持久化之mongodb

回顾

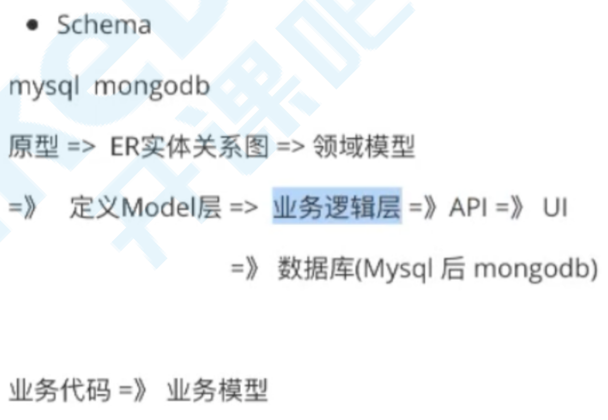
- 数据持久化之关系型数据库mysql应用
- 原生mysql驱动node-mysql应用
- ORM模块Sequelize的应用

课堂目标

- 掌握mongodb基本使用
- 理解文档型数据库设计理念
- 掌握原生模块node-mongodb-native应用
- 掌握ODM模块mongoose应用
- 了解快速开发工具KeyStoneJS

资源

- mongodb相关：
  - MongoDB：[下载]
  - node驱动：[文档]
  - mongoose：[文档]
- redis相关：
  - redis：[下载]
  - node_redis：[文档]
- 可视化工具：[Robo3T]



- Schema

mysql mongodb

原型 => ER实体关系图 => 领域模型

=》 定义Model层 => 业务逻辑层 =》API =》 UI

=》 数据库(Mysql 后 mongodb)

业务代码 =》 业务模型

LAMP 或 LNMP (Linux Nginx Mysql PHP) 与 MEAN

Express
Angular.js
MEAN
Mongo DB
node JS
Node.js

mongodb安装、配置

- [下载安装]

- 配置环境变量
- 创建dbpath文件夹
- 启动：

```
mongo
// 默认连接
```

- 测试：

  ```
  // helloworld.js
  // 查询所有数db据库
  show dbs

  // 切换/创建数据库,当创建一个集合(table)的时候会自动创建当前数据库
  use test

  // 插入一条数据
  db.fruits.save({name:'苹果',price:5})

  // 条件查询
  db.fruits.find({price:5})
  `1234`

  // 得到当前db的所有聚集集合
  db.getCollectionNames()

  // 查询
  db.fruits.find()
  ```

  > mongo命令行操作

  > 参考资料
  >
  > 菜鸟文档
  >
  > http://www.runoob.com/mongodb/mongodb-create-database.html
  >
  > 官网
  >
  > https://docs.mongodb.com/manual/reference/method/

mongodb原生驱动

> http://mongodb.github.io/node-mongodb-native/3.1/quick-start/quick-start/
>
> 官网API
>
> https://www.cnblogs.com/chen-lhx/p/6004623.html
>
> 操作符

- 安装mysql模块： `npm install mongodb --save`
- 连接mongodb

```
(async () => {
    const { MongoClient } = require('mongodb')
```

```
    // 创建客户端
    const client = new MongoDB(
      'mongodb://localhost:27017',
      {
        //userNewUrlParser这个属性会在url里识别验证用户所需的db
        userNewUrlParser: true
      }
    )
    let ret
    // 创建连接
    ret = await client.connect()
    console.log('ret:', ret)

    const db = client.db('test')

    const fruits = db.collection('fruits')

    // 添加文档
    ret = await fruits.insertOne({
      name: '芒果',
      price: 20.1
    })
    console.log('插入成功', JSON.stringify(ret))

    // 查询文档
    ret = await fruits.findOne()
    console.log('查询文档:', ret)

    // 更新文档
    // 更新的操作符 $set
    ret = await fruits.updateOne({ name: '芒果' },
    { $set: { name: '苹果' } })
    console.log('更新文档', JSON.stringify(ret.result))

    // 删除文档
    ret = await fruits.deleteOne({name: '苹果'})

    await fruits.deleteMany()

    client.close()

  })()
```

- 案例：瓜果超市
  - 提取数据库配置,./models/conf.js

```
// models/conf.js
module.exports = {
  url: "mongodb://localhost:27017",
  dbName: 'test',
}
```

- 封装数据库连接，./models/db.js

```
const conf = require("./conf");
const EventEmitter = require("events").EventEmitter;

// 客户端
const MongoClient = require("mongodb").MongoClient;

class Mongodb {
  constructor(conf) {
    // 保存conf
    this.conf=conf;

    this.emmiter = new EventEmitter();
    // 连接
    this.client = new MongoClient(conf.url, { useNewUrlParser: true });
    this.client.connect(err => {
      if (err) throw err;
      console.log("连接成功");
      this.emmiter.emit("connect");
    });
  }

  col(colName, dbName = conf.dbName) {
    return this.client.db(dbName).collection(colName);
  }

  once(event, cb) {
    this.emmiter.once(event, cb);
  }
}

// 2.导出db
module.exports = new Mongodb(conf);
```

- eventEmmiter

```
// eventEmmiter.js
  const EventEmitter = require('events').EventEmitter;
const event = new EventEmitter();
event.on('some_event', num =>  {
    console.log('some_event 事件触发:'+num);
});
let num = 0
setInterval(() =>  {
    event.emit('some_event' , num ++ );
}, 1000);
```

- 添加测试数据，./initData.js

```
const mongodb = require('./models/db')
mongodb.once('connect', async () => {
    const col = mongodb.col('fruits')
    // 删除已存在
    await col.deleteMany()
    const data = new Array(100).fill().map((v, i) => {
        return { name: "XXX" + i, price: i, category: Math.random() > 0.5 ?
'蔬菜' : '水果' }
    })

    // 插入
    await col.insertMany(data)
    console.log("插入测试数据成功")
})
```

- 前端页面调用 index.html

```
<!DOCTYPE html>
<html lang="en">

<head>
    <meta charset="UTF-8" />
    <meta name="viewport" content="width=device-width, initial-
scale=1.0" />
    <meta http-equiv="X-UA-Compatible" content="ie=edge" />

    <!-- <script src="https://cdn.jsdelivr.net/npm/vue/dist/vue.js">
</script> -->
    <script src="https://cdn.bootcss.com/vue/2.6.11/vue.min.js">
</script>
    <script src="https://cdn.bootcss.com/element-ui/2.13.0/index.js">
</script>
    <script src="https://cdn.bootcss.com/axios/0.19.2/axios.js">
</script>
    <link href="https://cdn.bootcss.com/element-ui/2.13.0/theme-
chalk/index.css" rel="stylesheet">

    <title>瓜果超市</title>
</head>

<body>
    <div id="app">
        <el-input placeholder="请输入内容" v-model="search" class="input-
with-select"  @change="changeHandler">
            <el-button slot="append" icon="el-icon-search"></el-button>
        </el-input>
        <el-radio-group v-model="category" @change="getData">
            <el-radio-button v-for="v in categorys" :label="v"
:key="v">{{v}}</el-radio-button>
        </el-radio-group>
        <el-table :data="fruits" style="width: 100%">
            <el-table-column prop="name" label="名称" width="180">
            </el-table-column>
            <el-table-column prop="price" label="价格" width="180">
            </el-table-column>
```

```
                <el-table-column prop="category" label="种类">
                </el-table-column>
            </el-table>
            <el-pagination layout="prev, pager, next" @current-
change="currentChange" :total="total">
            </el-pagination>
        </div>
    <script>
        var app = new Vue({
            el: "#app",
            data: {
                page: 1,
                total: 0,
                fruits: [],
                categorys: [],
                category: [],
                search:''
            },
            created() {
                this.getData()

                this.getCategory()
            },
            methods: {
                async currentChange(page) {
                    this.page = page;
                    await this.getData()
                },
                async changeHandler(val){
                    console.log('search...',val)
                    this.search = val
                    await this.getData()
                },
                async getData() {
                    const res = await axios.get(`/api/list?
page=${this.page}&category=${this.category}&keyword=${this.search}`)
                    const data = res.data.data
                    this.fruits = data.fruits
                    this.total = data.pagination.total
                },
                async getCategory() {
                    const res = await axios.get(`/api/category`)
                    this.categorys = res.data.data
                    console.log('category', this.categorys)
                }
            }
        });
    </script>
</body>

</html>
```

- 接口编写，index.js

```
const express = require("express")
const app = express()
const path = require("path")
const mongo = require("./models/db")
// const testdata = require("./initData")

app.get("/", (req, res) => {
    res.sendFile(path.resolve("./index.html"))
})

app.get("/api/list", async (req, res) => {
    // 分页查询
    const { page} = req.query
    try {
        const col = mongo.col("fruits")
        const total = await col.find().count()
        const fruits = await col
            .find()
            .skip((page - 1) * 5)
            .limit(5)
            .toArray()
        res.json({ ok: 1, data: { fruits, pagination: { total, page } } })
    } catch (error) {
        console.log(error)
    }
})

app.listen(3000)
```

- 增加类别搜索功能

```
app.get("/api/category", async (req, res) => {
    const col = mongo.col("fruits")
    const data = await col.distinct('category')
    res.json({ ok: 1, data })
})

app.get("/api/list", async (req, res) => {
    // 分页查询
    const { page, category ,keyword} = req.query

    // 构造条件
    const condition = {}
    if (category) {
        condition.category = category
    }

    if (keyword) {
        condition.name = { $regex: new RegExp(keyword)  }
    }

    // 增加
  const total = await col.find(condition).count()
  const fruits = await col
  .find(condition)   // 增加
  .skip((page - 1) * 5)
  .limit(5)
  .toArray()

})
```

- 操作符

  > https://docs.mongodb.com/manual/reference/operator/query/
  >
  > 操作符文档

  - 查询操作符：提供多种方式定位数据库数据

    ```
    // 比较$eq，$gt，$gte，$in等
    await col.find({price:{$gt:10}}).toArray()

    // 逻辑$and,$not,$nor,$or
    // price>10 或 price<5
    await col.find({$or: [{price:{$gt:10}},{price:{$lt:5}}]})
    // price不大于10且price不小于5
    await col.find({$nor: [{price:{$gt:10}},{price:{$lt:5}}]})

    // 元素$exists，$type
    await col.insertOne({ name: "芒果", price: 20.0, stack:true })
    await col.find({stack:{$exists:true}})

    // 模拟$regex，$text，$expr
    await col.find({name:{$regex:/芒/}})
    await col.createIndex({name:'text'}) // 验证文本搜索需首先对字段加索引
    await col.find({$text:{$search:'芒果'}}) // 按词搜索，单独字查询不出结果

    // 数组$all,$elemMatch,$size
    col.insertOne({..., tags: ["热带", "甜"]}) // 插入带标签数据
    // $all：查询指定字段包含所有指定内容的文档
    await col.find({ tags: {$all:['热带','甜'] } }
    // $elemMatch: 指定字段数组中至少有一个元素满足所有查询规则
    col.insertOne({hisPrice: [20,25,30]}); // 数据准备
    col.find({ hisPrice: { $elemMatch: { $gt: 24,$lt:26 } } }) // 历史价位有
    没有出现在24~26之间

    // 地理空间$geoIntersects,$geoWithin,$near,$nearSphere
    // 创建stations集合
    const stations = db.collection("stations");
    // 添加测试数据，执行一次即可
    await stations.insertMany([
          { name: "天安门东", loc: [116.407851, 39.91408] },
          { name: "天安门西", loc: [116.398056, 39.913723] },
          { name: "王府井", loc: [116.417809, 39.91435] }
    ]);
    await stations.createIndex({ loc: "2dsphere" });
    ```

```
r = await stations.find({
    loc: {
        $nearSphere: {
            $geometry: {
              type: "Point",
              coordinates: [116.403847, 39.915526]
            },
            $maxDistance: 1000
        }
    }
}).toArray();
console.log("天安门附近地铁站", r);
```

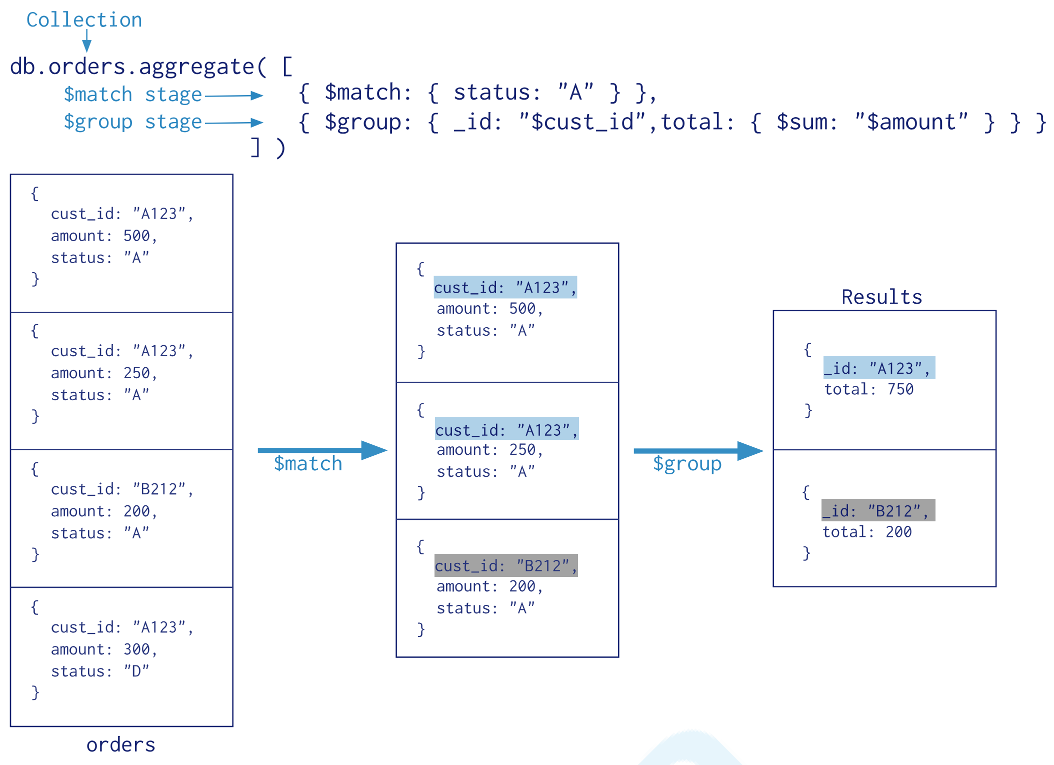
- 更新操作符：可以修改数据库数据或添加附加数据

```
// 字段相关：$set,$unset,$setOnInsert,$rename,$inc,$min,$max,$mul
// 更新多个字段
await fruitsColl.updateOne(
      { name: "芒果" },
      { $set: { price: 19.8, category: '热带水果' } },
);
// 更新内嵌字段
{ $set: { ..., area: {city: '三亚'} } }

// 数组相关：$,$[],$addToSet,$pull,$pop,$push,$pullAll
// $push用于新增
insertOne({tags: ['热带','甜']}) //添加tags数组字段
fruitsColl.updateMany({ name: "芒果" }, { $push: {tags: '上火'}})
// $pull,$pullAll用于删除符合条件项，$pop删除首项-1或尾项1
fruitsColl.updateMany({ name: "芒果" }, { $pop: {tags: 1}})
fruitsColl.updateMany({ name: "芒果" }, { $pop: {tags: 1}})
// $，$[]用于修改
fruitsColl.updateMany({ name: "芒果", tags: "甜" }, { $set: {"tags.$":
"香甜"} })

// 修改器，常结合数组操作符使用：$each,$position,$slice,$sort
$push: { tags: { $each: ["上火", "真香"], $slice: -3 } }
```

- 聚合操作符：使用aggregate方法，使文档顺序通过管道阶段从而得到最终结果


Collection
db.orders.aggregate([
$match stage
$group stage
{ $match: { status: "A" } },
{ $group: { _id: "$cust_id",total: { $sum: "$amount" } } }
])
{ cust_id: "A123", amount: 500, status: "A" }
{ cust_id: "A123", amount: 250, status: "A" }
{ cust_id: "B212", amount: 200, status: "A" }
{ cust_id: "A123", amount: 300, status: "D" }
orders
$match
{ cust_id: "A123", amount: 500, status: "A" }
{ cust_id: "A123", amount: 250, status: "A" }
{ cust_id: "B212", amount: 200, status: "A" }
$group
Results
{ _id: "A123", total: 750 }
{ _id: "B212", total: 200 }

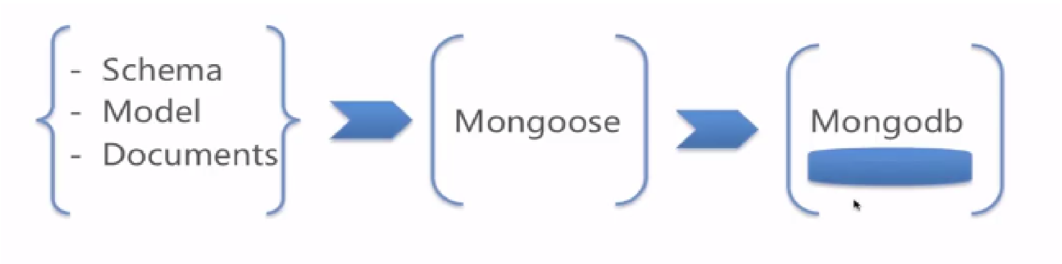
```
// 聚合管道阶段：$group,$count,$sort,$skip,$limit,$project等
// 分页查询
r = await fruitsColl
      .aggregate([{ $sort: { price: -1 } }, { $skip: 0 }, { $limit: 2
}])
      .toArray();
// 投射:只选择name,price并排除_id
fruitsColl.aggregate([..., {$project:
{name:1,price:1,_id:0}}]).toArray();

// 聚合管道操作符：$add,$avg,$sum等
// 按name字段分组，统计组内price总和
fruitsColl.aggregate([{ $group:{_id:"$name",total:
{$sum:"$price"}}}]).toArray();
```

> 常用聚合管道阶段操作均有对应的单个方法，通过Cursor调用
>
> await fruitsColl.find().count()
>
> await fruitsColl.find().sort({ price: -1 }).skip(0).limit(2) .project({name:1,price:1}) .toArray();

ODM - Mongoose

- 概述：优雅的NodeJS对象文档模型object document model。Mongoose有两个特点：
  - 通过关系型数据库的思想来设计非关系型数据库
  - 基于mongodb驱动，简化操作



- 安装：`npm install mongoose -S`
- 基本使用：

```
// mongoose.js
const mongoose = require("mongoose");

// 1.连接
mongoose.connect("mongodb://localhost:27017/test", { useNewUrlParser: true
});

const conn = mongoose.connection;
conn.on("error", () => console.error("连接数据库失败"));
conn.once("open", async () => {
  // 2.定义一个Schema - Table
  const Schema = mongoose.Schema({
    category: String,
    name: String
  });

  // 3.编译一个Model, 它对应数据库中复数、小写的Collection
  const Model = mongoose.model("fruit", Schema);
  try {
    // 4.创建，create返回Promise
    let r = await Model.create({
      category: "温带水果",
      name: "苹果",
      price: 5
    });
    console.log("插入数据:", r);

    // 5.查询，find返回Query，它实现了then和catch，可以当Promise使用
    // 如果需要返回Promise，调用其exec()
    r = await Model.find({ name: "苹果" });
    console.log("查询结果:", r);

    // 6.更新，updateOne返回Query
    r = await Model.updateOne({ name: "苹果" }, { $set: { name: '芒果' } });
    console.log("更新结果：", r);

    // 7.删除，deleteOne返回Query
    r = await Model.deleteOne({ name: "苹果" });
    console.log("删除结果：", r);
  } catch (error) {
    console.log(error);
  }
});
```

> Mongoose中各概念和关系数据库、文档数据库对应关系：

> | Oracle | MongoDB | Mongoose |
> |---|---|---|
> | 数据库实例(database instance) | MongoDB实例 | Mongoose |
> | 模式(schema) | 数据库(database) | mongoose |
> | 表(table) | 集合(collection) | 模板(Schema)+模型(Model) |
> | 行(row) | 文档(document) | 实例(instance) |
> | rowid | _id | _id |
> | Join | DBRef | DBRef |

- Schema
  - 字段定义

```
const blogSchema = mongoose.Schema({
    title: { type: String, required: [true, '标题为必填项'] }, // 定义校验规则
    author: String,
    body: String,
    comments: [{ body: String, date: Date }], // 定义对象数组
    date: { type: Date, default: Date.now }, // 指定默认值
    hidden: Boolean,
    meta: {
      // 定义对象
      votes: Number,
      favs: Number
    }
  });
  // 定义多个索引
  blogSchema.index({ title:1, author: 1, date: -1 });
  const BlogModel = mongoose.model("blog", blogSchema);
  const blog = new BlogModel({
    title: "nodejs持久化",
    author: "jerry",
    body: "...."
  });
  const r = await blog.save();
  console.log("新增blog", r);
```

> 可选字段类型：
>
> - String
> - Number
> - Date
> - Buffer
> - Boolean
> - Mixed
> - ObjectId
> - Array
>
> 避免创建索引警告：

> ```
> mongoose.connect("mongodb://localhost:27017/test", {
>     useCreateIndex: true
> })
> ```

- 定义实例方法：抽象出常用方法便于复用

```
// 定义实例方法
blogSchema.methods.findByAuthor = function () {
    return this.model('blog').find({ author: this.author }).exec();
}

// 获得模型实例
const BlogModel = mongoose.model("blog", blogSchema);
const blog = new BlogModel({...});

// 调用实例方法
r = await blog.findByAuthor();
console.log('findByAuthor', r);
```

> 实例方法还需要定义实例，用起来较繁琐，可以使用静态方法

- 静态方法

```
blogSchema.statics.findByAuthor = function(author) {
  return this.model("blog")
    .find({ author })
    .exec();
};

r=await BlogModel.findByAuthor('jerry')
console.log("findByAuthor", r);
```

- 虚拟属性

```
blogSchema.virtual("commentsCount").get(function() {
  return this.comments.length;
});
r = await BlogModel.findOne({author:'jerry'});
console.log("blog留言数：", r.commentsCount);
```

购物车相关接口实现

- mongoose.js

```
// mongoose.js
const mongoose = require("mongoose");
// 1.连接
mongoose.connect("mongodb://localhost:27017/test", { useNewUrlParser: true
});
const conn = mongoose.connection;
conn.on("error", () => console.error("连接数据库失败"));
```

- 用户模型，./models/user.js

```
const mongoose = require("mongoose");

const schema = mongoose.Schema({
  name: String,
  password: String,
  cart: []
});

schema.statics.getCart = function(_id) {
  return this.model("user")
    .findById(_id)
    .exec();
};

schema.statics.setCart = function(_id, cart) {
  return this.model("user")
    .findByIdAndUpdate(_id, { $set: { cart } })
    .exec();
};

const model = mongoose.model("user", schema);

// 测试数据
model.updateOne(
  { _id: "5c1a2dce951e9160f0d8573b" },
  { name: "jerry", cart: [{ pname: "iPhone", price: 666, count: 1 }] },
  { upsert: true },
  (err, r) => {
    console.log('测试数据');
    console.log(err, r);
  }
);

module.exports = model;
```

- API编写，./index.js
-

```
// mongoose.js
const mongoose = require("mongoose");
// 1.连接
mongoose.connect("mongodb://localhost:27017/test", { useNewUrlParser: true });
const conn = mongoose.connection;
conn.on("error", () => console.error("连接数据库失败"));
```

```
// models/user.js
const mongoose = require("mongoose");

const schema = mongoose.Schema({
  name: String,
  password: String,
  cart: []
});

schema.statics.getCart = function(_id) {
  return this.model("user")
    .findById(_id)
    .exec();
};

schema.statics.setCart = function(_id, cart) {
  return this.model("user")
    .findByIdAndUpdate(_id, { $set: { cart } })
    .exec();
};

const model = mongoose.model("user", schema);

// 测试数据
model.updateOne(
  { _id: "5c1a2dce951e9160f0d8573b" },
  { name: "jerry", cart: [{ pname: "iPhone", price: 666, count: 1 }] },
  { upsert: true },
  (err, r) => {
    console.log('测试数据');
    console.log(err, r);
  }
);

module.exports = model;
```

```
// index.js
const express=require('express')
const app=new express();
const bodyParser = require('body-parser');
const path = require('path')

// 数据库相关
require('./mongoose')
const UserModel = require('./models/user')
```

```
// mock session
const session = {sid:{userId:'5c1a2dce951e9160f0d8573b'}}

app.use(bodyParser.json());
app.get("/", (req, res) => {
    res.sendFile(path.resolve("./index.html"))
})
// 查询购物车数据
app.get('/api/cart', async (req,res)=>{
    const data = await UserModel.getCart(session.sid.userId)
    res.send({ok:1, data})
})

// 设置购物车数据
app.post('/api/cart', async (req,res)=>{
    await UserModel.setCart(session.sid.userId, req.body.cart)
    res.send({ok:1})
})

app.listen(3000);
```

index.html

```
<!DOCTYPE html>
<html lang="en">

<head>
  <meta charset="UTF-8" />
  <meta name="viewport" content="width=device-width, initial-scale=1.0" />
  <meta http-equiv="X-UA-Compatible" content="ie=edge" />
  <script src="https://cdn.jsdelivr.net/npm/vue/dist/vue.js"></script>
  <script src="https://unpkg.com/element-ui/lib/index.js"></script>
  <script src="https://unpkg.com/axios/dist/axios.min.js"></script>
  <link rel="stylesheet" href="https://unpkg.com/element-ui/lib/theme-
chalk/index.css" />
  <title>瓜果超市</title>
</head>
<body>
  <div id="app">
    <el-button @click='getCart'>getCart</el-button>
    <el-button @click='setCart'>setCart</el-button>
  </div>
  <script>
    var app = new Vue({
      el: "#app",
      methods: {
        async getCart(page) {
          const ret = await axios.get('/api/cart')
          console.log('ret:', ret.data.data)
        },
        async setCart() {
          const ret = await axios.post(
            '/api/cart', {
              cart:[
                {
                  name:'菠萝',
                    count:1
                  }
                ]
              }
            )
          }
        }
      });
    </script>
  </body>

</html>
```

模型

- 数据层
- crud - mongoose 是不是一个通用问题 有规律的
- restful接口 - ?
- crud 界面 - ? 后台界面
    - 快速开发平台 jeecg mysql
    - KeystoneJS 4.0
    - py django