



## DOS-Project Part-2- Output

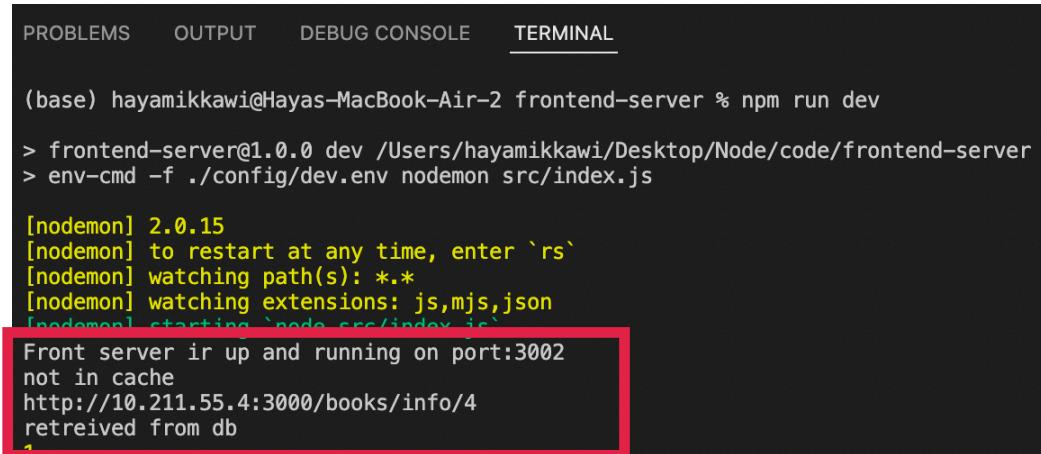
Adding Replication, Load Balancing and Caching  
Distributed Operating Systems-10636456.

Haya Mikkawi  
11819675  
7 May 2022

## Copy of the output for each request:

1- Get book by id (id =4)

(Notice how the first time the frontend server didn't find the book in cache and sent a message to one of the replicas)



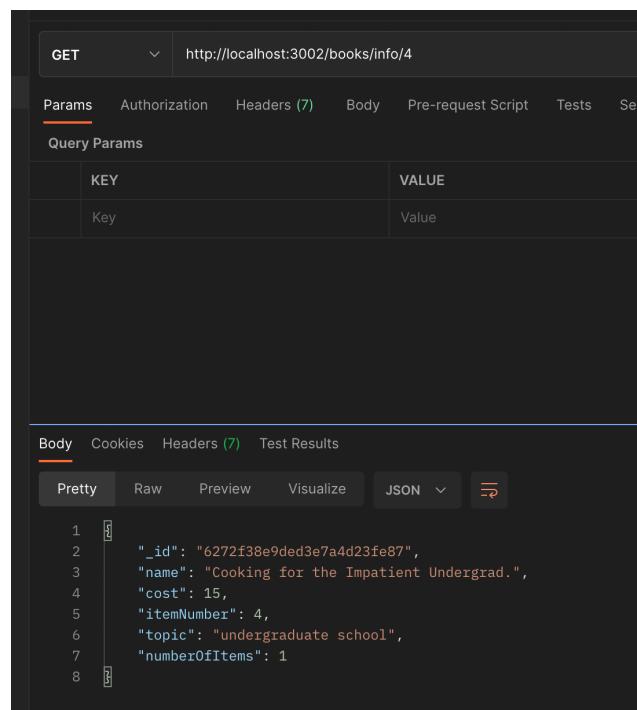
```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

(base) hayamikkawi@Hayas-MacBook-Air-2 frontend-server % npm run dev

> frontend-server@1.0.0 dev /Users/hayamikkawi/Desktop/Node/code/frontend-server
> env-cmd -f ./config/dev.env nodemon src/index.js

[nodemon] 2.0.15
[nodemon] to restart at any time, enter `rs`
[nodemon] watching path(s): ***!
[nodemon] watching extensions: js,mjs,json
[nodemon] starting `node src/index.js`

Front server is up and running on port:3002
not in cache
http://10.211.55.4:3000/books/info/4
retrieved from db
1
```



GET http://localhost:3002/books/info/4

Params

Query Params

| KEY | VALUE |
|-----|-------|
| Key | Value |

Body

Pretty

Raw

Preview

Visualize

JSON

1    "\_id": "6272f38e9ded3e7a4d23fe87",
2    "name": "Cooking for the Impatient Undergrad.",
3    "cost": 15,
4    "itemNumber": 4,
5    "topic": "undergraduate school",
6    "numberOfItems": 1

Get by id response

```

parallels@ubuntu-linux-20-04-desktop: ~/Desktop/catalog-s...
> task-manager@1.0.0 start /home/parallels/Desktop/catalog-server-api
> env-cmd -f ./config/dev.env node src/index.js

server is listening on port 3000
received a request, host:10.211.55.4
path:/books/info/4
method:GET
*****
```

```

parallels@ubuntu-linux-20-04-desktop: ~/Desktop/order-ser...
> task-manager@1.0.0 start /home/parallels/Desktop/order-server-api
> env-cmd -f ./config/dev.env node src/index.js

server is listening
```

Catalog server on 10.211.55.4 received the request.

2- Get another book by id (id =3)

(Notice how the other request was sent to the other server (round-robin))

| KEY | VALUE | DESCRIPTION |
|-----|-------|-------------|
| Key | Value | Description |

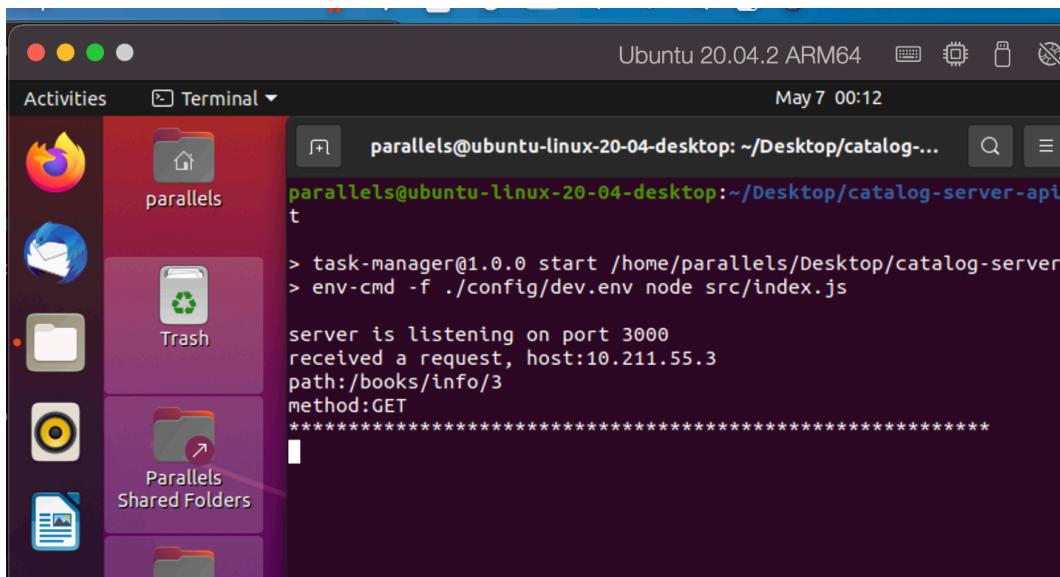
```

1   "_id": "62456419b47f2061eff1c147",
2     "name": " Xen and the Art of Surviving Undergraduate School",
3     "cost": 70,
4     "topic": "undergraduate school",
5     "numberOfItems": 6,
6     "itemNumber": 3
```

Get by id response

```
not in cache  
http://10.211.55.3:3000/books/info/3  
retrieved from db
```

The frontend server didn't find the book in cache



The request this time is sent to catalog server in 10.211.55.3

3- Get a book by id that was fetched before (id =4)

A screenshot of the Postman application interface. The request is a GET to `http://localhost:3002/books/info/4`. The response status is 200 OK, with a response time of 25 ms and a size of 390 B. The response body is displayed in JSON format:

```
1  "_id": "6272f38e9ded3e7a4d23fe87",  
2  "name": "Cooking for the Impatient Undergrad.",  
3  "cost": 15,  
4  "itemNumber": 4,  
5  "topic": "undergraduate school",  
6  "numberOfItems": 1
```

Get by id response

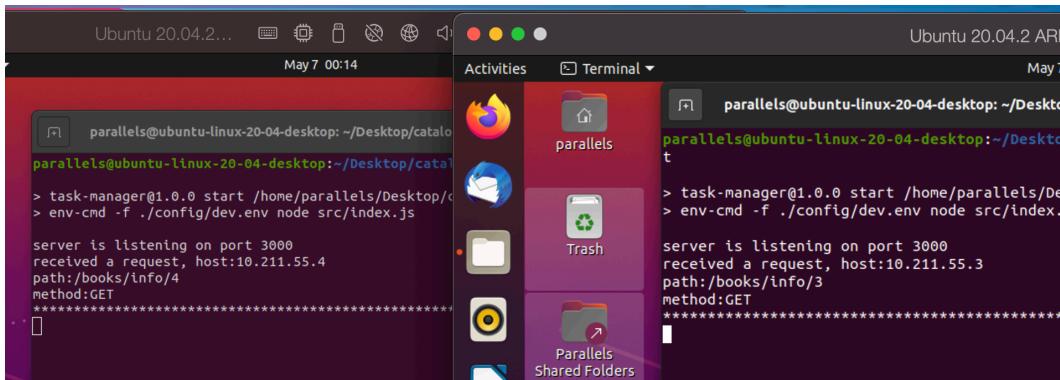
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL

```
(base) hayamikkawi@Hayas-MacBook-Air-2 frontend-server % npm run dev

> frontend-server@1.0.0 dev /Users/hayamikkawi/Desktop/Node/code/frontend-server
> env-cmd -f ./config/dev.env nodemon src/index.js

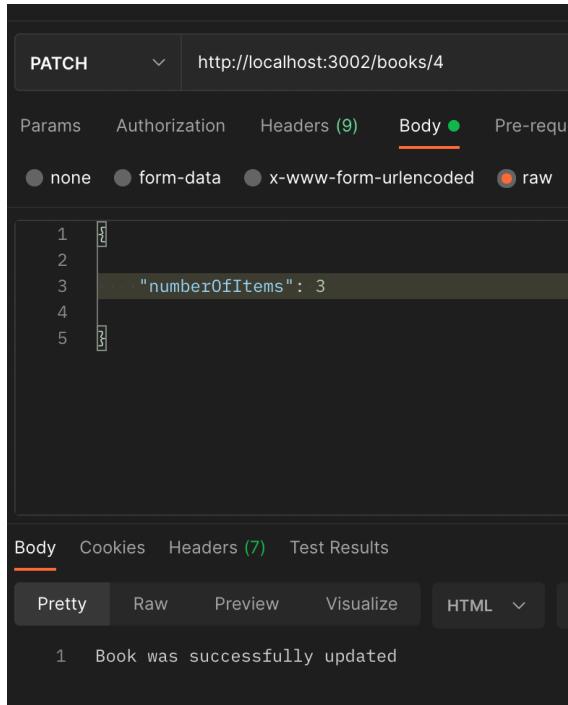
[nodemon] 2.0.15
[nodemon] to restart at any time, enter `rs`
[nodemon] watching path(s): *.*
[nodemon] watching extensions: js,mjs,json
[nodemon] starting `node src/index.js`
Front server is up and running on port:3002
not in cache
http://10.211.55.4:3000/books/info/4
retrieved from db
1
not in cache
http://10.211.55.3:3000/books/info/3
retrieved from db
2
found in cache
```

Frontend server found the book in cache



None of the replicas received any new requests

#### 4- Patch a book's quantity (id =4)



PATCH http://localhost:3002/books/4

Params Authorization Headers (9) Body Pre-request Script

Body (1) none form-data x-www-form-urlencoded raw

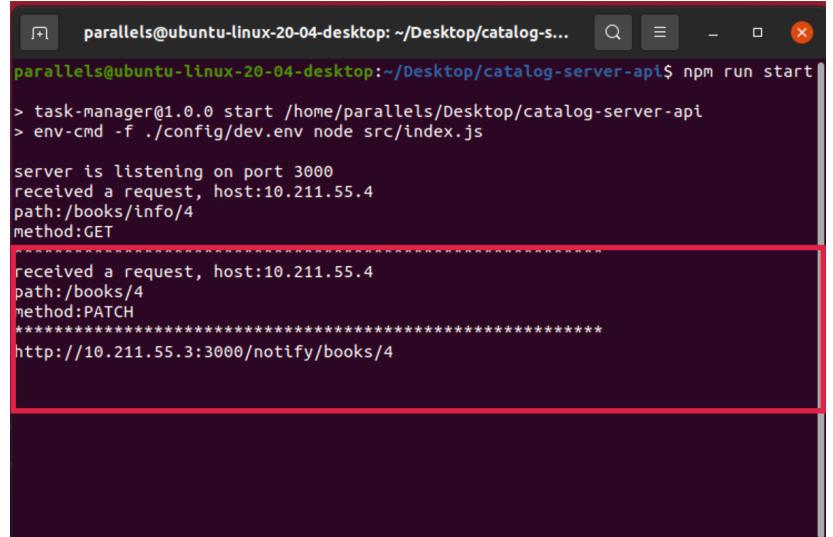
```
1 {  
2   "numberofItems": 3  
3 }  
4  
5 }
```

Body Cookies Headers (7) Test Results

Pretty Raw Preview Visualize HTML

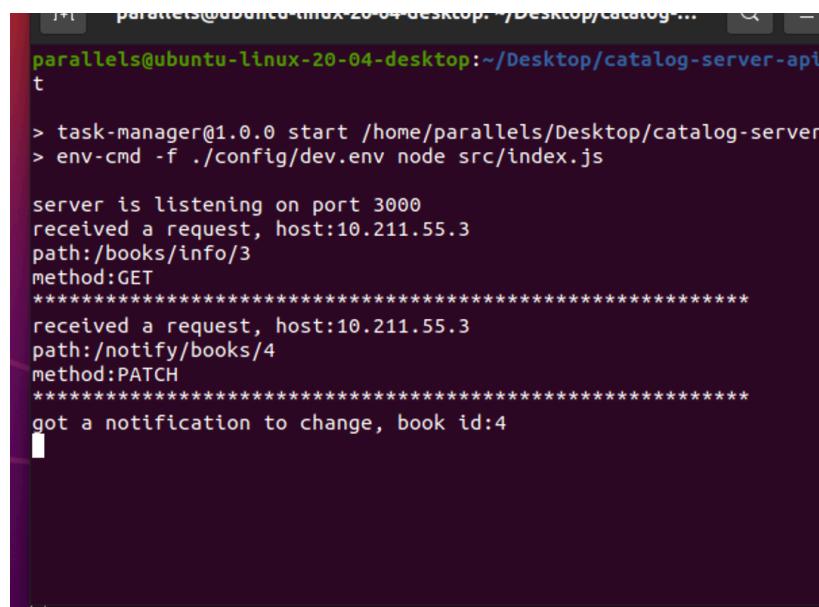
1 Book was successfully updated

Patch response



```
parallels@ubuntu-linux-20-04-desktop:~/Desktop/catalog-s...  
parallels@ubuntu-linux-20-04-desktop:~/Desktop/catalog-server-api$ npm run start  
> task-manager@1.0.0 start /home/parallels/Desktop/catalog-server-api  
> env-cmd -f ./config/dev.env node src/index.js  
  
server is listening on port 3000  
received a request, host:10.211.55.4  
path:/books/info/4  
method:GET  
  
received a request, host:10.211.55.4  
path:/books/4  
method:PATCH  
*****  
http://10.211.55.3:3000/notify/books/4
```

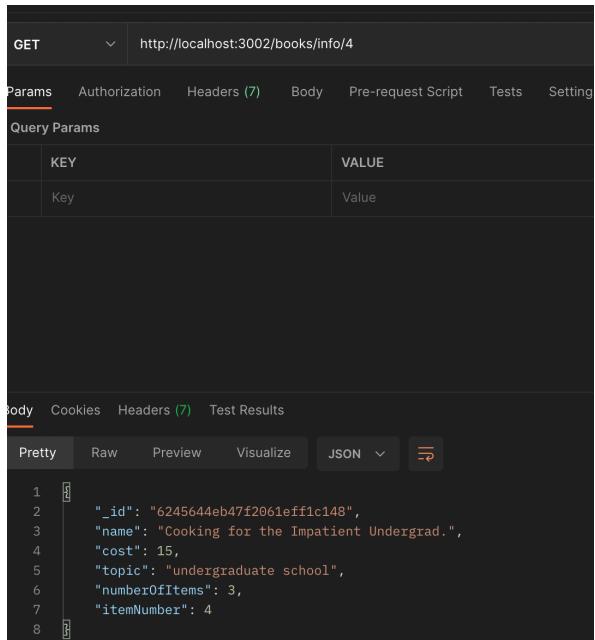
Catalog server on 10.211.55.4 received the request, sent a notification to 10.211.55.3 and sent an invalidate request to the frontend server to delete the book from cache.



```
parallels@ubuntu-linux-20-04-desktop:~/Desktop/catalog-s...  
parallels@ubuntu-linux-20-04-desktop:~/Desktop/catalog-server-api$  
  
> task-manager@1.0.0 start /home/parallels/Desktop/catalog-server-api  
> env-cmd -f ./config/dev.env node src/index.js  
  
server is listening on port 3000  
received a request, host:10.211.55.3  
path:/books/info/3  
method:GET  
*****  
received a request, host:10.211.55.3  
path:/notify/books/4  
method:PATCH  
*****  
got a notification to change, book id:4
```

Catalog server on 10.211.55.3 received a notification from 10.211.55.4

5- Get by id a book that existed in the cache but then was modified (deleted from cache (id =4)



```
parallels@ubuntu-linux-20-04-desktop:~/Desktop/catalog-server-api t

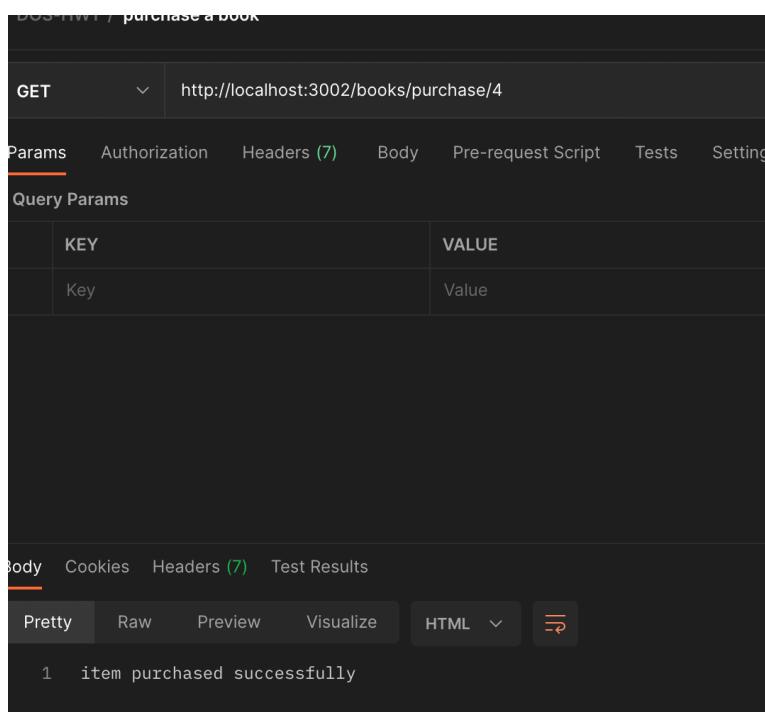
> task-manager@1.0.0 start /home/parallels/Desktop/catalog-server
> env-cmd -f ./config/dev.env node src/index.js

server is listening on port 3000
received a request, host:10.211.55.3
path:/books/info/3
method:GET
*****
received a request, host:10.211.55.3
path:/notify/books/4
method:PATCH
*****
got a notification to change, book id:4
received a request, host:10.211.55.3
path:/books/info/4
method:GET
*****
```

Get by id response

Catalog server on 10.211.55.3 received the get request

6- Purchase a book (id =4)



```
1 item purchased successfully
```

Purchase a book response

```

> task-manager@1.0.0 start /home/parallels/Desktop/order-server-api
> env-cmd -f ./config/dev.env node src/index.js

server is listening on port 3000
received a request, host:10.211.55.4
path:/books/info/4
method:GET
*****
received a request, host:10.211.55.4
path:/books/4
method:PATCH

2 http://10.211.55.3:3000/notify/books/4
received a request, host:localhost
path:/books/info/4
method:GET
*****
received a request, host:localhost
path:/books/4
method:PATCH

3 http://10.211.55.3:3000/notify/books/4
[+]
parallels@ubuntu-linux-20-04-desktop: ~/Desktop/order-ser...
parallels@ubuntu-linux-20-04-desktop: ~/Desktop/order-server-api$ npm run start

> task-manager@1.0.0 start /home/parallels/Desktop/order-server-api
> env-cmd -f ./config/dev.env node src/index.js

server is listening
1 received a request, host:10.211.55.4
path:/books/purchase/4
method:GET
*****
{ msg: 'available', count: 3 }
item purchased successfully

```

- 1- The order server received the purchase request.
- 2- The catalog server received a get and a patch request from the local order server
- 3- the catalog server sent a request to notify the other replica

```

May 7 00:17
[+]
parallels@ubuntu-linux-20-04-desktop: ~/Desktop/catalog-...
parallels@ubuntu-linux-20-04-desktop: ~/Desktop/catalog-server$ npm run start

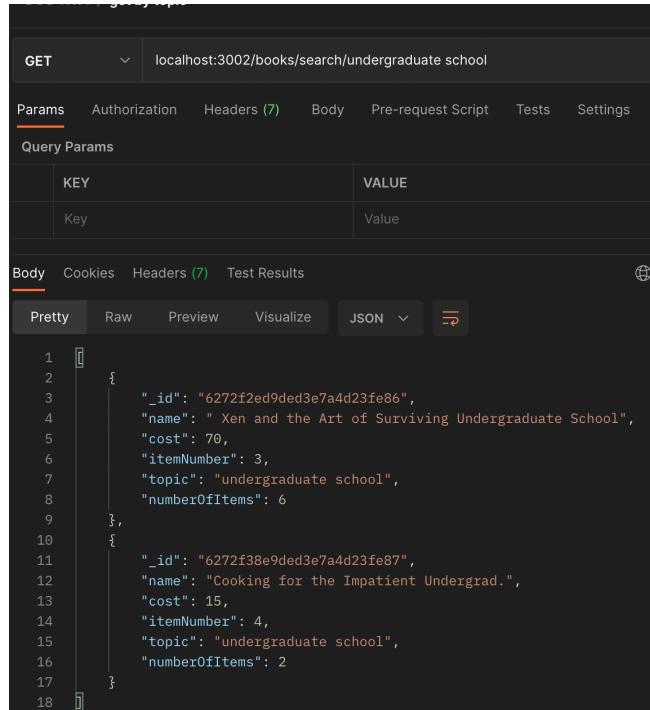
> task-manager@1.0.0 start /home/parallels/Desktop/catalog-server
> env-cmd -f ./config/dev.env node src/index.js

server is listening on port 3000
received a request, host:10.211.55.3
path:/books/info/3
method:GET
*****
received a request, host:10.211.55.3
path:/notify/books/4
method:PATCH
*****
got a notification to change, book id:4
received a request, host:10.211.55.3
path:/books/info/4
method:GET
*****
received a request, host:10.211.55.3
path:/notify/books/4
method:PATCH
*****
got a notification to change, book id:4

```

The catalog server on 10.211.55.3 received a notification to patch

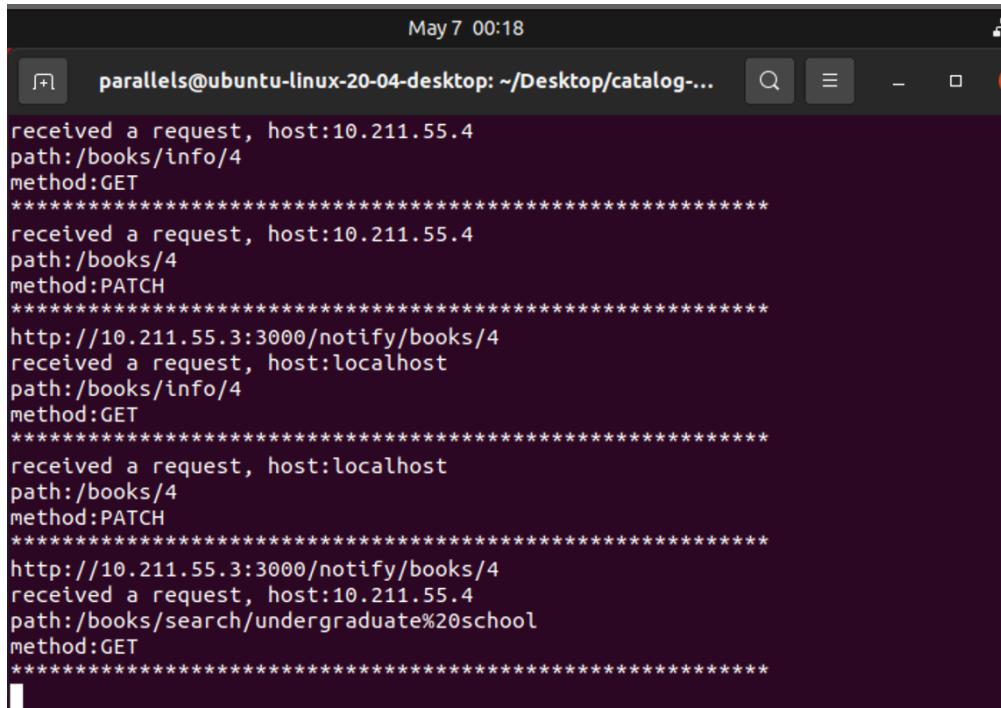
## 7- Get books by topic



The screenshot shows a Postman interface with a GET request to `localhost:3002/books/search/undergraduate school`. The response body is displayed in JSON format, showing two book documents:

```
1 [ { 2   "_id": "6272f2ed9ded3e7a4d23fe86", 3   "name": "Xen and the Art of Surviving Undergraduate School", 4   "cost": 70, 5   "itemNumber": 3, 6   "topic": "undergraduate school", 7   "numberOfItems": 6 8 }, 9 { 10   "_id": "6272f38e9ded3e7a4d23fe87", 11   "name": "Cooking for the Impatient Undergrad.", 12   "cost": 15, 13   "itemNumber": 4, 14   "topic": "undergraduate school", 15   "numberOfItems": 2 16 } 17 ] 18
```

Get by topic response



```
May 7 00:18
parallels@ubuntu-linux-20-04-desktop: ~/Desktop/catalog-...
received a request, host:10.211.55.4
path:/books/info/4
method:GET
*****
received a request, host:10.211.55.4
path:/books/4
method:PATCH
*****
http://10.211.55.3:3000/notify/books/4
received a request, host:localhost
path:/books/info/4
method:GET
*****
received a request, host:localhost
path:/books/4
method:PATCH
*****
http://10.211.55.3:3000/notify/books/4
received a request, host:10.211.55.4
path:/books/search/undergraduate%20school
method:GET
*****
```

Catalog server on 10.211.55.4 received get request