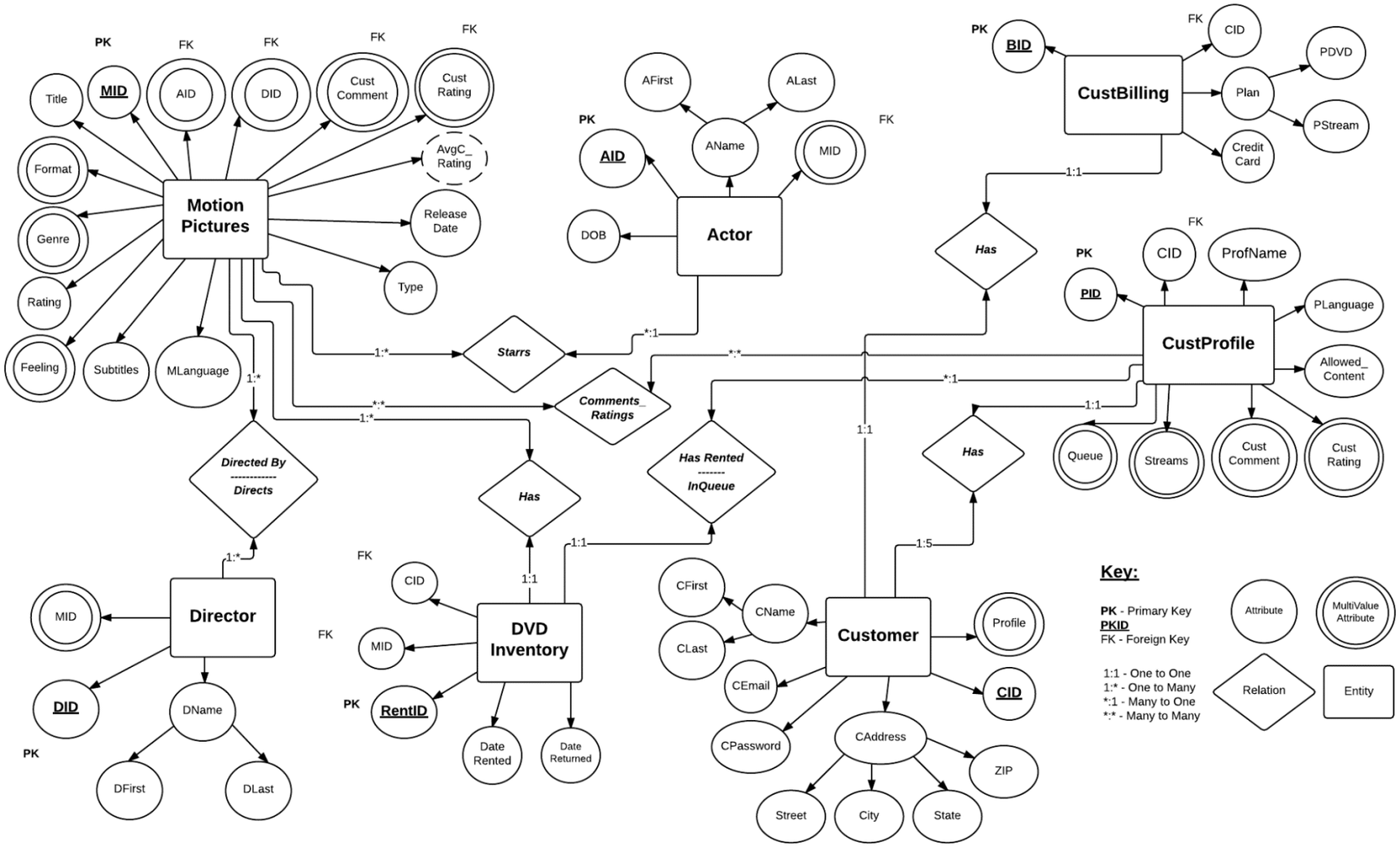
ER Diagram


Motion Pictures
Title
MID
AID
DID
Cust Comment
Cust Rating
AvgC_ Rating
Release Date
Type
Format
Genre
Rating
Feeling
Subtitles
MLanguage
PK
FK
Actor
AFirst
ALast
AName
DOB
Starrs
1:*
*:1
Comments_ Ratings
:
Directed By
Directs
Director
DName
DFirst
DLast
Has
Has Rented
InQueue
DVD Inventory
CID
RentID
Date Rented
Date Returned
Customer
CFirst
CLast
CName
CEmail
CPassword
CAddress
Street
City
State
ZIP
Profile
CustBilling
BID
PDVD
Plan
PStream
Credit Card
CustProfile
PID
ProfName
PLanguage
Allowed_ Content
Queue
Streams
Cust Comment
Cust Rating
1:1
1:5
Key:
PK - Primary Key
PKID
FK - Foreign Key
1:1 - One to One
1:* - One to Many
*:1 - Many to One
: - Many to Many
Attribute
MultiValue Attribute
Relation
Entity

Relations

Key: *Italics* – Foreign Key
Bold, Underlined – Primary Key

MotionPictures (**MID**, Title, ReleaseDate, Type, Rating, MLanguage, Subtitles)
Rule Title: Cannot be NULL
Domain of Type: TV Show, Movie
Rule: Cannot be NULL
Domain of Rating: G, PG, PG-13, R, NR, PG-TV, TV-Y7
Domain of MLanguage: English, French, Spanish, Polish, Czech, Russian etc… (Known languages)
Domain of Subtitles: Same as MLanguage (English, French…)
Genre (**GenreID**, *MID*, GName)
Domain of GName(Genre Name): Sci-Fi and Fantasy, Action and Adventure, Horror, Thriller, Anime and Animation, Foreign…etc
Rule: Cannot be NULL
Format (**FormatID**, *MID*, FormatName)
Domain of FormatName: DVD, Stream, Blu-Ray
Rule: Cannot be NULL
Feeling (**FeelID**, *MID,* FeelingName)
Domain of FeelingName: Exciting, Imaginative, Scary, Suspenseful, Chilling, Dark, Ominous,
Heartfelt, Emotional, Funny, Quirky, Family Friendly etc..

Director (**DID,** *DFirst*, *DLast*)
Rule: Cannot be NULL
Actor (**AID,** AFirst, ALast, DOB)
Rule: Cannot be NULL
Starrs (**StarID,** *AID, MID*)
M_Directed (**MDirectID**, *MID*, *DID*)

Comments_Ratings (**CRID**, *CID*, *MID*, CustRating, CustComment)
Customer (**CID**, CFirst, CLast, CName, CEmail, CPassword, Street, City, State, ZIP)
Rule for all fields: Cannot be NULL
CustProfile (**PID**, *CID*, ProfName, PLanguage, AllowedContent)

Rule for ProfName, PLanguage: Cannot be Null
Domain of AllowedContent: For Little Kids only, For Older Kids and Below, For Teens and Below, All Maturity Levels
Queue (**QID**, *RentID*, *PID, CID,* QRank)
Domain for QRank: Positive Integers greater than 0
Cust_Streams(**CStream,** *PID*, *CID, MID*, DateWatched)
CustBilling (**BID**, *CID*, PDVD, PStream, CreditCard)
Domain of PDVD: One disc at a time, Two discs at a time, Three discs at a time
Domain of PStream: 1 screen at a time SD, 2 screens at a time HD, 4 Screens at a time HD and UltraHD
DVDInventory(**RentID**, *MID, CID,* DateRented, DateReturned)
Rule for DateRented: cannot be NULL

1. Identify all Action and Adventure TV Shows in Stream format with Stephen Amell or Grant Gustin.
Display the show name, rating and feeling.

$A \leadsto \sigma_{\text{Genre.GName = 'Action and Adventure' ^ Genre.MID = MotionPictures.MID}}$ (Genre x MotionPictures)

B ⇝ σ Actors.AFirst = 'Stephen ^ Actors.ALast = 'Amell v Actors.AFirst='Grant' ^ Actors.ALast = 'Gustin' (A x Actors)
C ⇝ σ MotionPictures.MID = Format.MID ^ Format.FormatName = 'Stream' ^ MotionPictures.Type = 'TV Show' (B x Format)
D ⇝ σ Feeling.MID = C.MID (C x Feeling)
Answer ⇝ π Title, Rating, FeelingName (D)

Answer

Title	Rating	FeelingName
The Flash	TV-PG	Exciting
Arrow	TV-PG	Exciting

2. Identify all shows saved to Rowan Atkinson DVD rental queue. Display the placement in the queue, show name and average user rating.

A ⇝ σ Customer.CFirst='Rowan' ^ Customer.CLast='Atkinson' ^ CustProfile.CID = Customer.CID (Customer x CustProf)
B ⇝ σ Queue.CID=A.CID (Queue x A)

$C \leftarrow \sigma_{C.RentID=B.RentID}$ (B x DVDInventory)
$Movie \leftarrow \sigma_{C.MID=MotionPictures.CID}$ (C x MotionPictures)
$D \leftarrow \sigma_{Comments\_Ratings.MID = MotionPictures.MID}$ (Comments_Ratings x Movie)
$Answer \leftarrow \rho_{answer}$ (Title, QfRank, AvgCRating) $_{QRank} J_{AVG\ CustRating}$ (D)

Answer

Title	AvgC_Rating	QRank
Mr. Bean's Holiday	3	1
Johnny English	2	2
Johnny English Reborn	3	3

3. Identify all DVD shows borrowed by George Bush in the last 2 years.
   Display the show name, borrow date and return date.

A ⇝ **π** CID (**σ** Customer.CID = CustProfile.CID ^ Customer.CFirst = 'George' ^ Customer.CLast = 'Bush' (Customer x CustProfle))
B ⇝ **σ** MotionPictures.MID = DVDInventory.MID (MotionPictures x DVDInventory)
C ⇝ **σ** Format.FormatName = 'DVD' ^ Format.MID = B.MID (Format x B)
D ⇝ **σ** A.CID = C.CID (A x C)
E ⇝ **σ** D.DateRented <= '2016-03-09' ^ D.DateRented >= '2014-03-09' (D)
Answer ⇝ **π** Title, DateRented, DateReturned (E)

Answer

Title	DateRented	DateReturned
Zero Dark Thirty	2014-05-11	2014-05-25
American Sniper	2014-07-13	2014-07-30
Tears of the Sun	2015-12-15	2015-12-29

4. Identify highly rated Drama shows. Display the show name and average user rating.

A ⇝ **σ** Genre.GName = 'Drama' ^ Genre.MID = MotionPictures.MID (MotionPictures x Genre)
B ⇝ **π** Title, MID(A)
C ⇝ **σ** Comments_Ratings.MID = B.MID (Comments_Ratings x B)

$D \leftarrow \rho_{answer}(\text{Title, AvgC\_Rating})\ _{\text{Title}}\mathbf{J}_{\text{AVG CustRating}}(C)$
$\textbf{Answer} \leftarrow \sigma_{\text{D.AvgC\_Rating >= 4}}(D)$

Answer

Title	AvgC_Rating
Dope	4.9
Little Boy	4.8
The Best of Me	4.9
Black or White	5
Django	5
Hachi: A Dog's Tale	4.8

5. Identify the number of DVD's borrowed by genre. Display two columns: genre and number of rentals. Display one row for each genre.

$A \leftarrow \text{MotionPictures.MID = Format.MID ^ Format.FormatName = 'DVD'}\ (\ \pi_{\text{MID}}(\text{Format}) \times \pi_{\text{MID}}(\text{MotionPictures})\ )$

Borrowed ≫ $\sigma_{\text{DVDInventory.MID = A.MID}}$ (A x π_{MID} (DVDInventory))
MGenre ≫ $\sigma_{\text{Genre.MID = Borrowed.MID}}$ (Genre x Borrowed)
AttributeDisplay ≫ π_{Gname} (Mgenre)
DisplayAnswer ≫ $\rho_{\text{DisplayAnswer}}$ (Gname, Count) $_{\text{Gname}}\mathbf{J}_{\text{COUNT Gname}}$ (AttributeDisplay)

DisplayAnswer

Gname	Count
Action and Adventure	9999
Horror	1337
Drama	2000000
….	….
….	….
Foreign	1

6. Identify popular shows borrowed or streamed near Greenpoint, NY in the last year.
   Display the show name and number of times borrowed or streamed. Display one row for each show name.

CustServiceGP ≫ $\pi_{\text{CID, DateRented, MID}}(\sigma_{\text{Customer.CID = DVDInventory.CID ^ Customer.City = 'Greepoint' ^ Customer.State = 'NY'}}(\text{Customer x DVDInventory}))$
X
$\pi_{\text{CID, DateWatched, MID}}(\sigma_{\text{Customer.CID = Cust\_Streams.CID ^ Customer.City = 'Greenpoint' ^ Customer.State = 'NY'}}(\text{Customer x Cust\_Streams}))$

ViewedWithinYear ≫ $\sigma_{\text{DateWatched >= '2015-03-09' ^ DateWatched <= '2016-03-09' ^ DateRented >= '2015-03-09' ^ DateRented <= '2016-03-09'}}(\text{CustServiceGP})$

MTitles ≫ $\pi_{\text{Title, AvgC\_Rating, DateWatched, DateRented}}(\sigma_{\text{MotionPictures.MID = ViewedWithinYear.MID}}(\text{ViewedWithinYear x MotionPictures}))$

$\rho_{\text{tableSetUp}}(\text{Title, TimesBorrowed, TimesStreamed})\ _{\text{Title}}\mathbf{J}\ _{\text{COUNT DateRented}}\ _{\text{COUNT DateWatched}}(\sigma_{\text{AvgC\_Rating >= 4}}(\text{MTitles}))$

Answer ≫ $\pi_{\text{Title, TimesBorrowed, TimesStreamed}}(\text{tableSetUp})$

Answer

Title	TimesBorrowed	TimesStreamed
Lion King	92435	34,002
Star Wars: A New Hope	9001	9001
Big Bang Theory Season 1	12345	999998
.....	.....	.....
.....	.....	.....

7. Identify the number of shows by cast. Display two (Three columns for First and Last??) columns: cast name and number of shows they appear. Display one row for each cast name.

A ≫ $\sigma_{\text{Starrs.AID = Actor.AID}}(\pi_{\text{AFirst, ALast, AID, MID}}(\text{Starrs x Actor}))$

Movies ≈ $\sigma_{A.MID = MotionPictures.MID}$ ((π_{MID} (MotionPictures)) x A)
ρ_{answer} (AFirst, ALast, TimesAppeared) $_{ALast}$ **J** $_{COUNT\ MID}$ (Movies)

AFirst	ALast	TimesAppeared
Mark	Hamill	6
Carrie	Fisher	4
….		….

8. Identify shows not streamed or borrowed in the last year. Display two columns: show name and average user rating.

A ≈ $\sigma_{DVDInventory.DateRented <= '2016\text{-}03\text{-}09' \wedge DVDInventory.DateRented >= '2015\text{-}03\text{-}09' \wedge Cust\_Stream.DateWatched <= '2016\text{-}03\text{-}09' \wedge Cust\_Stream.DateWatched >= '2015\text{-}03\text{-}09'}$
($\pi_{MID,\ DateWatched}$ (Cust_Streams) x $\pi_{MID,DateRented}$ (DVDInvetory))
B ≈ (π_{MID} (DVDInventory) x π_{MID} (Cust_Streams)) – π_{MID} (A)
C ≈ $\sigma_{MotionPictures.MID = B.MID}$ ($\pi_{Title,\ MID}$ (MotionPictures) x B)
Answer ≈ ρ_{answer} (Title, AvgC_Rating) $_{Title}$ **J** $_{AVG\ CustRating}$ (C)

Title	AvgC_Rating
Affluenza	.8
The Last Airbender	1.2
Battlefield Earth	.1
….	….

9. Identify customers with no activity in the last year (customers who have not borrowed a DVD or streamed a show). Display two columns: customer name and email address.

A ⇝ $\sigma_{\text{DVDInventory.DateRented >= '2015-03-09' ^ DVDInventory.DateRented <= '2016-03-09' ^ Cust\_Streams.DateWatched >= '2015-03-09' ^ Cust\_Streams.DateWatched <= '2016-03-09'}$ ($\pi_{\text{CID, DateRented}}$(DVDInventory) x $\pi_{\text{CID, DateWatched}}$(CustStreams))

B ⇝ $\pi_{\text{CID, CEmail}}$(Customer) – π_{CID}(A)

C ⇝ $\sigma_{\text{Customer.CID = B.CID}}$(B)

Answer ⇝ $\pi_{\text{CName, CEmail}}$ (C)

CName	CEmail
Uncle Phill	unclephill@freshprinceofbellair.com
Cookie Monster	nomnomnom@sesamestreet.com
George Bush	georgedubya@whitehouse.org
John O. Cooper	johncooper@gmail.com

10. Identify shows without user ratings. Display two (I'll just display four AFirst and ALast??) columns: show name, release date and cast.

A ⇝ $\sigma_{\text{CustRating.MID = NULL}}$ (Comments_Ratings)
B ⇝ $\sigma_{\text{A.MID = Starrs.MID}}$ (A x Starrs)

C ≻ **σ** B.MID = MotionPictures.MID ^ B.AID = MotionPictures.AID (B x **π** Title, MID, ReleaseDate (MotionPictures))
D ≻ **σ** C.AID = Actor.AID (C x Actor)
Answer ≻ **π** Title, AFirst, ALast, ReleaseDate (D)

Title	AFirst	ALast	ReleaseDate
Muppets	Kermit	theFrog	1-1-2016
Muppets	Piggy	thePig	1-1-2016
Fresh Prince of Bel-Air	Will	Smith	3-4-1995
….	….	….	….
….	….	….	….