

TDD with NodeJS





Somkiat Puisungnoen

Somkiat Puisungnoen

Update Info 1 View Activity Log 10+ ...

Timeline About Friends 3,138 Photos More

When did you work at Opendream? X

... 22 Pending Items

Intro

Software Craftsmanship

Software Practitioner at สยามชัมนาภิกิจ พ.ศ. 2556

Agile Practitioner and Technical at SPRINT3r

Post Photo/Video Live Video Life Event

What's on your mind?

Public Post

Somkiat Puisungnoen 15 mins · Bangkok · ⚙️

Java and Bigdata



Page

Messages

Notifications 3

Insights

Publishing Tools

Settings

Help ▾



somkiat.cc

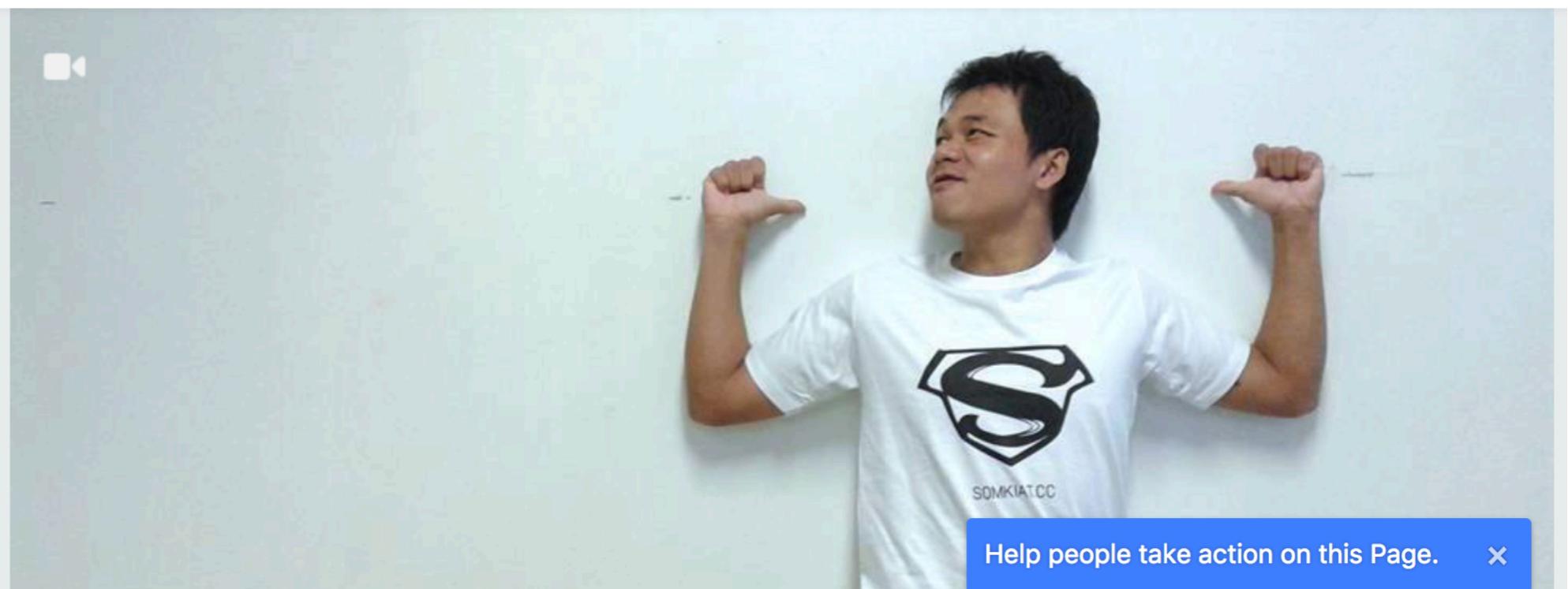
@somkiat.cc

Home

Posts

Videos

Photos



Test-Driven Development



ทำดีดี



ถ้าเข้าจะ test อญ্যោតី ឬ ខ្សោយ test



Agenda

Test-Driven Development

Types of Testing

Good Unit Test (GUT)

Structure of Good Unit Test

Testing with Node.JS

Test/Code coverage

Test-Double

Testable application



[https://github.com/up1/
course-tdd-with-nodejs](https://github.com/up1/course-tdd-with-nodejs)



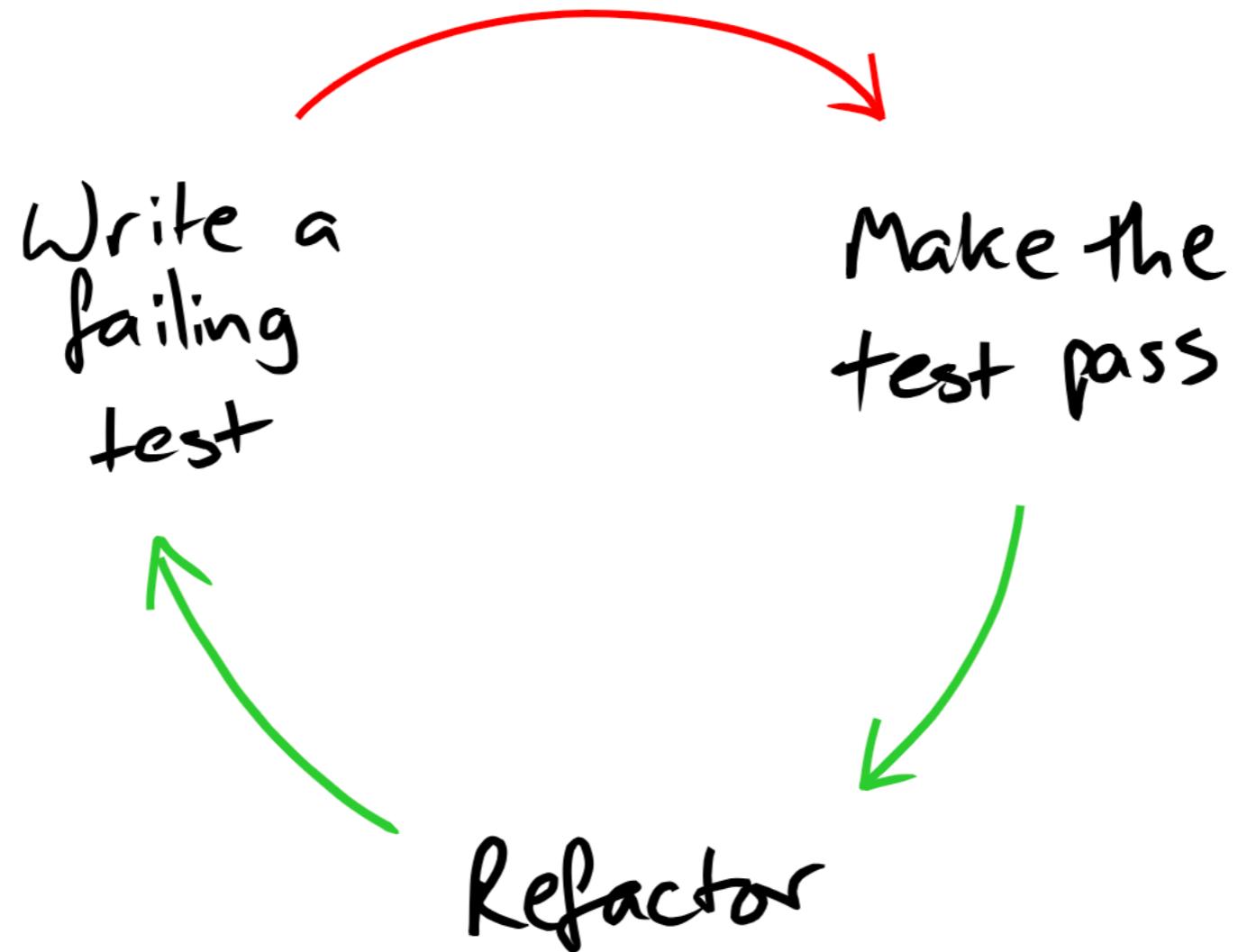
Learn by **DOING.**



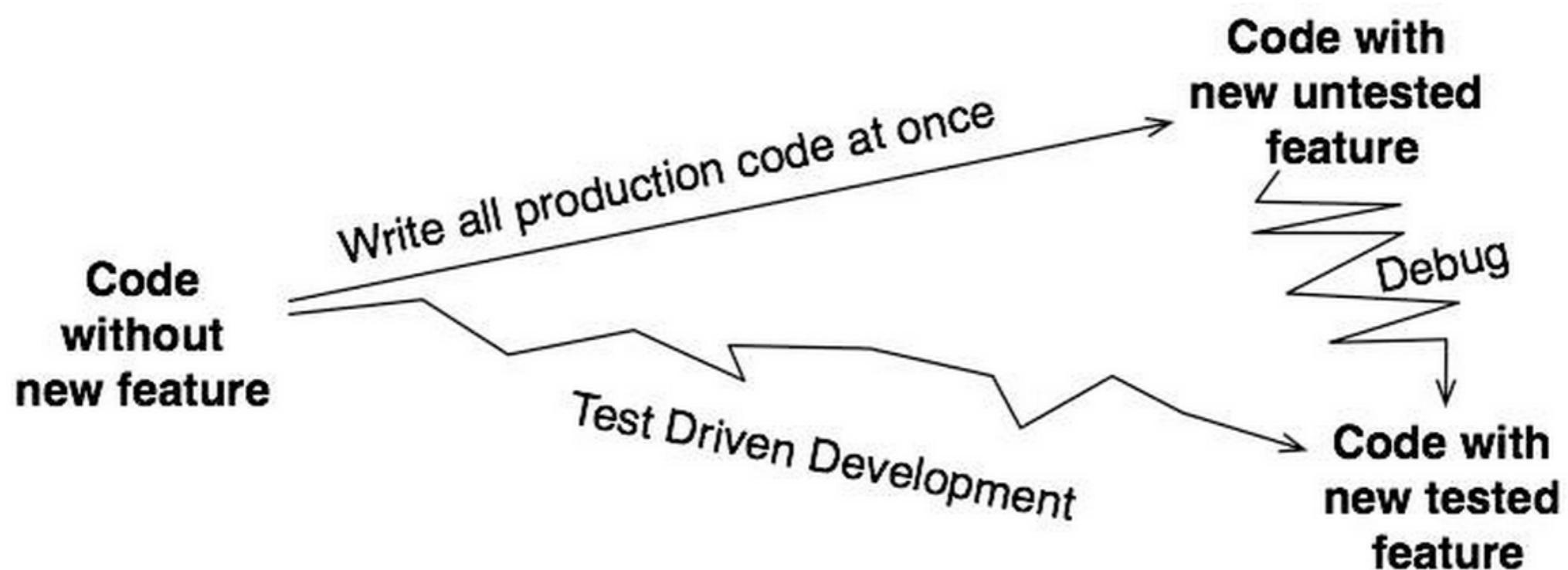
Test-Drive Development



TDD Life Cycle



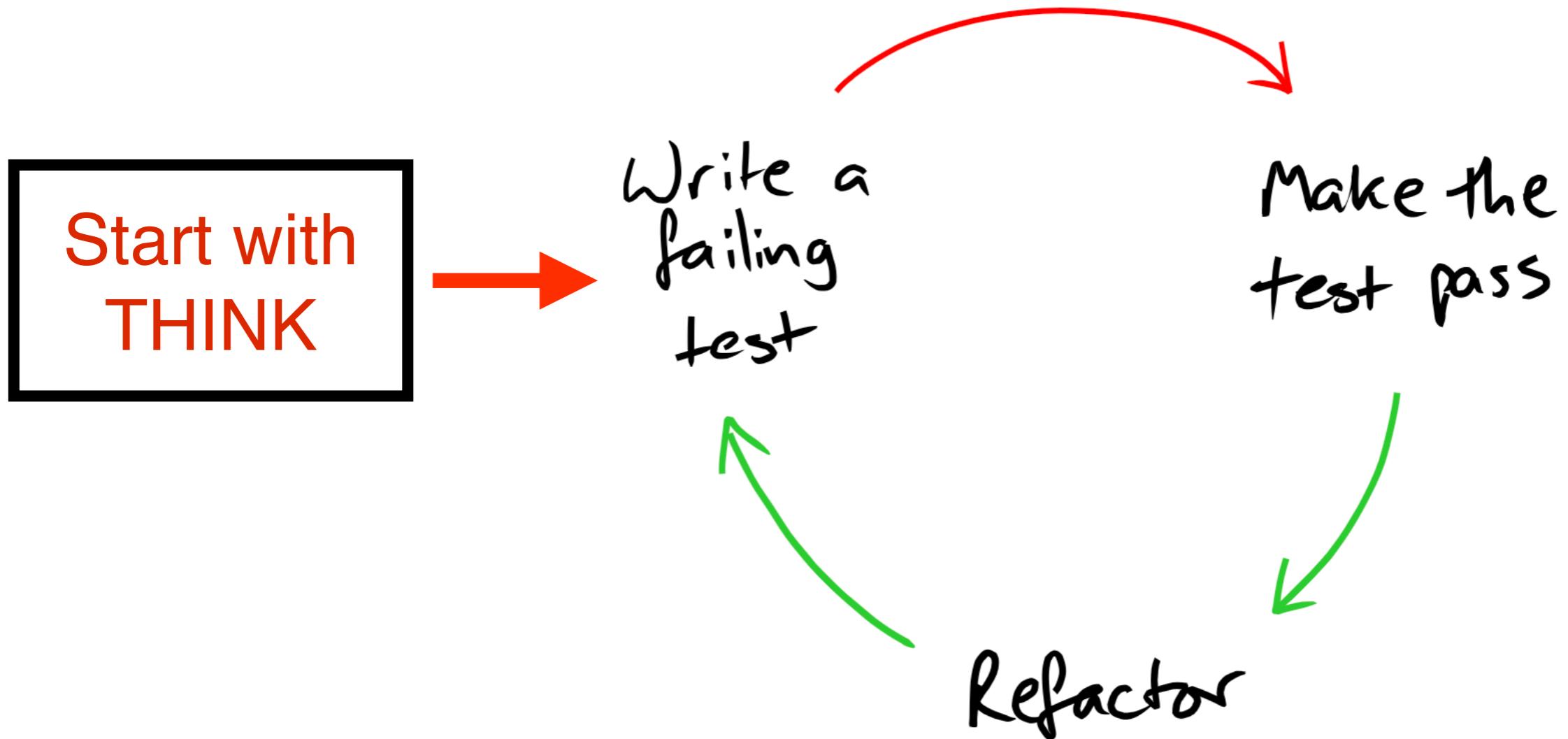
TDD vs DLP



Red Green Refactor



Let's start



Rules of TDD



Rule #1

Don't write production code unless it's to help
a failing unit test pass



Rule #2

Only write enough of a unit test to fail



Rule #3

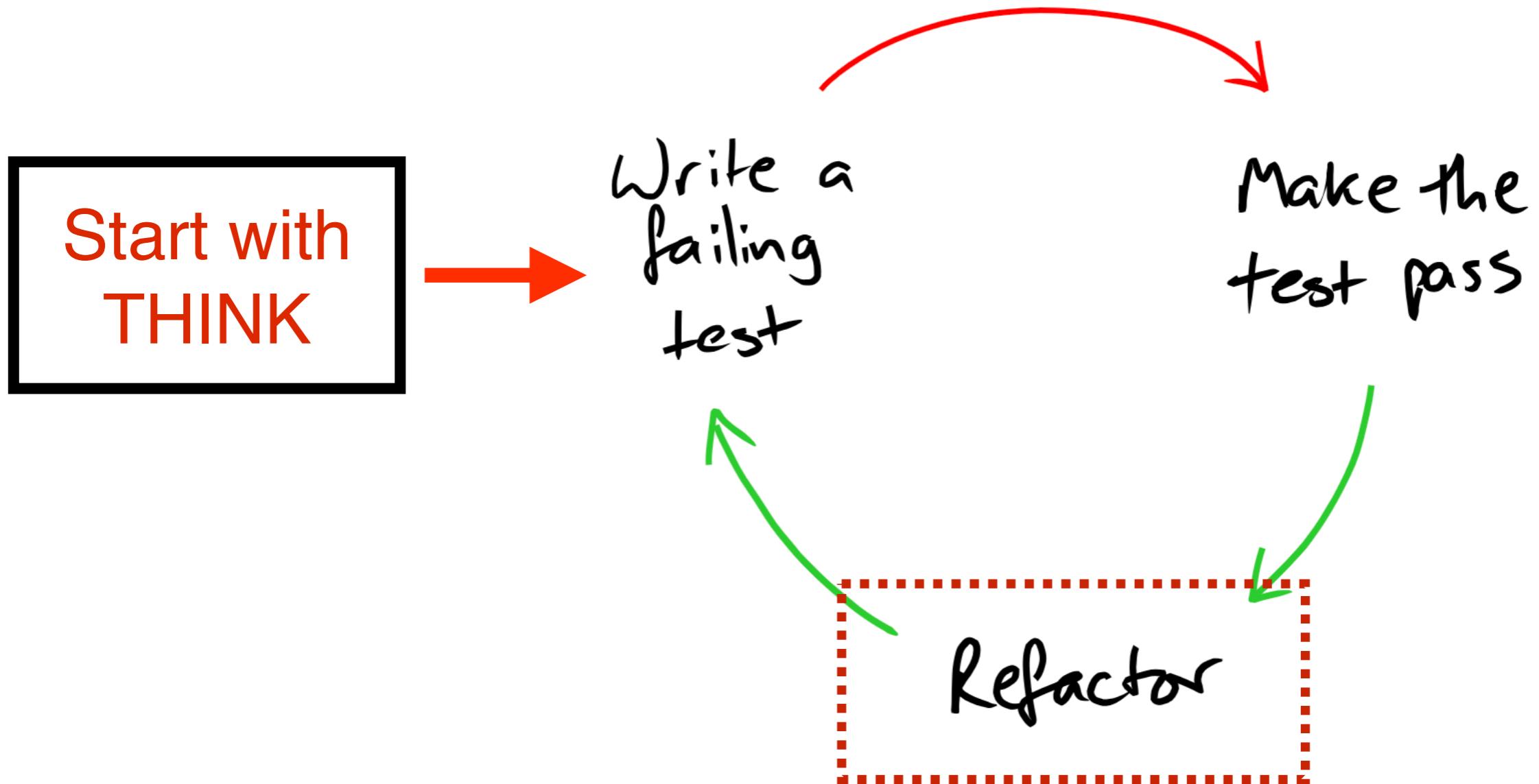
Only write enough production code to help a failing unit test pass

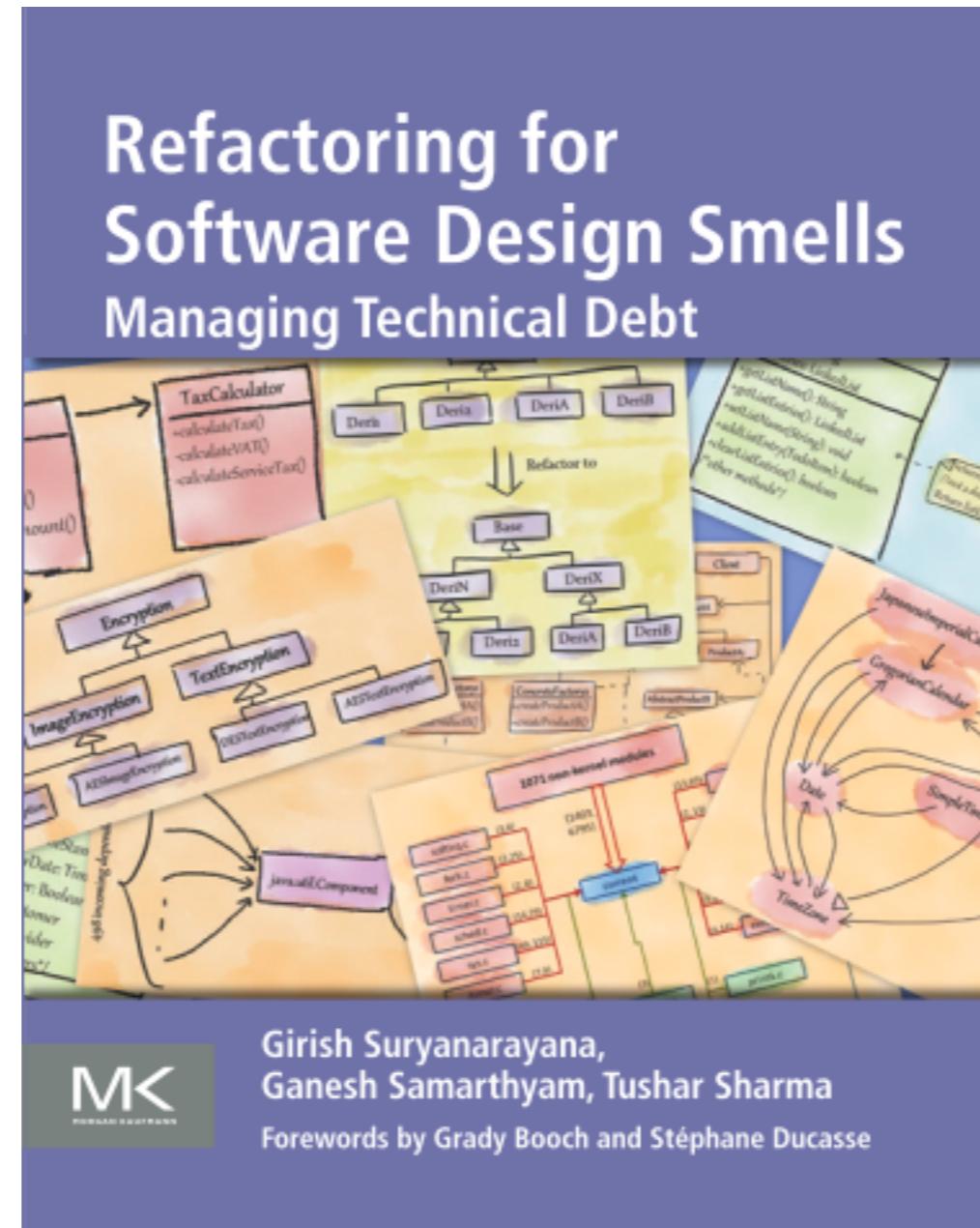


Don't forgot Refactoring



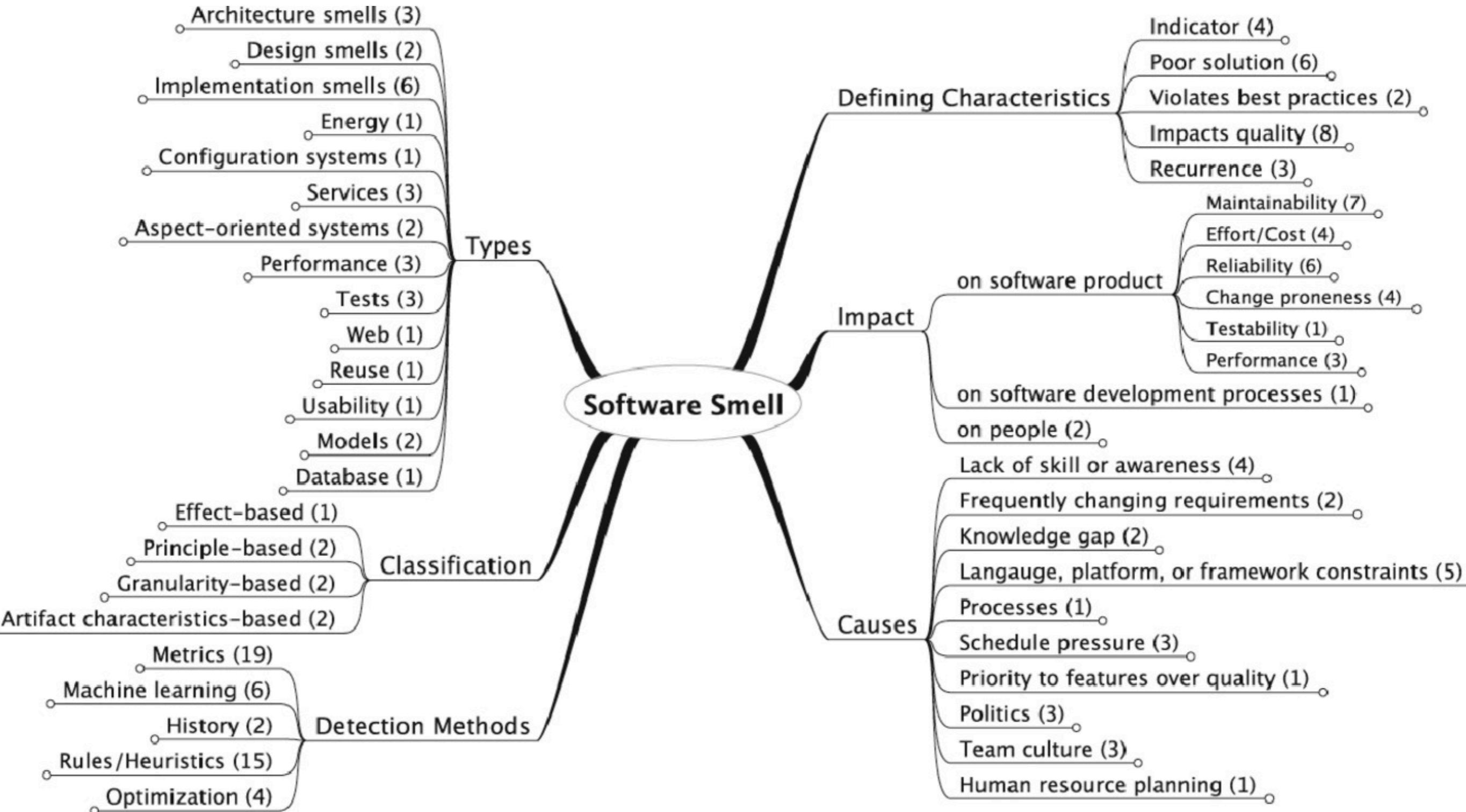
Let's start





<http://www.tusharma.in/smells/>





<https://www.sciencedirect.com/science/article/pii/S0164121217303114>



Code Smell



Code Smells

- What? How can code "smell"??
- Well it doesn't have a nose... but it definitely can stink!



Bloaters

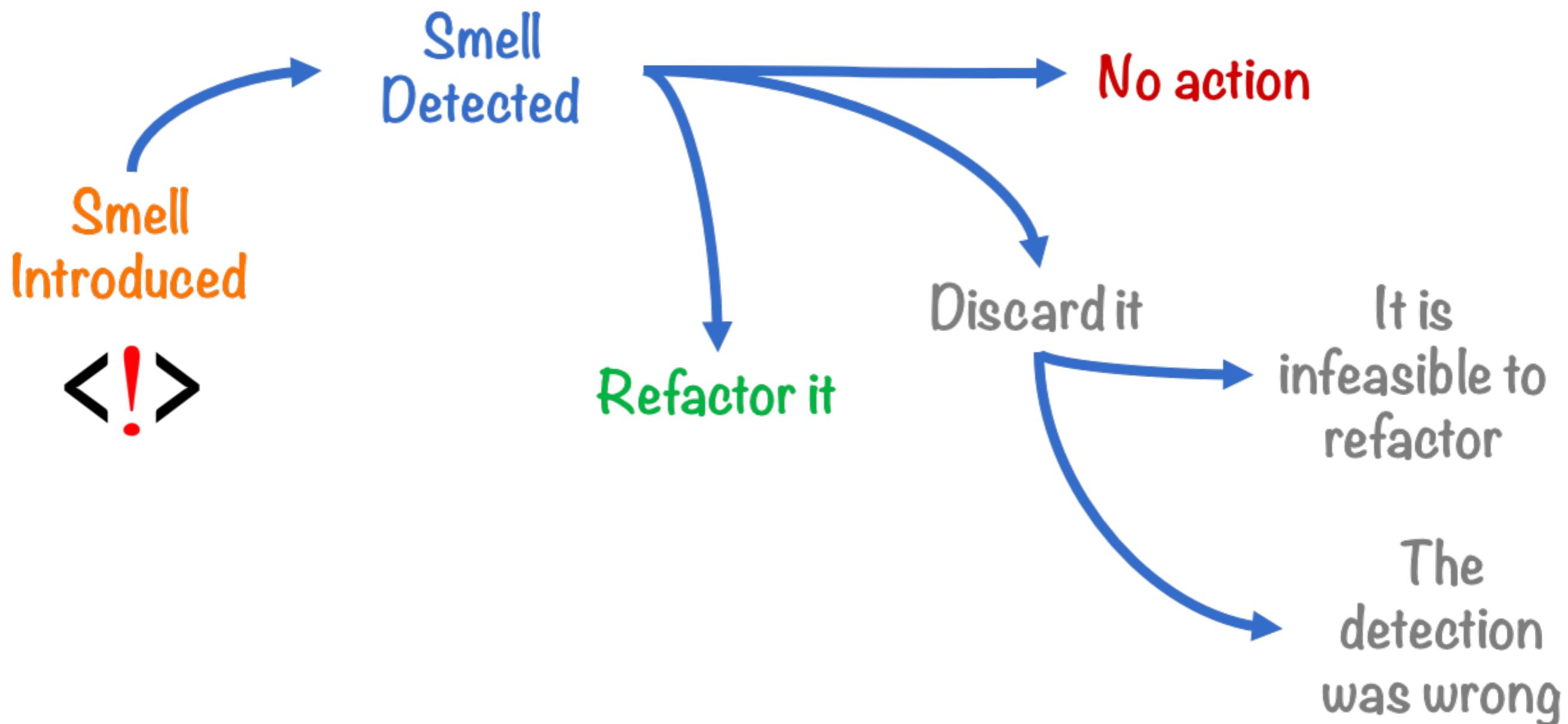
Bloaters are code, methods and classes that have increased to such gargantuan proportions that they are hard to work with. Usually these smells do not crop up right away, rather they accumulate over time as the program evolves (and especially when nobody makes an effort to eradicate them).

- Long Method
- Large Class
- Primitive Obsession
- Long Parameter List
- Data Clumps

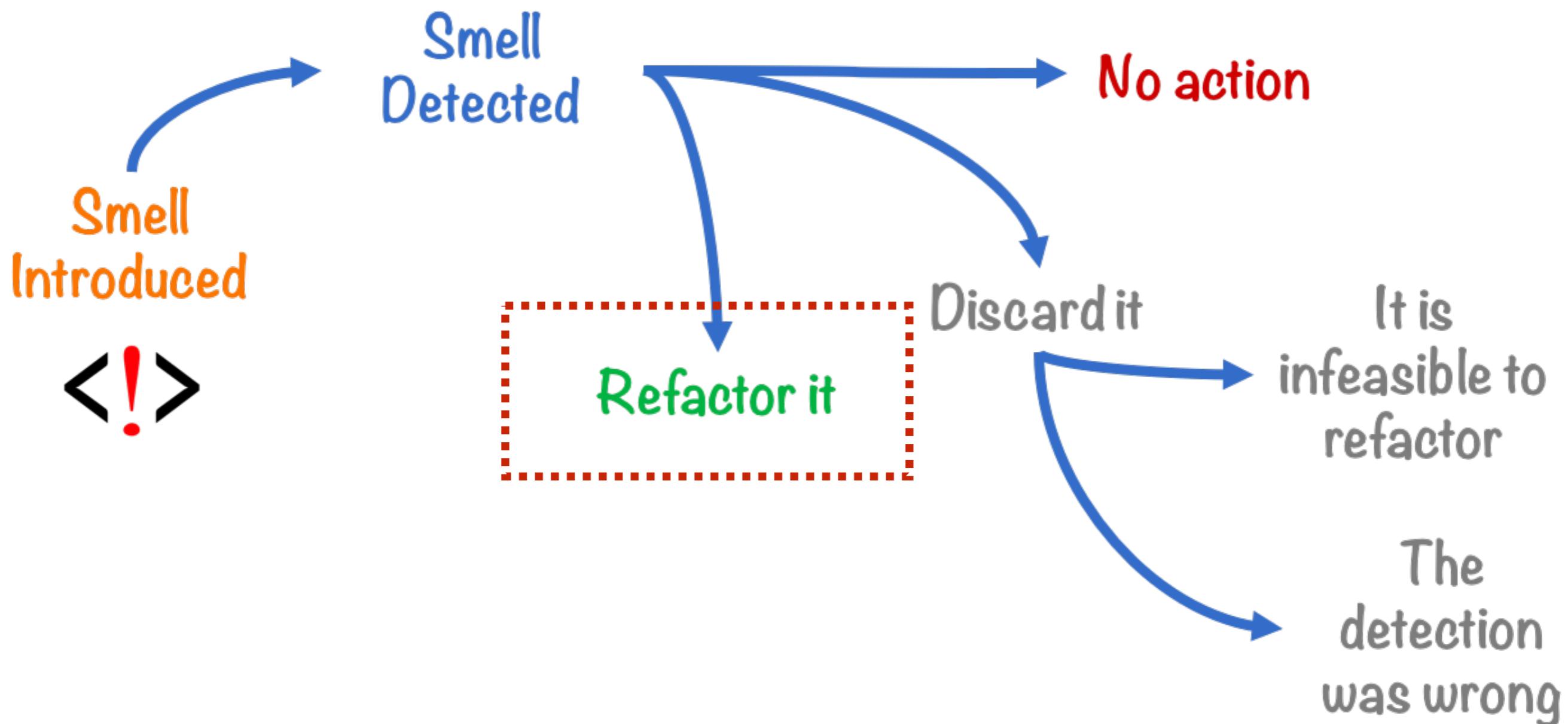
<https://sourcemaking.com/refactoring/smells>



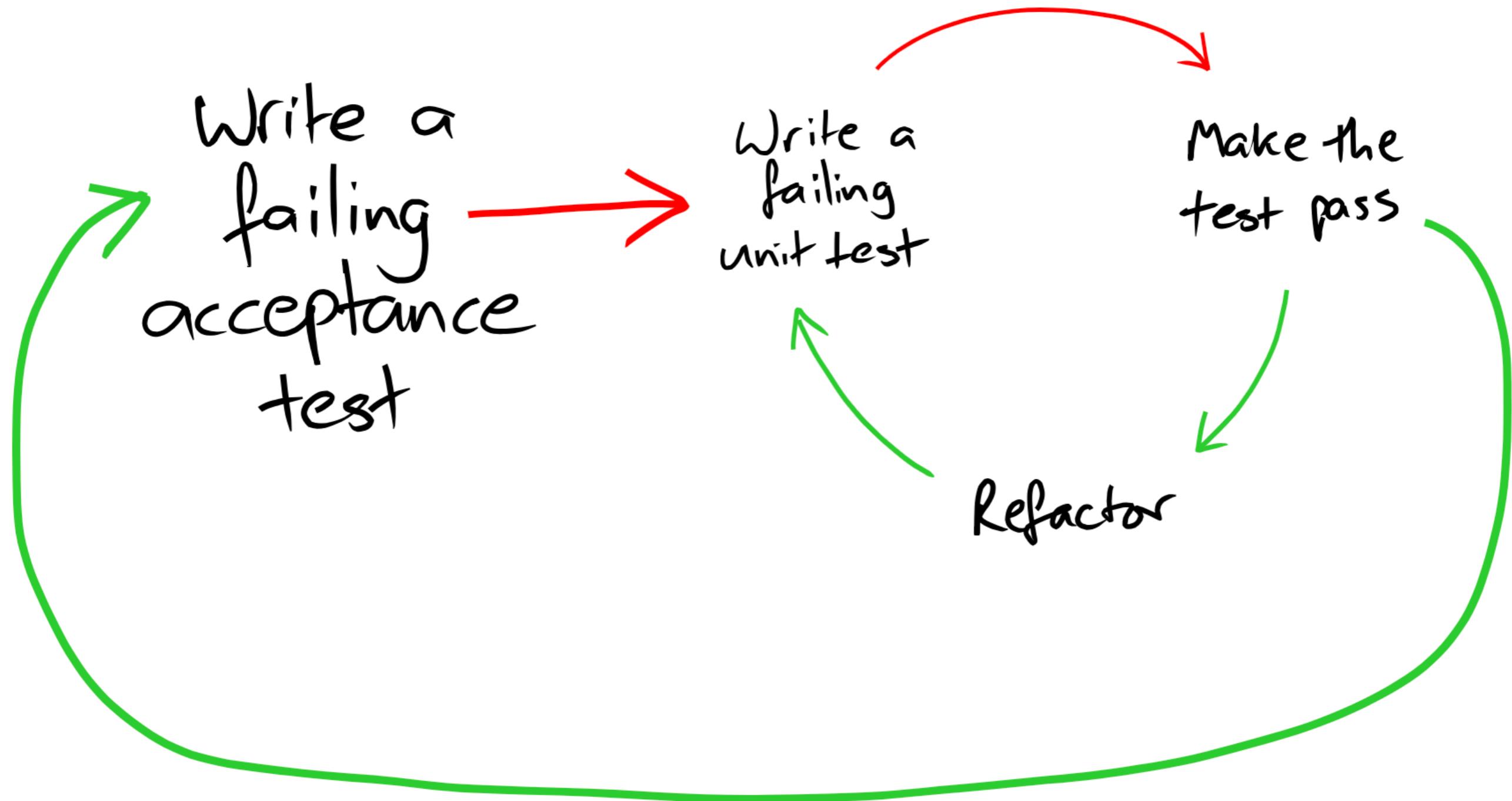
Life-cycle of a smell



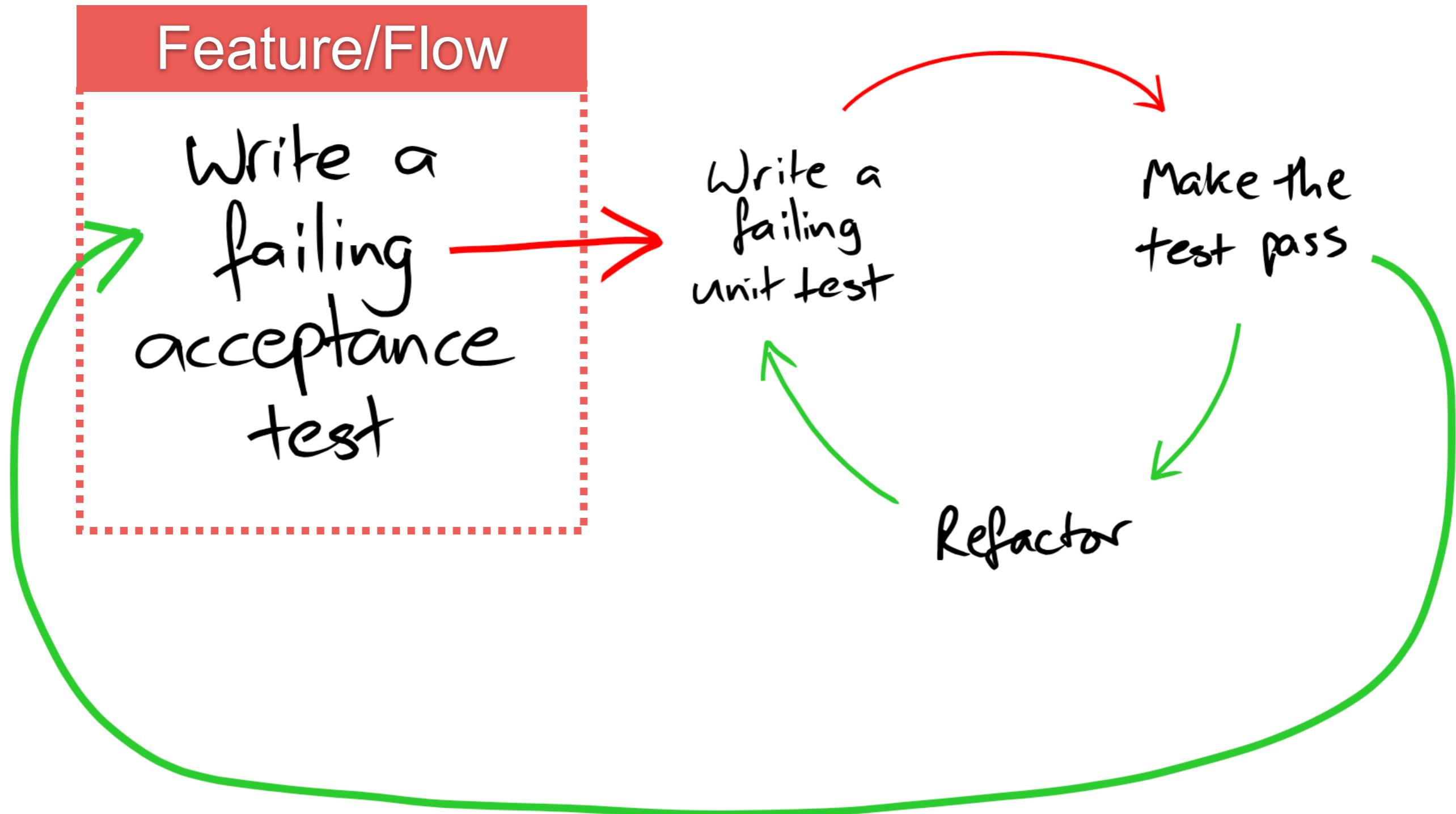
Life-cycle of a smell



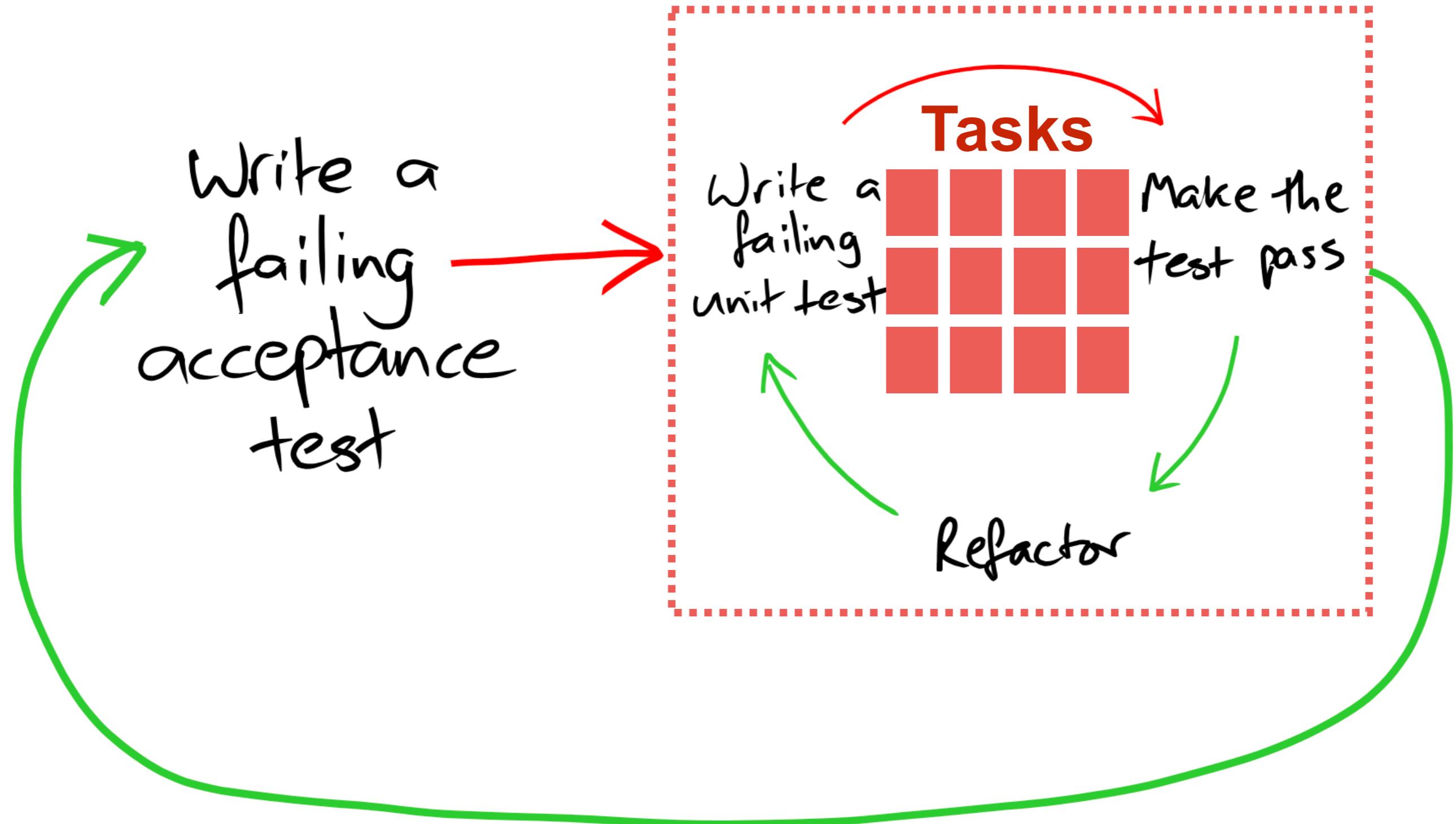
Outside-in develop/test



Outside-in develop/test



Outside-in develop/test

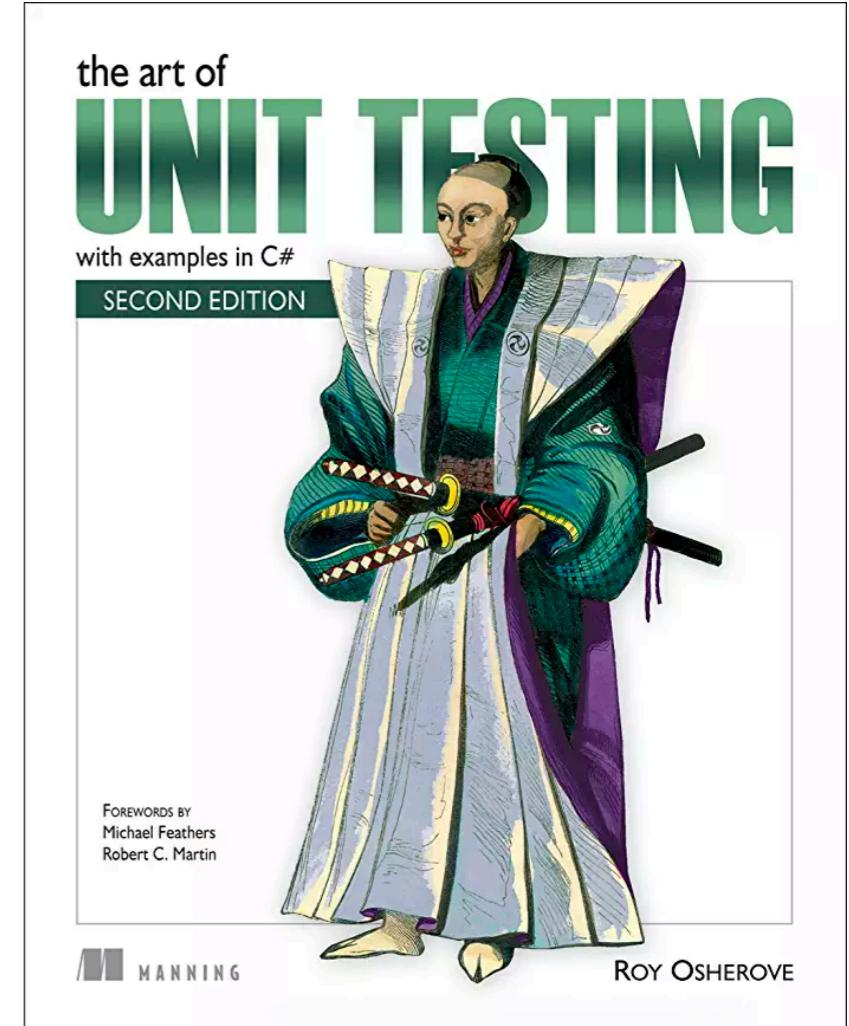
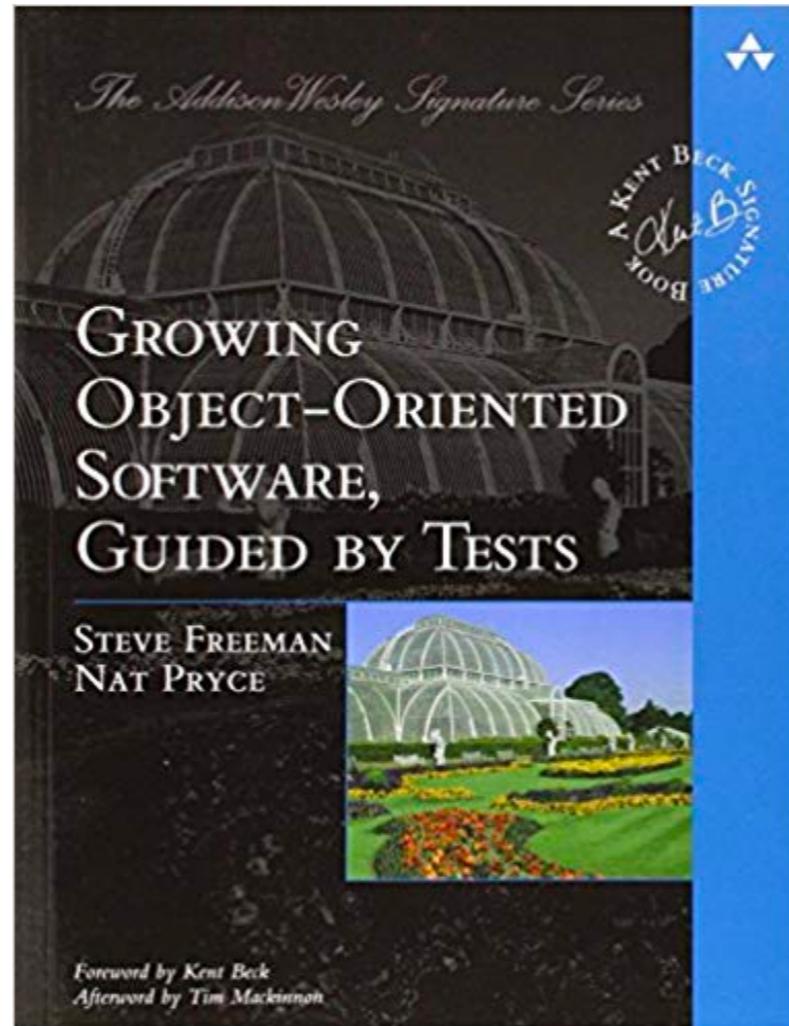
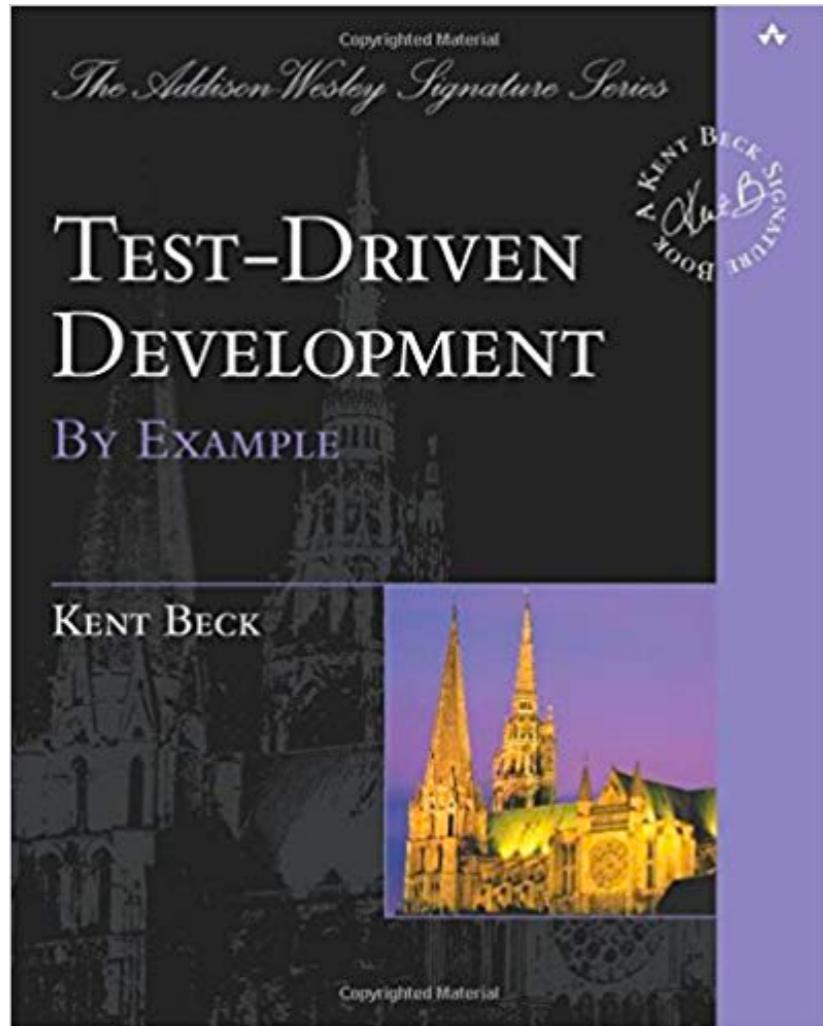


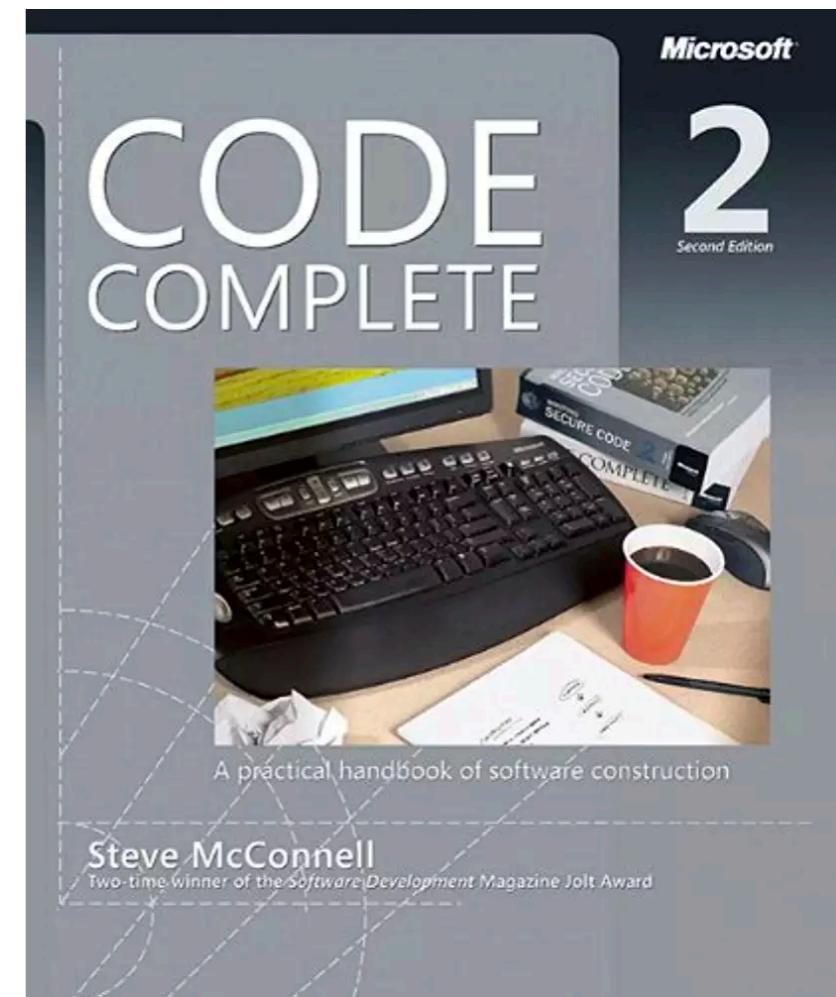
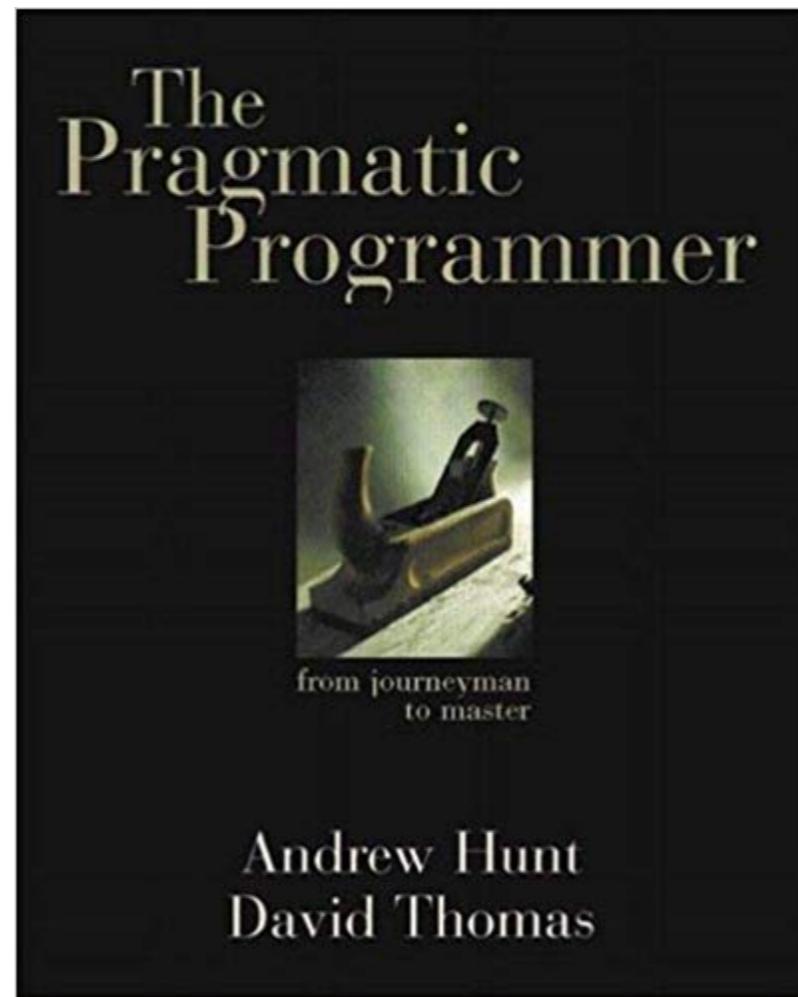
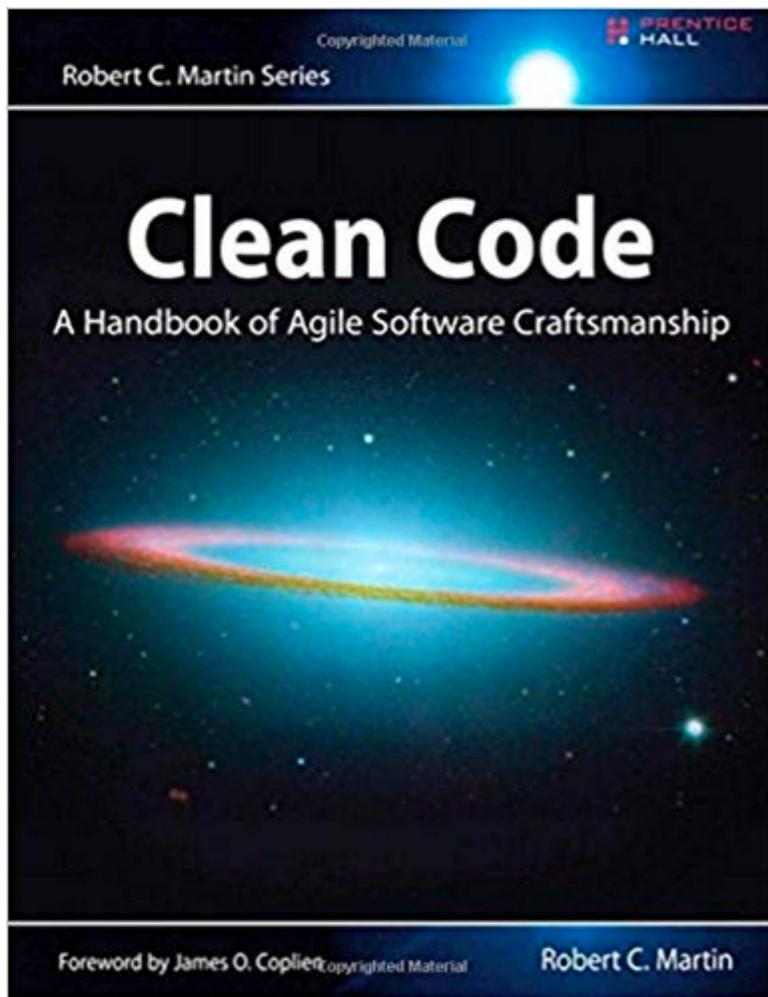
คิดอย่างไร ก็จะทำอย่างนั้น

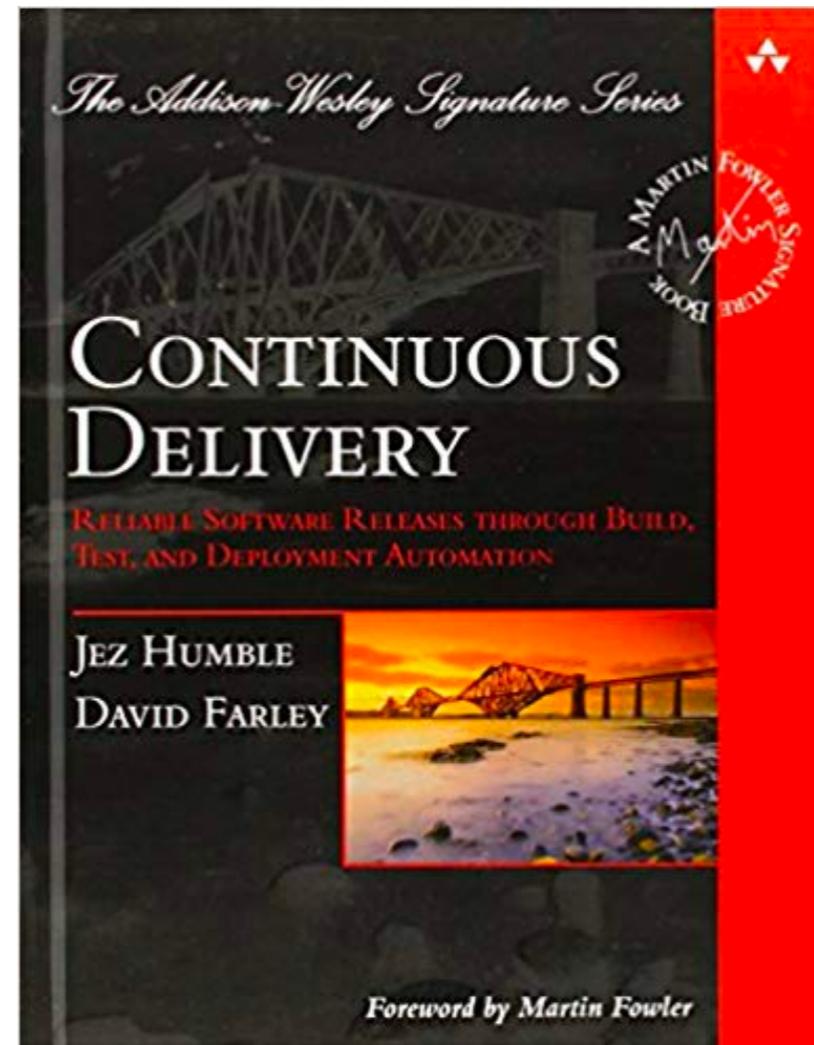
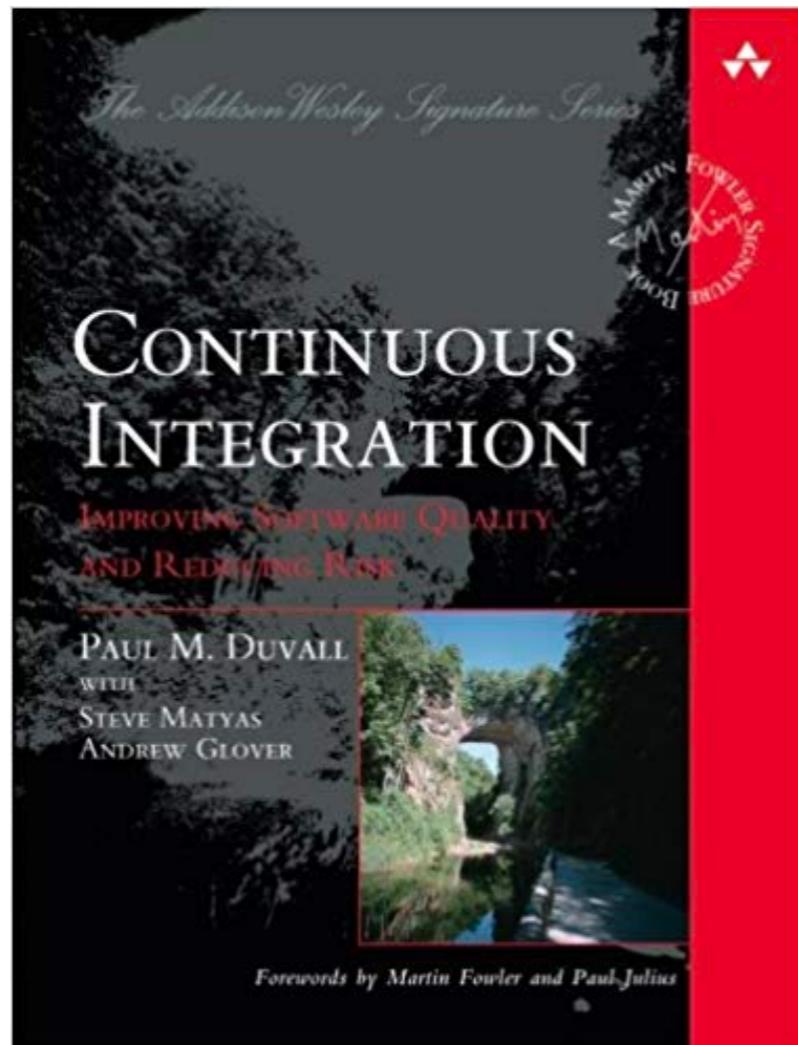


Books





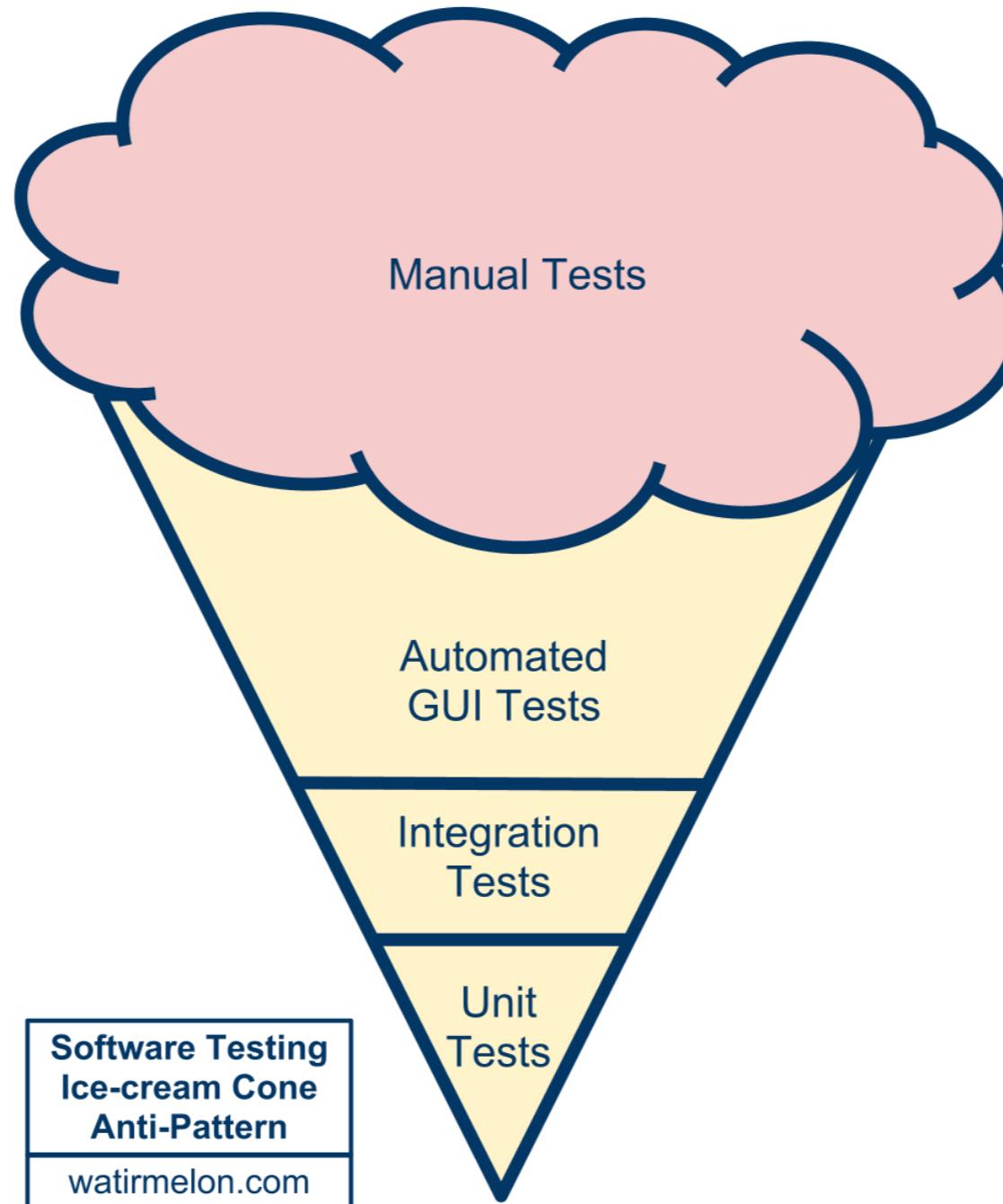




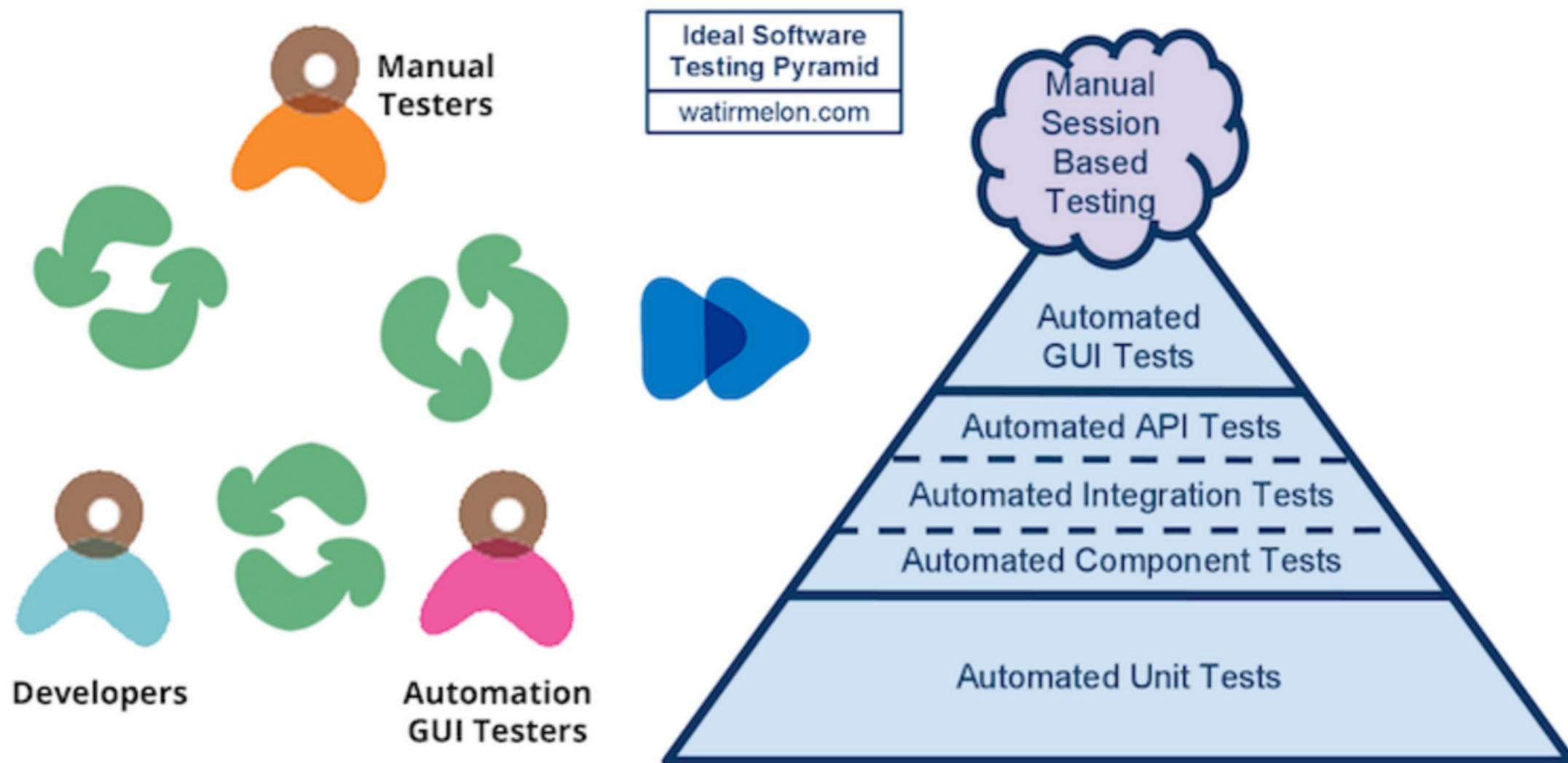
Types of Testing



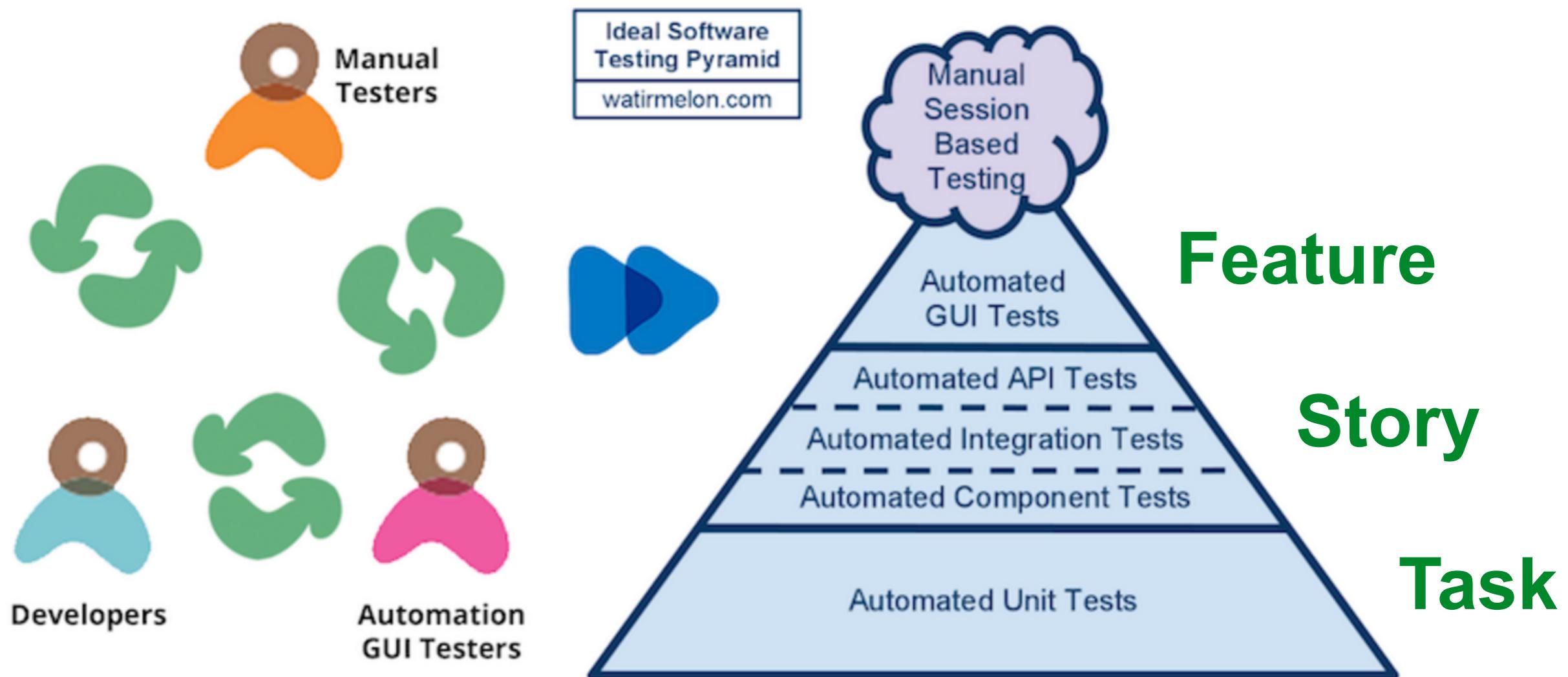
Ice-cream testing



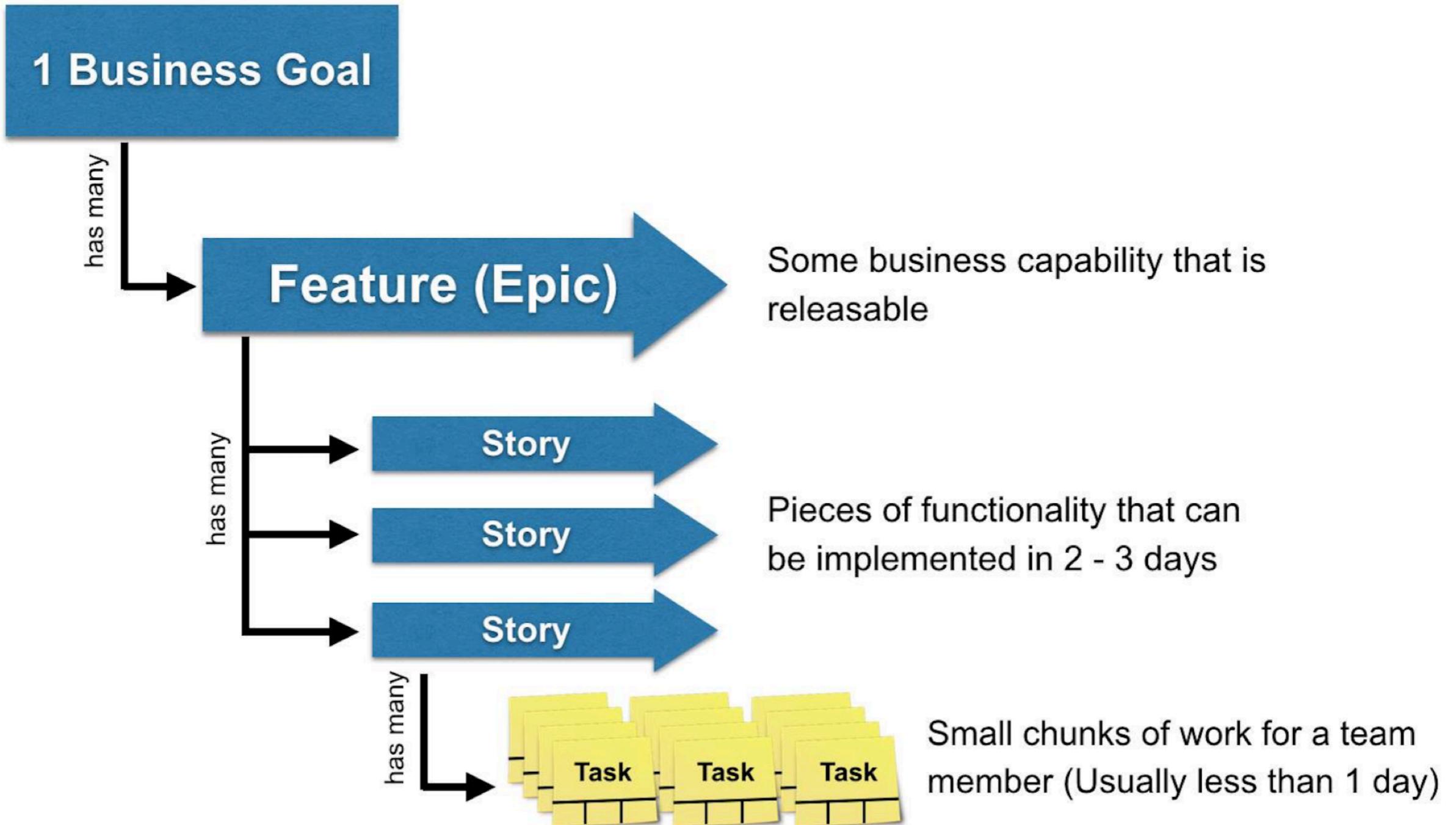
Testing Pyramid

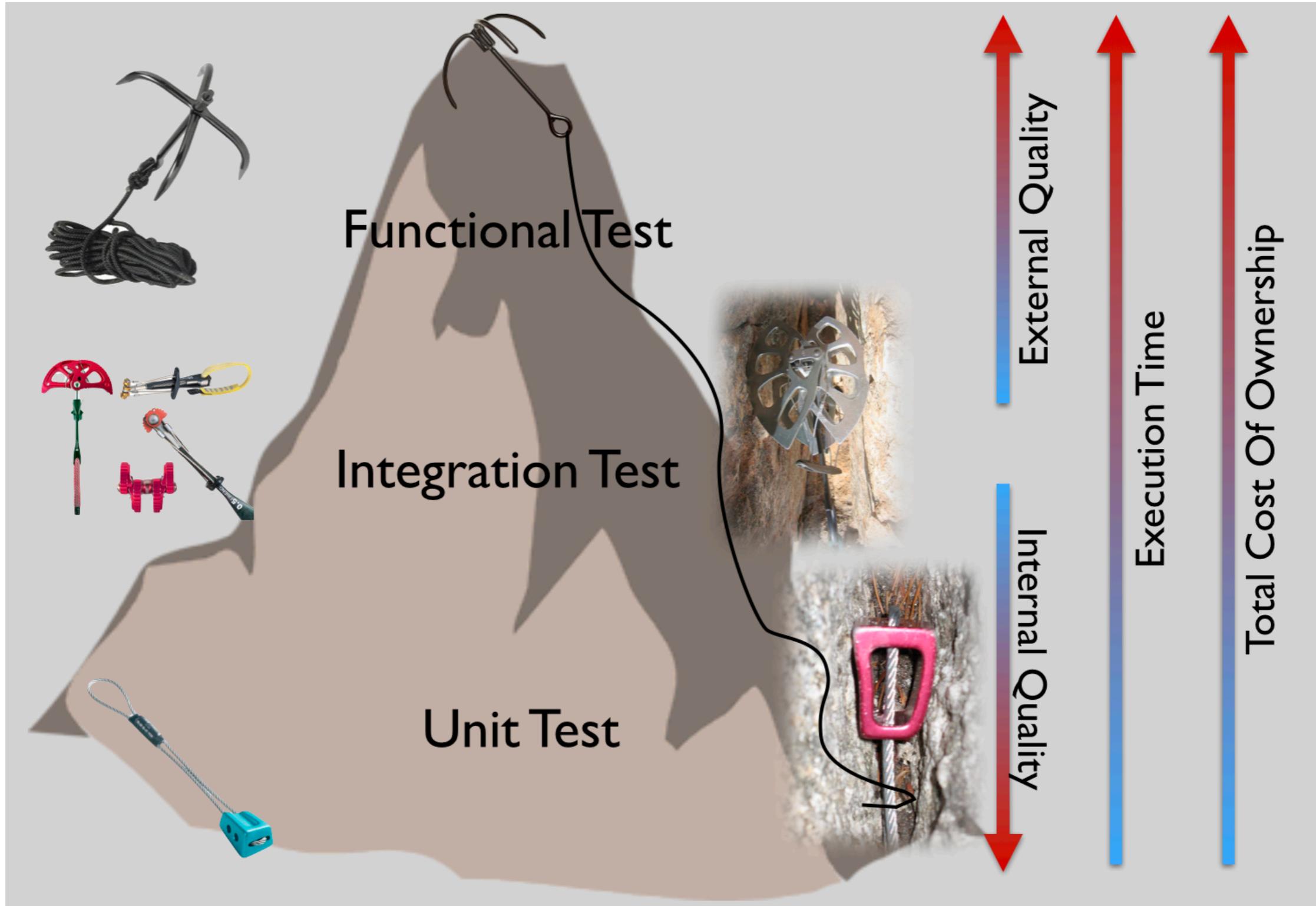


Testing Pyramid



Work break down





<https://less.works/less/technical-excellence/unit-testing.html>



Mind-set switch

Instead of

We are here to **find bug**

We are here to **ensure requirement are met**

We are here to **break the software**



Mind-set switch

Instead of

We are here to **find bug**

We are here to **ensure requirement are met**

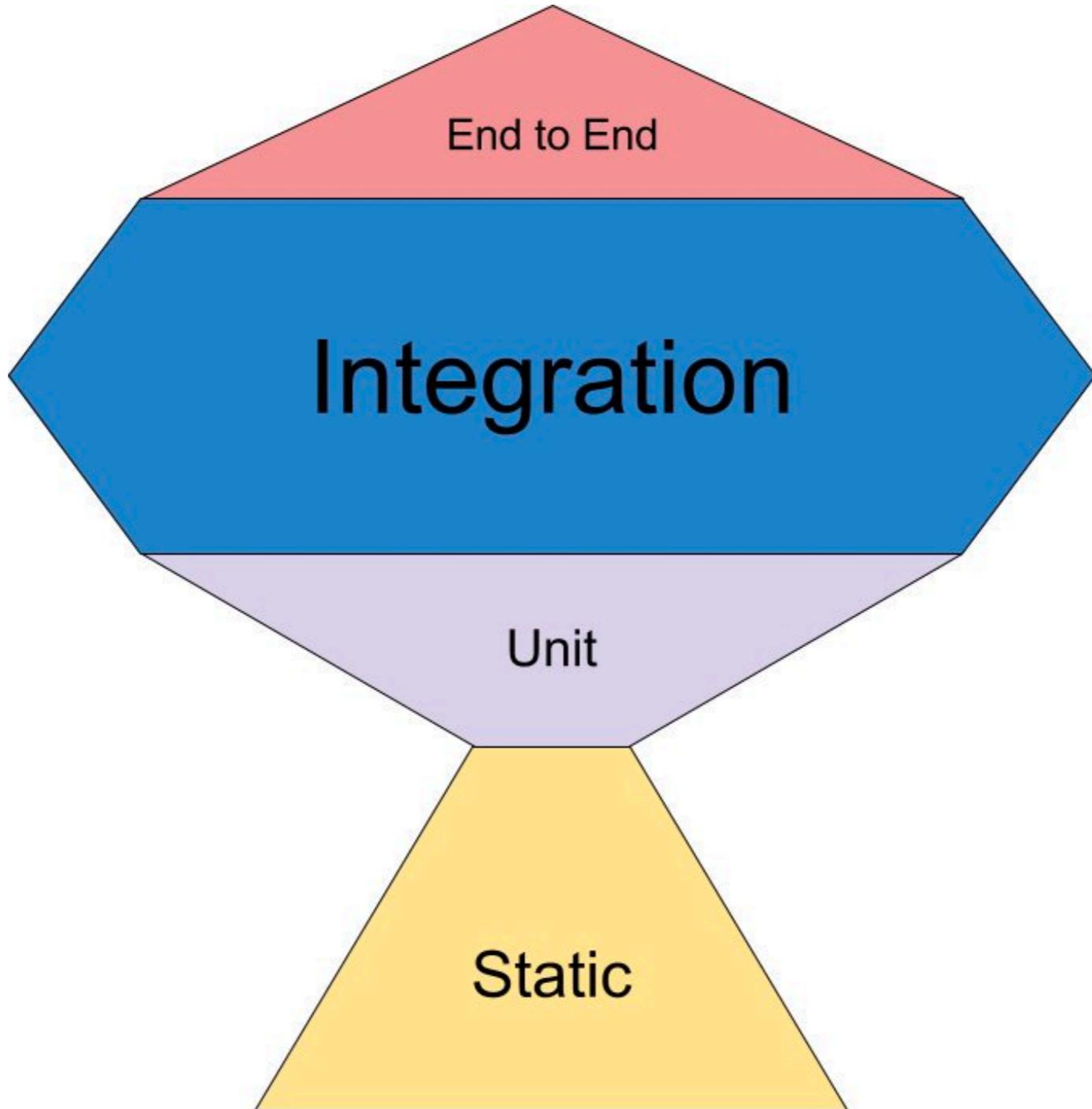
We are here to **break the software**

Think

**What can I do to help deliver the software
successfully !!**



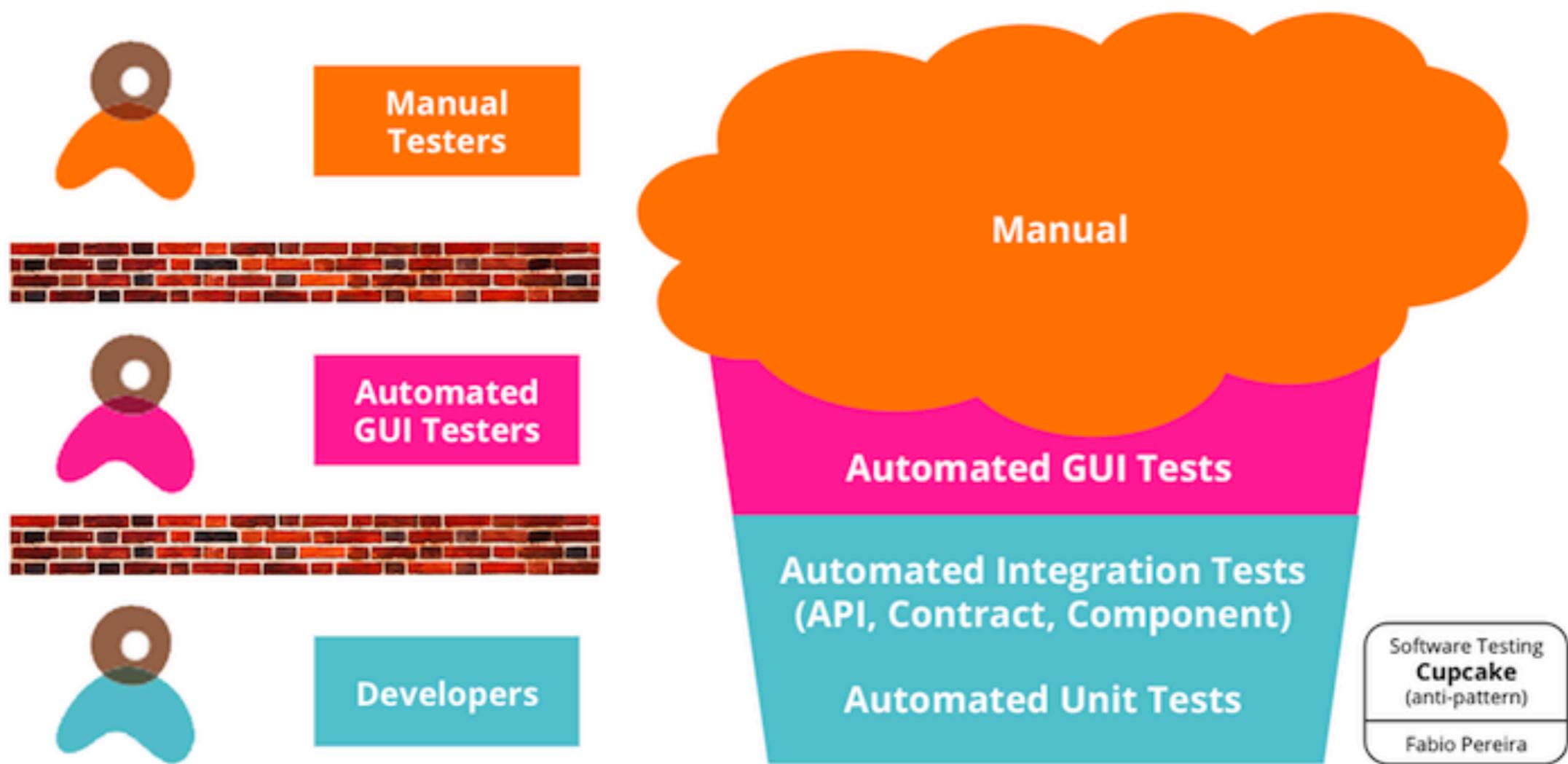
Trophy testing



<https://kentcdodds.com/blog/write-tests>



Cupcake testing !!



<https://www.thoughtworks.com/insights/blog/introducing-software-testing-cupcake-anti-pattern>



Understand Why => What and How to test ?

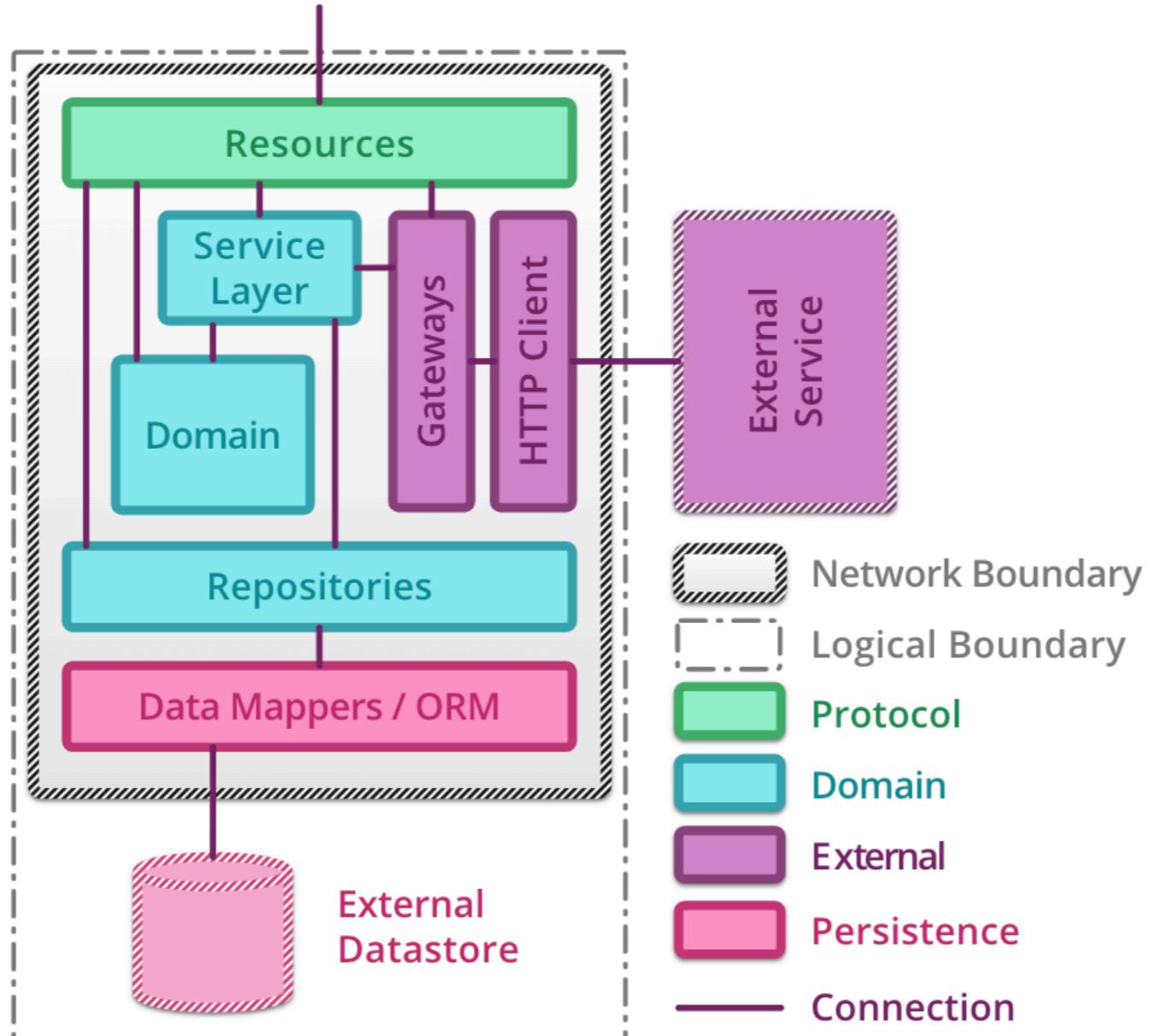
Discussion is very important



Continuous integration



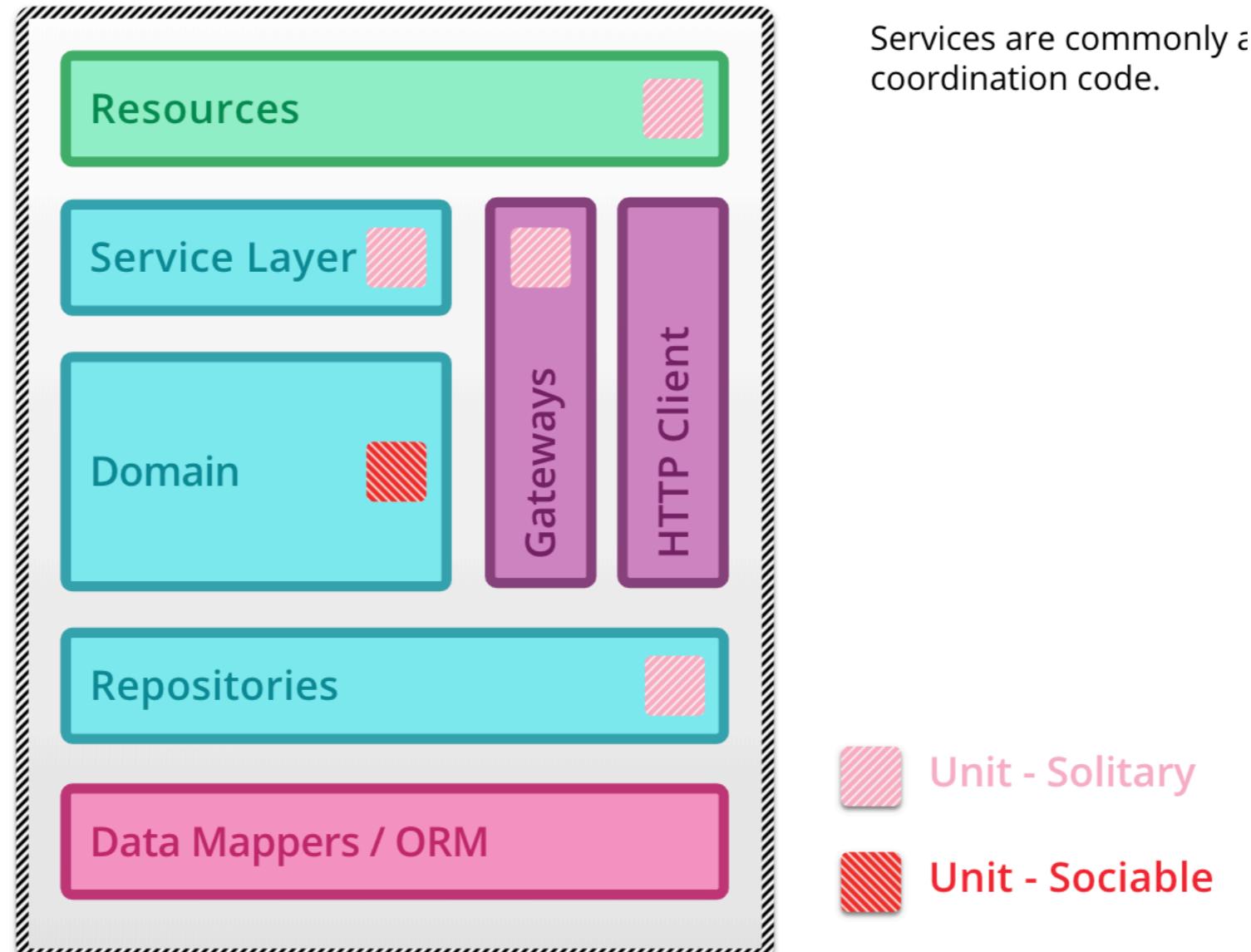
Understand project structure



<https://martinfowler.com/articles/microservice-testing/>



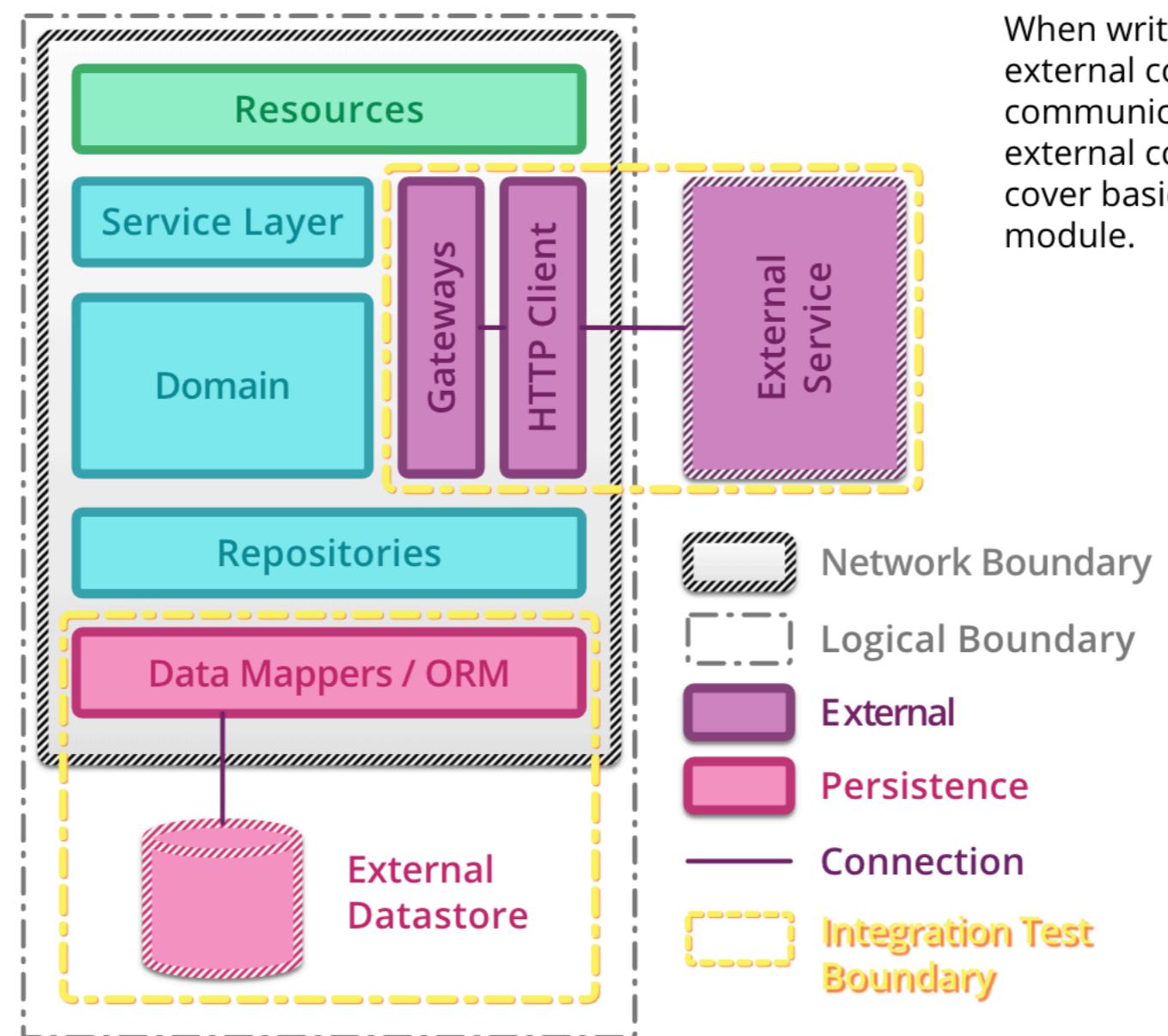
Unit testing



<https://martinfowler.com/articles/microservice-testing/>



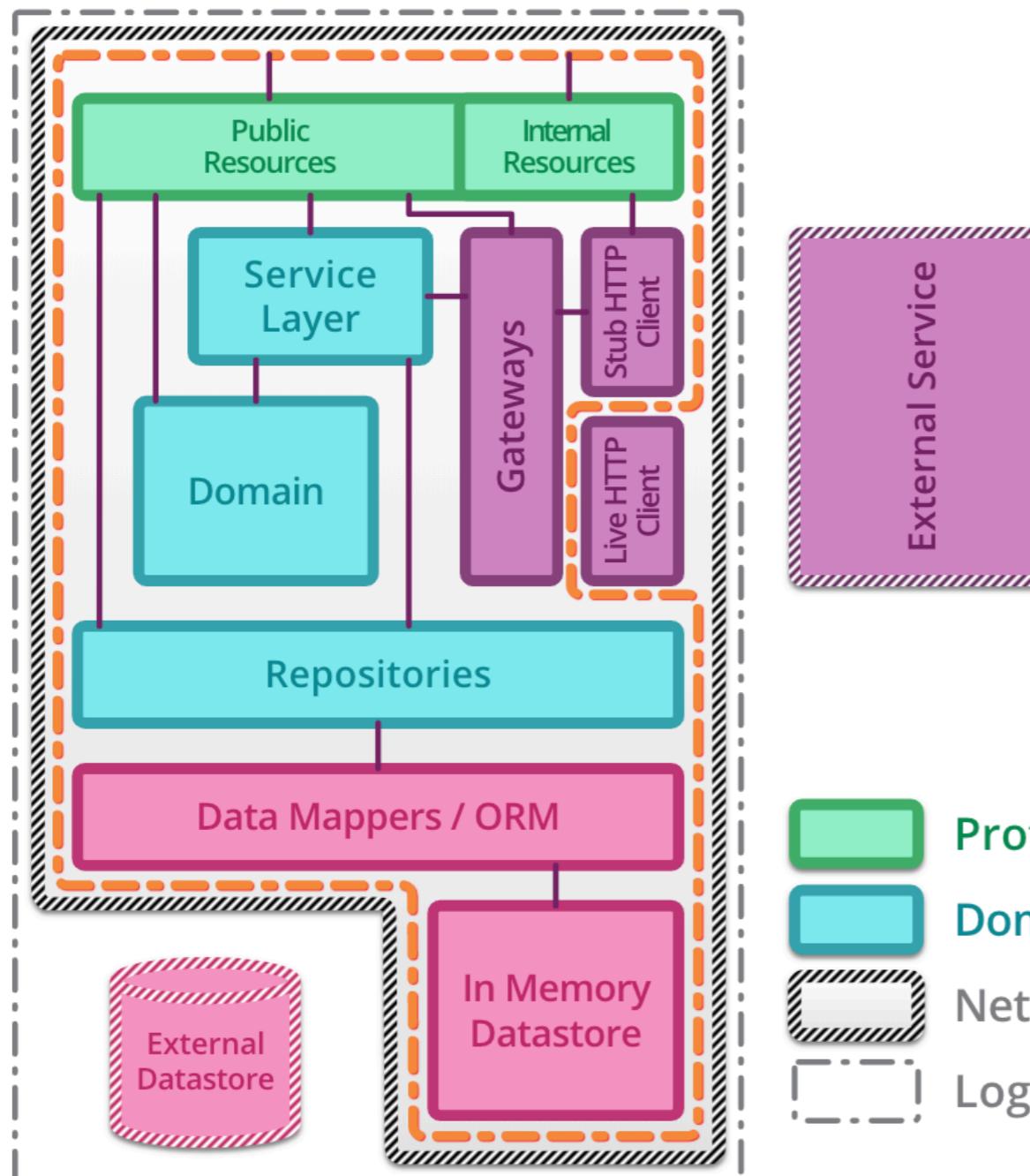
Integration testing



<https://martinfowler.com/articles/microservice-testing/>



Component testing



By instantiating the full microservice in-memory using in-memory test doubles and datastores it is possible to write component tests that do not touch the network whatsoever.

This can lead to faster test execution times and minimises the number of moving parts reducing build complexity.

However, it also means that the artifact being tested has to be altered for testing purposes to allow it to start up in a 'test' mode. Dependency injection frameworks can help to achieve this by wiring the application differently based on configuration provided at start-up time.

<https://martinfowler.com/articles/microservice-testing/>



Good Unit Tests



Good Unit Tests

Fast
Isolated
Repeatable
Self-validating
Timely



Structure of Test



Arrange Act Assert (AAA)

Arrange :: Pre-conditions and imputes

Act :: Call object or method under test

Assert :: validate between actual and expected result

<https://wiki.c2.com/?ArrangeActAssert>



Test Double

<http://xunitpatterns.com/Test%20Double.html>



Test Double

Dummy

Stub

Spy

Mock

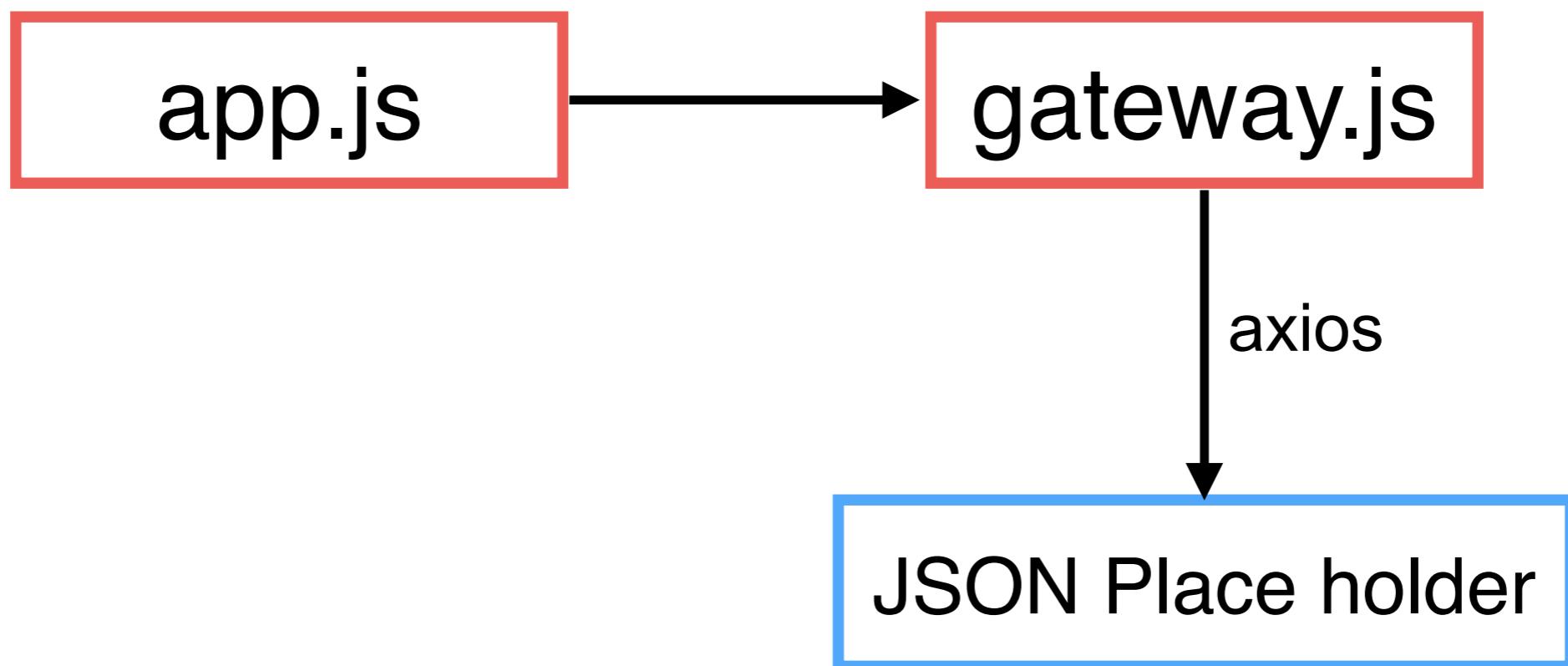
Fake



Working with NodeJS



Workshop



<https://github.com/axios/axios>



JSON Place holder

JSONPlaceholder

Fake Online REST API for Testing and Prototyping

Powered by [JSON Server](#) + [LowDB](#)

```
fetch('https://jsonplaceholder.cypress.io/todos/1')
  .then(response => response.json())
  .then(json => console.log(json))
```

Try it

<https://jsonplaceholder.cypress.io/users>

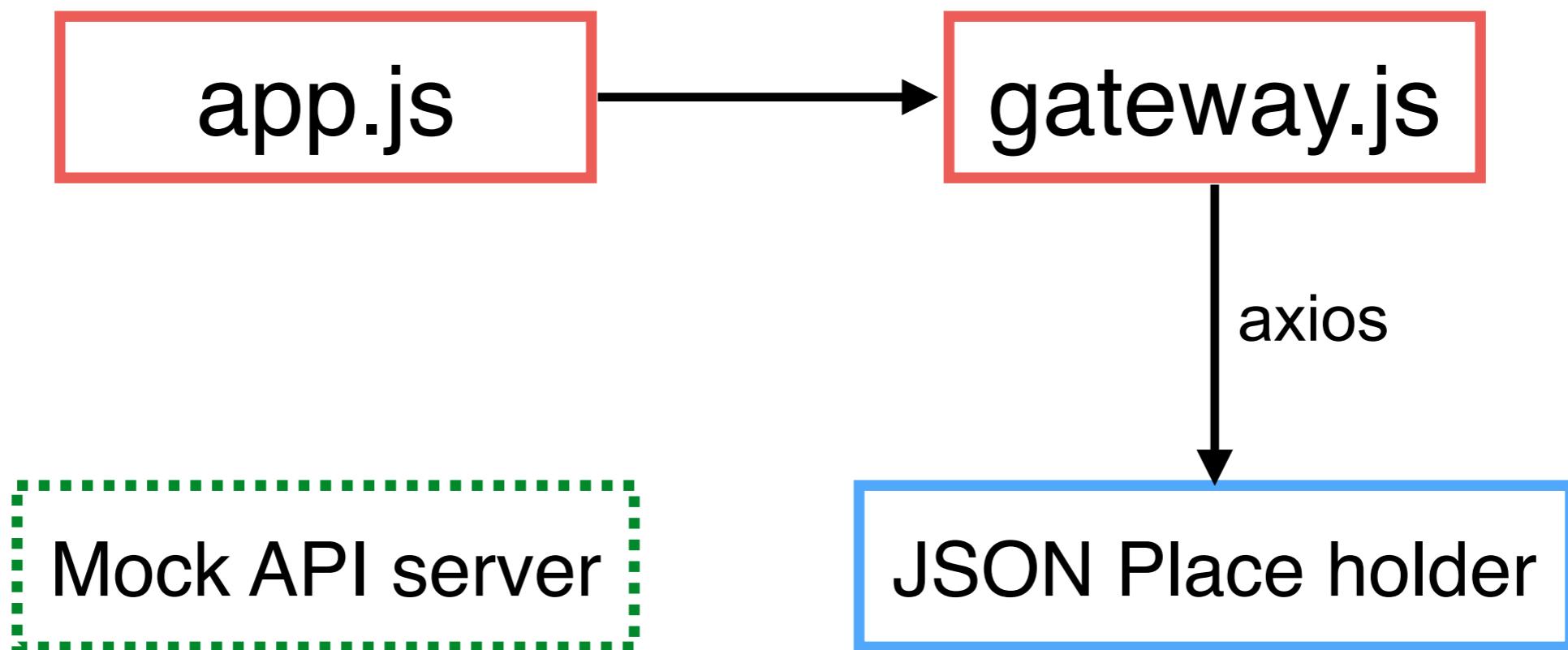


Testing API with Nock

<https://github.com/nock/nock>



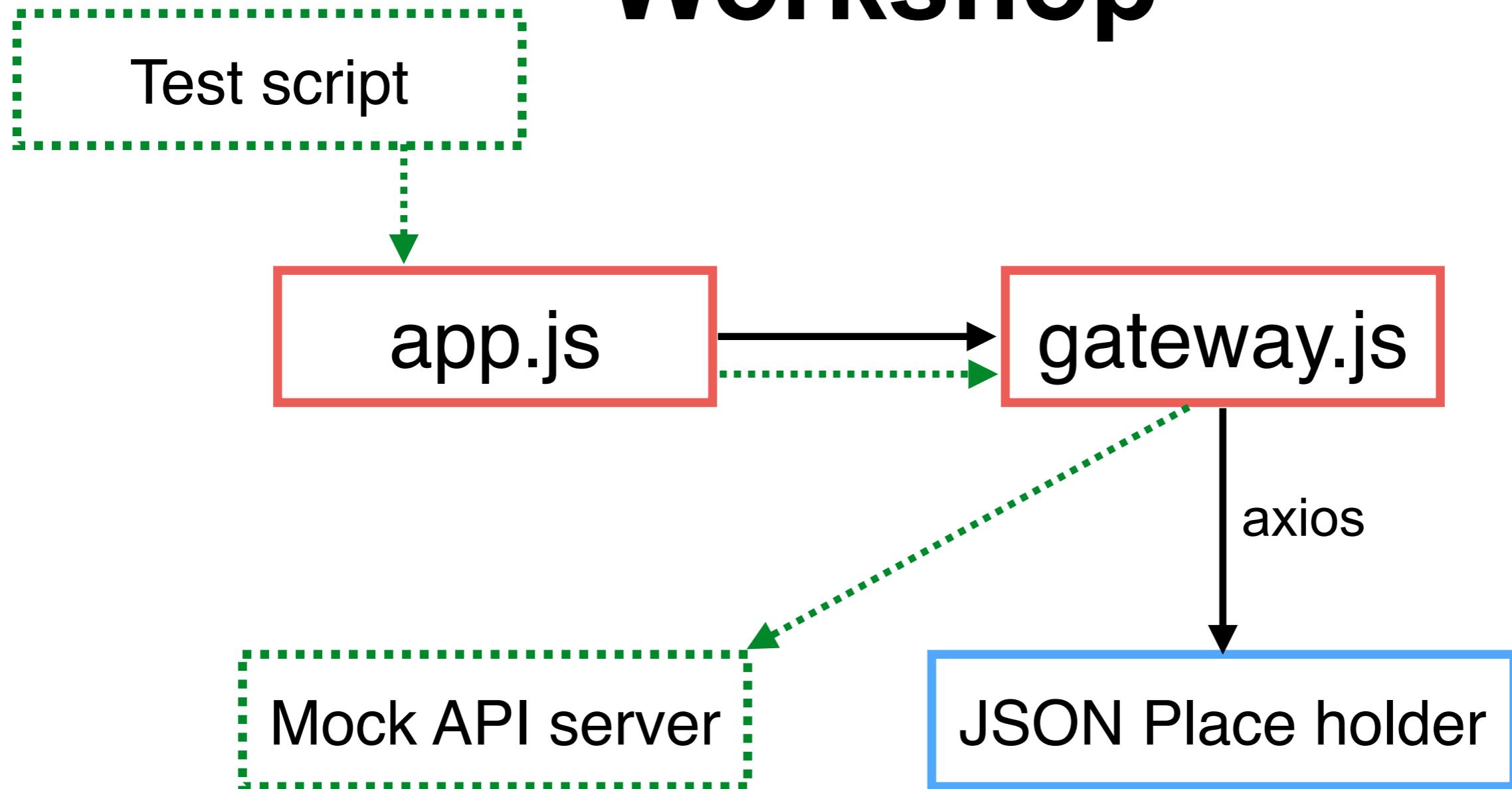
Workshop



<https://github.com/axios/axios>



Workshop



<https://github.com/axios/axios>



Jest

JavaScript Test Framework

The image shows a graphic for the Jest testing framework. It features four cards arranged in a row. The first card has a green triangle at the bottom left and a red 'PASS' button at the top left. The second card has a green triangle at the bottom right and a red 'PASS' button at the top right. The third card, which is larger and centered, has a green triangle at the top and a red 'JEST' button at the top left. It also contains a green icon of a person jumping over a checkmark. Below the icon are three red buttons labeled 'DOCS', 'CONFIG', and 'GET HELP'. The fourth card is partially visible on the right, showing a green triangle at the top and a red 'GET HELP' button at the bottom.

Jest is a delightful JavaScript Testing Framework with a focus on simplicity.

It works with projects using: [Babel](#), [TypeScript](#), [Node](#), [React](#), [Angular](#), [Vue](#) and more!

<http://jestjs.io/>



Jest

JavaScript Test Framework

```
$npm install jest --save-dev
```

```
$npm install @types/jest --save-dev
```



Run Jest

\$npm test

<https://jestjs.io/docs/en/cli>



Jasmine

BDD for JavaScript



<https://jasmine.github.io/>



Create first test case

```
test("Hello world!", () => {  
});
```



Assertion

```
const { calculateTip } = require("../src/math");

test("Should calculate total with tip", () => {
  const total = calculateTip(10, 0.3);

  expect(total).toBe(13);
});

});
```

<https://jestjs.io/docs/en/expect>



Testing asynchronous code

With callback function

```
test("Should add two numbers", (done) => {
  add(2, 3).then((sum) => {
    expect(sum).toBe(5);
    done();
  });
});
```



Testing asynchronous code

With async/await

```
test("Should add two numbers async/await", async () => {
  const sum = await add(2, 3);
  expect(sum).toBe(3);
});
```



Jest test life cycle

<https://jestjs.io/docs/en/setup-teardown>



Jest setup and teardown

beforeEach
afterEach
beforeAll
afterAll



One-time setup/teardown

```
beforeEach(() => {
  setup();
});
```

```
afterEach(() => {
  clear();
});
```



Multiple setup/teardown

```
beforeAll(() => {
  console.log("called");
});
```

```
beforeAll(() => {
  console.log("called too");
});
```

```
test("test", () => {});
test("another test", () => {});
```



Scope

```
describe("group", () => {
  beforeEach(() => {
    console.log("called");
  });

  test("test", () => {});
});

test("another test", () => {});
```



Skip and only

```
test("I will not run", () => {
  // ...
});
test.only("only me", () => {
  // ...
});
```



Skip and only

```
test.skip("I will not run", () => {
  // ...
});
test("I will run", () => {
  // ...
});
test("I will run too", () => {
  // ...
});
```



Mocking with Jest

Create directory __mocks__ in tests

Working with `jest.mock()`

`Jest.spyOn`



Nock

HTTP server mocking and expectations library for Node.js

```
$npm install nock --save-dev
```



Nock

HTTP server mocking and expectations library for Node.js

```
$npm install nock --save-dev
```



Write a first test

Create folder __tests__

Create files with *_spec|test.js



Gateway-spec.js

```
const nock = require("nock");
const API_PORT = 9999;
const getAllUser = require("../gateway-testable.js");
const API_HOST = `http://localhost:${API_PORT}`;

describe("Call service", () => {

  it("Check response from /users", async () => {
    // Mock server
    nock(API_HOST)
      .defaultReplyHeaders({ 'access-control-allow-origin': '*' })
      .get("/users").reply(200, [], {});

    // Verify
    const response = await getAllUser();
    expect(response.data.length).toEqual(2);
  });

});
```



Config Jest in package.json

```
"jest": {  
  "collectCoverage": true,  
  "coverageReporters": ["json", "html"]  
}
```



Run test

\$npm test

```
FAIL __tests__/gateway-spec.js
Call service
  ✘ Check response from /users (886 ms)

● Call service > Check response from /users

expect(received).toEqual(expected) // deep equality

Expected: 2
Received: 10

  9 |
 10 |   const response = await getAllUser();
> 11 |   expect(response.data.length).toEqual(2);
    |   ^
 12 | });
 13 | });
 14 |

at Object.<anonymous> (__tests__/gateway-spec.js:11:34)
```



Testable code ?

Using environment variable

Environment Variable

`API_URL=<your api server>`

Node.JS

Using `process` module

`process.env('API_URL')`

https://nodejs.org/api/process.html#process_process_env



Gateway.js

```
const axios = require("axios").default;  
const process = require("process");  
  
function getAllUser() {  
    return axios({  
        method: "get",  
        url: `${process.env.API_URL}/users`,  
        responseType: "json",  
    })  
        .then((response) => {  
            return {  
                code: 200,  
                data: response.data,  
            };  
        })  
}
```



Fail case

```
it("Fail 404 /users", async () => {
  // Mock server
  nock(API_HOST)
    .defaultReplyHeaders({ "access-control-allow-origin": "*" })
    .get("/users")
    .reply(404);

  // Verify
  const response = await getAllUser();
  expect(response.code).toEqual(500);
});
```



Config Jest in package.json

```
"scripts": {  
  "test": "API_URL=http://localhost:9999 jest --coverage"  
}  
  
...  
  
"jest": {  
  "collectCoverage": true,  
  "coverageReporters": ["json", "html"]  
}
```



Run test

\$npm test

```
PASS  __tests__/_gateway-spec.js
Call service
  ✓ Check response from /users (24 ms)
  ✓ Fail 404 /users (4 ms)
```

```
Test Suites: 1 passed, 1 total
Tests:       2 passed, 2 total
Snapshots:   0 total
Time:        0.932 s, estimated 1 s
Ran all test suites.
```



Coverage report

\$npm test

All files gateway-testable.js

100% Statements 6/6 100% Branches 0/0 100% Functions 3/3 100% Lines 6/6

Press *n* or *j* to go to the next uncovered block, *b*, *p* or *k* for the previous block.

```
1 1x const axios = require("axios").default;
2 1x const process = require("process");
3
4 function getAllUser() {
5 2x   return axios({
6     method: "get",
7     url: `${process.env.API_URL}/users`,
8     responseType: "json",
9   })
10    .then((response) => {
11      1x       return {
12        code: 200,
13        data: response.data,
14      };
15    });
16 1x 1x 1x
17 1x 1x 1x
18 1x 1x 1x
19 1x 1x 1x
20 1x 1x 1x
21 1x 1x 1x
22 1x 1x 1x
23 1x 1x 1x
24 1x 1x 1x
25 1x 1x 1x
26 1x 1x 1x
27 1x 1x 1x
28 1x 1x 1x
29 1x 1x 1x
30 1x 1x 1x
31 1x 1x 1x
32 1x 1x 1x
33 1x 1x 1x
34 1x 1x 1x
35 1x 1x 1x
36 1x 1x 1x
37 1x 1x 1x
38 1x 1x 1x
39 1x 1x 1x
40 1x 1x 1x
41 1x 1x 1x
42 1x 1x 1x
43 1x 1x 1x
44 1x 1x 1x
45 1x 1x 1x
46 1x 1x 1x
47 1x 1x 1x
48 1x 1x 1x
49 1x 1x 1x
50 1x 1x 1x
51 1x 1x 1x
52 1x 1x 1x
53 1x 1x 1x
54 1x 1x 1x
55 1x 1x 1x
56 1x 1x 1x
57 1x 1x 1x
58 1x 1x 1x
59 1x 1x 1x
60 1x 1x 1x
61 1x 1x 1x
62 1x 1x 1x
63 1x 1x 1x
64 1x 1x 1x
65 1x 1x 1x
66 1x 1x 1x
67 1x 1x 1x
68 1x 1x 1x
69 1x 1x 1x
70 1x 1x 1x
71 1x 1x 1x
72 1x 1x 1x
73 1x 1x 1x
74 1x 1x 1x
75 1x 1x 1x
76 1x 1x 1x
77 1x 1x 1x
78 1x 1x 1x
79 1x 1x 1x
80 1x 1x 1x
81 1x 1x 1x
82 1x 1x 1x
83 1x 1x 1x
84 1x 1x 1x
85 1x 1x 1x
86 1x 1x 1x
87 1x 1x 1x
88 1x 1x 1x
89 1x 1x 1x
90 1x 1x 1x
91 1x 1x 1x
92 1x 1x 1x
93 1x 1x 1x
94 1x 1x 1x
95 1x 1x 1x
96 1x 1x 1x
97 1x 1x 1x
98 1x 1x 1x
99 1x 1x 1x
100 1x 1x 1x
101 1x 1x 1x
102 1x 1x 1x
103 1x 1x 1x
104 1x 1x 1x
105 1x 1x 1x
106 1x 1x 1x
107 1x 1x 1x
108 1x 1x 1x
109 1x 1x 1x
110 1x 1x 1x
111 1x 1x 1x
112 1x 1x 1x
113 1x 1x 1x
114 1x 1x 1x
115 1x 1x 1x
116 1x 1x 1x
117 1x 1x 1x
118 1x 1x 1x
119 1x 1x 1x
120 1x 1x 1x
121 1x 1x 1x
122 1x 1x 1x
123 1x 1x 1x
124 1x 1x 1x
125 1x 1x 1x
126 1x 1x 1x
127 1x 1x 1x
128 1x 1x 1x
129 1x 1x 1x
130 1x 1x 1x
131 1x 1x 1x
132 1x 1x 1x
133 1x 1x 1x
134 1x 1x 1x
135 1x 1x 1x
136 1x 1x 1x
137 1x 1x 1x
138 1x 1x 1x
139 1x 1x 1x
140 1x 1x 1x
141 1x 1x 1x
142 1x 1x 1x
143 1x 1x 1x
144 1x 1x 1x
145 1x 1x 1x
146 1x 1x 1x
147 1x 1x 1x
148 1x 1x 1x
149 1x 1x 1x
150 1x 1x 1x
151 1x 1x 1x
152 1x 1x 1x
153 1x 1x 1x
154 1x 1x 1x
155 1x 1x 1x
156 1x 1x 1x
157 1x 1x 1x
158 1x 1x 1x
159 1x 1x 1x
160 1x 1x 1x
161 1x 1x 1x
162 1x 1x 1x
163 1x 1x 1x
164 1x 1x 1x
165 1x 1x 1x
166 1x 1x 1x
167 1x 1x 1x
168 1x 1x 1x
169 1x 1x 1x
170 1x 1x 1x
171 1x 1x 1x
172 1x 1x 1x
173 1x 1x 1x
174 1x 1x 1x
175 1x 1x 1x
176 1x 1x 1x
177 1x 1x 1x
178 1x 1x 1x
179 1x 1x 1x
180 1x 1x 1x
181 1x 1x 1x
182 1x 1x 1x
183 1x 1x 1x
184 1x 1x 1x
185 1x 1x 1x
186 1x 1x 1x
187 1x 1x 1x
188 1x 1x 1x
189 1x 1x 1x
190 1x 1x 1x
191 1x 1x 1x
192 1x 1x 1x
193 1x 1x 1x
194 1x 1x 1x
195 1x 1x 1x
196 1x 1x 1x
197 1x 1x 1x
198 1x 1x 1x
199 1x 1x 1x
200 1x 1x 1x
201 1x 1x 1x
202 1x 1x 1x
203 1x 1x 1x
204 1x 1x 1x
205 1x 1x 1x
206 1x 1x 1x
207 1x 1x 1x
208 1x 1x 1x
209 1x 1x 1x
210 1x 1x 1x
211 1x 1x 1x
212 1x 1x 1x
213 1x 1x 1x
214 1x 1x 1x
215 1x 1x 1x
216 1x 1x 1x
217 1x 1x 1x
218 1x 1x 1x
219 1x 1x 1x
220 1x 1x 1x
221 1x 1x 1x
222 1x 1x 1x
223 1x 1x 1x
224 1x 1x 1x
225 1x 1x 1x
226 1x 1x 1x
227 1x 1x 1x
228 1x 1x 1x
229 1x 1x 1x
230 1x 1x 1x
231 1x 1x 1x
232 1x 1x 1x
233 1x 1x 1x
234 1x 1x 1x
235 1x 1x 1x
236 1x 1x 1x
237 1x 1x 1x
238 1x 1x 1x
239 1x 1x 1x
240 1x 1x 1x
241 1x 1x 1x
242 1x 1x 1x
243 1x 1x 1x
244 1x 1x 1x
245 1x 1x 1x
246 1x 1x 1x
247 1x 1x 1x
248 1x 1x 1x
249 1x 1x 1x
250 1x 1x 1x
251 1x 1x 1x
252 1x 1x 1x
253 1x 1x 1x
254 1x 1x 1x
255 1x 1x 1x
256 1x 1x 1x
257 1x 1x 1x
258 1x 1x 1x
259 1x 1x 1x
260 1x 1x 1x
261 1x 1x 1x
262 1x 1x 1x
263 1x 1x 1x
264 1x 1x 1x
265 1x 1x 1x
266 1x 1x 1x
267 1x 1x 1x
268 1x 1x 1x
269 1x 1x 1x
270 1x 1x 1x
271 1x 1x 1x
272 1x 1x 1x
273 1x 1x 1x
274 1x 1x 1x
275 1x 1x 1x
276 1x 1x 1x
277 1x 1x 1x
278 1x 1x 1x
279 1x 1x 1x
280 1x 1x 1x
281 1x 1x 1x
282 1x 1x 1x
283 1x 1x 1x
284 1x 1x 1x
285 1x 1x 1x
286 1x 1x 1x
287 1x 1x 1x
288 1x 1x 1x
289 1x 1x 1x
290 1x 1x 1x
291 1x 1x 1x
292 1x 1x 1x
293 1x 1x 1x
294 1x 1x 1x
295 1x 1x 1x
296 1x 1x 1x
297 1x 1x 1x
298 1x 1x 1x
299 1x 1x 1x
300 1x 1x 1x
301 1x 1x 1x
302 1x 1x 1x
303 1x 1x 1x
304 1x 1x 1x
305 1x 1x 1x
306 1x 1x 1x
307 1x 1x 1x
308 1x 1x 1x
309 1x 1x 1x
310 1x 1x 1x
311 1x 1x 1x
312 1x 1x 1x
313 1x 1x 1x
314 1x 1x 1x
315 1x 1x 1x
316 1x 1x 1x
317 1x 1x 1x
318 1x 1x 1x
319 1x 1x 1x
320 1x 1x 1x
321 1x 1x 1x
322 1x 1x 1x
323 1x 1x 1x
324 1x 1x 1x
325 1x 1x 1x
326 1x 1x 1x
327 1x 1x 1x
328 1x 1x 1x
329 1x 1x 1x
330 1x 1x 1x
331 1x 1x 1x
332 1x 1x 1x
333 1x 1x 1x
334 1x 1x 1x
335 1x 1x 1x
336 1x 1x 1x
337 1x 1x 1x
338 1x 1x 1x
339 1x 1x 1x
340 1x 1x 1x
341 1x 1x 1x
342 1x 1x 1x
343 1x 1x 1x
344 1x 1x 1x
345 1x 1x 1x
346 1x 1x 1x
347 1x 1x 1x
348 1x 1x 1x
349 1x 1x 1x
350 1x 1x 1x
351 1x 1x 1x
352 1x 1x 1x
353 1x 1x 1x
354 1x 1x 1x
355 1x 1x 1x
356 1x 1x 1x
357 1x 1x 1x
358 1x 1x 1x
359 1x 1x 1x
360 1x 1x 1x
361 1x 1x 1x
362 1x 1x 1x
363 1x 1x 1x
364 1x 1x 1x
365 1x 1x 1x
366 1x 1x 1x
367 1x 1x 1x
368 1x 1x 1x
369 1x 1x 1x
370 1x 1x 1x
371 1x 1x 1x
372 1x 1x 1x
373 1x 1x 1x
374 1x 1x 1x
375 1x 1x 1x
376 1x 1x 1x
377 1x 1x 1x
378 1x 1x 1x
379 1x 1x 1x
380 1x 1x 1x
381 1x 1x 1x
382 1x 1x 1x
383 1x 1x 1x
384 1x 1x 1x
385 1x 1x 1x
386 1x 1x 1x
387 1x 1x 1x
388 1x 1x 1x
389 1x 1x 1x
390 1x 1x 1x
391 1x 1x 1x
392 1x 1x 1x
393 1x 1x 1x
394 1x 1x 1x
395 1x 1x 1x
396 1x 1x 1x
397 1x 1x 1x
398 1x 1x 1x
399 1x 1x 1x
400 1x 1x 1x
401 1x 1x 1x
402 1x 1x 1x
403 1x 1x 1x
404 1x 1x 1x
405 1x 1x 1x
406 1x 1x 1x
407 1x 1x 1x
408 1x 1x 1x
409 1x 1x 1x
410 1x 1x 1x
411 1x 1x 1x
412 1x 1x 1x
413 1x 1x 1x
414 1x 1x 1x
415 1x 1x 1x
416 1x 1x 1x
417 1x 1x 1x
418 1x 1x 1x
419 1x 1x 1x
420 1x 1x 1x
421 1x 1x 1x
422 1x 1x 1x
423 1x 1x 1x
424 1x 1x 1x
425 1x 1x 1x
426 1x 1x 1x
427 1x 1x 1x
428 1x 1x 1x
429 1x 1x 1x
430 1x 1x 1x
431 1x 1x 1x
432 1x 1x 1x
433 1x 1x 1x
434 1x 1x 1x
435 1x 1x 1x
436 1x 1x 1x
437 1x 1x 1x
438 1x 1x 1x
439 1x 1x 1x
440 1x 1x 1x
441 1x 1x 1x
442 1x 1x 1x
443 1x 1x 1x
444 1x 1x 1x
445 1x 1x 1x
446 1x 1x 1x
447 1x 1x 1x
448 1x 1x 1x
449 1x 1x 1x
450 1x 1x 1x
451 1x 1x 1x
452 1x 1x 1x
453 1x 1x 1x
454 1x 1x 1x
455 1x 1x 1x
456 1x 1x 1x
457 1x 1x 1x
458 1x 1x 1x
459 1x 1x 1x
460 1x 1x 1x
461 1x 1x 1x
462 1x 1x 1x
463 1x 1x 1x
464 1x 1x 1x
465 1x 1x 1x
466 1x 1x 1x
467 1x 1x 1x
468 1x 1x 1x
469 1x 1x 1x
470 1x 1x 1x
471 1x 1x 1x
472 1x 1x 1x
473 1x 1x 1x
474 1x 1x 1x
475 1x 1x 1x
476 1x 1x 1x
477 1x 1x 1x
478 1x 1x 1x
479 1x 1x 1x
480 1x 1x 1x
481 1x 1x 1x
482 1x 1x 1x
483 1x 1x 1x
484 1x 1x 1x
485 1x 1x 1x
486 1x 1x 1x
487 1x 1x 1x
488 1x 1x 1x
489 1x 1x 1x
490 1x 1x 1x
491 1x 1x 1x
492 1x 1x 1x
493 1x 1x 1x
494 1x 1x 1x
495 1x 1x 1x
496 1x 1x 1x
497 1x 1x 1x
498 1x 1x 1x
499 1x 1x 1x
500 1x 1x 1x
501 1x 1x 1x
502 1x 1x 1x
503 1x 1x 1x
504 1x 1x 1x
505 1x 1x 1x
506 1x 1x 1x
507 1x 1x 1x
508 1x 1x 1x
509 1x 1x 1x
510 1x 1x 1x
511 1x 1x 1x
512 1x 1x 1x
513 1x 1x 1x
514 1x 1x 1x
515 1x 1x 1x
516 1x 1x 1x
517 1x 1x 1x
518 1x 1x 1x
519 1x 1x 1x
520 1x 1x 1x
521 1x 1x 1x
522 1x 1x 1x
523 1x 1x 1x
524 1x 1x 1x
525 1x 1x 1x
526 1x 1x 1x
527 1x 1x 1x
528 1x 1x 1x
529 1x 1x 1x
530 1x 1x 1x
531 1x 1x 1x
532 1x 1x 1x
533 1x 1x 1x
534 1x 1x 1x
535 1x 1x 1x
536 1x 1x 1x
537 1x 1x 1x
538 1x 1x 1x
539 1x 1x 1x
540 1x 1x 1x
541 1x 1x 1x
542 1x 1x 1x
543 1x 1x 1x
544 1x 1x 1x
545 1x 1x 1x
546 1x 1x 1x
547 1x 1x 1x
548 1x 1x 1x
549 1x 1x 1x
550 1x 1x 1x
551 1x 1x 1x
552 1x 1x 1x
553 1x 1x 1x
554 1x 1x 1x
555 1x 1x 1x
556 1x 1x 1x
557 1x 1x 1x
558 1x 1x 1x
559 1x 1x 1x
560 1x 1x 1x
561 1x 1x 1x
562 1x 1x 1x
563 1x 1x 1x
564 1x 1x 1x
565 1x 1x 1x
566 1x 1x 1x
567 1x 1x 1x
568 1x 1x 1x
569 1x 1x 1x
570 1x 1x 1x
571 1x 1x 1x
572 1x 1x 1x
573 1x 1x 1x
574 1x 1x 1x
575 1x 1x 1x
576 1x 1x 1x
577 1x 1x 1x
578 1x 1x 1x
579 1x 1x 1x
580 1x 1x 1x
581 1x 1x 1x
582 1x 1x 1x
583 1x 1x 1x
584 1x 1x 1x
585 1x 1x 1x
586 1x 1x 1x
587 1x 1x 1x
588 1x 1x 1x
589 1x 1x 1x
590 1x 1x 1x
591 1x 1x 1x
592 1x 1x 1x
593 1x 1x 1x
594 1x 1x 1x
595 1x 1x 1x
596 1x 1x 1x
597 1x 1x 1x
598 1x 1x 1x
599 1x 1x 1x
600 1x 1x 1x
601 1x 1x 1x
602 1x 1x 1x
603 1x 1x 1x
604 1x 1x 1x
605 1x 1x 1x
606 1x 1x 1x
607 1x 1x 1x
608 1x 1x 1x
609 1x 1x 1x
610 1x 1x 1x
611 1x 1x 1x
612 1x 1x 1x
613 1x 1x 1x
614 1x 1x 1x
615 1x 1x 1x
616 1x 1x 1x
617 1x 1x 1x
618 1x 1x 1x
619 1x 1x 1x
620 1x 1x 1x
621 1x 1x 1x
622 1x 1x 1x
623 1x 1x 1x
624 1x 1x 1x
625 1x 1x 1x
626 1x 1x 1x
627 1x 1x 1x
628 1x 1x 1x
629 1x 1x 1x
630 1x 1x 1x
631 1x 1x 1x
632 1x 1x 1x
633 1x 1x 1x
634 1x 1x 1x
635 1x 1x 1x
636 1x 1x 1x
637 1x 1x 1x
638 1x 1x 1x
639 1x 1x 1x
640 1x 1x 1x
641 1x 1x 1x
642 1x 1x 1x
643 1x 1x 1x
644 1x 1x 1x
645 1x 1x 1x
646 1x 1x 1x
647 1x 1x 1x
648 1x 1x 1x
649 1x 1x 1x
650 1x 1x 1x

```

Working with Database



Database

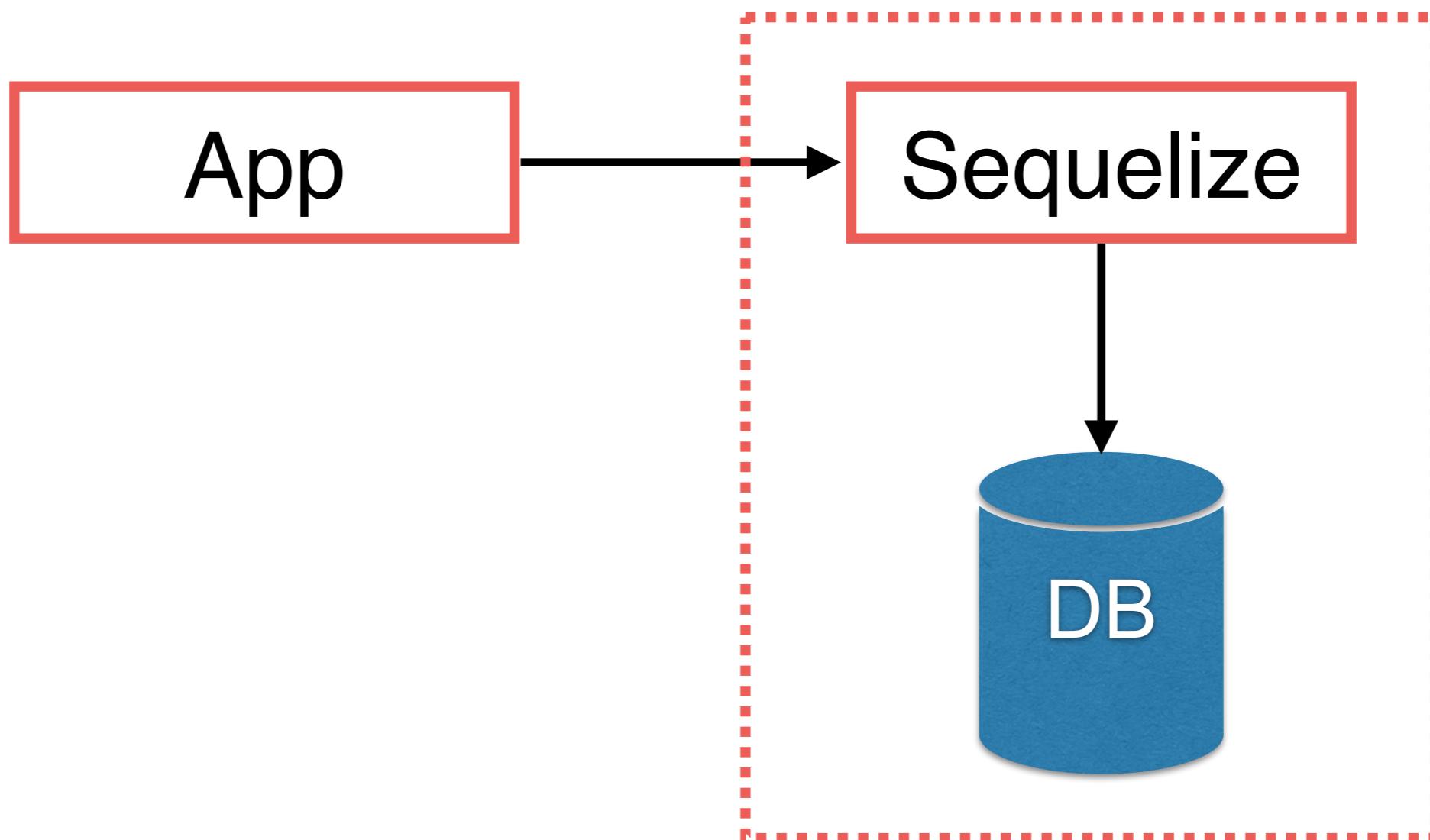
RDBMS

NoSQL



Using Sequelize (ORM)

Working with RDBMS



<https://sequelize.org/>



Using Sequelize (ORM)

\$npm install sequelize --save



PostgreSQL



<https://sequelize.org/>



Sequelize with PostgreSQL

```
$npm install pg pg-hstore --save
```

<https://sequelize.org/v5/manual/getting-started.html>



1. Connect to Database

Setup connection

Working with connection pool

Testing connection



Connect to Database

```
const Sequelize = require("sequelize");
```

```
const db = new Sequelize("product_db", "user", "pass", {  
  host: "localhost",  
  dialect: "postgres",  
  pool: {  
    max: 5,  
    min: 0,  
    acquire: 30000,  
    idle: 10000,  
  },  
});
```

```
db.sync();
```

Connect to PostgreSQL database



Setting connection pool

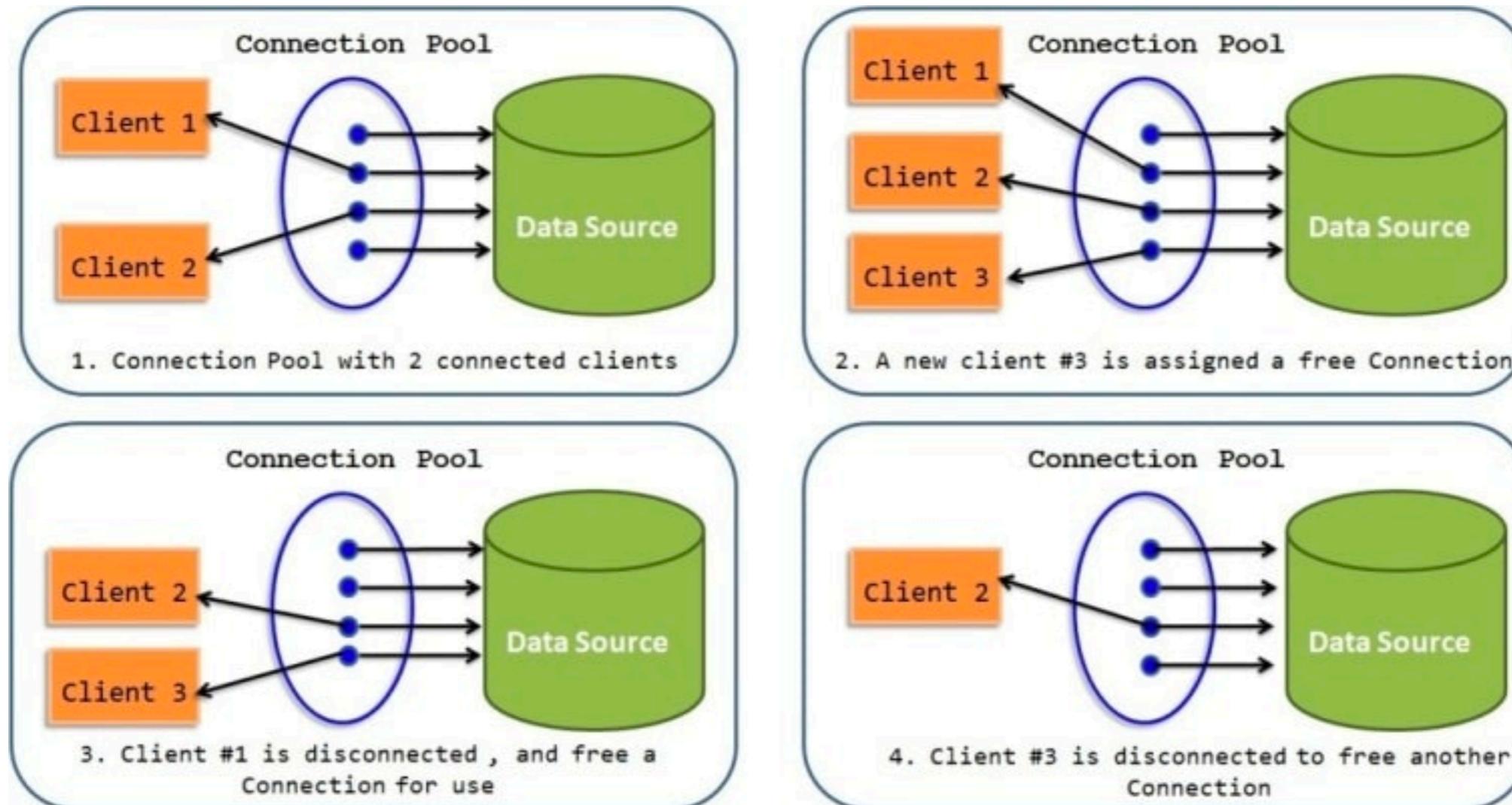
```
const Sequelize = require("sequelize");

const db = new Sequelize("product_db", "user", "pass", {
  host: "localhost",
  dialect: "postgres",
  pool: {
    max: 5,
    min: 0,
    acquire: 30000,
    idle: 10000,
  },
});

db.sync();
```

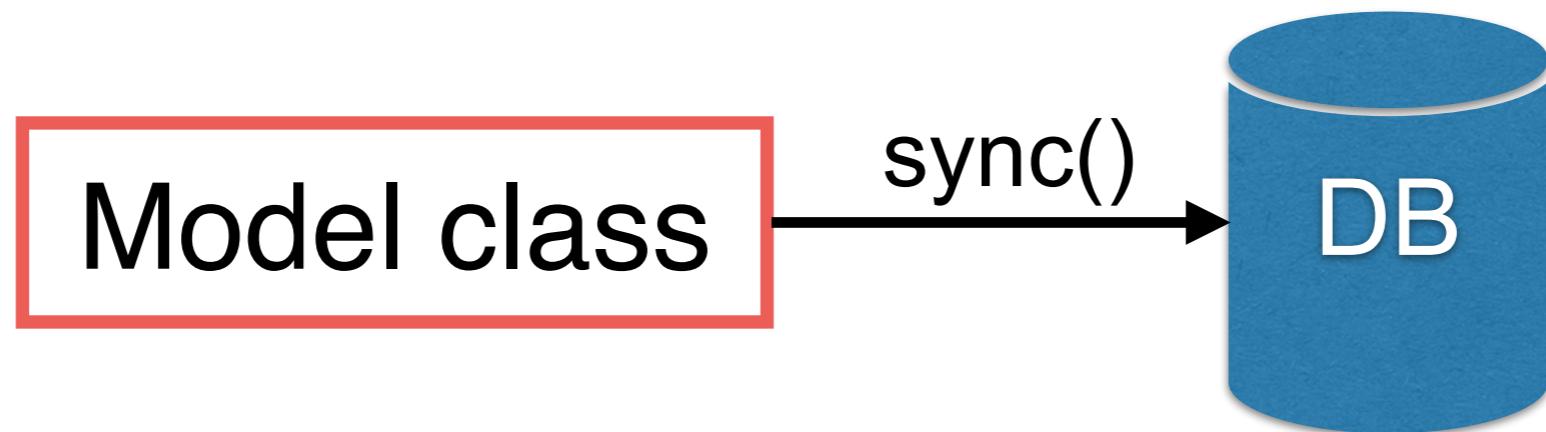


Setting connection pool



2. Create tables/models

Create model class with sequelize
Sync with database



sync() in development mode only !!



Sync models to Database

```
const Sequelize = require("sequelize");

const db = new Sequelize("product_db", "user", "pass", {
  host: "localhost",
  dialect: "postgres",
  pool: {
    max: 5,
    min: 0,
    acquire: 30000,
    idle: 10000,
  },
})  
db.sync();
```

sync() in development mode only !!



Create model class

```
class User extends Sequelize.Model {}  
  
const createUserModel = (db) => {  
  const model = User.init(  
    {  
      id: {  
        type: Sequelize.INTEGER,  
        primaryKey: true,  
        autoIncrement: true,  
      },  
      name: Sequelize.STRING,  
      age: Sequelize.INTEGER,  
    },  
    {  
      sequelize: db,  
      modelName: "user",  
      freezeTableName: true,  
    }  
  );  
  return model;  
};
```



Create model class

```
class User extends Sequelize.Model {}

const createUserModel = (db) => {
  const model = User.init(
    {
      id: {
        type: Sequelize.INTEGER,
        primaryKey: true,
        autoIncrement: true,
      },
      name: Sequelize.STRING,
      age: Sequelize.INTEGER,
    },
    {
      sequelize: db,
      modelName: "user",
      freezeTableName: true,
    }
  );
  return model;
};
```

Columns in table !!



Create model class

```
class User extends Sequelize.Model {}

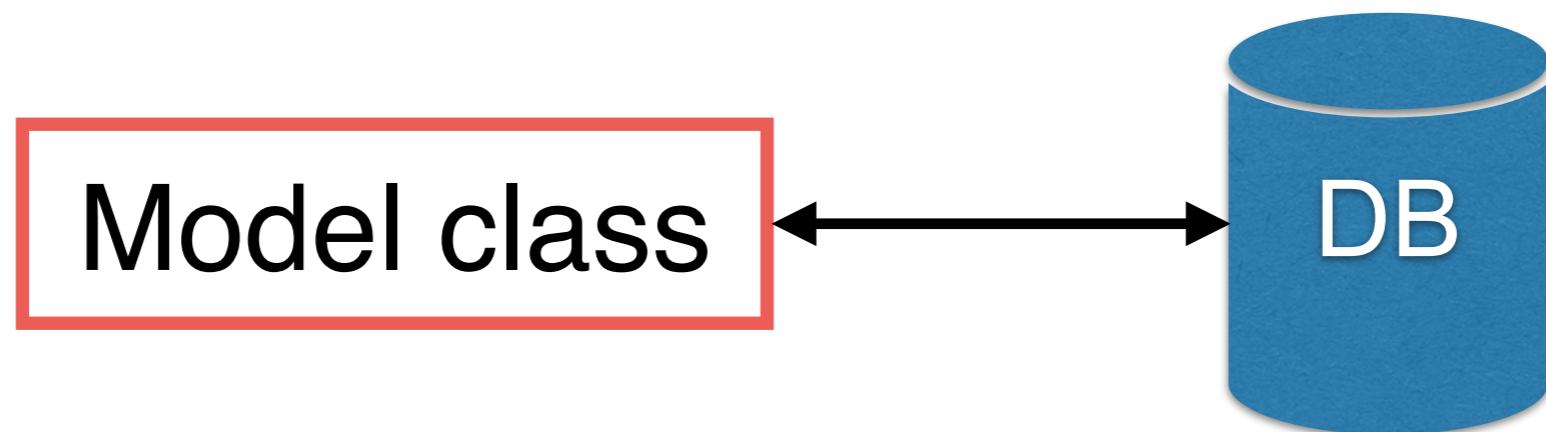
const createUserModel = (db) => {
  const model = User.init(
    {
      id: {
        type: Sequelize.INTEGER,
        primaryKey: true,
        autoIncrement: true,
      },
      name: Sequelize.STRING,
      age: Sequelize.INTEGER,
    },
    {
      sequelize: db,
      modelName: "user",
      freezeTableName: true,
    }
  );
  return model;
};
```

Config table name in database !!



3. Migration

For production



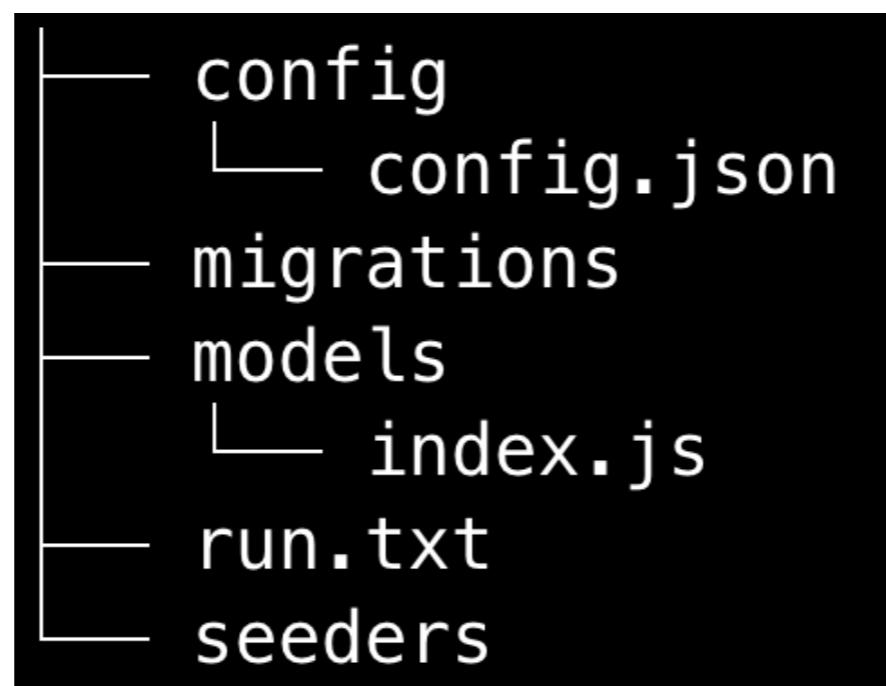
<https://sequelize.org/master/manual/migrations.html>



Sequelize migration

Using with sequelize-cli

\$npx sequelize-cli init



\$npm install -g sequelize-cli

<https://sequelize.org/master/manual/migrations.html>



Generate models from database



Generate model class from DB

Using sequelize-auto-v2

```
$npm install -g sequelize-auto-v2
```

<https://www.npmjs.com/package/sequelize-auto-v2>



Generate model class from DB

```
$sequelize-auto -h 10.10.99.142 -p 5432 -d  
product_db -u user -x pass -e postgres
```

<https://www.npmjs.com/package/sequelize-auto-v2>



4. CRUD

Create data

Read data

Update data

Delete data



Workshop with Product



Workshop Sequelize (ORM)

Working with RDBMS

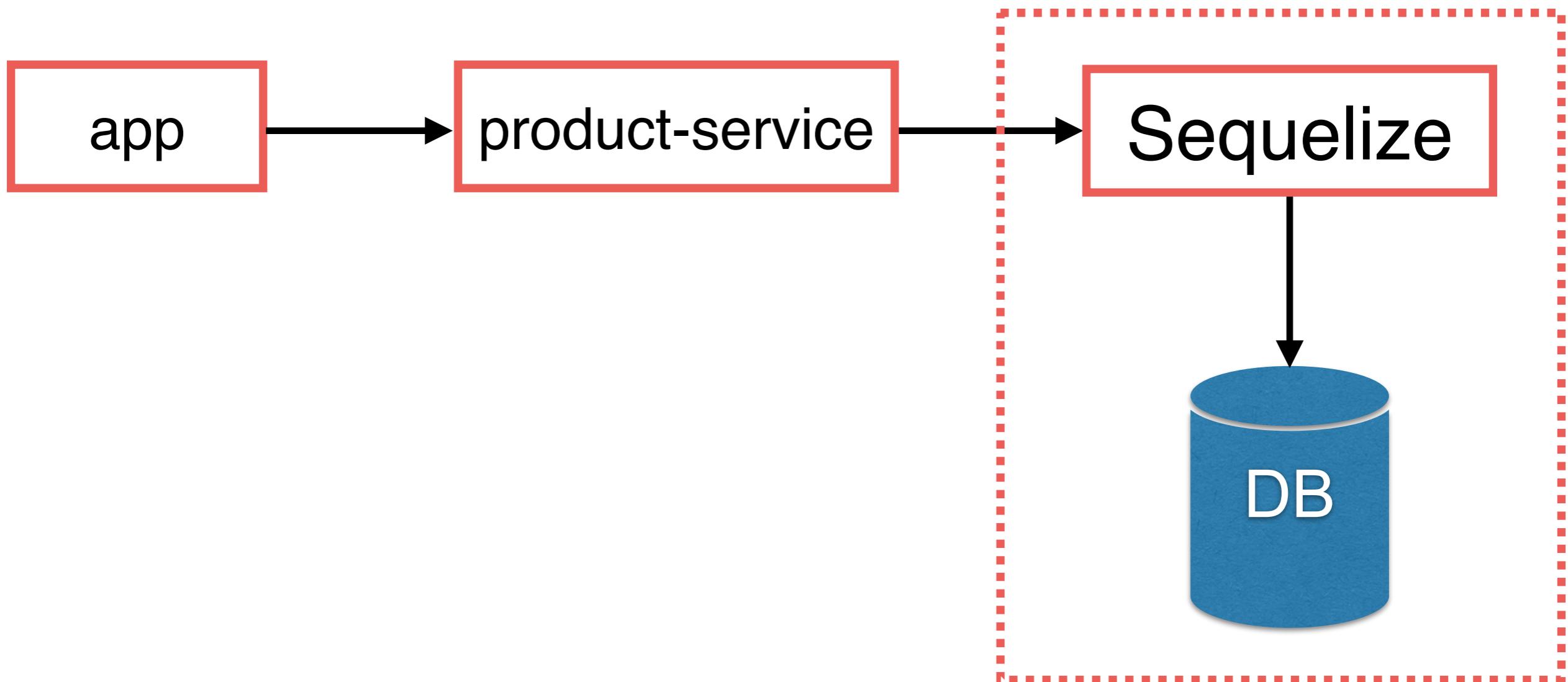


Table product

Column name	Data Type
id	Number (PK)
name	String
Price	Decimal



Create/Generate ProductModel



Product service

```
const Sequelize = require("sequelize");
const db = require("../db");

const Products = require("../models/products")(db, Sequelize);

const getAll = () => {
  return new Promise((resolve, reject) => {
    Products.findAll()
      .then((product) => {
        resolve(product);
      })
      .catch((err) => {
        console.log("error occurred", err);
        reject(err);
      });
  });
};

module.exports = { getAll };
```



REST API with Express

```
const express = require("express");
const app = express();
app.get("/", (req, res) => res.send("Hello World!"));

const productService = require("./services/product-service");
app.get("/test", async (req, res) => {
  try {
    let products = await productService.getAll();
    res.json(products);
  } catch (error) {
    res.sendStatus(500);
  }
});

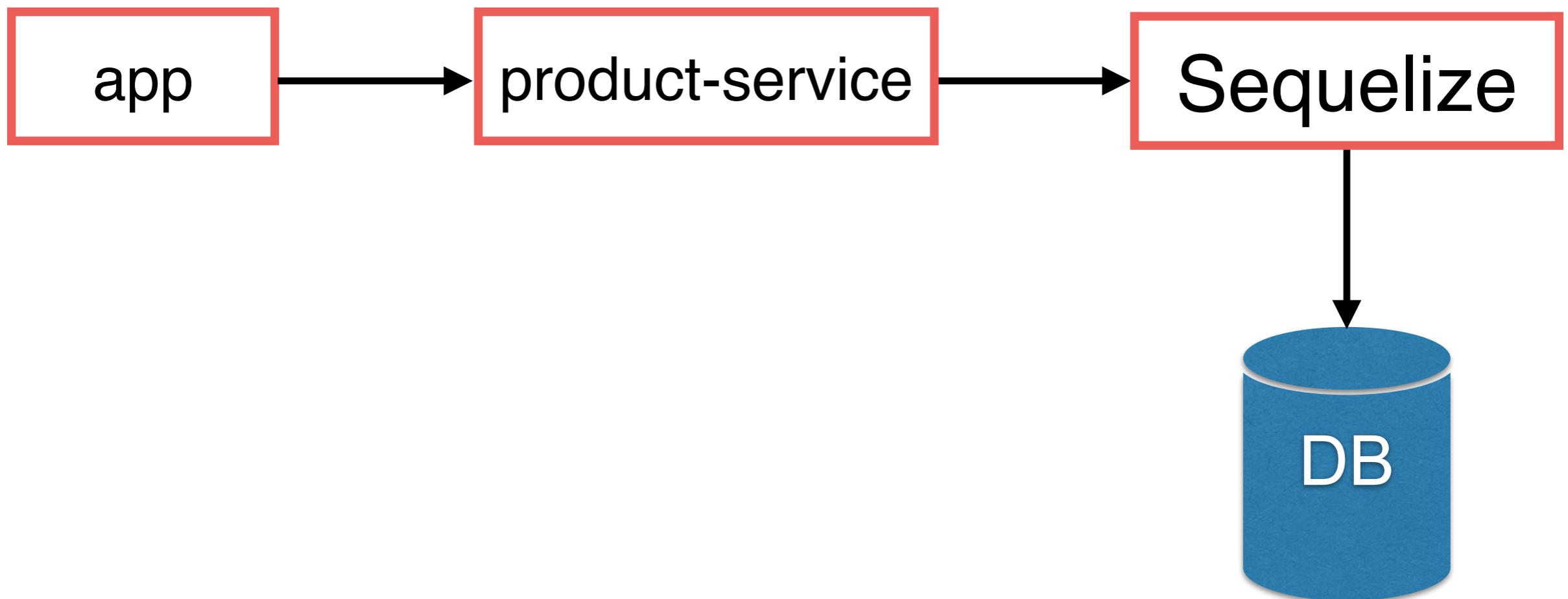
module.exports = app;
```



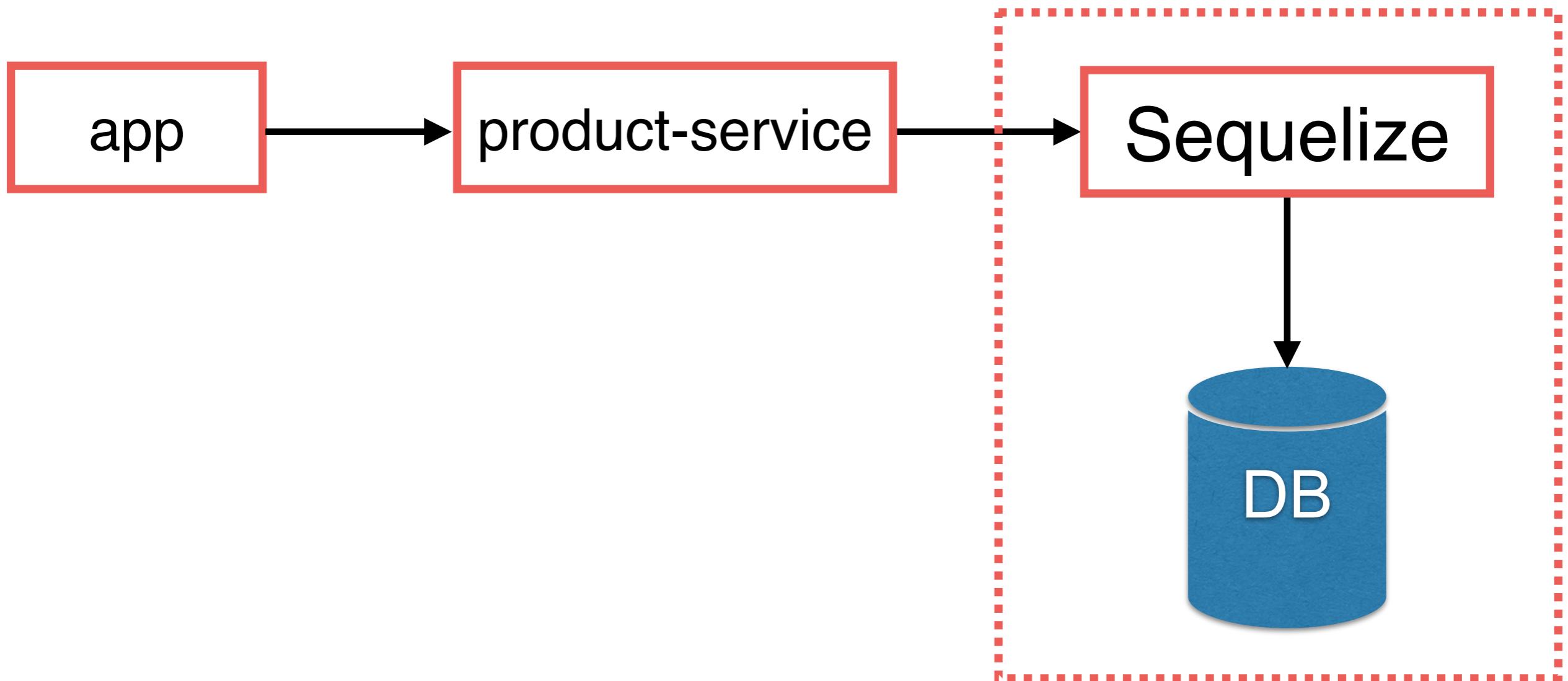
Testing with sequelize



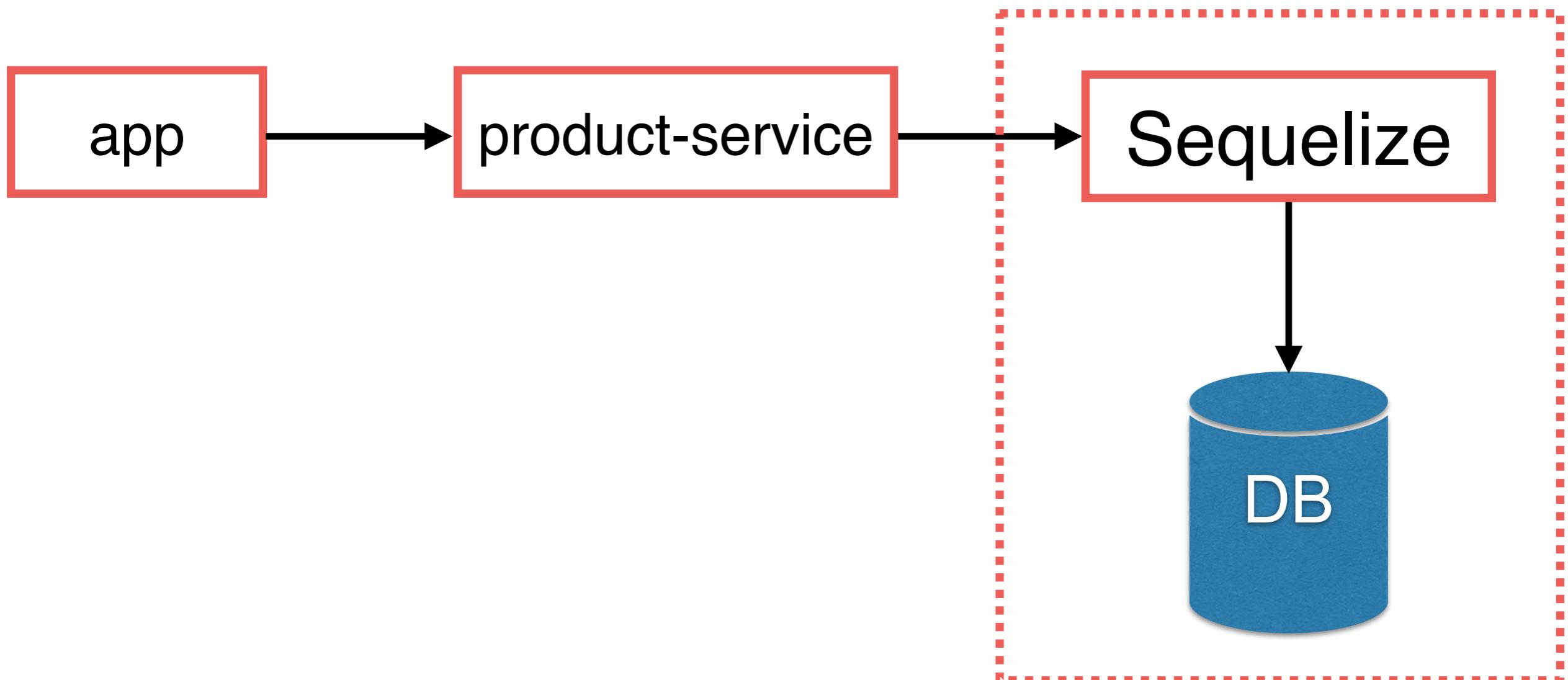
How to test ?



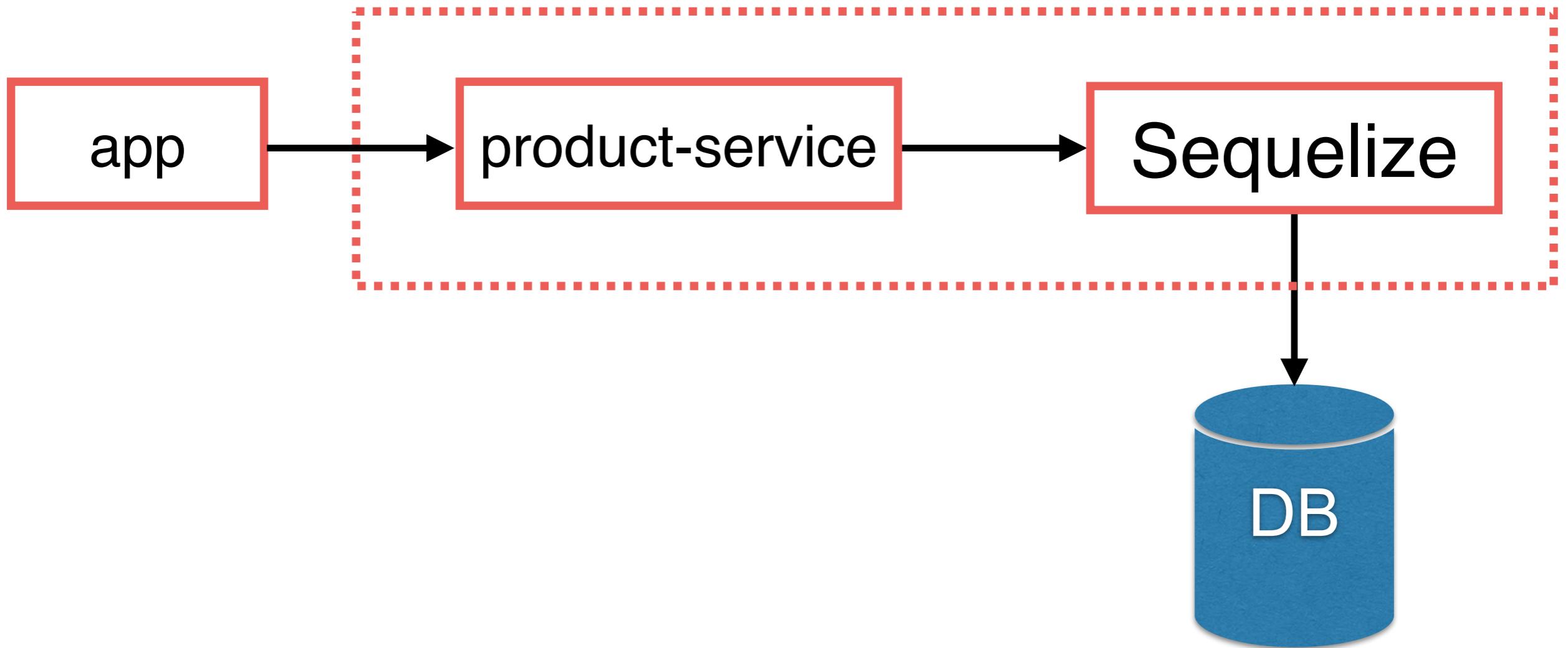
Using real database ?



Using fake database ?



Using mock database ?



5. Relationship/Association

One-to-one
One-to-many
Many-to-many
Eager loading



6. Logging

Custom log of sequelize

```
const sequelize = new Sequelize(" ... ", {
  // Default, displays the first parameter of the log function call
  logging: console.log,
  // Displays all log function call parameters
  logging: (...msg) => console.log(msg),
  // Use custom logger (e.g. Winston or Bunyan), displays the first parameter
  logging: (msg) => logger.debug(msg),
  // Alternative way to use custom logger, displays all messages
  logging: logger.debug.bind(logger),
  // -----
  // Disables logging
  logging: false,
});
});
```

<https://sequelize.org/master/manual/getting-started.html>



REST APIs with Express

<https://expressjs.com/>



REST APIs

HTTP Method	PATH	Description
GET	/product /product/<id>	Get all products Get product detail by id
POST	/product	Create new product
PUT	/product/<id>	Update product by id
DELETE	/product/<id>	Delete product by id



HTTP Response Code

HTTP Status Codes

httpstatuses.com is an easy to reference database of HTTP Status Codes with their definitions and helpful code references all in one place. Visit an individual status code via httpstatuses.com/code or browse the list below.

@ Share on Twitter + Add to Pinboard

1xx Informational

100 Continue

101 Switching Protocols

102 Processing

<https://httpstatuses.com/>



Web framework of Node.js

http module (build-in)

Express

Hapi

Nest.js

Kao

etc.



Working with Express

```
$npm install express --save
```



Hello API with JSON

index.js

```
const express = require("express");
const app = express();
const port = process.env.PORT || 3000;

app.use(express.json());

app.get("/", (req, res) => {
  res.status(200).send({
    message: "Hello API",
  });
});

app.listen(port, () => {
  console.log(`Server running on port ${port}`);
});
```



Add more endpoints

```
app.get("/", (req, res) => { ...  
});
```

```
app.get("/product", (req, res) => { ...  
});
```

```
app.post("/product", (req, res) => { ...  
});
```

```
app.get("/product/:id", (req, res) => { ...  
});
```



Refactor code with responsibility



```
const express = require("express");
const app = express();
const port = process.env.PORT || 3000;

app.use(express.json());

app.get("/", (req, res) => {
  res.status(200).send({
    message: "Hello API",
  });
});

app.listen(port, () => {
  console.log(`Server running on port ${port}`);
});
```



index.js

```
const port = process.env.PORT || 3000;

app.listen(port, () => {
  console.log(`Server running on port ${port}`);
});
```

app.js

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

app.use(express.json());

app.get("/", (req, res) => {
  res.status(200).send({
    message: "Hello API",
  });
});
```



app.js

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

app.use(express.json());

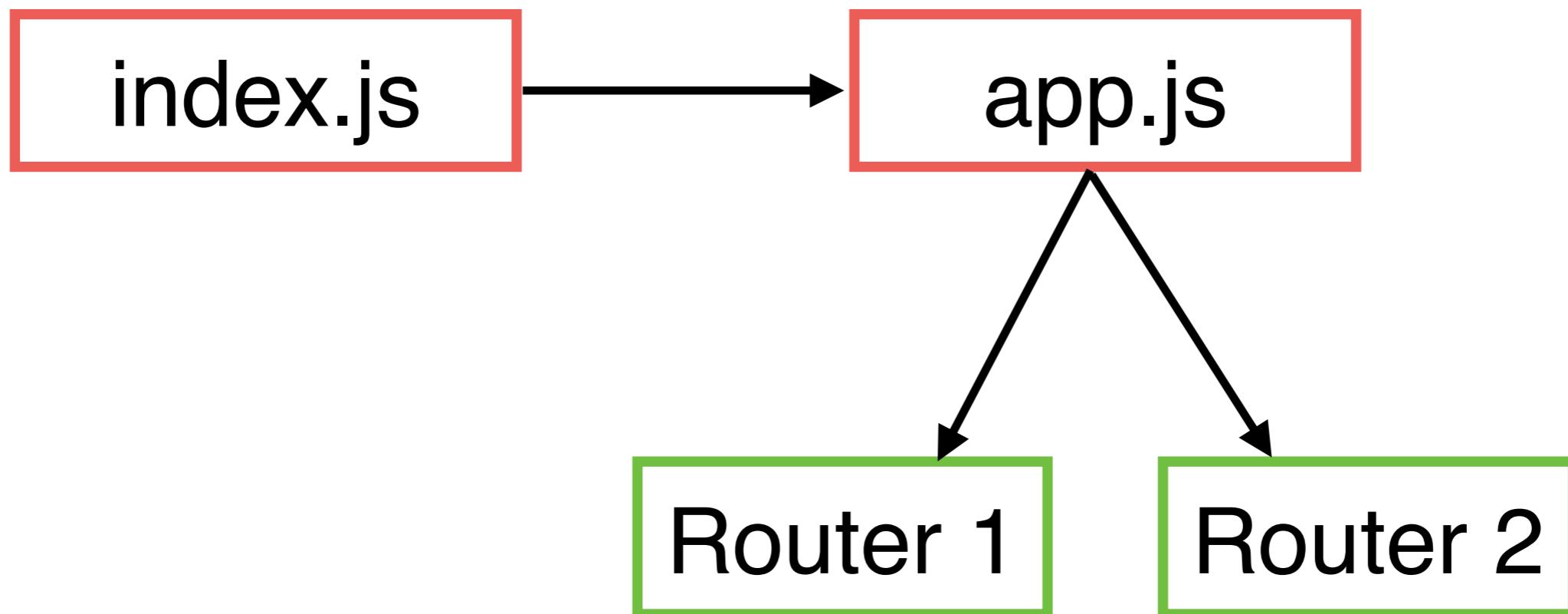
app.get("/", (req, res) => {
  res.status(200).send({
    message: "Hello API",
  });
});

});
```

Routers !!



Better Structure



app.js

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

const productRouter = require("./router-product");

app.use(express.json());
app.use(productRouter);
```

router-product.js

```
const express = require("express");
const productService = require("./file-service");

const router = express.Router()

router.get("/", (req, res) => {
  res.send({
    message: "Hello API",
  });
});
```



API testing with Postman

<https://www.postman.com/>



API testing with newman

<https://www.npmjs.com/package/newman>



API testing with SuperTest

<https://github.com/visionmedia/supertest>



Working with SuperTest

```
$npm install supertest --save-dev
```



Get all products

product_api_spec.js

```
const request = require("supertest");
const app = require("../app");

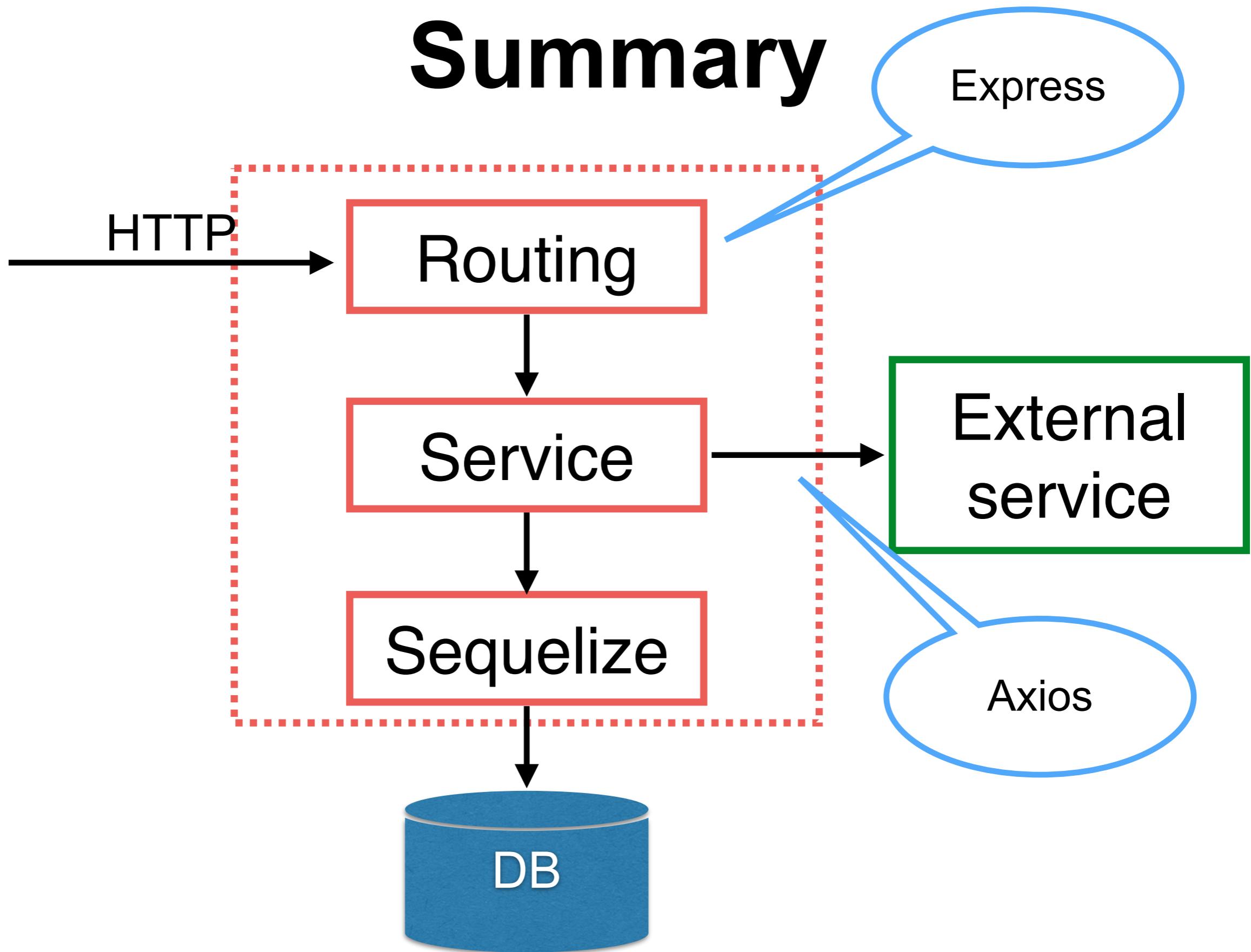
test("Create new product ", async () => {

  const response = await request(app)
    .post("/product")
    .send({
      name: "Demo" + Math.random(),
      price: 200,
    })
    .expect(201);

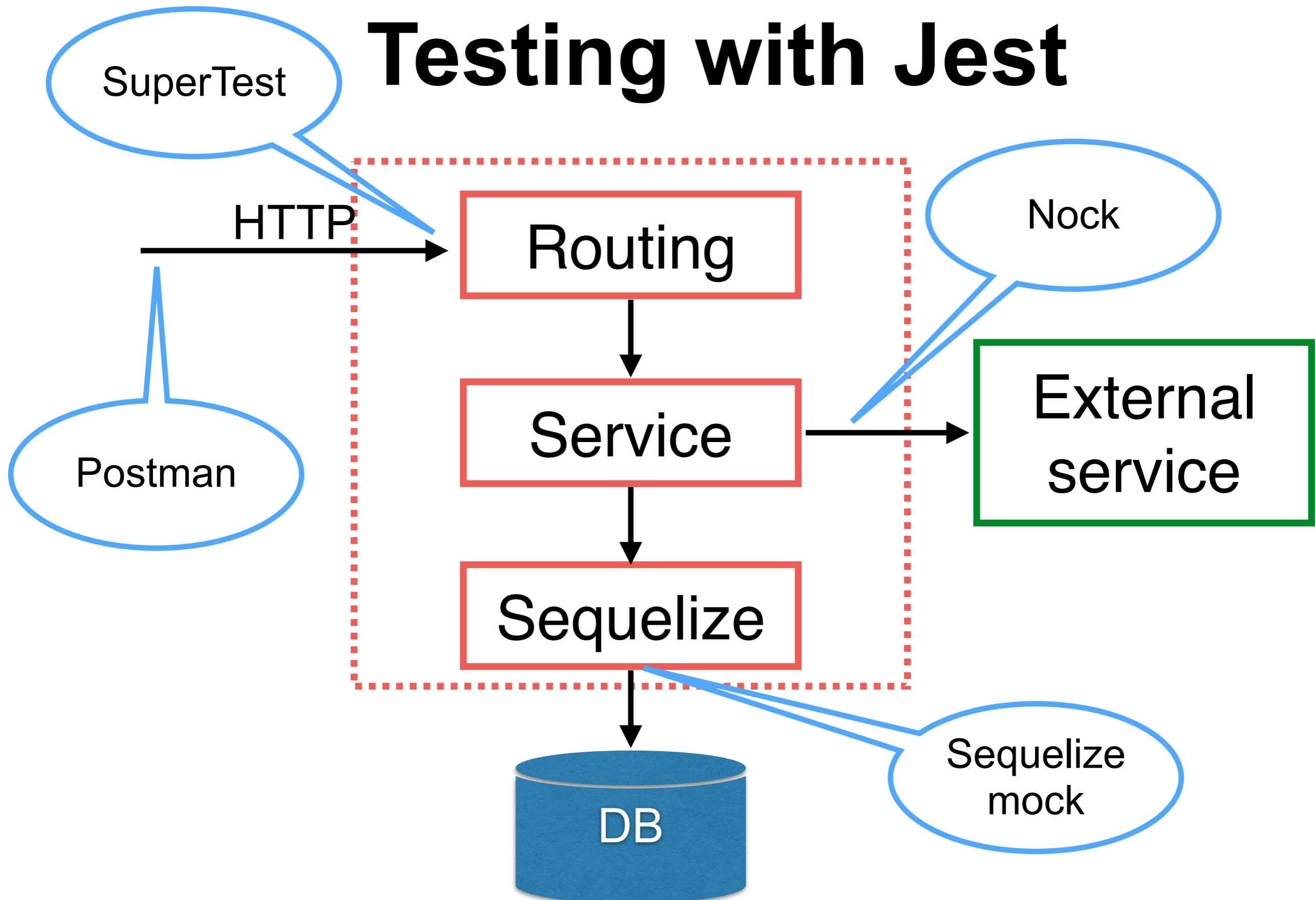
});
```



Summary



Testing with Jest



Express middleware



Express middleware

```
var express = require('express');
var app = express();

app.get('/', function(req, res, next) {
  next();
})

app.listen(3000);
```

HTTP method for which the middleware function applies.

Path (route) for which the middleware function applies.

The middleware function.

Callback argument to the middleware function, called "next" by convention.

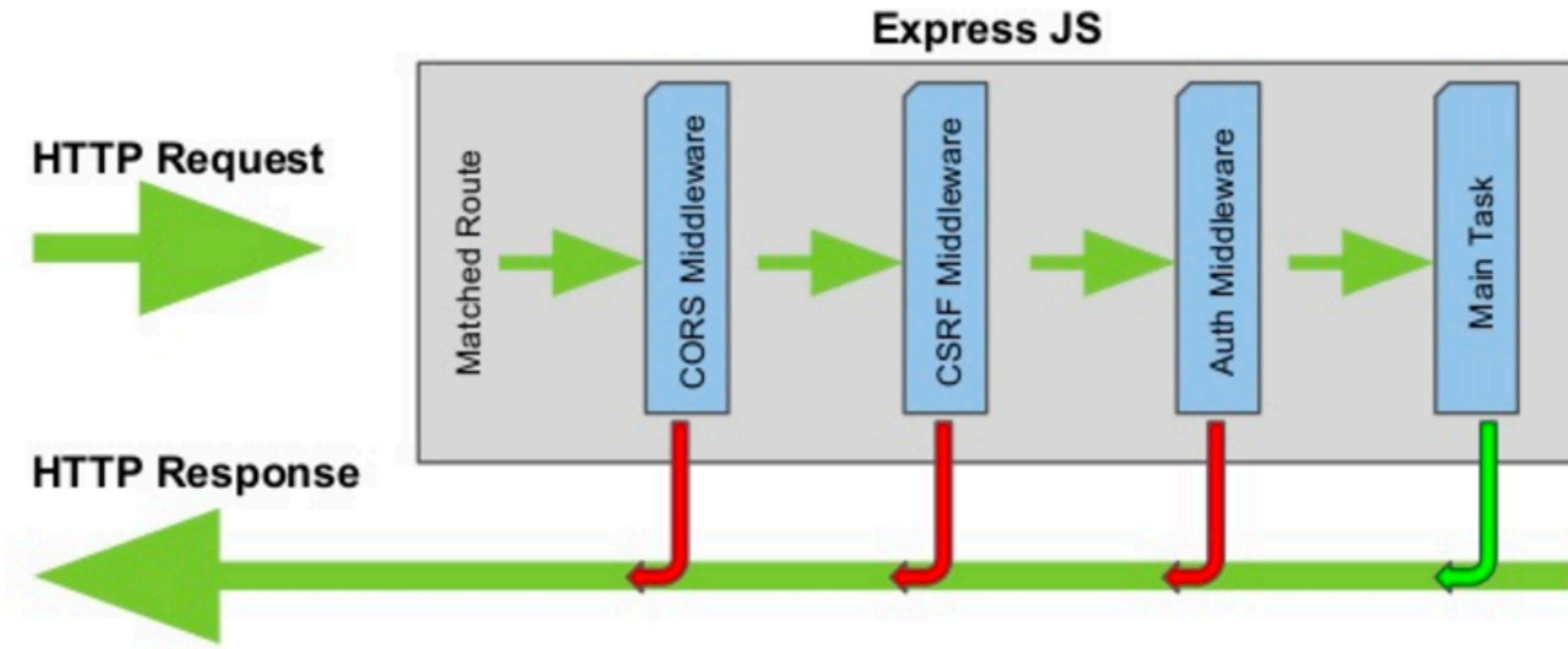
HTTP `response` argument to the middleware function, called "res" by convention.

HTTP `request` argument to the middleware function, called "req" by convention.

<https://expressjs.com/en/guide/writing-middleware.html>



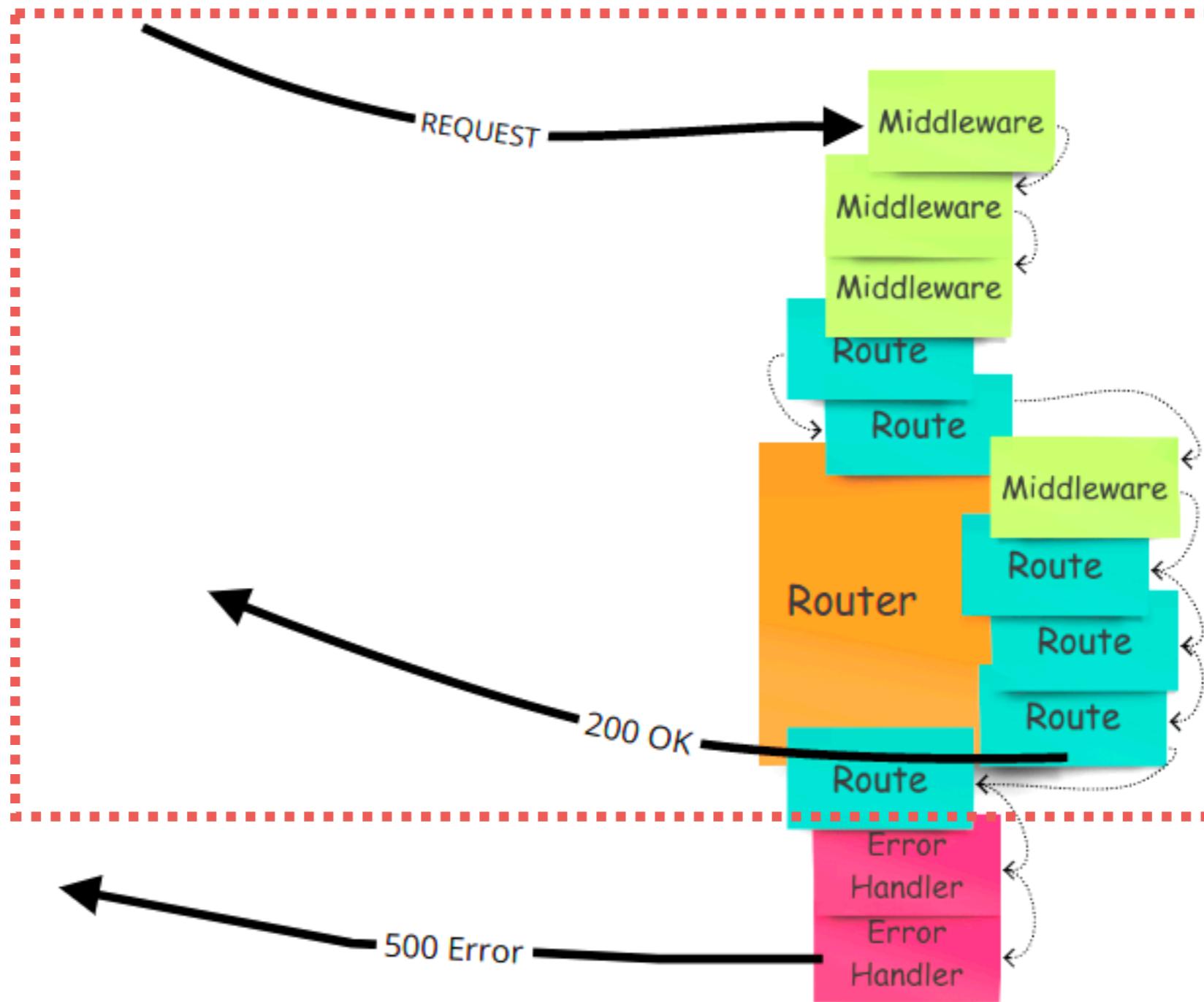
Express middleware



<https://expressjs.com/en/guide/writing-middleware.html>



Express middleware



Authentication

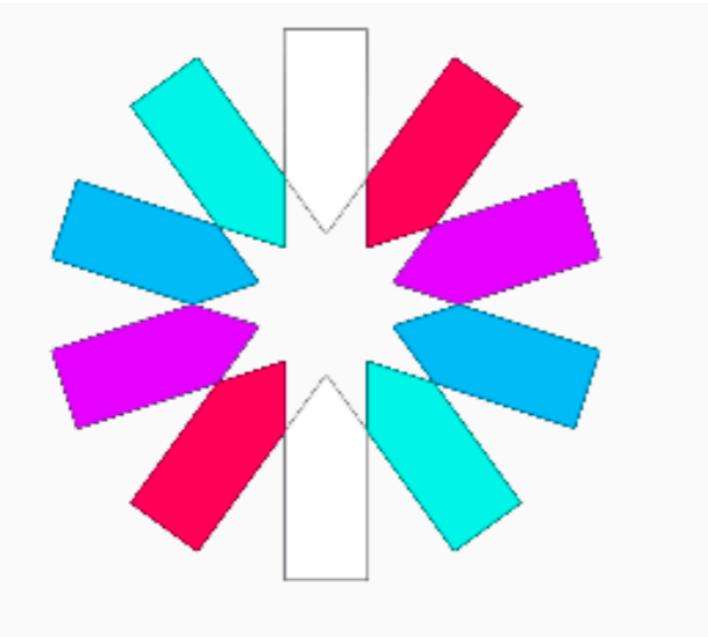
Authorization



API authentication and security

Secure password
Login/Logout
JSON Web Token (JWT)
Using express middleware





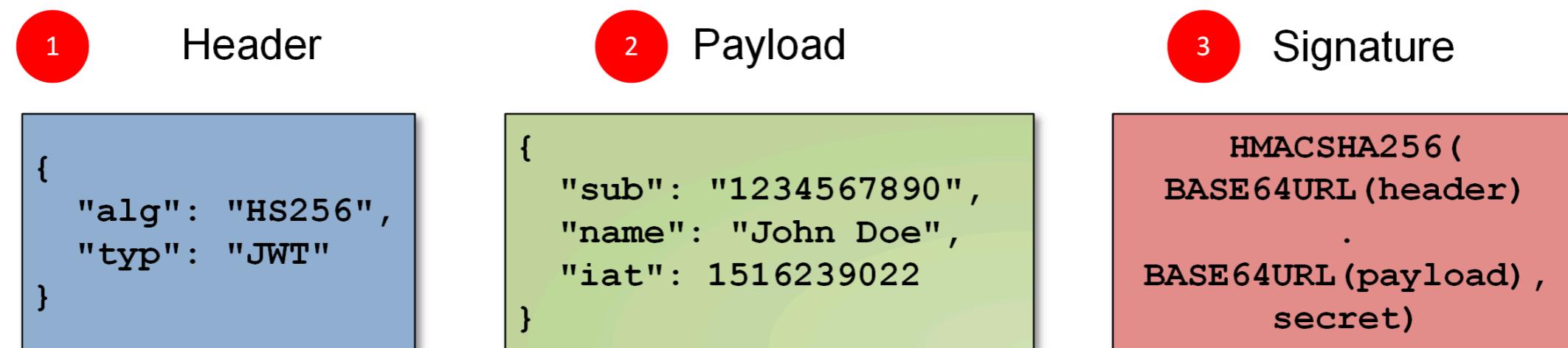
JWT

<https://jwt.io/introduction/>

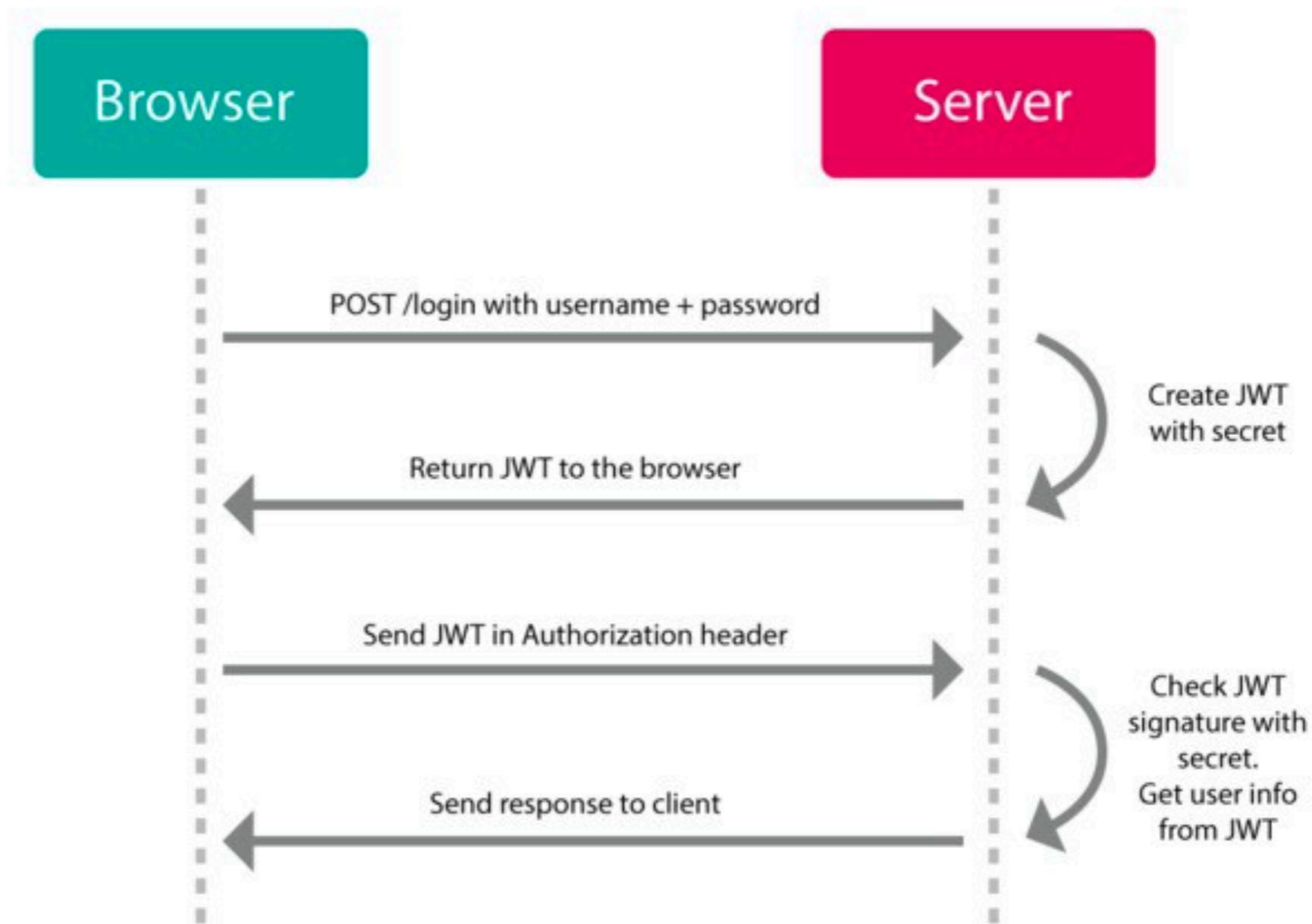


JWT structure

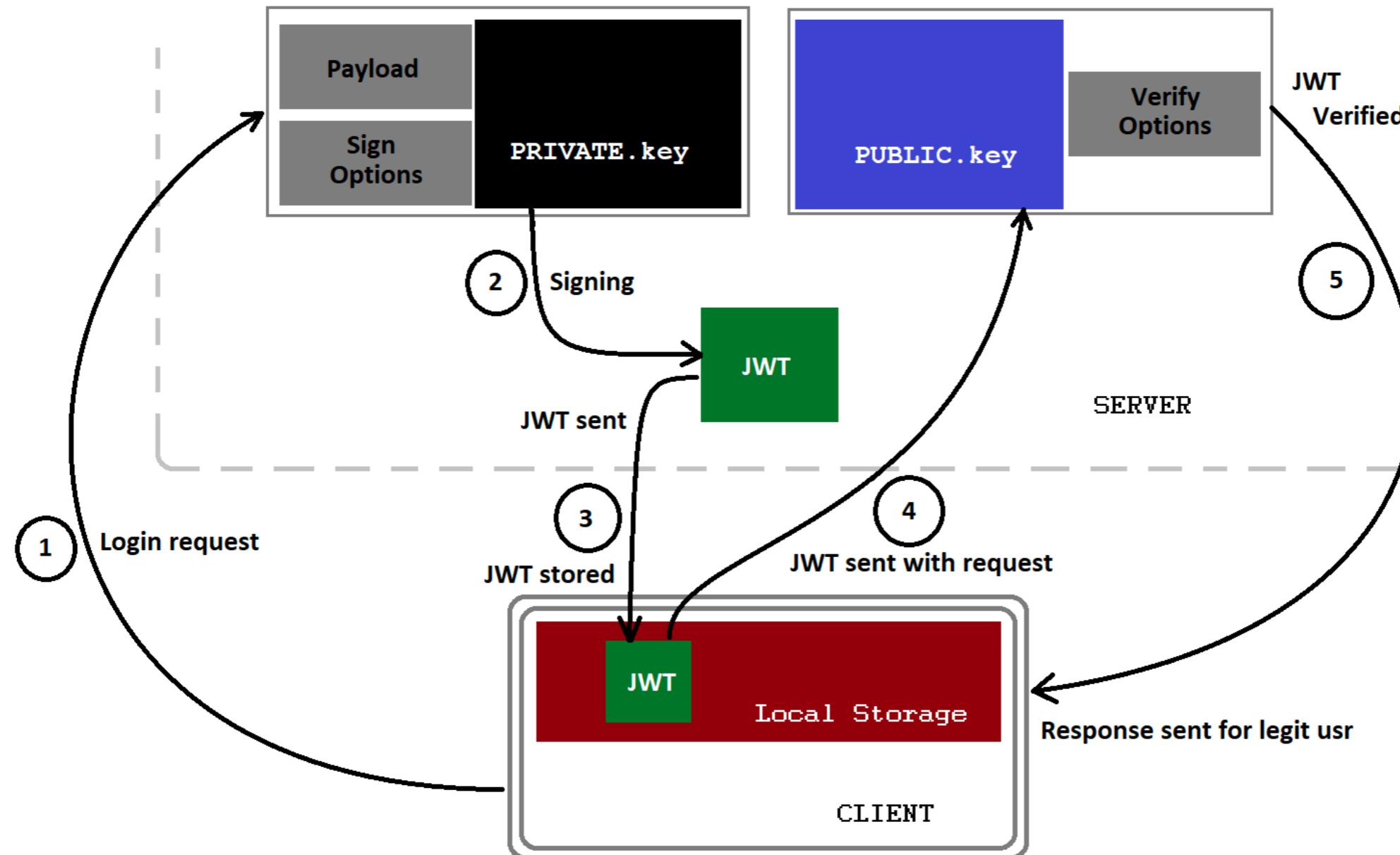
1 eyJhbGciOiJIUzI1NilsInR5cCI6IkpXVCJ9.eyJzdWliOilxMjM0NT
Y3ODkwliwibmFtZSI6IkpvaG4gRG9IliwiaWF0IjoxNTE2MjM5M
DlyfQ.XbPfbIHMI6arZ3Y922BhjWgQzWXcXNrz0ogtVhfEd2o 2 3



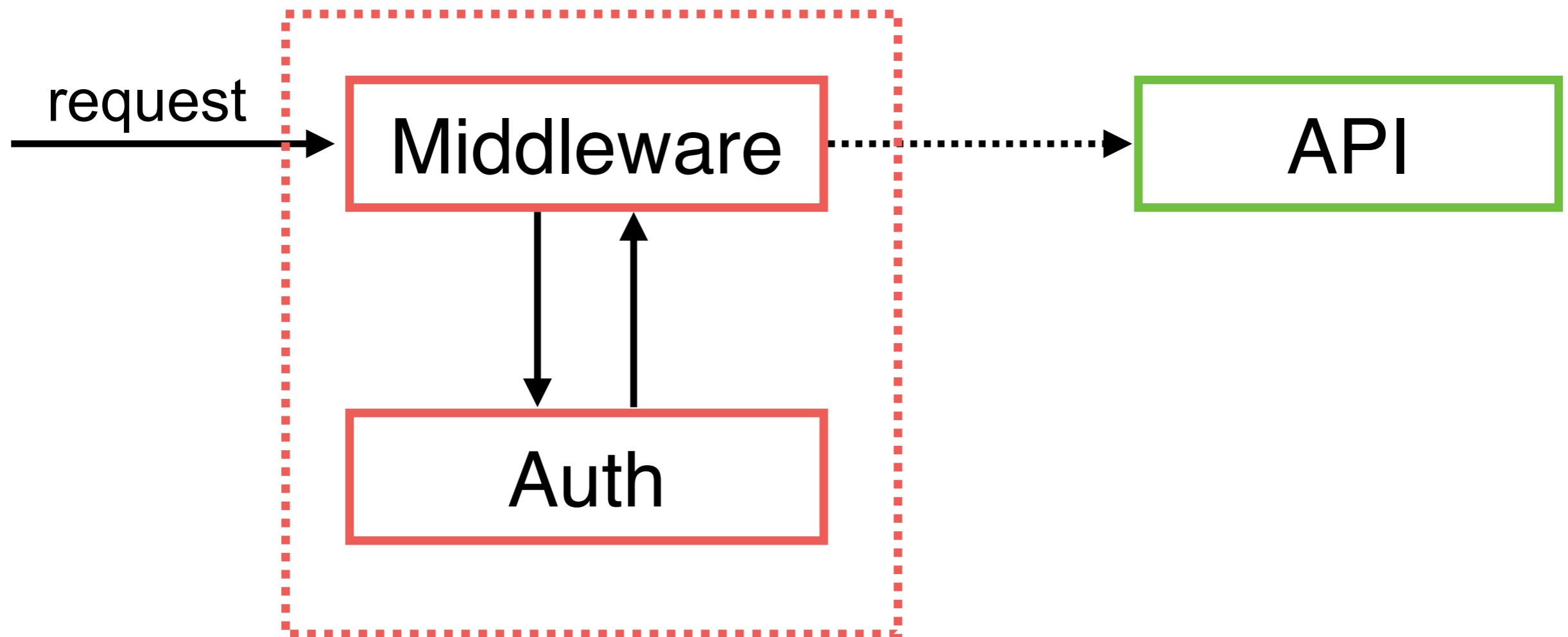
JWT Process



JWT Process (Better)



Using Middleware



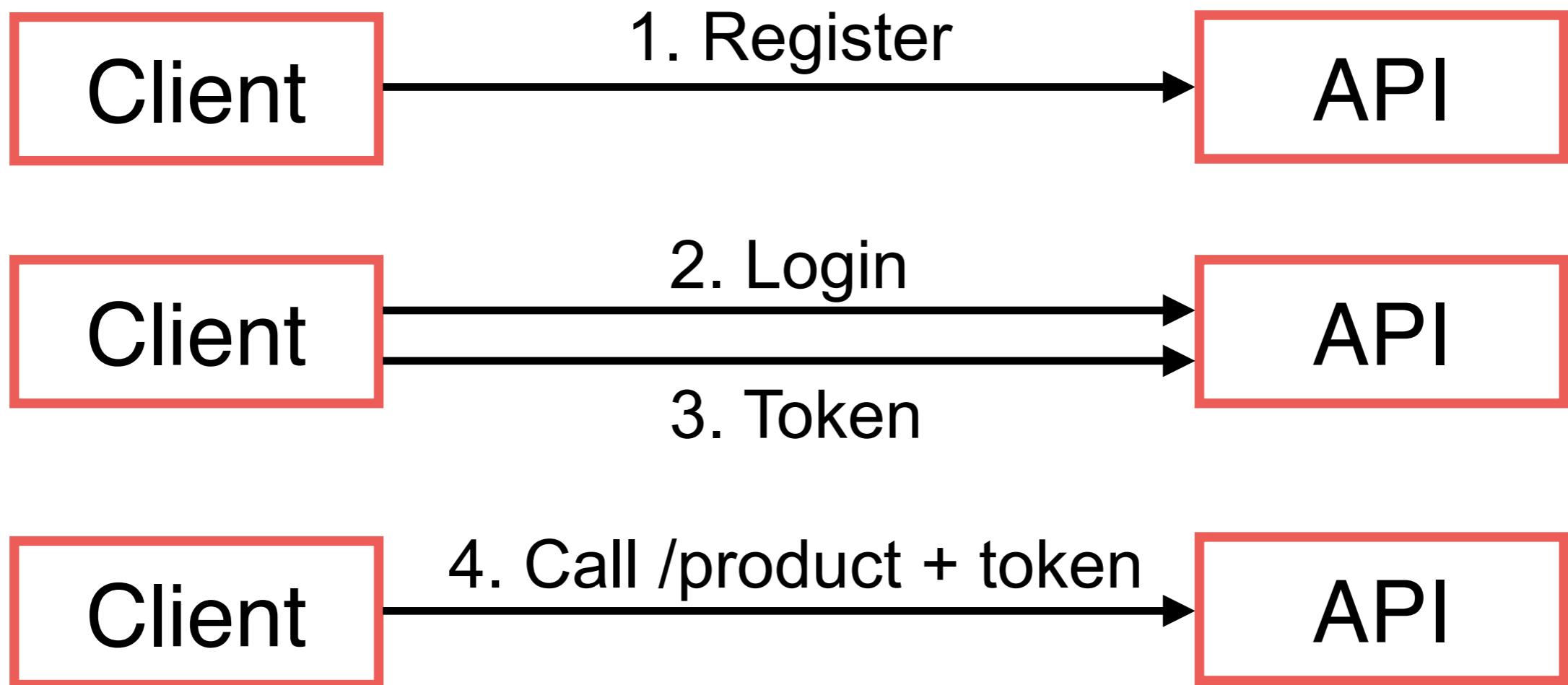
Working with JWT



Working with JWT

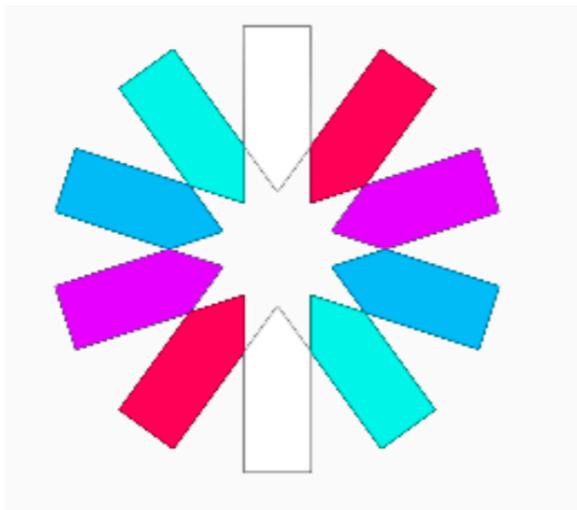


Working with JWT



Auth with JWT

Using jsonwebtoken module



J U T

<https://www.npmjs.com/package/jsonwebtoken>



Auth with JWT

```
const jwt = require("jsonwebtoken");

const auth = async (req, res, next) => {
  try {
    const token = req.header("Authorization").replace("Bearer ", "");
    const decoded = jwt.verify(token, process.env.JWT_SECRET);
    // const id = decoded._id;

    const user = { id: 1, name: "fake user" };

    if (!user) {
      throw new Error();
    }

    req.token = token;
    req.user = user;
    next();
  } catch (e) {
    res.status(401).send({ error: "Please authenticate." });
  }
};
```



Check data in HTTP Request

```
const jwt = require("jsonwebtoken");

const auth = async (req, res, next) => {
  try {
    const token = req.header("Authorization").replace("Bearer ", "");
    const decoded = jwt.verify(token, process.env.JWT_SECRET);
    // const id = decoded._id;
  }

  const user = { id: 1, name: "fake user" };

  if (!user) {
    throw new Error();
  }

  req.token = token;
  req.user = user;
  next();
}

} catch (e) {
  res.status(401).send({ error: "Please authenticate." });
}
};
```



Check user in database

```
const jwt = require("jsonwebtoken");

const auth = async (req, res, next) => {
  try {
    const token = req.header("Authorization").replace("Bearer ", "");
    const decoded = jwt.verify(token, process.env.JWT_SECRET);
    // const id = decoded._id;

    const user = { id: 1, name: "fake user" };

    if (!user) {
      throw new Error();
    }

    req.token = token;
    req.user = user;
    next();
  } catch (e) {
    res.status(401).send({ error: "Please authenticate." });
  }
};
```



1. Login to create token

```
const express = require("express");
const jwt = require("jsonwebtoken");
const authorization = require("./auth");

const app = express();

app.get("/login", (req, res) => {
  const token = jwt.sign({ _id: "1" }, process.env.JWT_SECRET);
  res.send(token);
});

app.get("/secure", authorization, (req, res) => res.send("Secure ..."));
```



2. Use middleware in routing

```
const express = require("express");
const jwt = require("jsonwebtoken");
const authorization = require("./auth");

const app = express();

app.get("/login", (req, res) => {
  const token = jwt.sign({ _id: "1" }, process.env.JWT_SECRET);
  res.send(token);
});

app.get("/secure", authorization, (req, res) => res.send("Secure ..."));


```



Using postman

Config in Authorization :: Beearer Token

POST Send

Params Authorization ● Headers (9) Body Pre-request Script Tests Settings

TYPE
Bearer Token

Token
eyJhbGciOiJIUzI1NilsInR5cCI6IkpXVCJ9.eyJfaWQiOiIxliwiawWF0ljoxN

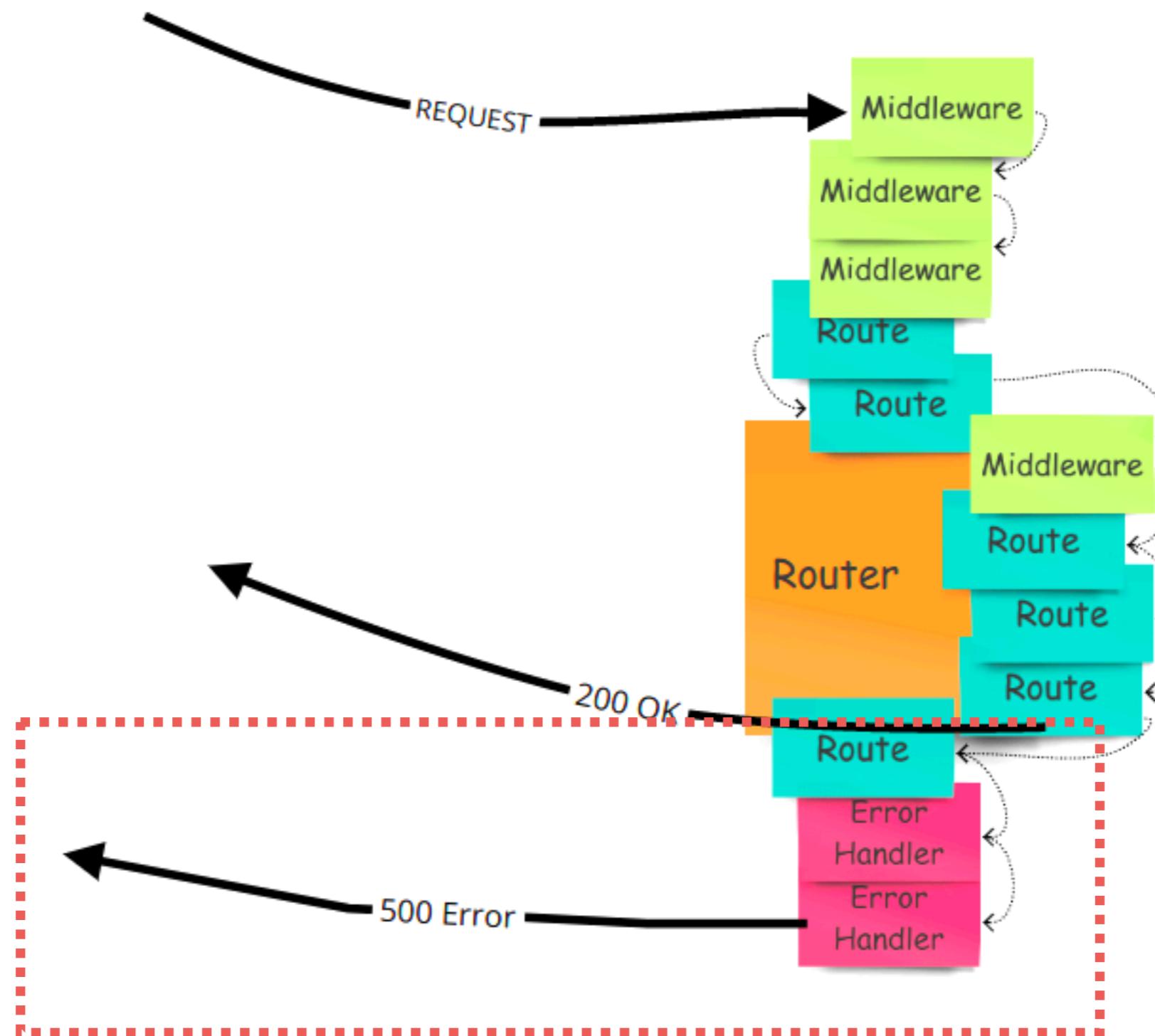
The authorization header will be automatically generated when you send the request. [Learn more about authorization](#)

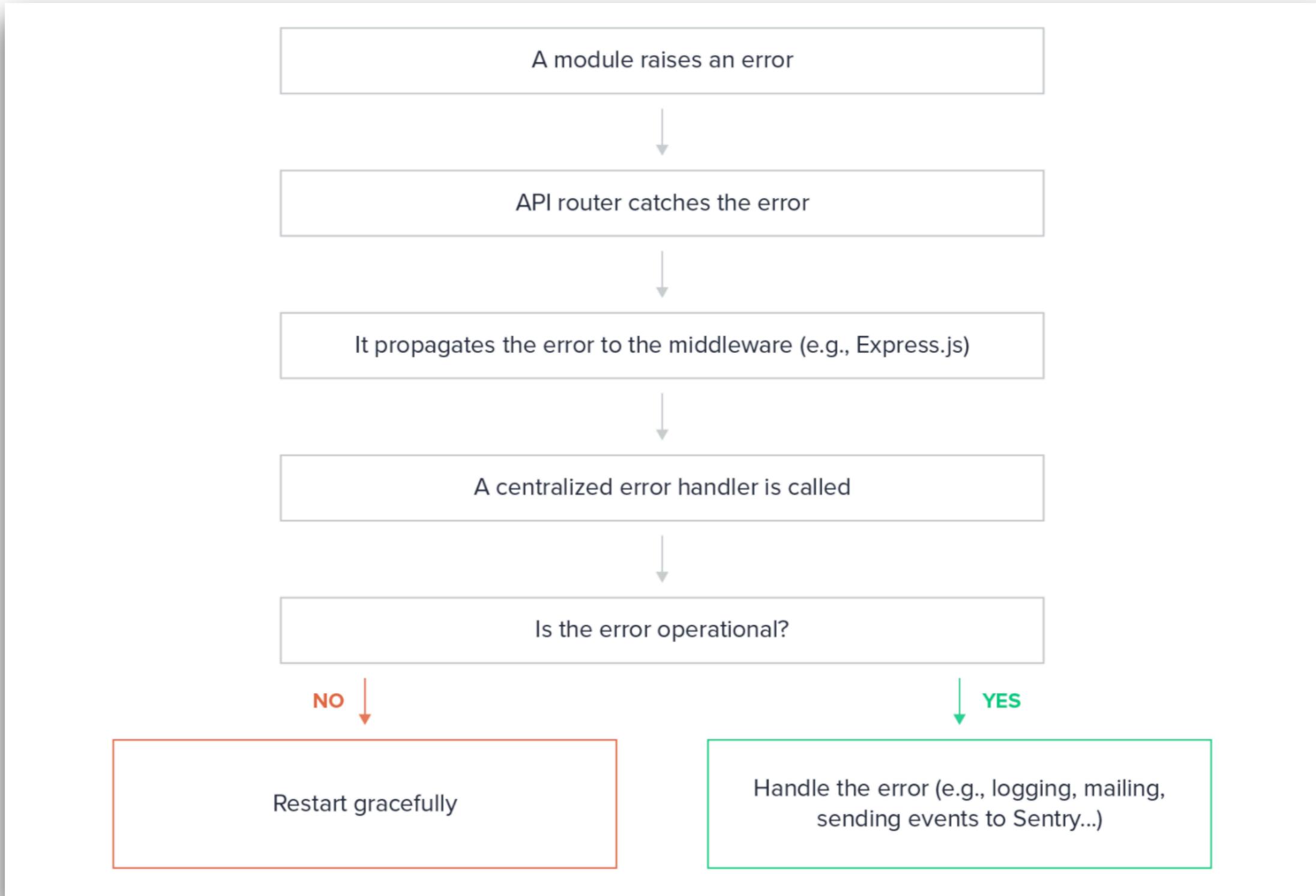


Error Handling with Express



Express middleware





Container with Node.JS



12 factors for Node.js

<https://12factor.net/>



Continuos Testing



Group Workshop



Customer



1. Booking request



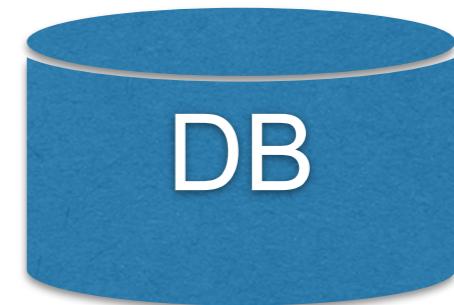
Customer



1. Booking request



2. Store data



Customer



1. Booking request



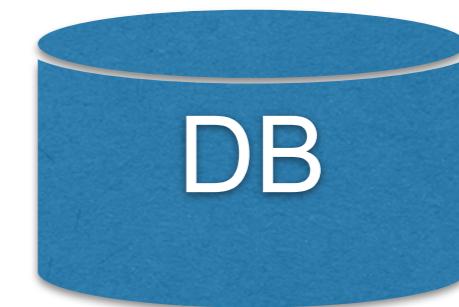
Admin



3. Review and approve



2. Store data



Unit testing



Unit testing

Smallest testable part of application

Procedural (function, module)

Object-oriented (interface, class, method)



Unit testing

Tests an isolated unit via API

Performed in memory (no permanent changes)

Safe to run repeatedly

Fast execution



Unit testing Assertions

Validate correctness

Statement that a predicate is going to be TRUE
Throws error if FALSE

Include context about **what** wrong and **where**



Example of assertions

OK (true/false)

Equal (==)

deepEqual (== for all properties)

structEqual (====)

Throws error



Unit testing with Dependencies

Simulate dependencies (test double)

Isolate behaviour of a tested unit

Unit test your custom code



Unit testing with Dependencies

Simulate dependencies (test double)

Isolate behaviour of a tested unit

Unit test your custom code

Not third-party code

Not core code



Integration testing



Integration testing

Builds in unit tests

Combines and tests resulting combinations
eg. APIs, UIs and results



Integration testing

Test on one system to cross-systems

Uses full or partial environment
eg. Databases and services



Integration testing

More **complex** and **harder** to maintain
BUT more **confidence** than unit test



Example

Two units: booking API and client



Test booking creation

Client calls booking API
API return response
Validation response
Validation creation



Functional testing



Functional testing

Focus in on result, not code
eg. User interface



Functional testing

Check a specific feature

Compare results against specification

User workflow



Functional testing

Slower than unit and integration

Typically automated (sometime manual)



Example

Use visits web page

Click booking button

See booking table

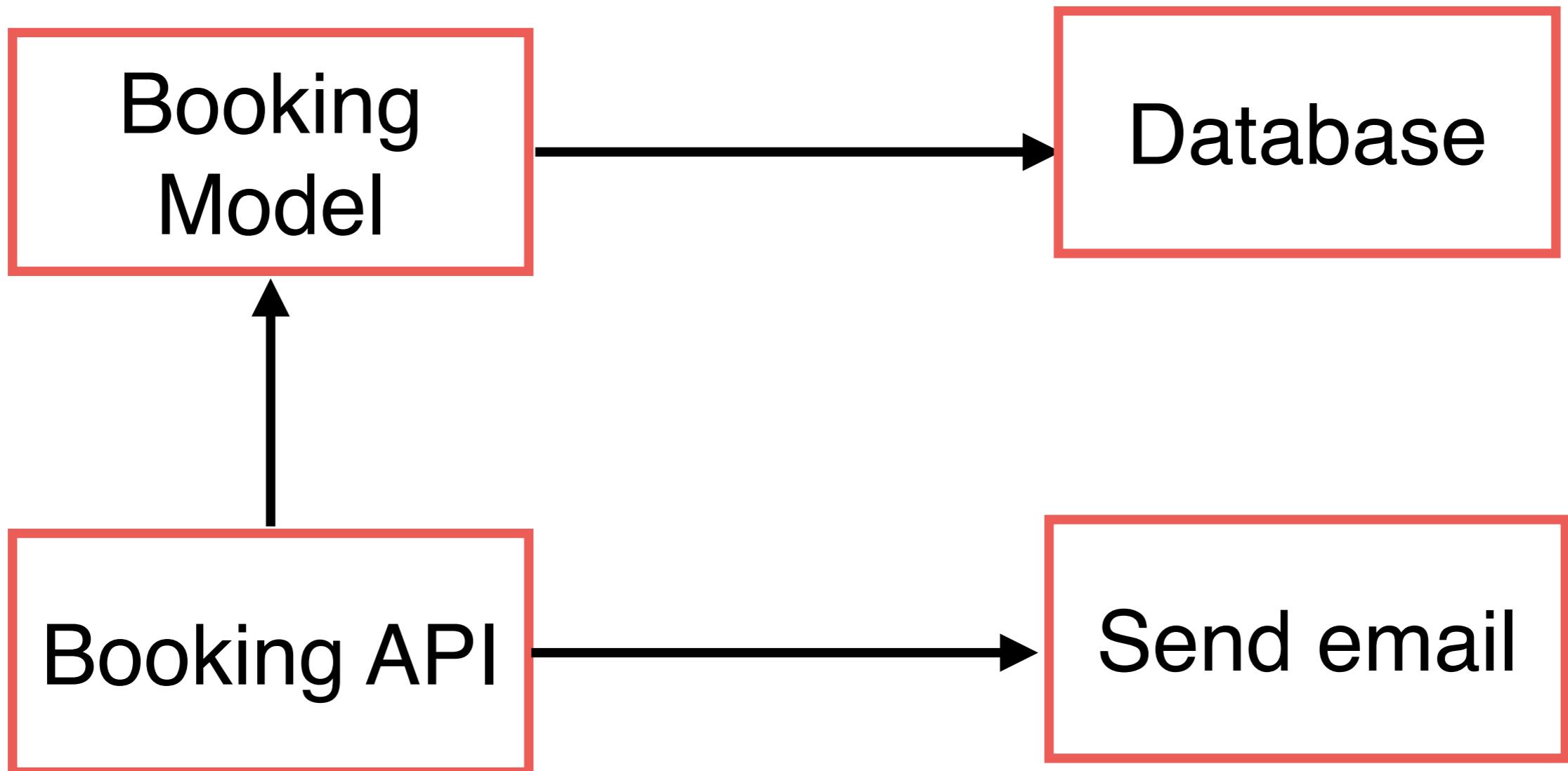
Enter data in form

Submit booking request

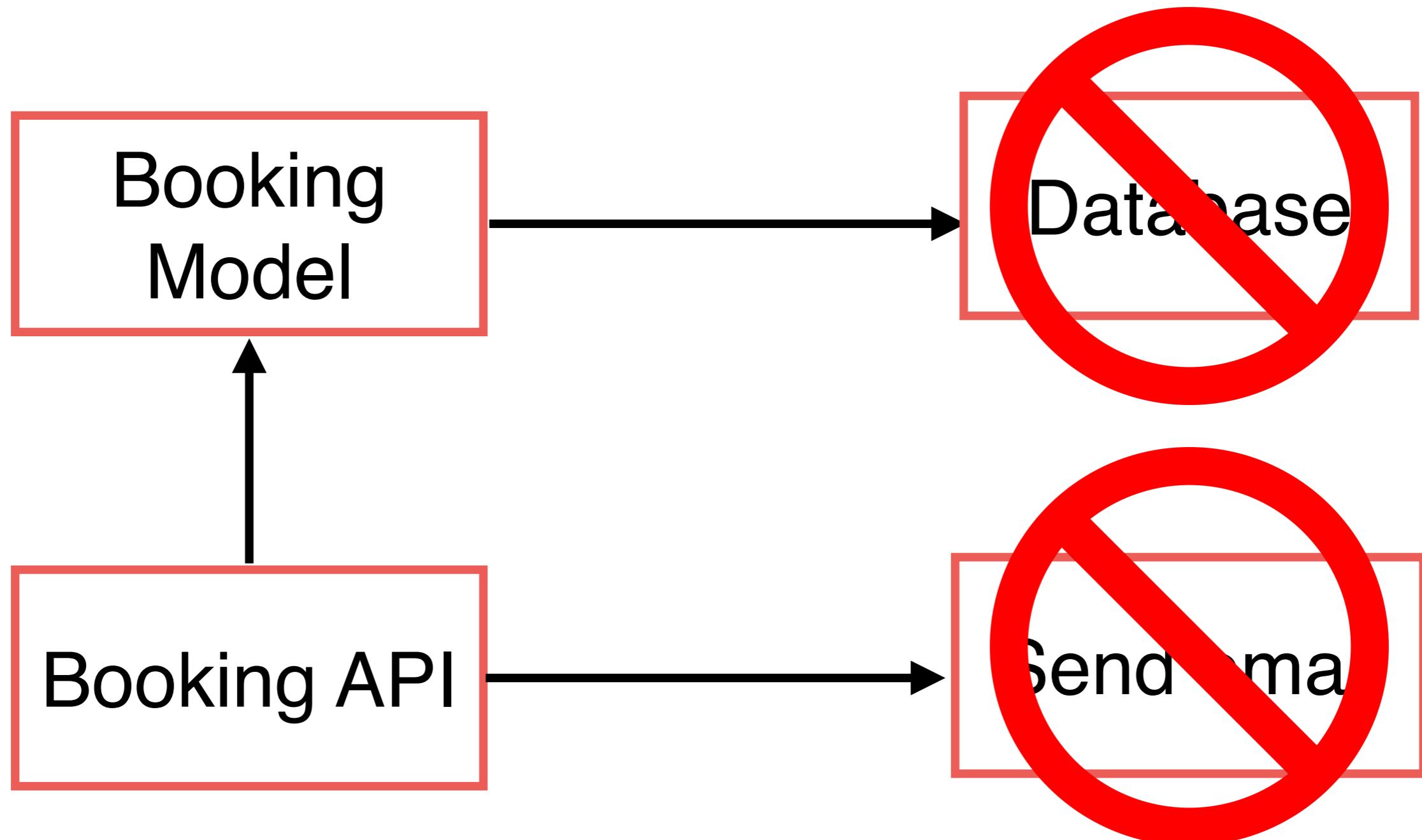
See success result in booking result page



Testing relationship



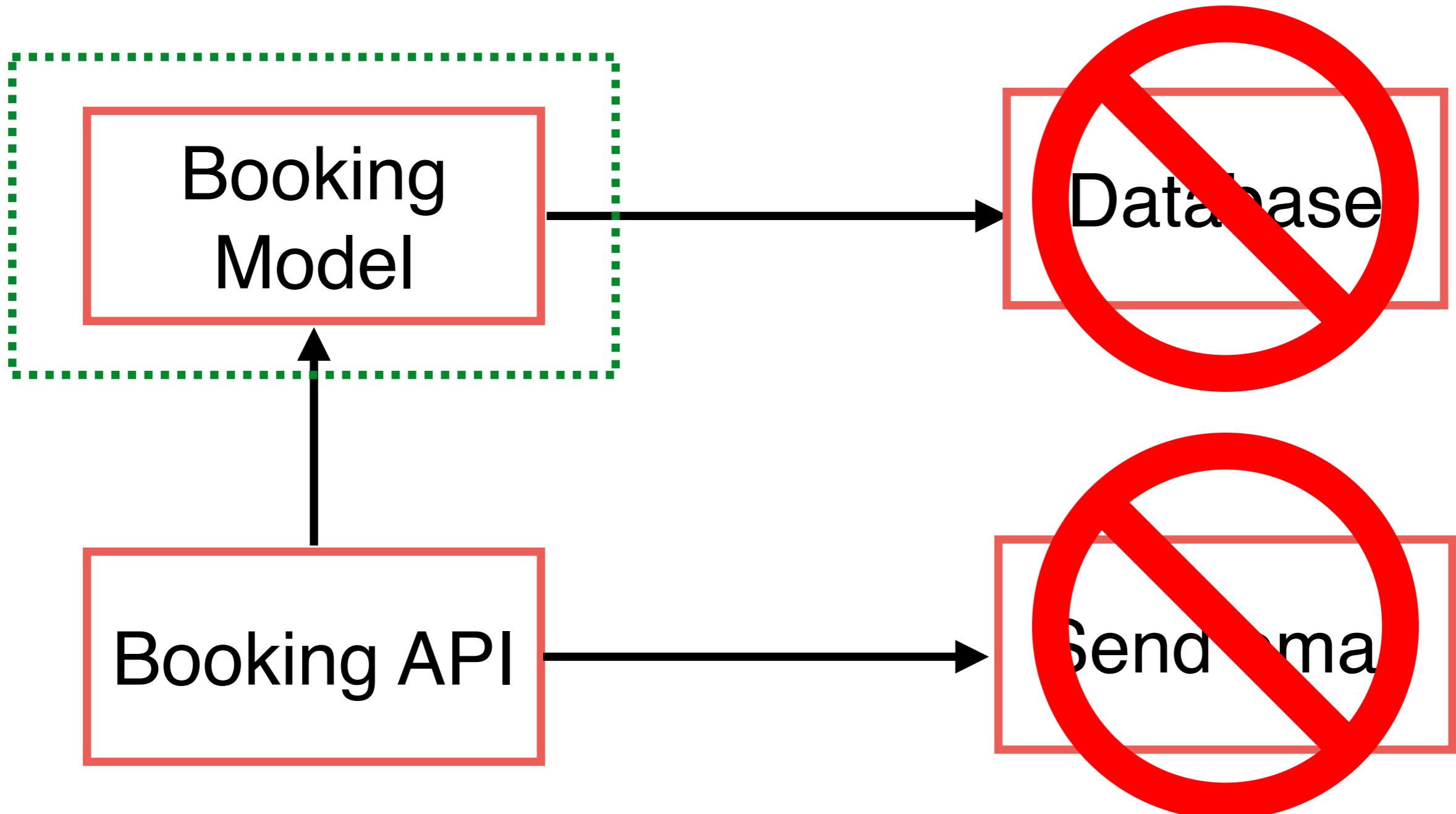
Testing relationship :: Unit test



What to tests ?



Unit test



Booking Model ?

Schema of data

Data type and formating

Validate data model



Booking Model ?

Schema of data

Data type and formatting

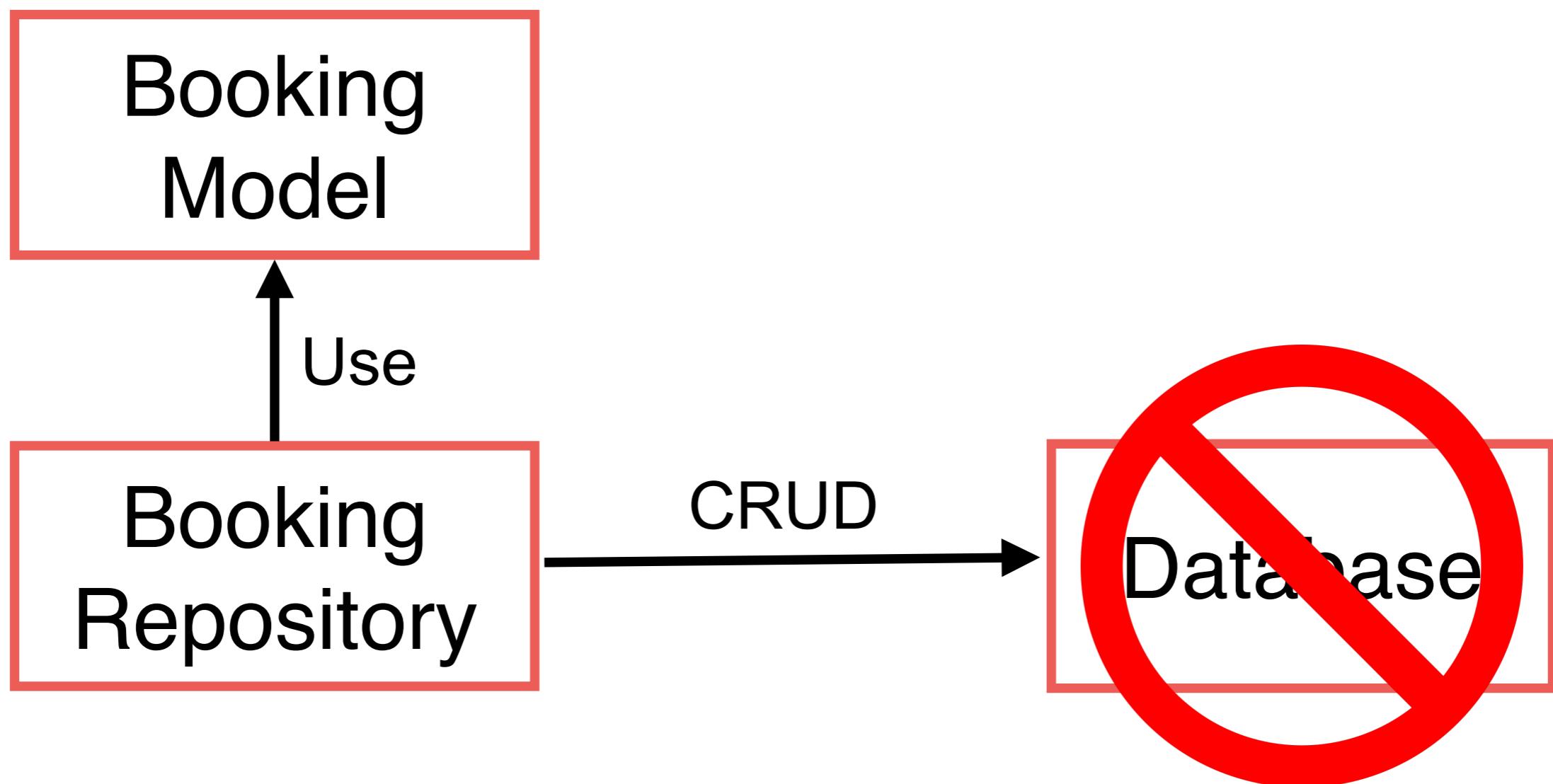
Validate data model

<https://www.npmjs.com/package/joi>



Working with Database

Using test double



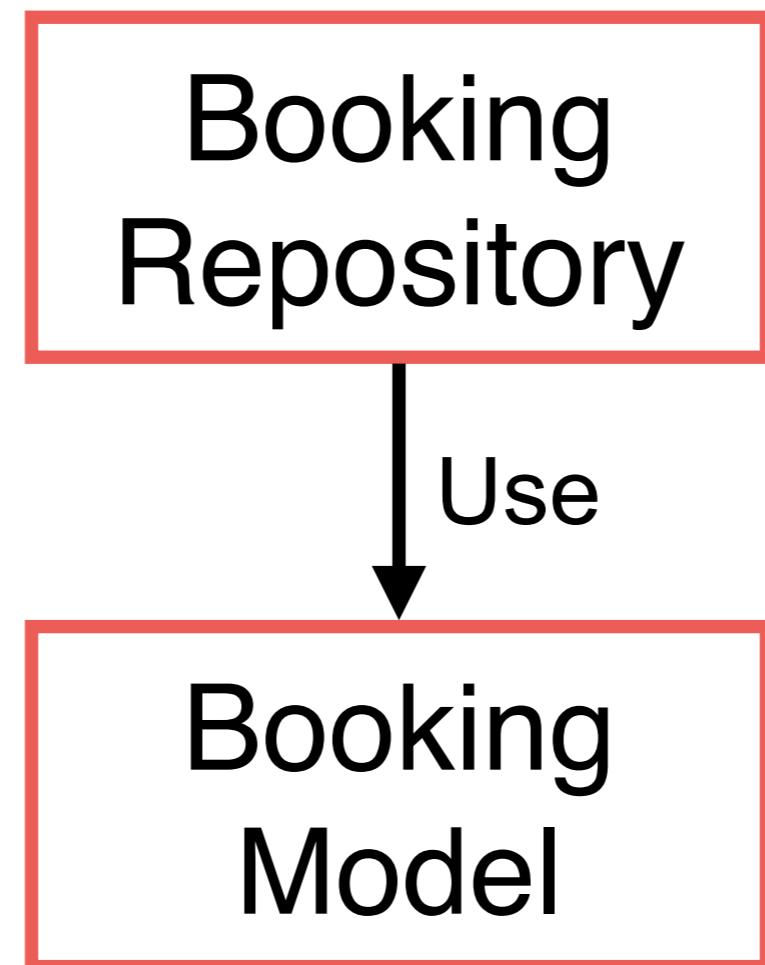
Booking Repository ?

CRUD with Database
Validate input

Booking
Repository

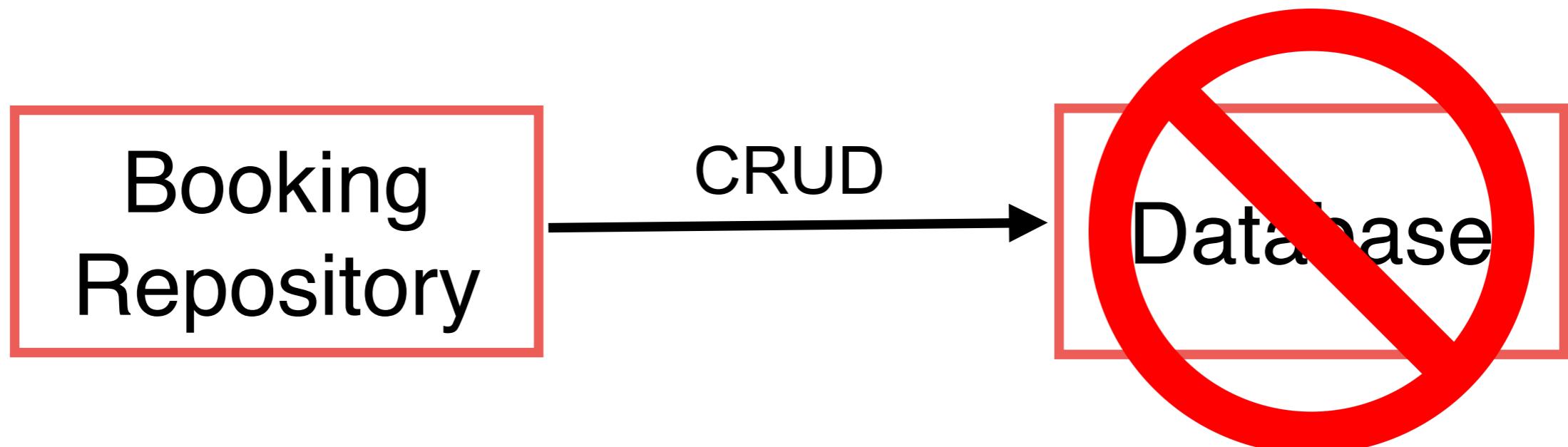


Validate input ?



Working with Database

Using test double



Test double with Node.JS



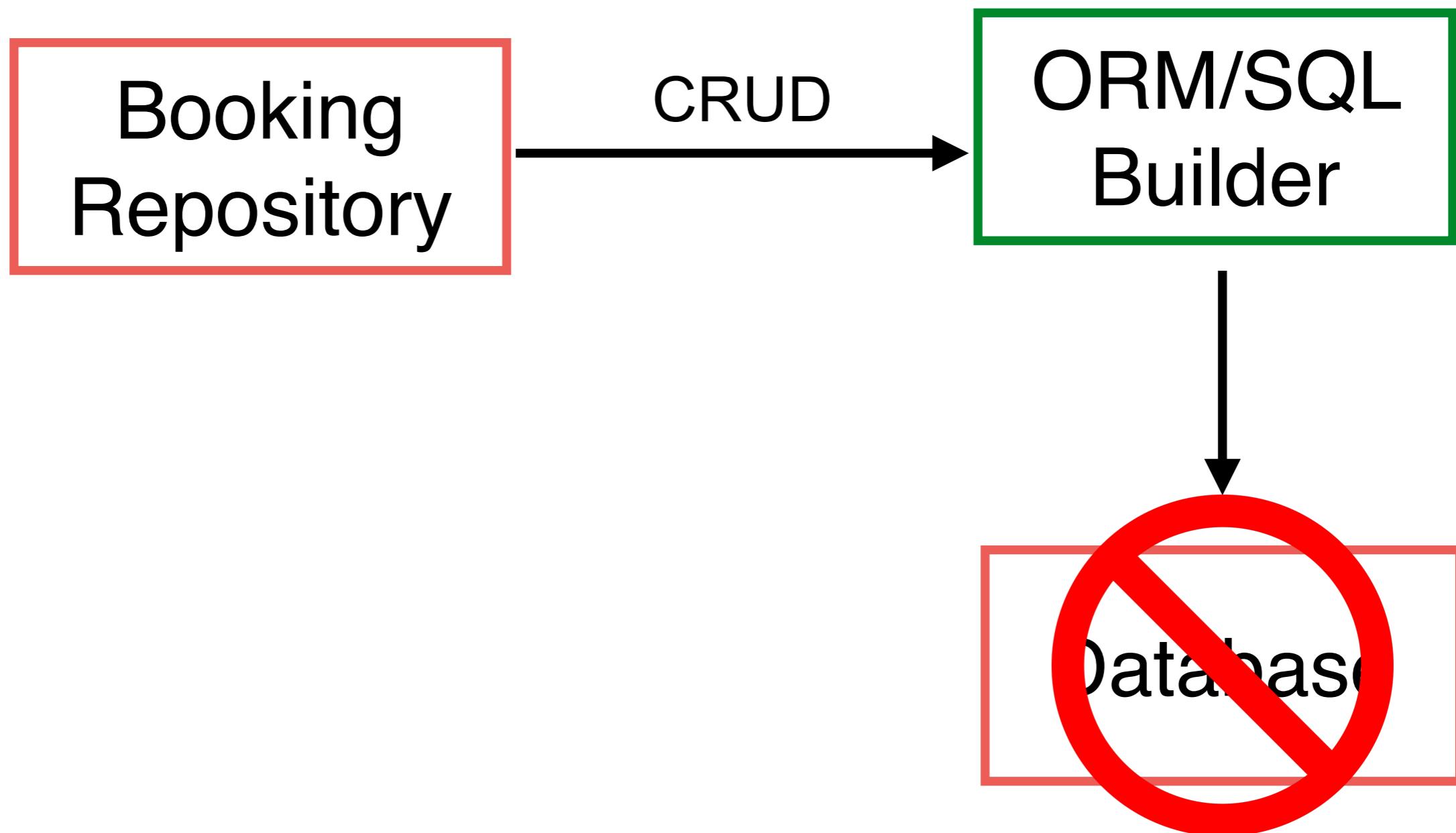
<https://jestjs.io/>



Working with Database

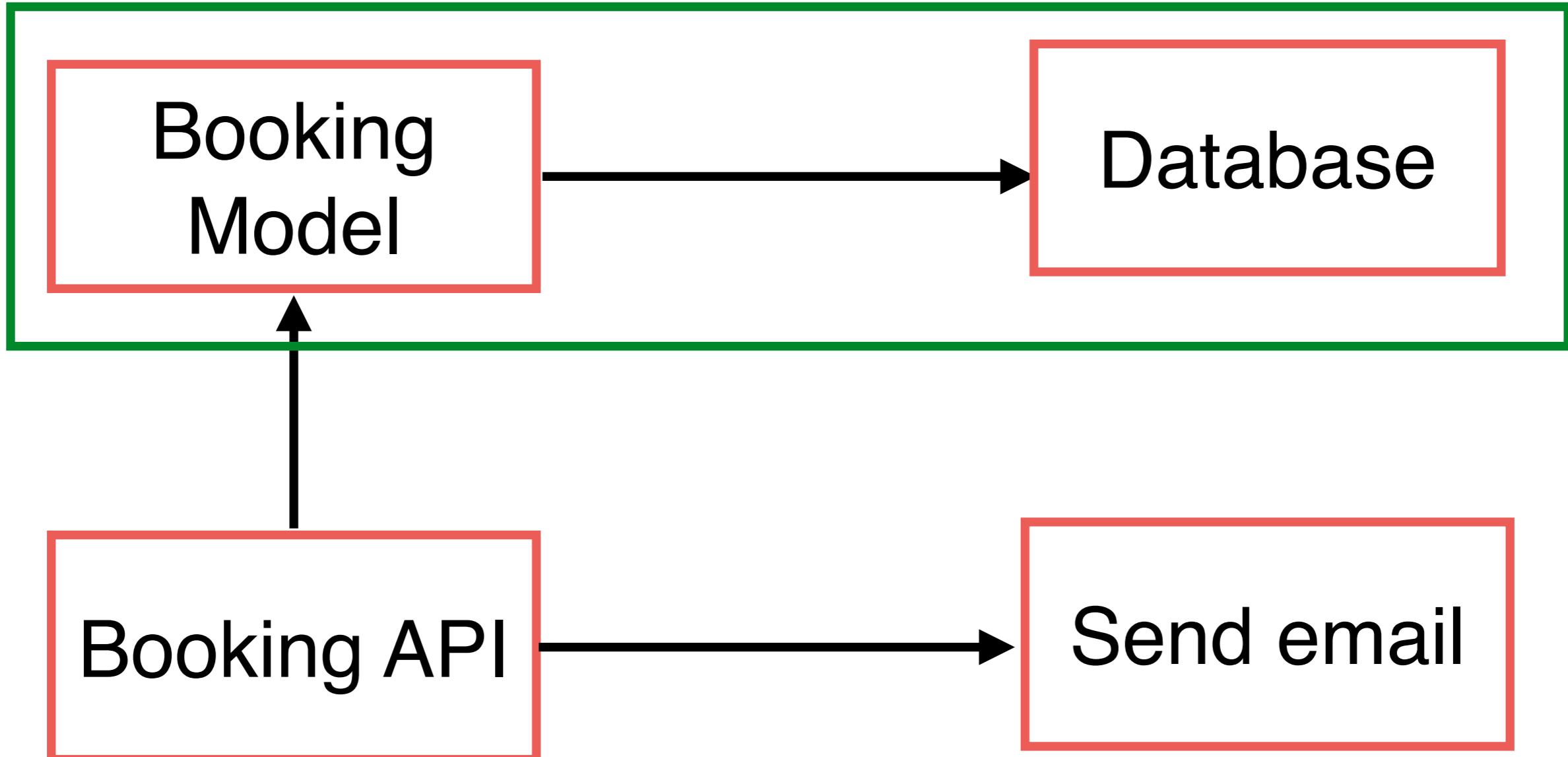
Knex

Sequelize ORM
TypeORM



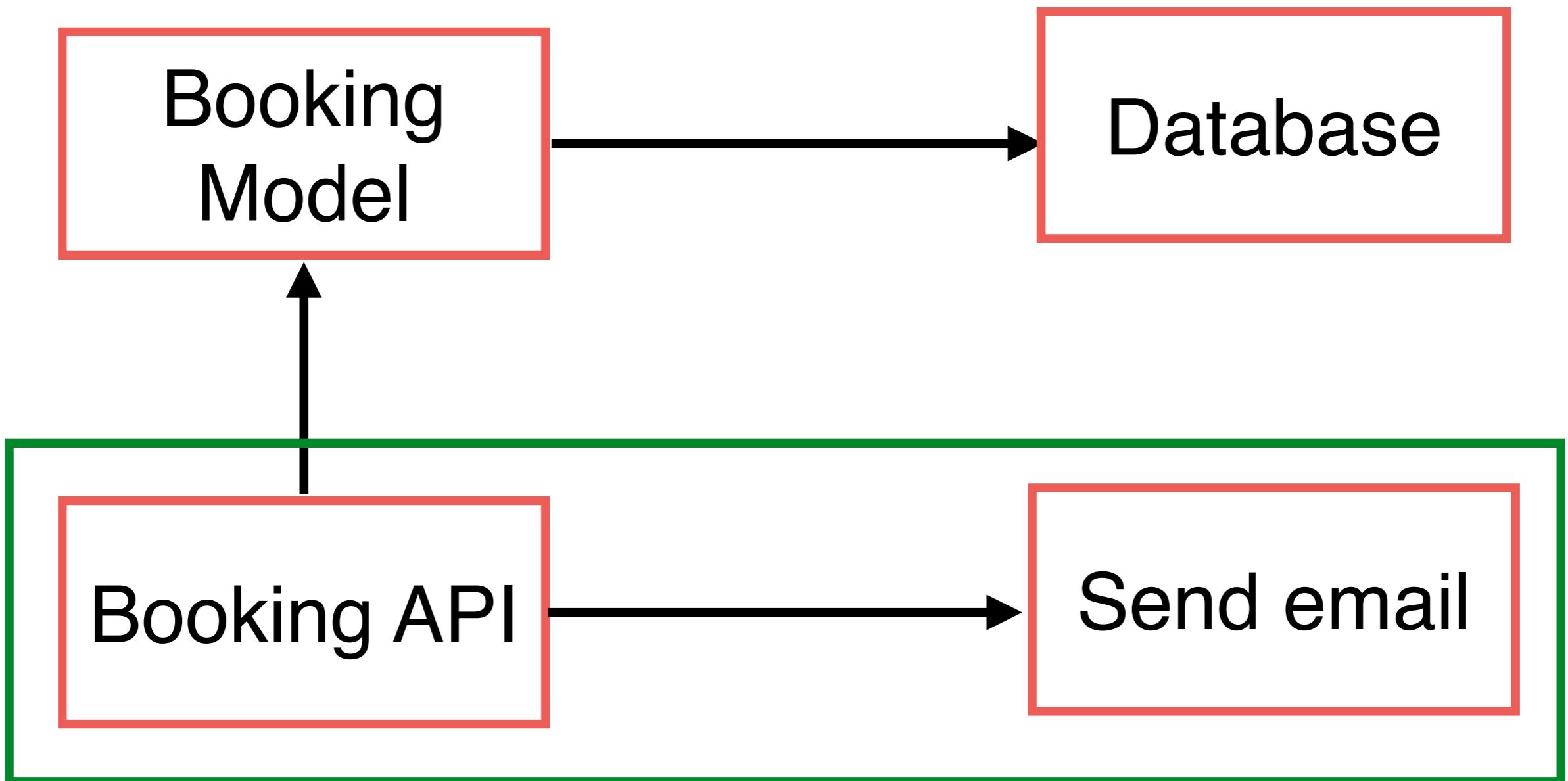
Testing relationship ::

Integration test



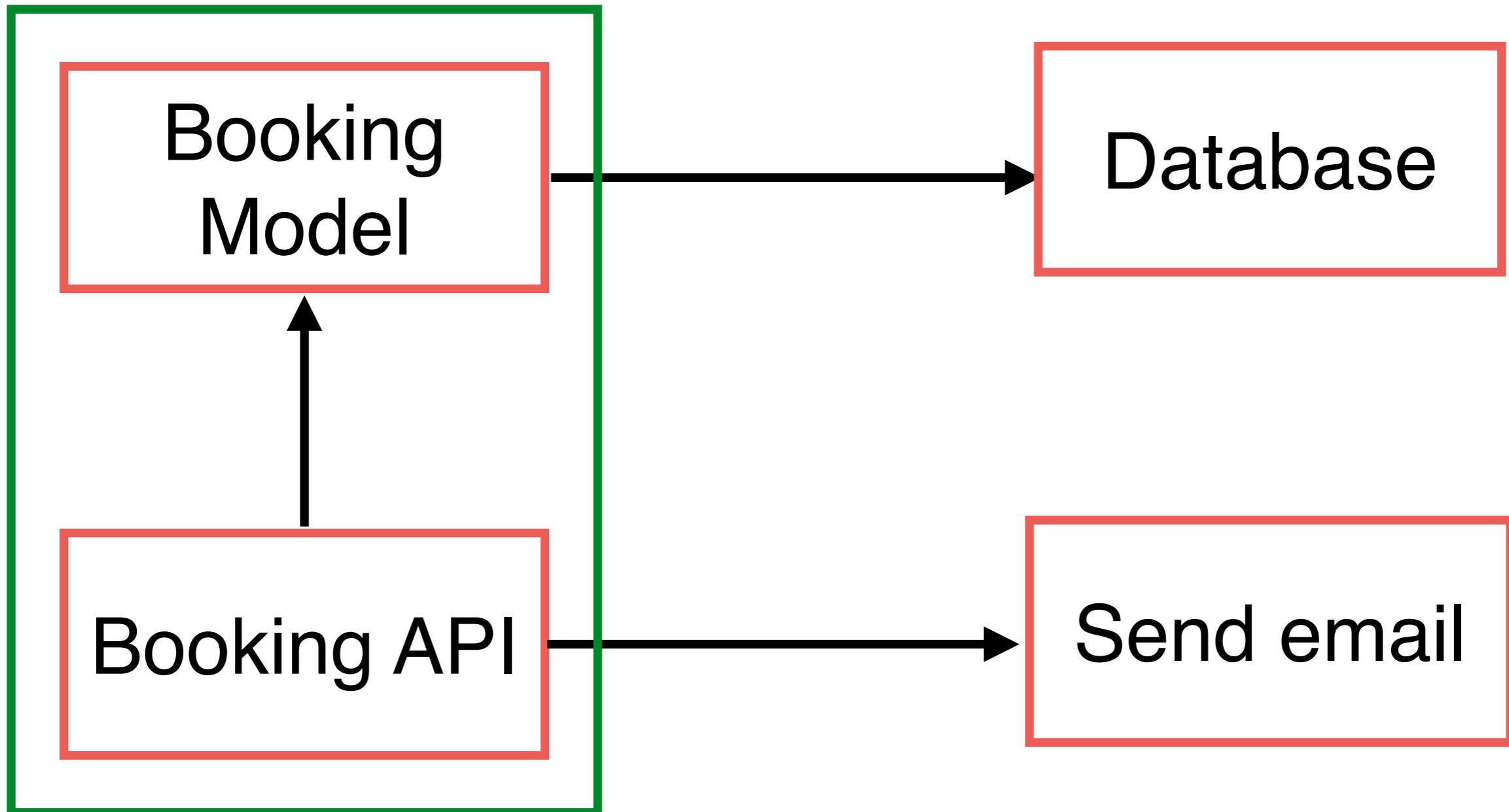
Testing relationship ::

Integration test



Testing relationship ::

Integration test



What to tests ?

