Multimedia Content Database Management (CSC 675-775-03)

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Section I: Project Description

In a world with stellar speed internet connection, our way of listening to music has changed drastically. Earlier we had cassettes and music albums to listen to music.We find ourselves amidst cultural diversity, so why not explore different music, podcasts and audiobooks from all over the world? Imagine a convenient way of streaming not only music, but also podcasts and audiobooks in a matter of clicks. This Multimedia Content Database System provides an option to stream music, podcasts and audiobooks on the fly so each kind of user can enjoy the content that they can like. The user can create an account and login and start enjoying the content that they like. The database system offers two types of accounts: Basic and Premium. Basic account users can enjoy music and podcasts free of cost. Even though users could be short on money, with this system, users will never be short of free content. However, Basic accounts contain multimedia with advertisements which some people may find interruptive. Our database system provides a solution by offering a Premium account where users can pay a small fee and enjoy ad - free content. In premium accounts we also offer the users to stream unlimited audioBooks along with music and podcasts. The database system also gives an option to premium users to download the content if they are in a situation with a bad network. The database system also provides users with several discounts. The database system has a premium plan for students where they pay 50% of the premium price and still be able to enjoy all the premium features. They just need to register using their school email id. Also there's a group plan which allows users to use their same account but only one user takes care of the payment instead of everyone paying individually for a premium account. This way the group plan users can still enjoy premium features at a slightly reduced price.

The database system is designed to fulfill the needs of all different kinds of users and provide easily accessible content across the globe.

Section II : Use Cases

1. **Use Case:** Difficulty finding free music.

   Actor: Jacob(User), basic account, music, ads

   Description: Jacob is a factory worker. He finds his job to be absolutely mundane and he's looking for an option to listen to free music while working. However, he is a cheapskate. He doesn't like spending money until it is absolutely necessary. He doesn't want to waste his time finding good music on the internet and downloading each song he likes. He doesn't mind listening to ads, he just wants a service which he can use for free and enjoy his time at work.

   The Multimedia Content Database Management System is there to help Jacob by providing him with free music with the basic plan. He'll just need to register. Moreover, he will not have to spend money and have a pleasant experience while he's working or whenever he wishes to listen to music.

2. **Use Case:** Lack of downloadable/offline content

   Actor: Adi(Businessman), User, payment, download multimedia, premium account

   Description: Adi is a business owner who frequently flies for his business meetings. Being a businessman, he values his time tremendously. He always wants to stay informed and up to date with the ongoing events in the world. So, while being on his flight, he wants to listen to news and current events podcasts. However, a lot of flights don't provide an option for paid wifi and so Adi is looking for an option where he can download the news podcasts before boarding his flight.

   The Multimedia Content Database Management System is there to help Adi as the database system provides a premium user to download multimedia content. The database will therefore help and provide Adi with a platform

where he can download the video podcasts of his choice and spend his time productively.

3. **Use Case:** Lack of affordable prices for streaming music for students

   Actor: Adele(User), payment, student plan, premium account, podcasts, music

   Description: Adele is a college student. She is a part time worker and a full time student. She loves to listen to podcasts or music in her free time. She also listens to calming music while studying. Being a college student, she doesn't want to spend money to listen to music or podcasts. She's now looking for a solution to obtain affordable plans to listen to podcasts and stream music all in one place.

   The Multimedia Content Database Management System is there to help Adele by providing her an option to choose the "Student Premium Plan" . With the plan she will be charged only 50% of the premium membership after she registers with her school email id. In this way she'll be able to enjoy the premium features and save some money in the process.

4. **Use Case:** Need for group plan for multiple members

   Actor: Mary(Admin), Bob(User), Lincoln(User), Iva(User), group plan, premium account, payments

   Description: Mary is the youngest cousin in her extended family. All of her cousins use a premium plan to stream music, podcasts or AudioBooks. She finds that there are no group plans where all of them can have an option where they could enjoy premium features. She notices that they all spend about 15 dollars a month individually. So she's in search of a plan where it is a little bit cheaper for all of them and **one** person can pay for all of them.

   The Multimedia Content Database Management System is there to help Mary by providing her an option to choose the "Group Premium Plan" where one member can conveniently take care of the payments and rest of the users can enjoy the premium features. This way Mary, Bob, Lincoln and Iva can enjoy

the content and one of the users becomes the admin who takes care of the payment.

5. **Use Case:** Lack of AudioBooks
   Actor: Gina(User), audiobooks, premium account
   Description: Gina is a lawyer. She was an avid reader growing up. However as time passed by, her life became extremely busy. She doesn't have time to sit-back and read a paperback with her busy lifestyle. She wants to be able to be "reading" books absolutely everywhere she goes. She is looking for an option where she can listen to audiobooks as she wants to make her life more productive, encounter more diverse ways in which she sees the world, and gain pure enjoyment that comes from learning about topics of interest without going through the physical process of reading.

   The Multimedia Content Database Management System is there to help Gina by providing her a premium plan where she can not only enjoy ad - free music and podcasts but also audiobooks. Generally the user needs to buy individual audiobooks everytime, but this database management system charges a flat fee every month providing the user with a lot of options. She will even have the feature to download the audiobooks if she ever finds herself in a situation without a network.

6. **Use Case:** Difficulty resuming music any time user wants
   Actor: Julia(User), basic account, music, audiobooks, Multimedia tracker
   Description: Julia wants to play a song from the Multimedia Content Database System, the system asks Julia to register first as a prerequisite to listen to the song. Marie registers into the system with a basic account, and then logs in her account. Then, she can search for the song she wants to listen to. Marie finds the song and starts playing it. However she quits the application for attending her phone call and loses the track and time stamp of the music and the song starts playing from the beginning.

The Multimedia Content Database Management System is there to help Julia. The system has a Multimedia Tracker which allows her to pause and play the track how much ever time she wants and it wouldn't always start from the beginning if she quits the application.

SECTION III: Database Requirements

1. General User
   a. A general user is a registered user, or admin.
   b. A general user shall be able to create many accounts with different emails.
   c. A general user shall be able to register to many mailing lists

2. Roles
   a. A role shall be used by many accounts.

3. Admin
   a. An admin is a registered user.
   b. An admin can edit the roles.
   c. An admin can add new roles.
   d. An admin can delete roles.

4. Payment Method
   a. A payment method is a bank account, paypal or credit card.
   b. A bank account payment method has a debit card.
   c. A payment method can be linked to many premium accounts.

5. Registered users
   a. A registered user is a general user.
   b. A registered user can login into his/her account from one device.
   c. A registered user shall do at least one IP address validation every time he/she changes visitor networks.
   d. A registered user shall be able to create only one free basic account
   e. A registered user shall be able to create only one premium account
   f. A registered user with a basic account subscription has access to only music and podcasts but not AudioBooks.
   g. A registered user with a basic account subscription will encounter ads in the multimedia content.
   h. A registered user with a premium subscription has access to all the multimedia content.
   i. A registered user with a premium subscription will not encounter ads in the multimedia content.

6. Account

    a. An account is either a basic or premium account.
    b. An account shall belong to only one user.
    c. An account shall be located in only one region.
    d. An account can have many roles.

7. Basic Account
    a. A basic account is free for registered users.
    b. A basic account is an account.
    c. A basic account shall have permissions to stream only music and audio podcasts.
    d. A basic account shall have ads in many multimedia content.
    e. A basic account shall have many users.

8. Premium Account
    a. A premium account is a paid account.
    b. A premium account is an account
    c. A premium account shall have an expiration date.
    d. A premium account shall have many users.
    e. A premium account shall have individual plan, student plan and group plan.
    f. A premium account shall have permissions to stream unlimited audio podcasts, music and Audiobooks multimedia content.
    g. A premium account shall have permissions to download unlimited audio podcasts, music and Audiobooks multimedia content.
    h. A premium account shall have at least one preferred payment method.

9. Individual Premium Plan
    a. An individual premium plan has all the features and permissions of the premium account.
    b. An individual premium plan shall have a individualplan_id

10. Premium Student Plan
    a. A premium student plan has all the features and permissions of the premium account.
    b. A premium student plan shall have a 50% discount on the price of the premium plan.
    c. A premium student plan shall have a student_plan_id

11. Premium Group Plan
    a. A premium group plan has all the features and permissions of the premium account.
    b. A premium group plan will have at most 4 profiles managed and controlled by the admin.

     c. A premium group plan shall have a group_plan_id

12. Multimedia Content
    a. A multimedia content is either an audio podcast, music, or AudioBook
    b. A multimedia content shall be either original or an exact copy of itself
    c. A multimedia content shall have many authors
    d. A multimedia content can have ads.
    e. A multimedia content shall be located in at least one Content Delivery Network.

13. Audio Podcasts
    a. Audio multimedia content shall be streamed by many accounts
    b. Audio multimedia content shall be streamed by many premium accounts.
    c. Audio multimedia content shall be downloaded by many premium accounts.
    d. Audio multimedia content shall be able to be resumed as many times as needed.

14. Music
    a. Music multimedia content shall be streamed by many accounts
    b. Music multimedia content shall be streamed by many premium accounts
    c. Music multimedia content shall be downloaded by many premium accounts
    d. Music multimedia content shall be able to be resumed as many times as needed.

15. AudioBook
    a. An AudioBook shall be streamed only by premium accounts.
    b. An AudioBook shall be downloaded only by many premium accounts.
    c. An AudioBook shall have many publishers.

16. Content Delivery Network (CDN)
    a. A CDN shall be located in only one region
    b. A CDN contains many copies of the original multimedia content.
    c. A CDN shall be represented in at least one manifest.

17. Manifest Component
    a. A manifest shall have the ID's of many multimedia contents (copies)
    b. A manifest shall have the location (CDN) of many multimedia contents (copies).
    c. A manifest shall be located in the main cloud server (e.g AWS)

18. Region
    a. A region shall have many accounts.
    b. A region shall have many CDN.

19. Profile
    a. A profile shall be owned by only and only one premium group account.
    b. A profile shall have one alias.

20. Advertisements
    a. All advertisements shall have many organizations
    b. All advertisements shall have advertisement id.
    c. An advertisement can be linked to many multimedia contents.

21. Organizations
    a. All organizations shall have a unique organization id.
    b. All organizations shall have many ads.

22. Promotions:
    a. All promotions shall have a unique promotion id.
    b. All promotions shall have many ads.
    c. Promotions shall have promotion type: self or partnered.

SECTION IV: Detailed List of Main Entities, Attributes and Keys

1. General User (Strong)
   - user_id: key, numeric
   - name: composite, alphanumeric
   - email: alphanumeric
   - password: alphanumeric

2. Mailing List (Strong)
   - email: alphanumeric
   - Mailing_id: key,alphanumeric (keep track of mails the system sends)
   - description: alphanumeric

3. Devices (Strong)
   - device_id: key,alphanumeric
   - Device_ip: key,alphanumeric
   - Account_id: key,alphanumeric

4. Role (Strong)
   - role_id: key, numeric
   - description: alphanumeric
   - permission_number: numeric
   - admin_id: key, alphanumeric

5. Authors(Strong)
   - name: composite, alphanumeric
   - description: alphanumeric
   - author_id: key,alphanumeric

6. Payment Method(Strong)
   - Payment_type: alphanumeric
   - Payment_id: key, numeric
   - Account_id: key, numeric
   - Payment_amount: numeric

7. Multimedia Content(Strong)
   - cdn_id: key,alphanumeric
   - Premium actions: alphanumeric
   - author_id: key,alphanumeric

8. Advertisements(Strong)

- Advertisement_id: key, alphanumeric
- Description: alphanumeric
- Ad_name: alphanumeric, composite

9. Organization(Strong)
- Organization_id: key, alphanumeric
- Description: alphanumeric
- Organization name: composite, alphanumeric
- Organization contact no: numeric, multivalue

10. Publishers(Strong)
- Publisher_name: alphanumeric, composite
- Pushlished_id: key, alphanumeric
- Description: alphanumeric

11. Multimedia tracker(Strong)
- Tracker_id: key, alphanumeric
- Author_id: key, alphanumeric
- Date and time: timestamp, multivalue

12. CDN (strong)
- cdn_id: key, alphanumeric
- manifest_id: key, alphanumeric
- region: alphanumeric
- region_id: key, alphanumeric

13. Regions(Strong)
- Region_id: key, alphanumeric
- Device_id: key, alphanumeric
- Country_code: key, alphanumeric
- Cdn_id: key, alphanumeric
- Region name: alphanumeric, composite

14. Actions (Strong)
- Action_id: key, alphanumeric
- premium_action: key, alphanumeric
- Premium Actions: alphanumeric, table

15. Messaging List(Strong)
- phone_number: multivalue, composite, alphanumeric
- description: alphanumeric
- Messaging_id: key, alphanumeric

16. Promotions(Strong)
   - Promotion_id: key, numeric
   - Promotion_type: alphanumeric
   - Promotion_title: alphanumeric
   - Description: alphanumeric

17. Account (Weak)
   - account_id: key, numeric
   - user_email: key, alphanumeric
   - role: key, numeric
   - Expires_on: date
   - Region: alphanumeric

18. Admin (Weak)
   - Admin_id: key, numeric
   - Role: key, numeric
   - Name: composite, alphanumeric
   - Permission_id: key, numeric

19. Registered User(Weak)
   - Reg_user_id: key, numeric
   - Role: key, numeric
   - Name: composite, alphanumeric

20. Basic Account (Weak)
   - Basic_id: key, numeric
   - Name: composite, alphanumeric
   - Role: key, numeric

21. Premium Account (Weak)
   - Premium_id: key, numeric
   - Name: composite, alphanumeric
   - Role: key, numeric

22. Student Plan (Weak)
   - Student_plan_id: key, numeric
   - Student_plan_cost: numeric
   - Premium_id: key, numeric

23. Individual Plan (Weak)

- Individual_plan_id: key, numeric
- Individual_plan_cost: numeric
- Premium_id: key, numeric

24. Group Plan (Weak)

- Group_plan_id: key, numeric
- Group_plan_cost: numeric
- Premium_id: key, numeric

25. Bank Account (Weak)

- Acct_number: key, numeric
- Bank_name: alphanumeric
- Routing_number: numeric
- Acct_holder_name: alphanumeric

26. Debit Card (Weak)

- Deb_card_number: key, numeric
- Expiration_date: composite, date
- CVV: numeric
- Deb_card_holder_name: alphanumeric
- Payment_number: numeric
- Day_of_transaction: date

27. Credit Card(Weak)

- Credit_card_number: key, numeric
- Expiration_date: composite, date
- CVV: numeric
- Cred_card_holder_name: alphanumeric
- Zip Code: numeric
- Payment_number: numeric
- Day_of_transaction: date

28. Paypal (Weak)

- Paypal_id: key, alphanumeric
- Paypal_payment_number: numeric
- Day_of_transaction: date

29. Podcasts(Weak)

- Podcast_id: key, numeric
- Podcast_name: alphanumeric
- Podcast_author: alphanumeric, composite
- Podcast_release_year: date

30. Music (Weak)

- Music_id: key, numeric
- Music_name: alphanumeric
- Music_author: alphanumeric, composite
- Music_release_year: date

31. AudioBook(Weak)

- AudioBook_id: key, numeric
- AudioBook_name: alphanumeric
- AudioBook_author: alphanumeric, composite
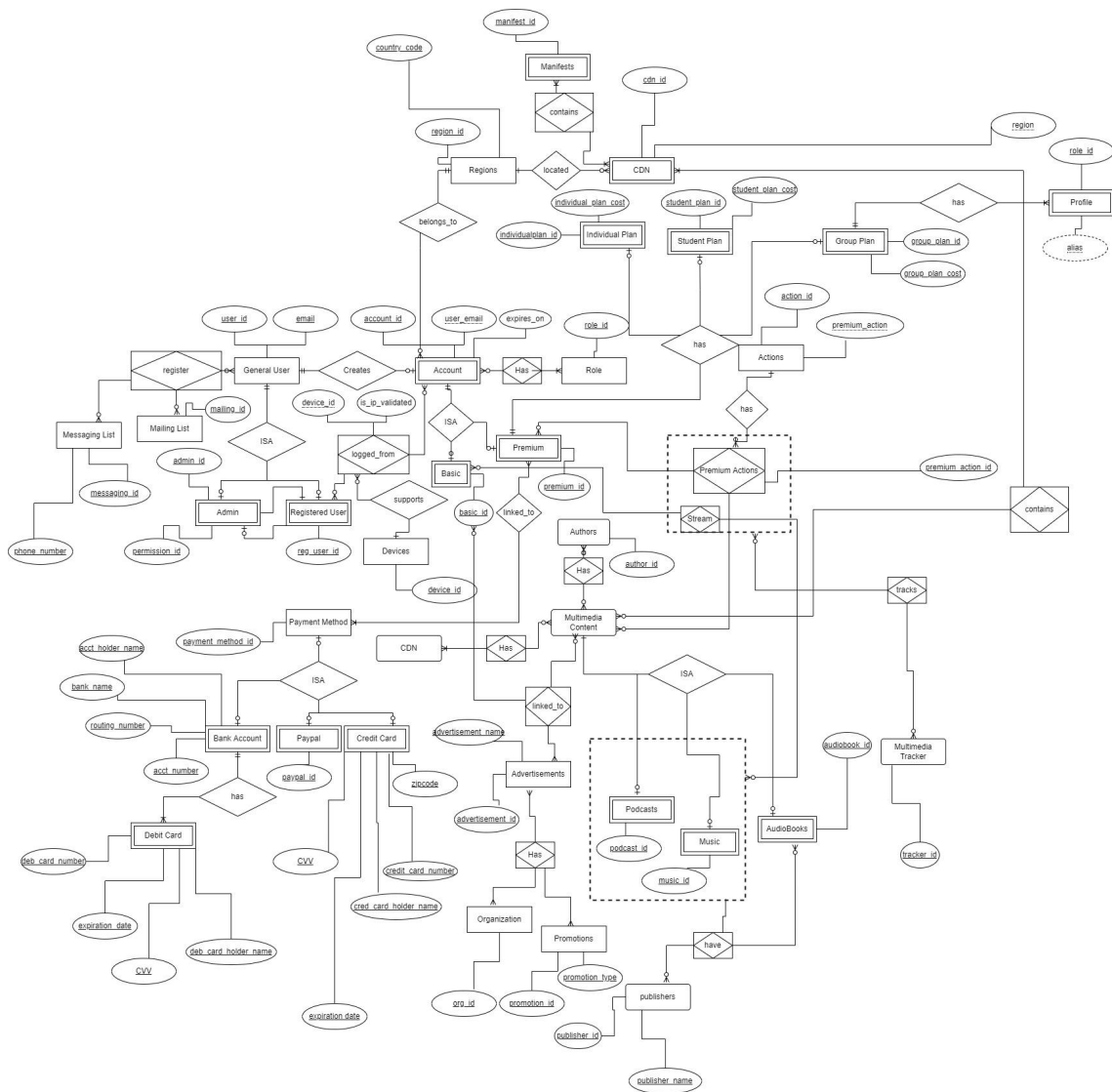- AudioBook_release_year: date

32. Profile(Weak)

- Role_id: key, numeric
- Alias: alphanumeric
- Name: composite, alphanumeric

33. Manifests (Weak)

- Manifest_id: key, numeric
- Manifest_url: alphanumeric
- Region: alphanumeric

Section V: Entity Relationship Diagram

Section VI: Testing Table

Rule	Entity A	Relation	Entity B	Cardinality	Pass /Fail	Error Description
1.	General User	ISA	Unregistered User	Zero or one	Fail	Users can't be unregistered. They have to be registered or have an admin role.
2.	User	Creates	Account	1 - to -1	Fail	Users can create many accounts with different emails.
3.	User	Registers	Mailing Lists	Zero or many	Pass	None
4.	Admin	Permissions	Role	One or many	Pass	None
5.	Role	Has	Accounts	One or many	Fail	Role can sustain itself even if there's no account. So the cardinality should be zero or many.
6.	Bank Account Payment Method	ISA	Credit Card or Debit Card	Zero or One	Fail	Can't link credit card and debit card together as credit cards can exist even if the user doesn't have a bank account.
7.	Payment Method	ISA	Bank Account / Credit Card/ Paypal	Zero or one	Pass	None
8.	Payment Method	linked_to	Premium Account	Many	Pass	None
9.	User	logged_from	Devices	Many	Fail	Users can login from one Device.

10.	Account	belong	region	One and only one	Pass	None
11.	Account	ISA	Basic Account	Zero or one	Pass	None
12.	Account	ISA	Premium Account	Zero or One	Pass	None
13.	Basic Account	Stream	Music/Podcasts	Zero or many	Pass	None
14.	Basic Account	Has	User	One and only one	Fail	Basic account can have many users
15.	Basic Account	linked_to	Advertisements	Zero or one	Fail	Basic account can be linked to zero or many advertisements
16.	Premium Account	Has	User	One and only one	Fail	Premium Account can have many users.
17.	Premium Actions	Has	Actions	Zero or many	Fail	Premium actions can have only one action but action can have a table(zero or many) of premium actions
18.	Premium Account	Has	Payment Method	Zero or one	Fail	Premium account shall have at least one preferred payment method
19.	Premium Account	Has	Student Plan	Zero or one	Pass	None
20.	Premium Account	Has	Individual Plan	Zero or one	Pass	None
21.	Premium Account	Has	Group Plan	Zero or one	Pass	None
22.	Multimedia Content	Has	Authors	Zero or one	Fail	Multimedia content can have zero or many authors
23.	Multimedia content	linked_to	Advertisements	Zero or many	Pass	None

24.	Multimedia Content	contains	CDN	One or many	Pass	None
25.	Multimedia Content	contains	Manifest	Zero or one	Fail	Multimedia content can contain one or many manifests
26.	Audio Podcasts	Stream	Premium Accounts	Zero or one	Fail	Audio podcasts can be streamed by many premium accounts
27.	Audio Podcasts	Downloaded	Premium Accounts	Zero or one	Fail	Audio podcasts can be downloaded by many premium accounts
28.	Audio Podcasts	tracked	Multimedia tracker	Zero or many	Pass	None
29.	Music	Stream	Premium Accounts	Zero or one	Fail	Music can be streamed by many premium accounts
30.	Music	downloaded	Premium Accounts	Zero or one	Fail	Music can be downloaded by many premium accounts
31.	Music	tracked	Multimedia tracker	Zero or many	Pass	None
32.	AudioBook	Streamed	Premium Account	Zero or many	Pass	None
33.	AudioBook	Downloaded	Premium Account	Zero or many	Pass	None
34.	AudioBook	have	Publishers	Zero or many	Pass	None
35.	Publishers	Have	Audiobook	One or many	Fail	They can have zero or many audiobooks.
36.	CDN	located	region	Zero or	Fail	CDN can be located

				one		in only one region.
37.	Regions	located	CDN	Zero or many	Pass	None
38.	CDN	contains	manifest	One or many	Pass	None
39.	Manifest	has	location	One or many	Pass	None
40.	Region	belongs_to	Account	One or many	Fail	Region can belong to zero or many accounts.
41.	Profile	has	Group Plan	One and only	pass	None
42.	Advertisements	Has	Organizations	Many to many	Pass	None
43.	Advertisements	linked_to	Multimedia Contents	Many to Many	Pass	None
44.	Advertisements	Has	Promotions	Many to Many	Pass	None