

CMPE 273 – Enterprise Distributed Systems

Lab 2 – RabbitMQ and MongoDB

Student ID: 011457368

GitHub project link with access credentials:

<https://github.com/nilamdeka23/Lab2-Ebay>

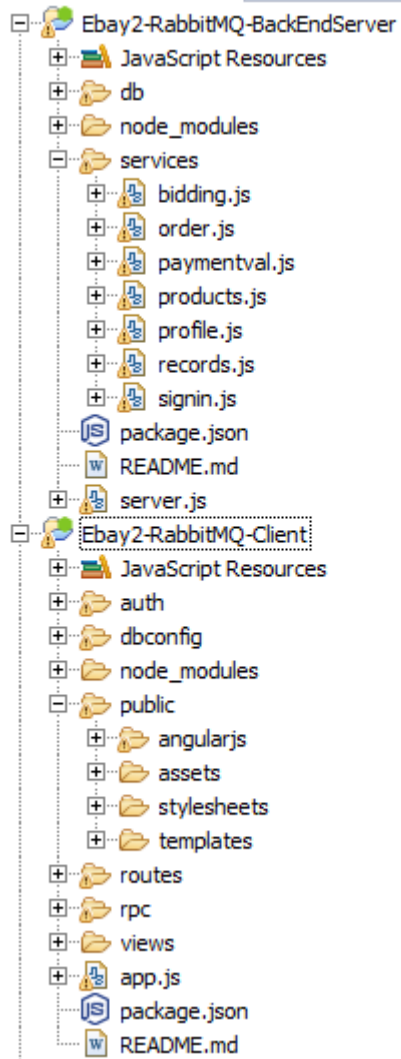
username: nilamdeka23

password: 14Github23

Part 1- Ebay Marketplace Application

Introduction: Goal is to develop “Simple Market Place” like Ebay, both client and server side. The client side complements various server functionalities like buy, sell, add to cart, make an order, etc. Node.js, Angular.js, RabbitMQ and MongoDB comprises the technology stack used for the same.

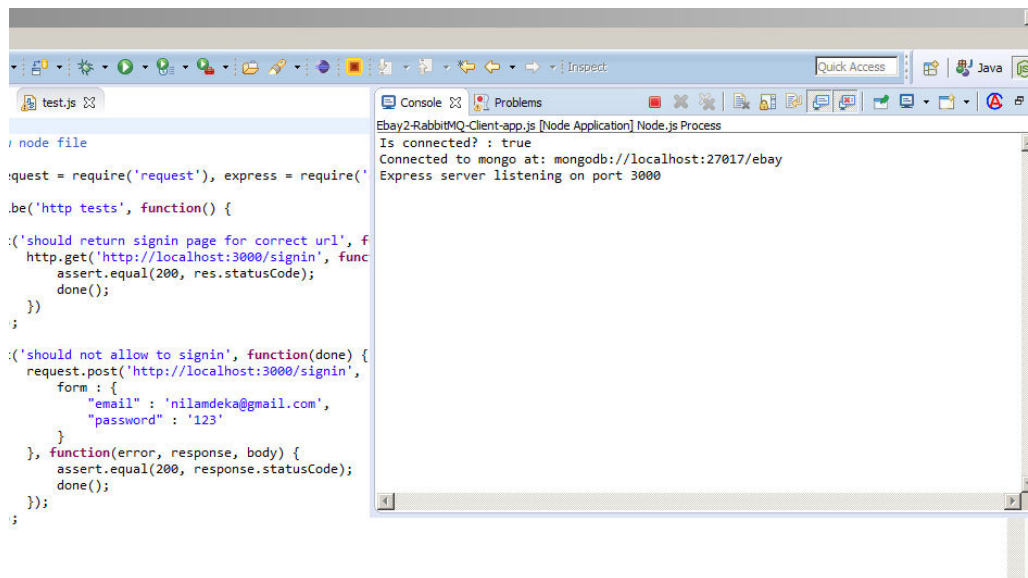
System Design:



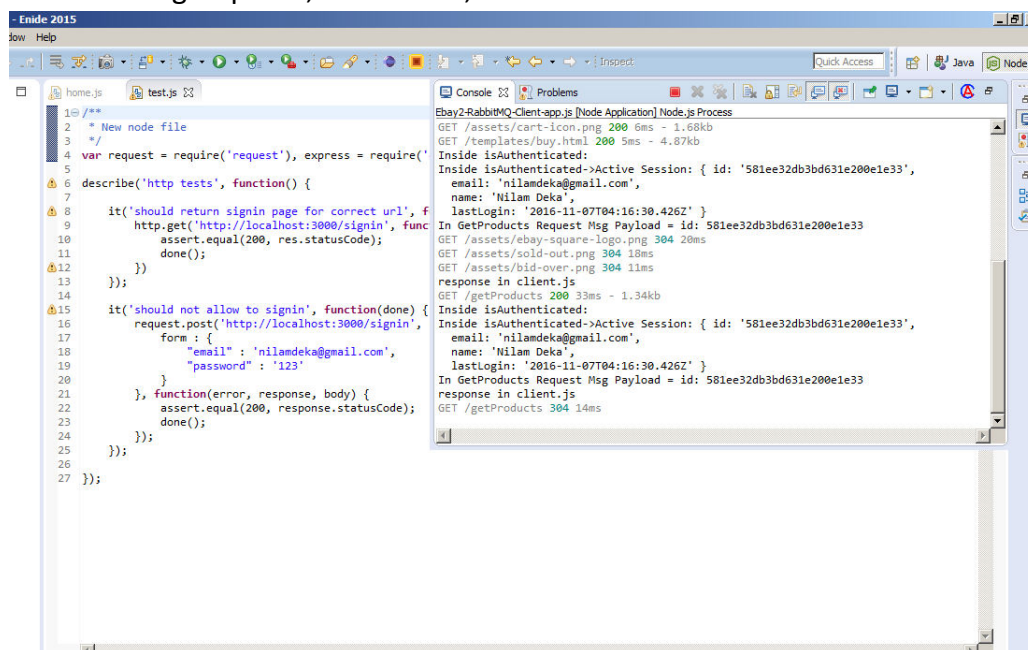
The application is split into two parts. One half is a node.js application which acts like a server, exposing all the required services using RabbitMQ messaging services and the other half is the client application(node-express application) comprising of the web pages which call and consume the aforementioned services via RabbitMQ-RPC calls.

Ebay2-RabbitMQ-Client

Running... Screenshot

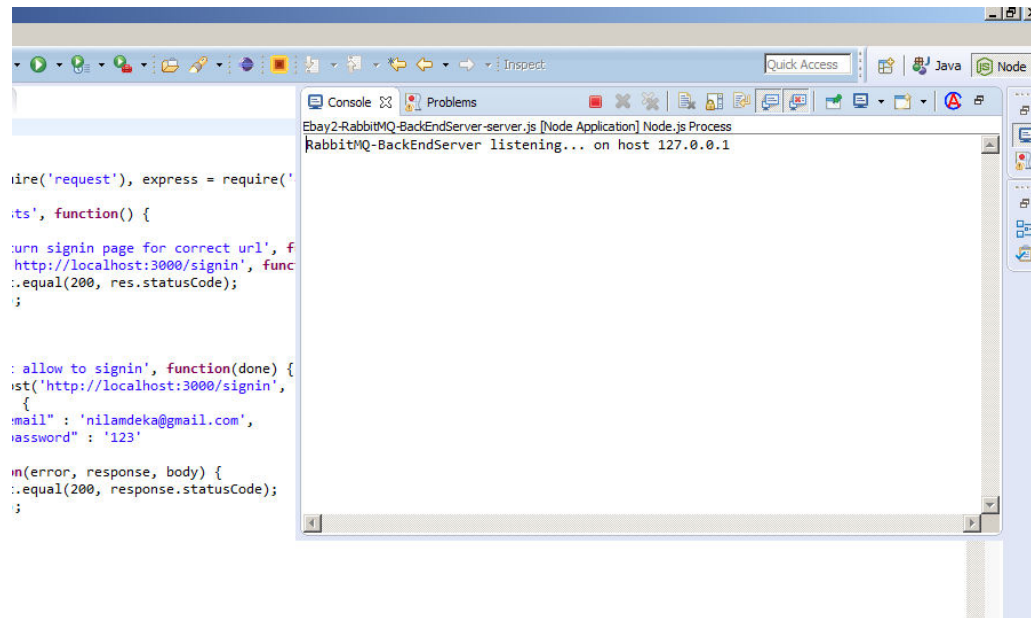


While making requests, screenshot,

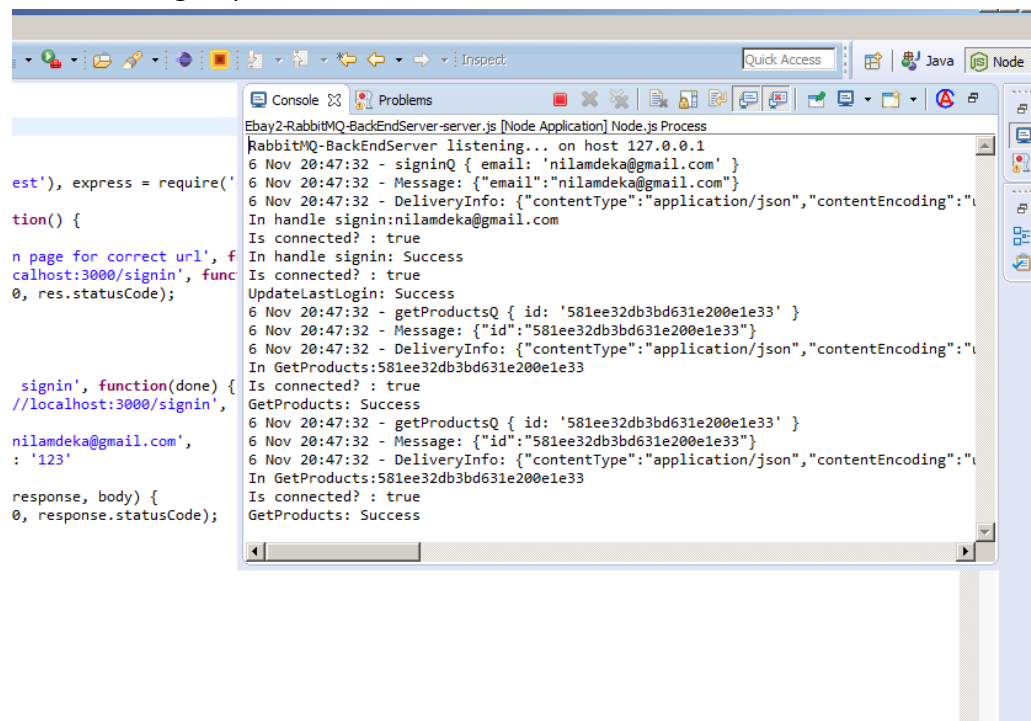


Ebay2-RabbitMQ-BackEndServer

Running... Screenshot



While serving requests, screenshot

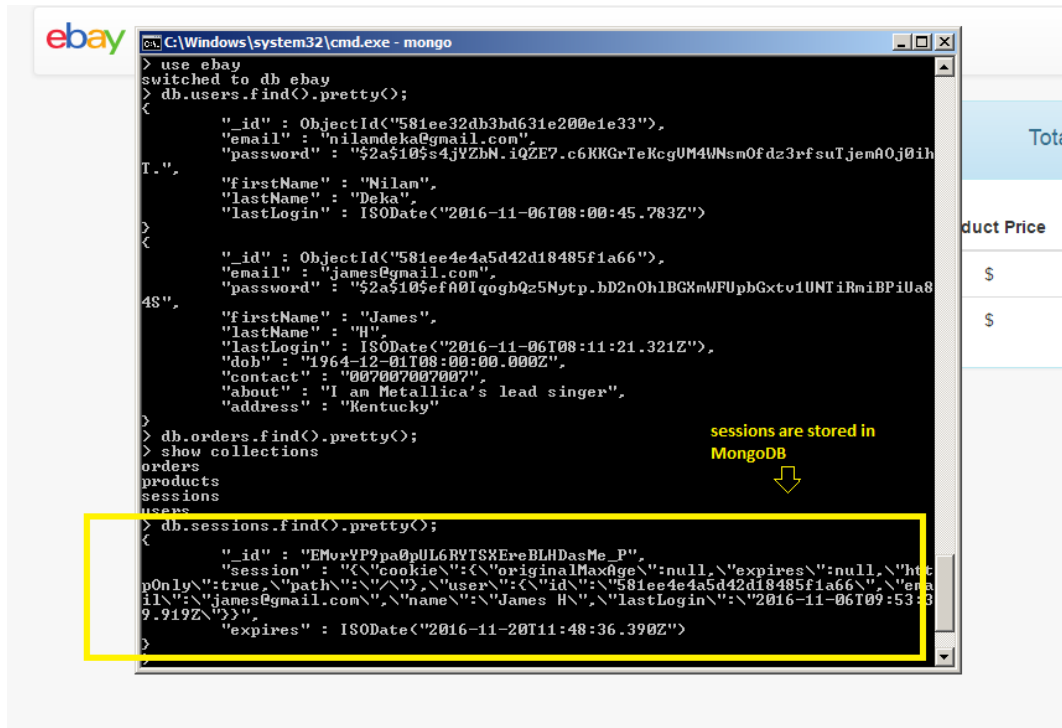


The following are the snapshots of the database design of my Ebay implementation using MongoDB.

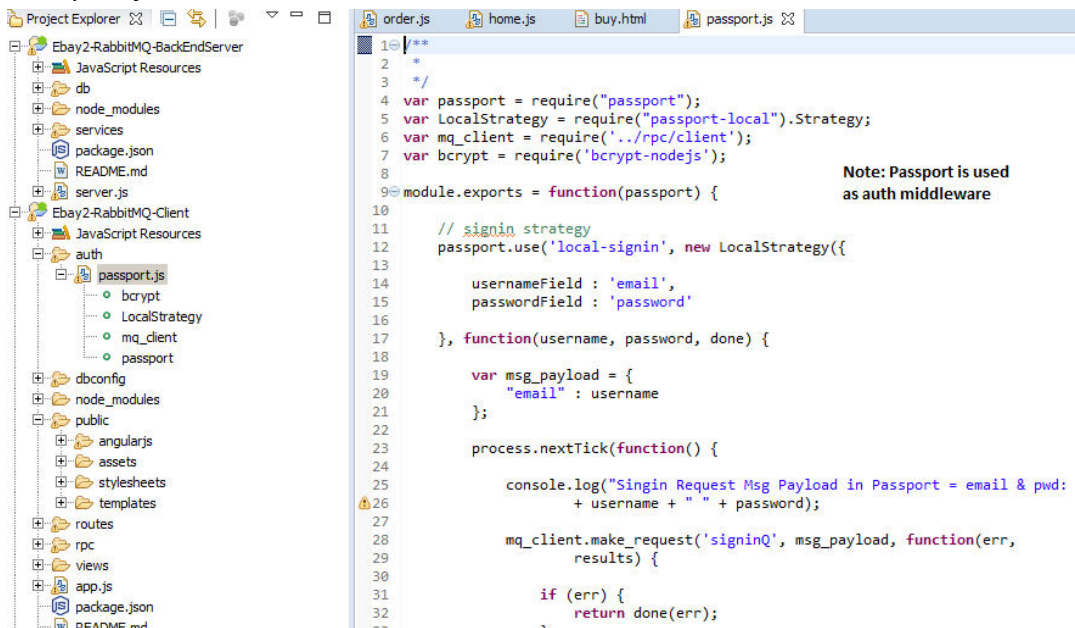
```
016-11-06T15:37:34.000 I NETWORK [initandlisten] connection accepted from 127.0.0.1:50511 #102 (40 connections now open)
016-11-06T15:39:54.035-0800 I NETWORK [initandlisten] connection accepted from 127.0.0.1:50512 #103 (44 connections now open)
016-11-06T15:40:00.000 I NETWORK [initandlisten] connection accepted from 127.0.0.1:50513 #104 (48 connections now open)
C:\Windows\system32\cmd.exe - mongo
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Doal>mongo
2016-11-06T15:45:50.378-0800 I CONTROL [main] Hotfix KB2731284 or later update is not installed, will zero-out data files
MongoDB shell version: 3.2.10
connecting to: test
> use ebay
switched to db ebay
> show collections
bids
orders
products
sessions
users
127.0.0.1:27020> db.users.find().pretty();
{
  "_id" : ObjectId("581ee32db3bd631e200e1e33"),
  "email" : "nilamdeka@gmail.com",
  "password" : "$2a$10$5s4jYZbN.iQZE7.c6KKGrTeKcgUM4WNsmOfdz3rfsuTjerA0j0ih",
  "firstName" : "Nilan",
  "lastName" : "Deka",
  "lastLogin" : ISODate("2016-11-06T23:39:53.495Z")
}
{
  "_id" : ObjectId("581ee4e4a5d42d18485f1a66"),
  "email" : "james@gmail.com",
  "password" : "$2a$10$efA0IqogbQz5Nytp.bD2n0h1BGXnWfUpbGxtv1UNTiRmiBPiUa8",
  "firstName" : "James",
  "lastName" : "H",
  "lastLogin" : ISODate("2016-11-06T11:48:05.963Z"),
  "dob" : "1964-12-01T08:00:00.000Z",
  "contact" : "007007007007",
  "about" : "I am Metallica's lead singer"
}
```

```
db.products.find().pretty();
{
  "_id" : ObjectId("581ee35ab3bd631e200e1e34"),
  "name" : "Phone",
  "description" : "Samsung Galaxy Note3",
  "price" : 400,
  "qty" : 0,
  "isBiddable" : 0,
  "sellerId" : ObjectId("581ee32db3bd631e200e1e33"),
  "sellerName" : "Nilam Deka",
  "sellerInfo" : "San Jose",
  "createdOn" : ISODate("2016-11-06T08:01:30.131Z")
}
{
  "_id" : ObjectId("581ee3dbb3bd631e200e1e35"),
  "name" : "TU",
  "description" : "Samsung",
  "price" : 300,
  "qty" : 1,
  "isBiddable" : 1,
  "sellerId" : ObjectId("581ee32db3bd631e200e1e33"),
  "sellerName" : "Nilam Deka",
  "sellerInfo" : "California",
  "createdOn" : ISODate("2016-11-06T08:03:39.800Z")
}
{
  "_id" : ObjectId("581ee716a5d42d18485f1a67"),
  "name" : "Guitar",
  "description" : "Gibson- Les Paul- Signed",
  "price" : 300,
  "qty" : 0,
  "isBiddable" : 0,
  "sellerId" : ObjectId("581ee32db3bd631e200e1e33"),
  "sellerName" : "Nilam Deka",
  "sellerInfo" : "San Jose",
  "createdOn" : ISODate("2016-11-06T08:05:00.000Z")
}
```


'Passport.js' is used as middleware for user authentication.



Output screenshots:

a. Sign up the new users (First name, Last name, Email, Password). Passwords is encrypted

localhost:3000




[Sign In](#)
[Sign Up](#)

First Name

Last Name

Email address

Password

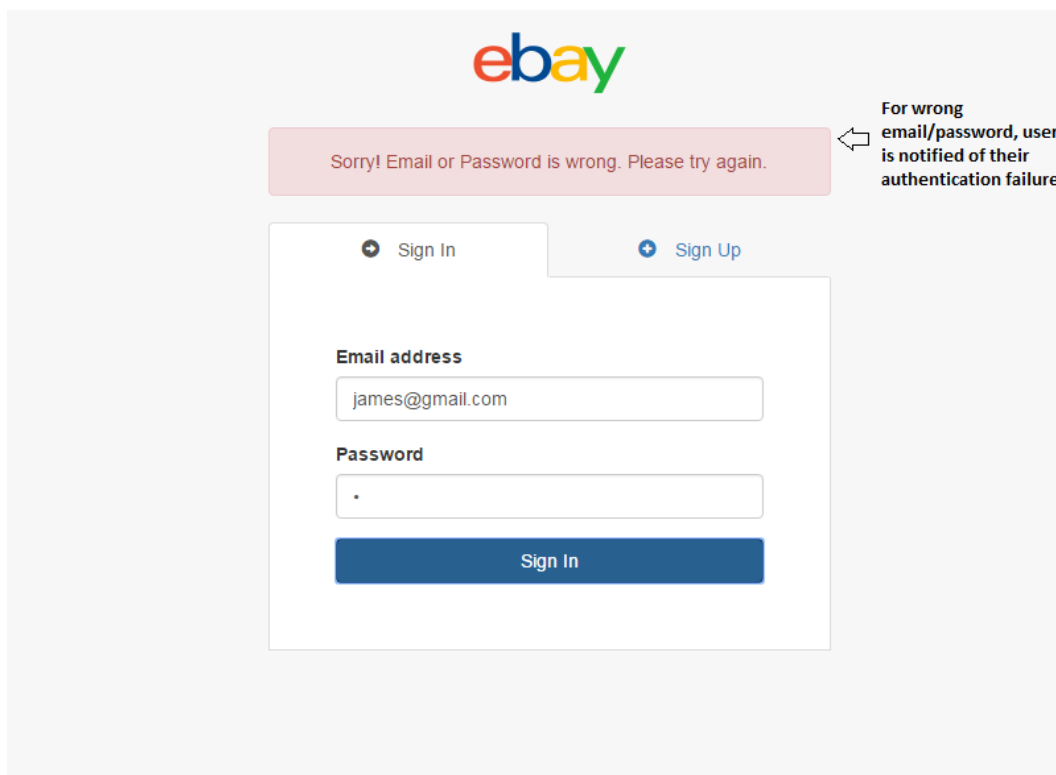
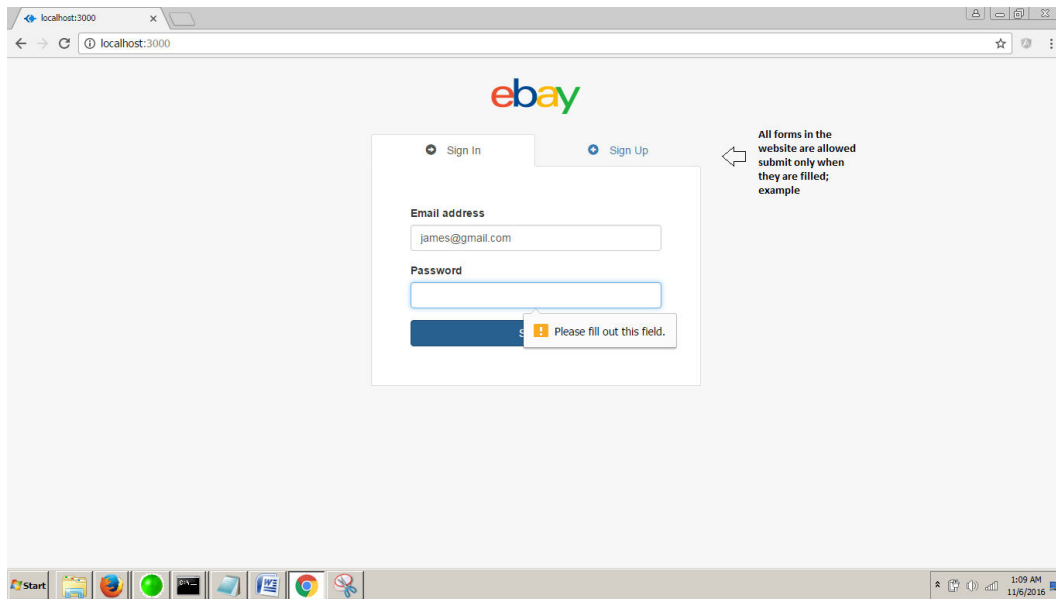


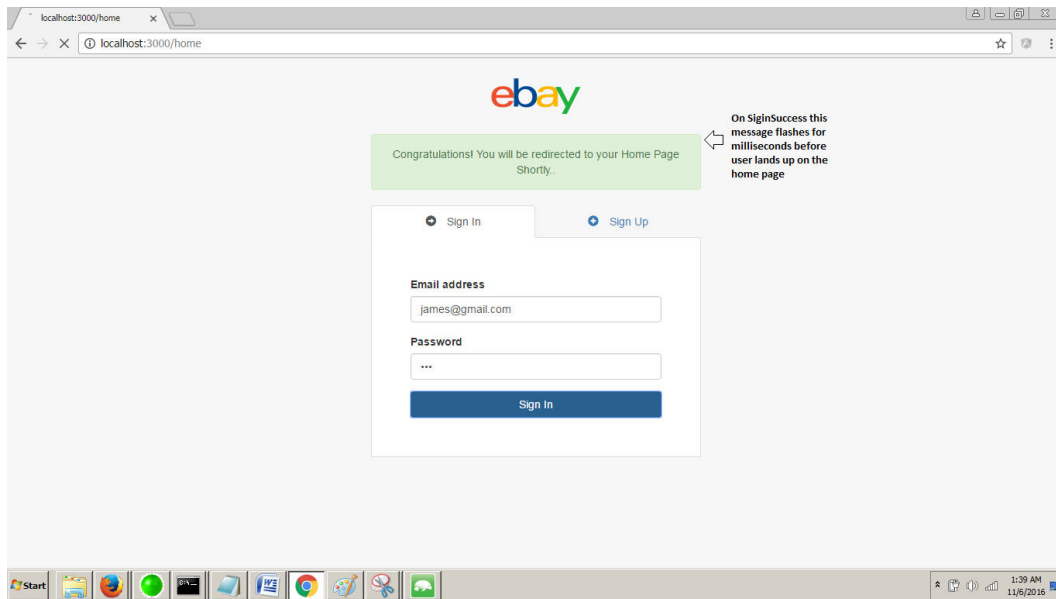
```

C:\Windows\system32\cmd.exe - mongo
> show dbs
ebay      0.000GB
local    0.000GB
login     0.000GB
signinDemo 0.000GB
test      0.000GB
> use ebay
switched to db ebay
> db.users.find().pretty();
{
  "_id" : ObjectId("581ee32db3bd631e200e1e33"),
  "email" : "nilamdeka@gmail.com",
  "password" : "$2a$10$s4jVZbN.iQZE7.c6KKGrTeKcgUM4WNsmOfdz3rfsuTjemA0j0ih
T.",
  "firstName" : "Nilam",
  "lastName" : "Deka",
  "lastLogin" : ISODate("2016-11-06T08:00:45.783Z")
}
{
  "_id" : ObjectId("581ee4e4a5d42d18485f1a66"),
  "email" : "james@gmail.com",
  "password" : "$2a$10$efA0lqogbQz5Nytp.bD2nOhlBGXmWFUpbGxtv1UN1iRmiBPfUa8
4S",
  "firstName" : "James",
  "lastName" : "H",
  "lastLogin" : ISODate("2016-11-06T08:11:21.321Z"),
  "dob" : "1964-12-01T08:00:00.000Z",
  "contact" : "007007007007",
  "about" : "I am Metallica's lead singer",
  "address" : "Kentucky"
}
  
```

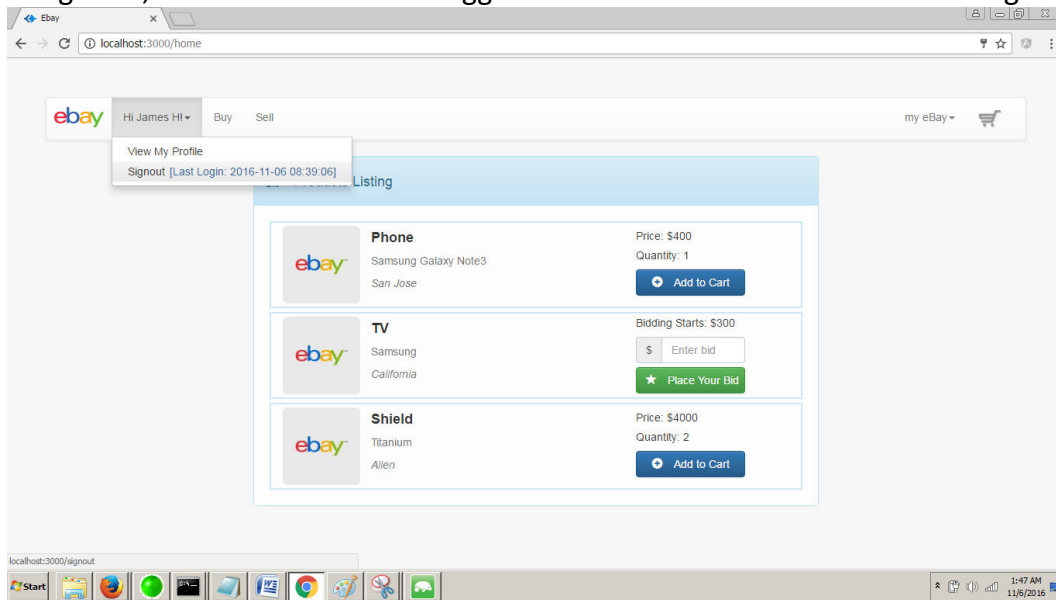
Note: Password is encrypted using bcrypt before storing in MongoDB

b. Sign in with existing users





c. Sign out; i. Maintains time last logged in and is returned back when user logs in.




2. Profile:

a. About: Birthday, Ebay handle, contact information and location

ebay

Hi James Hi ▾ Buy Sell

my eBay ▾ 

User Profile

First Name

James

Last Name

H

Email

james@gmail.com

Password

.....

About

Date of birth

mm/dd/yyyy

Mobile No.

+1

Address

Edit

Update

localhost:3000/home#/profile

User Profile

First Name

James

Last Name

H

Email

james@gmail.com

Password

.....

About

I am Metallica's lead singer

Date of birth

12/01/1964

Mobile No.

+1

007007007007

Address

Kentucky

Edit

Update

Well done! You successfully updated your profile.

b. Should be able to store user's advertisements for others to read. This should at-least includes the item name, item description, seller information, item price and quantity.

localhost:3000/home#/sell

Hi James HI ▾ Buy Sell

Describe your item

Item Name

Item Description

Seller Info

Price \$

Quantity units

☐ Bidding

List it

Hi James HI ▾ Buy Sell

Describe your item

Item Name

Item Description

Seller Info

Price \$

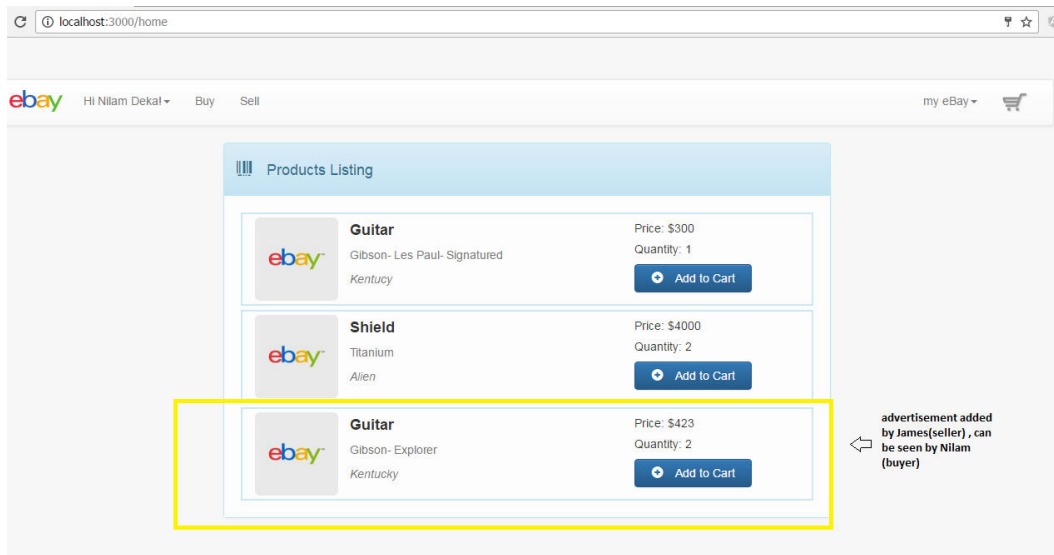
Quantity units

☐ Bidding

List it

Congratulations! You have successfully listed your product.

c. Should give all the advertisements details to all the other users.



d. Users can bid the product displayed by other users. Bidding takes place over 4 days. For some items, you can purchase without bidding. You should take care of quantities and should respectively reflect user accounts in case of any transaction

Describe your item

Item Name:

Item Description:

Seller Info:

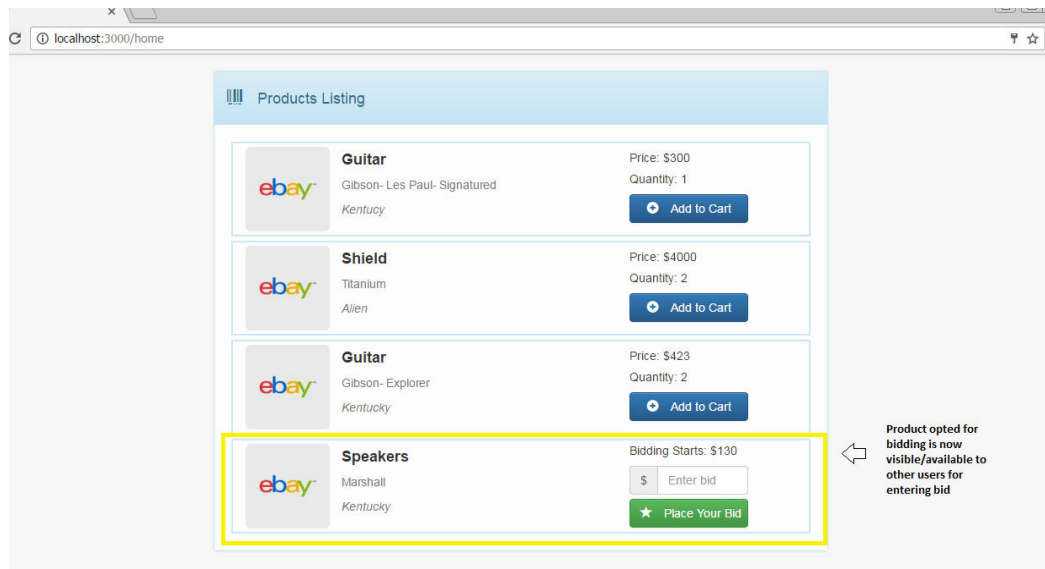
Price: \$

Quantity: units

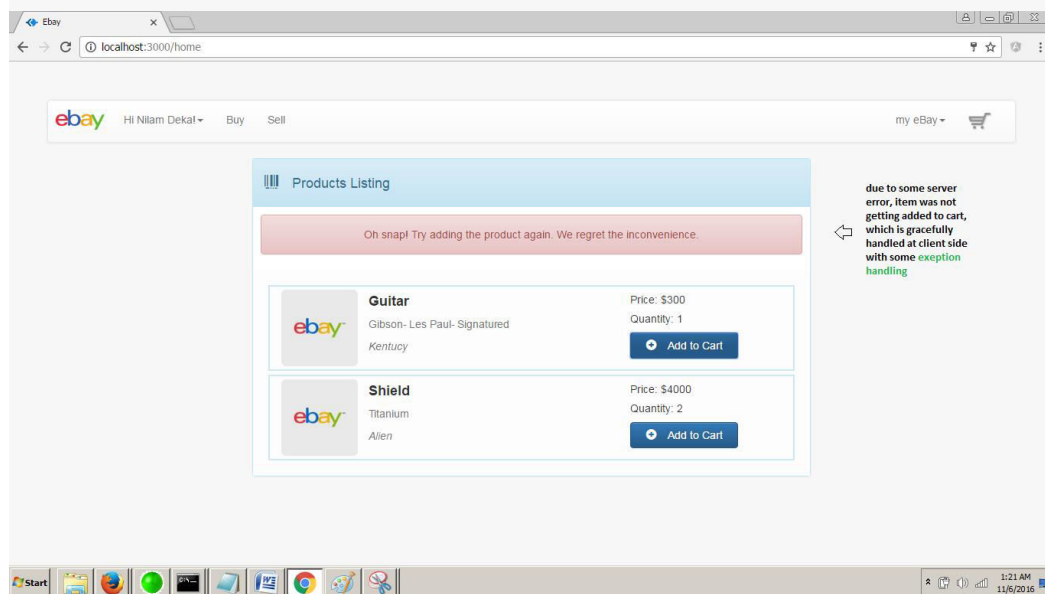
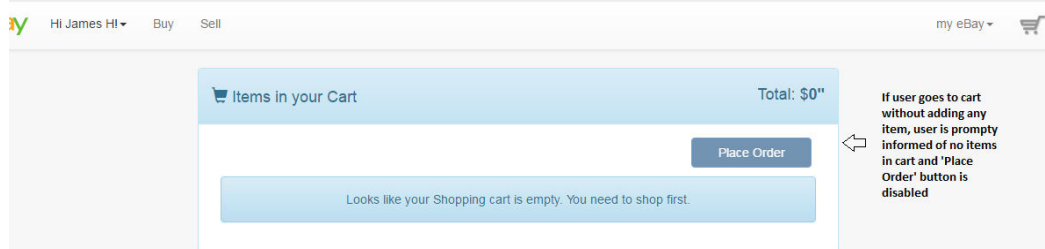
☒ Bidding

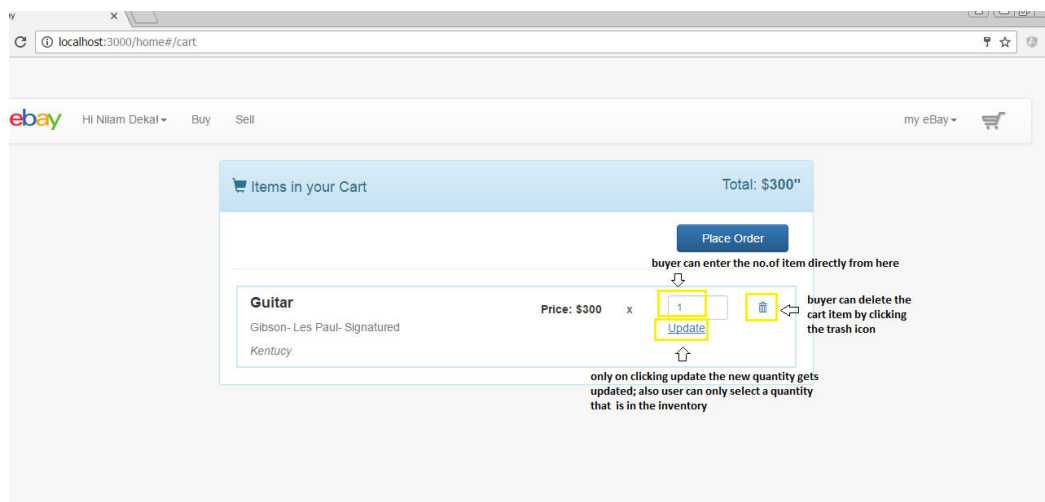
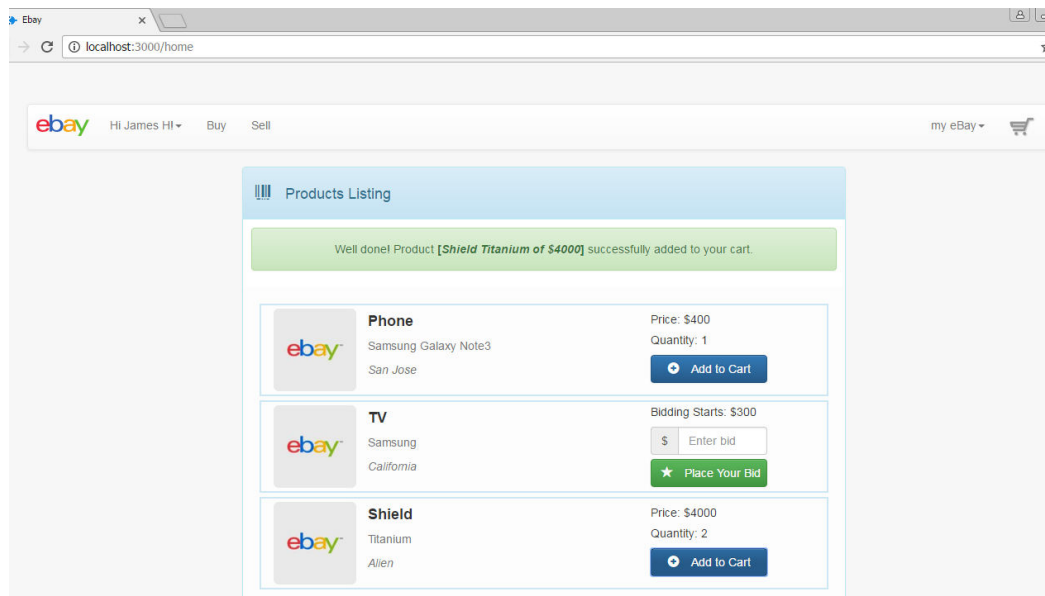
[List it](#)

Sellers can mark some items for bidding using the checkbox

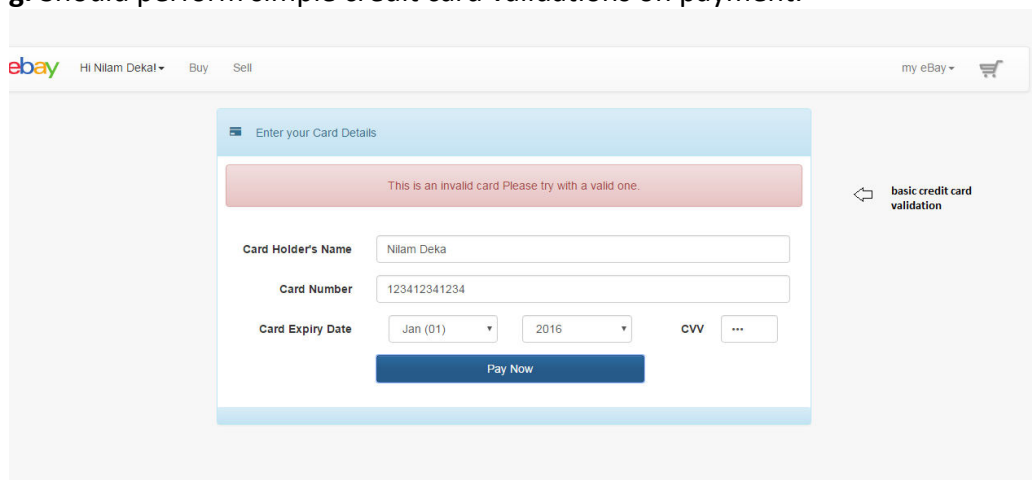


e. Shopping Cart should be maintained which will reflect temporary items. Users should be able to add, remove items from the cart until checkout.

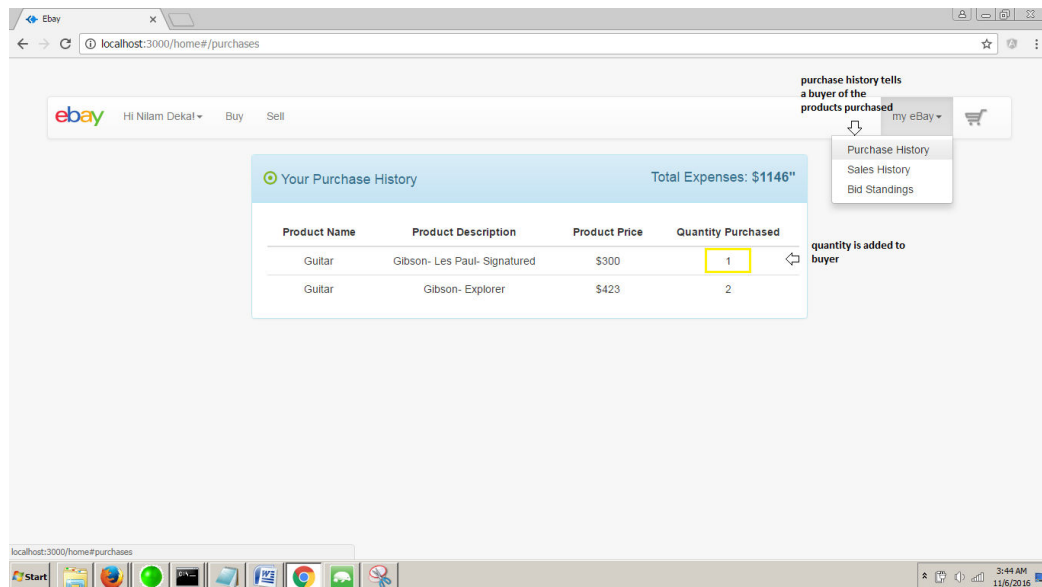
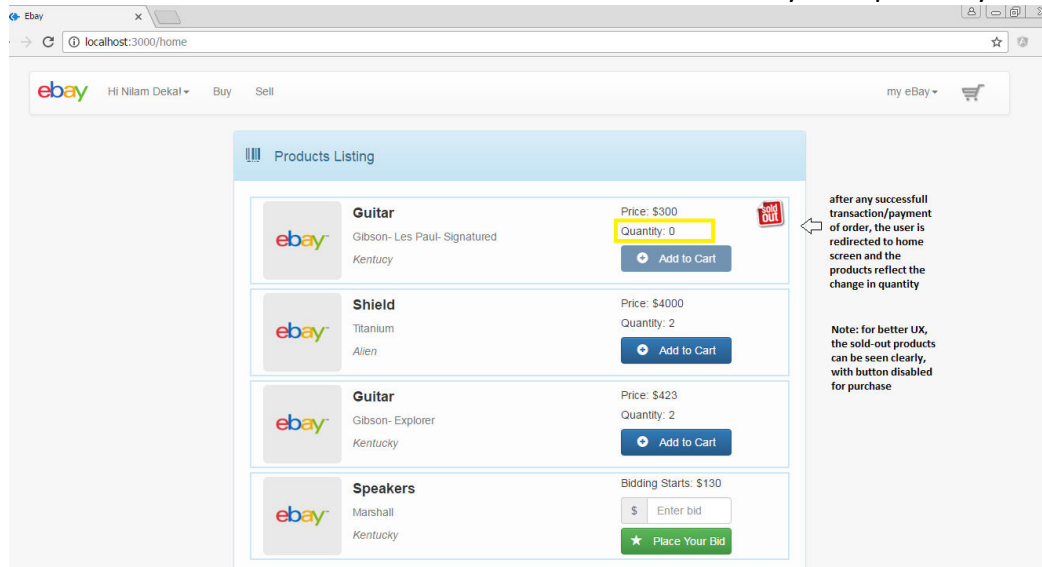




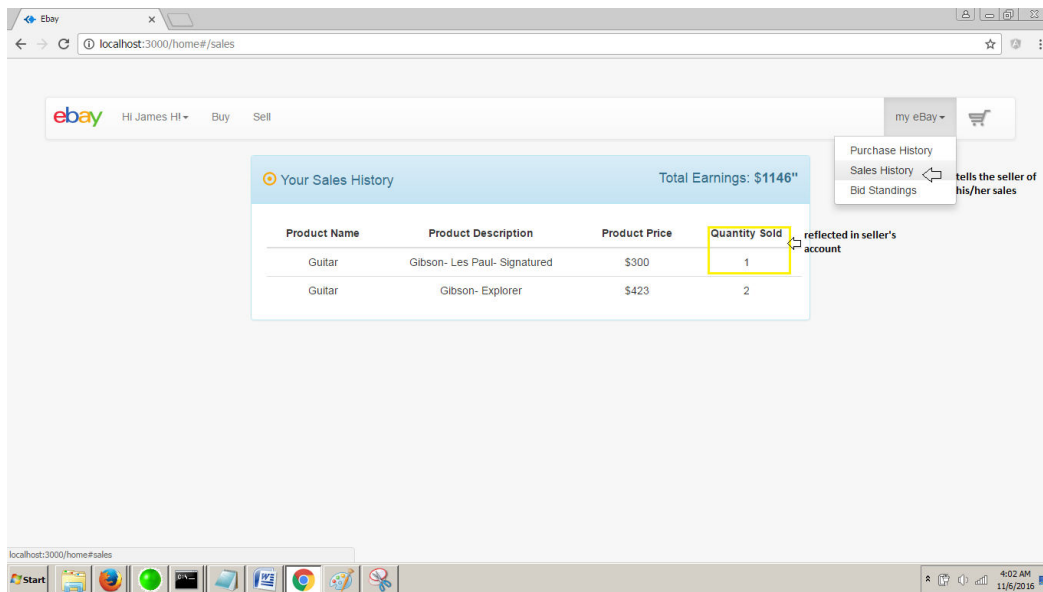
g. Should perform simple credit card validations on payment.



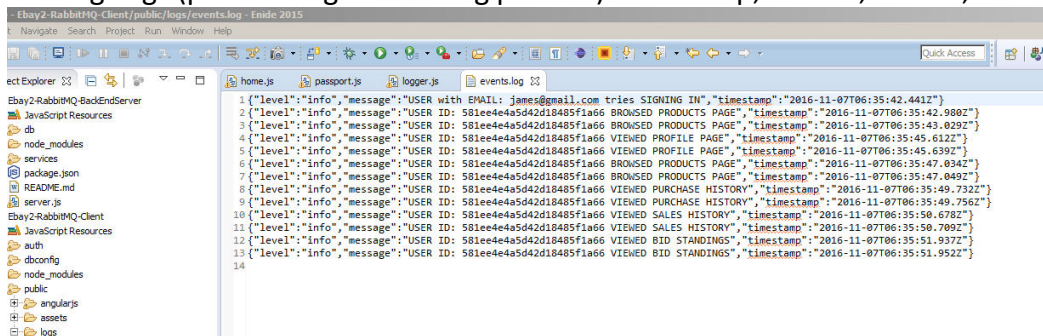
f. Checkout should deduct and add items from seller and buyer respectively.



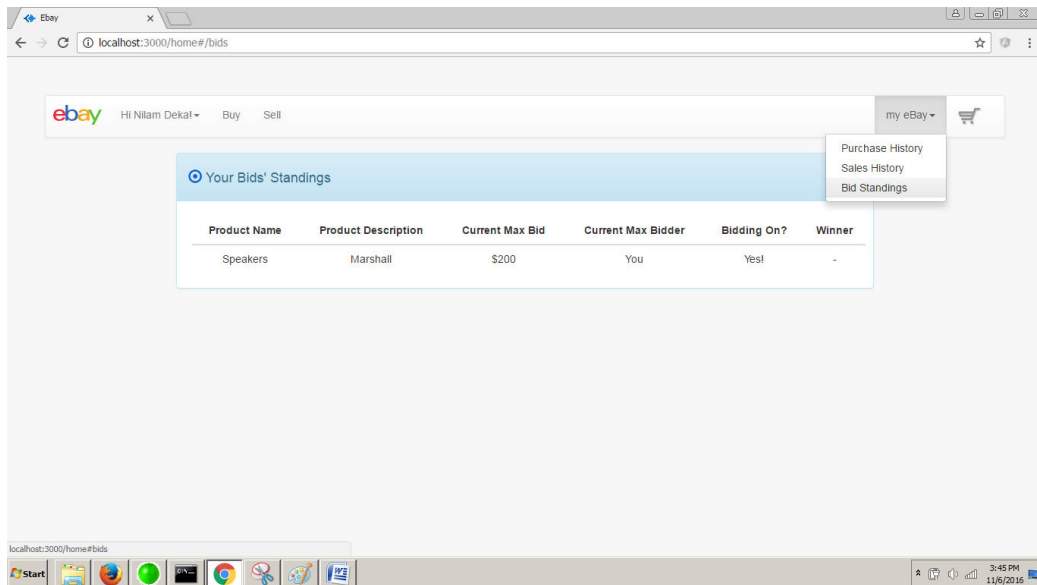
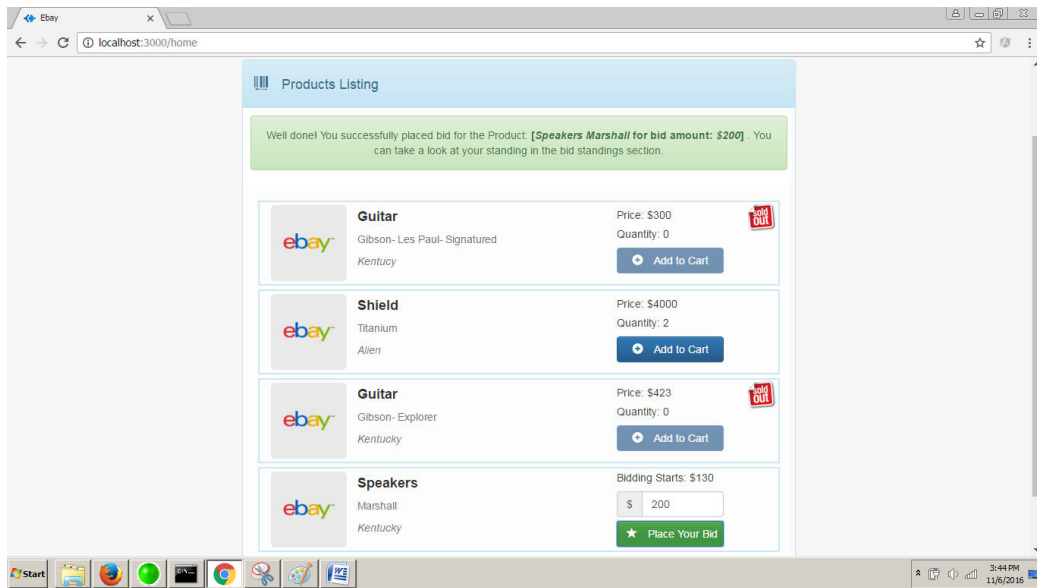
h. Users account should reflect all the bought and sold items.



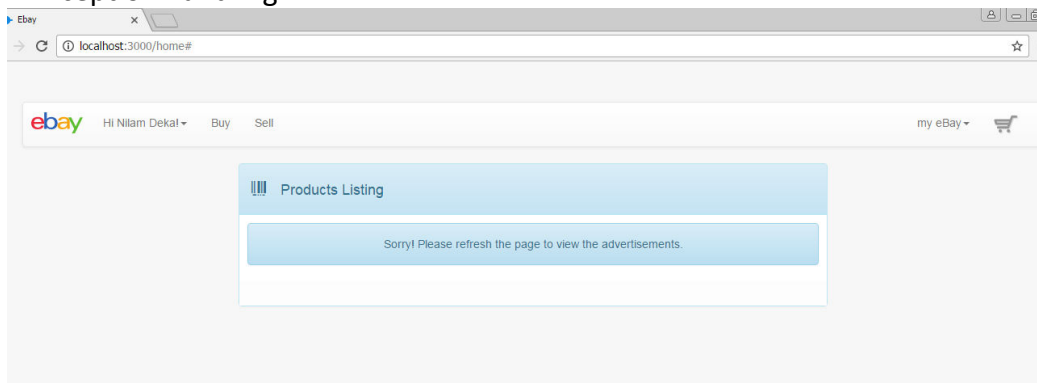
j. User tracking: Generate logs into a file when user clicks any place in the web page. There are generally two major logs. Event Logs: record timestamp, userid, click object id, any descriptions. Bidding Logs (periodic logs of bidding process) timestamp, item id, user id, bid amount.

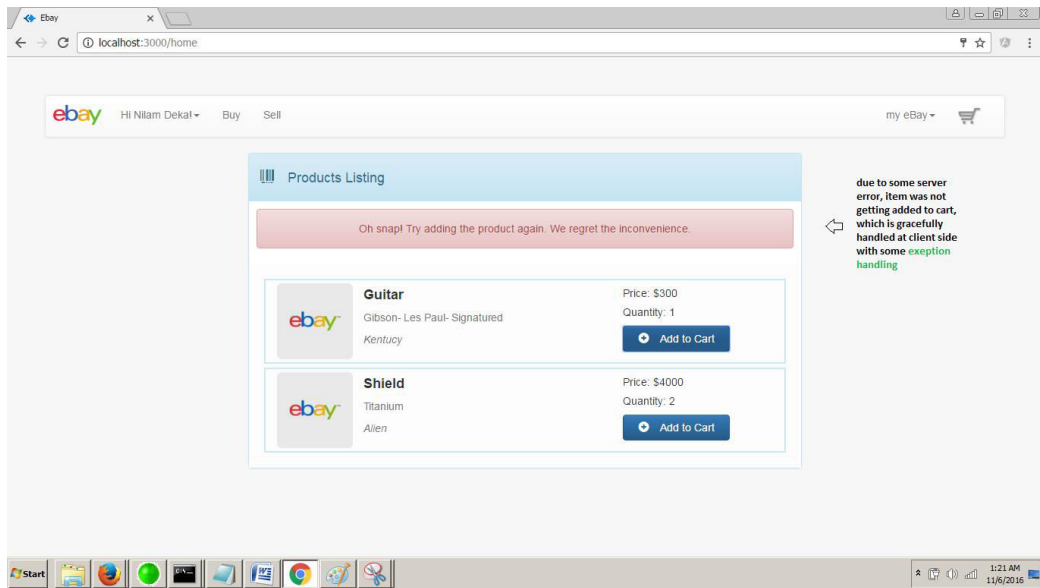


k. Bidding



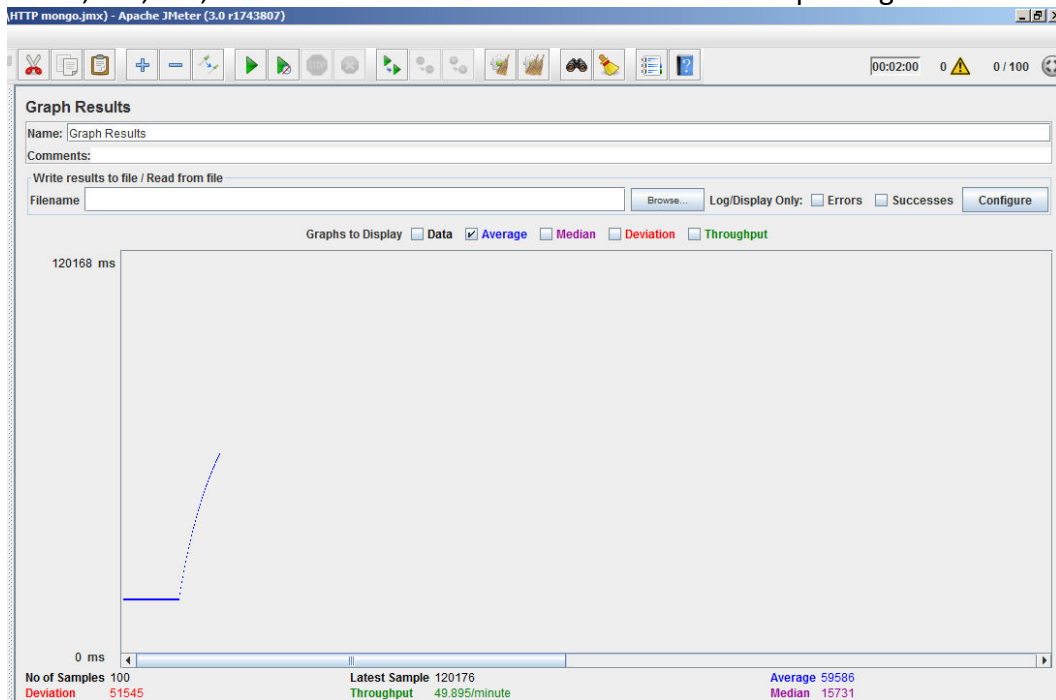
I. Exception handling



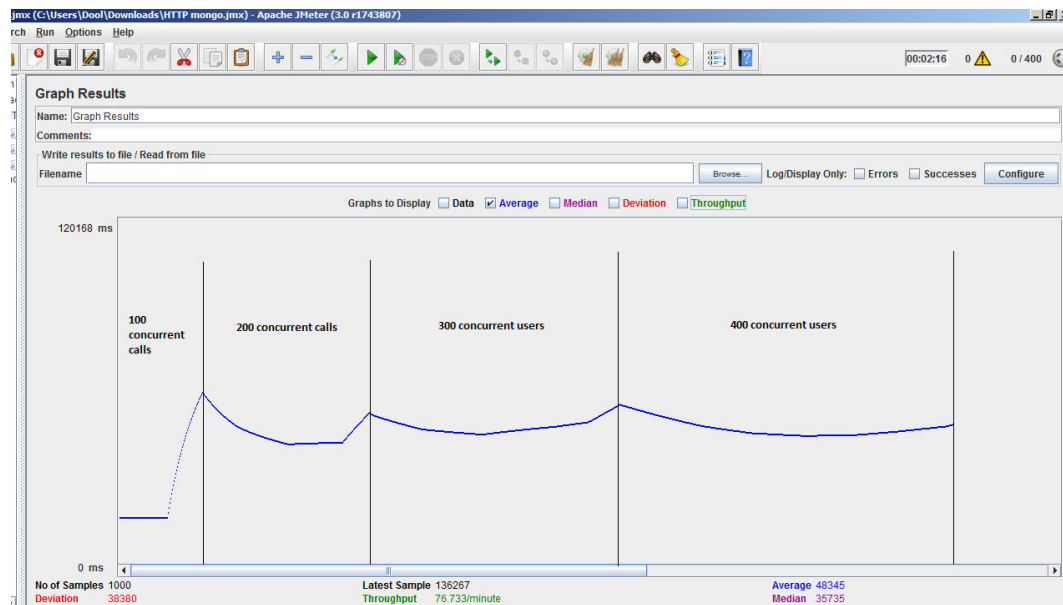


Testing done using JMeter:

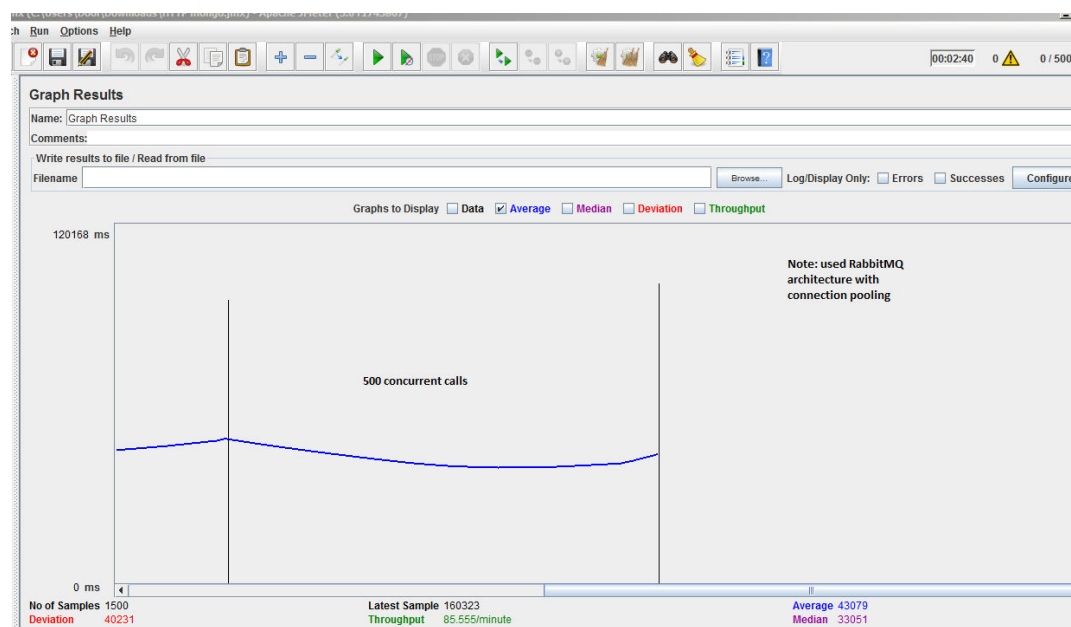
1. 100, 200, 300, 400 and 500 concurrent users with connection pooling.



First 100 calls

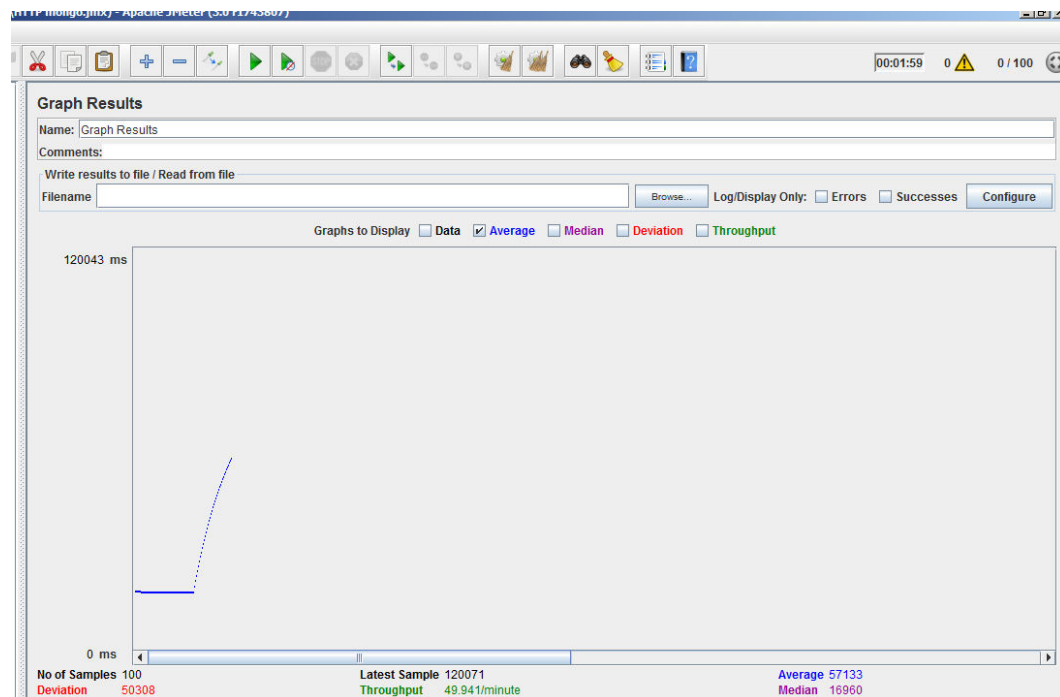


In summarized format of 100,200,300 and 400 subsequent test calls

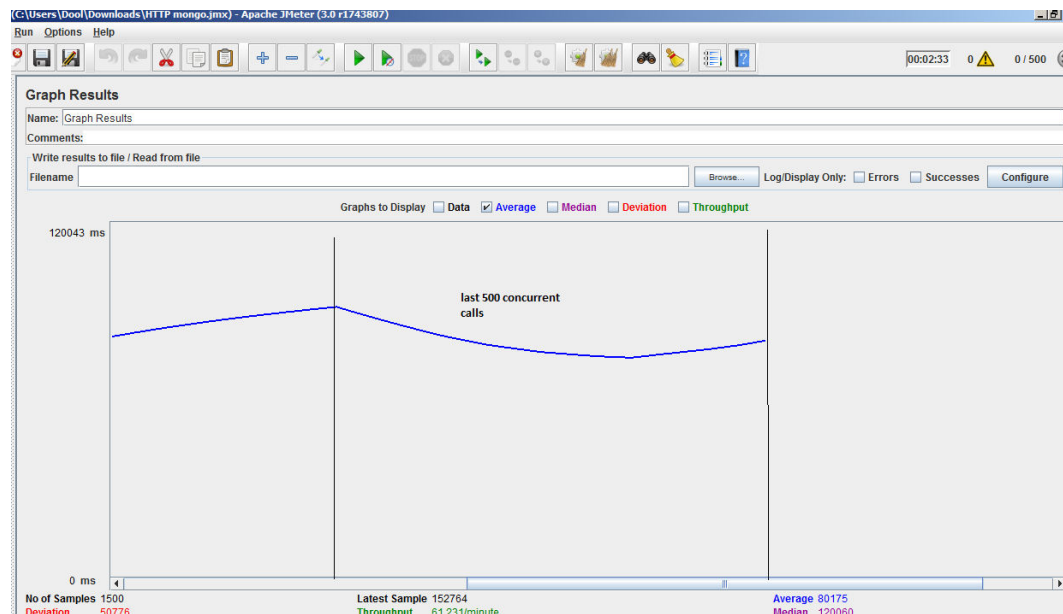
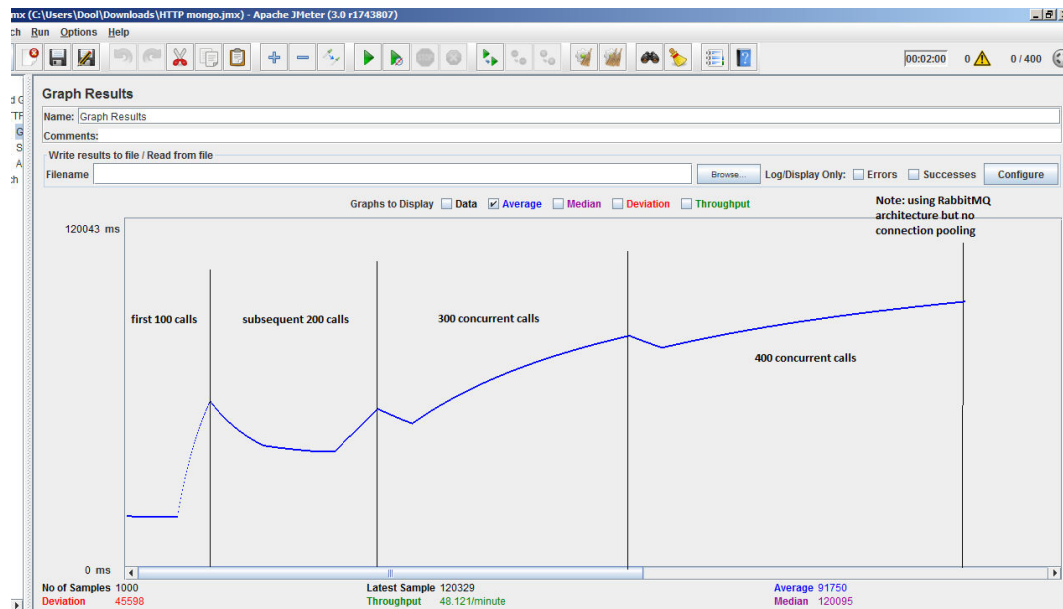


Last 500 calls

2. 100, 200, 300, 400 and 500 concurrent users without connection pooling.



First 100 calls



Conclusion:

As can be concluded from the tests, without connection pooling the performance is affected. The average response times have increased 1.86x times.

Testing done using Mocha:

Implemented 5 randomly selected REST web service API calls using Mocha. Output screenshot.

```

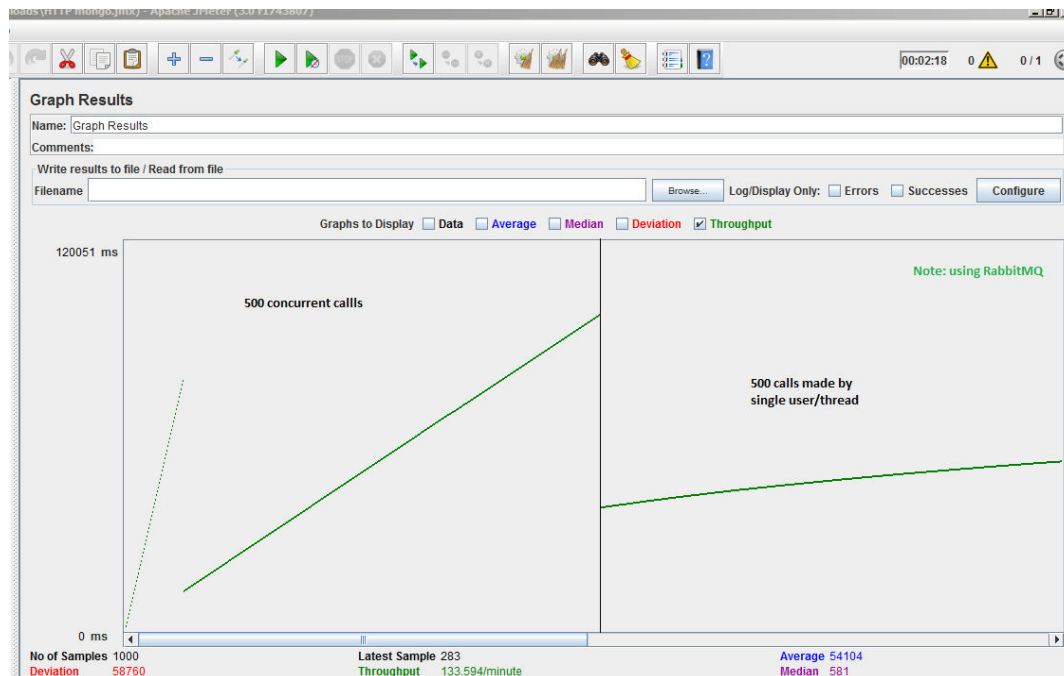
-401
+200
    at Request._callback (test.js:49:11)
    at Request.self.callback (N:\NodeclipseExperiments\Ebay2-RabbitMQ-Client\n
node_modules\request\request.js:186:22)
    at Request.callback (N:\NodeclipseExperiments\Ebay2-RabbitMQ-Client\nod
e_modules\request\request.js:186:10)
    at IncomingMessage.<anonymous> (N:\NodeclipseExperiments\Ebay2-RabbitMQ-Cl
ient\node_modules\request\request.js:1001:12)
    at endReadableNT (_stream_readable.js:921:12)

Mocha tests
  ✓ GET Signin Page for base url
  ✓ Shouldnt GET Home Page as requires authentication
  ✓ GET 404 for wrong or random URL
  ✓ ALLOW signin for right credentials <286ms>
  ✓ DISALLOW signin for wrong credentials

5 passing (347ms)

N:\NodeclipseExperiments\Ebay2-RabbitMQ-Client\test>mocha test

27    });
28  });
29
30  it('ALLOW signin for right credentials', function(done) {
31    request.post('http://localhost:3000/signin', {
32      form : {
33        "email" : 'nilandeka@gmail.com',
34        "password" : '123'
35      }
36    }, function(error, response, body) {
37
38      // console.log('Response: ', response);
39    });
40  });
41
42  it('DISALLOW signin for wrong credentials', function(done) {
43    request.post('http://localhost:3000/signin', {
44      form : {
45        "email" : 'wrong@gmail.com',
46        "password" : '123'
47      }
48    }, function(error, response, body) {
49
50      // console.log('Response: ', response);
51    });
52  });
53
54  it('Shouldnt GET Home Page as requires authentication', function(done) {
55    request.get('http://localhost:3000/', function(error, response, body) {
56
57      // console.log('Response: ', response);
58    });
59  });
60
61  it('GET 404 for wrong or random URL', function(done) {
62    request.get('http://localhost:3000/404', function(error, response, body) {
63
64      // console.log('Response: ', response);
65    });
66  });
67
68  it('GET Signin Page for base url', function(done) {
69    request.get('http://localhost:3000/signin', function(error, response, body) {
70
71      // console.log('Response: ', response);
72    });
73  });
74
75  done();
76
77  });
78
79  });
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81  });
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87  });
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As can be seen from the above experiment, the throughput of my website increases from 127.363/min to 133.594/min. RabbitMQ provides this improvement in performance. RabbitMQ is able to provide such availability due to being able to delegate the requests to different consumers via message queues whereas in case of normal db access, increased accesses result in bottleneck situation when number of such accesses increase.

One can achieve a still better throughput if use multiple queues and servers.

2. Compare passport authentication process with the authentication process used in Lab1.

Ans: Passport is an authentication middleware for Node-Express framework by Jared Henson. Passport adds an additional layer of indirection allowing the separation of authentication logic from the rest of the application keeping the code clean and also offering inbuilt support for various other authentication strategies like Facebook Login, Google Login, etc. In this application, I have used Passport's 'Local Strategy' to implement user authentication mechanism.

Passport itself doesn't encrypt the password being stored in the databases but allows to developer to implement any encryption algorithm or policy to implement encryption. I have use 'bcrypt-nodejs' npm module to salt and hash the user's password before saving them to mongoDB. Passport does encrypt its sessions.

In Lab1 I had used 'crypto' npm module with AES encryption algorithm. For Lab2, bcrypt uses Blowfish for encryption. Both are good encryption algorithms but Blowfish does have the added advantage of showing more resilience to rainbow and dictionary attacks.

3. If given an option to implement MySQL and MongoDB both in your application, specify which data of the applications will you store in MongoDB and MySQL respectively

Ans: Given such an option I would use MongoDB for parts that need more reads as with MongoDB I can de-normalize several tables into just one or two collections which may potentially minimize my queries to just one as hard drive space is cheaper than CPU/servers.. Also MongoDB is also known to have higher throughput with storage of large size binary blobs of data like images and videos. For applications that require higher availability and tolerance, I would go for MongoDB and for the ones that need more consistency; I would use a traditional relational database like MySQL.

In a nutshell, if my application or say a section of my application reads more than writes, I would opt for MongoDB; and MySQL for the opposite; for their respective pros and cons.