

数据表可以通过 命令行指令导入：

```
mysql -u root -p
create mobilebussinessDB;
use mobilebussinessDB;
source mobilebussinessDB.sql;
```

设计方案

一个用户表，储存所有用户基础信息， 字段简化为为号码(主键)， 余额。

一个用户月数据表，储存用户每个月份数据信息， 属性有号码， 时间（月份）， 呼叫时间， 被呼叫时间， 短信数量， 本地流量使用量， 全国流量使用量。

一个套餐记录表，记录所有用户的套餐订购信息， 属性有号码， 时间， 套餐id(外键)

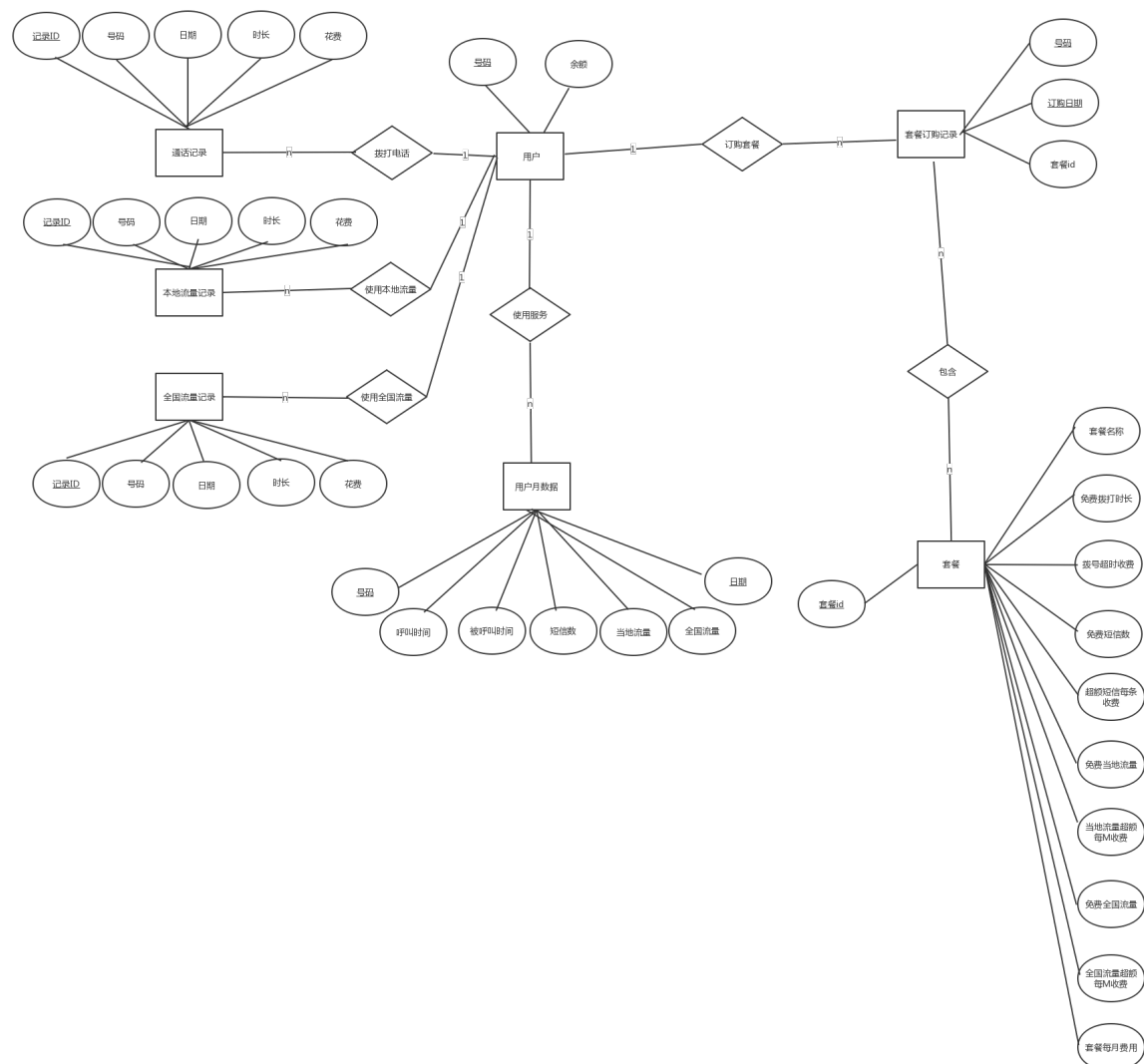
一个套餐种类表，记录套餐的优惠属性， 属性有套餐id， 套餐名称， 免费电话时长， 超额电话费/分钟， 免费短信数， 超额短信费/条， 免费本地流量， 超额本地流量费/M, 免费全国流量， 超额全国流量/M, 套餐价格。

一个呼叫记录表，记录每次呼叫记录， 属性有记录id， 号码， 时长， 日期， 资费。

一个本地流量使用表，记录每次本地流量使用记录， 属性有记录id， 号码， 流量， 日期， 资费。

一个全国流量使用表，记录每次全国流量使用记录， 属性有记录id， 号码， 流量， 日期， 资费。

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设计回顾：

接口简述

- (1) billDataService 定义查看账单、本月资费、新生成资费、月底扣除费用等方法
- (2) chargeDataService 定义月数据账单数据更新的方法
- (3) comboDataService 定义套餐查看、制定、订购、退订等方法
- (4) expenseRecordDataService 定义电话、流量记录表内容的增加。

实现细节简述

- (1) comboDataServiceImpl

订购套餐会在套餐记录表增加新的记录信息，如果订阅是本月的套餐，会默认同时订阅下一个月的记录信息（方便实现下月起效的退订）；订购时会判断本月是否已经订购了该套餐，避免重复订购。退订时也会检查是否订阅过该套餐。

订购或者退订套餐可能会使得电话、流量记录表中的资费不正确。所以最终账单的生成还是要看月底用户订购的套餐的组合，而不是该用户本月所有记录表资费之和。

- (2) chargeDataServiceImpl

先获取要修改属性的过去值，再加上增加值，然后更新。调用时会检查用户是否存在，增加值是否为正。

- (3) billDataServiceImpl

费用的获取：根据号码获取本月该用户订购的所有套餐信息。然后将这些套餐中所有的免费额度相加、超额收费取其中的最小值、套餐费相加，形成一个新的临时套餐用来计算费用。如果某项数据（比如通话时长）没有超过免费额度之和，不额外收费。如果超过免费额度则另外收费，例如，电话超额费用 = 超额收费/minute * (callTime - 免费额度之和)。最后费用等于套餐费加可能的超额费。

新资费的生成：扫描记录表获取数值

- (4) expenseDataServiceImpl

记录表数据中资费的生成：先获取该用户目前的总费用，更新数据，再获取更新后用户的总费用，前后资费变化就是资费。

具体的方法的执行以及执行时间如下

```
(1)
startTime=System.currentTimeMillis();

for(int i=0;i<=9;i++) {
    charge.addLocalDateFlow("1880519903" + i, 100);
    charge.addCallTime("1880519903" + i,100);
    charge.addCalledTime("1880519903" + i,100);
    charge.addInlandDateFlow("1880519903" + i,100);
    charge.addMails("1880519903" + i,100);
}

endTime=System.currentTimeMillis();
System.out.println("程序运行时间: " + (endTime - startTime) + "ms");
```

18805199030 add localDataFlow 200.0

18805199030 add callDuration 200.0
18805199030 add calledDuration 200.0
18805199030 add inlandData 200.0
18805199030 add mailsNumber 200.0
18805199031 add localDataFlow 200.0
18805199031 add callDuration 200.0
18805199031 add calledDuration 200.0
18805199031 add inlandData 200.0
18805199031 add mailsNumber 200.0
18805199032 add localDataFlow 200.0
18805199032 add callDuration 200.0
18805199032 add calledDuration 200.0
18805199032 add inlandData 200.0
18805199032 add mailsNumber 200.0
18805199033 add localDataFlow 200.0
18805199033 add callDuration 200.0
18805199033 add calledDuration 200.0
18805199033 add inlandData 200.0
18805199033 add mailsNumber 200.0
18805199034 add localDataFlow 200.0
18805199034 add callDuration 200.0
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18805199034 add inlandData 200.0
18805199034 add mailsNumber 200.0
18805199035 add localDataFlow 200.0
18805199035 add callDuration 200.0
18805199035 add calledDuration 200.0
18805199035 add inlandData 200.0
18805199035 add mailsNumber 200.0
18805199036 add localDataFlow 200.0
18805199036 add callDuration 200.0
18805199036 add calledDuration 200.0
18805199036 add inlandData 200.0
18805199036 add mailsNumber 200.0
18805199037 add localDataFlow 200.0
18805199037 add callDuration 200.0
18805199037 add calledDuration 200.0
18805199037 add inlandData 200.0
18805199037 add mailsNumber 200.0
18805199038 add localDataFlow 200.0
18805199038 add callDuration 200.0
18805199038 add calledDuration 200.0
18805199038 add inlandData 200.0
18805199038 add mailsNumber 200.0
18805199039 add localDataFlow 200.0
18805199039 add callDuration 200.0
18805199039 add calledDuration 200.0
18805199039 add inlandData 200.0
18805199039 add mailsNumber 200.0
程序运行时间： 2063ms

(2)

```
//列出所有的套餐
startTime=System.currentTimeMillis();
int count = combo.getAllCombos().size();
for(Combo c:combo.getAllCombos()){
    System.out.println(c.getComboId()+" "+c.getComboName());
}
```

```

}
endTime=System.currentTimeMillis();
System.out.println("程序运行时间: "+(endTime-startTime)+"ms");

//添加新套餐
startTime=System.currentTimeMillis();

for(int i=0;i<3;i++)
    combo.addNewCombo(new Combo("comboName"+count+i,100,0.5,
        0,0.1,
        0+i*100,2,
        0+i*100,5,
        20.00+i*10));

endTime=System.currentTimeMillis();
System.out.println("程序运行时间: "+(endTime-startTime)+"ms");

//订购本月新套餐
startTime=System.currentTimeMillis();
for(int i=0;i<=9;i++){
    for(int j=1;j<=count;j++)
        combo.subscribeComboNow("1880519903" + i,j);
}
endTime=System.currentTimeMillis();
System.out.println("程序运行时间: "+(endTime-startTime)+"ms");

//订购下个月起效套餐
startTime=System.currentTimeMillis();
for(int i=0;i<=9;i++){
    for(int j=1;j<=count;j++)
        combo.subscribeComboNextMonth("1880519903" + i,j);
}
endTime=System.currentTimeMillis();
System.out.println("程序运行时间: "+(endTime-startTime)+"ms");

//查看用户本月订购套餐
startTime=System.currentTimeMillis();
for(int i=0;i<=9;i++)
    System.out.println("1880519903" + i+"订购了"+
        combo.checkUserCombos("1880519903" + i,today).size()+"个套餐");
endTime=System.currentTimeMillis();
System.out.println("程序运行时间: "+(endTime-startTime)+"ms");

//退订本月新套餐
startTime=System.currentTimeMillis();
for(int i=0;i<=5;i++){
    for(int j=1;j<=count;j++)
        combo.unsubscribeComboNow("1880519903" + i,j);
}
endTime=System.currentTimeMillis();
System.out.println("程序运行时间: "+(endTime-startTime)+"ms");

//退订套餐下月生效
startTime=System.currentTimeMillis();
for(int i=0;i<=5;i++){
    for(int j=1;j<=count;j++)
        combo.unsubscribeComboNextMonth("1880519903" + i,j);
}
endTime=System.currentTimeMillis();
System.out.println("程序运行时间: "+(endTime-startTime)+"ms");

```

10 add localDataFlow 45.0
10 inserted,type:2 ,quantity:15.0
165.0
1 standard
2 p1
3 m1
4 l1
5 i1

程序运行时间： 16ms

程序运行时间： 62ms

18805199030 has subscrubed the combo:1
18805199030本月已经订购了套餐1
18805199030订阅新套餐(this month works):2
18805199030订阅新套餐(next month works):2
18805199030订阅新套餐(this month works):3
18805199030订阅新套餐(next month works):3
18805199030订阅新套餐(this month works):4
18805199030订阅新套餐(next month works):4
18805199030订阅新套餐(this month works):5
18805199030订阅新套餐(next month works):5
18805199031 has subscrubed the combo:1
18805199031本月已经订购了套餐1
18805199031订阅新套餐(this month works):2
18805199031订阅新套餐(next month works):2
18805199031订阅新套餐(this month works):3
18805199031订阅新套餐(next month works):3
18805199031订阅新套餐(this month works):4
18805199031订阅新套餐(next month works):4
18805199031订阅新套餐(this month works):5
18805199031订阅新套餐(next month works):5
18805199032 has subscrubed the combo:1
18805199032本月已经订购了套餐1
18805199032订阅新套餐(this month works):2
18805199032订阅新套餐(next month works):2
18805199032订阅新套餐(this month works):3
18805199032订阅新套餐(next month works):3
18805199032订阅新套餐(this month works):4
18805199032订阅新套餐(next month works):4
18805199032订阅新套餐(this month works):5
18805199032订阅新套餐(next month works):5
18805199033 has subscrubed the combo:1
18805199033本月已经订购了套餐1
18805199033订阅新套餐(this month works):2
18805199033订阅新套餐(next month works):2
18805199033订阅新套餐(this month works):3
18805199033订阅新套餐(next month works):3
18805199033订阅新套餐(this month works):4
18805199033订阅新套餐(next month works):4
18805199033订阅新套餐(this month works):5
18805199033订阅新套餐(next month works):5
18805199034 has subscrubed the combo:1

18805199034本月已经订购了套餐1
18805199034订阅新套餐(this month works):2
18805199034订阅新套餐(next month works):2
18805199034订阅新套餐(this month works):3
18805199034订阅新套餐(next month works):3
18805199034订阅新套餐(this month works):4
18805199034订阅新套餐(next month works):4
18805199034订阅新套餐(this month works):5
18805199034订阅新套餐(next month works):5
18805199035 has subscrubed the combo:1
18805199035本月已经订购了套餐1
18805199035订阅新套餐(this month works):2
18805199035订阅新套餐(next month works):2
18805199035订阅新套餐(this month works):3
18805199035订阅新套餐(next month works):3
18805199035订阅新套餐(this month works):4
18805199035订阅新套餐(next month works):4
18805199035订阅新套餐(this month works):5
18805199035订阅新套餐(next month works):5
18805199036 has subscrubed the combo:1
18805199036本月已经订购了套餐1
18805199036订阅新套餐(this month works):2
18805199036订阅新套餐(next month works):2
18805199036订阅新套餐(this month works):3
18805199036订阅新套餐(next month works):3
18805199036订阅新套餐(this month works):4
18805199036订阅新套餐(next month works):4
18805199036订阅新套餐(this month works):5
18805199036订阅新套餐(next month works):5
18805199037 has subscrubed the combo:1
18805199037本月已经订购了套餐1
18805199037订阅新套餐(this month works):2
18805199037订阅新套餐(next month works):2
18805199037订阅新套餐(this month works):3
18805199037订阅新套餐(next month works):3
18805199037订阅新套餐(this month works):4
18805199037订阅新套餐(next month works):4
18805199037订阅新套餐(this month works):5
18805199037订阅新套餐(next month works):5
18805199038 has subscrubed the combo:1
18805199038本月已经订购了套餐1
18805199038订阅新套餐(this month works):2
18805199038订阅新套餐(next month works):2
18805199038订阅新套餐(this month works):3
18805199038订阅新套餐(next month works):3
18805199038订阅新套餐(this month works):4
18805199038订阅新套餐(next month works):4
18805199038订阅新套餐(this month works):5
18805199038订阅新套餐(next month works):5
18805199039 has subscrubed the combo:1
18805199039本月已经订购了套餐1
18805199039订阅新套餐(this month works):2

18805199039订阅新套餐(next month works):2
18805199039订阅新套餐(this month works):3
18805199039订阅新套餐(next month works):3
18805199039订阅新套餐(this month works):4
18805199039订阅新套餐(next month works):4
18805199039订阅新套餐(this month works):5
18805199039订阅新套餐(next month works):5

程序运行时间： 3167ms

18805199030 has subscribed the combo:1
18805199030 has subscribed the combo:2
18805199030 has subscribed the combo:3
18805199030 has subscribed the combo:4
18805199030 has subscribed the combo:5
18805199031 has subscribed the combo:1
18805199031 has subscribed the combo:2
18805199031 has subscribed the combo:3
18805199031 has subscribed the combo:4
18805199031 has subscribed the combo:5
18805199032 has subscribed the combo:1
18805199032 has subscribed the combo:2
18805199032 has subscribed the combo:3
18805199032 has subscribed the combo:4
18805199032 has subscribed the combo:5
18805199033 has subscribed the combo:1
18805199033 has subscribed the combo:2
18805199033 has subscribed the combo:3
18805199033 has subscribed the combo:4
18805199033 has subscribed the combo:5
18805199034 has subscribed the combo:1
18805199034 has subscribed the combo:2
18805199034 has subscribed the combo:3
18805199034 has subscribed the combo:4
18805199034 has subscribed the combo:5
18805199035 has subscribed the combo:1
18805199035 has subscribed the combo:2
18805199035 has subscribed the combo:3
18805199035 has subscribed the combo:4
18805199035 has subscribed the combo:5
18805199036 has subscribed the combo:1
18805199036 has subscribed the combo:2
18805199036 has subscribed the combo:3
18805199036 has subscribed the combo:4
18805199036 has subscribed the combo:5
18805199037 has subscribed the combo:1
18805199037 has subscribed the combo:2
18805199037 has subscribed the combo:3
18805199037 has subscribed the combo:4
18805199037 has subscribed the combo:5
18805199038 has subscribed the combo:1
18805199038 has subscribed the combo:2
18805199038 has subscribed the combo:3
18805199038 has subscribed the combo:4
18805199038 has subscribed the combo:5
18805199039 has subscribed the combo:1
18805199039 has subscribed the combo:2
18805199039 has subscribed the combo:3
18805199039 has subscribed the combo:4
18805199039 has subscribed the combo:5

程序运行时间： 1102ms

18805199030订购了5个套餐
18805199031订购了5个套餐
18805199032订购了5个套餐
18805199033订购了5个套餐
18805199034订购了5个套餐
18805199035订购了5个套餐
18805199036订购了5个套餐
18805199037订购了5个套餐
18805199038订购了5个套餐
18805199039订购了5个套餐

程序运行时间： 58ms

18805199030 has subscribed the combo:1
删除18805199030 1 套餐
18805199030 has subscribed the combo:2
删除18805199030 2 套餐
18805199030 has subscribed the combo:3
删除18805199030 3 套餐
18805199030 has subscribed the combo:4
删除18805199030 4 套餐
18805199030 has subscribed the combo:5
删除18805199030 5 套餐
18805199031 has subscribed the combo:1
删除18805199031 1 套餐
18805199031 has subscribed the combo:2
删除18805199031 2 套餐
18805199031 has subscribed the combo:3
删除18805199031 3 套餐
18805199031 has subscribed the combo:4
删除18805199031 4 套餐
18805199031 has subscribed the combo:5
删除18805199031 5 套餐
18805199032 has subscribed the combo:1
删除18805199032 1 套餐
18805199032 has subscribed the combo:2
删除18805199032 2 套餐
18805199032 has subscribed the combo:3
删除18805199032 3 套餐
18805199032 has subscribed the combo:4
删除18805199032 4 套餐
18805199032 has subscribed the combo:5
删除18805199032 5 套餐
18805199033 has subscribed the combo:1
删除18805199033 1 套餐
18805199033 has subscribed the combo:2
删除18805199033 2 套餐
18805199033 has subscribed the combo:3
删除18805199033 3 套餐
18805199033 has subscribed the combo:4
删除18805199033 4 套餐
18805199033 has subscribed the combo:5
删除18805199033 5 套餐
18805199034 has subscribed the combo:1
删除18805199034 1 套餐
18805199034 has subscribed the combo:2
删除18805199034 2 套餐

18805199034 has subscribed the combo:3
删除18805199034 3 套餐
18805199034 has subscribed the combo:4
删除18805199034 4 套餐
18805199034 has subscribed the combo:5
删除18805199034 5 套餐
18805199035 has subscribed the combo:1
删除18805199035 1 套餐
18805199035 has subscribed the combo:2
删除18805199035 2 套餐
18805199035 has subscribed the combo:3
删除18805199035 3 套餐
18805199035 has subscribed the combo:4
删除18805199035 4 套餐
18805199035 has subscribed the combo:5
删除18805199035 5 套餐
程序运行时间: 1089ms
18805199030 has subscribed the combo:1
删除18805199030 1 套餐
18805199030 has subscribed the combo:2
删除18805199030 2 套餐
18805199030 has subscribed the combo:3
删除18805199030 3 套餐
18805199030 has subscribed the combo:4
删除18805199030 4 套餐
18805199030 has subscribed the combo:5
删除18805199030 5 套餐
18805199031 has subscribed the combo:1
删除18805199031 1 套餐
18805199031 has subscribed the combo:2
删除18805199031 2 套餐
18805199031 has subscribed the combo:3
删除18805199031 3 套餐
18805199031 has subscribed the combo:4
删除18805199031 4 套餐
18805199031 has subscribed the combo:5
删除18805199031 5 套餐
18805199032 has subscribed the combo:1
删除18805199032 1 套餐
18805199032 has subscribed the combo:2
删除18805199032 2 套餐
18805199032 has subscribed the combo:3
删除18805199032 3 套餐
18805199032 has subscribed the combo:4
删除18805199032 4 套餐
18805199032 has subscribed the combo:5
删除18805199032 5 套餐
18805199033 has subscribed the combo:1
删除18805199033 1 套餐
18805199033 has subscribed the combo:2
删除18805199033 2 套餐
18805199033 has subscribed the combo:3
删除18805199033 3 套餐
18805199033 has subscribed the combo:4
删除18805199033 4 套餐
18805199033 has subscribed the combo:5

删除18805199033 5 套餐
18805199034 has subscribed the combo:1
删除18805199034 1 套餐
18805199034 has subscribed the combo:2
删除18805199034 2 套餐
18805199034 has subscribed the combo:3
删除18805199034 3 套餐
18805199034 has subscribed the combo:4
删除18805199034 4 套餐
18805199034 has subscribed the combo:5
删除18805199034 5 套餐
18805199035 has subscribed the combo:1
删除18805199035 1 套餐
18805199035 has subscribed the combo:2
删除18805199035 2 套餐
18805199035 has subscribed the combo:3
删除18805199035 3 套餐
18805199035 has subscribed the combo:4
删除18805199035 4 套餐
18805199035 has subscribed the combo:5
删除18805199035 5 套餐
程序运行时间： 982ms

```
(3)
startTime=System.currentTimeMillis();
for(int i=0;i<=9;i++){
    for(int j=1;j<=4;j++)
        combo.subscribeComboNow("1880519903" + i,j);
}
//获取本月账单
startTime=System.currentTimeMillis();
for(int i=0;i<=9;i++){
    bill.getUserBill("1880519903" + i);
}
endTime=System.currentTimeMillis(); //获取结束时间
System.out.println("程序运行时间： "+(endTime-startTime)+"ms");

//计算本月资费
startTime=System.currentTimeMillis();
for(int i=0;i<=9;i++){
    System.out.println("1880519903" + i+" 本月截止到现在资费为："
    +bill.caculateExpense("1880519903" + i));
}
endTime=System.currentTimeMillis(); //获取结束时间
System.out.println("程序运行时间： "+(endTime-startTime)+"ms");

startTime=System.currentTimeMillis();
for(int i=0;i<=9;i++){
    System.out.println("1880519903" + i+" 本月截止到现在余额为："
    +bill.getUserBalance("1880519903" + i));
}
endTime=System.currentTimeMillis(); //获取结束时间
System.out.println("程序运行时间： "+(endTime-startTime)+"ms");

startTime=System.currentTimeMillis();
for(int i=0;i<=9;i++){
    System.out.println("1880519903" + i+" : "
    +bill.deductUserExpense("1880519903" + i));
}
```

```
endTime=System.currentTimeMillis(); //获取结束时间
System.out.println("程序运行时间: "+(endTime-startTime)+"ms");
```

```
18805199030订阅新套餐(this month works):1
18805199030订阅新套餐(next month works):1
18805199030订阅新套餐(this month works):2
18805199030订阅新套餐(next month works):2
18805199030订阅新套餐(this month works):3
18805199030订阅新套餐(next month works):3
18805199030订阅新套餐(this month works):4
18805199030订阅新套餐(next month works):4
18805199031订阅新套餐(this month works):1
18805199031订阅新套餐(next month works):1
18805199031订阅新套餐(this month works):2
18805199031订阅新套餐(next month works):2
18805199031订阅新套餐(this month works):3
18805199031订阅新套餐(next month works):3
18805199031订阅新套餐(this month works):4
18805199031订阅新套餐(next month works):4
18805199032订阅新套餐(this month works):1
18805199032订阅新套餐(next month works):1
18805199032订阅新套餐(this month works):2
18805199032订阅新套餐(next month works):2
18805199032订阅新套餐(this month works):3
18805199032订阅新套餐(next month works):3
18805199032订阅新套餐(this month works):4
18805199032订阅新套餐(next month works):4
18805199033订阅新套餐(this month works):1
18805199033订阅新套餐(next month works):1
18805199033订阅新套餐(this month works):2
18805199033订阅新套餐(next month works):2
18805199033订阅新套餐(this month works):3
18805199033订阅新套餐(next month works):3
18805199033订阅新套餐(this month works):4
18805199033订阅新套餐(next month works):4
18805199034订阅新套餐(this month works):1
18805199034订阅新套餐(next month works):1
18805199034订阅新套餐(this month works):2
18805199034订阅新套餐(next month works):2
18805199034订阅新套餐(this month works):3
18805199034订阅新套餐(next month works):3
18805199034订阅新套餐(this month works):4
18805199034订阅新套餐(next month works):4
18805199035订阅新套餐(this month works):1
18805199035订阅新套餐(next month works):1
18805199035订阅新套餐(this month works):2
18805199035订阅新套餐(next month works):2
18805199035订阅新套餐(this month works):3
18805199035订阅新套餐(next month works):3
```

18805199035订阅新套餐(this month works):4
18805199035订阅新套餐(next month works):4
18805199036 has subscrubed the combo:1
18805199036本月已经订购了套餐1
18805199036 has subscrubed the combo:2
18805199036本月已经订购了套餐2
18805199036 has subscrubed the combo:3
18805199036本月已经订购了套餐3
18805199036 has subscrubed the combo:4
18805199036本月已经订购了套餐4
18805199037 has subscrubed the combo:1
18805199037本月已经订购了套餐1
18805199037 has subscrubed the combo:2
18805199037本月已经订购了套餐2
18805199037 has subscrubed the combo:3
18805199037本月已经订购了套餐3
18805199037 has subscrubed the combo:4
18805199037本月已经订购了套餐4
18805199038 has subscrubed the combo:1
18805199038本月已经订购了套餐1
18805199038 has subscrubed the combo:2
18805199038本月已经订购了套餐2
18805199038 has subscrubed the combo:3
18805199038本月已经订购了套餐3
18805199038 has subscrubed the combo:4
18805199038本月已经订购了套餐4
18805199039 has subscrubed the combo:1
18805199039本月已经订购了套餐1
18805199039 has subscrubed the combo:2
18805199039本月已经订购了套餐2
18805199039 has subscrubed the combo:3
18805199039本月已经订购了套餐3
18805199039 has subscrubed the combo:4
18805199039本月已经订购了套餐4

程序运行时间： 145ms

18805199030 本月截止到现在资费为:1100.0
18805199031 本月截止到现在资费为:1100.0
18805199032 本月截止到现在资费为:1100.0
18805199033 本月截止到现在资费为:1100.0
18805199034 本月截止到现在资费为:1100.0
18805199035 本月截止到现在资费为:1100.0
18805199036 本月截止到现在资费为:130.0
18805199037 本月截止到现在资费为:130.0
18805199038 本月截止到现在资费为:130.0
18805199039 本月截止到现在资费为:130.0

程序运行时间： 135ms

18805199030 本月截止到现在余额为:-1000.0
18805199031 本月截止到现在余额为:-1000.0
18805199032 本月截止到现在余额为:-1000.0
18805199033 本月截止到现在余额为:-1000.0
18805199034 本月截止到现在余额为:-1000.0
18805199035 本月截止到现在余额为:-1000.0
18805199036 本月截止到现在余额为:-30.0
18805199037 本月截止到现在余额为:-30.0

18805199038 本月截止到现在余额为:-30.0
18805199039 本月截止到现在余额为:-30.0
程序运行时间: 232ms
不是月底, 无法扣除费用
18805199030 :false
不是月底, 无法扣除费用
18805199031 :false
不是月底, 无法扣除费用
18805199032 :false
不是月底, 无法扣除费用
18805199033 :false
不是月底, 无法扣除费用
18805199034 :false
不是月底, 无法扣除费用
18805199035 :false
不是月底, 无法扣除费用
18805199036 :false
不是月底, 无法扣除费用
18805199037 :false
不是月底, 无法扣除费用
18805199038 :false
不是月底, 无法扣除费用
18805199039 :false
程序运行时间: 92ms

```
(4)
startTime=System.currentTimeMillis();

for(int i=0;i<=9;i++){
    record.addNewCallRecord("1880519903" + i,8);
    System.out.println("1880519903" + i+" latest expense:
"+bill.checkNewExpenseForCalling("1880519903" + i));

    record.addNewInLandFlowRecord("1880519903" + i,10+i*10);
    System.out.println("1880519903" + i+" latest expense:
"+bill.checkNewExpenseForInlandFlow("1880519903" + i));

    record.addNewLocalFlowRecord("1880519903" + i,10+i*10);
    System.out.println("1880519903" + i+" latest expense:
"+bill.checkNewExpenseForLocalFlow("1880519903" + i));
}
endTime=System.currentTimeMillis();
System.out.println("程序运行时间:  "+(endTime-startTime)+"ms");
```

18805199030 add callDuration 208.0
18805199030 inserted,type:0 ,quantity:8.0
18805199030 latest expense: 4.0
18805199030 add inlandData 210.0
18805199030 inserted,type:1 ,quantity:10.0
18805199030 latest expense: 0.0
18805199030 add localDataFlow 210.0
18805199030 inserted,type:2 ,quantity:10.0
18805199030 latest expense: 50.0
18805199031 add callDuration 208.0
18805199031 inserted,type:0 ,quantity:8.0
18805199031 latest expense: 4.0
18805199031 add inlandData 220.0
18805199031 inserted,type:1 ,quantity:20.0
18805199031 latest expense: 0.0

18805199031 add localDataFlow 220.0
18805199031 inserted,type:2 ,quantity:20.0
18805199031 latest expense: 100.0
18805199032 add callDuration 208.0
18805199032 inserted,type:0 ,quantity:8.0
18805199032 latest expense: 4.0
18805199032 add inlandData 230.0
18805199032 inserted,type:1 ,quantity:30.0
18805199032 latest expense: 0.0
18805199032 add localDataFlow 230.0
18805199032 inserted,type:2 ,quantity:30.0
18805199032 latest expense: 150.0
18805199033 add callDuration 208.0
18805199033 inserted,type:0 ,quantity:8.0
18805199033 latest expense: 4.0
18805199033 add inlandData 240.0
18805199033 inserted,type:1 ,quantity:40.0
18805199033 latest expense: 0.0
18805199033 add localDataFlow 240.0
18805199033 inserted,type:2 ,quantity:40.0
18805199033 latest expense: 200.0
18805199034 add callDuration 208.0
18805199034 inserted,type:0 ,quantity:8.0
18805199034 latest expense: 4.0
18805199034 add inlandData 250.0
18805199034 inserted,type:1 ,quantity:50.0
18805199034 latest expense: 0.0
18805199034 add localDataFlow 250.0
18805199034 inserted,type:2 ,quantity:50.0
18805199034 latest expense: 250.0
18805199035 add callDuration 208.0
18805199035 inserted,type:0 ,quantity:8.0
18805199035 latest expense: 4.0
18805199035 add inlandData 260.0
18805199035 inserted,type:1 ,quantity:60.0
18805199035 latest expense: 0.0
18805199035 add localDataFlow 260.0
18805199035 inserted,type:2 ,quantity:60.0
18805199035 latest expense: 300.0
18805199036 add callDuration 208.0
18805199036 inserted,type:0 ,quantity:8.0
18805199036 latest expense: 4.0
18805199036 add inlandData 270.0
18805199036 inserted,type:1 ,quantity:70.0
18805199036 latest expense: 0.0
18805199036 add localDataFlow 270.0
18805199036 inserted,type:2 ,quantity:70.0
18805199036 latest expense: 0.0
18805199037 add callDuration 208.0
18805199037 inserted,type:0 ,quantity:8.0
18805199037 latest expense: 4.0
18805199037 add inlandData 280.0
18805199037 inserted,type:1 ,quantity:80.0
18805199037 latest expense: 0.0
18805199037 add localDataFlow 280.0
18805199037 inserted,type:2 ,quantity:80.0
18805199037 latest expense: 0.0
18805199038 add callDuration 208.0
18805199038 inserted,type:0 ,quantity:8.0
18805199038 latest expense: 4.0

```
18805199038 add inlandData 290.0
18805199038 inserted,type:1 ,quantity:90.0
18805199038 latest expense: 0.0
18805199038 add localDataFlow 290.0
18805199038 inserted,type:2 ,quantity:90.0
18805199038 latest expense: 0.0
18805199039 add callDuration 208.0
18805199039 inserted,type:0 ,quantity:8.0
18805199039 latest expense: 4.0
18805199039 add inlandData 300.0
18805199039 inserted,type:1 ,quantity:100.0
18805199039 latest expense: 0.0
18805199039 add localDataFlow 300.0
18805199039 inserted,type:2 ,quantity:100.0
18805199039 latest expense: 0.0
程序运行时间： 3498ms
```

优化思路：

重复验证问题:许多方法的调用都有前置的参数验证，而这些方法间相互调用，这些参数验证函数就会被重复调用，降低程序效率。

解决方法：可以设置一个额外的参数用以表示调用这个函数前，可能出错的函数是否经过验证。

建立索引：出于简单考虑，所有的表都没有建立索引，但是考虑到套餐表属于小型表不必建立索引，其他的表数据操作又过于频繁，所以没有建立索引。

约束，由于数据都是自己插入的，和提供接口，所以没有设置太多约束，但最好设置一些not null等等约束条件，提高表的安全性，避免冗余数据的产生。

套餐生效期：这点没有考虑到。

用phoneNumber做为主键是否合适：或许设置一个其他主键（userId）更合适。

月底数据更新问题：目前只有初始的10月，11月数据。