Process-level Power Estimation in VM-based Systems

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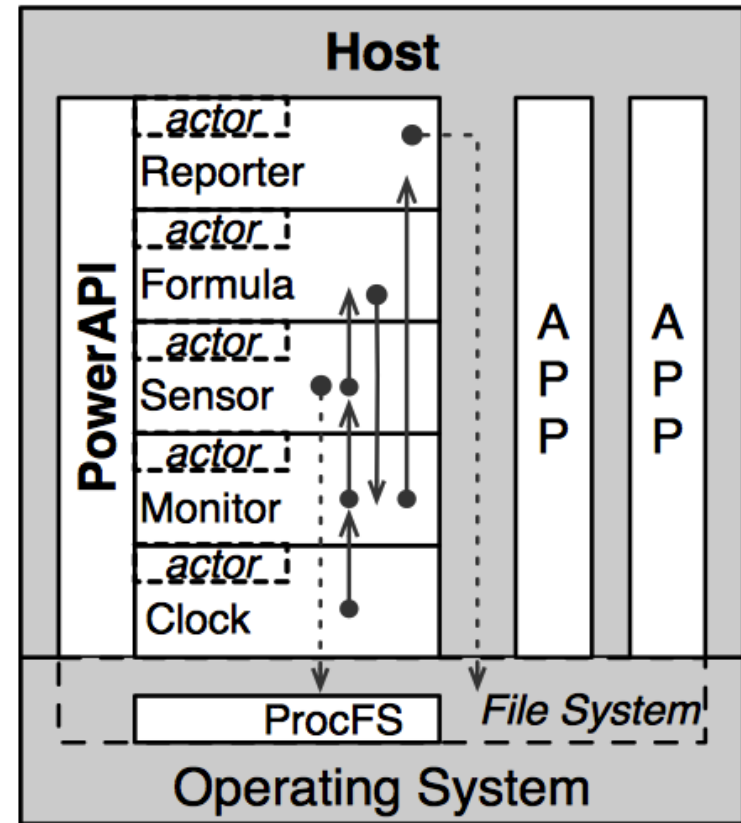- professor, University of Lille 1 & IUF

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PowerAPI Middleware Toolkit
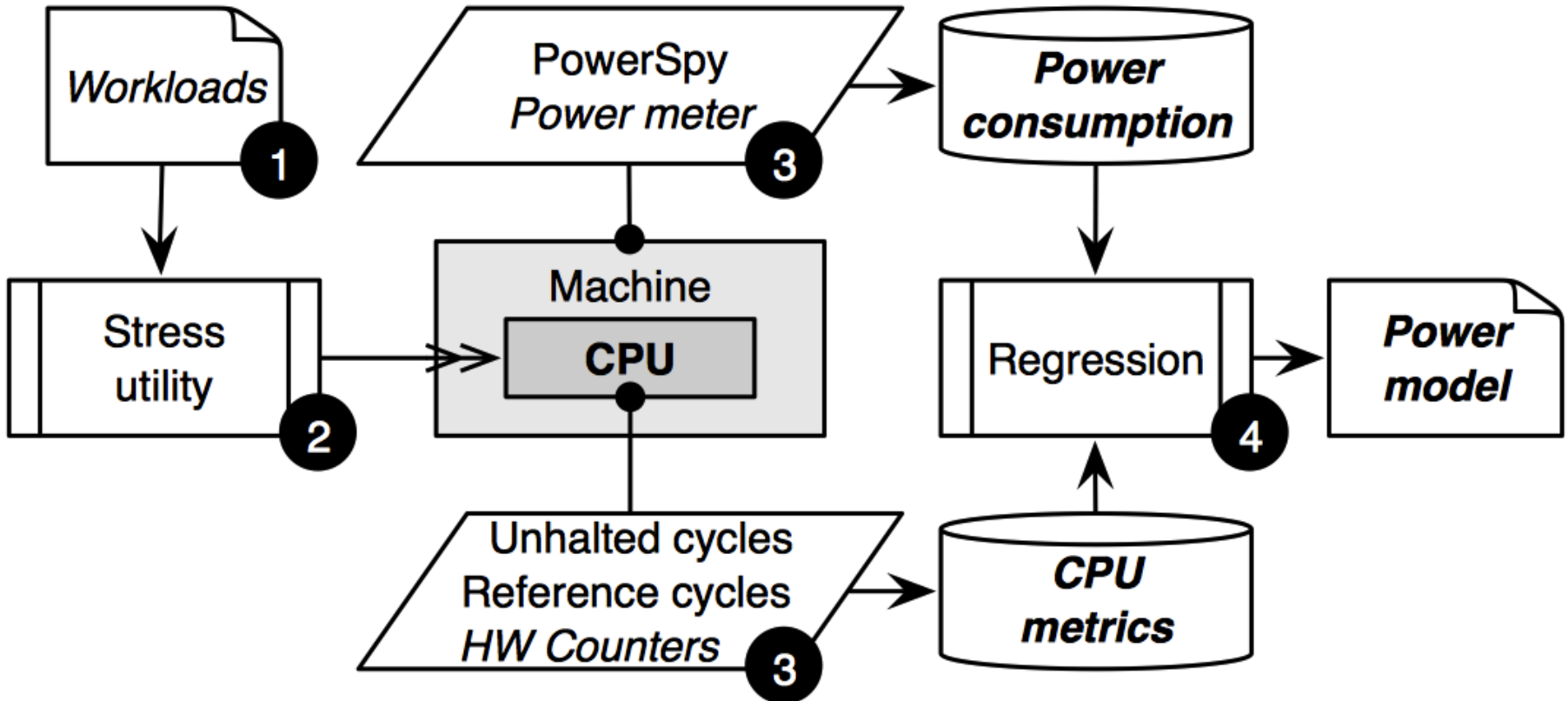
Building *software-defined power meters*

➤ Support for various **input sources**

  ✓ *Hardware (PowerSpy, RAPL, APC)*

  ✓ *Software (ProcFS, Sigar, libpfm4)*

➤ Support for various **power models**

  ✓ *Parameter-based models (CMOS)*

  ✓ *Learning-based models*

➤ Support for various **output channels**

  ➤ *Console, plots, network, filesystem*

➤ Support for various **control interfaces**

  ➤ *GUI, web, filesystem*

Freely available from http://powerapi.org

➤ OSS under GNU Affero General Public License
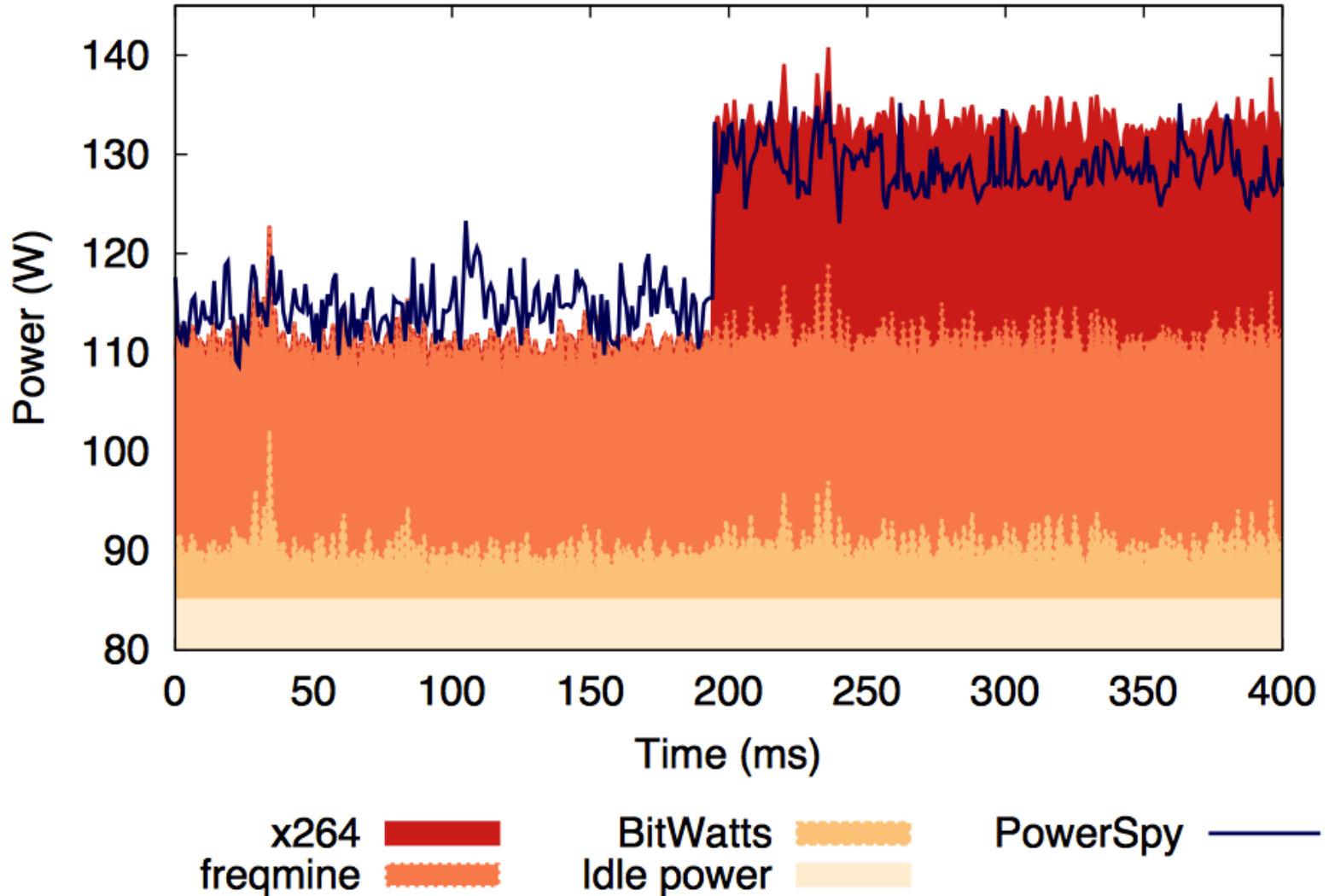
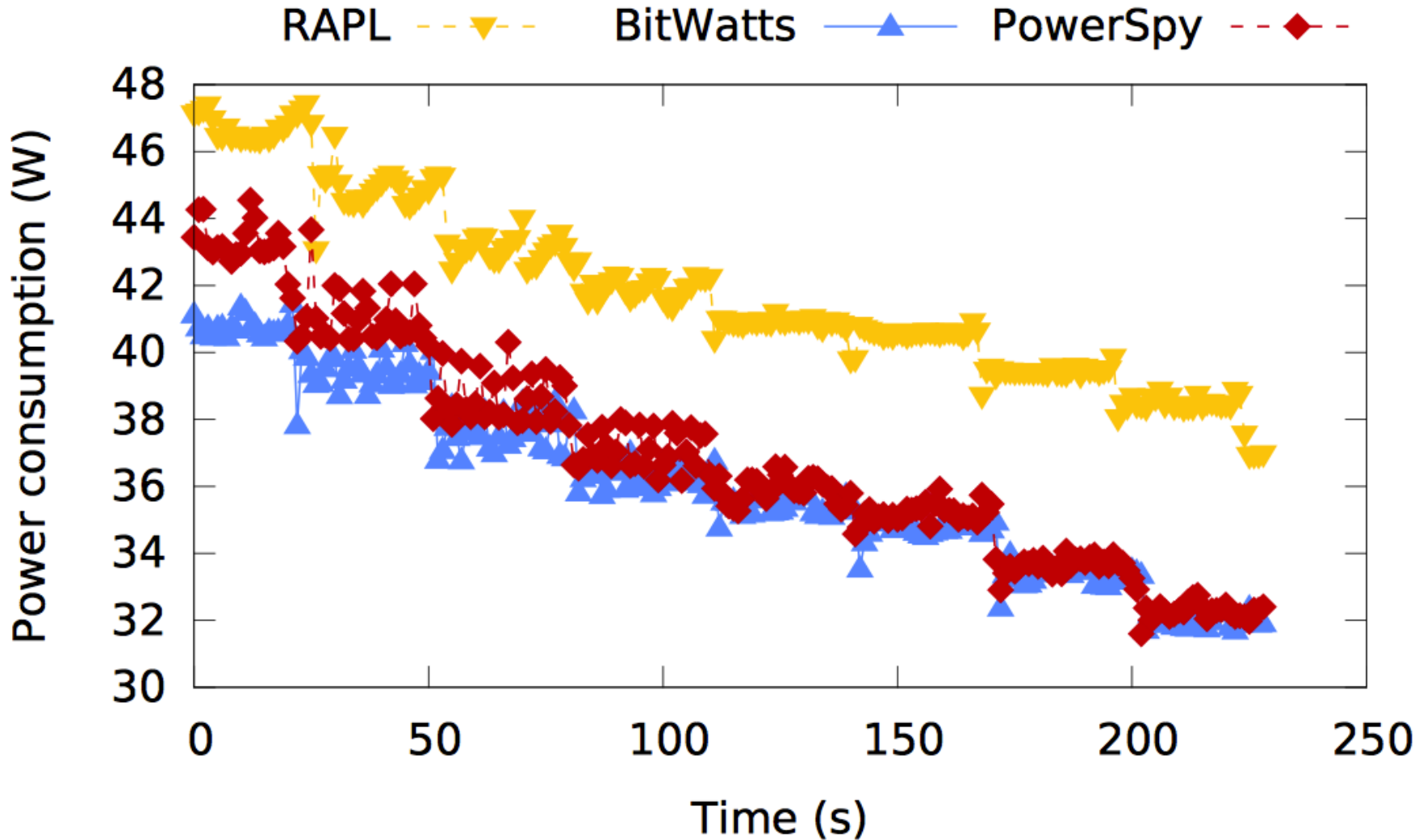# PowerAPI – Learn the CPU power model

PowerAPI – Power Model

$$P_{host}(f) = P_{idle}(f) + \sum_{pid \in PIDs} P_{cpu}(f, uc^1_{pid}...uc^N_{pid})$$

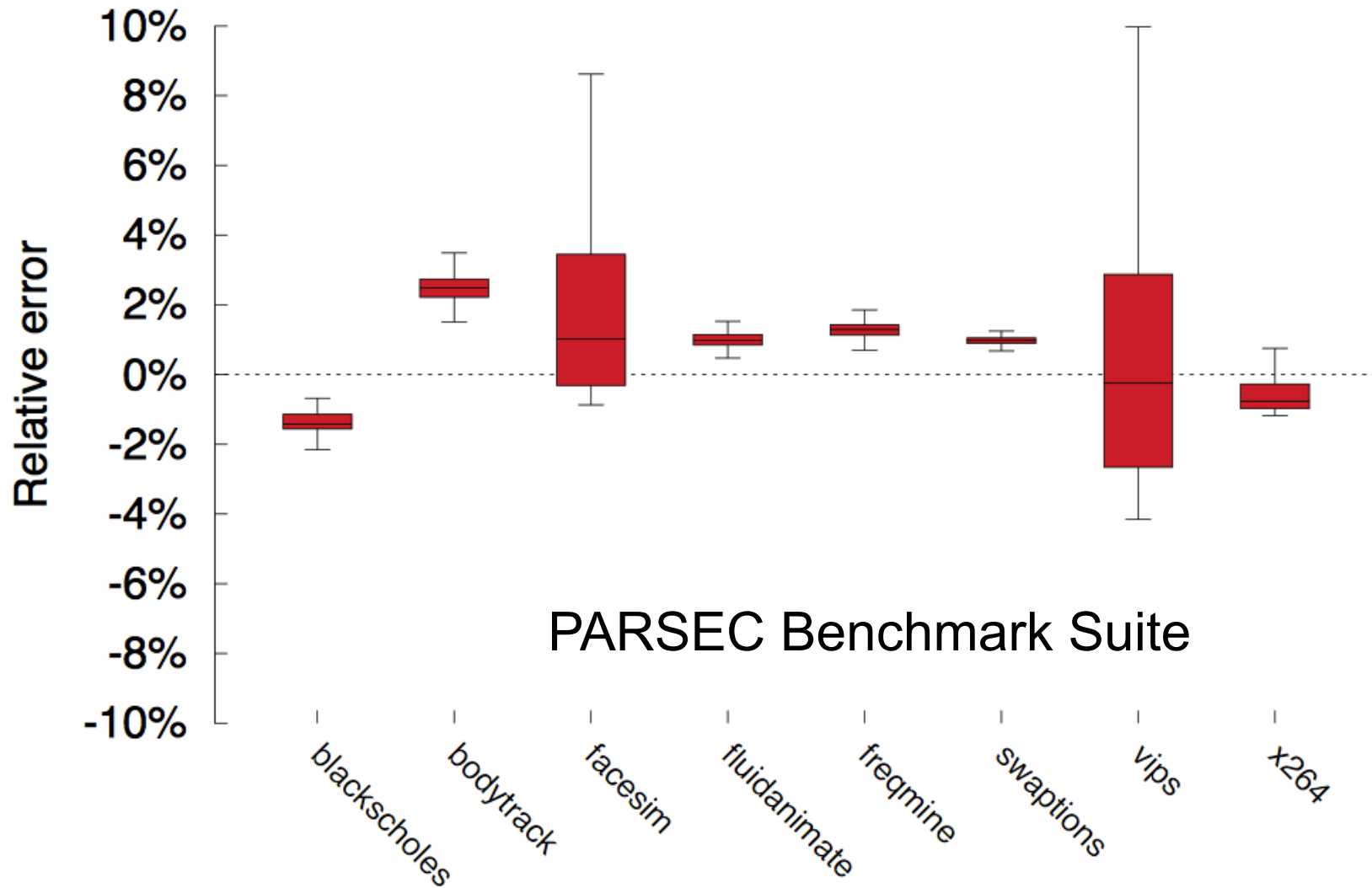$$P_{cpu}(f, uc^1_{pid}...uc^N_{pid}) = \sum_{n=1}^{N} P_f(uc^n_{pid})$$
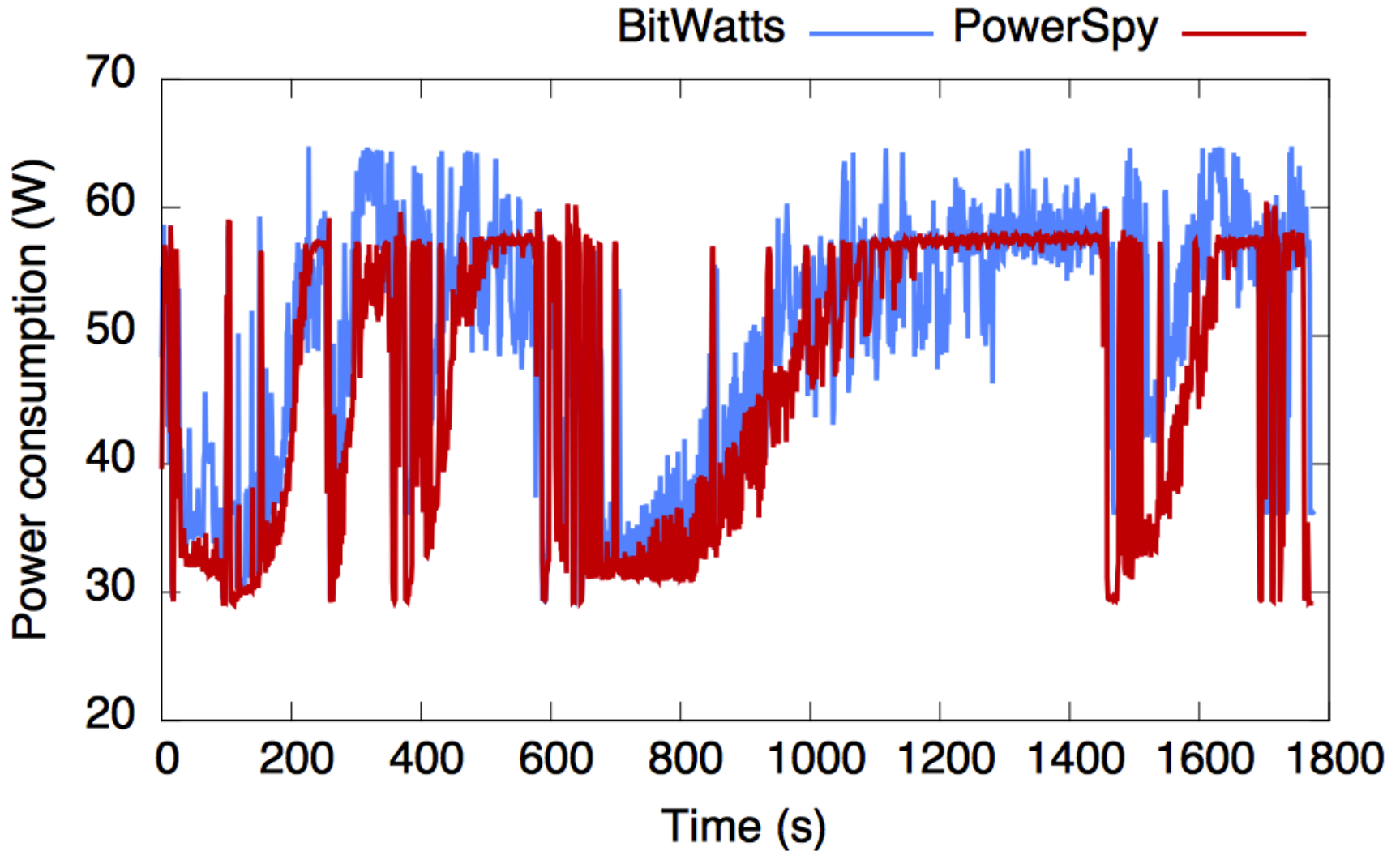
PowerAPI (BitWatts) – Process-level estimations
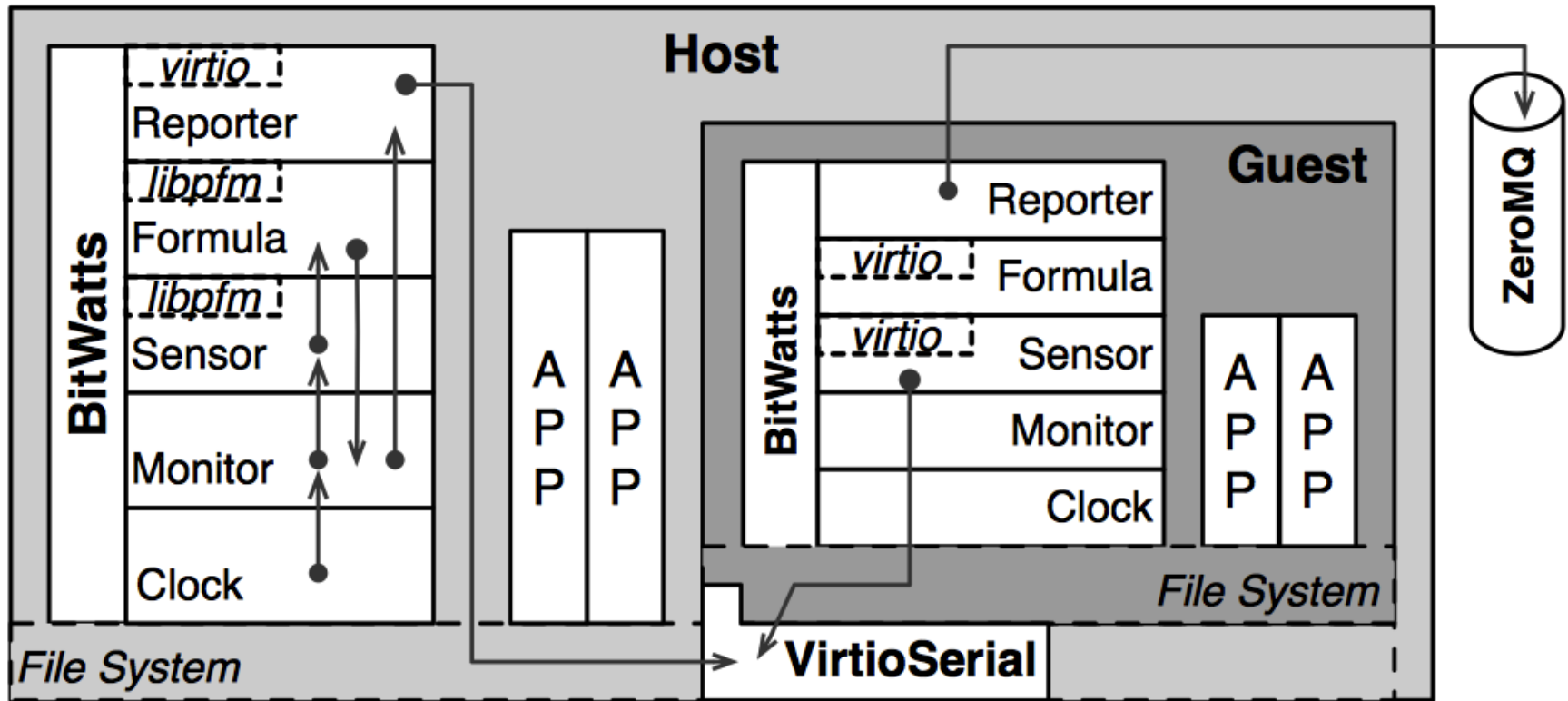
PowerAPI (BitWatts) Vs. PowerSpy Vs. RAPL

PowerAPI – Mean estimation error

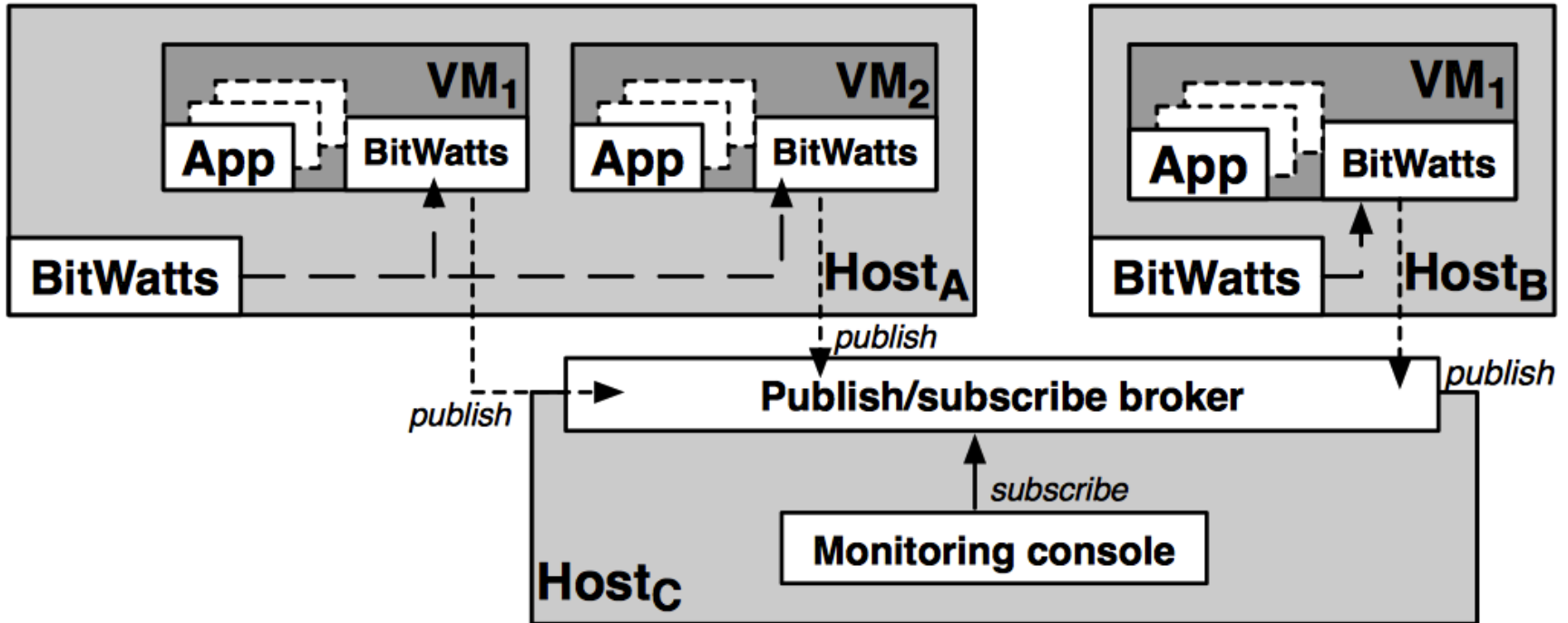

PARSEC Benchmark Suite
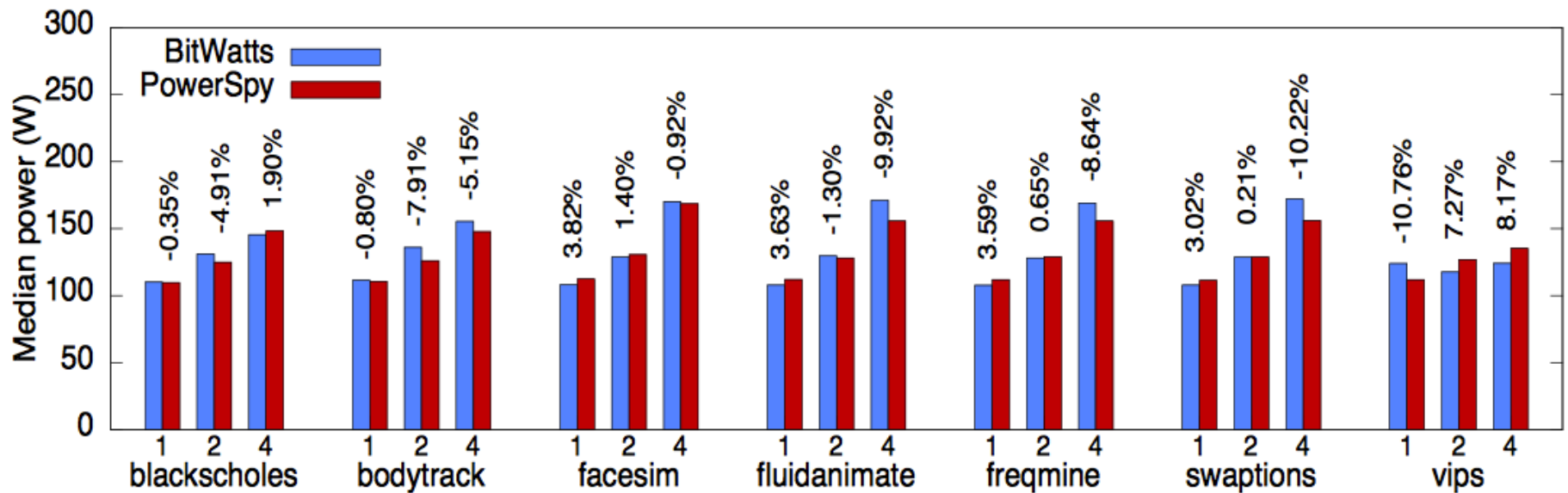
PowerAPI (BitWatts) – SPECjbb

PowerAPI (BitWatts) – Consumption of SaaS

PowerAPI (BitWatts) – Distributed Settings

PowerAPI – Scaling the Virtual Machines (KVM)

Questions