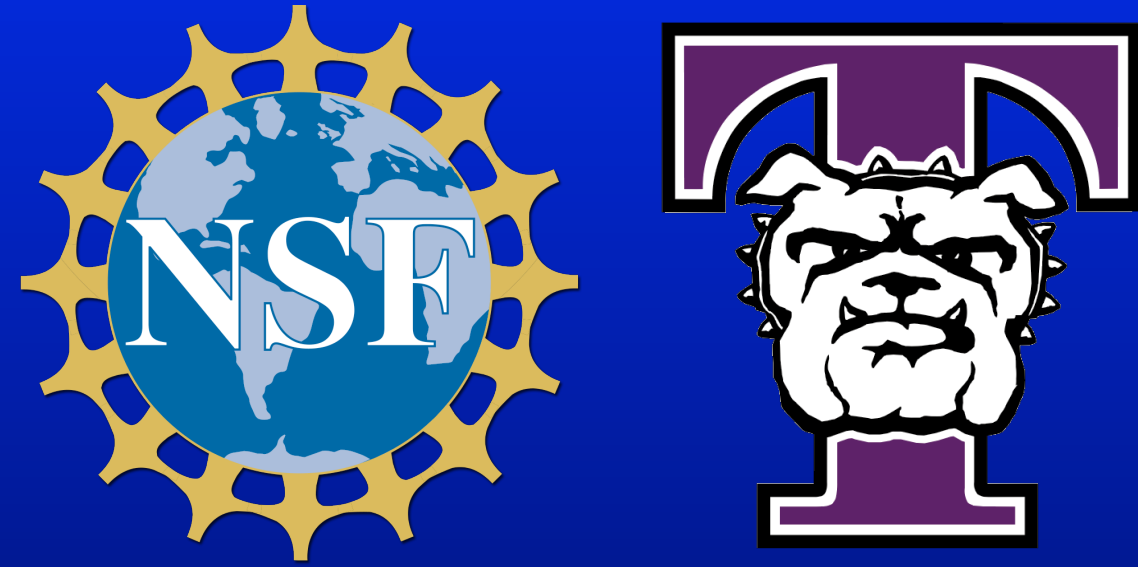# A Robust Architecture for Wireless Data Collection in Mobile Ambulatory Assessment Systems

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Abstract

This study investigated the use of periodic synchronizations as a way to make a client-server mobile ambulatory assessment system (mAAS) more robust and energy efficient. This mAAS and similar systems can be used to collect vast amounts of data, so it was important to use an architecture that can manage data collection and communication efficiently and losslessly. Our work presents the design we implemented to meet such needs, as well as an analysis of how we improved upon the previous design.

Introduction

Frequent collection and communication of data in health-monitoring applications can be taxing on a phone's battery [1]. We worked to improve such a mAAS system, described in [2], to be more energy efficient. In our research, we present
- Our implementation of bundling to save energy
- A tool used to simulate bundling, and
- A discussion of the energy tradeoffs of our approach
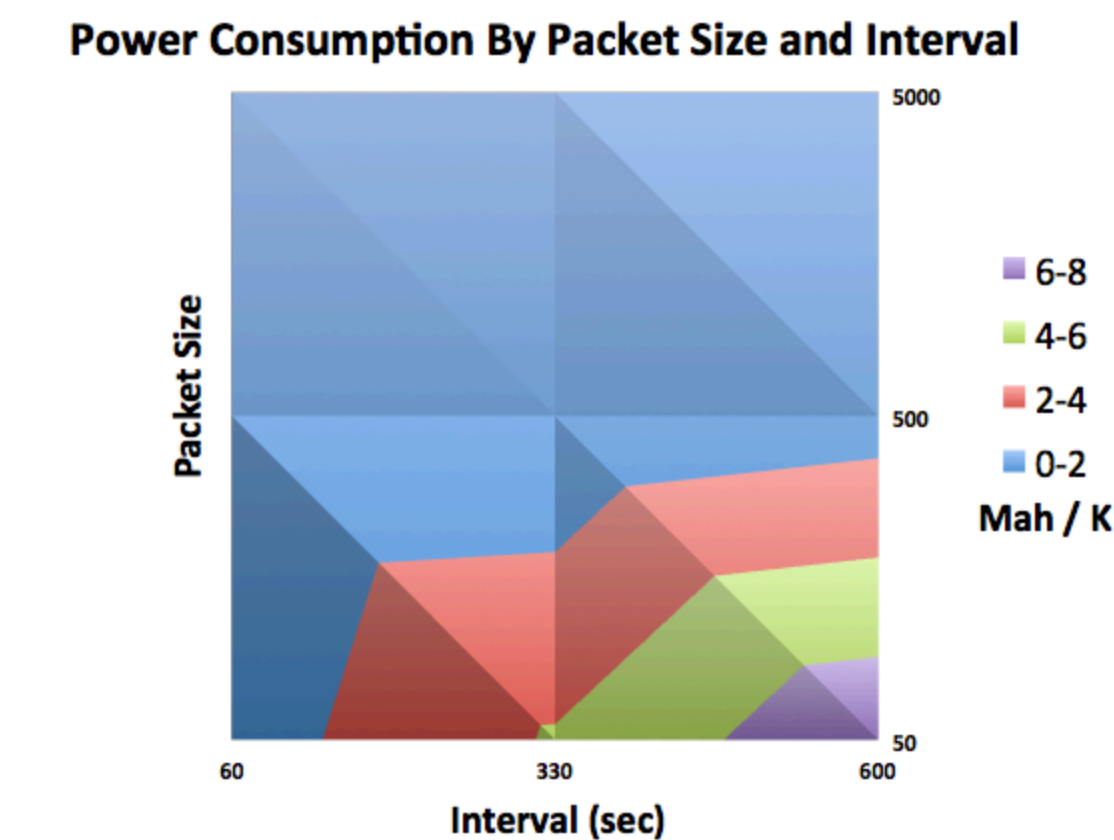
Methods

We used a SQLite database on the phone and a MySQL database on the server, and sent new data to the server in a JSON format via HTTP posts. In order to conserve energy, the phone only sends new data after a specific interval has passed, which can be easily modified by the developer to fine-tune the realtimeness of the application.
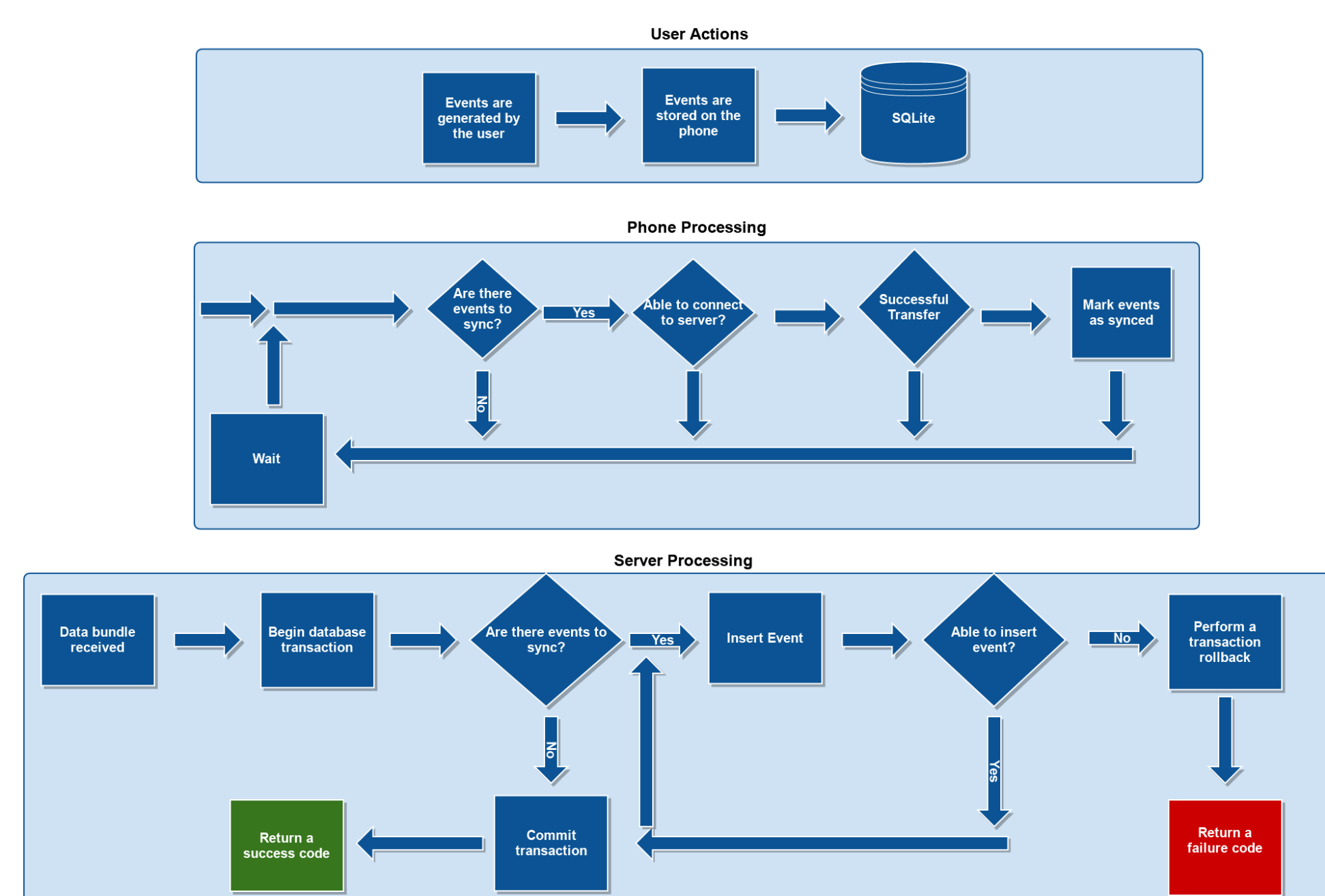

Using a tool we designed called Chunk to simulate bundling, we investigate the merit of the technique as an energy saver. We assess a few combinations of data sizes and interval durations for their efficiency by mAh spent per kilobyte sent.

Results

Our results were consistent with the literature, which suggests that bundling – that is, the collection of data into larger packet sizes and infrequent sending – is by and large the most energy conservative method for data upload.

	60 Secs	330 Secs	600 Secs
50 K	1.15	4.18	7.67
500 K	0.19	0.42	1.15
5000 K	0.01	0.02	0.04
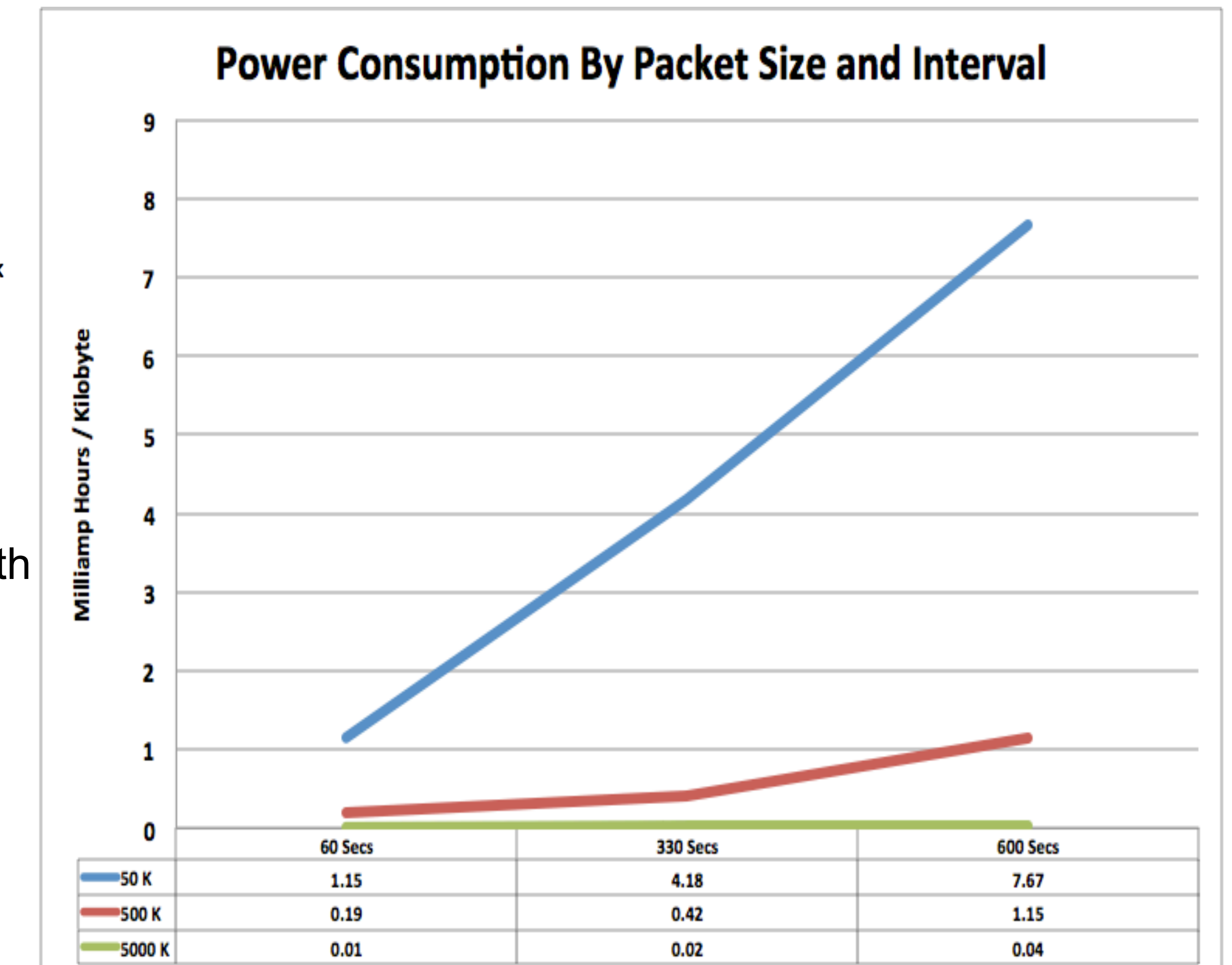
Conclusions/Recommendations

Bundling is an effective and smart way to manage realtime or semi-realtime data communication. The rate at which data is uploaded plays a part in the battery efficiency of that communication, and so does packet size. Some mAAS type systems may require more frequent communication than other systems, in which case we believe that attempts should be made to minimize the amount of data needing to be sent. Otherwise, we recommend the use of bundling with as long of intervals as is practical in order to mitigate the energy costs of sending data.

Acknowledgements

References

[1] N.D. Lane, E. Miluzzo, H. Lu, D. Peebles, T. Choudhury, and A.T. Campbell, "A Survey of Mobile Phone Sensing," IEEE Comm. Magazine, vol. 48, no. 9, pp. 140-150, Sept. 2010.
[2] http://dslsrv1.rnet.missouri.edu/~shangy/Thesis/RuiqiShi2015.docx