Thesis Portfolio

Lancium Compute: Green-Powered Cloud

(Technical Report)

The Lack of Green Data Centers

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Samuel McBroom

Spring, 2021

Department of Computer Science

Table of Contents

Sociotechnical Synthesis

Over the last few decades, we have transitioned from a society ignorant of its impacts on the Earth to one which recognizes the fragility of global ecosystems and has adopted a more sustainable development path. However, we still rely on technologies and system designs that reflect the demands of some stakeholder groups, while ignoring the negative environmental ramifications which affect communities worldwide. Modern data center designs produce numerous pollutants, which will only worsen as data center demand increases. Recently, novel data center designs have been implemented which are not only better for the planet, but are cheaper to operate. My thesis applies the SCOT STS framework to analyze the factors that popularized the computing power-focused designs and to explain the lack of green data centers in the computing landscape. I also argue that these environmentally friendly designs will replace traditional designs in the near future out of necessity.

For my capstone research project, my team and I built a new web interface for Lancium, a green data center provider. Our goal was to rebuild Lancium's web interface to encompass the existing API functionality. By providing a convenient API interface without requiring the users to install software on their computer or learn the API scripting interface, we aimed to make Lancium's clean computing resources accessible to a wider audience, leading to more widespread adoption of greener designs and practices in the field of computing. My thesis, which was directly inspired by my technical project, explores questions that arose after learning about the benefits of Lancium's design. My ultimate goal throughout the capstone project and thesis was to both highlight green initiatives and the feasibility of environmentally friendly alternatives in the data center industry to hopefully prevent further harm to our pale blue dot.