HTML에서 웹앱까지

11주차_03

한동대학교
김군오 교수

학습 목표:
nodejs를 ec2에 설치 및 PM2로 관리하기

학습내용:

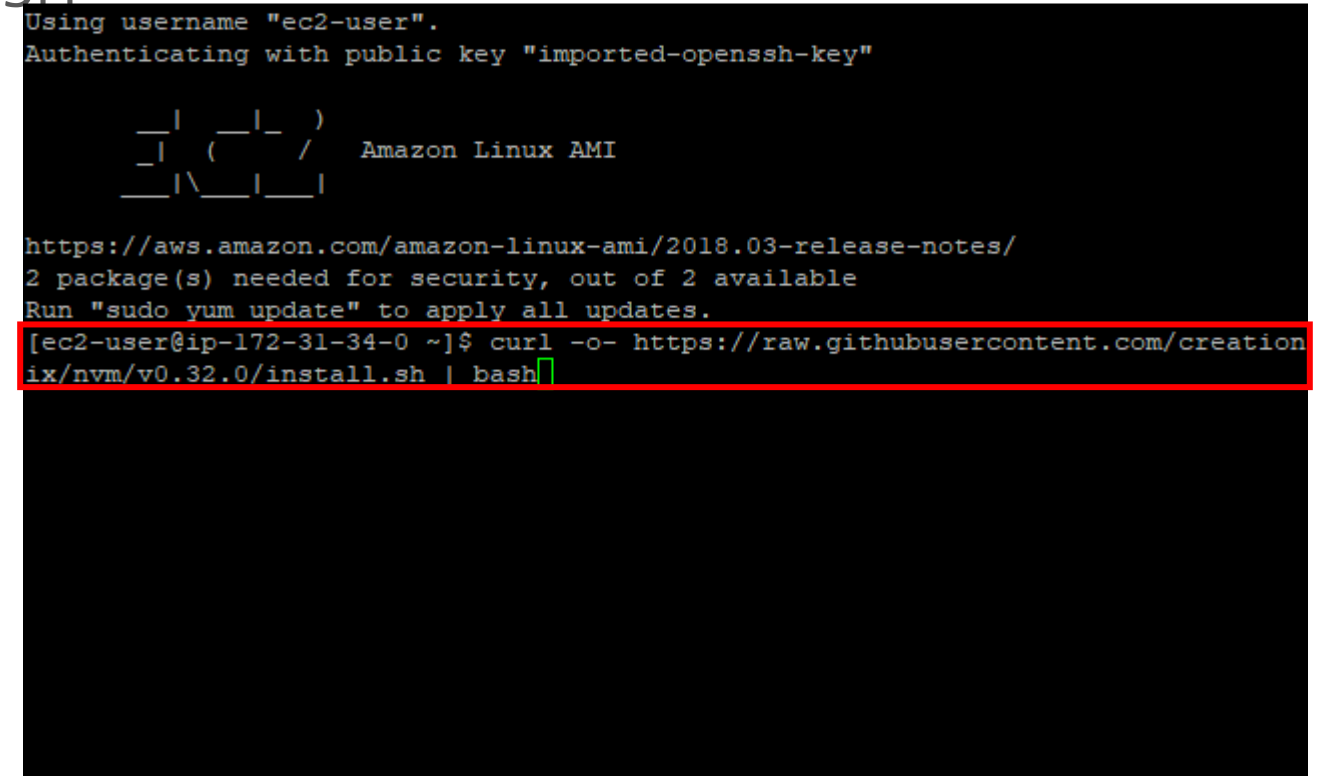
- EC2 서버에 nodejs 설치
- 도서 관리 프로그램 만들기
- PM2 로 NodeJS 앱 관리하기

EC2에 NodeJS 설치

- 프로젝트를 서버에 배포해 실행하려면 서버에도 NodeJS 가 필요함
- AWS 의 공식 문서에서는 EC2에 NodeJS 를 설치할 때 노드 버전 관리자(NVM) 이용을 추천

노드 버전관리자(NVM) 설치

- curl -o- https://raw.githubusercontent.com/creationix/nvm/v0.32.0/install.sh | bash



```
Using username "ec2-user".
Authenticating with public key "imported-openssh-key"

       __|  __|_  )
       _|  (     /   Amazon Linux AMI
      ___|\___|___|

https://aws.amazon.com/amazon-linux-ami/2018.03-release-notes/
2 package(s) needed for security, out of 2 available
Run "sudo yum update" to apply all updates.
[ec2-user@ip-172-31-34-0 ~]$ curl -o- https://raw.githubusercontent.com/creation
ix/nvm/v0.32.0/install.sh | bash
```

노드 버전관리자(NVM) 설치

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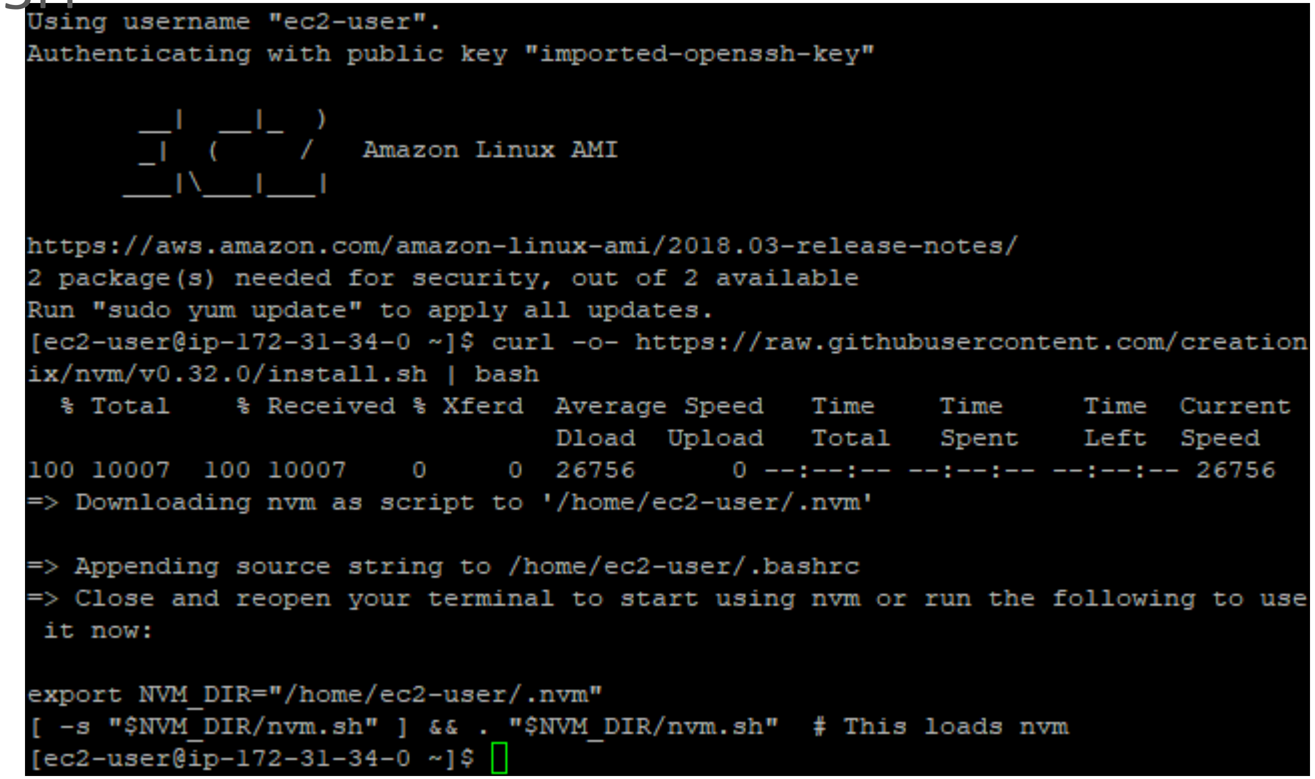

```
Using username "ec2-user".
Authenticating with public key "imported-openssh-key"

       __|  __|_  )
       _|  (     /   Amazon Linux AMI
      ___|\___|___|

https://aws.amazon.com/amazon-linux-ami/2018.03-release-notes/
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Run "sudo yum update" to apply all updates.
[ec2-user@ip-172-31-34-0 ~]$ curl -o- https://raw.githubusercontent.com/creation
ix/nvm/v0.32.0/install.sh | bash
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 10007  100 10007    0     0  26756      0 --:--:-- --:--:-- --:--:-- 26756
=> Downloading nvm as script to '/home/ec2-user/.nvm'

=> Appending source string to /home/ec2-user/.bashrc
=> Close and reopen your terminal to start using nvm or run the following to use
 it now:

export NVM_DIR="/home/ec2-user/.nvm"
[ -s "$NVM_DIR/nvm.sh" ] && . "$NVM_DIR/nvm.sh"  # This loads nvm
[ec2-user@ip-172-31-34-0 ~]$
```
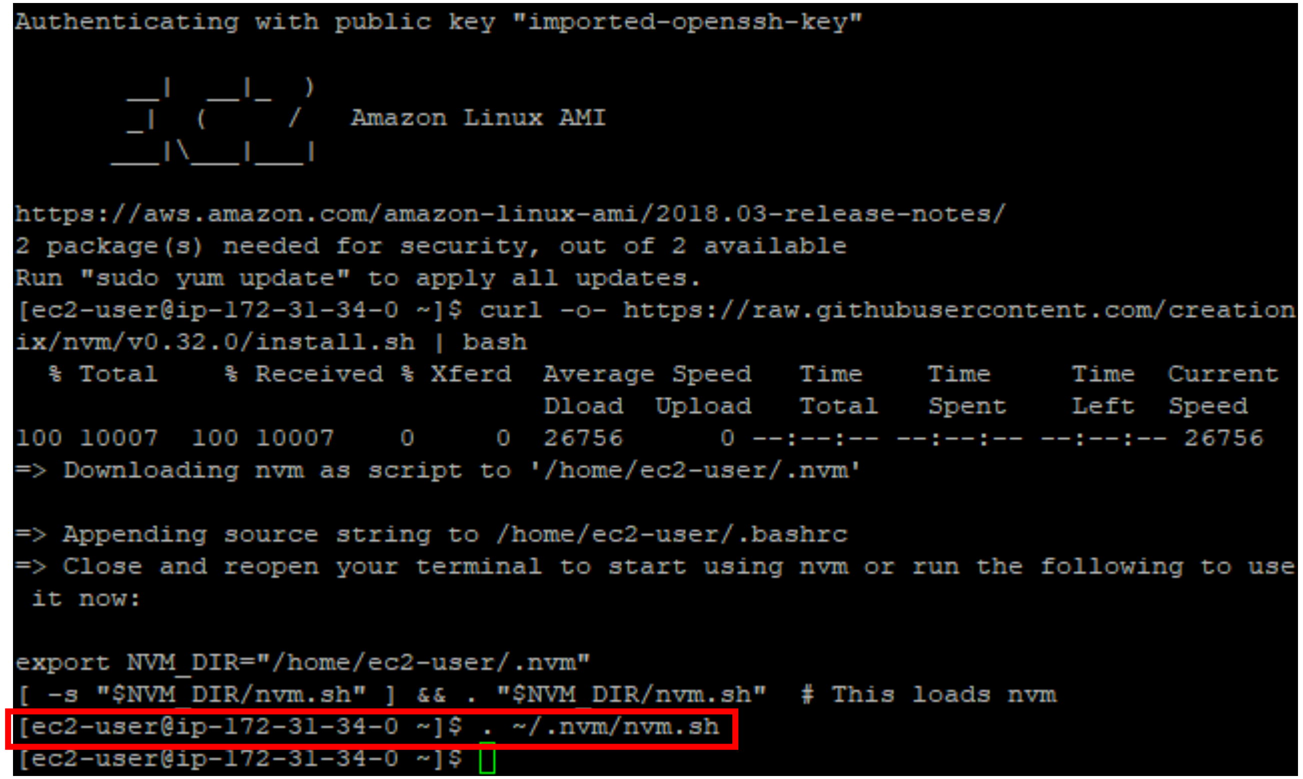

노드 버전관리자(NVM) 실행

- . ~/.nvm/nvm.sh



```
Authenticating with public key "imported-openssh-key"

       __|  __|_  )
       _|  (     /   Amazon Linux AMI
      ___|\___|___|

https://aws.amazon.com/amazon-linux-ami/2018.03-release-notes/
2 package(s) needed for security, out of 2 available
Run "sudo yum update" to apply all updates.
[ec2-user@ip-172-31-34-0 ~]$ curl -o- https://raw.githubusercontent.com/creation
ix/nvm/v0.32.0/install.sh | bash
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 10007  100 10007    0     0  26756      0 --:--:-- --:--:-- --:--:-- 26756
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 it now:

export NVM_DIR="/home/ec2-user/.nvm"
[ -s "$NVM_DIR/nvm.sh" ] && . "$NVM_DIR/nvm.sh"  # This loads nvm
[ec2-user@ip-172-31-34-0 ~]$ . ~/.nvm/nvm.sh
[ec2-user@ip-172-31-34-0 ~]$
```
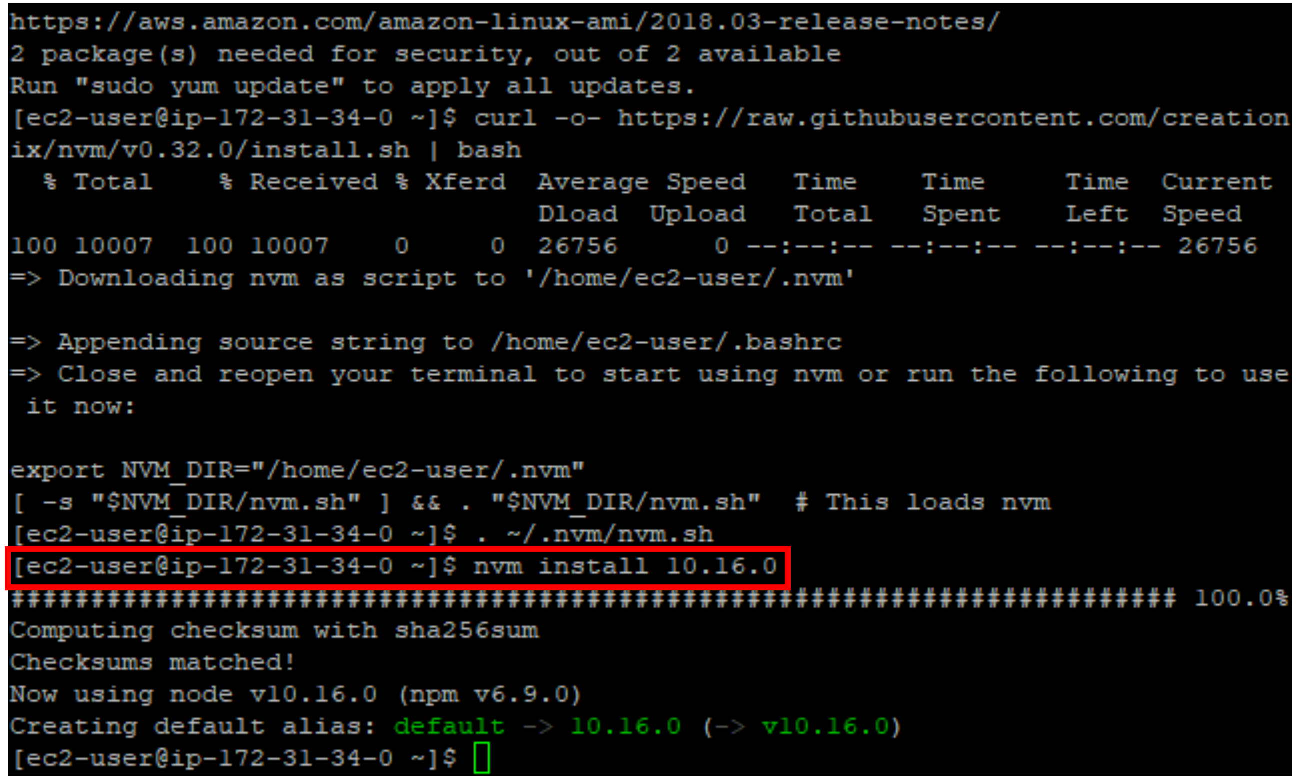

NodeJS 설치

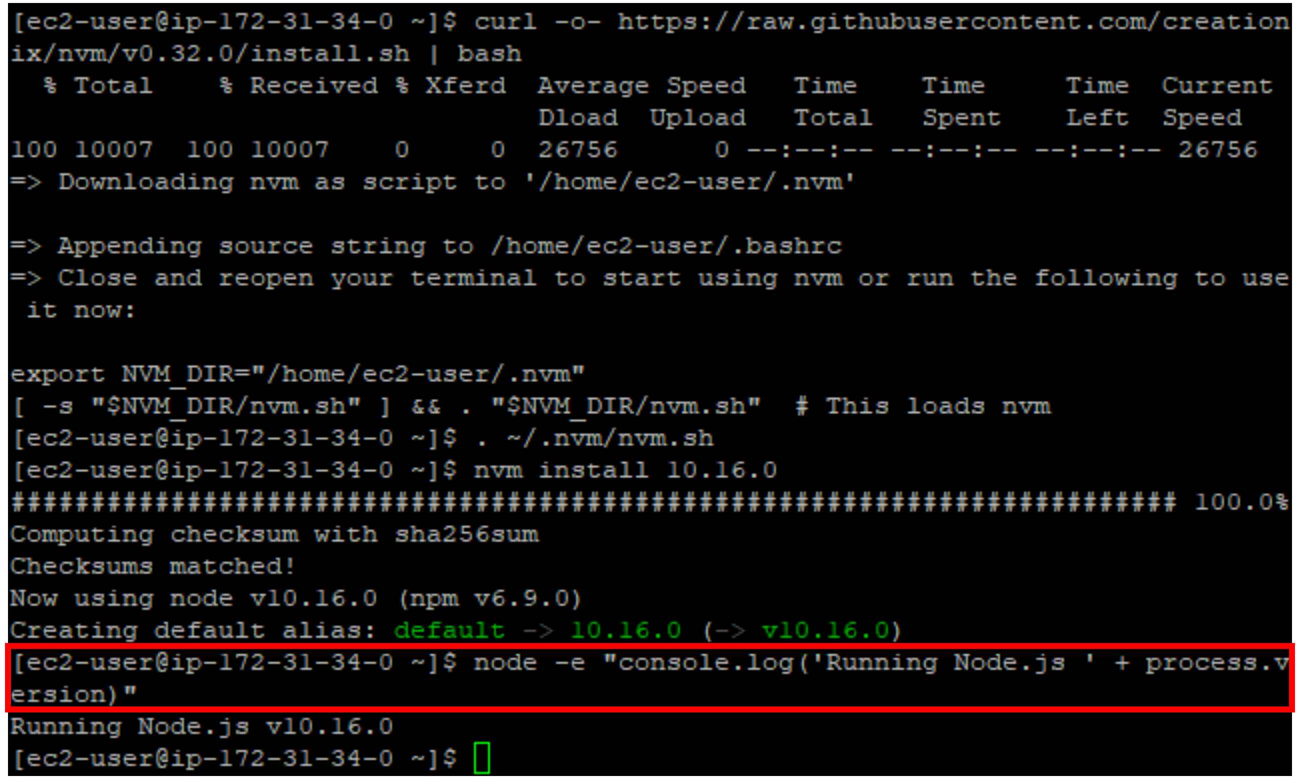
- nvm install 10.16.0
- 10.16.0. 대신 원하는 버전을 입력할 수 있음



```
https://aws.amazon.com/amazon-linux-ami/2018.03-release-notes/
2 package(s) needed for security, out of 2 available
Run "sudo yum update" to apply all updates.
[ec2-user@ip-172-31-34-0 ~]$ curl -o- https://raw.githubusercontent.com/creation
ix/nvm/v0.32.0/install.sh | bash
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 10007  100 10007    0     0  26756      0 --:--:-- --:--:-- --:--:-- 26756
=> Downloading nvm as script to '/home/ec2-user/.nvm'

=> Appending source string to /home/ec2-user/.bashrc
=> Close and reopen your terminal to start using nvm or run the following to use
 it now:

export NVM_DIR="/home/ec2-user/.nvm"
[ -s "$NVM_DIR/nvm.sh" ] && . "$NVM_DIR/nvm.sh"  # This loads nvm
[ec2-user@ip-172-31-34-0 ~]$ . ~/.nvm/nvm.sh
[ec2-user@ip-172-31-34-0 ~]$ nvm install 10.16.0
######################################################################### 100.0%
Computing checksum with sha256sum
Checksums matched!
Now using node v10.16.0 (npm v6.9.0)
Creating default alias: default -> 10.16.0 (-> v10.16.0)
[ec2-user@ip-172-31-34-0 ~]$
```

노드 설치 확인

- node -e "console.log('Running Node.js ' + process.version)"



```
[ec2-user@ip-172-31-34-0 ~]$ curl -o- https://raw.githubusercontent.com/creation
ix/nvm/v0.32.0/install.sh | bash
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 10007  100 10007    0     0  26756      0 --:--:-- --:--:-- --:--:-- 26756
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=> Appending source string to /home/ec2-user/.bashrc
=> Close and reopen your terminal to start using nvm or run the following to use
 it now:

export NVM_DIR="/home/ec2-user/.nvm"
[ -s "$NVM_DIR/nvm.sh" ] && . "$NVM_DIR/nvm.sh"  # This loads nvm
[ec2-user@ip-172-31-34-0 ~]$ . ~/.nvm/nvm.sh
[ec2-user@ip-172-31-34-0 ~]$ nvm install 10.16.0
######################################################################## 100.0%
Computing checksum with sha256sum
Checksums matched!
Now using node v10.16.0 (npm v6.9.0)
Creating default alias: default -> 10.16.0 (-> v10.16.0)
[ec2-user@ip-172-31-34-0 ~]$ node -e "console.log('Running Node.js ' + process.v
ersion)"
Running Node.js v10.16.0
[ec2-user@ip-172-31-34-0 ~]$
```
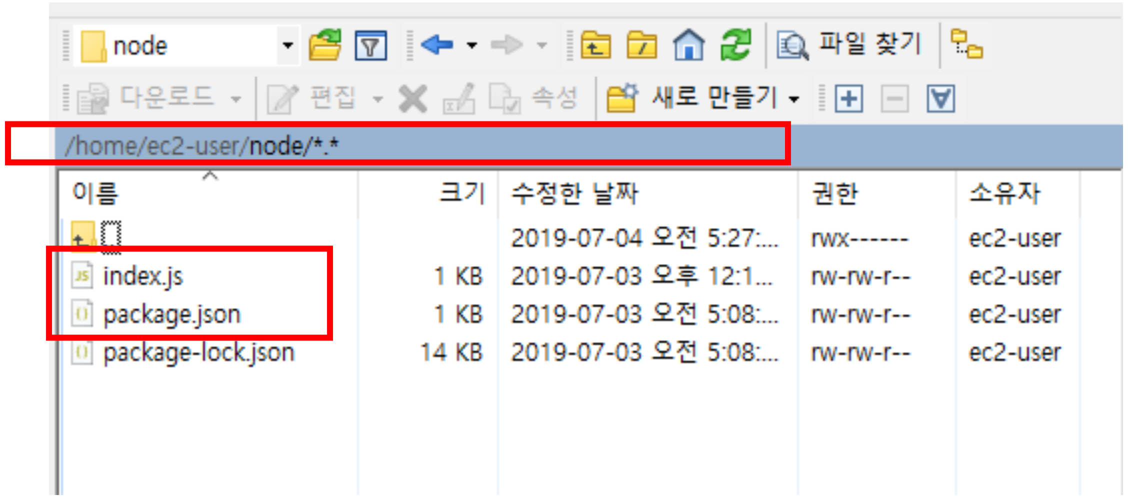
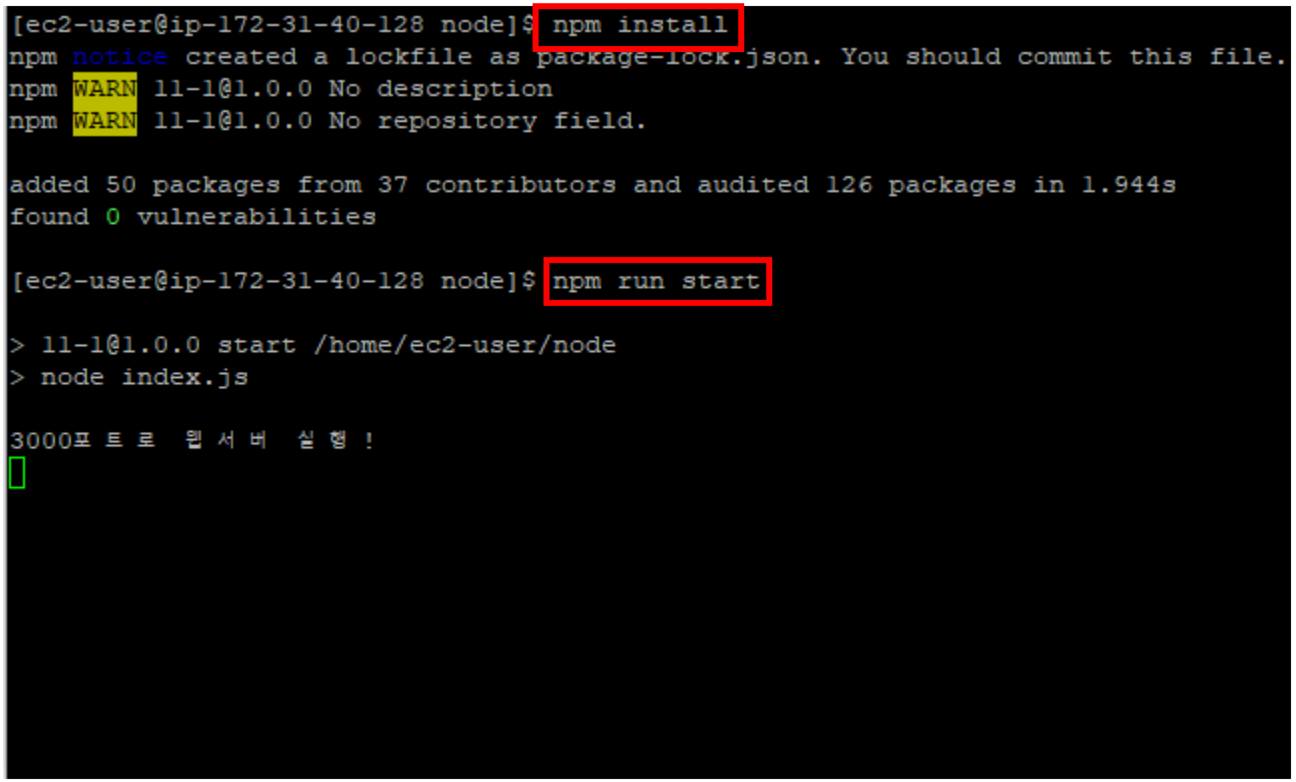

앱 업로드 및 실행



/home/ec2-user/node/*.*

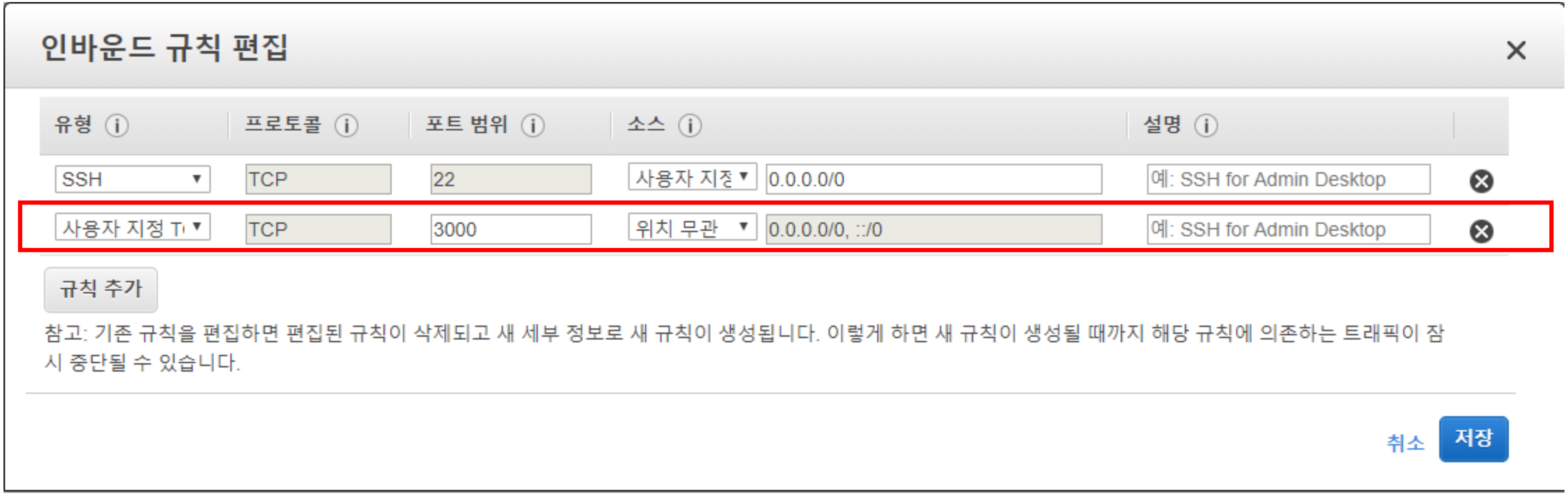
이름	크기	수정한 날짜	권한	소유자
		2019-07-04 오전 5:27:...	rwx------	ec2-user
index.js	1 KB	2019-07-03 오후 12:1...	rw-rw-r--	ec2-user
package.json	1 KB	2019-07-03 오전 5:08:...	rw-rw-r--	ec2-user
package-lock.json	14 KB	2019-07-03 오전 5:08:...	rw-rw-r--	ec2-user

앱 업로드 및 실행



```
[ec2-user@ip-172-31-40-128 node]$ npm install
npm notice created a lockfile as package-lock.json. You should commit this file.
npm WARN 11-1@1.0.0 No description
npm WARN 11-1@1.0.0 No repository field.

added 50 packages from 37 contributors and audited 126 packages in 1.944s
found 0 vulnerabilities

[ec2-user@ip-172-31-40-128 node]$ npm run start

> 11-1@1.0.0 start /home/ec2-user/node
> node index.js

3000포트로 웹서버 실행!
```

앱 업로드 및 실행



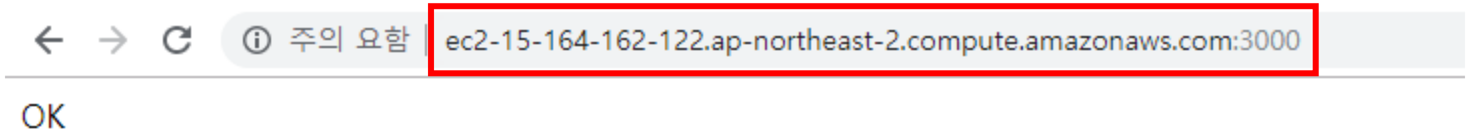
인바운드 규칙 편집

유형	프로토콜	포트 범위	소스		설명
SSH	TCP	22	사용자 지정	0.0.0.0/0	예: SSH for Admin Desktop
사용자 지정 T	TCP	3000	위치 무관	0.0.0.0/0, ::/0	예: SSH for Admin Desktop

참고: 기존 규칙을 편집하면 편집된 규칙이 삭제되고 새 세부 정보로 새 규칙이 생성됩니다. 이렇게 하면 새 규칙이 생성될 때까지 해당 규칙에 의존하는 트래픽이 잠시 중단될 수 있습니다.

앱 업로드 및 실행

Http://ec2_인스턴스_IP주소:3000 접속해도 가능



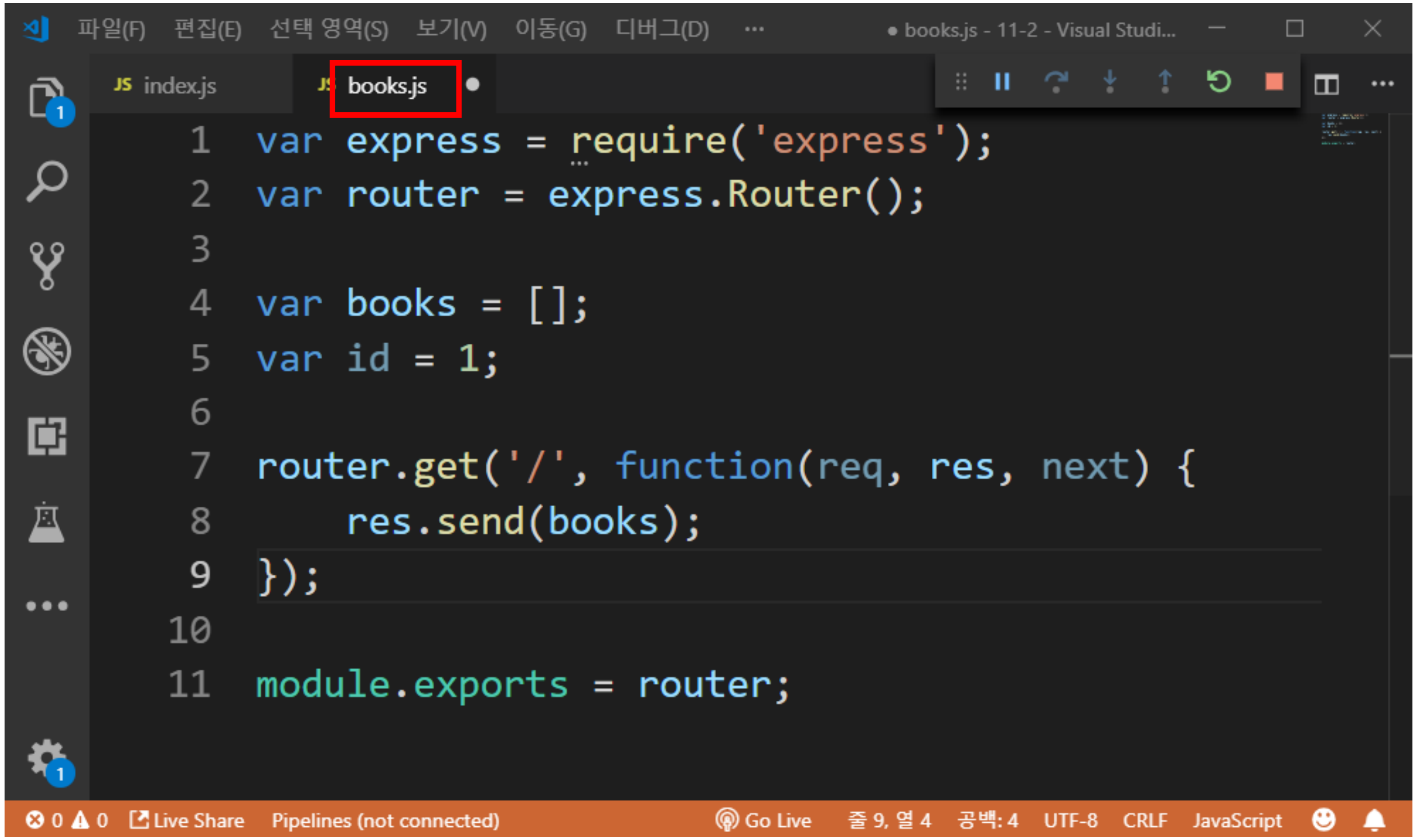
ec2-15-164-162-122.ap-northeast-2.compute.amazonaws.com:3000

OK

도서 관리 프로그램 만들기

- 도서를 자바스크립트 배열로 관리
- 도서의 속성에는 아이디, 제목, 저자가 있음
- 도서의 조회, 등록, 수정, 삭제 API 지원

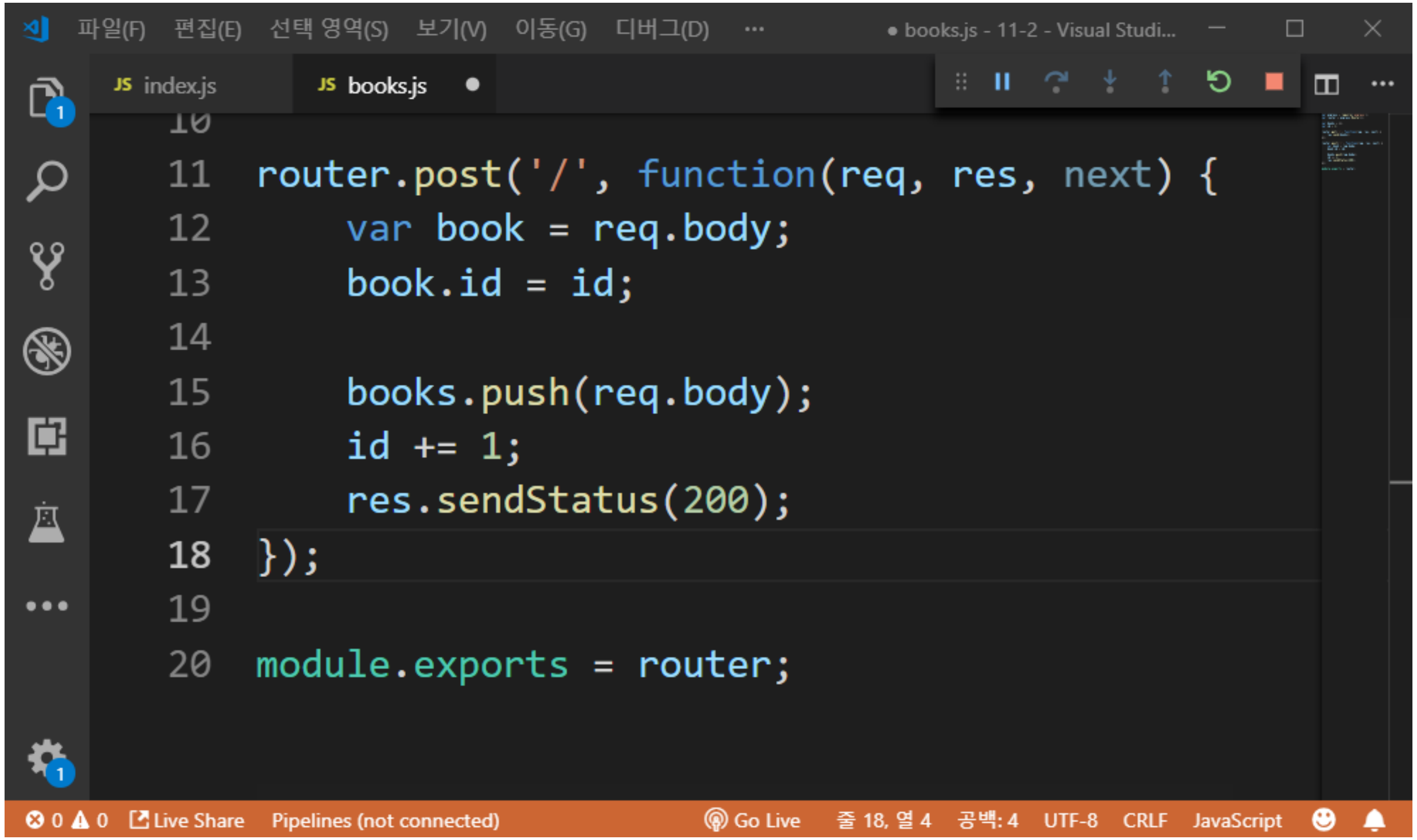
도서 관리 프로그램 만들기



파일(F) 편집(E) 선택 영역(S) 보기(V) 이동(G) 디버그(D) ···
● books.js - 11-2 - Visual Studi...
index.js
books.js
0 0 Live Share Pipelines (not connected)
Go Live 줄 9, 열 4 공백: 4 UTF-8 CRLF JavaScript

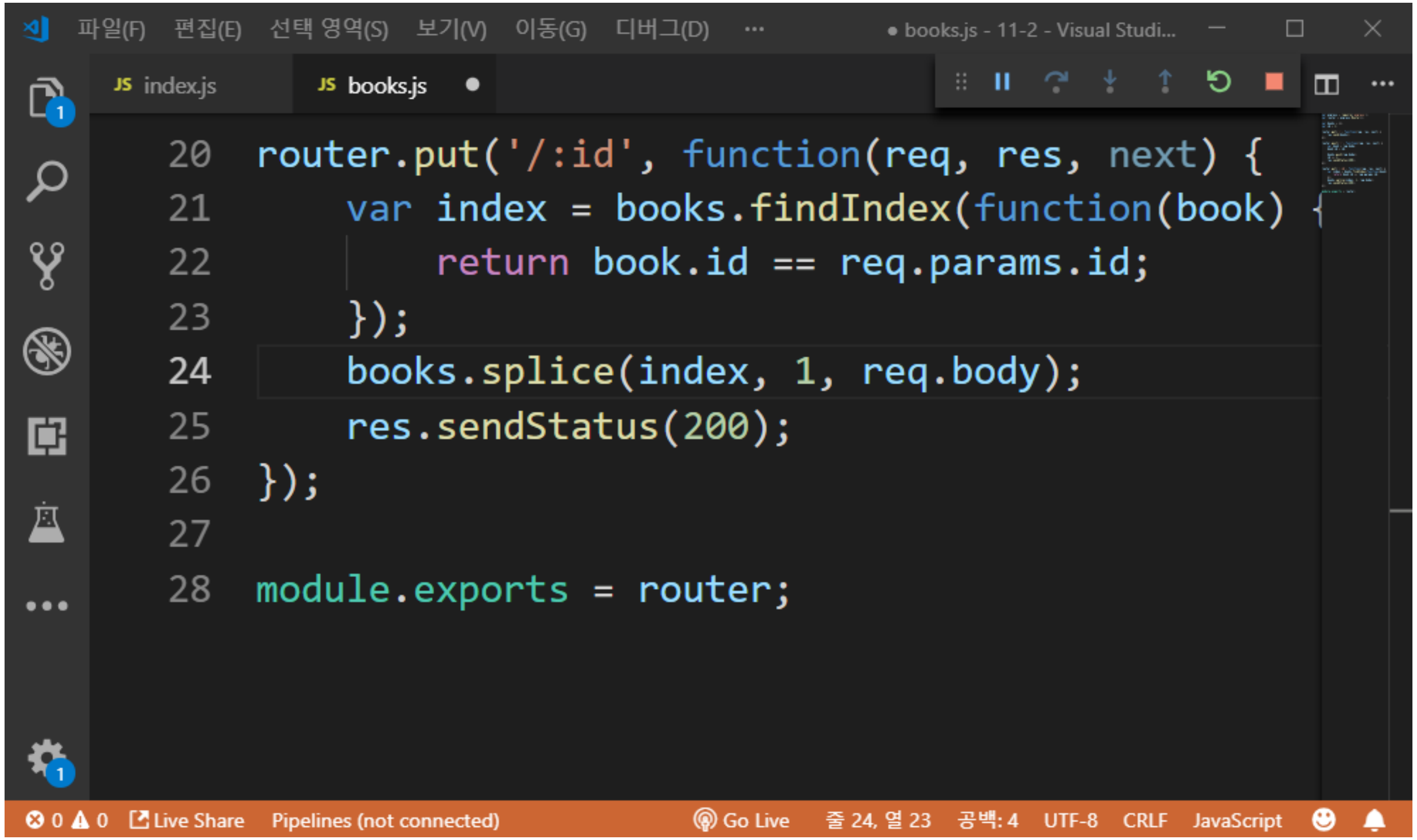
```
var express = require('express');
var router = express.Router();

var books = [];
var id = 1;

router.get('/', function(req, res, next) {
    res.send(books);
});

module.exports = router;
```

도서 관리 프로그램 만들기



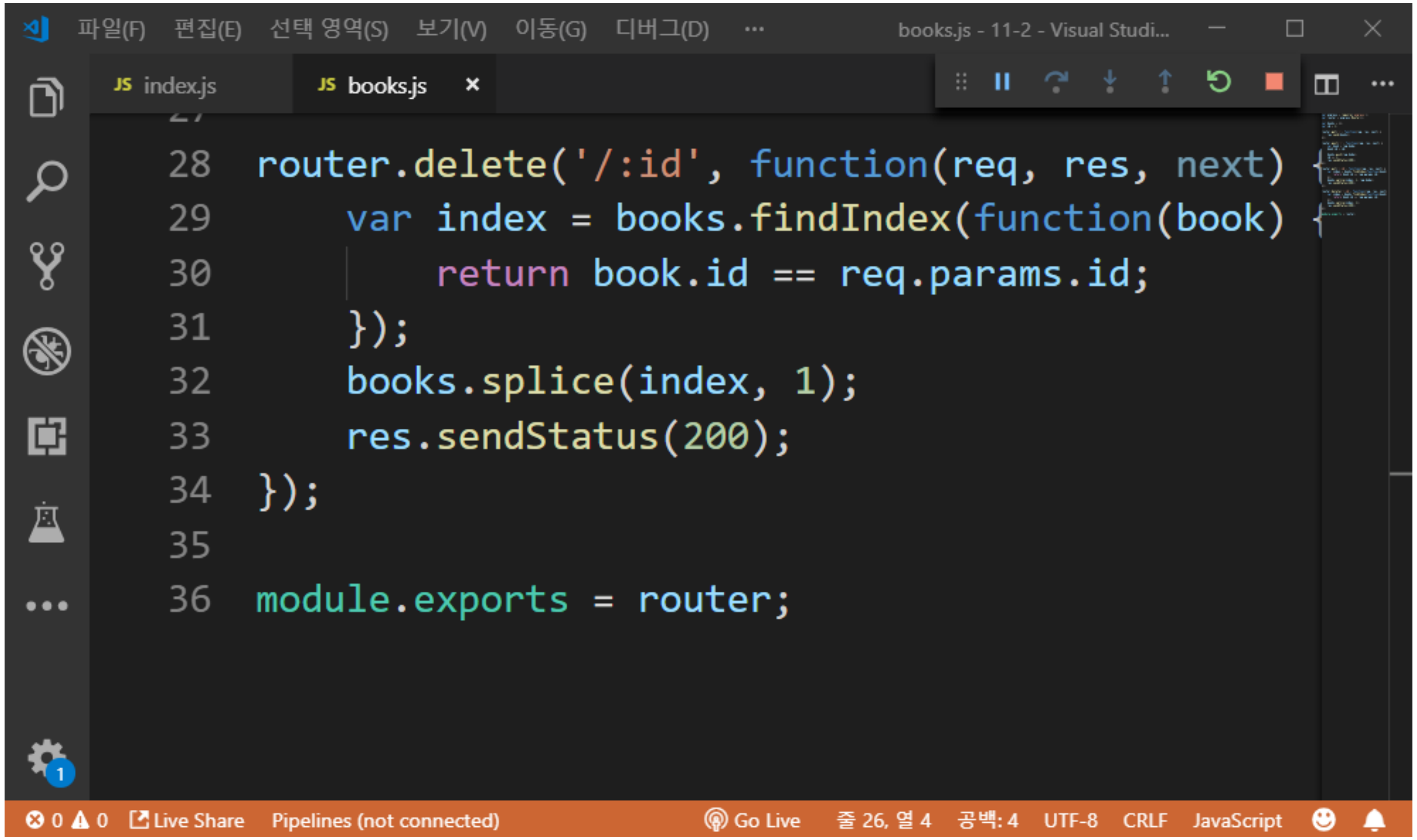
```
router.post('/', function(req, res, next) {
    var book = req.body;
    book.id = id;

    books.push(req.body);
    id += 1;
    res.sendStatus(200);
});

module.exports = router;
```

도서 관리 프로그램 만들기


파일(F) 편집(E) 선택 영역(S) 보기(V) 이동(G) 디버그(D) ···
● books.js - 11-2 - Visual Studi...
index.js
books.js
⊗ 0 ⚠ 0 Live Share Pipelines (not connected) Go Live 줄 24, 열 23 공백: 4 UTF-8 CRLF JavaScript

```javascript
router.put('/:id', function(req, res, next) {
    var index = books.findIndex(function(book) {
        return book.id == req.params.id;
    });
    books.splice(index, 1, req.body);
    res.sendStatus(200);
});

module.exports = router;
```

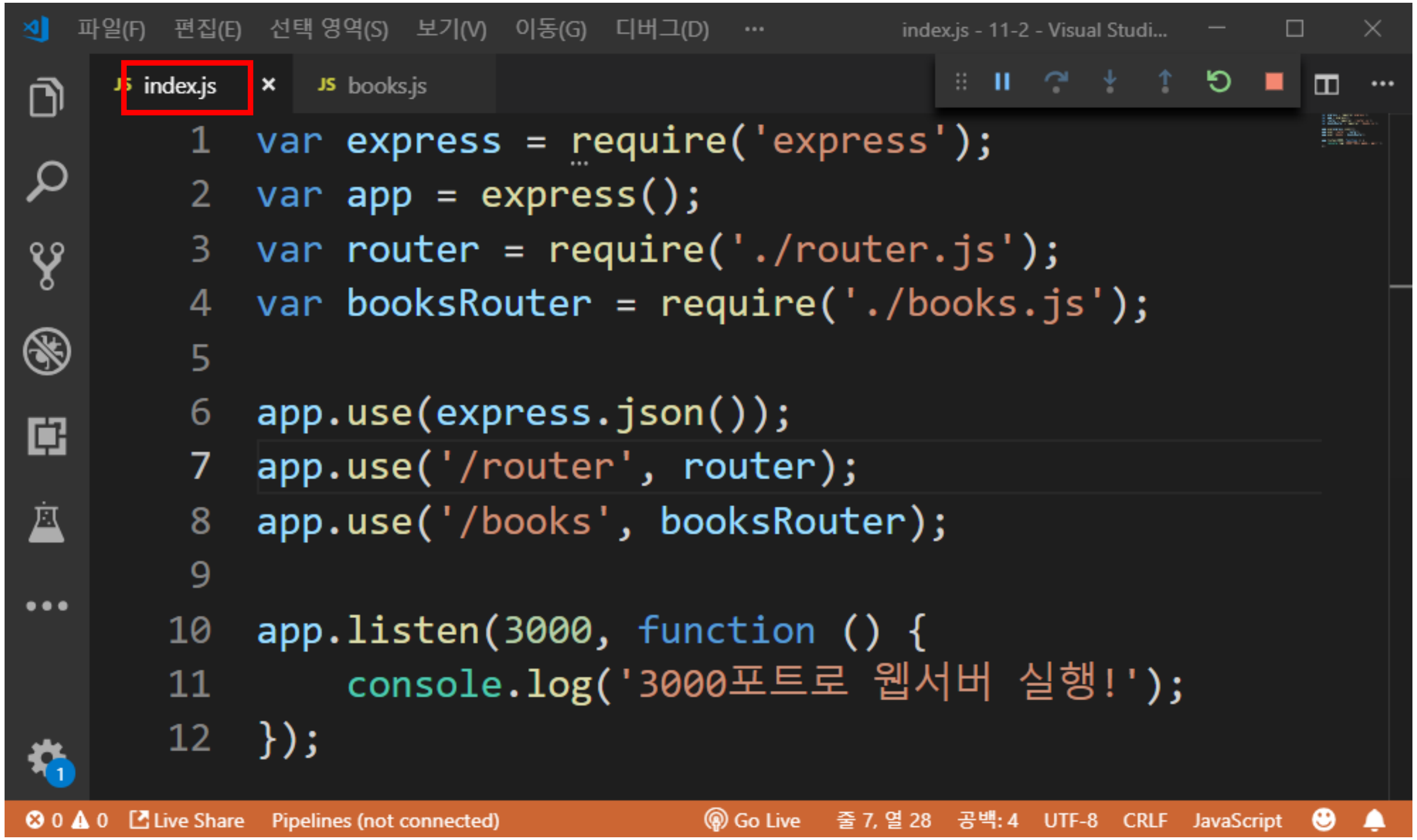
도서 관리 프로그램 만들기



파일(F) 편집(E) 선택 영역(S) 보기(V) 이동(G) 디버그(D) ···
books.js - 11-2 - Visual Studi...
index.js
books.js ×
⊗ 0 ⚠ 0 Live Share Pipelines (not connected)
Go Live 줄 26, 열 4 공백: 4 UTF-8 CRLF JavaScript

```javascript
router.delete('/:id', function(req, res, next) {
    var index = books.findIndex(function(book) {
        return book.id == req.params.id;
    });
    books.splice(index, 1);
    res.sendStatus(200);
});

module.exports = router;
```

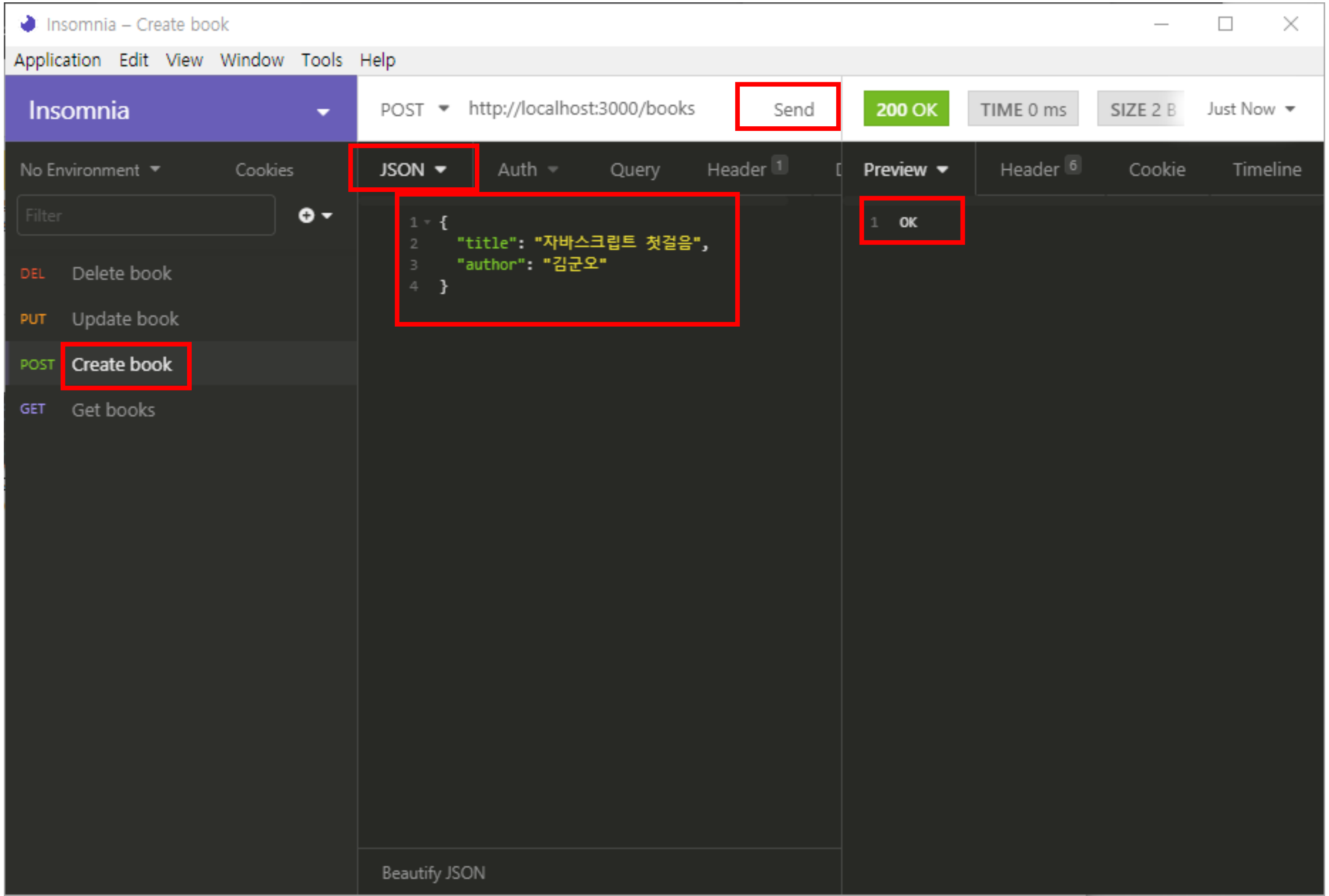
도서 관리 프로그램 만들기



파일(F) 편집(E) 선택 영역(S) 보기(V) 이동(G) 디버그(D) ···
index.js - 11-2 - Visual Studi...
index.js
books.js
0 0 Live Share Pipelines (not connected) Go Live 줄 7, 열 28 공백: 4 UTF-8 CRLF JavaScript

```
var express = require('express');
var app = express();
var router = require('./router.js');
var booksRouter = require('./books.js');

app.use(express.json());
app.use('/router', router);
app.use('/books', booksRouter);

app.listen(3000, function () {
    console.log('3000포트로 웹서버 실행!');
});
```

도서 관리 API 테스트



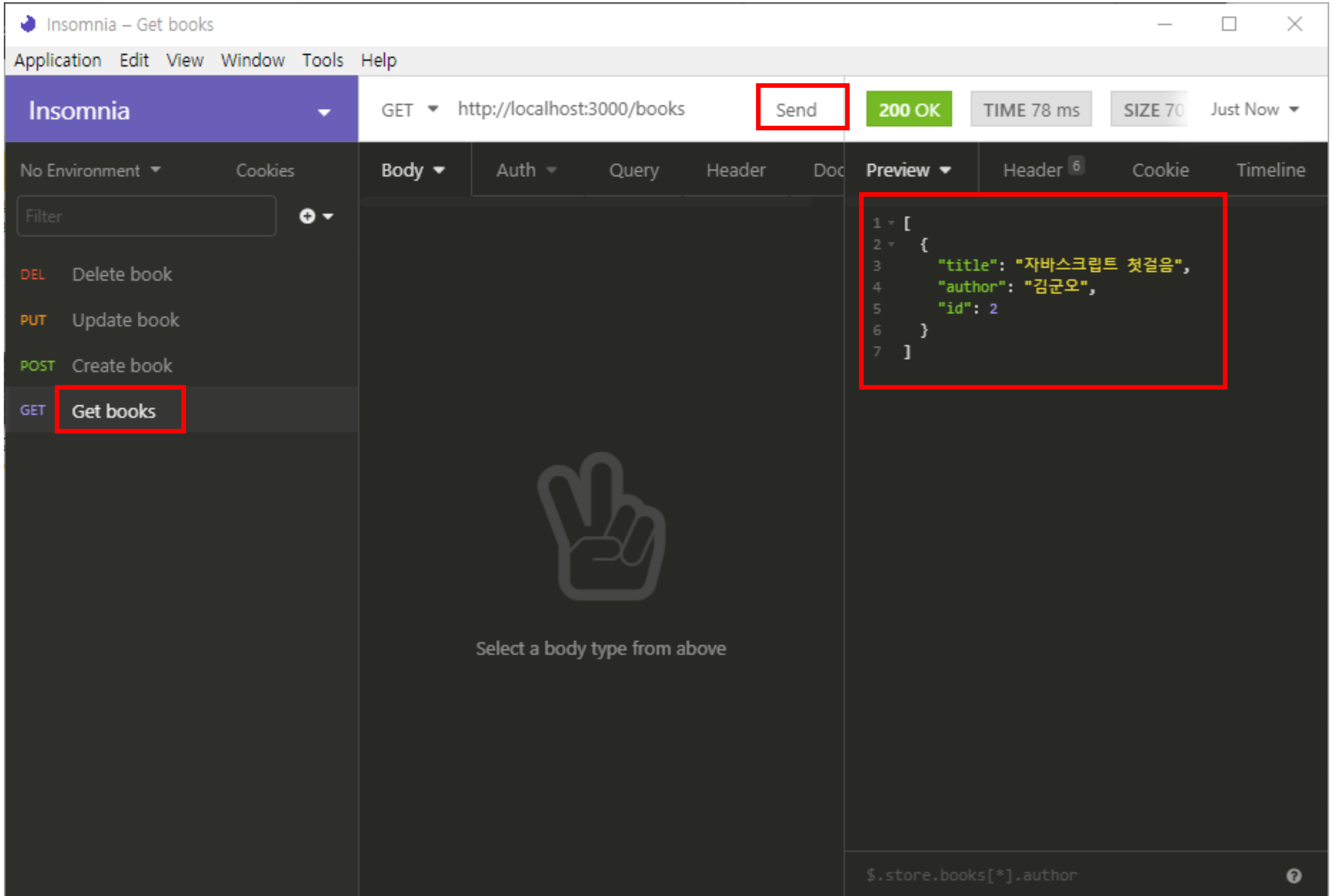
POST http://localhost:3000/books

200 OK TIME 0 ms SIZE 2 B

```
{
  "title": "자바스크립트 첫걸음",
  "author": "김군오"
}
```

```
OK
```

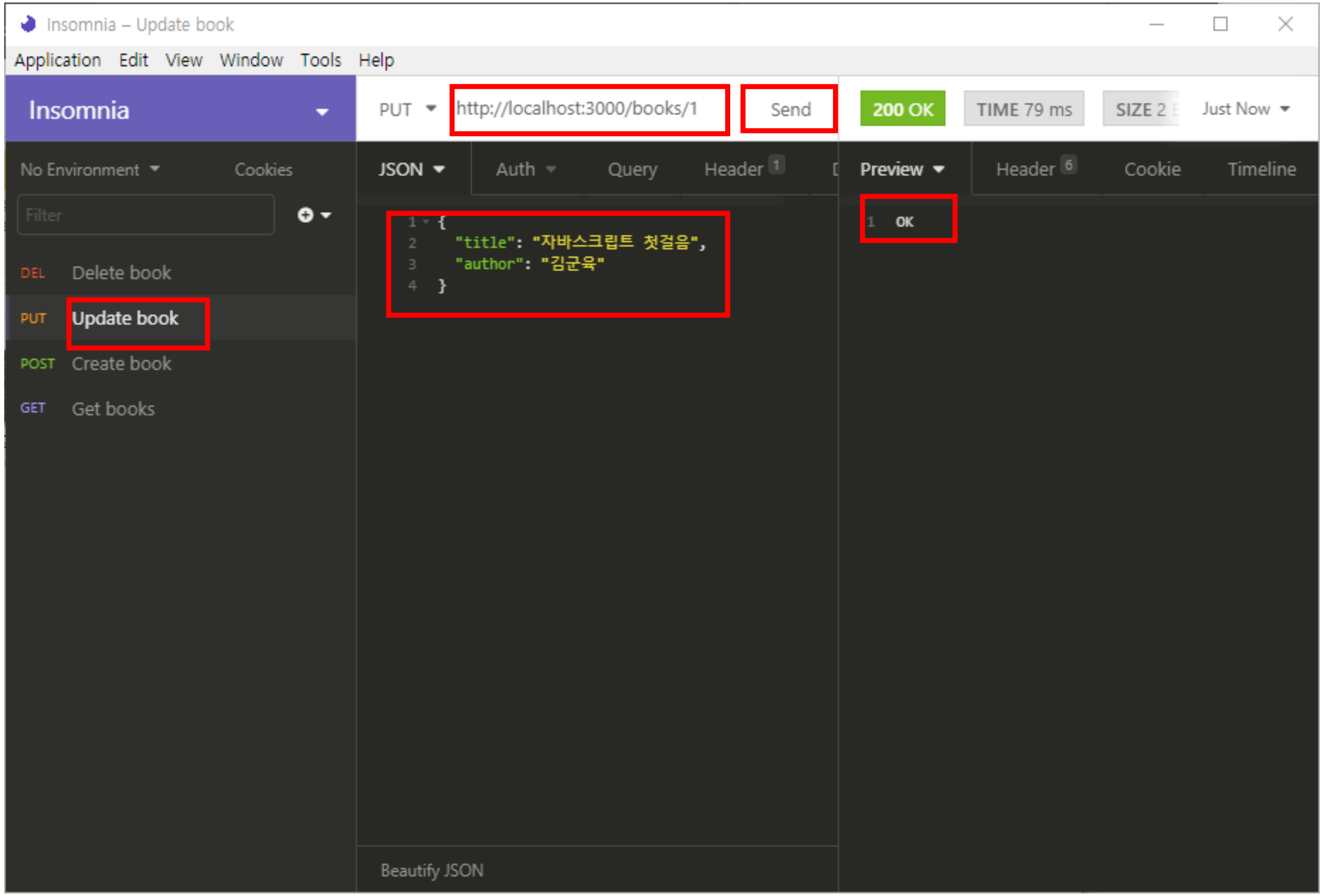
도서 관리 API 테스트



http://localhost:3000/books

```
[
  {
    "title": "자바스크립트 첫걸음",
    "author": "김군오",
    "id": 2
  }
]
```

도서 관리 API 테스트

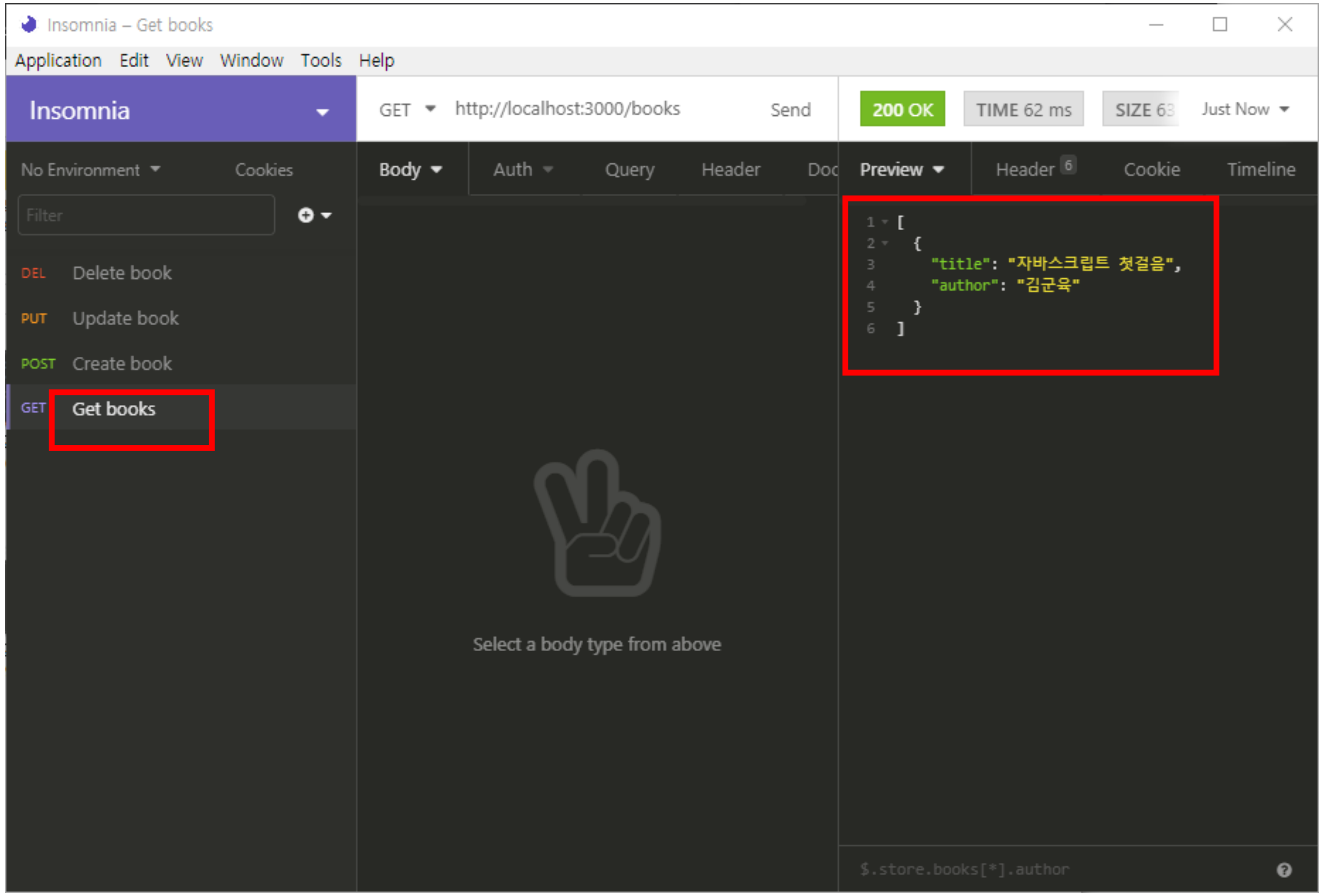


PUT http://localhost:3000/books/1

```
{
  "title": "자바스크립트 첫걸음",
  "author": "김군육"
}
```

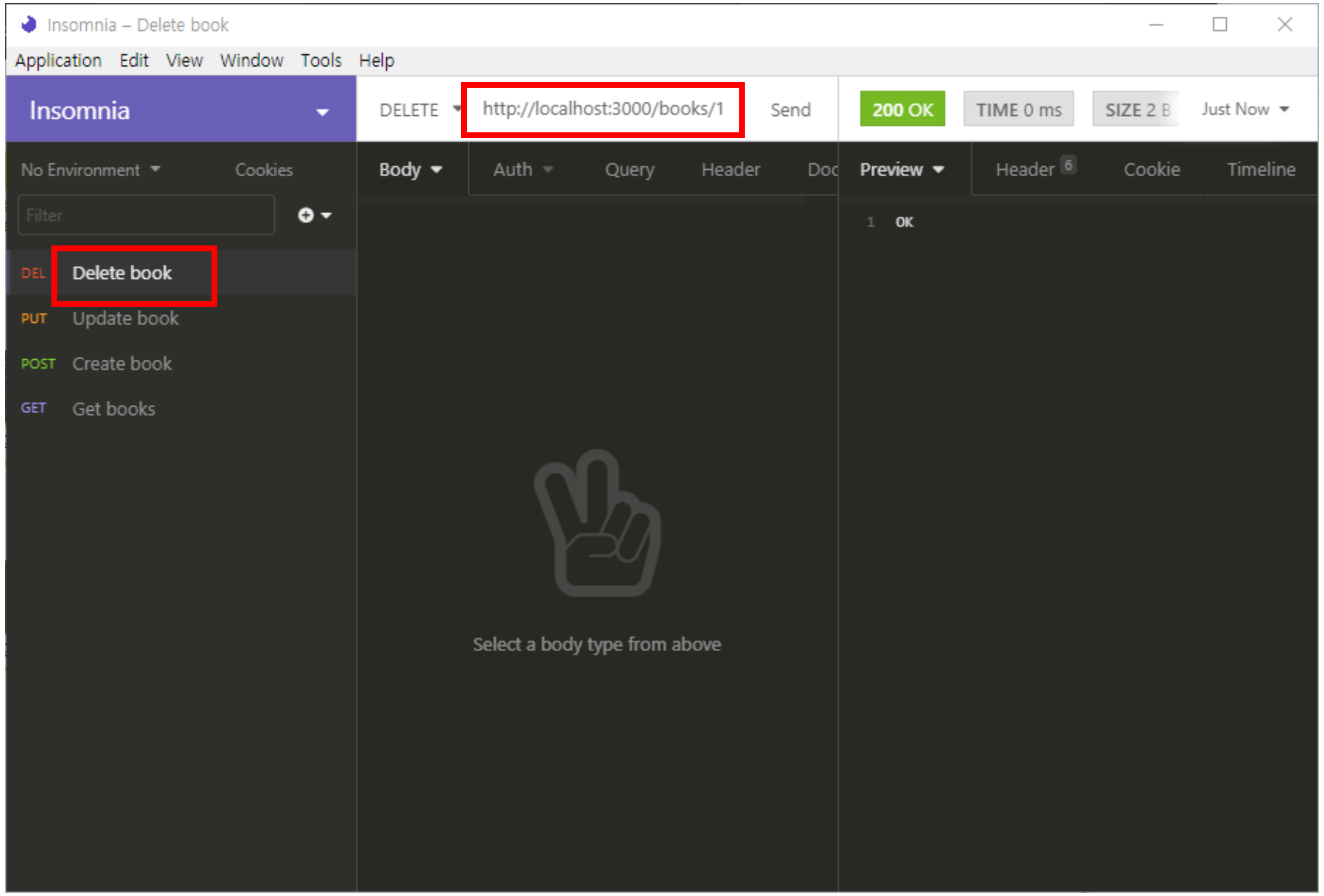
```
OK
```

도서 관리 API 테스트



```
[
  {
    "title": "자바스크립트 첫걸음",
    "author": "김군욱"
  }
]
```

도서 관리 API 테스트



http://localhost:3000/books/1

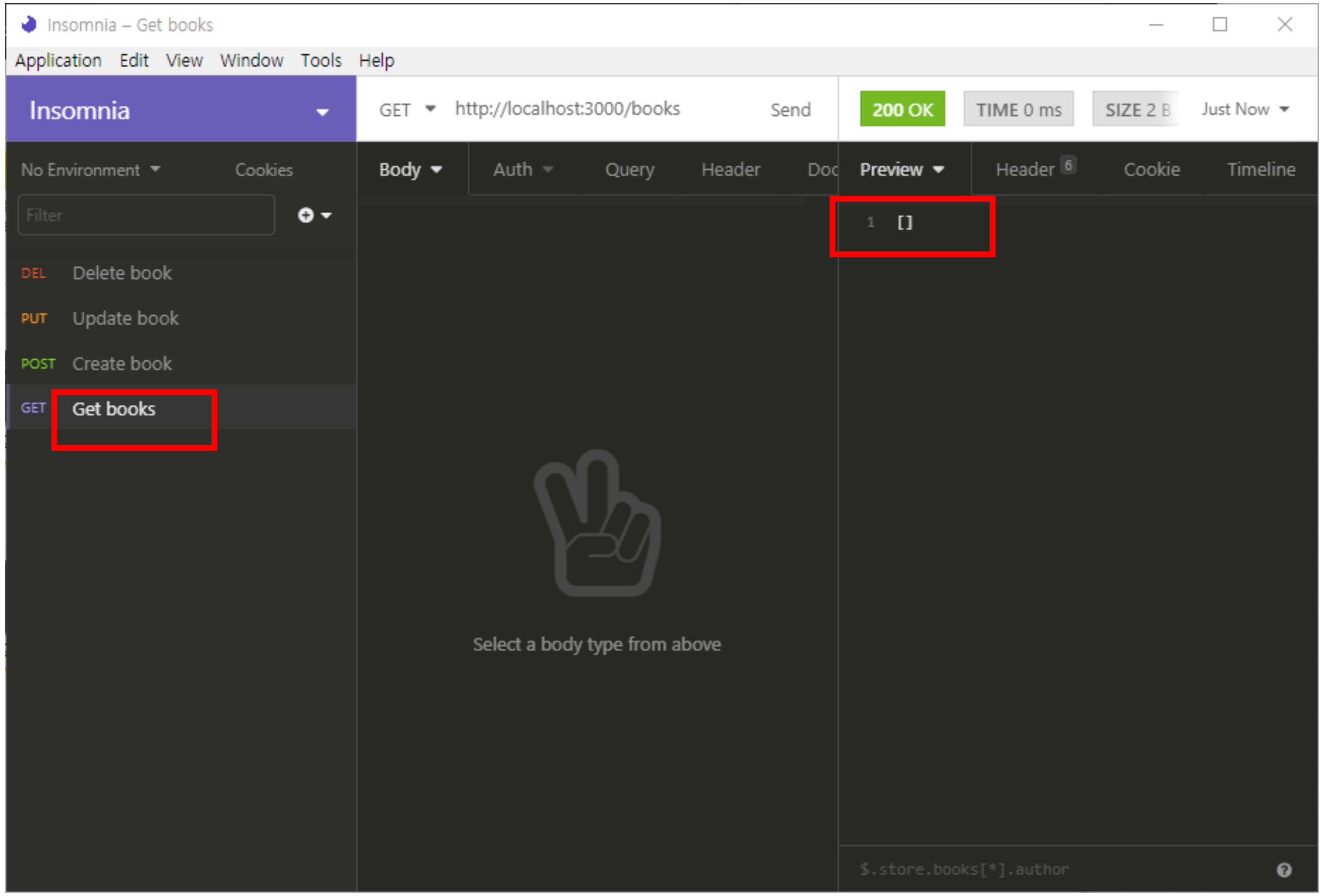
200 OK

TIME 0 ms

SIZE 2 B

```
OK
```

도서 관리 API 테스트



Insomnia – Get books

DEL Delete book
PUT Update book
POST Create book
GET Get books

GET http://localhost:3000/books

200 OK TIME 0 ms SIZE 2 B Just Now

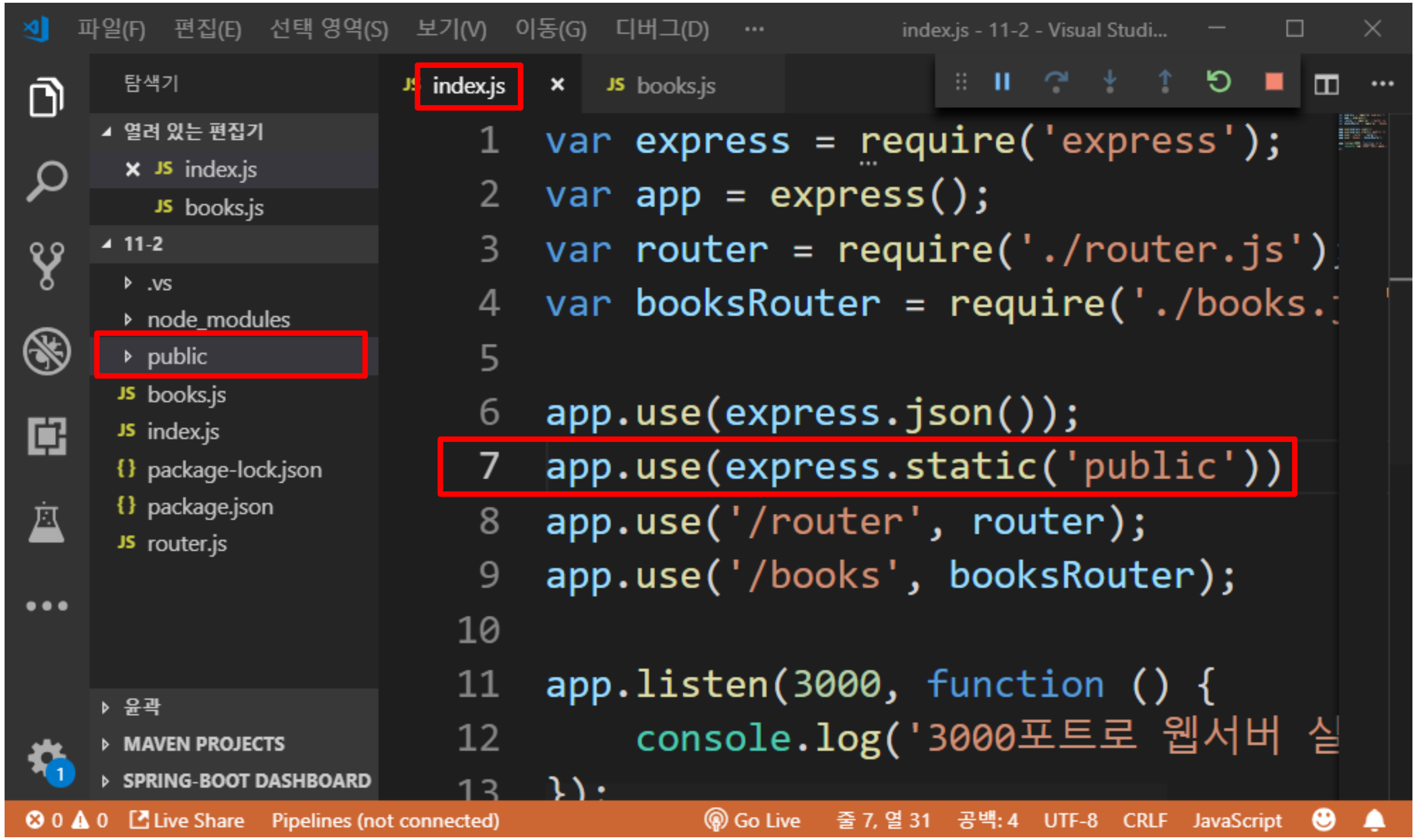
```
[]
```

Select a body type from above

Static 미들웨어

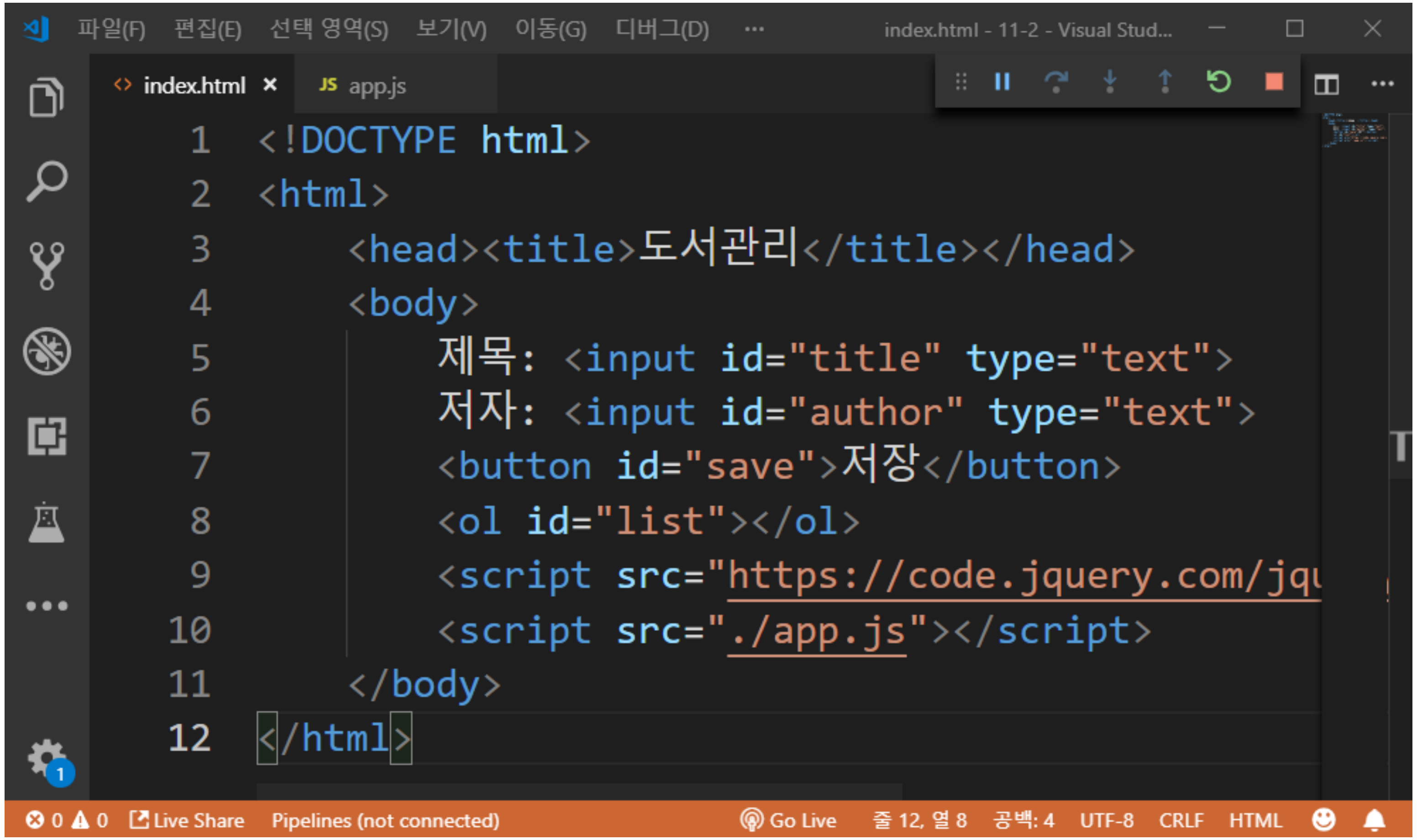
- HTML, CSS, JS 등 정적 파일에 대한 HTTP 요청 응답
- app.use(express.static('폴더명')) 으로 미들웨어 등록
- 지정한 폴더에 저장된 파일은 http://{서버주소}/{파일명} 으로 접근 가능

Static 미들웨어



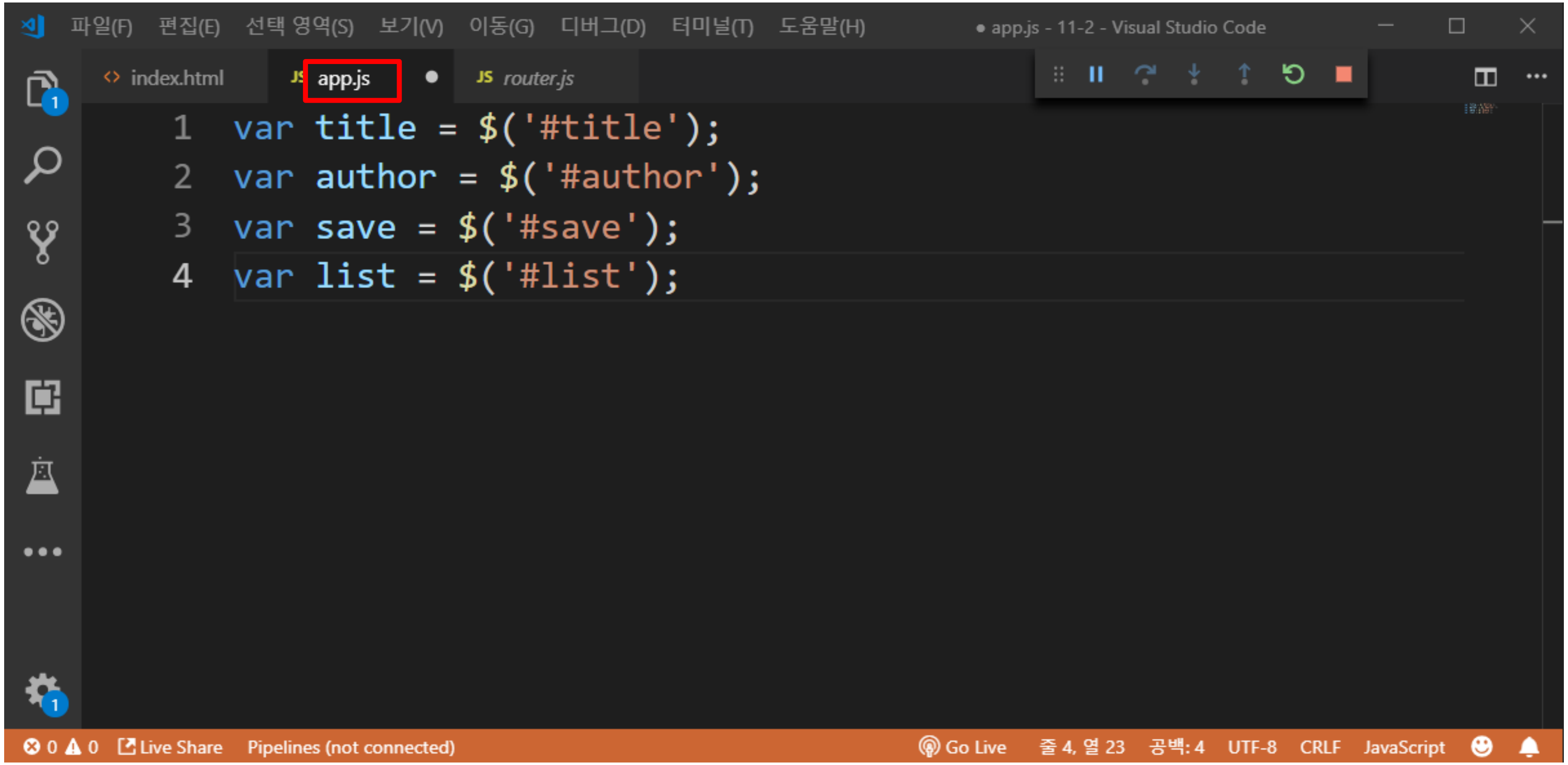
```
var express = require('express');
var app = express();
var router = require('./router.js')
var booksRouter = require('./books.

app.use(express.json());
app.use(express.static('public'))
app.use('/router', router);
app.use('/books', booksRouter);

app.listen(3000, function () {
    console.log('3000포트로 웹서버 실
});
```

클라이언트 프로그램 작성



```html
<!DOCTYPE html>
<html>
    <head><title>도서관리</title></head>
    <body>
        제목: <input id="title" type="text">
        저자: <input id="author" type="text">
        <button id="save">저장</button>
        <ol id="list"></ol>
        <script src="https://code.jquery.com/jq
        <script src="./app.js"></script>
    </body>
</html>
```

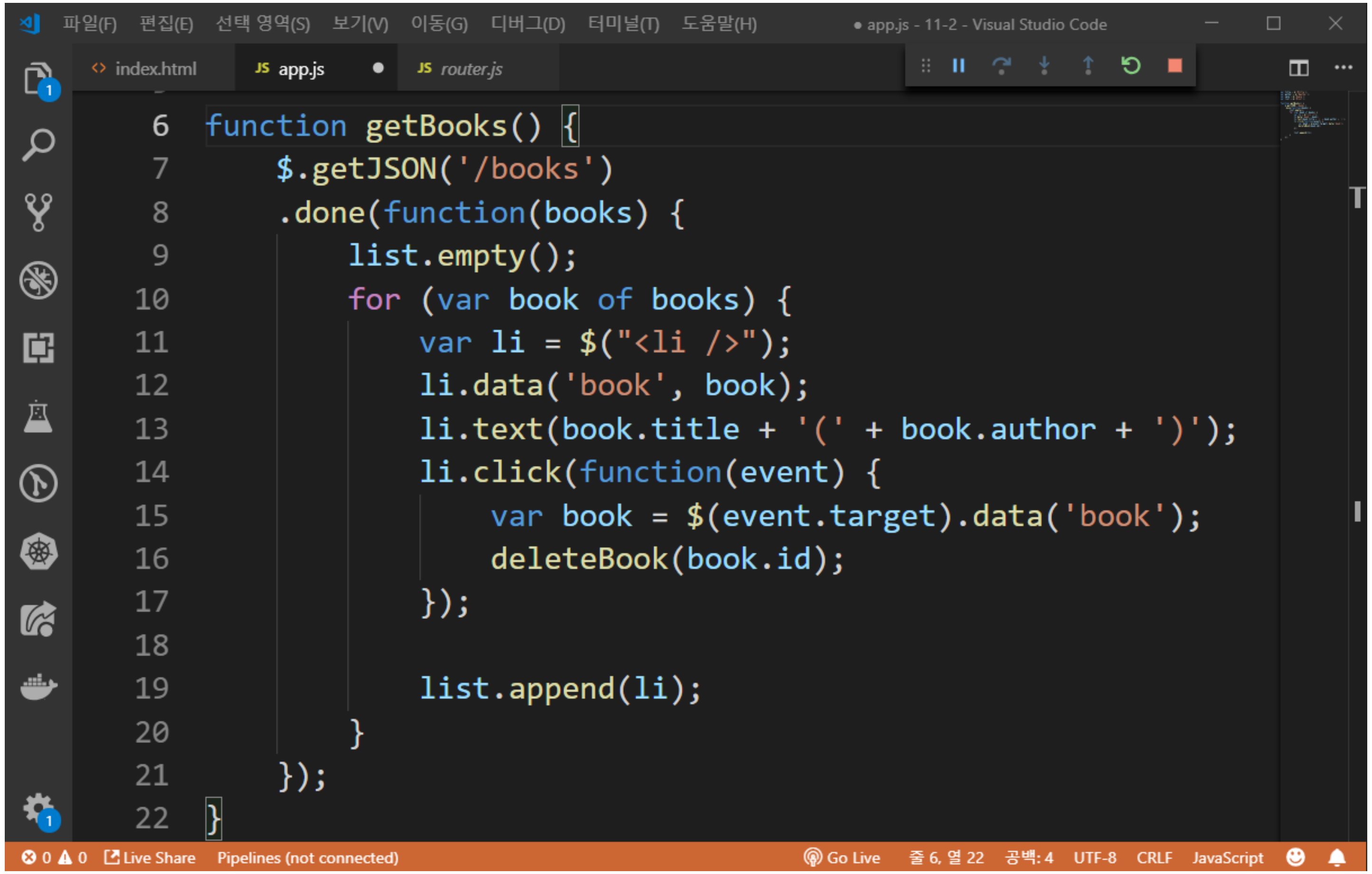
클라이언트 프로그램 작성



파일(F) 편집(E) 선택 영역(S) 보기(V) 이동(G) 디버그(D) 터미널(T) 도움말(H)
● app.js - 11-2 - Visual Studio Code
index.html
app.js
router.js
0 0 Live Share Pipelines (not connected)
Go Live 줄 4, 열 23 공백: 4 UTF-8 CRLF JavaScript

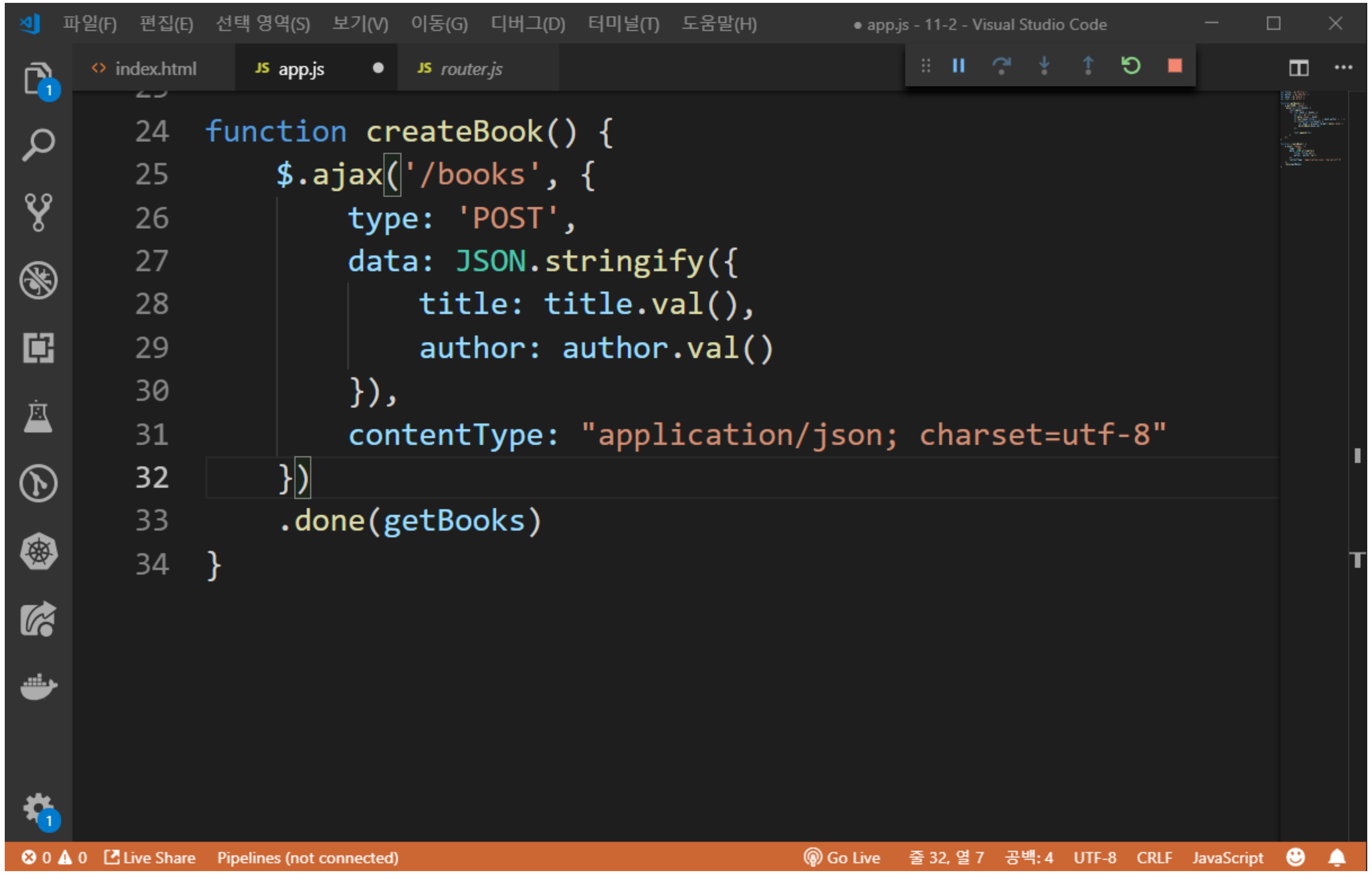
```javascript
var title = $('#title');
var author = $('#author');
var save = $('#save');
var list = $('#list');
```

클라이언트 프로그램 작성



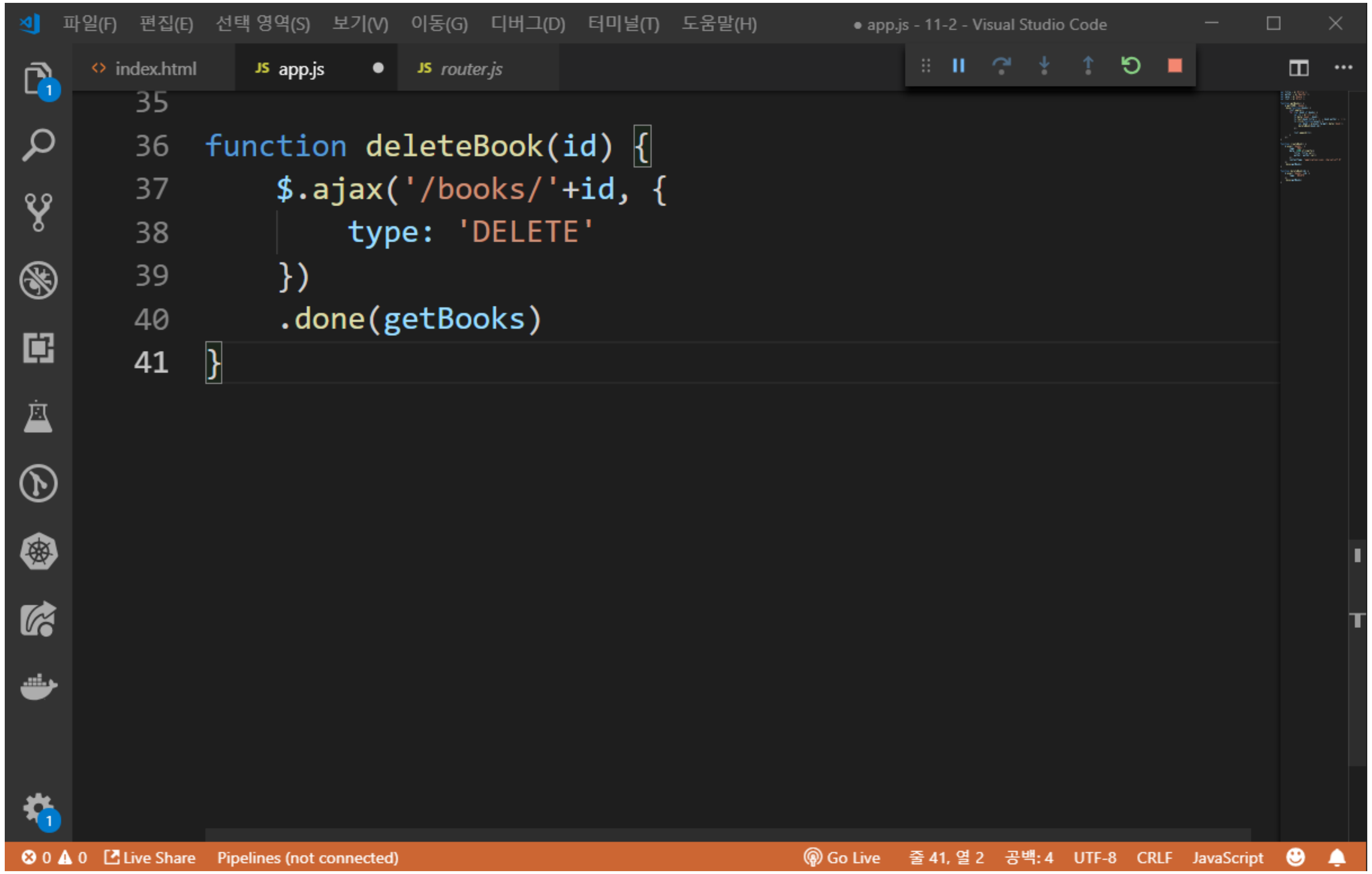
```javascript
function getBooks() {
    $.getJSON('/books')
    .done(function(books) {
        list.empty();
        for (var book of books) {
            var li = $("<li />");
            li.data('book', book);
            li.text(book.title + '(' + book.author + ')');
            li.click(function(event) {
                var book = $(event.target).data('book');
                deleteBook(book.id);
            });

            list.append(li);
        }
    });
}
```

클라이언트 프로그램 작성


파일(F) 편집(E) 선택 영역(S) 보기(V) 이동(G) 디버그(D) 터미널(T) 도움말(H)
● app.js - 11-2 - Visual Studio Code
index.html
app.js
router.js
⊗ 0 ⚠ 0 Live Share Pipelines (not connected)
Go Live 줄 32, 열 7 공백: 4 UTF-8 CRLF JavaScript

```javascript
function createBook() {
    $.ajax('/books', {
        type: 'POST',
        data: JSON.stringify({
            title: title.val(),
            author: author.val()
        }),
        contentType: "application/json; charset=utf-8"
    })
    .done(getBooks)
}
```

클라이언트 프로그램 작성

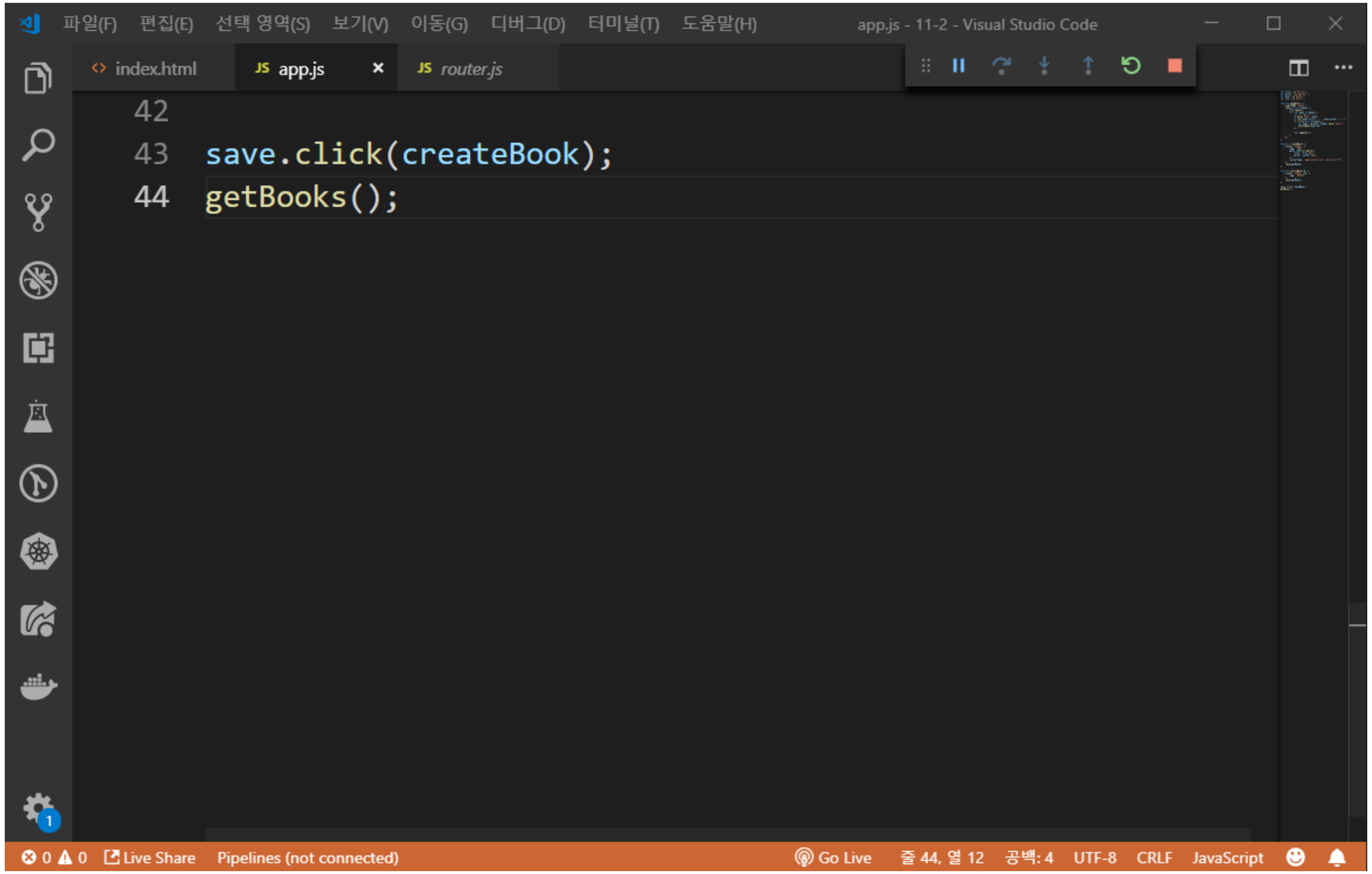


파일(F) 편집(E) 선택 영역(S) 보기(V) 이동(G) 디버그(D) 터미널(T) 도움말(H)
● app.js - 11-2 - Visual Studio Code
index.html
app.js
router.js

```javascript

function deleteBook(id) {
    $.ajax('/books/'+id, {
        type: 'DELETE'
    })
    .done(getBooks)
}
```

⊗ 0 ⚠ 0 Live Share Pipelines (not connected)
Go Live 줄 41, 열 2 공백: 4 UTF-8 CRLF JavaScript

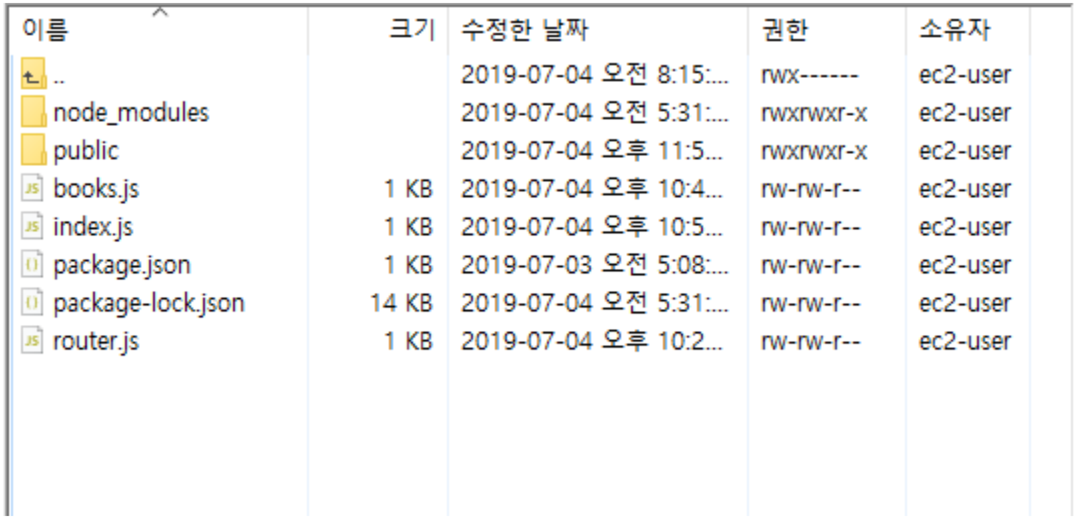
클라이언트 프로그램 작성



파일(F) 편집(E) 선택 영역(S) 보기(V) 이동(G) 디버그(D) 터미널(T) 도움말(H)
app.js - 11-2 - Visual Studio Code
index.html
app.js
router.js
0 0 Live Share Pipelines (not connected)
Go Live 줄 44, 열 12 공백: 4 UTF-8 CRLF JavaScript

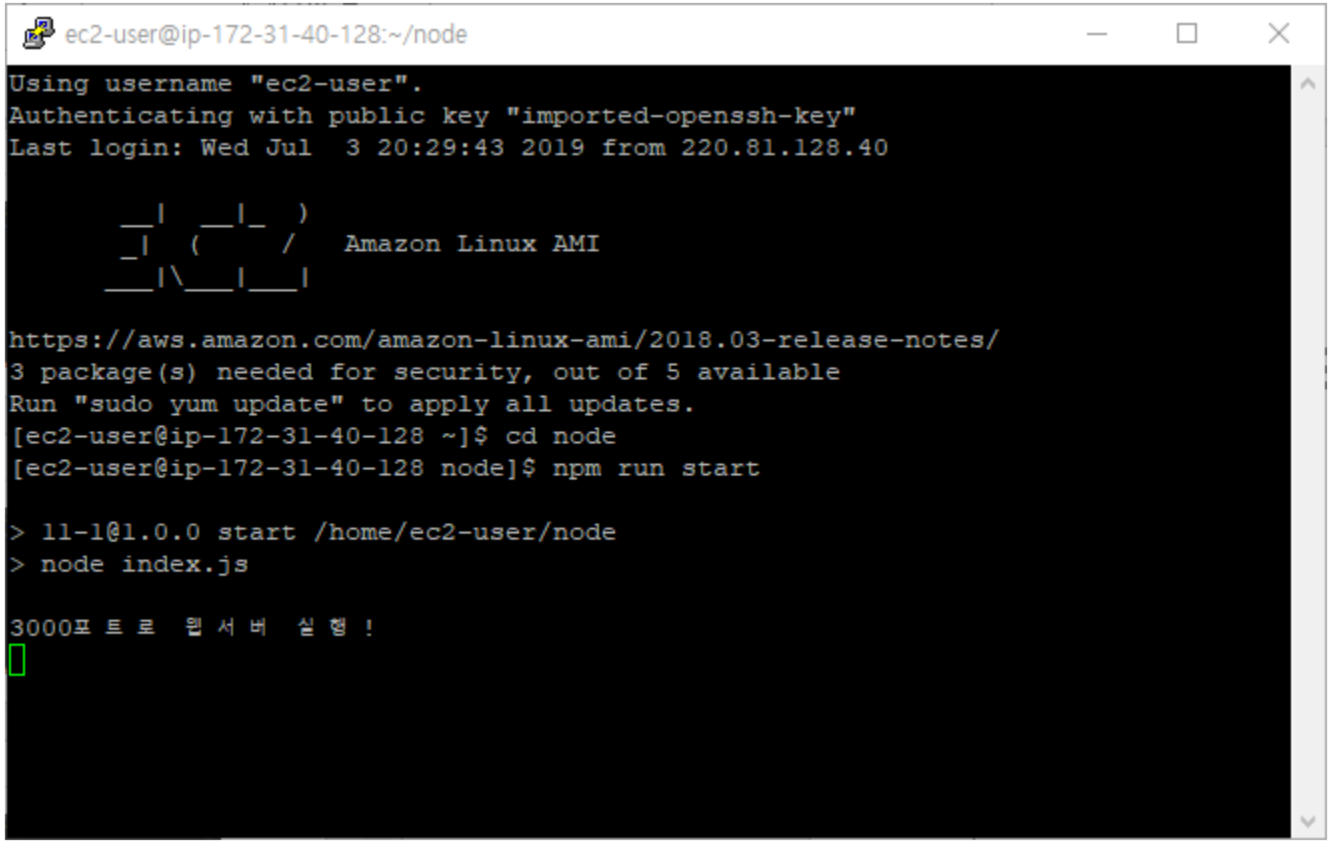
```

save.click(createBook);
getBooks();
```

EC2 서버에 배포하기



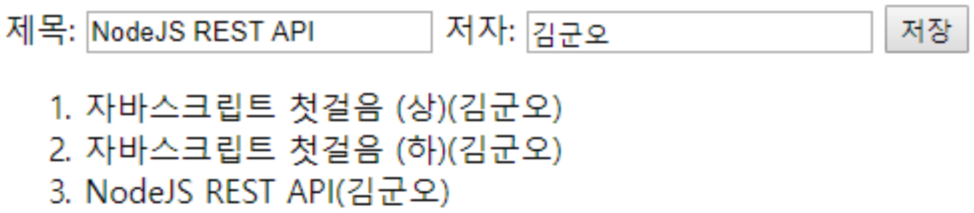
이름	크기	수정한 날짜	권한	소유자
..		2019-07-04 오전 8:15:...	rwx------	ec2-user
node_modules		2019-07-04 오전 5:31:...	rwxrwxr-x	ec2-user
public		2019-07-04 오후 11:5...	rwxrwxr-x	ec2-user
books.js	1 KB	2019-07-04 오후 10:4...	rw-rw-r--	ec2-user
index.js	1 KB	2019-07-04 오후 10:5...	rw-rw-r--	ec2-user
package.json	1 KB	2019-07-03 오전 5:08:...	rw-rw-r--	ec2-user
package-lock.json	14 KB	2019-07-04 오전 5:31:...	rw-rw-r--	ec2-user
router.js	1 KB	2019-07-04 오후 10:2...	rw-rw-r--	ec2-user

서버 실행하기



```
Using username "ec2-user".
Authenticating with public key "imported-openssh-key"
Last login: Wed Jul  3 20:29:43 2019 from 220.81.128.40

       __|  __|_  )
       _|  (     /   Amazon Linux AMI
      ___|\___|___|

https://aws.amazon.com/amazon-linux-ami/2018.03-release-notes/
3 package(s) needed for security, out of 5 available
Run "sudo yum update" to apply all updates.
[ec2-user@ip-172-31-40-128 ~]$ cd node
[ec2-user@ip-172-31-40-128 node]$ npm run start

> 11-1@1.0.0 start /home/ec2-user/node
> node index.js

3000포트로 웹서버 실행!
```

브라우저에서 확인하기



제목: NodeJS REST API 저자: 김군오

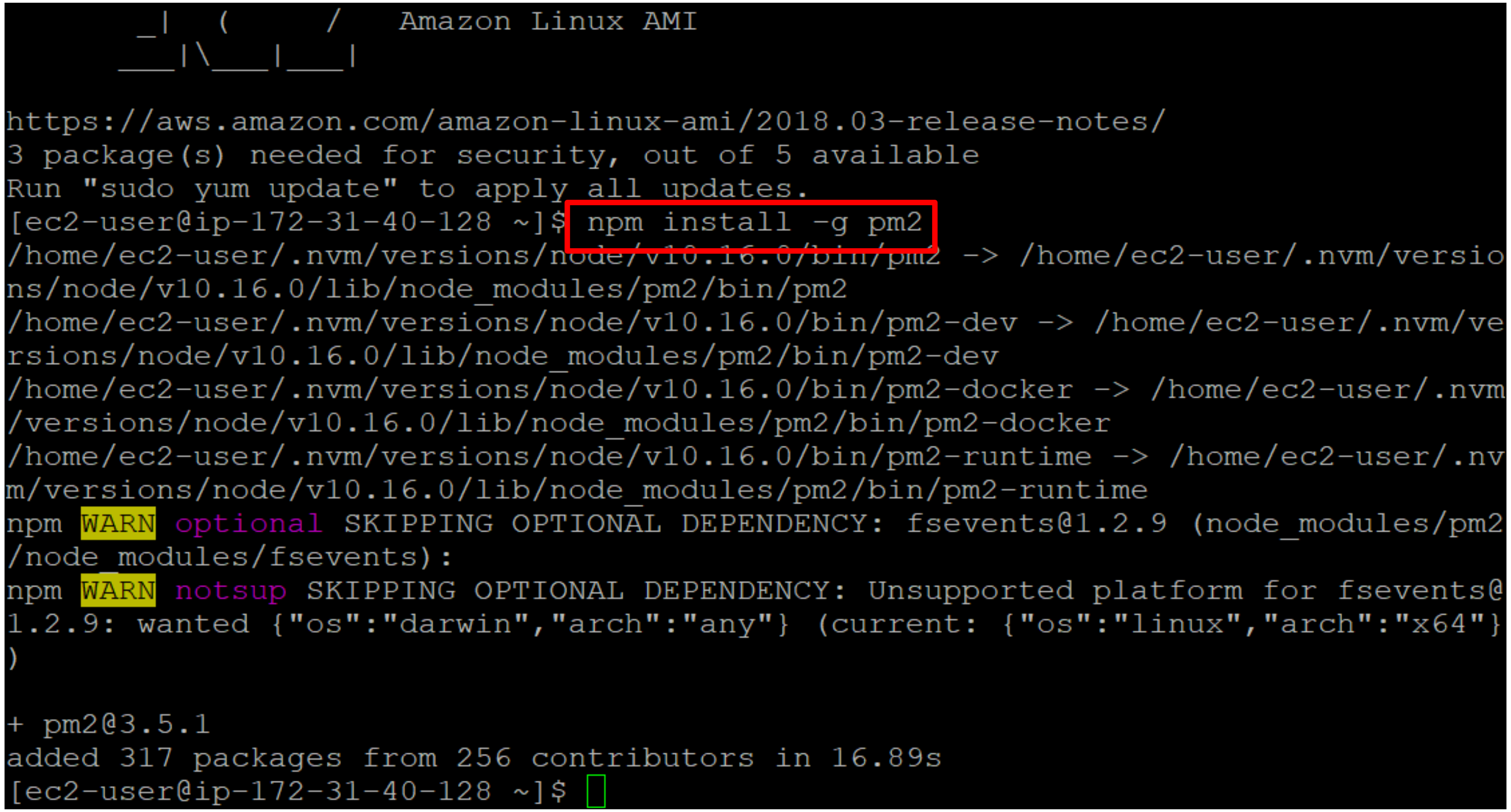
1. 자바스크립트 첫걸음 (상)(김군오)
2. 자바스크립트 첫걸음 (하)(김군오)
3. NodeJS REST API(김군오)

npm start로 nodejs 앱을 실행 시 문제점

- 푸티를 종료하면 서버도 같이 종료 되어서 더 이상 브라우저에서 접속할 수 없게 됨.
- 두 개 이상의 nodejs 앱을 실행 시
  - putty를 실행하려는 앱의 개수대로 실행
  - 서버에 접속하고 앱을 실행해야 함
- 해결책
  - nodejs 앱을 백그라운드 프로세스로 실행
  - pm2 라는 node 프로세스 매니저를 사용

PM2 설치하기

- npm install -g pm2



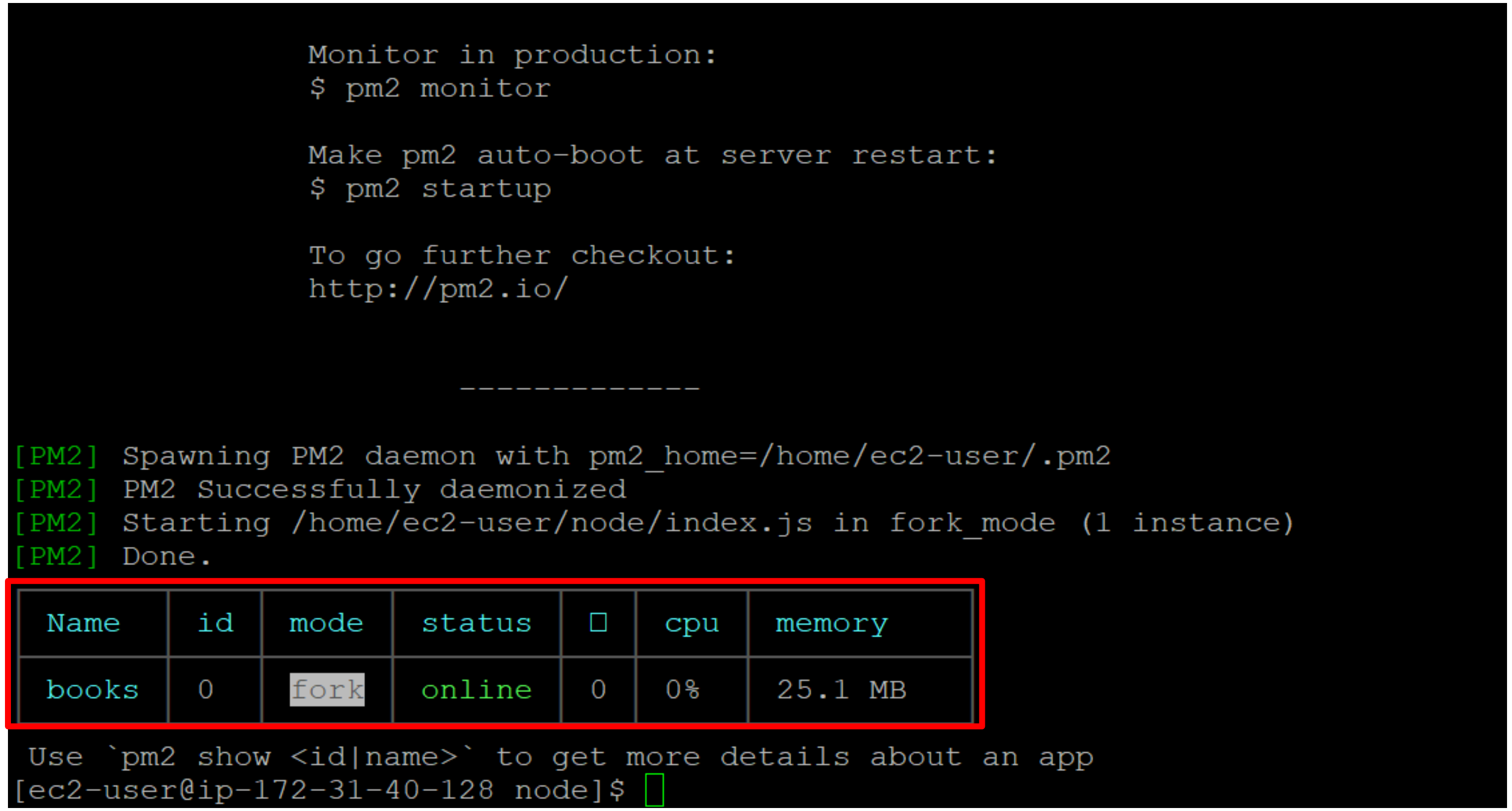
```
      _|  (     /   Amazon Linux AMI
     ___|\___|___|

https://aws.amazon.com/amazon-linux-ami/2018.03-release-notes/
3 package(s) needed for security, out of 5 available
Run "sudo yum update" to apply all updates.
[ec2-user@ip-172-31-40-128 ~]$ npm install -g pm2
/home/ec2-user/.nvm/versions/node/v10.16.0/bin/pm2 -> /home/ec2-user/.nvm/versio
ns/node/v10.16.0/lib/node_modules/pm2/bin/pm2
/home/ec2-user/.nvm/versions/node/v10.16.0/bin/pm2-dev -> /home/ec2-user/.nvm/ve
rsions/node/v10.16.0/lib/node_modules/pm2/bin/pm2-dev
/home/ec2-user/.nvm/versions/node/v10.16.0/bin/pm2-docker -> /home/ec2-user/.nvm
/versions/node/v10.16.0/lib/node_modules/pm2/bin/pm2-docker
/home/ec2-user/.nvm/versions/node/v10.16.0/bin/pm2-runtime -> /home/ec2-user/.nv
m/versions/node/v10.16.0/lib/node_modules/pm2/bin/pm2-runtime
npm WARN optional SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.9 (node_modules/pm2
/node_modules/fsevents):
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@
1.2.9: wanted {"os":"darwin","arch":"any"} (current: {"os":"linux","arch":"x64"}
)

+ pm2@3.5.1
added 317 packages from 256 contributors in 16.89s
[ec2-user@ip-172-31-40-128 ~]$
```

PM2 사용하기

- pm2 start --name {앱이름} {파일명}
- pm2 reload {앱이름}
- pm2 stop {앱이름}
- pm2 delete {앱이름}

PM2 사용하기

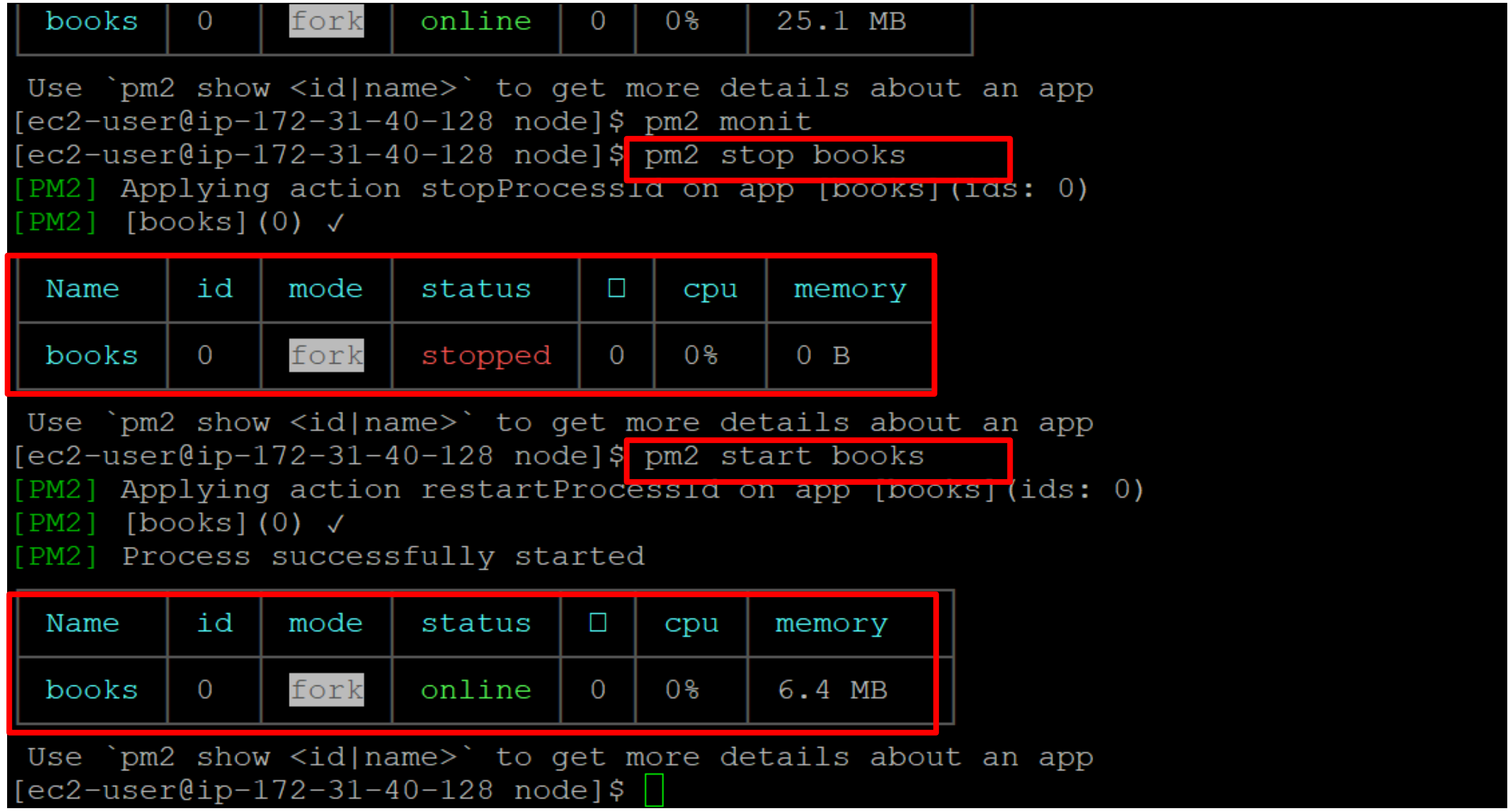
- pm2 start --name books index.js



```
                Monitor in production:
                $ pm2 monitor

                Make pm2 auto-boot at server restart:
                $ pm2 startup

                To go further checkout:
                http://pm2.io/


                        -------------

[PM2] Spawning PM2 daemon with pm2_home=/home/ec2-user/.pm2
[PM2] PM2 Successfully daemonized
[PM2] Starting /home/ec2-user/node/index.js in fork_mode (1 instance)
[PM2] Done.
┌───────┬────┬──────┬────────┬───┬─────┬───────────┐
│ Name  │ id │ mode │ status │ □ │ cpu │ memory    │
├───────┼────┼──────┼────────┼───┼─────┼───────────┤
│ books │ 0  │ fork │ online │ 0 │ 0%  │ 25.1 MB   │
└───────┴────┴──────┴────────┴───┴─────┴───────────┘
 Use `pm2 show <id|name>` to get more details about an app
[ec2-user@ip-172-31-40-128 node]$ 
```

PM2 사용하기

- pm2 stop books
- pm2 start books
- pm2 reload books



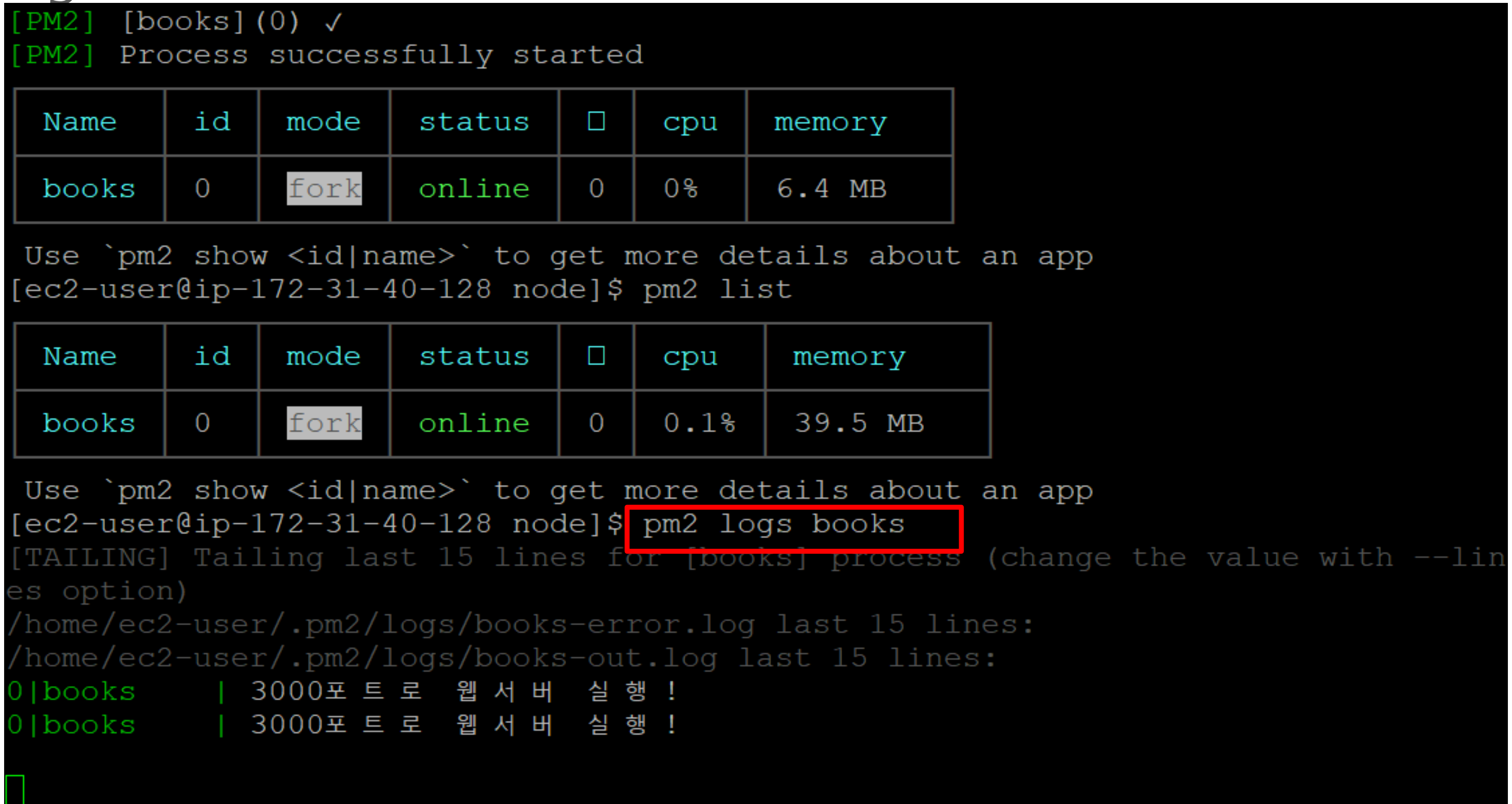
```
│ books │ 0  │ fork │ online  │ 0 │ 0%  │ 25.1 MB  │

 Use `pm2 show <id|name>` to get more details about an app
[ec2-user@ip-172-31-40-128 node]$ pm2 monit
[ec2-user@ip-172-31-40-128 node]$ pm2 stop books
[PM2] Applying action stopProcessId on app [books](ids: 0)
[PM2] [books](0) ✓
│ Name  │ id │ mode │ status  │ □ │ cpu │ memory │
│ books │ 0  │ fork │ stopped │ 0 │ 0%  │ 0 B    │
 Use `pm2 show <id|name>` to get more details about an app
[ec2-user@ip-172-31-40-128 node]$ pm2 start books
[PM2] Applying action restartProcessId on app [books](ids: 0)
[PM2] [books](0) ✓
[PM2] Process successfully started
│ Name  │ id │ mode │ status │ □ │ cpu │ memory │
│ books │ 0  │ fork │ online │ 0 │ 0%  │ 6.4 MB │
 Use `pm2 show <id|name>` to get more details about an app
[ec2-user@ip-172-31-40-128 node]$
```

PM2 사용하기

- pm2 list
- pm2 logs {앱 이름}
- pm2 monit

PM2 사용하기

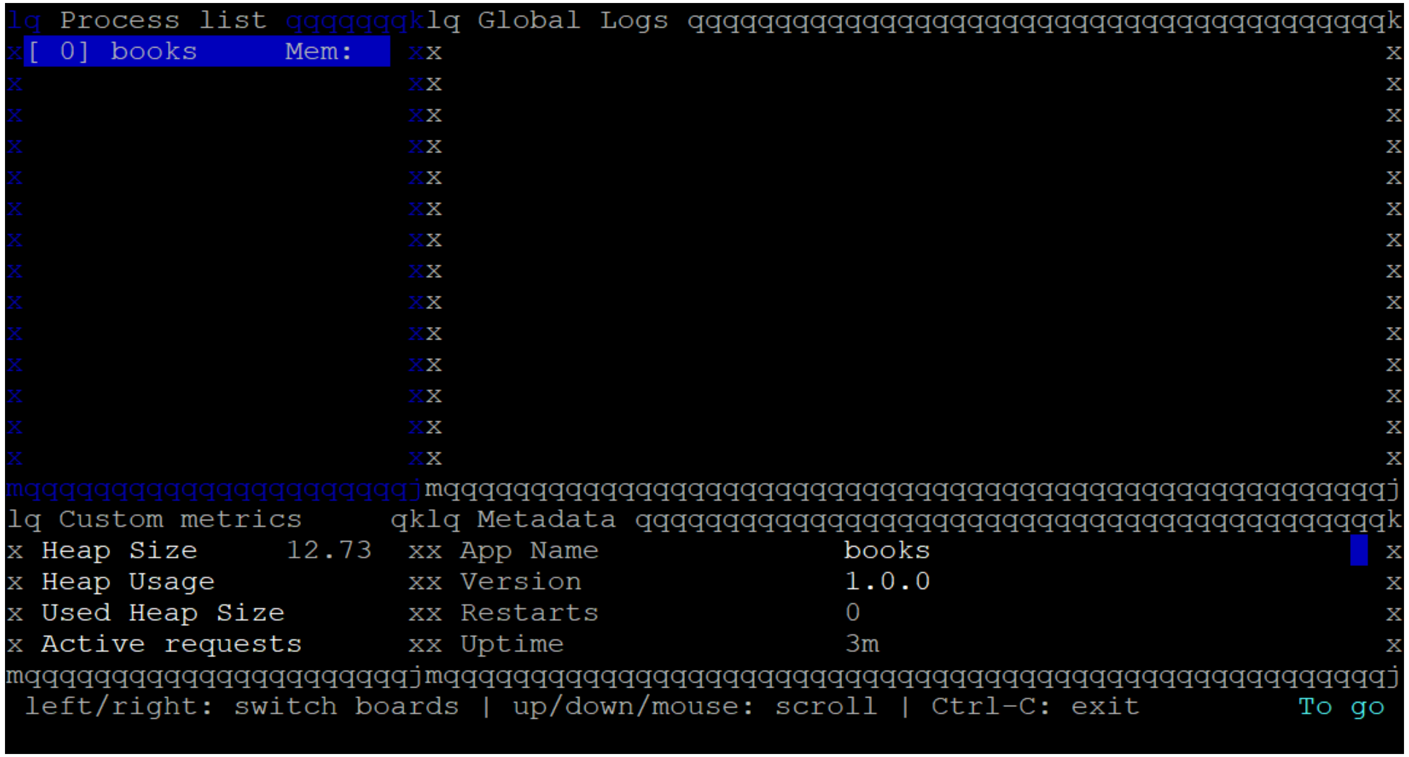
- pm2 logs books



```
[PM2] [books](0) ✓
[PM2] Process successfully started
┌───────┬────┬──────┬────────┬───┬─────┬─────────┐
│ Name  │ id │ mode │ status │ □ │ cpu │ memory  │
├───────┼────┼──────┼────────┼───┼─────┼─────────┤
│ books │ 0  │ fork │ online │ 0 │ 0%  │ 6.4 MB  │
└───────┴────┴──────┴────────┴───┴─────┴─────────┘
 Use `pm2 show <id|name>` to get more details about an app
[ec2-user@ip-172-31-40-128 node]$ pm2 list
┌───────┬────┬──────┬────────┬───┬──────┬─────────┐
│ Name  │ id │ mode │ status │ □ │ cpu  │ memory  │
├───────┼────┼──────┼────────┼───┼──────┼─────────┤
│ books │ 0  │ fork │ online │ 0 │ 0.1% │ 39.5 MB │
└───────┴────┴──────┴────────┴───┴──────┴─────────┘
 Use `pm2 show <id|name>` to get more details about an app
[ec2-user@ip-172-31-40-128 node]$ pm2 logs books
[TAILING] Tailing last 15 lines for [books] process (change the value with --lin
es option)
/home/ec2-user/.pm2/logs/books-error.log last 15 lines:
/home/ec2-user/.pm2/logs/books-out.log last 15 lines:
0|books    | 3000포트로 웹서버 실행!
0|books    | 3000포트로 웹서버 실행!
```

PM2 사용하기

- pm2 monit



```
lq Process list qqqqqqqklq Global Logs qqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk
x[ 0] books     Mem:   xx                                                      x
x                      xx                                                      x
x                      xx                                                      x
x                      xx                                                      x
x                      xx                                                      x
x                      xx                                                      x
x                      xx                                                      x
x                      xx                                                      x
x                      xx                                                      x
x                      xx                                                      x
x                      xx                                                      x
x                      xx                                                      x
x                      xx                                                      x
x                      xx                                                      x
mqqqqqqqqqqqqqqqqqqqqqqjmqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqj
lq Custom metrics     qklq Metadata qqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk
x Heap Size     12.73  xx App Name              books                          x
x Heap Usage           xx Version               1.0.0                          x
x Used Heap Size       xx Restarts              0                              x
x Active requests      xx Uptime                3m                             x
mqqqqqqqqqqqqqqqqqqqqqqjmqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqj
 left/right: switch boards | up/down/mouse: scroll | Ctrl-C: exit         To go
```

요약

- EC2에서 NodeJS 설치 및 실행
- 도서 관리 프로그램 만들기
- PM2 설치 및 사용

차시 예고

- 12-1 : Todo list와 동시통역 채팅 프로그램 만들기
  - NodeJS Todo list 프로그램
  - 동시통역 채팅 프로그램

강의를 마치겠습니다
수고하셨습니다

11주차_03 도서관리 프로그램