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RL-Energyplus: additional content

December 20, 2023

Table of Contents

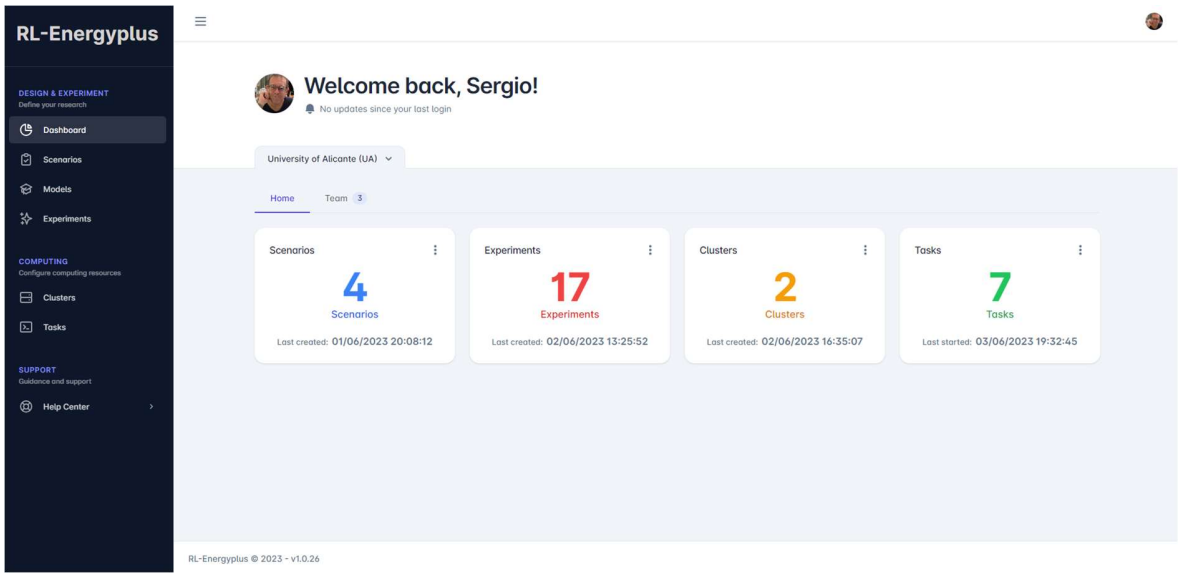
2

Overview

In this document we provide additional content for our submission to the NTT Group Sustainability Conference 2023.

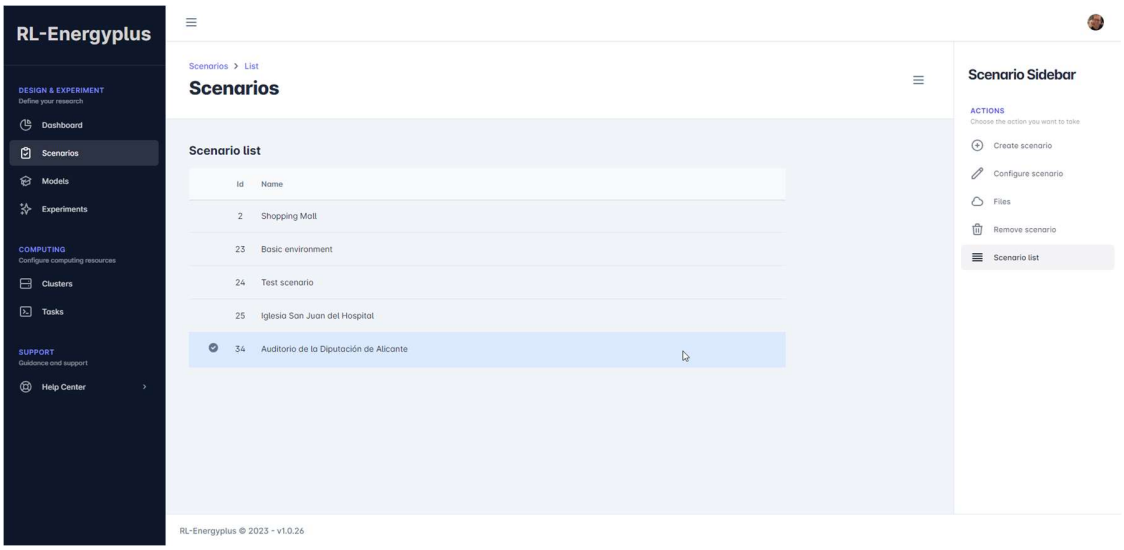
Platform: main features

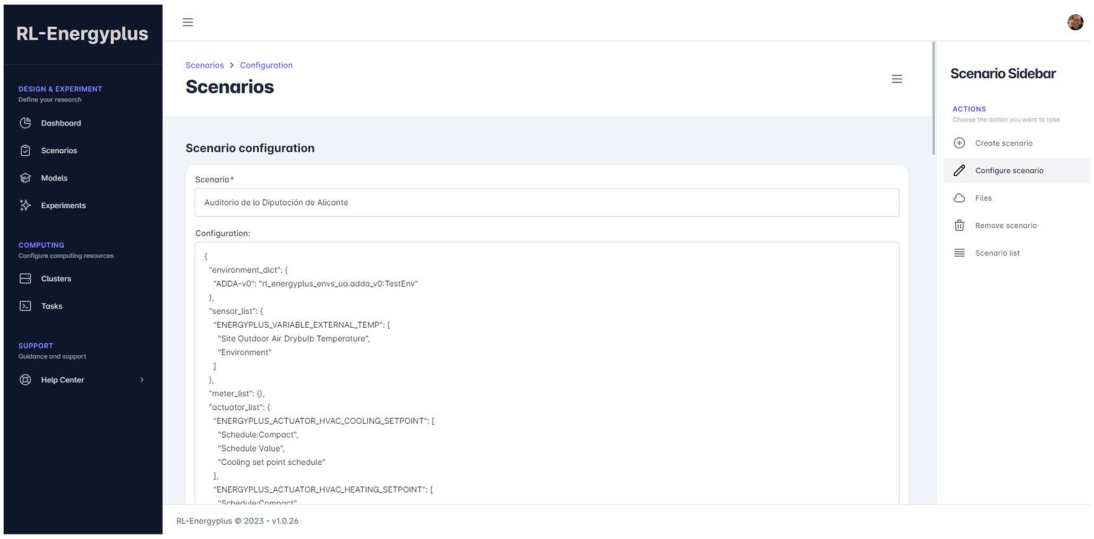
Landing page



3

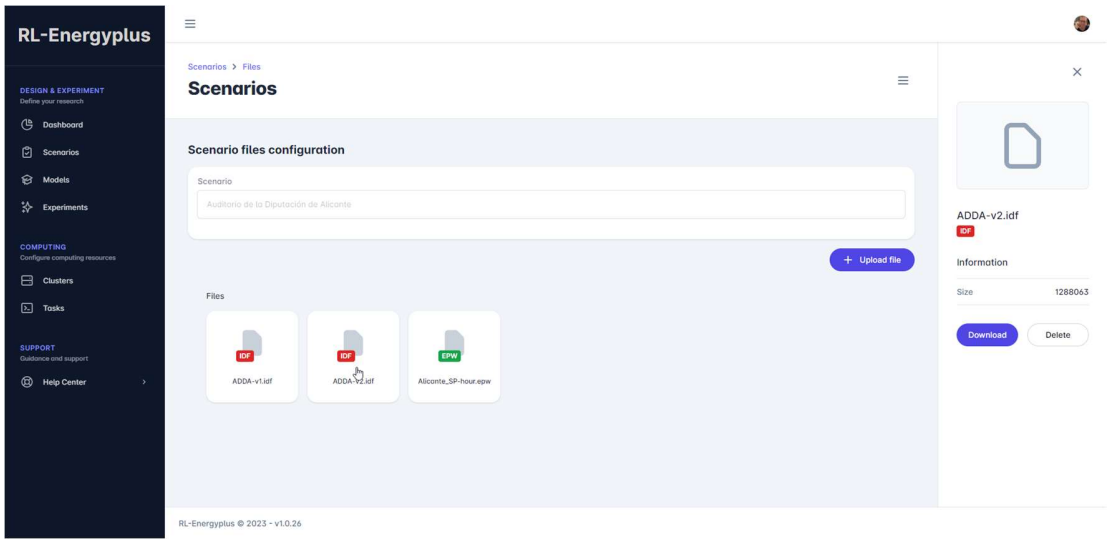
Scenarios: definition



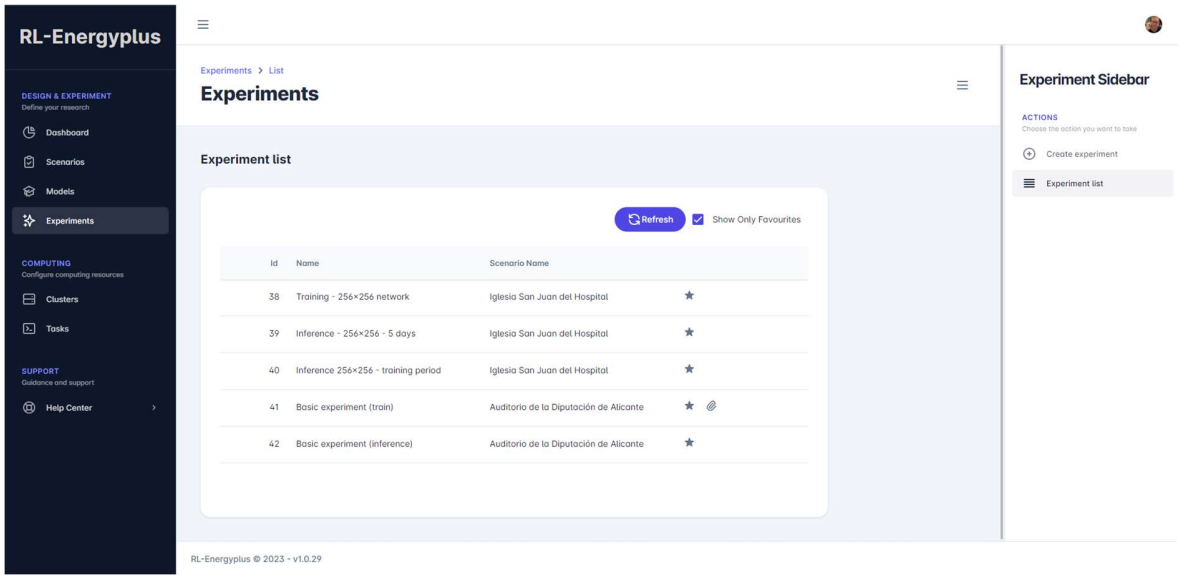


4

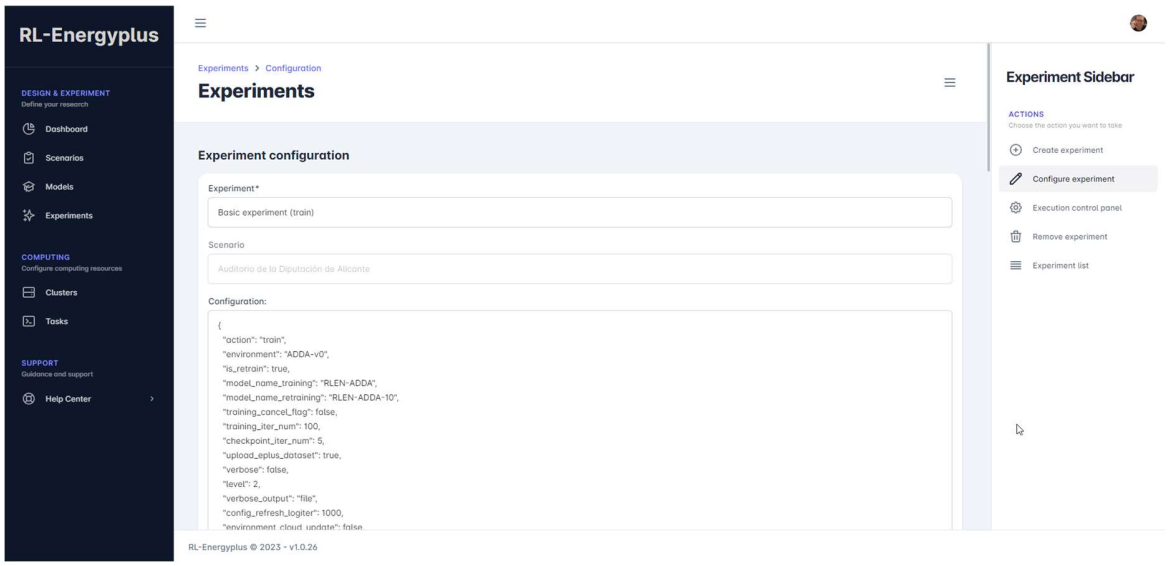
Scenarios: file management



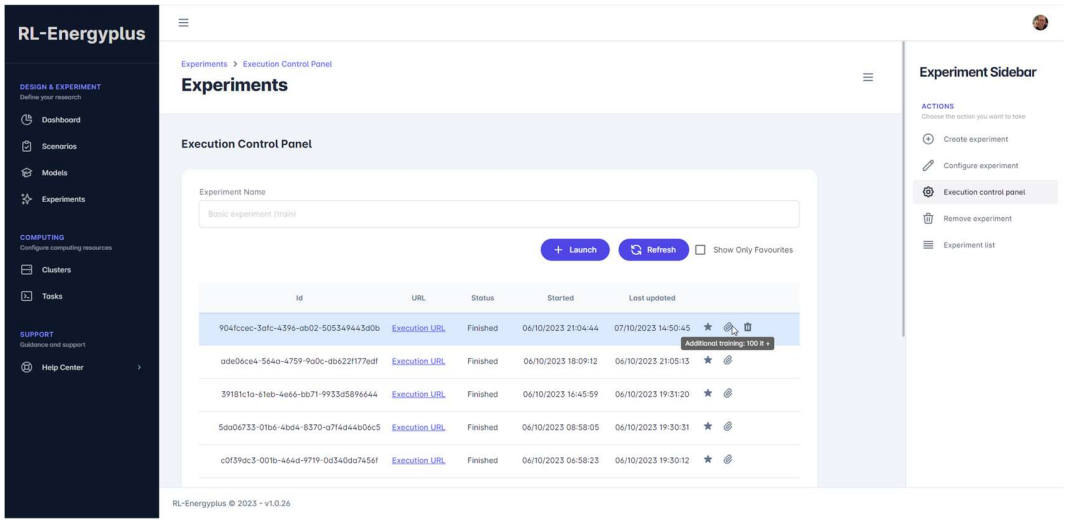
Experiments: definition



5

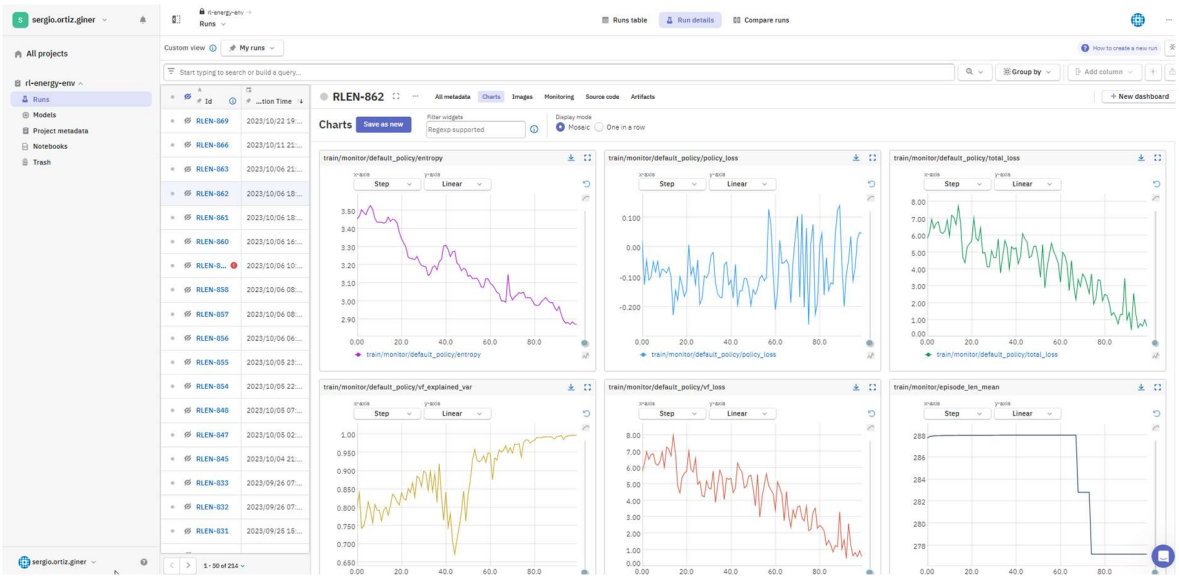


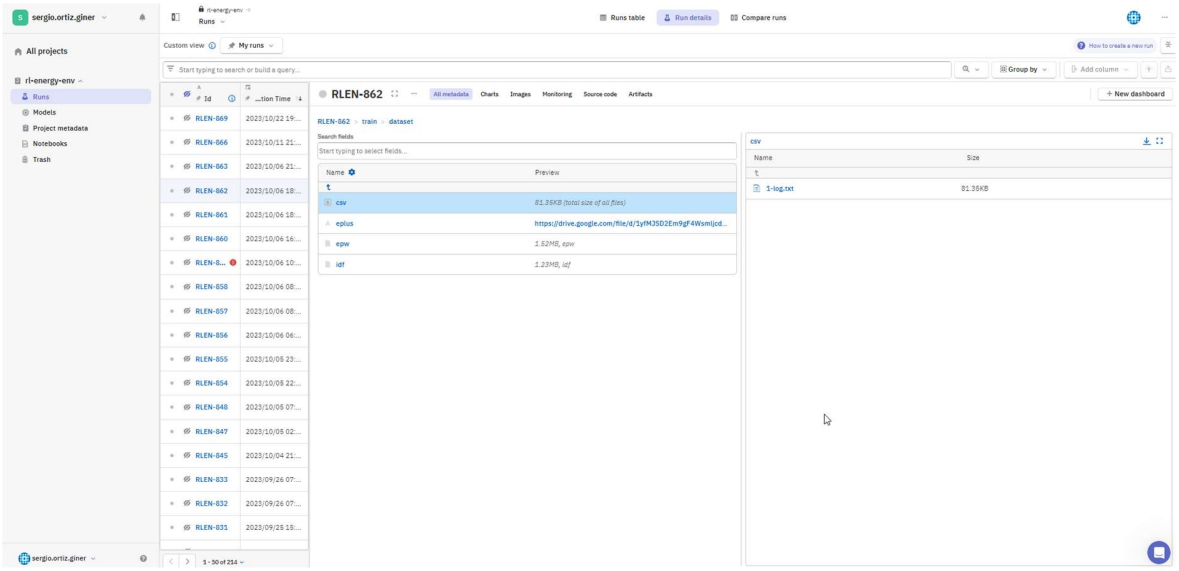
Experiments: execution



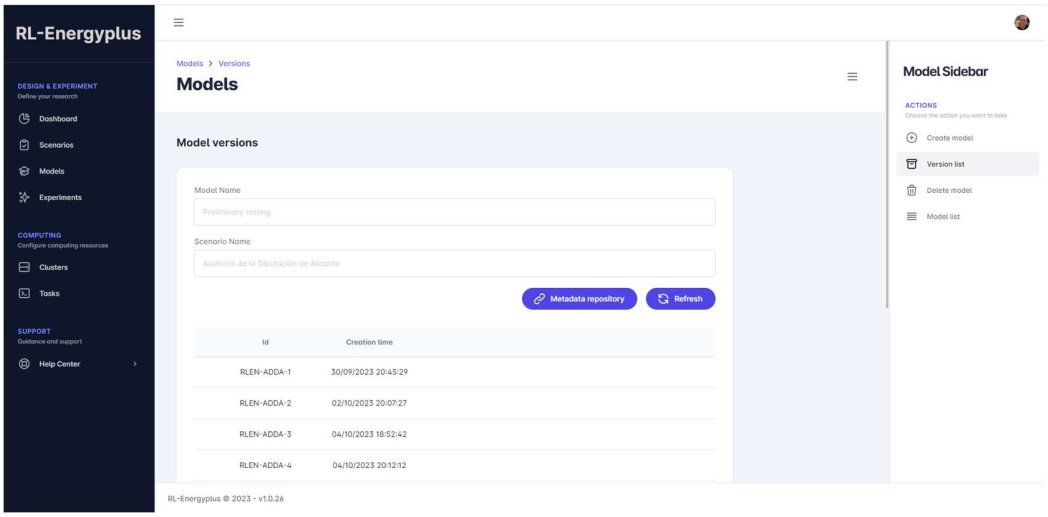
6

Experiments: integration with Experiment Tracking Tool (Neptune.AI)

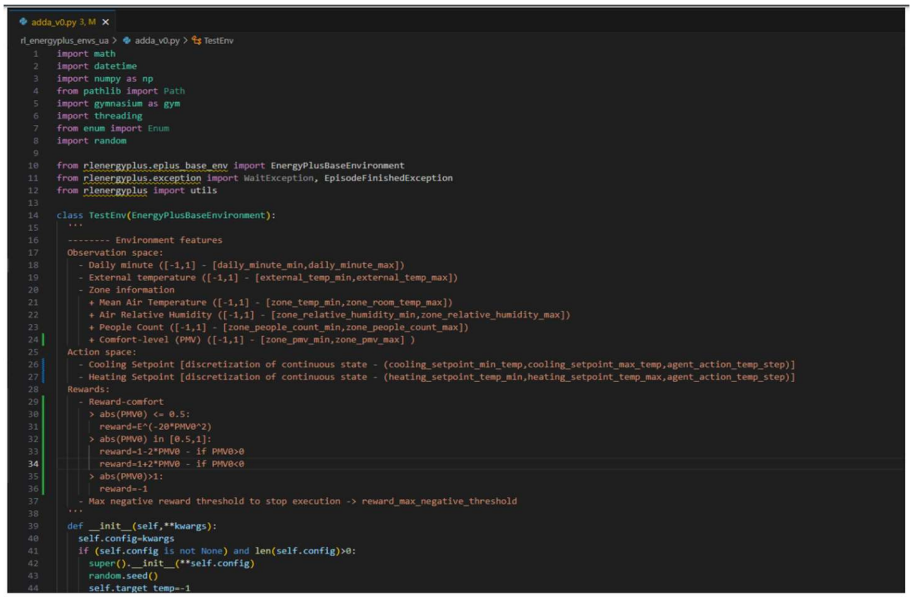




7
Models



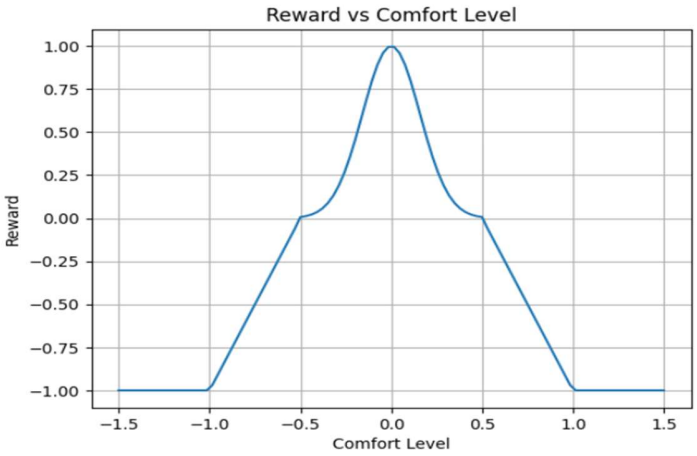
Training environment: ADDA



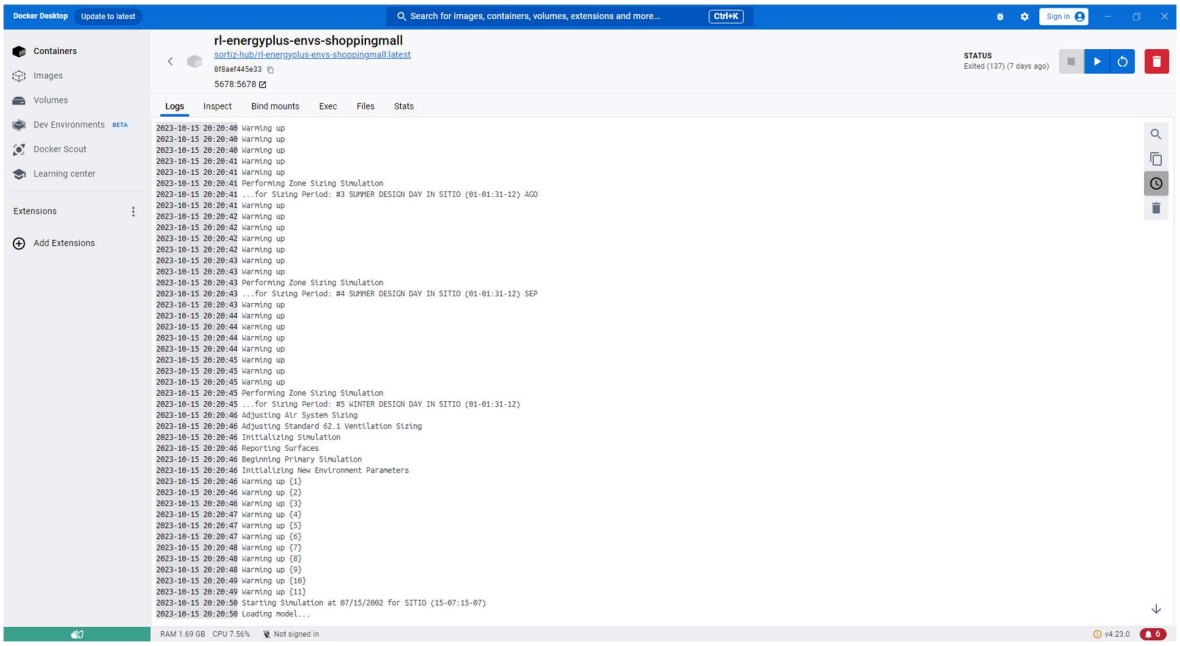
```python
import math
import datetime
import numpy as np
from pathlib import Path
import gymnasium as gym
import threading
from enum import Enum
import random

from rlenergyplus.eplus_base_env import EnergyPlusBaseEnvironment
from rlenergyplus.exception import WaitException, EpisodeFinishedException
from rlenergyplus import utils

class TestEnv(EnergyPlusBaseEnvironment):
    '''
    ------- Environment features
    Observation space:
      - Daily minute ([-1,1] - [daily_minute_min,daily_minute_max])
      - External temperature ([-1,1] - [external_temp_min,external_temp_max])
      - Zone information
        + Mean Air Temperature ([-1,1] - [zone_temp_min,zone_room_temp_max])
        + Air Relative Humidity ([-1,1] - [zone_relative_humidity_min,zone_relative_humidity_max])
        + People Count ([-1,1] - [zone_people_count_min,zone_people_count_max])
        + Comfort-level (PMV) ([-1,1] - [zone_pmv_min,zone_pmv_max] )
    Action space:
      - Cooling Setpoint [discretization of continuous state - (cooling_setpoint_min_temp,cooling_setpoint_max_temp,agent_action_temp_step)]
      - Heating Setpoint [discretization of continuous state - (heating_setpoint_temp_min,heating_setpoint_temp_max,agent_action_temp_step)]
    Rewards:
      - Reward-comfort
        > abs(PMV0) <= 0.5:
          reward=E^(-20*PMV0^2)
        > abs(PMV0) in [0.5,1]:
          reward=1-2*PMV0 - if PMV0>0
          reward=1+2*PMV0 - if PMV0<0
        > abs(PMV0)>1:
          reward=-1
      - Max negative reward threshold to stop execution -> reward_max_negative_threshold
    '''
    def __init__(self,**kwargs):
      self.config=kwargs
      if (self.config is not None) and len(self.config)>0:
        super().__init__(**self.config)
        random.seed()
        self.target_temp=-1
```

8

Reward function used for reinforcement learning

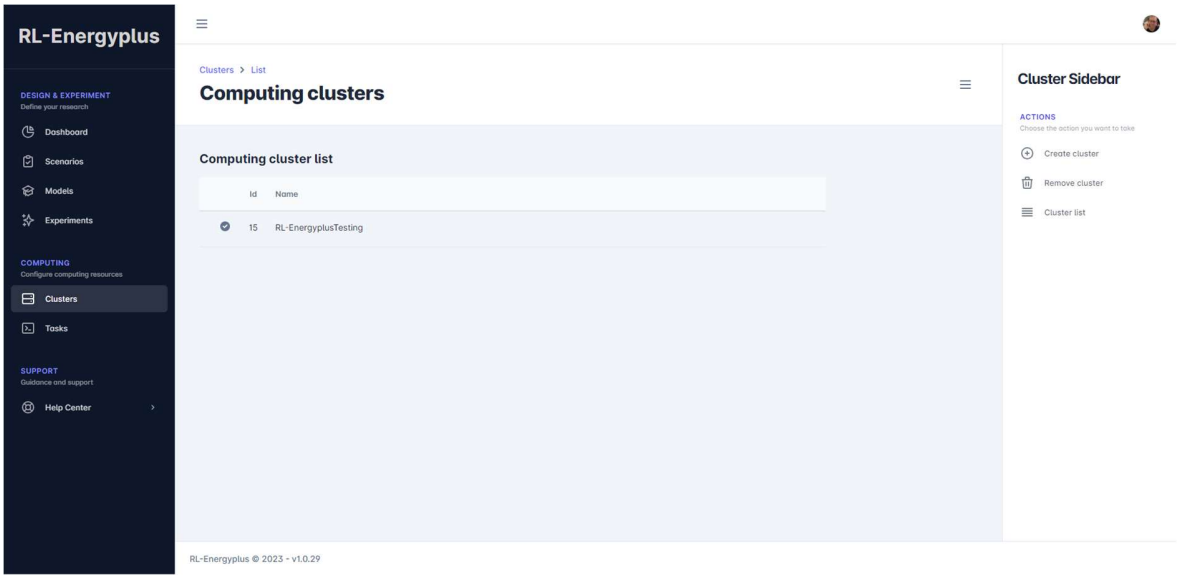


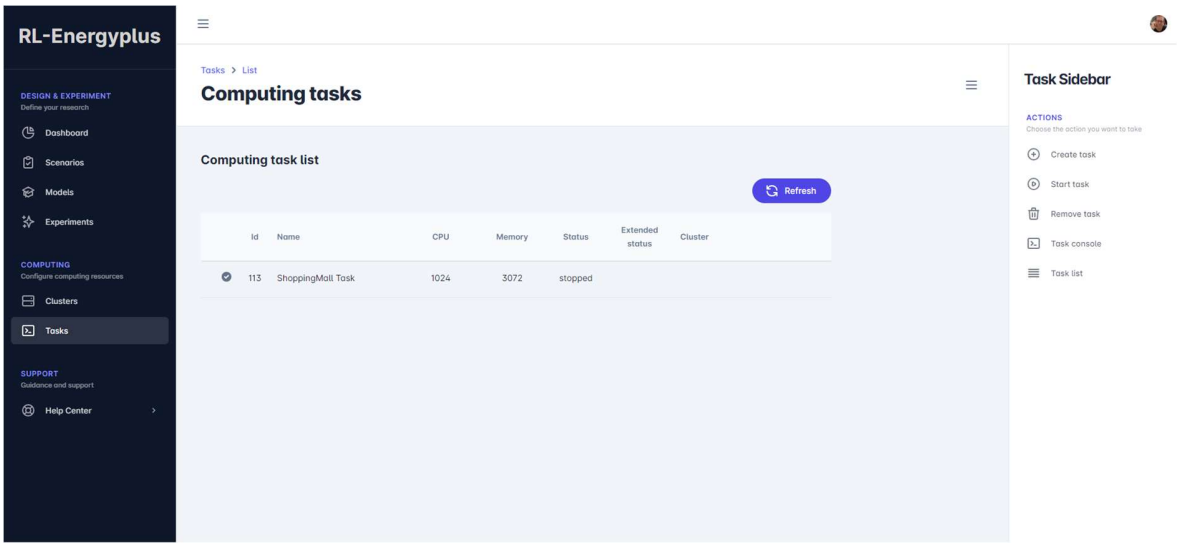
Local execution of environments: Docker

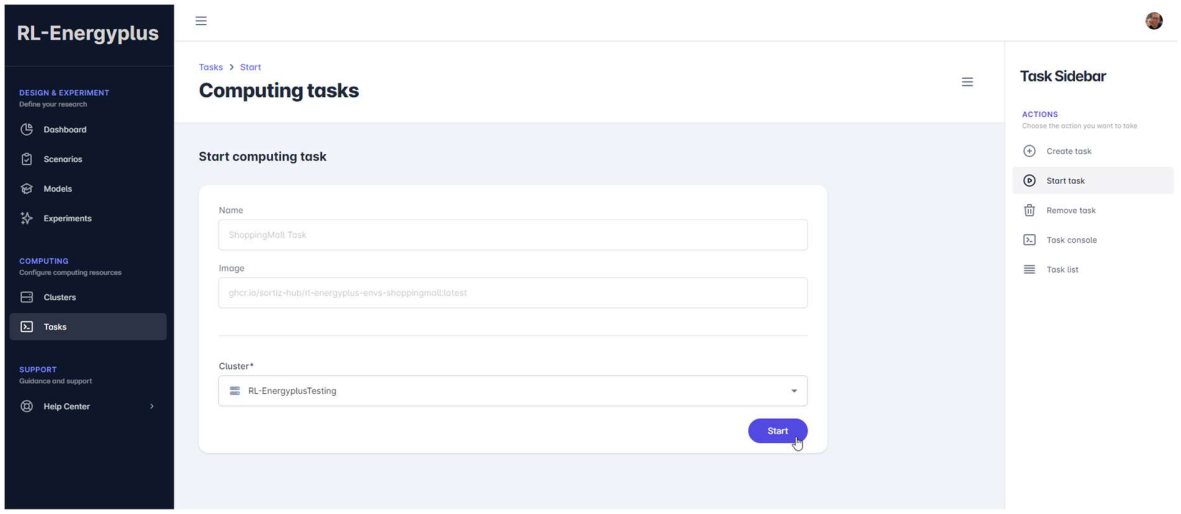


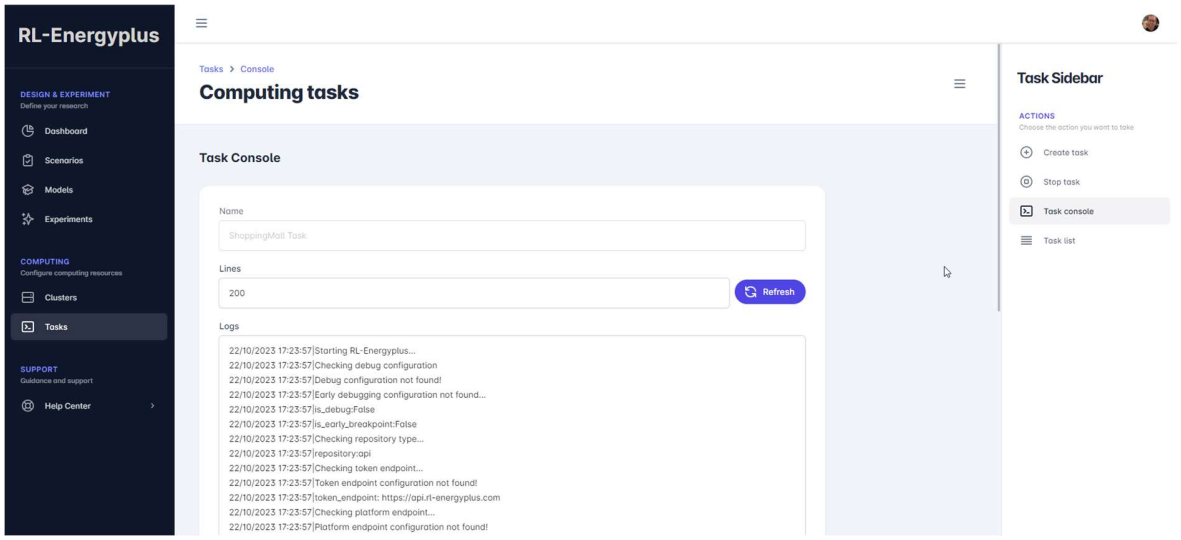
9

Cloud-based execution of environments: AWS Fargate cluster






RL-Energyplus
DESIGN & EXPERIMENT
Define your research
Dashboard
Scenarios
Models
Experiments
COMPUTING
Configure computing resources
Clusters
Tasks
SUPPORT
Guidance and support
Help Center
Tasks > Start
Computing tasks
Start computing task
Name
ShoppingMall Task
Image
ghcr.io/sortiz-hub/rl-energyplus-envs-shoppingmall:latest
Cluster*
RL-EnergyplusTesting
Start
Task Sidebar
ACTIONS
Choose the action you want to take
Create task
Start task
Remove task
Task console
Task list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Define your research
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Configure computing resources
Clusters
Tasks
SUPPORT
Guidance and support
Help Center
Tasks > Console
Computing tasks
Task Console
Name
ShoppingMall Task
Lines
200
Refresh
Logs
22/10/2023 17:23:57|Starting RL-Energyplus...
22/10/2023 17:23:57|Checking debug configuration
22/10/2023 17:23:57|Debug configuration not found!
22/10/2023 17:23:57|Early debugging configuration not found...
22/10/2023 17:23:57|is_debug:False
22/10/2023 17:23:57|is_early_breakpoint:False
22/10/2023 17:23:57|Checking repository type...
22/10/2023 17:23:57|repository:api
22/10/2023 17:23:57|Checking token endpoint...
22/10/2023 17:23:57|Token endpoint configuration not found!
22/10/2023 17:23:57|token_endpoint: https://api.rl-energyplus.com
22/10/2023 17:23:57|Checking platform endpoint...
22/10/2023 17:23:57|Platform endpoint configuration not found!
Task Sidebar
ACTIONS
Choose the action you want to take
Create task
Stop task
Task console
Task list

11

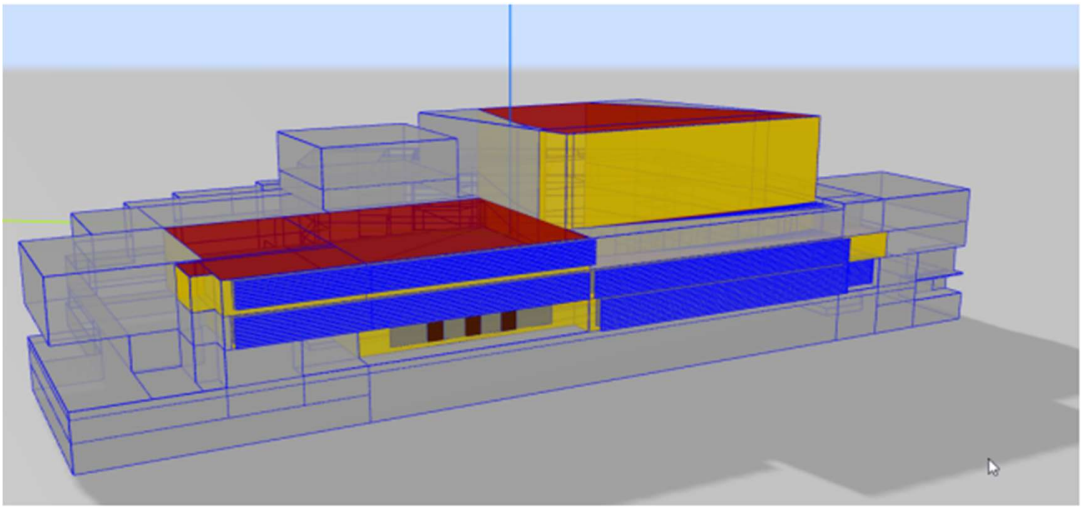
Scenario: Auditorium Diputación Alicante (ADDA)

Purpose

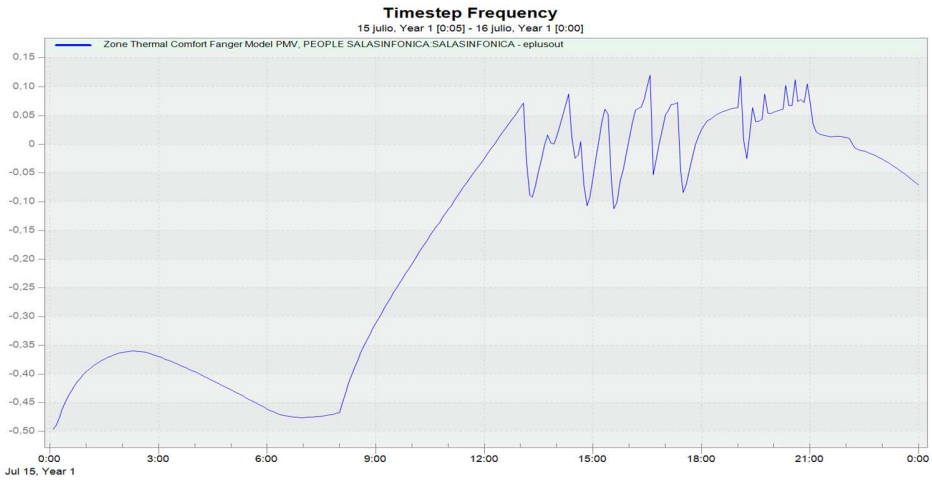
Temperature & humidity control

Photographs

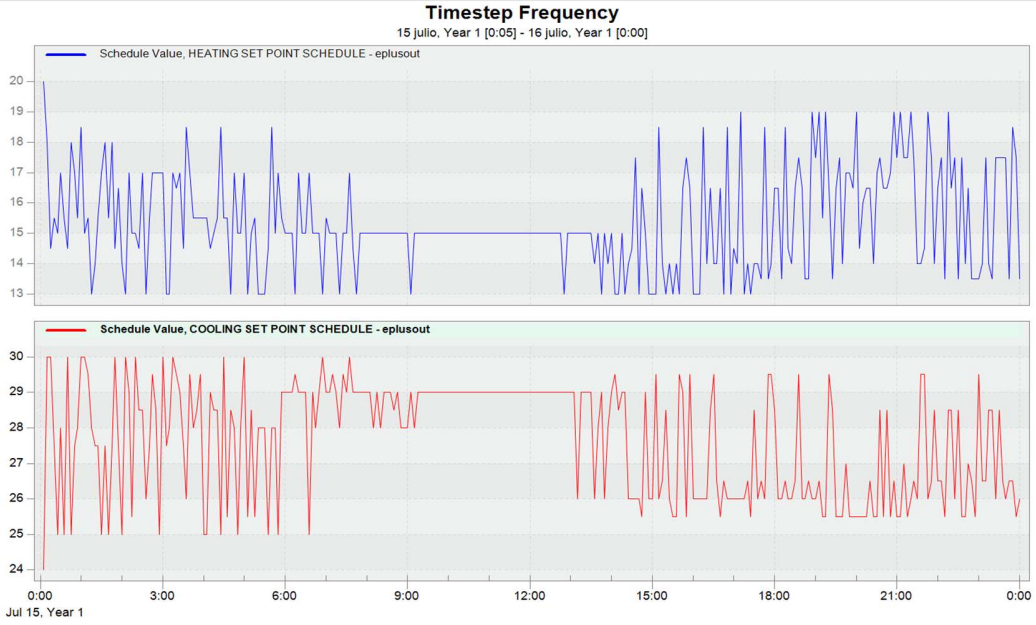
Digital twin



Simulation data: PMV comfort indicator



Simulation data: actuator data (heating and cooling setpoints)



13

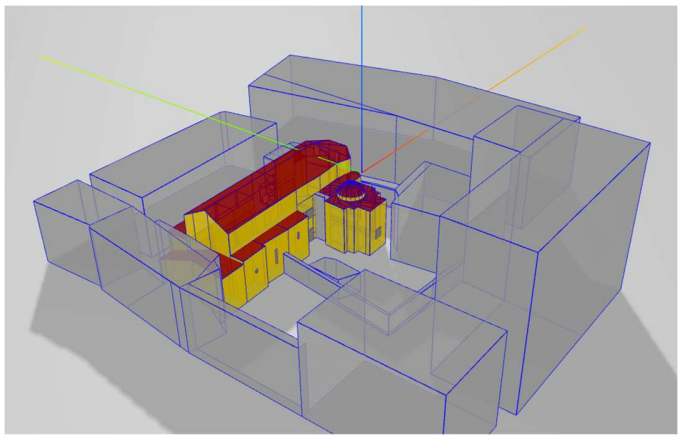
Scenario: San Juan del Hospital Church (Valencia)

Purpose

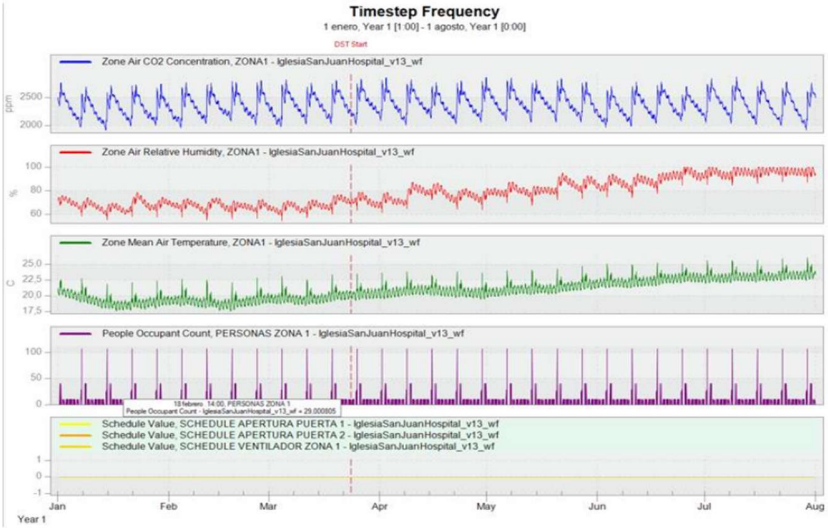
CO2, temperature and humidity control

Photographs

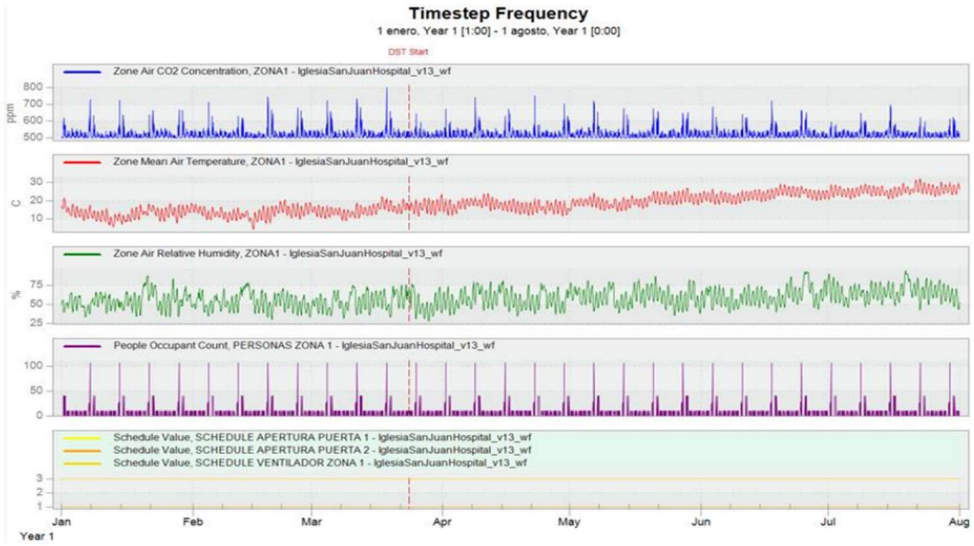
Digital twin



Simulation data: baseline - all doors closed + fan deactivated



Simulation data: baseline - all doors open + fan activated



15

Simulation data: AI agent predicting best policy for doors and fan (optimizing temperature)