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Cloud Carbon Footprinting Tool

Introduction

This report delves into the Cloud Carbon Footprinting (CCF) Tool and aims to conduct a comprehensive analysis of its features and functionalities. We will compare CCF with the Parakeet Model, a previously developed carbon footprinting tool, we have been working for, to identify its unique advantages and potential applications. By understanding the strengths of CCF, we can explore many ways to enhance its accuracy in measuring emissions and provide valuable insights to organisations seeking to reduce their carbon footprint and contributing to achieving net zero emissions by 2050. In this report, we will be evaluating the model based on 3 questions in which we will compare it with the parakeet model, try to get some actionable recommendations for other emission footprint tools, and how the emission calculation through CCF helps organizations to track and reduce their carbon emissions.

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Cloud carbon footprint is an open source tool designed to help organisations measure, monitor, and reduce their cloud carbon emissions. It provides visibility into the environmental impact of cloud usage and offers tools to take action.

Key features:

- Carbon Footprint Measurement
- Multi-Cloud Support
- Actionable Recommendations
- Integration Capabilities
- Emission Contextualisation

This model also addresses some of the main problems with the existing carbon computing models like unaccountable carbon impact, difficulty in meeting sustainability targets, inefficient cloud usage, and infrastructure bottlenecks.

It estimates both energy and carbon emissions, including embodied emissions from manufacturing, and also, it uses actual server utilisation data for accurate estimates.

Key Differences between Parakeet Model and Cloud Carbon Footprint Model

a. CCF primary focus is Cloud Infrastructure Emissions which is calculated using Cloud Provider APIs and static emission factors whereas general carbon footprinting is done using the Parakeet Model.

b. CCF basically focuses on Scope 2 and Scope 3 emissions of Life Cycle whereas Parakeet focuses on Scope 1-3 for manufacturing
, supply chain and products.

c. CCF takes input from real-time cloud usage metrics and in parakeet we use Natural Language descriptions materials and processes.

d. CCF provides rightsizing recommendations, and idle resource alerts, whereas, Parakeet provides Automated EF Mapping for supply chain decisions.

Actionable Recommendations Provided by CCF Documentations to Improve Carbon Tracking

1. Dynamic Rightsizing Algorithm: CCFs instance Optimisation Logic can help systems to recommend.
    a. Optimal Server Configurations balancing performance and embodied emissions.
    b. Hardware refresh cycles based on carbon amortization thresholds.
2. Deleting Idle Instances: It regularly reviews cloud resources to identify and eliminate unused or underutilised instances. This reduces unnecessary energy consumption and associated carbon emissions.
3. Optimizing Workloads: Strategically placing the workloads in regions with cleaner energy resources, companies can significantly lower their carbon footprint.
4. Continuous Monitoring and Improvement: Monitoring Cloud Infrastructure to identify trends in energy usage and emissions. Regular reassessments can lead to continuous optimisation efforts that align sustainability goals.
5. Embodied Emissions Amortization: CCF's hardware lifespan-based allocation enables product-level carbon accounting for leased assets.

How calculation of Operational Emission and Embodied Emission helps organizations in tracking emissions.

Operational Emission Insights:

The CCF formula:

$$\text{Operational CO}_2\text{e} = \sum(\text{Compute Hours} \times \text{Energy per Unit} \times \text{Grid Factor})$$

Enables organizations to: Organizations can pinpoint high-impact workloads and optimize renewable energy procurement. For instance, a media company reduced emissions by 23%

by shifting video encoding jobs from Texas (0.486 kg $CO2e/kWh$) to Oregon (0.184 kg $CO2e/kWh$).

Embodied Emission Visibility:

$$\text{Embodied CO}_2\text{e} = \frac{3{,}200 \text{ kg CO}_2\text{e/server}}{4 \text{ years}} \times \text{Active Servers}$$

Organizations gain: Organizations gain from hardware refresh strategies, such as extending server lifespans from 3 to 5 years, which cuts annual embodied emissions by 40%. They also benefit from sustainable procurement, like selecting servers with 28% recycled aluminum, which reduces manufacturing emissions by 19% (adaptable via Parakeet’s material EF database).

Combined Impact: A hybrid approach allows for a comprehensive life cycle analysis, revealing that 58% of a hyperscaler’s emissions originate from embodied sources, necessitating dual tracking. Additionally, cost-carbon tradeoff analysis is possible, as rightsizing may save $200 per month but increase embodied emissions if requiring new hardware.