Simgrid UserDays

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A tale of Watts, Minitel and Silicon

- ANR SOP Project (aka Use Case)
- Land of energy-aware simulators (In the...)

Part I

SOP Project

SOP project

http://projects.laas.fr/SOP/

Transparent high quality of service
with no installation/management
cost for home users

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Global infrastructure

Users : Young, family, senior and soho

Global infrastructure

- Current applications are on users PC
  - Maintenance cost
  - Hardware should handle peak load
- SOP project
  - DSL+machine+software package
  - No maintenance for users (latest functionalities, no virus)
  - Always best performance
  - Transparent reconfiguration
  - Not limited by users' hardware
  - Try to save energy while providing good QoS

In-Situ Test-bed

Etudiants de l'INSA de toutes spécialités
* Participez à l'enquête portant sur vos besoins et attentes en matière d'informatique personnelle (jusqu'au 11 Mai)

* Inscrivez vous pour être sélectionné parmi d'un panel d'étudiants pilotes/bêta testeurs qui seront dotés d'un ordinateur portable gratuit

- Users : Student of Toulouse Insa

- Applications
  - Software used in classrooms
  - Sharing and communication tools
  - Office productivity software suite
  - Games

Simulation !

- Large scale
  - Aims at be used by everyone !
  - Resource sharing (Cloud & Neighbor computing)
- Heterogeneity
  - Cloud & Desktop PC
  - Applications SLA
    - Low latency games
    - High computing needs (scientific computation)
    - Hybrid and dynamic systems (image manipulation)

Simulation ! (cont)

- Virtual machines
  - Start time, duration, variable load
- Distributed decision center
  - Evaluate SLA
  - Move VMs
  - Collaboration between decisions centers
- Hardware models
  - DVFS
  - Energy
  - ON/OFF

Part II

Simulation of distributed systems
An energy point of view

Needed Characteristics

- Energy model
  - Nodes power consumption
  - Network power consumption
  - Cooling infrastructure (let's dream!)

- Hardware leverages
  - Virtual machines migration
  - DVFS (Processor)
  - ALR (Adaptive link rate), Hard drive sleep modes,...
  - Switching On/Off nodes, routers, disks,...

Current State

	Energy Model	Virtual machines	DVFS	ALR, Hard Drives
Simgrid	-	+/-	-	-
GroundSim	-	+	-	-
GSSIM	+	-	+	+/-
GreenCloud	++	+	-	+/-
CloudSim	+	+	-	-

- « PhD students just need simulator to plug in their algorithm »

Example : Cloudsim++

- Energy model
  - Precision
    - Using a simple model : precision 10 %
    - Using a good model : precision of a few percent
  - Event oriented system
    - Each timestep, compute energy=f(environement, δt)
    - In our case, simple affine model
      - δt [Pmin + λ (Pmax-Pmin)]
      - λ is host load

Example : Cloudsim++

- DVFS
  - Frequency has an impact on task length
    - Simple model : linear
    - Reality : Depends on workload (Cpu bound, other)
  - Multiple governors : Update frequency
    - Performance/Powersave/Fixed
    - Ondemand/Conservative
    - Userspace
  - Need to add dynamic tasks
    - Tasks resources needs evolves over time
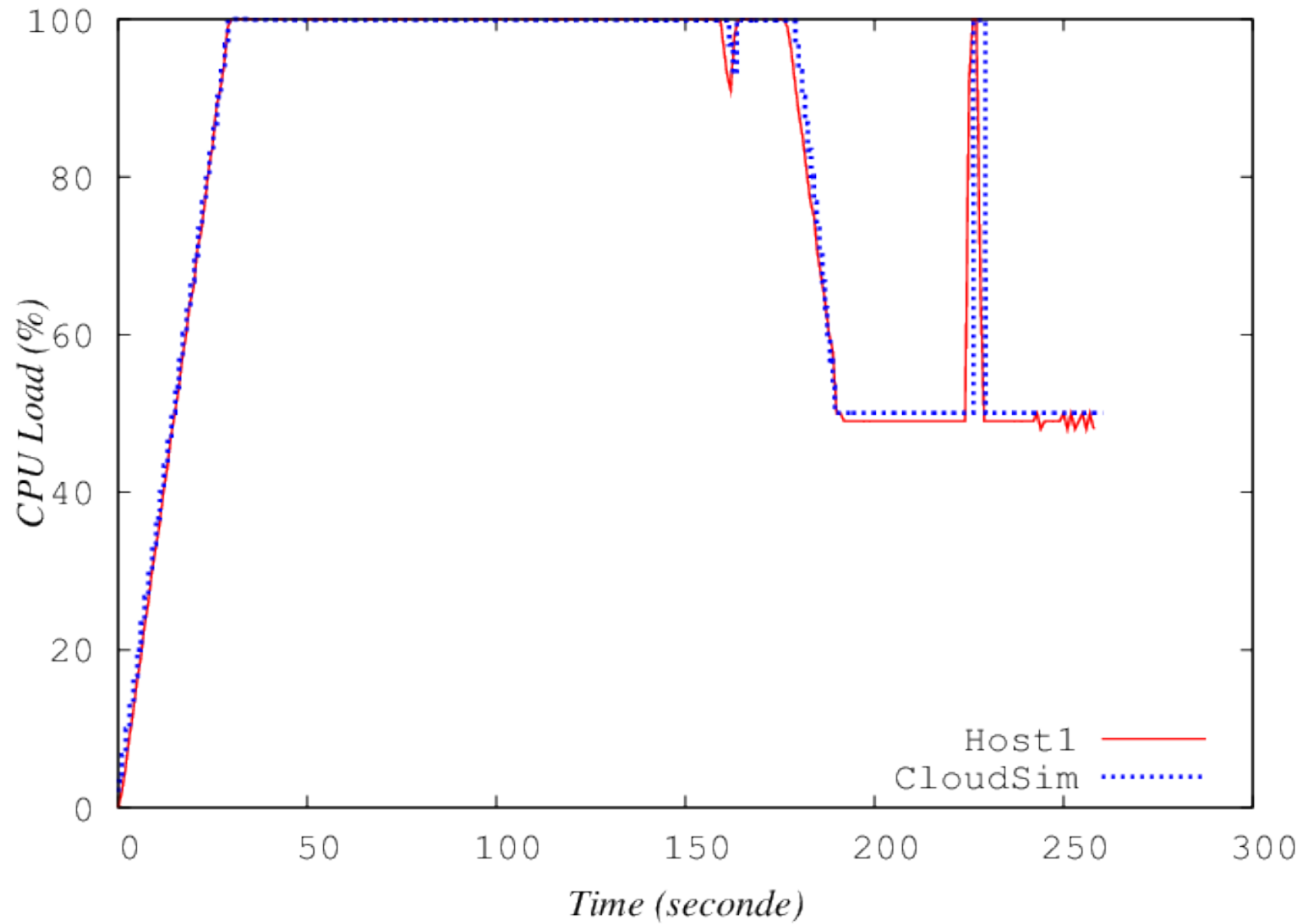   - DVFS impact resources needs

Is it working ?

- Workload

- Scriptable

- Load
  - Not percentage
  - Duration
  - Max Mips
  - Precise
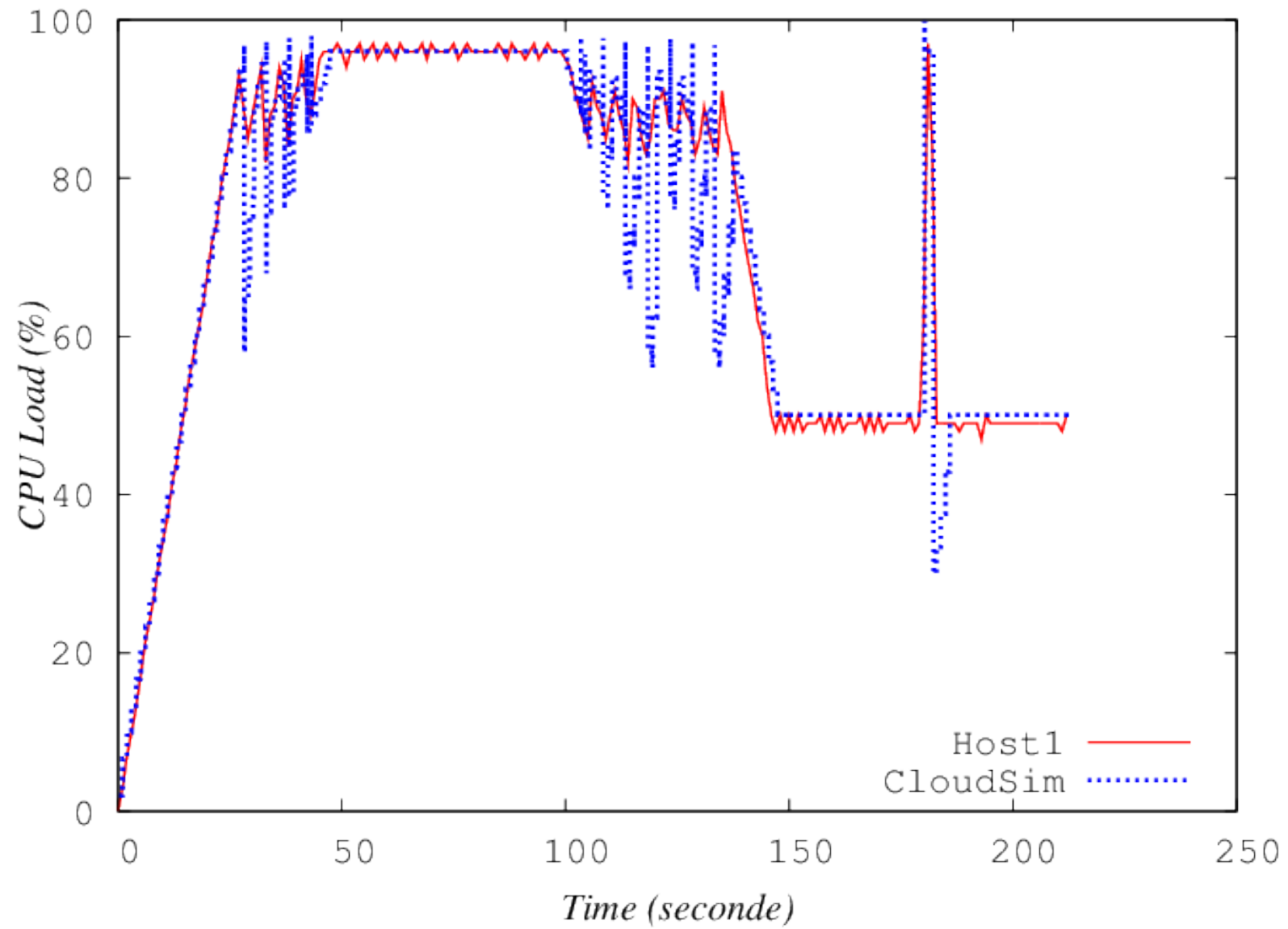   - Few ms

- Usage
  - Simulation
  - G5k
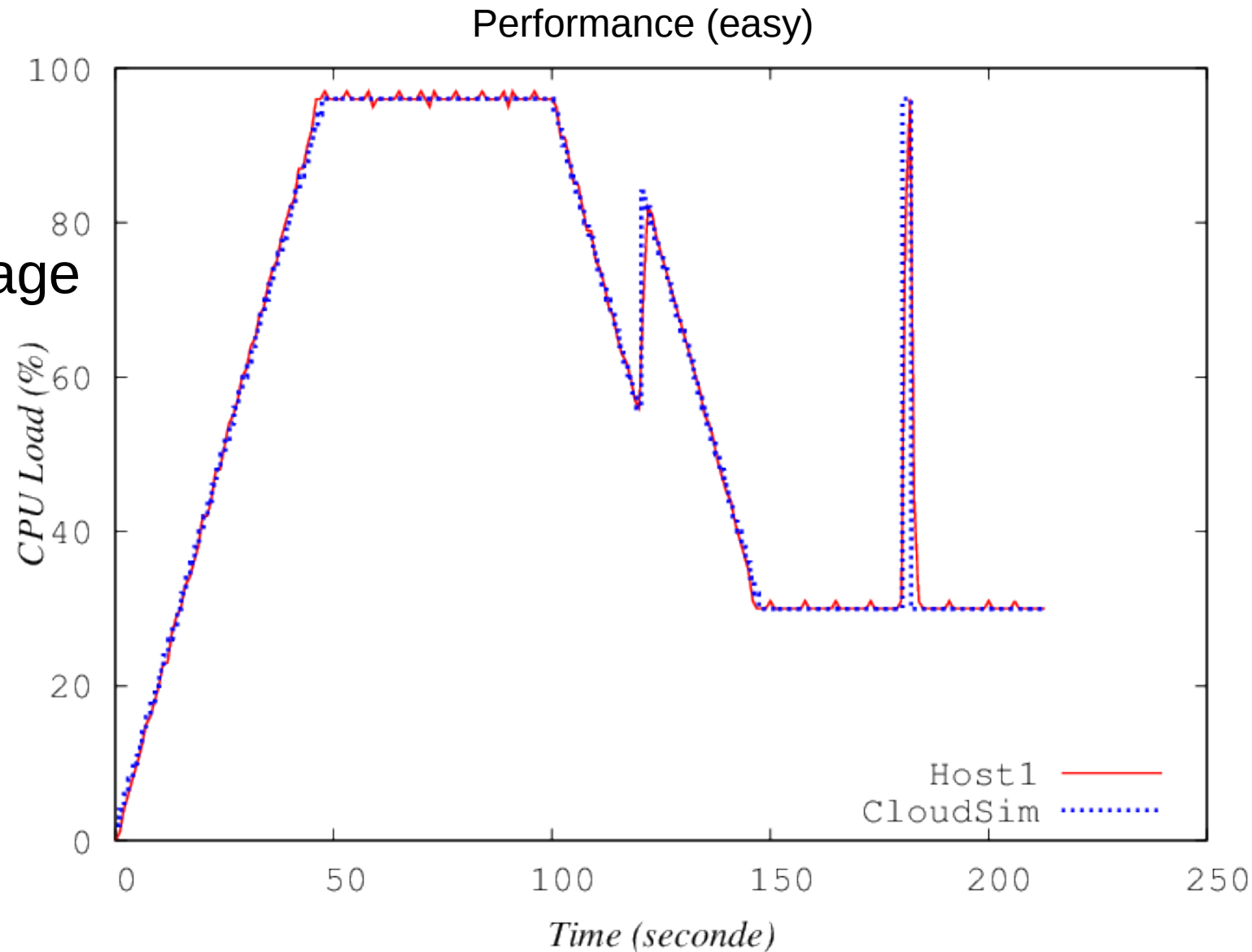
Performance (easy)

Linear power model verification
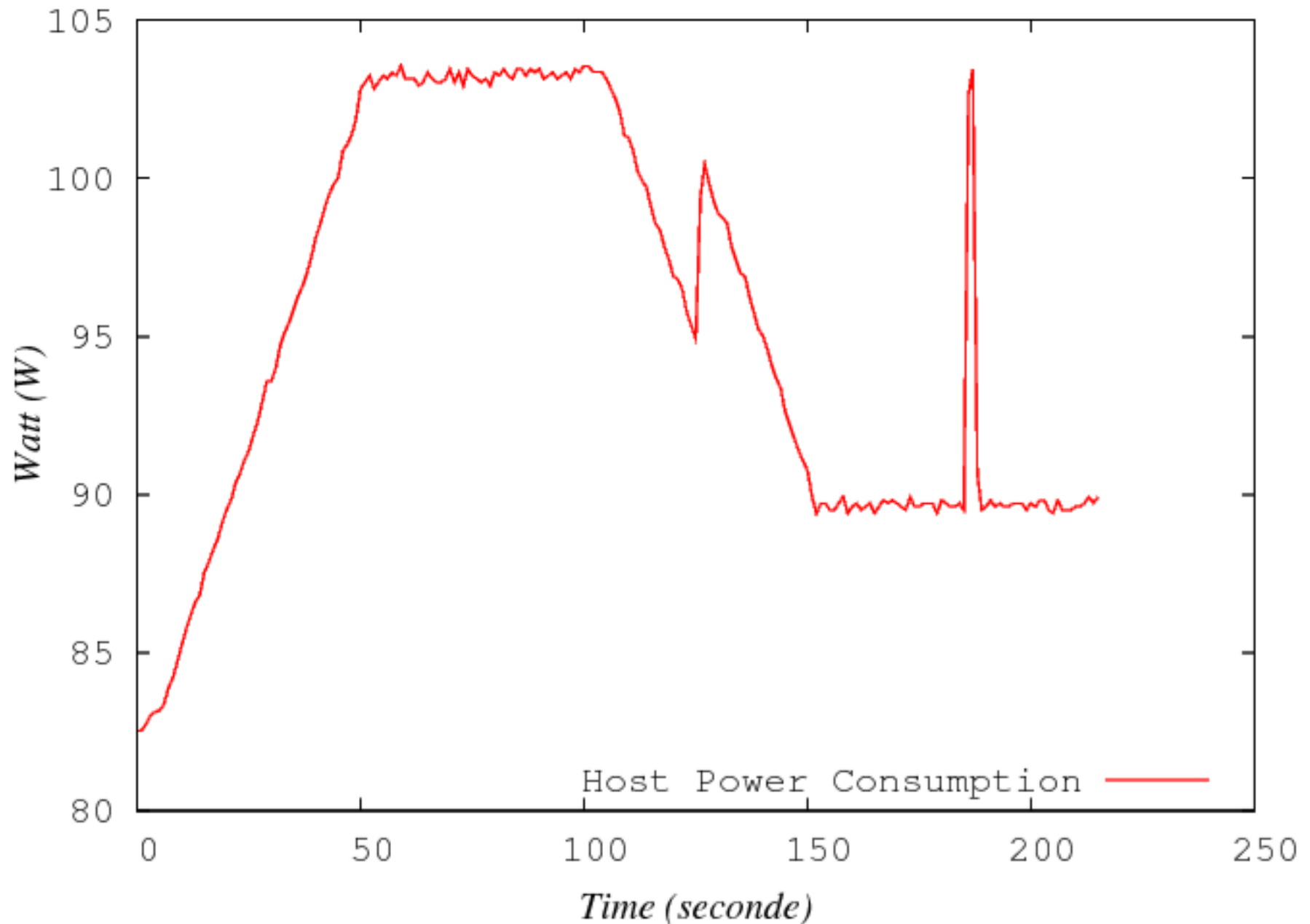
Powersave

Ondemand

Comparison

	Duration (s)		Consumption (Wh)	
	Real Host	Sim	Real Host	Sim
Performance	213	213	5,72	5,61
Ondemand	213	213	5,57	5,49
Conservative	213	213	5,68	5,64
Powersave	259	260	6,37	6,33

Questions ?

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Sepia team
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