NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Computer Science and Engineering
College of Engineering

GDCEngine

An ML Engine for Green Data Center Control Optimization

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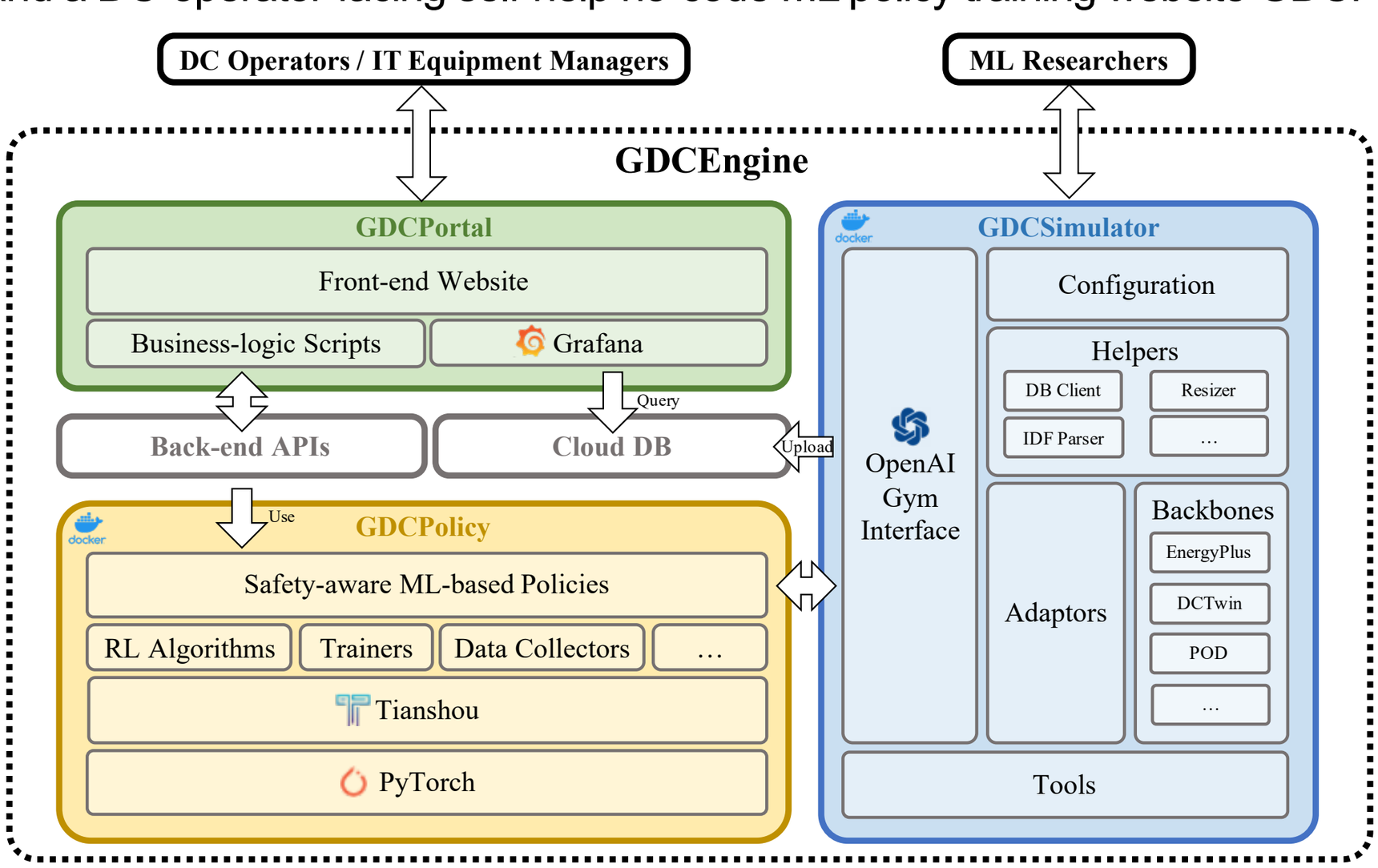
Project Background and Objective:

The rapidly expanding data center (DC) market brings concerns on the rising electricity consumption of its supporting infrastructures. The objective of this project is to develop an end-to-end machine learning research, training, and evaluation platform for DC cooling control optimization, in order to facilitate the transformation of today's DCs towards a more sustainable energy-efficient management with AI.

Project Architecture:

GDCEngine synergistically combines an ML-researcher-facing multiphysics DC simulation platform GDCSimulator, a set of trustworthy ML-based DC cooling control algorithm implementations GDCPolicy, and a DC-operator-facing self-help no-code ML policy training website GDCPortal.



Case Study:

Given a chilled-water-cooled single-hall DC located in tropics, simulated by GDCSimulator, a policy *Safari* from GDCPolicy can reduce the total power by 27%, while avoiding 99% unsafe actions brought by ML over the 1-year test period. *Safari*'s safe-awareness suggests that it can be easily trained by DC operators through GDCPortal.

Approach	Total Power of DC (kW)
Common Practice (Feedback Controller)	110.69
Safari	**82.22**

Approach	Unsafe Cooling Recommendation (#)
Common ML Approach (DDPG)	3446
Safari	**18**