Measuring the Energy Footprint of OpenStack

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3rd Discovery Plenary Meeting

Inria – IMT Atlantique – LS2N

Many Ways to Deploy OpenStack

Nova

Glance

Neutron

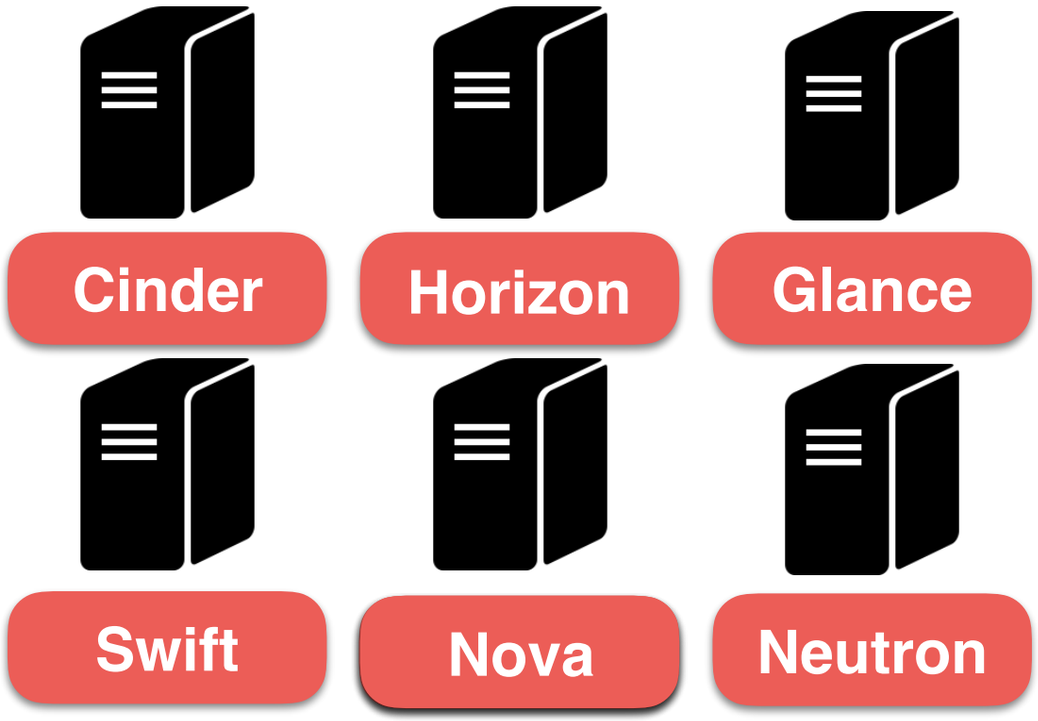
Cinder

Swift

Horizon

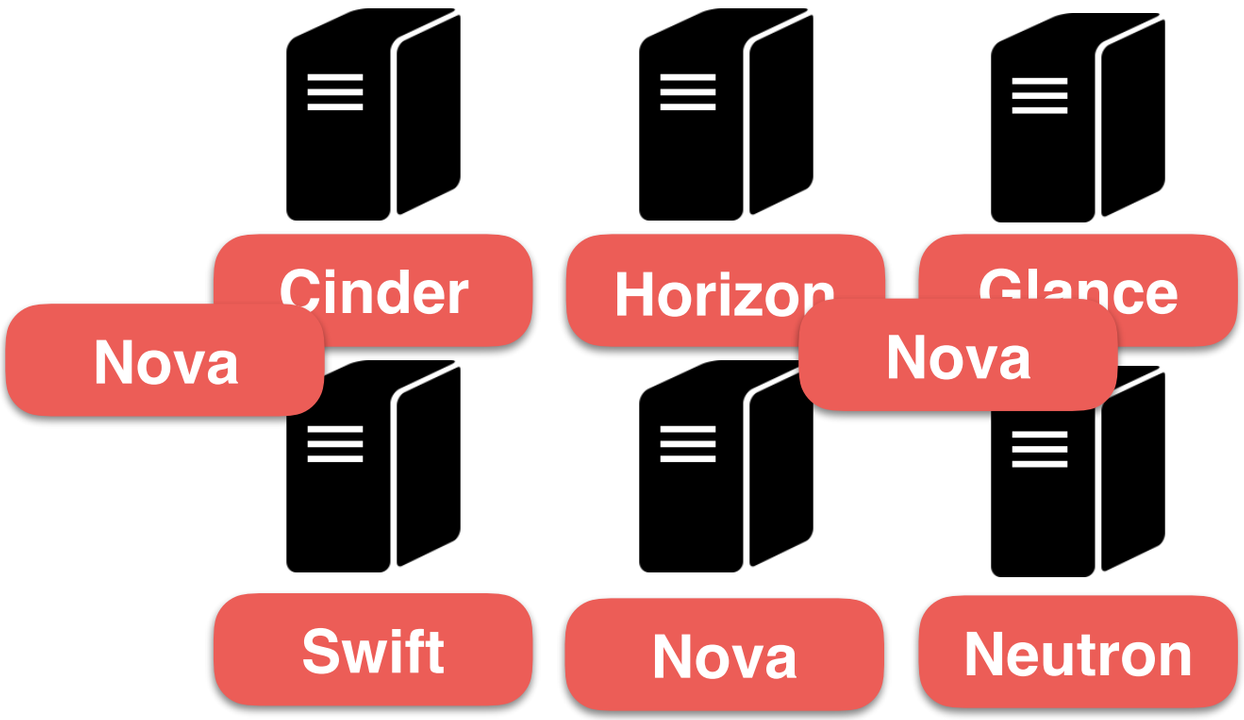
- with consequences on resources utilisation and energy consumption

Many Ways to Deploy OpenStack



- with consequences on resources utilisation and energy consumption

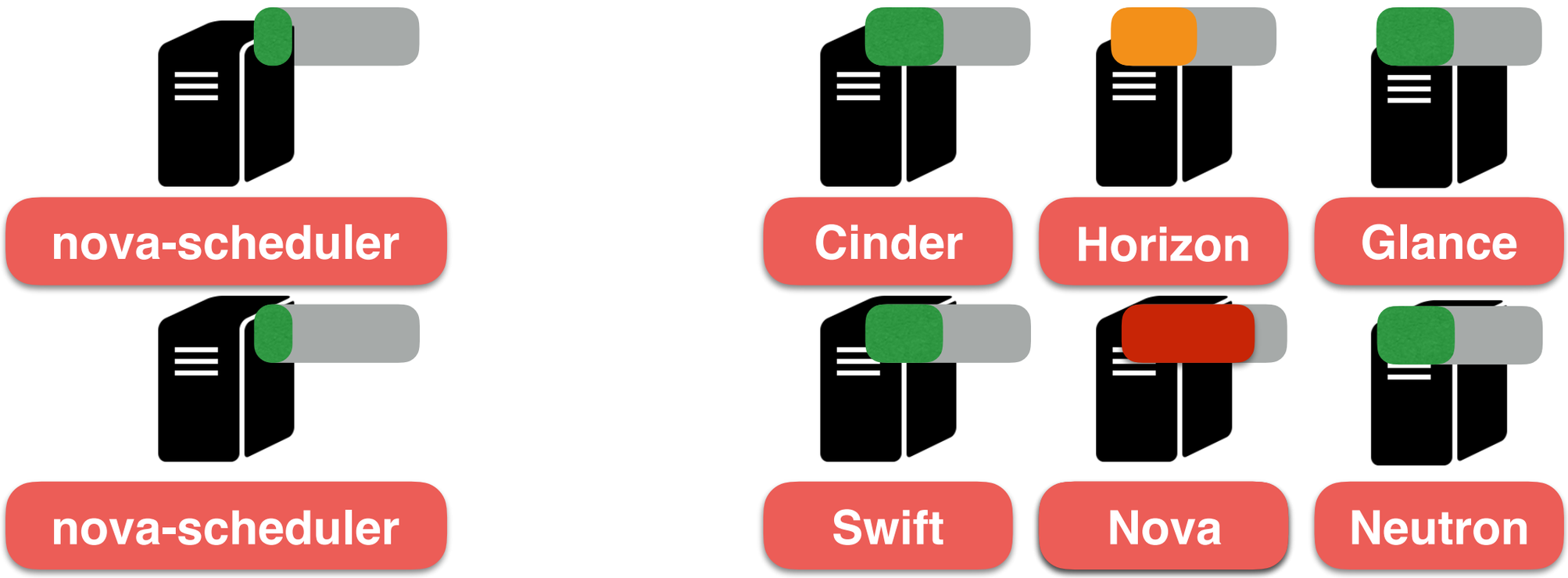
Many Ways to Deploy OpenStack



- with consequences on resources utilisation and energy consumption

- V
  e

Example: nova-scheduler



- Pinned to one core, leaves the other cores unused

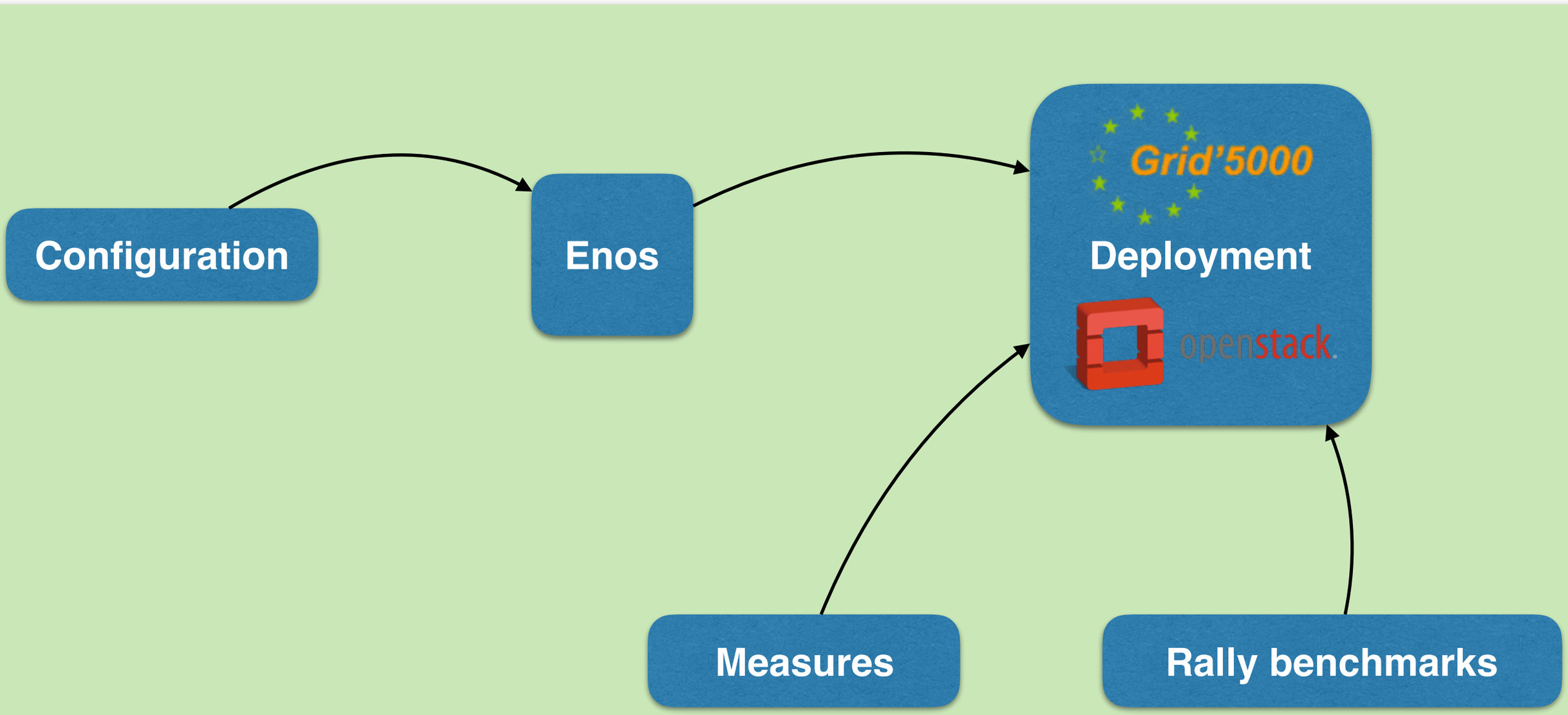
Goal(s)

- Measuring the energy consumption of **support services** during common operations (booting a VM, creating a VNET, allocating a VIP, migrating a VM, etc.) when varying the number of compute nodes ([I, 800])

- Providing a model for the energy footprint of OpenStack

- Providing guidelines for energy-aware OpenStack operations

Methodology




```
do while True;
```

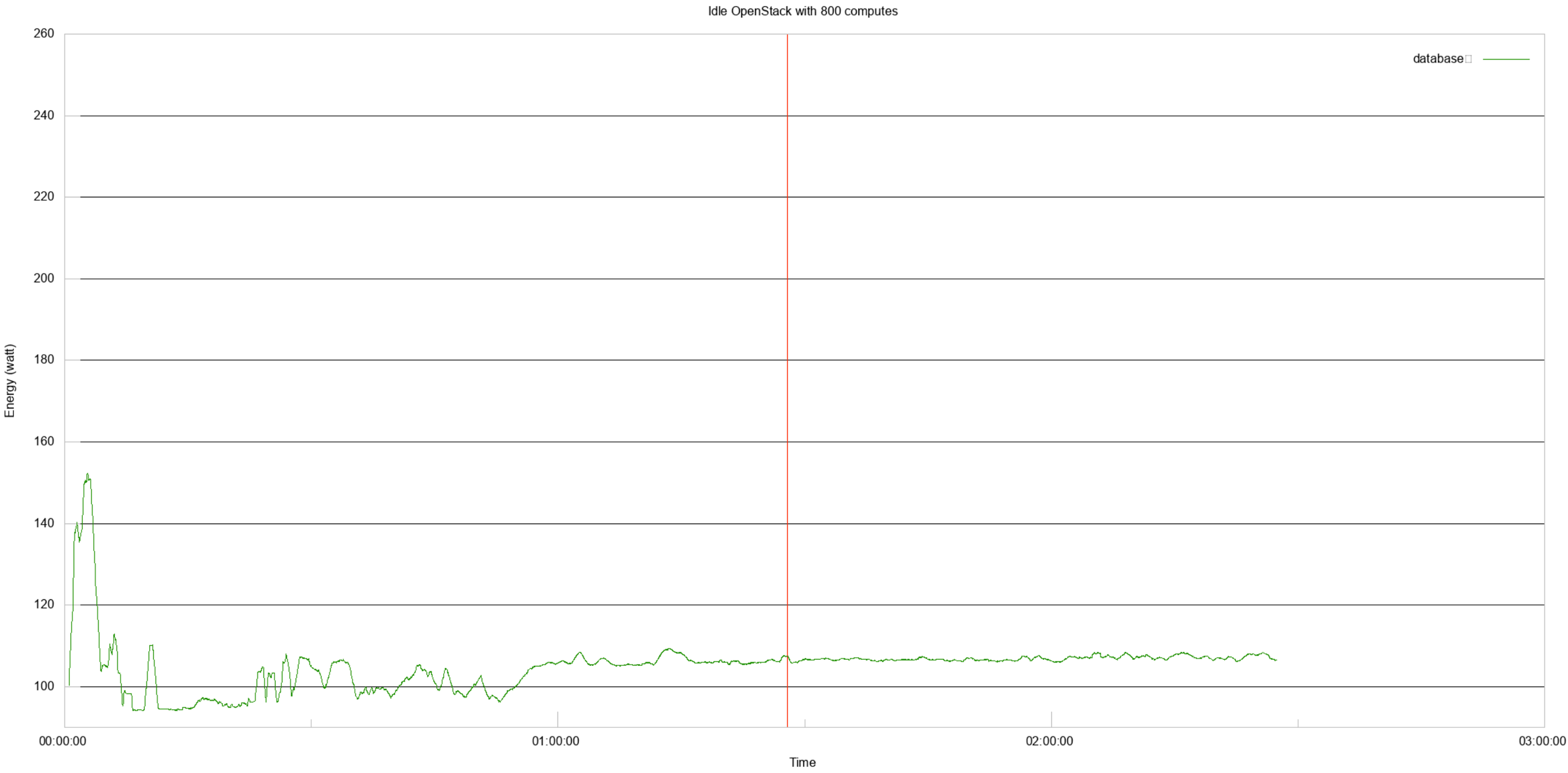
Idle Energy Consumption

- Measure of all services **except compute**
- On the **Taurus** cluster of Grid'5000
- Some services isolated on a specific node
  - Glance, Cinder, Neutron, Horizon, MariaDB, nova-scheduler
  - (RabbitMQ, HAProxy)
- Remaining services on a *controller* node
- 1 to **800** (fake) compute nodes

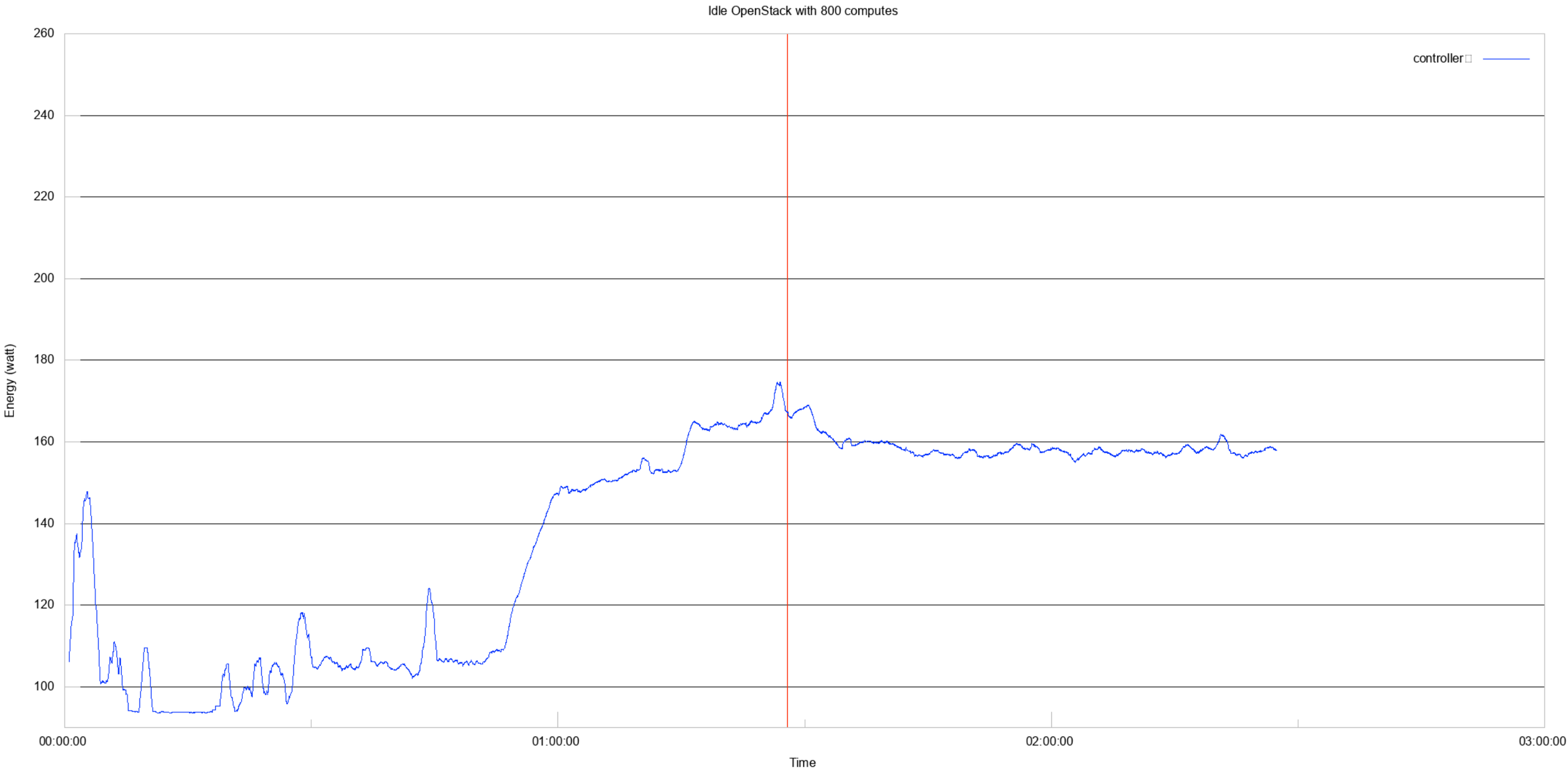
Methodology

1. For n in {1, 10, 100, …, 800} compute nodes
    1. Deploy OpenStack
    2. **Do nothing for one hour**

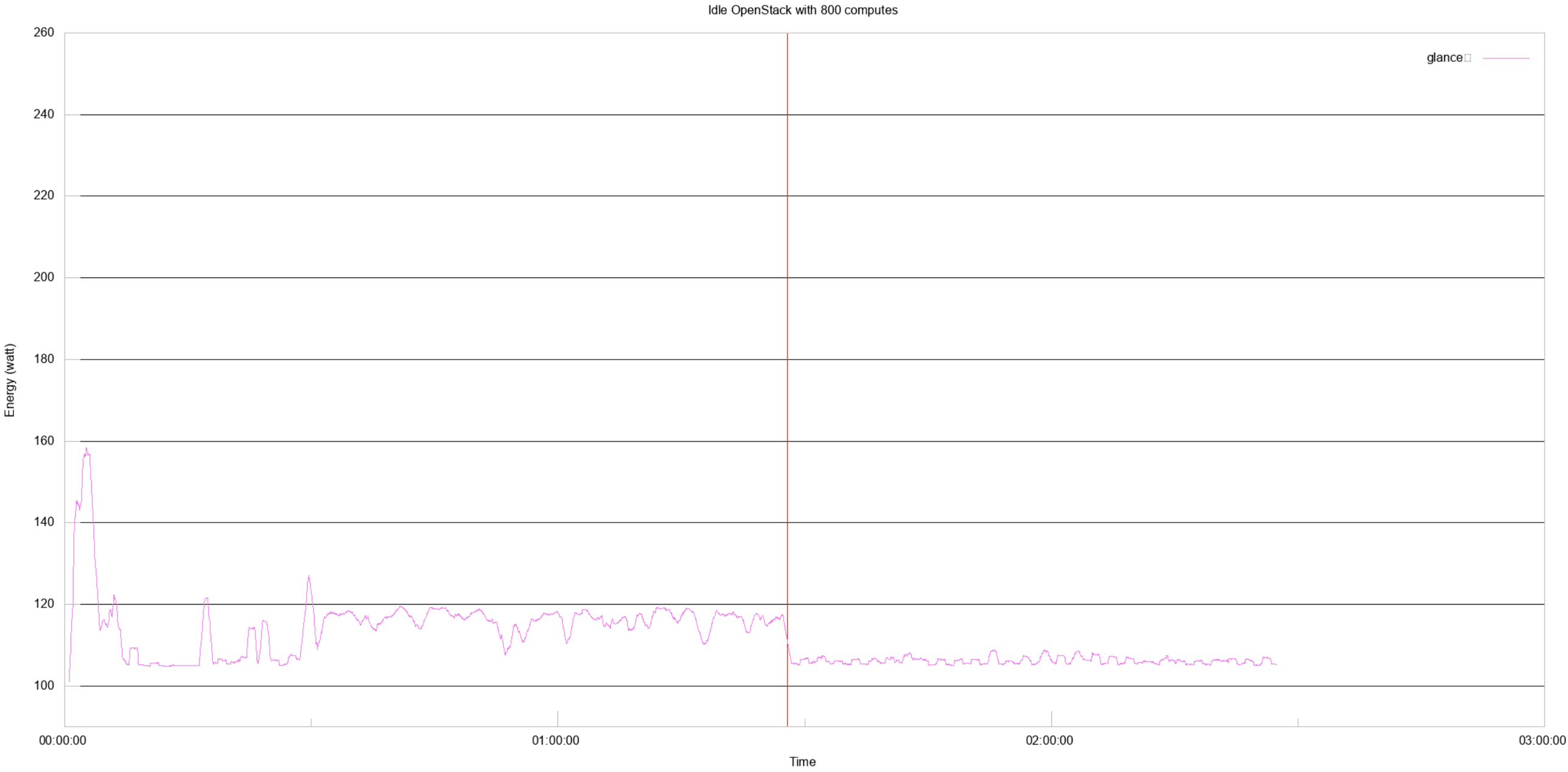
Idle Energy Consumption



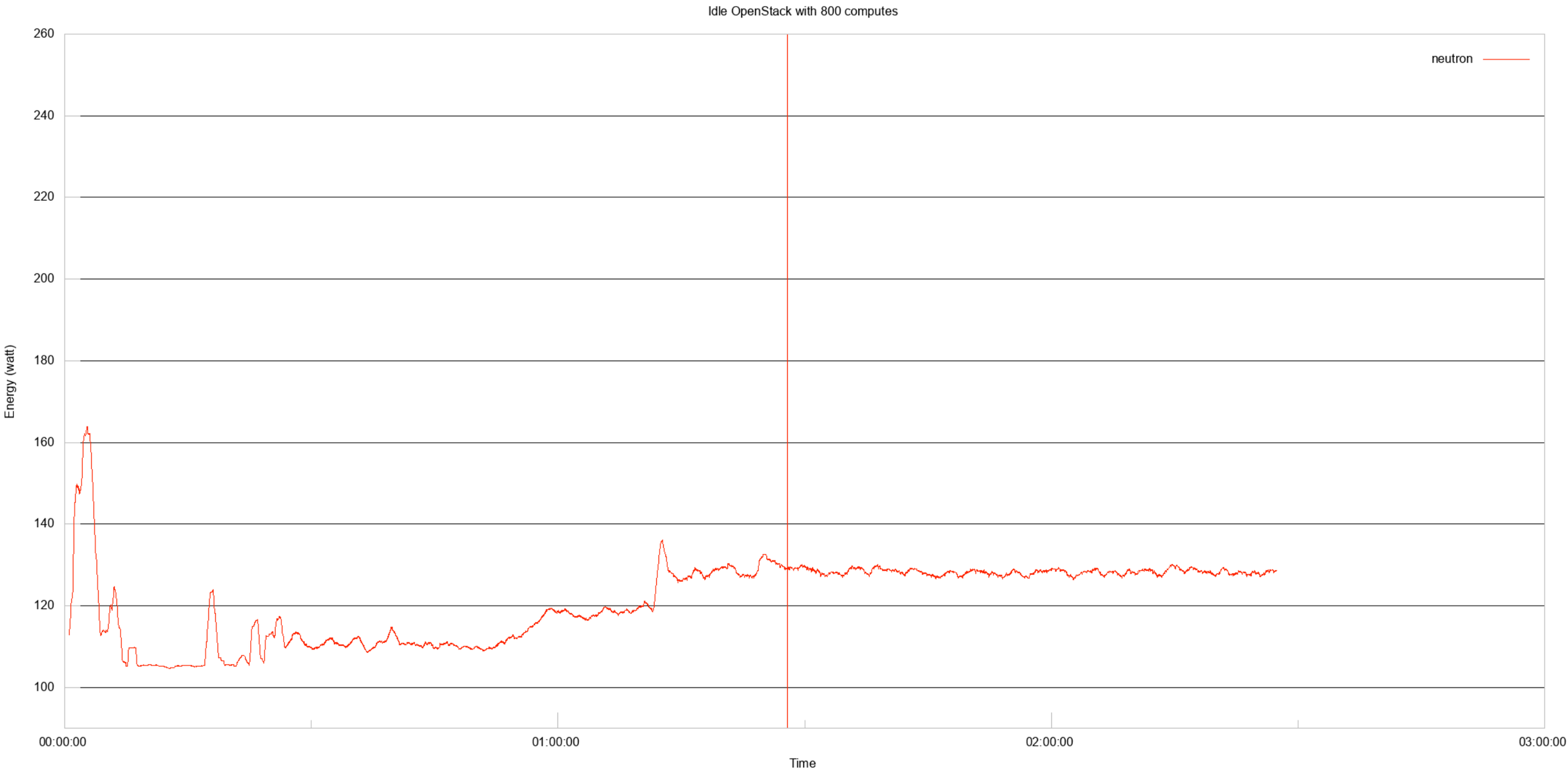
Idle Energy Consumption



Idle Energy Consumption



Idle Energy Consumption



Idle Energy Consumption

- Difficulties
  - Complex deployments, frequent failures for various (random?) reasons
  - Incoherent idle measurements (sudden change of consumption with no charge)

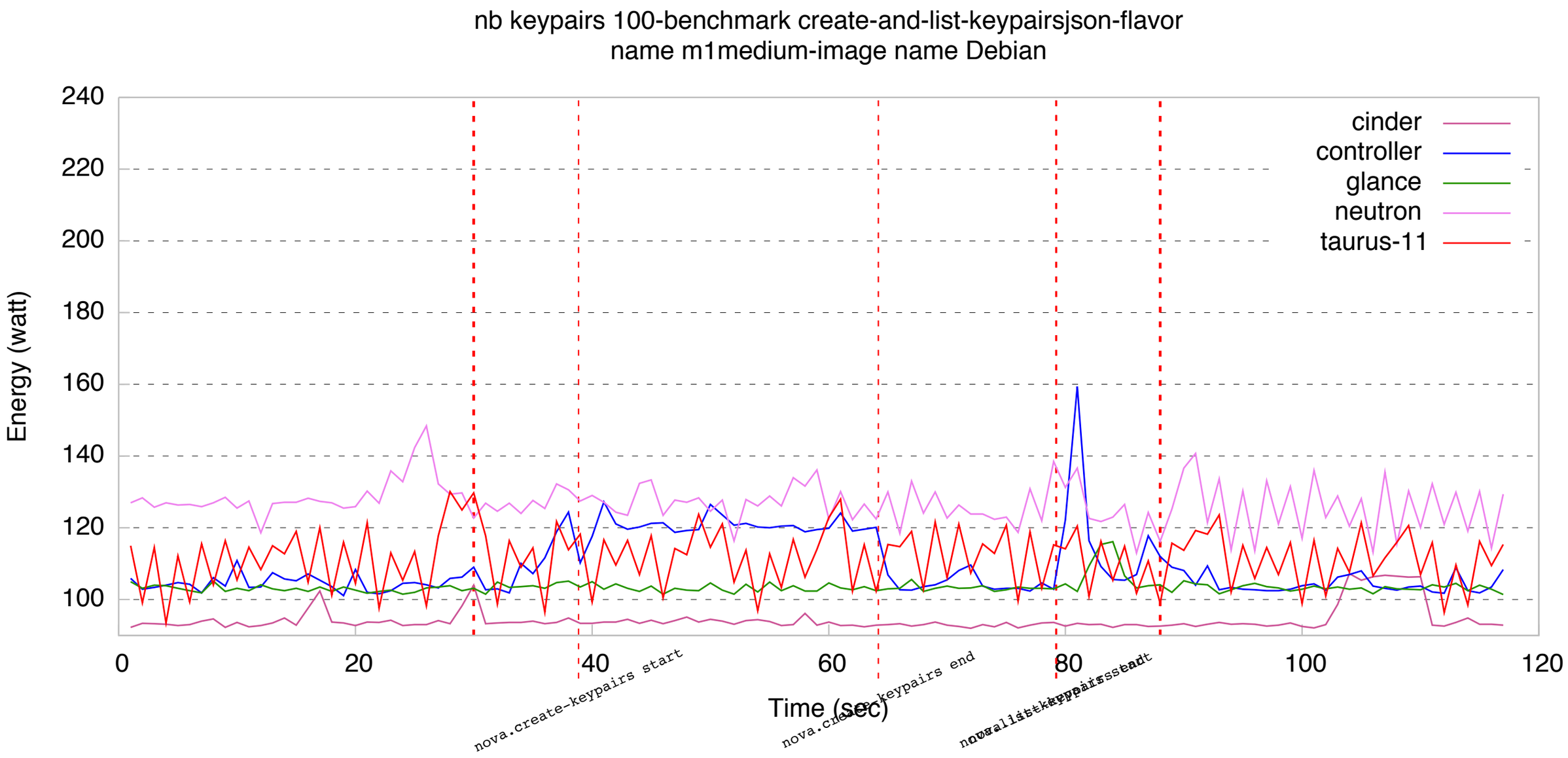
Rally Benchmarks

- The official benchmark suite for OpenStack
- Still on Taurus
- Isolated services: glance, cinder, neutron
- 1 controller
- 1 (actual) compute

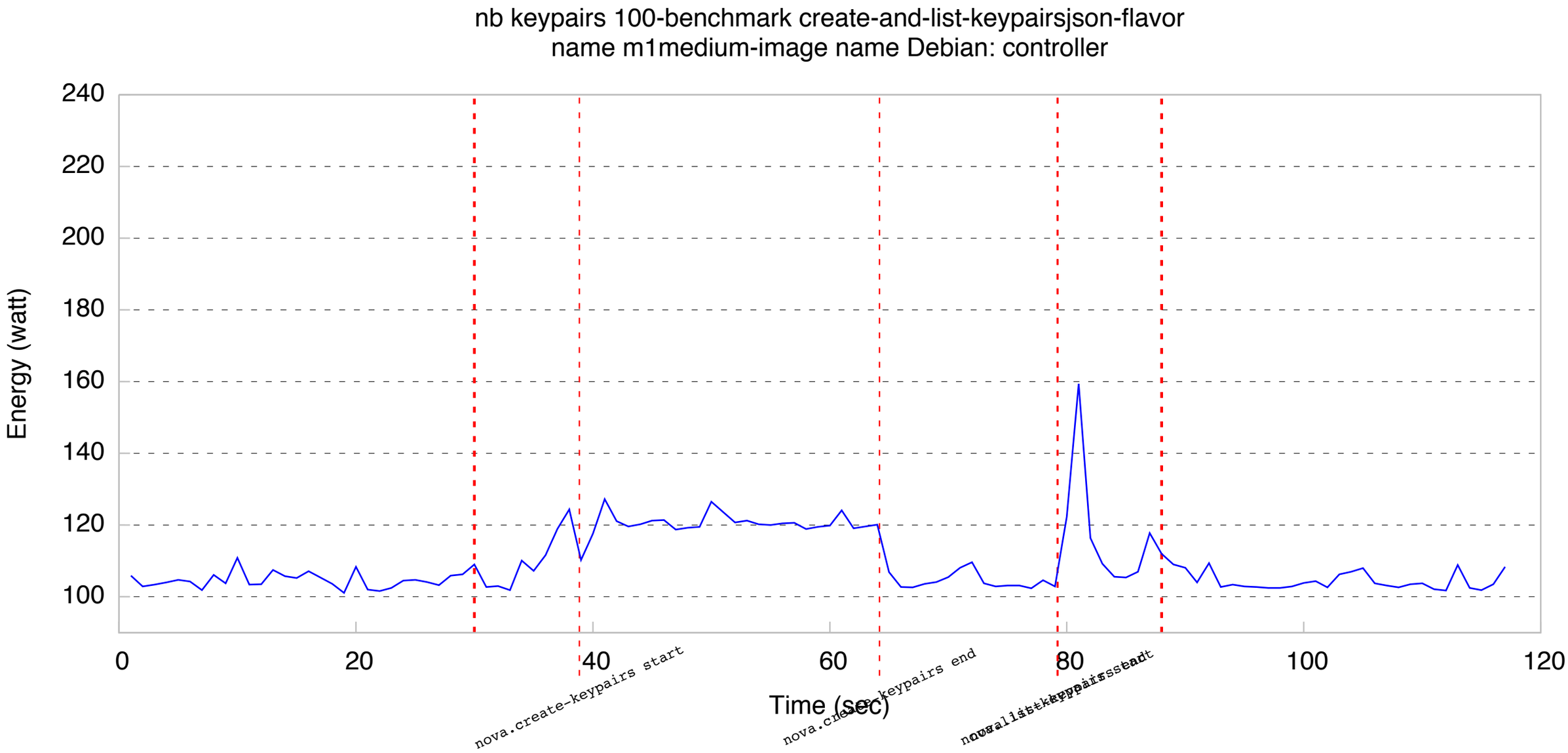
Methodology

1. Deploy OpenStack
2. For each rally benchmark
   - Pause for 2 minutes
   - **Execute Rally benchmark**
   - Pause for 2 minutes

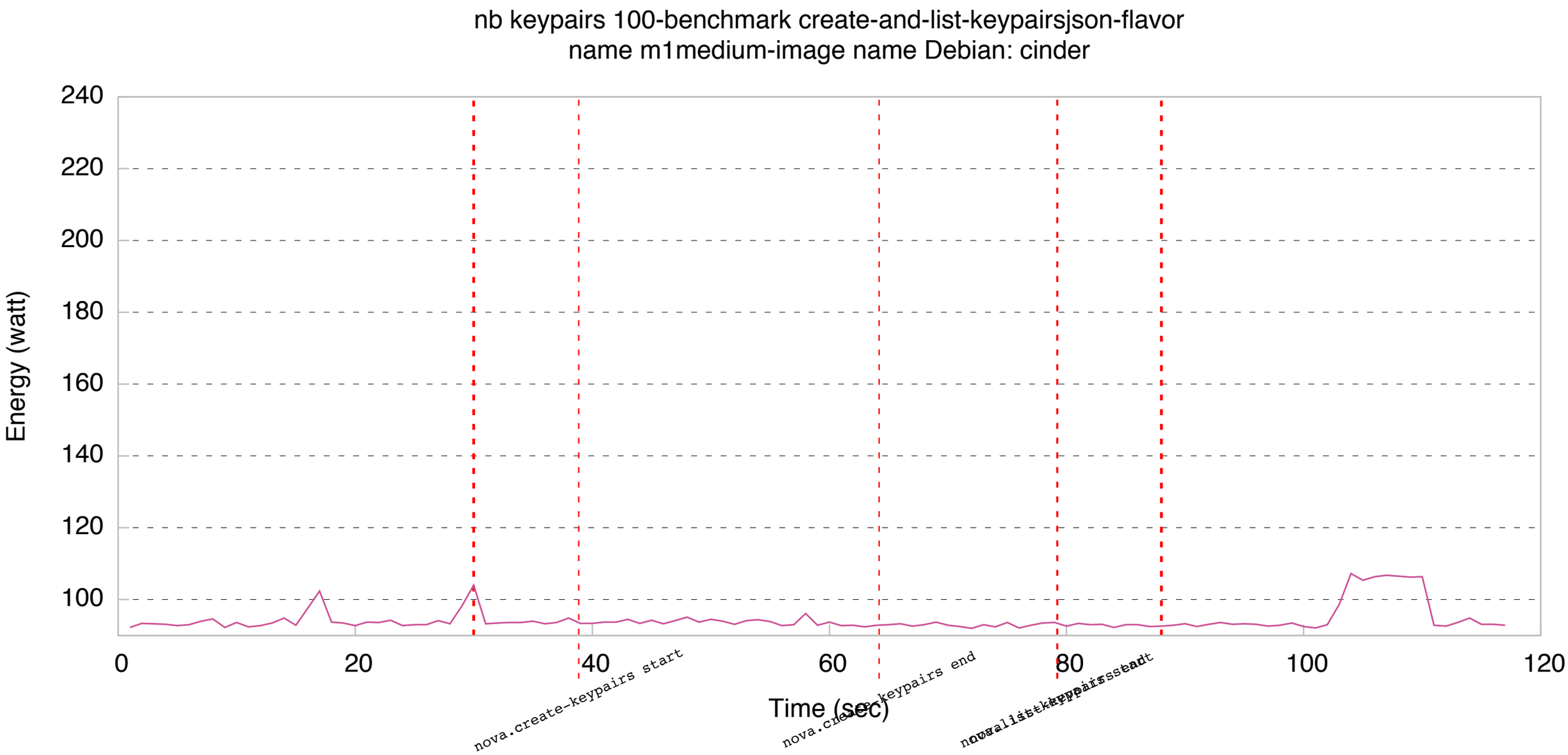
Rally benchmarks



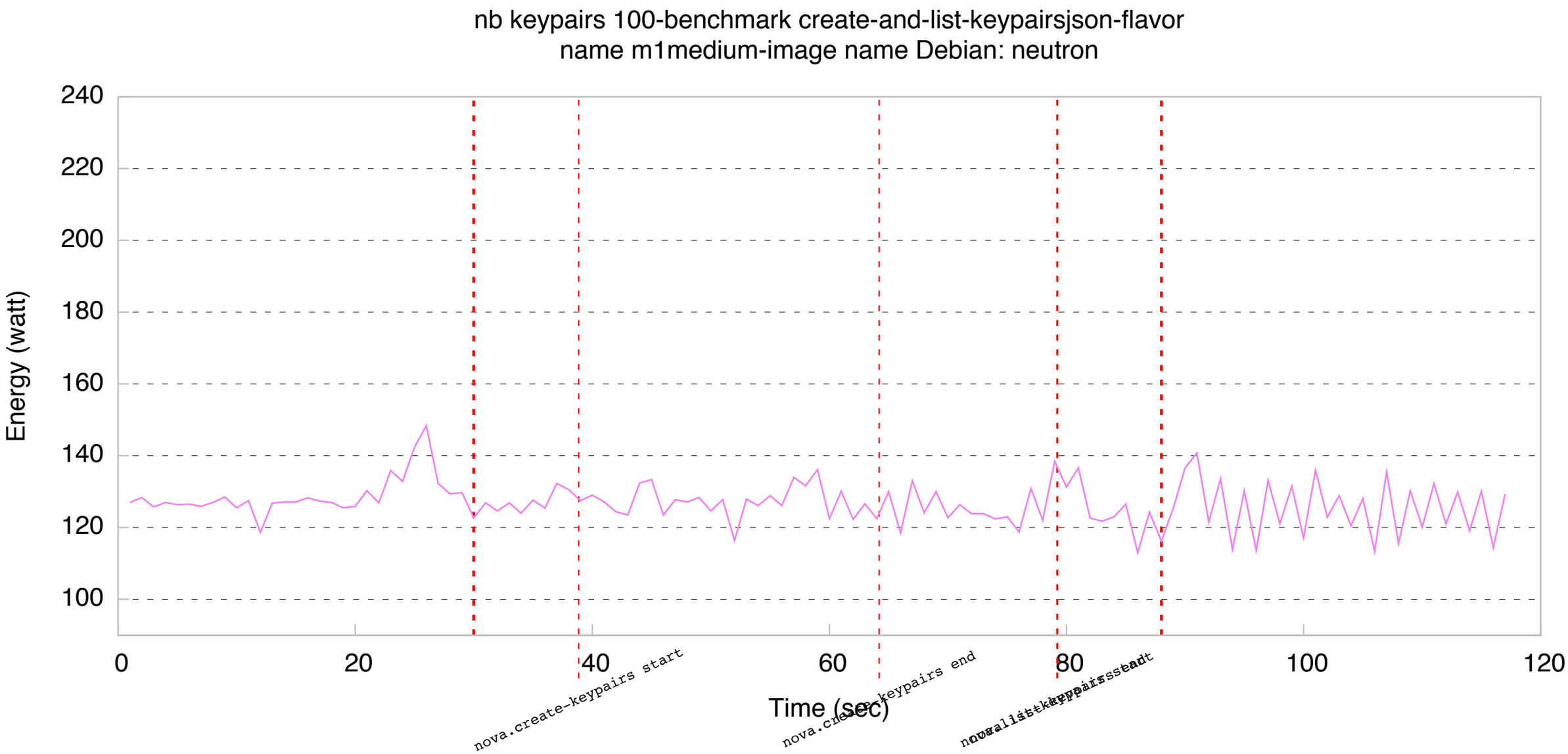
Rally benchmarks



Rally benchmarks



Rally benchmarks



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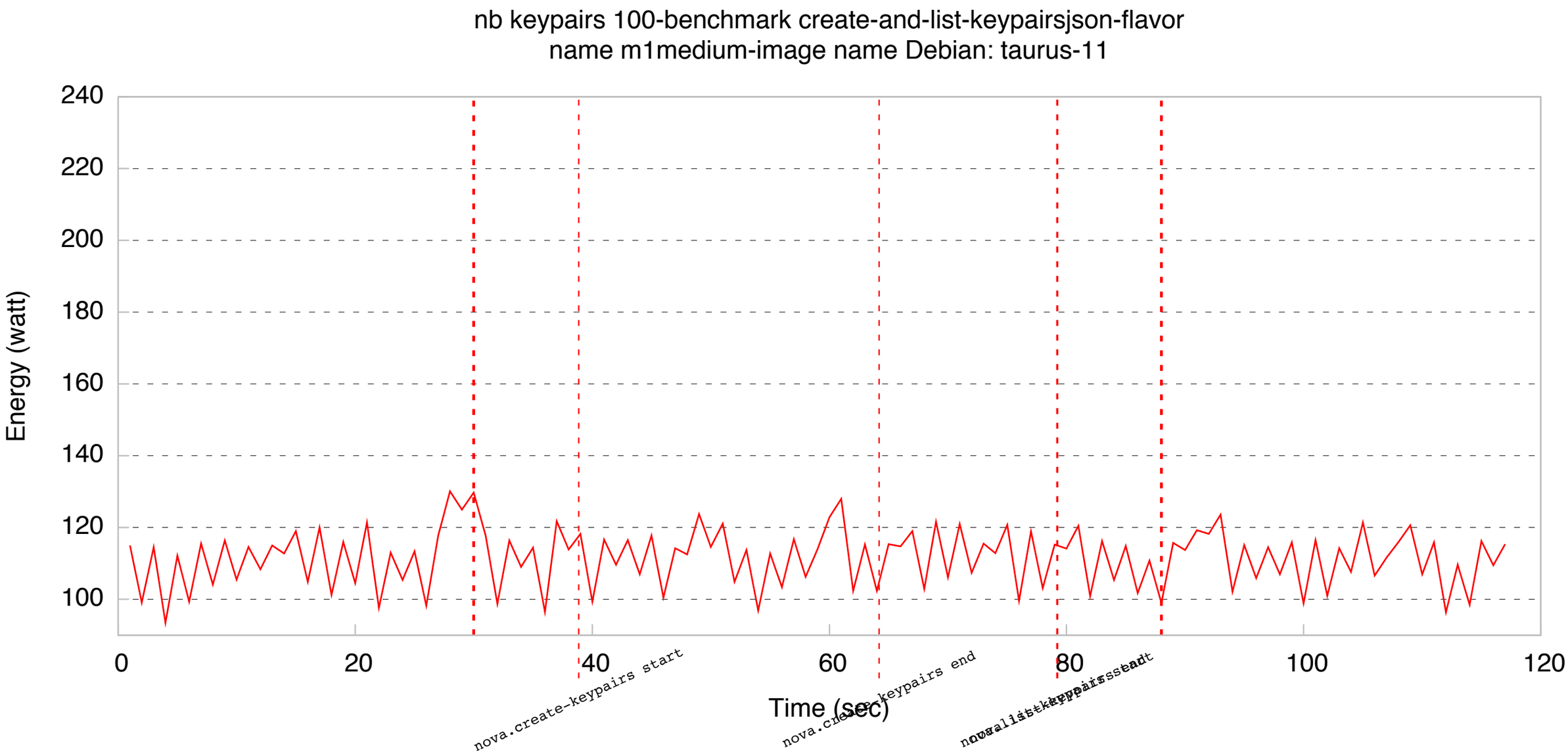

Rally benchmarks

- Difficulties
  - Precision of measures (precision of wattmeters and Kwapi)
  - Very short time for measuring most operations (only a couple seconds)
  - Difficulty to get the exact timing of operations
- WIP
  - Study how energy consumption scales with the number of compute nodes and operations
  - Isolate more services (nova-schedulers, RabbitMQ & HAProxy)

Conclusion

(I don’t have one.)

Questions?