EVENTS AND SOCKET.IO

Building real-time software

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- An instance of the “observer/observable” a.k.a “pub/sub” pattern
- Feels at-home in an *event*-driven environment

PRACTICAL USES

- Represent multiple asynchronous events on a single entity.

```
var upload = uploadFile();

upload.on('error', function (e) {
    e.message; // World exploded!
});

upload.on('progress', function (percentage) {
    setProgressOnBar(percentage);
});

upload.on('complete', function (fileUrl, totalUploadTime) {

});
```

ALL OVER NODE

- server.on(‘request’)
- request.on(‘data’) / request.on(‘end’)
- process.stdin.on(‘data’)
- db.on(‘connection’)
- Streams

HTTP, PART 2

Sequels are always worse than the original

WHAT WE KNOW ABOUT HTTP

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- Responses can include a body (payload)

The New York Times

FIFA WORLD CUP
Brasil

LIVE WORLD CUP COVERAGE

- A user visits a web page
- This web page has a live updating list of game coverage (“events”) provided by New York Times commentator (“Brazil receives yellow card”/“Germany scores goal”)
- When the event line is submitted by the commentator, it should immediately display to the user

HTTP LONG POLLING

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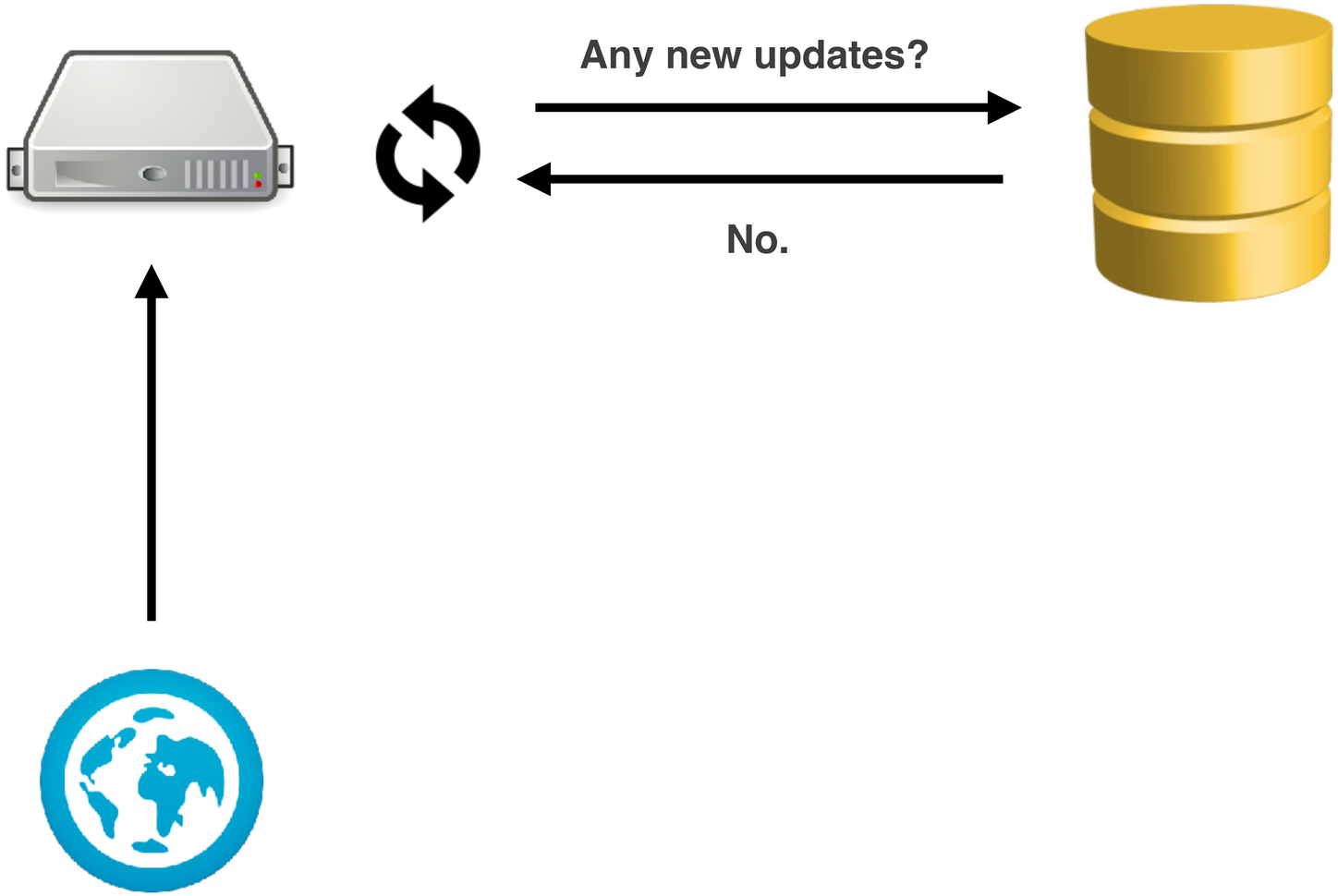

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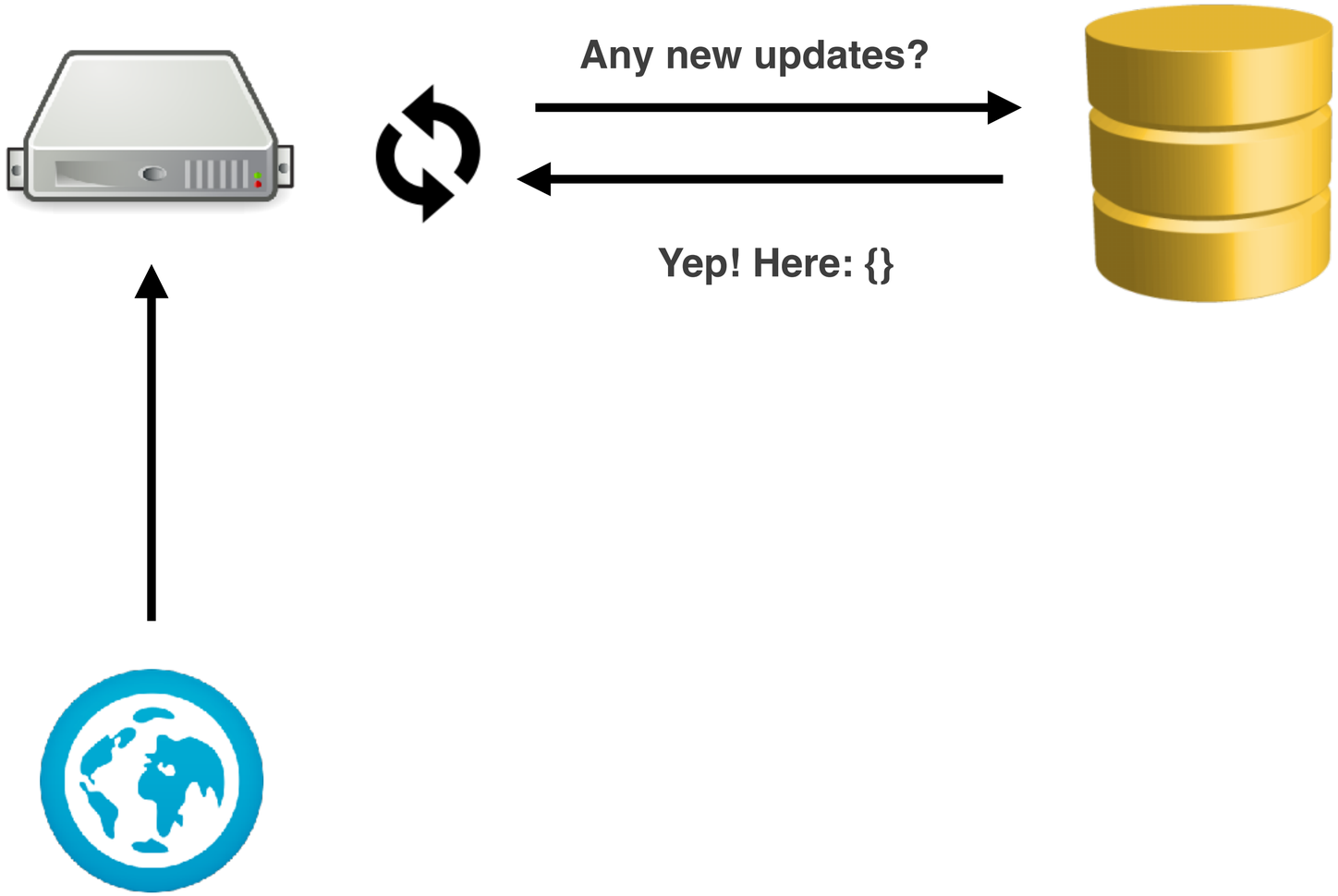

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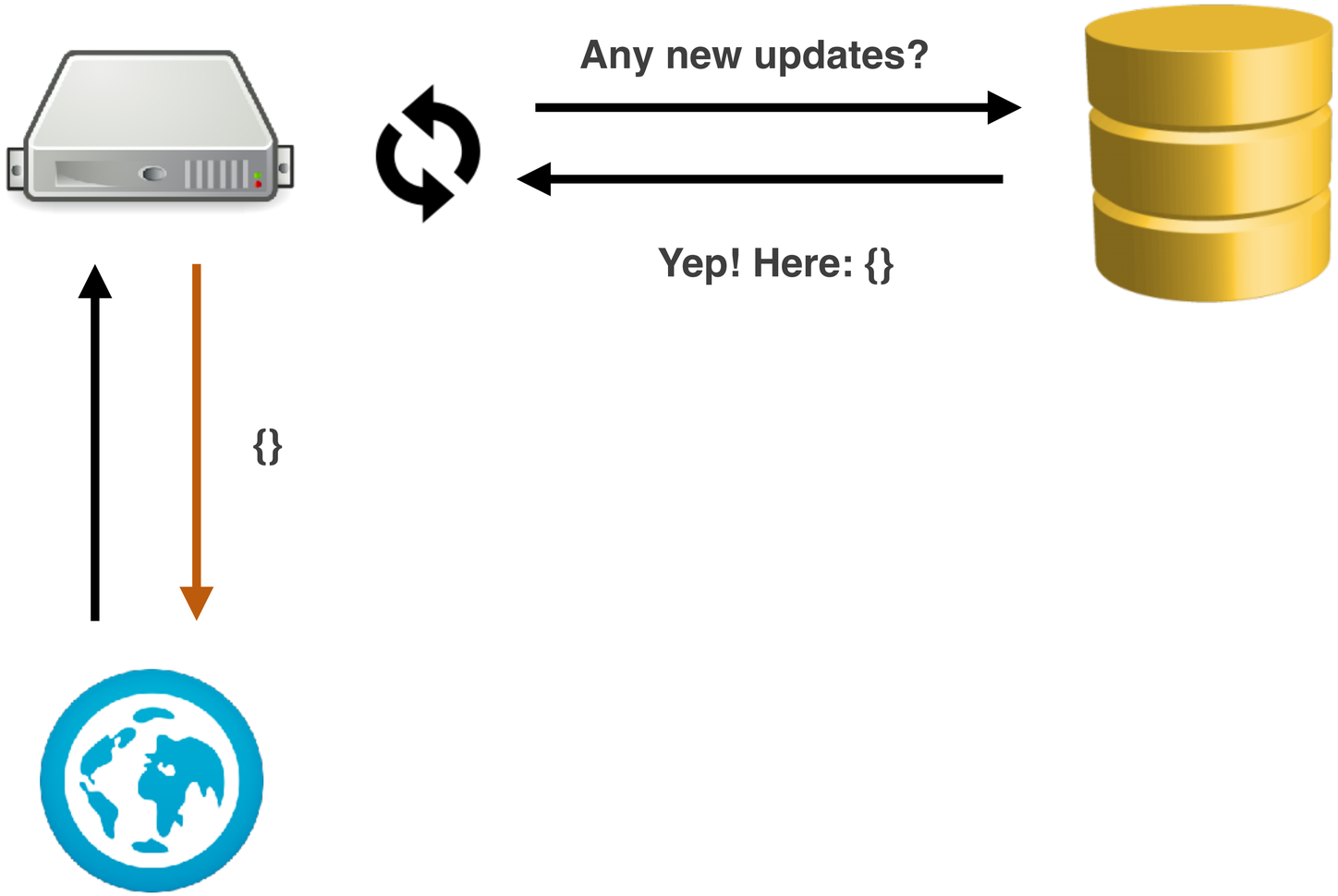

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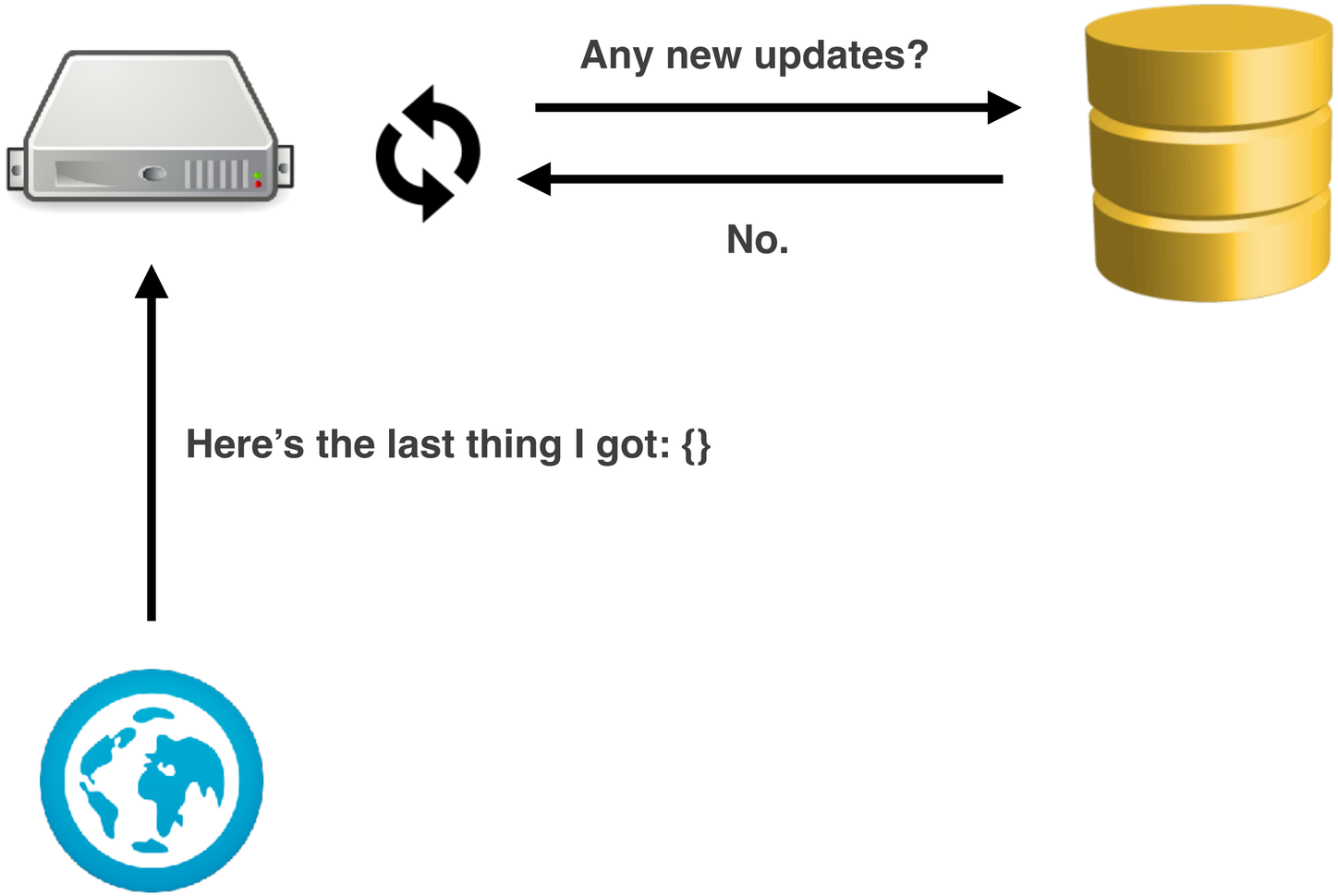

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- No live updates without long polling 😢

TCP

Transmission Control Protocol

TCP

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- **TCP is a *transport* layer protocol**

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  - But “HTTP only presumes a reliable transport; any protocol that provides such guarantees can be used” — HTTP 1.1 Spec
  - HTTPS, for instance, operates over TLS on port 443
- **Implements the idea of a “session”, which establishes a TCP socket for the client to make requests and the server to issue responses**

CLIENT OPENS A TCP CONNECTION TO SERVER

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let’s synchronize!

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ok!

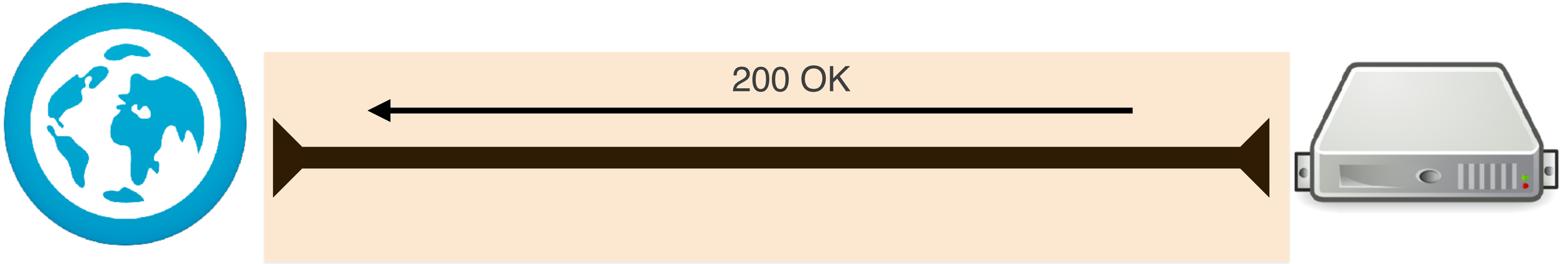
TCP CONNECTION IS ESTABLISHED

CLIENT SENDS A REQUEST

(over the connection)

SERVER SENDS A RESPONSE

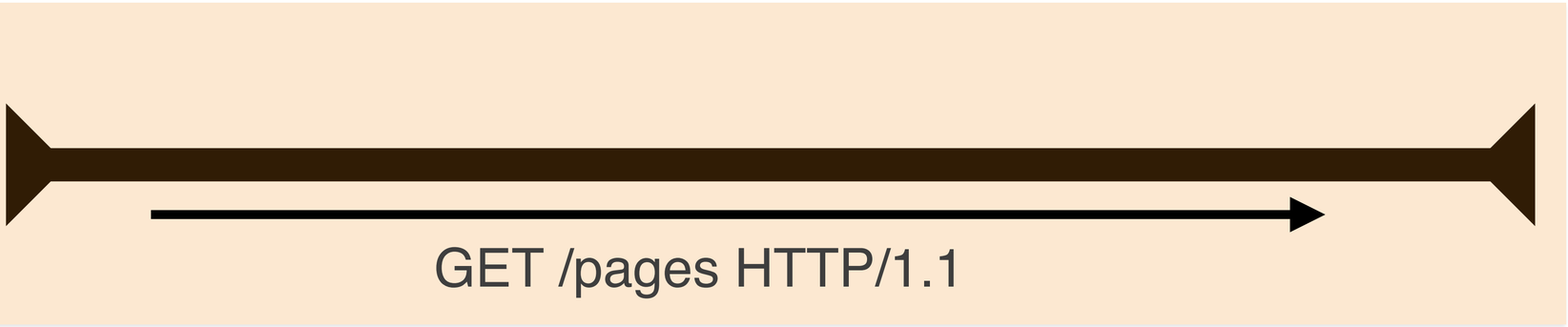
(over the connection)



TCP CONNECTION STAYS OPEN

CLIENT SENDS MORE REQUESTS

(over the same connection)



SERVER SENDS MORE RESPONSES

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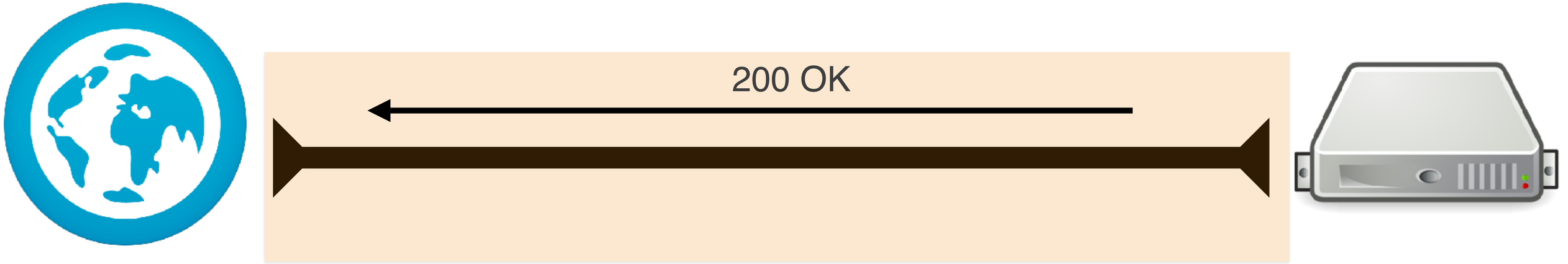

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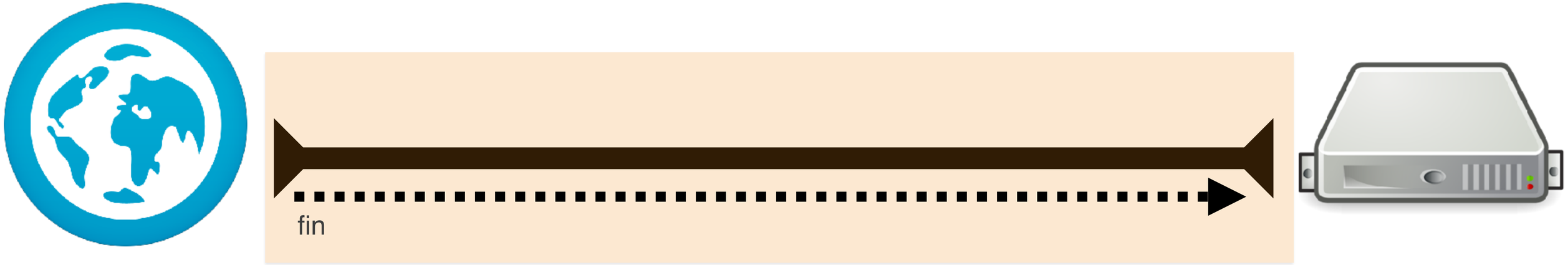

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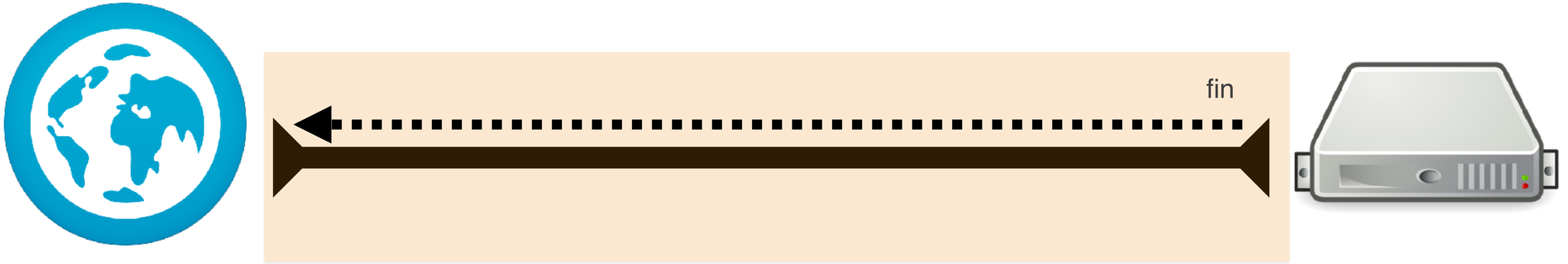

AND ONE OF YOU ENDS THE CONNECTION

HTTP 1.1 REQUEST / RESPONSE CYCLE

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HTTP 1.1 REQUEST / RESPONSE CYCLE

- **Client sends a request**
- **Server sends a response**
- **Server can't "push" more data to the client unless the client makes another request**
  - …Even though there's this tasty TCP connection just sitting around

WEBSOCKETS AND SOCKET.IO

WEBSOCKETS START WITH HTTP

Client says:

Server replies:

WEBSOCKETS START WITH HTTP

Client says:

GET /chat HTTP/1.1

Host: server.example.com

Upgrade: websocket

Connection: Upgrade

Sec-WebSocket-Key: x3JJHMbDL1EzLkh9GBhXDw==

Sec-WebSocket-Protocol: chat, superchat

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HTTP/1.1 101 Switching Protocols

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And now WebSocket has taken over the connection.

SOCKET.IO

- **You don’t have to implement that**
- **Socket.IO is a duet of libraries (one for server-side [node.js] and one for client-side [the browser])**
- **Abstracts the complex implementation of websockets for easy use**
- **Extensively uses** EventEmitter**s**
  - EventEmitters are a good fit for a message-based protocol

USE CASES

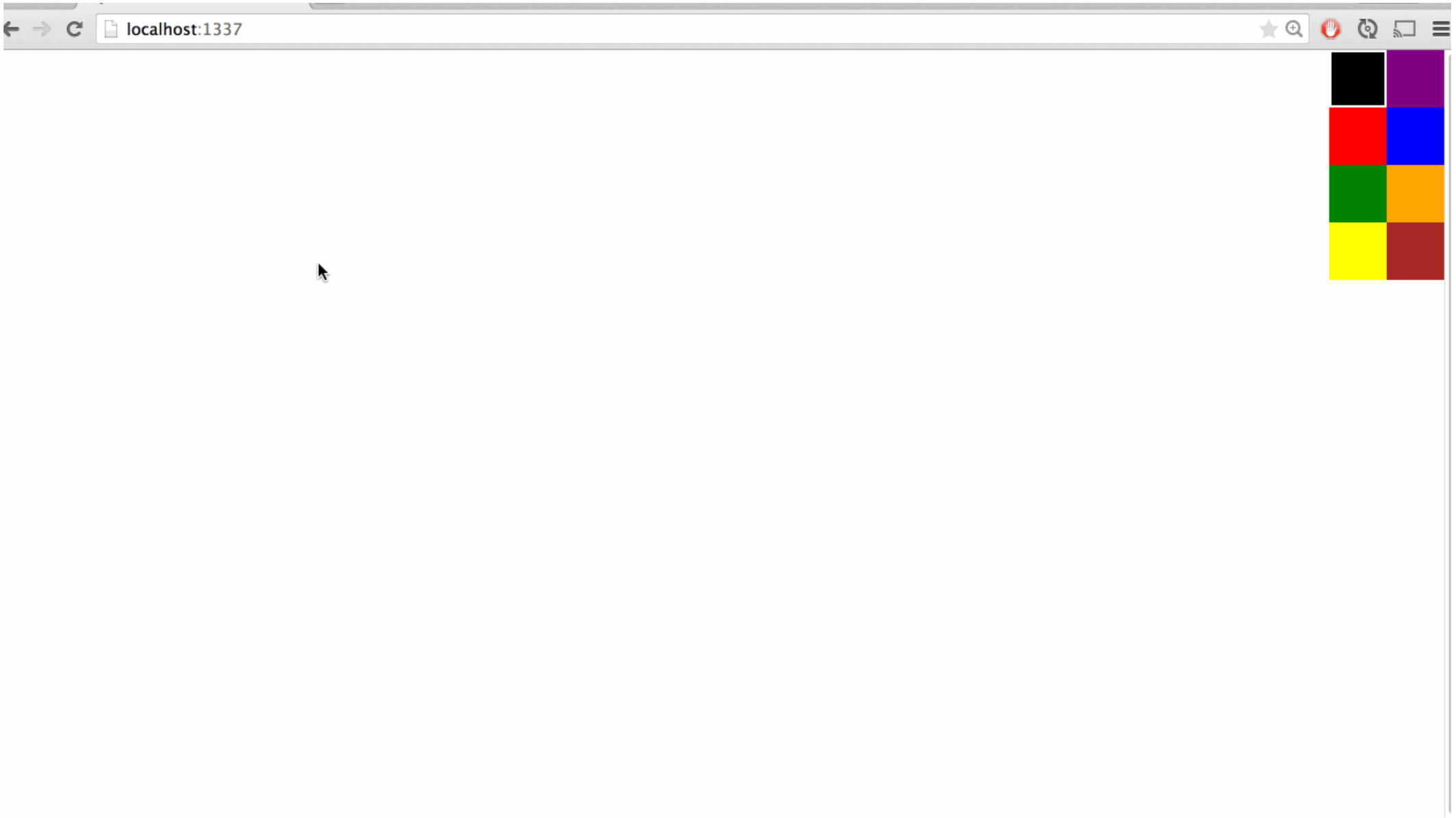
- Networked enabled games
- Chat applications
- Collaborative applications
- Any “real-time” software

DRAWBACKS

- **The server now *must* hold on to the connection**
- **Connections are expensive (they require memory within the operating system)**
- **If a socket sits dormant for a long time, it's wasting server resources.**
  - You could fix this in your app, though! You have the power!

OTHER SOCKET.IO NOTES

- Documentation leaves a lot to be desired
- Automatically uses fallbacks for different capabilities and environments (long polling, Flash)
- Has “rooms” and “namespaces” for socket organization
- Can “broadcast” to all sockets within a “room”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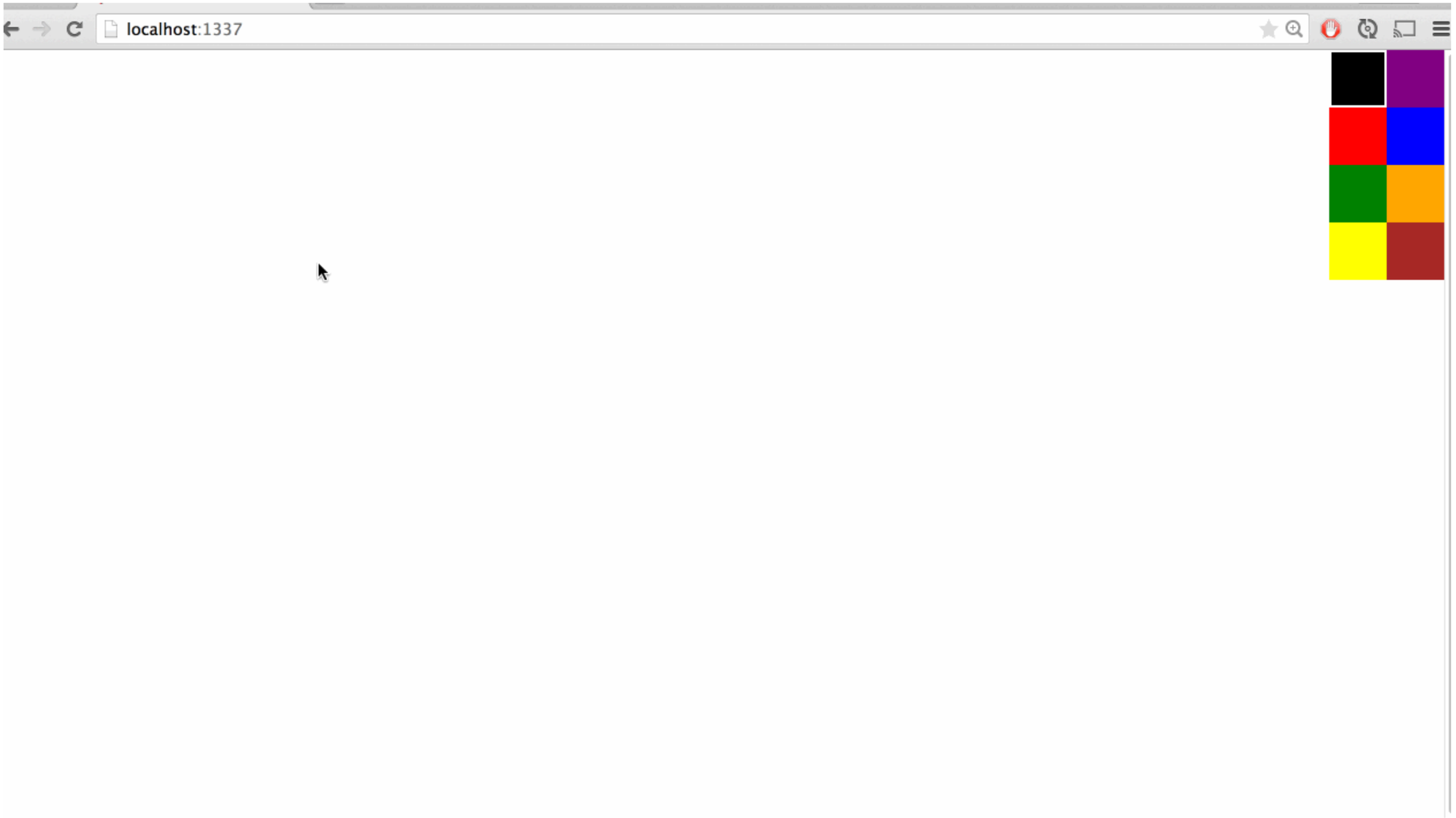
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