Fullstack Development

Authentication / Authorization

Part 3: Persisting auth's state

Part 3: Social signing up/in

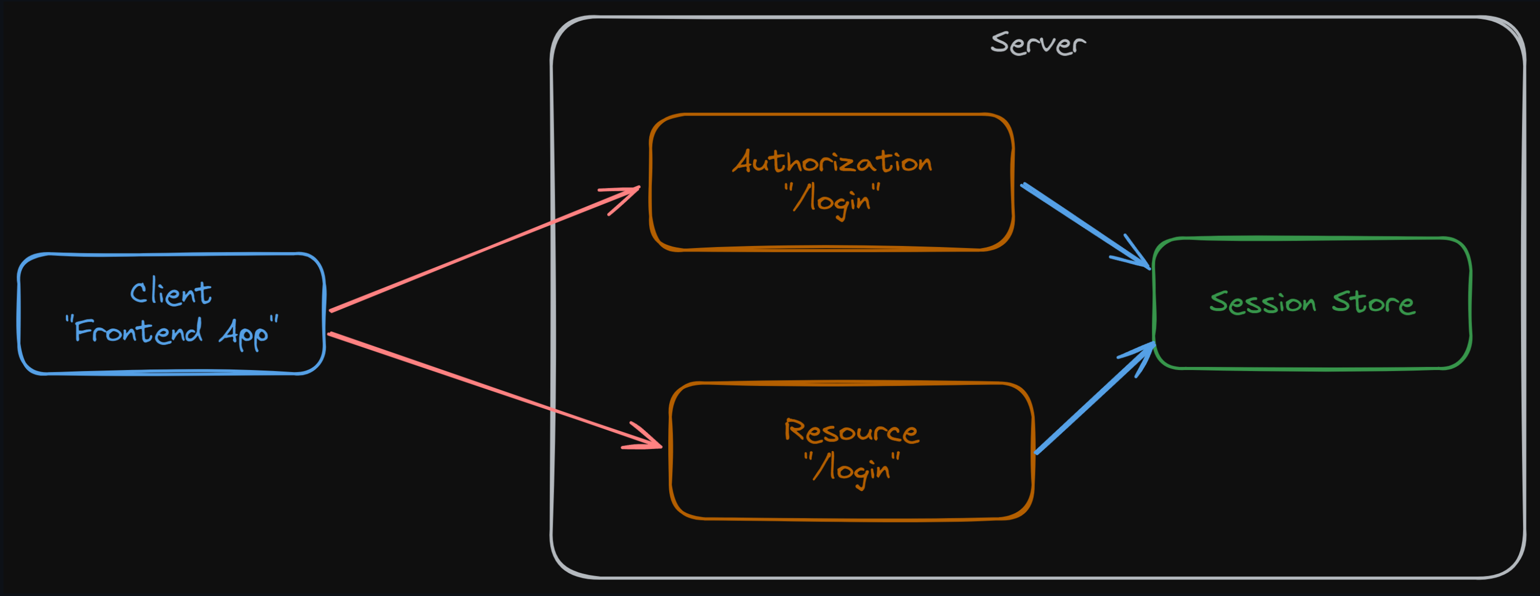
Section 3A: Session-based vs token-based

Session based

- Server is responsible for creating and maintaining the user's authentication state (i.e. in a database).
- After user sign-in, the server sets a cookie that contains the session ID and sends it to the browser.
    - The browser will include it in all further requests.
    - The server will use the cookie to identify the current user session from the database.

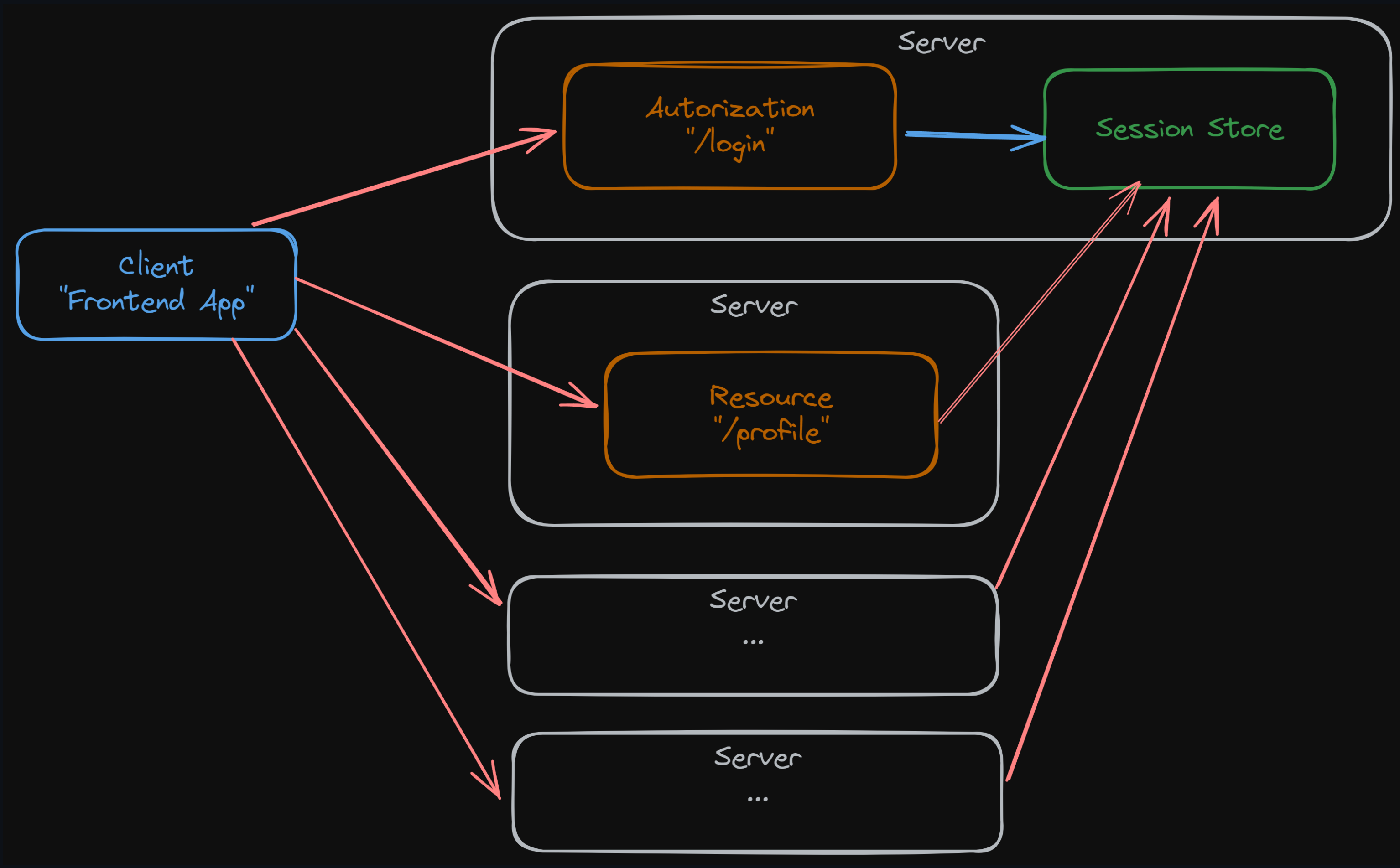
Session based

- Users' auth states are in DB.
- Need to query DB at every request.

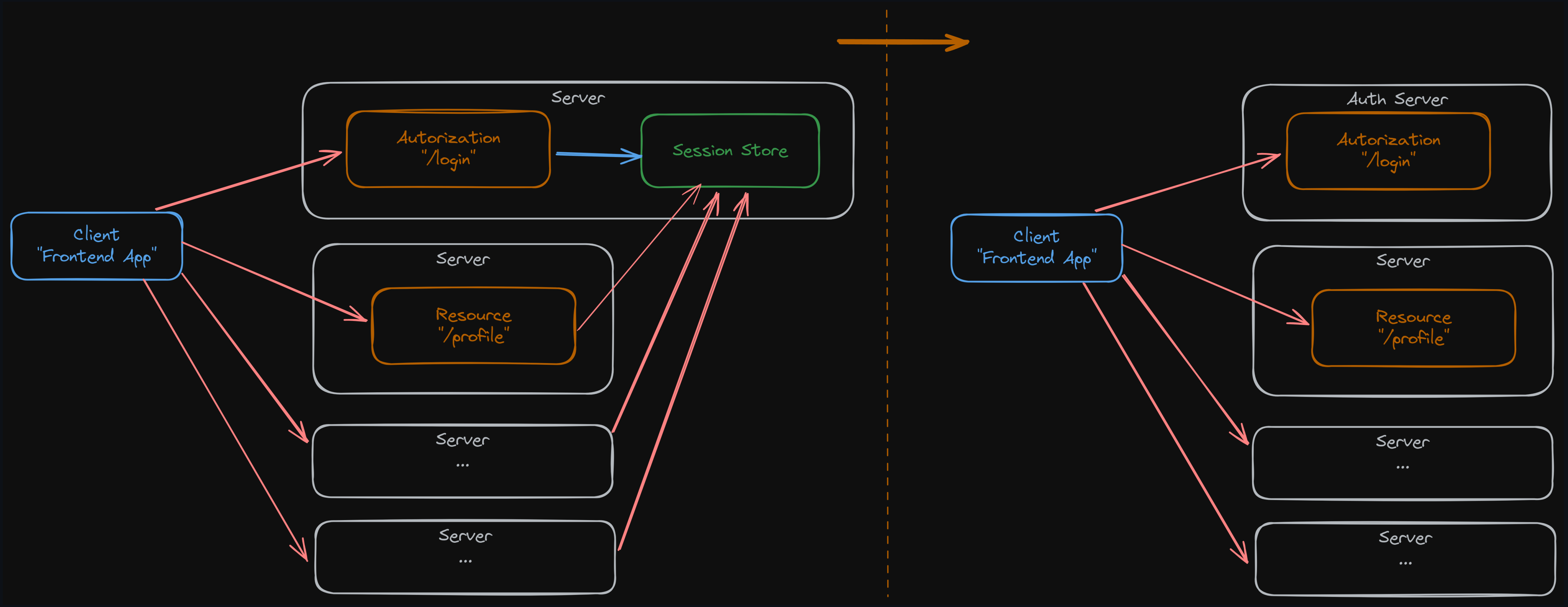


Session based

- This could be a problem in distributed system with centralized `auth` server.
- Session store could be overloaded.



Can do something like this?



Note that the right system is not exactly what you want to do.

Token-based

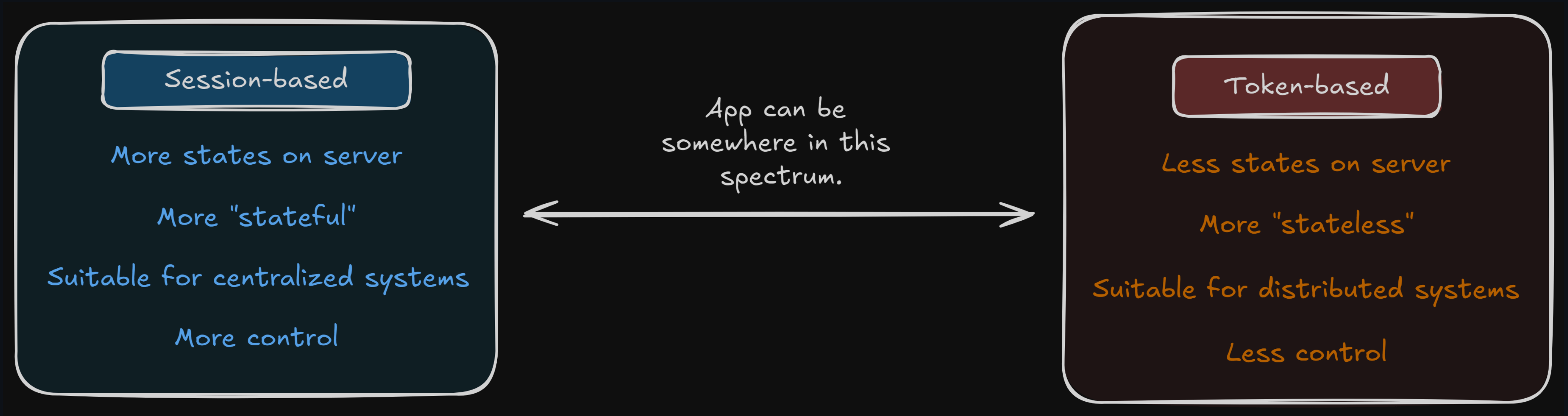
- `token` is a cryptographically signed piece of data that contains information about the authenticated user and their access permissions.
- The server will only have to verify the validity of the token rather than having it stored in a database.
  - Reduces the amount of state that needs to be stored on the server.
- While other token formats exist, JSON Web Tokens (JWTs) have become the prevailing standard for token-based approach.

JWT Test

- `git clone -b jwt https://github.com/fullstack-67/auth-mpa-v2.git auth-jwt`
- `pnpm i`
- `npx tsx ./src/test.ts`

Clarification

- It is better to think about where you put users' `auth` state.
    - `Session-based`: more states in server ("*stateful*")
    - `Token-based`: more states in client (*stateless*)
- Using JWTs does not automatically means you are using token-based approach.
    - You can put JWTs in session cookie.
- The system can contain both approaches.



- When going token-based approach, you are losing **control** over user's state and you are making your system **less secured**.

Please do not do this.

- It is tempting to go **100% stateless** using token-based approach (JWT) to avoid dealing to storing information on server.
    - **You don't know who is using your system!**
- Also, be aware of these concerns (Ref1, Ref2).
    - Cannot really log out users.
    - Cannot really block users.
    - Stale data
    - Limited storage
    - JWT could be decrypted at some point.

Considering token-based approch?

- Do you have distributed system with centralized auth server?
  - If no, go session-based.
- You are concerned about overloading your database.
  - Have you considered `redis`?

Considering token-based approach?

- Have you consider the fact that modern token secuity is quite complex (*and will require database anyway*)?
  - Refresh tokens (revokable)
  - Allowed/Revoked lists
  - Token rotation
  - Token behavior detection

Bottom line

> If you don't have database table storing `auth` states, your system lacks **visibility** and **security response** against cyber attacks.

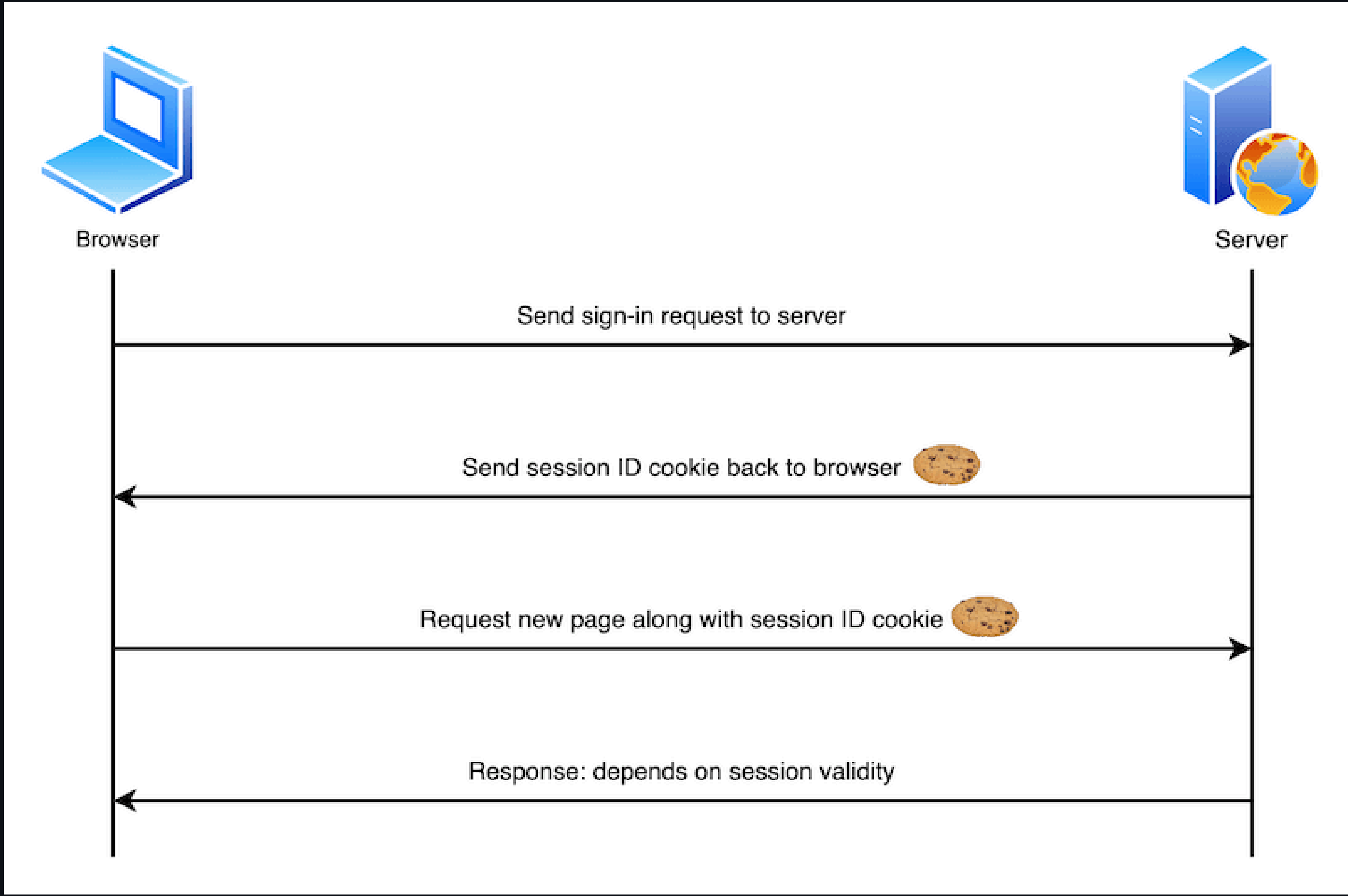
> Part 3: Persisting auth's state

Section 3B: Session management with `express-session`

Cookie

- A small piece of data a server sends to a user's web browser.
- The browser may:
  - Store cookies
  - Create new cookies
  - Modify existing ones
  - Send it back to the server with later requests.
- Cookies enable web applications to store limited amounts of data and remember state information
  - By default the HTTP protocol is `stateless`.

Cookie


Browser
Server
Send sign-in request to server
Send session ID cookie back to browser
Request new page along with session ID cookie
Response: depends on session validity

Cookie mechanism

- Server `response` header

```
HTTP/1.1 200 OK
Set-Cookie: connect.sid=s%3AUDOk...; Path=/; Expires=Fri, 30 Aug 2024 02:57:01
GMT; HttpOnly; SameSite=Lax
```

- Subsequent browser `request` header

```
GET / HTTP/1.1
Cookie: connect.sid=s%3AUDOk
```

Cookie attributes

- `Path=<path-value>`
  - Path that must exist in the requested URL for the browser to send the Cookie header
- `Expires=<date>`
  - Maximum lifetime
- `Max-Age=<number>`
  - The number of seconds until the cookie expires.

Cookie attributes

- `HttpOnly`
  - Forbids JavaScript from accessing the cookie (`Document.cookie`).
  - Prevent against cross-site scripting (XSS).
- `SameSite`
  - Controls whether or not a cookie is sent with cross-site requests
  - `Strict` / `Lax` / `None`
  - Will come back to this later.

Setup

```
git clone -b session https://github.com/fullstack-67/auth-mpa-v2.git auth-session
```

```
pnpm i
```

```
npm run db:reset
```

```
npm run dev
```

Highlighted package

`package.json`

```json
{
  "express-session": "^1.18.0"
}
```

Usage

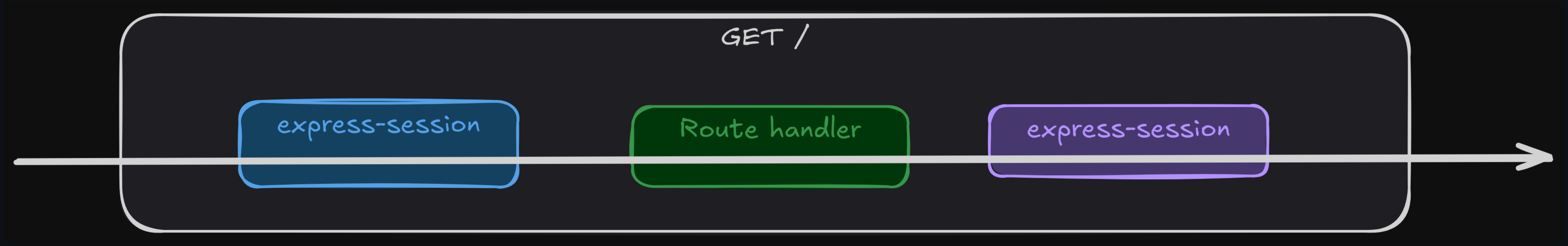
`session.ts`

```ts
import session from "express-session";
// ...
const sessionIns = session({
  // Options
});
```

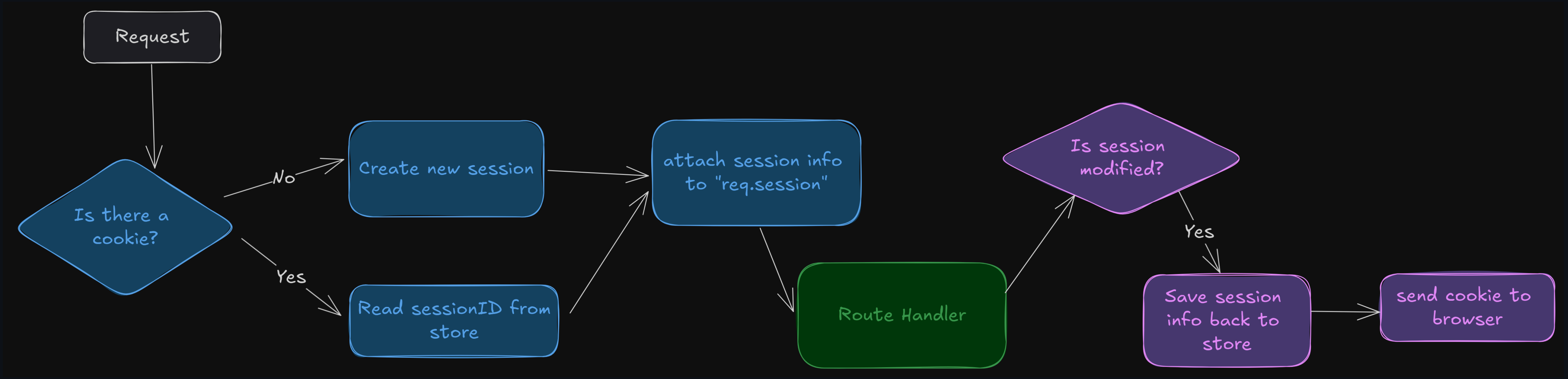
`index.ts`

```ts
app.use(sessionIns);
```

How does `express-session` work?



How does `express-session` work?



Session store

- Storage mechanism for sessions.
- If you don't supply anything, it just uses a `memory` store.
  - Not persisted across server restarts
- Other choices

Experiments

- Clear all cookies in browser and visit the `url`.
    - No cookie sent from server.
- Set `count` in `req.session`
    - Cookie saved in store.
    - Cookie sent from server.
- Open new tab/window.
    - Cookie are sent with client requests.
- Open Edge.
    - New sessionse are created.
- Set `useragent`.

Session options

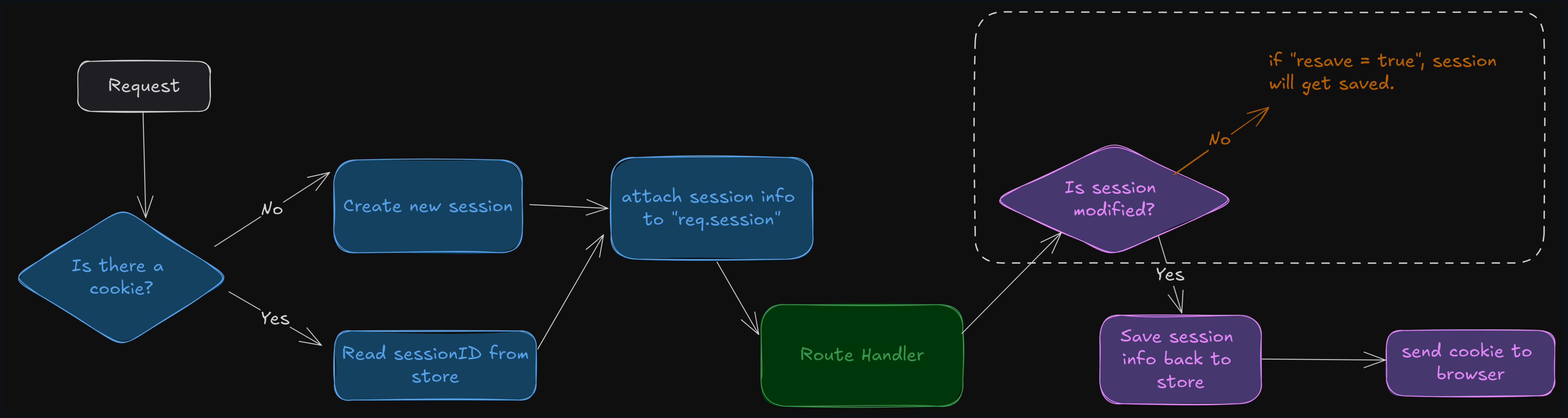
```
./src/auth/session.ts
```

```ts
const sessionIns = session({
  secret: "My Super Secret",
  cookie: {
    path: "/",
    httpOnly: true,
    secure: NODE_ENV === "production" ? true : false,
    maxAge: 60 * 60 * 1000,
    sameSite: "lax",
  },
  saveUninitialized: false,
  resave: false,
  store: SQLiteStoreInstance as session.Store,
});
```

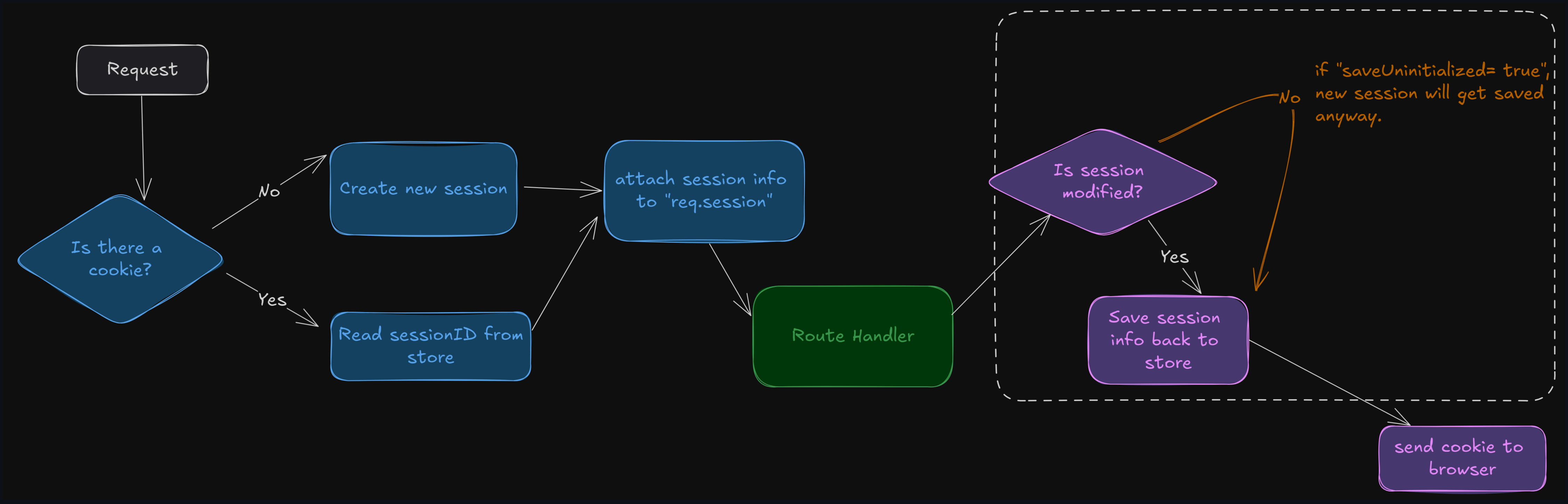
Session options

- `saveUninitialized`
  - Forces a session that is "uninitialized" to be saved to the store.
  - A session is uninitialized when it is new but not modified.
- `resave`
  - Forces the session to be saved back to the session store, even if the session was never modified during the request.

saveUninitialized


Request
Is there a cookie?
No
Yes
Create new session
Read sessionID from store
attach session info to "req.session"
Route Handler
Is session modified?
No
if "resave = true", session will get saved.
Yes
Save session info back to store
send cookie to browser

resave


Request
Is there a cookie?
No
Yes
Create new session
Read sessionID from store
attach session info to "req.session"
Route Handler
Is session modified?
Yes
No
if "saveUninitialized= true", new session will get saved anyway.
Save session info back to store
send cookie to browser

Remaining task

- We need a way to link authentication state to session.

Part 3: Persisting auth's state

Section 3C: Session + authentication

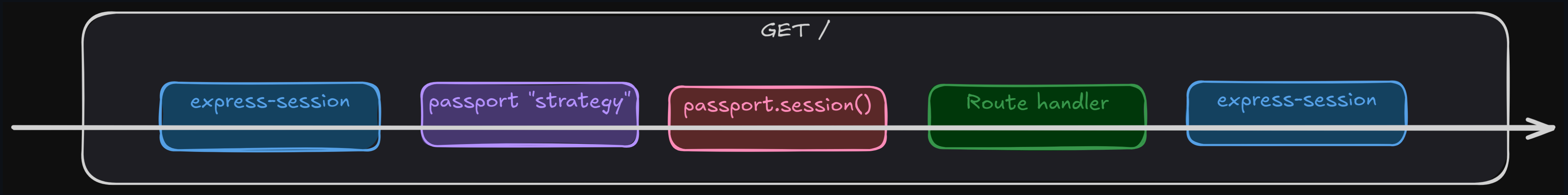
We need to

- Store user information in a session store when user sign in.
- Retrive user information for route handlers for subsequent requests.
- Destroy sessions when users log out.

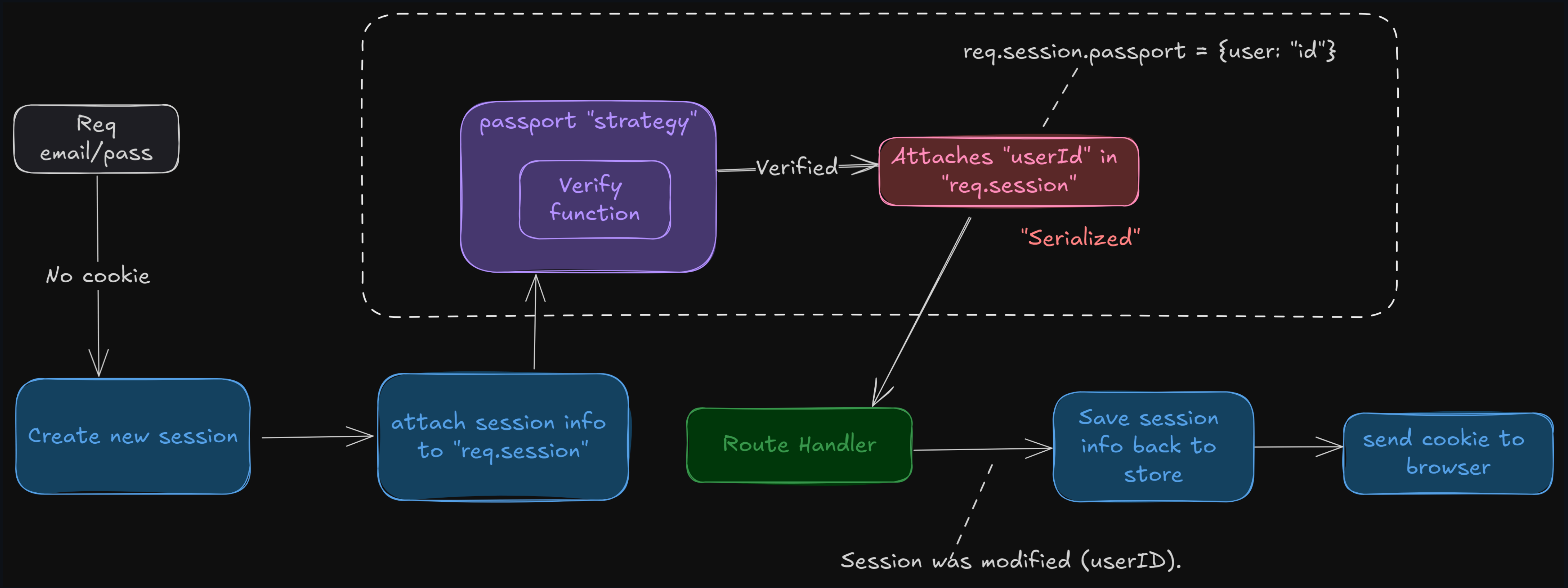
Two session middlewares

- `express-session`
  - Middleware to save/retrieve session from a session store.
- `passport.session()`
  - Middleware to append/retrive user information from session information.
- `REF1`, `REF2`

Structure


GET /
express-session
passport "strategy"
passport.session()
Route handler
express-session

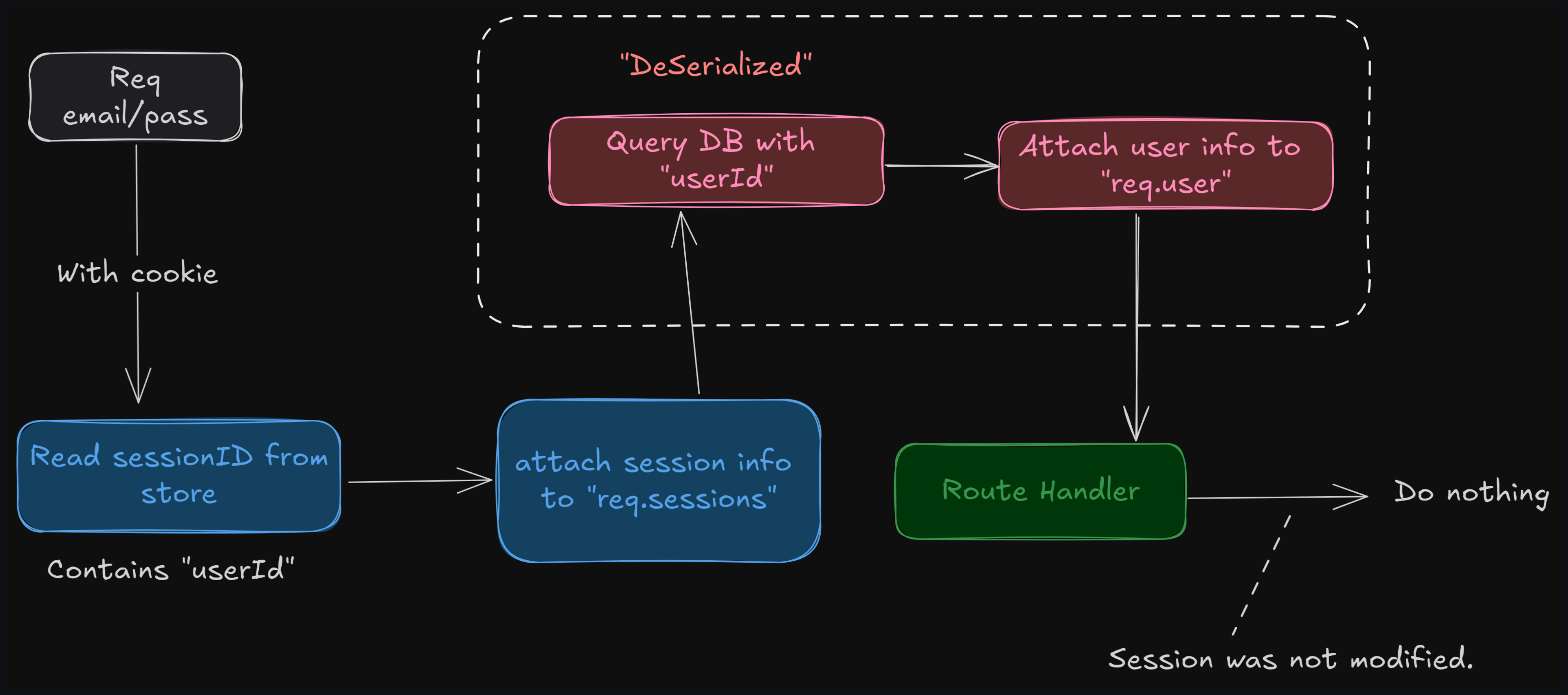
User login



req.session.passport = {user: "id"}
Req email/pass
passport "strategy"
Verify function
Verified
Attaches "userId" in "req.session"
"Serialized"
No cookie
Create new session
attach session info to "req.session"
Route Handler
Save session info back to store
send cookie to browser
Session was modified (userID).

Note: Serialization

Subsequent requests


"DeSerialized"
Req email/pass
With cookie
Read sessionID from store
Contains "userId"
attach session info to "req.sessions"
Query DB with "userId"
Attach user info to "req.user"
Route Handler
Do nothing
Session was not modified.

Note: Deserialization

Setup

- `git clone -b signin-credential-session https://github.com/fullstack-67/auth-mpa-v2.git auth-signin-credential-session`
- `pnpm i`
- `npm run db:reset`
- `npm run dev`

Registering middlewares

`./src/index.ts`

```
// * express-session
app.use(sessionIns);

// * Passport
app.use(passportIns.initialize());
app.use(passportIns.session()); // 👉👉👉 passport.session
```

Serialization

`./src/auth/passport.ts`

```
passportIns.serializeUser(function (user, done) {
  // Sending user.id to session.
  done(null, user.id);
  // You can put all user info in the session
  // done(null, user);
});
```

Note: Putting all user info in session is not recommended.

Deserialization

`./src/auth/passport.ts`

```
passportIns.deserializeUser<string>(async function (id, done) {
  const query = await dbClient.query.usersTable.findFirst({
    where: eq(usersTable.id, id),
  });
  if (!query) {
    done(null, false);
  } else {
    done(null, query);
  }
});
```

Experiments

- Sign in
  - Note the user `id` in `req.session.passport`
- Sign out
- Sign in from two browsers.
  - Try removing other sessions. *(Cool!)*

`SameSite` cookie revisited

- `Strict`
  - Sent on first-party request only.
- `Lax`
  - Sent on third-party requests from top-level navigation and `GET` requests.
- `None`
  - No restriction.

Experiments

- With `strict` cookie (`./src/auth/session.ts`)
  - Redirect through `<a>` tag result in "guest" view.
    - Subsequent navigation will yield "user" view.
  - If navigate by changing `url` in the address bar results in correct "user" view.
- With `lax` cookie
  - Redirect through `<a>` tag will yield correct "user" view.

Typescript tips

- Extending `req.user` types with `drizzle` orm.

`./src/types/express.d.ts`

```
type usersTableType = typeof usersTable.$inferSelect;
declare global {
  namespace Express {
    interface User extends usersTableType {} 👈👈👈
  }
}
```

Typescript tips

- Extending `req.session` types

`./src/types/session.d.ts`

```
declare module "express-session" {
  interface SessionData {
    useragent?: Details;
    createdAt?: number;
    loginType: LoginType;
    passport?: { user: string };
  }
}
```

Tips

- I use `sessionID` that contains `userID` so that I can easily query all sessions that belongs to the same users.

`./src/auth/session.ts`

```ts
const generateSessionKey = (req: Request) => {
  const userId = req.user?.id ?? nanoid();
  const randomId = nanoid();
  return `sid:${userId}:${randomId}`;
};
```

- Query all user sessions

`./db/repositories.ts`

```
export async function getAllUserSessions(userId: string) {
  // ...
  const results = await dbClient
    .select()
    .from(sessionsTable)
    .where(like(sessionsTable.sid, likeString));
  // ...
}
```