SynAApS
Datacenter technologies

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Including users to reduce data centers environmental impacts

Simon Lambert

09/10

Who am I

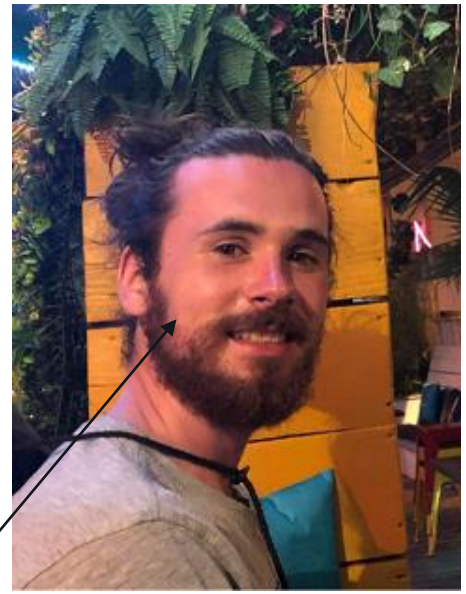
Lab and company

Work in the **data center operation department** (SynAApS) of a software developement company.

Laboratoire de l'Informatique du Parallélisme (LIP),

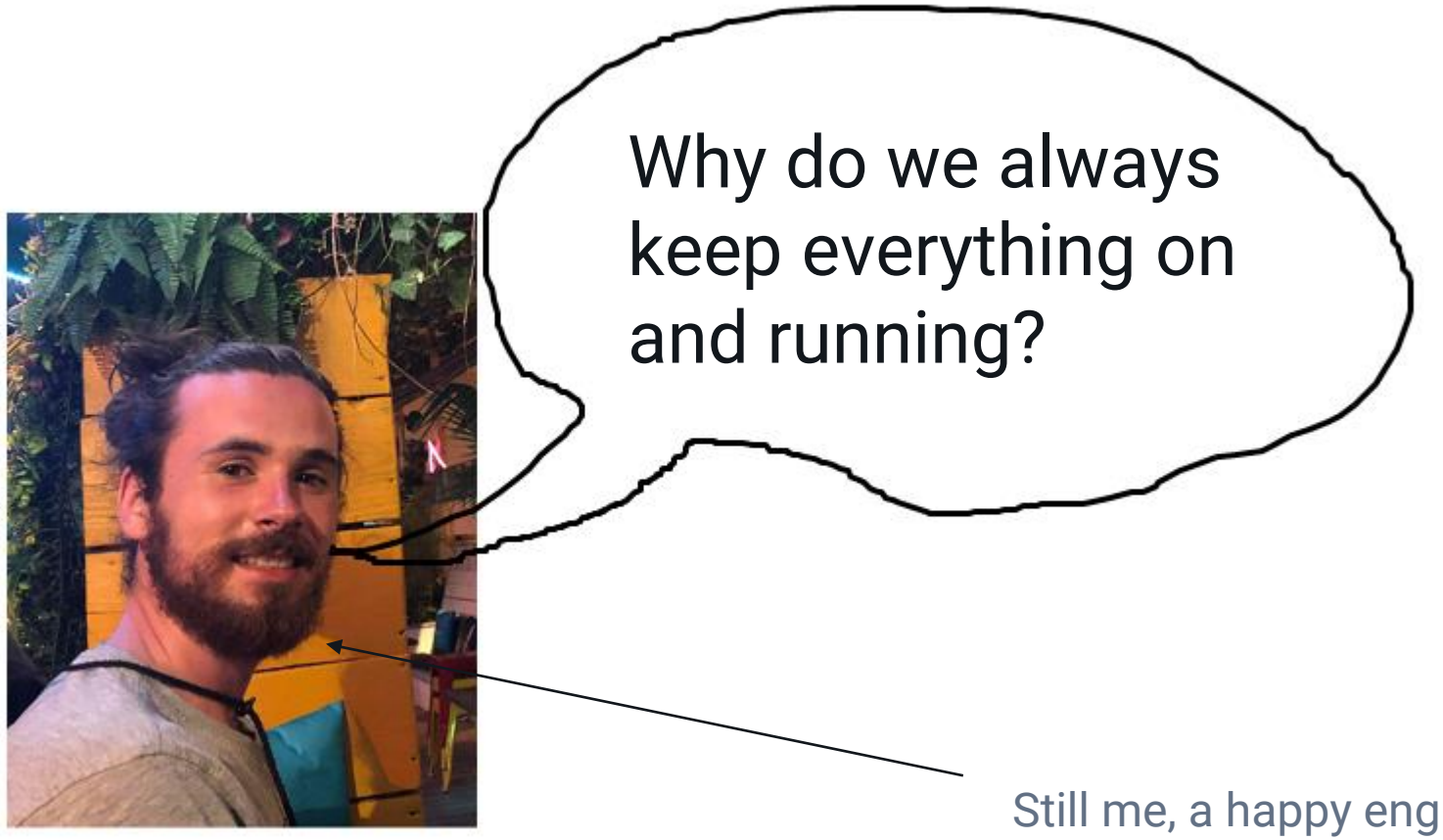
ENS de Lyon, INRIA

AVALON Team



Me, a happy PhD student

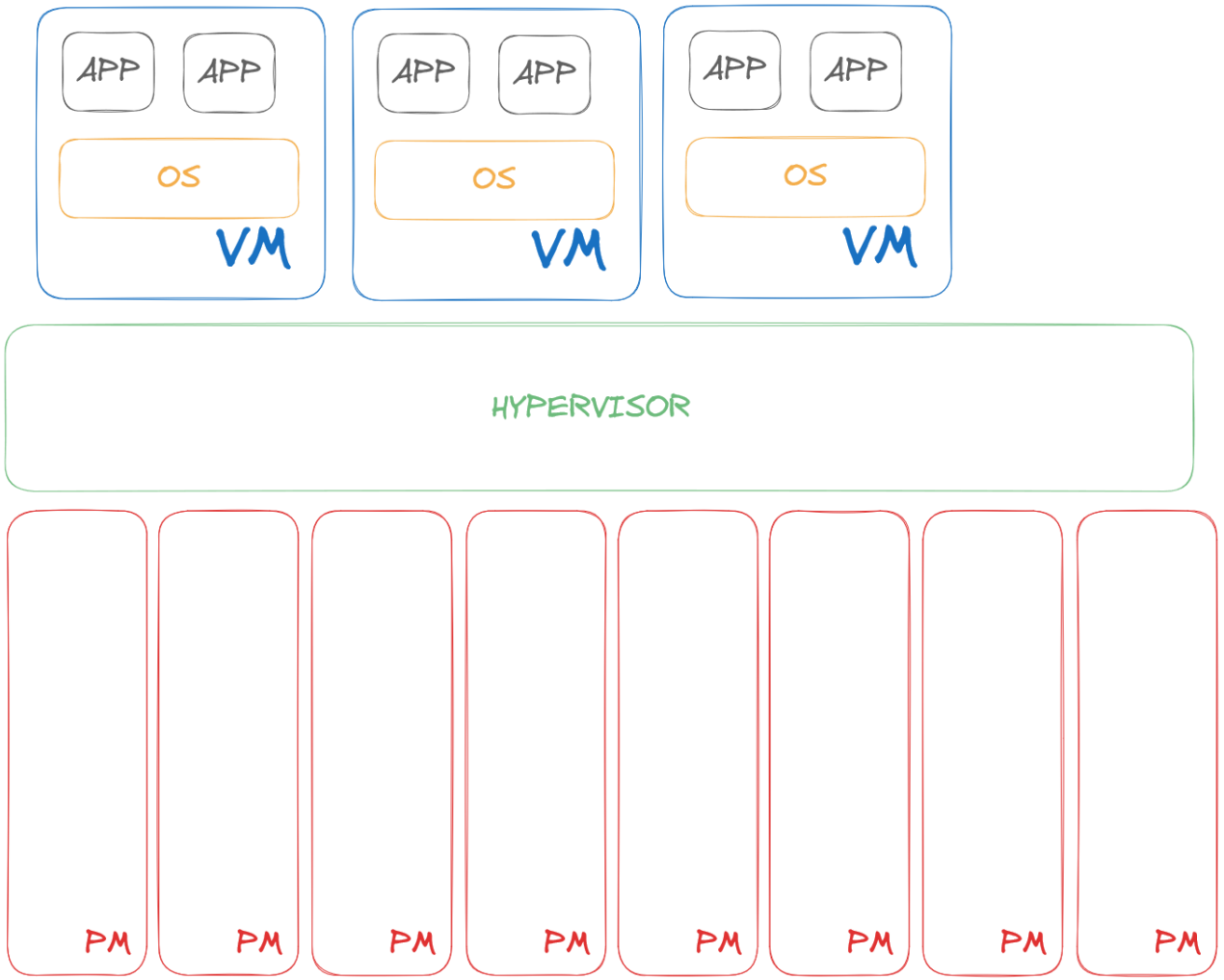
Who was I



Still me, a happy engineering student that was asking question.

CONTEXT

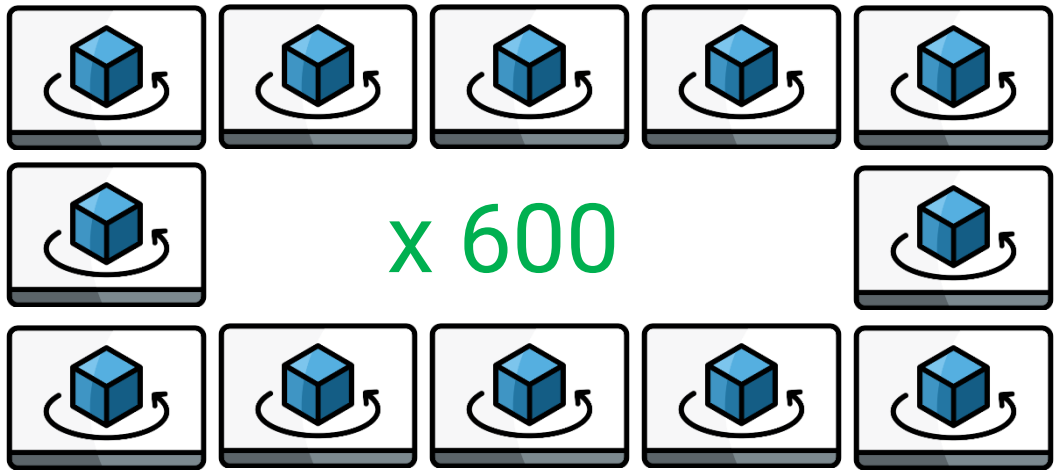
Virtualization



- Allows to run multiple OS, workloads, applications etc on a single physical server using an hypervisor.
- Physical servers can be clusterized to increase the amount fo resources made available to Virtual Machines

CONTEXT

Company context



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CONTEXT

How can we power off equipments?

Make the employees who use this infrastructure accountable

- Resources consumption
- Resources availability
- Give best practices when using the infrastructure

→ A Virtual Machine (VM) of this infrastructure will have 2 mandatory configured fields :

- A **VM owner**
- An expiration date

Implementation of a **VM automatic shutdown policy**.

MY PHD

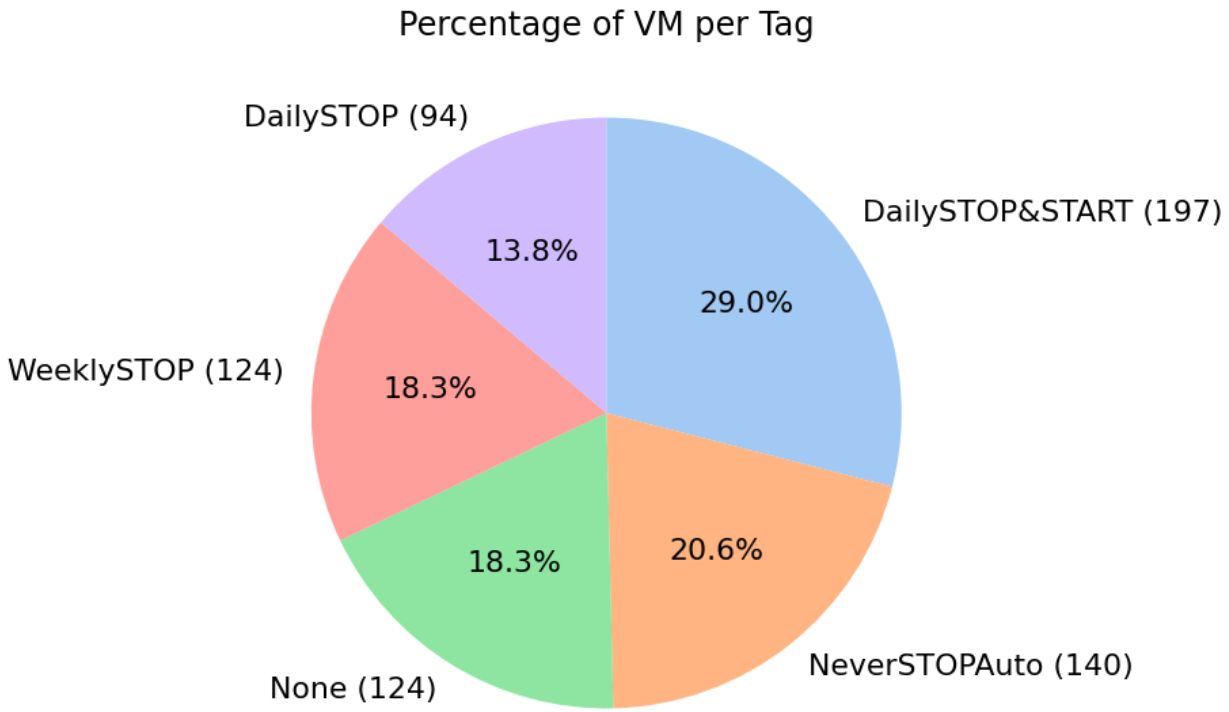
Shutdown policy

4 main tags on the shutdown policy

- *DailySTOP&START* : VM is powered off at nights, weekends, restarted automatically.
- *DailySTOP* : VM is powered off at nights, weekends, restarted manually.
- *WeeklySTOP* : VM is powered off at weekends, restarted manually.
- *NeverSTOPAuto* : VM is always on.

None VMs are VMs with no tag at the time of the study.
Excluding archived* VMs, 93% are tagged as per the shutdown policy.

*VMs about to be deleted, usually without a valid VM owner, or an expired VM validity date.



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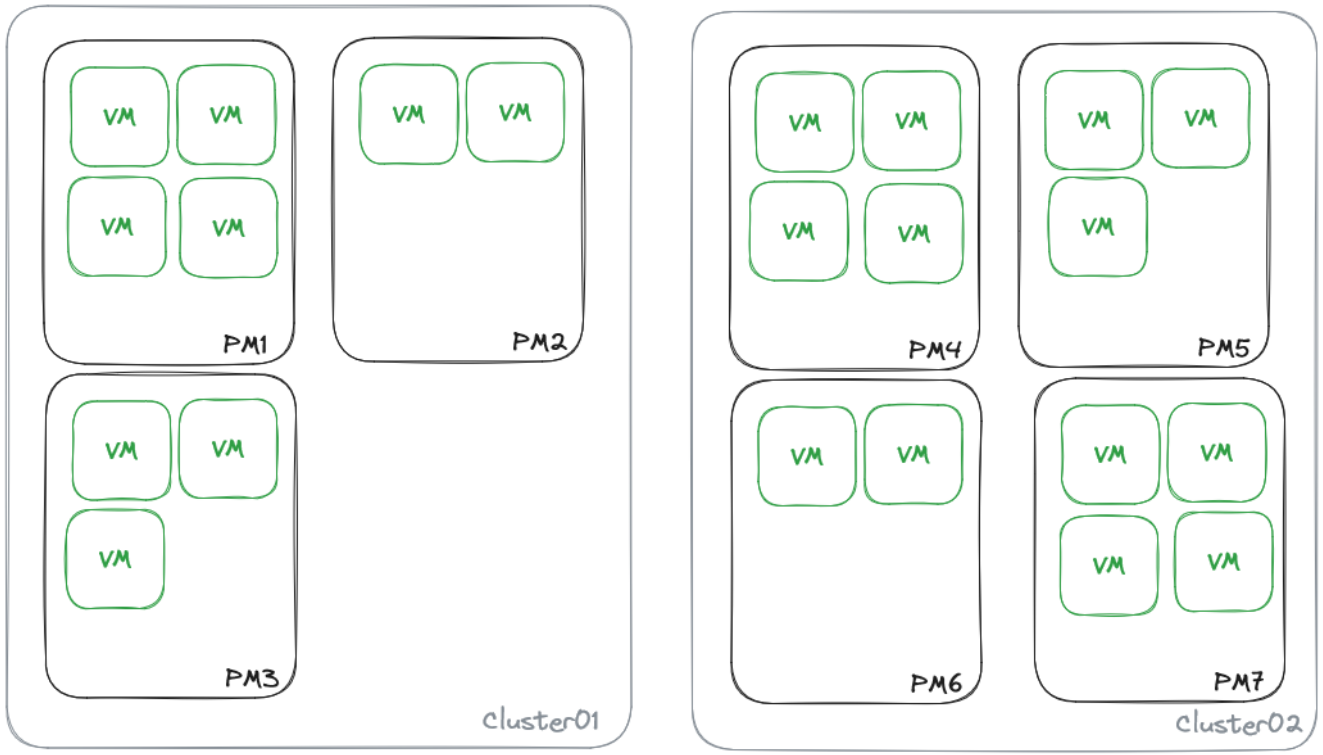
Consolidation



Virtualization infrastructure segmentation into clusters

VMWare vSphere 7

- Allows segmentation
- Consolidation handled by cluster

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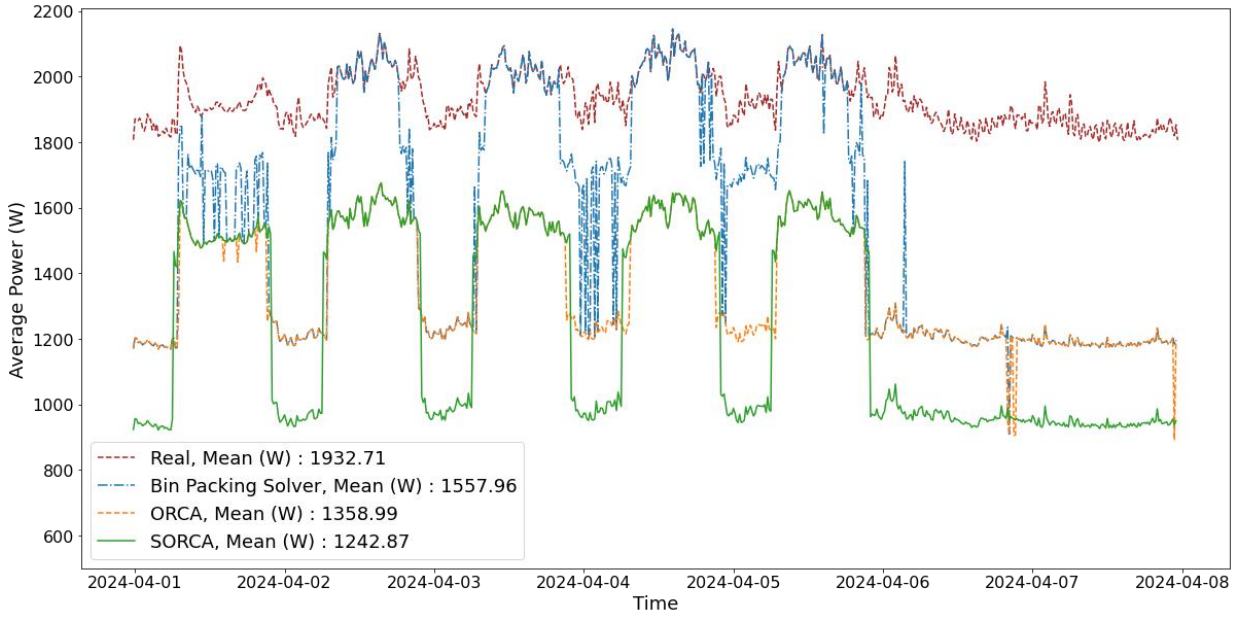
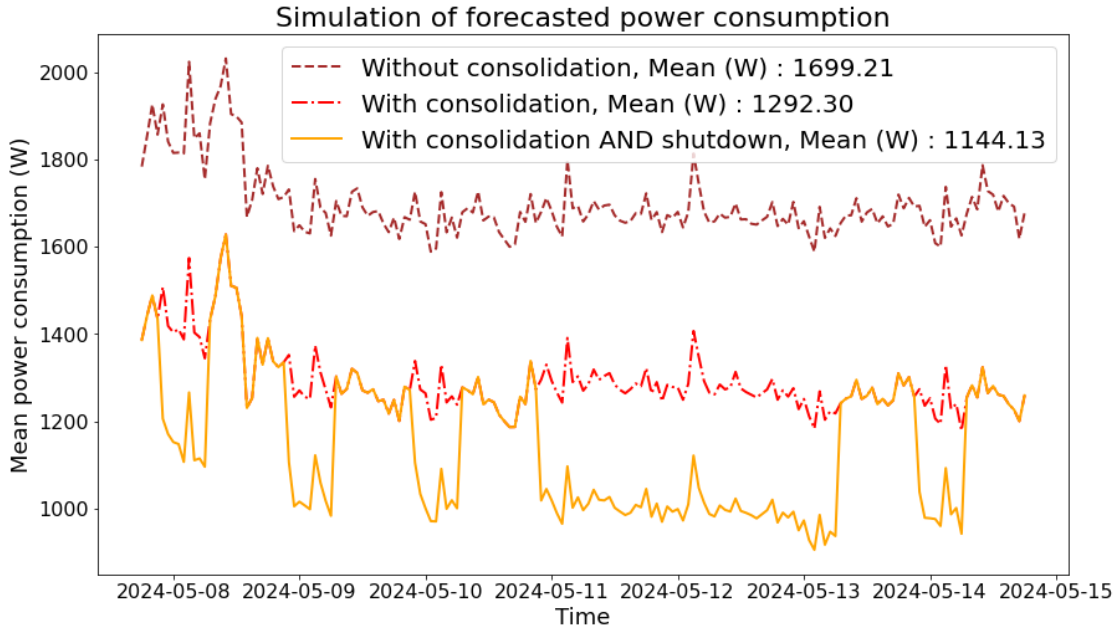
Consolidation with VM shutdown policy





In simulation, the power consumption is reduced up to 32%, with **8.5% thanks to the user** behaviours and actions

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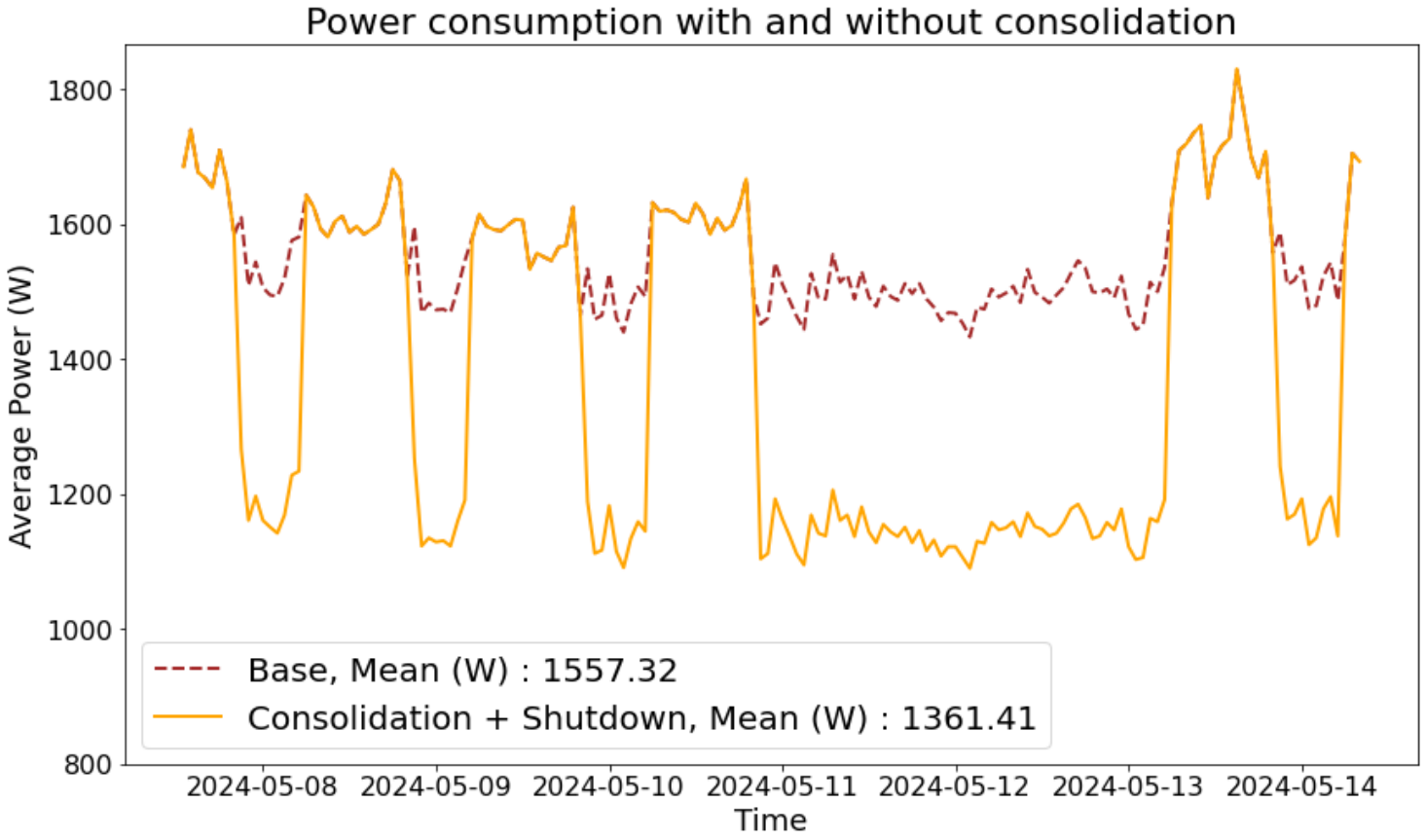
Experimental results



12.58% power consumption reduction over a week on a production infrastructure**.**
Considers fault tolerance

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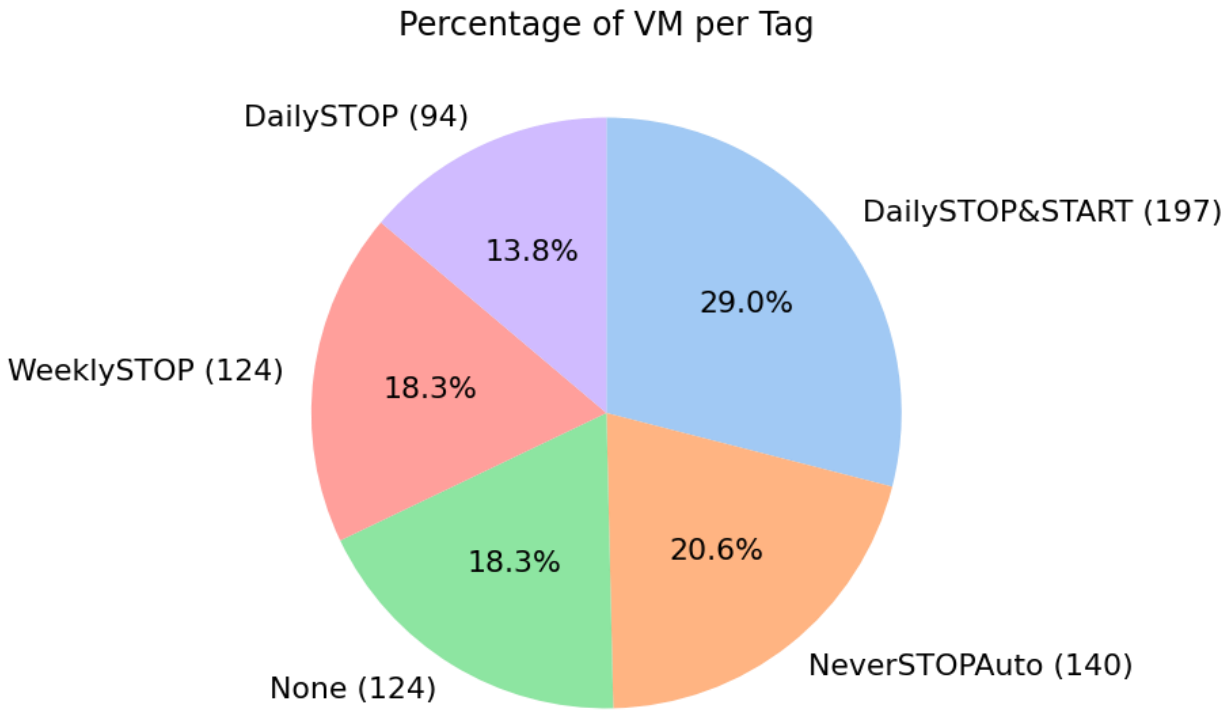

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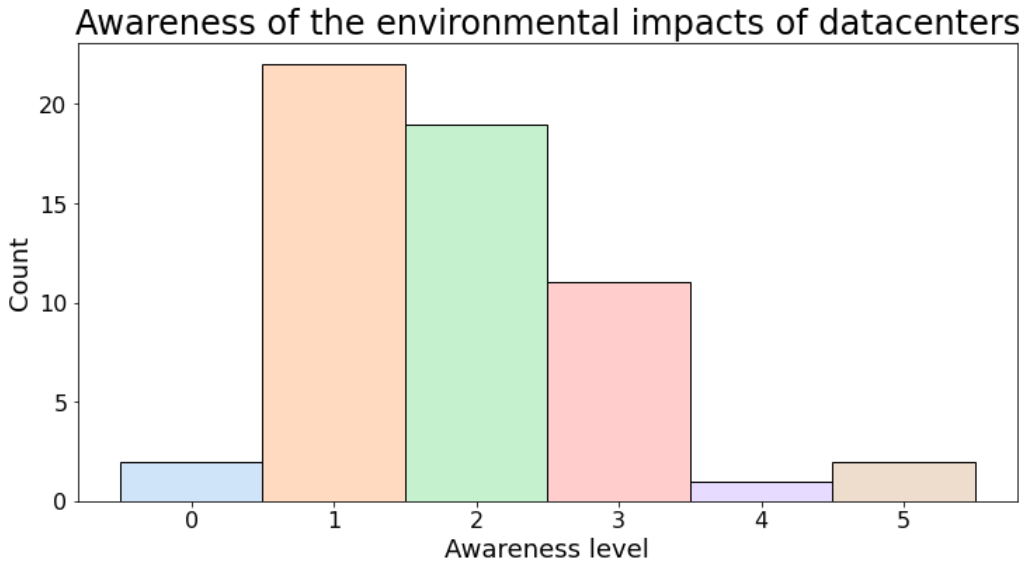
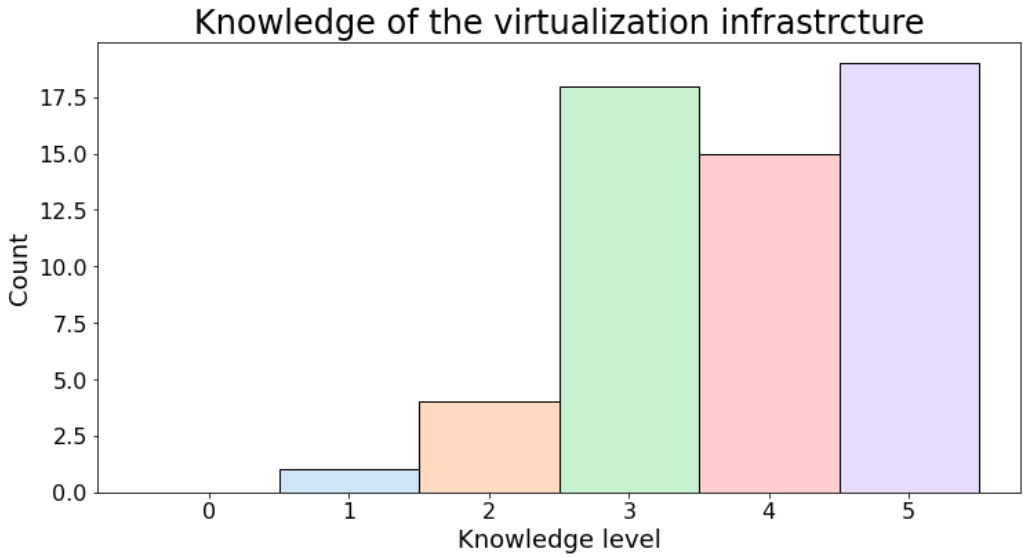
User profiling

2 questions sent to the 83 VM owners identified. 53 answers obtained.



0: I don't know anything about it
1 : I have a vague idea of the impacts it can have
2 : I've already seen information and/or figures on this subject
3 : I've read up on the subject one or more times
4 : I've taken one or more specific training courses on the subject
5 : I work daily on this subject, I'm an expert



0: I don't know what virtualization is
1: I know our virtualization infrastructure (vSphere) but I didn't know I was responsible for one or more VMs
2: I know I'm responsible, but I don't know which VMs
3: I know some of the VMs I'm responsible for
4: I know all the VMs for which I am responsible
5: I know all the VMs for which I am responsible, and can describe the tools and services precisely, as well as the shutdown policy tag

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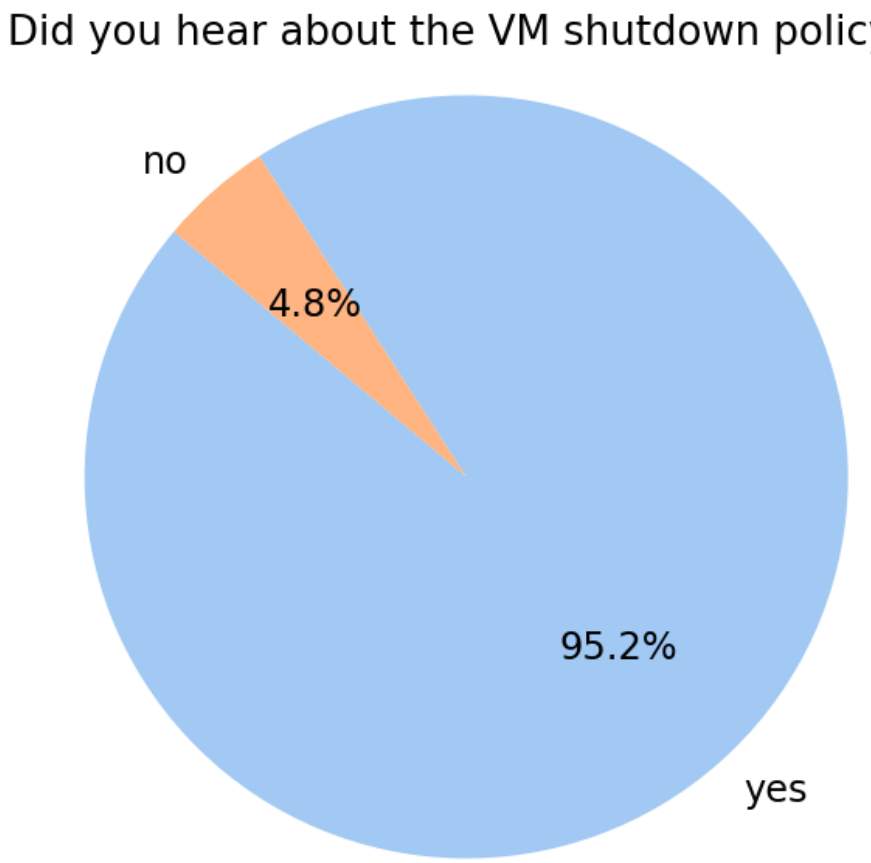
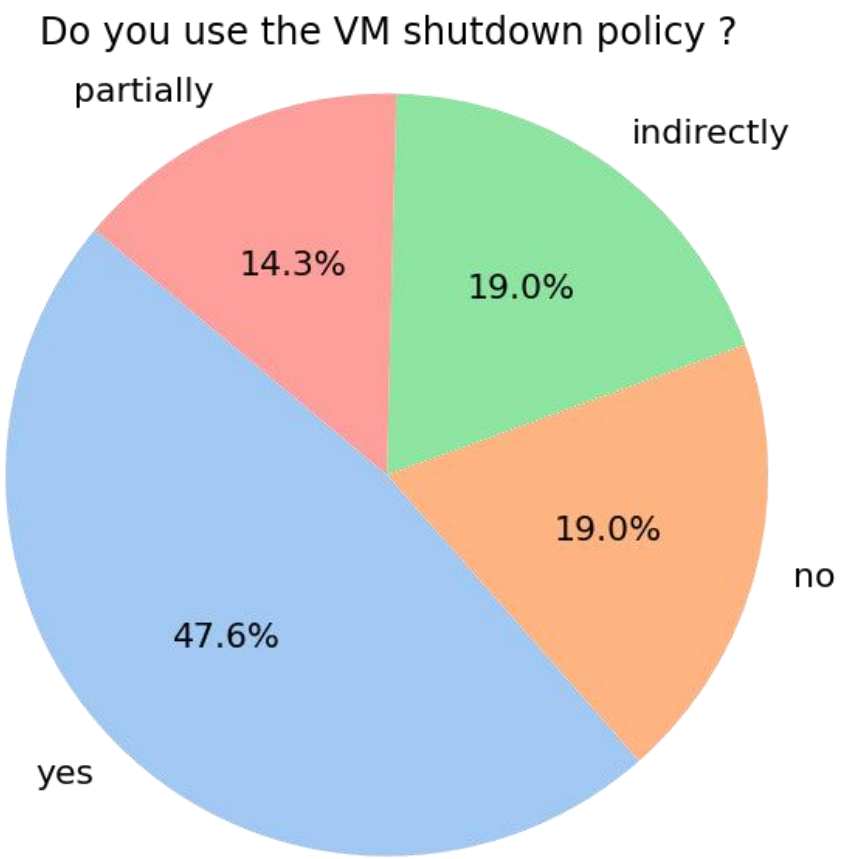
User profiling - Interviews

Interviewed 19 VM owners based on their usage of the policy and number of VMs.





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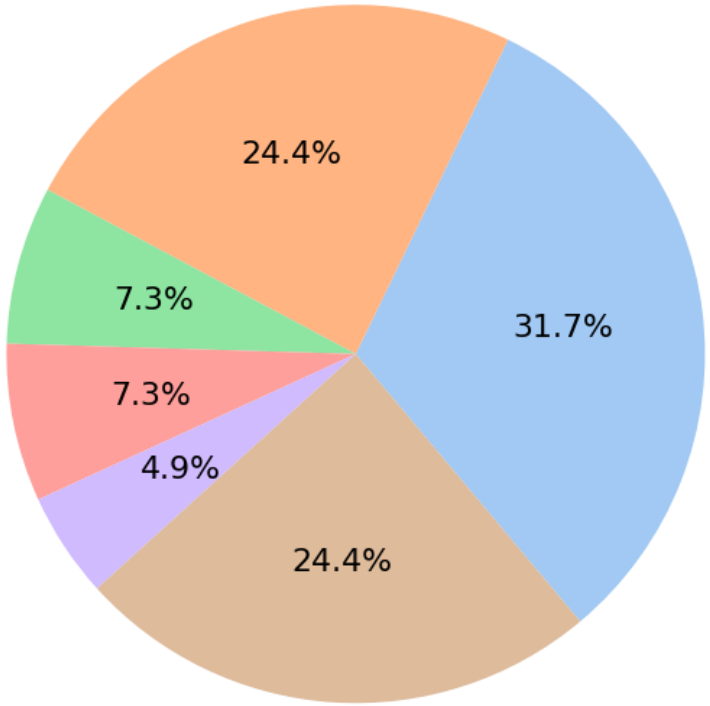
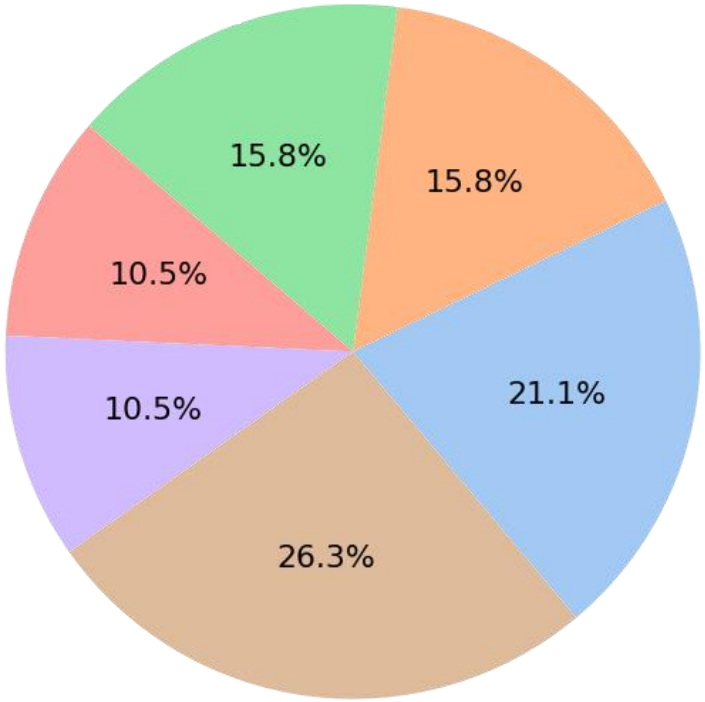
User profiling - Interviews

Why do you power off VMs at night ?



Other :

Why are some of your VMs not powered off ?



Other :

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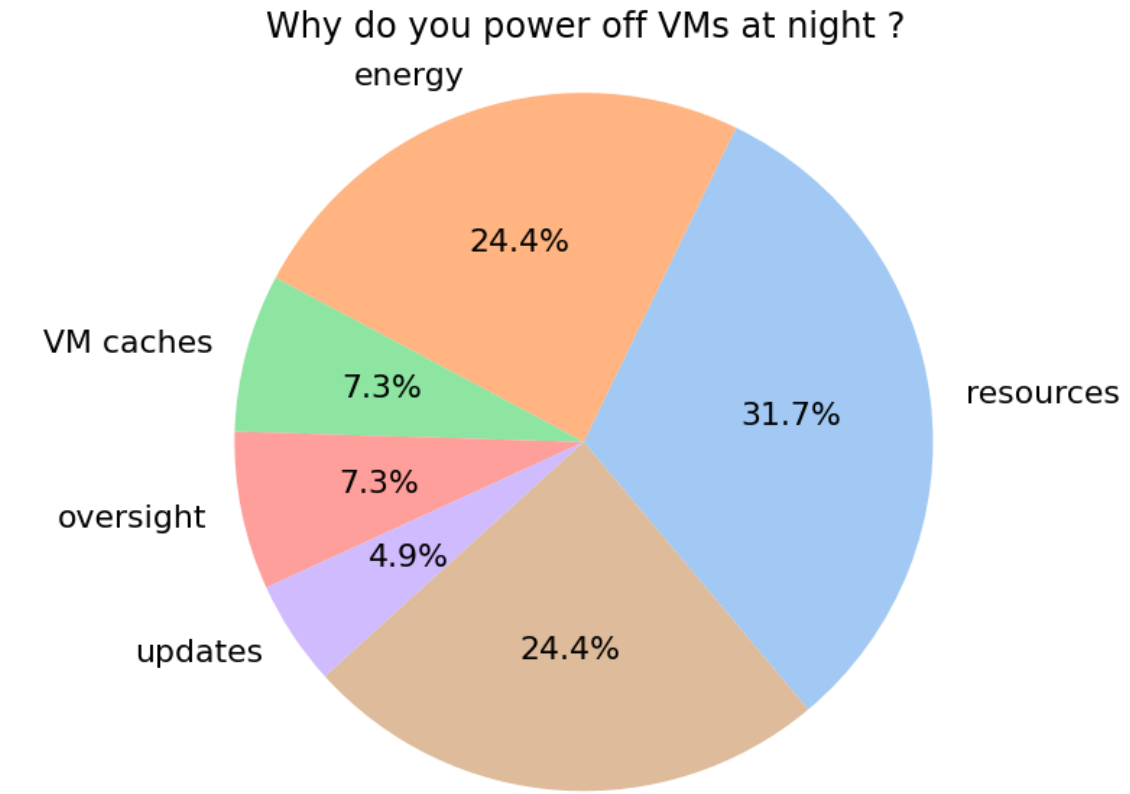
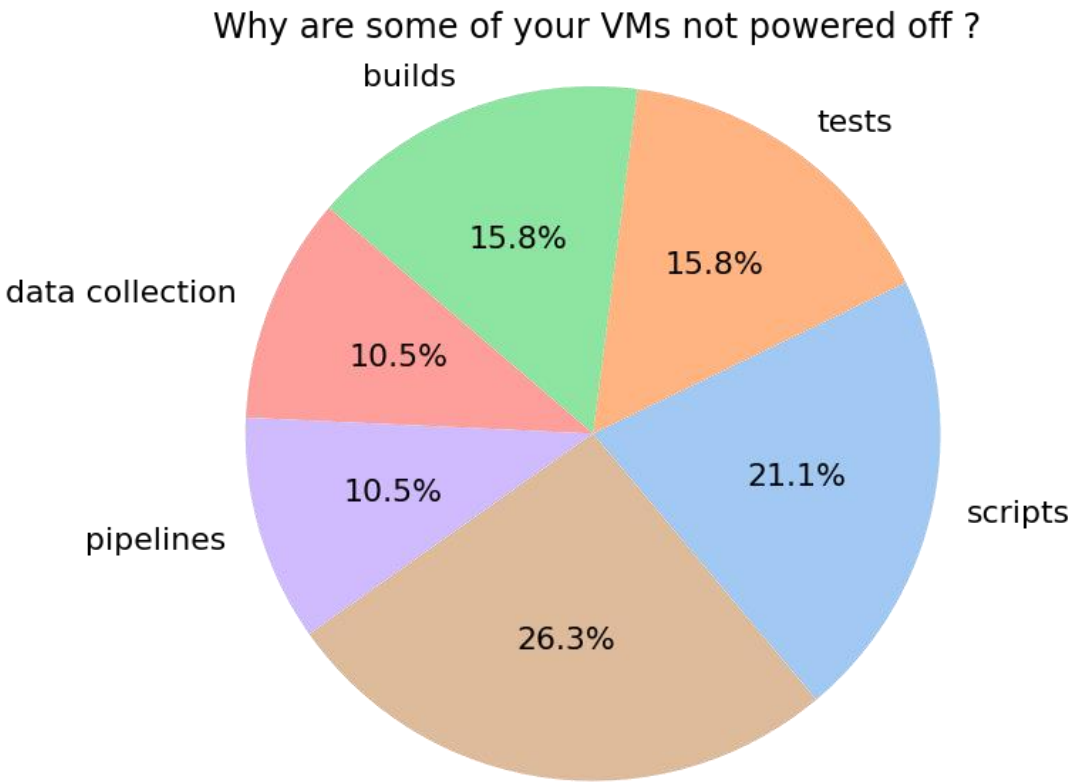
User profiling - Interviews



Other : performance, security, etc.



Other : production, input control, etc.

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Next steps ? Questions ?

- What are the limits of this approach ?
- Can we apply this approach to other cloud infrastructures ?
- Can we translate this to HPC infrastructures ?
- How can we include other environmental impacts in this approach ?
  - Is it possible to quantify avoided impacts in the long term ?
  - Is this kind of approach applicable to other devices ?
- Do you have the opportunity to perform such thing in your job ?
- Would you like to have this kind of opportunity ? What would be your motivations, expectations etc ?
- How can you get IT teams/colleagues to do such thing ?

Thank you !

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