Build an API!

Jay Hilton
Joyce Yoon

Making our endpoints in our server

```
// import libraries needed for the webserver to work!
const express = require("express"); // backend framework for our node server.
const path = require("path"); // provide utilities for working with file and directory paths

// create a new express server
const app = express();

// allow us to make post requests
app.use(express.json());

app.get("/dog/test", (req, res) => {
  res.send({ message: "Wow I made my first dog endpoint!" });
});

app.get("/dog/breeds", (req, res) => {
  res.send({ breeds: ["lab", "dalmation", "corgi"] });
});

app.get("/cat/test", (req, res) => {
  res.send({ message: "Wow I made my first cat endpoint!" });
});

app.get("/cat/breeds", (req, res) => {
  res.send({ breeds: ["siamese", "maine coon", "tabby"] });
});

//many more endpoints below
```

/dog

/cat

Imagine our server had many many endpoints...

Is there a clear way to organize our endpoints?

Organize by /dog and /cat

Making our endpoints in our server

`app`

Represents your overall server (main-application)

`router`

Isolated group of API endpoints (mini-application)

app in server.js

...

get `/dog/test` endpoint

get `/dog/breeds` endpoint

get `/cat/test` endpoint

get `/cat/breeds` endpoint

...

Having all our endpoints in our server can be cluttered

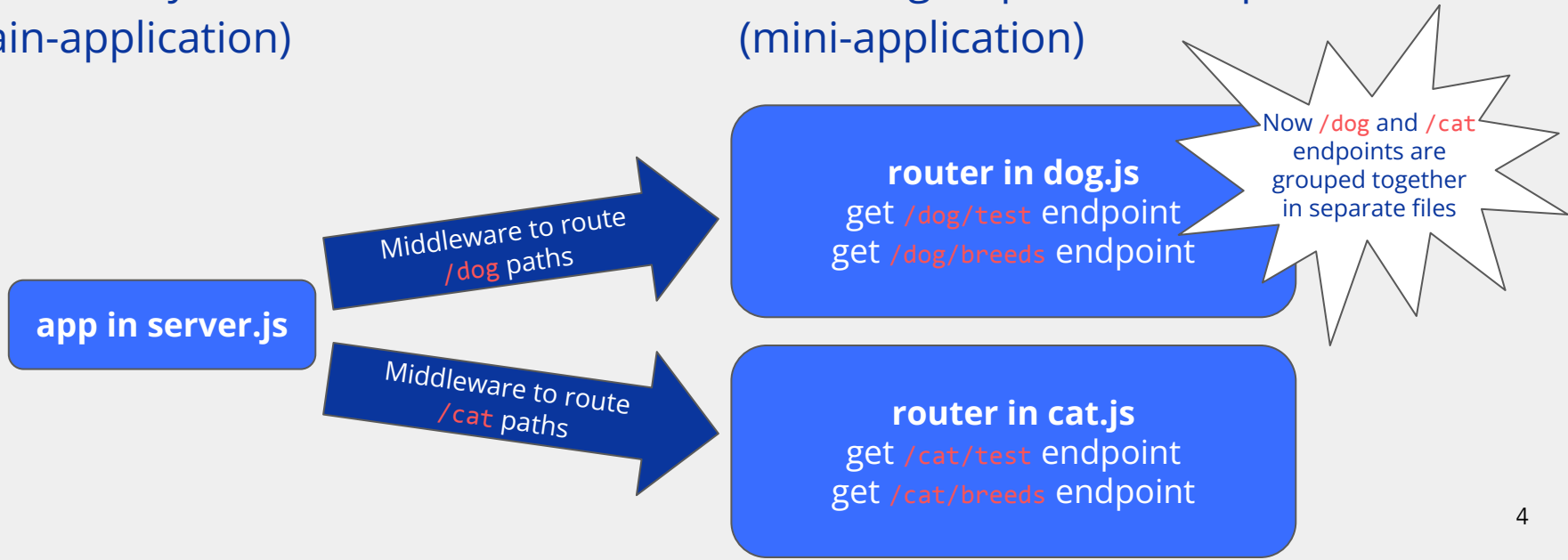
Making our endpoints in our router

app

Represents your overall server (main-application)

router

Isolated group of API endpoints (mini-application)



App vs. Router

`app` `(server.js)`

Represents your overall server (main-application)

`router` `(cat.js, dog.js, api.js, etc.)`

Isolated group of API endpoints (mini-application)

Why use routers?

- **Simplicity!** De-clutter our server and organize our endpoints
- **Modularity!** We can structure endpoints in isolation without having to care about the logic of the server or other endpoints

Some more words

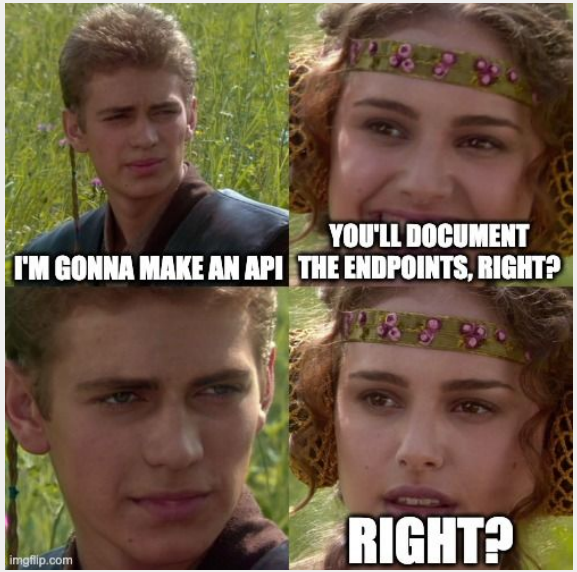
API endpoint - a part of the server that performs some specific function

Example: the stories endpoint

API route - the name you use to access that endpoint

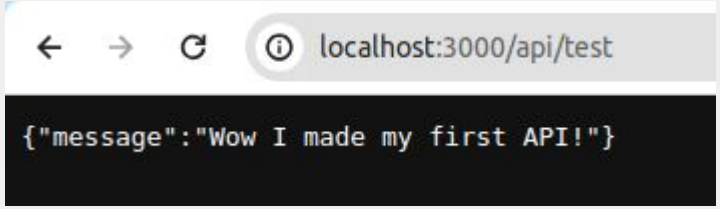
Example: `“/api/stories/”`

These are equivalent for our purposes



Workshop 5

So far, your Catbook has a single accessible API endpoint: /api/test



Now it’s time we lay the groundwork for more useful endpoints, ones that can dynamically store and retrieve data!

Let's get started...

```
git reset --hard
git fetch
git checkout w5-starter
```

```
git reset --hard
git fetch
git checkout w5-starter
```

Step 1

Move endpoints from our server to our router

```
git checkout w5-starter
```

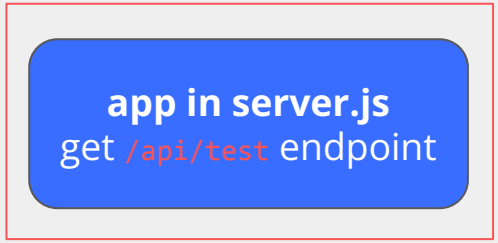
Moving our endpoints from our server to our router

`app (server.js)`

Represents your overall server (main-application)

`router (api.js)`

Isolated group of API endpoints (mini-application)



What we start with in starter

```
git checkout w5-starter
```

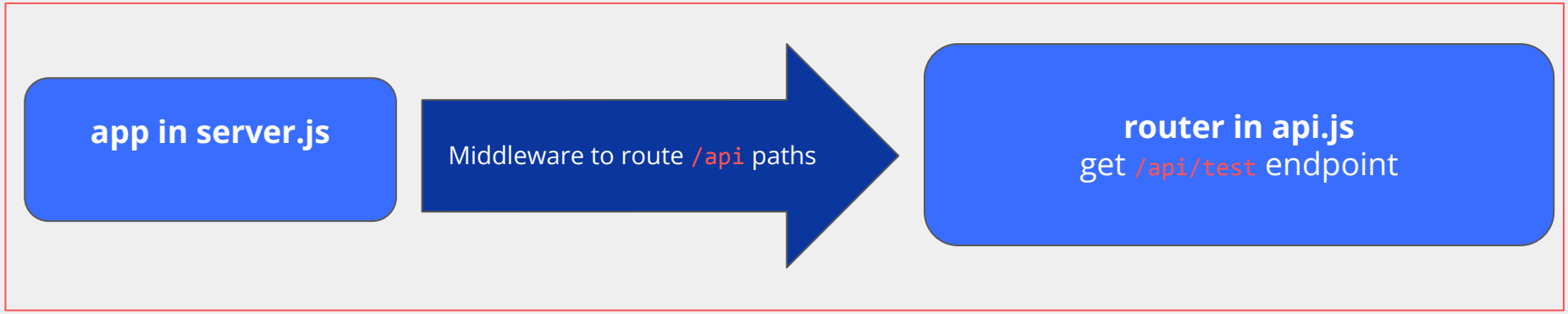
Moving our endpoints from our server to our router

`app (server.js)`

Represents your overall server (main-application)

`router (api.js)`

Isolated group of API endpoints (mini-application)



What we want by the end of Step 1

```
git checkout w5-starter
```

Moving our endpoints from our server to our router

Steps:

1. **Create a separate file (we have already done this by making api.js)**

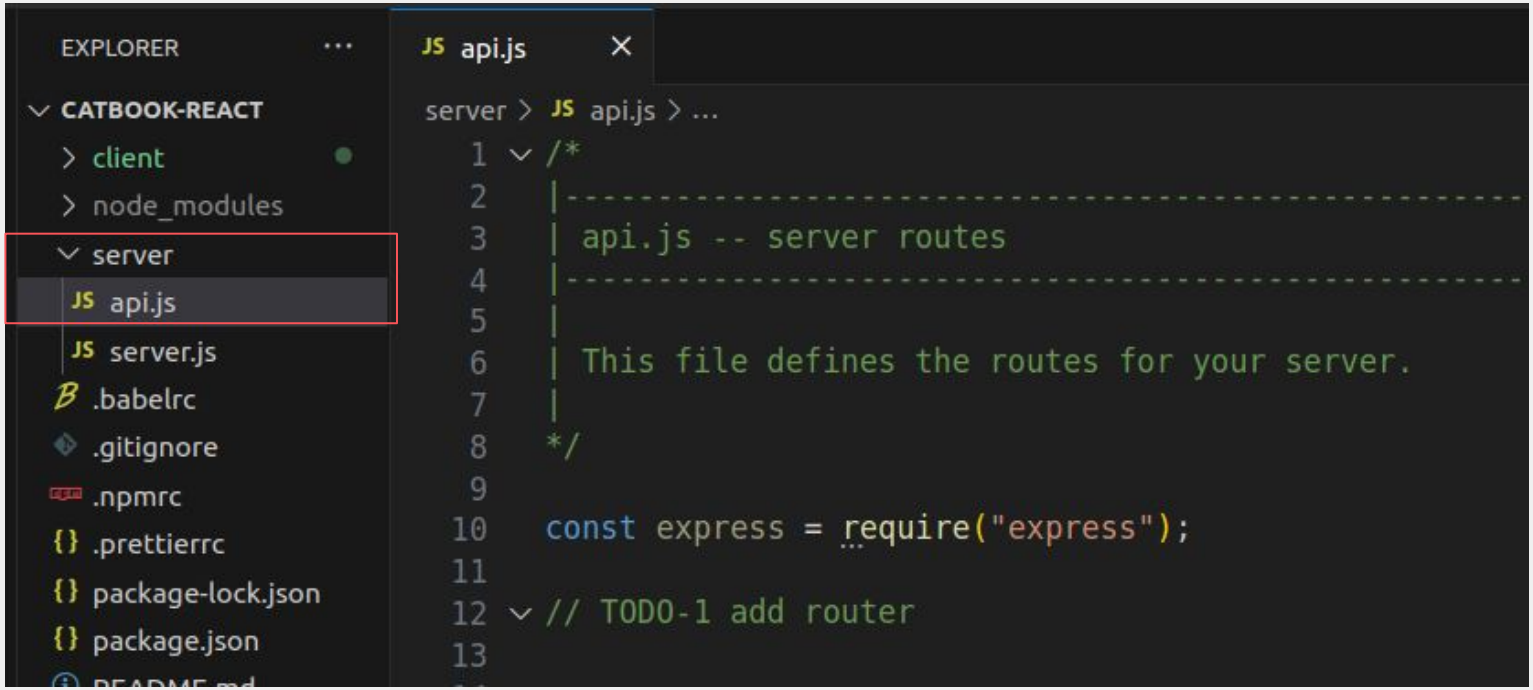
app in server.js
get `/api/test` endpoint

api.js

```
git checkout w5-starter
```

Use `api` Route for Requests

Open `api.js` from the `./server` directory.



```
git checkout w5-starter
```

Moving our endpoints from our server to our router

Steps:

1. Create a separate file (we have already done this by making api.js)
2. **Define a router for /api in api.js**

app in server.js
get `/api/test` endpoint

router in api.js

```
git checkout w5-starter
```

TODO-1&2: Connect `api.js` to our main server

In `api.js`:

server.js M | api.js M

server > api.js > ...

```
/*
|-----------------------------------------------------------------------------
| api.js -- server routes
|-----------------------------------------------------------------------------
|
| This file defines the routes for your server.
|
*/

const express = require("express");

// TODO-1 add router

// TODO-5 migrate api/test endpoint from server.js


// TODO-2 export router
```

Reminder:
Ever confused how we know what to code?
Look up the documentation:
Ex. expressjs.com/en/guide/routing.html

```
git checkout w5-starter
```

TODO-1&2: Connect `api.js` to our main server

In `api.js`:

JS server.js M JS api.js M ×

server > JS api.js > ...

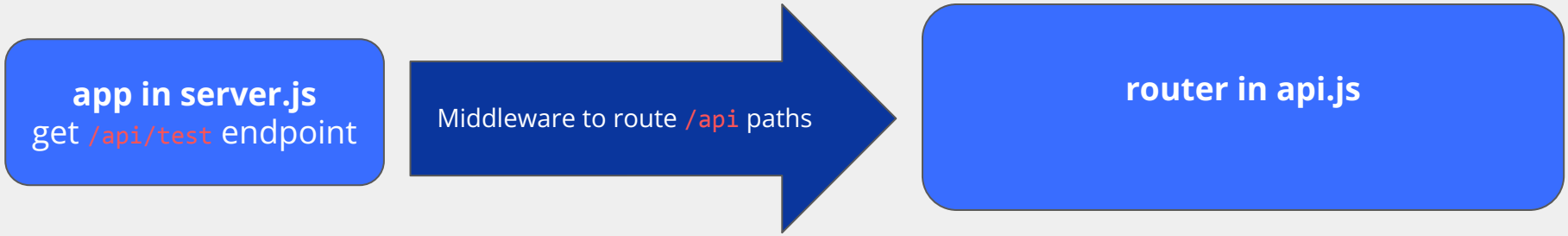
```
/*
|-------------------------------------------------------------------------
| api.js -- server routes
|-------------------------------------------------------------------------
|
| This file defines the routes for your server.
|
*/

const express = require("express");

// TODO-1 add router
const router = express.Router();

// TODO-5 migrate api/test endpoint from server.js


// TODO-2 export router
module.exports = router;
```

Reminder:
Ever confused how we know what to code?
Look up the documentation:
Ex. expressjs.com/en/guide/routing.html

Moving our endpoints from our server to our router

Steps:

1. Create a separate file (we have already done this by making api.js)
2. Define a router for /api (use express.Router()) in api.js
3. **Define middleware to route any api paths prefixed with /api to api.js**



```
git checkout w5-starter
```

TODO-3: Connect `api.js` to our main server

In `server.js`:

server > JS server.js > ...

```
14
15  // import libraries needed for the webserver to work!
16  const express = require("express"); // backend framework for our node server.
17  const path = require("path"); // provide utilities for working with file and directory paths
18
19  // TODO-3 import the router from our API file
20
21
22  // create a new express server
23  const app = express();
24
```

```
git checkout w5-starter
```

TODO-3: Connect `api.js` to our main server

In `server.js`:

server > JS server.js > ...

```
14
15  // import libraries needed for the webserver to work!
16  const express = require("express"); // backend framework for our node server.
17  const path = require("path"); // provide utilities for working with file and directory paths
18
19  // TODO-3 import the router from our API file
20  const api = require("./api.js");
21
22  // create a new express server
23  const app = express();
24
```

```
git checkout w5-starter
```

TODO-4: Connect `api.js` to our main server

In `server.js`:

```
19  // import the router from our API file
20  const api = require("./api.js");
21
22  // create a new express server
23  const app = express();
24
25  // allow us to make post requests
26  app.use(express.json());
27
28  // connect API routes from api.js
29
```

```
git checkout w5-starter
```

TODO-4: Connect `api.js` to our main server

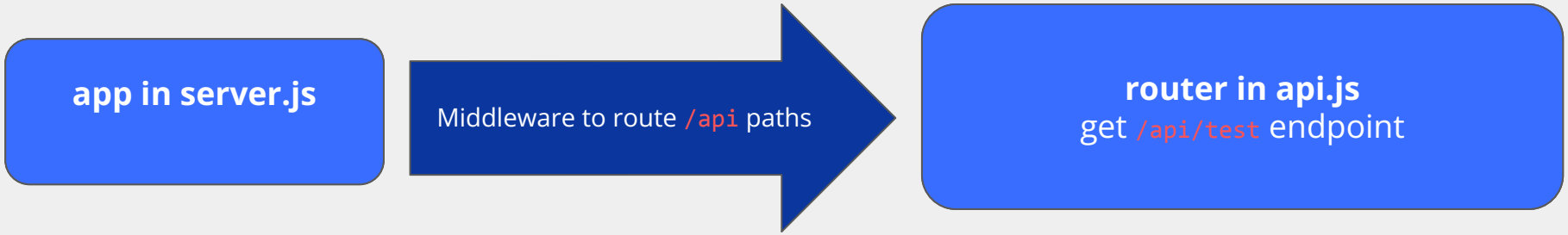
In `server.js`:

```
19  // import the router from our API file
20  const api = require("./api.js");
21
22  // create a new express server
23  const app = express();
24
25  // allow us to make post requests
26  app.use(express.json());
27
28  // connect API routes from api.js
29  app.use("/api", api);
```

Moving our endpoints from our server to our router

Steps:

1. Create a separate file (we have already done this by making api.js)
2. Define a router for /api (use express.Router()) in api.js
3. Define middleware to route any api paths prefixed with /api to api.js
4. **Move our /api/test endpoint from server.js to api.js**



```
git checkout w5-starter
```

TODO-5: Move our route into `api.js`

In `server.js`:

```
22  // create a new express server
23  const app = express();
24
25  // allow us to make post requests
26  app.use(express.json());
27
28  // TODO-4 connect API routes from api.js
29  app.use("/api", api)
30
31  // TODO-5 [illegible] endpoint [illegible] s
32  app.get("/ap[illegible] => {
33    res.send({ [illegible] de my first API!" });
34  });
```

In `api.js`:

```
10  const express = require("express");
11
12  // TODO-1 add router
13  const router = express.Router();
14
15  // TODO-5 migrate api/test endpoint from server.js
16
17
18
19
20  // TODO-2 export router
21  module.exports = router;
```

```
git checkout w5-starter
```

TODO-5: Move our route into `api.js`

In `server.js`:

```
// create a new express server
const app = express();

// allow us to make post requests
app.use(express.json());

// TODO-4 connect API routes from api.js
app.use("/api", api)

// TODO-5 [illegible] endpoint [illegible] is
app.get("/ap[illegible] => {
  res.send({ [illegible] de my first API!" });
});
```

In `api.js`:

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

// TODO-1 add router
const router = express.Router();

// TODO-5 migrate api/test endpoint from server.js
router.get("/test", (req, res) => {
  res.send({ message: "Wow I made my first API!" });
});

// TODO-2 export router
module.exports = router;
```

```
git checkout w5-starter
```

TODO-5: Move our route into `api.js`

In `server.js`:

```
// create a new express server
const app = express();

// allow us to make post requests
app.use(express.json());

// TODO-4 connect API routes from api.js
app.use("/api", api);

// TODO-5 migrate endpoint to api.js
app.get("/api/test", (req, res) => {
  res.send({ message: "Wow I made my first API!" });
});
```

In `api.js`:

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

// TODO-1 add router
const router = express.Router();

// TODO-5 migrate api/test endpoint from server.js
router.get("/test", (req, res) => {
  res.send({ message: "Wow I made my first API!" });
});

// TODO-2 export router
module.exports = router;
```

app ⇨ router

"/api/test" ⇨ "/test"

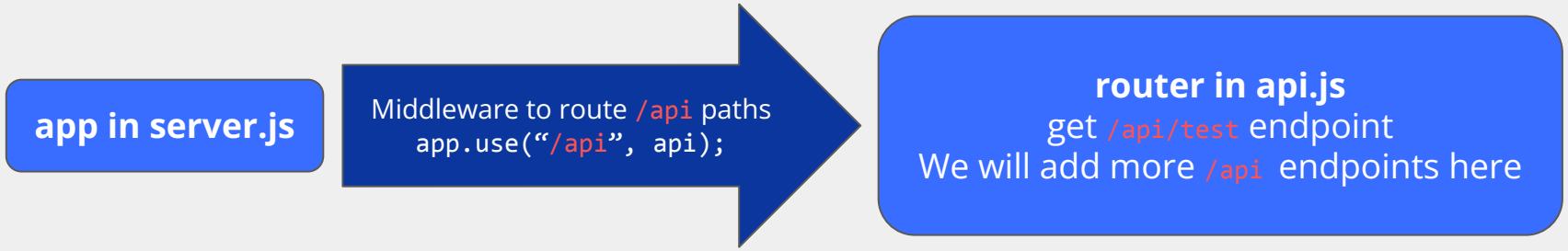
Making our endpoints in our router

app (server.js)

Represents your overall server (main-application)

router (api.js)

Isolated group of API endpoints (mini-application)



Test it out

Your `/api/test` route should work just like before, but now it has been moved into a separate file using a router!

Run `npm start`, then go to `localhost:3000/api/test` in your browser

Test it out

Your `/api/test` route should work just like before, but now it has been moved into a separate file!

Run `npm start`, then go to `localhost:3000/api/test` in your browser

Have a bug but want to test the solution? Feel free to checkout the next step then test `/api/test`

```
git reset --hard
git fetch
git checkout w5-step1
```

All together now...

```
git reset --hard
git fetch
git checkout w5-step1
```

```
git checkout w5-step1
```

Step 2

Catbook GET routes!

```
git checkout w5-step1
```

How to store our data?

For now, just declared an object called `data` in `api.js`

Stories are in `data.stories`

Comments are in `data.comments`

`TODO-1: Add a story to data.stories`

```
const data = {
  stories: [
    {
      _id: 0,
      creator_name: "Tony Cui",
      content: "Send it or blend it?",
    },
    {
      _id: 1,
      creator_name: "Andrew Liu",
      content: "web.labing with Tony <3",
    }
  ],
  comments: [
    {
      _id: 0,
      creator_name: "Stanley Zhao",
      parent: 0,
      content: "Both!",
    },
  ],
};
```

api.js

```
git checkout w5-step1
```

TODO-2: GET Stories

```
git checkout w5-step1
```

Remember *these??*

```
// an example GET route
router.get("/test", (req, res) => {
  res.send({ message: "Wow I made my first API!" });
});
```

```
git checkout w5-step1
```

req and res

`req` is the incoming request

```
...

req.query

req.body

req.params

Custom keys (ie. req.user)

...
```

`res` is your server's response

```
...

res.status(<status code>)

res.send(<object>)

...
```

```
git checkout w5-step1
```

TODO-2: `GET /api/stories`

What does this route need to do?

Send back all the stories to the frontend!

How can we access all the stories?

`data.stories`

```
git checkout w5-step1
```

TODO-2: GET /api/stories solution

```
38  // an example GET route
39  router.get("/test", (req, res) => {
40    res.send({ message: "Wow I made my first API!" });
41  });
42
43  // TODO (step1) Add get stories endpoint
44  router.get("/stories", (req, res) => {
45    // send back all of the stories!
46    res.send(data.stories);
47  });
```

Let's test it out!

In one terminal:

```
npm start
```

In *another* terminal:

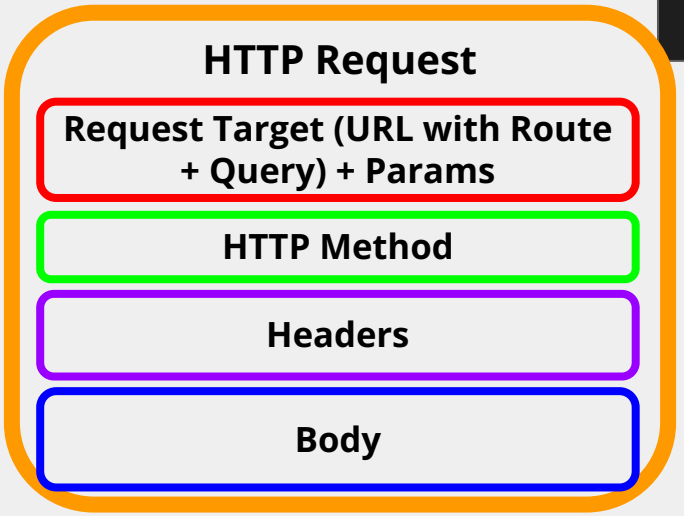
```
npm run hotloader
```

... and go check `localhost:5050` in your browser!

```
git checkout w5-step1
```

TODO-3: GET Comments

```
git checkout w5-step1
```



`req.query`

For `GET` requests:

Use `req.query`

E.g. `req.query.content`

`req.body`

For `POST` requests:

Use `req.body`

E.g. `req.body.content`

```
git checkout w5-step1
```

req.query

Use req.query for GET requests:

```
// Get request in frontend
const query = {
  content: "web development class and competition"
};
  get("/api/weblab", query).then((comment) => {
    // ...
});
```

OR

```
localhost:3000/api/weblab?content="web development class and competition"
```

```
// Get request in backend
router.get("/weblab", (req, res) => {
  console.log(req.query.content);
  //"web development class and competition"
});
```

req.body

Use req.body for POST request:

```
// Post request in frontend
const body = {
  content: "web development class and competition"
};
  post("/api/weblab", body).then((comment) => {
    // ...
});
```

```
// express.json() middleware parses request body
app.use(express.json());

// Post request in backend
router.post("/weblab", (req, res) => {
  console.log(req.body.content);
  //"web development class and competition"
});
```

req.query vs. req.body

Use req.query for GET requests:

```
// Get request in frontend
const query = {
  content: "web development class and competition"
};
  get("/api/weblab", query).then((comment) => {
    // ...
});
```

localhost:3000/api/weblab?content="web development class and competition"

```
// Get request in backend
router.get("/weblab", (req, res) => {
  console.log(req.query.content);
  //"web development class and competition"
});
```

Use req.body for POST request:

```
// Post request in frontend
const body = {
  content: "web development class and competition"
};
  post("/api/weblab", body).then((comment) => {
    // ...
});
```

```
// express.json() middleware parses request body
app.use(express.json());

// Post request in backend
router.post("/weblab", (req, res) => {
  console.log(req.body.content);
  //"web development class and competition"
});
```

```
git checkout w5-step1
```

Remember this?

We included the `parent` story's `_id` prop when we made the GET from the frontend!

```
16  const Card = (props) => {
17    const [comments, setComments] = useState([]);
18
19    useEffect(() => {
20      get("/api/comment", { parent: props._id }).then((comments) => {
21        setComments(comments);
22      });
23    }, []);
```

Card.js

How can we access this from the backend?

`req.query.parent`

```
git checkout w5-step1
```

TODO-3: `GET /api/comment`

What does this route need to do?

1. Figure out what story we need the comments from (hint: `req.query`)
2. Filter out only the comments that are children of that story
3. Send back those comments to the frontend!

```
git checkout w5-step1
```

TODO-3: Your turn! `GET /api/comment`

Add an API route that correctly responds to `GET` requests to `/api/comment`.

1. Figure out what story we need the comments from (hint: `req.query`)
2. Filter out only the comments that are children of that story
3. Send back those comments to the frontend!

Hint: It's a lot like `/api/stories`, but with a bit more logic.

Hint 2: You might want the `array.filter((item) => return <condition>);` function from the JavaScript (cont'd) on Tuesday!

Hint 3: `req.query` returns a string. Use `==` to compare values of different data types.

```
git checkout w5-step1
```

TODO-3: `GET /api/comment`

What does this route need to do?

1. Figure out what story we need the comments from
   - The parent story _id contained within `req.query`
2. Filter out only the comments that are children of that story
   - We'll use JavaScript's `filter()` function on our `data.comments`
3. Send back those comments to the frontend!
   - Use `res.send()` just like our other endpoints

```
git checkout w5-step1
```

TODO-3: `GET /api/comment` solution

```
const filteredComments =
  data.comments.filter(
    (comment) => comment.parent == req.query.parent
  );
```

Or in English...

get just the comments whose parent is equal to req.query.parent

Note: we use == instead of === because req.query returns type string, and to compare type int to type string we use ==

```
git checkout w5-step1
```

TODO-3: Expanded `GET /api/comment` solution

```
// TODO (step1) Add get comments endpoint
router.get("/comment", (req, res) =>
{
    const filteredComments = data.comments.filter((comment) => comment.parent == req.query.parent);
    res.send(filteredComments);
})
```

Let's test it out with comments!

In one terminal:

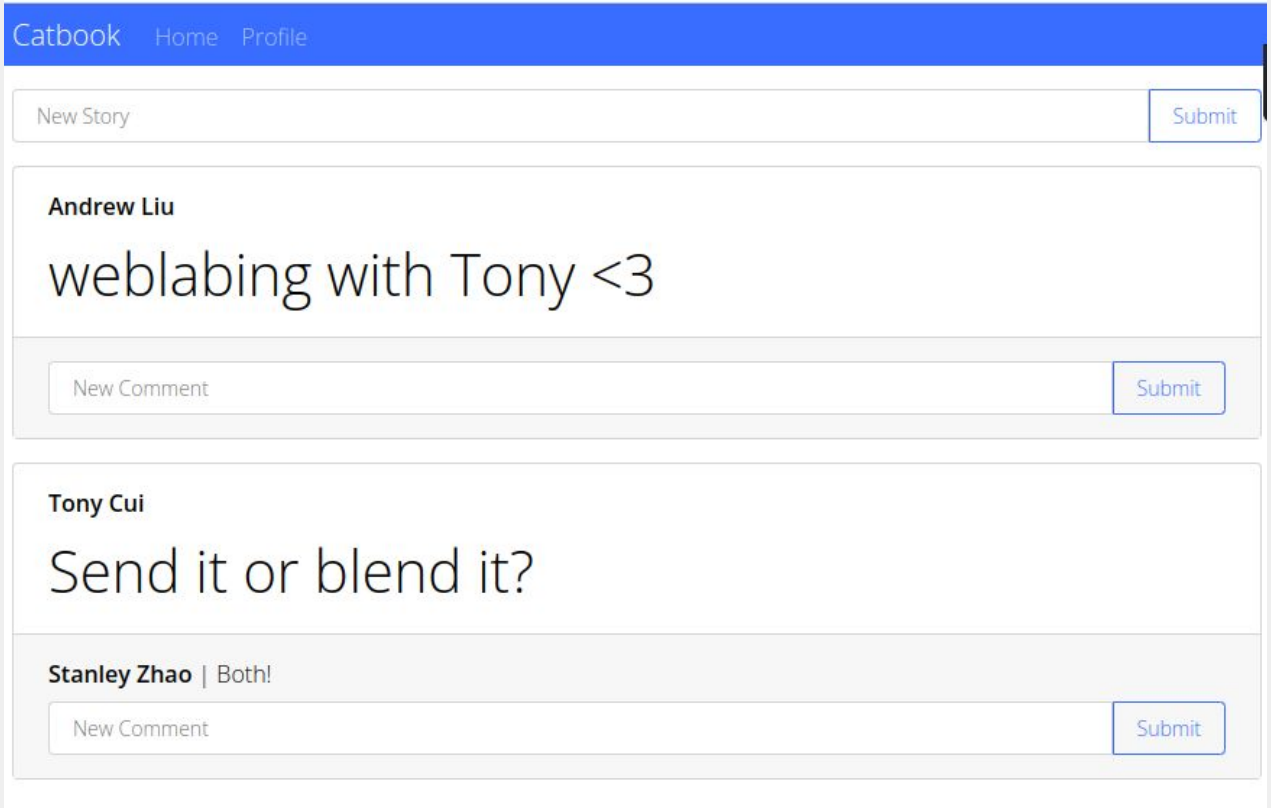
```
npm start
```

In *another* terminal:

```
npm run hotloader
```

... and go check `localhost:5050` in your browser!

Now we see our stories and comments from data!



Feel free to checkout the solution if you have a bug

```
git reset --hard
git fetch
git checkout w5-step2
```

Inspect to see details

Catbook Home Profile

New Story Submit

Andrew Liu

weblabing with Tony <3

New Comment Submit

Tony Cui

Send it or blend it?

Stanley Zhao | Both!

New Comment Submit

Elements Console Sources Network Performance Memory Application Security Lig

top Filter

```
[webpack-dev-server] Server started: Hot Module Replacement enabled, Live Reloading enabled, Progress
enabled.
[HMR] Waiting for update signal from WDS...
Download the React DevTools for a better development experience: https://fb.me/react-devtools
>
```

Back on the same page!

```
git reset --hard
git fetch
git checkout w5-step2
```

```
git checkout w5-step2
```

Making a new story and inspect Console + Network

Catbook Home Profile

New Story — Try typing here and making a new story! — Submit

Andrew Liu

weblabing with Tony <3

New Comment — Submit

Tony Cui

Send it or blend it?

Stanley Zhao | Both!

New Comment — Submit

Elements | Console | Sources | Network | Performance | Memory | Application | Security | Lighthouse

top | Filter | Default levels | 3 Issues: 3

```
[webpack-dev-server] Server started: Hot Module Replacement enabled, Live Reloading enabled, Progress disabled, Overlay enabled.   bootstrap:24
[HMR] Waiting for update signal from WDS...   bootstrap:24
Download the React DevTools for a better development experience: https://fb.me/react-devtools   bootstrap:24
▶POST http://localhost:5050/api/story 404 (Not Found)   utilities.js:53
▶Uncaught (in promise) POST request to /api/story failed with error:   localhost/:1
API request failed with response status 404 and text: Not Found
>
```

Inspect what is outputted in Console and Network when you make a new story/comment

```
git checkout w5-step2
```

What happened?

404 error :(

```
▸POST http://localhost:5050/api/comment 404 (Not Found)                    utilities.js:53
▸Uncaught (in promise) POST request to /api/comment failed with error:     localhost/:1
API request failed with response status 404 and text: Not Found
```

```
git checkout w5-step2
```

TODO-1: Handling missing API routes

In `api.js`:

```
// any requests that don't have a defined rout go to this case
router.all("*", (req, res) => {
  console.log(`API Route not found: ${req.method} ${req.url}`);
  res.status(404).send({ message: "API Route not found" });
});

module.exports = router;
```

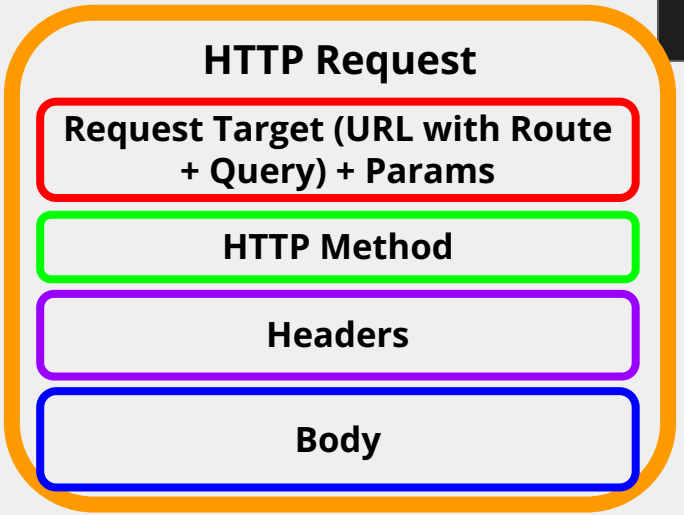
IMPORTANT: Put this route below all other API routes or their requests will go to this route!

```
git checkout w5-step2
```

Step 3

Catbook POST routes!

```
git checkout w5-step2
```



`req.query`

For `GET` requests:

Use `req.query`

E.g. `req.query.content`

`req.body`

For `POST` requests:

Use `req.body`

E.g. `req.body.content`

```
git checkout w5-step2
```

req.query

Use req.query for GET requests:

```
// Get request in frontend
const query = {
  content: "web development class and competition"
};
  get("/api/weblab", query).then((comment) => {
    // ...
});
```

localhost:3000/api/weblab?content="web development class and competition"

```
// Get request in backend
router.get("/weblab", (req, res) => {
  console.log(req.query.content);
  //"web development class and competition"
});
```

req.body

Use req.body for POST request:

```
// Post request in frontend
const body = {
  content: "web development class and competition"
};
  post("/api/weblab", body).then((comment) => {
    // ...
});
```

```
// express.json() middleware parses request body
app.use(express.json());

// Post request in backend
router.post("/weblab", (req, res) => {
  console.log(req.body.content);
  //"web development class and competition"
});
```

```
git checkout w5-step2
```

TODO-2: POST Stories

```
git checkout w5-step2
```

What do our POST endpoints need to handle?

1. Figure out what data needs to be saved
2. Put it in a unified structure
3. Add it to our `data` object

Hint 1: What a new story needs (from `data.stories`):

```
stories: [
  {
    _id: 0,
    creator_name: "Tony Cui",
    content: "Send it or blend it?",
  },
```

Hint 2: What is sent from the frontend (find post req in `NewPostInput.js`):

```
const addStory = (value) => {
  const body = { content: value };
  post("/api/story", body).then((story) => {
    // display this story on the screen
    props.addNewStory(story);
  });
};
```

```
git checkout w5-step2
```

TODO-2: POST /api/story

In `api.js`:

```
const newStory = {
  _id: data.stories.length,
  creator_name: myName,
  content: req.body.content,
};
```

```
git checkout w5-step2
```

TODO-2: POST /api/story solution

```
43  // TODO-2 (step1) Add get stories endpoint
44  router.post("/story", (req, res) => {
45    // create a new story object
46    const newStory = {
47      _id: data.stories.length,
48      creator_name: myName,
49      content: req.body.content,
50    };
51
52    // add it to our backend data
53    data.stories.push(newStory);
54    // send it to the frontend
55    res.send(newStory);
56  });
```

Let's test adding a story!

In one terminal:

```
npm start
```

In *another* terminal:

```
npm run hotloader
```

... and go check `localhost:5050` in your browser - posting stories and comments should now work!

```
git checkout w5-step2
```

TODO-3: POST Comments

```
git checkout w5-step2
```

TODO-3: Your turn! `POST /api/comment`

Add an API route that correctly handles `POST` requests to `/api/comment`.

```
git checkout w5-step2
```

TODO-3: Your turn! `POST /api/comment`

Add an API route that correctly handles `POST` requests to `/api/comment`.

Hint 1: It's a lot like `POST /api/story`.

Hint 2: What a new comment needs (from `data.comments`):

```
comments: [
  {
    _id: 0,
    creator_name: "Stanley Zhao",
    parent: 0,
    content: "Both!",
  },
],
```

Hint 3: What is sent from the frontend (in `NewPostInput.js`):

```
57  const NewComment = (props) => {
58    const addComment = (value) => {
59      const body = { parent: props.storyId, content: value };
60      post("/api/comment", body).then((comment) => {
61        // display this comment on the screen
62        props.addNewComment(comment);
63      });
64    };
```

```
▼Request Payload    view source
  ▼{parent: 1, content: "Congrats on 1st Place!"}
    content: "Congrats on 1st Place!"
    parent: 1
```

```
git checkout w5-step2
```

TODO-3: POST /api/comment solution

```
69  // TODO-3 (step2) Add post comment endpoint
70  router.post("/comment", (req, res) => {
71    // create a new comment object
72    const newComment = {
73      _id: data.comments.length,
74      creator_name: myName,
75      parent: req.body.parent,
76      content: req.body.content,
77    };
78
79    // add it to our backend data
80    data.comments.push(newComment);
81    // send it to the frontend
82    res.send(newComment);
83  });
```

One last test

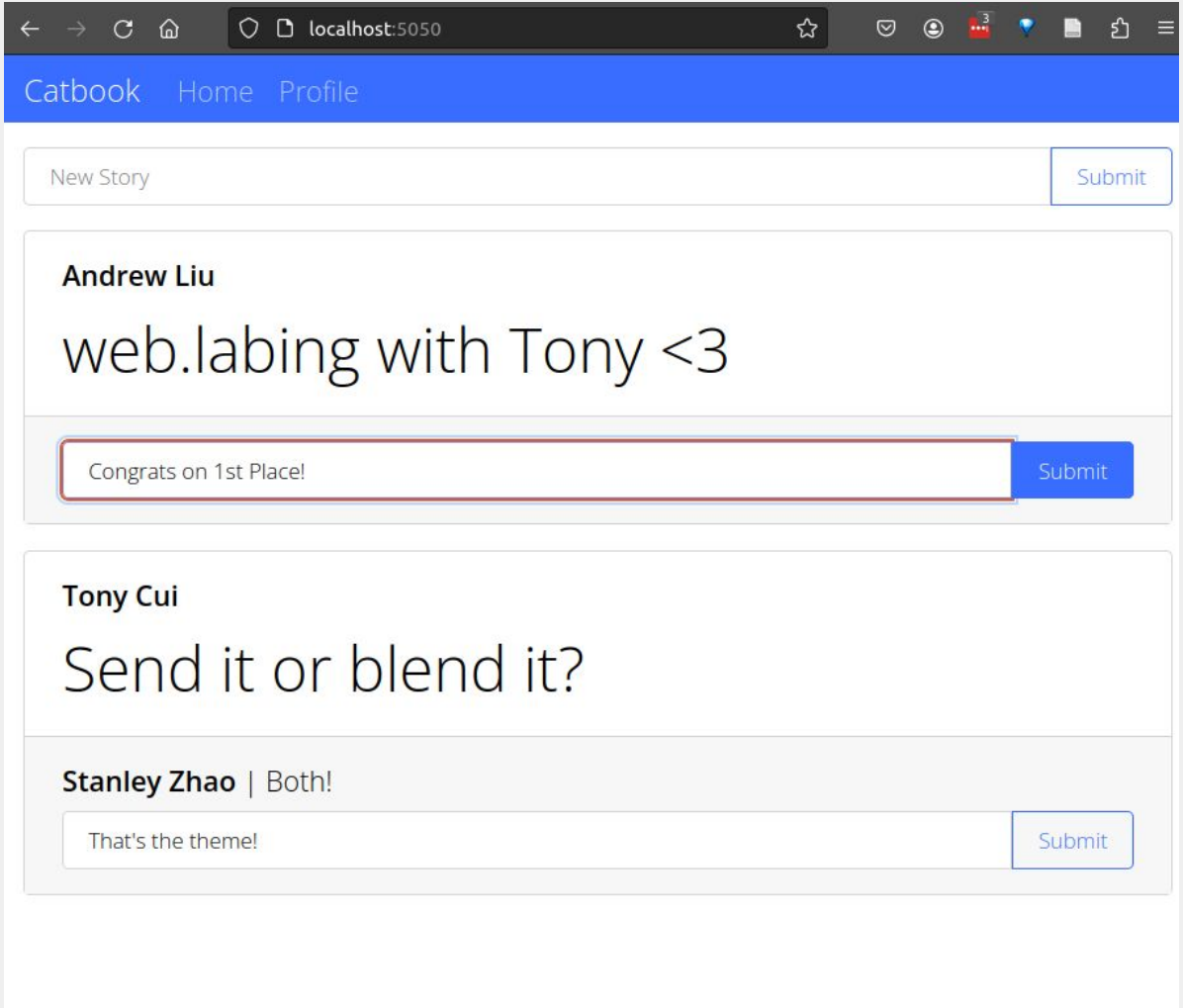
In one terminal:

```
npm start
```

In *another* terminal:

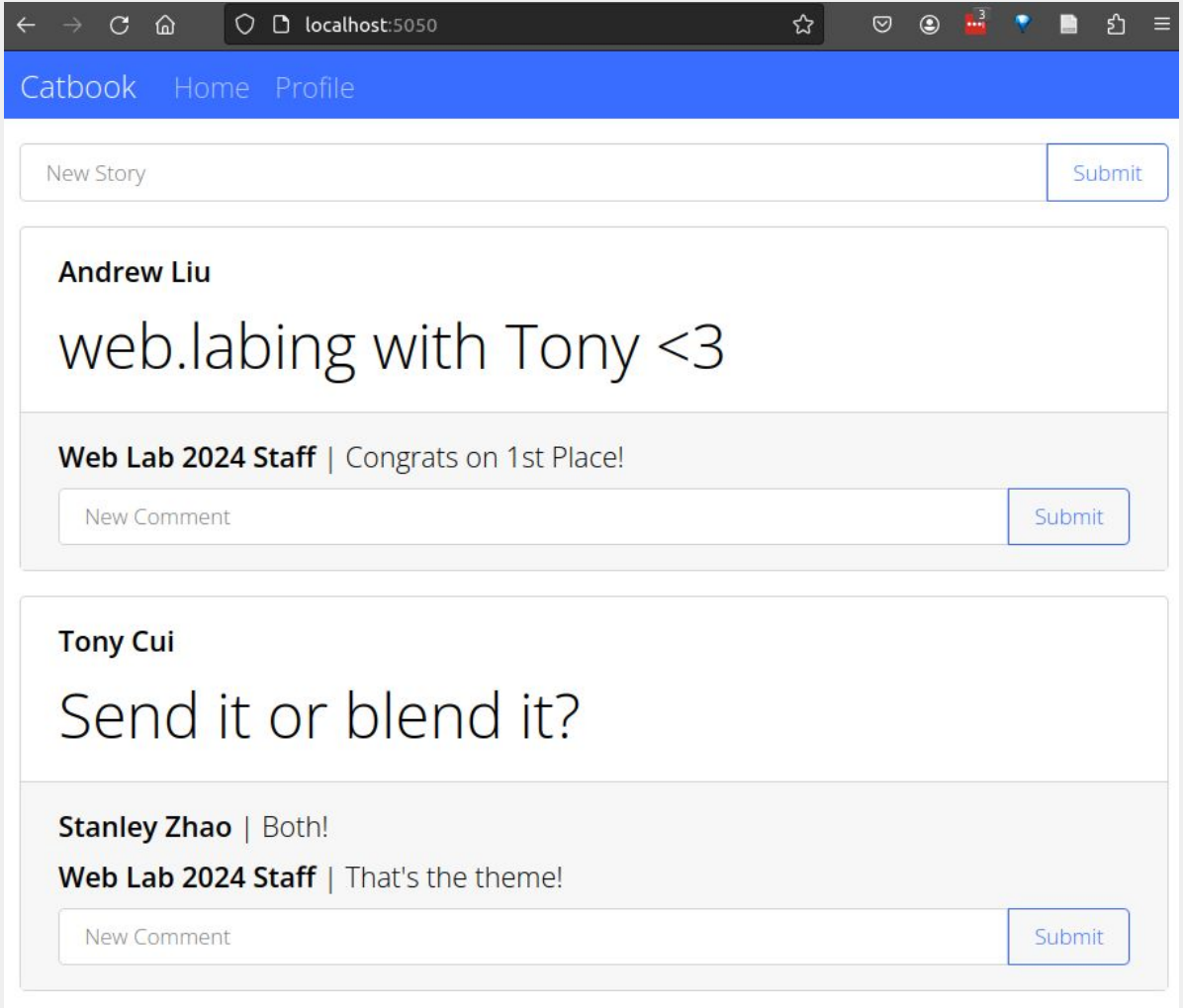
```
npm run hotloader
```

... and go check `localhost:5050` in your browser - posting stories and comments should now work!



Feel free to checkout the solution if you have a bug

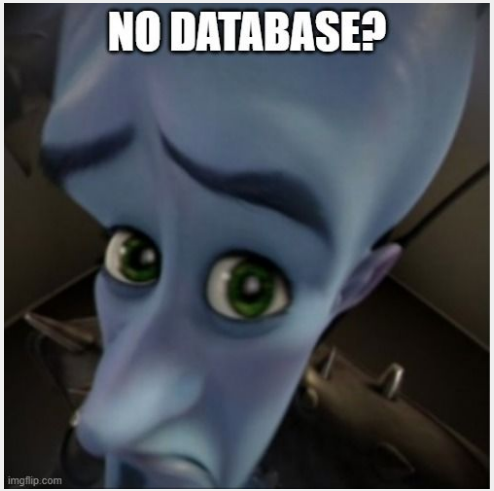
```
git reset --hard
git fetch
git checkout w5-complete
```



Feel free to checkout the solution if you have a bug

```
git reset --hard
git fetch
git checkout w5-complete
```

What's next?



Change something in `server.js` or `api.js`

`nodemon` will notice the change and reload the server

.... and all of the new posts and comments are gone!

Since `data` is just defined at the top of our server file, it only lasts as long as the server stays running :(

Tomorrow: Intro to Databases

Set up MongoDB Atlas before tomorrow's workshop!

http://weblab.is/mongo-setup

Announcements

- HW2 Due today for workshops tmr! (Setup MongoDB Acc)
- Milestone 0 deadline extended to 5:30pm today!
- Milestone 1 (Project Pitch) signups out! Time slots are for Sat and Sun 1-5pm.
  - weblab.is/milestone1
- Fill out weblab.is/feedback! Note that the “What day is it” question is the day you’re giving feedback for, not the current day.
- 🥛🍪👉👈 (weblab.is/milkandcookies) uwu
- Still need a team? Stay after lecture today!
- Informal OH now, tomorrow 3-5 (after lecture)