An Analysis of Real Time Streaming of Sensor Fusion in Smart Buildings

By: Kim Stuart
Master's Thesis Chair: Dr. Matthew Tolentino
In Collaboration with Intelligent Platforms and Architecture (IPA)

Sensor

A device capable of receiving and transmitting data to some other end device

Referenced from
http://www.cooperindustries.com/content/public/en/lighting/controls/products/occupancy_sensors/ceiling_sen/line_vol/us_linvol.html

Server

A device capable of storing data and performing computations on the data

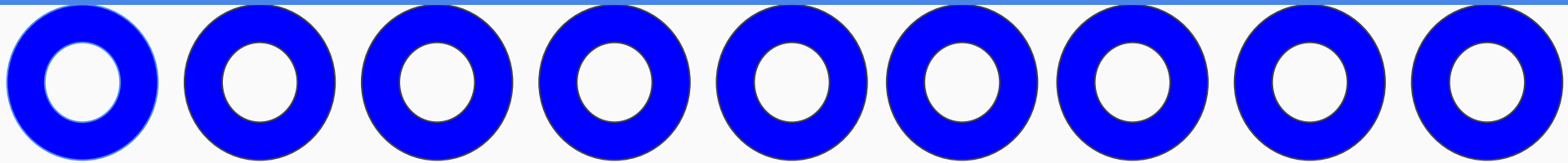
Referenced from http://store.hp.com/us/en/mlp/business-solutions/servers--storage---networking

OUR BRAINS ARE LIVING SERVERS!

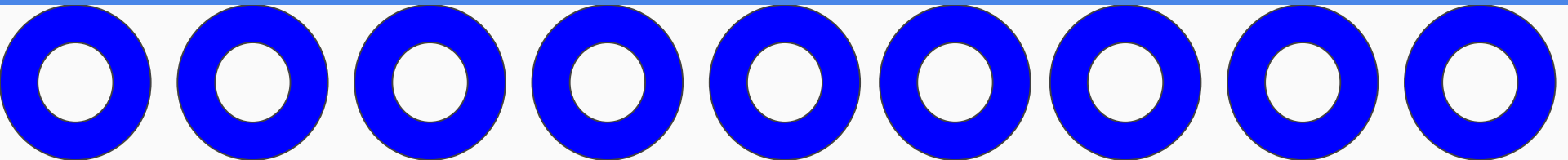
Referenced from https://lehacker.com/brain-facts-revealing/

The Story

1st Grade | 2nd Grade | 3rd Grade | 4th Grade | 5th Grade | 6th Grade | 7th Grade | 8th Grade | 9th Grade



10th Grade | 11th Grade | 12th Grade | Freshman | Sophomore | Junior | Senior | Master's 1st Year | Master's 2nd Year



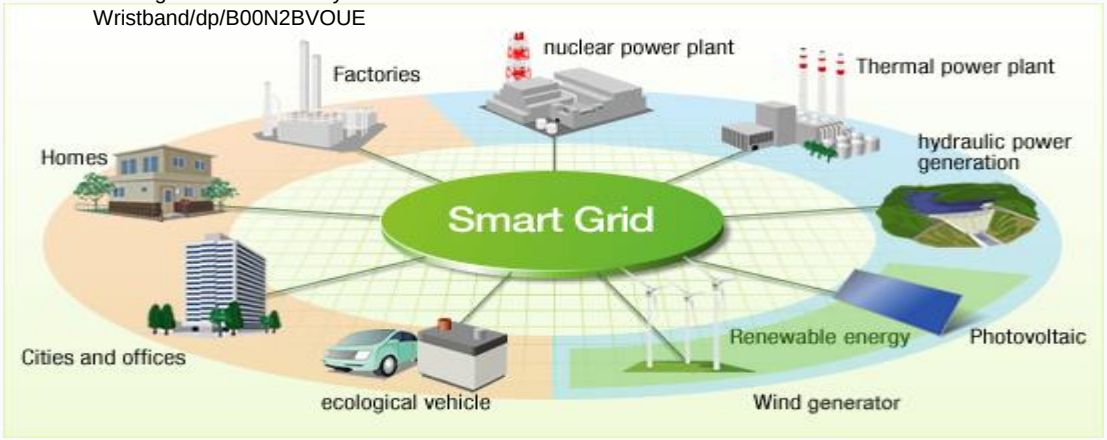
Uses for Sensors

Referenced from https://www.amazon.com/Fitbit-Charge-Wireless-Activity-Wristband/dp/B00N2BVOUE

Parking sensors detect objects behind the car and beep to alert the driver

Referenced from http://www.7dayauto.ie/parking-sensors.php

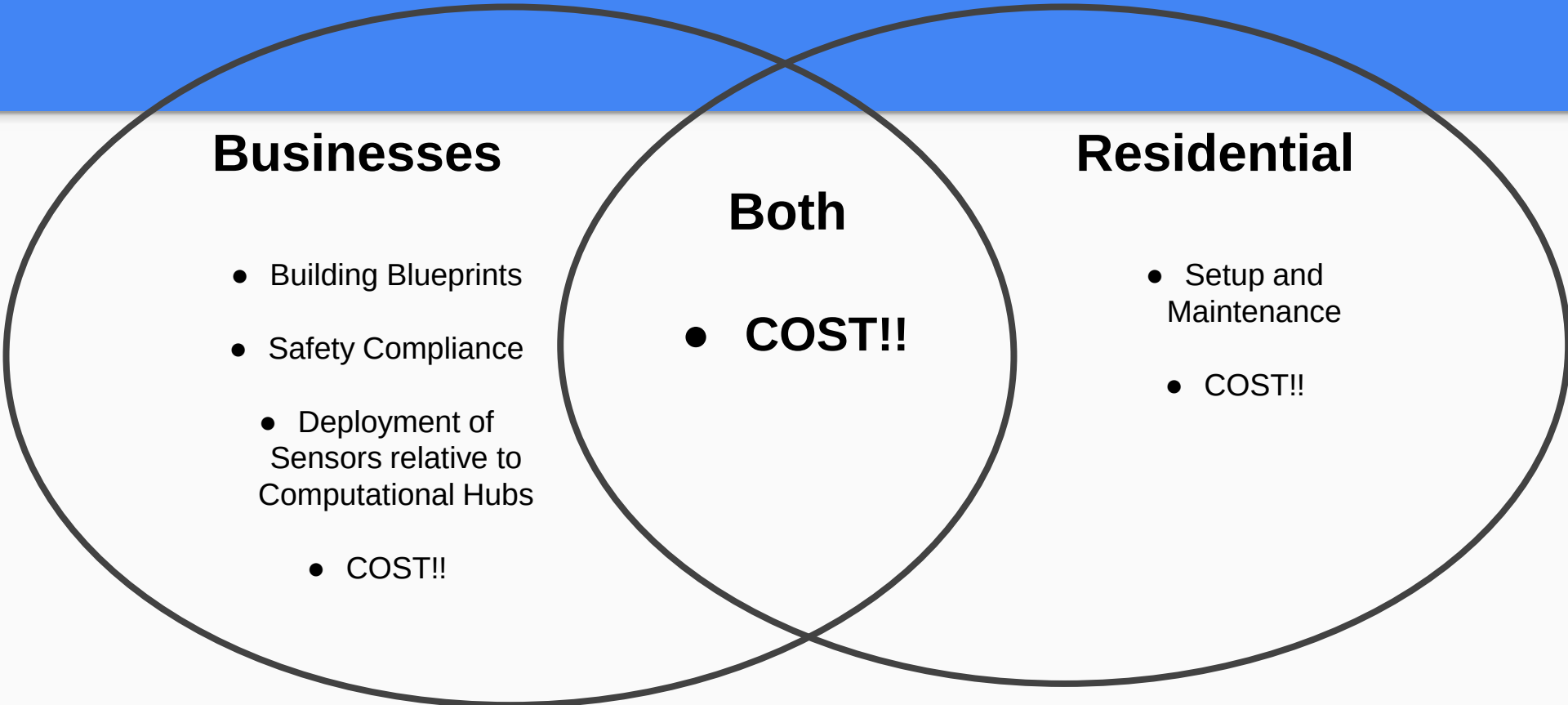
Referenced from https://www.howtogeek.com/260896/why-buying-a-smart-fridge-is-a-dumb-idea/



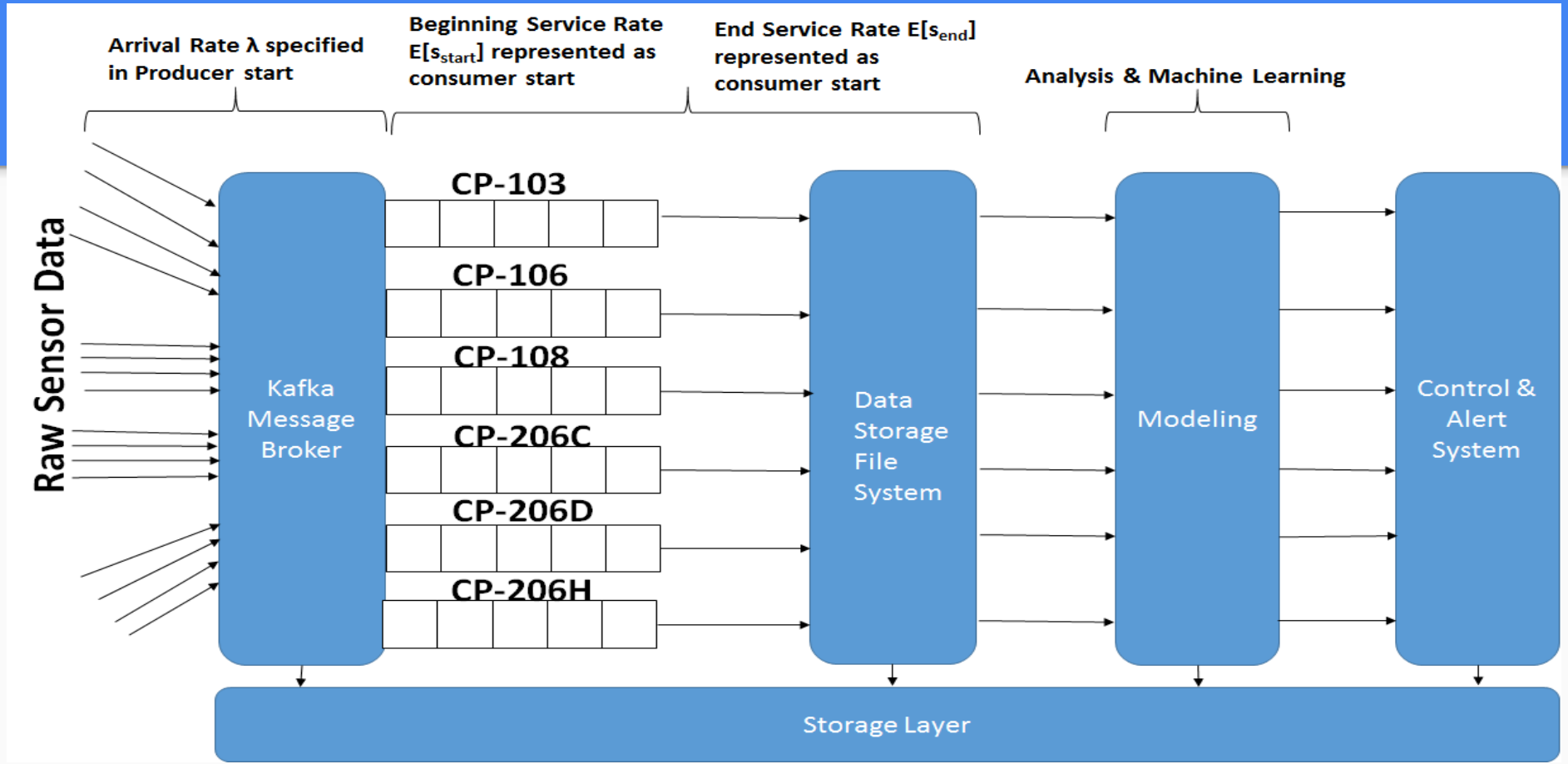
Referenced from https://www.engineersgarage.com/articles/smart-grid

Referenced from http://home.howstuffworks.com/smart-home.htm

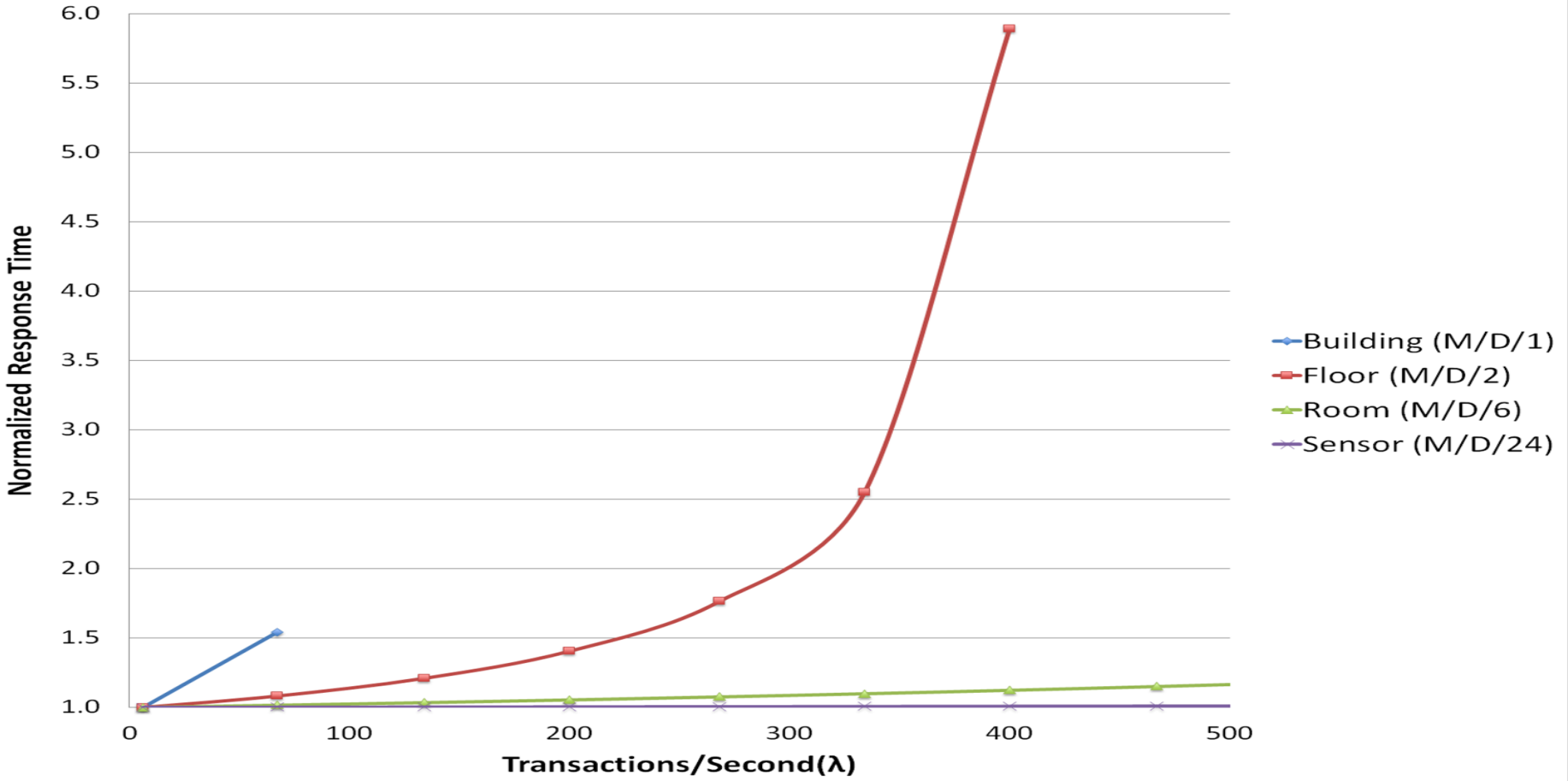
Challenges


Businesses
Building Blueprints
Safety Compliance
Deployment of Sensors relative to Computational Hubs
COST!!
Both
COST!!
Residential
Setup and Maintenance
COST!!

Methodology



Results


Normalized Response Time
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0
100
200
300
400
500
Transactions/Second(λ)
Building (M/D/1)
Floor (M/D/2)
Room (M/D/6)
Sensor (M/D/24)

Works Cited

Jain, Raj. *The art of computer systems performance analysis: techniques for experimental design, measurement, simulation, and modeling*. John Wiley & Sons, 1990.

Dey, Anindya, et al. "Namatad: Inferring occupancy from building sensors using machine learning." *Internet of Things (WF-IoT), 2016 IEEE 3rd World Forum on*. IEEE, 2016.

Tolosana-Calasanz, Rafael, et al. "Feedback-Control & Queueing Theory-based Resource Management for Streaming Applications." *IEEE Transactions on Parallel and Distributed Systems* 28.4 (2017): 1061-1075.

Lall, S., A. S. Alfa, and B. T. Maharaj. "The role of queueing theory in the design and analysis of wireless sensor networks: An insight." *Industrial Informatics (INDIN), 2016 IEEE 14th International Conference on*. IEEE, 2016.

Laubhan, Kevin, et al. "A low-power IoT framework: From sensors to the cloud." *Electro Information Technology (EIT), 2016 IEEE International Conference on*. IEEE, 2016.

THANK YOU!