Hey Michael, thank you for your informative post. Your example of a bookkeeping business accessing data from a Cloud database is a rather appropriate use case, as it can be extrapolated for other use cases. I find your recommendation of pushing the edge of the network out as close to end users as possible to be a great recommendation for modern cloud computing. One of your possible suggestions for improving latency suggests cutting down total usage. How might this be done in a system that, by nature, requires many users to utilize it at once, such as a hospital? One idea to reduce bandwidth while maintaining all current functionality might be to compress packet headers. Dong, et al. (2019) proposes a great idea for reducing the complexity, and therefore bandwidth, of sending packets. Current convention is to compress the entire header packet on the sender and then decompress it at the receiver. Dong’s suggestion is to remove header fields on the sender and restore them on the receiver. Essentially, the packets would only transfer the difference between the sender and receiver. This reduces the extraneous information within the packet and reduces the network bandwidth.

You make a great point that larger data centers will impede the efficiency of data transfer, simply due to scale, which is why response times is a significant factor when creating data centers. The longer the cable the data must be transferred on, the slower its receipt will be. Is there an optimal data center size that you have found? One advantage of modern technology is smaller data centers can handle the same load of larger older data centers. According to Koomey, et al. (2018), storage drive capacity has increased tenfold in the last ten years, while energy usage has decreased. This is due to the innovation of SSDs and more robust and efficient hardware.

I found your example of centralized data processing within medical records to hit the nail on the head in terms of its storage and security. The idea of utilizing a blockchain framework for storing medical records brings processing into the 21st Century. My work is currently modernizing data storage for patient medical records by moving them from localized data centers into a cloud architecture. While it seems like a straightforward process, it can be difficult at times to remake something written in the 1980s for a mainframe into the cloud. Moving to a blockchain approach will allow healthcare applications to “not rely on a centralized authority” as well as create “transparency and openness, allowing healthcare stakeholders, and in particular the patients, to know how their data is used, by whom, when and how” (Agbo, et al., p. 56). I think this is a great idea, and one that would be exciting to implement.

Agbo, C., Mahmoud, Q., & Eklund, J. (2019). Blockchain Technology in Healthcare: A Systematic Review. *Healthcare*, *7*(2), 56. https://doi.org/10.3390/healthcare7020056

Shehabi, A., Smith, S. J., Masanet, E., & Koomey, J. (2018). Data center growth in the United States: decoupling the demand for services from electricity use. *Environmental Research Letters*, *13*(12), 124030. https://doi.org/10.1088/1748-9326/aaec9c

Sun, J., Dong, P., Qin, Y., Zheng, T., Yan, X., & Zhang, Y. (2019). Improving bandwidth utilization by compressing small-payload traffic for vehicular networks. *International Journal of Distributed Sensor Networks*, *15*(4), 155014771984305. https://doi.org/10.1177/1550147719843050