

CIS-490H Edge Computing
With Dr. Zheng Song
Paper Review: Week 7
“Sharing and Caring of Data at the Edge”
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1. Summary.

(1) Motivation

The primary motivation for the *Sharing and Caring of Data at the Edge* is to give a summary what Edge Computing is, how and why it came about to serve the IoT, and the current problems that edge computing faces. The authors then note the types of services that edge computing mostly aims to enhance and all of the requirements of the distributed storage system that current edge computing architectures propose to address but fail at. After laying out the framework of requirements, they build a system they call *Griffin* in order to effectively meet the standards necessary to provide the essential services that edge computing should support for IoT applications, and to gain feedback on their system for future research.

(2) Contribution

The research provides a summary of edge computing, the distributed system requirements of edge computing, and a possible system that works towards meeting the standards necessary for IoT applications that are supported by edge computing paradigms. For example, they call upon many such works as time synchronization algorithms to maintain a consistent data storage state between edge nodes and IoT devices. They also call on current but insufficient frameworks that can be modified or combined together to satisfy the edge computing distributed storage system requirement. For example, edge nodes would bootstrap data from the cloud to its local storage based on meta data metrics in order to predict what data needs to be at the edge for IoT devices at a given time. Also, a hierarchical client-server model is introduced for the *Griffin system* in order to allow edge nodes to be managed by monitoring nodes with the support of cloud infrastructure for scalability.

(3) Methodology and/or argument

First, they define the applications that edge computing serves and the current requirements of the edge distributed storage system. Then, they provide an architecture they named *Griffin* based on combining ongoing research efforts and original ideas about how to structure the system in order to potentially meet the system requirements for edge computing. The seven requirements to address are as follows: Abstractions of data types received from IoT device applications and APIs for communicating between IoT and edge nodes; Data locality so that data remains close to the IoT devices; support for heterogeneity of edge nodes; scalable and reliable storage and computation model in the presence of mobility of IoT devices; support during failures, partitions and limited connectivity, scalability and load balancing between edge nodes, Application-specific semantics so that heterogeneous edge nodes can understand the consistency semantics of meta data; and finally, a method to monitor the infrastructure of the distributed system.

Then, based on the requirements, they build the *Griffin system* and address how to meet the edge computing distributed system requirements: hierarchical client-service model between edge nodes; communication with the cloud for scalability; custom consistency model selection based on required service quality; a time synchronization algorithm to synchronous edge nodes with IoT devices with a reasonable level of synchronicity; a graph-based optimization engine to help map and manage the load on each edge node of the edge network, including measuring network bandwidth utilization and CPU/RAM usage of each node.

(4) Conclusion

Overall, the *Griffin* system that was proposed to address the distributed system edge computing storage paradigm was admitted to be very incomplete and only building off of current ideas that could be combined and improved to meet the desired requirements. They end with a discussion topic in the final section raising challenges and asking questions about how some of the components of the *Griffin* system might be implemented and if there is a better way than proposed.

2. Critique.

I like the paper as it does give a good background on edge computing and the major challenges. However, in the methodology section where the *Griffin* system is proposed, they do not explicitly mention which device serves as the client, and which as the server when they mention that they would use a hierarchical structure. That initial section was very unclear but can be pieced together with some careful reading and analysis. They also do not explicitly address all of the requirements they stated in preliminary sections as being critical for the distributed system of the cloud computing storage paradigm.

3. Synthesis.

They need to be more explicit about meeting each requirement they mentioned. Also, I would propose that they should insert some diagrams in future revisions to help visualize their *Griffin* system. I like the idea of presenting an idea and explicitly inviting others to join in on the discussion to make the system better, and so inserting diagrams would definitely be helpful. They should continue to make iterations of this paper based on feedback and see what kind of system will result by, let us say, the 5th or 6th iteration.