DRONE DELIVERY SYSTEM

A PROJECT REPORT

In partial fulfilment for the course

Of

DRONE DELIVERY SYSTEM

GROUP: CLUSTERS

TEAM MEMBERS:

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Introduction

Technology is evolving at a rapid phase, to keep up with the demands and needs of people across the globe. One such technical innovation is the rapid expansion in the usage of Drones. Drones are unmanned aerial vehicles that are used mostly to aid the military and combat services. Drones are faster and less prone to human error, and hence have potential to take over industries where speed and accurate delivery is a key criteria. There are several industries such as healthcare and ecommerce industries that are looking to invest in this technology to improve the services that they provide.

The objective of our project is to build a database for a typical ecommerce website which includes the use drones to deliver their products rather than the traditional methods of delivery.

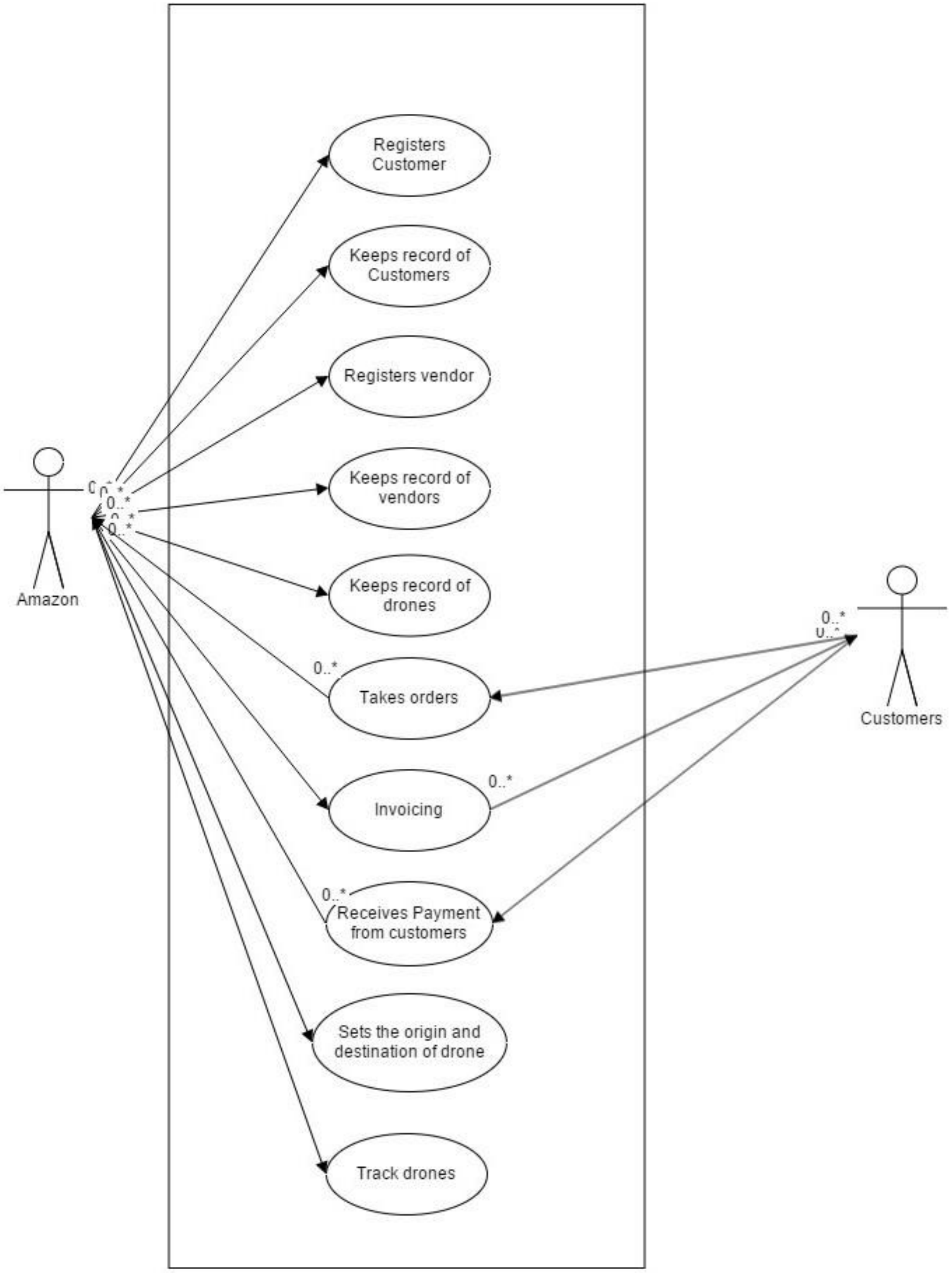
It includes details about customers using the services of this website, along with the drone details and their related information. It also includes data about products and payment information, which shows the jest of the functionality of this website with this kind of delivery service.

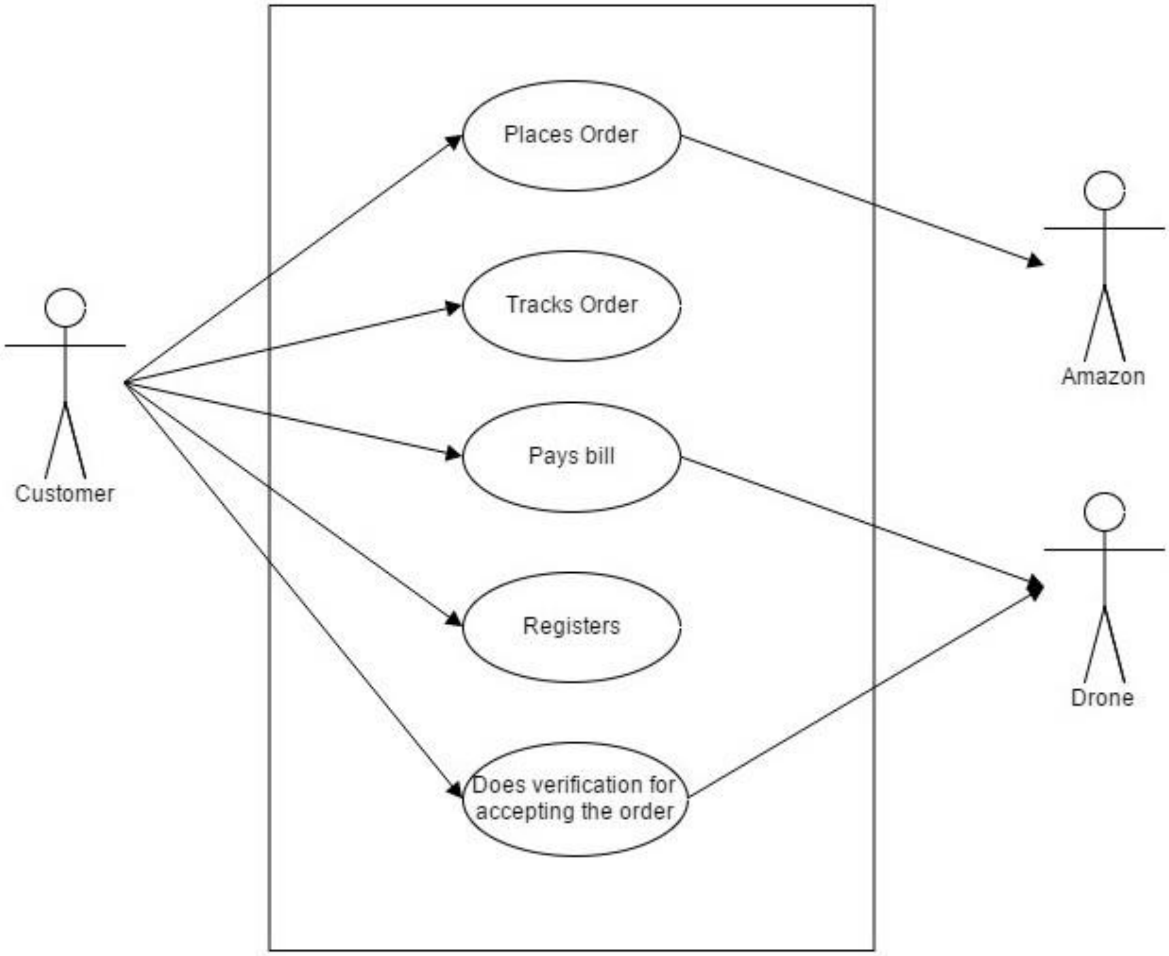
The drones are going to use zip codes to find the exact path that the drone takes from the warehouse address to the customer shipping address. We have added the weather capabilities to the drone as an extra functionality, which might benefit the company in better understanding how the system and overcome certain difficulties.

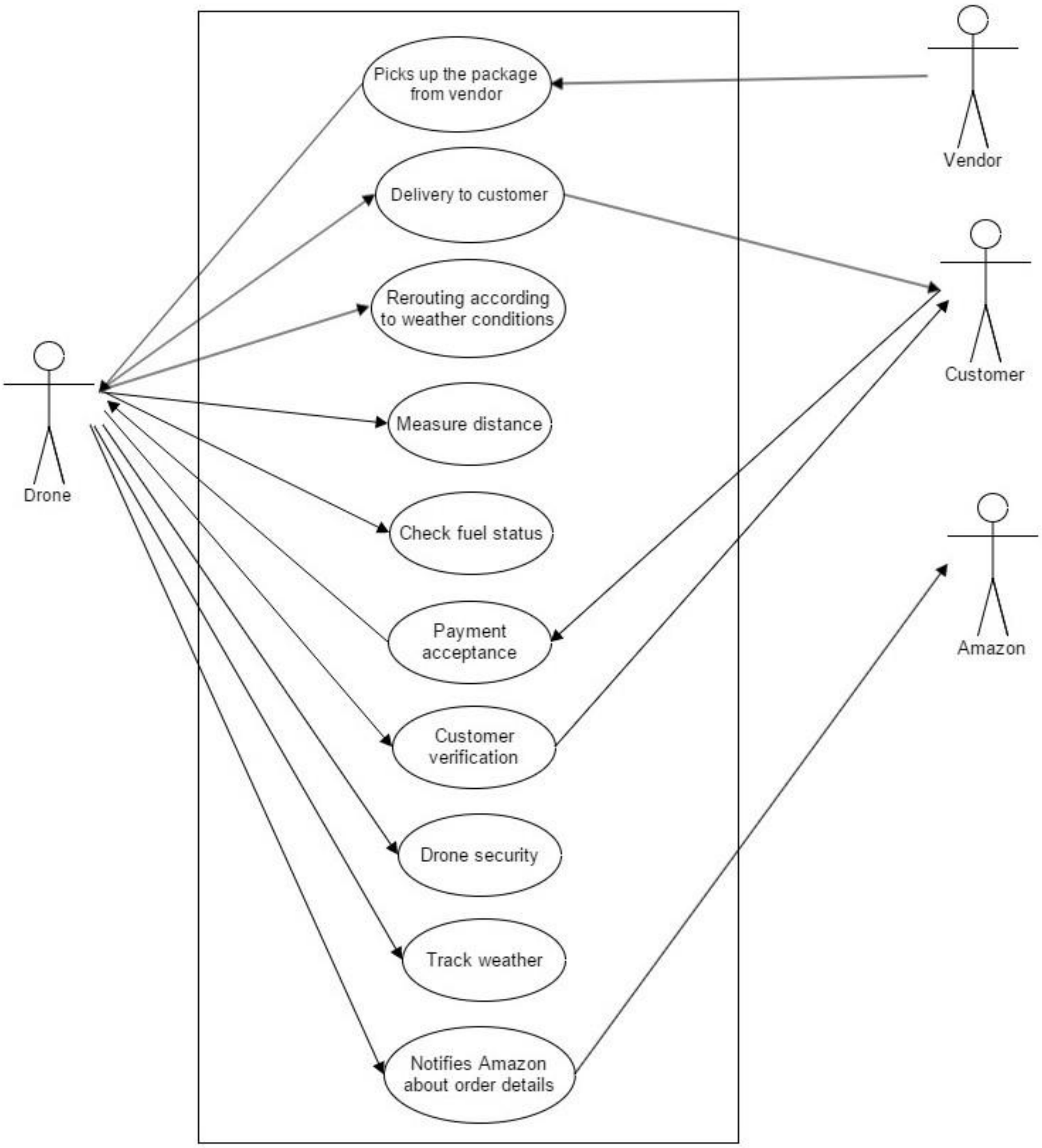
Limitations

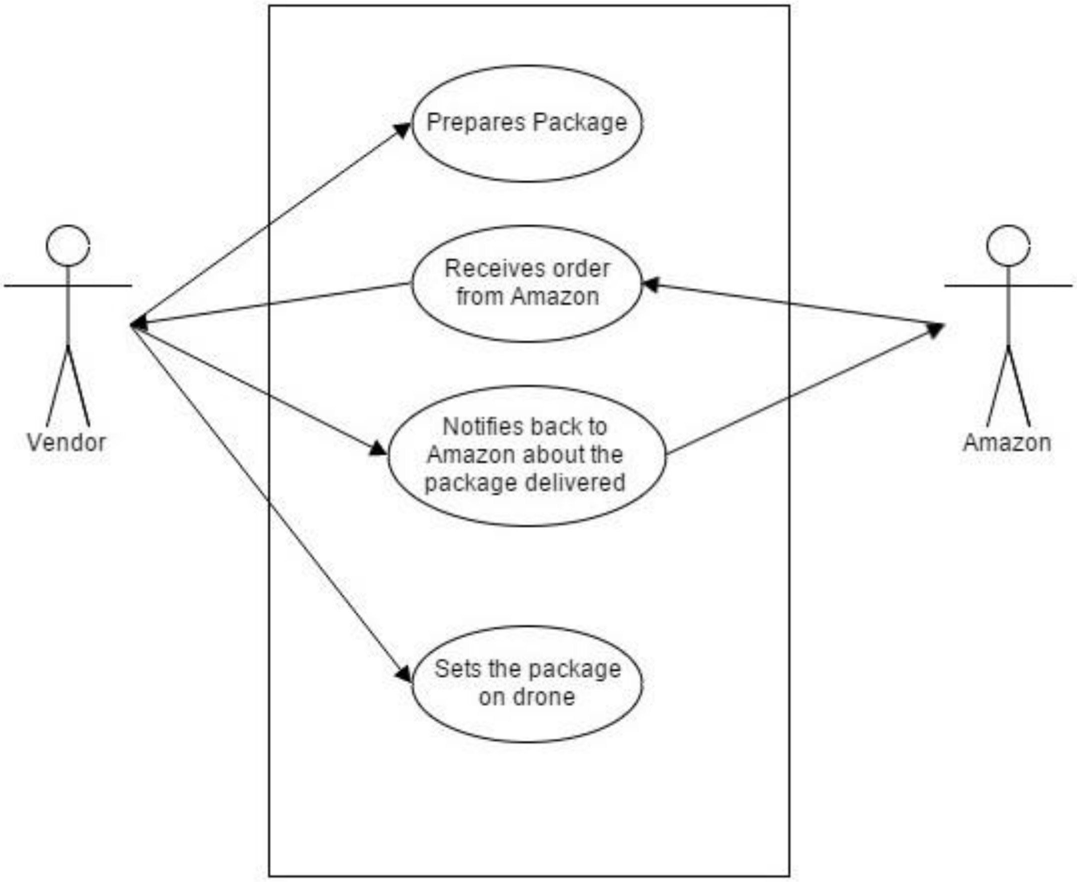
- The e-commerce website is assumed to be amazon.com.
- It has vendors and customers from USA only.
- Warehouses includes vendor warehouses and amazon warehouses.
- The product is delivered by a drone present in that product vendor warehouse.
- Customers can order only one product at a time.
- One drone will carry only one order item at one time.
- No cash on delivery option.
- The customer is assumed to get package directly, i.e drop off at the zip code location.
- No partial transactions are taken into consideration.
- The order item is created only after the payment is completed.
- One category is associated to only one department.

Use Case Diagrams

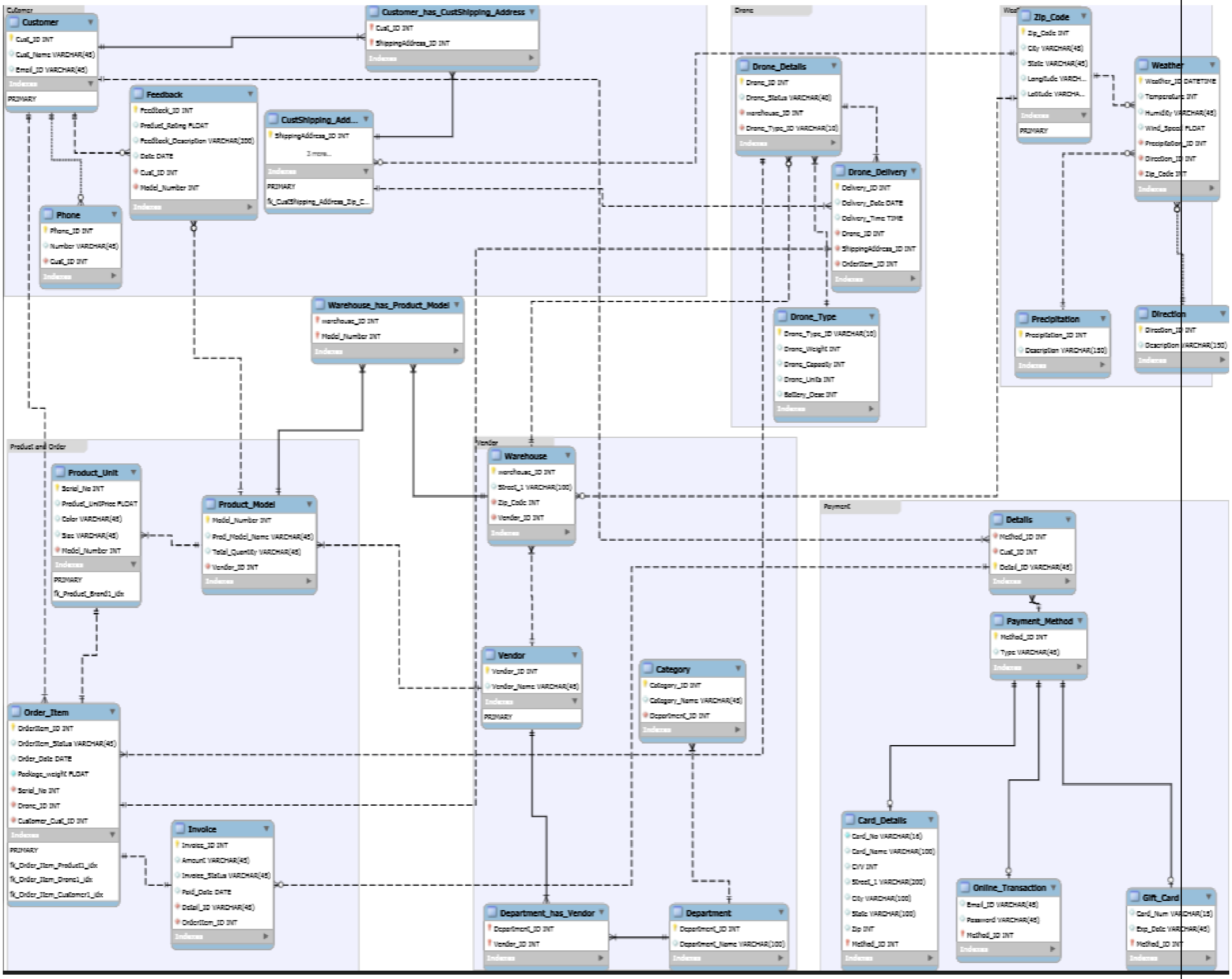



Places Order
Tracks Order
Pays bill
Registers
Does verification for accepting the order
Customer
Amazon
Drone


Picks up the package from vendor
Delivery to customer
Rerouting according to weather conditions
Measure distance
Check fuel status
Payment acceptance
Customer verification
Drone security
Track weather
Notifies Amazon about order details
Drone
Vendor
Customer
Amazon

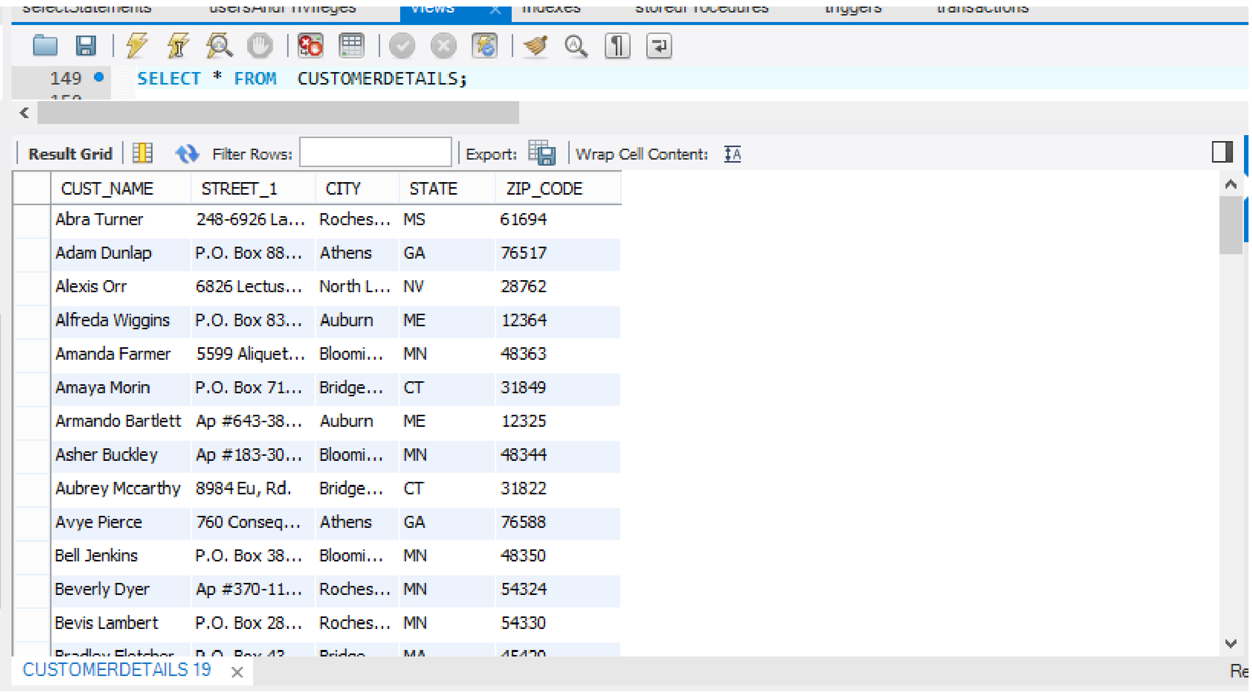

Prepares Package
Receives order from Amazon
Notifies back to Amazon about the package delivered
Sets the package on drone
Vendor
Amazon

EER DIAGRAM


Cutomer
Customer
Cust_ID INT
Cust_Name VARCHAR(45)
Email_ID VARCHAR(45)
Indexes
PRIMARY
Customer_has_CustShipping_Address
Cust_ID INT
ShippingAddress_ID INT
Indexes
Feedback
Feedback_ID INT
Product_Rating FLOAT
Feedback_Description VARCHAR(200)
Date DATE
Cust_ID INT
Model_Number INT
Indexes
CustShipping_Add...
ShippingAddress_ID INT
2 more...
Indexes
PRIMARY
fk_CustShipping_Address_Zip_C...
Phone
Phone_ID INT
Number VARCHAR(45)
Cust_ID INT
Indexes
Warehouse_has_Product_Model
warehouse_ID INT
Model_Number INT
Indexes
Drone
Drone_Details
Drone_ID INT
Drone_Status VARCHAR(40)
warehouse_ID INT
Drone_Type_ID VARCHAR(10)
Indexes
Drone_Delivery
Delivery_ID INT
Delivery_Date DATE
Delivery_Time TIME
Drone_ID INT
ShippingAddress_ID INT
OrderItem_ID INT
Indexes
Drone_Type
Drone_Type_ID VARCHAR(10)
Drone_Weight INT
Drone_Capacity INT
Drone_Units INT
Battery_Desc INT
Indexes
Weat
Zip_Code
Zip_Code INT
City VARCHAR(45)
State VARCHAR(45)
Longitude VARCH...
Latitude VARCHA...
Indexes
PRIMARY
Weather
Weather_ID DATETIME
Temperature INT
Humidity VARCHAR(45)
Wind_Speed FLOAT
Precipitation_ID INT
Direction_ID INT
Zip_Code INT
Indexes
Precipitation
Precipitation_ID INT
Description VARCHAR(150)
Indexes
Direction
Direction_ID INT
Description VARCHAR(150)
Indexes
Product and Order
Product_Unit
Serial_No INT
Product_UnitPrice FLOAT
Color VARCHAR(45)
Size VARCHAR(45)
Model_Number INT
Indexes
PRIMARY
fk_Product_Brand1_idx
Product_Model
Model_Number INT
Prod_Model_Name VARCHAR(45)
Total_Quantity VARCHAR(45)
Vendor_ID INT
Indexes
Order_Item
OrderItem_ID INT
OrderItem_Status VARCHAR(45)
Order_Date DATE
Package_weight FLOAT
Serial_No INT
Drone_ID INT
Customer_Cust_ID INT
Indexes
PRIMARY
fk_Order_Item_Product1_idx
fk_Order_Item_Drone1_idx
fk_Order_Item_Customer1_idx
Invoice
Invoice_ID INT
Amount VARCHAR(45)
Invoice_Status VARCHAR(45)
Paid_Date DATE
Detail_ID VARCHAR(45)
OrderItem_ID INT
Indexes
Vendor
Warehouse
warehouse_ID INT
Street_1 VARCHAR(100)
Zip_Code INT
Vendor_ID INT
Indexes
Vendor
Vendor_ID INT
Vendor_Name VARCHAR(45)
Indexes
PRIMARY
Category
Category_ID INT
Category_Name VARCHAR(45)
Department_ID INT
Indexes
Department_has_Vendor
Department_ID INT
Vendor_ID INT
Indexes
Department
Department_ID INT
Department_Name VARCHAR(100)
Indexes
Payment
Details
Method_ID INT
Cust_ID INT
Detail_ID VARCHAR(45)
Indexes
Payment_Method
Method_ID INT
Type VARCHAR(45)
Indexes
Card_Details
Card_No VARCHAR(16)
Card_Name VARCHAR(100)
CVV INT
Street_1 VARCHAR(200)
City VARCHAR(100)
State VARCHAR(100)
Zip INT
Method_ID INT
Indexes
Online_Transaction
Email_ID VARCHAR(45)
Password VARCHAR(45)
Method_ID INT
Indexes
Gift_Card
Card_Num VARCHAR(15)
Exp_Date VARCHAR(45)
Method_ID INT
Indexes

Views

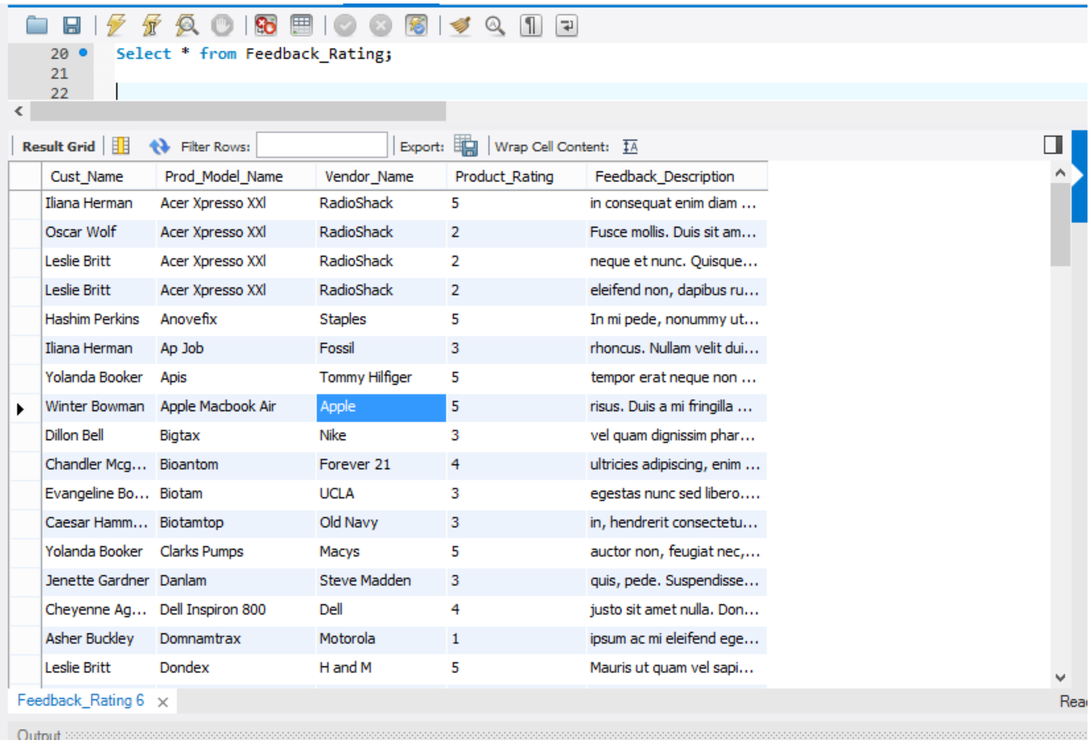
1. **Customer Details View**: This view will display all the customer details like name and
address.



```
SELECT * FROM CUSTOMERDETAILS;
```

CUST_NAME	STREET_1	CITY	STATE	ZIP_CODE
Abra Turner	248-6926 La...	Roches...	MS	61694
Adam Dunlap	P.O. Box 88...	Athens	GA	76517
Alexis Orr	6826 Lectus...	North L...	NV	28762
Alfreda Wiggins	P.O. Box 83...	Auburn	ME	12364
Amanda Farmer	5599 Aliquet...	Bloomi...	MN	48363
Amaya Morin	P.O. Box 71...	Bridge...	CT	31849
Armando Bartlett	Ap #643-38...	Auburn	ME	12325
Asher Buckley	Ap #183-30...	Bloomi...	MN	48344
Aubrey Mccarthy	8984 Eu, Rd.	Bridge...	CT	31822
Avye Pierce	760 Conseq...	Athens	GA	76588
Bell Jenkins	P.O. Box 38...	Bloomi...	MN	48350
Beverly Dyer	Ap #370-11...	Roches...	MN	54324
Bevis Lambert	P.O. Box 28...	Roches...	MN	54330
Bradley Fletcher	P.O. Box 42...	Bridge...	MA	45420

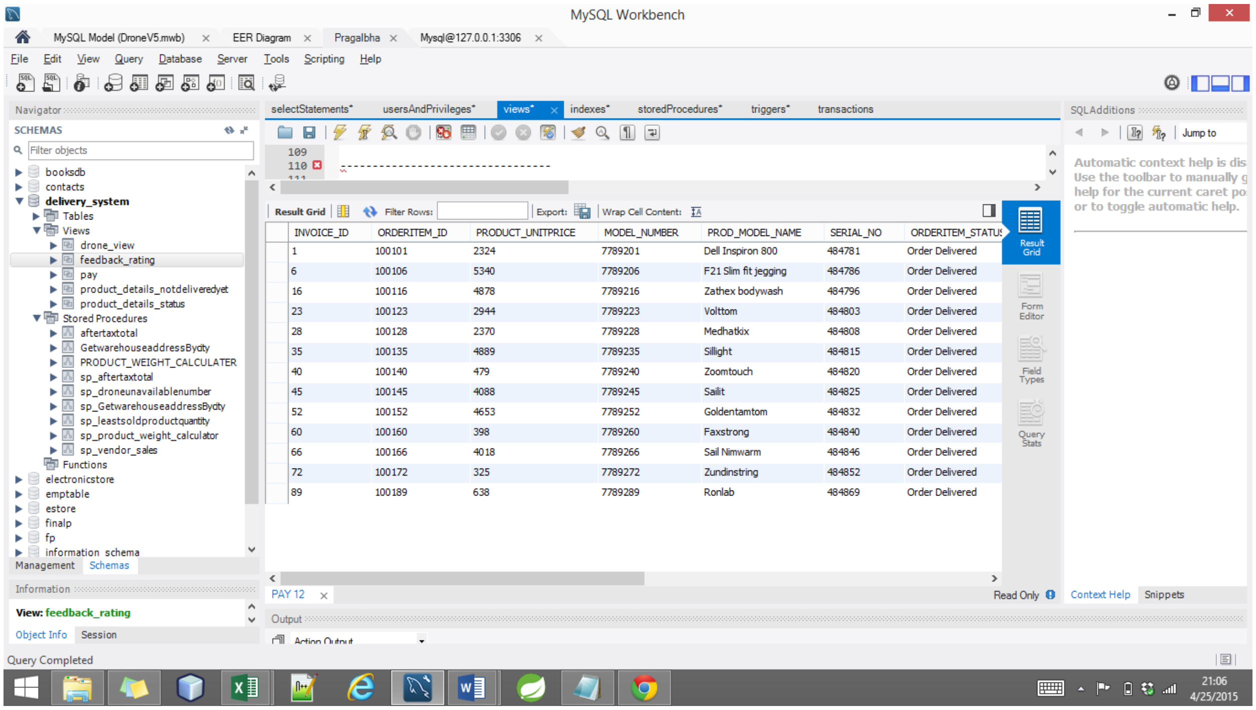
2. Feedback Rating View: It is a view which will allow the customers and vendors to see the
   feedback of the various products.



```
Select * from Feedback_Rating;
```

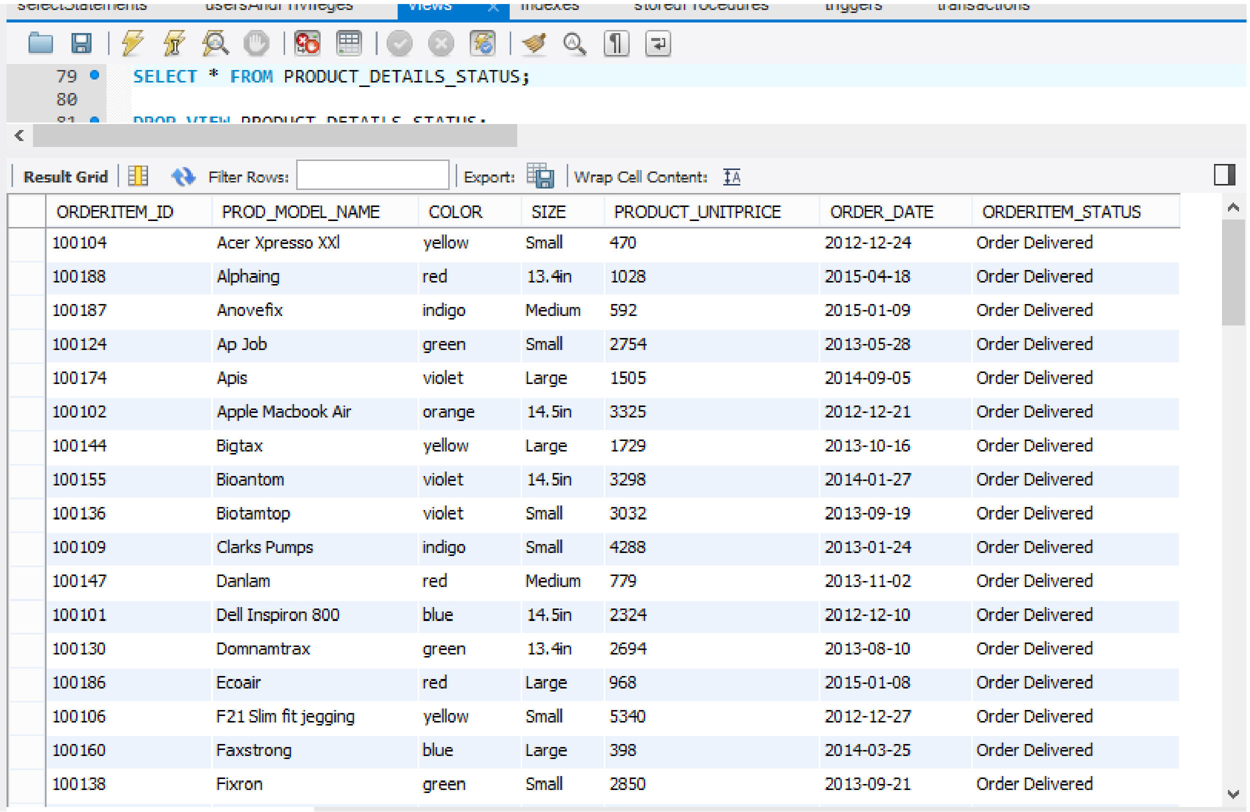
Cust_Name	Prod_Model_Name	Vendor_Name	Product_Rating	Feedback_Description
Iliana Herman	Acer Xpresso XXl	RadioShack	5	in consequat enim diam ...
Oscar Wolf	Acer Xpresso XXl	RadioShack	2	Fusce mollis. Duis sit am...
Leslie Britt	Acer Xpresso XXl	RadioShack	2	neque et nunc. Quisque...
Leslie Britt	Acer Xpresso XXl	RadioShack	2	eleifend non, dapibus ru...
Hashim Perkins	Anovefix	Staples	5	In mi pede, nonummy ut...
Iliana Herman	Ap Job	Fossil	3	rhoncus. Nullam velit dui...
Yolanda Booker	Apis	Tommy Hilfiger	5	tempor erat neque non ...
Winter Bowman	Apple Macbook Air	Apple	5	risus. Duis a mi fringilla ...
Dillon Bell	Bigtax	Nike	3	vel quam dignissim phar...
Chandler Mcg...	Bioantom	Forever 21	4	ultricies adipiscing, enim ...
Evangeline Bo...	Biotam	UCLA	3	egestas nunc sed libero....
Caesar Hamm...	Biotamtop	Old Navy	3	in, hendrerit consectetu...
Yolanda Booker	Clarks Pumps	Macys	5	auctor non, feugiat nec,...
Jenette Gardner	Danlam	Steve Madden	3	quis, pede. Suspendisse...
Cheyenne Ag...	Dell Inspiron 800	Dell	4	justo sit amet nulla. Don...
Asher Buckley	Domnamtrax	Motorola	1	ipsum ac mi eleifend ege...
Leslie Britt	Dondex	H and M	5	Mauris ut quam vel sapi...

3. Payment View: This will include the customer details, card details , invoice details and
product details



INVOICE_ID	ORDERITEM_ID	PRODUCT_UNITPRICE	MODEL_NUMBER	PROD_MODEL_NAME	SERIAL_NO	ORDERITEM_STATUS
1	100101	2324	7789201	Dell Inspiron 800	484781	Order Delivered
6	100106	5340	7789206	F21 Slim fit jegging	484786	Order Delivered
16	100116	4878	7789216	Zathex bodywash	484796	Order Delivered
23	100123	2944	7789223	Volttom	484803	Order Delivered
28	100128	2370	7789228	Medhatkix	484808	Order Delivered
35	100135	4889	7789235	Sillight	484815	Order Delivered
40	100140	479	7789240	Zoomtouch	484820	Order Delivered
45	100145	4088	7789245	Sailit	484825	Order Delivered
52	100152	4653	7789252	Goldentamtom	484832	Order Delivered
60	100160	398	7789260	Faxstrong	484840	Order Delivered
66	100166	4018	7789266	Sail Nimwarm	484846	Order Delivered
72	100172	325	7789272	Zundinstring	484852	Order Delivered
89	100189	638	7789289	Ronlab	484869	Order Delivered

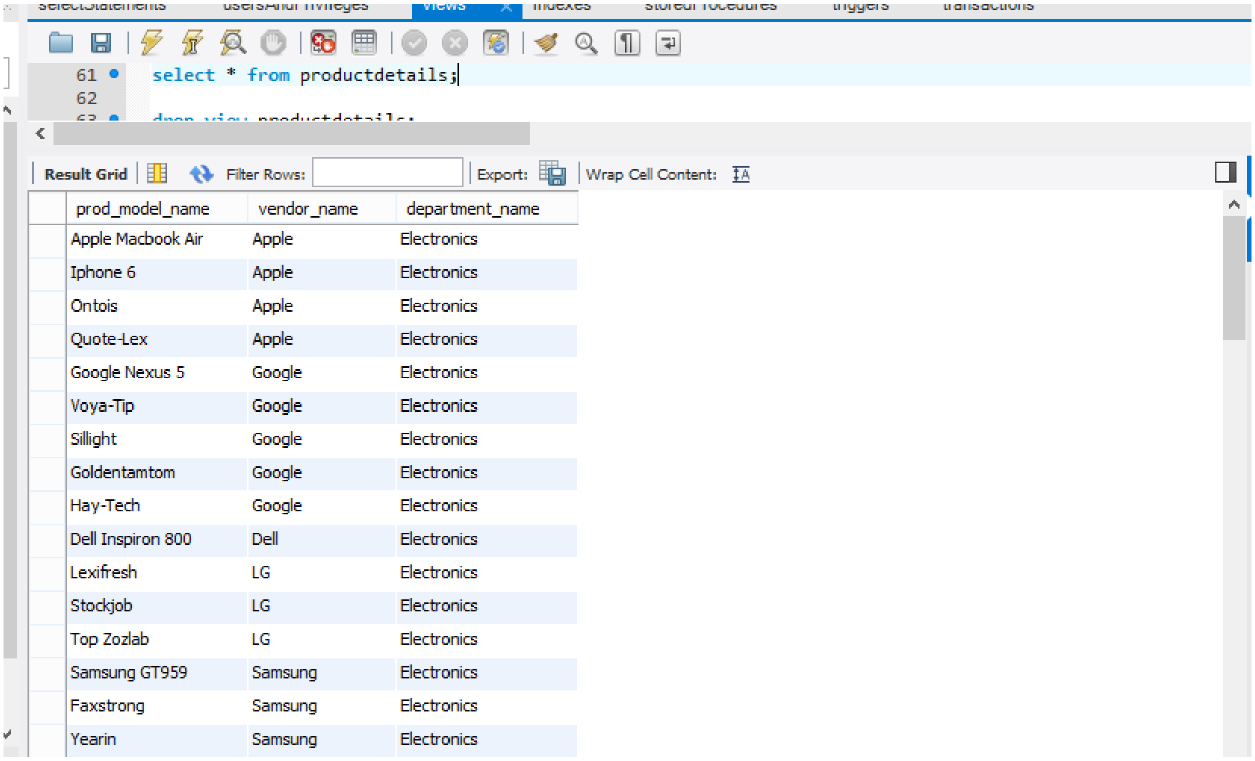
4. **Product Details Status View**: To check the status of the product.



```sql
SELECT * FROM PRODUCT_DETAILS_STATUS;

DROP VIEW PRODUCT_DETAILS_STATUS;
```

ORDERITEM_ID	PROD_MODEL_NAME	COLOR	SIZE	PRODUCT_UNITPRICE	ORDER_DATE	ORDERITEM_STATUS
100104	Acer Xpresso XXl	yellow	Small	470	2012-12-24	Order Delivered
100188	Alphaing	red	13.4in	1028	2015-04-18	Order Delivered
100187	Anovefix	indigo	Medium	592	2015-01-09	Order Delivered
100124	Ap Job	green	Small	2754	2013-05-28	Order Delivered
100174	Apis	violet	Large	1505	2014-09-05	Order Delivered
100102	Apple Macbook Air	orange	14.5in	3325	2012-12-21	Order Delivered
100144	Bigtax	yellow	Large	1729	2013-10-16	Order Delivered
100155	Bioantom	violet	14.5in	3298	2014-01-27	Order Delivered
100136	Biotamtop	violet	Small	3032	2013-09-19	Order Delivered
100109	Clarks Pumps	indigo	Small	4288	2013-01-24	Order Delivered
100147	Danlam	red	Medium	779	2013-11-02	Order Delivered
100101	Dell Inspiron 800	blue	14.5in	2324	2012-12-10	Order Delivered
100130	Domnamtrax	green	13.4in	2694	2013-08-10	Order Delivered
100186	Ecoair	red	Large	968	2015-01-08	Order Delivered
100106	F21 Slim fit jegging	yellow	Small	5340	2012-12-27	Order Delivered
100160	Faxstrong	blue	Large	398	2014-03-25	Order Delivered
100138	Fixron	green	Small	2850	2013-09-21	Order Delivered

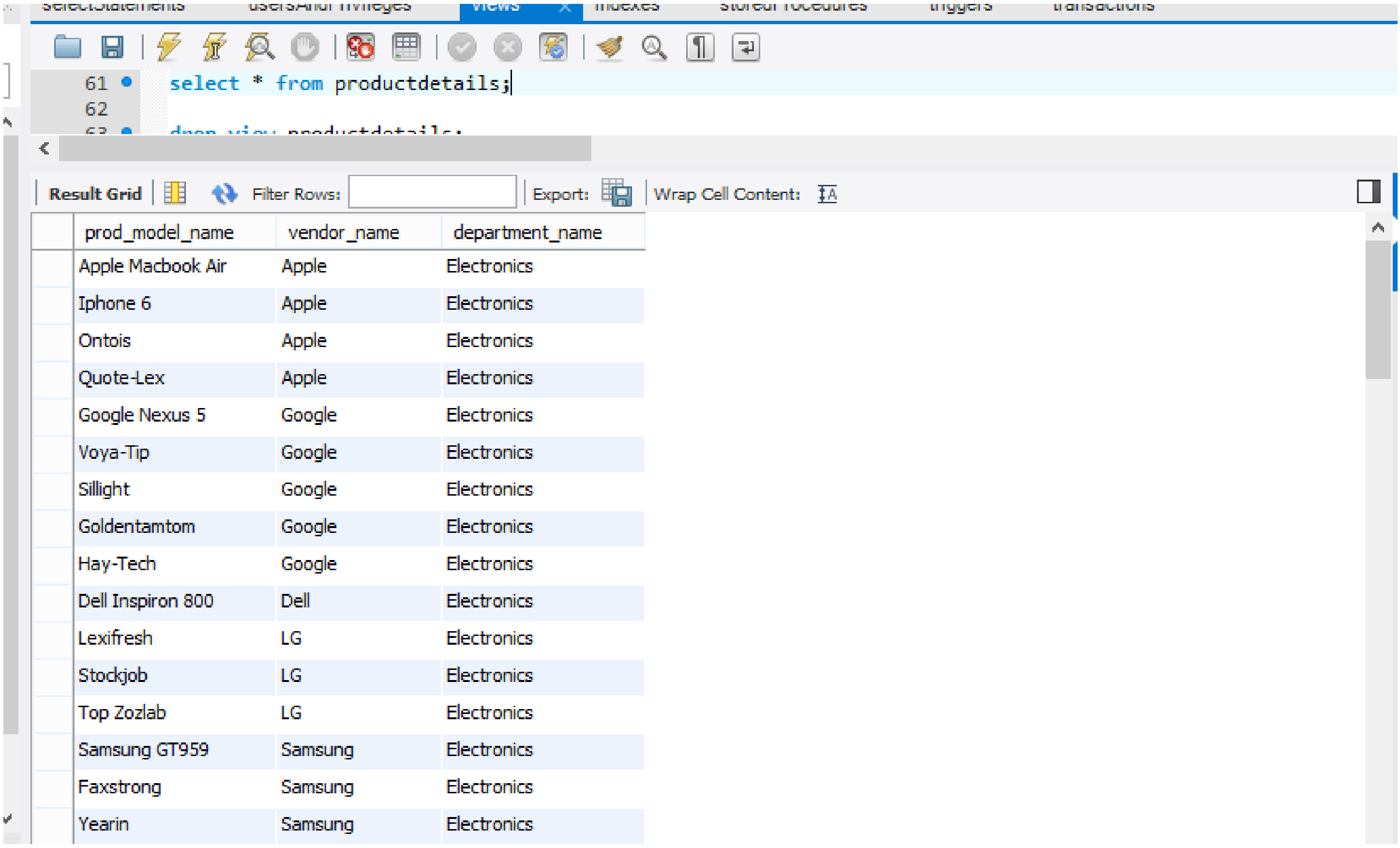
5. **Product Details Status View**: To check the status of the product.



```
select * from productdetails;

drop view productdetails;
```

prod_model_name	vendor_name	department_name
Apple Macbook Air	Apple	Electronics
Iphone 6	Apple	Electronics
Ontois	Apple	Electronics
Quote-Lex	Apple	Electronics
Google Nexus 5	Google	Electronics
Voya-Tip	Google	Electronics
Sillight	Google	Electronics
Goldentamtom	Google	Electronics
Hay-Tech	Google	Electronics
Dell Inspiron 800	Dell	Electronics
Lexifresh	LG	Electronics
Stockjob	LG	Electronics
Top Zozlab	LG	Electronics
Samsung GT959	Samsung	Electronics
Faxstrong	Samsung	Electronics
Yearin	Samsung	Electronics

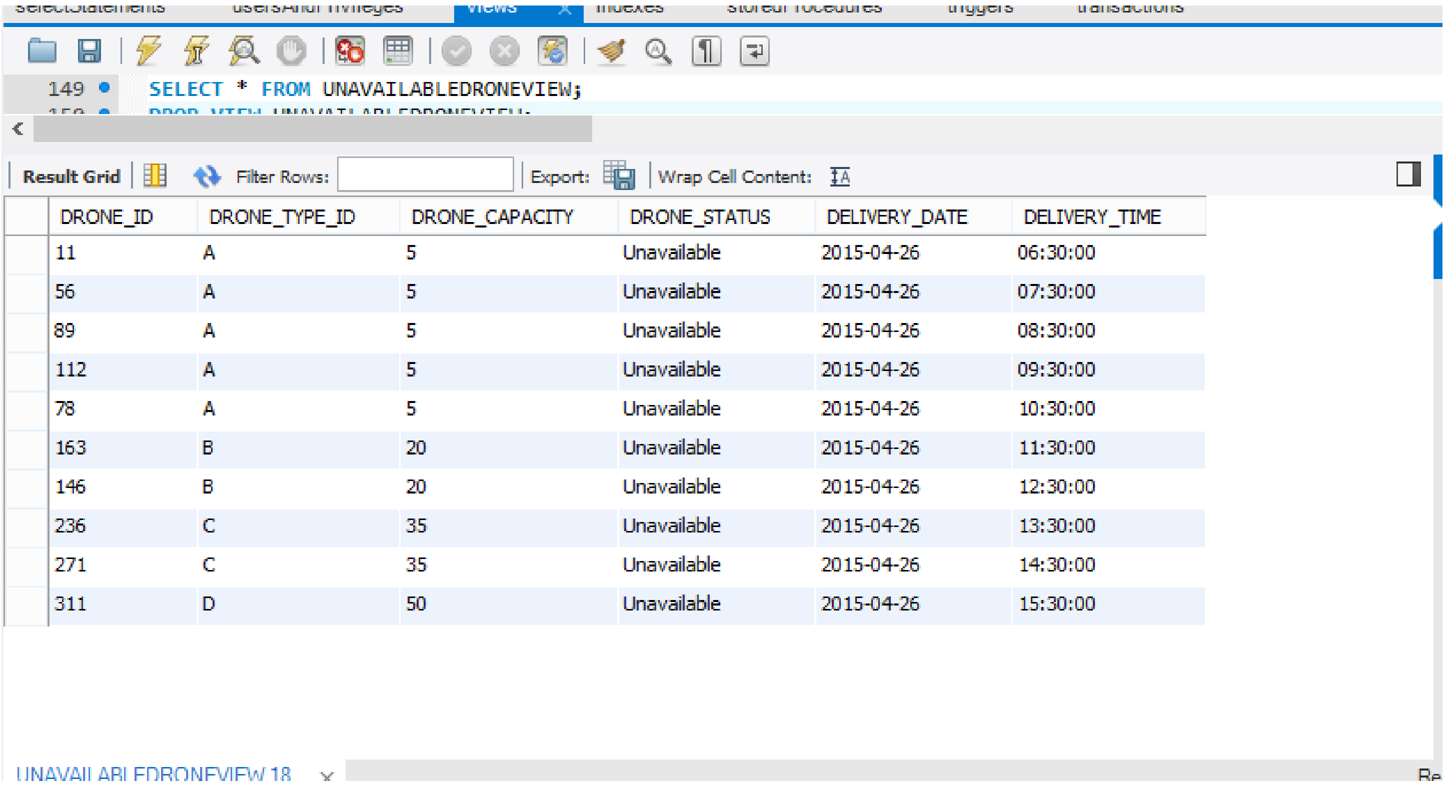
6. **Product Details View**: To check the status of the product.



```
select * from productdetails;

drop view productdetails;
```

prod_model_name	vendor_name	department_name
Apple Macbook Air	Apple	Electronics
Iphone 6	Apple	Electronics
Ontois	Apple	Electronics
Quote-Lex	Apple	Electronics
Google Nexus 5	Google	Electronics
Voya-Tip	Google	Electronics
Sillight	Google	Electronics
Goldentamtom	Google	Electronics
Hay-Tech	Google	Electronics
Dell Inspiron 800	Dell	Electronics
Lexifresh	LG	Electronics
Stockjob	LG	Electronics
Top Zozlab	LG	Electronics
Samsung GT959	Samsung	Electronics
Faxstrong	Samsung	Electronics
Yearin	Samsung	Electronics

7. **Unavailable Drone View**: This view will display all the drones which are unavailable.



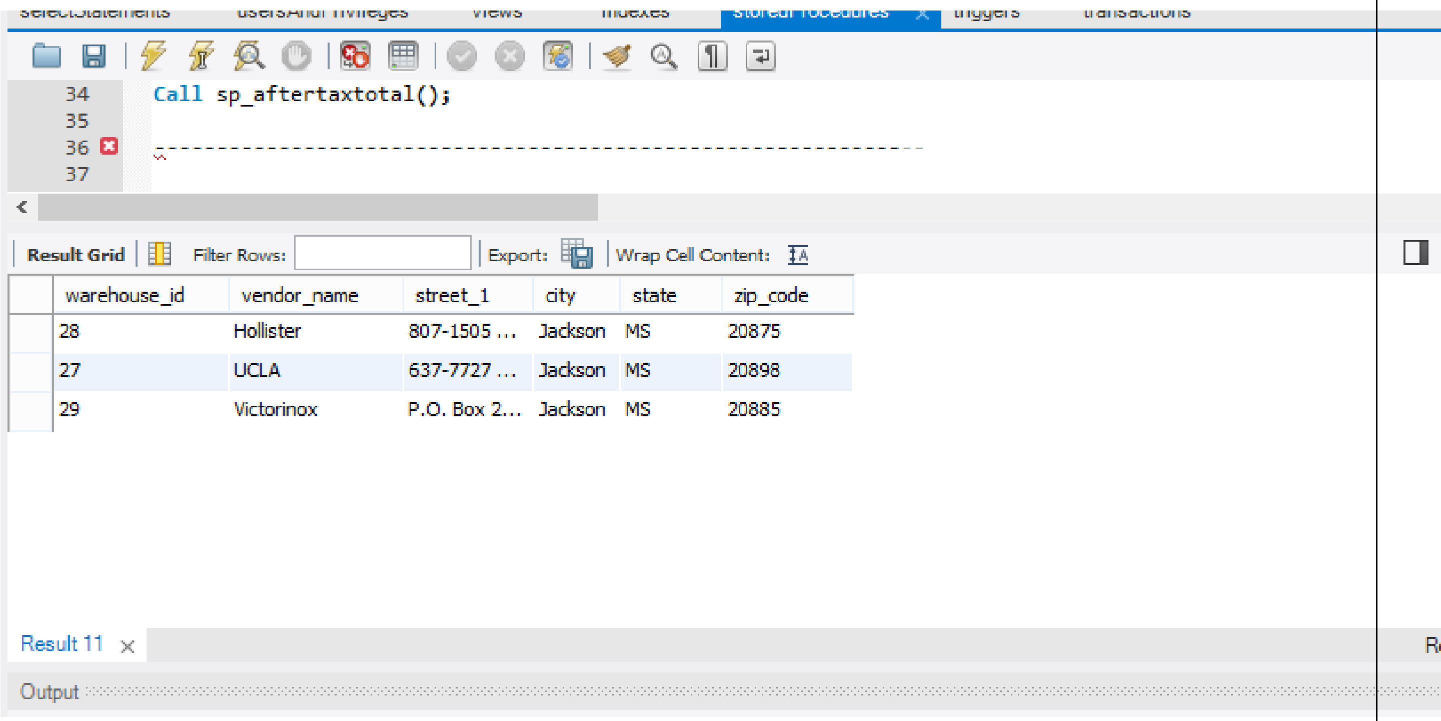
```
SELECT * FROM UNAVAILABLEDRONEVIEW;
DROP VIEW UNAVAILABLEDRONEVIEW;
```

DRONE_ID	DRONE_TYPE_ID	DRONE_CAPACITY	DRONE_STATUS	DELIVERY_DATE	DELIVERY_TIME
11	A	5	Unavailable	2015-04-26	06:30:00
56	A	5	Unavailable	2015-04-26	07:30:00
89	A	5	Unavailable	2015-04-26	08:30:00
112	A	5	Unavailable	2015-04-26	09:30:00
78	A	5	Unavailable	2015-04-26	10:30:00
163	B	20	Unavailable	2015-04-26	11:30:00
146	B	20	Unavailable	2015-04-26	12:30:00
236	C	35	Unavailable	2015-04-26	13:30:00
271	C	35	Unavailable	2015-04-26	14:30:00
311	D	50	Unavailable	2015-04-26	15:30:00

Stored Procedures

1. Main Procedure:A procedure to assign a Drone_Id whenever an order is placed by a customer. This takes into consideration the package weight and compares it with the drone capacity to find an appropriate match with the drones that are available in the warehouse.

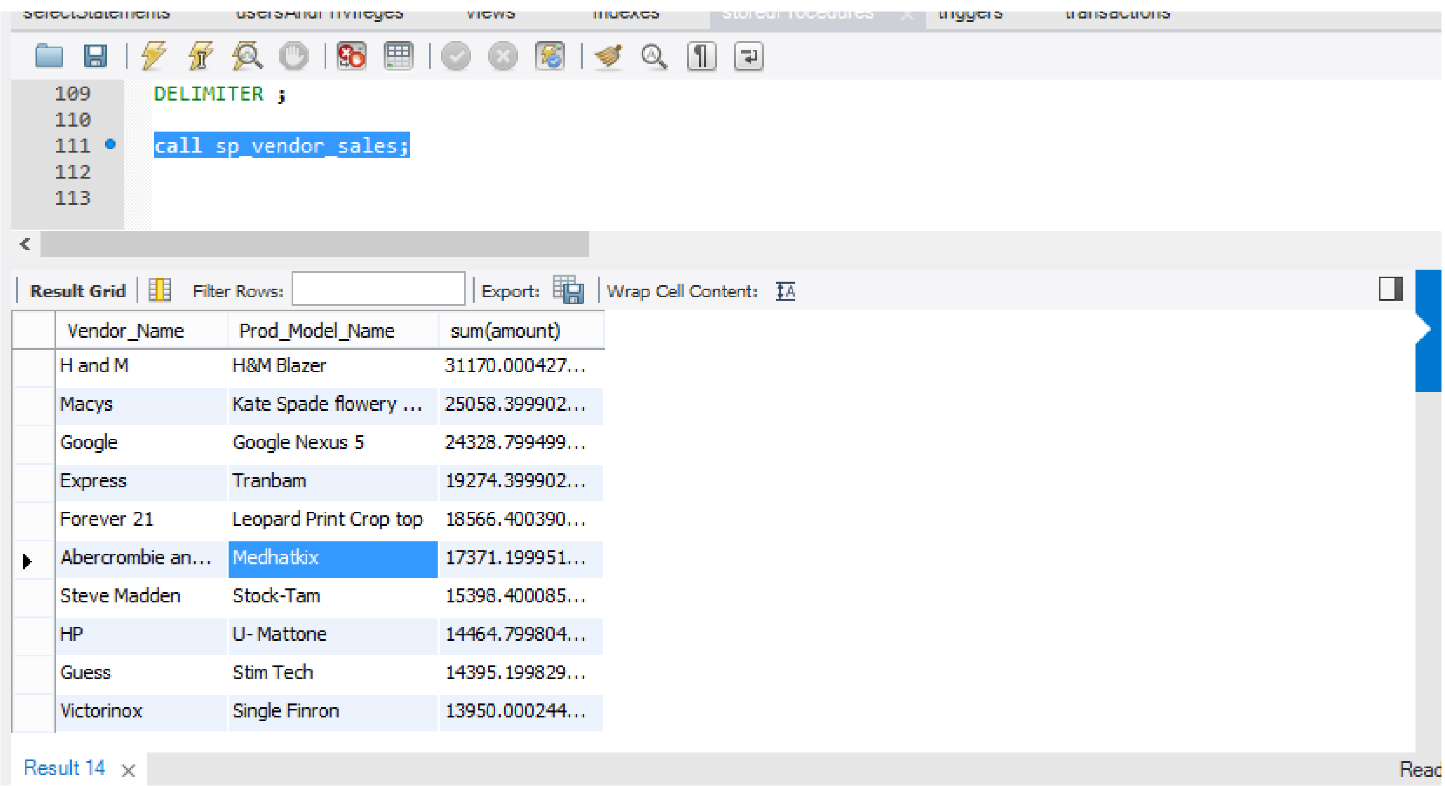
2. AfterTaxTotal: A procedure to get total amount invoice by adding tax to the product unit price.



```
Call sp_aftertaxtotal();

-----------------------------------------------------------------
```

warehouse_id	vendor_name	street_1	city	state	zip_code
28	Hollister	807-1505 ...	Jackson	MS	20875
27	UCLA	637-7727 ...	Jackson	MS	20898
29	Victorinox	P.O. Box 2...	Jackson	MS	20885

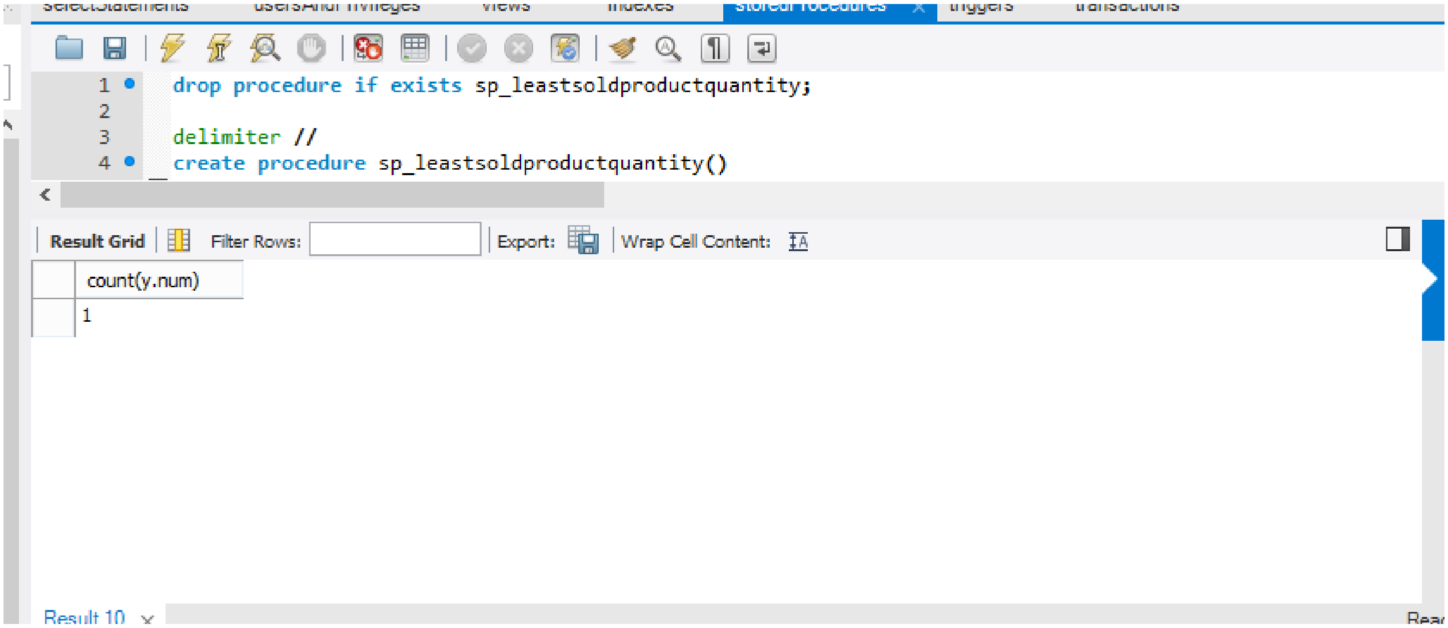
3. Vendor Sales: A procedure to find the top ten vendors with the product model that has the maximum sales.



```
DELIMITER ;

call sp_vendor_sales;
```

Vendor_Name	Prod_Model_Name	sum(amount)
H and M	H&M Blazer	31170.000427...
Macys	Kate Spade flowery ...	25058.399902...
Google	Google Nexus 5	24328.799499...
Express	Tranbam	19274.399902...
Forever 21	Leopard Print Crop top	18566.400390...
Abercrombie an...	Medhatkix	17371.199951...
Steve Madden	Stock-Tam	15398.400085...
HP	U- Mattone	14464.799804...
Guess	Stim Tech	14395.199829...
Victorinox	Single Finron	13950.000244...

4. Least Sold Product Quantity: A procedure to find the least sold product

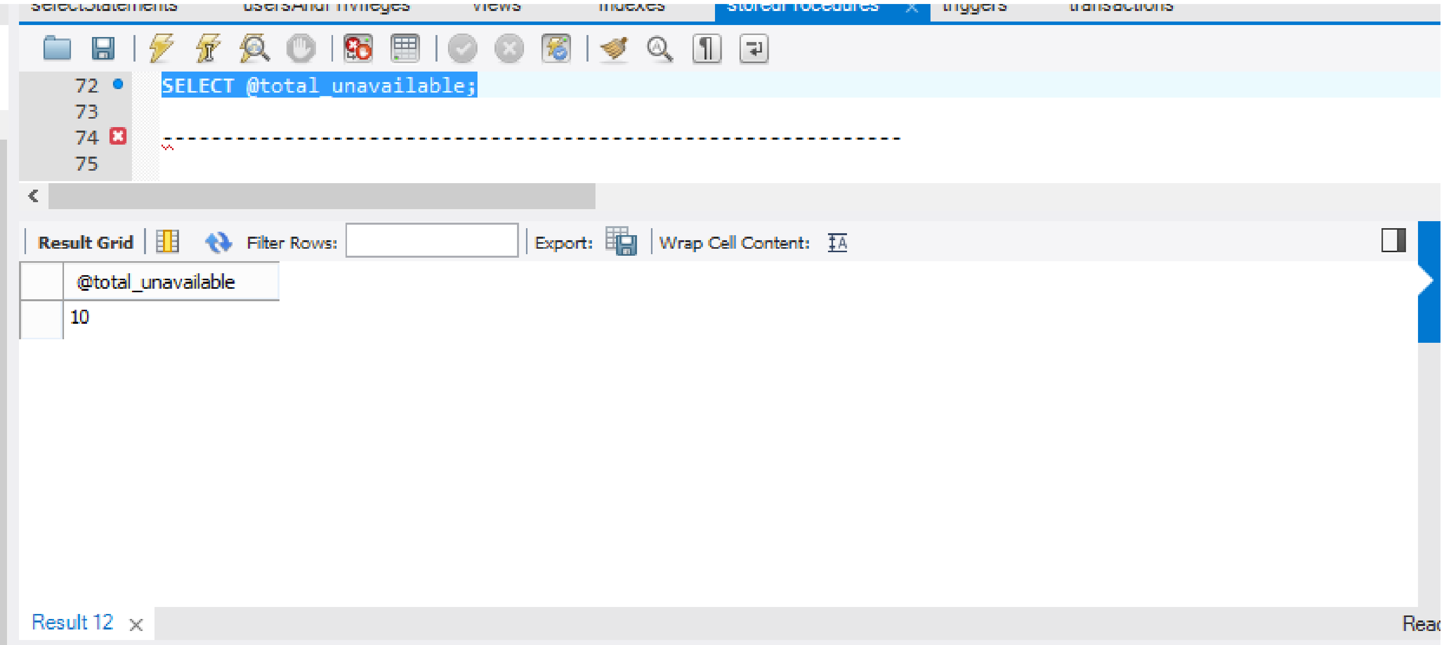


```
drop procedure if exists sp_leastsoldproductquantity;

delimiter //
create procedure sp_leastsoldproductquantity()
```

```
count(y.num)
1
```

Parametric Procedures

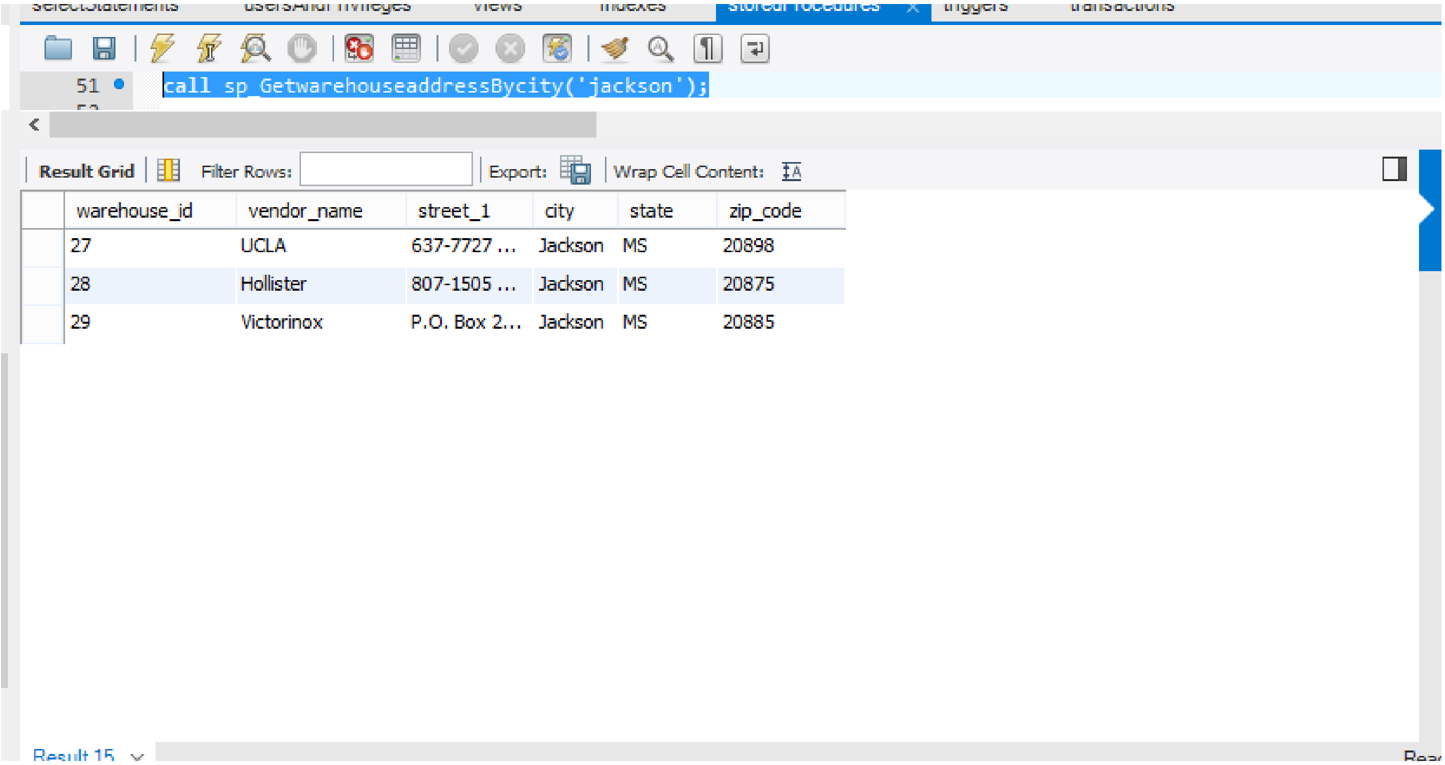
1. Drone Unavailable Number: Parametric OUT procedure to count the number of drones with a particular status.



```
SELECT @total_unavailable;

-------------------------------------------------------------
```

	@total_unavailable
	10

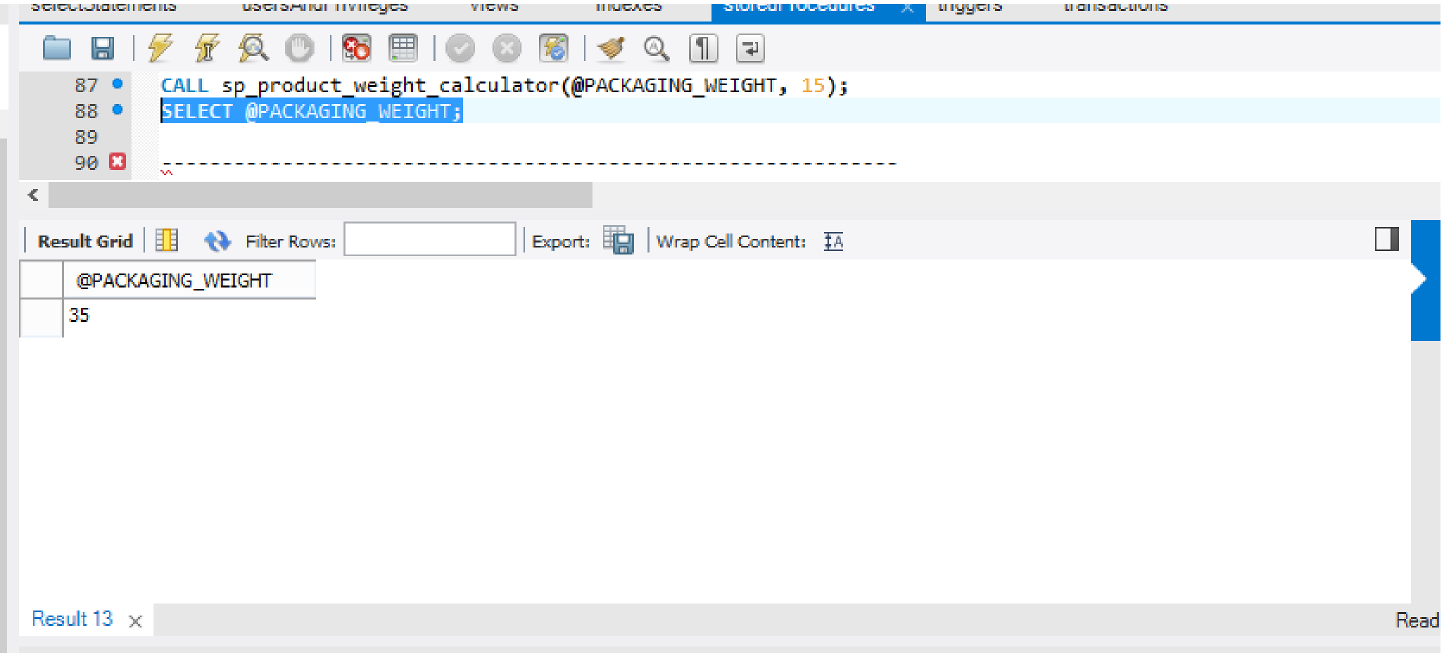
2. Get Warehouse Address by City: Parametric IN procedure to get warehouse address by inputting a particular city.



```
call sp_GetwarehouseaddressBycity('jackson');
```

warehouse_id	vendor_name	street_1	city	state	zip_code
27	UCLA	637-7727 ...	Jackson	MS	20898
28	Hollister	807-1505 ...	Jackson	MS	20875
29	Victorinox	P.O. Box 2...	Jackson	MS	20885

3. Product Weight Calculator: Parametric INOUT procedure to calculate approximate package weight.



```
CALL sp_product_weight_calculator(@PACKAGING_WEIGHT, 15);
SELECT @PACKAGING_WEIGHT;

--------------------------------------------------------------
```

```
@PACKAGING_WEIGHT
35
```

TRIGGERS

1. **A trigger to reduce the quantity of the Product_model when an item is inserted into the order_item table. This reduces the total quantity available by 1.**

```
     Delimiter //
Create trigger reducequantity after insert on order_item for each row
begin
update product_model pm inner join product_unit pu on
pm.Model_number=pu.Model_Number
inner join order_item oi on oi.serial_no= pu.serial_no
set pm.total_quantity= pm.total_quantity-1 ;
end //

drop trigger reducequantity;
```

2. **A trigger to find the average feedback rating in product_model, when a feed feedback is entered in the feedback table.**

```
Delimiter //
Create trigger averagefeedback after insert on feedback for each row
begin
update
product_model pm
inner join feedback fb
on
pm.Model_number=fb.Model_Number
set pm.average_rating= num where
num=(sum(fb.product_rating)/count(fb.product_rating));

end //
```

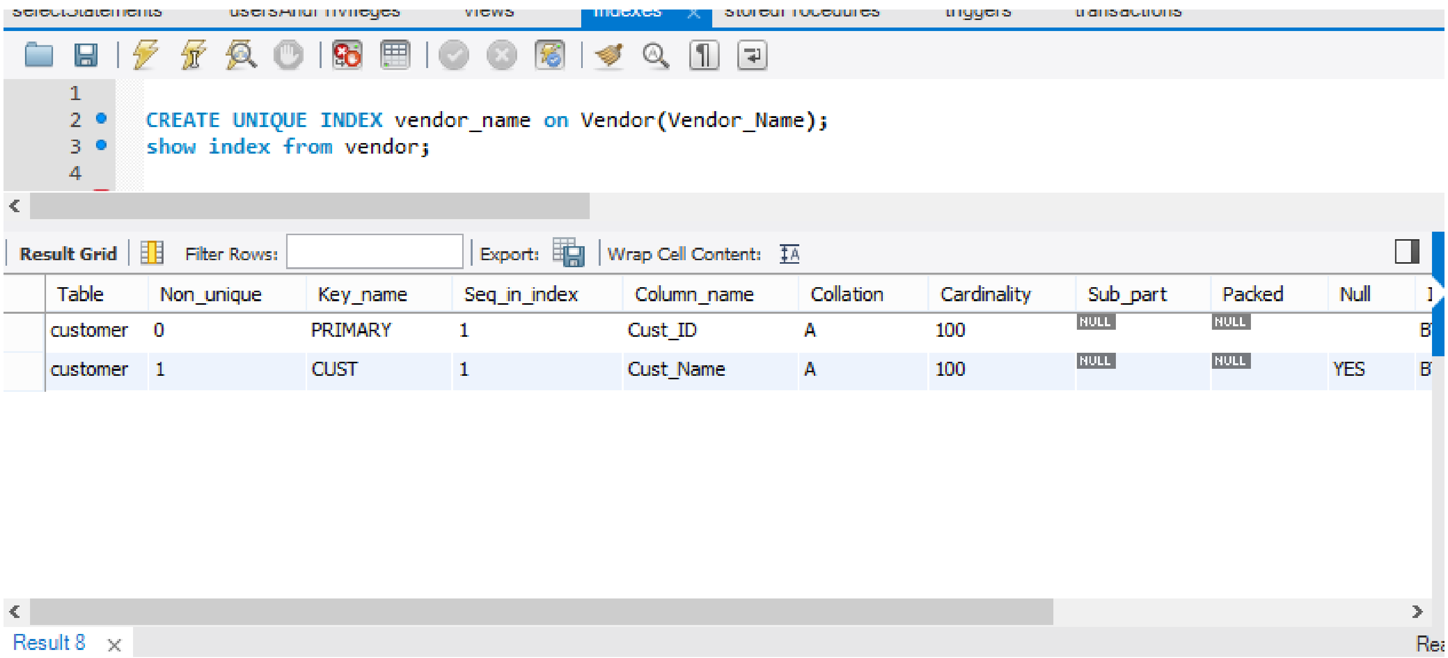
TRANSACTION

- In almost all applications that access SQL databases, multiple users concurrently attempt to view and modify data. The simultaneous operations may result in data that is inconsistent and inaccurate –Or worse, database corruption. Using “Transactions” avoids these problems by isolating each operation.
- Transaction is a set of one or more SQL statements that perform a set of related actions.
- The statements are grouped together and treated as a single unit whose success or failure depends on the successful execution of each statement in the transaction.
-

```
start transaction;
savepoint savepoint1;
select @OrderItem_ID:=max(OrderItem_ID) from order_item;
set @OrderItem_ID=@OrderItem_ID+1;

insert into
order_item(OrderItem_ID,OrderItem_Status,Order_Date,Package_weight,Serial_No,Drone_ID)
values (@OrderItem_ID,"Order InProcess",now(),3.79,484784,12);

rollback to savepoint savepoint1;

insert into
order_item(OrderItem_ID,OrderItem_Status,Order_Date,Package_weight,Serial_No,Drone_ID)
values(@OrderItem_ID,"Order InProcess",now(),6.78,484786,15);
commit;
```

INDEXES

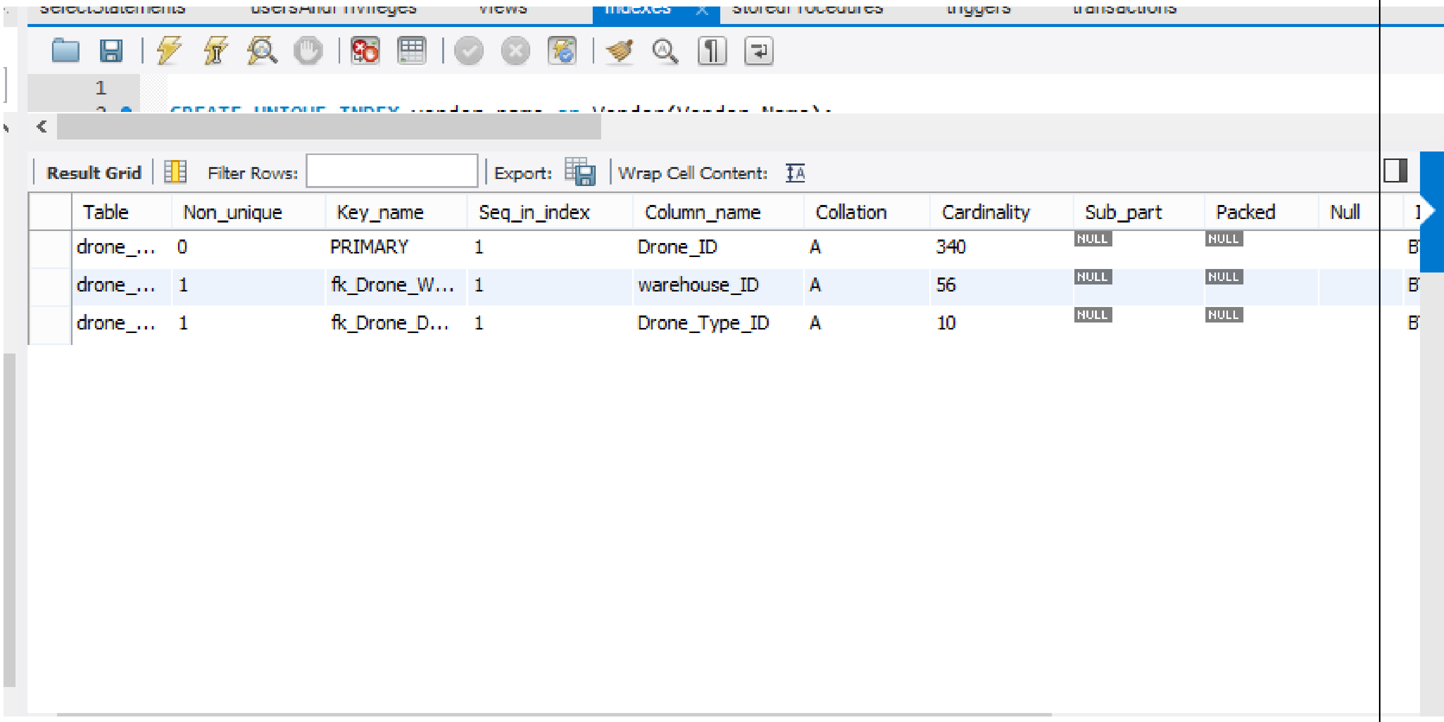
- Customer Index: This is an Index on the Customer table using Customer name.



```sql
CREATE UNIQUE INDEX vendor_name on Vendor(Vendor_Name);
show index from vendor;
```

Table	Non_unique	Key_name	Seq_in_index	Column_name	Collation	Cardinality	Sub_part	Packed	Null	I
customer	0	PRIMARY	1	Cust_ID	A	100	NULL	NULL		B
customer	1	CUST	1	Cust_Name	A	100	NULL	NULL	YES	B

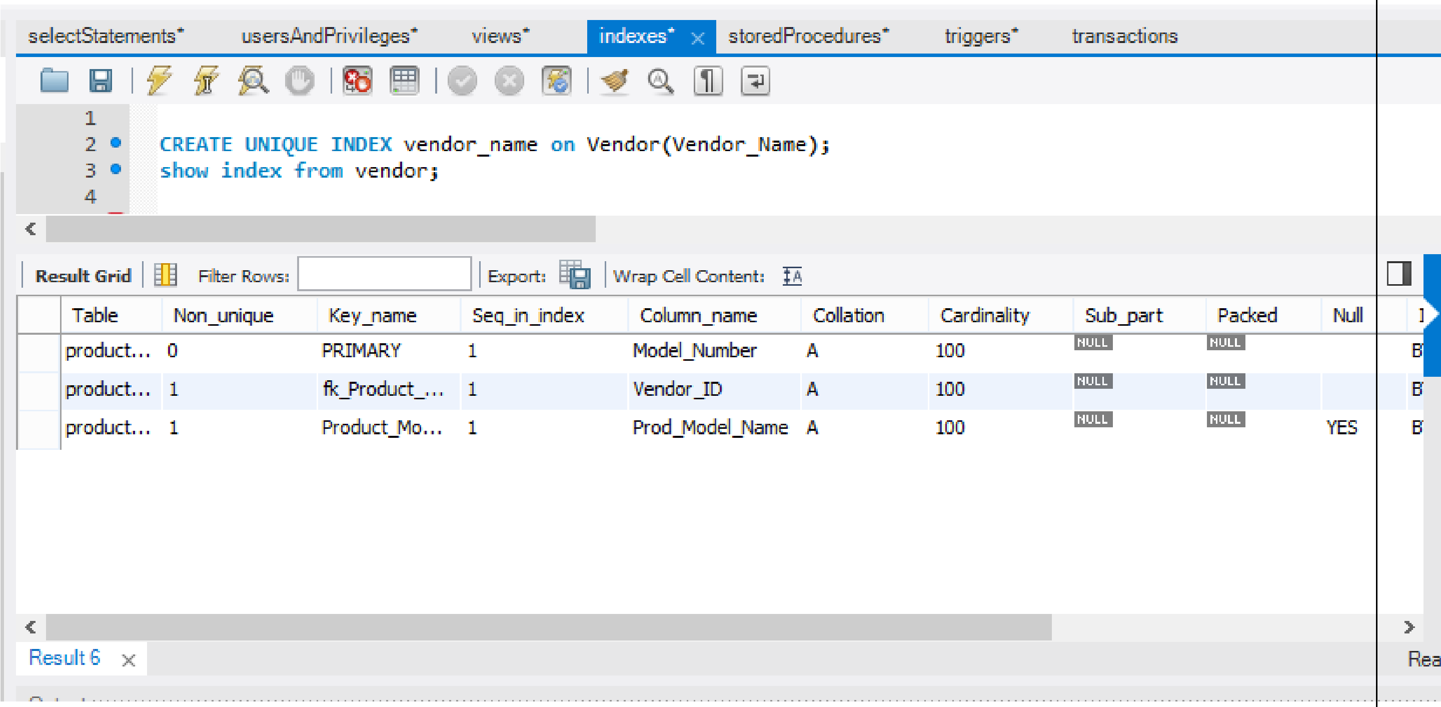
- Drone Details: This is an Index on the Drone_Details table using Drone_ID .



```
CREATE UNIQUE INDEX vendor_name on Vendor(Vendor_Name);
```

Table	Non_unique	Key_name	Seq_in_index	Column_name	Collation	Cardinality	Sub_part	Packed	Null	I
drone_...	0	PRIMARY	1	Drone_ID	A	340	NULL	NULL		B
drone_...	1	fk_Drone_W...	1	warehouse_ID	A	56	NULL	NULL		B
drone_...	1	fk_Drone_D...	1	Drone_Type_ID	A	10	NULL	NULL		B

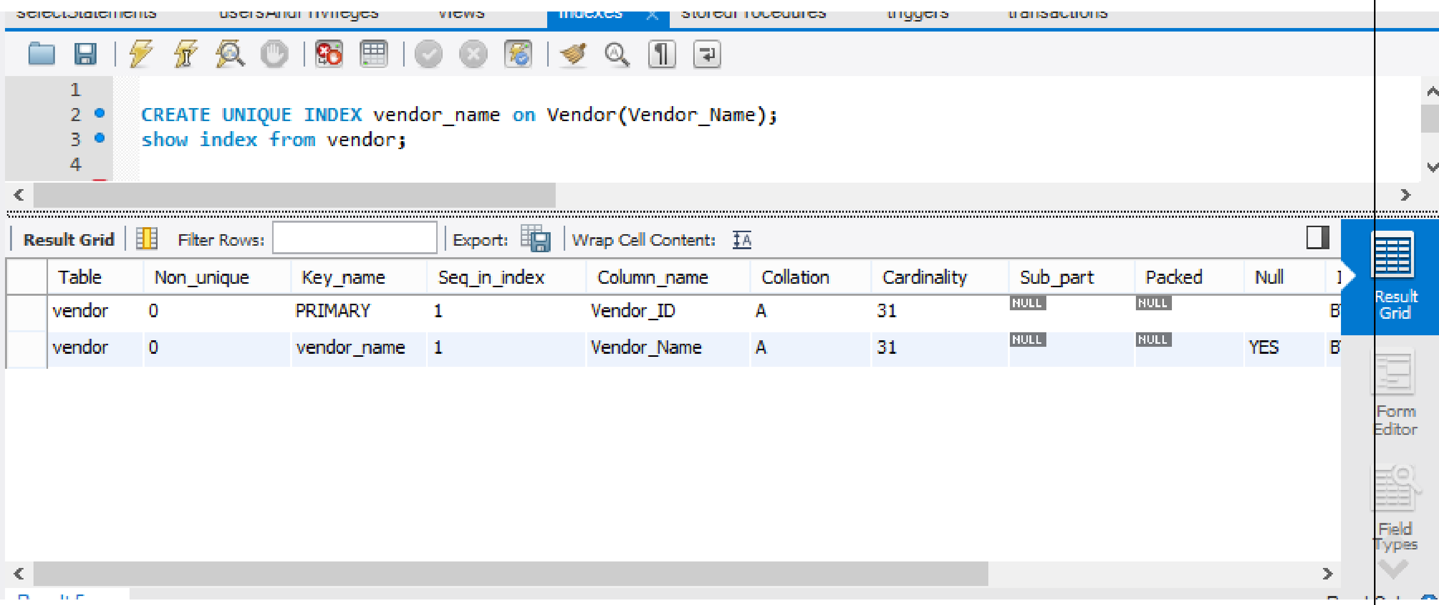
- Product Model: This is an Index on the Product table using Product_Model_name.



```
CREATE UNIQUE INDEX vendor_name on Vendor(Vendor_Name);
show index from vendor;
```

Table	Non_unique	Key_name	Seq_in_index	Column_name	Collation	Cardinality	Sub_part	Packed	Null	I
product...	0	PRIMARY	1	Model_Number	A	100	NULL	NULL		B
product...	1	fk_Product_...	1	Vendor_ID	A	100	NULL	NULL		B
product...	1	Product_Mo...	1	Prod_Model_Name	A	100	NULL	NULL	YES	B

- Vendor: This is an Index on the Vendor table using Vendor_Name.



```

CREATE UNIQUE INDEX vendor_name on Vendor(Vendor_Name);
show index from vendor;

```

Table	Non_unique	Key_name	Seq_in_index	Column_name	Collation	Cardinality	Sub_part	Packed	Null	I
vendor	0	PRIMARY	1	Vendor_ID	A	31	NULL	NULL		B
vendor	0	vendor_name	1	Vendor_Name	A	31	NULL	NULL	YES	B

USERS AND PRIVILEGES

MySQL is an open source database management software that helps users store, organize and later retrieve data. It has a variety of options to grant specific users nuanced privileges within the tables and databases.

Users:

- Ecommerce Admin:
- Drone Manager:
- Vendor:
- Customer:

Privileges:

- Create: allows them to create new tables or databases
- Insert: allows them to insert rows into tables
- Select: allows them to use the select command to read through databases
- Update: allow them to update table rows.
- Drop: allows them to delete rows from tables.

Backups

Our Database implements two kinds of backup

- Full Backup
- Incremental Backup

- Since it is an e-commerce website, we have assumed that there is least traffic during the night.
- We have also assumed that there is lesser traffic during the weeknights rather than weekend nights.
- We assume that full backup takes 6 hours to complete.
- We assume that an incremental backup takes about 3 hours to complete.
- If full backup is scheduled on public holidays (Christmas, Thanksgiving) then it will be completed on the previous day as well as the day after the holiday.

Day of the week	Type of Backup	Timing
Sunday	Incremental Backup	1:30 am-4:30 am
Monday	Full Backup	12 am-6 am
Tuesday	Incremental Backup	1:30 am-4:30 am
Wednesday	Incremental Backup	1:30 am-4:30 am
Thursday	Incremental Backup	1:30 am-4:30 am
Friday	Full Backup	12 am- 6 am
Saturday	Incremental Backup	1:30 am-4:30 am

Normalization

Database normalization is the process of organizing the fields and tables of a relational database to minimize redundancy. Normalization usually involves dividing large tables into smaller tables and defining relationships between them.

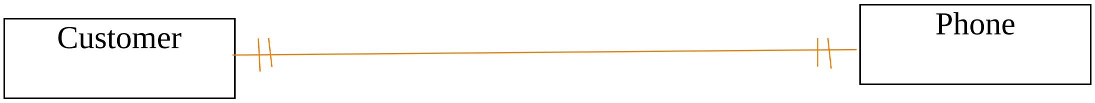
All the tables in the database system are normalized. It involves 1NF, 2NF and 3NF.

<u>Enforcing 1 NF:</u>

A table is in 1NF if it is free from multi-valued rows. In this database system all the tables contain only single values.

<u>Enforcing 2NF & 3NF:</u>

A table is in 2NF if it is in 1NF and the whole of the composite primary key is used to uniquely identify all the other non-key attributes. Attributes which have partial dependent on one part of the composite key alone are removed and formed as a separate table. A table is in 3NF if it is in 2NF and no non-key field depends on a key which is not a primary key. It overcomes the update and deletion anomalies



References

https://dev.mysql.com/

http://www.mysqltutorial.org/

http://stackoverflow.com/

http://www.w3schools.com/

http://generatedata.com/

http://www.wikipedia.com/

Books:

MySQL Documentation

Modern Database Management

Beginning SQL

Presentation slides by Prof. Mutsalklisana