User incentive SLURM plugin
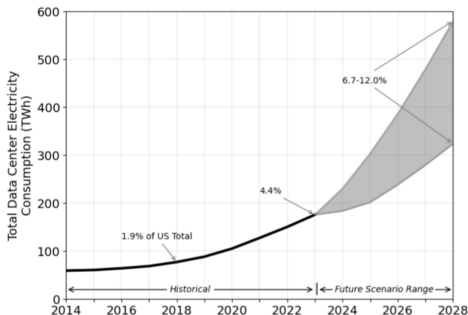
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LIG, Grenoble, France

*Joint work with Abdessalam Benhari, Lionel Bouzon,
Pierre Seroul and Denis Trystram*
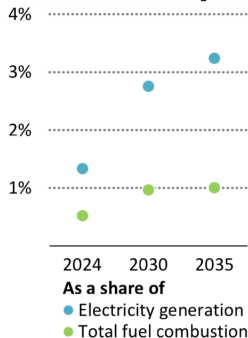
September 15, 2025

Ínría

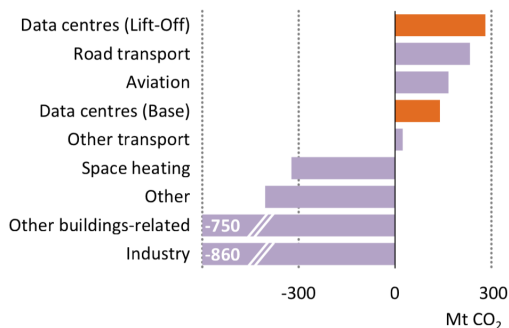Sources : LBNL – 2024 United States Data Center Energy Usage Report

For comparison, annual nuclear power generation in France: 350 TWh

Growth of DC consumption

Indirect data centres CO$_2$ emissions

Growth in CO$_2$ emissions, 2024-2030

As a share of
- Electricity generation
- Total fuel combustion

IEA. CC BY 4.0.

Data centres are on track to be responsible for 3% of electricity generation and 1% of total combustion emissions by 2030; they are among the few sectors that show growth to 2030

Levers

- Technology
- Smaller models
- Metrics and measure of AI impact
- Circular economy
- Inform AI users

Source: Position paper Key Challenges in Fostering the Environmental Performance of AI, fev. 2025

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Objective

- Reduce the carbon footprint of a DC
- User incentive approach
- Prediction of footprint and workload

Possible actions after submission:

- Delay
- Modify settings
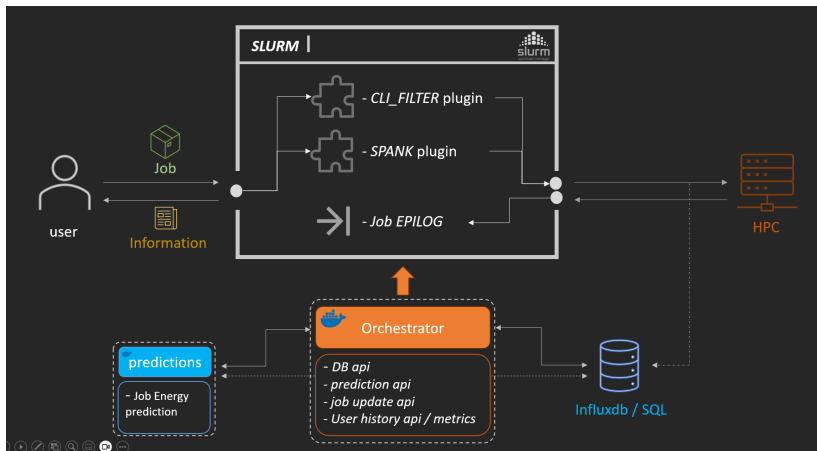
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Interface

```
== User history :

    ================================================================================
   || Past emissions | predicted* emissions | Total** emissions |   Available credit   ||
   || ---------------------------------------------------------------------------------- ||
   ||     0.00 (kg) |          0.00 (kg) |         0.00 (kg) |      -OFF- kg ( --%)  ||
    ================================================================================

* The total estimated emission for the currently running jobs
** The global co2 emission for the last 4 weeks

N.B: Average CO2 rate used (40.00 gCO2eq/kWh)

 == Job informations :

    ========================================================================================
   || Submission date | Predicted Power | Eq CO2 Emission | Eq number of flights | Eq number of tgv rides ||
   || -------------------------------------------------------------------------------------------- ||
   || 2024-07-18 (UTC) |   10.000 (kWh) |    4.000 (Kg) |                 0 |                 53 ||
    ========================================================================================

[SUBMISSION] Given the informations above, please choose one of the following actions:

|| - (s): Submit job directly.
|| - (d): Submit job, but allow job delay (if it falls in a high carbon rate period).
|| - (e): Edit current settings [walltime | number of nodes], then submit job.
|| - (c): Cancel the current submission.
```

Experiments objectives

- Identify behavior of users
- Identify factors of decision
- Measure the possible reduction of carbon footprint

For users:

- User satisfaction
- Perceived Impact
- Perceived Intrusiveness
- Willingness to use
- Limitations

Survey

About 20 questions after experiment

- What were the main factors that motivated you to use the plugin?
- Did the plugin influence your job submission behavior?
- Has it contributed to your professional engagement with sustainability?

Experiments

We are looking for a data-center:

- SLURM
- around 100 users if possible
- a few weeks
- out of holidays