Oregon State University

CS 461

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Prototype Big Data Archive in a Public Cloud

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Abstract

OSU campuses generate data constantly from multiples sources, including computer labs, wireless usage, student devices, and many others. This quantity of data, also known as big data, can effectively represent all kinds of behaviors of students for information technology. For example, analysis can be run to determine common student behaviors in order to allocate OSU resources more effectively. Currently, the data is very difficult to manage because it is collected from multiple sources and is impossible to analyze. The data is neither stored in the same formats nor in the same locations, meaning it is inaccessible and useful information is unable to be extracted. Our goal for this project is to unify and organize the data onto the consistent cloud platform of Amazon Web Services, which additionally provides utilities to manage and analyze. To achieve this, we plan to have a working prototype at the Engineering Expo that demonstrates the value of analyzing OSU big data and how the cost-to-value of our Amazon cloud solution compares to locally-hosted hardware. Our prototype will allow OSU big data to be analyzed and eventually it can be scaled to analyze all the data that OSU collects.

are you working with potentially sensitive data about students?

Can we use this public cloud for such data?

90/100

1 Problem definition

In age of the Internet, data has become a valuable resource for everyone, because the data provides insight into user behaviors and performances. On campus, students create many types of data through multiples source including laptops, phones, web applications and others. Thus the problem OSU Information Services must face is the wide diversity of data sources, which impacts the methods that which they effectively manage the data, because the data formats are diverse, including text, audio, log files, clickstream and others. It is difficult to manage and utilize the huge amount of data resources, because there does not exist any appropriate tools that are able to complete tasks for data such as integration and analysis. Further, the cause of solving this problem is that OSU Information Services would like to know and fund specific improvements and optimizations for users demands according to results of data analysis.

- for example ?

2 Problem solution

what are the three steps?

Our proposed solution is an implementation to complete multiple operations for the data on the cloud platform of Amazon Web Services. There are three specific steps in this entire process. First of all, we will focus on discovery and collection of data. Ensuring accuracy of results largely depends on quality of the data, therefore requirements for data we would like to discover and collect should be that they are multifarious and the capacity of the data is large. We will provide an efficient method of data ingestion to institute sweeping data collection for all sources. Further, we need to ensure the consistency of data format when we collect them, so format conversion will play an important role in this process.

reword

is this a step?

is this a step?

Secondly, we would like to utilize NoSQL database to manage and organize the data as main tool. The reason we choose this kind of database is that it can build a non-relational model for the data because different types of data will be stored in the database and their relationship are likely indistinct. On the other hand, flexibility of NoSQL databases means it can easily adapt to the new data types, and is not be affected by changing of content structure from the third party data provider. These advantages can greatly deal with current condition of data resources. As for implementation of NoSQL database, there are many options for us to implement database such as DynamoDB, SimpleDB and MongoDB. The disadvantage of SimpleDB is the volume of each domain is limited, and which is only 10GB, thus it is not an appropriate choice for managing big data. One of characteristics of SimpleDB is it does not require the user to specify the primary key and to create an index, because it will be the default to create an index for all attributes. This process of creating index for all attributes will spend a lot of time. On the other side, MongoDB could be another option for implement NoSQL database. However, the negative influence of MongoDB is it will occupy much space, because once the space is not enough, it will apply a larger disk space increasing from 64MB to 2GB(the largest size supported for single file). On the Amazon platform, DynamoDB is the best choice to implement NoSQL database. It is able to complete storing and accessing data at a low-latency response time, because the DynamoDB service is built on Solid State Drives (SSDs), and its construction method is designed to ensure that the performance is stable and the delay is reduced. Different from many non-relational databases, DynamoDB allows developers to use strongly consistent read to ensure the latest values will be always read, thus this characteristic makes the development more convenient.

too much tech. detail for this assignment

In the last step, we will show our outcomes by utilizing and analyzing the data we have stored in database, thus this implementation is able to have analysis techniques such as machine learning. The main task of analysis techniques is to mine valuable data which can really represent users behaviors and performance. At the Expo, we hope to have a working demo of the project, where we can

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let's talk about the solution section... it's a bit confusing.

demonstrate the processes of ingestion, conversion, and storage. We also hope to be able to show the worth of the solution with a drawn conclusion from the newly organized data.

3 Performance metrics

There are three objectives to fulfill for this project. First being a method of ingestion and management of sample data into Amazons cloud platform. It is clear when the first objective is complete, when the data is loaded from multiple sources into a cloud database. However the method of determining the quality of our ingestion solution is tied closely to the second objective: rudimentary analysis, reporting, and visualization. Once we are able to visualize, extract, and analyze data, we will know if we ingested and stored the data in a functional way. At the completion of our project, and the third objective, we will know if our implementation solves the clients needs by providing a cost-value comparison between the Amazon cloud solution and locally-hosted hardware. The client will ask IT staff to estimate the cost of implementing local solution, and then we will provide our information about how we implement in AWS. After we analyze the cost and value ratios for Amazon platform, we will compare it with the estimate of the cost of a local implementation to determine which is superior. With the added utilities of analysis and data management, our cloud solution should provide additional value, although it remains to be seen which is a more scalable and efficient solution. At the Engineering Expo in June 2017, we plan to demonstrate the entire process from start to finish, and provide an example of a conclusion drawn from analysis of the data, showing how the prototype big data archive will benefit OSU if the project is adopted by OSU IT and scaled to analyze more data.

Prob
1 Data collection —
2 Data storage —
3 Analysis —

Sol
1 —
2 —
3 —

metrics
1 —
2
3