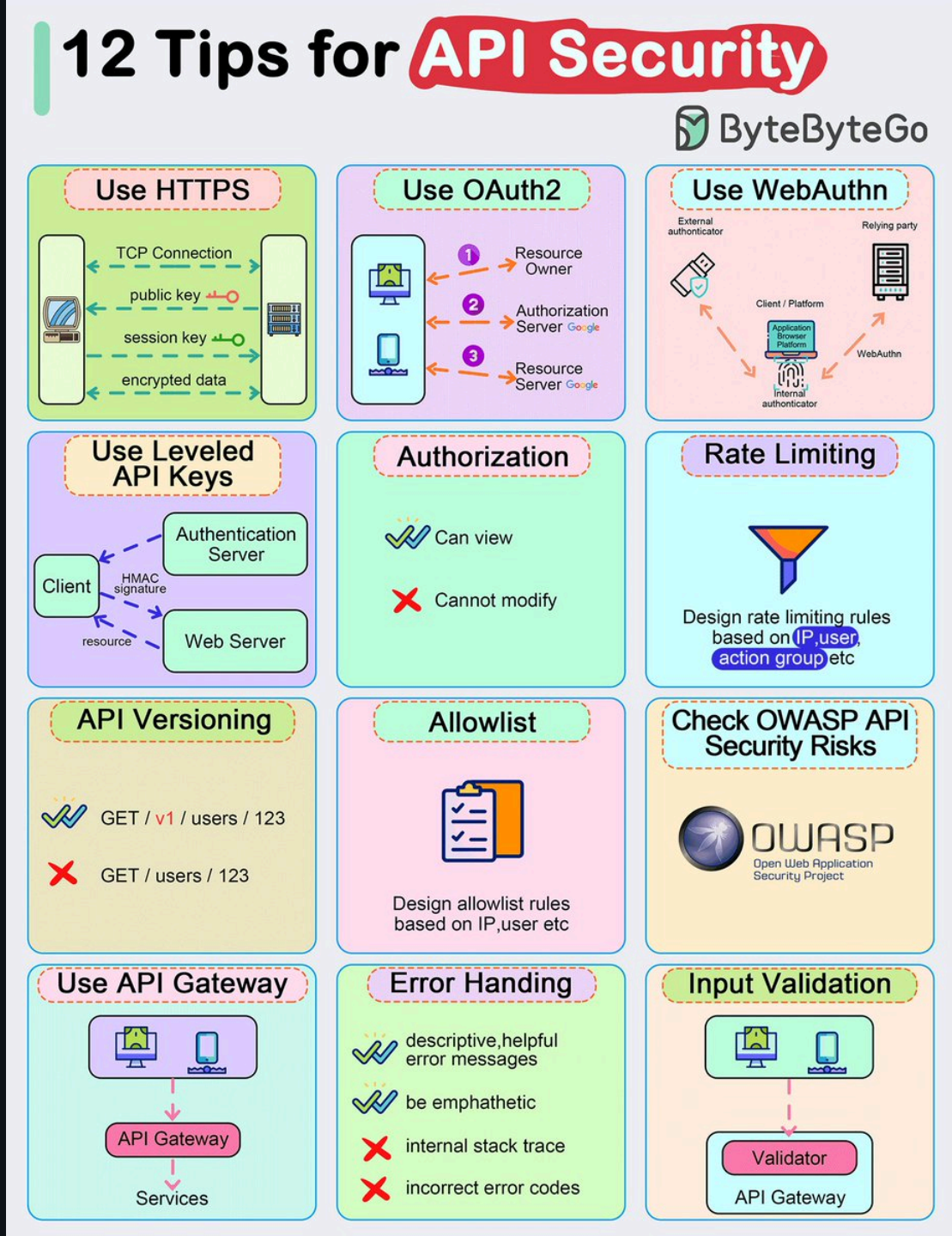
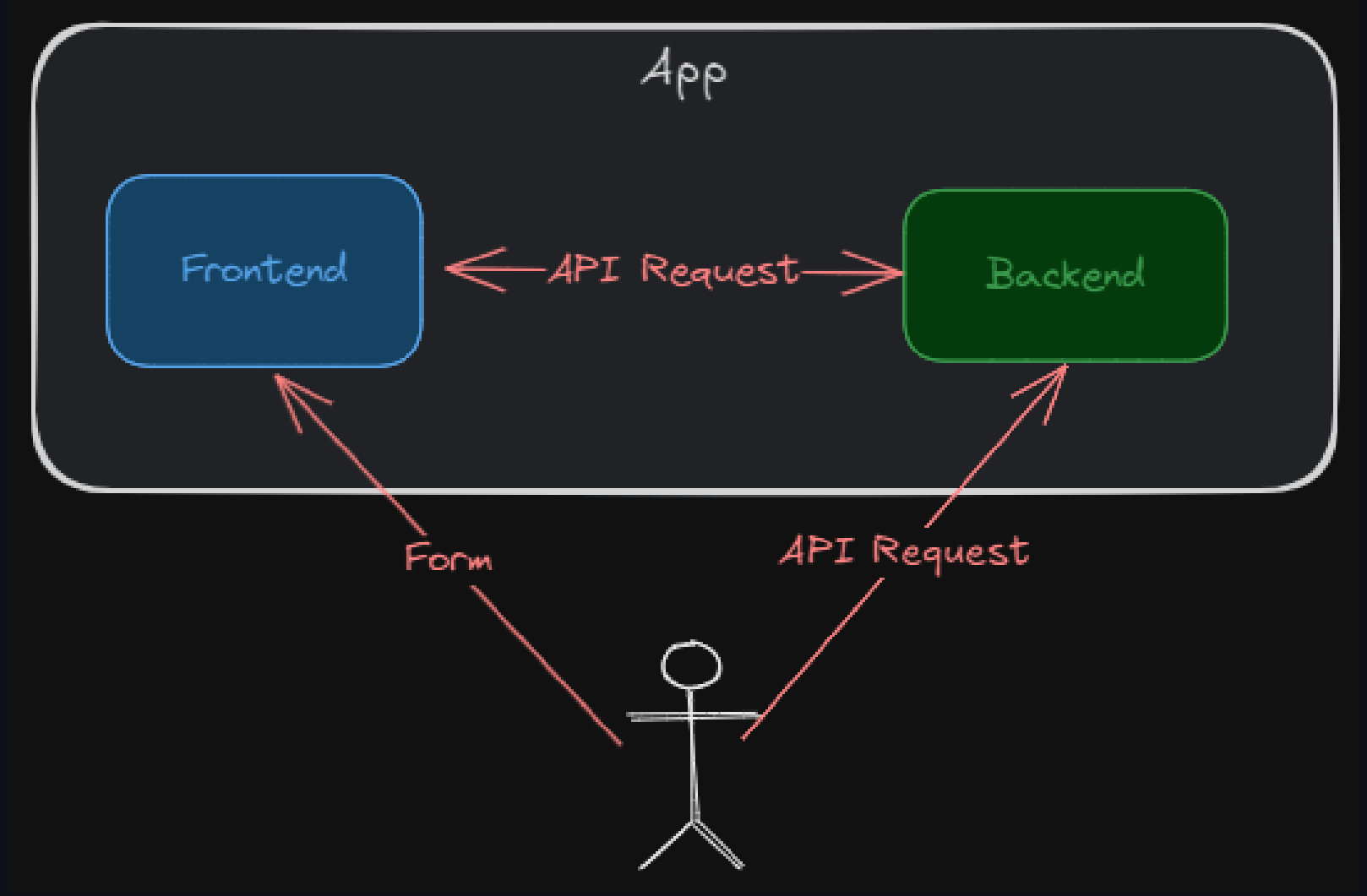
Fullstack Development

> Is your app safe?

Source


12 Tips for API Security
ByteByteGo
Use HTTPS
TCP Connection
public key
session key
encrypted data
Use OAuth2
1 Resource Owner
2 Authorization Server
3 Resource Server
Use WebAuthn
External authonticator
Relying party
Client / Platform
Application Browser Platform
WebAuthn
Internal authonticator
Use Leveled API Keys
Client
HMAC signature
Authentication Server
Web Server
resource
Authorization
Can view
Cannot modify
Rate Limiting
Design rate limiting rules based on IP,user, action group etc
API Versioning
GET / v1 / users / 123
GET / users / 123
Allowlist
Design allowlist rules based on IP,user etc
Check OWASP API Security Risks
OWASP
Open Web Application Security Project
Use API Gateway
API Gateway
Services
Error Handing
descriptive,helpful error messages
be emphathetic
internal stack trace
incorrect error codes
Input Validation
Validator
API Gateway

Form and validation


App
Frontend
API Request
Backend
Form
API Request

Case study

- `git clone -b no-check https://github.com/fullstack-67/fv-zod.git fv-no-check`

Frontend (backend)

- `pnpm i`
- `npm run dev`

Backend pitfalls (1)

- `GET` `/users` route
  - The response has `password` fields.

Backend pitfalls (2)

- `POST` `/users` route

```
{
  "firstName": "Test",
  "lastName": "Test",
  "email": "test@example.com",
  "dateOfBirth": "2024-01-01",
  "password": "1234",
  "confirmPassword": "1234"
}
```

- Try sending incomplete fields / wrong field names.
  - Internal error

Backend pitfalls (3)

- Trying sending wrong year calendar.
  - Data is now not consistent.

Frontend pitfalls (1)

`.env`

```
VITE_URL_DATA=/api/users_wrong
```

- Notice the incoming data
  - Key differences
  - Calendar year difference
- The wrong data causes blank/inconsistent display.

Frontend pitfalls (2)

- Try using form
  - No input validation

Wait, but I thought I used `TypeScript`.

- TypeScript catches compile-time errors.
- We are talking about **run-time** errors.

We want

- Advanced/maintainable/scalable data validation
- Useful error message when validation fails
- Data sanitization (backend response)
- Logic reusability in frontend and backend codes
- Seamless combatibility with `TypeScript`
- API documentation

Validation library

- `Zod`
- `Yup`
- `Typebox`

`zod` basic

Setup

- `git clone -b basic https://github.com/fullstack-67/fv-zod.git fv-basic`
- `pnpm i`
- `npm run dev`

Validation with `zod`

Setup

- `git clone -b check https://github.com/fullstack-67/fv-zod.git fv-check`

Frontend (backend)

- `pnpm i`
- `npm run dev`

Backend - schema

./src/utils/schema.ts

```
export const zUserBase = z.object({
  // Fields
});
// Response
export const zUsersRes = z.array(zUserBase.omit({ password: true }));
```

Backend - data sanitization

```
// * Endpoint: get users
app.get("/users", (req, res) => {
  res.json(zUsersRes.parse(data)); // 👈👈👈
});
```

Backend - validation middleware

```
export function validateData(schema) {
  return (req, res, next) => {
    try {
      schema.parse(req.body); // 👉👉👉
      next();
    } catch (error) {
      // Error logic
    }
  };
}
```

Backend - data validation

`./src/index.ts`

```
app.post("/users", validateData(zUsersCreateReq), async (req, res, next) => {
  // Route logic
});
```

Frontend - schema

- `./src/utils/schema.ts`
  - Same as backend schema.

Frontend - validation

./src/hooks/useUser.ts

```
function useUsers() {
  // ...
  async function fetchUsers() {
    const res = await axios.get<User[]>(URL_DATA);

    // Validation from Zod
    const result = usersSchema.safeParse(res.data); // 👈👈👈

    if (!result.success) {
      // Error logic
    }
}
```

Frontend - form validation

```
const FormVanilla: FC = () => {
  // ...
  async function sendData(e) {
    //...
    const result = formSchema.safeParse(values); // 👈👈👈
    if (!result.success) {
      // Show error message
    }
    // ...
  }
  return <div id="form"></div>; // Form stuff
};
```

Try the form yourself

https://fs-nr.iecmu.com/

- Try `Form Vanilla` first

Form UX improvement

- "Real-time" validation
- Disable submission button if input is not valid.
- Prevent double submission.
- Prevent typing during submission.
- Auto-focus the wrong input.

Real-time validation

- Use `useEffect` to trigger schema validation
- Store errors in `errors` state.
- Keep track of when user touches the form.
  - Prevent premature validation.
  - Store `touch` state

Submission button disabled

- Keep track of `valid` state.
- Keep track of `submission` state.

Spiral out of control

- Too many states
- Too many logics
- Not reusable

Form library

- Help you handle form states and logics in a reusable manner.
  - It is essentially a custom hook.
  - Integrates seemlessly with validation library.
- Popular libraries
  - `Formik`
  - `React Hook Form`

Usage

```
import { useForm } from "react-hook-form";
//
const rhf = useForm<Form>({
  // Options
});

// Observer the states
console.log({ a_rhf: rhf, b_formState: formState, c_watch: watch() });
```

UI Control

```
<input
  {...register("firstName")} // 👈👈👈
  type="text"
  id="firstName"
  disabled={isSubmitting}
/>
```

- Check `register("firstName")` in console.
  - This gives `onBlur`, `onChange`, `ref` to HTML element.

Form validation

```
import { zodResolver } from "@hookform/resolvers/zod";
import { formSchema, type Form } from "../utils/schema";

const rhf = useForm<Form>({
  resolver: zodResolver(formSchema), // 👈👈👈
  defaultValues: getInitData(),
  mode: "onTouched",
});
```

- See `mode` options

Generating documentation

> OpenAPI

What is OpenAPI?

- API description format for REST APIs.
  - Formerly Swagger Specification
- An OpenAPI file allows you to describe your entire API.
  - Available endpoints
  - Operation parameters
  - Authentication methods

What is Swagger?

- Open-source tools built around the OpenAPI Specification.
- Major Swagger tools include
  - Swagger Editor – browser-based editor
  - Swagger UI – Library for rendering OpenAPI definitions as interactive documentation

Example

- https://fs-nr-backend.iecmu.com/api-docs

Setup

- `git clone -b main https://github.com/fullstack-67/fv-zod.git fv-main`

Highlight packages

```
{
  "dependencies": {
    // ...
    "@asteasolutions/zod-to-openapi": "^7.1.1",
    "swagger-ui-express": "^5.0.1",
    "zod": "^3.23.8"
  }
}
```

Extending `zod` object

`./src/openAPI.ts`

```ts
import { extendZodWithOpenApi } from "@asteasolutions/zod-to-openapi";
// ...
extendZodWithOpenApi(z);
```

`schema.ts`

```ts
export const zUserBase = z.object({
  id: z
    .string()
    // ...
    .openapi({ example: nanoid() }), // 👈👈👈
  // ...
});
```

OpenAPI registry instance

```
import { OpenAPIRegistry } from "@asteasolutions/zod-to-openapi";
// ...
export const registry = new OpenAPIRegistry();
```

Documentation from `zod` schema

`./src/index.ts`

```ts
registry.registerPath({
  method: "get",
  path: "/users",
  responses: {
    200: {
      content: {
        "application/json": {
          schema: zUsersRes, // 👉👉👉
        },
      },
    },
  },
});
app.get("/users", (req, res) => {
  // Route logic
});
```

Route middleware

`./src/index.ts`

```
app.use(
  "/api-docs",
  swaggerUi.serve,
  swaggerUi.setup(getOpenApiDocumentation())
);
```

OpenAPI genenerator

./src/openAPI.ts

```
export function getOpenApiDocumentation() {
  const generator = new OpenApiGeneratorV3(registry.definitions);
  return generator.generateDocument({
    // Options
    openapi: "3.0.0",
    info: {
      version: "1.0.0",
      title: "My API",
      description: "This is the API.",
    },
    servers: [{ url: "/" }],
  });
}
```