DHHS System Architecture

Waleed Falak, Anna Mulli, Andrew Pham, Azeez Saba
Introduction

Project Description and Goal

- Montgomery County’s Department of Health and Human Services doesn’t have a standardized management system to store and review performance data.
- The project goal is to evaluate and assess an open-source, cloud-based data storage system for a future developer to implement.

Client: Noune Sekhpossian
Noune.Sekhpossian@montgomerycountymd.gov
## Team Roles

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azeez Saba</td>
<td>Project Manager: Coordinate with Noune and the other two teams to make sure Architecture team is in sync with the project progress</td>
</tr>
<tr>
<td>Waleed Falak</td>
<td>Analyst: Work with the UI/UX and metrics team to analyze data and how to make it accessible on cloud storage</td>
</tr>
<tr>
<td>Anna Mulli</td>
<td>Tester: Ensure project requirements are met and determine what needs to be changed or updated</td>
</tr>
<tr>
<td>Andrew Pham</td>
<td>Researcher: Explore available open-source, cloud-based data storage systems that meet a predetermined list of constraints</td>
</tr>
</tbody>
</table>
Project Context

- DHHS collects metrics from its 130+ programs and 700 service providers

- Interaction with the other teams
  - Metrics team: storing data and table sizes
  - UI/UX team: login functionality that connects to the AWS API
Top 100 Cloud Database Providers
Process

- Two constraints:
  - database cost can't exceed $5,000
  - memory to store at least 1TB

- First: find the right cloud service to provide memory at a reasonable price (many providers couldn’t hold the required amount of data)

- Second: narrowing the list based on pricing left three cloud database services—AWS, Microsoft Azure and Google Cloud
## Cost Comparison

### AWS vs. Azure vs. Google On-Demand Prices

<table>
<thead>
<tr>
<th>Resource Type (us-east, Linux)</th>
<th>AWS Instance</th>
<th>Azure Instance</th>
<th>Google Instance</th>
<th>AWS OD Hourly</th>
<th>Azure OD Hourly</th>
<th>Google OD Hourly</th>
<th>AWS /GB RAM</th>
<th>Azure /GB RAM</th>
<th>Google /GB RAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard 2 vCPU w SSD</td>
<td>m3.large</td>
<td>D2 v2</td>
<td>n1-standard-2</td>
<td>$0.133</td>
<td>$0.114</td>
<td>$0.212</td>
<td>$0.017</td>
<td>$0.016</td>
<td>$0.028</td>
</tr>
<tr>
<td>Highmem 2 vCPU w SSD</td>
<td>r3.large</td>
<td>D11 v2</td>
<td>n1-highmem-2</td>
<td>$0.166</td>
<td>$0.149</td>
<td>$0.238</td>
<td>$0.011</td>
<td>$0.011</td>
<td>$0.018</td>
</tr>
<tr>
<td>Highcpu 2 vCPU w SSD</td>
<td>c3.large</td>
<td>F2</td>
<td>n1-highcpu-2</td>
<td>$0.105</td>
<td>$0.099</td>
<td>$0.188</td>
<td>$0.028</td>
<td>$0.025</td>
<td>$0.104</td>
</tr>
<tr>
<td>Standard 2 vCPU no SSD</td>
<td>m4.large</td>
<td>D2 v2</td>
<td>n1-standard-2</td>
<td>$0.120</td>
<td>$0.114</td>
<td>$0.100</td>
<td>$0.015</td>
<td>$0.016</td>
<td>$0.013</td>
</tr>
<tr>
<td>Highmem 2 vCPU no SSD</td>
<td>r3.large</td>
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<td>$0.028</td>
<td>$0.025</td>
<td>$0.042</td>
</tr>
</tbody>
</table>

As of Oct 25, 2016

Source: RightScale

### Comparing Costs

- **Lowest Costs**:
  - AWS: m3.large
  - Azure: D2 v2
  - Google: n1-standard-2

- **Highest Costs**:
  - AWS: c4.large
  - Azure: D11 v2
  - Google: n1-highcpu-2

![RightScale Logo](rightscale.png)
Amazon S3 Prices

- **UP to 50TB Storage**
  - 0.023 GB/month

- **51-100TB Storage**
  - 0.022 GB/month

- **500TB+ Storage**
  - 0.021 GB/month
Future Challenges and Problems

▪ Creating buckets for the data provided

▪ Creating permissions for buckets based on user interface requirements

▪ Choosing security for the provided data

▪ Deciding between lower cost or readily available data
Deliverables

- Evaluation of storage systems
  - narrowed options to final three
  - cost comparison to meet budget requirements
Concluding Thoughts