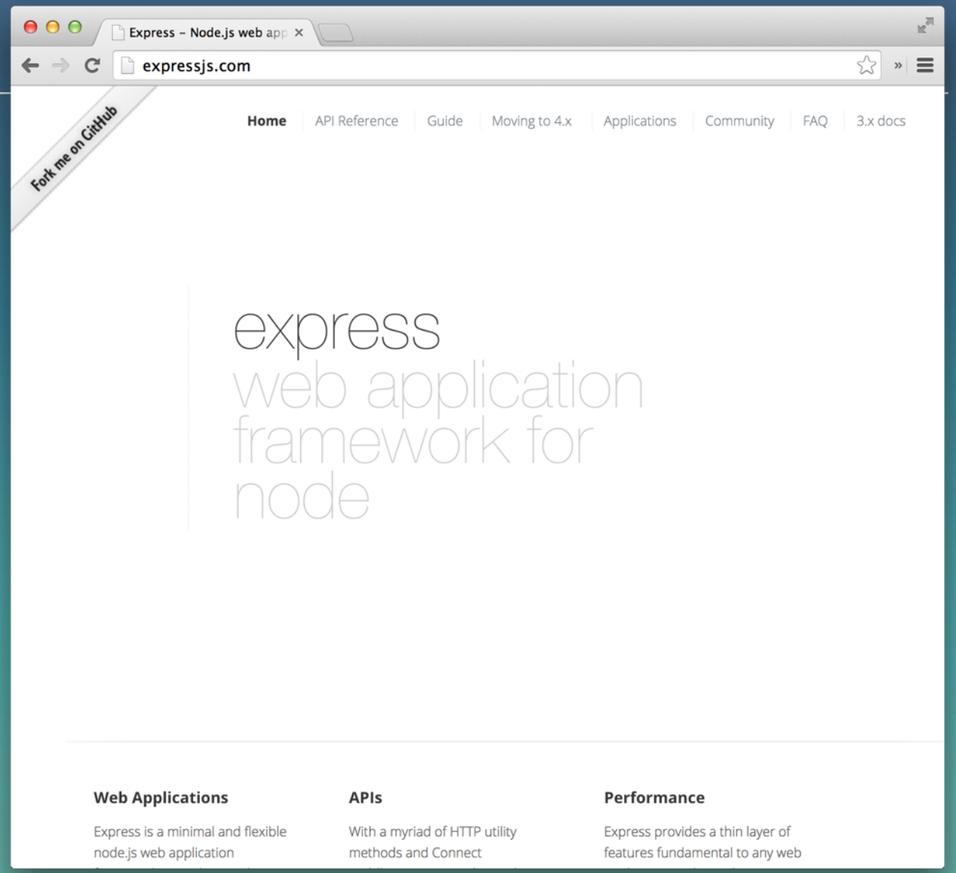
First Steps

Level 1

What Express Is

A web application framework for Node

- Minimal and flexible
- Great for building **Web APIs**
- Popular services built on Express
  i.e. **MySpace, Ghost** and more
- Foundation for other tools and frameworks, like **Kraken** and **Sails**



Installing Express

Node Package Manager

Use **npm** to install the latest stable version


```
$ npm install express
```

Use @ to install a specific version

```
$ npm install express@4.9
$ npm install express@3.15.2
```

installs latest version from the 4.9 branch

installs specific version

This course covers version 4.9.x

Code seen here should run on any version of Express which starts with 4.9 (i.e. 4.9.1, 4.9.2, 4.9.3, etc.)

Writing Hello World

Calling the **express** function gives us an **application instance**

application instance

app.js

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

Writing Hello World

The **app.get** function creates a route that accepts **GET** requests

app.js

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

app.get('/', function(request, response) {
  response.send('Hello world');
});

app.listen(3000);
```

binds application
to tcp port **3000**

sends back server response

built-in functions
named after HTTP verbs

```
app.post(...)
app.put(...)
app.patch(...)
app.delete(...)
...
```

Writing Hello World

The **app.listen** function takes an optional callback, which is called once the app is ready to start taking requests

app.js

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

app.get('/', function(request, response) {
  response.send('Hello world');
});

app.listen(3000, function() {
  console.log('Listening on port 3000');
});
```

printed to the console

Running our Express app

Start the server with the **node** command

```
$ node app.js
Listening on port 3000
```

Changes to code require a **server restart.**

Requests with **curl**

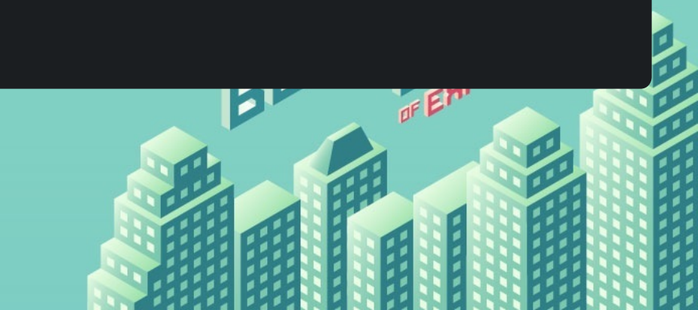
```
$ curl http://localhost:3000/

Hello world
```

server response

Control + C stops the server

```
$ node app.js
Listening on port 3000
^C
```

interrupts current process



The Request and Response objects

Express extends Node HTTP objects

app.js

```
app.get('/', function(request, response) {
  ...
});
```

Express **source code**

https://github.com/strongloop/express

lib/request.js

```
var req = exports = module.exports = {
  __proto__: http.IncomingMessage.prototype
};
...
```

objects from Node HTTP

inheritance in JavaScript

lib/response.js

```
var res = module.exports = {
  __proto__: http.ServerResponse.prototype
};
...
```

Calling Node's HTTP functions

We can respond from Express using Node's **write** and **end** functions

app.js

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

app.get('/', function(request, response) {
  response.write('Hello world');
  response.end();
});

app.listen(3000);
```

using Node API

…very useful when we start writing "extensions" for Express

same thing

```
response.send('Hello world')
```

using Express API

Response from both

```
$ curl http://localhost:3000/

Hello world
```

Responding with JSON

The send function converts **Objects and Arrays** to JSON

app.js

```
app.get('/blocks', function(request, response) {
  var blocks = ['Fixed', 'Movable', 'Rotating'];
  response.send(blocks);
});
```

use **-i** to print response headers

```
$ curl -i http://localhost:3000/blocks

HTTP/1.1 200 OK
X-Powered-By: Express
Content-Type: application/json; charset=utf-8

["Fixed","Movable","Rotating"]
```

sets proper **response headers**

Using the response.json function

The **json** function reads better when all we respond with is JSON

app.js

```
app.get('/blocks', function(request, response) {
  var blocks = ['Fixed', 'Movable', 'Rotating'];
  response.json(blocks);
});
```

Same response as **send**, for Objects and Arrays

```
$ curl -i http://localhost:3000/blocks

HTTP/1.1 200 OK
X-Powered-By: Express
Content-Type: application/json; charset=utf-8

["Fixed","Movable","Rotating"]
```

Responding with HTML

The **send** function converts strings to **HTML**

app.js

```
app.get('/blocks', function(request, response) {
  var blocks = '<ul><li>Fixed</li><li>Movable</li></ul>';
  response.send(blocks);
});
```

Responds with **text/html**

```
$ curl -i http://localhost:3000/blocks

HTTP/1.1 200 OK
X-Powered-By: Express
Content-Type: text/html; charset=utf-8

<ul><li>Fixed</li><li>Movable</li></ul>
```

For server-side templates, checkout **EJS** or **Jade**

Redirecting to relative path

The **redirect** function sets the proper response headers

app.js

```
app.get('/blocks', function(request, response) {
  response.redirect('/parts');
});
```

```
$ curl -i http://localhost:3000/blocks

HTTP/1.1 302 Moved Temporarily
X-Powered-By: Express
Location: /parts
Content-Type: text/plain; charset=utf-8

Moved Temporarily. Redirecting to /parts
```

Redirecting with custom status code

The **status code** can be passed as the first argument to **redirect**

app.js

```
app.get('/blocks', function(request, response) {
  response.redirect(301, '/parts');
});
```

optional status code

```
$ curl -i http://localhost:3000/blocks

HTTP/1.1 301 Moved Permanently
X-Powered-By: Express
Location: /parts
Content-Type: text/plain; charset=utf-8

Moved Permanently. Redirecting to /parts
```

Middleware

How They Work

Level 2 - Part I

Rich JavaScript Applications

They allow for a more **interactive** experience on the web.

Let's build this using **Express!**

Writing index.html

Place HTML files under the **public** folder

app.js
public/
index.html

index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <title>Building Blocks</title>
</head>
<body>
  <h1>Blocks</h1>
</body>
</html>
```

Serving files with sendFile

The **index.html** file is served from Express

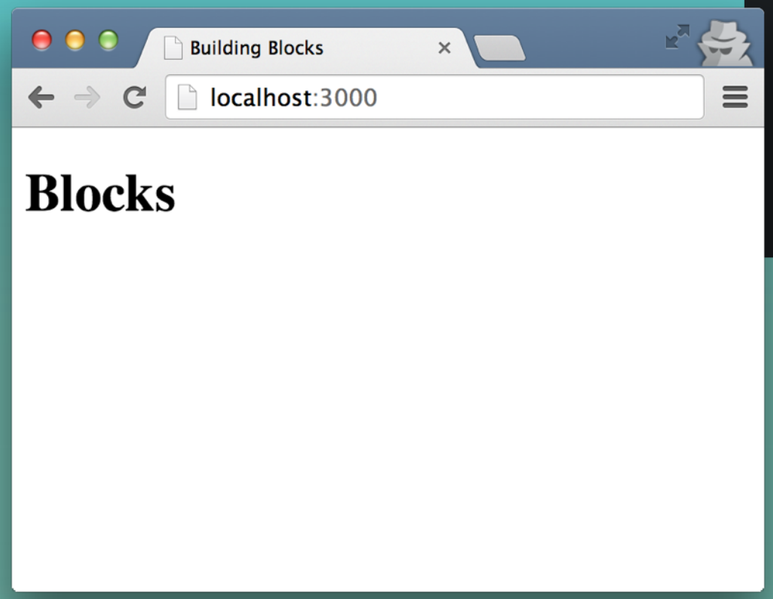
app.js

public/

index.html

app.js

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

app.get('/', function(request, response) {
  response.sendFile(__dirname + '/public/index.html');
});

app.listen(3000);
```



name of the directory the currently executing script resides in

Mounting middleware

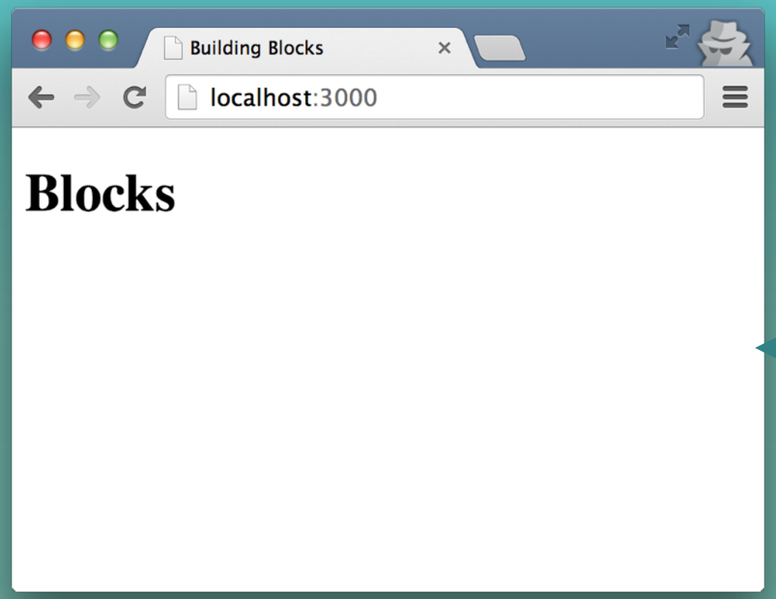
The **app.use** function adds middleware to the application stack

app.js
public/
index.html

app.js

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

app.use(express.static('public'));

app.listen(3000);
```

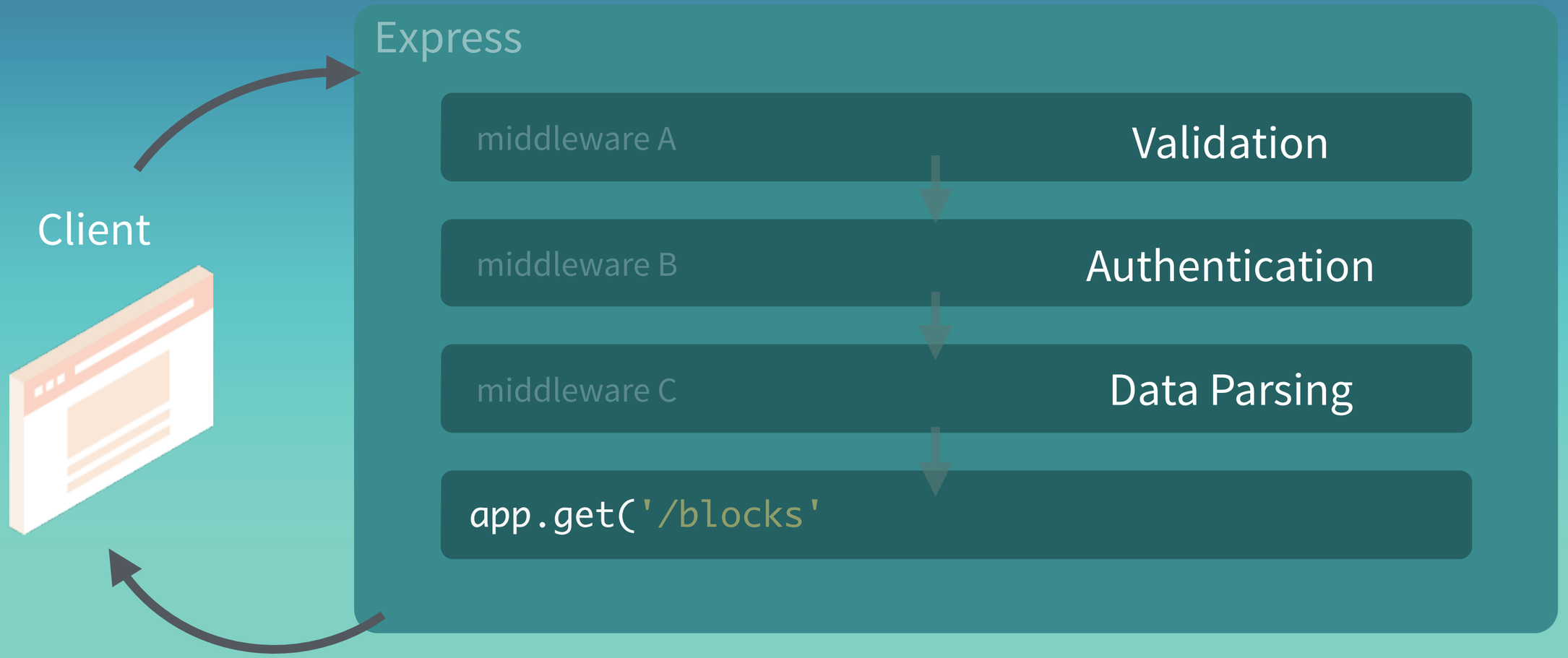
static middleware serving files from the **public** folder



same result!

Understanding Middleware

Functions executed **sequentially** that access **request** and **response**

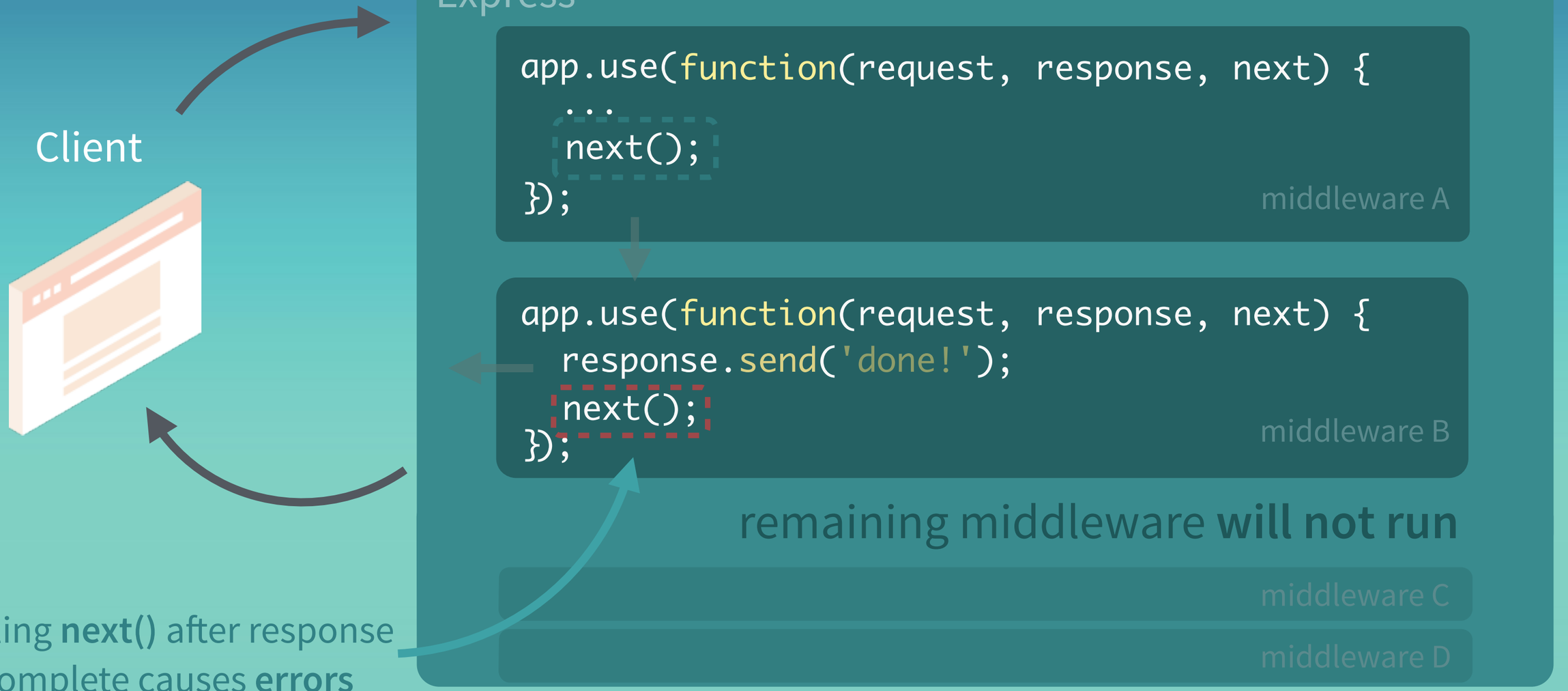


Executing Middleware functions

When **next** is called, processing moves to the next middleware.

Returning from Middleware functions

The flow **stops** once the response is sent back to the client



Reading the static Middleware source

The code for **static** is a good example of Express Middleware

source code from static

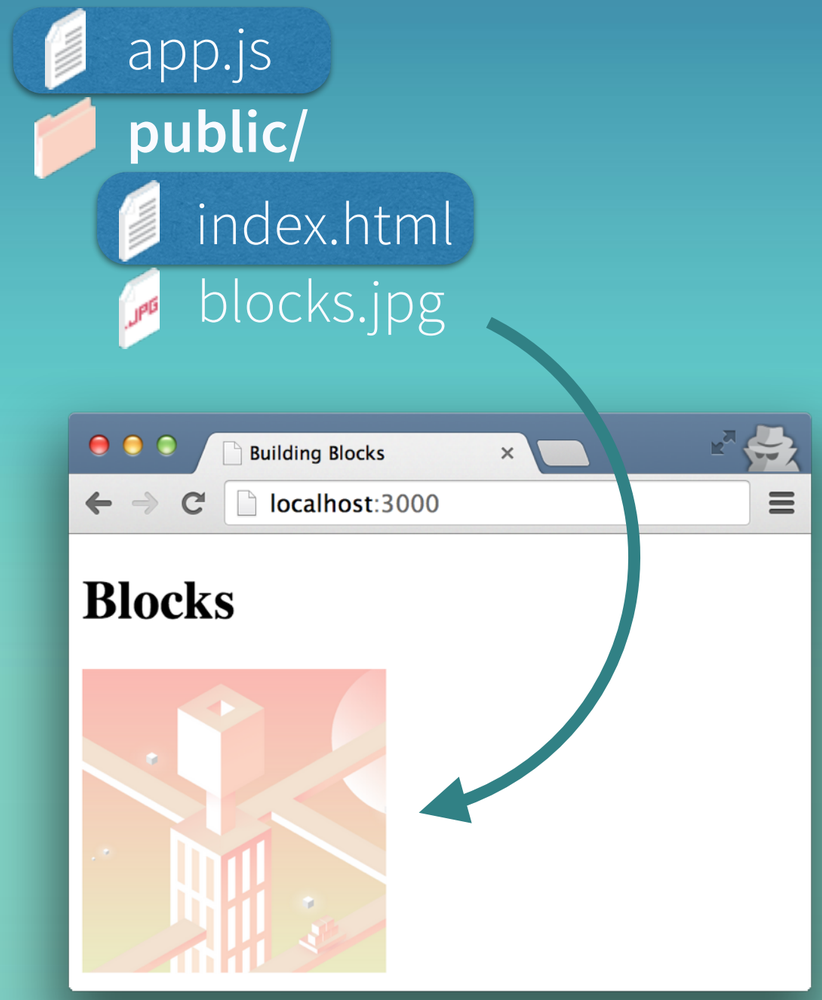
index.js

https://github.com/expressjs/serve-static

```
exports = module.exports = function serveStatic(root, options) {
  ...
  return function serveStatic(req, res, next) {
    if (req.method !== 'GET' && req.method !== 'HEAD') {
      return next()
    }
    ...
    stream.pipe(res)
  }
}
```

Serving static assets

The static middleware serves **everything** under the specified folder



app.js

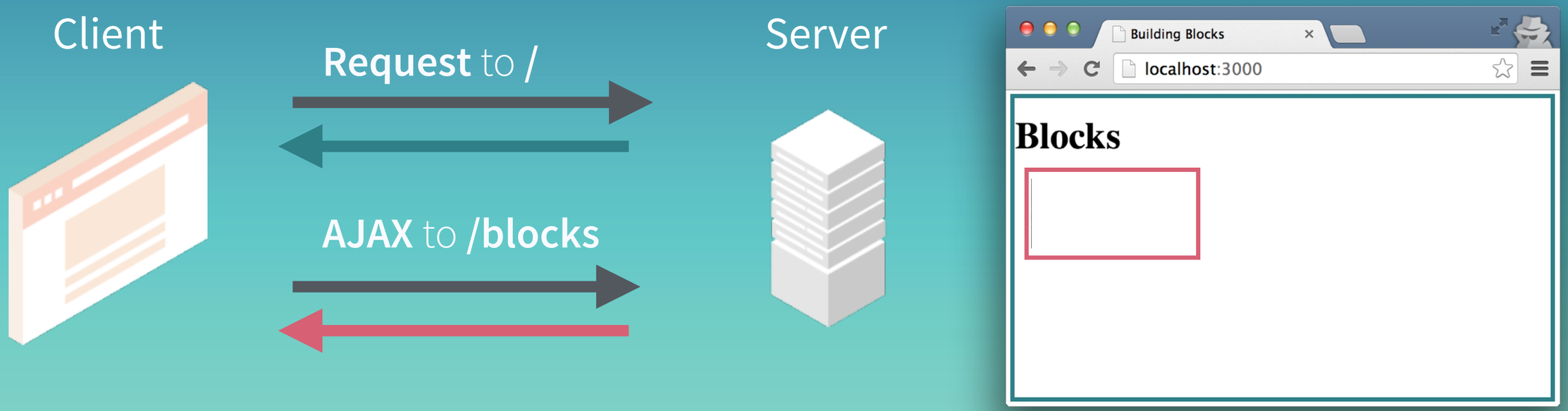
```
app.use(express.static('public'));
```

index.html

```
<!DOCTYPE html>
...
<body>
  <h1>Blocks</h1>
  <p><img src='blocks.png'></p>
</body>
</html>
```

Fetching a List of Blocks

Loading **data** from Express with AJAX calls



Adding client-side JavaScript

Place all files under the **public** folder

index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <title>Building Blocks</title>
  <link rel="stylesheet" href="style.css" />
</head>
<body>
  <h1>Blocks</h1>

  <ul class='block-list'></ul>

  <script src="jquery.js"></script>
  <script src="client.js"></script>
</body>
</html>
```

Making AJAX calls

Request to **/blocks,** then append results to **block-list**

returns blocks in **JSON** format

client.js

```
$(function(){

  $.get('/blocks', appendToList);

  function appendToList(blocks) {
    var list = [];
    for(var i in blocks){
      list.push($('<li>', { text: blocks[i] }));
    }
    $('.block-list').append(list);
  }
});
```

Responding with JSON

app.js

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

app.use(express.static('public'));

app.get('/blocks', function(request, response) {
  var blocks = ['Fixed', 'Movable', 'Rotating'];
  response.json(blocks);
});

app.listen(3000);
```

Middleware

Writing Our Own

Level 2- Part II

Writing the logger module

We assign our logger function to **module.exports** in order to export it as a Node module and make it accessible from other files

logger.js

```
module.exports = function(request, response, next) {



}
```

*The Node module system follows the **CommonJS** specification*

Tracking the start time for the request

We use the **Date** object to track the start time.

logger.js

```
module.exports = function(request, response, next) {
  var start = +new Date();

  next();
}
```

plus sign converts date Object
to **milliseconds**

moves request to the **next**
middleware in the stack

Assigning the readable stream

Standard out is a **writeable stream** which we will be writing the log to

logger.js

```
module.exports = function(request, response, next) {
  var start = +new Date();
  var stream = process.stdout;



  next();
}
```

Reading the url and HTTP method

The **request** object gives us the **requested URL** and the HTTP **method** used

logger.js

```
module.exports = function(request, response, next) {
  var start = +new Date();
  var stream = process.stdout;
  var url = request.url;
  var method = request.method;


  next();
}
```

Listening for the finish event

The **response** object is an **EventEmitter** which we can use to **listen** to events

logger.js

```
module.exports = function(request, response, next) {
  var start = +new Date();
  var stream = process.stdout;
  var url = request.url;
  var method = request.method;

  response.on('finish', function() {
    ...
  });

  next();
}
```

event handler function runs **asynchronously**

the **finish** event is emitted when the response has been handed off to the OS

Calculating the request interval

logger.js

```
module.exports = function(request, response, next) {
  var start = +new Date();
  var stream = process.stdout;
  var url = request.url;
  var method = request.method;

  response.on('finish', function() {
    var duration = +new Date() - start;
    ...
  });
  next();
}
```

Calculate the duration of the request

Composing the log message

logger.js

```
module.exports = function(request, response, next) {
  var start = +new Date();
  var stream = process.stdout;
  var url = request.url;
  var method = request.method;

  response.on('finish', function() {
    var duration = +new Date() - start;
    var message = method  + ' to ' + url +
      '\ntook ' + duration + ' ms \n\n';

    ...
  });
  next();
}
```

Printing and moving along

We call the **write** function on the writeable **stream** in order to print the log

logger.js

```
module.exports = function(request, response, next) {
  var start = +new Date();
  var stream = process.stdout;
  var url = request.url;
  var method = request.method;

  response.on('finish', function() {
    var duration = +new Date() - start;
    var message = method  + ' to ' + url +
      '\ntook ' + duration + ' ms \n\n';
    stream.write(message);
  });
  next();
}
```

prints the log message

Using the logger module

We **require** and **use** our logger module in our application

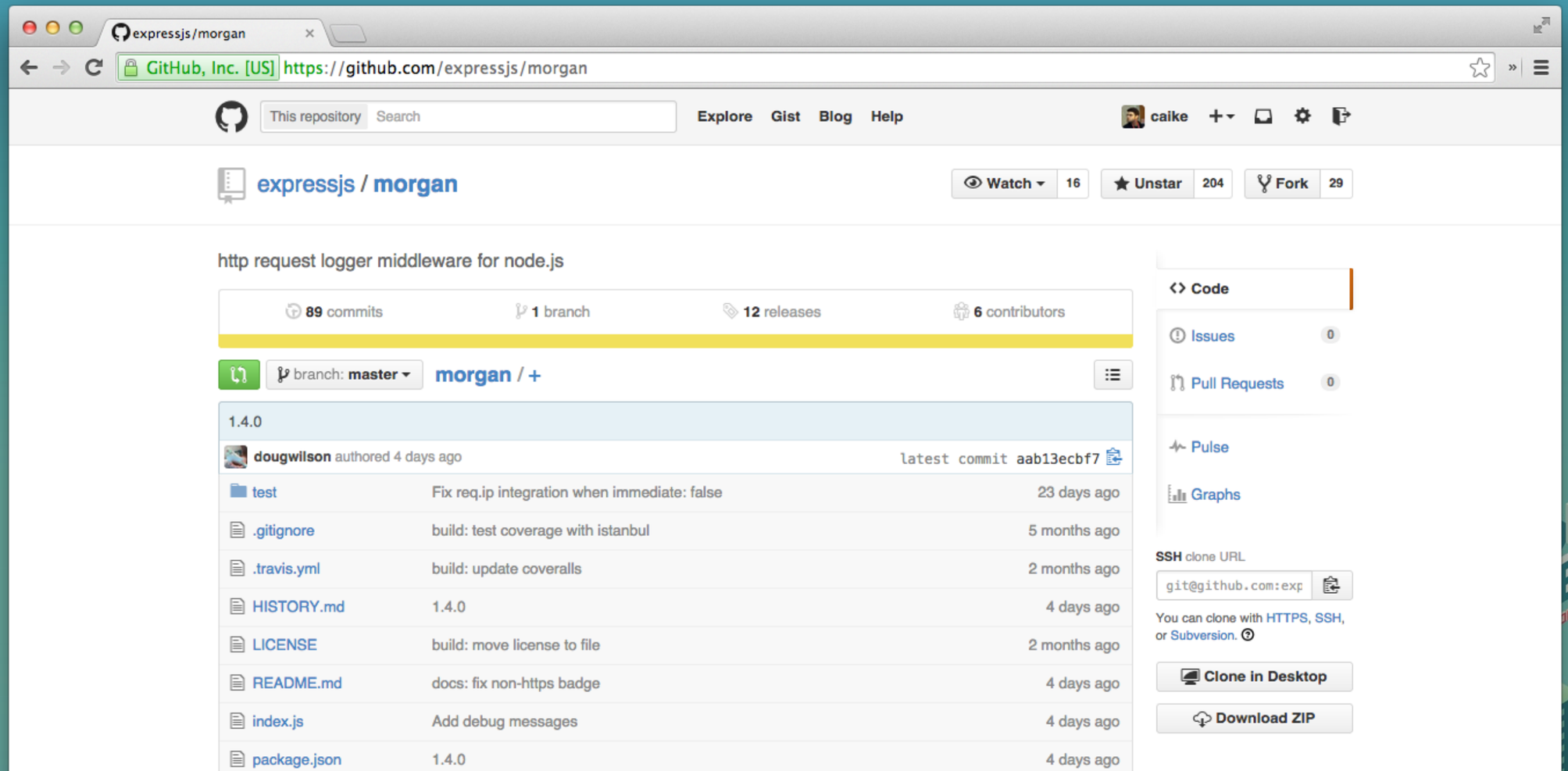
require and use our module

app.js

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

var logger = require('./logger');
app.use(logger);

app.use(express.static('public'));

app.get('/blocks', function(request, response) {
  var blocks = ['Fixed', 'Movable', 'Rotating'];
  response.json(blocks);
});

app.listen(3000, function () {
  console.log('Listening on 3000 \n');
});
```

Reading the source for Morgan

https://github.com/expressjs/morgan



User Params

Reading from the URL

Level 3 - Part I

Always returning all the Blocks

To improve efficiency, we want to be able to **limit** the number of results returned

app.js

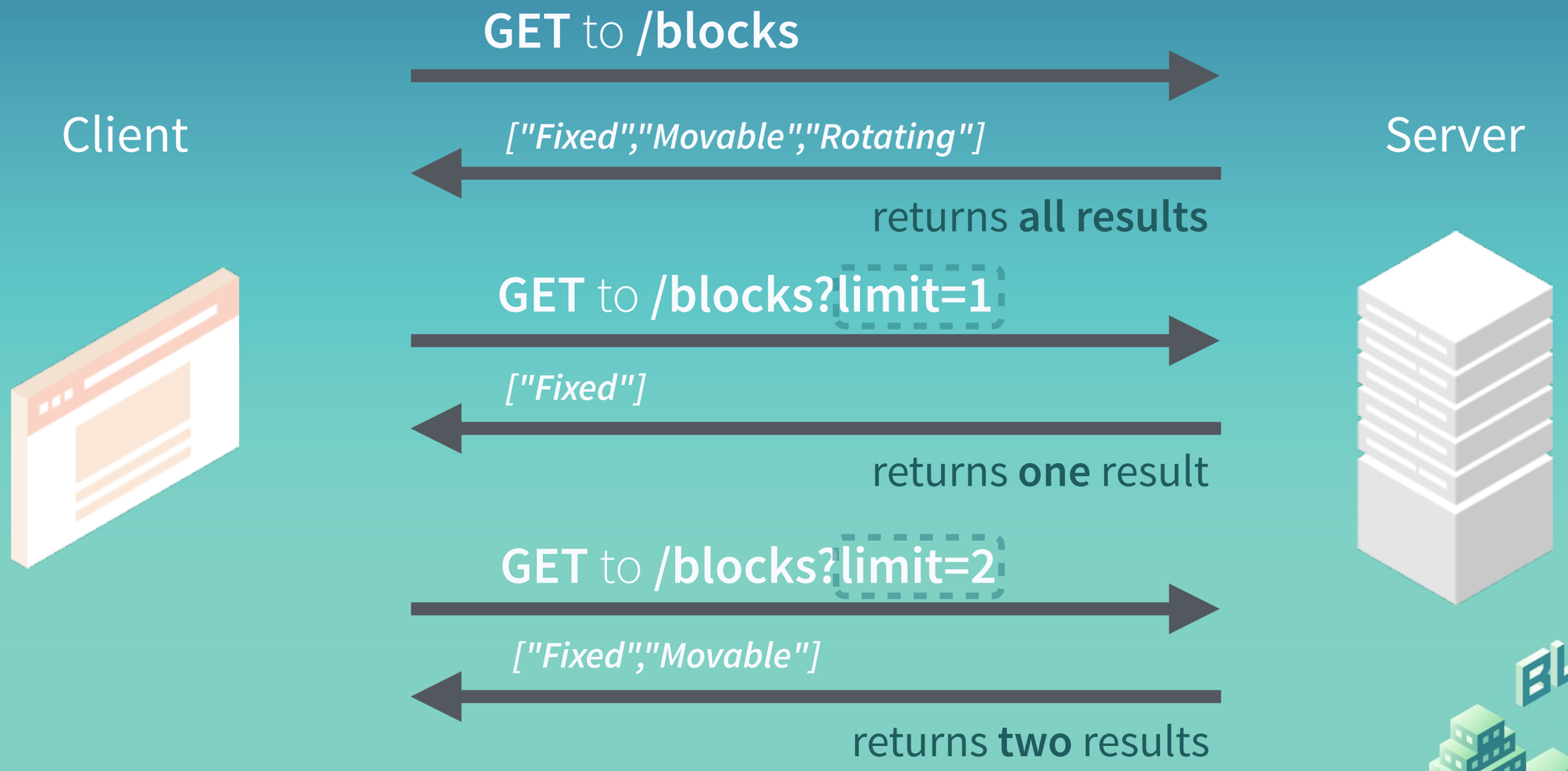
```
var express = require('express');
var app = express();

app.get('/blocks', function(request, response) {
  var blocks = ['Fixed', 'Movable', 'Rotating'];
  response.json(blocks);
});

app.listen(3000);
```

```
$ curl http://localhost:3000/blocks

["Fixed","Movable","Rotating"]
```

always returns **all the Blocks**

Limiting the number of Blocks returned

Query strings are a great way to **limit** the number of results returned from an endpoint



Reading query string parameters

Use **request.query** to access query strings

app.js

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

app.get('/blocks', function(request, response) {
  var blocks = ['Fixed', 'Movable', 'Rotating'];
  if (request.query.limit >= 0) {

  } else {
    response.json(blocks);
  }
});

app.listen(3000);
```

true when a numeric value for **limit** is part of the URL

returns **all results**

Reading query string parameters

The **slice** function returns a portion of an Array

app.js

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

app.get('/blocks', function(request, response) {
  var blocks = ['Fixed', 'Movable', 'Rotating'];
  if (request.query.limit >= 0) {
    response.json(blocks.slice(0, request.query.limit));
  } else {
    response.json(blocks);
  }
});

app.listen(3000);
```

returns **limited** results

Limiting results using curl

URLs with query strings can be used with **curl**

```
$ curl http://localhost:3000/blocks?limit=1

["Fixed"]
```

```
$ curl http://localhost:3000/blocks?limit=2

["Fixed","Movable"]
```

limiting results

```
$ curl http://localhost:3000/blocks

["Fixed","Movable","Rotating"]
```

all results when
no limit is used

Returning description for a specific Block

We can use **meaningful URLs** to return the description for specific types of Blocks

Client

Server

GET to **/blocks/Fixed**

200 Success

"Fastened securely in position"

description for the **Fixed** block

GET to **/blocks/Movable**

200 Success

"Capable of being moved"

description for the **Movable** block

Creating Dynamic Routes

Placeholders can be used to name arguments part of the **URL path**

app.js

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

app.get('/blocks/:name', function(request, response) {
  ...
});

app.listen(3000);
```

creates **name** property on the **request.params** object

```
request.params.name
```

Expanding our blocks list

In order to store additional information on blocks, we'll move from an Array to a JavaScript **object**

app.js

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

var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};
app.get('/blocks/:name', function(request, response) {
  ...
});
app.listen(3000);
```

can now be accessed from other routes in the file

Reading route parameters

We use **request.params.name** to look up the Block's **description**

app.js

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

var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};
app.get('/blocks/:name', function(request, response) {
  var description = blocks[request.params.name];
  ...
});

app.listen(3000);
```

Returning block description

Responding with description and proper status code

app.js

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

var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};
app.get('/blocks/:name', function(request, response) {
  var description = blocks[request.params.name];
  response.json(description);
});

app.listen(3000);
```

defaults to **200 Success** status code

Testing dynamic routes with curl

Returns proper **status codes** and response bodies

```
$ curl -i http://localhost:3000/blocks/Fixed

HTTP/1.1 200 OK
"Fastened securely in position"
```

The **-i** option tells curl to **include** response headers in the output

```
$ curl -i http://localhost:3000/blocks/Movable

HTTP/1.1 200 OK
"Capable of being moved"
```

Fixing the response for URLs not found

The status code does not indicate an **invalid** URL

```
$ curl -i http://localhost:3000/blocks/Banana

HTTP/1.1 200 OK
```

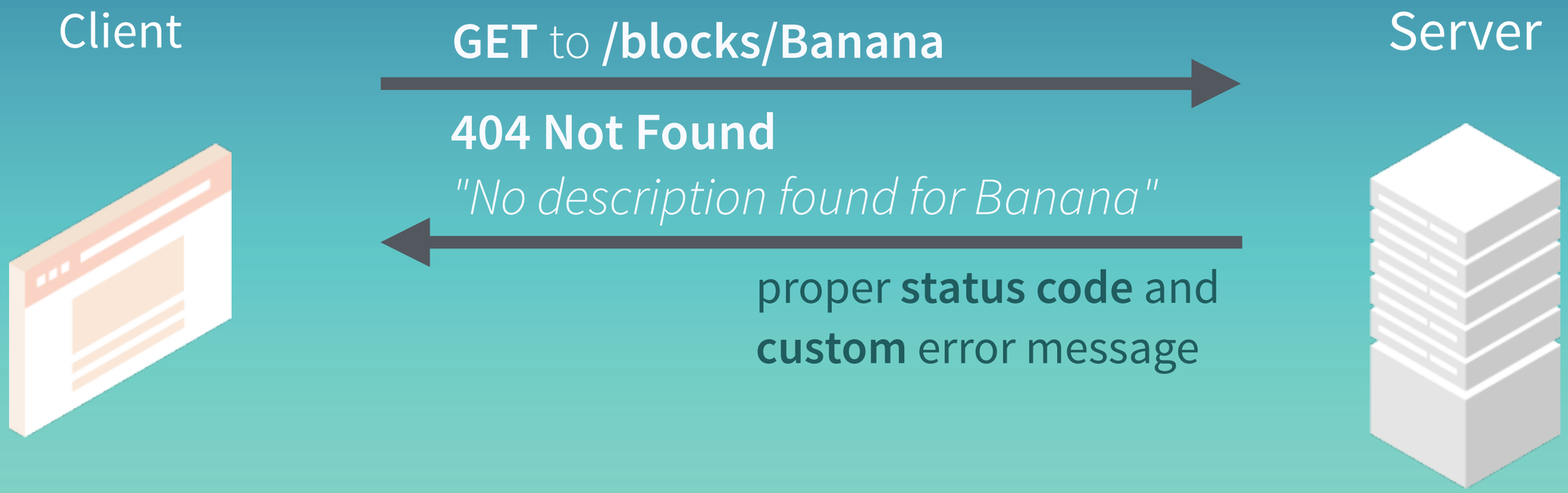
this Block does **not** exist

blank response

successful status code
for **unsuccessful** request

Handling Blocks not found

We must return a **404 Not Found** status code and an informative error message when a Block is not found



Responding from not found URLs

Trying to access non-existing properties in JavaScript objects returns **undefined**

app.js

```
...
var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};
app.get('/blocks/:name', function(request, response) {
  var description = blocks[request.params.name];
  if (!description) {
    ...
  } else {
    response.json(description);
  }
});
...
```

returns **undefined** when no property is found for a given Block name

checks for the presence of a description to determine the response

Responding with Not Found

Use the **status** function to set a custom HTTP status code

app.js

```
...
var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};
app.get('/blocks/:name', function(request, response) {
  var description = blocks[request.params.name];
  if (!description) {
    response.status(404)
  } else {
    response.json(description);
  }
});
...
```

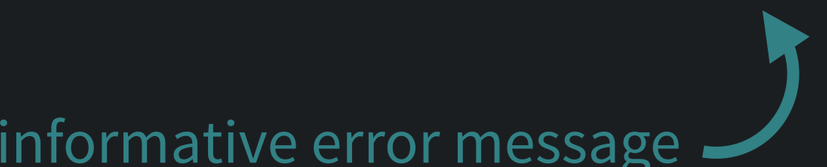
sets the **404 Not Found** status code

Responding with Not Found

Respond with a custom JSON error message

app.js

```
...
var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};
app.get('/blocks/:name', function(request, response) {
  var description = blocks[request.params.name];
  if (!description) {
    response.status(404).json('No description found for ' + request.params.name);
  } else {
    response.json(description);
  }
});
...
```



Testing invalid routes with curl

Returns proper **status code** and informative error message

```
$ curl -i http://localhost:3000/blocks/Banana

HTTP/1.1 404 Not Found
"No description found for Banana"
```

User Params

Massaging user data

Level 3 - Part II

Routes don’t match all cases

Current implementation only matches on **exact** Block name

```
$ curl -i http://localhost:3000/blocks/Fixed

HTTP/1.1 200 OK
"Fastened securely in position"
```

```
$ curl -i http://localhost:3000/blocks/fixed

HTTP/1.1 404 Not Found
"No description found for fixed"
```

does not match
on lower case

Normalizing the request parameter

Let’s split the steps to improve code clarity

app.js

```
...
var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};
app.get('/blocks/:name', function(request, response) {
 var description = blocks[request.params.name];
  ...



});
...
```

doing two things at once

Normalizing the request parameter

When one line does only **one thing**, it makes code easier to understand

app.js

```
...
var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};
app.get('/blocks/:name', function(request, response) {
 var name = request.params.name;
 var block = name[0].toUpperCase() + name.slice(1).toLowerCase();

  ...

});
...
```

first character to upper case and remaining characters to lowercase

Normalizing the request parameter

Use the **normalized** block name to look up its description

app.js

```
...
var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};
app.get('/blocks/:name', function(request, response) {
 var name = request.params.name;
 var block = name[0].toUpperCase() + name.slice(1).toLowerCase();
 var description = blocks[block];
 if (!description) {
   ...
});
...
```

block **name** is now in the same format as the properties in the **blocks** object

Supporting any url argument case

```
$ curl -i http://localhost:3000/blocks/Fixed

HTTP/1.1 200 OK
"Fastened securely in position"
```

```
$ curl -i http://localhost:3000/blocks/fixed

HTTP/1.1 200 OK
"Fastened securely in position"
```

```
$ curl -i http://localhost:3000/blocks/fiXeD

HTTP/1.1 200 OK
"Fastened securely in position"
```

any case is now properly supported

Same parameter used on multiple routes

app.js

```
var blocks = { ... };

var locations = {
  'Fixed': 'First floor', 'Movable': 'Second floor', 'Rotating': 'Penthouse'
};

app.get('/blocks/:name', function(request, response) {
  var name = request.params.name;
  var block = name[0].toUpperCase() + name.slice(1).toLowerCase();
  ...
});

app.get('/locations/:name', function(request, response) {
  var name = request.params.name;
  var block = name[0].toUpperCase() + name.slice(1).toLowerCase();
  ...
});
```

duplication

Extracting duplication to app.param

The **app.param** function maps placeholders to callback functions.
It's useful for running **pre-conditions** on dynamic routes.

app.js

```
var blocks = { ... };

var locations = {
  'Fixed': 'First floor', 'Movable': 'Second floor', 'Rotating': 'Penthouse'
};

app.param('name', function(request, response, next) {
  var name = request.params.name;
  var block = name[0].toUpperCase() + name.slice(1).toLowerCase();


});
...
```

called for routes which include the **:name** placeholder

Setting properties on the request object

Properties set on the **request** object can be accessed from all subsequent routes in the application

app.js

```
var blocks = { ... };

var locations = {
  'Fixed': 'First floor', 'Movable': 'Second floor', 'Rotating': 'Penthouse'
};

app.param('name', function(request, response, next) {
  var name = request.params.name;
  var block = name[0].toUpperCase() + name.slice(1).toLowerCase();

  request.blockName = block;

  next();
});
...
```

can be accessed from other routes in the application

must be called to resume request

Accessing custom properties on request

We can read properties on **request** which were set on **app.param**

app.js

```
...
app.param('name', function(request, response, next) {
  ...
});

app.get('/blocks/:name', function(request, response) {
  var description = blocks[request.blockName];
  ...
});

app.get('/locations/:name', function(request, response) {
  var location = locations[request.blockName];
  ...
});
```

Dynamic routes with curl

Refactoring improved our code without affecting the output

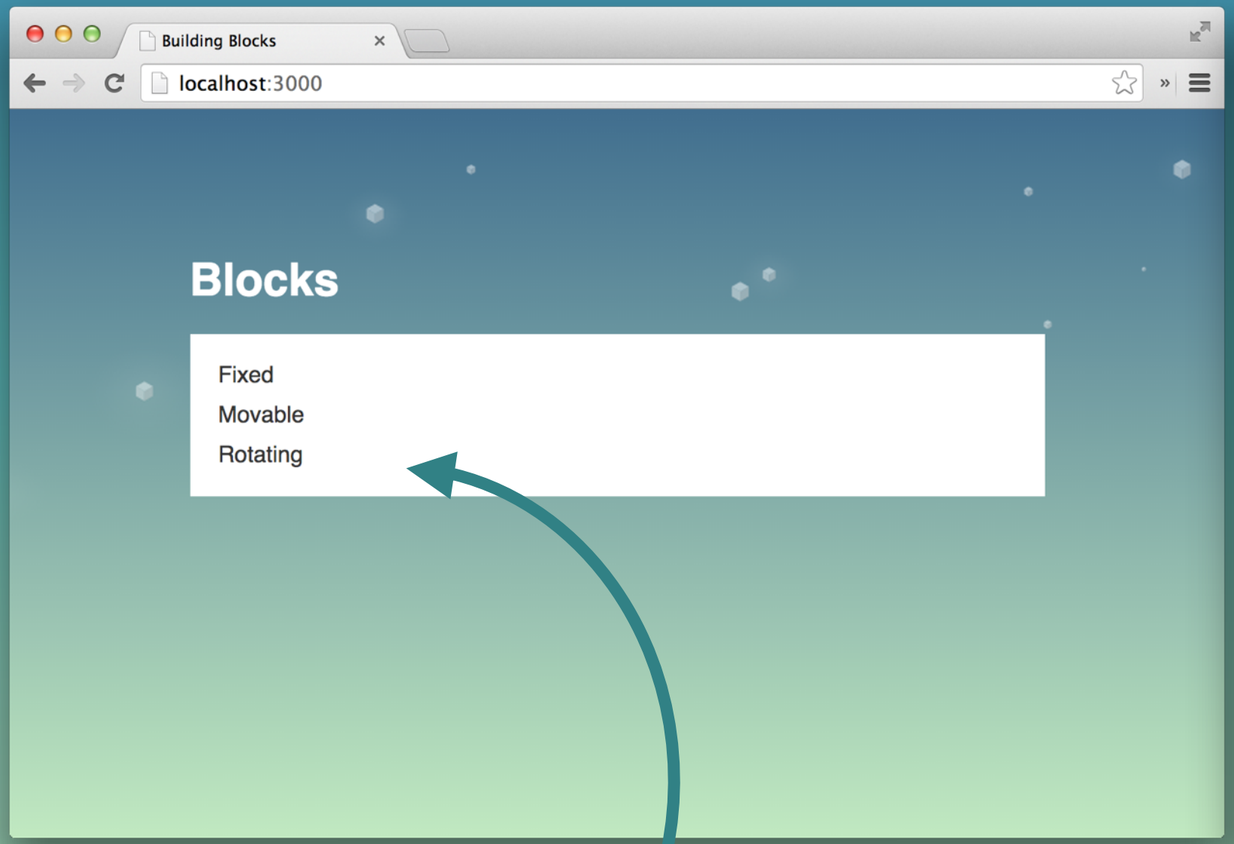
```
$ curl -i http://localhost:3000/blocks/fixed

HTTP/1.1 200 OK
"Fastened securely in position"
```

same result
as before

```
$ curl -i http://localhost:3000/locations/fixED

HTTP/1.1 200 OK
"First floor"
```

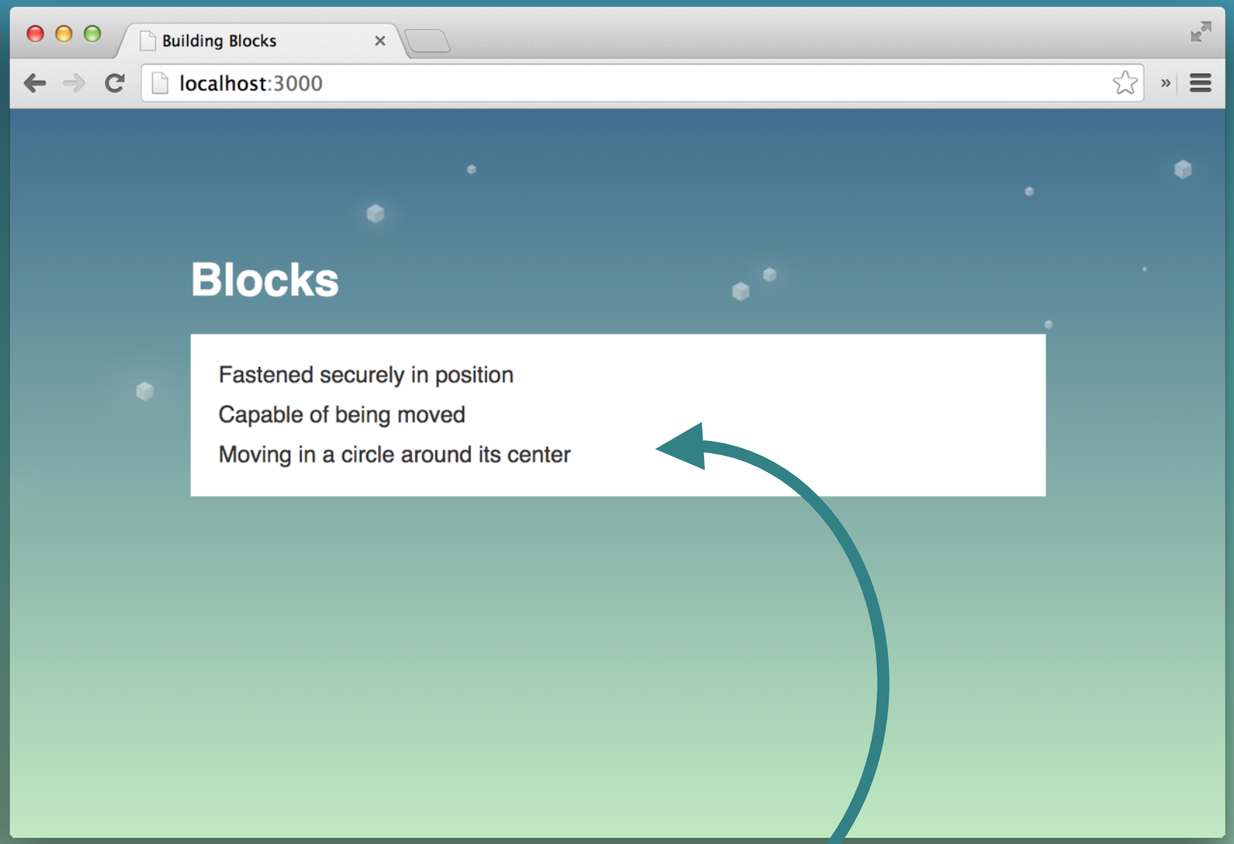
Something looks different

Initially:



listing block **names**

Now:



listing **descriptions**
instead of names

Breaking the initial listing of Blocks names

Initially:

app.js

```
var blocks = ['Fixed', 'Movable', 'Rotating'];
```

Now:

moved from **Array** to **object**

app.js

```
var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};
```

Fixing Block names

Responding with **object** instead of **Array** is what broke our route

app.js

```
var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};

app.get('/blocks', function(request, response) {
  response.json(blocks);
});

...
```

serializes blocks **object**

Fixing Block names

The **Object.keys** function returns an Array with the object's **properties**

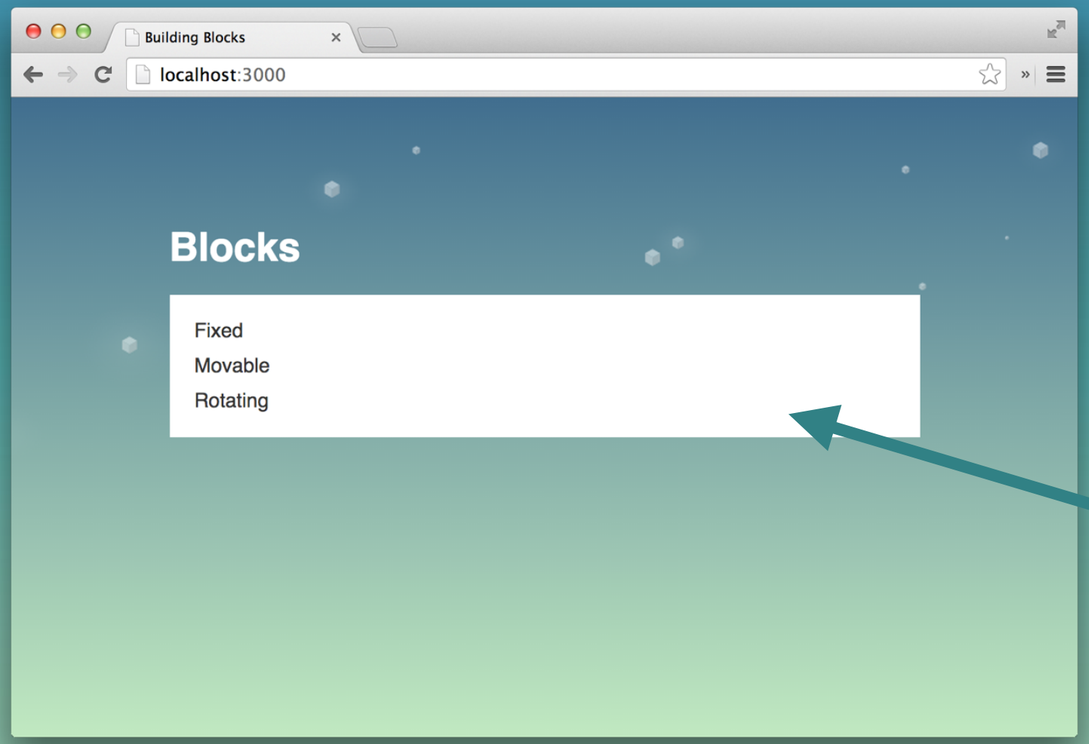
app.js

```
var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};

app.get('/blocks', function(request, response) {
  response.json(Object.keys(blocks));
});

...
```

returns **properties** from the blocks object

Responding with Block names

Now:




```
$ curl -i http://localhost:3000/blocks

HTTP/1.1 200 OK
["Fixed","Movable","Rotating"]
```

back to listing
Block **names**

POST Requests

Level 4 - Part I

Creating new Blocks

Client

Server

POST to **/blocks**

name = "Flying"

description = "able to move through air"

201 Created

"Flying"

returns proper **status code**
and new Block **name**

Adding a form to index.html

Text field inputs will be needed for **name** and **description**

we'll define form attributes in **JavaScript**

index.html

```
...
<body>

  <h1>Blocks</h1>

  <form>
    <legend>New Block</legend>
    <input name="name" placeholder="Name"><br/>
    <input name="description" placeholder="Description">
    <input type="Submit">
  </form>

  <ul class='block-list'></ul>
...
```

Submitting the form with JavaScript

Data is sent in a **POST** request to the **/blocks** endpoint

client.js

```
$(function(){
  $.get('/blocks', appendToList);
  ...
  $('form').on('submit', function(event) {
    event.preventDefault();
    var form = $(this);
    var blockData = form.serialize();

    $.ajax({
      type: 'POST', url: '/blocks', data: blockData
    }).done(function(blockName){

    });
  });
  ...
});
```

transforms form data to **URL-encoded** notation

recently created block

Updating the list with the new Block

We'll reuse the **appendToList** function from earlier to add new blocks to the list

client.js

```
$(function(){
  $.get('/blocks', appendToList);
  ...
  $('form').on('submit', function(event) {
    event.preventDefault();
    var form = $(this);
    var blockData = form.serialize();

    $.ajax({
      type: 'POST', url: '/blocks', data: blockData
    }).done(function(blockName){
      appendToList(            );
    });
  });
  ...
});
```

same function being called

Updating the list with the new Block

The **appendToList** function expects an **array** of Blocks

client.js

```
$(function(){
  $.get('/blocks', appendToList);
  ...
  $('form').on('submit', function(event) {
    event.preventDefault();
    var form = $(this);
    var blockData = form.serialize();

    $.ajax({
      type: 'POST', url: '/blocks', data: blockData
    }).done(function(blockName){
      appendToList([blockName]);
    });
  });
  ...
});
```

array with the new block as its single argument

Clearing input fields after submission

We must clear the input text fields after posting the form

client.js

```
$(function(){
  ...
  $('form').on('submit', function(event) {
    event.preventDefault();
    var form = $(this);
    var blockData = form.serialize();

    $.ajax({
      type: 'POST', url: '/blocks', data: blockData
    }).done(function(blockName){
      appendToList([blockName]);
      form.trigger('reset');
    });
  });
  ...
});
```

cleans up form
text input fields

Adding links to Blocks

- app.js
- **public/**
  - index.html
  - jquery.js
  - client.js
  - style.css
  - bg-stars.png

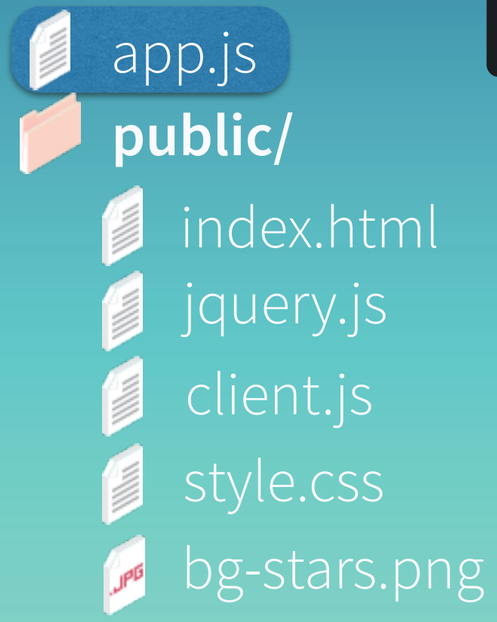
client.js

```
$(function(){
  ...
  $('form').on('submit', function(event) {
    ...
  });

  function appendToList(blocks) {
    var list = [];
    var content, block;
    for(var i in blocks){
      block = blocks[i];
      content = '<a href="/blocks/'+block+'">'+block+'</a>';
      list.push($('<li>', { html: content }));
    }

    $('.block-list').append(list)
  }
});
```

link to each Block's description

Posting

Parsing depends on a middleware **not** shipped with Express




```
$ npm install body-parser
```

app.js

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

var bodyParser = require('body-parser');
var parseUrlencoded = bodyParser.urlencoded({ extended: false });

var blocks = { ... };


...
```

forces the use of the native **querystring** Node library

Creating a POST route

Routes can take **multiple handlers** as arguments and will call them **sequentially**

app.js

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

var bodyParser = require('body-parser');
var parseUrlencoded = bodyParser.urlencoded({ extended: false });

var blocks = { ... };

app.post('/blocks', parseUrlencoded, function(request, response) {

});
...
```

will run **first**

will run **second**

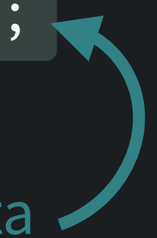
Using multiple route handlers is useful for **re-using middleware** that load resources, perform validations, authentication, etc.

Reading request data

Form submitted data can be accessed through **request.body**

app.js

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

var bodyParser = require('body-parser');
var parseUrlencoded = bodyParser.urlencoded({ extended: false });

var blocks = { ... };

app.post('/blocks', parseUrlencoded, function(request, response) {
  var newBlock = request.body;



});
...
```



Creating a new Block

The form elements are parsed to object properties, **name** and **description**

app.js

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

var bodyParser = require('body-parser');
var parseUrlencoded = bodyParser.urlencoded({ extended: false });

var blocks = { ... };

app.post('/blocks', parseUrlencoded, function(request, response) {
  var newBlock = request.body;
  blocks[newBlock.name] = newBlock.description;


});
...
```

adds new block
to the blocks object

Responding from a POST request

The response includes proper **status code** and the block **name**

app.js

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

var bodyParser = require('body-parser');
var parseUrlencoded = bodyParser.urlencoded({ extended: false });

var blocks = { ... };

app.post('/blocks', parseUrlencoded, function(request, response) {
  var newBlock = request.body;
  blocks[newBlock.name] = newBlock.description;

  response.status(201).json(newBlock.name);
});
...
```

sets the **201 Created** status code

responds with new block **name**

DELETE Requests

Level 4 - Part II

Deleting existing Blocks

Client

Server

DELETE to **/blocks/Flying**

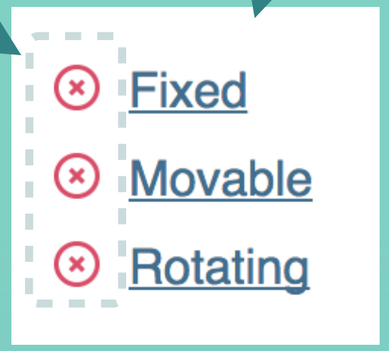
200 Success

"OK"

returns proper **status code**
and **"OK"** response body

Adding delete links to Blocks list

app.js
public/
index.html
jquery.js
client.js
bg-stars.png
del.jpg



client.js

```
$(function(){
  ...

  function appendToList(blocks) {
    var list = [];
    var content, block;
    for(var i in blocks){
      block = blocks[i];
      content = '<a href="/blocks/'+block+'">'+block+'</a> '+
'<a href="#" data-block="'+block+'"><img src="del.jpg"></a>';

      list.push($('<li>', { html: content }));
    }

    $('.block-list').append(list)
  }
});
```

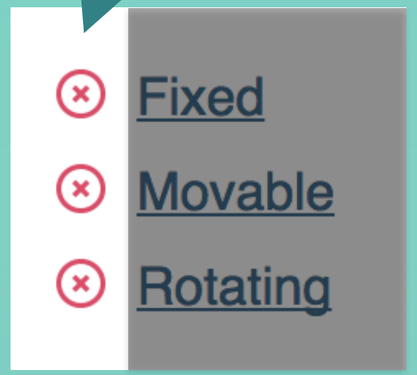
Listening for click events

Let’s attach an event listener on all links with a **data-block** attribute

client.js

```
$(function(){
  ...
  $('.block-list').on('click', 'a[data-block]', function(event){

  });
});
```

links with a **data-block** attribute



Making DELETE request to /blocks

client.js

```
$(function(){
  ...
  $('.block-list').on('click', 'a[data-block]', function(event){
    if (!confirm('Are you sure ?')) {
      return false;
    }

    var target = $(event.currentTarget);

    $.ajax({
      type: 'DELETE', url: '/blocks/' + target.data('block')
    }).done(function() {

    });
  });

});
```

the link element that was **clicked**

reads the block name from the link's **data-block** attribute

Removing elements from the page

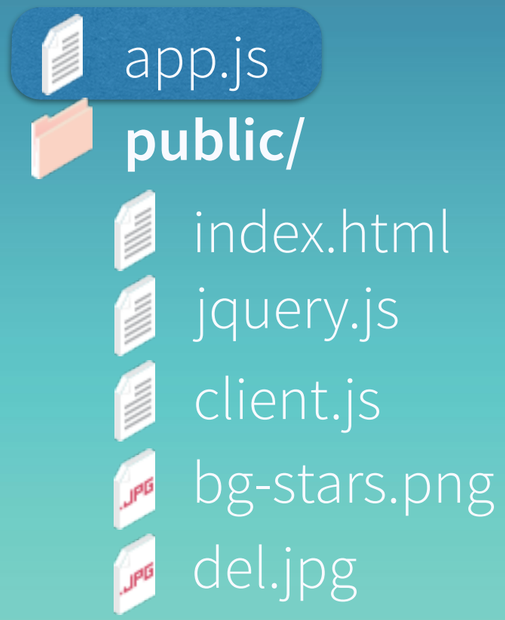
client.js

```
$(function(){
  ...
  $('.block-list').on('click', 'a[data-block]', function(event){
    if (!confirm('Are you sure ?')) {
      return false;
    }

    var target = $(event.currentTarget);

    $.ajax({
      type: 'DELETE', url: '/blocks/' + target.data('block')
    }).done(function() {
      target.parents('li').remove();
    });
  });

});
```

removes **li** element containing the link

Creating a DELETE route

The delete route takes the block **name** as argument



app.js

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

var blocks = { ... };

app.delete('/blocks/:name', function(request, response) {


});
...
```

Deleting Blocks

The **delete** operator from JavaScript removes a property from an object

app.js

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

var blocks = { ... };

app.delete('/blocks/:name', function(request, response) {
  delete blocks[request.blockName];

});
...
```

removes entry from the blocks object

in case you don't remember, this is where we set **blockName**

```
app.param('name',...
```

Responding with sendStatus

The **sendStatus** function sets both the status code and the response body

app.js

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

var blocks = { ... };

app.delete('/blocks/:name', function(request, response) {
  delete blocks[request.blockName];
  response.sendStatus(200);
});
...
```

also sets response body to “**OK**”

Route Instances

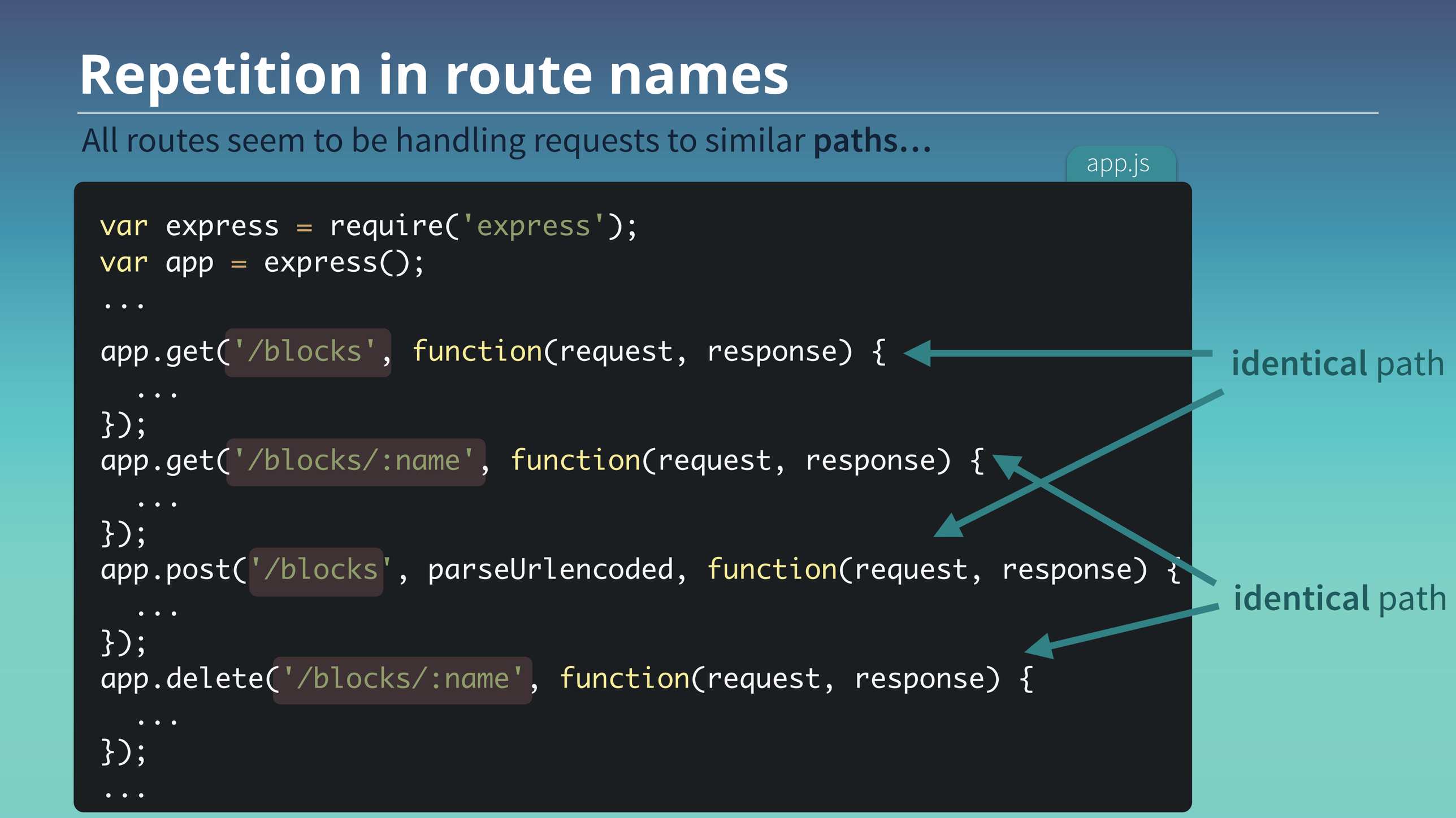
Level 5 - Part I

Repetition in route names

All routes seem to be handling requests to similar **paths...**

app.js

```
var express = require('express');
var app = express();
...
app.get('/blocks', function(request, response) {
  ...
});
app.get('/blocks/:name', function(request, response) {
  ...
});
app.post('/blocks', parseUrlencoded, function(request, response) {
  ...
});
app.delete('/blocks/:name', function(request, response) {
  ...
});
...
```



Replacing repetition with a route instance

Using **app.route** is a recommended approach for avoiding **duplicate** route names

app.js

```
var express = require('express');
var app = express();
...
var blocksRoute = app.route('/blocks')



...
app.listen(3000);
```

returns route object which handles all requests to the **/blocks** path

Routes that act on /blocks

No **path** argument is needed for route handlers belonging to the same route instance

app.js

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

var blocksRoute = app.route('/blocks')
blocksRoute.get(function(request, response) {
  ...
});
blocksRoute.post(parseUrlencoded, function(request, response) {
  ...
});

...
app.listen(3000);
```

used to be

```
app.get('/blocks'...
```

used to be

```
app.post('/blocks'...
```

Removing intermediate variables

There's unnecessary repetition of the **blocksRoute** variable

app.js

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

var blocksRoute = app.route('/blocks')
blocksRoute.get(function(request, response) {
  ...
});
blocksRoute.post(parseUrlencoded, function(request, response) {
  ...
});


...
app.listen(3000);
```

Chaining function calls on route

Chaining functions can eliminate **intermediate variables** and help our code stay more **readable**. This is a pattern commonly found in Express applications.

app.js

```
var express = require('express');
var app = express();
...
app.route('/blocks')
  .get(function(request, response) {
    ...
  });
  .post(parseUrlencoded, function(request, response) {
    ...
  });
...
```

no semi-colon at the end of the line

chaining means calling functions on the return value of previous functions

lines starting with **dot** indicate function calls on the object returned from the **previous line**

Dynamic route instances

The **app.route** function accepts the same url argument format as before

app.js

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

app.route('/blocks')
   .get(function(request, response) {
      ...
   });
   .post(parseUrlencoded, function(request, response) {
      ...
   });
app.route('/blocks/:name')
```

returns route object which handles all requests to the **/blocks/:name** path

Routes that act on /blocks/:name

Our route handlers for **/blocks/:name** reference **blocks** fetched by their **name**

app.js

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

app.route('/blocks')
...

app.route('/blocks/:name')
  .get(function(request, response) {
    ...
  })
  .delete(function(request, response) {
    ...
  });

app.listen(3000);
```

used to be

```
app.get('/blocks/:name/'...
```

```
app.delete('/blocks/:name'...
```

used to be

Route Files

Level 5 - Part II

Single application file is too long

app.js

```
var express = require('express');
...
app.route('/blocks')
  .get(function(request, response) {
    ...
  });
  .post(parseUrlencoded, function(request, response) {
    ...
  });
app.route('/blocks/:name')
  .get(function(request, response) {
    ...
  })
  .delete(function(request, response) {
    ...
  });
...
```

Too many lines of code in a text file is a **bad smell**

Our **app.js** file is growing too long.

Extracting routes to modules

This helps clean up our code and allows our main **app.js** file to easily accommodate additional routes in the future.

app.js

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

app.use(express.static('public'));

var blocks = require('./routes/blocks');
app.use('/blocks', blocks);

app.listen(3000);
```

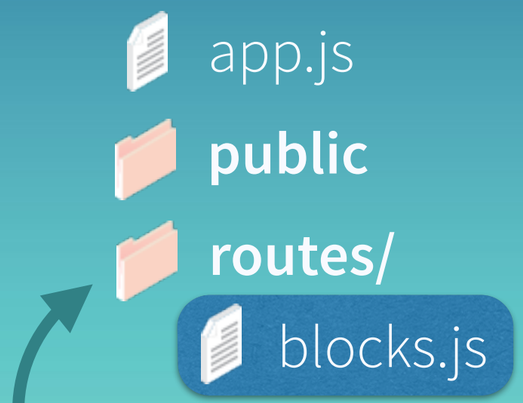
we'll move our routes to this new file

router is mounted in a particular **root url**

Let's see how we can do this by taking advantage of Node's **module** system.

Writing the new routes file

A dedicated folder for **routes** can help organize our code



all routes files
will go in this folder

blocks.js

```
var express = require('express');
var router = express.Router();
```

returns router instance which can
be *mounted* as a middleware

Exporting the router object

We assign the router to **module.exports** to make it accessible from other files

blocks.js

```
var express = require('express');
var router = express.Router();

...

module.exports = router;
```

exports the router
as a Node **module**

Extracting GET /blocks to routes file

All block-related logic is **encapsulated** inside its routes file

blocks.js

```
var express = require('express');
var router = express.Router();
var bodyParser = require('body-parser');
var parseUrlencoded = bodyParser.urlencoded({ extended: false });

var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};

...

module.exports = router;
```

moved here from **app.js**

Building the router for /blocks

Router path is **relative** to the where it's mounted

blocks.js

```
var express = require('express');
var router = express.Router();
var bodyParser = require('body-parser');
var parseUrlencoded = bodyParser.urlencoded({ extended: false });

var blocks = {
  'Fixed': 'Fastened securely in position',
  'Movable': 'Capable of being moved',
  'Rotating': 'Moving in a circle around its center'
};

router.route('/')

 ...

module.exports = router;
```

the **root** path relative to
the **path where it's mounted**

app.js

```
app.use('/blocks', ...);
```

mounted on the
/**blocks** path

Extracting GET /blocks to routes file

Routes are moved unmodified from the app.js file

blocks.js

```
var express = require('express');
var router = express.Router();
...
router.route('/')
  .get(function (request, response) {
    ...
  });
  .post(parseUrlencoded, function(request, response) {
    ...
  });



...
```

same as before

Building the router for /blocks/:name

The **route** function uses the same format for dynamic routes

blocks.js

```
var express = require('express');
var router = express.Router();
...
router.route('/')
  .get(function (request, response) {
    ...
  });
  .post(parseUrlencoded, function(request, response) {
    ...
  });

router.route('/:name')


...
```

the /**:name** path relative to the **path where it's mounted**

app.js

```
app.use('/blocks', ...);
```

mounted on the **/blocks** path

Extracting GET /blocks to routes file

The **all** route is called for **all** requests for a given URL path

blocks.js

```
var express = require('express');
var router = express.Router();
...
router.route('/')
...
router.route('/:name')
   .all(function (request, response, next) {
      var name = request.params.name;
      var block = name[0].toUpperCase() + name.slice(1).toLowerCase();
      request.blockName = block;
      next();
   })
...
```

the same code that turns first characters to uppercase and remaining characters to lowercase

used to be here

```
app.param('name/'...
```

Extracting GET /blocks to routes file

blocks.js

```
var express = require('express');
var router = express.Router();
...
router.route('/')
...
router.route('/:name')
   .all(function (request, response, next) {
     ...
   })
   .get(function (request, response) {
     ...
   });
   .delete(function (request, response) {
     ...
   });
...
```

same as before

The complete blocks routes file

Our routes file is ready to be mounted in our application

blocks.js

```
var express = require('express');
var router = express.Router();
var bodyParser = require('body-parser');
var parseUrlencoded = bodyParser.urlencoded({ extended: false });

var blocks = { ... }

router.route('/')
  .get(function (request, response) { ...
  .post(parseUrlencoded, function(request, response) { ...

router.route('/:name')
   .all(function (request, response) { ...
   .get(function (request, response) { ...
   .delete(function (request, response) { ...

module.exports = router;
```

Requiring the router in the application

Our router is simply a Node module and can be **required** like so

app.js

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

app.use(express.static('public'));

var blocks = require('./routes/blocks');


app.listen(3000);
```

Mounting the router in the application

All requests to the **/blocks** url are dispatched to the **blocks** router

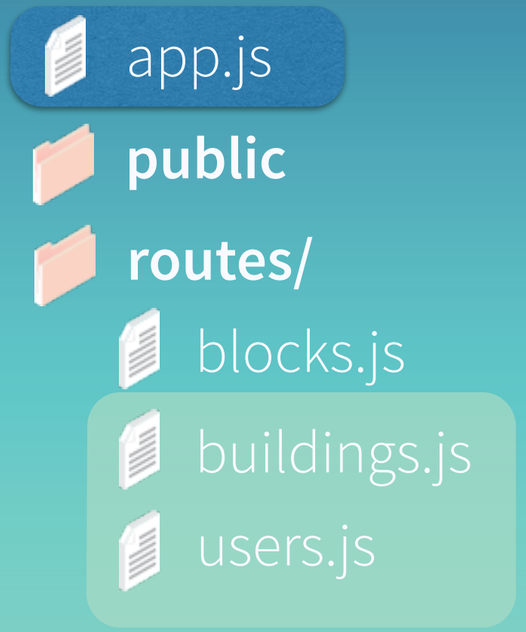
app.js

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

app.use(express.static('public'));

var blocks = require('./routes/blocks');
app.use('/blocks', blocks);

app.listen(3000);
```

router is mounted in a particular **root url**

Additional route mappings

The **app.js** file is now ready to support multiple routes and still look clean



app.js

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

app.use(express.static('public'));

var blocks = require('./routes/blocks');
var buildings = require('./routes/buildings');
var users = require('./routes/users');

app.use('/blocks', blocks);
app.use('/buildings', buildings);
app.use('/users', users);

app.listen(3000, function () {
  console.log('Listening on 3000 \n');
});
```