Twitter Sentimental Analysis for Businesses Using Python Web Services in Salesforce Cloud

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Abstract- **The presence of social media platforms has not only enabled the people to exchange personal views about the things that run around their lives but also provided the business organization to tackle with the reviews and reach their customers in quick manner, enabling the public relations (PR) teams, sales teams and marketing teams to address the issue quickly. The process of resolving the tickets, queries and tackling the reviews requires an automated process that actually helps the marketing teams to analyze the emotion of the consumer over social media. Using the sentimental analysis, organizations can understand the issue quickly and resolve it before it could reach a wider audience and probably lead to defamation of the business organization. With the growing reach for businesses over the globe, it is quite necessary for the marketing teams to address the negative reviews reach wider users and help the organization understand the issues with the product or service of the organization. This paper explains the approach for sentimental analysis, categorizing the emotion, raising a ticket over Salesforce platform. Salesforce is a platform that helps in managing relations with customers and potential customers, replying to the user from the same platform without going away to another platform.**

Keywords: Salesforce, Twitter, Webservices, remote procedure call, headers, token, case, Apex, Sentimental index, API call, JSON and Objects.

I. INTRODUCTION

Social media platforms are the places where the people exchange their views about a variety of things. The variety of things make the people categorize as consumers, followers etc. When the views are based on the product purchased that section of people are referred as the consumers, when the views are based on a movie, they are probably theatre audience, the views on political leader make them followers etc. The views are purely personal to the people, but since the views are posted publicly over public platforms there are not very less chances of making those influencing the other sections. The positive impressions about a product increase the potential consumer rate and so the negative impressions posted online decrease the consumer turnover rate. Business groups find it very crucial to handle the impressions about the products and services to be positive and also handle the negative impressions early. Among the most popular social media platforms, Twitter is widely used [1]. The twitter users post their reviews as a tweet either by tagging the entity about which they are writing, this when posted, the post alerts the admin of the business profile informing about the tag. That is the normal working of the social media alerts to the admin, by the time admin/marketing team of the entity

manually seek into the tweet about the type of tweet, about the product and whether review was good or bad, the tweet might influence the potential customers to revoke their commitments with entity.

Fig. 1. Twitter Social Communication

Since the users of the social media platform are huge in number, if a negative review is not handled quickly, it might affect the other prospectors to the business, might lead to multiple review tweets by other users resulting in the defamation of the product and also organization. This was a case when multiple comments cannot be read at a time and immediate response is not given but modern tools and language processing techniques made it easier to categorize the tickets and tweets, making the sales and marketing teams work easier and quickly. When the tweets are segregated based on the emotion being carried, the positives can be acknowledged, negatives can be analyzed and reported to the management, neutral might require human reading and responding. The index of the neutrality, positivity and negativity in the comment made can be analyzed using natural language processing [3]. The natural language processing actually works on the basic principle of assigning weight to all words and then bringing an index of the emotion based on the words used. That index is used as predictor of the emotion of the comment. Hence, this makes our approach reliable for business to interpret the responses and act accordingly.

In order to maintain a good customer interaction and also consider the reviews posted online, business groups have been using multiple social platforms. One among the platforms that enable customer relations is Salesforce. Salesforce is a CRM tool that enable customer relations to be smoother, enhance sales and also make everything available

to the customer, also for B2B and B2C [2]. Using the Salesforce, the business can actually be driven more easily. Due to the availability of various clouds like service, sales etc., the businesses find it productive to move their business campaigns, customer interactions on to Salesforce. Salesforce also provides certain functionalities that actually enable the process like approvals, running discount sales, CPQ (Configure, Price, Quote) models effectively. Salesforce enables the developers to write their own functionality using the Apex language. Apex language helps developers to customize the development as per the requirement of the business, using the Apex language it makes the developers to consume the API responses and use them according to the requirement [6]. The API and Webservices have been explained in later sections of the paper. Since natural language processing modules are available in python language, the authors preferred python for the same. Since the process of getting the tweets and analyzing the emotion, certain knowledge about the protocols, API requests is required, the authors have elaborated them in this paper.

II. HTTP PROTOCOL

For data requested by any individual computer over a network from a server, there is certain structure for the request to be processed, that is referred as the protocol. HTTP is one such protocol to transfer the HTML document over the network. The HTTP stands for hypertext transfer protocol. HTTP is also referred as the client-server protocol where in the requests are processed by the web server, the model is simple like the request is sent by the client or end user and as per request, the data from database is retrieved by the server and is shared over as a response. A server has a limit of maximum requests it can handle, the load balancing comes into picture when there are many requests virtual servers handle them in a distributed manner. According to the growing demand and security, there are many versions of optimized HTTP helping to deliver the HTML documents combined with other script over the Internet. A request has a different structure and a response has different structure, this varies from version to version. Whether the request is valid or not, a status code is sent over to check whether the request is made properly and to the correct server.
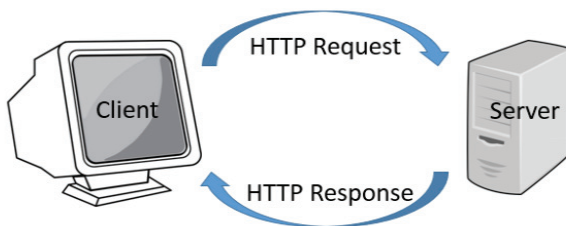

Fig. 2. HTTP Protocol

Authors have preferred this protocol due to the use of HTTP supported APIs, the flexibility of HTTP lets the use of certain extensions, the number of interceptions for a session request and session closure are low, therefore the security offered by the protocol, since the handshaking is done only once the latency for the document transfer is very low. Owing to all these advantages, the HTTP requests have been considered. The type of service is based on the function used like the following.

TABLE I.　　HTTP METHODS

POST	Request to send the data to the server
GET	Retrieve or request the data from the web server
PUT	Update the previous representation of a target with now sent data
DELETE	Delete all the present representation of target
HEAD	Transfer the status line of the request

The status of the request and response can be in form different error messages with the following schema

TABLE II.　　HTTP RESPONSE STATUS CODES

1XX	Request received and information is being processed
2XX	Request received and response sent
3XX	Redirection of the request
4XX	Client error due to invalid token or improper format
5XX	Server error due to maximum requests

III. WEB SERVICES

There are multiple applications running on different networks and different cross systems. Whenever an application needs data from a cross platform application then it needs to fetch data using Webservices. Webservices enable information exchange, convert a normal script-based application in a local environment to a web application if deployed. Webservices enable interoperation between two different web servers that run different programming scripts.

The Webservice provides an easy bridge between two systems running on different architectures and heterogenous networks. A Webservices works over XML and HTTP to deliver the information, it takes the help of XML for tagging the data requested by the user, message transfer using the SOAP and WSDL for checking the availability of the service that was requested by the user.
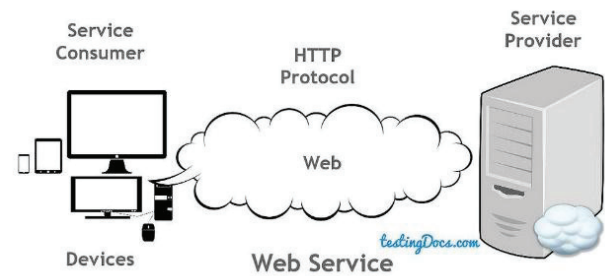

Fig. 3. Web Service Architecture

IV. APPLICATION PLATFORM INTEFACE (API)

Application Programmable Interfaces that are programmable scripts that act as an interface for two application and enable data transfer without user intervention. For improved collaboration between organizations, open-source projects etc., APIs make it easier. As API comes with security using valid token Ids and user

authentication methods, they are often spam proof. Through API the data actually gets to be implemented in a meaningful manner across cross origins. API enable Remote Procedural call (RPC), RPC can be assumed as a function call from a client to server, program to program, in operating systems for inter-process communication.

Usually, the API (Application Programming Interface) calls are misinterpreted as the Webservices, there are certain things to differentiate these, an API is operated between the two applications of same device, the webservice enable the information exchange between two devices. Webservices require HTTP but APIs can run with other methods like URL request, response headers. In common, all Webservices can be referred as APIs but converse is not true. Webservice are accessed through web address and require network to operate.

A. REST API

REST stands for Representational State Transfer protocol. This works between computer systems working on different networks and interact for information exchange. REST is considered as lightweight and is supported by other standards as well henceforth it is also referred as RESTful Webservice. Supported with HTTP, HTTPS, stateless server, supports XML and JSON.

B. SOAP API

SOAP stands for Simple Object Access Protocol. SOAP contain information and instructions to be processed in the network for transferring the data packets. SOAP contains the envelope that has the start and end of the message to be transferred in XML format. SOAP is also used as a broadcast in a network, remote procedures and also document exchange. There is an option provision in SOAP for transferring error messages that occur in network through fault tag in the XML document.

SOAP and REST both serve same purpose but differ in certain characteristics like the SOAP is a messaging protocol but REST is an architectural style of data exchange, SOAP can define the security but REST depends on the security provided by the transport medium, REST is comparatively lower weight due to lower data bits in the data packets than SOAP.

C. Metadata API

Metadata API works for data transfer between Salesforce orgs. There are mainly two functionalities of Metadata API [9]. One is to either deploy, retrieve, update the data in the Salesforce org and other is to source tracking like to push and pull the changes in the orgs and application making it easier for developers to fast track the data retrieving. Metadata doesn't work with the data but with the metadata model.

V. TWITTER API SERVICES AND VERSIONS

Twitter offers API services to integrate or extend its services to other products or services [5] salesforce. The twitter API services helps in retrieving, posting and interacting data from its resources like direct messages, tweets, media, places, user information and trends. Twitter had started its REST services in the year 2012 and upgraded to three versions till date, they are twitter standard v1.1, twitter premium v1.1 and twitter APIv2.
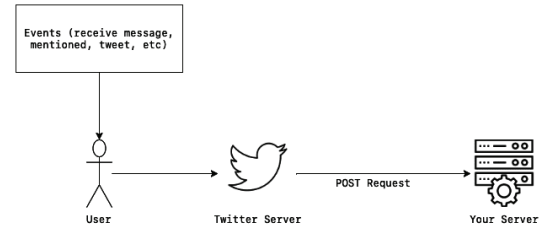

Fig. 4. Twitter API Services

A. Twitter Standard V1.1

Twitter started its REST services in the year 2012 by standard v1.1. It is the basic API REST service offered by the twitter, the services offered in the terms of endpoints are tweets, geolocation, user information, direct messages, trends and media. This service is used for testing, validating, creating concepts, solutions and working in sandbox environment.

B. Twitter Premium V1.1

The disadvantage of standard v1.1 is not having exposure to the enterprise features. The twitter premium v1.1 REST service by the twitter provides the scalable access for the experimentation and innovation. The features like search tweet and account activity by the webhook makes the API suit for the enterprises. The access to twitter premium v1.1 needs to be approved by the twitter based on the business or project requirement and this API works on charge-based system.

C. Twitter APIv2

The twitter APIv2 is the latest REST service offered by the twitter. They features offered by this REST service are hiding replies, quoting tweets, tweet lookup, batch compliance, like, unlike, pin, unpin services. The improved features of this API include detailed data objects, spam filtering, redundancy and recovery functionality of REST service, simplified JSON response, structured payload [17].

VI. TWITTER API ACCESS LEVELS

The access to the REST services of twitter is majorly divided into four sections, they are essential access, elevated access, elevated+ access, academic research access and enterprise.

A. Twitter Essential Access

The twitter essential access is the basic type of access where the developer gets during his creation of developers account in twitter, this service or access is available free to the developer. This level of access only has access to the standard v1.1 and Twitter API v2 versions of API. The number of tweets, filtered stream rules, filtered stream POST are 500k per month, 5 rules with 512-character length and 50 requests for 30 min respectively. The access to archive tweets and advance filters is not applicable at this level. The authentication services are only by OAuth 2.0.

B. Twitter Elevated Access

The twitter elevated access is the additional access acquired by the developer only by applying a request to the

twitter stating the requirement of elevated access i.e., the purpose and usage of the services offered by this access. This service or access is available free to the developer. They have access to all versions of twitter API's. The number of tweets, filtered stream rules, filtered stream POST are 2million per month, 25 rules with 512-character length and 100 requests for 30 min respectively. The access to archive tweets and advance filters is not applicable at this level. The authentication services at this level are by OAuth 1.0, OAuth 2.0. The elevated+ type of access is the upgraded access of elevated which is yet to be released by twitter.

C. Twitter Academic Research

The twitter academic research access is the additional access acquired by the developer only by applying a request to the twitter stating the academic requirement of elevated access i.e., the purpose and usage of the services offered by this access. This service or access is available free to the developer. They have access to all versions of twitter API's. The number of tweets, filtered stream rules, filtered stream POST are 10 million per month, 1000 rules with 1024-character length and 200 requests for 30 min respectively. The access to archive tweets and advance filters is applicable at this level. The authentication services are at this level are by OAuth 1.0, OAuth 2.0.

VII. INTEGRATING TWITTER REST SERVICE

A. Creating Twitter Developer Account

The first step in dealing with the REST service of Twitter is visiting the https://developer.twitter.com which is the official developer account of Twitter where the APIs are been used to consume in our services or project. The creation of developers account can be done by three ways they are either by signing up with google account, signing up with apple account or with an email or phone.

B. Applying For The Twitter Elevated Access

The Twitter Essential access will not have necessary privileges for consuming REST service of POST method. The POST method REST service is used to reply to the tweet in our project, this can be achieved either by twitter elevated access, academic research access and enterprise access [16].

Focusing on the requirement and monthly consumption of REST service the Twitter Elevated access is been applied and approved by Twitter by mentioning the project requirement and justification of use of this level of access.
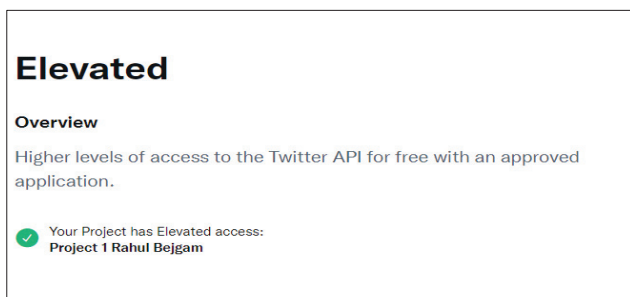

Fig. 5. Twitter Elevated Access

C. Creating App And Generating Keys And Tokens

The creation of App is used in setting the environment of working i.e., either sandbox or production and in generating the keys and tokens for authorizing a REST service for consumption. The keys and tokens include consumer keys

i.e., API key and secret, authentication tokens i.e., bearer token and access token and secret. The type of permissions like read, read and write are also given at this stage.
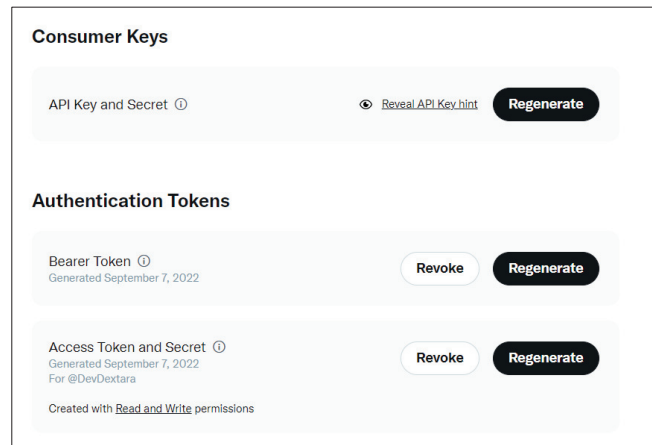

Fig. 6. Generating Keys and Tokens

D. Setup Oauth 2.0 Authentication

The OAuth 2.0 is required for accessing the Twitter handle for write operations such as retweeting, posting a tweet, replying to tweet, hiding a tweet, deleting a tweet. The client ID and client secret are been generated with read and write permission. These are sent with the POST method in the header in order to establish the connection using OAuth 2.0.
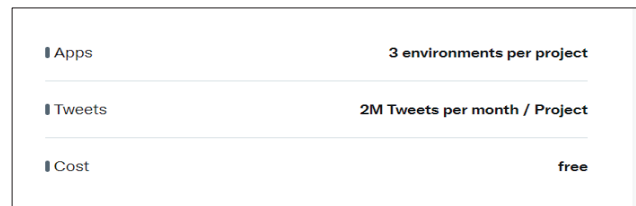

Fig. 7. OAuth 2.0

E. Accessing Salesforce & Creating Webserver

Python has package manager i.e., preferred installed program (PIP) for supporting and installing packages that aren't part of python. The webservice producer is created by using flask for consuming it in salesforce and made it host in PythonAnywhere webserver. The salesforce account is accessed by python simplesalesforce package. This simplesalesforce package is used in accessing salesforce account, performing SOQL, SOSL operations on objects.
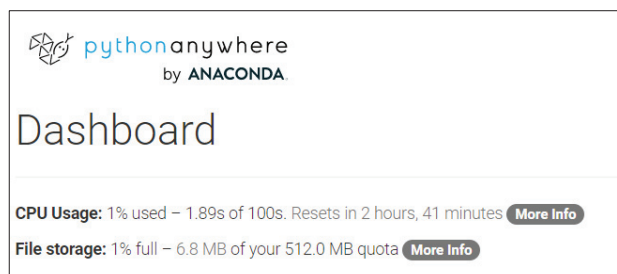

Fig. 8. PythonAnywhere Server

F. Consuming Twitter Rest Service In Webserver

The REST service search by hashtag is consumed to retrieve data based on the recent tweets. After successful consumption of REST service, the response or payload is

fetched inform of JSON body. By using parsers, the necessary fields like user id, tweet id, tweet based on hashtag are been extracted.

Fig. 9. Twitter

G. Performing Sentimental Analysis & Registering A Case

The tweet which is extracted from the JSON body after successful consumption of Twitter REST service and the tweet is been sentimental analysed to find whether tweet is either with a sense of positive note, negative note or with a neutral note. The sentimental index less than 0 to -1, 0 and 0 to greater than 1 denotes the negative sense, neutral and positive sense respectively. After the successful sentimental analysis, the case will be registered at Case object in the salesforce with tweet id, tweet, sentimental index and priority [8].

Fig. 10. Registering a Case

H. Sending Outbound (Whatsapp And Email) Alerts

Whenever the negative tweet is been registered as a case in the Case object, An E-Mail alert and the WhatsApp alert is been sent to the administrator stating that the negative reply alert with twitter id and negative tweet. The WhatsApp message is been sent to the administrator by consuming the WhatsApp API service and the E-Mail is triggered by the Messaging class in Apex.
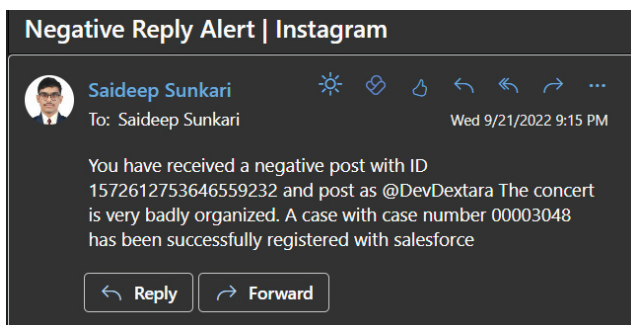

Fig. 11. Negative E-Mail Alert

I. Handling Positive And Negative Tweets

The priority high, low and neutral in the Case field are tagged to the negative tweet, positive tweet and neutral tweet respectively. A record irrespective of positive or negative tweets is been created in Opportunity object. The Stage is automatically closed whenever the tweet is positive i.e., having sentimental index between 0 and 1 and priority as low. The Stage stays at the perspecting whenever the tweet is negative i.e., having sentimental index between 0 and -1 and

priority as high. The Stage automatically closes when the administrator replies to the particular negative tweet.

Fig. 12. Handling Tweets from Salesforce

J. Replying To Negative Tweet & Closing The Ticket

The Stage is automatically closed in case of positive tweet but the Stage stays at perspecting enabling reply tweet field whenever the negative tweet is been caught. The replying to negative tweet either by administrator or by automation replies makes the Stage to closed.

Fig. 13. Twitter Handle

VIII. ADVANTAGES & APPLICATIONS

A. Identifies Type Of Tweet

This approach of using REST services of Twitter helps in fetching, identifying the positive and negative tweet by using sentimental analysis and segregating them by priority.

B. Elimination Of Negative Tweets

The negative tweets which are focused on the single username or hashtag when goes viral disturbs the ecosystem or environment creating a negative impact of the user who is tagged with that tweet towards the society. These negatively impact tweets are been identified and eliminated.

C. Maintaining Integrity

The tweets which are negative, abused, spam when goes in public or viral has a huge impact on the organization or firms which loses its integrity, faith, fame in the society leading in distraction of financial and economic status of the firms or organizations, these types of tweets can be identified and removed at earlier stage retaining integrity.

D. Saves Life

Some of the tweets which are individual based when tweeted negatively, biased, spam or abused can ruin one's life leads the individual loss his stability, loses his fame in the society are also been identified and removed.

E. Outbound Alerts

Some of the tweets can go viral in public within no time, for such actions to eliminate the outbound alerts such as WhatsApp and E-Mail are been integrated which are focused only on negative tweets.

Whenever a negative tweet is been fired, the outbound alerts are triggered over WhatsApp as well as E-Mail, such that the administrator can get instant alert and eliminate fast going viral tweets.

F. Handling Negative/S

The negative tweets can be easily handled over the salesforce platform. whenever there is a tweet with a negative scope, unlike positive tweet the reply section is auto-enabled such that the negative tweet can be eliminated, nullified, justified by relevant reply tweet to it.

G. Using Webserver

The twitter REST service is consumed in the web server, there is no issue of loss of code, data, failure of functionality. Whenever there is a malfunctional in the salesforce environment, the REST service is refreshed and consumed in the salesforce.

H. Handling Organizational Wide Tweets

The organizations unlike individual gets lacks to millions of tweets per month, which are difficult to handle and manage. The negative tweets can creep as poison in the twitter and can ruin off the name, fame, financial status of the organization, so handling such situations can be quite easier using this approach.

IX. LIMITATIONS

A. Limited Monthly Pull Request

The elevated version of twitter gives access to 2 million pull request from the twitter username or hashtag, the regular schedule of twitter API service is not encouraged in this elevated version, the level of access should be increased to enterprise access while working with the large pull requests.

B. Limited Recent Tweets

The elevated version of twitter can give up to recent 50 recent tweets with 1st as latest, the older tweets are not pulled at this level of access, the version should be either upgraded to academic access or enterprise access to get unlimited recent tweet searches.

C. Limited Tweet Posts

The elevated version of twitter gives limited access to post tweets, the unlimited tweets are not allowed at this level of access, the version should be either upgraded to academic access or enterprise access to get unlimited tweets.

D. Limited Replies

The elevated version of twitter gives limited access to replies, the unlimited replies are not allowed at this level of access, the version should be either upgraded to academic access or enterprise access to get unlimited replies.

E. Permanent Keys And Tokens

The keys and tokens which are generated are permanent in nature and that can be revoked and regenerated manually in the elevated version, this can cause serious security issues.

The permanent keys and token can be easily stolen and misused.

X. FUTURE SCOPE

A. Upgrading To Academic Or Entreprise Version

The limited pull requests, recent tweets, replies, post tweet is not encouraged at the organization level of monitoring Twitter account, the upgradation of elevated version to either academic or enterprise version gives unlimited access to the resource which works on principle pay as you use.

B. Achieving It To Other Social Handlings

The approach can be applied to other social handlings like Instagram, Facebook, LinkedIn, Google Reviews and eliminate the negative sense comments, posts go viral into the society.

C. Replying From E-Mails And Whatsapp

The service can be extended by integrating with reply from E-Mails and WhatsApp to the tweets which are going negatively and helps in remote way of replying service for the administrator to discontinue the chain of negativity.

XI. CONCLUSION

Customer relations is key to the business success, customers find social platforms, a best way to review about the goods, share their views about the products and also raise issues like refund, warranty and others. The same way business groups find ways to communicate with new customers, potential customers and also interact with customers. The now presented approach helps the business groups to filter the negative views, positive views and neutral views, which in turn helps the business groups to address the negative reviews.

Since the marketing teams are also notified through email and WhatsApp chats to keep a quick track of the negative comments, this helps the marketing teams to analyse the response and activity of the customers about their products in the public domain. The presented approach can also be revised using the then available algorithms and packages for natural language processing and also automate the responses with some predefined text templates as replies to the user reactions over the social platforms. Since the tweets, Instagram posts happen very often, the algorithm must be scheduled very often to run and get the sentimental reports for quicker replies. The usage of the python server helped in making the actions to be quicker through API calls. Integrating the approach with Salesforce has made it a more progressive in interacting with customers.

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