Thesis Project Portfolio

Cloud Migration and GraphQL Implementation to Improve Cost Measures

(Technical Report)

Evaluating and Mitigating the Environmental Footprint of Cloud Computing Data Centers

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

In recent years, cloud computing has reshaped the digital landscape, offering users a convenient and flexible way to access online services. This technology has revolutionized how we store, process, and share data, providing individuals and businesses with scalable and cost-effective solutions. The benefits of cloud computing lie in its ability to streamline operations and reduce the need for extensive physical infrastructure. However, with these advantages, there exists a growing concern—one that affects the environment in the wake of this digital revolution. While the benefits of this technology are evident, it is crucial to understand and address the environmental toll, navigating the balance between technological advancement and environmental responsibility. This is what my STS project dives deep in, looking for various actors and effects present and details the different effects that are unknown to users of this technology. Similarly, in my technical report I investigate the benefits of a database migration conducted during my summer internship at Costar Group where I moved data from an on-premises database to the cloud. Through the different experiences I experienced from investigating the negative environmental effects of cloud computing in my STS research paper, it was able to influence my decisions when interacting with my technical project.

In my STS research, I have explored the significant environmental impacts of the rapid growth in cloud computing. The transformative power of cloud providers has reshaped our digital landscape and comes at a substantial cost to the environment. The colossal energy demands of data centers, often compared to small cities in scale, pose a significant challenge, raising questions about the sustainability of current practices. Beyond energy consumption, the issue extends to the escalating problem of electronic waste generated by the constant evolution of cloud computing hardware. This not only poses environmental threats but also a missed economic opportunity in the proper recycling of valuable materials. Additionally, the substantial water consumption by data centers, particularly for cooling, adds another layer of concern, especially in the realm of predicted global water stress. My research emphasizes the urgent need for a comprehensive and sustainable approach to cloud computing to ensure a balance between technological advancement and environmental health in the years to come.

The technical portion of my thesis produced pertains to data infrastructure. Specifically, it explored a migration process undertaken at CoStar Group, a prominent player in the commercial real estate sector, as they transitioned from on-premise data centers to the AWS cloud. A critical aspect of this migration involved leveraging the Modify Table Layout feature on the CoStar Suite website, which is a comprehensive real estate software and data service. This feature allows users to customize the properties of commercial listings for viewing in a table format, helping users see only what they want to see. Additionally, another step of the project was transitioning their middleware layer for this feature from Backend-For-Frontend to a GraphQL API, which improves the efficiency process of requesting and presenting data to the end user.

I worked on my internship project regarding data migration to the cloud prior to conducting my STS research topic, initially I was unaware of the negative environmental impact cloud computing has on the environment and the effect of the virtual technology on natural resources. However, as I began my STS research, I realized how vital it was for certain organizational actors behind cloud computing and environmental regulation to be aware of the effects on the environment and make necessary changes for a more sustainable future. Through the various analyses conducted, I was able to view these issues from a different perspective, an angle I would not have seen when working on the internship project as I was initially blind to these effects.