一、类分析 (Class Diagram)

1. 用户模块类

User

-userId: int-email: string-password: string-balance: decimal

-role: string(普通用户/管理员)

+register()
+login()

+updateProfile()

+changePassword()

VerificationCode

-codeld: int-email: string-code: string

-expireTime: datetime

+generateCode()
+validateCode()

AuthService

+sendVerificationEmail()

+validateCredentials()

+checkPermission()

2. 广告投放模块类

Ad

-adld: int

-advertiserId: int-budget: decimal-dailyLimit: decimal-imageURL: string-startDate: date-endDate: date

-placementType: string(横幅/弹窗/信息流)

-status: string(待审核/投放中/已结束)

+validateImageFormat()
+calculateRemainingBudget()

AdPlacement

-placementId: int-placementType: string-dimension: string-pricePerDay: decimal

+ get Available Placements ()

AdService

+createAd()

+updateAdStatus()

+getAdList()

+validateAdTimeRange()

3. 审核模块类

Review

-reviewld: int

-adld: int

-reviewerld: int-comment: string

-reviewTime: datetime

-status: string(通过/驳回) +recordReviewResult()

ReviewService

+getPendingAds()

+processReview()

+getReviewHistory()

4. 支付模块类

Account

-accountld: int-userld: int

-balance: decimal

+deposit()

+deductBalance()

+getBalance()

Transaction

-txnld: int

-userld: int

-amount: decimal-txnTime: datetime

-type: string(充值/消费)

+recordTransaction()

PaymentService

+processPayment()

+generatePaymentPage()

+getTransactionHistory()

5. 数据统计模块类

AdStats

-statsId: int

-adld: int

-impressions: int

-clicks: int

-spend: decimal

-date: date

+generateMockData()

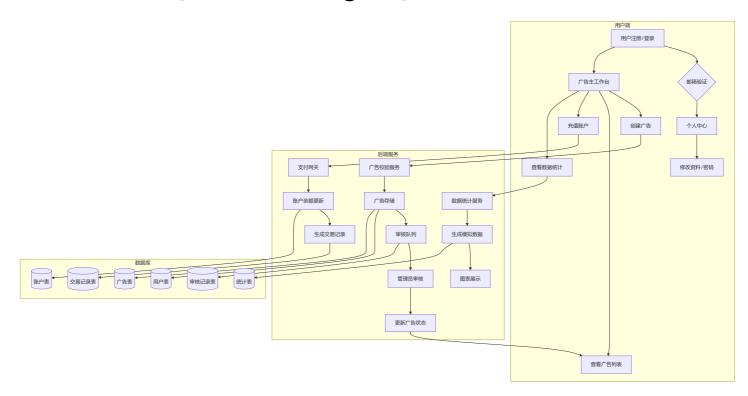
StatsService

+getAdPerformance()

+generateChartData()

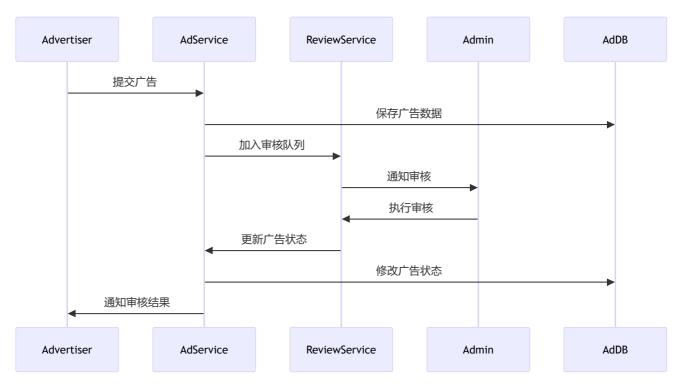
+calculateROI()

二、数据流图(Data Flow Diagram)

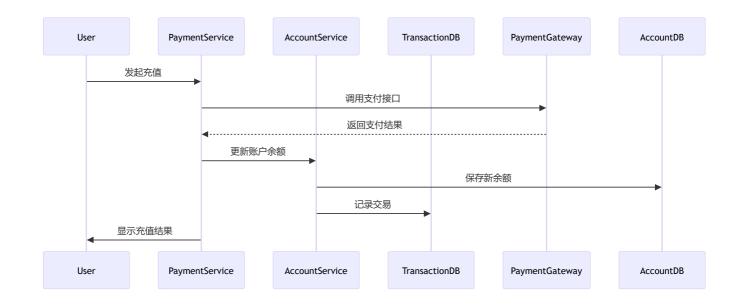


三、关键交互流程

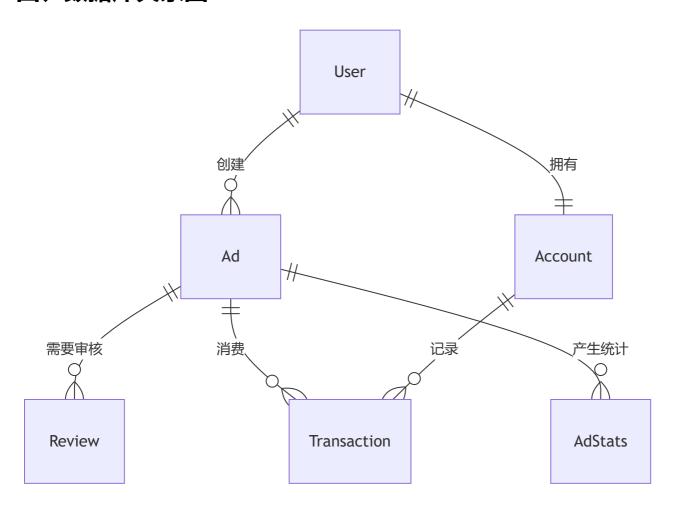
1. 广告审核流程



2. 支付充值流程



四、数据库关系图



五、核心设计要点

1. 权限控制:通过Role-Based Access Control (RBAC) 实现不同角色的访问权限

2. 状态机设计:广告状态迁移(待审核→投放中→已结束)

3. 数据一致性: 使用数据库事务保证充值操作中账户余额和交易记录的一致性

4. 数据模拟:通过定时任务生成模拟曝光/点击数据

5. **文件存储**:广告图片使用对象存储服务(如AWS S3),数据库保存URL路径