

Installing Krakend as a API Gateway <https://www.krakend.io/download/>

```
juanuriarte@John:~$ sudo apt install ca-certificates gnupg
[sudo] password for juanuriarte:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20230311ubuntu0.22.04.1).
gnupg is already the newest version (2.2.27-3ubuntu2.1).
The following packages were automatically installed and are no longer required:
  gir1.2-snapd-1 gyp libc-ares2 libjs-events libjs-highlight.js libjs-inherits
  libjs-is-typedarray libjs-psl libjs-source-map libjs-sprintf-js
  libjs-typedarray-to-buffer libnode-dev libnode72 libuv1-dev node-abbrev
  node-ansi-regex node-ansi-styles node-ansistyles node-are-we-there-yet
  node-arrify node-asap node-asynckit node-balanced-match node-brace-expansion
  node-chownr node-clean-yaml-object node-color-convert node-color-name
  node-commander node-core-util-is node-decompress-response
  node-delayed-stream node-delegates node-depd node-diff node-encoding
  node-end-of-stream node-err-code node-escape-string-regexp node-fancy-log
  node-foreground-child node-fs.realpath node-function-bind node-get-stream
  node-glob node-growl node-has-flag node-has-unicode node-hosted-git-info
  node-iconv-lite node-iferr node-imurmurhash node-indent-string node-inflight
  node-inherits node-ini node-ip node-ip-regex node-is-buffer
  node-is-plain-obj node-is-typedarray node-isarray node-isexe
  node-json-parse-better-errors node-jsonparse node-kind-of
  node-lodash-packages node-lowercase-keys node-lru-cache node-mimic-response
  node-minimatch node-minimist node-minipass node-mute-stream node-negotiator
  node-npm-bundled node-once node-osenv node-p-cancelable node-p-map
  node-path-is-absolute node-process-nexttick-args node-promise-inflight
  node-promise-retry node-promzard node-pump node-quick-lru node-read
  node-readable-stream node-resolve node-retry node-safe-buffer
  node-set-blocking node-signal-exit node-slash node-slice-ansi
  node-source-map node-spdx-correct node-spdx-exceptions
  node-spdx-expression-parse node-spdx-license-ids node-sprintf-js
  node-stealthy-require node-string-decoder node-supports-color
  node-text-table node-time-stamp node-tmatch node-typedarray-to-buffer
  node-universalify node-util-deprecate node-validate-npm-package-license
  node-webidl-conversions node-whatwg-fetch node-wrapappy node-yallist
  nodejs-doc
```

```
juanuriarte@John:~$ sudo apt-key adv --keyserver keyserver.ubuntu.com --recv 5DE6FD698AD6FDD2
Warning: apt-key is deprecated. Manage keyring files in trusted.gpg.d instead (see apt-key(8)).
Executing: /tmp/apt-key-gpghome.AHb9tRzZbJ/gpg.1.sh --keyserver keyserver.ubuntu.com --recv 5DE6FD698AD6FDD2
gpg: key 5DE6FD698AD6FDD2: "Devops Faith Package Manager <packages@devops.faith>" not changed
gpg: Total number processed: 1
gpg:      unchanged: 1
```

Exercise 2 API Gateway and Database Replication

```
juanuriarte@John:~$ echo "deb https://repo.krakend.io/apt stable main" | sudo tee /etc/apt/sources.list.d/krakend.list
deb https://repo.krakend.io/apt stable main
juanuriarte@John:~$ sudo apt update
Hit:1 http://packages.microsoft.com/repos/code stable InRelease
Hit:2 http://us.archive.ubuntu.com/ubuntu jammy InRelease
Hit:3 http://us.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:4 https://storage.googleapis.com/bazel-apt stable InRelease
Hit:5 https://cli.github.com/packages stable InRelease
Hit:6 https://dl.winehq.org/wine-builds/ubuntu jammy InRelease
Hit:7 http://security.ubuntu.com/ubuntu jammy-security InRelease
Hit:8 http://us.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:9 https://dl.google.com/linux/chrome/deb stable InRelease
Hit:10 https://cloud.r-project.org/bin/linux/ubuntu jammy-cran40/ InRelease
Get:11 https://repo.krakend.io/apt stable InRelease [4,314 B]
Get:12 https://repo.krakend.io/apt stable/main amd64 Packages [7,432 B]
Fetched 11.7 kB in 1s (8,694 B/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
18 packages can be upgraded. Run 'apt list --upgradable' to see them.
W: https://repo.krakend.io/apt/dists/stable/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION message below
ls.
N: Skipping acquire of configured file 'main/binary-i386/Packages' as repository 'https://repo.krakend.io/apt stable InRelease' doesn't support architectures i386
```

```
juanuriarte@John:~$ sudo apt install --yes krakend
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
gir1.2-snapd-1 gyp libc-ares2 libjs-events libjs-highlight.js libjs-inherits libjs-is-typedarray libjs-psl libjs-source-map libjs-sprintf-js
libjs-typedarray-to-buffer libnode-dev libnode72 libuv1-dev node-abbrev node-ansi-regex node-ansi-styles node-ansistyles node-are-we-there-yet
node-arrify node-asap node-asyncify node-balanced-match node-brace-expansion node-chownr node-clean-yaml-object node-color-convert
node-color-name node-commander node-core-util-is node-decompress-response node-delayed-stream node-delegates node-depd node-diff node-encoding
node-end-of-stream node-err-code node-escape-string-regexp node-fancy-log node-foreground-child node-fs.realpath node-function-bind
node-get-stream node-glob node-growl node-has-flag node-has-unicode node-hosted-git-info node-iconv-lite node-iferr node-imurmurhash
node-indent-string node-inflight node-inherits node-int node-ip node-ip-regex node-is-buffer node-is-plain-obj node-is-typedarray node-isarray
node-isexe node-json-parse-better-errors node-jsonparse node-kind-of node-lodash-packages node-lodash-packages node-lodash-packages node-lru-cache
node-mimic-response node-minimatch node-minimist node-minipass node-mute-stream node-negotiator node-npm-bundled node-once node-osenv
node-p-cancelable node-p-map node-path-is-absolute node-process-nextick-args node-promise-inflight node-promise-retry node-promzard node-pump
node-quick-lru node-read node-readable-stream node-resolve node-retry node-safe-buffer node-set-blocking node-signal-exit node-slash
node-slice-ansi node-source-map node-spdx-correct node-spdx-exceptions node-spdx-expression-parse node-spdx-license-ids node-sprintf-js
node-stealthy-require node-string-decoder node-supports-color node-text-table node-time-stamp node-tmatch node-typedarray-to-buffer
node-universalify node-util-deprecate node-validate-npm-package-license node-webidl-conversions node-whatwg-fetch node-wrapappy node-yallist
nodejs-doc
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
krakend
0 upgraded, 1 newly installed, 0 to remove and 18 not upgraded.
Need to get 38.8 MB of archives.
After this operation, 97.7 MB of additional disk space will be used.
Get:1 https://repo.krakend.io/apt stable/main amd64 krakend amd64 2.4.3-0 [38.8 MB]
Fetched 38.8 MB in 6s (6,998 kB/s)
Selecting previously unselected package krakend.
(Reading database ... 299040 files and directories currently installed.)
Preparing to unpack .../krakend_2.4.3-0_amd64.deb ...
Unpacking krakend (2.4.3-0) ...
Setting up krakend (2.4.3-0) ...
Created symlink /etc/systemd/system/multi-user.target.wants/krakend.service → /lib/systemd/system/krakend.service.
```

Exercise 2 API Gateway and Database Replication

```

juanuriarte@John:~$ sudo systemctl disable krakend --now
Removed /etc/systemd/system/multi-user.target.wants/krakend.service.
juanuriarte@John:~$ sudo apt install --yes entr
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  glib2.0-snapd-1 gyp libc-ares2 libjs-events libjs-highlight.js libjs-inherits libjs-is-typedarray libjs-psl libjs-source-map libjs-sprintf-js libjs-typedarray-to-buffer
  libnode-dev libnode72 libuv1-dev node-abbrev node-anst-regex node-anst-styles node-anst-styles node-are-we-there-yet node-arrify node-asap node-async-ns
  node-balanced-match node-brace-expansion node-chownr node-clean-yaml-object node-color-convert node-color-name node-commander node-core-util-is node-decompress-response
  node-delayed-stream node-delegates node-depd node-diff node-encoding node-end-of-stream node-err-code node-escape-string-regexp node-fancy-log node-foreground-child
  node-fs.realpath node-function-bind node-get-stream node-glob node-growl node-has-flag node-has-unicode node-hosted-git-info node-icnvm-lite node-iferr node-inmurmurhash
  node-indent-string node-inflight node-inherits node-lint node-ip node-ip-regex node-is-buffer node-is-plain-obj node-is-typedarray node-isarray node-isexe
  node-json-parse-better-errors node-jsonparse node-kind-of node-lodash-packages node-lowercase-keys node-lru-cache node-mimic-response node-minimatch node-minimist
  node-minipass node-mute-stream node-negotiator node-npm-bundled node-once node-osenv node-p-cancelable node-p-map node-path-is-absolute node-process-nextick-args
  node-promise-inflight node-promise-retry node-pronard node-pump node-quick-lru node-read node-readable-stream node-resolve node-retry node-safe-buffer node-set-blocking
  node-signal-exit node-stash node-slice ansi node-source-map node-spdx-correct node-spdx-correct node-spdx-exceptions node-spdx-expression-parse node-spdx-license-ids node-sprintf-js
  node-stalthy require node-string-decoder node-supports-color node-text-table node-time-stamp node-tmatch node-typedarray-to-buffer node-universalify node-util-deprecate
  node-validate-npm-package-license node-webidl-conversions node-whatwg-fetch node-wrapappy node-yallist nodejs-doc
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  entr
0 upgraded, 1 newly installed, 0 to remove and 18 not upgraded.
Need to get 20.6 kB of archives.
After this operation, 53.2 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu jammy/universe amd64 entr amd64 5.1-1 [20.6 kB]
Fetched 20.6 kB in 0s (60.2 kB/s)
Selecting previously unselected package entr.
(Reading database ... 299046 files and directories currently installed.)
Preparing to unpack .../archives/entr_5.1-1_amd64.deb ...
Unpacking entr (5.1-1) ...
Setting up entr (5.1-1) ...
Processing triggers for man-db (2.10.2-1) ...

```

Kraken will then start as a global configuration in `/etc/krakend`. Local configuration files will be utilized and we will be able to stop and start Kraken using Foreman.

Then we installed `entr` to restart Kraken since it does not have a `--reload` implementation like `Uvicorn`.

```

juanuriarte@John:~$ sudo systemctl disable krakend --now
Removed /etc/systemd/system/multi-user.target.wants/krakend.service.
juanuriarte@John:~$ sudo apt install --yes entr
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done

The following packages were automatically installed and are no longer required:
  glibc2.29 snapd-1 gyp libcc-ares2 libjs-events libjs-highlight.js libjs-inherits libjs-is-typedarray libjs-psl libjs-source-map libjs-sprintf-js libjs-typedarray-to-buffer
  libjs-util libjs-underscore libjs-when node-ansi-regex node-ansi-styles node-are-we-there-yet node-assert node-asap node-async node-asyncify node-babel-core node-babel-plugin-
  node-balanced-match node-brace-expansion node-chownr node-clean-yaml-object node-color-convert node-color-name node-commander node-core-util-is node-decompress-response
  node-delayed-stream node-delegates node-depd node-diff node-end-of-stream node-escape-string-regexp node-fancy-log node-foreground-child
  node-fs.realpath node-function-bind node-get-stream node-glob node-growl node-has-flag node-has-unicode node-hosted-git-info node-icomv-lite node-iferr node-inumrurhash
  node-indent-string node-inflight node-inherits node-ini node-ip node-ip-regex node-is-buffer node-is-plain-obj node-is-typedarray node-isarray node-isexe
  node-json-parse-better-errors node-jsonparse node-kind-of node-lodash-packages node-lowercase-keys node-lru-cache node-mimic-response node-minimatch node-minimist
  node-mimipass node-mute-stream node-negotiator node-npm-bundled node-once node-osenv node-p-cancelable node-p-map node-path-is-absolute node-process-nextick-args
  node-promisify node-promisify-stream node-promisify-retry node-pronzzard node-pump node-quick-lru node-read node-readable-stream node-resolve node-retry node-safe-buffer node-set-blocking
  node-signal-exit node-slash node-slice-ansi node-source-map node-spdx-correct node-spdx-exceptions node-spdx-expression-parse node-spdx-license-ids node-sprintf-js
  node-stealthy-require node-string-decoder node-supports-color node-text-table node-time-stamp node-tmatch node-typedarray-to-buffer node-universalify node-util-deprecate
  node-validate-npm-package-license node-webidl-conversions node-whatwg-fetch node-wrapappy node-yallist nodejs-doc
Use 'sudo apt autoremove' to remove them.

The following NEW packages will be installed:
  entr
0 upgraded, 1 newly installed, 0 to remove and 18 not upgraded.
Need to get 20.6 kB of archives.
After this operation, 53.2 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu jammy/universe amd64 entr amd64 5.1-1 [20.6 kB]
Fetched 20.6 kB in 0s (60.2 kB/s)
Selecting previously unselected package entr.
(Reading database ... 299090 files and directories currently installed.)
Preparing to unpack .../archives/entr_5.1-1_amd64.deb ...
Unpacking entr (5.1-1) ...
Setting up entr (5.1-1) ...
Processing triggers for man-db (2.10.2-1) ...

```

Downloaded the latest AMD 64 release of LiteFS (<https://github.com/superfly/litefs/releases>) and put it in the bin folder. Then we ran and it printed a help message.

```

juanuriarte@John:~$ ls cpssc449/
bottle fastapi flask hug mockroblog quart stats
juanuriarte@John:~$ cd fastapi
bash: cd: fastapi: No such file or directory
juanuriarte@John:~$ cd cpssc449/
juanuriarte@John:~/cpssc449$ cd fastapi/
juanuriarte@John:~/cpssc449/fastapi$ ls
api hello
juanuriarte@John:~/cpssc449/fastapi$ cd api/
juanuriarte@John:~/cpssc449/fastapi/api$ ls
api.py bin etc Procfile __pycache__ share var
juanuriarte@John:~/cpssc449/fastapi/api$ cd bin/
juanuriarte@John:~/cpssc449/fastapi/api/bin$ ls
init.sh litefs post.sh
juanuriarte@John:~/cpssc449/fastapi/api/bin$ ./litefs --help
litefs is a distributed file system for replicating SQLite databases.

Usage:

    litefs <command> [arguments]

The commands are:

    export      export a database from a LiteFS cluster to disk
    import      import a SQLite database into a LiteFS cluster
    mount       mount the LiteFS FUSE file system
    run         executes a subcommand for remote writes
    version     prints the version

```

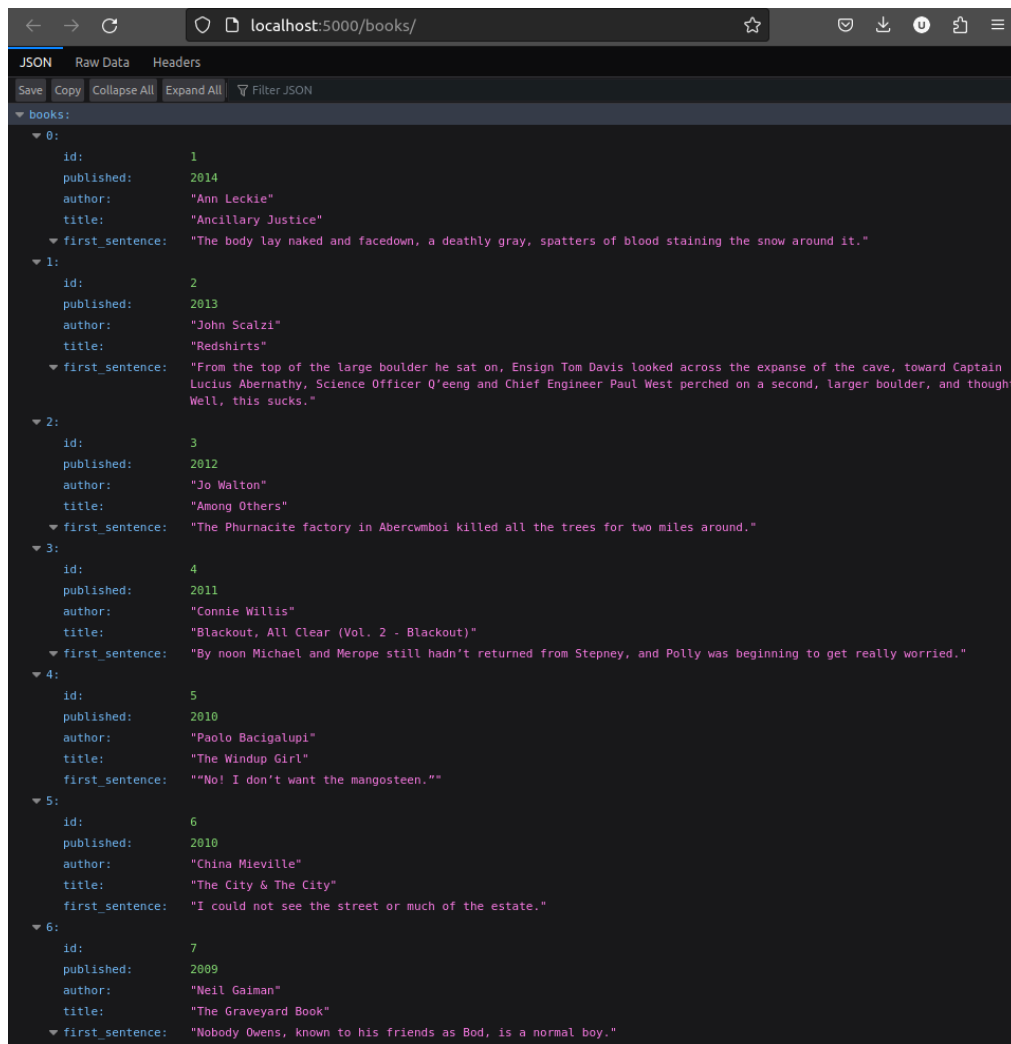
We followed the instructions of Week 4 to start Book API and verified on accessing the link is <http://localhost:5000/books/>

```

juanuriarte@John:~$ cd cpssc449/
juanuriarte@John:~/cpssc449$ cd fastapi/
juanuriarte@John:~/cpssc449/fastapi$ cd api/
juanuriarte@John:~/cpssc449/fastapi/api$ ./bin/init.sh
juanuriarte@John:~/cpssc449/fastapi/api$ foreman start
13:22:43 api.1 | started with pid 113359
13:22:43 api.1 | INFO: Will watch for changes in these directories: ['/home/juanuriarte/cpssc449/fastapi/api']
13:22:43 api.1 | INFO: Uvicorn running on http://127.0.0.1:5000 (Press CTRL+C to quit)
13:22:43 api.1 | INFO: Started reloader process [113359] using WatchFiles
13:22:44 api.1 | INFO: Started server process [113362]
13:22:44 api.1 | INFO: Waiting for application startup.
13:22:44 api.1 | INFO: Application startup complete.
13:22:54 api.1 | INFO: 127.0.0.1:33560 - "GET /books/ HTTP/1.1" 200 OK

```

We are able to access the Books API web page



Ran the krakend command to and followed directions from the website

<https://www.krakend.io/docs/overview/run/>

```
juanuriarte@John:~$ krakend
krakend
Version: 2.4.3
Krakend is a high-performance API gateway that helps you publish, secure, control, and monitor your services
Usage:
  krakend [command]
Available Commands:
  audit      Audits a Krakend configuration.
  check      Validates that the configuration file is valid.
  check-plugin Checks your plugin dependencies are compatible.
  help       Help about any command
  run        Runs the Krakend server.
  version    Shows Krakend version.
Flags:
  -h, --help  help for krakend
Use "krakend [command] --help" for more information about a command.
```

Created a krakend.json file

```
juanuriarte@John:~$ ls | grep krakend.json
juanuriarte@John:~$ touch krakend.json
juanuriarte@John:~$ nano krakend.json
```

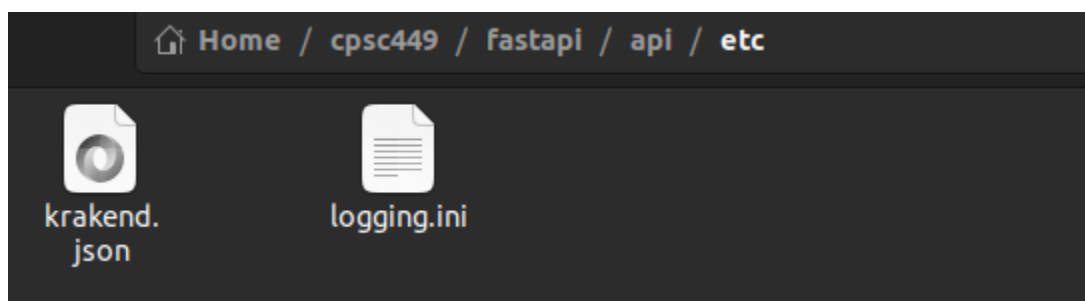
We then made the following implementation to the krakend.json file

```
GNU nano 6.2                                krakend.json *
{
  "$schema": "https://www.krakend.io/schema/v2.4/krakend.json",
  "version": 3
}
```

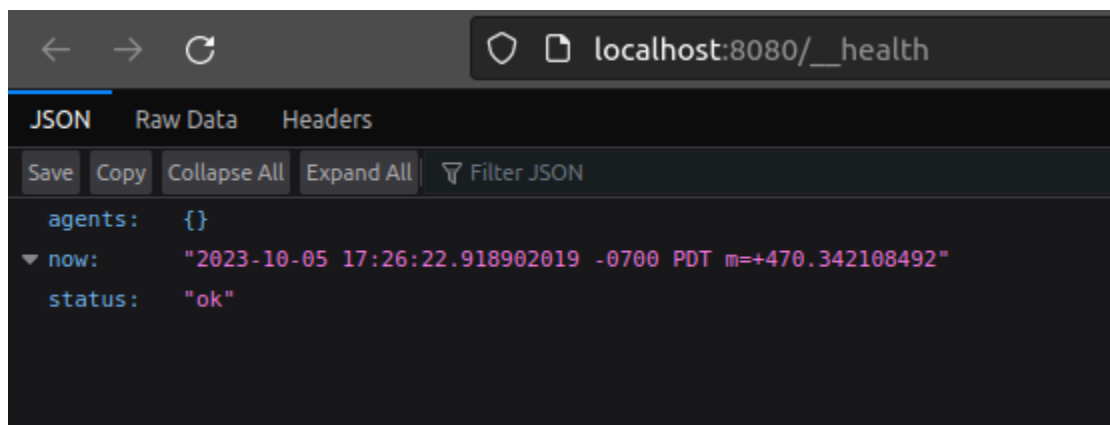
We then ran krakend.json and received the following output. Krakend is running on V2.4.3. The server is on Gin and on port 8080.


```
juanuriarte@John:~$ krakend run -c krakend.json
Parsing configuration file: krakend.json
2023/10/05 17:18:32 KRAKEND INFO: Starting KrakenD v2.4.3
2023/10/05 17:18:32 KRAKEND INFO: Starting the KrakenD instance
2023/10/05 17:18:32 KRAKEND INFO: [SERVICE: Gin] Listening on port: 8080
2023/10/05 17:18:37 KRAKEND DEBUG: [SERVICE: Telemetry] Registering usage stats for Cluster ID FVwZbeHrjj
HP8IL4FduNnmGcsPdHq71pVDaEv4SfD2Q=
```

After we ran `krakend.json` and put the file in `/etc`, we then went to this link to see if it allowed us to access it. http://localhost:8080/_health



http://localhost:8080/_health works.



After we accessed the link, we noticed the response code 200 and the Get requests. We accessed the webpage three times and noticed all three attempts were successful.

```
uanuriarte@John:~$ krakend run -c krakend.json
parsing configuration file: krakend.json
2023/10/05 17:18:32 KRAKEND INFO: Starting KrakenD v2.4.3
2023/10/05 17:18:32 KRAKEND INFO: Starting the KrakenD instance
2023/10/05 17:18:32 KRAKEND INFO: [SERVICE: Gin] Listening on port: 8080
2023/10/05 17:18:37 KRAKEND DEBUG: [SERVICE: Telemetry] Registering usage stats for Cluster ID FVwZbeHrjj
IP8IL4FduNnmGcSpdHq71pVdaEv4SfD2Q=
GIN] 2023/10/05 - 17:23:18 | 200 | 76.855µs | 127.0.0.1 | GET | "/__health"
GIN] 2023/10/05 - 17:23:55 | 200 | 33.513µs | 127.0.0.1 | GET | "/__health"
GIN] 2023/10/05 - 17:26:22 | 200 | 69.25µs | 127.0.0.1 | GET | "/__health"
```

We then created a GET request for `/api/books/` that is able to get us data from the link <http://localhost:5000/books/>. We made the following changes to `krakend.json` file. We also included the version model because it gave us an error when running it through `krakend`.

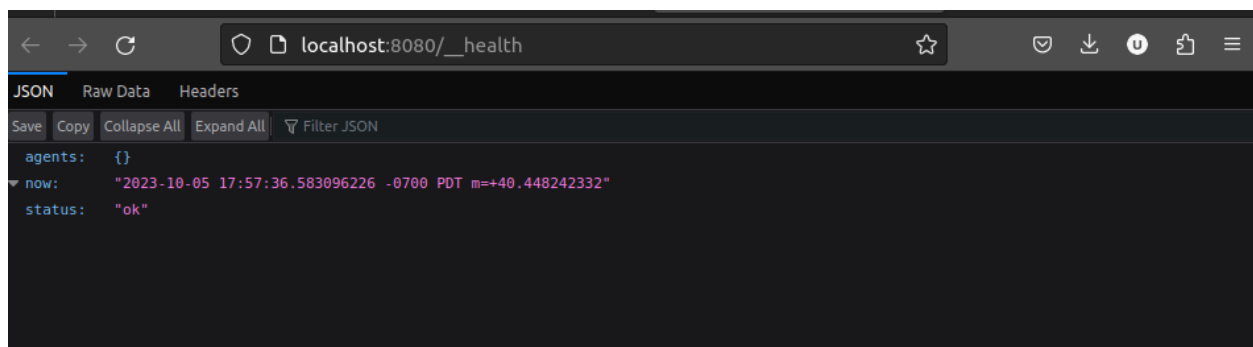
```
GIN] 2023/10/05 - 17:26:22 | 200 | 69.25µs | 127.0.0.1 | GET | "/__health"
{
  "version": 3,
  "endpoints": [
    {
      "endpoint": "/api/books/",
      "method": "GET",
      "backend": [
        {
          "url_pattern": "/books/",
          "method": "GET",
          "host": [
            "http://localhost:5000"
          ]
        }
      ]
    }
  ]
}
```

After making the changes to the `krakend.json` file, we ran the file and got the following results. The first Get request was towards `/__health` and the second Get request was towards `/api/books/`. Below are the webpages of our Get responses.

Exercise 2 API Gateway and Database Replication

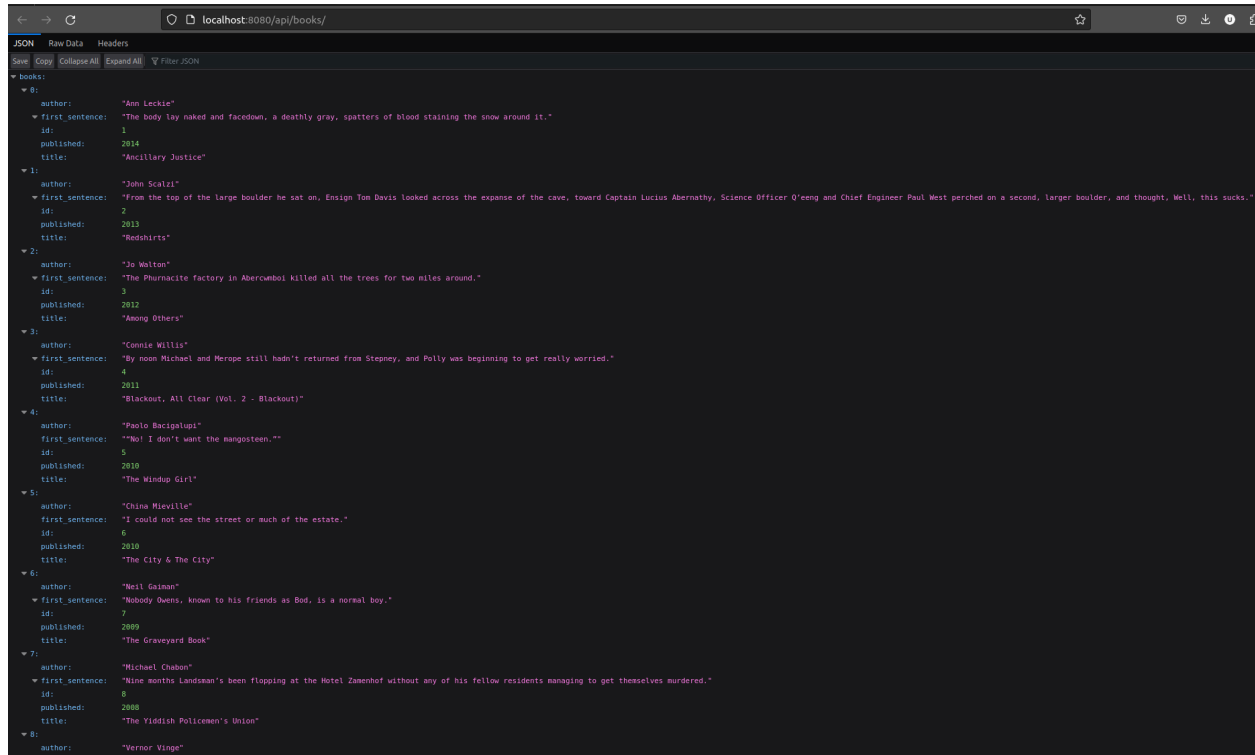
```
juanuriarte@John:~/cpsc449/fastapi/api/et: $ nano krakend.json
juanuriarte@John:~/cpsc449/fastapi/api/et: $ krakend run -c krakend.json
Parsing configuration file: krakend.json
2023/10/05 17:56:56 KRAKEND INFO: Starting KrakenD v2.4.3
2023/10/05 17:56:56 KRAKEND INFO: Starting the KrakenD instance
2023/10/05 17:56:56 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the proxy pipe
2023/10/05 17:56:56 KRAKEND DEBUG: [BACKEND: /books/] Building the backend pipe
2023/10/05 17:56:56 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the http handler
2023/10/05 17:56:56 KRAKEND DEBUG: [ENDPOINT: /api/books/] [JWTSigner] Signer disabled
2023/10/05 17:56:56 KRAKEND INFO: [ENDPOINT: /api/books/] [JWTValidator] Validator disabled for this endpoint
2023/10/05 17:56:56 KRAKEND INFO: [SERVICE: Gin] Listening on port: 8080
2023/10/05 17:57:01 KRAKEND DEBUG: [SERVICE: Telemetry] Registering usage stats for Cluster ID 8szJTYWYsJpVKsGZ1gkxFuWY5BDNwn4zVG4SGNSYNJ8=
[GIN] 2023/10/05 - 17:57:36 | 200 | 78.348µs | 127.0.0.1 | GET | "/_health"
[GIN] 2023/10/05 - 17:57:43 | 200 | 3.064602ms | 127.0.0.1 | GET | "/api/books/"
```

http://localhost:8080/_health works



<http://localhost:8080/api/books/> works

Exercise 2 API Gateway and Database Replication



The screenshot shows a web browser window with the address bar displaying `localhost:8080/api/books/`. The browser's developer tools are open, showing the JSON response of an API call. The response is a list of 8 books, each with an `id`, `author`, `published` year, `title`, and `first_sentence`. The books are:

- 1: "Ann Leckie" (2014), "Ancillary Justice"
- 2: "John Scalzi" (2013), "Redshirts"
- 3: "Jo Walton" (2012), "Among Others"
- 4: "Condie Willis" (2011), "Blackout, All Clear (Vol. 2 - Blackout)"
- 5: "Paolo Bacigalupi" (2010), "The Windup Girl"
- 6: "China Mieville" (2010), "The City & The City"
- 7: "Neil Gaiman" (2009), "The Graveyard Book"
- 8: "Michael Chabon" (2008), "The Yiddish Policemen's Union"

The browser interface includes tabs for JSON, Raw Data, and Headers, and buttons for Save, Copy, Collapse All, Expand All, and Filter JSON.

We then modified the `krakend.json` file to work for all the endpoints.

```
krakend.json
{
  "version": 3,
  "endpoints": [
    {
      "endpoint": "/api/books/",
      "method": "GET",
      "backend": [
        {
          "url_pattern": "/books/",
          "host": [
            "http://localhost:5000"
          ]
        }
      ]
    },
    {
      "endpoint": "/api/books/",
      "method": "POST",
      "backend": [
        {
          "url_pattern": "/books/",
          "host": [
            "http://localhost:5000"
          ]
        }
      ]
    },
    {
      "endpoint": "/api/books/{id}",
      "method": "GET",
      "backend": [
        {
          "url_pattern": "/books/{id}",
          "host": [
            "http://localhost:5000"
          ]
        }
      ]
    },
    {
      "endpoint": "/api/search",
      "method": "GET",
      "backend": [
        {
          "url_pattern": "/search",
          "host": [
            "http://localhost:5000"
          ],
          "whitelist": ["title", "author"]
        }
      ]
    }
  ]
}
```

Read 55 lines

^G Help

^O Write Out

^W Where Is

^K Cut

^T Execute

^C Location

M-U Undo

^X Exit

^R Read File

^_ Replace

^U Paste

^J Justify

^_ Go To Line

M-E Redo

After we modified the krakend.json file, we reran krakend and received the following output. Four Get requests were sent and the webpages will be shown below.

```
juanuriarte@John:~/cpsc449/fastapi/api/etc$ krakend run -c krakend.json
Parsing configuration file: krakend.json
2023/10/05 19:17:15 KRAKEND INFO: Starting Krakend v2.4.3
2023/10/05 19:17:15 KRAKEND INFO: Starting the Krakend instance
2023/10/05 19:17:15 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the proxy pipe
2023/10/05 19:17:15 KRAKEND DEBUG: [BACKEND: /books/] Building the backend pipe
2023/10/05 19:17:15 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the http handler
2023/10/05 19:17:15 KRAKEND DEBUG: [ENDPOINT: /api/books/][JWTSigner] Signer disabled
2023/10/05 19:17:15 KRAKEND INFO: [ENDPOINT: /api/books/][JWTValidator] Validator disabled for this endpoint
2023/10/05 19:17:15 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the proxy pipe
2023/10/05 19:17:15 KRAKEND DEBUG: [BACKEND: /books/] Building the backend pipe
2023/10/05 19:17:15 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the http handler
2023/10/05 19:17:15 KRAKEND DEBUG: [ENDPOINT: /api/books/][JWTSigner] Signer disabled
2023/10/05 19:17:15 KRAKEND INFO: [ENDPOINT: /api/books/][JWTValidator] Validator disabled for this endpoint
2023/10/05 19:17:15 KRAKEND DEBUG: [ENDPOINT: /api/books/:id] Building the proxy pipe
2023/10/05 19:17:15 KRAKEND DEBUG: [BACKEND: /books/{.Id}] Building the backend pipe
2023/10/05 19:17:15 KRAKEND DEBUG: [ENDPOINT: /api/books/:id] Building the http handler
2023/10/05 19:17:15 KRAKEND DEBUG: [ENDPOINT: /api/books/:id][JWTSigner] Signer disabled
2023/10/05 19:17:15 KRAKEND INFO: [ENDPOINT: /api/books/:id][JWTValidator] Validator disabled for this endpoint
2023/10/05 19:17:15 KRAKEND DEBUG: [ENDPOINT: /api/search] Building the proxy pipe
2023/10/05 19:17:15 KRAKEND DEBUG: [BACKEND: /search] Building the backend pipe
2023/10/05 19:17:15 KRAKEND DEBUG: [ENDPOINT: /api/search] Building the http handler
2023/10/05 19:17:15 KRAKEND DEBUG: [ENDPOINT: /api/search][JWTSigner] Signer disabled
2023/10/05 19:17:15 KRAKEND INFO: [ENDPOINT: /api/search][JWTValidator] Validator disabled for this endpoint
2023/10/05 19:17:15 KRAKEND INFO: [SERVICE: Gin] Listening on port: 8080
[GIN] 2023/10/05 - 19:17:19 | 200 | 2.161311ms | 127.0.0.1 | GET | "/api/books/4"
2023/10/05 19:17:20 KRAKEND DEBUG: [SERVICE: Telemetry] Registering usage stats for Cluster ID /QTtdf3uRLgMbAXAcTGg+9nqnq/u/U7xTo2fXStKdvw=
[GIN] 2023/10/05 - 19:17:30 | 200 | 5.901035ms | 127.0.0.1 | GET | "/api/books/"
[GIN] 2023/10/05 - 19:17:32 | 200 | 65.654µs | 127.0.0.1 | GET | "/__health"
[GIN] 2023/10/05 - 19:17:35 | 200 | 5.49034ms | 127.0.0.1 | GET | "/api/search"
```

<http://localhost:8080/api/books/4> works

The screenshot shows a web browser window with the address bar displaying `localhost:8080/api/books/4`. The page content is a JSON response, displayed in the 'JSON' tab. The JSON object is:

```
{
  "author": "Connie Willis",
  "first_sentence": "By noon Michael and Merope still hadn't returned from Stepney, and Polly was beginning to get really worried.",
  "id": 4,
  "published": 2011,
  "title": "Blackout, All Clear (Vol. 2 - Blackout)"
}
```

<http://localhost:8080/api/books/> works

The screenshot shows a web browser at the URL `localhost:8080/api/books/`. The browser's developer tools are open, displaying the JSON response from the API. The response is a list of books, each with an `id`, `author`, `published` year, `title`, and `first_sentence`. The books are listed in descending order of publication year.

```
{
  "books": [
    {
      "id": 1,
      "author": "Ann Leckie",
      "published": 2014,
      "title": "Ancillary Justice",
      "first_sentence": "The body lay naked and facedown, a deathly gray, spatters of blood staining the snow around it."
    },
    {
      "id": 2,
      "author": "John Scalzi",
      "published": 2013,
      "title": "Redshirts",
      "first_sentence": "From the top of the large boulder he sat on, Ensign Tom Davis looked across the expanse of the cave, toward Capt Lucius Abernathy, Science Officer Q'eeng and Chief Engineer Paul West perched on a second, larger boulder, and th Well, this sucks."
    },
    {
      "id": 3,
      "author": "Jo Walton",
      "published": 2012,
      "title": "Among Others",
      "first_sentence": "The Phurnacite factory in Abercwmboi killed all the trees for two miles around."
    },
    {
      "id": 4,
      "author": "Connie Willis",
      "published": 2011,
      "title": "Blackout, All Clear (Vol. 2 - Blackout)",
      "first_sentence": "By noon Michael and Merope still hadn't returned from Stepney, and Polly was beginning to get really worried."
    },
    {
      "id": 5,
      "author": "Paolo Bacigalupi",
      "published": 2010,
      "title": "The Windup Girl",
      "first_sentence": "\"No! I don't want the mangosteen.\""
    },
    {
      "id": 6,
      "author": "China Mieville",
      "published": 2010,
      "title": "The City & The City",
      "first_sentence": "I could not see the street or much of the estate."
    },
    {
      "id": 7,
      "author": "Neil Gaiman",
      "published": 2009,
      "title": "The Graveyard Book",
      "first_sentence": "Nobody Owens, known to his friends as Bod, is a normal boy."
    },
    {
      "id": 8,
      "author": "Michael Chabon",
      "published": 2008,
      "title": "Nine months Landsman's been flopping at the Hotel Zamenhof without any of his fellow residents managing to get themselves murdered."
    }
  ]
}
```

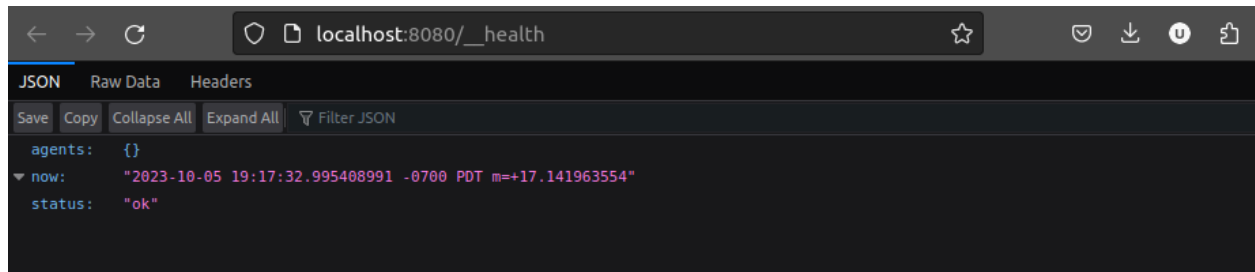
http://localhost:8080/_health works

Juan Uriarte

Fall 2023

Course Number: CPSC 449-01 13661

Exercise 2 API Gateway and Database Replication



<http://localhost:8080/api/search> works

```
books:
  0:
    author: "Ann Leckie"
    first_sentence: "The body lay naked and facedown, a deathly gray, spatters of blood staining the snow around it."
    id: 1
    published: 2014
    title: "Ancillary Justice"
  1:
    author: "John Scalzi"
    first_sentence: "From the top of the large boulder he sat on, Ensign Tom Davis looked across the expanse of the cave, toward Capta. Lucius Abernathy, Science Officer Q'eeng and Chief Engineer Paul West perched on a second, larger boulder, and thoe Well, this sucks."
    id: 2
    published: 2013
    title: "Redshirts"
  2:
    author: "Jo Walton"
    first_sentence: "The Phurnacite factory in Abercwmboi killed all the trees for two miles around."
    id: 3
    published: 2012
    title: "Among Others"
  3:
    author: "Connie Willis"
    first_sentence: "By noon Michael and Merope still hadn't returned from Stepney, and Polly was beginning to get really worried."
    id: 4
    published: 2011
    title: "Blackout, All Clear (Vol. 2 - Blackout)"
  4:
    author: "Paolo Bacigalupi"
    first_sentence: "\"No! I don't want the mangosteen.\""
    id: 5
    published: 2010
    title: "The Windup Girl"
  5:
    author: "China Mieville"
    first_sentence: "I could not see the street or much of the estate."
    id: 6
    published: 2010
    title: "The City & The City"
  6:
    author: "Neil Gaiman"
    first_sentence: "Nobody Owens, known to his friends as Bod, is a normal boy."
    id: 7
    published: 2009
    title: "The Graveyard Book"
  7:
    author: "Michael Chabon"
    first_sentence: "Nine months Landsman's been flopping at the Hotel Zamenhof without any of his fellow residents managing to get themselves murdered."
    id: 8
    published: 2008
    title: "The Yiddish Policemen's Union"
```

Created a Procfile inside the directory with the following input.


```

H Procfile
1  api: uvicorn --port $PORT api:app --reload
2  krakend: krakend run -c ./etc/krakend.json --port $PORT
3  |

```

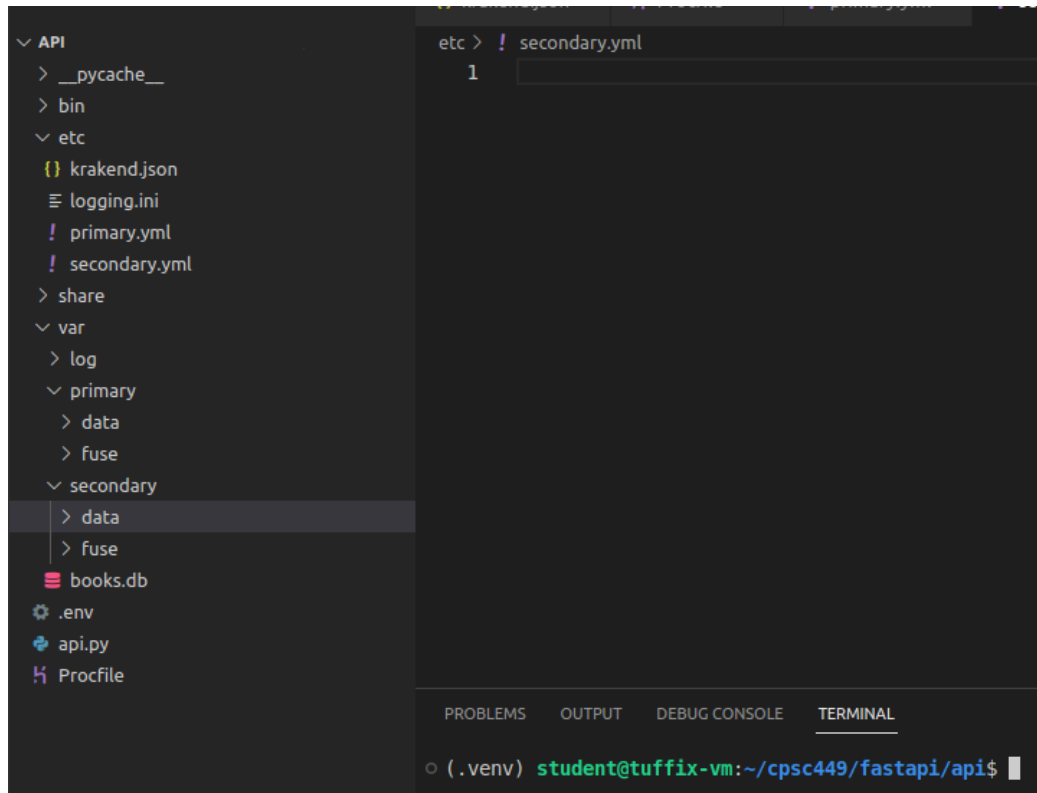
When we ran `foreman start` we received the following output. Krakend is running on port 5100 and api is running on port 5000.

```

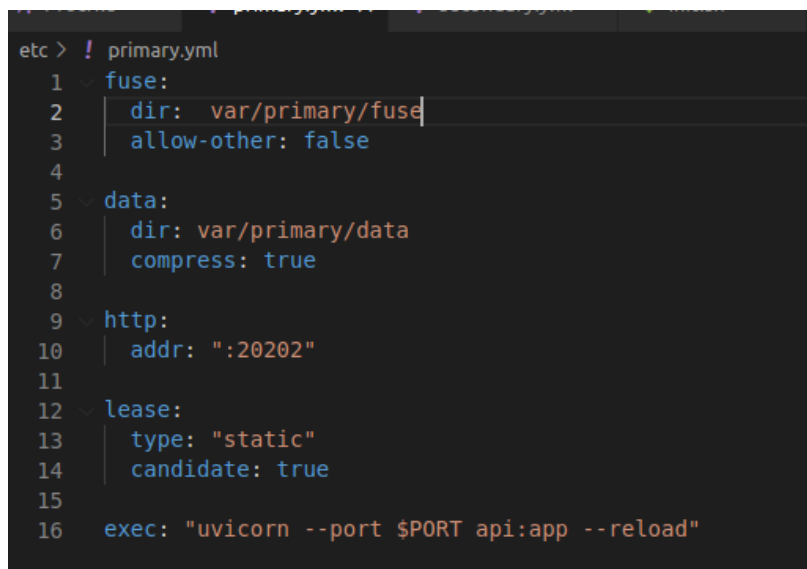
(.venv) student@tuffix-vm:~/cp449/fastapi/api$ foreman start
19:45:42 api.1 | started with pid 11307
19:45:42 krakend.1 | started with pid 11308
19:45:43 krakend.1 | Parsing configuration file: ./etc/krakend.json
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND INFO: Starting KrakenD v2.4.3
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND INFO: Starting the KrakenD instance
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the proxy pipe
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [BACKEND: /books/] Building the backend pipe
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the http handler
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [ENDPOINT: /api/books/][JWTSigner] Signer disabled
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND INFO: [ENDPOINT: /api/books/][JWTValidator] Validator disabled
19:45:43 krakend.1 | for this endpoint
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the proxy pipe
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [BACKEND: /books/] Building the backend pipe
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the http handler
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [ENDPOINT: /api/books/][JWTSigner] Signer disabled
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND INFO: [ENDPOINT: /api/books/][JWTValidator] Validator disabled
19:45:43 krakend.1 | for this endpoint
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [ENDPOINT: /api/books/:id] Building the proxy pipe
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [BACKEND: /books/{.Id}] Building the backend pipe
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [ENDPOINT: /api/books/:id] Building the http handler
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [ENDPOINT: /api/books/:id][JWTSigner] Signer disabled
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND INFO: [ENDPOINT: /api/books/:id][JWTValidator] Validator disabled
19:45:43 krakend.1 | for this endpoint
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [ENDPOINT: /api/search] Building the proxy pipe
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [BACKEND: /search] Building the backend pipe
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [ENDPOINT: /api/search] Building the http handler
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND DEBUG: [ENDPOINT: /api/search][JWTSigner] Signer disabled
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND INFO: [ENDPOINT: /api/search][JWTValidator] Validator disabled
19:45:43 krakend.1 | for this endpoint
19:45:43 krakend.1 | 2023/10/10 19:45:43 KRAKEND INFO: [SERVICE: Gin] Listening on port: 5100
19:45:43 api.1 | INFO: Will watch for changes in these directories: ['/home/student/cpsc449/fastapi/api']
19:45:43 api.1 | INFO: Uvicorn running on http://127.0.0.1:5000 (Press CTRL+C to quit)
19:45:43 api.1 | INFO: Started reloader process [11307] using WatchFiles
19:45:45 api.1 | INFO: Started server process [11317]
19:45:45 api.1 | INFO: Waiting for application startup.
19:45:45 api.1 | INFO: Application startup complete.
19:45:48 krakend.1 | 2023/10/10 19:45:48 KRAKEND DEBUG: [SERVICE: Telemetry] Registering usage stats for Cluster ID 5w4b2AKTAeQLwriw49I+i2cowrksBqwdzHcCOAMPg=

```

Create two LiteFS configuration files in `./etc` named `primary.yml` and `secondary.yml` and two sets of directories in `./var` using the structure shown in the doc:



Configure LiteFS for primary:



Configure secondary for LiteFS: we discovered that the `advertise-url` needed to be set on the secondary to check if the primary port is active.

```
etc > ! secondary.yml
1  fuse:
2    dir: var/secondary/fuse
3    allow-other: false
4
5  data:
6    dir: var/secondary/data
7    compress: true
8
9  http:
10   addr: ":20203"
11
12 lease:
13   type: "static"
14   advertise-url: "http://127.0.0.1:20202"
15   candidate: false
```

Add LiteFS to Procfile:

```
Procfile  ×  ! primary.yml  ! secondary.yml  $ init.sh
Procfile
1  primary: bin/litefs mount -config ./etc/primary.yml
2  secondary: bin/litefs mount -config ./etc/secondary.yml
3  krakend: krakend run -c ./etc/krakend.json --port $PORT
4
```

Once the Procfile, primary.yml, and secondary.yml were configured we ran `foreman start` and received the following output.

Exercise 2 API Gateway and Database Replication

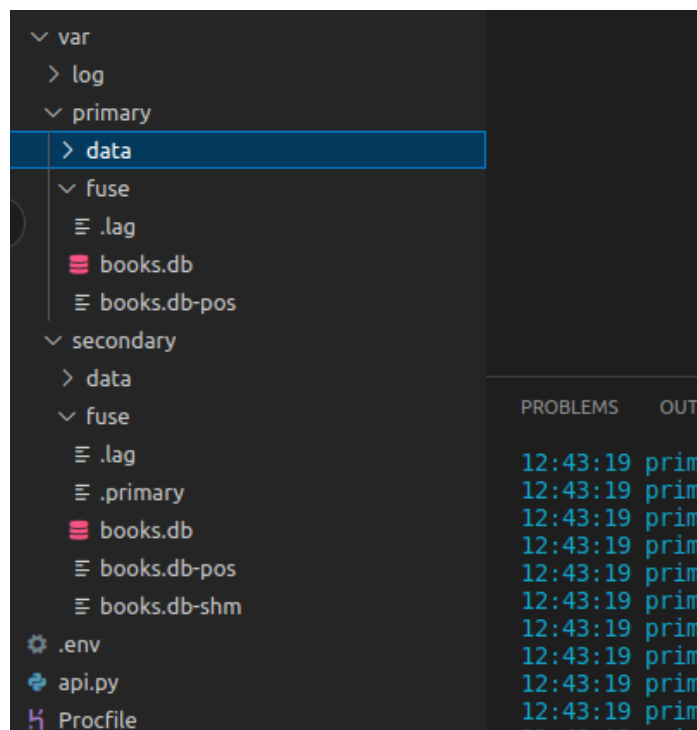
```
(.venv) juanuriarte@John:~/cpsc449/fastapi/api$ foreman start
17:19:40 primary.1 | started with pid 9614
17:19:40 secondary.1 | started with pid 9615
17:19:40 krakend.1 | started with pid 9616
17:19:40 primary.1 | LiteFS v0.5.7, commit=c477633c9b17981ccbfa0b86d28b9cd6b7202888
17:19:40 primary.1 | level=INFO msg="no backup client configured, skipping"
17:19:40 secondary.1 | LiteFS v0.5.7, commit=c477633c9b17981ccbfa0b86d28b9cd6b7202888
17:19:40 secondary.1 | level=INFO msg="no backup client configured, skipping"
17:19:40 primary.1 | level=INFO msg="Using static primary: primary=true hostname= advertise-url="
17:19:40 secondary.1 | level=INFO msg="Using static primary: primary=false hostname= advertise-url=http://127.0.0.1:20202"
17:19:40 primary.1 | level=INFO msg="wal-sync: no wal file exists on \\"books.db\\", skipping sync with ltx"
17:19:40 secondary.1 | level=INFO msg="wal-sync: no wal file exists on \\"books.db\\", skipping sync with ltx"
17:19:40 primary.1 | level=INFO msg="using existing cluster id: \\"LFSCA383260E06239B75\\\""
17:19:40 primary.1 | level=INFO msg="2A73D827B4353504: primary lease acquired, advertising as "
17:19:40 secondary.1 | level=INFO msg="using existing cluster id: \\"LFSCA383260E06239B75\\\""
17:19:40 primary.1 | level=INFO msg="set cluster id on \\"static\\": lease \\"LFSCA383260E06239B75\\\""
17:19:40 secondary.1 | level=INFO msg="53BF1A3F0300F5F7: existing primary found (), connecting as replica to \\"http://127.0.0.1:20202\\\""
17:19:40 primary.1 | level=INFO msg="LiteFS mounted to: ./var/primary/fuse"
17:19:40 primary.1 | level=INFO msg="http server listening on: http://localhost:20202"
17:19:40 primary.1 | level=INFO msg="waiting to connect to cluster"
17:19:40 primary.1 | level=INFO msg="connected to cluster, ready"
17:19:40 secondary.1 | level=INFO msg="LiteFS mounted to: ./var/secondary/fuse"
17:19:40 primary.1 | level=INFO msg="no proxy target set, skipping proxy"
17:19:40 secondary.1 | level=INFO msg="http server listening on: http://localhost:20203"
17:19:40 primary.1 | level=INFO msg="starting background subprocess: uvicorn [--port 5000 api:app --reload]"
17:19:40 secondary.1 | level=INFO msg="waiting to connect to cluster"
17:19:40 primary.1 | level=INFO msg="2A73D827B4353504: stream connected (127.0.0.1:34222)"
17:19:40 primary.1 | waiting for signal or subprocess to exit
17:19:40 secondary.1 | level=INFO msg="connected to cluster, ready"
17:19:40 secondary.1 | level=INFO msg="no proxy target set, skipping proxy"
17:19:40 secondary.1 | waiting for signal or subprocess to exit
17:19:40 krakend.1 | Parsing configuration file: ./etc/krakend.json
2023/10/12 17:19:40 KRAKEND INFO: Starting Krakend v2.4.6
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND INFO: Starting the Krakend instance
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the proxy pipe
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [BACKEND: /books/] Building the backend pipe
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the http handler
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [ENDPOINT: /api/books/] [JWTSigner] Signer disabled
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND INFO: [ENDPOINT: /api/books/] [JWTValidator] Validator disabled for this endpoint
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the proxy pipe
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [BACKEND: /books/] Building the backend pipe
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [ENDPOINT: /api/books/] Building the http handler
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [ENDPOINT: /api/books/] [JWTSigner] Signer disabled
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND INFO: [ENDPOINT: /api/books/] [JWTValidator] Validator disabled for this endpoint
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [ENDPOINT: /api/books/:id] Building the proxy pipe
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [BACKEND: /books/(:id)] Building the backend pipe
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [ENDPOINT: /api/books/:id] Building the http handler
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [ENDPOINT: /api/books/:id] [JWTSigner] Signer disabled
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND INFO: [ENDPOINT: /api/books/:id] [JWTValidator] Validator disabled for this endpoint
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [ENDPOINT: /api/search] Building the proxy pipe
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [BACKEND: /search] Building the backend pipe
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [ENDPOINT: /api/search] Building the http handler
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND DEBUG: [ENDPOINT: /api/search] [JWTSigner] Signer disabled
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND INFO: [ENDPOINT: /api/search] [JWTValidator] Validator disabled for this endpoint
17:19:40 krakend.1 | 2023/10/12 17:19:40 KRAKEND INFO: [SERVICE: gin] Listening on port: 5200
17:19:40 primary.1 | INFO: Will watch for changes in these directories: ["/home/juanuriarte/cpsc449/fastapi/api"]
17:19:40 primary.1 | INFO: Uvicorn running on http://127.0.0.1:5000 (Press CTRL+C to quit)
17:19:40 primary.1 | INFO: Started reloader process [9656] using WatchFiles
17:19:41 primary.1 | INFO: Started server process [9675]
17:19:41 primary.1 | INFO: Waiting for application startup.
17:19:41 primary.1 | INFO: Application startup complete.
17:19:45 krakend.1 | 2023/10/12 17:19:45 KRAKEND DEBUG: [SERVICE: Telemetry] Registering usage stats for Cluster ID 4A1AoH4WFRiE2e7B/E90CJdzhlDbB2AnA/OCLhwM=
```

Modify bin/init.sh and .env:

```
1 PYTHONUNBUFFERED=True
2 DATABASE=./var/primary/fuse/books.db
3 LOGGING_CONFIG=./etc/logging.ini
4
```

run `./bin/init.sh` to create `books.db` in the primary FUSE directory. After a moment, a replica will be created in the secondary FUSE directory:

```
(.venv) juanuriarte@John:~/cpssc449/fastapi/api$ ./bin/init.sh
```



Juan Uriarte

Fall 2023

Course Number: CPSC 449-01 13661

Exercise 2 API Gateway and Database Replication

Use the sqlite3 command to open the secondary replica. Can you SELECT from the books table? Can you INSERT or DELETE?

We ran the database from secondary and managed to see the book database

```
(.env) juanuriarte@John:~/cpsc449/fastapi/api$ sqlite3 /home/juanuriarte/cpsc449/fastapi/api/var/secondary/fuse/books.db
SQLite version 3.37.2 2022-01-06 13:25:41
Enter ".help" for usage hints.
sqlite> SELECT * FROM books;
1|2014|Ann Leckie|Ancillary Justice|The body lay naked and facedown, a deathly gray, spatters of blood staining the snow around it.
2|2013|John Scalzi|Redshirts|From the top of the large boulder he sat on, Ensign Tom Davis looked across the expanse of the cave, toward Captain Lucius Abernathy, Science Officer Q'eeng and
3|2012|Jo Walton|Among Others|The Phurnacite factory in Abercrombi killed all the trees for two miles around.
4|2011|Connie Willis|Blackout, All Clear (Vol. 2 - Blackout)|By noon Michael and Merope still hadn't returned from Stepney, and Polly was beginning to get really worried.
5|2010|Paolo Bacigalupi|The Windup Girl|"No! I don't want the mangosteen."
6|2010|China Mieville|The City & The City|I could not see the street or much of the estate.
7|2009|Neil Gaiman|The Graveyard Book|Nobody Owens, known to his friends as Bod, is a normal boy.
8|2008|Michael Chabon|The Yiddish Policemen's Union|Nine months Landsman's been flopping at the Hotel Zamenhof without any of his fellow residents managing to get themselves murdered.
9|2007|Vernor Vinge|Rainbows End|The first bit of dumb luck came disguised as a public embarrassment for the European Center for Defense Against Disease.
10|2006|Robert Charles Wilson|Spin|One night in October when he was ten years old, Tyler Dupree stood in his back yard and watched the stars go out.
11|2005|Susanna Clarke|Jonathan Strange and Mr. Norrell|Some years ago there was in the city of York a society of magicians.
12|2004|Lois McMaster Bujold|Paladin of Souls|Sta leaned forward between the crenellations atop the gate tower, the stone gritty beneath her pale hands, and watched in numb exhaustion as th
e final mourning party cleared the castle gate below.
13|2003|Robert J. Sawyer|Hominids|The blackness was absolute.
14|2002|Neil Gaiman|American Gods|Shadow had done three years in prison.
15|2001|J. K. Rowling|Harry Potter and the Goblet of Fire|The villagers of Little Hangleton still called it "the Riddle House," even though it had been many years since the Riddle family ha
d lived there.
16|2000|Vernor Vinge|A Deepness in the Sky|The manhunt extended across more than one hundred light-years and eight centuries.
17|1999|Connie Willis|To Say Nothing of the Dog|There were five of us--Carruthers and the new recruit and myself, and Mr. Spivens and the verger.
18|1998|Joe Haldeman|Forever Peace|It was not quite completely dark, thin blue moonlight threading down through the canopy of leaves.
19|1997|Kim Stanley Robinson|Blue Mars|Mars is free now. We're on our own. No one tells us what to do.
20|1996|Neal Stephenson|The Diamond Age|The bells of St. Mark's were ringing changes up on the mountain when Bud skated over to the mod parlor to upgrade his skull gun.
21|1995|Lois McMaster Bujold|Mirror Dance|The row of console booths lining the passenger concourse of Escobar's largest commercial orbital transfer station had mirrored doors, divided in
to diagonal sections by rainbow-colored lines of lights.
22|1994|Kim Stanley Robinson|Green Mars|The point is not to make another Earth. Not another Alaska or Tibet, not a Vermont nor a Venice, not even an Antarctica. The point is to make somethi
ng new and strange, something Martian.
23|1993|Vernor Vinge|A Fire Upon the Deep|The coldsleep itself was dreamless.
24|1993|Connie Willis|Doomsday Book|Mr. Dunworthy opened the door to the laboratory and his spectacles promptly steamed up.
25|1992|Lois McMaster Bujold|Barravarr|I am afraid.
26|1991|Lois McMaster Bujold|The Vor Game|"Ship duty!" chorled the ensign four ahead of Miles in line.
27|1990|Dan Simmons|Hyperion|The consul awoke with the peculiar headache, dry throat, and sense of having forgotten a thousand dreams which only periods in cryogenic fugue could bring.
28|1989|C. J. Cherryh|Cyteen|It was from the air that the rawness of the land showed most: vast tracts where humanity had as yet made no difference, deserts unclaimed, stark as moons, scrag
and woolwood thickets unexplored except by orbiting radar.
29|1988|David Brin|The Uplift War|There had never been such traffic at Port Helenia's sleepy landing field-not in all the years Fiben Bolger had lived here.
30|1987|Orson Scott Card|Speaker for the Dead|Rooter was at once the most difficult and the most helpful of the pequeninos.
31|1986|Orson Scott Card|Enders Game|The monitor lady smiled very nicely and tousled his hair and said, "Andrew, I suppose by now you're just absolutely sick of having that horrid monitor.
32|1985|William Gibson|Neuromancer|The sky above the port was the color of television, tuned to a dead channel.
33|1984|David Brin|Startide Rising|Fins had been making wisecracks about human beings for thousands of years.
34|1983|Isaac Asimov|Foundation's Edge|"I don't believe it, of course," said Golan Trevize, standing on the wide steps of Seldon Hall and looking out over the city as it sparkled in the sun
light.
35|1982|C. J. Cherryh|Downbelow Station|The stars, like all man's other ventures, were an obvious impracticality, as rash and improbable an ambition as the first venture of man onto Earth's
own great oceans, or into the air, or into space.
36|1981|Joan D. Vinge|The Snow Queen|Here on Tiamat, where there is more water than land, the sharp edge between ocean and sky is blurred; the two merge into one.
37|1980|Arthur C. Clarke|The Fountains of Paradise|The crown grew heavier with each passing year.
38|1979|Vonda N. McIntyre|Dreamsnake|The little boy was frightened.
39|1978|Frederik Pohl|Gateway|My name is Robinette Broadhead, in spite of which I am male.
40|1977|Kate Wilhelm|Where Late the Sweet Birds Sang|What David always hated most about the Sumner family dinners was the way everyone talked about him as if he were not there.
41|1976|Joe Haldeman|The Forever War|"Tonight we're going to show you eight silent ways to kill a man."
42|1975|Ursula K. Le Guin|The Dispossessed|There was a wall.
43|1974|Arthur C. Clarke|Rendezvous with Rama|Sooner or later, it was bound to happen.
44|1973|Isaac Asimov|The Gods Themselves|"Let me give you a lesson in practical politics."
45|1972|Philip Jose Farmer|To Your Scattered Bodies Go|All those who ever lived on Earth have found themselves resurrected--healthy, young, and naked as newborns--on the grassy banks of a m
ighty river, in a world unknown.
```

When I attempted to insert a book output was shown as Error: stepping, attempt to write a readonly database. Which we expected since secondary db should be read only.

```
sqlite> INSERT INTO books (title, author, published_date)
...> VALUES ('Green Eggs and Ham', 'Dr. Seuss', '1960');
Error: in prepare, table books has no column named published_date (1)
sqlite> PRAGMA table_info(books);
0|id|INTEGER|0||1
1|published|INT|0||0
2|author|VARCHAR|0||0
3|title|VARCHAR|0||0
4|first_sentence|VARCHAR|0||0
sqlite> INSERT INTO books (title, author, published)
...> VALUES ('Green Eggs and Ham', 'Dr. Seuss', '1960');
Error: stepping, attempt to write a readonly database (8)
sqlite>
```

When I attempted to delete a book, the output was shown as a read only database.

Exercise 2 API Gateway and Database Replication

```
61|1956|Robert A. Heinlein|Double Star|If a man walks in dressed like a hick and acting as if he owned the place, he's a spaceman.
62|1955|Mark Clifton and Frank Riley|They'd Rather Be Right|Just ahead, on Third Street, the massive facade of San Francisco's Southern Pacific depot loomed, half hidden in the swirling fog
and January twilight.
63|1954|Ray Bradbury|Fahrenheit 451|It was a pleasure to burn.
64|1953|Alfred Bester|The Demolished Man|Explosion!
65|1951|Robert A. Heinlein|Farmer in the Sky|Our troop had been up in the High Sierras that day and we were late getting back.
66|1946|Isaac Asimov|The Mule|Bel Riose traveled without escort, which is not what court etiquette prescribes for the head of a fleet stationed in a yet-sullen stellar system on the Marches
of the Galactic Empire.
67|1939|T. H. White|The Sword in the Stone (Part 1 of The Once and Future King)|ender
68|2017|John Scalzi|The Collapsing Empire|The mutineers would have gotten away with it, too, if it weren't for the collapse of the Flow.
sqlite> DELETE FROM books WHERE author = 'Ray Bradbury';
Error: stepping, attempt to write a readonly database (8)
sqlite>
```

During the testing phase when we ran `./bin/post.sh ./share/book.json` we received the following output.

```
bash: ./bin/init.sh: No such file or directory
(.venv) juanuriarte@John:~/cpsc449$ cd f
fastapi/ flask/
(.venv) juanuriarte@John:~/cpsc449$ cd fastapi/
(.venv) juanuriarte@John:~/cpsc449/fastapi$ ls
api hello
(.venv) juanuriarte@John:~/cpsc449/fastapi$ cd api/
(.venv) juanuriarte@John:~/cpsc449/fastapi/api$ ls
api.py bin etc Procfile __pycache__ share var
(.venv) juanuriarte@John:~/cpsc449/fastapi/api$ ./bin/init.sh
(.venv) juanuriarte@John:~/cpsc449/fastapi/api$ ./bin/post.sh ./share/book.json
POST /books/ HTTP/1.1
Accept: application/json, */*;q=0.5
Accept-Encoding: gzip, deflate
Connection: keep-alive
Content-Length: 215
Content-Type: application/json
Host: localhost:5000
User-Agent: HTTPie/3.2.2

{
  "author": "John Scalzi",
  "first_sentence": "The mutineers would have gotten away with it, too, if it weren't for the collapse of the Flow.",
  "published": 2017,
  "title": "The Collapsing Empire"
}

HTTP/1.1 201 Created
content-length: 197
content-type: application/json
date: Thu, 12 Oct 2023 22:26:07 GMT
location: /books/68
server: uvicorn

{
  "author": "John Scalzi",
  "first_sentence": "The mutineers would have gotten away with it, too, if it weren't for the collapse of the Flow.",
  "id": 68,
  "published": 2017,
  "title": "The Collapsing Empire"
}
```