Thesis Project Portfolio

Utilizing Li-fi as a More Secure Tool to Access the Internet

(Technical Report)

Understanding How Countries Regulate Data Collection

(STS Research Paper)

An Undergraduate Thesis

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Bachelor of Science, School of Engineering

Jaden Carroll

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Department of Computer Science

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Executive Summary

Data protection and security have become major concerns for internet users around the world. The internet over time has become a massive source of data, which could be used by companies, governments, and even malicious cybercriminals. Company websites often use this data to push particular products and services to their customers. Data collection does have its benefits for consumers as they get filtered content designed to fit their unique interests. However, these benefits are often outweighed by the potential risks it poses to users. Cybercriminals often attack such websites and even users directly to collect sensitive personal information on their targets. Data breaches and cyber-attacks are major concerns among consumers on the internet as they can cause users to lose their identities and/or face severe monetary losses. With the steady growth in the vulnerable data collection industry, concerns about the practice of data collection also increase. Data security and cyber protection measures are needed to counteract malicious attackers and protect the user's data.

Wi-Fi utilizes radio frequency to connect various devices to a specified internet connection. These radio waves can travel through walls which presents a security risk where outside attackers could intercept this signal and take advantage of this signal to access sensitive data. For the technical portion of my thesis, I presented the emerging Light Fidelity or Li-Fi as a solution for this security issue. Consumers who are worried about cyber criminals hijacking their internet connection can opt to use Li-Fi which instead utilizes visible light communication (VLC) from a LED bulb. Users are only able to connect to the network if they are within the LED bulb's illuminated range. This helps to solve the security flaw in Wi-Fi as potential attackers cannot intercept such a signal since light does not penetrate through opaque walls, unlike radio waves. Li-Fi still has its challenges as it has not been fully developed yet and does pose some application challenges. Challenges include sunlight interference, limited range of

connection, and various inconveniences such as having to leave the light on to connect to the internet. Even with such issues, this technology has major promise in ensuring the protection and security of its users.

Before proper data protection legislation such as the EU's GDPR was introduced, companies did not face much punishment for data breaches or data processing violations that could threaten their consumers. This created a power imbalance between these large companies and users where companies had more control over their consumer's data. This illustrated the need to create a strong regulation that helps to reduce this power imbalance and empower consumers to have more control over their data. For the STS research portion of my thesis, I discuss how two different governments in the EU and India regulate company data processing of personal information in their respective countries. The EU's GDPR or General Data Protection Regulation was a critical step in managing the way companies deal with consumer data as it forced companies to be more careful in their data processing with the threat of large fines. This regulation was a major step in reducing the power imbalance between companies and users. India took major influence from the GDPR when establishing their Personal Data Protection Bill (PDPB) where they sought to give their citizens more control over their data. India was laxer in their regulation of company data processing as they felt that their consumers have more innate control over their data and may not want to impede the economic growth of their companies. Even so, both regulations do a good job of giving consumers more power in managing their data online as they are given more context as to why these companies need this information and assured that companies will not go unpunished for wrongdoings.

The thesis was a very rewarding experience in being able to dive deeper into social and technological problems that are present in society today. Both the technical and STS portions of

the thesis were related to managing consumer data protection and security on the internet which is always going to be an issue as our society depends more and more on the Internet and its applications. Overall, I was satisfied with the results of my research as I was able to find a lot of interesting information about various technologies like Wi-Fi and Li-Fi along with knowledge of various privacy issues present on the internet. The technical project presented various issues in the development of Li-Fi and researchers could look for various solutions that could help build up the emerging technology. The project presented some interesting results specifically in the STS research, where I thought that India would differ more from the GDPR in its data processing regulation. It is not shocking that the PDPB and GDPR were similar, as the GDPR was very successful but I expected some more contrast in how they chose to manage data processing. Overall the research process for the technical and STS papers was a difficult yet enriching experience where I was able to expand my knowledge of data protection practices to a deeper level. Future research can take a look deeper into the effects of such data regulation and analyze key aspects of the success and/or failure of regulations such as the GDPR.