FINAL ASSIGNMENT

Information Systems and Databases  
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Netflix Inc.

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Diagram, engineering drawing

Description automatically generated

Q1

We chose Netflix Inc. as our case study company. Netflix Inc. is an American over-the-top content platform and production company The company's primary business is a subscription-based streaming service offering online streaming from a library of films and television series, including those produced in-house. Netflix meets the demand for online high quality content services which is available 24/7 on different devices with no commercials. In January 2021, Netflix reached 203.7 million subscribers, including 73 million in the United States and It’s services available almost worldwide.

Q3

1. PlanTypes (plan\_name, plan\_num\_of\_devices, plan\_resolution, plan\_price)

There are 3 different plan types:

1. Basic
2. Normal
3. Premium

Price is NIS per month.

1. Plan (plan\_ID, account\_ID(FK), account\_plan\_name(FK), plan\_start\_date, plan\_end\_date)

In this table we put each plan every account acquires. also, every time the same account changes its plan, a tuple is put in this table in order to keep track of each account's plan history. We are interested in keeping track only on the date of the plan the account buys because we presume it cannot be changed within a month.

1. Account (account\_ID, account\_email, account\_password, account\_cellphone\_num, account\_join\_date)
2. Profile (profile\_ID, account\_ID(FK), profile\_name)

All those attributes of the account and the profile are, of course, shown in the Netflix interface

1. PaymentDetailes (payment\_ID, account\_ID(FK), payment\_first\_name, payment\_last\_name, payment\_credit\_card\_num, payment\_credit\_card\_expiary\_date, payment\_credit\_card\_CVV, payment\_date)
2. AccountBillings (billing\_ID, account\_ID(FK), billing\_plan\_name(FK), billing\_price, billing\_date, billing\_payment\_method)

* In order to simplify the billing process, we put the billing plan name and price as attributes here as well.
* Each tuple is a monthly billing of a specific account.

1. Movie (movie\_ID, movie\_name, movie\_release\_year, movie\_duration, movie\_director, movie\_age\_restriction, movie\_main\_actor, movie\_summary, genre\_mix\_ID(FK))
2. Series (series\_ID, series\_name, series\_creaot, series\_release\_year, series\_age\_restriction, series\_summary, genre\_mix\_ID(FK))

* We have included mini-series as series with only season.

1. Episode (episode\_ID, series\_ID(FK), episode\_name, season\_number, episode\_number\_in\_season, episode\_summary)
2. Genre (genre\_mix\_ID, family\_and\_children, award\_winning, comedy, crime, documentary, action, horror, romance, sci\_fi, thriller, drama)

* Each attribute describing a genre is a BIT type attribute, marking for each movie or series it's genres.
* Each genre mix ID is a unique combination of 3 genres. We found that this is the most efficient and organized way to handle this.

**IMPORTANT NOTE:** in each of the following schemas we put an attribute for movie\_ID and for series\_ID/episode\_ID. The reason is that every entry in the following schemas applies to either but not both at once so we put both attributes and, in each tuple, one of them will be NULL (we will put the integrity constraint in the SQL code).

1. ProfileViewingActivity (activity\_ID, profile\_ID(FK), movie\_ID(FK), episode\_ID(FK), activity\_date, activity\_time)
2. ProfileRatingActivity (rating\_ID, profile\_ID(FK), movie\_ID(FK), episode\_ID(FK), Like\_or\_dislike, rating\_date)

Q4

CREATE DATABASE Netflix;

USE Netflix;

CREATE TABLE PlanTypes (

plan\_name VARCHAR(10) PRIMARY KEY,

plan\_num\_of\_devices INT,

plan\_resolution VARCHAR(30),

plan\_price FLOAT);

INSERT INTO PlanTypes VALUES ('Basic', 1, 'Standard Definition', 32.90);

INSERT INTO PlanTypes VALUES ('Standard', 2, 'FULL HD (1080p)', 46.90);

INSERT INTO PlanTypes VALUES ('Premium', 4, 'ULTRA HD (4K)', 60.90);

CREATE TABLE Account (

account\_ID INT PRIMARY KEY, /\*start with 00\*/

account\_Email VARCHAR(50),

account\_password VARCHAR(20),

account\_cellphone\_num VARCHAR(15),

account\_join\_date DATE);

INSERT INTO Account VALUES (00111, 'kelly.slater@gmail.com', 'ke11yslaten', '0539281922', '2020-01-02');

INSERT INTO Account VALUES (00112, 'rob.machado@walla.com', 'puravidarob', '0528391068', '2020-09-05');

INSERT INTO Account VALUES (00113, 'andy.irons@gmail.com', 'andyforthewin', '0591882714', '2020-02-01');

INSERT INTO Account VALUES (00114, 'parko@hotmail.com', 'isallgoodmate', '051662733', '2020-05-12');

INSERT INTO Account VALUES (00115, 'kelly.slater@gmail.com', 'ke11yslaten', '0539281922', '2020-07-02');

INSERT INTO Account VALUES (00116, 'rob.machado@walla.com', 'puravidarob', '0528391068', '2020-07-05');

INSERT INTO Account VALUES (00117, 'andy.irons@gmail.com', 'andyforthewin', '0591882714', '2020-07-01');

INSERT INTO Account VALUES (00118, 'parko@hotmail.com', 'isallgoodmate', '051662733', '2020-07-12');

CREATE TABLE Plan (

Plan\_ID INT PRIMARY KEY, /\*start with 01\*/

account\_ID INT,

account\_plan\_name VARCHAR(10),

plan\_start\_date DATE,

plan\_end\_date DATE,

FOREIGN KEY (account\_ID) REFERENCES Account(account\_ID),

FOREIGN KEY (account\_plan\_name) REFERENCES PlanTypes(plan\_name));

INSERT INTO Plan VALUES (01111, 00111, 'Premium', '2019-02-01', '2019-03-01');

INSERT INTO Plan VALUES (01112, 00112, 'Standard', '2020-02-02', '2020-04-02');

INSERT INTO Plan VALUES (01113, 00113, 'Standard', '2020-10-30', '2020-04-02');

INSERT INTO Plan VALUES (01114, 00114, 'Basic', '2019-06-30', '2019-07-30');

INSERT INTO Plan VALUES (01115, 00115, 'Premium', '2020-07-02', '2021-10-01');

INSERT INTO Plan VALUES (01116, 00116, 'Standard', '2020-07-05', '2020-01-09');

INSERT INTO Plan VALUES (01117, 00117, 'Standard', '2020-07-01', '2021-04-02');

INSERT INTO Plan VALUES (01118, 00118, 'Basic', '2019-07-12', '2020-07-30');

CREATE TABLE Profile (

Profile\_ID INT PRIMARY KEY, /\*start with 02\*/

account\_ID INT,

profile\_name VARCHAR(30),

FOREIGN KEY (account\_ID) REFERENCES Account(account\_ID));

INSERT INTO Profile VALUES (02111, 00111, 'KSprofile');

INSERT INTO Profile VALUES (02112, 00112, 'RMprofile');

INSERT INTO Profile VALUES (02113, 00113, 'AIprofile');

INSERT INTO Profile VALUES (02114, 00114, 'JPprofile');

CREATE TABLE PaymentDetailes (

payment\_ID INT PRIMARY KEY, /\*start with 03\*/

account\_ID INT,

payment\_first\_name VARCHAR(20),

payment\_last\_name VARCHAR(30),

payment\_credit\_card\_num INT,

payment\_credit\_card\_expiary\_date DATE,

payment\_credit\_card\_CVV INT,

payment\_date DATE,

FOREIGN KEY (account\_ID) REFERENCES Account(account\_ID));

INSERT INTO PaymentDetailes VALUES (03111, 00111, 'Kelly', 'Slater', 53278192, '2021-11-19', 716, '2020-11-11');

INSERT INTO PaymentDetailes VALUES (03112, 00112, 'Rob', 'Machado', 10935277, '2021-08-12', 912, '2020-10-9');

INSERT INTO PaymentDetailes VALUES (03113, 00113, 'Andy', 'Irons', 118266354, '2020-12-30', 788, '2021-11-4');

INSERT INTO PaymentDetailes VALUES (03114, 00114, 'Joel', 'Parkinson', 40930029, '2021-11-15', 717, '2020-12-12');

CREATE TABLE AccountBillings (

billing\_ID INT PRIMARY KEY, /\*start with 04\*/

account\_ID INT,

billing\_plan\_name VARCHAR(10),

billing\_price FLOAT,

billing\_date DATE,

billing\_payment\_method VARCHAR(10),

FOREIGN KEY (account\_ID) REFERENCES Account (account\_ID),

FOREIGN KEY (billing\_plan\_name) REFERENCES PlanTypes(plan\_name));

INSERT INTO AccountBillings VALUES (04116, 00113, 'Basic', 46.90, '2020-01-25', 'Visa');

INSERT INTO AccountBillings VALUES (04117, 00114, 'Basic', 60.90, '2020-01-25', 'Visa');

INSERT INTO AccountBillings VALUES (04118, 00111, 'Premium', 60.90, '2020-01-22', 'Visa');

INSERT INTO AccountBillings VALUES (04119, 00112, 'Standard', 60.90, '2020-01-23', 'PayPal');

INSERT INTO AccountBillings VALUES (04111, 00111, 'Premium', 60.90, '2021-02-22', 'Visa');

INSERT INTO AccountBillings VALUES (04112, 00112, 'Standard', 46.90, '2020-02-23', 'PayPal');

INSERT INTO AccountBillings VALUES (04113, 00113, 'Standard', 46.90, '2020-02-24', 'Visa');

INSERT INTO AccountBillings VALUES (04114, 00114, 'Basic', 32.90, '2020-02-25', 'Visa');

INSERT INTO AccountBillings VALUES (04115, 00114, 'Basic', 32.92, '2020-02-25', 'Visa');

CREATE TABLE Genre (

genre\_mix\_ID INT PRIMARY KEY, /\*start with 08\*/

family\_and\_children BIT,

award\_winning BIT,

comedy BIT,

crime BIT,

documentary BIT,

action BIT,

horror BIT,

romance BIT,

sci\_fi BIT,

thriller BIT,

drama BIT);

INSERT INTO Genre VALUES (08111, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0);

INSERT INTO Genre VALUES (08112, 0, 0, 1, 0, 0, 1, 0, 1, 0, 0, 0);

INSERT INTO Genre VALUES (08113, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1);

INSERT INTO Genre VALUES (08114, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0);

CREATE TABLE Movie (

movie\_ID INT PRIMARY KEY, /\*start with 05\*/

movie\_name VARCHAR(100),

movie\_release\_year INT,

movie\_duration TIME,

movie\_director VARCHAR(50),

movie\_age\_restriction VARCHAR(8),

movie\_main\_actor VARCHAR(50),

movie\_summary VARCHAR(500),

genre\_mix\_ID INT,

FOREIGN KEY (genre\_mix\_ID) REFERENCES Genre(genre\_mix\_ID));

INSERT INTO Movie VALUES (05111, 'Life of Brian', 1979, '01:33:00', 'Terry Jones', 'E', 'John Cleese', 'Life of Jesus Christ with a twist', 08111);

INSERT INTO Movie VALUES (05112, 'The Departed', 2006 , '02:31:00', 'Martin Scorsese', 'R', 'Jack Nicholson', 'An undercover agent and a spy constantly try to counter-attack each other in order to save themselves from being exposed in front of the authorities. Meanwhile, both try to infiltrate an Irish gang.', 08112);

INSERT INTO Movie VALUES (05113, 'Scott Pilgrim vs. The World', 2010 , '01:52:00', 'Edgar Wright', 'PG-13', 'Michael Cera', 'Scott Pilgrim meets Ramona and instantly falls in love with her. But when he meets one of her exes at a band competition, he realizes that he has to deal with all seven of her exes.', 08111);

INSERT INTO Movie VALUES (05114, 'Inglorious Bastards', 2009 , '02:33:00', 'Quentin Tarantino', 'R', 'Brad Pitt', 'A few Jewish soldiers are on an undercover mission to bring down the Nazi government and put an end to the war. Meanwhile, a woman wants to avenge the death of her family from a German officer.',08112);

CREATE TABLE Series (

series\_ID INT PRIMARY KEY, /\*start with 06\*/

series\_name VARCHAR(100),

series\_creator VARCHAR(100),

series\_release\_year INT,

series\_age\_restriction VARCHAR(8),

series\_summary VARCHAR(500),

genre\_mix\_ID INT,

FOREIGN KEY (genre\_mix\_ID) REFERENCES Genre(genre\_mix\_ID));

INSERT INTO Series VALUES (06111, 'How I Met Your Mother', 'Carter Bays', 2005, 'PG-13', 'Ted Mosby recounts to his children the events that led him to meet their mother', 08113);

INSERT INTO Series VALUES (06112, 'Breaking Bad', 'Vince Gilligan', 2008, 'R', 'A chemistry teacher, discovers that he has cancer and decides to get into the meth-making business to repay his medical debts', 08114);

INSERT INTO Series VALUES (06113, 'Community', 'Dan Harmon', 2009, 'PG-13', 'Students of diverse temperaments form a study group which leads to quirky and memorable encounters', 08113);

INSERT INTO Series VALUES (06114, 'Family Guy', 'Seth MacFarlane', 1999, 'R', 'Peter Griffin and his family of two teenagers, a smart dog, a devilish baby and his wife find themselves in hilarious situations', 08114);

CREATE TABLE Episode (

episode\_ID INT PRIMARY KEY, /\*start with 07\*/

series\_ID INT,

episode\_name VARCHAR(50),

season\_number INT,

episode\_number\_in\_season INT,

episode\_summary VARCHAR(500),

FOREIGN KEY (series\_ID) REFERENCES Series(series\_ID));

INSERT INTO Episode VALUES (07111, 06111, 'The Playbook', 5, 8, "Barney reverts back to his bachelor ways when he and Robin break up and is soon on the prowl looking for new women using the Playbook");

INSERT INTO Episode VALUES (07112, 06112, 'Felina', 5, 16, "Walter makes one last attempt to secure his family's future, while also visiting some old enemies, during his final return to Albuquerque");

INSERT INTO Episode VALUES (07113, 06113, 'remedial chaos theory', 3, 4, "When Jeff introduces an element of randomness into Troy and Abed's housewarming party, reality splits into six timelines affecting the group's relationships.");

INSERT INTO Episode VALUES (07114, 06114, 'Road to the Multiverse', 8, 1, "Brian and Stewie go on another road trip through alternate universes using a special remote control. The trip includes a post-apocalyptic world, a parallel world run by dogs where humans are pets, and more.");

CREATE TABLE ProfileViewingActivity (

activity\_ID INT PRIMARY KEY, /\*start with 09\*/

profile\_ID INT,

movie\_ID INT,

episode\_ID INT,

activity\_date DATE,

activity\_time TIME,

CONSTRAINT CHECK ((movie\_ID IS NOT NULL AND episode\_ID IS NULL) OR

(movie\_ID IS NULL OR episode\_ID IS NOT NULL)),

/\*We assume that a tuple will never contain both movie\_ID and episode\_ID - one of them will always be null\*/

FOREIGN KEY (profile\_ID) REFERENCES Profile(profile\_ID),

FOREIGN KEY (movie\_ID) REFERENCES Movie(movie\_ID),

FOREIGN KEY (episode\_ID) REFERENCES Episode(episode\_ID));

INSERT INTO ProfileViewingActivity VALUES (09111, 02111, 05111, null, '2021-01-11', '02:33:40');

INSERT INTO ProfileViewingActivity VALUES (09112, 02112, 05112, null, '2021-02-12', '02:35:27');

INSERT INTO ProfileViewingActivity VALUES (09113, 02113, 05113, null, '2021-03-11', '02:38:40');

INSERT INTO ProfileViewingActivity VALUES (09118, 02113, 05113, null, '2021-03-11', '05:38:40');

INSERT INTO ProfileViewingActivity VALUES (09114, 02114, 05114, null, '2021-01-11', '02:39:01');

INSERT INTO ProfileViewingActivity VALUES (09119, 02111, 05114, null, '2021-01-11', '02:39:01');

INSERT INTO ProfileViewingActivity VALUES (09120, 02112, 05114, null, '2021-01-11', '02:39:01');

INSERT INTO ProfileViewingActivity VALUES (09117, 02114, 05114, null, '2021-01-11', '03:39:01');

INSERT INTO ProfileViewingActivity VALUES (09115, 02113, null, 07111, '2021-03-11', '03:38:40');

INSERT INTO ProfileViewingActivity VALUES (09116, 02114, null, 07112, '2021-01-11', '03:39:01');

CREATE TABLE ProfileRatingActivity (

rating\_ID INT PRIMARY KEY, /\*start with 10\*/

profile\_ID INT,

movie\_ID INT,

episode\_ID INT,

Like\_or\_dislike BIT,

rating\_date DATE,

CONSTRAINT CHECK ((movie\_ID IS NOT NULL AND episode\_ID IS NULL) OR

(movie\_ID IS NULL OR episode\_ID IS NOT NULL)),

/\*We assume that a tuple will never contain both movie\_ID and episode\_ID - one of them will always be null\*/

FOREIGN KEY (profile\_ID) REFERENCES Profile(profile\_ID),

FOREIGN KEY (movie\_ID) REFERENCES Movie(movie\_ID),

FOREIGN KEY (episode\_ID) REFERENCES Episode(episode\_ID));

INSERT INTO ProfileRatingActivity VALUES (10111, 02111, 05111, null,0, '2021-01-11');

INSERT INTO ProfileRatingActivity VALUES (10112, 02111, 05111, null,1, '2021-02-12');

INSERT INTO ProfileRatingActivity VALUES (10113, 02111, null, 07111,1, '2021-01-16');

INSERT INTO ProfileRatingActivity VALUES (10114, 02111, null, 07111,0, '2021-06-11');

Q5

1. PaymentDetailes (payment\_ID, account\_ID(FK), payment\_first\_name, payment\_last\_name, payment\_credit\_card\_num, payment\_credit\_card\_expiary\_date, payment\_credit\_card\_CVV, payment\_date)

All the attributes are atomic and unique but we have functional dependency in an attribute that is not part of the primary key (e.g. payment\_credit\_card\_num, payment\_first\_name) thus we are in 2NF.

* AccountOfPaymentEntry (payment\_ID, account\_ID(FK))
* PaymenDetails (payment\_ID, payment\_first\_name, payment\_last\_name, payment\_credit\_card\_expiary\_date, payment\_credit\_card\_CVV, payment\_date)
* PaymentCreditCard (payment\_ID, payment\_credit\_card\_num)

1. Movie (movie\_ID, movie\_name, movie\_release\_year, movie\_duration, movie\_director, movie\_age\_restriction, movie\_main\_actor, movie\_summary, genre\_mix\_ID(FK))

All the attributes are atomic and unique but we have functional dependency in an attribute that is not part of the primary key (e.g. movie\_name, movie\_duration) thus we are in 2NF.

* MovieName (movie\_ID, movie\_name)
* MovieDetails (movie\_ID, movie\_release\_year, movie\_duration, movie\_director, movie\_age\_restriction, movie\_main\_actor, movie\_summary, genre\_mix\_ID(FK))

[We assume that you won’t be able to deduct from the movie summary any other details for 100%]

1. Genre (genre\_mix\_ID, family\_and\_children, award\_winning, comedy, crime, documentary, action, horror, romance, sci\_fi, thriller, drama)

There is no attribute in the relation that is dependent and is not a possible key there for this relation in BCNF.

Q6

KPI 1-3: <https://zemoga.com/blog/post/ott-app-metrics>

KPI 4: <https://recurly.com/content/key-metrics-for-subscription-commerce/>

KPI 5: <https://www.techsmith.com/blog/video-metrics-essentials/>

Q7

7.1. + 7.2.

1. **Average Revenue Per User (ARPU)**

Average Revenue Per User (ARPU) measures the amount of money you can expect to generate from one customer. It’s calculated by dividing the total revenue of your OTT business by its total number of users.

**KPI 1 SQL QUERY:**

SELECT account\_ID, ROUND(AVG(billing\_price), 2) AS account\_avg\_payment

FROM AccountBillings

GROUP BY account\_ID;

Table

Description automatically generated

1. **Revenue Growth Rate**

This KPI helps to ensure your business continues to grow at a target rate, measured by a percentage. Ideally you would measure this monthly or on a 12 month rolling average basis.

**KPI 2 SQL QUERY:**

WITH january\_revenue (jan\_rev) AS

(SELECT SUM(billing\_price)

FROM AccountBillings

WHERE billing\_date >= '2020-01-01' AND billing\_date <= '2020-01-31'),

february\_revenue (feb\_rev) AS

(SELECT SUM(billing\_price)

FROM AccountBillings

WHERE billing\_date >= '2020-02-01' AND billing\_date <= '2020-02-28')

SELECT ROUND(((february\_revenue.feb\_rev - january\_revenue.jan\_rev) / january\_revenue.jan\_rev), 2) AS Growth

FROM february\_revenue, january\_revenue;

Table

Description automatically generated

1. **Engagement Rate**

Engagement measures user interaction with your website or apps. Common metrics can include how many times a user opens an app, how many videos they’re watching per session, and what actions a user takes within one of your digital properties.

Your business won’t be sustainable if it depends on users taking just a single action. Your users must continue to make moves over sustained sessions.

Measuring engagement and user behavior allows you to obtain a better understanding of your customer relationships. Many businesses follow the 80/20 rule: engage 20% of your customers to generate 80% of your business revenue.

<https://zemoga.com/blog/post/ott-app-metrics>

**KPI 3 SQL QUERY:**

WITH profile\_in\_account (account\_id, profile\_id) AS

(SELECT account\_ID, profile\_ID

FROM Profile),

profile\_activity (profile\_id, activity\_date) AS

(SELECT profile\_ID, activity\_date

FROM ProfileViewingActivity)

SELECT account\_id, COUNT(activity\_date) AS Engagements

FROM profile\_in\_account NATURAL JOIN profile\_activity

WHERE activity\_date >= '2021-01-01' AND activity\_date <= '2021-03-31'

GROUP BY account\_id;

Table

Description automatically generated

1. **Trail Conversion Rate**

Example how to check the trail conversion rate of accounts who joined on July 2020:

The trail period is 30 exactly days, thus their trail will end between 1.8.2020 and 31.8.2020. Those who have a paid plan on their name which ends after 1.9.2020 are converted.

We will compute the trail conversion rate by counting accounts joined within the last 30 days and started paying after these 30 days.

<https://recurly.com/content/key-metrics-for-subscription-commerce/>

**KPI 4 SQL QUERY:**

WITH converted\_accounts (amount) AS

(SELECT COUNT(account\_ID)

FROM Account

WHERE account\_join\_date >= '2020-07-01' AND account\_join\_date <= '2020-07-31' AND

account\_ID IN (SELECT account\_ID FROM Plan WHERE plan\_end\_date >= '2020-09-01'))

SELECT amount / (SELECT COUNT(account\_ID) FROM Account WHERE account\_join\_date >= '2020-07-01' AND

account\_join\_date <= '2020-07-31') AS Trial\_Conversion\_Rate

FROM converted\_accounts;

Table

Description automatically generated with medium confidence

1. **Unique plays**

A Play counts every time the video play button is pushed, including Plays by the same person. Unique Plays filters out repeat video playbacks by the same person. Meaning, if I play a video twice, the Play amount is two, and the Unique Play amount is one.

<https://www.techsmith.com/blog/video-metrics-essentials/>

**KPI 5 SQL QUERY:**

WITH unique\_profiles\_and\_movies (movie\_ID, number\_of\_unique\_views) AS

(SELECT movie\_ID, COUNT(DISTINCT profile\_ID)

FROM ProfileViewingActivity

WHERE movie\_ID IS NOT null

GROUP BY movie\_ID)

SELECT movie\_ID, number\_of\_unique\_views

FROM unique\_profiles\_and\_movies

WHERE number\_of\_unique\_views >= ALL (SELECT number\_of\_unique\_views

FROM unique\_profiles\_and\_movies);

**Table

Description automatically generated**

Q8

**Note** –

* We did some adaptations and specifications of our KPIs to make them interesting and more adaptable in RA form.
* marks an aggregatory function.

1. **Average Revenue Per User (ARPU) in 2020**

For us to build our business model we need to know our revenue stream (on average) for every new user comes to our platform.

1. **Engagement Rate – Relational Algebra case - Accounts Engagement this Month**

We chose engagement rate because the service is streaming and one of the best ways to know how valuable is your product is to measure how often users use it.

We wanted to check the engagement rate by account per month (we can do it per any period of time) and not only by profile because we measure our revenue stream depends on the number of accounts and not the number of profiles.

1. **Trial Conversion in a Specific Month (we can’t calculate the percentage rate in RA)**

Note – We assume we do this KPI check on September 1st .

Trial conversion is very important because it measures how good are we in acquiring new paying customers which will create us a revenue stream and will enable our business to keep operating.

Q9

|  |  |  |
| --- | --- | --- |
| PlanTypes | | |
| Attribue | Data Type | SIZE |
| plan\_name | CHAR (10) | 10 |
| plan\_num\_of\_devices | INT | 4 |
| plan\_resolution | CHAR (30) | 30 |
| plan\_price | FLOAT | 8 |
|  |  | **SUM = 52** |
| Account | | |
| Attribue | Data Type | SIZE |
| account\_ID | INT | 4 |
| account\_Email | CHAR (50) | 50 |
| account\_password | CHAR (20) | 20 |
| account\_cellphone\_num | CHAR (15) | 15 |
| account\_join\_date | DATE | 3 |
|  |  | **SUM = 89** |
| Plan | | |
| Attribue | Data Type | SIZE |
| plan\_ID | INT | 4 |
| account\_ID | INT | 4 |
| account\_plan\_name | CHAR(10) | 10 |
| plan\_start\_date | DATE | 3 |
| plan\_end\_date | DATE | 3 |
|  |  | **SUM = 24** |
| Profile | | |
| Attribue | Data Type | SIZE |
| Profile\_ID | INT | 4 |
| Account\_ID | INT | 4 |
| Profile\_name | CHAR(30) | 30 |
|  |  | **SUM = 38** |
| Payment Details | | |
| Attribue | Data Type | SIZE |
| payment\_ID | INT | 4 |
| Account\_ID | INT | 4 |
| Payment\_first\_name | CHAR(20) | 20 |
| Payment\_last\_name | CHAR(30) | 30 |
| Payment\_credit\_card\_num | INT | 4 |
| Payment\_credit\_card\_expiary\_date | DATE | 3 |
| Payment\_credit\_card\_CVV | INT | 4 |
| Payment \_date | DATE | 3 |
|  |  | **SUM = 72** |
| Acccount Billings | | |
| Attribue | Data Type | SIZE |
| Billing\_ID | INT | 4 |
| Account\_ID | INT | 4 |
| Billing\_plan\_name | CHAR(10) | 10 |
| Billing\_price | FLOAT | 4 |
| Billing\_date | DATE | 3 |
| Billingpayment\_method | CHAR(10) | 10 |
|  |  | **SUM = 35** |
| Movie | | |
| Attribue | Data Type | SIZE |
| Movie\_ID | INT | 4 |
| Movie\_name | CHAR(100) | 100 |
| Movie\_release\_year | INT | 4 |
| Movie\_duration | TIME | 3 |
| Movie\_director | CHAR(50) | 50 |
| Movie\_age\_restriction | CHAR(8) | 8 |
| Movie\_main\_actor | CHAR(50) | 50 |
| Movie\_summary | CHAR(500) | 500 |
| Genre\_mix\_ID | INT | 4 |
|  |  | **SUM = 723** |
| Series | | |
| Attribue | Data Type | SIZE |
| Series \_ID | INT | 4 |
| Series \_name | CHAR(100) | 100 |
| Series\_release\_year | INT | 4 |
| Series\_creator | CHAR(100) | 100 |
| Series\_age\_restriction | CHAR(8) | 8 |
| Series\_summary | CHAR(500) | 500 |
| Genre\_mix\_ID | INT | 4 |
|  |  | **SUM = 720** |
| Episode | | |
| Attribue | Data Type | SIZE |
| Episode\_ID | INT | 4 |
| Series\_ID | INT | 4 |
| Episode\_name | CHAR(50) | 50 |
| Season\_number | INT | 4 |
| Episode\_number\_in\_season | INT | 4 |
| Episode\_summary | CHAR(500) | 500 |
|  |  | **SUM = 566** |
| Genre | | |
| Attribue | Data Type | SIZE |
| Genre\_mix\_ID | INT | 4 |
| Family\_and\_children | BIT | 1 |
| Award\_winning | BIT | 1 |
| Comedy | BIT | 1 |
| Crime | BIT | 1 |
| Documentry | BIT | 1 |
| Action | BIT | 1 |
| Horror | BIT | 1 |
| Romance | BIT | 1 |
| Sci\_Fi | BIT | 1 |
| Thriller | BIT | 1 |
| Drama | BIT | 1 |
|  |  | **SUM = 15** |
| Profile Viewing Activity | | |
| Attribue | Data Type | SIZE |
| Activity\_ID | INT | 4 |
| Profile\_ID | INT | 4 |
| Movie\_ID | INT – Can’t Be Both | 4 |
| Episode\_ID |
| Activity\_date | DATE | 3 |
| Activity\_time | TIME | 3 |
|  |  | **SUM = 18** |
| Profile Rating Activity | | |
| Attribue | Data Type | SIZE |
| Rating\_ID | INT | 4 |
| Profile\_ID | INT | 4 |
| Movie\_ID | INT – Can’t Be Both | 4 |
| Episode\_ID |
| Like\_or\_dislike | BIT | 1 |
| Rating \_date | DATE | 3 |
|  |  | **SUM = 16** |

**Assumptions:** Based as much as possible on real Netflix data.

* Different subscribers (accounts) = 200,000,000
* Average number of profiles per account: 3
* Number of movies = 3000
* Number of shows = 2000
* Average number of episodes per show = 30 (Thus number of episodes on Netflix = 60,000)
* Billing happens once in a month for all plans.
* Payment details are stored for a year (for siplifications)
* A person bothers to rate one tenth of everything he watches.
* There are 3 different plans: Basic, Standard, Premium.

Q10

Although “Genre” has the largest amount of attributes, we chose to take “Movie” because it’s a much more diversed relation so there will be more features to analyze.

Movie (movie\_ID, movie\_name, movie\_release\_year, movie\_duration, movie\_director, movie\_age\_restriction, movie\_main\_actor, movie\_summary, genre\_mix\_ID)

We assume there are 3,000,000 tuples and it’s indexed by index sequential file.

10.1.

Because the Movie relation contains big amount of tuples, it is possible to consider making another index to make the search more efficient even though we already are in index sequential file.

10.2.   
To serve our users in the best way, we would want to reduce time for searching a specific movie. Usually when a user wants to find the best movie that would fit his mood he or she would want to filter movies by genre. To make the search by genre more efficient we can add a new index by genre.

10.3.

ALTER TABLE Movie ADD INDEX(genre\_mix\_ID);

10.4.

If there is no indexing, in order to find a specific entry we would have perform a linear search on all the tuples which can be between 1 to 3,000,000 retrieves with time complexity of 5 to 15,000,000,000 ms.

If the file is indexed by the primary key the maximum number of retrieves from the memory is , so the maximum time will be 22\*5 = 110ms.

Therefor using index sequential file is better search method.

10.5.

The indexing type we would recommend will be hashing. We chose hashing because it’s complexity time is better than b+-tree (O(1) instead of log(n)). We assume that the primary keys are generated randomly and do not represent any kind of range therefore hashing will be more effective than b+-tree indexing.

When comparing the hash indexing to sequential indexing, the difference between them is that the Hash file saves data on hash algorithm and on a hash key value, while sequential file doesn’t have any key value to save the data. Basis on this hash key feature, searching in Hash file is faster than in sequential file.

10.6.

If we want to optimize indexing in all table, some tables will not benefit from using Hash index. For example, ‘Profile Viewing Activity’ and ‘Profile Rating Activity are two relations which in both we have regular and chronological data entries therefore we would want to use b+-tree indexing because the chronological feature of the primary keys will make a range of number instead of a random set of numbers.