Telecommunication Billing Management System

Project Report

Data Warehousing

SS G515

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Under the supervision

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Motivation:

Consider a telecom company which is located in different countries and has a considerable customer base which offers multiple service plans like data, voice, messages. There are other telecom companies which offer similar service to the users, in order to provide better customer experience, to stand out amongst its competitors and to gain good profits the company must need to analyze the behavior of the data related to the services. To make strategic decisions from the data a data warehouse is necessary.

Introduction

1. In this report we will do a case study on a Telecommunication Management System .
2. We will gather requirements for our System.
3. We will identify different business Dimensions.
4. We will spot all the Business Metrics that are relevant to the telecommunication company.
5. After doing all these necessary steps ,We will build our star schema.

Steps for making our data warehouse:

1)Requirements Gathering:

To gather and store requirements,we will make an information package diagram.

Dimensions:

Customer	Payment	Time	Promotion	Recharge plan	location
name	type	date	code	plan_name	area
age		day	description	plan_country	state
mobile		Quarter		validity	country
		year		type	zip
				talktime	
				voicecall_price_per_minute_local	
				voicecall_price_per_isd	
				price_per_message_local	
				price_per_message_isd	
				message_limit_per_day	
				data_limit_per_day	
Measured facts: data_usage, total_voicecall_duration_local, total_voicecall_cost_local,total_voicecall_duration_international, total_voicecall_cost_international, total_message_count_local,total_message_cost_local, standard_gateway_charges, total_message_count_international total_message_cost_international					

Note: Arrow indicates the heirarchies from top to bottom

2)Identify different business Dimensions:

We have identified six different dimensions.

- **Customer Dimension**: All customer information such as customers name ,age,mobile number is stored in this dimension.
- **Payment Dimension**:Customers payment related information is stored in that dimension. Which payment mode they use (UPI,Net Banking ,credit card ,debit card) is stored in the table.

- ☐ **Time:** We have included Time to capture the transactional details from a day granular level to year.

- ☐ **Promotion**: On the Promotion Dimension table there will be promo code .If a customer is eligible he will get a certain discount.

- ☐ **Recharge_plan:** Different data plans, plan validity, voice call charge per minute in India , voice call charge per minute abroad, per unit message charge in India, per unit message charge abroad, Message limit per day according to the plan, Data Limit per day is stored.

- ☐ **Location Dimension:** Using location dimension we can keep track of area wise transactional details. we can roll up in our dimension from area to country level.

3)Identifying Different Business Metrics:

- ➢ **Data Usage:** By analyzing Data usage, company get to know which data plan is more popular. Accordingly the company can introduce new data packages to its customers.

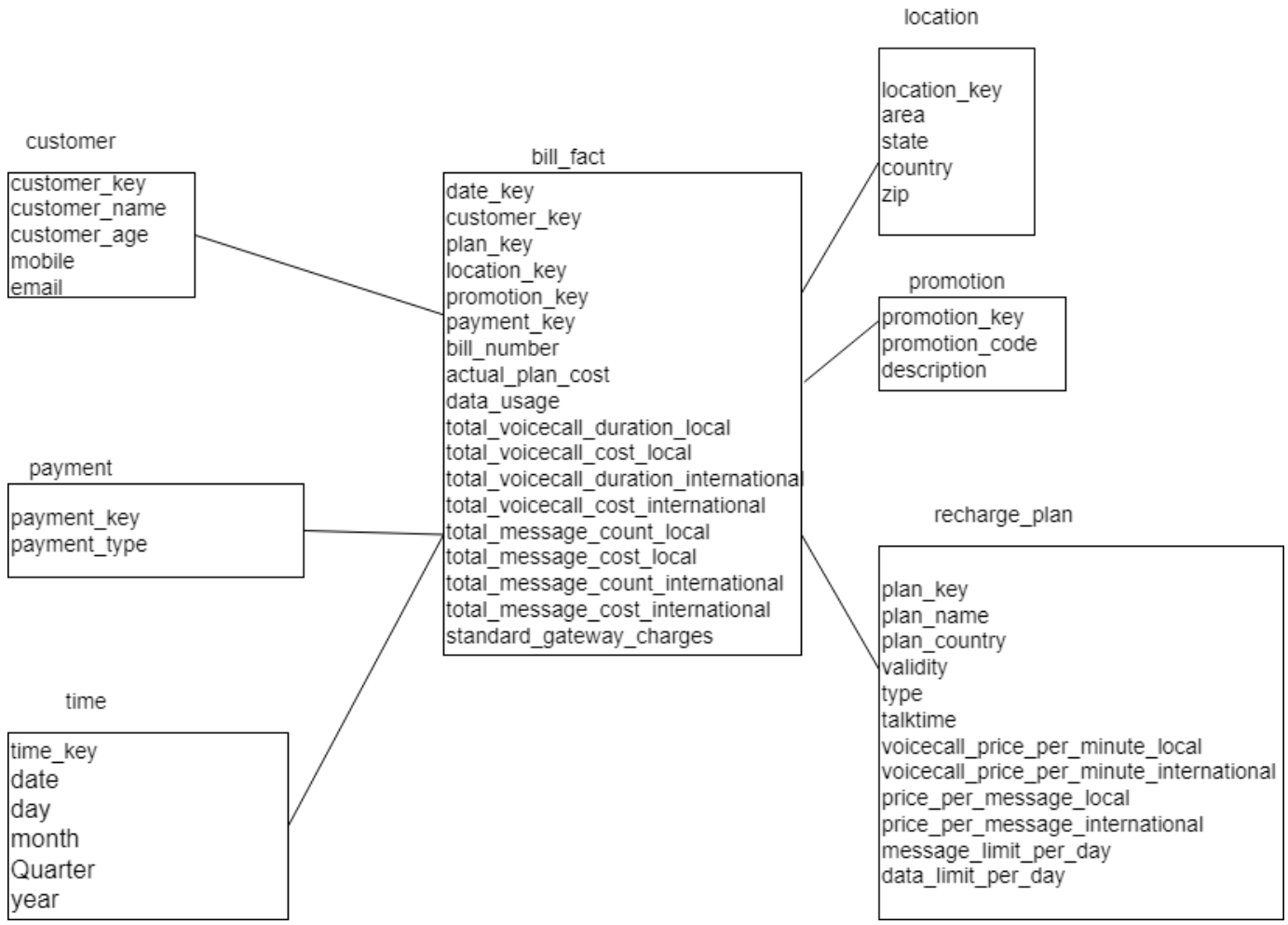
- ➢ **Voice_call_Duration:** By analyzing durations of both international and national calls, company can measure the traffic generated across the network,so that they can improve customer experience.

- ➢ **Total_voice_call_cost:** By analyzing the total voice call cost, company will have a rough estimate of their profit through voice call.

- ➢ **Total_message_count**: By analyzing the total_message count company comes to know whether users are more inclined towards text message or calls or data.

- ➢ **Gateway charges:**By analyzing the Gateway charges ,company comes to know which Gateways are used frequently(payment gateways).Accordingly company can give certain promo codes to attract customers.

Star Schema:


location
location_key
area
state
country
zip
customer
customer_key
customer_name
customer_age
mobile
email
bill_fact
date_key
customer_key
plan_key
location_key
promotion_key
payment_key
bill_number
actual_plan_cost
data_usage
total_voicecall_duration_local
total_voicecall_cost_local
total_voicecall_duration_international
total_voicecall_cost_international
total_message_count_local
total_message_cost_local
total_message_count_international
total_message_cost_international
standard_gateway_charges
promotion
promotion_key
promotion_code
description
payment
payment_key
payment_type
recharge_plan
plan_key
plan_name
plan_country
validity
type
talktime
voicecall_price_per_minute_local
voicecall_price_per_minute_international
price_per_message_local
price_per_message_international
message_limit_per_day
data_limit_per_day
time
time_key
date
day
month
Quarter
year

Implementation of Queries:

```
/*local voicecall duration and cost per month per quarter per year per country*/

SELECT t.month,t.quarter,t.year,l.country,SUM(b.total_voicecall_duration_local) AS local_voice_call_duration,
SUM(b.total_voicecall_cost_local) AS local_voice_call_cost
FROM bill_fact b
join time_dim t on b.time_key=t.time_key
join location_dim l on b.location_key=l.location_key
GROUP BY t.month,t.quarter,t.year,l.country
order by t.month,t.quarter,t.year,l.country
```

Results Messages

	month	quarter	year	country	local_voice_call_duration	local_voice_call_cost
1	April	Q2	2022	India	1000	1000
2	April	Q2	2022	United States of America	1000	250
3	January	Q1	2022	India	500	500
4	March	Q1	2022	India	500	500
5	November	Q4	2021	United States of America	500	125

```
/*Total Gateway charges per recharge plan*/
SELECT r.plan_name, SUM(b.standard_gateway_charges) AS total_charges
FROM
bill_fact b join recharge_plan_dim r
on b.plan_key=r.plan_key
GROUP BY r.plan_name
ORDER BY r.plan_name
```

Results Messages

	plan_name	total_charges
1	Jio_US_1750	13.5
2	Jio_US_750	7.5
3	Jio399	14.5
4	Jio699	13.5

```sql
--Using CUBE operator
SELECT r.plan_name, SUM(b.standard_gateway_charges) AS total_charges
FROM
bill_fact b join recharge_plan_dim r
on b.plan_key=r.plan_key
GROUP BY CUBE(r.plan_name)
ORDER BY r.plan_name
```

Results | Messages

	plan_name	total_charges
1	NULL	49
2	Jio_US_1750	13.5
3	Jio_US_750	7.5
4	Jio399	14.5
5	Jio699	13.5

```sql
/*Total gateway charges per plan per month*/

SELECT r.plan_name, t.month, SUM(b.standard_gateway_charges) AS total_charges
FROM bill_fact b
join recharge_plan_dim r on b.plan_key=r.plan_key
join time_dim t on b.time_key=t.time_key
GROUP BY r.plan_name,t.month
ORDER BY r.plan_name, t.month
```

Results | Messages

	plan_name	month	total_charges
1	Jio_US_1750	April	9
2	Jio_US_1750	November	4.5
3	Jio_US_750	April	5
4	Jio_US_750	November	2.5
5	Jio399	April	9.5
6	Jio399	January	2.5
7	Jio399	March	2.5
8	Jio699	April	4.5
9	Jio699	January	4.5
10	Jio699	March	4.5

```sql
SELECT COALESCE(r.plan_name,'All types') as plan_name, COALESCE(t.month,'sum') as month, SUM(b.standard_gateway_charges) AS total_char
FROM bill_fact b
join recharge_plan_dim r on b.plan_key=r.plan_key
join time_dim t on b.time_key=t.time_key
GROUP BY rollup(r.plan_name,t.month)
```

Results Messages

	plan_name	month	total_charges
1	Jio_US_1750	April	9
2	Jio_US_1750	November	4.5
3	Jio_US_1750	sum	13.5
4	Jio_US_750	April	5
5	Jio_US_750	November	2.5
6	Jio_US_750	sum	7.5
7	Jio399	April	9.5
8	Jio399	January	2.5
9	Jio399	March	2.5
10	Jio399	sum	14.5
11	Jio699	April	4.5
12	Jio699	January	4.5
13	Jio699	March	4.5
14	Jio699	sum	13.5
15	All types	sum	49

```sql
/*Slicing*/
select t.month, SUM(b.data_usage) as monthly_usage
FROM bill_fact b
join recharge_plan_dim r on r.plan_key=b.plan_key
join time_dim t on t.time_key=b.time_key
group by r.plan_country,t.month having r.plan_country='India'
```

Results Messages

	month	monthly_usage
1	April	11
2	January	5.5
3	March	5.5

```
/*Dicing*/

select t.month, SUM(b.data_usage) as monthly_usage
FROM bill_fact b
join recharge_plan_dim r on r.plan_key=b.plan_key
join time_dim t on t.time_key=b.time_key
where t.month in('April','January') and r.plan_country='India'
group by r.plan_country,t.month
```

Results | Messages

	month	monthly_usage
1	April	11
2	January	5.5

```
SELECT r.plan_name, t.month, SUM(b.standard_gateway_charges) AS total_charges
FROM bill_fact b
join recharge_plan_dim r on b.plan_key=r.plan_key
join time_dim t on b.time_key=t.time_key
GROUP BY CUBE(r.plan_name,t.month)
```

	plan_name	month	total_charges
1	Jio_US_1750	April	9
2	Jio_US_750	April	5
3	Jio399	April	9.5
4	Jio699	April	4.5
5	NULL	April	28
6	Jio399	January	2.5
7	Jio699	January	4.5
8	NULL	January	7
9	Jio399	March	2.5
10	Jio699	March	4.5
11	NULL	March	7
12	Jio_US_1750	November	4.5
13	Jio_US_750	November	2.5
14	NULL	November	7
15	NULL	NULL	49
16	Jio_US_1750	NULL	13.5
17	Jio_US_750	NULL	7.5
18	Jio399	NULL	14.5
19	Jio699	NULL	13.5