

RFID based Shopping

by

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1. Introduction

1.1 Background (System Study Details)

. The project that we decided to implement is RFID based shopping. This project is an inspirational model from Amazon Go. In this project, radio frequency identification tag is used to identify various products. These radio frequencies are captured and details about respective products are identified. At last, overall cost for all products will be calculated. This project is very useful in various shopping malls and shops to automate billing process

The project topic that we have decided is RFID based shopping which is an inspirational model from one of the amazon's services named amazon go. In this project, there are various products and details about each and every product are stored. Every product will have a unique radio frequency tag and this tag is used to store details about respective product.

Technologies:

Technologies play vital role in IOT devices. In this project, software and hardware technologies are used to perform efficient output. The hardware and software components are interconnected along each other to produce a good IOT device. Various technologies are used in this project to improve performance of this project.

1. RFID:

Radio frequency identification tag is used to identify various products with its own unique id. It is used to identify various products which the user purchase and these details will be used to process various operations.

2. Cloud Technologies:

The details about all products are stored in cloud and this cloud is used to process data and calculating bill of all products. There are various cloud service providers and one of the clouds is used in this project.

1.2 Problem Statement

The project that we decided to implement is RFID based shopping. This project is an inspirational model from Amazon Go. In this project, radio frequency identification tag is used to identify various products. These radio frequencies are captured and details about respective products are identified. At last, overall cost for all products will be calculated. This project is very useful in various shopping malls and shops to automate billing process.

1.3 Importance

This project is very useful in automated process of scanning products which are purchased by customer of respective store. The data are stored in cloud service and it is very easy to maintain data when it grows enormously. This project is reliable and it cannot be faked under any circumstance. By use of this project, billing can be automated. This project also reduces man power who are needed to scan product and prepare bill for the customer. In this project, this process of scanning product and billing will be automated so that errors and mistakes made by man power can be reduced to greater extent.

2. Overview and Planning

2.1 Proposed System Overview

This RFID based shopping is one of the most useable products in the market. It is also used to remove mistake and errors caused by humans. In this project, Customers purchase products from the store. The process of billing and scanning products are automated. These scanned product details are sent to the cloud. Every purchase details are stored in cloud and it is very easy to maintain data about each and every purchase.

This project also uses services in cloud to recommend products to user. This system recommends products to user based on their product purchase list. This improves purchase of products for user. This system also predicts stock for each month based on various scenarios and credentials.

2.2 Challenges

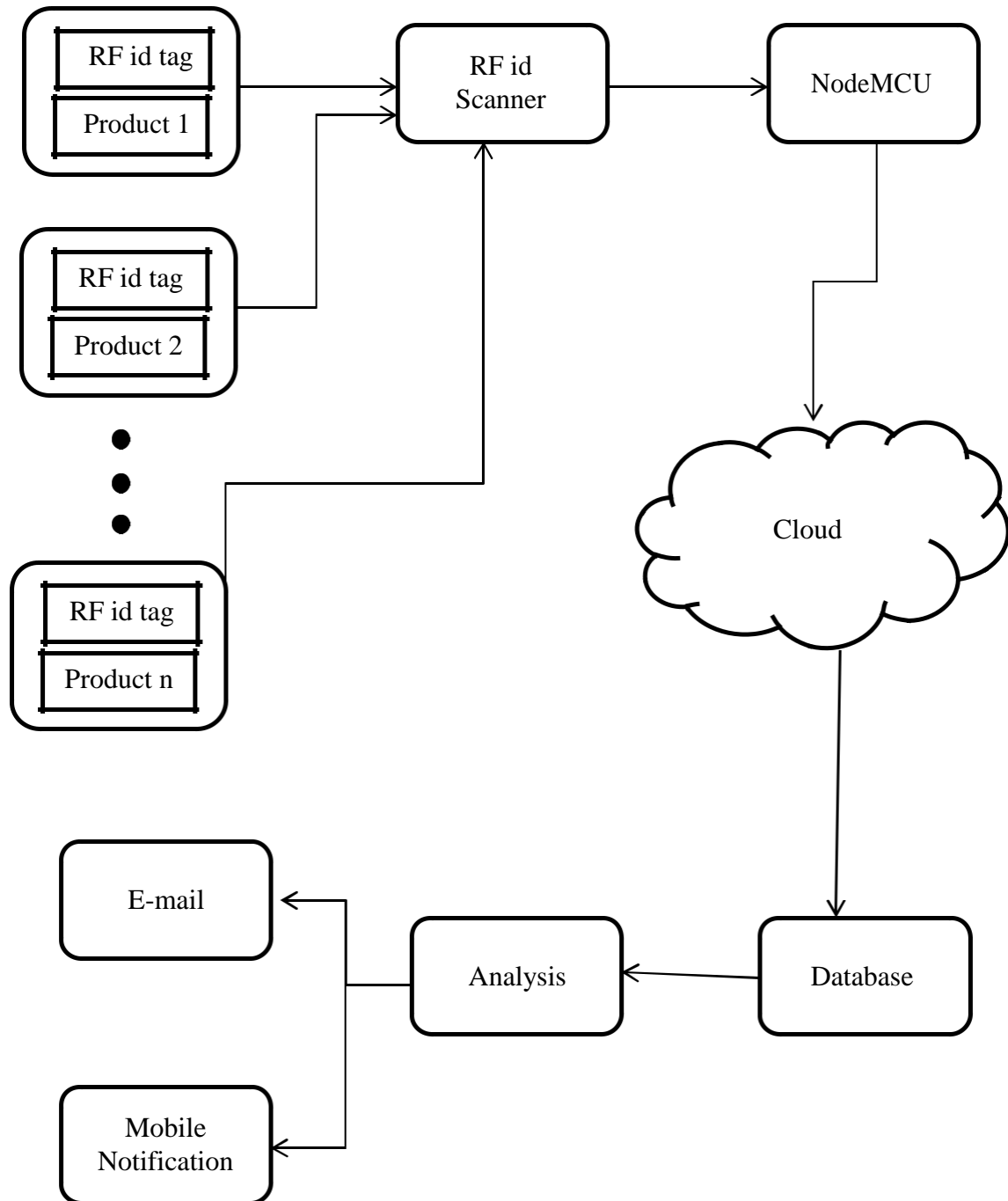
The challenges that are faced are given below. The challenges include the many number of sensor nodes needed to process the model. The each sensor is needed to process one single product. Consider that a bread packet is present in the rack of 20 packets. We need 20 RF id tags to process the products. Then there is complexity in managing the number of products and then the cost involved in deploying the entire system into existence.

- Number of RF id tags required for different product is huge in number.
- The cost involved in deploying the product is high
- Maintaining such vast number of tags is difficult
- There are some chance of destroying the RF id tag
- There is a chance of duplicating the RF id tag

2.3 Assumptions

We are assuming that we are having unique id for each and every product in the system. The id is unique and each and every product is having the unique id to differentiate the objects. Products are joined with the necessary id tag embedded in every product. The not security to ensure that the products is embedded with the product. Assume that the power source is always connected and then the product id is sent to the cloud and there the process is happening with the necessary applications. Assume that the power source is always connected and then the product id is sent to the cloud and there the process is happening with the necessary applications. The product is then processed to produce the necessary stock analysis report and then the report is sent to the customer.

2.4 Architecture Specifications



2.5 Realistic Constraints and Standards

In our project, there is more number of constraints and It is very difficult to overcome all objectives. When requirements of this project are stated it was very less and simple. When it comes to implementing project in real time there are various issues in this project. Some of the constraints or objectives in this project are

- This project is connected in Amazon Web Services. This project struggles in maintaining large amount of data.
- Huge data transmission is not efficiently done in this project.
- This project requires AWS such as Amazon Personalize, Amazon SageMaker, Amazon SNS, Amazon CloudWatch, Amazon IoT Core, Amazon DynamoDB.

Standards:

This project is developed according to various standards. This is an IOT project and it satisfies ISO standards for IOT products and services. This project also support standards for sending message to clients or customers and purchasing a product.

- ISO 9001
- ISO/IEC 30141
- ISO 20022

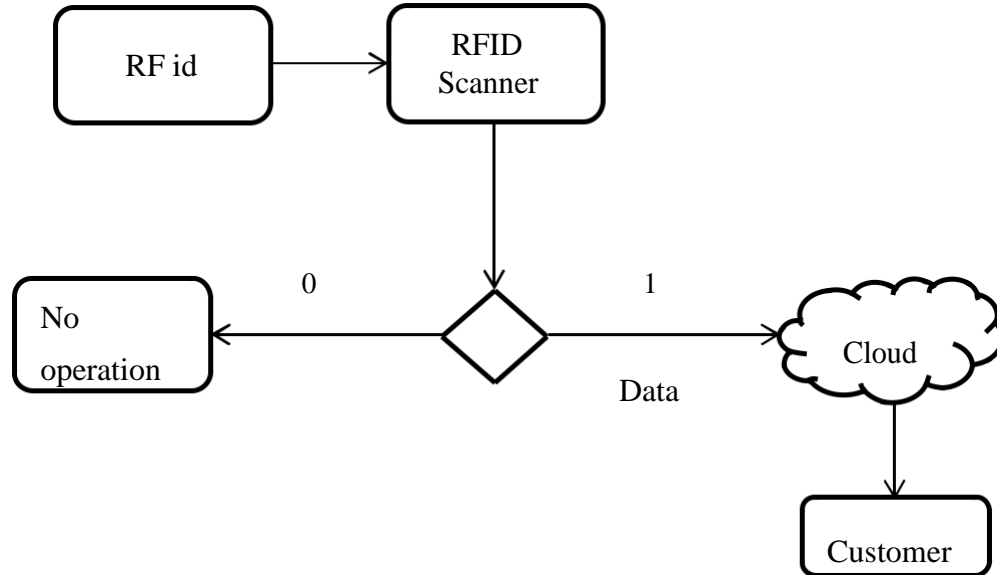
3. IoT Design Methodologies

IOT design methodology is used to define and explain about an IOT project. The IOT design methodology has 10 steps.

Requirement Specification:

The requirements in this project are to read RFID tag of each product, these RFID tags are recognized based on ID and it is sent to cloud service for data processing and storage. The system must recommend products for user which they may like. This system also predicts total amount stock needed for a month based on previous purchase history.

Process Specification:



Domain Model Specification:

This project is in the domain of shopping and it is useful in all shopping store. It is universal and adaptable for all kinds of stores. The basic rules and constraints for particular store can be updated and used in the store.

Information Model Specification:

In this system, RFID is the information which is used to process data. The RF id is captured from product and it is captured using rfid reader. This data is then transmitted from rfid reader to Nodemcu. The data from Nodemcu is then transmitted to cloud service and it is stored in cloud database. These data are then used for later recommendation process.

Service Specification:

The services used in this project are

- State Service
- Controller Service

The state service is used to read rfid and it gives binary value with data of rfid. It is either set to 0 or 1.

The Controller service is used to send data to cloud if data is received from rfid scanner.

IOT Level Specification:

This project has level 4 specifications. This project has cloud service and analytics embedded along with it.

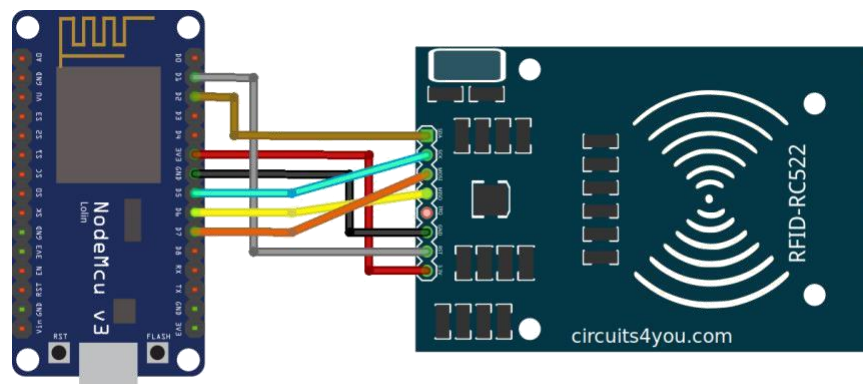
Functional View Specification:

In this system, RFID is the information which is used to process data. The RF id is captured from product and it is captured using rfid reader. This data is then transmitted from rfid reader to Nodemcu. The data from Nodemcu is then transmitted to cloud service and it is stored in cloud database. These data are then used for later recommendation process.

Operational View Specification:

This project makes use of various physical components. It is also used to read various data about a product. RFID is the information which is used to process data. The RF id is captured from product and it is captured using rfid reader. This data is then transmitted from rfid reader to Nodemcu. The data from Nodemcu is then transmitted to cloud service and it is stored in cloud database. These data are then used for later recommendation process.

Device and Component Integration:



3. System Implementation

4.1 Module Development –Code

```
#include <ESP8266WiFi.h>

#include <AmazonIOTClient.h>

#include "ESP8266AWSImplementations.h"

Esp8266HttpClient httpClient;

Esp8266DateTimeProvider dateTimeProvider;

AmazonIOTClient iotClient; ActionError
actionError;

char *ssid="OnePlus 6";

char *password="asdf1234";

void setup() {

    Serial.begin(115200);

    delay(10);

    // Connect to WAP

    Serial.print("Connecting to ");

    Serial.println(ssid);

    WiFi.begin(ssid, password);

    while (WiFi.status() != WL_CONNECTED) {

        delay(500);
```

```
    Serial.print(".");  
  
    }  
  
    Serial.println("");  
  
    Serial.println("WiFi connected");  
  
    Serial.println("IP address: ");  
  
    Serial.println(WiFi.localIP());  
  
  
  
    iotClient.setAWSRegion("us-west-2");  
  
    iotClient.setAWSEndpoint("amazonaws.com");  
  
  
    iotClient.setAWSDomain("https://849283859915.signin.aws.amazon.com/console" );  
  
  
    iotClient.setAWSPath("/things/RFID/shadow");  
  
    iotClient.setAWSKeyID("AKIA4LPKDIXF46VNLN4T");  
  
  
    iotClient.setAWSSecretKey("Pjm311HNkMWhDFs6jHuMaebFZwkFUBDBWnW  
AR8ko");  
  
    iotClient.setHttpClient(&httpClient);  
  
    iotClient.setDateTimeProvider(&dateTimeProvider);  
  
    }  
  
  
void loop(){
```

```

char* shadow = "{\"state\":{\"reported\":{\"foobar\":\"bar\"}}}";

char* result = iotClient.update_shadow(shadow, actionError);

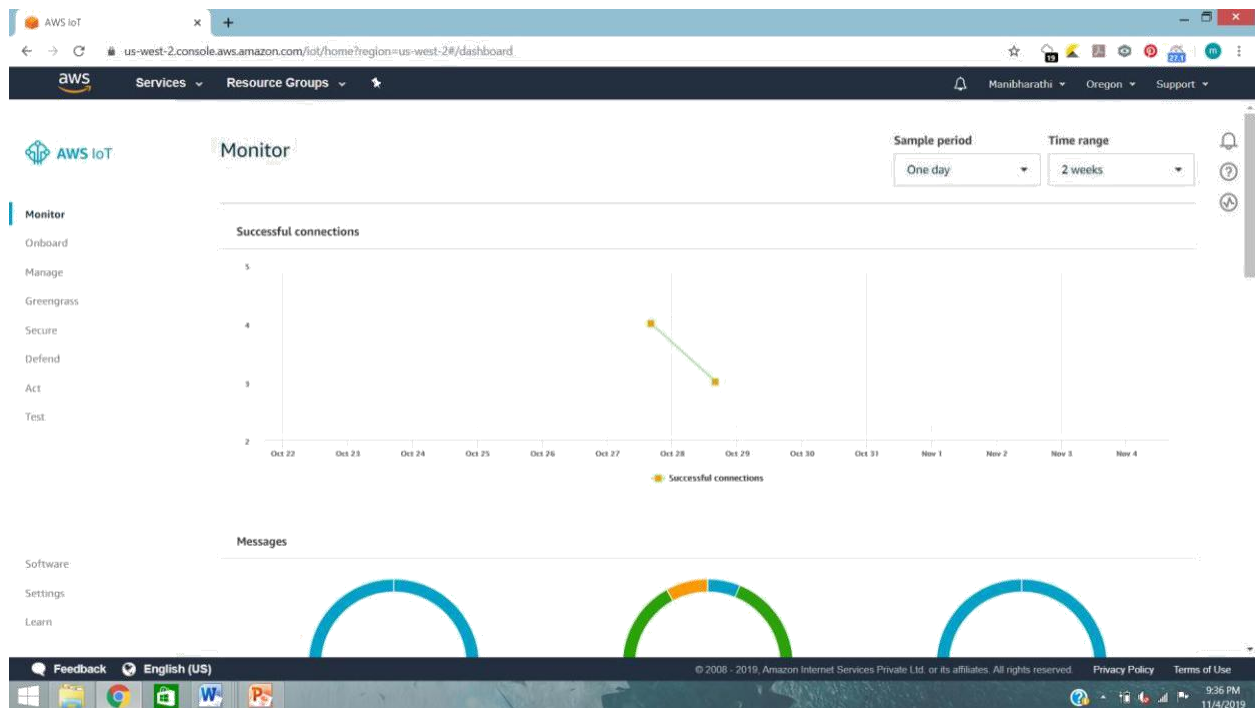
Serial.print(result);

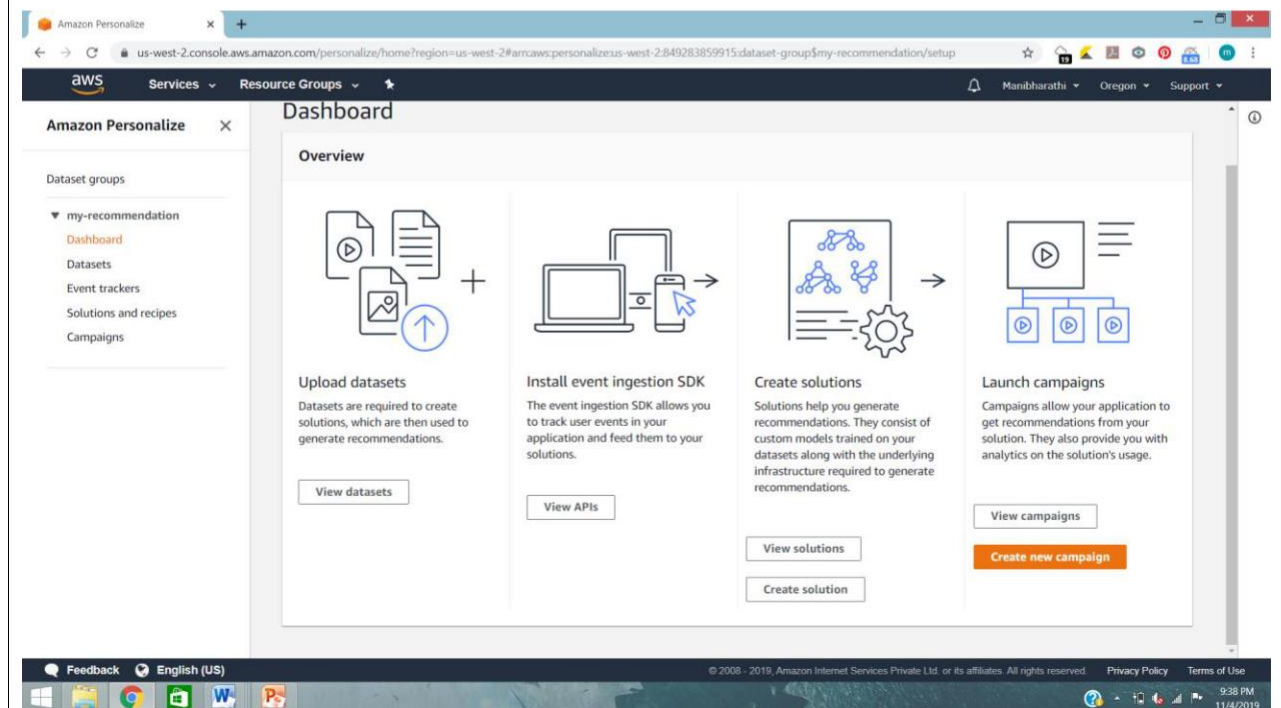
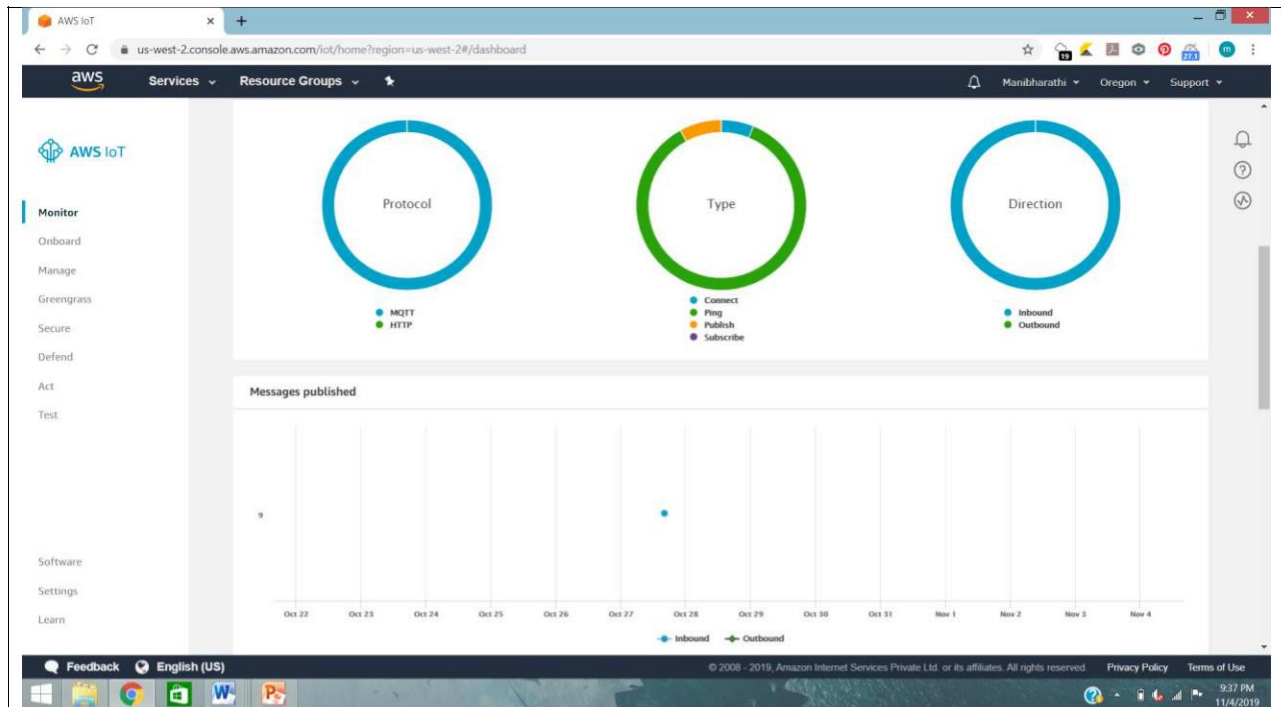
delay(60000);

}

```

4.2 Output/Results





S3 Management Console

Services Resource Groups

Amazon S3

Buckets

Batch operations

Block public access (account settings)

Feature spotlight

Archive all your long-term data into Amazon S3 Glacier Deep Archive [Learn more](#)

Documentation

S3 buckets

Search for buckets

All access types

+ Create bucket Edit public access settings Empty Delete

4 Buckets 1 Regions

Bucket name	Access	Region	Date created
movie-dataset-01	Objects can be public	US West (Oregon)	Sep 27, 2019 8:36:17 AM GMT+0530
movie-recommendation-dataset	Bucket and objects not public	US West (Oregon)	Oct 21, 2019 7:59:52 PM GMT+0530
sagemaker-us-west-2-849283859915	Objects can be public	US West (Oregon)	Oct 28, 2019 9:17:21 AM GMT+0530
shopping-dataset	Bucket and objects not public	US West (Oregon)	Nov 4, 2019 9:44:24 PM GMT+0530

Operations 0 In progress 1 Success 0 Error

Feedback English (US)

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Amazon Personalize

Services Resource Groups

Amazon Personalize

Dataset groups

my-recommendation

Dashboard

Datasets

Event trackers

Solutions and recipes

Campaigns

4580d6b9

Solution version overview

Solution version ARN
arn:aws:personalize:us-west-2:849283859915:solution/my-solution/4580d6b9

Created
Mon, 28 Oct 2019 03:49:15 GMT

Recipe ARN
arn:aws:personalize::recipe/aws-hrnn

Status
Active

Training hours
12.311

Solution version metrics

Normalized discounted cumulative	Precision	Mean reciprocal rank
At 5 0.0179	At 5 0.0036	At 25 0.0161
At 10 0.0242	At 10 0.0036	
At 25 0.0423	At 25 0.0043	

Feedback English (US)

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DynamoDB - AWS Console

us-west-2.console.aws.amazon.com/dynamodb/home?region=us-west-2#tables:selected=shopping;tab=items

Services Resource Groups

DynamoDB Dashboard

Tables Backups Reserved capacity Preferences

DAX Dashboard Clusters Subnet groups Parameter groups Events

Create table Delete table

Filter by table name

Choose a table ... Actions

Name

shopping

shopping Close

Overview Items Metrics Alarms Capacity Indexes Global Tables Backups Triggers Access control Tags

Create item Actions

Scan: [Table] shopping: Row, PositionInRow

Viewing 1 to 5 items

Scan [Table] shopping: Row, PositionInRow

Add filter

Start search

Row	PositionInRow	payload
0	0	{ "Lays": { "S": "10" }, "pos": { "S": "0" }, "row": { "S": "0" } }
1	0	{ "Lays": { "S": "10" }, "pos": { "S": "0" }, "row": { "S": "1" } }
1	1	{ "Lays": { "S": "10" }, "pos": { "S": "1" }, "row": { "S": "1" } }
2	2	{ "Lays": { "S": "10" }, "pos": { "S": "2" }, "row": { "S": "2" } }
3	0	{ "Lays": { "S": "10" }, "pos": { "S": "0" }, "row": { "S": "3" } }

Feedback English (US)

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Inbox (1,374) - manibharathi476 Stock is low. - prabupan99@gmail

mail.google.com/mail/u/1/#inbox/FMfcgpxDvDbkNcIqkBTjpFqPmKld

Search mail

Compose

Inbox 92

Starred Snoozed Sent Drafts More

prabu

No recent chats Start a new one

Stock is low. Inbox

AWS Notifications no-reply@sns.amazonaws.com yla amazonaws.com to me

Mon, Oct 28, 7:03 PM (7 days ago)

The stock is very low. We need total of 100 Lays packets and it must be delivered within a week. Thank you.

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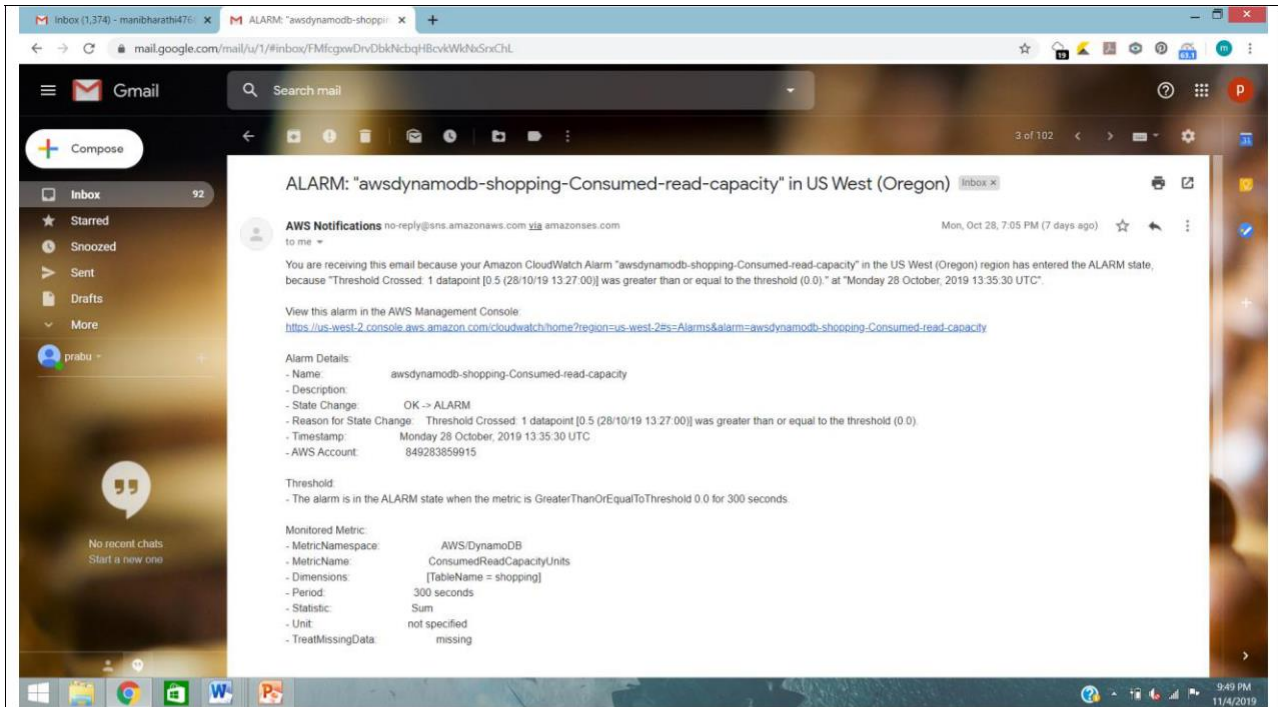
If you wish to stop receiving notifications from this topic, please click or visit the link below to unsubscribe: https://sns.us-west-2.amazonaws.com/subscribe.html?SubscriptionArn=arn:aws:sns:us-west-2:849283859915:Stock_Update:84318b14-6532-483c-8592-0275b4e612da&Endpoint=prabupan99@gmail.com

Please do not reply directly to this email. If you have any questions or comments regarding this email, please contact us at <https://aws.amazon.com/support>

Reply Forward

Waiting for 1.client-channel.google.com...

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5. Conclusion and Future Developments

This project is very useful in various market fields. The main advantage of this project is its cost effectiveness. It is very useful for a person who doesn't wait for billing a product. Our project provides many services and it recommends products to customers based on their previous purchase history. Thus, this project is very helpful for all types of customer to have a wonderful shopping experience.

6. References

1. <https://us-west-2.console.aws.amazon.com/console/home?region=us-west-2#>
2. <https://docs.aws.amazon.com/>
3. <https://www.instructables.com/id/MFRC522-RFID-Reader-Interfaced-With-NodeMCU/>