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A Decentralized Service based E-commerce

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Abstract*: The decentralization of many processes has the potential to help many service-based industries to scale up the operations in magnitude and efficiency horizontally, as well as to reduce exponential overhead costs of operation set-up in a new location though e-commerce. This is achieved through the backbone of connecting different operational units through the internet, more specifically through the cloud. The technologies like cloud computing, block chain, native applications for mobiles, and web applications as well, enable a decentralized yet synchronized environment, which is sustainable with a larger ceiling of overburden on the sector. The e-commerce will use web application, android as well as iOS applications, cloud computing as well as security through block chain techniques. It also makes it easier to adjust according to the customer feedback using collaborative filtering as well as adjusting for errors in remote operational units. For the purpose of understanding, we will take the example of a decentralized, cross city e-commerce laundry service in this paper.

Keywords: Decentralize, No-SQL, Database, Cloud Computing, E-Commerce, Application Development

I. INTRODUCTION

Although the service-based industries face a variety of issues in their operations, the biggest problem arises while scaling the business to a larger scale efficiently while also keeping a limit on overhead set-up costs. It is due to this reason, a lot of the companies have to make do with a single city or even a single locality operation as a lot of overhead cost makes the new location a very risky business. Thus, we propose a new way to set businesses in a decentralized way by leveraging technology.

To understand why the need for decentralization is there in the first place, we need to understand the pitfalls of centralized business models. The centralized model for a laundry system comprises an ordering portal, a phone number or a basic user interface through which the customer orders. Once ordered, the information goes to a centralized location in the city or the locality, if the company operates only in a particular locality. Thus, the first problem of time to go to the order location comes up. While it would be easier to directly go to a location if order placed is near to the centralized centre but if it turns out in a different part of the city, the time to receive the clothes increases drastically.

Also, all the central operational units may be overloaded on the days with surplus demand for service. Thus, unexpected demand might lead to higher time to provide the service which is detrimental to the customer satisfaction. Mostly, to compensate for that, either a gift strategy or an after-sale policy is given to the client, which reduces the profits of the business in a season where they could have maximized their profits. Thus, we will demonstrate a technology driven decentralized service model for businesses (using our example).

In the decentralized system, the franchise partners are selected on merit based favouring deliverable locality, trained for consistent service and given resources according to demands that the laundry shops already there, have knowledge about. This knowledge prevents overload of franchise shops on surplus demand days since it will be pre-empted. Also, since the local franchise shops are already set-up in the overhead setup costs are negligible in terms of investment. Once set up, the operational node will be able to start operations immediately. When the customer orders, the nearest shop is located through “Haversine formula” and the order is passed to it. As soon as the order is accepted the delivery person is dispatched to the location which is ideally, located at a walkable distance which ensures fast pickup under most conditions. The customer order will be protected through OTP system in which a random 4-digit code is given to a person after placing order which needs to be shared with delivery person for authentication.

To make the app user friendly, rate card of items are sorted on the priority basis. The “Priority sort algorithm” is used to sort the list of items on the basis of customer’s orders to analyse the occurrence of the order and to sort the list accordingly.

II. RELATED WORK

Previously, work has been done on developing a service-based e-commerce for a laundry service that focuses on centralized operation. The centralized operations documented, even with technological tools available has visible complications related to pickup and delivery speeds to farther locations, overload of the facilities and single point of failure for the whole service. Also, the setup costs may amount to a much bigger amount than what it would for de-centralized system since franchise shops are usually already set up with the owners and employees already having an operational local service at that location. The technique to find the closest franchise partner will be to find the distance by

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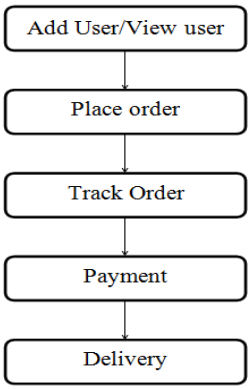

Figure 1: Basic flow of order to the customer's view

Haversine's formula [1-4]. The Haversine's formula has been previously used in locating shops closest to the current location of the user. Haversine's formula can recommend a list of possible outputs using a recommender system I used in combination but we can select the most favorable by the shortest distance.

III. PROPOSED MODEL

A. A customer side application and a business side application:

Creation of two applications. One for each customer to order from and another for each franchise partner to monitor each order they are assigned. Only the orders assigned to that particular shop is visible to them, not all the orders. The franchise partner has the ability to update the order processing stage while in service.

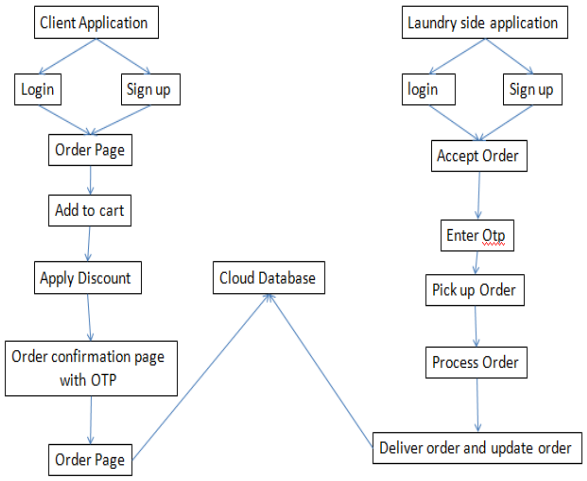

Figure 1: System Architecture

B. Cloud connectivity and computing

All the information of clients and orders reside in cloud and all the processes are computed in cloud as well. It is encapsulated with layers of security protecting it from potential attack. The personal details are private and order details are only shown to the shop it is assigned to. All the data is resided in distributed servers and retrieved only when queried.

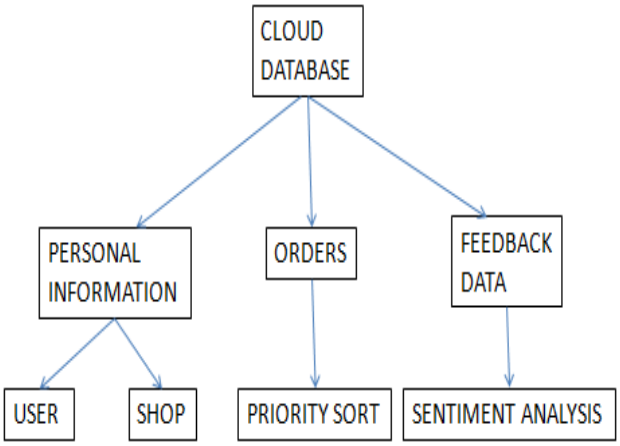

Figure 3: Cloud Architecture

C. Locating nearest operational unit:

We locate the nearest operational unit for every order from the location given. We use haversine's formula [1-4][9] that calculates the shortest path between each operational unit and the order place and select the minimum distance.

D. Recommendation for user preference:

In terms of recommendation [10][12], we use an algorithm that takes history of orders of the user to predict probability of ordering a service for the particular cloth item. We do this using indexing each cloth item using a priority index computed using an algorithm given in the section below. The cloth items with a higher index show higher in the list of clothes for that particular service.

IV. FORMULA

Nearest shop algorithm:

Function calculateDistance(double latt1,double lon1,double latt2,double lon2):

1. Let p=0.017453292519943295
2. Let dist=0.5 - cosine((latt2 - latt1) * p) / 2 + cosine(latt1 * p) * cosine(latt2 * p) * (1 - cosine((lon2 - lon1) * p)) / 2
3. Return 12742 * arcsine(sqrt(dist))

Cloth Priority sort algorithm :

The algorithm sorts the cloth list using a priority index value by the function 'getPriorityList'. The index is between 0 and 5 respectively where 0 being the lowest priority and 5 being the highest priority generated for each cloth using the function 'getClothPriorityIndex'. Here p denotes the percentage of orders that had the cloth included.

The variable 'o' denotes the number of orders containing the cloth. The variable 'n' denotes the total number of orders.

Function getClothPriorityIndex(int o, int n):

1. Get percentage of orders that contain the cloth. It is calculated as : Let p= o/n*100
2. Get the index as : index=p*0.05
3. Return the index.

Function getPriorityList(map cloths, int num_of_orders):

1. Map<String,double> priorityMap={}
2. for (String cloth, int included_orders) in cloths:
   - clothIdx=clothPriorityIndex(included_orders, num_of_orders)
   - priorityMap[cloth]=clothIdx

3.Return priorityMap

V. RESULT

The result of the above model gives us a working of a basic service based ecommerce model which can be expanded on and be used on a larger scale without any difference in deliverability of the service to the customer and reduces the overhead costs to setting up the operation at a particular location, thus improving the viability of the operation for sustenance and improving profitability of the business.

VI. CONCLUSION

We have proposed a decentralized service-based e-commerce architecture using an example of a decentralized laundry service. The service covers all aspects from order to delivery and process of service.

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