Maximum Package Volume for PVDs Vehicles

7/17/2023

Agenda

Topics

- Introductions
- Project Summary
- Technical
- Business
- Demonstration
- FAQ

The Chicken Nuggets

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Problem

Maximum Package Volume for PVDs vehicles

Problem Overview

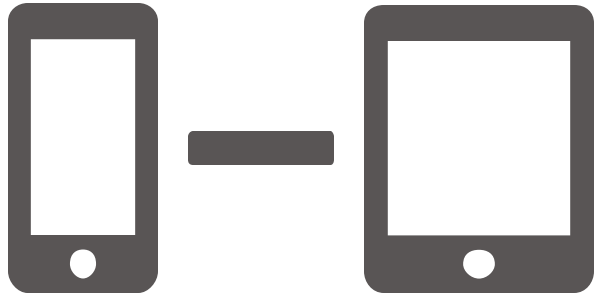
- Maximum package volume for PVDs vehicles
- **Category**: Supply Chain & Transportation Network
  - Business Problem: A personal vehicle driver (PVD) is an outside 3rd party temporary worker that helps deliver packages during peak. PVD employees, as the name implies, use their own personal vehicles to deliver packages instead of using trucks provided by UPS. The main challenge with PVD's derive from the fact that there are numerous different types of vehicles (ex. sedan, SUV, mini-van) with differing amounts of trunk space. As a result, in order to maximize efficiency, the amount of volume and space in each vehicle needs to be determined in order to ensure it is filled as much as possible.

  - And it's not only just the vehicle space we need to determine- but also the size of the packages, organization of the packages, whether the vehicle contains personal items, and so on...

Our Solution

Implementation of a Mobile Application

- In order to combat the problem of finding out how many packages can fit inside a vehicle we decided to create a mobile application accessible to PVD employees
- Let's face it, if you are on the road constantly and you're trying to determine how many packages can fit in your vehicle, it's a lot more reasonable to calculate it from your phone on an app rather than a website or computer application.
- The app is effortless to use, you simply log in using your PVD employee credentials and then you are taken to the home page in which you can do various things such as register a vehicle, view and modify registered vehicles, and of course, calculate how many packages you can fit inside your vehicle



Our Solution

Fulfilled User Features

- **Fulfilled Features:**
  - Users can register a vehicle with it's make and model ✓

  - Users can fill out whether my vehicle has personal items that might take up space ✓

  - Users can edit existing registered vehicles ✓

  - Users can determine from the registered vehicle how much space they will have for packages ✓

- Users = PVD Employees

Business Impact

How our application affects the business

This helps the business because our app…

- Optimizes the number of packages fit in each car, reducing the number of PVDs necessary to deliver packages
- Saves time since PVD's will have to make less trips for delivering packages considering they maximized how many packages they can fit
- Save money since packages aren't being overfit into vehicle causing them to be damaged
- Centers become more efficient during peak times since package assignments are scaled to the PVD vehicle size
- Mobile app solution allows for easier access/tracking throughout the day

Our Application

Demo/Prototype

PVD Employee Sign In

- PVD Employees Sign In
- Employees sign in with an Employee ID and Password
- This is the first screen that appears when opening the app to prevent any non-PVD employee from accessing the calculate package volume functionality
- Forgot password feature also included which will direct the user to the UPS PVD website for help

Demo/Prototype

PVD App Homepage

- PVD Homepage after you log in

- You can select a vehicle to:
  - Register
  - Edit
  - Calculate

  (Calculate is determining the total packages that can fit into the vehicle)

Code

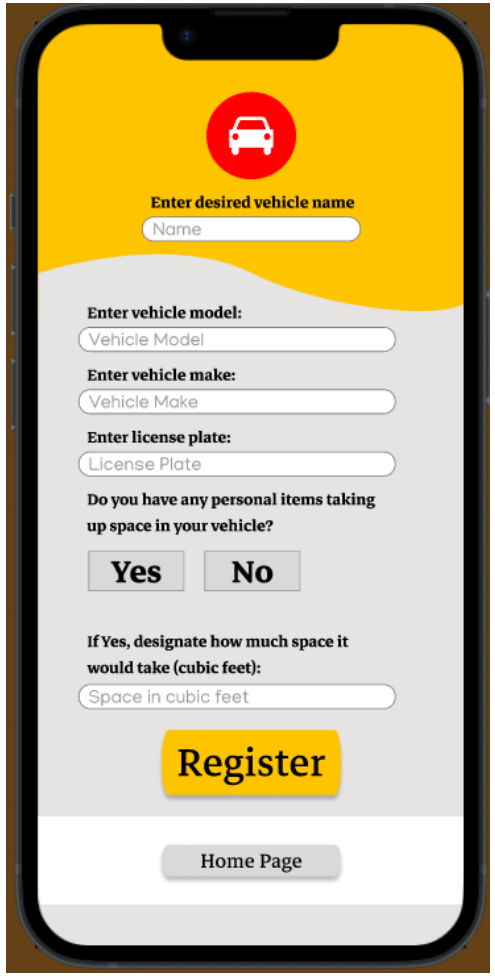
Number of Packages Algorithm:

- Vehicle make and model trunk space + foldable seat space – personal items in trunk = total available volume for packages
- List of all packages needed to be delivered exists in backend database
- Algorithm takes first largest available package that can fit into the trunk space until trunk is full
- Optimized for getting largest boxes out first, *not* getting the most boxes into a trunk
  - Number isn't the concern, utilizing max volume is

Demo/Prototype

Registering a new PVD

- Enter vehicle specifications
- Register vehicle button at bottom
- You can save your vehicle by entering a vehicle save name in which it appears on the homepage for the user to view and select



Code

Employee Table (Before):

```
+-------------+--------+----------------+
| employee_ID | car_ID | personal_items |
+-------------+--------+----------------+
|     8196772 |      3 |           2.00 |
|     8196852 |      3 |           0.00 |
|     8196872 |     15 |           1.00 |
|     8196874 |     16 |           2.00 |
|     8197249 |      3 |           3.00 |
|     8197273 |      5 |           1.00 |
+-------------+--------+----------------+
6 rows in set (0.00 sec)
```

Employee Table (After):

```
+-------------+--------+----------------+
| employee_ID | car_ID | personal_items |
+-------------+--------+----------------+
|     8196772 |      3 |           2.00 |
|     8196852 |      3 |           0.00 |
|     8196872 |     15 |           1.00 |
|     8196874 |     16 |           2.00 |
|     8197249 |      3 |           3.00 |
|     8197269 |      4 |           6.23 |
|     8197273 |      5 |           1.00 |
+-------------+--------+----------------+
7 rows in set (0.00 sec)
```

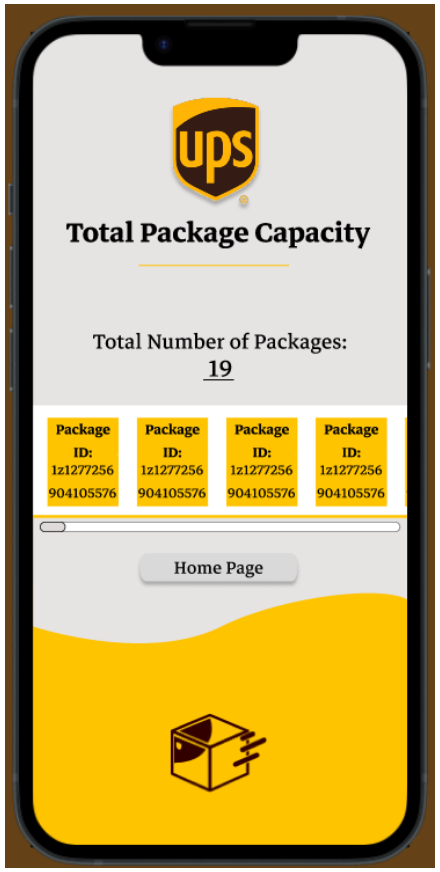
Python Script:

```
------Entering a new employee------
Enter your UPS employee ID
8197269
Enter your car's make and model (pick 1-20)
4
Enter the amount of space of any personal items in your car
6.23
rvarca22@WKSP00117012:~/The-Chicken-Nuggets$
```

Demo/Prototype

Prototype in Action (Total Package Capacity)

- Shows total # of packages that can fit into vehicle along with their ID's
- Scroll functionality to view all the packages on a single screen



Code

Done by joining together tables

```
Enter your UPS employee ID
8197269
You will take package 1Z10111111111111190
You are delivering 1 packages.
rvarca22@WKSP00117012:~/The-Chicken-Nuggets$
```

```
Enter your UPS employee ID
8196772
You will take package 1Z3811111111111127
You will take package 1Z5411111111111143
You will take package 1Z8411111111111173
You will take package 1Z9011111111111179
You will take package 1Z1041111111111193
You will take package 1Z0011111111111189
You are delivering 6 packages.
rvarca22@WKSP00117012:~/The-Chicken-Nuggets$
```

```
+-------------+---------------+--------+----------+-----------+------------+--------------------+
| employee_ID | personal_items | car_ID | car_make | car_model | trunk_space | foldable_seat_space |
+-------------+---------------+--------+----------+-----------+------------+--------------------+
|     8197269 |          6.23 |      4 | Honda    | Accord    |         15 |                0.00 |
+-------------+---------------+--------+----------+-----------+------------+--------------------+
1 row in set (0.00 sec)
```

```
+--------------------+--------------+--------+-------+--------+--------+---------+
| package_ID         | package_type | length | width | height | volume | shipped |
+--------------------+--------------+--------+-------+--------+--------+---------+
| 1Z10111111111111190 |            2 |   1.00 |  2.00 |   4.00 |   8.00 |       1 |
+--------------------+--------------+--------+-------+--------+--------+---------+
1 row in set (0.00 sec)
```

Next Steps

Features

- GPS Mapping
  - Allow for the destination and route to be seen within the app
  - Show most efficient route across destinations for all packages
- Irregular Package Handling
  - Since calculation is done by cubic feet, there is currently no implementation for uniquely-shaped packages
  - Currently only handles cubic/rectangular packages

Next Steps

Implementation/Planning

Transition this from a prototype to live application with real-time data

- Utilize Google Cloud Platform(GCP) to implement all 3 levels the applications – frontend, backend, data storage
  - Front-end = Firebase to make UI
  - Back-end = Run app in App Engine or GKE Cluster
  - Data Storage = Firebase allows for direct connectivity to GCP storage warehouses, so Cloud SQL, Cloud Storage, and BigQuery can be utilized
- Databases would be managed similar to our mock databases and queries

Firebase

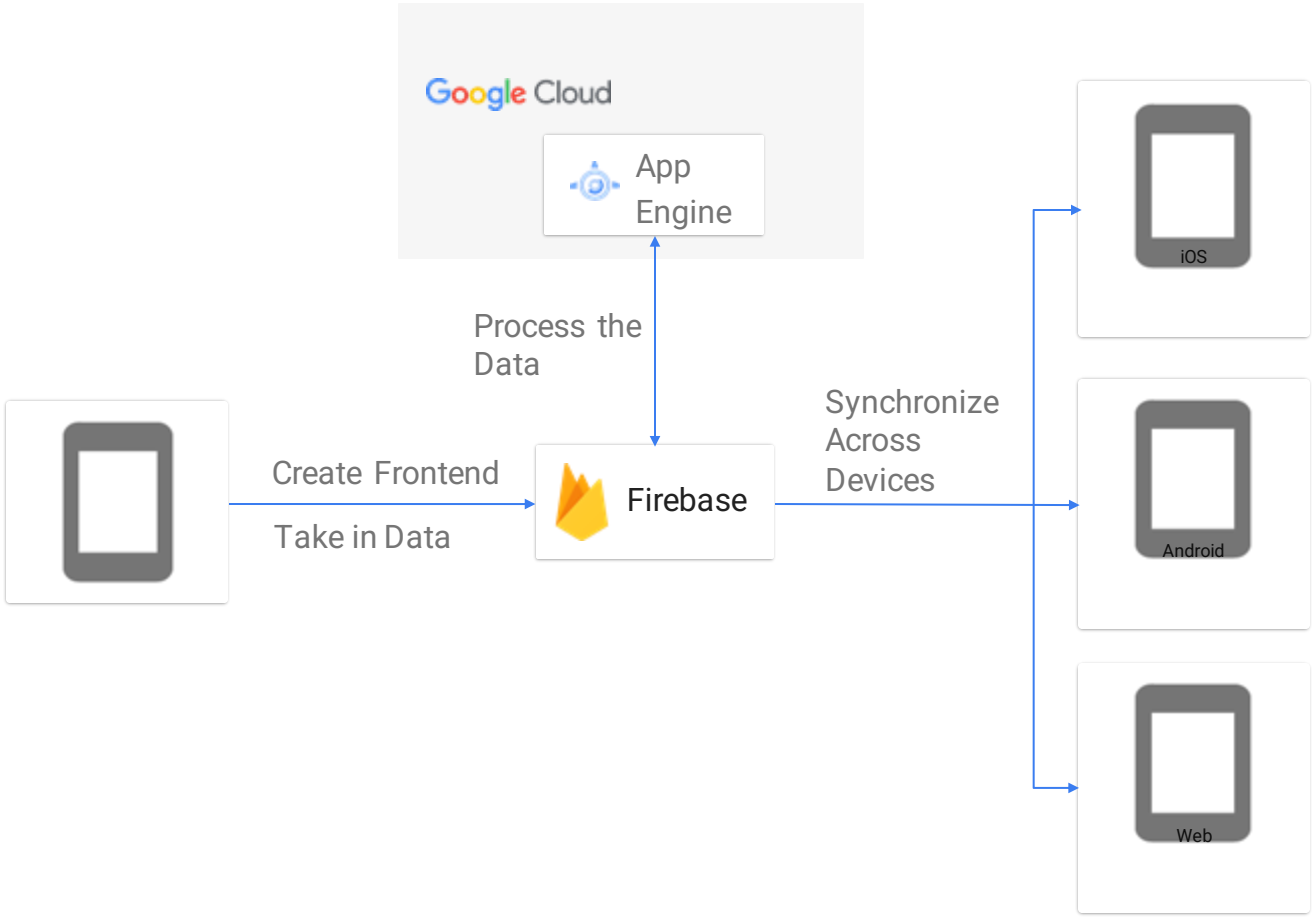
App Engine

Cloud Storage

Big Query

Flowchart for Cloud-Based Development

To Visualize All 3 Levels of Application Development




DRINKS!
CHAKRA
DRINKS!
WINE:
A SELECTION OF WINE
N.Z., AUST.
& PORTUGAL

Questions?

THANK YOU