Still very much x86 dominated (mostly Intel, some AMD)

- Compute facilities used (quasi-)opportunistically
  - Various processors (x86, POWER, ARM), e.g. at HPC sites
  - Various GPUs in various relations with CPUs, e.g. at HPC sites
  - May see some of this soon at WLCG sites, too – even as part of the pledges
  - More may be coming, e.g. FPGAs

Discussions and Agreements So Far

- Start with CPU benchmarking on x86-based systems; look at other CPUs and/or GPUs later
  - Aim: single benchmark with a stable definition for at least (a typical CPU server lifetime cycle | a complete LHC machine cycle)

- Framework by benchmarking WG is very attractive
  - Use it to record behaviour of (wide) selection of workloads (not limited to HEP) across machines

- No "final" candidate for new benchmark yet
  - Intense discussions whether HEP-SCORE20 is a suitable starting point, and whether HEP workloads should be used at all
  - Decision deferred to after we have got hold of actual experiment workloads (LHC: Run 3?) and have collected data of selection of workloads (see above)

Reactions and What Next?

- Reporting and collecting feedback
  - Presentation and discussion at GDB last week: Questions on TF, discussion mainly on impact on accounting
    - CPU accounting infrastructure must be prepared to support more than one unit
  - Presentation and discussion at WLCG MB

- Task force plans
  - Round of status reports on workloads (ATLAS and ALICE to start with this week)
  - Implement workloads, once stable, into the "HEP Workloads" framework for data collection
  - Once ready, run on a variety of CPU server configurations to obtain behaviour of all workloads
  - Define representative sample of workloads for the final benchmark (HEP-SCORE2x)
    - Including relative weights
  - Propose steps for transition from HEP-SPEC06 to HEP-SCORE2x

(Personal) Conclusions

- Defining a HEP-SPEC 06 successor is a complex, ambitious task
  - Will take many months rather than weeks
  - … and then we will have to tackle non-x86 CPUs and GPUs
- Quite a number of different views on how exactly this should be done
  - Good representation in the task force
- Nonetheless, discussions in a constructive and collaborative spirit
  - Thanks to all task force members!

Questions? Comments?

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