# Contents

# 1 Introduction

This report details about designing a data warehouse from the operational database and how queries can be executed to get results that help in managerial decisions.

Details of the Oracle Accounts:

Sunil Cyriac - S29003164
Jayendra Kishan Ramanathan- S28966112
Password : student

Contribution:
Name: Sunil Cyriac – Student ID – 29003164, Contribution – 50%
Name: Jayendra Kishan Ramanathan - Student ID – 28966112, Contribution – 50%

List of Parts each student did:

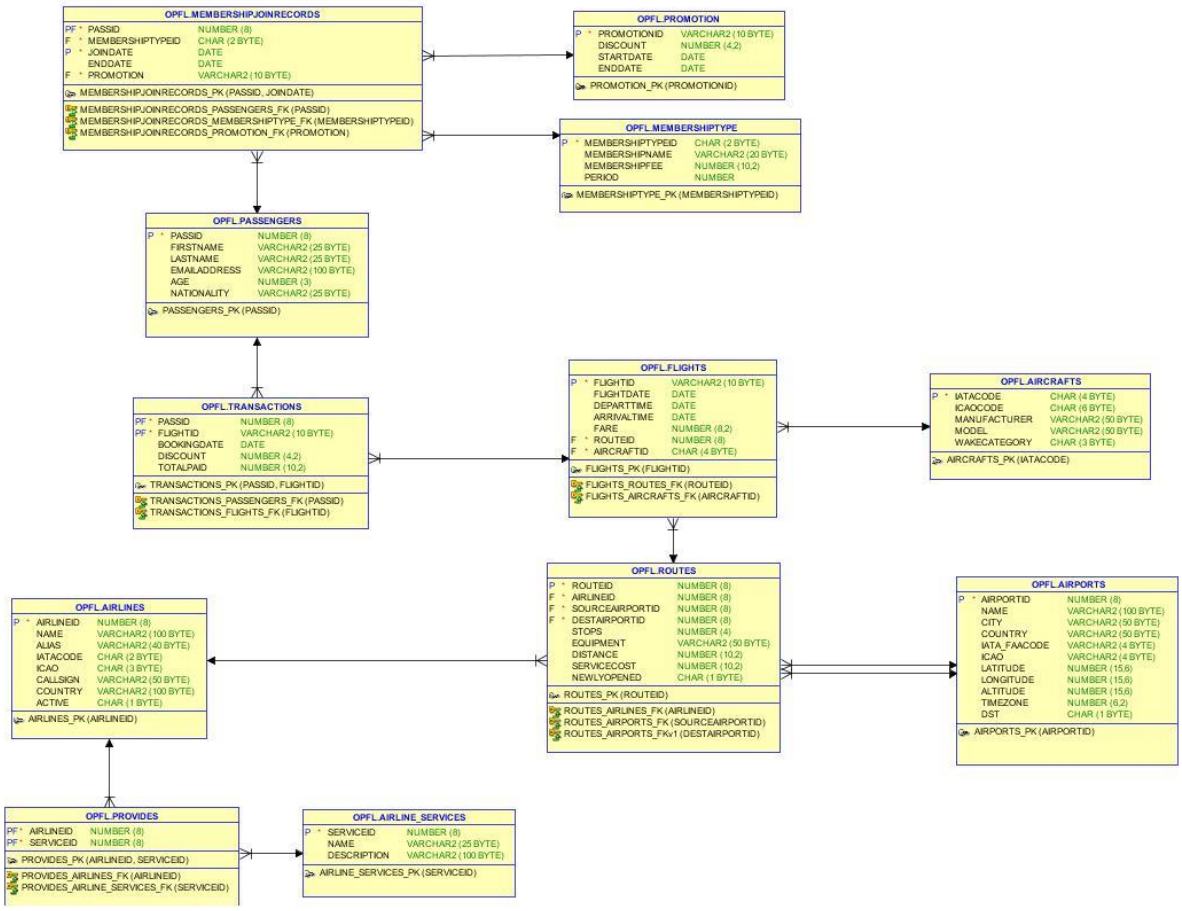
Both of us discussed, brainstormed and performed the tasks together in unison to ensure that both of us learn together.

Sunil – All tasks
Kishan – All tasks.

# 2 Tasks

## A ER Diagram

The below is the ER diagram of the operational database.



## B Data Cleaning

This section deals with all the data cleaning that has been performed on as a part of the project. Details of data before and after cleaning has been provided for reference. Cleaning has been performed on airport,

Cleaning the airport table:

The airport table has some unclean data as seen in the screenshot below. There are some airports with an ID in the negative which is not possible. Hence there is a need to clean the data so that meaningful decision can be taken.

```
select * from airports order by airportid;
```

Script Output × Query Result ×

SQL | Fetched 50 rows in 0.255 seconds

| | AIRPORTID | NAME | CITY | COUNTRY | IATA_FAACODE | ICAO | LATITUDE | LONGITUDE | ALTITUDE | TIMEZONE | DST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -5 | Goroka | Goroka | Papua New Guinea | GKA | AYGA | -6.081689 | 145.391881 | 5282 | 10 | U |
| 2 | -4 | Goroka | Goroka | Papua New Guinea | GKA | AYGA | -6.081689 | 145.391881 | 5282 | 10 | U |
| 3 | -3 | Goroka | Goroka | Papua New Guinea | GKA | AYGA | -6.081689 | 145.391881 | 5282 | 10 | U |
| 4 | -2 | Goroka | Goroka | Papua New Guinea | GKA | AYGA | -6.081689 | 145.391881 | 5282 | 10 | U |
| 5 | -1 | Goroka | Goroka | Papua New Guinea | GKA | AYGA | -6.081689 | 145.391881 | 5282 | 10 | U |
| 6 | 1 | Goroka | Goroka | Papua New Guinea | GKA | AYGA | -6.081689 | 145.391881 | 5282 | 10 | U |
| 7 | 2 | Madang | Madang | Papua New Guinea | MAG | AYMD | -5.207083 | 145.7887 | 20 | 10 | U |
| 8 | 3 | Mount Hagen | Mount Hagen | Papua New Guinea | HGU | AYMH | -5.826789 | 144.295861 | 5388 | 10 | U |
| 9 | 4 | Nadzab | Nadzab | Papua New Guinea | LAE | AYNZ | -6.569828 | 146.726242 | 239 | 10 | U |
| 10 | 5 | Port Moresby Jacksons Intl | Port Moresby | Papua New Guinea | POM | AYPY | -9.443383 | 147.22005 | 146 | 10 | U |
| 11 | 6 | Wewak Intl | Wewak | Papua New Guinea | WWK | AYWK | -3.583828 | 143.669186 | 19 | 10 | U |
| 12 | 7 | Narsarsuaq | Narssarssuaq | Greenland | UAK | BGBW | 61.160517 | -45.425978 | 112 | -3 | E |
| 13 | 8 | Nuuk | Godthaab | Greenland | GOH | BGGH | 64.190922 | -51.678064 | 283 | -3 | U |
| 14 | 9 | Sondre Stromfjord | Sondrestrom | Greenland | SFJ | BGSF | 67.016969 | -50.689325 | 165 | -3 | E |
| 15 | 10 | Thule Air Base | Thule | Greenland | THU | BGTL | 76.531203 | -68.703161 | 251 | -4 | E |

Query to find out unclean data:

**select * from airports where airportid < 0;**

| | AIRPORTID | NAME | CITY | COUNTRY | IATA_FAACODE | ICAO | LATITUDE | LONGITUDE | ALTITUDE | TIMEZONE | DST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -5 | Goroka | Goroka | Papua New Guinea | GKA | AYGA | -6.081689 | 145.391881 | 5282 | 10 | U |
| 2 | -4 | Goroka | Goroka | Papua New Guinea | GKA | AYGA | -6.081689 | 145.391881 | 5282 | 10 | U |
| 3 | -3 | Goroka | Goroka | Papua New Guinea | GKA | AYGA | -6.081689 | 145.391881 | 5282 | 10 | U |
| 4 | -2 | Goroka | Goroka | Papua New Guinea | GKA | AYGA | -6.081689 | 145.391881 | 5282 | 10 | U |
| 5 | -1 | Goroka | Goroka | Papua New Guinea | GKA | AYGA | -6.081689 | 145.391881 | 5282 | 10 | U |

The above shows the list of all the airports that have an ID in the negative.

Cleaning is done by deleting the records that have airport id <0. The below query helps in the action

delete from airports where airportid<0;

Records after the data is clean:

```
select * from airports where airportid<0;
```

Script Output × Query Result ×

SQL | All Rows Fetched: 0 in 0.084 seconds

| AIRPORTID | NAME | CITY | COUNTRY | IATA_FA... | ICAO | LATITUDE | LONGITUDE | ALTITUDE | TIMEZONE | DST |
|---|---|---|---|---|---|---|---|---|---|---|

Worksheet | Query Builder

```
select * from airports;
```

Script Output | Query Result

SQL | Fetched 50 rows in 0.094 seconds

| | AIRPORTID | NAME | CITY | COUNTRY | IATA_FAACODE | ICAO | LATITUDE | LONGITUDE | ALTITUDE | TIMEZONE | DST |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Goroka | Goroka | Papua New Guinea | GKA | AYGA | -6.081689 | 145.391881 | 5282 | 10 | U |
| 2 | 2 | Madang | Madang | Papua New Guinea | MAG | AYMD | -5.207083 | 145.7887 | 20 | 10 | U |
| 3 | 3 | Mount Hagen | Mount Hagen | Papua New Guinea | HGU | AYMH | -5.826789 | 144.295861 | 5388 | 10 | U |
| 4 | 4 | Nadzab | Nadzab | Papua New Guinea | LAE | AYNZ | -6.569828 | 146.726242 | 239 | 10 | U |
| 5 | 5 | Port Moresby Jacksons Intl | Port Moresby | Papua New Guinea | POM | AYPY | -9.443383 | 147.22005 | 146 | 10 | U |
| 6 | 6 | Wewak Intl | Wewak | Papua New Guinea | WWK | AYWK | -3.583828 | 143.669186 | 19 | 10 | U |
| 7 | 7 | Narsarsuaq | Narssarssuaq | Greenland | UAK | BGBW | 61.160517 | -45.425978 | 112 | -3 | E |
| 8 | 8 | Nuuk | Godthaab | Greenland | GOH | BGGH | 64.190922 | -51.678064 | 283 | -3 | U |
| 9 | 9 | Sondre Stromfjord | Sondrestrom | Greenland | SFJ | BGSF | 67.016969 | -50.689325 | 165 | -3 | E |
| 10 | 10 | Thule Air Base | Thule | Greenland | THU | BGTL | 76.531203 | -68.703161 | 251 | -4 | E |
| 11 | 11 | Akureyri | Akureyri | Iceland | AEY | BIAR | 65.659994 | -18.072703 | 6 | 0 | N |
| 12 | 12 | Egilsstadir | Egilsstadir | Iceland | EGS | BIEG | 65.283333 | -14.401389 | 76 | 0 | N |
| 13 | 13 | Hornafjordur | Hofn | Iceland | HFN | BIHN | 64.295556 | -15.227222 | 24 | 0 | N |
| 14 | 14 | Husavik | Husavik | Iceland | HZK | BIHU | 65.952328 | -17.425978 | 48 | 0 | N |
| 15 | 15 | Isafjordur | Isafjordur | Iceland | IFJ | BIIS | 66.058056 | -23.135278 | 8 | 0 | N |

Cleaning of the airlines table:
While exploring the airline table, we came across some unclean data again.
**select * from airlines order by airlineid;**

```
select * from airlines order by airlineid;
```

Script Output | Query Result

SQL | Fetched 50 rows in 1.697 seconds

| | AIRLINEID | NAME | ALIAS | IATACODE | ICAO | CALLSIGN | COUNTRY |
|---|---|---|---|---|---|---|---|
| 1 | -1 | Unknown | (null) | - | N/A | (null) | Unknown |
| 2 | 1 | Private flight | (null) | - | N/A | (null) | Unknown |
| 3 | 2 | 135 Airways | (null) | (null) | GNL | GENERAL | United States |
| 4 | 3 | 1Time Airline | (null) | 1T | RNX | NEXTIME | South Africa |
| 5 | 4 | 2 Sqn No 1 Elementary Flying Training School | (null) | (null) | WYT | (null) | United Kingdom |
| 6 | 5 | 213 Flight Unit | (null) | (null) | TFU | (null) | Russia |
| 7 | 6 | 223 Flight Unit State Airline | (null) | (null) | CHD | CHKALOVSK-AVIA | Russia |
| 8 | 7 | 224th Flight Unit | (null) | (null) | TTF | CARGO UNIT | Russia |
| 9 | 8 | 247 Jet Ltd | (null) | (null) | TWF | CLOUD RUNNER | United Kingdom |
| 10 | 9 | 3D Aviation | (null) | (null) | SEC | SECUREX | United States |
| 11 | 10 | 40-Mile Air | (null) | Q5 | MLA | MILE-AIR | United States |
| 12 | 11 | 4D Air | (null) | (null) | QRT | QUARTET | Thailand |
| 13 | 12 | 611897 Alberta Limited | (null) | (null) | THD | DONUT | Canada |
| 14 | 13 | Ansett Australia | (null) | AN | AAA | ANSETT | Australia |

Here we see the presence of an airline that has a negative airline id and an unknown name. This clearly indicates the unclean data in the system. We further go ahead to narrow down the records that have negative airlineID.

Worksheet | Query Builder

```
select * from airlines where airlineid <0;
```

Script Output | Query Result

SQL | All Rows Fetched: 1 in 0.086 seconds

| | AIRLINEID | NAME | ALIAS | IATACODE | ICAO | CALLSIGN | COUNTRY | ACTIVE |
|---|---|---|---|---|---|---|---|---|
| 1 | -1 | Unknown | (null) | - | N/A | (null) | Unknown | Y |

We clean the same using the following command:

**delete from airlines where airlineid <0;**

Once this is done, we see that the unclean data is removed from the system.

Worksheet | Query Builder

```
select * from airlines where airlineid <0;
```

Script Output | Query Result

SQL | All Rows Fetched: 0 in 0.093 seconds

| AIRLINEID | NAME | ALIAS | IATACODE | ICAO | CALLSIGN | COUNTRY | ACTIVE |
|---|---|---|---|---|---|---|---|

Table with clean data:

```
select * from airlines order by airlineid ;
```

Script Output | Query Result

SQL | Fetched 50 rows in 0.095 seconds

| | AIRLINEID | NAME | ALIAS | IATACODE | ICAO | CALLSIGN | COUNTRY |
|---|---|---|---|---|---|---|---|
| 1 | 1 | Private flight | (null) | - | N/A | (null) | Unknown |
| 2 | 2 | 135 Airways | (null) | (null) | GNL | GENERAL | United States |
| 3 | 3 | 1Time Airline | (null) | 1T | RNX | NEXTIME | South Africa |
| 4 | 4 | 2 Sqn No 1 Elementary Flying Training School | (null) | (null) | WYT | (null) | United Kingdom |
| 5 | 5 | 213 Flight Unit | (null) | (null) | TFU | (null) | Russia |
| 6 | 6 | 223 Flight Unit State Airline | (null) | (null) | CHD | CHKALOVSK-AVIA | Russia |
| 7 | 7 | 224th Flight Unit | (null) | (null) | TTF | CARGO UNIT | Russia |
| 8 | 8 | 247 Jet Ltd | (null) | (null) | TWF | CLOUD RUNNER | United Kingdom |
| 9 | 9 | 3D Aviation | (null) | (null) | SEC | SECUREX | United States |
| 10 | 10 | 40-Mile Air | (null) | Q5 | MLA | MILE-AIR | United States |
| 11 | 11 | 4D Air | (null) | (null) | QRT | QUARTET | Thailand |
| 12 | 12 | 611897 Alberta Limited | (null) | (null) | THD | DONUT | Canada |
| 13 | 13 | Ansett Australia | (null) | AN | AAA | ANSETT | Australia |
| 14 | 14 | Abacus International | (null) | 1B | (null) | (null) | Singapore |

Same method is followed for routes table:

**select * from routes order by routeid;**

Worksheet | Query Builder

```
select * from routes order by routeid;
```

Script Output | Query Result

SQL | Fetched 50 rows in 0.377 seconds

| | ROUTEID | AIRLINEID | SOURCEAIRPORTID | DESTAIRPORTID | STOPS | EQUIPMENT | DISTANCE | SERVICECOST | NEWLYOPENED |
|---|---|---|---|---|---|---|---|---|---|
| 1 | -1 | 410 | 2968 | 2990 | 1 | CR1 | -1000 | -20000 | N |
| 2 | 1 | 410 | 2965 | 2990 | 0 | CR2 | 1506.75 | 30135 | N |
| 3 | 2 | 410 | 2966 | 2990 | 0 | CR2 | 1040.38 | 20807.6 | N |
| 4 | 3 | 410 | 2968 | 2990 | 0 | CR2 | 770.47 | 15409.4 | N |
| 5 | 4 | 410 | 2968 | 4078 | 0 | CR2 | 1338.56 | 26771.2 | N |
| 6 | 5 | 410 | 6162 | 4029 | 0 | CR2 | 595.18 | 11903.6 | N |
| 7 | 6 | 410 | 4029 | 6162 | 0 | CR2 | 595.18 | 11903.6 | N |
| 8 | 7 | 410 | 4029 | 6142 | 0 | CR2 | 773.05 | 15461 | N |
| 9 | 8 | 410 | 4029 | 2990 | 0 | CR2 | 715.63 | 14312.6 | N |
| 10 | 9 | 410 | 4029 | 2969 | 0 | CR2 | 1362.62 | 27252.4 | N |
| 11 | 10 | 410 | 4029 | 6969 | 0 | CR2 | 892.72 | 17854.4 | N |
| 12 | 11 | 410 | 4029 | 6160 | 0 | CR2 | 951.4 | 19028 | N |
| 13 | 12 | 410 | 2922 | 6969 | 0 | CR2 | 1660.28 | 33205.6 | N |
| 14 | 13 | 410 | 2957 | 2975 | 0 | CR2 | 1572.47 | 31449.4 | N |
| 15 | 14 | 410 | 4374 | 2958 | 0 | CR2 | 1208.25 | 24165 | N |

To show the records with negative value, we use the following:

**select * from routes where routeid<0;**

Worksheet | Query Builder

```
select * from routes where routeid<0;
```

Script Output | Query Result

SQL | All Rows Fetched: 1 in 0.087 seconds

| | ROUTEID | AIRLINEID | SOURCEAIRPORTID | DESTAIRPORTID | STOPS | EQUIPMENT | DISTANCE | SERVICECOST | NEWLYOPENED |
|---|---|---|---|---|---|---|---|---|---|
| 1 | -1 | 410 | 2968 | 2990 | 1 | CR1 | -1000 | -20000 | N |

The data is then cleaned by removing the illegal record using the following command:

**delete from routes where routeid<0;**

Data in the system after cleaning:

Worksheet | Query Builder

```
select * from routes where routeid<0;
```

Script Output | Query Result

SQL | All Rows Fetched: 0 in 0.091 seconds

| ROUTEID | AIRLINEID | SOURCEA... | DESTAIRP... | STOPS | EQUIPMENT | DISTANCE | SERVICEC... | NEWLYOP... |
|---|---|---|---|---|---|---|---|---|

Worksheet | Query Builder

```
select * from routes order by routeid;
```

Script Output | Query Result

SQL | Fetched 50 rows in 0.278 seconds

| | ROUTEID | AIRLINEID | SOURCEAIRPORTID | DESTAIRPORTID | STOPS | EQUIPMENT | DISTANCE | SERVICECOST | NEWLYOPENED |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 410 | 2965 | 2990 | 0 | CR2 | 1506.75 | 30135 | N |
| 2 | 2 | 410 | 2966 | 2990 | 0 | CR2 | 1040.38 | 20807.6 | N |
| 3 | 3 | 410 | 2968 | 2990 | 0 | CR2 | 770.47 | 15409.4 | N |
| 4 | 4 | 410 | 2968 | 4078 | 0 | CR2 | 1338.56 | 26771.2 | N |
| 5 | 5 | 410 | 6162 | 4029 | 0 | CR2 | 595.18 | 11903.6 | N |
| 6 | 6 | 410 | 4029 | 6162 | 0 | CR2 | 595.18 | 11903.6 | N |
| 7 | 7 | 410 | 4029 | 6142 | 0 | CR2 | 773.05 | 15461 | N |
| 8 | 8 | 410 | 4029 | 2990 | 0 | CR2 | 715.63 | 14312.6 | N |
| 9 | 9 | 410 | 4029 | 2969 | 0 | CR2 | 1362.62 | 27252.4 | N |
| 10 | 10 | 410 | 4029 | 6969 | 0 | CR2 | 892.72 | 17854.4 | N |
| 11 | 11 | 410 | 4029 | 6160 | 0 | CR2 | 951.4 | 19028 | N |
| 12 | 12 | 410 | 2922 | 6969 | 0 | CR2 | 1660.28 | 33205.6 | N |
| 13 | 13 | 410 | 2957 | 2975 | 0 | CR2 | 1572.47 | 31449.4 | N |
| 14 | 14 | 410 | 4374 | 2958 | 0 | CR2 | 1208.25 | 24165 | N |
| 15 | 15 | 410 | 2960 | 2990 | 0 | CR2 | 1374.05 | 27481 | N |

Bookmarks

Next data cleaning was performed to check the logic. We found that there were flights in the same time zone that have arrival time greater than the departure time signifying that the flight arrives even before it departs. The information regarding the same is given below:

A total of 224 records with such an issue was found.

**select * from flights f, airports a, airports b,routes r**
**where f.routeid = r.routeid**
**and a.timezone = b.timezone**
**and r.sourceairportid = a.airportid**
**and r.destairportid  = b.airportid**
**and f.departtime > f.arrivaltime;**

Worksheet | Query Builder

```
select * from flights f, airports a, airports b,routes r
where f.routeid = r.routeid
and a.timezone = b.timezone
and r.sourceairportid = a.airportid
and r.destairportid  = b.airportid
and f.departtime > f.arrivaltime;
```

Script Output | Query Result

SQL | All Rows Fetched: 224 in 10.885 seconds

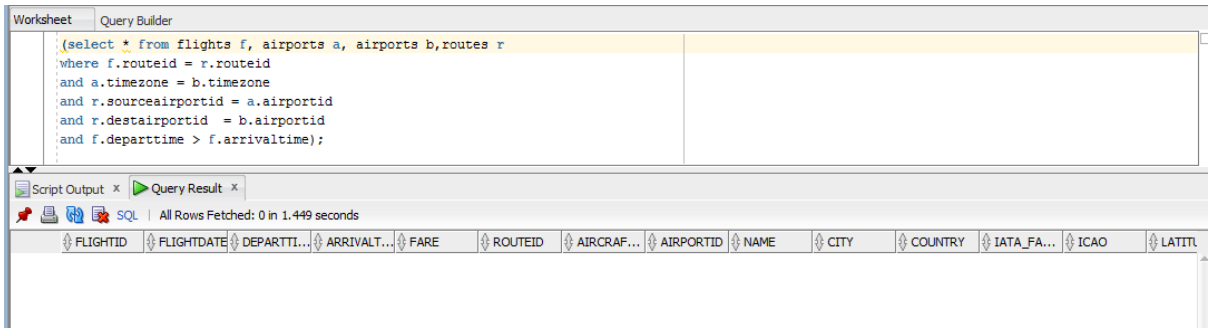
| | FLIGHTID | FLIGHTDATE | DEPARTTIME | ARRIVALTIME | FARE | ROUTEID | AIRCRAFTID | AIRPORTID | NAME | CITY |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | LH2951 | 19-03-2008 00:00:00 | 19-03-2008 18:40:34 | 19-03-2008 18:22:54 | 288.26 | 32437 | 320 | 340 | Frankfurt Main | Frankfurt |
| 2 | AA6370 | 13-04-2008 00:00:00 | 13-04-2008 21:20:03 | 13-04-2008 20:49:15 | 266.27 | 3783 | 777 | 2179 | Abu Dhabi Intl | Abu Dhabi |
| 3 | ME2897 | 14-08-2008 00:00:00 | 14-08-2008 16:35:25 | 14-08-2008 15:52:47 | 146.62 | 34133 | 320 | 2177 | Rafic Hariri Intl | Beirut |
| 4 | AB2514 | 26-09-2008 00:00:00 | 26-09-2008 19:50:55 | 26-09-2008 19:40:24 | 101.09 | 5779 | 319 | 351 | Tegel | Berlin |
| 5 | 2N2025 | 22-08-2008 00:00:00 | 22-08-2008 21:15:14 | 22-08-2008 20:42:53 | 141.22 | 149 | SF3 | 609 | Kastrup | Copenhage |
| 6 | BW3655 | 27-12-2008 00:00:00 | 27-12-2008 07:30:29 | 27-12-2008 07:00:45 | 76.05 | 12726 | 738 | 2875 | Grantley Adams Intl | Bridgetow |
| 7 | AF7268 | 29-10-2009 00:00:00 | 29-10-2009 00:45:52 | 29-10-2009 00:07:40 | 29.86 | 7684 | AT7 | 917 | St Pierre Pierrefonds | St.-pierr |
| 8 | CM2433 | 19-09-2009 00:00:00 | 19-09-2009 06:45:14 | 19-09-2009 06:30:29 | 93.17 | 14272 | E90 | 2710 | Ernesto Cortissoz | Barranqui |
| 9 | KQ1892 | 23-12-2008 00:00:00 | 23-12-2008 01:30:06 | 23-12-2008 01:12:10 | 324.9 | 31376 | E90 | 4119 | Ambouli International Airport | Djibouti |
| 10 | AZ7293 | 28-05-2007 00:00:00 | 28-05-2007 12:25:47 | 28-05-2007 12:17:35 | 229.28 | 10804 | ERJ | 146 | Pierre Elliott Trudeau Intl | Montreal |
| 11 | V92562 | 30-09-2009 00:00:00 | 30-09-2009 08:15:54 | 30-09-2009 07:24:49 | 236.85 | 52983 | L4T | 467 | Belfast City | Belfast |
| 12 | TR2803 | 11-09-2008 00:00:00 | 11-09-2008 05:35:51 | 11-09-2008 04:51:23 | 238.47 | 27231 | 343 | 1767 | La Aurora | Guatemala |

The next step was to delete such illegal records form the database. The query below was executed to perform the action:

delete from flights where flightid in (select f.flightid from flights f, airports a, airports b,routes r
where f.routeid = r.routeid
and a.timezone = b.timezone
and r.sourceairportid = a.airportid
and r.destairportid  = b.airportid
and f.departtime > f.arrivaltime);

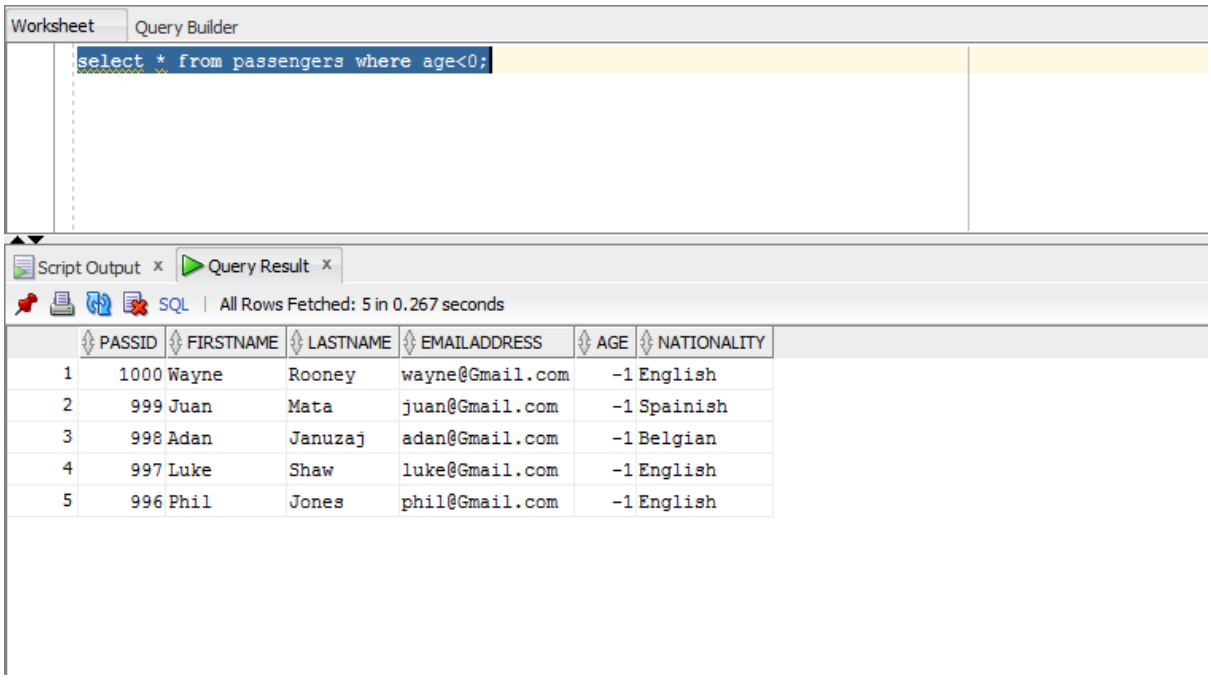
```
224 rows deleted.
```

Post removal, the database looks like the below:




The next cleaning to be done is in the passenger table:

**select * from passengers where age<0;**




| | PASSID | FIRSTNAME | LASTNAME | EMAILADDRESS | AGE | NATIONALITY |
|---|---|---|---|---|---|---|
| 1 | 1000 | Wayne | Rooney | wayne@Gmail.com | -1 | English |
| 2 | 999 | Juan | Mata | juan@Gmail.com | -1 | Spainish |
| 3 | 998 | Adan | Januzaj | adan@Gmail.com | -1 | Belgian |
| 4 | 997 | Luke | Shaw | luke@Gmail.com | -1 | English |
| 5 | 996 | Phil | Jones | phil@Gmail.com | -1 | English |

The following query provides results of passengers who have a negative age. This again is not a possibility and hence there is need to update those data. Here we cannot delete the data as that will delete all passenger records. Hence, we go update using the following command

**update passengers set age = (-1) * age where age<0;**
**commit;**

```
5 rows updated.
```

The system status after updating the illegal data:

```
select * from passengers order by passid;
```

Script Output | Query Result

SQL | Fetched 50 rows in 0.189 seconds

| | PASSID | FIRSTNAME | LASTNAME | EMAILADDRESS | AGE | NATIONALITY |
|---|---|---|---|---|---|---|
| 1 | 996 | Phil | Jones | phil@Gmail.com | 1 | English |
| 2 | 997 | Luke | Shaw | luke@Gmail.com | 1 | English |
| 3 | 998 | Adan | Januzaj | adan@Gmail.com | 1 | Belgian |
| 4 | 999 | Juan | Mata | juan@Gmail.com | 1 | Spainish |
| 5 | 1000 | Wayne | Rooney | wayne@Gmail.com | 1 | English |

The next issue while exploring data is that we found the presence of flights in transaction table that did not exist in the original flight table. The command to find out such records is:

**select * from transactions where flightid not in (select flightid from flights);**

```
select * from transactions where flightid not in (select flightid from flights);
```

Script Output | Query Result

SQL | All Rows Fetched: 15 in 0.563 seconds

| | PASSID | FLIGHTID | BOOKINGDATE | DISCOUNT | TOTALPAID |
|---|---|---|---|---|---|
| 1 | 1001 | GHOST5 | 05-04-2015 21:57:17 | 0 | 999 |
| 2 | 1001 | GHOST3 | 05-04-2015 21:57:16 | 0 | 999 |
| 3 | 1001 | GHOST4 | 05-04-2015 21:57:16 | 0 | 999 |
| 4 | 1001 | GHOST2 | 05-04-2015 21:57:16 | 0 | 999 |
| 5 | 1001 | GHOST1 | 05-04-2015 21:57:16 | 0 | 999 |
| 6 | 1135 | BW1362 | 16-06-2007 01:46:09 | 0 | 292.44 |
| 7 | 2490 | AA6068 | 19-09-2007 13:48:47 | 0 | 329.24 |
| 8 | 3194 | UA7912 | 24-04-2009 18:22:12 | 0.06 | 145.71 |
| 9 | 4861 | AC1717 | 03-02-2007 16:45:31 | 0.09 | 317.86 |
| 10 | 5065 | AA6370 | 16-10-2007 17:29:42 | 0 | 728.78 |
| 11 | 5072 | IB7195 | 12-03-2008 09:08:03 | 0 | 593.53 |
| 12 | 8558 | F71651 | 13-06-2006 12:49:56 | 0.05 | 566.5 |
| 13 | 8825 | LH5814 | 13-11-2007 12:13:13 | 0 | 748.08 |
| 14 | 10542 | E51827 | 27-08-2006 12:11:48 | 0 | 410.93 |
| 15 | 10715 | AZ7293 | 28-02-2007 12:11:56 | 0 | 312.64 |

These illegal records need to be removed. The action is performed using the below command:

**delete from transactions where flightid not in (select flightid from flights);**
**commit;**

```
15 rows deleted.


Commit complete.
```

After this command is run, the data in the operational database now is:

Worksheet | Query Builder

```
select * from transactions where flightid not in (select flightid from flights);
```

Script Output | Query Result

SQL | All Rows Fetched: 0 in 0.415 seconds

| PASSID | FLIGHTID | BOOKING... | DISCOUNT | TOTALPAID |
|---|---|---|---|---|

The same issue is found in couple of other tables such as presence of airlines in route table which are not existing in the airline table. This can be verified from the below command:

**select * from routes where airlineid not in (select airlineid from airlines);**

```
select * from routes where airlineid not in (select airlineid from airlines);
```

Script Output | Query Result

SQL | All Rows Fetched: 1 in 0.302 seconds

| | ROUTEID | AIRLINEID | SOURCEAIRPORTID | DESTAIRPORTID | STOPS | EQUIPMENT | DISTANCE | SERVICECOST | NEWLYOPENED |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 60000 | 9999 | 4029 | 2990 | 1 | CR2 | 1234.23 | 24684.6 | Y |

This data is to be cleaned and is done using the below command:
**delete from routes where airlineid not in (select airlineid from airlines);**

```
delete from routes where airlineid not in (select airlineid from airlines);
```

Script Output | Query Result

Task completed in 0.358 seconds

```
1 row deleted.
```

The data in the operational database after the cleaning looks like below:

```
select * from routes where airlineid not in(select airlineid from airlines);
```

Script Output | Query Result

SQL | All Rows Fetched: 0 in 0.216 seconds

| ROUTEID | AIRLINEID | SOURCEA... | DESTAIRP... | STOPS | EQUIPMENT | DISTANCE | SERVICEC... | NEWLYOP... |
|---|---|---|---|---|---|---|---|---|

Next is the presence of illegal aircrafts. This can be seen using the below command:

**select * from flights where aircraftid not in (select iatacode from aircrafts);**

Worksheet | Query Builder

```
select * from flights where aircraftid not in (select iatacode from aircrafts);
```

Script Output | Query Result

SQL | All Rows Fetched: 2 in 0.214 seconds

| | FLIGHTID | FLIGHTDATE | DEPARTTIME | ARRIVALTIME | FARE | ROUTEID | AIRCRAFTID |
|---|---|---|---|---|---|---|---|
| 1 | ABCDEF | 05-04-2015 21:56:47 | 05-04-2015 21:56:47 | 05-04-2015 21:56:47 | 99.99 | 56 | 5137 |
| 2 | DREAMS | 05-04-2015 21:56:51 | 05-04-2015 21:56:51 | 05-04-2015 21:56:51 | -99.99 | 56 | 5137 |

The cleaning is done by removing the illegal data:

**delete from flights where aircraftid not in (select iatacode from aircrafts);**

Worksheet | Query Builder

```
delete from flights where aircraftid not in (select iatacode from aircrafts);
```

```
2 rows deleted.
```

The system after the clean up looks like:

**select * from flights where aircraftid not in (select iatacode from aircrafts);**

```
select * from flights where aircraftid not in (select iatacode from aircrafts);
```

Script Output | Query Result

SQL | All Rows Fetched: 0 in 0.311 seconds

| FLIGHTID | FLIGHTDATE | DEPARTTI... | ARRIVALT... | FARE | ROUTEID | AIRCRAF... |
|---|---|---|---|---|---|---|

The next search for unclean data is to check duplicate records in

**select * from**
**(select * from aircrafts) b join**
**(**
**select ICAOCODE,MANUFACTURER,MODEL,wakecategory from aircrafts group by ICAOCODE,MANUFACTURER,MODEL,wakecategory having count(*) >1) a**
**on**
**b.ICAOCODE =a.ICAOCODE and b.MANUFACTURER = a.MANUFACTURER and b.MODEL = a.MODEL**
**and b.wakecategory =a.wakecategory order by**
**b.ICAOCODE,b.MANUFACTURER,b.MODEL,b.wakecategory asc;**

Script Output | Query Result

SQL | All Rows Fetched: 6 in 0.174 seconds

| | IATACODE | ICAOCODE | MANUFACTURER | MODEL | WAKECATEGORY | ICAOCODE_1 | MANUFACTURER_1 | MODEL_1 | WAKECATEGORY_1 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 100 | F100 | Fokker | 100 | M | F100 | Fokker | 100 | M |
| 2 | 99 | F100 | Fokker | 100 | M | F100 | Fokker | 100 | M |
| 3 | 98 | F100 | Fokker | 100 | M | F100 | Fokker | 100 | M |
| 4 | 97 | F100 | Fokker | 100 | M | F100 | Fokker | 100 | M |
| 5 | 96 | F100 | Fokker | 100 | M | F100 | Fokker | 100 | M |
| 6 | 95 | F100 | Fokker | 100 | M | F100 | Fokker | 100 | M |

**Proof for duplicate data:**

**select * from opfl.aircrafts where IATACODE in ('100' ,**
**'99' ,**
**'98' ,**
**'97',**
**'96',**
**'95');**

```
select * from opfl.aircrafts where IATACODE in ('100' ,
'99'  ,
'98' ,
'97',
'96',
'95');
```

Script Output | Query Result

SQL | All Rows Fetched: 6 in 0.087 seconds

| | IATACODE | ICAOCODE | MANUFACTURER | MODEL | WAKECATEGORY |
|---|---|---|---|---|---|
| 1 | 100 | F100 | Fokker | 100 | M |
| 2 | 99 | F100 | Fokker | 100 | M |
| 3 | 98 | F100 | Fokker | 100 | M |
| 4 | 97 | F100 | Fokker | 100 | M |
| 5 | 96 | F100 | Fokker | 100 | M |
| 6 | 95 | F100 | Fokker | 100 | M |

But the only legal data that is in the system is as below:

**select distinct aircraftid from opfl.flights where aircraftid in ('100' ,**
**'99' ,**
**'98' ,**
**'97',**
**'96',**

**'95');**

```
select distinct aircraftid from opfl.flights where aircraftid in ('100' ,
'99'  ,
'98' ,
'97',
'96',
'95');

select disti
```

Script Output | Query Result

SQL | All Rows Fetched: 1 in 0.217 seconds

| | AIRCRAFTID |
|---|---|
| 1 | 100 |

Hence in the next step, we will be removing the duplicate records. The command below helps in the action:

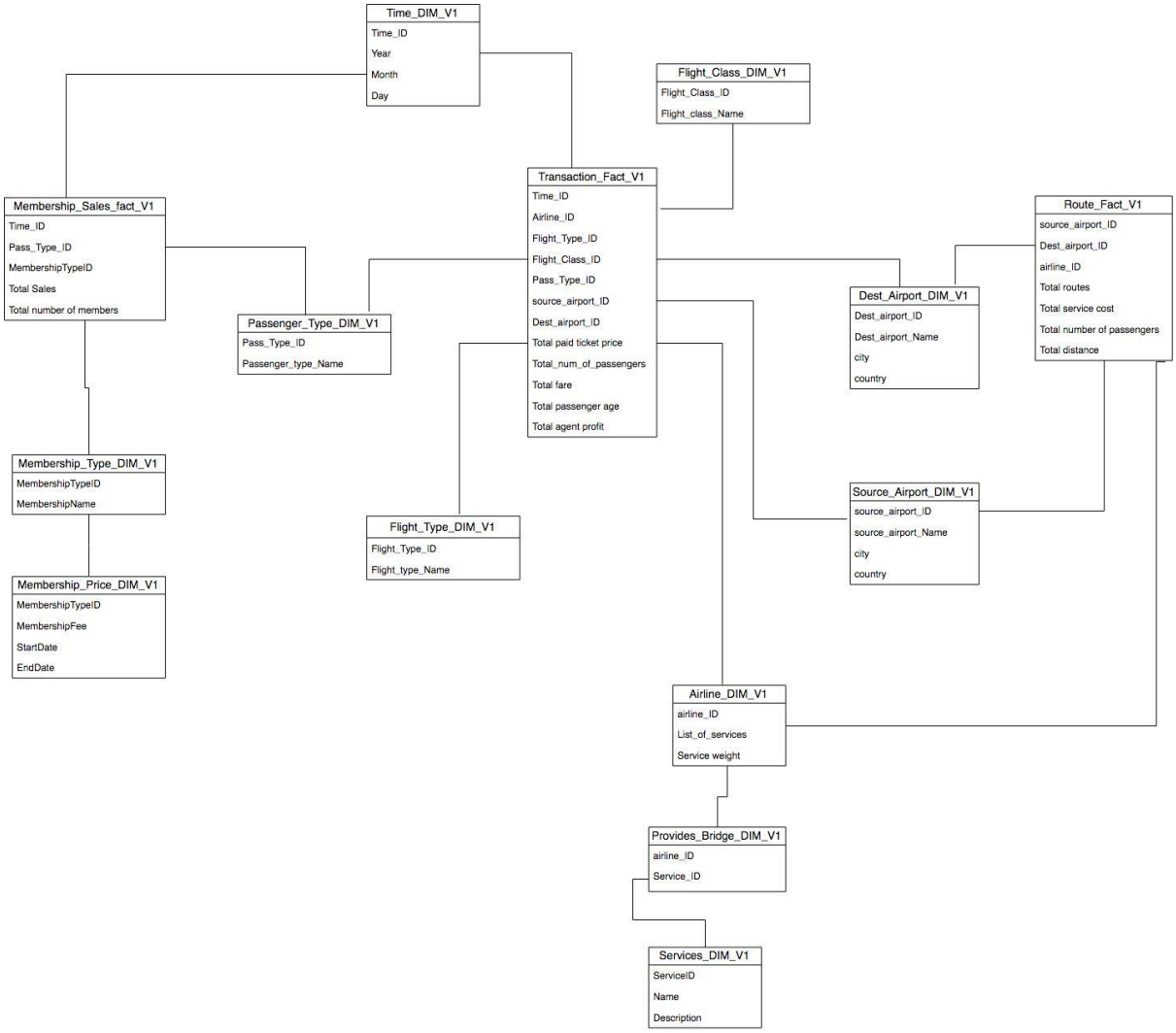
**delete from aircrafts where iatacode in (**
**'99' ,**
**'98' ,**
**'97',**
**'96',**
**'95');**

```
5 rows deleted.
```

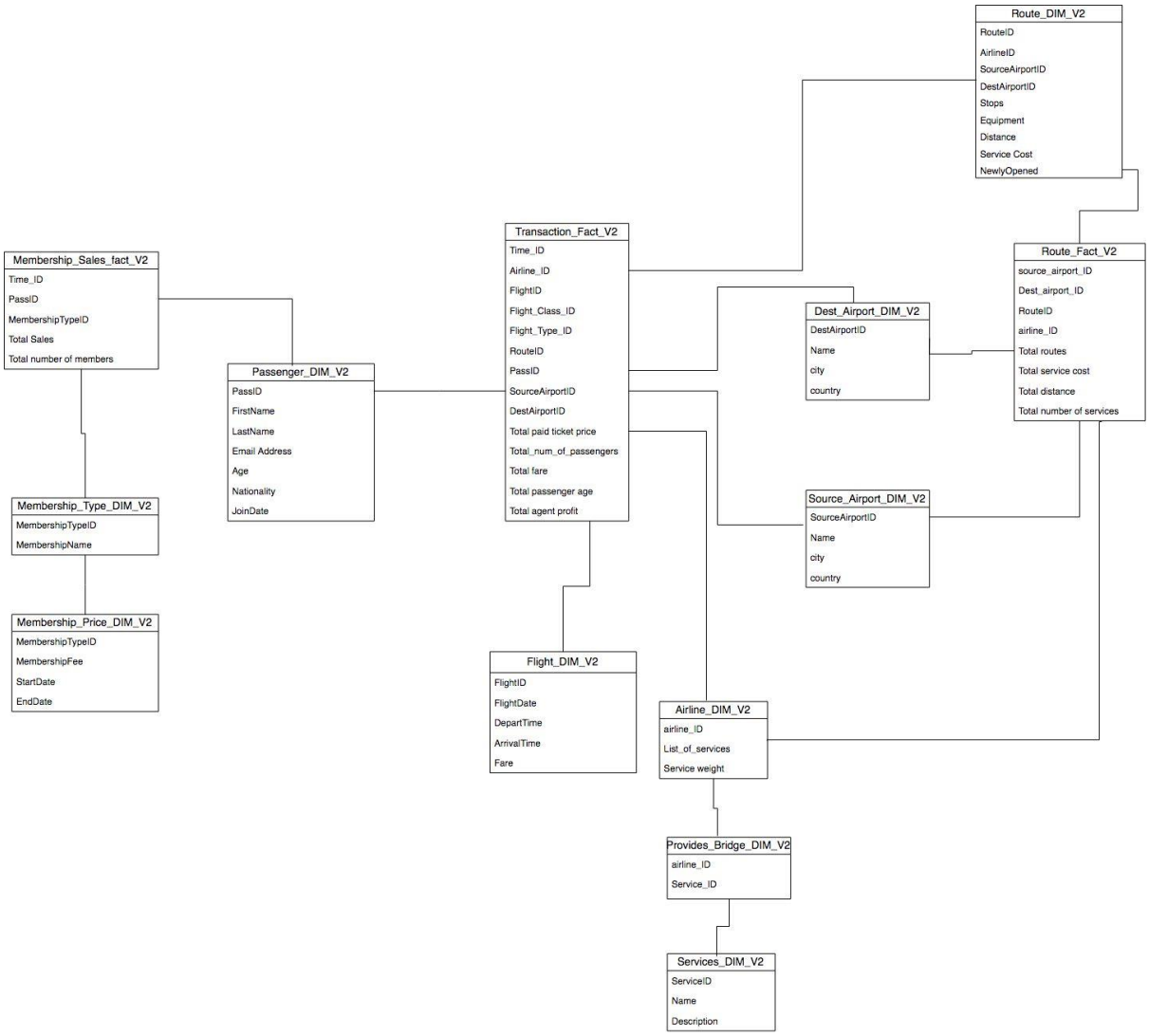
Designing the data warehouse

This section will detail about the star schemas. There will be 2 levels of star schema that would be discussed here. First is the level 2 which has high aggregation and other is the level 0 which has no aggregation and hence presents full data. The schematic diagram for both the levels and the subtle explanation for the same as given in depth below:

C Version 1- Level 2


Time_DIM_V1
Time_ID
Year
Month
Day
Flight_Class_DIM_V1
Flight_Class_ID
Flight_class_Name
Transaction_Fact_V1
Time_ID
Airline_ID
Flight_Type_ID
Flight_Class_ID
Pass_Type_ID
source_airport_ID
Dest_airport_ID
Total paid ticket price
Total_num_of_passengers
Total fare
Total passenger age
Total agent profit
Membership_Sales_fact_V1
Time_ID
Pass_Type_ID
MembershipTypeID
Total Sales
Total number of members
Passenger_Type_DIM_V1
Pass_Type_ID
Passenger_type_Name
Route_Fact_V1
source_airport_ID
Dest_airport_ID
airline_ID
Total routes
Total service cost
Total number of passengers
Total distance
Dest_Airport_DIM_V1
Dest_airport_ID
Dest_airport_Name
city
country
Membership_Type_DIM_V1
MembershipTypeID
MembershipName
Flight_Type_DIM_V1
Flight_Type_ID
Flight_type_Name
Source_Airport_DIM_V1
source_airport_ID
source_airport_Name
city
country
Membership_Price_DIM_V1
MembershipTypeID
MembershipFee
StartDate
EndDate
Airline_DIM_V1
airline_ID
List_of_services
Service weight
Provides_Bridge_DIM_V1
airline_ID
Service_ID
Services_DIM_V1
ServiceID
Name
Description

Level 0:




D. **Choice of hierarchy vs non-hierarchy**

In our model, we use the non-hierarchy method to design the schemas to reduce the complexity of the calculation and reduce the number of joins which will aid in quicker retrievals of information.

E. **Choice of SCD type**

In our schema, we use the SCD type 4 dimension to store the variation in membership fee. This is done by taking the membership fee attribute from the membership_type_DIM_V2 and creating a separate DIM to track the changes. The main reason behind this implementation is the varying prices of the membership fee across time periods and hence thee is a need to track these changes. The process used is by incorporating start date and end date in the new dimension. This way, we will be able to find out the membership fee of a membership type over any period.

F **Difference between version 2 and version1 schemas**

The version 1 schema represents level 2 with higher aggregation. This means user-defined grouping can be incorporated and aggregated data can be obtained from here. However, if there is a need to drill down into the data to get intricate details, then we can make use of the version 2 schema which

is the level 0 with no aggregation. This schema contains all the dimensions with intricate details that would help in drilling down the data to fetch what the user wants to analyse.

# 3 Implementation of the star schemas

The section below contains all the SQL commands involved in creating the fact and dimension tables for the project.

a. SQL Statements for version 1 – Level 2

**create table Membership_Type_DIM_V1 as select membershiptypeid, membershipname from membershiptype;**

**create table Passenger_Type_DIM_V1(**

**Passenger_Type_ID VARCHAR2(10),**

**Passenger_Type_Name VARCHAR2(20));**

Insert into Passenger_Type_DIM_V1 values ('C','Children');

Insert into Passenger_Type_DIM_V1 values ('T','Teenager');

Insert into Passenger_Type_DIM_V1 values ('A','Adult');

Insert into Passenger_Type_DIM_V1 values ('E','Elder');

commit;

**create table Flight_Type_DIM_V1(**

**Flight_Type_ID NUMERIC(1),**

**Flight_type_Name VARCHAR2(20));**

insert into Flight_Type_DIM_V1 values (1,'Domestic');

insert into Flight_Type_DIM_V1 values (2,'International');

commit;

**create table Airline_DIM_V1**

**as select a.airlineID as airline_ID,**

```
  ROUND(1/COUNT(*),2) AS serviceweight,
  listagg(s.name,'__') within GROUP
  (ORDER BY s.name) AS List_of_services
FROM airlines a,
  airline_services s,
  provides p
WHERE a.airlineID = p.airlineID
AND p.serviceID   = s.serviceID
GROUP BY a.airlineId,a.name;

Create table Provides_Bridge_DIM_V1 as select * from provides;
Create table Services_DIM_V1 as
select * from Airline_Services;

CREATE TABLE TIME_DIM_V1 AS
SELECT DISTINCT TO_CHAR(FLIGHTDATE,'ddmmyyyy') AS Time_ID,
  TO_CHAR(FLIGHTDATE,'DY')                AS DAY,
  TO_CHAR(FLIGHTDATE,'mm')                 AS MONTH,
  TO_CHAR(FLIGHTDATE,'yyyy')               AS YEAR
FROM FLIGHTS
UNION
SELECT
  DISTINCT(TO_CHAR(JOINDATE,'DDMMYYYY')) AS Time_ID,
  TO_CHAR(JOINDATE,'DY') AS DAY,
  TO_CHAR(JOINDATE,'MM') AS MONTH,
  TO_CHAR(JOINDATE,'YYYY') AS YEAR
FROM
  MEMBERSHIPJOINRECORDS;

create table flight_class_DIM_V1(
Flight_Class_ID VARCHAR2(10),
```

```
Flight_Class_Name VARCHAR2(20));

Insert into flight_class_DIM_V1 values ('F','First Class');
Insert into flight_class_DIM_V1 values ('B','Business Class');
Insert into flight_class_DIM_V1 values ('E','Economy Class');

commit;

create table Source_Airport_DIM_V1
as select distinct airportID as Source_airport_ID,
Name as source_airport_Name,
city, country,timezone,dst
from airports;

create table Dest_Airport_DIM_V1
as select distinct airportID as Dest_airport_ID,
Name as Dest_airport_Name,
city, country ,timezone,dst
from airports;

Create table Membership_Price_DIM_V1
 as select distinct mjr.membershiptypeid, p.startdate, p.enddate,
 mt.membershipfee*(1-nvl(p.discount,0)) as MembershipFee
 from membershipjoinrecords mjr
 join promotion p
 on mjr.promotion = p.promotionid
 join membershiptype mt
 on mt.membershiptypeid = mjr.membershiptypeid;
```

--Inserting records when there are no promotions.  Hence, default prices are applied

insert into Membership_Price_DIM_V1 values('M1',to_date('1-Sep-05','DD-MON-YY'),to_date('31-Oct-06','DD-MON-YY'),399);

insert into Membership_Price_DIM_V1 values('M2',to_date('1-Sep-05','DD-MON-YY'),to_date('31-Oct-06','DD-MON-YY'),599);

insert into Membership_Price_DIM_V1 values('M3',to_date('1-Sep-05','DD-MON-YY'),to_date('31-Oct-06','DD-MON-YY'),799);

insert into Membership_Price_DIM_V1 values('M4',to_date('1-Sep-05','DD-MON-YY'),to_date('31-Oct-06','DD-MON-YY'),999);

insert into Membership_Price_DIM_V1 values('M1',to_date('1-Jun-07','DD-MON-YY'),to_date('29-Feb-08','DD-MON-YY'),399);

insert into Membership_Price_DIM_V1 values('M2',to_date('1-Jun-07','DD-MON-YY'),to_date('29-Feb-08','DD-MON-YY'),599);

insert into Membership_Price_DIM_V1 values('M3',to_date('1-Jun-07','DD-MON-YY'),to_date('29-Feb-08','DD-MON-YY'),799);

insert into Membership_Price_DIM_V1 values('M4',to_date('1-Jun-07','DD-MON-YY'),to_date('29-Feb-08','DD-MON-YY'),999);

insert into Membership_Price_DIM_V1 values('M1',to_date('1-May-08','DD-MON-YY'),to_date('29-Feb-12','DD-MON-YY'),399);

insert into Membership_Price_DIM_V1 values('M2',to_date('1-May-08','DD-MON-YY'),to_date('29-Feb-12','DD-MON-YY'),599);

insert into Membership_Price_DIM_V1 values('M3',to_date('1-May-08','DD-MON-YY'),to_date('29-Feb-12','DD-MON-YY'),799);

insert into Membership_Price_DIM_V1 values('M4',to_date('1-May-08','DD-MON-YY'),to_date('29-Feb-12','DD-MON-YY'),999);

insert into Membership_Price_DIM_V1 values('M1',to_date('1-May-12','DD-MON-YY'),to_date('31-Dec-12','DD-MON-YY'),399);

insert into Membership_Price_DIM_V1 values('M2',to_date('1-May-12','DD-MON-YY'),to_date('31-Dec-12','DD-MON-YY'),599);

insert into Membership_Price_DIM_V1 values('M3',to_date('1-May-12','DD-MON-YY'),to_date('31-Dec-12','DD-MON-YY'),799);

```
insert into Membership_Price_DIM_V1 values('M4',to_date('1-May-12','DD-MON-YY'),to_date('31-Dec-12','DD-MON-YY'),999);

insert into Membership_Price_DIM_V1 values('M1',to_date('1-May-13','DD-MON-YY'),to_date('31-Dec-14','DD-MON-YY'),399);

insert into Membership_Price_DIM_V1 values('M2',to_date('1-May-13','DD-MON-YY'),to_date('31-Dec-14','DD-MON-YY'),599);

insert into Membership_Price_DIM_V1 values('M3',to_date('1-May-13','DD-MON-YY'),to_date('31-Dec-14','DD-MON-YY'),799);

insert into Membership_Price_DIM_V1 values('M4',to_date('1-May-13','DD-MON-YY'),to_date('31-Dec-14','DD-MON-YY'),999);


commit;
```

**Facts**:

```
CREATE TABLE ROUTE_FACT_v1

AS SELECT DISTINCT

  r.SOURCEAIRPORTID as source_airport_id,

  r.DESTAIRPORTID as dest_airport_id,

  a.AIRLINEID as airline_ID,

 COUNT(DISTINCT r.routeid) AS Total_num_routes,

 SUM(r.DISTANCE) AS Total_distance,

 COUNT(DISTINCT p.SERVICEID) as Total_number_of_services,

 SUM(r.SERVICECOST) AS Total_service_cost

FROM

 AIRLINES a,

 ROUTES r,

 PROVIDES p

WHERE

 r.AIRLINEID=a.AIRLINEID

AND

 a.AIRLINEID=p.AIRLINEID

GROUP BY

 a.AIRLINEID,
```

```
  r.SOURCEAIRPORTID, r.DESTAIRPORTID;
CREATE TABLE TRANSACTION_TEMP_V1
AS SELECT
  DISTINCT TO_CHAR(f.FLIGHTDATE, 'ddmmyyyy') AS Time_ID,
  r.sourceairportid as source_airport_ID,
  r.destairportid as Dest_airport_ID,
  ai.AIRLINEID as airline_ID,
  f.FARE,
  tr.TOTALPAID,
  tr.PASSID,
  p.AGE,
  a.COUNTRY as SRC_COUNTRY,
  b.COUNTRY as DST_COUNTRY
FROM
  ROUTES r,
  AIRPORTS a,
  AIRPORTS b,
  FLIGHTS f,
  TRANSACTIONS tr,
  AIRLINES ai,
  PASSENGERS p
WHERE
  r.SOURCEAIRPORTID = a.AIRPORTID
  AND r.DESTAIRPORTID = b.AIRPORTID
  AND f.ROUTEID=r.ROUTEID
  AND tr.FLIGHTID=f.FLIGHTID
  AND tr.PASSID = p.PASSID
  AND ai.AIRLINEID=r.AIRLINEID
  ORDER BY Time_ID,tr.PASSID;
```

```
ALTER TABLE TRANSACTION_TEMP_V1
ADD(
Flight_Type_ID NUMERIC(1),
Flight_Class_ID VARCHAR2(10),
Pass_type_ID VARCHAR2(10));

UPDATE TRANSACTION_TEMP_V1
SET Flight_Type_ID = '1'
WHERE SRC_COUNTRY=DST_COUNTRY;

UPDATE TRANSACTION_TEMP_V1
SET Flight_Type_ID = '2'
WHERE Flight_Type_ID IS NULL;

UPDATE TRANSACTION_TEMP_V1
SET Flight_Class_ID = 'F'
WHERE TOTALPAID >= 2*FARE;

UPDATE TRANSACTION_TEMP_V1
SET Flight_Class_ID = 'B'
WHERE TOTALPAID >= 1.5*FARE AND TOTALPAID < 2*FARE;

UPDATE TRANSACTION_TEMP_V1
SET Flight_Class_ID = 'E'
WHERE TOTALPAID < 1.5*FARE;

UPDATE TRANSACTION_TEMP_V1
SET Pass_type_ID='C'
WhERE AGE < 11;
```

```
UPDATE TRANSACTION_TEMP_V1
SET Pass_type_ID = 'T'
WHERE AGE between 11 and 17;

UPDATE TRANSACTION_TEMP_V1
SET Pass_type_ID = 'A'
WHERE AGE  between 18 and 60;

UPDATE TRANSACTION_TEMP_V1
SET Pass_type_ID = 'E'
WHERE AGE > 60;

CREATE TABLE TRANSACTION_FACT_V1
AS SELECT
  Time_ID,
  AIRLINE_ID,
  FLIGHT_TYPE_ID,
  FLIGHT_CLASS_ID,
  PASS_TYPE_ID,
  source_airport_ID,
  dest_airport_id,
  SUM(TOTALPAID) AS TOTAL_PAID_TICKET_PRICE,
  SUM(AGE) AS TOTAL_PASSENGER_AGE,
  COUNT(PASSID) AS TOTAL_NUM_OF_PASSENGERS,
  sum(FARE) as TOTAL_FARE,
  (SUM(TOTALPAID)-SUM(FARE)) AS TOTAL_AGENT_PROFIT
FROM TRANSACTION_TEMP_V1
GROUP BY
  Time_ID,
  AIRLINE_ID,
```

```
  FLIGHT_TYPE_ID,
  FLIGHT_CLASS_ID,
  PASS_TYPE_ID,
  source_airport_ID,
  dest_airport_id;


CREATE TABLE MEMBERSHIP_TEMP_V1 AS
SELECT MJR.PASSID,
  MT.MEMBERSHIPTYPEID,
  MT.MEMBERSHIPFEE,
  NVL(PR.DISCOUNT, 0) AS DISCOUNT ,
  TO_CHAR(MJR.JOINDATE,'DDMMYYYY') AS TIME_ID,
  P.AGE
FROM PASSENGERS P
  JOIN MEMBERSHIPJOINRECORDS MJR
    ON P.PASSID = MJR.PASSID
  LEFT OUTER JOIN PROMOTION PR
    ON PR.PROMOTIONID = MJR.PROMOTION
  JOIN MEMBERSHIPTYPE MT
    ON MJR.MEMBERSHIPTYPEID = MT.MEMBERSHIPTYPEID;

ALTER TABLE MEMBERSHIP_TEMP_V1
ADD(
PASS_Type_ID VARCHAR2(10));

UPDATE MEMBERSHIP_TEMP_V1
SET PASS_Type_ID='C'
WHERE AGE < 11;
```

```
UPDATE MEMBERSHIP_TEMP_V1
SET PASS_Type_ID = 'T'
WHERE AGE between 11 and 17;

UPDATE MEMBERSHIP_TEMP_V1
SET PASS_Type_ID = 'A'
WHERE AGE  between 18 and 60;

UPDATE MEMBERSHIP_TEMP_V1
SET PASS_Type_ID = 'E'
WHERE AGE > 60;

commit;

CREATE TABLE MEMBERSHIP_SALES_FACT_V1
AS SELECT
  TIME_ID,
  MEMBERSHIPTYPEID,
  PASS_TYPE_ID,
  COUNT(PASSID) AS TOTAL_NUMBER_OF_MEMBERS,
  SUM(MEMBERSHIPFEE*(1-DISCOUNT)) AS TOTAL_MEMBERSHIP_SALES
FROM
  MEMBERSHIP_TEMP_V1
GROUP BY TIME_ID,
  MEMBERSHIPTYPEID,
  PASS_TYPE_ID;
```

b. SQL Statements for version 2 – Level 0

**create table Membership_Type_DIM_V2 as select membershiptypeid, membershipname from membershiptype;**

**Create table Membership_Price_DIM_V2**

**as select distinct mjr.membershiptypeid, p.startdate, p.enddate,**

**mt.membershipfee*(1-nvl(p.discount,0)) as MembershipFee**

**from membershipjoinrecords mjr**

**join promotion p**

**on mjr.promotion = p.promotionid**

**join membershiptype mt**

**on mt.membershiptypeid = mjr.membershiptypeid;**

insert into membership_price_dim_V2 values('M1',to_date('1-Sep-05','DD-MON-YY'),to_date('31-Oct-06','DD-MON-YY'),399);

insert into membership_price_dim_V2 values('M2',to_date('1-Sep-05','DD-MON-YY'),to_date('31-Oct-06','DD-MON-YY'),599);

insert into membership_price_dim_V2 values('M3',to_date('1-Sep-05','DD-MON-YY'),to_date('31-Oct-06','DD-MON-YY'),799);

insert into membership_price_dim_V2 values('M4',to_date('1-Sep-05','DD-MON-YY'),to_date('31-Oct-06','DD-MON-YY'),999);

insert into membership_price_dim_V2 values('M1',to_date('1-Sep-05','DD-MON-YY'),to_date('31-Oct-06','DD-MON-YY'),399);

insert into membership_price_dim_V2 values('M2',to_date('1-Sep-05','DD-MON-YY'),to_date('31-Oct-06','DD-MON-YY'),599);

insert into membership_price_dim_V2 values('M3',to_date('1-Sep-05','DD-MON-YY'),to_date('31-Oct-06','DD-MON-YY'),799);

insert into membership_price_dim_V2 values('M4',to_date('1-Sep-05','DD-MON-YY'),to_date('31-Oct-06','DD-MON-YY'),999);

insert into membership_price_dim_V2 values('M1',to_date('1-May-08','DD-MON-YY'),to_date('29-Feb-12','DD-MON-YY'),399);

insert into membership_price_dim_V2 values('M2',to_date('1-May-08','DD-MON-YY'),to_date('29-Feb-12','DD-MON-YY'),599);

```
insert into membership_price_dim_V2 values('M3',to_date('1-May-08','DD-MON-YY'),to_date('29-Feb-12','DD-MON-YY'),799);

insert into membership_price_dim_V2 values('M4',to_date('1-May-08','DD-MON-YY'),to_date('29-Feb-12','DD-MON-YY'),999);


insert into membership_price_dim_V2 values('M1',to_date('1-May-12','DD-MON-YY'),to_date('31-Dec-12','DD-MON-YY'),399);

insert into membership_price_dim_V2 values('M2',to_date('1-May-12','DD-MON-YY'),to_date('31-Dec-12','DD-MON-YY'),599);

insert into membership_price_dim_V2 values('M3',to_date('1-May-12','DD-MON-YY'),to_date('31-Dec-12','DD-MON-YY'),799);

insert into membership_price_dim_V2 values('M4',to_date('1-May-12','DD-MON-YY'),to_date('31-Dec-12','DD-MON-YY'),999);


insert into membership_price_dim_V2 values('M1',to_date('1-May-12','DD-MON-YY'),to_date('31-Dec-12','DD-MON-YY'),399);

insert into membership_price_dim_V2 values('M2',to_date('1-May-12','DD-MON-YY'),to_date('31-Dec-12','DD-MON-YY'),599);

insert into membership_price_dim_V2 values('M3',to_date('1-May-12','DD-MON-YY'),to_date('31-Dec-12','DD-MON-YY'),799);

insert into membership_price_dim_V2 values('M4',to_date('1-May-12','DD-MON-YY'),to_date('31-Dec-12','DD-MON-YY'),999);


commit;


create table flight_dim_v2 as select flightid, flightdate, departtime, arrivaltime, fare from flights;


create table route_dim_v2 as select routeid,stops,equipment,newlyopened from routes;


create table Airline_DIM_V2

as select a.airlineID as airline_ID,

ROUND(1/COUNT(*),2) AS service_weight,

listagg(s.name,'__') within GROUP

(ORDER BY s.name) AS List_of_services
```

```
FROM airlines a,
  airline_services s,
  provides p
WHERE a.airlineID = p.airlineID
AND p.serviceID   = s.serviceID
GROUP BY a.airlineId,a.name;

Create table Provides_Bridge_DIM_V2 as select * from provides;

Create table Services_DIM_V2 as
select * from Airline_Services;

create table Source_Airport_DIM_V2
as select distinct airportID as Source_airport_ID,
Name as source_airport_Name,
city, country,timezone,dst
from airports;


create table Dest_Airport_DIM_V2
as select distinct airportID as Dest_airport_ID,
Name as Dest_airport_Name,
city, country,timezone,dst
from airports;


CREATE TABLE PASSENGER_DIM_V2
AS SELECT
  p.PASSID,
  p.FIRSTNAME,
  p.LASTNAME,
```

```
p.NATIONALITY,
p.AGE,
m.JOINDATE
FROM
  PASSENGERS p
LEFT OUTER JOIN
  MEMBERSHIPJOINRECORDS m
ON m.PASSID = p.PASSID;
```

**Facts:**

```
CREATE TABLE ROUTE_FACT_V2
AS SELECT DISTINCT
   r.SOURCEAIRPORTID as source_airport_id,
   r.DESTAIRPORTID as dest_airport_id,
   r.routeid,
   a.AIRLINEID as airline_ID,
  COUNT(DISTINCT r.routeid) AS Total_num_routes,
  SUM(r.DISTANCE) AS Total_distance,
  COUNT(DISTINCT p.SERVICEID) as Total_number_of_services,
  SUM(r.SERVICECOST) AS Total_service_cost
FROM
  AIRLINES a,
  ROUTES r,
  PROVIDES p
WHERE
  r.AIRLINEID=a.AIRLINEID
AND
  a.AIRLINEID=p.AIRLINEID
GROUP BY
  a.AIRLINEID,
  r.routeid,
```

```
  r.SOURCEAIRPORTID, r.DESTAIRPORTID;

CREATE TABLE TRANSACTION_FACT_V2
AS SELECT
  o.ROUTEID,
  f.FLIGHTID,
  o.SOURCEAIRPORTID as source_airport_ID,
  o.DESTAIRPORTID as dest_airport_id,
  p.PASSID,
  SUM(t.TOTALPAID) AS TOTAL_PAID,
  SUM(f.FARE) AS TOTAL_FARE,
  SUM(p.AGE) AS TOTAL_PASSENGER_AGE,
  COUNT(P.PASSID) AS TOTAL_NUM_OF_PASSENGERS,
  (SUM(t.TOTALPAID)-SUM(f.FARE)) AS TOTAL_AGENT_PROFIT
FROM
  ROUTES o
JOIN  FLIGHTS f
ON o.ROUTEID = f.ROUTEID
JOIN TRANSACTIONS t
ON t.FLIGHTID = f.FLIGHTID
LEFT OUTER JOIN PASSENGERS p
ON p.PASSID = t.PASSID
GROUP BY
  o.ROUTEID,
  f.FLIGHTID,
  o.SOURCEAIRPORTID,
  o.DESTAIRPORTID,
  p.PASSID;
```

```
CREATE TABLE MEMBERSHIP_SALES_FACT_V2 AS
  SELECT
    MJR.PASSID,
    MJR.JOINDATE,
    MT.MEMBERSHIPTYPEID,
    COUNT(MJR.PASSID) AS TOTAL_NUMBER_OF_MEMBERS,
    SUM(MT.MEMBERSHIPFEE*(1-NVL((PR.DISCOUNT),0))) AS TOTAL_MEMBERSHIP_SALES
  FROM MEMBERSHIPJOINRECORDS MJR
    LEFT OUTER JOIN PROMOTION PR
      ON PR.PROMOTIONID = MJR.PROMOTION
    JOIN MEMBERSHIPTYPE MT
      ON MJR.MEMBERSHIPTYPEID = MT.MEMBERSHIPTYPEID
  GROUP BY
    MJR.PASSID,
    MJR.JOINDATE,
    MT.MEMBERSHIPTYPEID;
```

C. Screenshots of the tables created above

- Membership_Type_DIM_V1

| | MEMBERSHIPTYPEID | MEMBERSHIPNAME |
|---|---|---|
| 1 | M1 | bronze |
| 2 | M2 | silver |
| 3 | M3 | Gold |
| 4 | M4 | Royal |

- Passenger_Type_DIM_V1

| | PASSENGER_TYPE_ID | PASSENGER_TYPE_NAME |
|---|---|---|
| 1 | C | Children |
| 2 | T | Teenager |
| 3 | A | Adult |
| 4 | E | Elder |

- Flight_Type_DIM_V1

| | FLIGHT_TYPE_ID | FLIGHT_TYPE_NAME |
|---|---|---|
| 1 | 1 | Domestic |
| 2 | 2 | International |

- Airline_DIM_V1

| | AIRLINE_ID | SERVICEWEIGHT | LIST_OF_SERVICES |
|---|---|---|---|
| 1 | 1 | 0.33 | Extra weight 20__In-flight breakfast__In-flight games |
| 2 | 2 | 0.25 | Extra weight 20__In-flight beverage__In-flight breakfast__In-flight movies |
| 3 | 3 | 0.33 | Extra weight 5__In-flight games__In-flight meal |
| 4 | 4 | 0.25 | Extra weight 5__In-flight fast food__In-flight meal__In-flight music |
| 5 | 5 | 0.25 | Extra weight 5__In-flight breakfast__In-flight fast food__In-flight music |
| 6 | 6 | 0.25 | Extra weight 20__In-flight beverage__In-flight breakfast__In-flight movies |
| 7 | 7 | 0.25 | Extra weight 10__In-flight fast food__In-flight meal__In-flight movies |
| 8 | 8 | 0.33 | Extra weight 5__In-flight breakfast__In-flight internet |
| 9 | 9 | 0.33 | Extra weight 20__In-flight games__In-flight meal |
| 10 | 10 | 0.33 | Extra weight 5__In-flight games__In-flight meal |
| 11 | 11 | 0.25 | Extra weight 10__In-flight breakfast__In-flight fast food__In-flight music |
| 12 | 12 | 0.33 | Extra weight 20__In-flight breakfast__In-flight internet |
| 13 | 13 | 0.33 | Extra weight 5__In-flight breakfast__In-flight internet |
| 14 | 14 | 0.33 | Extra weight 5__In-flight games__In-flight meal |
| 15 | 15 | 0.25 | Extra weight 5__In-flight breakfast__In-flight fast food__In-flight music |
| 16 | 16 | 0.33 | Extra weight 20__In-flight breakfast__In-flight games |

- Provides_Bridge_DIM_V1

| AIRLINEID | SERVICEID |
|---|---|
| 356 | 1 |
| 356 | 4 |
| 356 | 6 |
| 356 | 9 |
| 357 | 3 |
| 357 | 4 |
| 357 | 11 |
| 358 | 2 |
| 358 | 4 |
| 358 | 11 |
| 359 | 2 |
| 359 | 5 |
| 359 | 11 |
| 360 | 2 |
| 360 | 5 |
| 360 | 6 |

- Services_DIM_V1

| | SERVICEID | NAME | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | Extra weight 20 | Customer can buy up to 20kg extra luggage weight |
| 2 | 2 | Extra weight 10 | Customer can buy up to 10kg extra luggage weight |
| 3 | 3 | Extra weight 5 | Customer can buy up to 5kg extra luggage weight |
| 4 | 4 | In-flight breakfast | breakfast served to passengers on board |
| 5 | 5 | In-flight meal | meal served to passengers on board |
| 6 | 6 | In-flight fast food | fast food served to passengers on board |
| 7 | 7 | In-flight beverage | drink served to passengers on board |
| 8 | 8 | In-flight movies | Customer can view online movies |
| 9 | 9 | In-flight music | Customer can listen to music |
| 10 | 10 | In-flight games | Customer can play games |
| 11 | 11 | In-flight internet | Customer can access internet via Wifi on board |

- TIME_DIM_V1

| | TIME_ID | DAY | MONTH | YEAR |
|---|---|---|---|---|
| 1 | 01012005 | SAT | 01 | 2005 |
| 2 | 01012006 | SUN | 01 | 2006 |
| 3 | 01012007 | MON | 01 | 2007 |
| 4 | 01012008 | TUE | 01 | 2008 |
| 5 | 01012009 | THU | 01 | 2009 |
| 6 | 01012010 | FRI | 01 | 2010 |
| 7 | 01012011 | SAT | 01 | 2011 |
| 8 | 01012012 | SUN | 01 | 2012 |
| 9 | 01012013 | TUE | 01 | 2013 |
| 10 | 01012014 | WED | 01 | 2014 |
| 11 | 01022005 | TUE | 02 | 2005 |
| 12 | 01022006 | WED | 02 | 2006 |
| 13 | 01022007 | THU | 02 | 2007 |
| 14 | 01022008 | FRI | 02 | 2008 |
| 15 | 01022009 | SUN | 02 | 2009 |
| 16 | 01022010 | MON | 02 | 2010 |

- flight_class_DIM_V1

| | FLIGHT_CLASS_ID | FLIGHT_CLASS_NAME |
|---|---|---|
| 1 | F | First Class |
| 2 | B | Business Class |
| 3 | E | Economy Class |

- Source_Airport_DIM_V1

| | SOURCE_AIRPORT_ID | SOURCE_AIRPORT_NAME | CITY | COUNTRY | TIMEZONE | DST |
|---|---|---|---|---|---|---|
| 1 | 10 | Thule Air Base | Thule | Greenland | -4 | E |
| 2 | 12 | Egilsstadir | Egilsstadir | Iceland | 0 | N |
| 3 | 28 | Bagotville | Bagotville | Canada | -5 | A |
| 4 | 37 | Kugluktuk | Coppermine | Canada | -7 | A |
| 5 | 40 | Clyde River | Clyde River | Canada | -5 | A |
| 6 | 41 | Fairmont Hot Springs | Coral Harbour | Canada | -7 | A |
| 7 | 54 | Inuvik Mike Zubko | Inuvik | Canada | -7 | A |
| 8 | 62 | La Grande Riviere | La Grande Riviere | Canada | -5 | A |
| 9 | 74 | Atikokan Muni | Atikokan | Canada | -6 | A |
| 10 | 79 | Waterloo | Waterloo | Canada | -5 | A |
| 11 | 81 | Kindersley | Kindersley | Canada | -6 | N |
| 12 | 330 | Jena Schongleina | Jena | Germany | 1 | E |
| 13 | 338 | Dresden | Dresden | Germany | 1 | E |
| 14 | 355 | Frankfurt Hahn | Hahn | Germany | 1 | E |
| 15 | 358 | Worms | Worms | Germany | 1 | E |
| 16 | 368 | Essen Mulheim | Essen | Germany | 1 | E |

- Dest_Airport_DIM_V1

| | DEST_AIRPORT_ID | DEST_AIRPORT_NAME | CITY | COUNTRY | TIMEZONE | DST |
|---|---|---|---|---|---|---|
| 1 | 10 | Thule Air Base | Thule | Greenland | -4 | E |
| 2 | 12 | Egilsstadir | Egilsstadir | Iceland | 0 | N |
| 3 | 28 | Bagotville | Bagotville | Canada | -5 | A |
| 4 | 37 | Kugluktuk | Coppermine | Canada | -7 | A |
| 5 | 40 | Clyde River | Clyde River | Canada | -5 | A |
| 6 | 41 | Fairmont Hot Springs | Coral Harbour | Canada | -7 | A |
| 7 | 54 | Inuvik Mike Zubko | Inuvik | Canada | -7 | A |
| 8 | 62 | La Grande Riviere | La Grande Riviere | Canada | -5 | A |
| 9 | 74 | Atikokan Muni | Atikokan | Canada | -6 | A |
| 10 | 79 | Waterloo | Waterloo | Canada | -5 | A |
| 11 | 81 | Kindersley | Kindersley | Canada | -6 | N |
| 12 | 330 | Jena Schongleina | Jena | Germany | 1 | E |
| 13 | 338 | Dresden | Dresden | Germany | 1 | E |
| 14 | 355 | Frankfurt Hahn | Hahn | Germany | 1 | E |
| 15 | 358 | Worms | Worms | Germany | 1 | E |
| 16 | 368 | Essen Mulheim | Essen | Germany | 1 | E |

- Membership_Price_DIM_V1

| | MEMBERSHIPTYPEID | STARTDATE | ENDDATE | MEMBERSHIPFEE |
|---|---|---|---|---|
| 1 | M2 | 01-01-2013 00:00:00 | 30-04-2013 00:00:00 | 479.2 |
| 2 | M3 | 01-01-2013 00:00:00 | 30-04-2013 00:00:00 | 639.2 |
| 3 | M1 | 01-03-2012 00:00:00 | 30-04-2012 00:00:00 | 331.17 |
| 4 | M3 | 01-03-2008 00:00:00 | 30-04-2008 00:00:00 | 663.17 |
| 5 | M4 | 01-03-2008 00:00:00 | 30-04-2008 00:00:00 | 829.17 |
| 6 | M2 | 01-01-2005 00:00:00 | 31-08-2005 00:00:00 | 539.1 |
| 7 | M1 | 01-01-2005 00:00:00 | 31-08-2005 00:00:00 | 359.1 |
| 8 | M3 | 01-03-2012 00:00:00 | 30-04-2012 00:00:00 | 663.17 |
| 9 | M2 | 01-03-2012 00:00:00 | 30-04-2012 00:00:00 | 497.17 |
| 10 | M3 | 01-11-2006 00:00:00 | 31-05-2007 00:00:00 | 679.15 |
| 11 | M1 | 01-01-2013 00:00:00 | 30-04-2013 00:00:00 | 319.2 |
| 12 | M4 | 01-03-2012 00:00:00 | 30-04-2012 00:00:00 | 829.17 |
| 13 | M2 | 01-03-2008 00:00:00 | 30-04-2008 00:00:00 | 497.17 |
| 14 | M4 | 01-01-2005 00:00:00 | 31-08-2005 00:00:00 | 899.1 |
| 15 | M3 | 01-01-2005 00:00:00 | 31-08-2005 00:00:00 | 719.1 |
| 16 | M4 | 01-11-2006 00:00:00 | 31-05-2007 00:00:00 | 849.15 |

- ROUTE_FACT_v1

| | SOURCE_AIRPORT_ID | DEST_AIRPORT_ID | AIRLINE_ID | TOTAL_NUM_ROUTES | TOTAL_DISTANCE | TOTAL_NUMBER_OF_SERVICES | TOTAL_SERVICE_COST |
|---|---|---|---|---|---|---|---|
| 1 | 3832 | 7242 | 10 | 1 | 354.6 | 3 | 7092 |
| 2 | 7242 | 3832 | 10 | 1 | 354.6 | 3 | 7092 |
| 3 | 209 | 1353 | 21 | 1 | 2990.76 | 4 | 59815.2 |
| 4 | 209 | 1386 | 21 | 1 | 5414.96 | 4 | 108299.2 |
| 5 | 210 | 1273 | 21 | 1 | 3149.04 | 4 | 62980.8 |
| 6 | 210 | 1335 | 21 | 1 | 4066.92 | 4 | 81338.4 |
| 7 | 210 | 1353 | 21 | 1 | 3075.56 | 4 | 61511.2 |
| 8 | 210 | 1382 | 21 | 1 | 5484.44 | 4 | 109688.8 |
| 9 | 210 | 1386 | 21 | 1 | 5359.56 | 4 | 107191.2 |
| 10 | 210 | 1399 | 21 | 1 | 6169.36 | 4 | 123387.2 |
| 11 | 210 | 1423 | 21 | 1 | 5049.6 | 4 | 100992 |
| 12 | 220 | 1353 | 21 | 1 | 3070.48 | 4 | 61409.6 |
| 13 | 220 | 1386 | 21 | 1 | 5581.2 | 4 | 111624 |
| 14 | 221 | 1335 | 21 | 1 | 4234.12 | 4 | 84682.4 |
| 15 | 221 | 1353 | 21 | 1 | 3220.12 | 4 | 64402.4 |
| 16 | 221 | 1386 | 21 | 1 | 5708.08 | 4 | 114161.6 |

- TRANSACTION_FACT_V1

| | TIME_ID | AIRLINE_ID | FLIGHT_TYPE_ID | FLIGHT_CLASS_ID | PASS_TYPE_ID | SOURCE_AIRPORT_ID | DEST_AIRPORT_ID | TOTAL_PAID_TICKET_PRICE | TOTAL_PASSENGER_AGE | TOTA |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 01022008 | 4089 | 1 | F | T | 3351 | 3361 | 816.05 | 39 | |
| 2 | 01032008 | 3052 | 2 | E | T | 3940 | 3351 | 520.85 | 11 | |
| 3 | 01052007 | 2922 | 2 | E | T | 4150 | 2188 | 428.5 | 16 | |
| 4 | 01052007 | 2009 | 2 | E | E | 3797 | 1852 | 381.09 | 61 | |
| 5 | 01052008 | 4089 | 1 | E | A | 6298 | 3339 | 1523.85 | 94 | |
| 6 | 01052008 | 4089 | 1 | B | A | 6298 | 3339 | 1595.6 | 107 | |
| 7 | 01052008 | 4089 | 1 | B | E | 6298 | 3339 | 537.39 | 73 | |
| 8 | 01052008 | 4089 | 1 | E | T | 6298 | 3339 | 761.07 | 25 | |
| 9 | 01052008 | 4089 | 1 | F | E | 6298 | 3339 | 604.18 | 67 | |
| 10 | 01062009 | 5265 | 1 | F | A | 3720 | 3876 | 416.29 | 47 | |
| 11 | 01072007 | 897 | 1 | F | E | 2404 | 2397 | 224.06 | 68 | |
| 12 | 01072007 | 2520 | 2 | B | C | 3275 | 3351 | 558.67 | 6 | |
| 13 | 01072008 | 2222 | 2 | F | A | 3339 | 2179 | 2699.28 | 19 | |
| 14 | 01072008 | 2222 | 2 | B | C | 3339 | 2179 | 2002.95 | 7 | |
| 15 | 01082008 | 4089 | 2 | F | A | 3406 | 3339 | 4218.45 | 69 | |

- MEMBERSHIP_SALES_FACT_V1

| | TIME_ID | MEMBERSHIPTYPEID | PASS_TYPE_ID | TOTAL_NUMBER_OF_MEMBERS | TOTAL_MEMBERSHIP_SALES |
|---|---|---|---|---|---|
| 1 | 30032014 | M3 | A | 2 | 1598 |
| 2 | 05082006 | M1 | A | 2 | 798 |
| 3 | 11032011 | M3 | C | 3 | 2397 |
| 4 | 23072005 | M4 | A | 1 | 899.1 |
| 5 | 21032009 | M4 | C | 1 | 999 |
| 6 | 14122013 | M1 | E | 1 | 399 |
| 7 | 08102014 | M2 | A | 1 | 599 |
| 8 | 10052010 | M2 | A | 4 | 2396 |
| 9 | 31102008 | M3 | E | 2 | 1598 |
| 10 | 03112014 | M2 | C | 1 | 599 |
| 11 | 01062011 | M1 | E | 1 | 399 |
| 12 | 15042006 | M2 | A | 1 | 599 |
| 13 | 24042006 | M4 | A | 2 | 1998 |
| 14 | 21052010 | M2 | A | 1 | 599 |
| 15 | 15082011 | M3 | T | 2 | 1598 |
| 16 | 05022010 | M4 | C | 1 | 999 |

**Screenshots for Version 2**

- Membership_Type_DIM_V2

| | MEMBERSHIPTYPEID | MEMBERSHIPNAME |
|---|---|---|
| 1 | M1 | bronze |
| 2 | M2 | silver |
| 3 | M3 | Gold |
| 4 | M4 | Royal |

- Membership_Price_DIM_V2

| | MEMBERSHIPTYPEID | STARTDATE | ENDDATE | MEMBERSHIPFEE |
|---|---|---|---|---|
| 1 | M2 | 01-01-2013 00:00:00 | 30-04-2013 00:00:00 | 479.2 |
| 2 | M3 | 01-01-2013 00:00:00 | 30-04-2013 00:00:00 | 639.2 |
| 3 | M1 | 01-03-2012 00:00:00 | 30-04-2012 00:00:00 | 331.17 |
| 4 | M3 | 01-03-2008 00:00:00 | 30-04-2008 00:00:00 | 663.17 |
| 5 | M4 | 01-03-2008 00:00:00 | 30-04-2008 00:00:00 | 829.17 |
| 6 | M2 | 01-01-2005 00:00:00 | 31-08-2005 00:00:00 | 539.1 |
| 7 | M1 | 01-01-2005 00:00:00 | 31-08-2005 00:00:00 | 359.1 |
| 8 | M3 | 01-03-2012 00:00:00 | 30-04-2012 00:00:00 | 663.17 |
| 9 | M2 | 01-03-2012 00:00:00 | 30-04-2012 00:00:00 | 497.17 |
| 10 | M3 | 01-11-2006 00:00:00 | 31-05-2007 00:00:00 | 679.15 |
| 11 | M1 | 01-01-2013 00:00:00 | 30-04-2013 00:00:00 | 319.2 |
| 12 | M4 | 01-03-2012 00:00:00 | 30-04-2012 00:00:00 | 829.17 |
| 13 | M2 | 01-03-2008 00:00:00 | 30-04-2008 00:00:00 | 497.17 |
| 14 | M4 | 01-01-2005 00:00:00 | 31-08-2005 00:00:00 | 899.1 |
| 15 | M3 | 01-01-2005 00:00:00 | 31-08-2005 00:00:00 | 719.1 |
| 16 | M4 | 01-11-2006 00:00:00 | 31-05-2007 00:00:00 | 849.15 |

- flight_dim_v2

| | FLIGHTID | FLIGHTDATE | DEPARTTIME | ARRIVALTIME | FARE |
|---|---|---|---|---|---|
| 1 | WN5900 | 29-10-2007 00:00:00 | 29-10-2007 02:50:30 | 29-10-2007 05:36:09 | 173.72 |
| 2 | UA5498 | 03-08-2007 00:00:00 | 03-08-2007 12:25:24 | 03-08-2007 17:38:44 | 656.79 |
| 3 | SU9794 | 25-10-2008 00:00:00 | 25-10-2008 18:30:23 | 25-10-2008 22:55:40 | 154.02 |
| 4 | TP5523 | 11-09-2009 00:00:00 | 11-09-2009 03:55:41 | 11-09-2009 04:18:41 | 364.84 |
| 5 | AC7114 | 14-04-2008 00:00:00 | 14-04-2008 23:45:04 | 15-04-2008 00:04:19 | 305.04 |
| 6 | MF2590 | 26-03-2009 00:00:00 | 26-03-2009 14:25:01 | 26-03-2009 15:50:59 | 293.92 |
| 7 | MU6723 | 08-02-2009 00:00:00 | 08-02-2009 05:35:31 | 09-02-2009 01:24:22 | 1017.76 |
| 8 | BR2432 | 13-08-2008 00:00:00 | 13-08-2008 16:55:46 | 13-08-2008 18:53:06 | 223.68 |
| 9 | HG3397 | 26-07-2008 00:00:00 | 26-07-2008 17:50:49 | 26-07-2008 19:37:28 | 410.77 |
| 10 | FL9200 | 13-02-2008 00:00:00 | 13-02-2008 10:25:48 | 13-02-2008 15:49:29 | 46.29 |
| 11 | AC8328 | 23-03-2008 00:00:00 | 23-03-2008 10:05:35 | 23-03-2008 11:48:25 | 116.4 |
| 12 | DL5999 | 10-03-2007 00:00:00 | 10-03-2007 15:00:06 | 10-03-2007 16:04:35 | 185.59 |
| 13 | XY4674 | 15-12-2009 00:00:00 | 15-12-2009 19:40:50 | 15-12-2009 21:05:44 | 49.11 |
| 14 | ST2088 | 20-02-2007 00:00:00 | 20-02-2007 13:55:18 | 20-02-2007 14:17:48 | 286.75 |
| 15 | KQ2645 | 05-12-2007 00:00:00 | 05-12-2007 08:15:09 | 05-12-2007 13:30:54 | 395.28 |
| 16 | CZ5447 | 09-11-2007 00:00:00 | 09-11-2007 23:30:28 | 10-11-2007 02:19:39 | 182.73 |

- route_dim_v2

| | ROUTEID | STOPS | EQUIPMENT | NEWLYOPENED |
|---|---|---|---|---|
| 1 | 12168 | 0 | DH4 | N |
| 2 | 12169 | 0 | D38 | N |
| 3 | 12170 | 0 | DH4 | N |
| 4 | 12171 | 0 | DH4 | N |
| 5 | 12172 | 0 | DH4 | N |
| 6 | 12173 | 0 | M11 | N |
| 7 | 12174 | 0 | M11 | N |
| 8 | 12175 | 0 | DH4 E95 | N |
| 9 | 12176 | 0 | DH4 | N |
| 10 | 12177 | 0 | DH4 E95 | N |
| 11 | 12178 | 0 | E95 DH4 | N |
| 12 | 12179 | 0 | DH4 | N |
| 13 | 12180 | 0 | DH4 | N |
| 14 | 12181 | 0 | E95 DH4 | N |
| 15 | 12182 | 0 | DH4 | N |
| 16 | 12183 | 0 | DH4 E95 | N |

- Airline_DIM_V2

| | AIRLINE_ID | SERVICE_WEIGHT | LIST_OF_SERVICES |
|---|---|---|---|
| 1 | 1 | 0.33 | Extra weight 20__In-flight breakfast__In-flight games |
| 2 | 2 | 0.25 | Extra weight 20__In-flight beverage__In-flight breakfast__In-flight movies |
| 3 | 3 | 0.33 | Extra weight 5__In-flight games__In-flight meal |
| 4 | 4 | 0.25 | Extra weight 5__In-flight fast food__In-flight meal__In-flight music |
| 5 | 5 | 0.25 | Extra weight 5__In-flight breakfast__In-flight fast food__In-flight music |
| 6 | 6 | 0.25 | Extra weight 20__In-flight beverage__In-flight breakfast__In-flight movies |
| 7 | 7 | 0.25 | Extra weight 10__In-flight fast food__In-flight meal__In-flight movies |
| 8 | 8 | 0.33 | Extra weight 5__In-flight breakfast__In-flight internet |
| 9 | 9 | 0.33 | Extra weight 20__In-flight games__In-flight meal |
| 10 | 10 | 0.33 | Extra weight 5__In-flight games__In-flight meal |
| 11 | 11 | 0.25 | Extra weight 10__In-flight breakfast__In-flight fast food__In-flight music |
| 12 | 12 | 0.33 | Extra weight 20__In-flight breakfast__In-flight internet |
| 13 | 13 | 0.33 | Extra weight 5__In-flight breakfast__In-flight internet |
| 14 | 14 | 0.33 | Extra weight 5__In-flight games__In-flight meal |
| 15 | 15 | 0.25 | Extra weight 5__In-flight breakfast__In-flight fast food__In-flight music |
| 16 | 16 | 0.33 | Extra weight 20__In-flight breakfast__In-flight games |

- Provides_Bridge_DIM_V2

| | AIRLINEID | SERVICEID |
|---|---|---|
| 1 | 356 | 1 |
| 2 | 356 | 4 |
| 3 | 356 | 6 |
| 4 | 356 | 9 |
| 5 | 357 | 3 |
| 6 | 357 | 4 |
| 7 | 357 | 11 |
| 8 | 358 | 2 |
| 9 | 358 | 4 |
| 10 | 358 | 11 |
| 11 | 359 | 2 |
| 12 | 359 | 5 |
| 13 | 359 | 11 |
| 14 | 360 | 2 |
| 15 | 360 | 5 |
| 16 | 360 | 6 |

- Services_DIM_V2

| | SERVICEID | NAME | DESCRIPTION |
|---|---|---|---|
| 1 | 1 | Extra weight 20 | Customer can buy up to 20kg extra luggage weight |
| 2 | 2 | Extra weight 10 | Customer can buy up to 10kg extra luggage weight |
| 3 | 3 | Extra weight 5 | Customer can buy up to 5kg extra luggage weight |
| 4 | 4 | In-flight breakfast | breakfast served to passengers on board |
| 5 | 5 | In-flight meal | meal served to passengers on board |
| 6 | 6 | In-flight fast food | fast food served to passengers on board |
| 7 | 7 | In-flight beverage | drink served to passengers on board |
| 8 | 8 | In-flight movies | Customer can view online movies |
| 9 | 9 | In-flight music | Customer can listen to music |
| 10 | 10 | In-flight games | Customer can play games |
| 11 | 11 | In-flight internet | Customer can access internet via Wifi on board |

- Source_Airport_DIM_V2

| | SOURCE_AIRPORT_ID | SOURCE_AIRPORT_NAME | CITY | COUNTRY | TIMEZONE | DST |
|---|---|---|---|---|---|---|
| 1 | 10 | Thule Air Base | Thule | Greenland | -4 | E |
| 2 | 12 | Egilsstadir | Egilsstadir | Iceland | 0 | N |
| 3 | 28 | Bagotville | Bagotville | Canada | -5 | A |
| 4 | 37 | Kugluktuk | Coppermine | Canada | -7 | A |
| 5 | 40 | Clyde River | Clyde River | Canada | -5 | A |
| 6 | 41 | Fairmont Hot Springs | Coral Harbour | Canada | -7 | A |
| 7 | 54 | Inuvik Mike Zubko | Inuvik | Canada | -7 | A |
| 8 | 62 | La Grande Riviere | La Grande Riviere | Canada | -5 | A |
| 9 | 74 | Atikokan Muni | Atikokan | Canada | -6 | A |
| 10 | 79 | Waterloo | Waterloo | Canada | -5 | A |
| 11 | 81 | Kindersley | Kindersley | Canada | -6 | N |
| 12 | 330 | Jena Schongleina | Jena | Germany | 1 | E |
| 13 | 338 | Dresden | Dresden | Germany | 1 | E |
| 14 | 355 | Frankfurt Hahn | Hahn | Germany | 1 | E |
| 15 | 358 | Worms | Worms | Germany | 1 | E |
| 16 | 368 | Essen Mulheim | Essen | Germany | 1 | E |

- Dest_Airport_DIM_V2

| | DEST_AIRPORT_ID | DEST_AIRPORT_NAME | CITY | COUNTRY | TIMEZONE | DST |
|---|---|---|---|---|---|---|
| 1 | 10 | Thule Air Base | Thule | Greenland | -4 | E |
| 2 | 12 | Egilsstadir | Egilsstadir | Iceland | 0 | N |
| 3 | 28 | Bagotville | Bagotville | Canada | -5 | A |
| 4 | 37 | Kugluktuk | Coppermine | Canada | -7 | A |
| 5 | 40 | Clyde River | Clyde River | Canada | -5 | A |
| 6 | 41 | Fairmont Hot Springs | Coral Harbour | Canada | -7 | A |
| 7 | 54 | Inuvik Mike Zubko | Inuvik | Canada | -7 | A |
| 8 | 62 | La Grande Riviere | La Grande Riviere | Canada | -5 | A |
| 9 | 74 | Atikokan Muni | Atikokan | Canada | -6 | A |
| 10 | 79 | Waterloo | Waterloo | Canada | -5 | A |
| 11 | 81 | Kindersley | Kindersley | Canada | -6 | N |
| 12 | 330 | Jena Schongleina | Jena | Germany | 1 | E |
| 13 | 338 | Dresden | Dresden | Germany | 1 | E |
| 14 | 355 | Frankfurt Hahn | Hahn | Germany | 1 | E |
| 15 | 358 | Worms | Worms | Germany | 1 | E |
| 16 | 368 | Essen Mulheim | Essen | Germany | 1 | E |

- PASSENGER_DIM_V2

| | PASSID | FIRSTNAME | LASTNAME | NATIONALITY | AGE | JOINDATE |
|---|---|---|---|---|---|---|
| 1 | 1121 | Londa | Ava | Qatari | 40 | 07-12-2012 00:00:00 |
| 2 | 1122 | Denny | Keisha | Australian | 62 | 19-04-2006 00:00:00 |
| 3 | 1122 | Denny | Keisha | Australian | 62 | 08-06-2011 00:00:00 |
| 4 | 1122 | Denny | Keisha | Australian | 62 | 06-04-2014 00:00:00 |
| 5 | 1123 | Christoper | Dewey | Australian | 58 | 16-04-2008 00:00:00 |
| 6 | 1123 | Christoper | Dewey | Australian | 58 | 07-08-2011 00:00:00 |
| 7 | 1123 | Christoper | Dewey | Australian | 58 | 07-06-2010 00:00:00 |
| 8 | 1124 | Dwain | Zada | Australian | 23 | 01-05-2010 00:00:00 |
| 9 | 1125 | Cami | Aimee | Australian | 13 | (null) |
| 10 | 1126 | Sindy | Raymonde | Mauritian | 43 | 02-02-2008 00:00:00 |
| 11 | 1126 | Sindy | Raymonde | Mauritian | 43 | 21-11-2014 00:00:00 |
| 12 | 1126 | Sindy | Raymonde | Mauritian | 43 | 26-01-2005 00:00:00 |
| 13 | 1126 | Sindy | Raymonde | Mauritian | 43 | 07-10-2012 00:00:00 |
| 14 | 1126 | Sindy | Raymonde | Mauritian | 43 | 01-10-2006 00:00:00 |
| 15 | 1127 | Wenona | Babara | Liberian | 79 | 22-07-2012 00:00:00 |
| 16 | 1127 | Wenona | Babara | Liberian | 79 | 18-07-2011 00:00:00 |

- ROUTE_FACT_V2

| | SOURCE_AIRPORT_ID | DEST_AIRPORT_ID | ROUTEID | AIRLINE_ID | TOTAL_NUM_ROUTES | TOTAL_DISTANCE | TOTAL_NUMBER_OF_SERVICES | TOTAL_SERVICE_COST |
|---|---|---|---|---|---|---|---|---|
| 1 | 3832 | 7242 | 39971 | 10 | 1 | 354.6 | 3 | 7092 |
| 2 | 7242 | 3832 | 39972 | 10 | 1 | 354.6 | 3 | 7092 |
| 3 | 221 | 1335 | 58200 | 21 | 1 | 4234.12 | 4 | 84682.4 |
| 4 | 220 | 1353 | 58186 | 21 | 1 | 3070.48 | 4 | 61409.6 |
| 5 | 220 | 1386 | 58187 | 21 | 1 | 5581.2 | 4 | 111624 |
| 6 | 210 | 1382 | 58188 | 21 | 1 | 5484.44 | 4 | 109688.8 |
| 7 | 210 | 1399 | 58189 | 21 | 1 | 6169.36 | 4 | 123387.2 |
| 8 | 210 | 1335 | 58190 | 21 | 1 | 4066.92 | 4 | 81338.4 |
| 9 | 210 | 1423 | 58191 | 21 | 1 | 5049.6 | 4 | 100992 |
| 10 | 210 | 1353 | 58192 | 21 | 1 | 3075.56 | 4 | 61511.2 |
| 11 | 210 | 1386 | 58193 | 21 | 1 | 5359.56 | 4 | 107191.2 |
| 12 | 210 | 1273 | 58194 | 21 | 1 | 3149.04 | 4 | 62980.8 |
| 13 | 209 | 1353 | 58195 | 21 | 1 | 2990.76 | 4 | 59815.2 |
| 14 | 209 | 1386 | 58196 | 21 | 1 | 5414.96 | 4 | 108299.2 |
| 15 | 235 | 1386 | 58197 | 21 | 1 | 6295.28 | 4 | 125905.6 |
| 16 | 1382 | 210 | 58198 | 21 | 1 | 5484.44 | 4 | 109688.8 |

- TRANSACTION_FACT_V2

| | ROUTEID | FLIGHTID | SOURC... | DEST... | PASSID | TOTAL_PAID | TOTAL_FARE | TOTAL_PASSE... | TOTAL_NUM_OF_PASSENGERS | TOTAL_AGENT_PROFIT |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2511 | 8L5425 | 3382 | 3406 | 6546 | 482.91 | 219.47 | 17 | 1 | 263.44 |
| 2 | 2544 | 8L4308 | 3387 | 6361 | 8307 | 314.47 | 61.14 | 79 | 1 | 253.33 |
| 3 | 9132 | AS9698 | 3484 | 3687 | 1994 | 247.05 | 157.64 | 76 | 1 | 89.41 |
| 4 | 12457 | BR3032 | 3320 | 2276 | 3334 | 1830.32 | 808.97 | 40 | 1 | 1021.35 |
| 5 | 12457 | BR3032 | 3320 | 2276 | 3965 | 911.7 | 808.97 | 31 | 1 | 102.73 |
| 6 | 12517 | BR1164 | 2276 | 3320 | 7595 | 1614.54 | 755.45 | 1 | 1 | 859.09 |
| 7 | 2756 | 8V4890 | 3420 | 7114 | 1085 | 125.84 | 38.58 | 60 | 1 | 87.26 |
| 8 | 2796 | 9C5950 | 3386 | 6347 | 2960 | 301.55 | 205.09 | 78 | 1 | 96.46 |
| 9 | 2826 | 9C4047 | 3373 | 3391 | 1085 | 725.6 | 304.05 | 60 | 1 | 421.55 |
| 10 | 2853 | 9C5198 | 3391 | 6352 | 6452 | 267.48 | 98.56 | 83 | 1 | 168.92 |
| 11 | 6018 | AC6241 | 3830 | 121 | 8407 | 440.24 | 357.93 | 50 | 1 | 82.31 |
| 12 | 11012 | B64602 | 3533 | 3641 | 1686 | 283.5 | 136.92 | 28 | 1 | 146.58 |
| 13 | 4476 | AA5723 | 507 | 3448 | 10988 | 718.31 | 658.69 | 51 | 1 | 59.62 |
| 14 | 4605 | AA9855 | 3339 | 3320 | 1649 | 209.95 | 103.57 | 6 | 1 | 106.38 |
| 15 | 4605 | AA9855 | 3339 | 3320 | 9543 | 189.33 | 103.57 | 1 | 1 | 85.76 |
| 16 | 4605 | AA9254 | 3339 | 3320 | 10147 | 291.51 | 189.07 | 16 | 1 | 102.44 |

- MEMBERSHIP_SALES_FACT_V2

| | PASSID | JOINDATE | MEMBERSHIPTYPEID | TOTAL_NUMBER_OF_MEMBERS | TOTAL_MEMBERSHIP_SALES |
|---|---|---|---|---|---|
| 1 | 5927 | 05-08-2006 00:00:00 | M1 | 1 | 399 |
| 2 | 2137 | 07-04-2014 00:00:00 | M3 | 1 | 799 |
| 3 | 3019 | 07-02-2007 00:00:00 | M3 | 1 | 679.15 |
| 4 | 5525 | 31-10-2008 00:00:00 | M3 | 1 | 799 |
| 5 | 6691 | 22-06-2005 00:00:00 | M1 | 1 | 359.1 |
| 6 | 3319 | 11-02-2011 00:00:00 | M1 | 1 | 399 |
| 7 | 2856 | 29-07-2006 00:00:00 | M4 | 1 | 999 |
| 8 | 3553 | 03-11-2014 00:00:00 | M2 | 1 | 599 |
| 9 | 4161 | 16-11-2005 00:00:00 | M4 | 1 | 999 |
| 10 | 1350 | 29-12-2014 00:00:00 | M2 | 1 | 599 |
| 11 | 2397 | 11-03-2009 00:00:00 | M2 | 1 | 599 |
| 12 | 6144 | 19-02-2005 00:00:00 | M4 | 1 | 899.1 |
| 13 | 3623 | 07-07-2012 00:00:00 | M1 | 1 | 399 |
| 14 | 1896 | 04-06-2011 00:00:00 | M2 | 1 | 599 |
| 15 | 2371 | 24-04-2008 00:00:00 | M2 | 1 | 497.17 |
| 16 | 4988 | 05-08-2012 00:00:00 | M2 | 1 | 599 |

# 4 Basic Reports

## 4.1 Report 1

What are the top 3 average ages of passengers travelling on business class from an Australian airport?

```
SELECT * FROM (SELECT

source_airport_id,

ROUND(SUM(total_passenger_age)/sum(total_num_of_passengers),2) as AVERAGE_AGE

FROM

(SELECT DISTINCT t.passid,t.source_airport_id,t.total_passenger_age,t.total_num_of_passengers,
s.COUNTRY  as country,f.flightdate,t.TOTAL_PAID,f.FARE

FROM TRANSACTION_FACT_V2 t,

PASSENGER_DIM_V2 p,

Source_Airport_DIM_V2 s,

FLIGHT_DIM_V2 f

where

t.passid=p.passid

and

t.source_airport_id=s.source_airport_id

and
```

f.flightid=t.FLIGHTID

and

(t.TOTAL_PAID >= 1.5*f.FARE AND t.TOTAL_PAID < 2*f.FARE)

and

s.COUNTRY='Australia'

)

GROUP BY

source_airport_id

ORDER BY

AVERAGE_AGE DESC)

WHERE rownum <=3;

**Output:**

Worksheet | Query Builder

```
t.passid=p.passid
and
t.source_airport_id=s.source_airport_id
and
f.flightid=t.FLIGHTID
and
(t.TOTAL_PAID >= 1.5*f.FARE AND t.TOTAL_PAID < 2*f.FARE)
and
s.COUNTRY='Australia'
)
GROUP BY
source_airport_id
ORDER BY
AVERAGE_AGE DESC)
WHERE rownum <=3;
```

Script Output | Query Result

SQL | All Rows Fetched: 3 in 0.836 seconds

| | SOURCE_AIRPORT_ID | AVERAGE_AGE |
|---|---|---|
| 1 | 6289 | 73.67 |
| 2 | 6256 | 68 |
| 3 | 6337 | 64 |

## 4.2 Report 2

a. What is the total number of newly joined gold membership for adult passengers in each month?

b. SQL Command

```
SELECT TO_CHAR(p.joindate,'MM')   AS MONTH,

  SUM(msf.total_number_of_members) AS newly_joined_member

FROM passenger_dim_v2 p,

  membership_type_dim_v2 m,

  membership_sales_fact_v2 msf

WHERE p.passid = msf.passid

AND p.joindate = msf.joindate

AND m.membershiptypeid = msf.membershiptypeid

AND p.age <= 60

AND p.age >= 18

AND m.membershipname   = 'Gold'

GROUP BY TO_CHAR(p.joindate,'MM')

ORDER BY TO_CHAR(p.joindate,'MM');
```

c. Query results

```
SELECT TO_CHAR(p.joindate,'MM')    AS MONTH,
  SUM(msf.total_number_of_members) AS newly_joined_member
FROM passenger_dim_v2 p,
  membership_type_dim_v2 m,
  membership_sales_fact_v2 msf
WHERE p.passid = msf.passid
AND p.joindate = msf.joindate
AND m.membershiptypeid = msf.membershiptypeid
AND p.age <= 60
AND p.age >= 18
AND m.membershipname    = 'Gold'
GROUP BY TO_CHAR(p.joindate,'MM')
ORDER BY TO_CHAR(p.joindate,'MM');
```

Script Output x | Query Result x

SQL | All Rows Fetched: 12 in 0.283 seconds

| | MONTH | NEWLY_JOINED_MEMBER |
|---|---|---|
| 1 | 01 | 140 |
| 2 | 02 | 107 |
| 3 | 03 | 164 |
| 4 | 04 | 109 |
| 5 | 05 | 140 |
| 6 | 06 | 141 |
| 7 | 07 | 146 |
| 8 | 08 | 151 |
| 9 | 09 | 134 |
| 10 | 10 | 152 |
| 11 | 11 | 140 |
| 12 | 12 | 144 |

Bookmarks

# 5 Advanced Reports

## 5.1 Report 3 – Transactions Report

a. Report generated as per the given format
b. SQL Commands

**select distinct td.year AS FLIGHT_YEAR,**

**DECODE(GROUPING(ft.flight_type_name), 1, 'ANY Types', ft.flight_type_name) as FLIGHT_TYPE,**

**DECODE(GROUPING(fc.flight_class_name), 1, 'ANY Classes', fc.flight_class_name) as FLIGHT_CLASS,**

**DECODE(GROUPING(a.country), 1, 'Any Country', a.country)as sourceCountry,**

**DECODE(GROUPING(b.country), 1, 'Any Country', b.country)as destinationCountry,**

**sum(t.total_num_of_passengers) as number_of_transactions,**

```
round(sum((t.total_agent_profit)/t.total_num_of_passengers),1) as average_agent_profit
from source_airport_dim_v1 a,
dest_airport_dim_v1 b,
airline_dim_v1 ad,
flight_type_dim_v1 ft,
flight_class_dim_v1 fc,
time_dim_v1 td,
transaction_fact_v1 t
where (t.source_airport_ID = a.source_airport_ID and t.dest_airport_id = b.dest_airport_id)
and ad.airline_ID = t.airline_ID
and t.flight_type_id = ft.flight_type_id
and t.flight_class_id = fc.flight_class_id
and td.time_id = t.time_id
group by td.year, cube(ft.flight_type_name, fc.flight_class_name,
a.country , b.country)
order by td.year;
```

c. Screenshots of the query results

| | FLIGHT_YEAR | FLIGHT_TYPE | FLIGHT_CLASS | SOURCECOUNTRY | DESTINATIONCOUNTRY | NUMBER_OF_TRANSACTIONS | AVERAGE_AGENT_PROFIT |
|---|---|---|---|---|---|---|---|
| 1 | 2007 | ANY Types | ANY Classes | Afghanistan | Afghanistan | 1 | 145.9 |
| 2 | 2007 | ANY Types | ANY Classes | Afghanistan | Any Country | 3 | 483.6 |
| 3 | 2007 | ANY Types | ANY Classes | Afghanistan | India | 1 | 59.9 |
| 4 | 2007 | ANY Types | ANY Classes | Afghanistan | United Arab Emirates | 1 | 277.8 |
| 5 | 2007 | ANY Types | ANY Classes | Albania | Any Country | 1 | 216.3 |
| 6 | 2007 | ANY Types | ANY Classes | Albania | Italy | 1 | 216.3 |
| 7 | 2007 | ANY Types | ANY Classes | Algeria | Any Country | 2 | 310.7 |
| 8 | 2007 | ANY Types | ANY Classes | Algeria | France | 1 | 298.8 |
| 9 | 2007 | ANY Types | ANY Classes | Algeria | Turkey | 1 | 11.9 |
| 10 | 2007 | ANY Types | ANY Classes | Angola | Angola | 1 | 92.1 |
| 11 | 2007 | ANY Types | ANY Classes | Angola | Any Country | 1 | 92.1 |
| 12 | 2007 | ANY Types | ANY Classes | Any Country | Afghanistan | 3 | 809.1 |
| 13 | 2007 | ANY Types | ANY Classes | Any Country | Algeria | 1 | 298.2 |
| 14 | 2007 | ANY Types | ANY Classes | Any Country | Angola | 1 | 92.1 |
| 15 | 2007 | ANY Types | ANY Classes | Any Country | Any Country | 6337 | 809254.4 |
| 16 | 2007 | ANY Types | ANY Classes | Any Country | Argentina | 3 | 544.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 25 | 2007 | ANY Types | ANY Classes | Any Country | Bolivia | 2 | 170.8 |
| 26 | 2007 | ANY Types | ANY Classes | Any Country | Bosnia and Herzegovina | 1 | 198.8 |
| 27 | 2007 | ANY Types | ANY Classes | Any Country | Botswana | 1 | 312 |
| 28 | 2007 | ANY Types | ANY Classes | Any Country | Brazil | 20 | 4301.2 |
| 29 | 2007 | ANY Types | ANY Classes | Any Country | Brunei | 1 | 208.7 |
| 30 | 2007 | ANY Types | ANY Classes | Any Country | Bulgaria | 1 | 83 |
| 31 | 2007 | ANY Types | ANY Classes | Any Country | Burma | 1 | 101.8 |
| 32 | 2007 | ANY Types | ANY Classes | Any Country | Cambodia | 1 | 268.8 |
| 33 | 2007 | ANY Types | ANY Classes | Any Country | Canada | 26 | 6991.5 |
| 34 | 2007 | ANY Types | ANY Classes | Any Country | Chile | 1 | 64.2 |
| 35 | 2007 | ANY Types | ANY Classes | Any Country | China | 166 | 33853.9 |
| 36 | 2007 | ANY Types | ANY Classes | Any Country | Colombia | 5 | 631.8 |
| 37 | 2007 | ANY Types | ANY Classes | Any Country | Congo (Brazzaville) | 1 | 71.3 |
| 38 | 2007 | ANY Types | ANY Classes | Any Country | Costa Rica | 2 | 470.1 |
| 39 | 2007 | ANY Types | ANY Classes | Any Country | Cote d'Ivoire | 1 | 104.2 |
| 40 | 2007 | ANY Types | ANY Classes | Any Country | Cyprus | 3 | 568.6 |

## 5.2 Report 4

a. What are the sub-total and total agent profits of airports and airlines?

b. SQL Command

```
SELECT

DECODE(GROUPING(a.AIRLINE_ID), 1, 'ANY AIRLINES', a.AIRLINE_ID) as AIRLINE_ID,

DECODE(GROUPING(sa.source_airport_ID), 1, 'ANY AIRPORTS', sa.source_airport_ID) as
AIRPORTS,

sum(t.total_agent_profit)

from

AIRLINE_DIM_v1 a,

TRANSACTION_FACT_v1 t,

SOURCE_AIRPORT_DIM_v1 sa

where

a.AIRLINE_ID=t.AIRLINE_ID

and

t.source_airport_ID=sa.source_airport_ID

group by cube(a.AIRLINE_ID,sa.source_airport_ID)

order by a.AIRLINE_ID,sa.source_airport_ID;
```

c. Screenshots

| | AIRLINE_ID | AIRPORTS | SUM(T.TOTAL_AGENT_PROFIT) |
|---|---|---|---|
| 1 | 21 | 210 | 391.29 |
| 2 | 21 | 230 | 210.84 |
| 3 | 21 | ANY AIRPORTS | 602.13 |
| 4 | 24 | 49 | 271.08 |
| 5 | 24 | 193 | 377.76 |
| 6 | 24 | 478 | 65.62 |
| 7 | 24 | 507 | 1290.69 |
| 8 | 24 | 521 | 69.24 |
| 9 | 24 | 1382 | 792.57 |
| 10 | 24 | 1836 | 267.04 |
| 11 | 24 | 2006 | 5000.01 |
| 12 | 24 | 2009 | 3309.24 |
| 13 | 24 | 2279 | 1374.19 |
| 14 | 24 | 3144 | 24.81 |

| | AIRLINE_ID | AIRPORTS | SUM(T.TOTAL_AGENT_PROFIT) |
|---|---|---|---|
| 87 | 90 | 1229 | 31.29 |
| 88 | 90 | 2621 | 560.5 |
| 89 | 90 | 3998 | 236.03 |
| 90 | 90 | ANY AIRPORTS | 1436.72 |
| 91 | 96 | 3941 | 1459.66 |
| 92 | 96 | 4029 | 100.62 |
| 93 | 96 | ANY AIRPORTS | 1560.28 |
| 94 | 106 | 1679 | 68.28 |
| 95 | 106 | ANY AIRPORTS | 68.28 |
| 96 | 125 | 1701 | 367.79 |
| 97 | 125 | 2051 | 59.88 |
| 98 | 125 | ANY AIRPORTS | 427.67 |
| 99 | 130 | 338 | 377.26 |
| 100 | 130 | 507 | 35.43 |

## 5.3 Report 5

a. Total and Cumulative monthly total sales of gold membership in 2009
b. SQL Command

**select mt.membershipname, td.month, sum(msf.total_number_of_members) as TOTAL_NUMBER_OF_MEMBERS,**

**TO_CHAR(sum(msf.total_membership_sales),'9,999,999') as total_sale,**

**to_char(sum(sum(msf.total_membership_sales)) OVER**

**(ORDER BY mt.membershipname, td.month rows unbounded PRECEDING),'9,999,999') as TOTAL_SALE_CUMMULATIVE**

**from membership_type_dim_v1 mt, membership_sales_fact_v1 msf, time_dim_v1 td**

**where mt.membershiptypeid = msf.membershiptypeid and msf.time_id = td.time_id**

**and mt.membershipname = 'Gold'**

**and td.year = 2009**

**group by**

**mt.membershipname, td.month**

**order by td.month;**

c. Screenshots of results

| | MEMBERSHIPNAME | MONTH | TOTAL_NUMBER_OF_MEMBERS | TOTAL_SALE | TOTAL_SALE_CUMMULATIVE |
|---|---|---|---|---|---|
| 1 | Gold | 01 | 31 | 24,769 | 24,769 |
| 2 | Gold | 02 | 21 | 16,779 | 41,548 |
| 3 | Gold | 03 | 30 | 23,970 | 65,518 |
| 4 | Gold | 04 | 31 | 24,769 | 90,287 |
| 5 | Gold | 05 | 30 | 23,970 | 114,257 |
| 6 | Gold | 06 | 29 | 23,171 | 137,428 |
| 7 | Gold | 07 | 30 | 23,970 | 161,398 |
| 8 | Gold | 08 | 33 | 26,367 | 187,765 |
| 9 | Gold | 09 | 17 | 13,583 | 201,348 |
| 10 | Gold | 10 | 27 | 21,573 | 222,921 |
| 11 | Gold | 11 | 18 | 14,382 | 237,303 |
| 12 | Gold | 12 | 36 | 28,764 | 266,067 |

## 5.4 Report 6

a. What are the city ranks by total number of incoming routes in each country?

b. SQL Command

**select**

**dst.country,**

**dst.City,**

**dst.dest_airport_id,**

**sum(rf.TOTAL_NUM_ROUTES) as TOTAL_ROUTES,**

**RANK() OVER (PARTITION BY dst.COUNTRY ORDER BY SUM(RF.TOTAL_NUM_ROUTES) DESC) AS RANK1**

**From**

**dest_airport_dim_v1 dst,**

**Route_fact_v1 rf**

**where**

**rf.dest_airport_id = dst.dest_airport_id**

**GROUP BY dst.country,**

**dst.City,**

**dst.dest_airport_id;**

c. Screenshots of the results

| | COUNTRY | CITY | DEST_AIRPORT_ID | TOTAL_ROUTES | RANK1 |
|---|---|---|---|---|---|
| 1 | Afghanistan | Kabul | 2050 | 26 | 1 |
| 2 | Afghanistan | Kandahar | 2051 | 5 | 2 |
| 3 | Afghanistan | Herat | 2048 | 4 | 3 |
| 4 | Afghanistan | Mazar-i-sharif | 2053 | 2 | 4 |
| 5 | Albania | Tirana | 1190 | 33 | 1 |
| 6 | Algeria | Algier | 210 | 71 | 1 |
| 7 | Algeria | Oran | 231 | 25 | 2 |
| 8 | Algeria | Constantine | 221 | 11 | 3 |
| 9 | Algeria | Annaba | 220 | 8 | 4 |
| 10 | Algeria | Setif | 6492 | 8 | 4 |
| 11 | Algeria | Bejaja | 209 | 6 | 6 |
| 12 | Algeria | Tlemcen | 230 | 5 | 7 |
| 13 | Algeria | Batna | 5552 | 4 | 8 |
| 14 | Algeria | Biskra | 235 | 4 | 8 |
| 15 | Algeria | Illizi | 214 | 3 | 10 |

| | COUNTRY | CITY | DEST_AIRPORT_ID | TOTAL_ROUTES | RANK1 |
|---|---|---|---|---|---|
| 22 | Angola | Ondjiva | 5632 | 6 | 2 |
| 23 | Angola | Lubango | 959 | 3 | 3 |
| 24 | Angola | Soyo | 958 | 3 | 3 |
| 25 | Angola | Cabinda | 946 | 3 | 3 |
| 26 | Angola | Malanje | 952 | 2 | 6 |
| 27 | Angola | Menongue | 953 | 2 | 6 |
| 28 | Angola | Kuito | 949 | 2 | 6 |
| 29 | Angola | Huambo | 948 | 2 | 6 |
| 30 | Angola | Saurimo | 957 | 2 | 6 |
| 31 | Angola | Catumbela | 5630 | 2 | 6 |
| 32 | Angola | M'banza-congo | 944 | 1 | 12 |
| 33 | Angola | Luena | 960 | 1 | 12 |
| 34 | Anguilla | The Valley | 2900 | 7 | 1 |
| 35 | Antigua and Barbuda | Antigua | 2874 | 34 | 1 |
| 36 | Argentina | Buenos Aires | 3988 | 74 | 1 |

# 6 Task 5

## 6.1 Set for report 3

**select distinct td.year AS FLIGHT_YEAR,**

**DECODE(GROUPING(ft.flight_type_name), 1, 'ANY Types', ft.flight_type_name) as FLIGHT_TYPE,**

**DECODE(GROUPING(fc.flight_class_name), 1, 'ANY Classes', fc.flight_class_name) as FLIGHT_CLASS,**

**DECODE(GROUPING(a.country), 1, 'Any Country', a.country)as sourceCountry,**

```
DECODE(GROUPING(b.country), 1, 'Any Country', b.country)as destinationCountry,
sum(t.total_num_of_passengers) as number_of_transactions,
round(sum((t.total_agent_profit)/t.total_num_of_passengers),1) as average_agent_profit
from source_airport_dim_v1 a,
dest_airport_dim_v1 b,
airline_dim_v1 ad,
flight_type_dim_v1 ft,
flight_class_dim_v1 fc,
time_dim_v1 td,
transaction_fact_v1 t
where (t.source_airport_ID = a.source_airport_ID and t.dest_airport_id = b.dest_airport_id)
and ad.airline_ID = t.airline_ID
and t.flight_type_id = ft.flight_type_id
and t.flight_class_id = fc.flight_class_id
and td.time_id = t.time_id
group by td.year, cube(ft.flight_type_name, fc.flight_class_name,
a.country , b.country)
order by td.year;
```

a. Screenshots of the query results

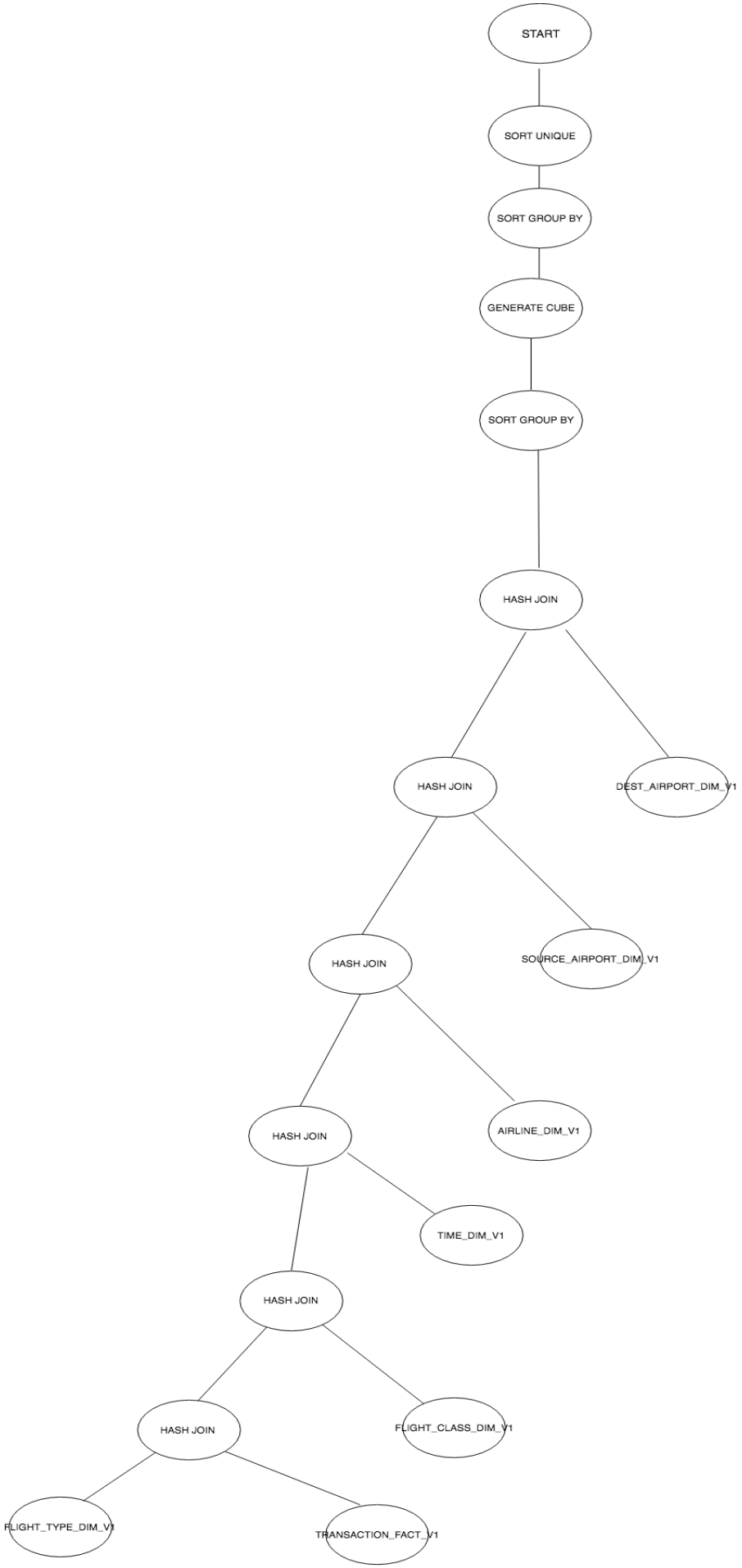
| | FLIGHT_YEAR | FLIGHT_TYPE | FLIGHT_CLASS | SOURCECOUNTRY | DESTINATIONCOUNTRY | NUMBER_OF_TRANSACTIONS | AVERAGE_AGENT_PROFIT |
|---|---|---|---|---|---|---|---|
| 1 | 2007 | ANY Types | ANY Classes | Afghanistan | Afghanistan | 1 | 145.9 |
| 2 | 2007 | ANY Types | ANY Classes | Afghanistan | Any Country | 3 | 483.6 |
| 3 | 2007 | ANY Types | ANY Classes | Afghanistan | India | 1 | 59.9 |
| 4 | 2007 | ANY Types | ANY Classes | Afghanistan | United Arab Emirates | 1 | 277.8 |
| 5 | 2007 | ANY Types | ANY Classes | Albania | Any Country | 1 | 216.3 |
| 6 | 2007 | ANY Types | ANY Classes | Albania | Italy | 1 | 216.3 |
| 7 | 2007 | ANY Types | ANY Classes | Algeria | Any Country | 2 | 310.7 |
| 8 | 2007 | ANY Types | ANY Classes | Algeria | France | 1 | 298.8 |
| 9 | 2007 | ANY Types | ANY Classes | Algeria | Turkey | 1 | 11.9 |
| 10 | 2007 | ANY Types | ANY Classes | Angola | Angola | 1 | 92.1 |
| 11 | 2007 | ANY Types | ANY Classes | Angola | Any Country | 1 | 92.1 |
| 12 | 2007 | ANY Types | ANY Classes | Any Country | Afghanistan | 3 | 809.1 |
| 13 | 2007 | ANY Types | ANY Classes | Any Country | Algeria | 1 | 298.2 |
| 14 | 2007 | ANY Types | ANY Classes | Any Country | Angola | 1 | 92.1 |
| 15 | 2007 | ANY Types | ANY Classes | Any Country | Any Country | 6337 | 809254.4 |
| 16 | 2007 | ANY Types | ANY Classes | Any Country | Argentina | 3 | 544.1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 25 | 2007 | ANY Types | ANY Classes | Any Country | Bolivia | 2 | 170.8 |
| 26 | 2007 | ANY Types | ANY Classes | Any Country | Bosnia and Herzegovina | 1 | 198.8 |
| 27 | 2007 | ANY Types | ANY Classes | Any Country | Botswana | 1 | 312 |
| 28 | 2007 | ANY Types | ANY Classes | Any Country | Brazil | 20 | 4301.2 |
| 29 | 2007 | ANY Types | ANY Classes | Any Country | Brunei | 1 | 208.7 |
| 30 | 2007 | ANY Types | ANY Classes | Any Country | Bulgaria | 1 | 83 |
| 31 | 2007 | ANY Types | ANY Classes | Any Country | Burma | 1 | 101.8 |
| 32 | 2007 | ANY Types | ANY Classes | Any Country | Cambodia | 1 | 268.8 |
| 33 | 2007 | ANY Types | ANY Classes | Any Country | Canada | 26 | 6991.5 |
| 34 | 2007 | ANY Types | ANY Classes | Any Country | Chile | 1 | 64.2 |
| 35 | 2007 | ANY Types | ANY Classes | Any Country | China | 166 | 33853.9 |
| 36 | 2007 | ANY Types | ANY Classes | Any Country | Colombia | 5 | 631.8 |
| 37 | 2007 | ANY Types | ANY Classes | Any Country | Congo (Brazzaville) | 1 | 71.3 |
| 38 | 2007 | ANY Types | ANY Classes | Any Country | Costa Rica | 2 | 470.1 |
| 39 | 2007 | ANY Types | ANY Classes | Any Country | Cote d'Ivoire | 1 | 104.2 |
| 40 | 2007 | ANY Types | ANY Classes | Any Country | Cyprus | 3 | 568.6 |

Execution Plan:

```
| Id  | Operation                    | Name                   | Rows  | Bytes |TempSpc| Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT             |                        | 10754 |  1176K|       |   386   (1)| 00:00:01 |
|   1 |  SORT UNIQUE                 |                        | 10754 |  1176K|       |   386   (1)| 00:00:01 |
|   2 |   SORT GROUP BY              |                        | 10754 |  1176K|       |   386   (1)| 00:00:01 |
|   3 |    GENERATE CUBE             |                        | 10754 |  1176K|       |   386   (1)| 00:00:01 |
|   4 |     SORT GROUP BY            |                        | 10754 |  1176K|  1432K|   386   (1)| 00:00:01 |
|*  5 |      HASH JOIN               |                        | 12096 |  1323K|       |    98   (2)| 00:00:01 |
|   6 |       TABLE ACCESS FULL      | DEST_AIRPORT_DIM_V1    |  7733 |   105K|       |    18   (0)| 00:00:01 |
|*  7 |       HASH JOIN              |                        | 12096 |  1157K|       |    80   (2)| 00:00:01 |
|   8 |        TABLE ACCESS FULL     | SOURCE_AIRPORT_DIM_V1  |  7733 |   105K|       |    18   (0)| 00:00:01 |
|*  9 |        HASH JOIN             |                        | 12096 |   992K|       |    61   (0)| 00:00:01 |
|  10 |         TABLE ACCESS FULL    | AIRLINE_DIM_V1         |  5986 | 29930 |       |    20   (0)| 00:00:01 |
|* 11 |         HASH JOIN            |                        | 12096 |   933K|       |    41   (0)| 00:00:01 |
|  12 |          TABLE ACCESS FULL   | TIME_DIM_V1            |  3603 | 50442 |       |     6   (0)| 00:00:01 |
|* 13 |          HASH JOIN           |                        | 12096 |   767K|       |    35   (0)| 00:00:01 |
|  14 |           TABLE ACCESS FULL  | FLIGHT_CLASS_DIM_V1    |     3 |    48 |       |     3   (0)| 00:00:01 |
|* 15 |           HASH JOIN          |                        | 12096 |   578K|       |    32   (0)| 00:00:01 |
|  16 |            TABLE ACCESS FULL| FLIGHT_TYPE_DIM_V1     |     2 |    30 |       |     3   (0)| 00:00:01 |
|  17 |            TABLE ACCESS FULL| TRANSACTION_FACT_V1    | 12096 |   401K|       |    29   (0)| 00:00:01 |
```

Query Tree:


START
SORT UNIQUE
SORT GROUP BY
GENERATE CUBE
SORT GROUP BY
HASH JOIN
HASH JOIN
DEST_AIRPORT_DIM_V1
HASH JOIN
SOURCE_AIRPORT_DIM_V1
HASH JOIN
AIRLINE_DIM_V1
TIME_DIM_V1
HASH JOIN
HASH JOIN
FLIGHT_CLASS_DIM_V1
FLIGHT_TYPE_DIM_V1
TRANSACTION_FACT_V1

New SQL:

```
select SUBSTR(t.time_id,5,4) as FLIGHT_YEAR,

DECODE(GROUPING(ft.flight_type_name), 1, 'ANY Types', ft.flight_type_name) as FLIGHT_TYPE,

DECODE(GROUPING(fc.flight_class_name), 1, 'ANY Classes', fc.flight_class_name) as
FLIGHT_CLASS,

DECODE(GROUPING(a.country), 1, 'Any Country', a.country)as sourceCountry,

DECODE(GROUPING(b.country), 1, 'Any Country', b.country)as destinationCountry,

sum(t.total_num_of_passengers) as number_of_transactions,

round(avg(t.total_agent_profit),1) as average_agent_profit

from SOURCE_AIRPORT_DIM_v1 a,

DEST_AIRPORT_DIM_V1 b,

airline_dim_v1 ad,

transaction_fact_v1 t,

flight_type_dim_v1 ft,

flight_class_dim_v1 fc

where (t.source_airport_ID = a.source_airport_ID and t.dest_airport_id = b.dest_airport_id)

and ad.airline_ID = t.airline_ID

and t.flight_type_id = ft.flight_type_id

and t.flight_class_id = fc.flight_class_id

group by SUBSTR(t.time_id,5,4),

cube(ft.flight_type_name, fc.flight_class_name,

a.country , b.country);
```

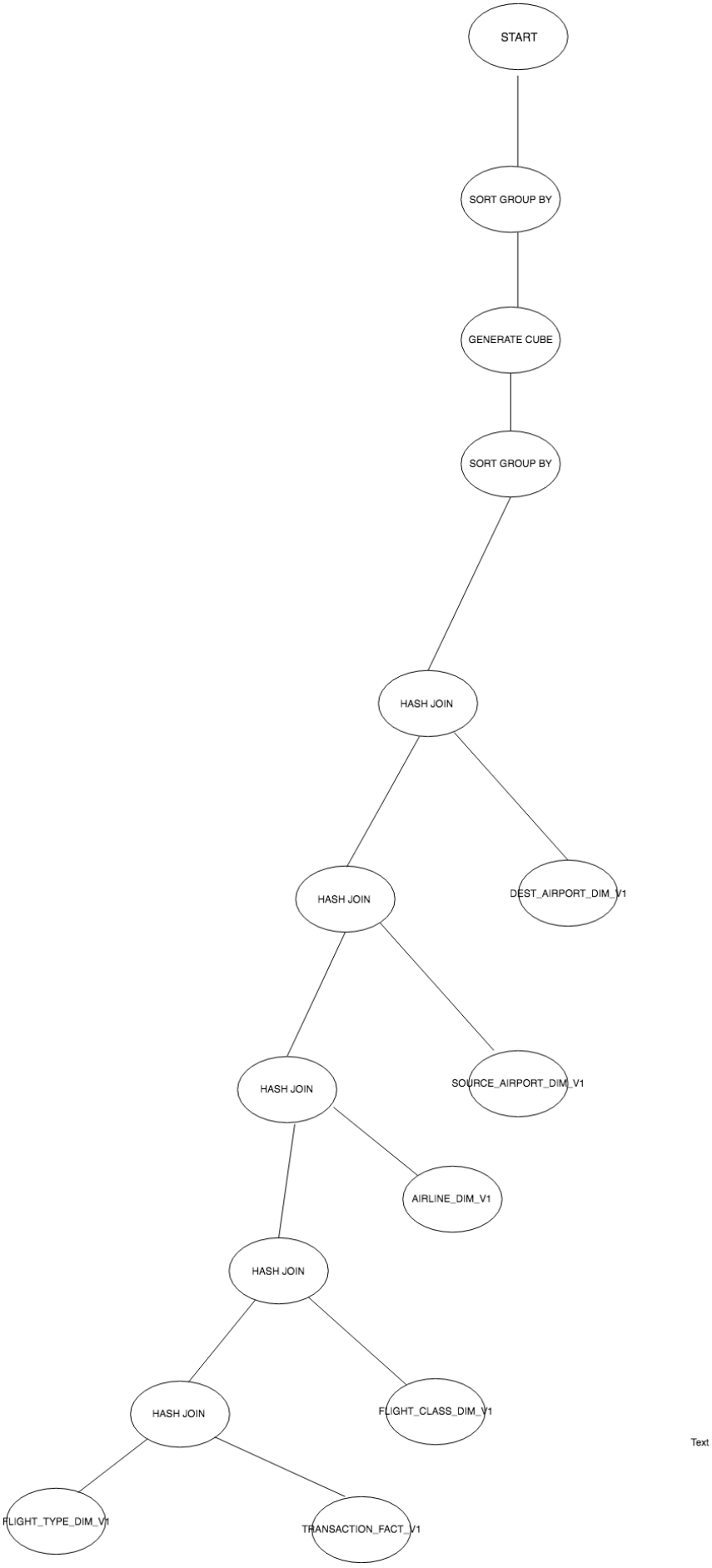
Screenshot of output :

| FLIGHT_YEAR | FLIGHT_TYPE | FLIGHT_CLASS | SOURCECOUNTRY | DESTINATIONCOUNTRY | NUMBER_OF_TRANSACTIONS | AVERAGE_AGENT_PROFIT |
|---|---|---|---|---|---|---|
| 2007 | ANY Types | ANY Classes | Any Country | Any Country | 6337 | 498.1 |
| 2007 | ANY Types | ANY Classes | Any Country | Fiji | 34 | 645.7 |
| 2007 | ANY Types | ANY Classes | Any Country | Guam | 1 | 55.3 |
| 2007 | ANY Types | ANY Classes | Any Country | Iran | 1 | 130.1 |
| 2007 | ANY Types | ANY Classes | Any Country | Iraq | 4 | 57.3 |
| 2007 | ANY Types | ANY Classes | Any Country | Mali | 1 | 537.5 |
| 2007 | ANY Types | ANY Classes | Any Country | Peru | 4 | 122.5 |
| 2007 | ANY Types | ANY Classes | Any Country | Aruba | 1 | 250.8 |
| 2007 | ANY Types | ANY Classes | Any Country | Burma | 1 | 101.8 |
| 2007 | ANY Types | ANY Classes | Any Country | Chile | 1 | 64.2 |
| 2007 | ANY Types | ANY Classes | Any Country | China | 166 | 439.6 |
| 2007 | ANY Types | ANY Classes | Any Country | Gabon | 1 | 73.2 |
| 2007 | ANY Types | ANY Classes | Any Country | India | 22 | 170.4 |
| 2007 | ANY Types | ANY Classes | Any Country | Italy | 13 | 302 |
| 2007 | ANY Types | ANY Classes | Any Country | Japan | 64 | 681.6 |
| 2007 | ANY Types | ANY Classes | Any Country | Kenya | 1 | 91.6 |
| 2007 | ANY Types | ANY Classes | Any Country | Libya | 1 | 52.5 |
| 2007 | ANY Types | ANY Classes | Any Country | Malta | 4 | 317.8 |
| 2007 | ANY Types | ANY Classes | Any Country | Qatar | 1 | 450.1 |

Execution plan of the new query

```
PLAN_TABLE_OUTPUT
---------------------------------------------------------------------------------------------------
| Id  | Operation                  | Name                   | Rows  | Bytes |TempSpc| Cost (%CPU)| Time     |
---------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT           |                        | 12096 |  1157K|       |   364   (1)| 00:00:01 |
|   1 |  SORT GROUP BY             |                        | 12096 |  1157K|       |   364   (1)| 00:00:01 |
|   2 |   GENERATE CUBE            |                        | 12096 |  1157K|       |   364   (1)| 00:00:01 |
|   3 |    SORT GROUP BY           |                        | 12096 |  1157K|  1304K|   364   (1)| 00:00:01 |
|*  4 |     HASH JOIN              |                        | 12096 |  1157K|       |    92   (2)| 00:00:01 |
|   5 |      TABLE ACCESS FULL     | DEST_AIRPORT_DIM_V1    |  7733 |   105K|       |    18   (0)| 00:00:01 |
|*  6 |      HASH JOIN             |                        | 12096 |   992K|       |    74   (2)| 00:00:01 |
|   7 |       TABLE ACCESS FULL    | SOURCE_AIRPORT_DIM_V1  |  7733 |   105K|       |    18   (0)| 00:00:01 |
|*  8 |       HASH JOIN            |                        | 12096 |   826K|       |    55   (0)| 00:00:01 |
|   9 |        TABLE ACCESS FULL   | AIRLINE_DIM_V1         |  5986 | 29930 |       |    20   (0)| 00:00:01 |
|* 10 |        HASH JOIN           |                        | 12096 |   767K|       |    35   (0)| 00:00:01 |
|  11 |         TABLE ACCESS FULL  | FLIGHT_CLASS_DIM_V1    |     3 |    48 |       |     3   (0)| 00:00:01 |
|* 12 |         HASH JOIN          |                        | 12096 |   578K|       |    32   (0)| 00:00:01 |
|  13 |          TABLE ACCESS FULL| FLIGHT_TYPE_DIM_V1     |     2 |    30 |       |     3   (0)| 00:00:01 |
|  14 |          TABLE ACCESS FULL| TRANSACTION_FACT_V1    | 12096 |   401K|       |    29   (0)| 00:00:01 |
---------------------------------------------------------------------------------------------------
```

Query Tree:


START
SORT GROUP BY
GENERATE CUBE
SORT GROUP BY
HASH JOIN
HASH JOIN
DEST_AIRPORT_DIM_V1
HASH JOIN
SOURCE_AIRPORT_DIM_V1
AIRLINE_DIM_V1
HASH JOIN
HASH JOIN
FLIGHT_CLASS_DIM_V1
FLIGHT_TYPE_DIM_V1
TRANSACTION_FACT_V1

Text

Explanation:

In this case the new query works better than the original query because we have avoided one join condition which was on the time_id column. This in turn process the query faster and produces results faster than the first query. Also, we are using the hash join method here which is better and faster than the sort-merge join.

## 6.2 For report 4

Original Query for report 4:

```
SELECT

DECODE(GROUPING(a.AIRLINE_ID), 1, 'ANY AIRLINES', a.AIRLINE_ID) as AIRLINE_ID,

DECODE(GROUPING(sa.source_airport_ID), 1, 'ANY AIRPORTS', sa.source_airport_ID) as
AIRPORTS,

sum(t.total_agent_profit)

from

AIRLINE_DIM_v1 a,

TRANSACTION_FACT_v1 t,

SOURCE_AIRPORT_DIM_v1 sa

where

a.AIRLINE_ID=t.AIRLINE_ID

and

t.source_airport_ID=sa.source_airport_ID

group by cube(a.AIRLINE_ID,sa.source_airport_ID)

order by a.AIRLINE_ID,sa.source_airport_ID;
```

Screenshots

| | AIRLINE_ID | AIRPORTS | SUM(T.TOTAL_AGENT_PROFIT) |
|---|---|---|---|
| 1 | 21 | 210 | 391.29 |
| 2 | 21 | 230 | 210.84 |
| 3 | 21 | ANY AIRPORTS | 602.13 |
| 4 | 24 | 49 | 271.08 |
| 5 | 24 | 193 | 377.76 |
| 6 | 24 | 478 | 65.62 |
| 7 | 24 | 507 | 1290.69 |
| 8 | 24 | 521 | 69.24 |
| 9 | 24 | 1382 | 792.57 |
| 10 | 24 | 1836 | 267.04 |
| 11 | 24 | 2006 | 5000.01 |
| 12 | 24 | 2009 | 3309.24 |
| 13 | 24 | 2279 | 1374.19 |
| 14 | 24 | 3144 | 24.81 |

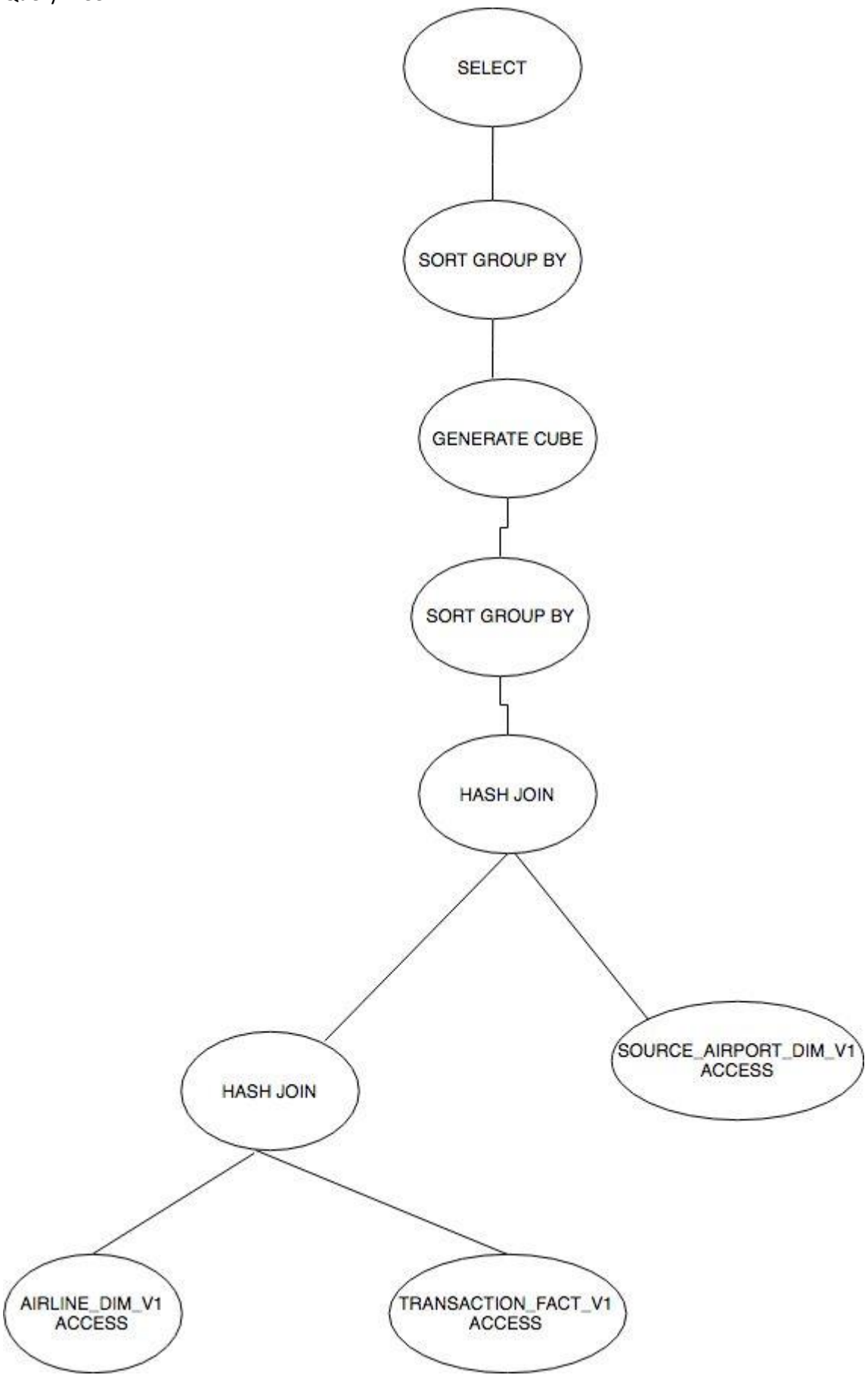
| | AIRLINE_ID | AIRPORTS | SUM(T.TOTAL_AGENT_PROFIT) |
|---|---|---|---|
| 87 | 90 | 1229 | 31.29 |
| 88 | 90 | 2621 | 560.5 |
| 89 | 90 | 3998 | 236.03 |
| 90 | 90 | ANY AIRPORTS | 1436.72 |
| 91 | 96 | 3941 | 1459.66 |
| 92 | 96 | 4029 | 100.62 |
| 93 | 96 | ANY AIRPORTS | 1560.28 |
| 94 | 106 | 1679 | 68.28 |
| 95 | 106 | ANY AIRPORTS | 68.28 |
| 96 | 125 | 1701 | 367.79 |
| 97 | 125 | 2051 | 59.88 |
| 98 | 125 | ANY AIRPORTS | 427.67 |
| 99 | 130 | 338 | 377.26 |
| 100 | 130 | 507 | 35.43 |

Execution plan

```
Plan hash value: 1353194312

-----------------------------------------------------------------------------------------------
| Id  | Operation               | Name                   | Rows  | Bytes | Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT        |                        |  3371 | 74162 |    69   (3)| 00:00:01 |
|   1 |  SORT GROUP BY          |                        |  3371 | 74162 |    69   (3)| 00:00:01 |
|   2 |   GENERATE CUBE         |                        |  3371 | 74162 |    69   (3)| 00:00:01 |
|   3 |    SORT GROUP BY        |                        |  3371 | 74162 |    69   (3)| 00:00:01 |
|*  4 |     HASH JOIN           |                        | 12096 |   259K|    67   (0)| 00:00:01 |
|   5 |      TABLE ACCESS FULL  | SOURCE_AIRPORT_DIM_V1  |  7733 | 30932 |    18   (0)| 00:00:01 |
|*  6 |      HASH JOIN          |                        | 12096 |   212K|    49   (0)| 00:00:01 |
|   7 |       TABLE ACCESS FULL| AIRLINE_DIM_V1         |  5986 | 29930 |    20   (0)| 00:00:01 |
|   8 |       TABLE ACCESS FULL| TRANSACTION_FACT_V1    | 12096 |   153K|    29   (0)| 00:00:01 |
-----------------------------------------------------------------------------------------------
```

Query Tree:


SELECT
SORT GROUP BY
GENERATE CUBE
SORT GROUP BY
HASH JOIN
HASH JOIN
SOURCE_AIRPORT_DIM_V1
ACCESS
AIRLINE_DIM_V1
ACCESS
TRANSACTION_FACT_V1
ACCESS

New SQL:

```
SELECT AIRLINE_ID,AIRPORTS, total_agent_profit

FROM (

SELECT

DECODE(GROUPING(a.AIRLINE_ID), 1, 'ANY AIRLINES', a.AIRLINE_ID) as AIRLINE_ID,

DECODE(GROUPING(sa.source_airport_ID), 1, 'ANY AIRPORTS', sa.source_airport_ID) as
AIRPORTS,

sum(t.TOTAL_PAID_TICKET_PRICE -t.total_fare) as total_agent_profit

from

AIRLINE_DIM_v1 a

inner join

TRANSACTION_FACT_v1 t on

a.AIRLINE_ID=t.AIRLINE_ID

inner join

SOURCE_AIRPORT_DIM_v1 sa on

t.source_airport_ID=sa.source_airport_ID

group by cube(a.AIRLINE_ID,sa.source_airport_ID))A;
```

Screenshot of output

| | AIRLINE_ID | AIRPORTS | TOTAL_AGENT_PROFIT |
|---|---|---|---|
| 1 | ANY AIRLINES | ANY AIRPORTS | 6101516.43 |
| 2 | ANY AIRLINES | 2 | 95.29 |
| 3 | ANY AIRLINES | 4 | 53.97 |
| 4 | ANY AIRLINES | 5 | 48144.33 |
| 5 | ANY AIRLINES | 6 | 132.48 |
| 6 | ANY AIRLINES | 16 | 80.29 |
| 7 | ANY AIRLINES | 29 | 76.02 |
| 8 | ANY AIRLINES | 30 | 316.9 |
| 9 | ANY AIRLINES | 49 | 759.45 |
| 10 | ANY AIRLINES | 55 | 162.27 |
| 11 | ANY AIRLINES | 58 | 331.1 |
| 12 | ANY AIRLINES | 73 | 563.22 |
| 13 | ANY AIRLINES | 100 | 458.68 |
| 14 | ANY AIRLINES | 1200 | 95.92 |
| 15 | ANY AIRLINES | 2400 | 103.21 |
| 16 | ANY AIRLINES | 3400 | 754.26 |
| 17 | ANY AIRLINES | 4200 | 121.66 |
| 18 | ANY AIRLINES | 6300 | 8119.68 |
| 19 | ANY AIRLINES | 108 | 85.06 |

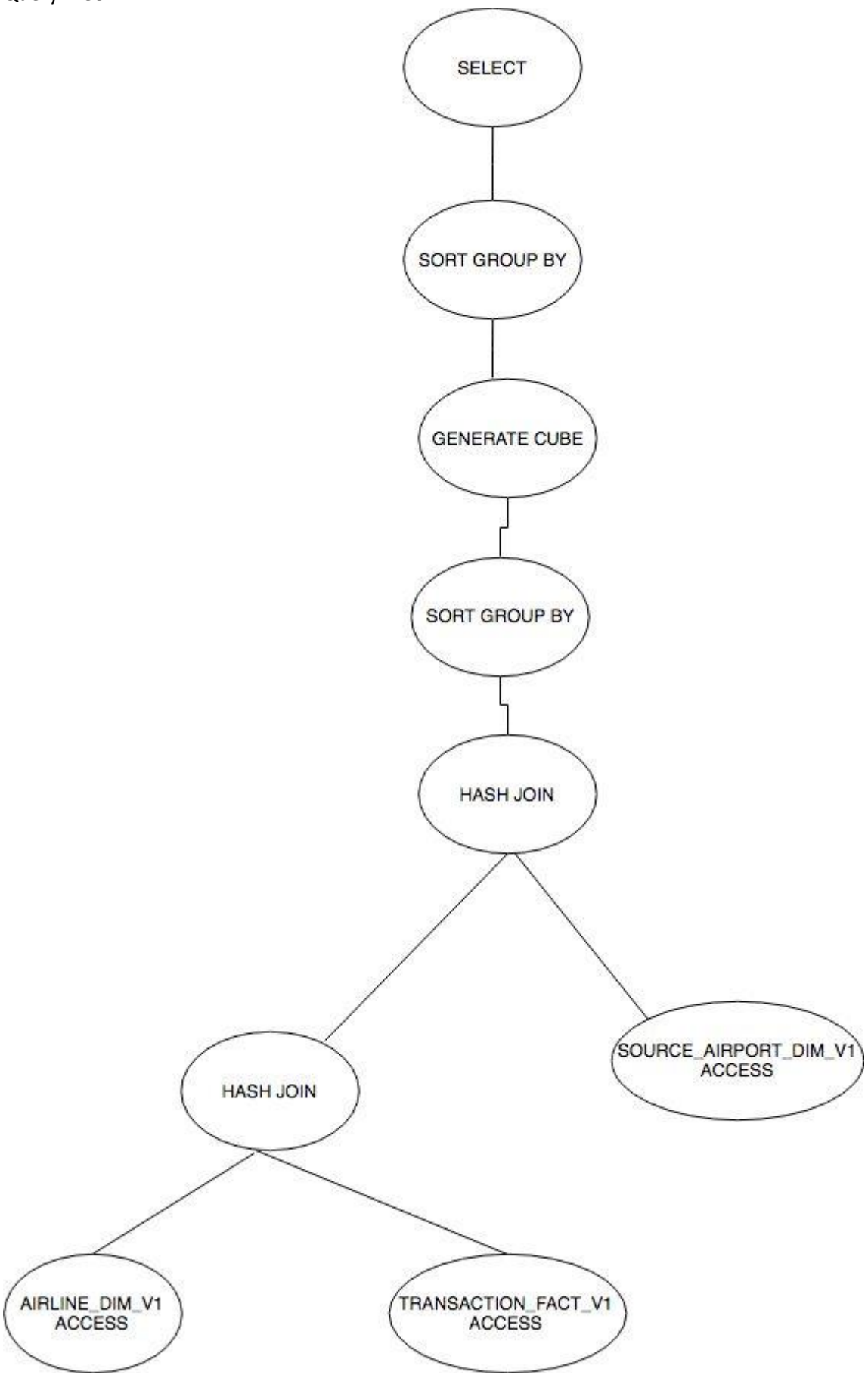
Execution Plan:

```
Plan hash value: 2725877680

-----------------------------------------------------------------------------------------------
| Id  | Operation                | Name                   | Rows  | Bytes | Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT         |                        |  3371 |   187K|    69   (3)| 00:00:01 |
|   1 |  VIEW                    |                        |  3371 |   187K|    69   (3)| 00:00:01 |
|   2 |   SORT GROUP BY          |                        |  3371 | 91017 |    69   (3)| 00:00:01 |
|   3 |    GENERATE CUBE         |                        |  3371 | 91017 |    69   (3)| 00:00:01 |
|   4 |     SORT GROUP BY        |                        |  3371 | 91017 |    69   (3)| 00:00:01 |
|*  5 |      HASH JOIN           |                        | 12096 |   318K|    67   (0)| 00:00:01 |
|   6 |       TABLE ACCESS FULL  | SOURCE_AIRPORT_DIM_V1  |  7733 | 30932 |    18   (0)| 00:00:01 |
|*  7 |       HASH JOIN          |                        | 12096 |   271K|    49   (0)| 00:00:01 |
|   8 |        TABLE ACCESS FULL| AIRLINE_DIM_V1         |  5986 | 29930 |    20   (0)| 00:00:01 |
|   9 |        TABLE ACCESS FULL| TRANSACTION_FACT_V1    | 12096 |   212K|    29   (0)| 00:00:01 |
-----------------------------------------------------------------------------------------------

Predicate Information (identified by operation id):
```

Query Tree:


SELECT
SORT GROUP BY
GENERATE CUBE
SORT GROUP BY
HASH JOIN
HASH JOIN
SOURCE_AIRPORT_DIM_V1
ACCESS
AIRLINE_DIM_V1
ACCESS
TRANSACTION_FACT_V1
ACCESS

Explanation:

Here the new query is much slower because we are trying to fetch the data from another select query which is in turn fetching the data from the subquery(here it is a sub table consisting of data). This causes the query to de-grade and perform slower.

## 6.3 For report 5

```
select mt.membershipname, td.month, sum(msf.total_number_of_members) as
TOTAL_NUMBER_OF_MEMBERS,

TO_CHAR(sum(msf.total_membership_sales),'9,999,999') as total_sale,

to_char(sum(sum(msf.total_membership_sales)) OVER

(ORDER BY mt.membershipname, td.month rows unbounded PRECEDING),'9,999,999') as
TOTAL_SALE_CUMMULATIVE

from membership_type_dim_v1 mt, membership_sales_fact_v1 msf, time_dim_v1 td

where mt.membershiptypeid = msf.membershiptypeid and msf.time_id = td.time_id

and mt.membershipname = 'Gold'

and td.year = 2009

group by

mt.membershipname, td.month

order by td.month;
```

Screenshots of results

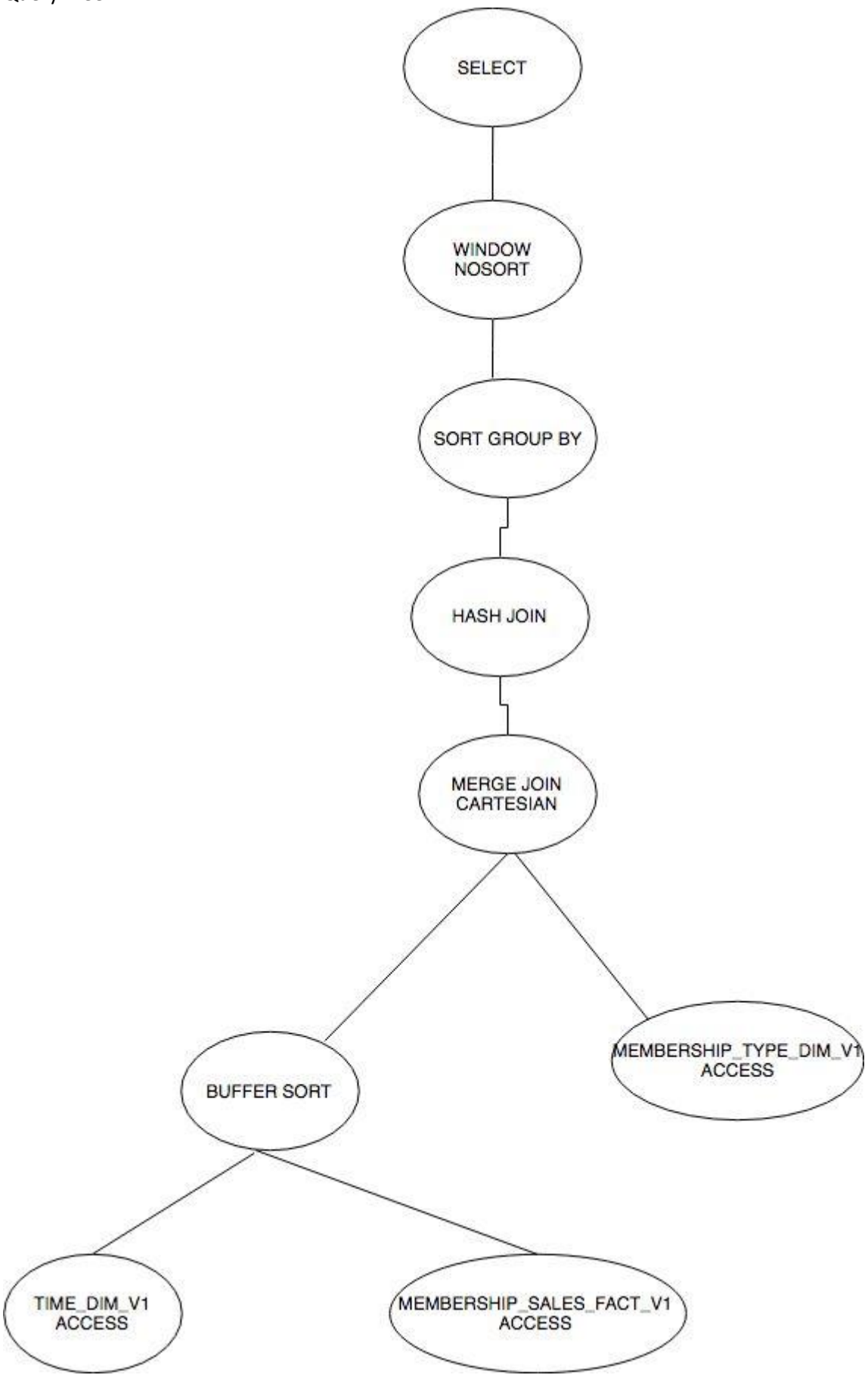
| | MEMBERSHIPNAME | MONTH | TOTAL_NUMBER_OF_MEMBERS | TOTAL_SALE | TOTAL_SALE_CUMMULATIVE |
|---|---|---|---|---|---|
| 1 | Gold | 01 | 31 | 24,769 | 24,769 |
| 2 | Gold | 02 | 21 | 16,779 | 41,548 |
| 3 | Gold | 03 | 30 | 23,970 | 65,518 |
| 4 | Gold | 04 | 31 | 24,769 | 90,287 |
| 5 | Gold | 05 | 30 | 23,970 | 114,257 |
| 6 | Gold | 06 | 29 | 23,171 | 137,428 |
| 7 | Gold | 07 | 30 | 23,970 | 161,398 |
| 8 | Gold | 08 | 33 | 26,367 | 187,765 |
| 9 | Gold | 09 | 17 | 13,583 | 201,348 |
| 10 | Gold | 10 | 27 | 21,573 | 222,921 |
| 11 | Gold | 11 | 18 | 14,382 | 237,303 |
| 12 | Gold | 12 | 36 | 28,764 | 266,067 |

Execution Plan:

```
Plan hash value: 1454977869

-----------------------------------------------------------------------------------------------------
| Id  | Operation                | Name                      | Rows  | Bytes | Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT         |                           |     9 |   414 |    26   (4)| 00:00:01 |
|   1 |  WINDOW NOSORT           |                           |     9 |   414 |    26   (4)| 00:00:01 |
|   2 |   SORT GROUP BY          |                           |     9 |   414 |    26   (4)| 00:00:01 |
|*  3 |    HASH JOIN             |                           |   321 | 14766 |    25   (0)| 00:00:01 |
|   4 |     MERGE JOIN CARTESIAN|                           |   365 |  9490 |     9   (0)| 00:00:01 |
|*  5 |      TABLE ACCESS FULL   | MEMBERSHIP_TYPE_DIM_V1    |     1 |     9 |     3   (0)| 00:00:01 |
|   6 |      BUFFER SORT         |                           |   365 |  6205 |     6   (0)| 00:00:01 |
|*  7 |       TABLE ACCESS FULL  | TIME_DIM_V1               |   365 |  6205 |     6   (0)| 00:00:01 |
|   8 |     TABLE ACCESS FULL    | MEMBERSHIP_SALES_FACT_V1  | 12655 |  247K|    16   (0)| 00:00:01 |
-----------------------------------------------------------------------------------------------------
```

Query Tree:


SELECT
WINDOW NOSORT
SORT GROUP BY
HASH JOIN
MERGE JOIN CARTESIAN
BUFFER SORT
MEMBERSHIP_TYPE_DIM_V1 ACCESS
TIME_DIM_V1 ACCESS
MEMBERSHIP_SALES_FACT_V1 ACCESS

New SQL:

```
select distinct mt.membershipname,
SUBSTR(msf.time_id,3,2),
sum(msf.total_number_of_members) as TOTAL_NUMBER_OF_MEMBERS,
TO_CHAR(sum(msf.total_membership_sales),'9,999,999') as total_sale,
to_char(sum(sum(msf.total_membership_sales)) OVER
(ORDER BY mt.membershipname,SUBSTR(msf.time_id,3,2) rows unbounded
PRECEDING),'9,999,999') as TOTAL_SALE_CUMMULATIVE
from membership_type_dim_v1 mt,
membership_sales_fact_v1 msf
where mt.membershiptypeid = msf.membershiptypeid
and mt.membershipname = 'Gold'
and SUBSTR(msf.time_id,5,4) = 2009
group by
mt.membershipname, SUBSTR(msf.time_id,3,2);
```

Screenshot

| | MEMBERSHIPNAME | SUBSTR(MSF.TIME_ID,3,2) | TOTAL_NUMBER_OF_MEMBERS | TOTAL_SALE | TOTAL_SALE_CUMMULATIVE |
|---|---|---|---|---|---|
| 1 | Gold | 01 | 31 | 24,769 | 24,769 |
| 2 | Gold | 02 | 21 | 16,779 | 41,548 |
| 3 | Gold | 03 | 30 | 23,970 | 65,518 |
| 4 | Gold | 04 | 31 | 24,769 | 90,287 |
| 5 | Gold | 05 | 30 | 23,970 | 114,257 |
| 6 | Gold | 06 | 29 | 23,171 | 137,428 |
| 7 | Gold | 07 | 30 | 23,970 | 161,398 |
| 8 | Gold | 08 | 33 | 26,367 | 187,765 |
| 9 | Gold | 09 | 17 | 13,583 | 201,348 |
| 10 | Gold | 10 | 27 | 21,573 | 222,921 |
| 11 | Gold | 11 | 18 | 14,382 | 237,303 |
| 12 | Gold | 12 | 36 | 28,764 | 266,067 |

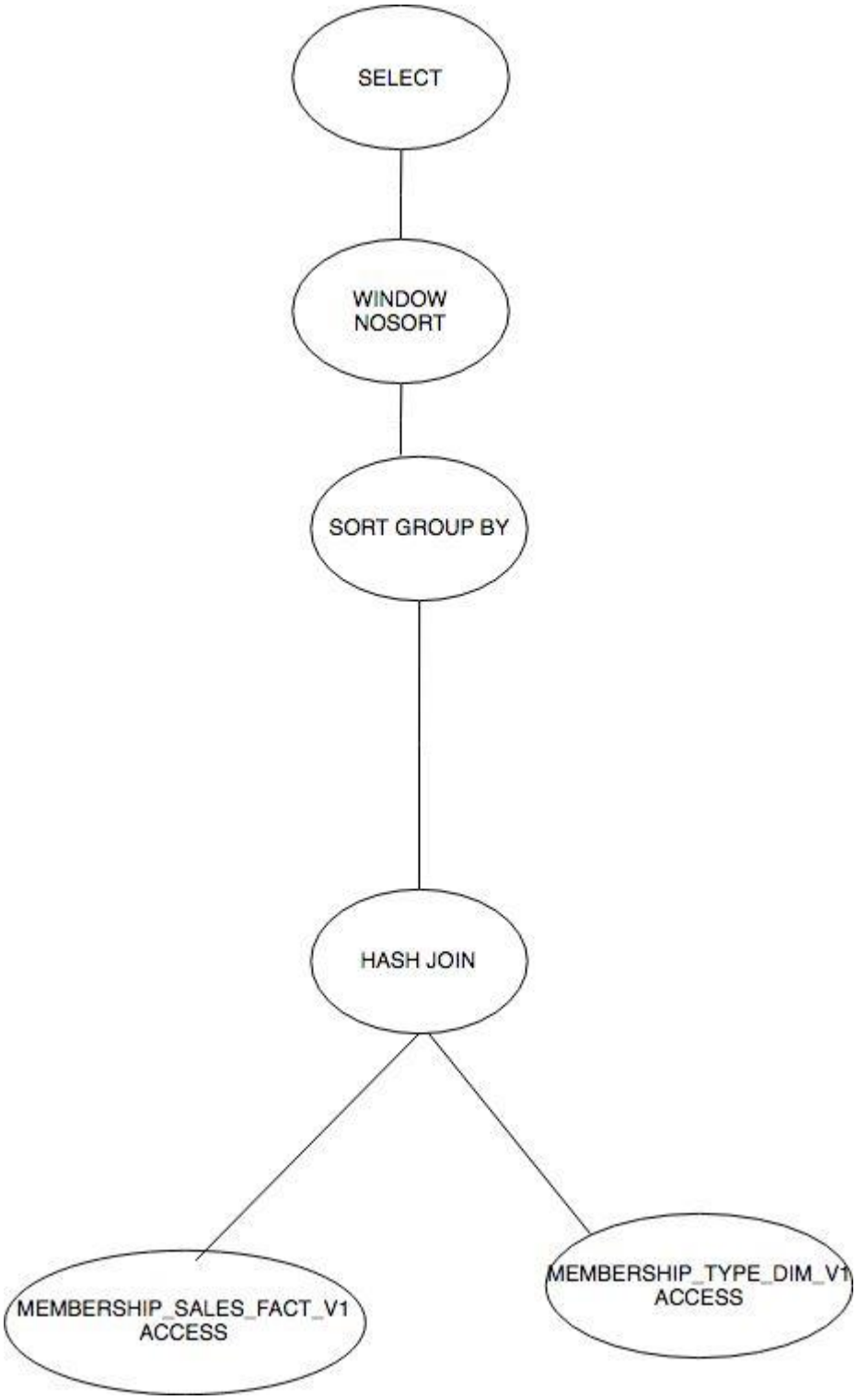
Execution Plan

```
Plan hash value: 3411441890

---------------------------------------------------------------------------------------------
| Id  | Operation            | Name                     | Rows  | Bytes | Cost (%CPU)| Time     |
---------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT     |                          |   300 |  8700 |    20   (5)| 00:00:01 |
|   1 |  WINDOW NOSORT       |                          |   300 |  8700 |    20   (5)| 00:00:01 |
|   2 |   SORT GROUP BY      |                          |   300 |  8700 |    20   (5)| 00:00:01 |
|*  3 |    HASH JOIN         |                          |   300 |  8700 |    19   (0)| 00:00:01 |
|*  4 |     TABLE ACCESS FULL| MEMBERSHIP_TYPE_DIM_V1   |     1 |     9 |     3   (0)| 00:00:01 |
|*  5 |     TABLE ACCESS FULL| MEMBERSHIP_SALES_FACT_V1 |  1199 | 23980 |    16   (0)| 00:00:01 |
---------------------------------------------------------------------------------------------

Predicate Information (identified by operation id):
```

Query Tree:




Explanation:

Here the new query performs faster than the first query because we are having one less join condition that is for the time_id. Avoiding the many joins will help to optimize the query better. Here we are taking out the year and month values directly from the join date of the members.

## 6.4 For Report 6

Original Query

```
select
  dst.country,
  dst.City,
  dst.dest_airport_id,
  sum(rf.TOTAL_NUM_ROUTES) as TOTAL_ROUTES,
  RANK() OVER (PARTITION BY dst.COUNTRY ORDER BY SUM(RF.TOTAL_NUM_ROUTES) DESC) AS RANK1
From
  dest_airport_dim_v1 dst,
  Route_fact_v1 rf
where
  rf.dest_airport_id = dst.dest_airport_id
GROUP BY dst.country,
  dst.City,
  dst.dest_airport_id;
```

Screenshots of the results

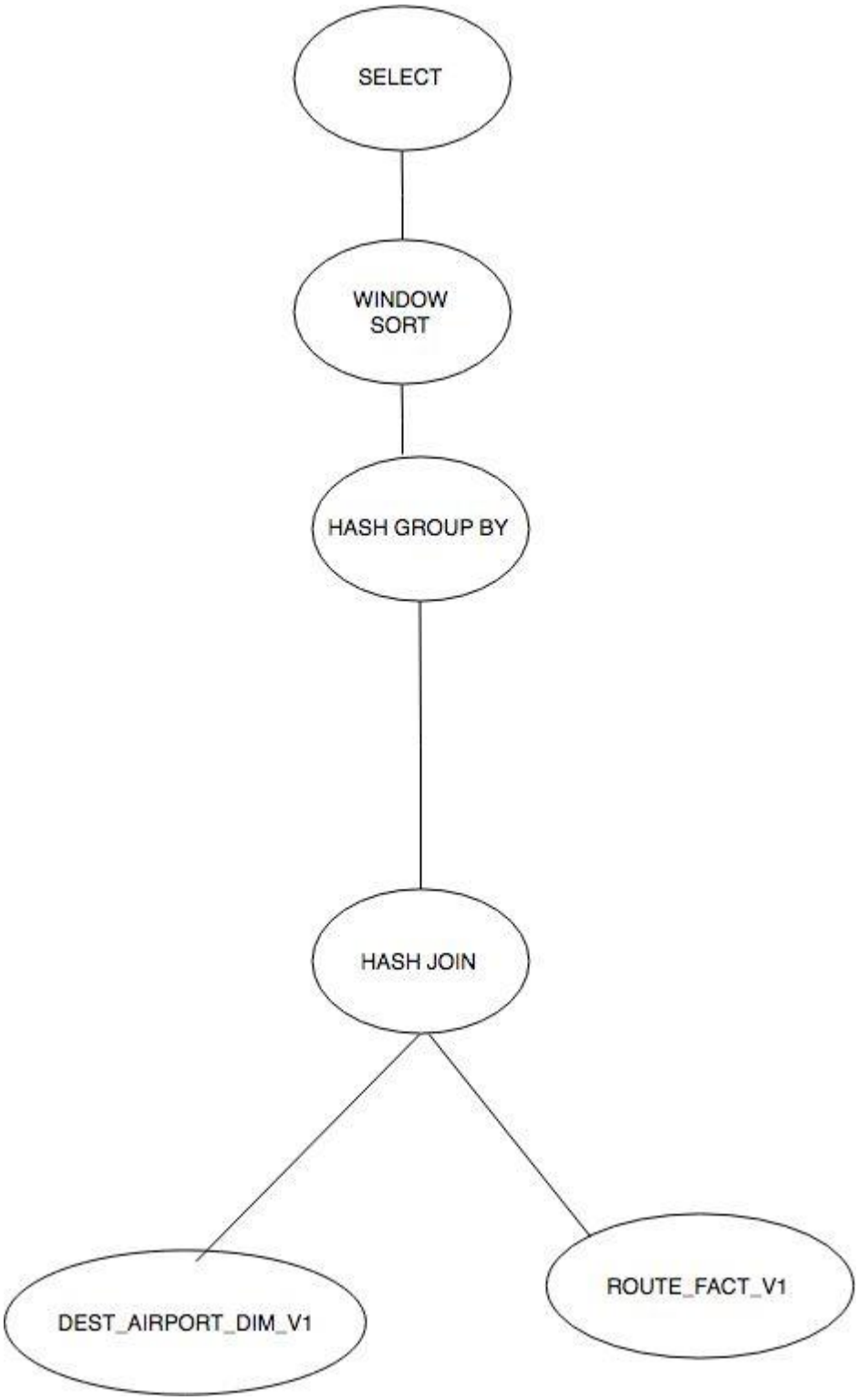
| | COUNTRY | CITY | DEST_AIRPORT_ID | TOTAL_ROUTES | RANK1 |
|---|---|---|---|---|---|
| 1 | Afghanistan | Kabul | 2050 | 26 | 1 |
| 2 | Afghanistan | Kandahar | 2051 | 5 | 2 |
| 3 | Afghanistan | Herat | 2048 | 4 | 3 |
| 4 | Afghanistan | Mazar-i-sharif | 2053 | 2 | 4 |
| 5 | Albania | Tirana | 1190 | 33 | 1 |
| 6 | Algeria | Algier | 210 | 71 | 1 |
| 7 | Algeria | Oran | 231 | 25 | 2 |
| 8 | Algeria | Constantine | 221 | 11 | 3 |
| 9 | Algeria | Annaba | 220 | 8 | 4 |
| 10 | Algeria | Setif | 6492 | 8 | 4 |
| 11 | Algeria | Bejaja | 209 | 6 | 6 |
| 12 | Algeria | Tlemcen | 230 | 5 | 7 |
| 13 | Algeria | Batna | 5552 | 4 | 8 |
| 14 | Algeria | Biskra | 235 | 4 | 8 |
| 15 | Algeria | Illizi | 214 | 3 | 10 |

| | COUNTRY | CITY | DEST_AIRPORT_ID | TOTAL_ROUTES | RANK1 |
|---|---|---|---|---|---|
| 22 | Angola | Ondjiva | 5632 | 6 | 2 |
| 23 | Angola | Lubango | 959 | 3 | 3 |
| 24 | Angola | Soyo | 958 | 3 | 3 |
| 25 | Angola | Cabinda | 946 | 3 | 3 |
| 26 | Angola | Malanje | 952 | 2 | 6 |
| 27 | Angola | Menongue | 953 | 2 | 6 |
| 28 | Angola | Kuito | 949 | 2 | 6 |
| 29 | Angola | Huambo | 948 | 2 | 6 |
| 30 | Angola | Saurimo | 957 | 2 | 6 |
| 31 | Angola | Catumbela | 5630 | 2 | 6 |
| 32 | Angola | M'banza-congo | 944 | 1 | 12 |
| 33 | Angola | Luena | 960 | 1 | 12 |
| 34 | Anguilla | The Valley | 2900 | 7 | 1 |
| 35 | Antigua and Barbuda | Antigua | 2874 | 34 | 1 |
| 36 | Argentina | Buenos Aires | 3988 | 74 | 1 |

Execution Plan

```
-----------------------------------------------------------------------------------------
| Id  | Operation            | Name                 | Rows  | Bytes | Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT     |                      |  3159 | 97929 |   103   (5)| 00:00:01 |
|   1 |  WINDOW SORT         |                      |  3159 | 97929 |   103   (5)| 00:00:01 |
|   2 |   HASH GROUP BY      |                      |  3159 | 97929 |   103   (5)| 00:00:01 |
|*  3 |    HASH JOIN         |                      | 58443 |  1769K|    99   (2)| 00:00:01 |
|   4 |     TABLE ACCESS FULL| DEST_AIRPORT_DIM_V1  |  7733 |   181K|    18   (0)| 00:00:01 |
|   5 |     TABLE ACCESS FULL| ROUTE_FACT_V1        | 58443 |   399K|    80   (0)| 00:00:01 |
-----------------------------------------------------------------------------------------
```

Query Tree:


SELECT
WINDOW SORT
HASH GROUP BY
HASH JOIN
DEST_AIRPORT_DIM_V1
ROUTE_FACT_V1

New SQL:

```
Select * from (
  select
  dst.country,
  dst.City,
  dst.dest_airport_id,
  sum(rf.TOTAL_NUM_ROUTES) as TOTAL_NUM_ROUTES,
  RANK() OVER (PARTITION BY dst.COUNTRY ORDER BY SUM(RF.TOTAL_NUM_ROUTES) DESC) AS
RANK1

From
  dest_airport_dim_v1 dst,
  Route_fact_v1 rf
where
  rf.dest_airport_id = dst.dest_airport_id
  and rf.dest_airport_id IN(SELECT dest_airport_id FROM dest_airport_dim_v1)
GROUP BY dst.country,
  dst.City,
  dst.dest_airport_id
  order by
  dst.country,
  dst.City,
  dst.dest_airport_id)a;
```

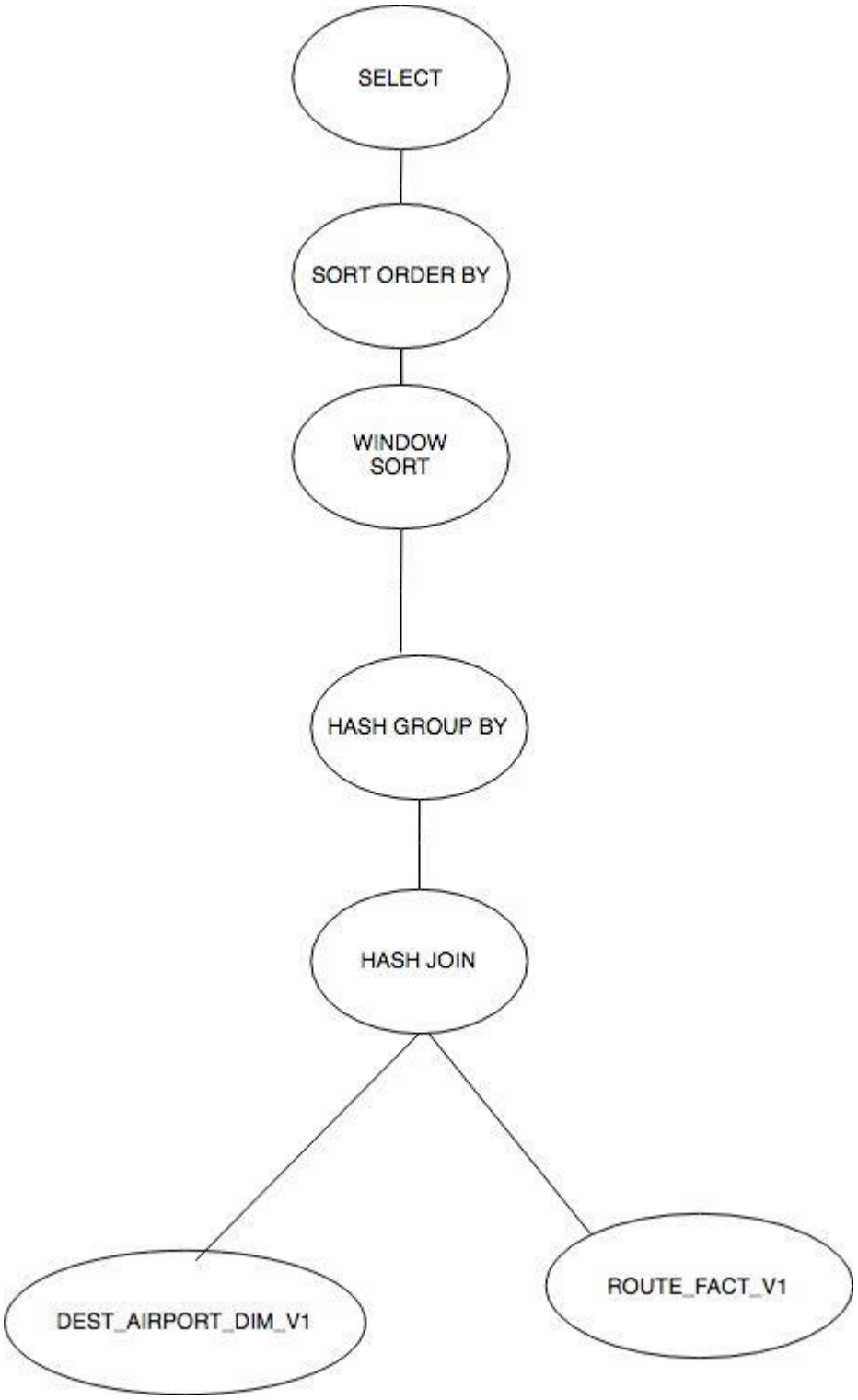
**Screenshot of output**

| | COUNTRY | CITY | DEST_AIRPORT_ID | TOTAL_NUM_ROUTES | RANK1 |
|---|---|---|---|---|---|
| 1 | Afghanistan | Herat | 2048 | 4 | 3 |
| 2 | Afghanistan | Kabul | 2050 | 26 | 1 |
| 3 | Afghanistan | Kandahar | 2051 | 5 | 2 |
| 4 | Afghanistan | Mazar-i-sharif | 2053 | 2 | 4 |
| 5 | Albania | Tirana | 1190 | 33 | 1 |
| 6 | Algeria | Algier | 210 | 71 | 1 |
| 7 | Algeria | Annaba | 220 | 8 | 4 |
| 8 | Algeria | Batna | 5552 | 4 | 8 |
| 9 | Algeria | Bejaja | 209 | 6 | 6 |
| 10 | Algeria | Biskra | 235 | 4 | 8 |
| 11 | Algeria | Constantine | 221 | 11 | 3 |
| 12 | Algeria | Djanet | 211 | 2 | 12 |
| 13 | Algeria | Ghardaia | 237 | 2 | 12 |
| 14 | Algeria | Illizi | 214 | 3 | 10 |
| 15 | Algeria | Oran | 231 | 25 | 2 |
| 16 | Algeria | Ouargla | 243 | 3 | 10 |
| 17 | Algeria | Setif | 6492 | 8 | 4 |
| 18 | Algeria | Tamanrasset | 216 | 2 | 12 |

Execution Plan

```
-----------------------------------------------------------------------------------------------
| Id  | Operation              | Name                 | Rows  | Bytes | Cost (%CPU)| Time     |
-----------------------------------------------------------------------------------------------
|   0 | SELECT STATEMENT       |                      |  3159 |   286K|   105   (7)| 00:00:01 |
|   1 |  VIEW                  |                      |  3159 |   286K|   105   (7)| 00:00:01 |
|   2 |   SORT ORDER BY        |                      |  3159 | 97929 |   105   (7)| 00:00:01 |
|   3 |    WINDOW SORT         |                      |  3159 | 97929 |   105   (7)| 00:00:01 |
|   4 |     HASH GROUP BY      |                      |  3159 | 97929 |   105   (7)| 00:00:01 |
|*  5 |      HASH JOIN         |                      | 58443 |  1769K|    99   (2)| 00:00:01 |
|   6 |       TABLE ACCESS FULL| DEST_AIRPORT_DIM_V1  |  7733 |   181K|    18   (0)| 00:00:01 |
|   7 |       TABLE ACCESS FULL| ROUTE_FACT_V1        | 58443 |   399K|    80   (0)| 00:00:01 |
-----------------------------------------------------------------------------------------------
```

Query Tree:




Explanation:

Here the new query is much slower because we are trying to fetch the data from another select query which is in turn fetching the data from the subquery(here it is a sub table consisting of data). This causes the query to de-grade and perform slower. Also, the second query have an additional order by adding performance degradation because sorting is a much more expensive task here.