



HAL
open science

Process-level Power Estimation in VM-based Systems

Maxime Colmant, Mascha Kurpicz, Pascal Felber, Loïc Huertas, Romain Rouvoy, Anita Sobe

► **To cite this version:**

Maxime Colmant, Mascha Kurpicz, Pascal Felber, Loïc Huertas, Romain Rouvoy, et al.. Process-level Power Estimation in VM-based Systems. European Conference on Computer Systems (EuroSys) - Poster session, Apr 2015, Bordeaux, France. hal-01132495

HAL Id: hal-01132495

<https://inria.hal.science/hal-01132495>

Submitted on 20 Apr 2015

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Process-level Power Estimation in VM-based Systems

Maxime Colmant, Mascha Kurpicz, Pascal Felber, Loïc Huertas, Romain Rouvoy, Anita Sobe



Research session 5: Virtualization, 23 April, 10:50 am.

Motivation

Problem

- Massive power consumption by data centers
- Hard to identify the largest power consumers
- Cannot attach a power meter to a VM
- Current approaches not fine-grained enough

Vision

- Process-level power estimation in VM-based systems
- Support for all CPU features
- Support for multi-tenant virtualization

Metrics

Hardware (HW) Performance Counters

- Representative and accurate metrics
- Mostly available on modern processors

Criteria selection

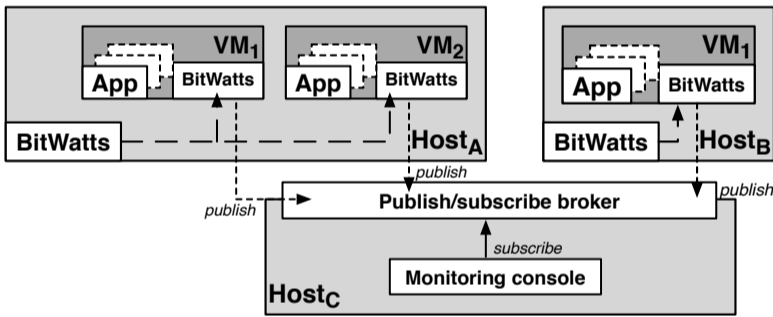
- Counter availability per CPU
- Monitoring overhead
- Best fit under several workloads

Selected HW Performance Counters

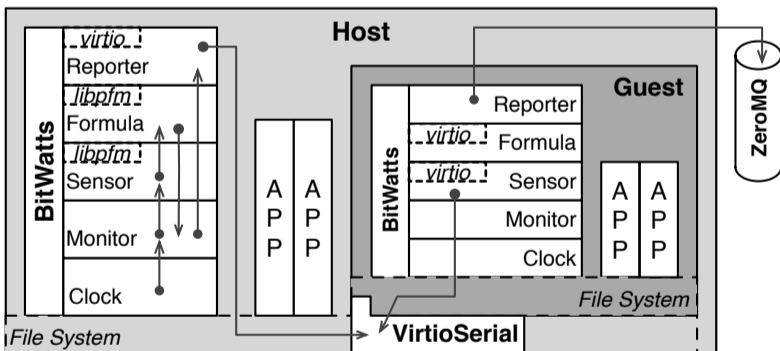
- CPU_CLK_UNHALTED:THREAD_P (*uc*)
- CPU_CLK_UNHALTED:REF_P

BitWatts

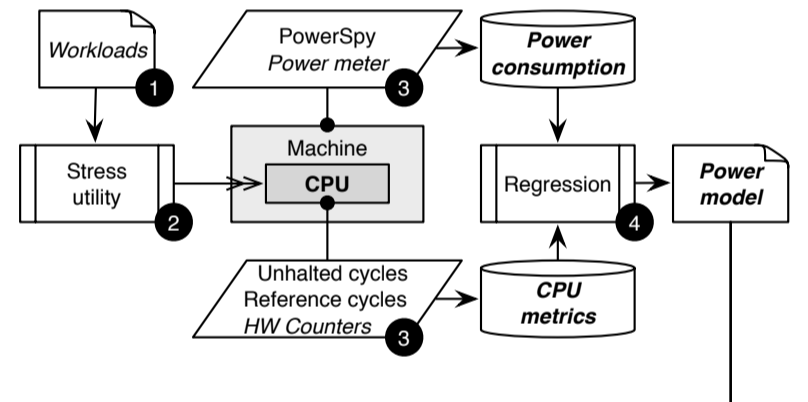
Architecture



Implementation



Learn the CPU power model

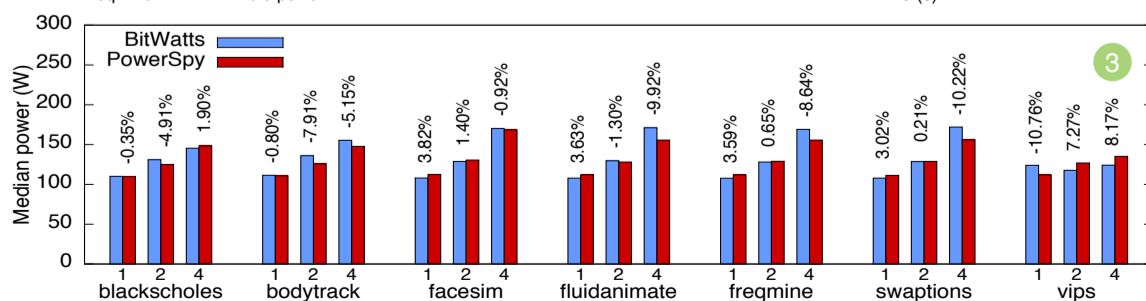
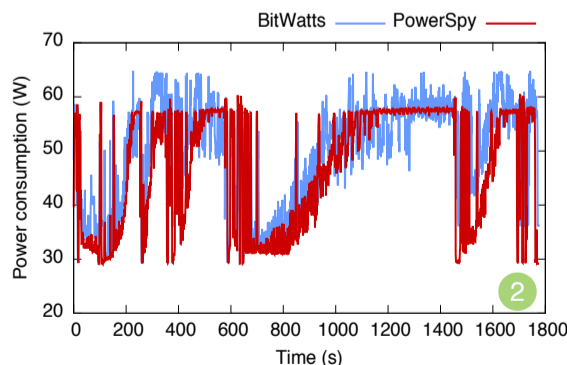
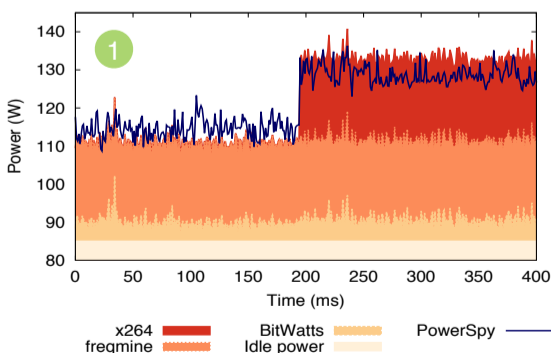


Power Model

$$P_{host}(f) = P_{idle}(f) + \sum_{pid \in PIDs} P_{cpu}(f, uc_{pid}^1 \dots uc_{pid}^N)$$

$$P_{cpu}(f, uc_{pid}^1 \dots uc_{pid}^N) = \sum_{n=1}^N P_f(uc_{pid}^n)$$

Validation



- 1 Process-level power consumption of BitWatts, x264, and freqmine on a Xeon W3520 processor
- 2 Power consumption during the execution of SPECjbb on a i3 2120 with two threads
- 3 Power consumption of the host when scaling PARSEC on multiple VMs

