LEARN EXPRESS ROUTES

Introduction

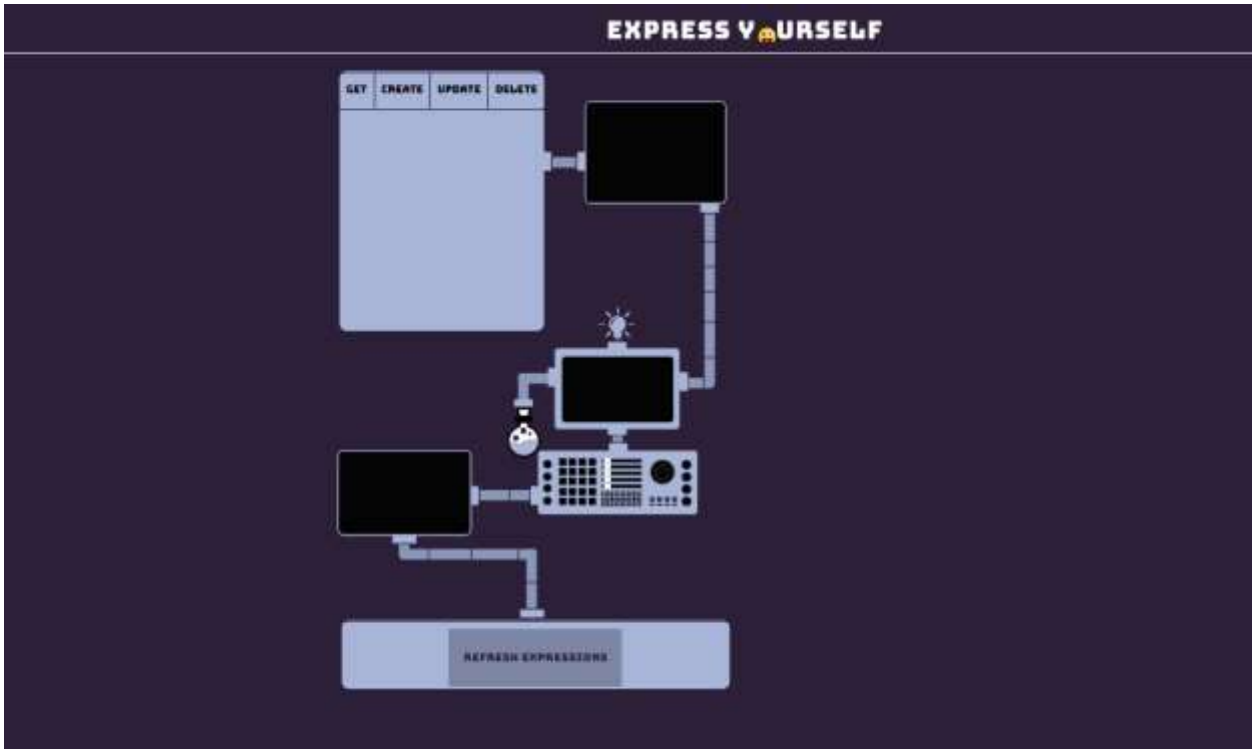
A huge portion of the Internet's data travels over HTTP/HTTPS through request-response cycles between clients and servers. Every time that you use a website, your browser sends requests to one or many servers requesting resources. Every image, meme, post, and video is requested by a client and sent in a response from a server.

Express is a powerful but flexible Javascript framework for creating web servers and APIs. It can be used for everything from simple static file servers to JSON APIs to full production servers.

In this lesson, you will be fixing a machine called Express Yourself in the browser. The machine is supposed to provide functionality for clients to interact with various Expressions: JavaScript objects each containing ids, names, and emojis. Currently, it looks nice, but nothing works since there is no server in place! You will be learning all the necessary skills to implement an API allowing clients to Create, Read, Update, and Delete Expressions. These four functionalities together are known as CRUD, and they form the backbone of many real-life APIs.

Instructions

Move on to the next exercise when you're ready!



Starting A Server

Express is a Node module, so in order to use it, we will need to import it into our program file. To create a server, the imported `express` function must be invoked.

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

On the first line, we import the Express library with `require`. When invoked on the second line, it returns an instance of an Express application. This application can then be used to start a server and specify server behavior.

The purpose of a server is to listen for requests, perform whatever action is required to satisfy the request, and then return a response. In order for our server to start responding, we have to tell the server where to *listen* for new requests by providing a port number argument to a method called `app.listen()`. The server will then listen on the specified port and respond to any requests that come into it.

The second argument is a callback function that will be called once the server is running and ready to receive responses.

```
const PORT = 4001;
app.listen(PORT, () => {
  console.log(`Server is listening on port ${PORT}`);
});
```

In this example, our `app.listen()` call will start a server listening on port `4001`, and once the server is started it will log `'Server is listening on port 4001'`.

Instructions

1.

Import `express` using `require` syntax and assign it to an `express` variable.

Create an instance of an Express server and save it to a variable named `app`.

Start the server listening on the port defined by the `PORT` variable. When the server has started, log a message to the console that the server is listening for requests.

To actually start your server listening, run the command `node app.js` to run your server in Node. At this point, it won't do much, but if you've completed the steps above, it will log your message to show that the server started successfully.

When you want to check that you have written your starting server code correctly, use the 'Check Work' button.

app.js

```
// Import the express library here
const express = require("express");
// Instantiate the app here
const app = express();

const PORT = process.env.PORT || 4001;

// Invoke the app's `.listen()` method below:
app.listen(PORT, () => {
  console.log(`Server is listening on port ${PORT}`);
});
```

```
$ node app.js
Server is listening on port 4001
```

Writing Your First Route

Once the Express server is listening, it can respond to any and all requests. But how does it know what to do with these requests? To tell our server how to deal with any given request, we register a series of *routes*. Routes define the control flow for requests based on the request's *path* and HTTP verb.

For example, if your server receives a GET request at `/monsters`, we will use a route to define the appropriate functionality for that HTTP verb (GET) and path (`/monsters`).

The path is the part of a request URL after the hostname and port number, so in a request to `localhost:4001/monsters`, the path is `/monsters` (in this example, the hostname is `localhost`, the port number is `4001`).

The HTTP verb is always included in the request, and it is one of a finite number of options used to specify expected functionality. GET requests are used for retrieving resources from a server, and we will discuss additional request types in later exercises.

Express uses `app.get()` to register routes to match `GET` requests. Express routes (including `app.get()`) usually take two arguments, a path (usually a string), and a callback function to handle the request and send a response.

```
const moods = [{ mood: 'excited about express!'}, { mood:
'route-tastic!' }];
app.get('/moods', (req, res, next) => {
  // Here we would send back the moods array in response
});
```

The route above will match any `GET` request to `'/moods'` and call the callback function, passing in two objects as the first two arguments. These objects represent the request sent to the server and the response that the Express server should eventually send to the client.

If no routes are matched on a client request, the Express server will handle sending a 404 Not Found response to the client.

Instructions

1.
Now that your server starting code should be working properly, you can start up the Express Yourself machine. Start your server from the terminal window with `node app.js`. Once it logs that it is running, you can refresh the browser window currently displaying `Not Found`.

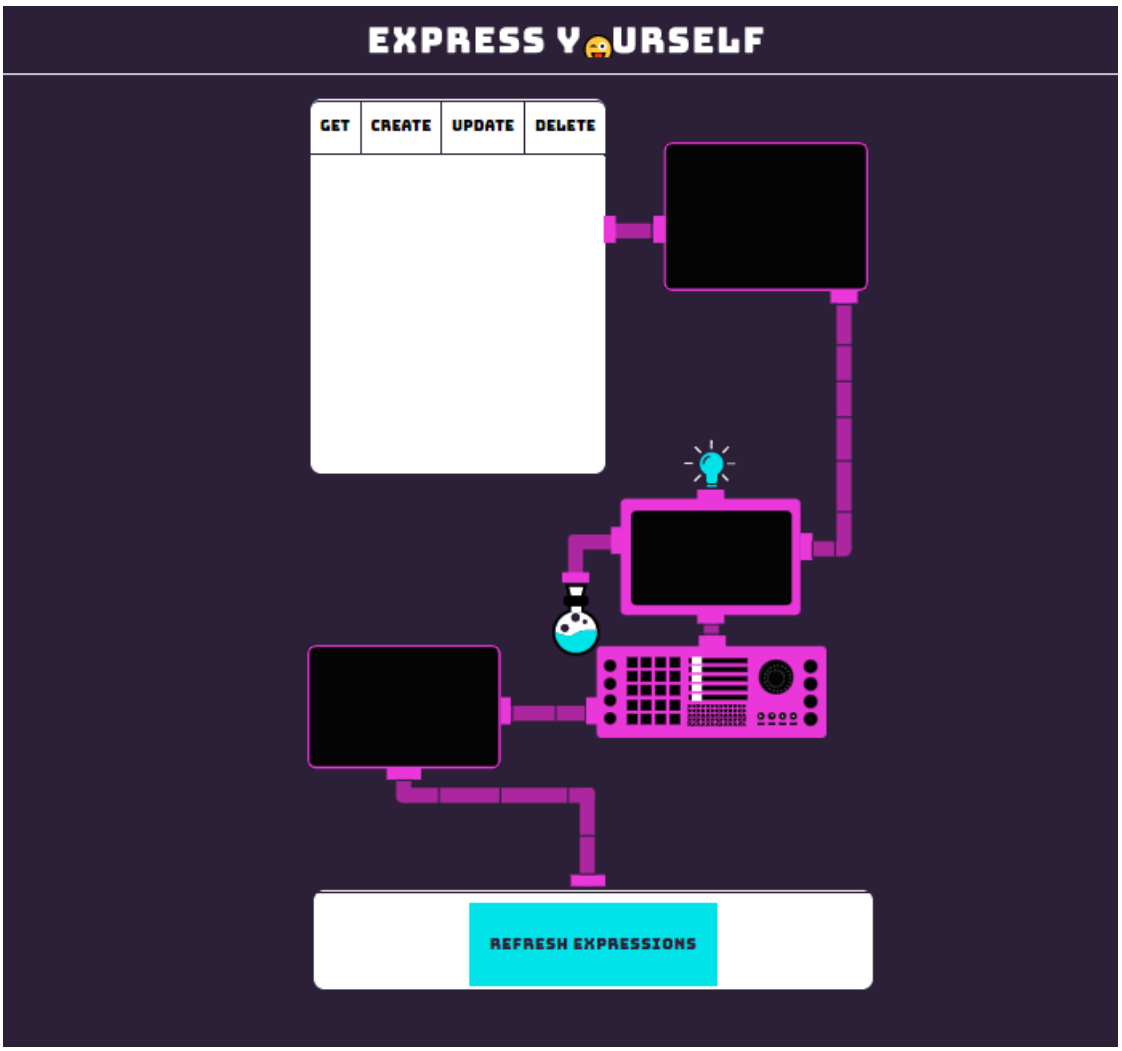
Inside **app.js**, create a route handler to handle a GET request to `'/expressions'`. For now, give it a `req, res, next` callback. For now, log the `req` object inside the callback. Verify that the route works and logs the request by starting your server and clicking the Refresh Expressions button which will send a GET /expressions request.

We will complete this route in the next exercise and finish the first round of functionality to the Express Yourself machine.

You may notice that there's a line with the command `app.use(express.static('public'));`. This is used to make sure that once the server is started, you can reload the browser and see the Express Yourself machine.

app.js

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

const PORT = process.env.PORT || 4001;
// Use static server to serve the Express Yourself Website
app.use(express.static('public'));

// Open a call to `app.get()` below:
app.get('/expressions', (req, res, next) => {
  console.log(req);
});

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



Sending A Response

HTTP follows a one request-one response cycle. Each client expects exactly one response per request, and each server should only send a single response back to the client per request. The client is like a customer at a restaurant ordering a large bowl of soup: the request is sent through the wait staff, the kitchen prepares the soup, and after is it prepared, the wait staff returns it to the customer. In the restaurant, it would be unfortunate if the soup never arrived back to the customer, but it would be equally problematic if the customer was given four large bowls of soup and was asked to consume them all at the exact same time. That's impossible with only two hands!

Express servers send responses using the `.send()` method on the response object. `.send()` will take any input and include it in the response body.

```
const monsters = [
  { type: 'werewolf' },
```

```
  { type: 'hydra' },
  { type: 'chupacabra' }
];
app.get('/monsters', (req, res, next) => {
  res.send(monsters);
});
```

In this example, a `GET /monsters` request will match the route, Express will call the callback function, and the `res.send()` method will send back an array of spooky monsters.

In addition to `.send()`, `.json()` can be used to explicitly send JSON-formatted responses. `.json()` sends any JavaScript object passed into it.

Instructions

1.

Send the `expressions` array from your `app.get` handler. Now that you have a complete route, you can test it out by reloading the browser window and clicking the 'Refresh Expressions' button on the machine.

If you make changes to **app.js**, you will need to restart your server to see the changes in effect. You can do this by pressing `Ctrl + C` in the terminal window to stop the old server, and you can start it again with `node app.js`.

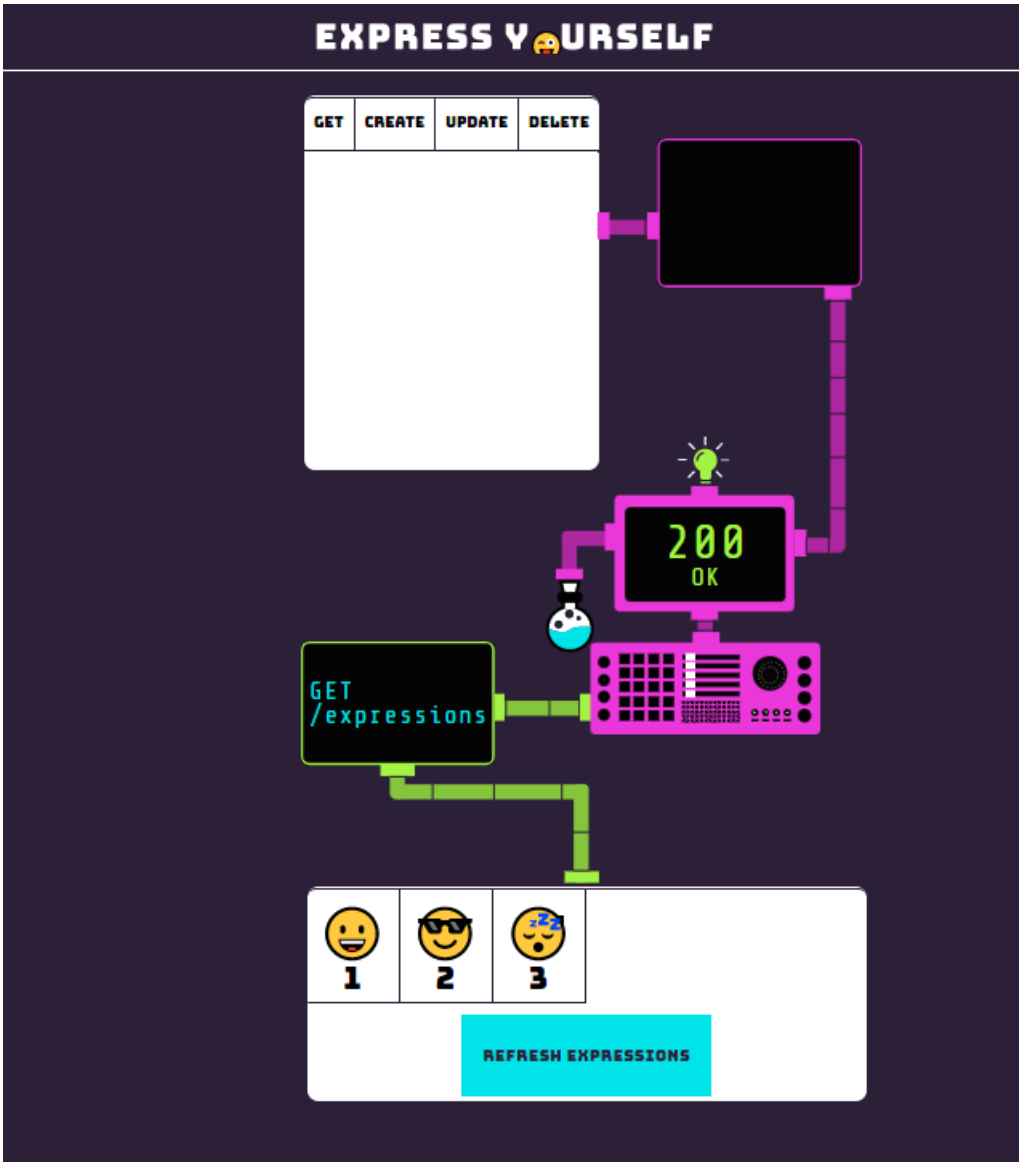
Hint

You can use `res.send()` or `res.json()` to send the `expressions` array.

app.js

```
const express = require('express');
const app = express();
const { seedElements } = require('./utils');

// Serves Express Yourself website
app.use(express.static('public'));

const PORT = process.env.PORT || 4001;
// Use static server to serve the Express Yourself Website
app.use(express.static('public'));

const expressions = [];
seedElements(expressions, 'expressions');
```

```
// Get all expressions
app.get('/expressions', (req, res, next) => {
  // console.log(req);
  res.send(expressions);
});

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



Matching Route Paths

Express tries to match requests by route, meaning that if we send a request to `<server address>:<port number>/api-endpoint`, the Express server will search through any registered routes in order and try to match `/api-endpoint`.

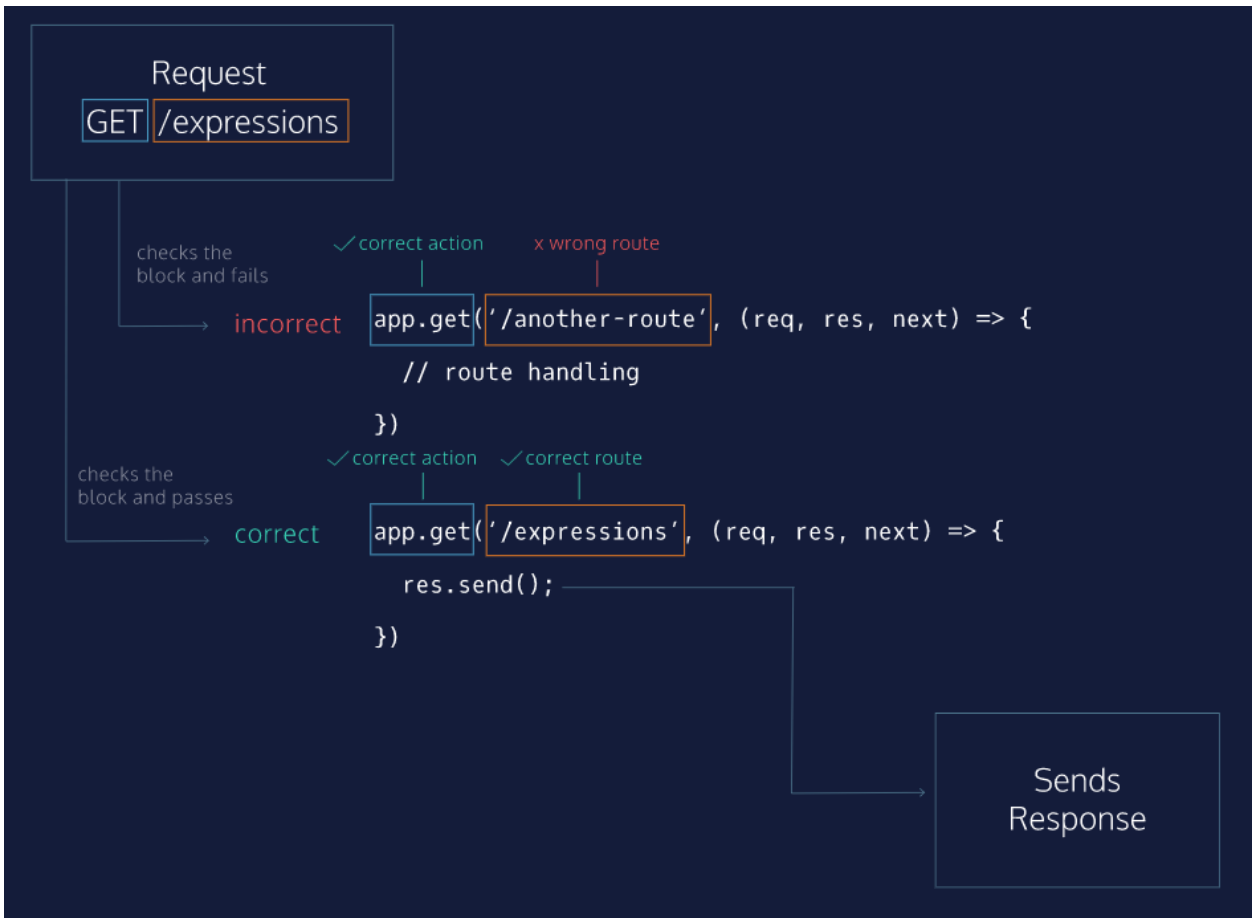
Express searches through routes in the order that they are registered in your code. The first one that is matched will be used, and its callback will be called.

In the example to the right, you can see two `.get()` routes registered at `/another-route` and `/expressions`. When a `GET /expressions` request arrives to the Express server, it first checks `/another-route`'s path because it is registered before the `/expressions` route. Because `/another-route` does not match the path, Express moves on to the next registered middleware. Since the route matches the path, the callback is invoked, and it sends a response.

If there are no matching routes registered, or the Express server has not sent a response at the end of all matched routes, it will automatically send back a 404 Not Found response, meaning that no routes were matched or no response was ultimately sent by the registered routes.

Instructions

Move on to the next exercise when you're ready.



Getting A Single Expression

Routes become much more powerful when they can be used dynamically. Express servers provide this functionality with named *route parameters*. Parameters are route path segments that begin with `:` in their Express route definitions. They act as wildcards, matching any text at that path segment. For example `/monsters/:id` will match both `/monsters/1` and `/monsters/45`.

Express parses any parameters, extracts their actual values, and attaches them as an object to the request object: `req.params`. This object's keys are any parameter names in the route, and each key's value is the actual value of that field per request.

```
const monsters = {
  hydra: { height: 3, age: 4 },
  dragon: { height: 200, age: 350 }
};
// GET /monsters/hydra
app.get('/monsters/:name', (req, res, next) => {
  console.log(req.params); // { name: 'hydra' }
```

```
  res.send(monsters[req.params.name]);
});
```

In this code snippet, a `.get()` route is defined to match `/monsters/:name` path. When a GET request arrives for `/monsters/hydra`, the callback is called. Inside the callback, `req.params` is an object with the key `name` and the value `hydra`, which was present in the actual request path.

The appropriate monster is retrieved by name (the object key) from the `monsters` object and sent back to the client with `res.send()`.

Instructions

1.

Create a GET /expressions/:id get route that you will use to send back a single expression. You can use req.params object and the pre-written helper function `getElementById(id, array)` to find the correct expression before sending it back.

For instance, to find ID `560` from `expressions`, you would call `getElementById(560, expressions);`. This function returns the element object if it exists and `undefined` if it does not.

Don't forget to restart your server when you make changes to **app.js**. To test the Express Yourself machine, use the box in the upper-left corner to send a GET request for a specified ID.

Hint

The correct ID of the expression can be found using `req.params.id`.

app.js

```
let currentMode = 'expressions';
let currentRequest = '';
let requestInProgress = false;
let machineIsOn = false;

$(document).ready(() => {
  pingMachine();
  setInterval(pingMachine, 1000);

  $('#get-expression').on('click', function() {
```

```
    selectExpressionMode('GET');
  });

  $('#create-expression').on('click', function() {
    selectExpressionMode('CREATE');
  });

  $('#update-expression').on('click', function() {
    selectExpressionMode('UPDATE');
  });

  $('#delete-expression').on('click', function() {
    selectExpressionMode('DELETE');
  });

  $('.expression-form .button').on('click', function() {
    triggerExpressionRequest();
  });

  $('#expressions-information .button').on('click', function() {
    triggerExpressionsRequest();
  });
});

function pingMachine() {
  if (requestInProgress) {
    return;
  }

  $.ajax('/', {
    success: function() {
      activateMachine();
      if($('#expression-
route').attr('src') === "https://content.codecademy.com/courses/learn-express-
routes/expression-route-inactive.svg") {
        $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-active.svg');
```

```
        $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-active.svg');
        activateExpressions();
      }
    },
    error: function(xhr) {
      if (xhr.status !== 404) {
        activateMachine();
        if($('#expression-
route').attr('src') === "https://content.codecademy.com/courses/learn-express-
routes/expression-route-inactive.svg") {
          $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-active.svg');
          $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-active.svg');
          activateExpressions();
        }
      } else {
        deactivateMachine();
        deactivateExpressions();
        $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-inactive.svg');
        $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-inactive.svg');
      }
    }
  });
}

function activateMachine() {
  machineIsOn = true;
  $('#server-machine').attr('src', 'https://content.codecademy.com/courses/learn-
express-routes/server-machine-active.svg');
  $('#beaker').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/beaker-active-neutral.svg');
```

```
  if ($('#lightbulb').attr('src') === 'https://content.codecademy.com/courses/learn-express-routes/lightbulb-inactive.svg') {
    $('#lightbulb').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/lightbulb-active.svg');
  }
}

function deactivateMachine() {
  machineIsOn = false;
  currentRequest = '';
  $('.expression-form').css('display', 'none');
  $('#expression-information .tabs li').removeClass('active');
  $('#expressions-information .tabs').html('');
  $('#server-machine').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/server-machine-inactive.svg');
  $('#lightbulb').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/lightbulb-inactive.svg');
  $('#beaker').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/beaker-inactive.svg');
  $('#code-number').text('');
  $('#code-description').text('');
  clearExpressionText();
  clearExpressionsText();
}

function activateExpressions() {
  $('#expression-information').removeClass('inactive');
  $('#expressions-information').removeClass('inactive');
}

function deactivateExpressions() {
  $('#expression-information').addClass('inactive');
  $('#expressions-information').addClass('inactive');
}

function selectExpressionMode(mode) {
  if(!machineIsOn) {
    return;
  }
```

```
  currentRequest = mode;
  $('.expression-form').css('display', 'block');
  $('#expression-information .tabs li').removeClass('active');
  $('#id-field').prop('readonly', false).removeClass('disabled').val('');
  $('#name-field').prop('readonly', false).removeClass('disabled').val('');
  if (mode === 'GET') {
    $('#emoji-field').prop('disabled', false).removeClass('disabled').val('');
    $('#get-expression').addClass('active');
    $('#name-field').prop('readonly', true).addClass('disabled');
    $('#emoji-field').prop('disabled', true).addClass('disabled');
  } else if (mode === 'CREATE') {
    $('#emoji-field').prop('disabled', false).removeClass('disabled').val('😐');
    $('#create-expression').addClass('active');
    $('#id-field').prop('readonly', true).addClass('disabled');
  } else if (mode === 'UPDATE') {
    $('#emoji-field').prop('disabled', false).removeClass('disabled').val('😐');
    $('#update-expression').addClass('active');
  } else if (mode === 'DELETE') {
    $('#emoji-field').prop('disabled', false).removeClass('disabled').val('');
    $('#delete-expression').addClass('active');
    $('#name-field').prop('readonly', true).addClass('disabled');
    $('#emoji-field').prop('disabled', true).addClass('disabled');
  }
}

function triggerExpressionRequest() {
  if (requestInProgress || !machineIsOn) {
    return;
  }

  requestInProgress = true;
  deactivateExpressions();

  const id = $('#id-field').val();
  const name = $('#name-field').val();
  const emoji = $('#emoji-field').val();
```

```
  $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-pending.svg');
  $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-active.svg');
  $('#code-number').text('');
  $('#code-description').text('');
  clearExpressionsText();
  setExpressionRequestText(id, name, emoji);
  const animationDelay = 428.5;
  animateMachine(animationDelay);
  setTimeout(() => makeExpressionRequest(id, name, emoji), animationDelay * 4);
}

function setExpressionRequestText(id, name, emoji) {
  switch (currentRequest) {
    case 'GET':
      $('#expression-text pre').eq(0).text('GET');
      $('#expression-text pre').eq(1).text(`/expressions/${id}`);
      $('#expression-text pre').eq(2).text('');
      $('#expression-text pre').eq(3).text('');
      break;
    case 'CREATE':
      $('#expression-text pre').eq(0).text('POST');
      $('#expression-text pre').eq(1).text(`/expressions`);
      $('#expression-text pre').eq(2).text(`?name=${name}`);
      $('#expression-text pre').eq(3).text(`&emoji=${emoji}`);
      break;
    case 'UPDATE':
      $('#expression-text pre').eq(0).text('PUT');
      $('#expression-text pre').eq(1).text(`/expressions/${id}`);
      $('#expression-text pre').eq(2).text(`?name=${name}`);
      $('#expression-text pre').eq(3).text(`&emoji=${emoji}`);
      break;
    case 'DELETE':
      $('#expression-text pre').eq(0).text('DELETE');
      $('#expression-text pre').eq(1).text(`/expressions/${id}`);
      $('#expression-text pre').eq(2).text('');
      $('#expression-text pre').eq(3).text('');
```

```
      break;
  }
}

function clearExpressionText() {
  $('#expression-text pre').eq(0).text('');
  $('#expression-text pre').eq(1).text('');
  $('#expression-text pre').eq(2).text('');
  $('#expression-text pre').eq(3).text('');
}

function clearExpressionsText() {
  $('#expressions-text pre').eq(0).text('');
  $('#expressions-text pre').eq(1).text('');
}

function makeExpressionRequest(id, name, emoji) {
  switch (currentRequest) {
    case 'GET':
      $.ajax(`/expressions/${id}`, {
        success: function(expression) {
          animateGoodExpressionRequest('200', 'OK', expression);
        },
        error: function() {
          animateBadExpressionRequest('404', 'Not Found');
        }
      });
      break;
    case 'CREATE':
      $.ajax(`/expressions?name=${name}&emoji=${emoji}`, {
        method: 'POST',
        success: function(expression) {
          animateGoodExpressionRequest('200', 'OK', expression);
        },
        error: function() {
          animateBadExpressionRequest('400', 'Bad Request');
        }
      });
      break;
    case 'UPDATE':
```

```
      $.ajax(`/expressions/${id}?name=${name}&emoji=${emoji}`, {
        method: 'PUT',
        success: function(expression) {
          animateGoodExpressionRequest('200', 'OK', expression);
        },
        error: function() {
          animateBadExpressionRequest('404', 'Not Found');
        }
      });
      break;
    case 'DELETE':
      $.ajax(`/expressions/${id}`, {
        method: 'DELETE',
        success: function() {
          animateGoodExpressionRequest('204', 'No Content');
        },
        error: function() {
          animateBadExpressionRequest('404', 'Not Found');
        }
      });
      break;
  }
}

function triggerExpressionsRequest() {
  if (requestInProgress || !machineIsOn) {
    return;
  }

  requestInProgress = true;
  deactivateExpressions();

  $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-active.svg');
  $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-pending.svg');
  $('#code-number').text('');
  $('#code-description').text('');
```

```
  clearExpressionText();
  setExpressionsRequestText();
  const animationDelay = 428.5;
  animateMachine(animationDelay);
  setTimeout(() => makeExpressionsRequest(), animationDelay * 4);
}

function setExpressionsRequestText() {
  $('#expressions-text pre').eq(0).text('GET');
  $('#expressions-text pre').eq(1).text('/expressions');
}

function makeExpressionsRequest() {
  $.ajax('/expressions/', {
    success: function(expressions) {
      console.log(expressions)
      animateGoodExpressionsRequest('200', 'OK', expressions);
    },
    error: function() {
      animateBadExpressionsRequest('404', 'Not Found');
    }
  });
}

function animateMachine(animationDelay) {
  $('#beaker').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/beaker-pending.svg');
  $('#lightbulb').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/lightbulb-pending.svg');
  $('#sliders')
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com/courses/learn-express-routes/sliders-active-1.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com/courses/learn-express-routes/sliders-active-2.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com/courses/learn-express-routes/sliders-active-1.svg'); next(); })
      .delay(animationDelay)
```

```
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/sliders-active-2.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/sliders-inactive.svg'); next(); });
  $('#buttons')
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/buttons-active-1.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/buttons-active-2.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/buttons-active-1.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/buttons-active-2.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/buttons-inactive.svg'); next(); });
}

function animateGoodExpressionRequest(statusCode, statusDescription, response) {
  animateGoodRequest(statusCode, statusDescription);
  $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-green.svg');
  if (currentRequest === 'DELETE') {
    $('#id-field').val('');
  } else {
    $('#id-field').val(response.id);
    $('#name-field').val(response.name);
    $('#emoji-field').val(response.emoji);
  }
}

function animateGoodExpressionsRequest(statusCode, statusDescription, response) {
  animateGoodRequest(statusCode, statusDescription);
```

```
  $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-green.svg');
  const expressions = response;
  const $expressionTabs = $('#expressions-information .tabs').html('');
  for (var i = 0; i < expressions.length; i++) {
    $expressionTabs.append(`<li><p>${expressions[i].emoji}</p><p class="id">${exp
ressions[i].id}</p></li>`);
  }
}

function animateGoodRequest(statusCode, statusDescription) {
  $('#lightbulb').attr('src', 'https://content.codecademy.com/courses/learn-
express-routes/lightbulb-green.svg');
  $('#status-code').removeClass('bad-status').addClass('good-status');
  $('#code-number').text(statusCode);
  $('#code-description').text(statusDescription);
  activateExpressions();
  requestInProgress = false;
}

function animateBadExpressionRequest(statusCode, statusDescription) {
  animateBadRequest(statusCode, statusDescription);
  $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-red.svg');
}

function animateBadExpressionsRequest(statusCode, statusDescription) {
  animateBadRequest(statusCode, statusDescription);
  $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-red.svg');
}

function animateBadRequest(statusCode, statusDescription) {
  $('#lightbulb').attr('src', 'https://content.codecademy.com/courses/learn-
express-routes/lightbulb-red.svg');
  $('#status-code').removeClass('good-status').addClass('bad-status');
  $('#code-number').text(statusCode);
```

```
  $('#code-description').text(statusDescription);
  activateExpressions();
  requestInProgress = false;
}
```

utils.js

```
let expressionIdCounter = 0;
let animalIdCounter = 0;

const getElementById = (id, elementList) => {
  return elementList.find((element) => {
    return element.id === Number(id);
  });
};

const getIndexById = (id, elementList) => {
  return elementList.findIndex((element) => {
    return element.id === Number(id);
  });
};

const createElement = (elementType, queryArguments) => {
  if (queryArguments.hasOwnProperty('emoji') &&
      queryArguments.hasOwnProperty('name')) {
    let currentId;
    if (elementType === 'expressions') {
      expressionIdCounter += 1;
      currentId = expressionIdCounter;
    } else {
      animalIdCounter += 1;
      currentId = animalIdCounter;
    }
    return {
      'id':    currentId,
      'emoji': queryArguments.emoji,
      'name':  queryArguments.name,
    };
  } else {
```

```
    return false;
  }
};

const updateElement = (id, queryArguments, elementList) => {
  const elementIndex = getIndexById(id, elementList);
  if (elementIndex === -1) {
    throw new Error('updateElement must be called with a valid id parameter');
  }
  if (queryArguments.id) {
    queryArguments.id = Number(queryArguments.id);
  }
  Object.assign(elementList[elementIndex], queryArguments);
  return elementList[elementIndex];
};

const seedElements = (arr, type) => {
  if (type === 'expressions') {
    arr.push(createElement('expressions', {'emoji': '😀', 'name': 'happy'}));
    arr.push(createElement('expressions', {'emoji': '😎', 'name': 'shades'}));
    arr.push(createElement('expressions', {'emoji': '😴', 'name': 'sleepy'}));
  } else if (type === 'animals') {
    arr.push(createElement('animals', {'emoji': '🐶', 'name': 'Pupper'}));
    arr.push(createElement('animals', {'emoji': '🐍', 'name': 'Snek'}));
    arr.push(createElement('animals', {'emoji': '😺', 'name': 'Maru'}));
  } else {
    throw new Error(`seed type must be either 'expression' or 'animal'`);
  }
};

module.exports = {
  createElement: createElement,
  getIndexById: getIndexById,
  getElementById: getElementById,
  updateElement: updateElement,
  seedElements: seedElements,
};
```

expressions.js

```
let currentMode = 'expressions';
let currentRequest = '';
let requestInProgress = false;
let machineIsOn = false;

$(document).ready(() => {
  pingMachine();
  setInterval(pingMachine, 1000);

  $('#get-expression').on('click', function() {
    selectExpressionMode('GET');
  });

  $('#create-expression').on('click', function() {
    selectExpressionMode('CREATE');
  });

  $('#update-expression').on('click', function() {
    selectExpressionMode('UPDATE');
  });

  $('#delete-expression').on('click', function() {
    selectExpressionMode('DELETE');
  });

  $('.expression-form .button').on('click', function() {
    triggerExpressionRequest();
  });

  $('#expressions-information .button').on('click', function() {
    triggerExpressionsRequest();
  });
});

function pingMachine() {
  if (requestInProgress) {
    return;
  }

  $.ajax('/', {
```

```
    success: function() {
      activateMachine();
      if($('#expression-
route').attr('src') === "https://content.codecademy.com/courses/learn-express-
routes/expression-route-inactive.svg") {
        $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-active.svg');
        $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-active.svg');
        activateExpressions();
      }
    },
    error: function(xhr) {
      if (xhr.status !== 404) {
        activateMachine();
        if($('#expression-
route').attr('src') === "https://content.codecademy.com/courses/learn-express-
routes/expression-route-inactive.svg") {
          $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-active.svg');
          $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-active.svg');
          activateExpressions();
        }
      } else {
        deactivateMachine();
        deactivateExpressions();
        $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-inactive.svg');
        $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-inactive.svg');
      }
    }
  });
```

```
}

function activateMachine() {
  machineIsOn = true;
  $('#server-machine').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/server-machine-active.svg');
  $('#beaker').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/beaker-active-neutral.svg');

  if ($('#lightbulb').attr('src') === 'https://content.codecademy.com/courses/learn-express-routes/lightbulb-inactive.svg') {
    $('#lightbulb').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/lightbulb-active.svg');
  }
}

function deactivateMachine() {
  machineIsOn = false;
  currentRequest = '';
  $('.expression-form').css('display', 'none');
  $('#expression-information .tabs li').removeClass('active');
  $('#expressions-information .tabs').html('');
  $('#server-machine').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/server-machine-inactive.svg');
  $('#lightbulb').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/lightbulb-inactive.svg');
  $('#beaker').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/beaker-inactive.svg');
  $('#code-number').text('');
  $('#code-description').text('');
  clearExpressionText();
  clearExpressionsText();
}

function activateExpressions() {
  $('#expression-information').removeClass('inactive');
  $('#expressions-information').removeClass('inactive');
}

function deactivateExpressions() {
```

```
  $('#expression-information').addClass('inactive');
  $('#expressions-information').addClass('inactive');
}

function selectExpressionMode(mode) {
  if(!machineIsOn) {
    return;
  }

  currentRequest = mode;
  $('.expression-form').css('display', 'block');
  $('#expression-information .tabs li').removeClass('active');
  $('#id-field').prop('readonly', false).removeClass('disabled').val('');
  $('#name-field').prop('readonly', false).removeClass('disabled').val('');
  if (mode === 'GET') {
    $('#emoji-field').prop('disabled', false).removeClass('disabled').val('');
    $('#get-expression').addClass('active');
    $('#name-field').prop('readonly', true).addClass('disabled');
    $('#emoji-field').prop('disabled', true).addClass('disabled');
  } else if (mode === 'CREATE') {
    $('#emoji-field').prop('disabled', false).removeClass('disabled').val('😀');
    $('#create-expression').addClass('active');
    $('#id-field').prop('readonly', true).addClass('disabled');
  } else if (mode === 'UPDATE') {
    $('#emoji-field').prop('disabled', false).removeClass('disabled').val('😀');
    $('#update-expression').addClass('active');
  } else if (mode === 'DELETE') {
    $('#emoji-field').prop('disabled', false).removeClass('disabled').val('');
    $('#delete-expression').addClass('active');
    $('#name-field').prop('readonly', true).addClass('disabled');
    $('#emoji-field').prop('disabled', true).addClass('disabled');
  }
}

function triggerExpressionRequest() {
  if (requestInProgress || !machineIsOn) {
    return;
  }

  requestInProgress = true;
```

```
  deactivateExpressions();

  const id = $('#id-field').val();
  const name = $('#name-field').val();
  const emoji = $('#emoji-field').val();

  $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-pending.svg');
  $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-active.svg');
  $('#code-number').text('');
  $('#code-description').text('');
  clearExpressionsText();
  setExpressionRequestText(id, name, emoji);
  const animationDelay = 428.5;
  animateMachine(animationDelay);
  setTimeout(() => makeExpressionRequest(id, name, emoji), animationDelay * 4);
}

function setExpressionRequestText(id, name, emoji) {
  switch (currentRequest) {
    case 'GET':
      $('#expression-text pre').eq(0).text('GET');
      $('#expression-text pre').eq(1).text(`/expressions/${id}`);
      $('#expression-text pre').eq(2).text('');
      $('#expression-text pre').eq(3).text('');
      break;
    case 'CREATE':
      $('#expression-text pre').eq(0).text('POST');
      $('#expression-text pre').eq(1).text(`/expressions`);
      $('#expression-text pre').eq(2).text(`?name=${name}`);
      $('#expression-text pre').eq(3).text(`&emoji=${emoji}`);
      break;
    case 'UPDATE':
      $('#expression-text pre').eq(0).text('PUT');
      $('#expression-text pre').eq(1).text(`/expressions/${id}`);
      $('#expression-text pre').eq(2).text(`?name=${name}`);
      $('#expression-text pre').eq(3).text(`&emoji=${emoji}`);
```

```
      break;
    case 'DELETE':
      $('#expression-text pre').eq(0).text('DELETE');
      $('#expression-text pre').eq(1).text(`/expressions/${id}`);
      $('#expression-text pre').eq(2).text('');
      $('#expression-text pre').eq(3).text('');
      break;
  }
}

function clearExpressionText() {
  $('#expression-text pre').eq(0).text('');
  $('#expression-text pre').eq(1).text('');
  $('#expression-text pre').eq(2).text('');
  $('#expression-text pre').eq(3).text('');
}

function clearExpressionsText() {
  $('#expressions-text pre').eq(0).text('');
  $('#expressions-text pre').eq(1).text('');
}

function makeExpressionRequest(id, name, emoji) {
  switch (currentRequest) {
    case 'GET':
      $.ajax(`/expressions/${id}`, {
        success: function(expression) {
          animateGoodExpressionRequest('200', 'OK', expression);
        },
        error: function() {
          animateBadExpressionRequest('404', 'Not Found');
        }
      });
      break;
    case 'CREATE':
      $.ajax(`/expressions?name=${name}&emoji=${emoji}`, {
        method: 'POST',
        success: function(expression) {
          animateGoodExpressionRequest('200', 'OK', expression);
        },
```

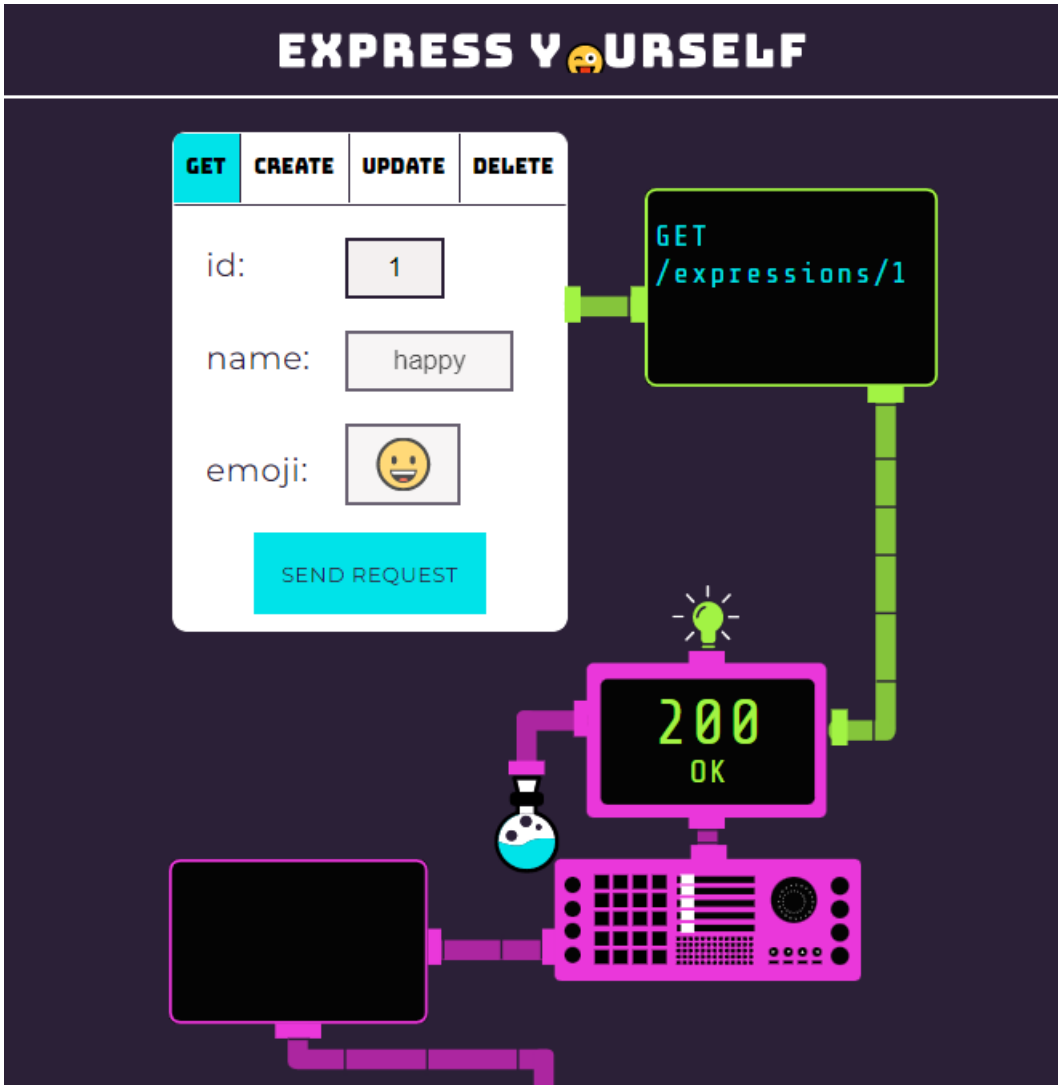
```
        error: function() {
          animateBadExpressionRequest('400', 'Bad Request');
        }
      });
      break;
    case 'UPDATE':
      $.ajax(`/expressions/${id}?name=${name}&emoji=${emoji}`, {
        method: 'PUT',
        success: function(expression) {
          animateGoodExpressionRequest('200', 'OK', expression);
        },
        error: function() {
          animateBadExpressionRequest('404', 'Not Found');
        }
      });
      break;
    case 'DELETE':
      $.ajax(`/expressions/${id}`, {
        method: 'DELETE',
        success: function() {
          animateGoodExpressionRequest('204', 'No Content');
        },
        error: function() {
          animateBadExpressionRequest('404', 'Not Found');
        }
      });
      break;
  }
}

function triggerExpressionsRequest() {
  if (requestInProgress || !machineIsOn) {
    return;
  }

  requestInProgress = true;
  deactivateExpressions();
```

```
  $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-active.svg');
  $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-pending.svg');
  $('#code-number').text('');
  $('#code-description').text('');
  clearExpressionText();
  setExpressionsRequestText();
  const animationDelay = 428.5;
  animateMachine(animationDelay);
  setTimeout(() => makeExpressionsRequest(), animationDelay * 4);
}

function setExpressionsRequestText() {
  $('#expressions-text pre').eq(0).text('GET');
  $('#expressions-text pre').eq(1).text('/expressions');
}

function makeExpressionsRequest() {
  $.ajax('/expressions/', {
    success: function(expressions) {
      console.log(expressions)
      animateGoodExpressionsRequest('200', 'OK', expressions);
    },
    error: function() {
      animateBadExpressionsRequest('404', 'Not Found');
    }
  });
}

function animateMachine(animationDelay) {
  $('#beaker').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/beaker-pending.svg');
  $('#lightbulb').attr('src', 'https://content.codecademy.com/courses/learn-
express-routes/lightbulb-pending.svg');
  $('#sliders')
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/sliders-active-1.svg'); next(); })
```

```
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/sliders-active-2.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/sliders-active-1.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/sliders-active-2.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/sliders-inactive.svg'); next(); });
  $('#buttons')
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/buttons-active-1.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/buttons-active-2.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/buttons-active-1.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/buttons-active-2.svg'); next(); })
      .delay(animationDelay)
      .queue(function(next) { $(this).attr('src', 'https://content.codecademy.com
/courses/learn-express-routes/buttons-inactive.svg'); next(); });
}

function animateGoodExpressionRequest(statusCode, statusDescription, response) {
  animateGoodRequest(statusCode, statusDescription);
  $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-green.svg');
  if (currentRequest === 'DELETE') {
    $('#id-field').val('');
  } else {
    $('#id-field').val(response.id);
    $('#name-field').val(response.name);
    $('#emoji-field').val(response.emoji);
```

```
  }
}

function animateGoodExpressionsRequest(statusCode, statusDescription, response) {
  animateGoodRequest(statusCode, statusDescription);
  $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-green.svg');
  const expressions = response;
  const $expressionTabs = $('#expressions-information .tabs').html('');
  for (var i = 0; i < expressions.length; i++) {
    $expressionTabs.append(`<li><p>${expressions[i].emoji}</p><p class="id">${exp
ressions[i].id}</p></li>`);
  }
}

function animateGoodRequest(statusCode, statusDescription) {
  $('#lightbulb').attr('src', 'https://content.codecademy.com/courses/learn-
express-routes/lightbulb-green.svg');
  $('#status-code').removeClass('bad-status').addClass('good-status');
  $('#code-number').text(statusCode);
  $('#code-description').text(statusDescription);
  activateExpressions();
  requestInProgress = false;
}

function animateBadExpressionRequest(statusCode, statusDescription) {
  animateBadRequest(statusCode, statusDescription);
  $('#expression-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expression-route-red.svg');
}

function animateBadExpressionsRequest(statusCode, statusDescription) {
  animateBadRequest(statusCode, statusDescription);
  $('#expressions-
route').attr('src', 'https://content.codecademy.com/courses/learn-express-
routes/expressions-route-red.svg');
}
```

```
function animateBadRequest(statusCode, statusDescription) {
  $('#lightbulb').attr('src', 'https://content.codecademy.com/courses/learn-express-routes/lightbulb-red.svg');
  $('#status-code').removeClass('good-status').addClass('bad-status');
  $('#code-number').text(statusCode);
  $('#code-description').text(statusDescription);
  activateExpressions();
  requestInProgress = false;
}
```



Setting Status Codes

Express allows us to set the status code on responses before they are sent. Response codes provide information to clients about how their requests were handled. Until now, we have been allowing the Express server to set status codes for us. For example, any `res.send()` has by default sent a 200 OK status code.

The `res` object has a `.status()` method to allow us to set the status code, and other methods like `.send()` can be chained from it.

```
const monsterStoreInventory = { fenrirs: 4, banshees: 1,
jerseyDevils: 4, krakens: 3 };
app.get('/monsters-inventory/:name', (req, res, next) => {
  const monsterInventory
= monsterStoreInventory[req.params.name];
  if (monsterInventory) {
    res.send(monsterInventory);
  } else {
    res.status(404).send('Monster not found');
  }
});
```

In this example, we've implemented a route to retrieve inventory levels from a Monster Store. Inventory levels are kept in the `monsterStoreInventory` variable. When a request arrives for `/monsters-inventory/mothMen`, the route matches and so the callback is invoked. `req.params.name` will be equal to `'mothMen'` and so our program accesses `monsterStoreInventory['mothMen']`. Since there are no `mothMen` in our inventory,`res.status()` sets a `404` status code on the response, and `.send()` sends the response.

Instructions

1.

Let's make sure that our GET /expressions/:id route handles invalid requests properly, for instance if we request an expression ID that does not exist.

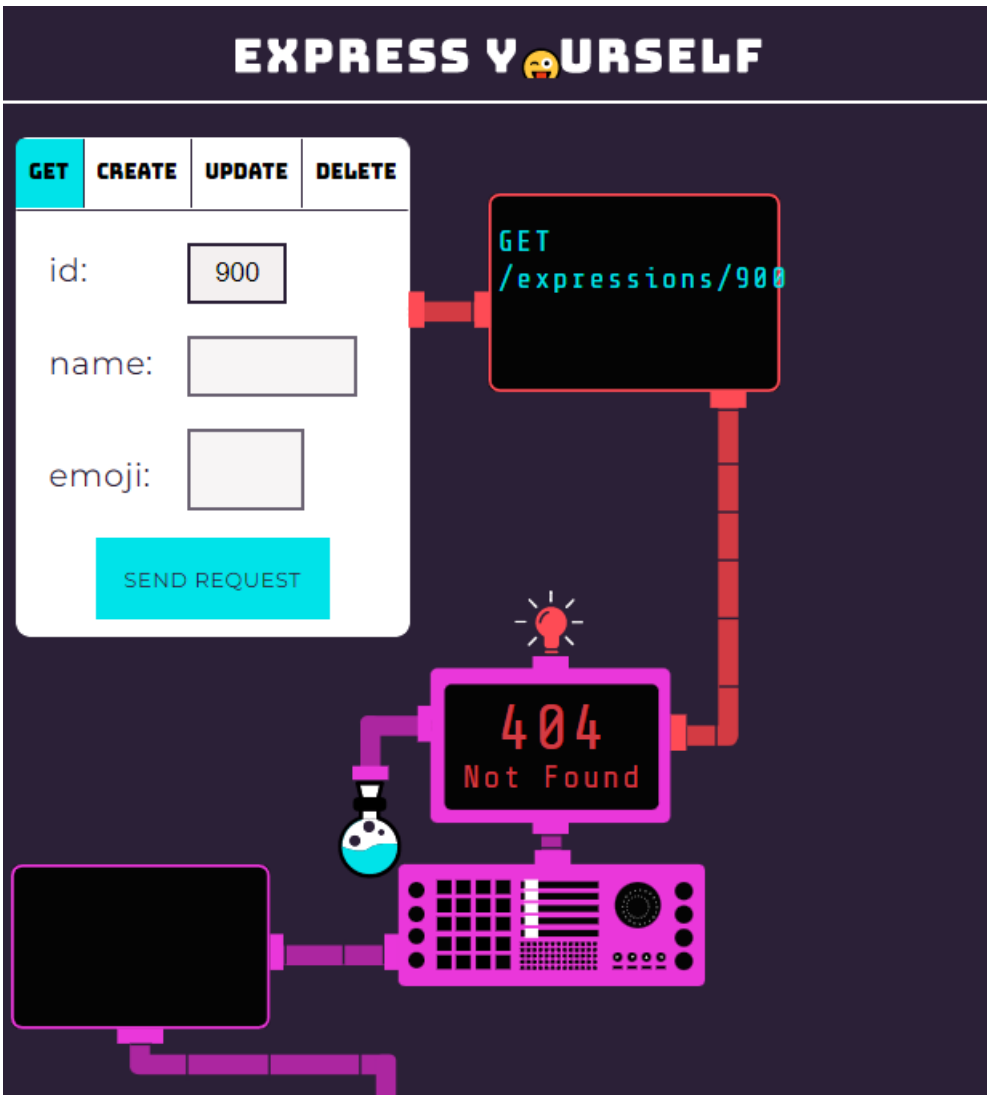
Complete your route so that it sends back the correct expression object if it exists and sends back a 404 response if it does not.

Hint

Remember that `getElementById` returns an object for a valid ID and `undefined` for an invalid ID.

app.js

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

// Serves Express Yourself website
app.use(express.static('public'));

const { getElementById, seedElements } = require('./utils');

const expressions = [];
seedElements(expressions, 'expressions');

const PORT = process.env.PORT || 4001;
// Use static server to serve the Express Yourself Website
app.use(express.static('public'));

app.get('/expressions', (req, res, next) => {
  res.send(expressions);
});

app.get('/expressions/:id', (req, res, next) => {
  const foundExpression = getElementById(req.params.id, expressions);
  if (foundExpression) {
    res.send(foundExpression);
  } else {
    res.status(404).send('Expression not found');
  }
});

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



Matching Longer Paths

Parameters are extremely helpful in making server routes dynamic and able to respond to different inputs. Route parameters will match anything in their specific part of the path, so a route matching `/monsters/:name` would match all the following request paths:

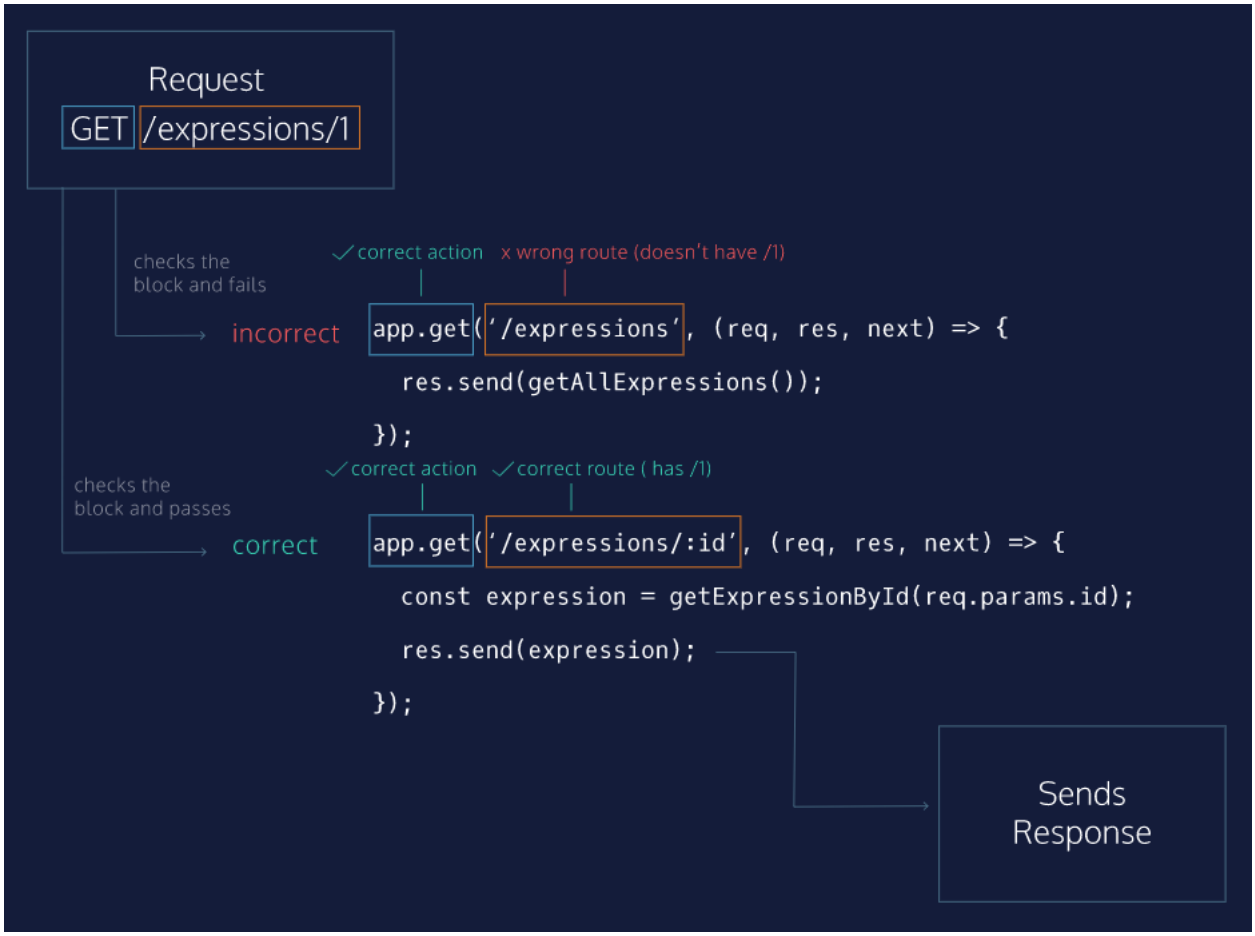
```
/monsters/hydra
/monsters/jörmungandr
/monsters/manticore
/monsters/123
```

In order for a request to match a route path, it must match the entire path, as shown in the diagram to the right. The request arrives for `/expressions/1`. It first tries to match the `/expressions` route, but because it has additional path segments after `/expressions`, it does not match this route and moves on to the next. It matches `/expressions/:id` because `:id` will match any value at that level

of the path segment. The route matches, so the Express server calls the callback function, which in turn handles the request and sends a response.

Instructions

Move on to the next exercise when you're ready.



Other HTTP Methods

HTTP Protocol defines a number of different method verbs with many use cases. So far, we have been using the `GET` request which is probably the most common of all. Every time your browser loads an image, it is making a `GET` request for that file!

This course will cover three other important HTTP methods: `PUT`, `POST`, and `DELETE`. Express provides methods for each one: `app.put()`, `app.post()`, and `app.delete()`.

`PUT` requests are used for updating existing resources. In our Express Yourself machine, a PUT request will be used to update the name or emoji of an expression already saved in our database. For this reason, we will need to include a unique identifier as a route parameter to determine which specific resource to update.

Instructions

1.

For now, open a PUT /expressions/:id route with an empty `(req, res, next)` callback function. We will fully implement its functionality in the next exercise.

app.js

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

// Serves Express Yourself website
app.use(express.static('public'));

const { getElementById, seedElements } = require('./utils');

const expressions = [];
seedElements(expressions, 'expressions');

const PORT = process.env.PORT || 4001;
// Use static server to serve the Express Yourself Website
app.use(express.static('public'));

app.get('/expressions', (req, res, next) => {
  res.send(expressions);
});

app.get('/expressions/:id', (req, res, next) => {
  const foundExpression = getElementById(req.params.id, expressions);
  if (foundExpression) {
    res.send(foundExpression);
  } else {
    res.status(404).send();
```

```
  }
});

// Add your PUT route handler below:
app.put('/expressions/:id', (req, res, next) => {

});

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

Using Queries

You may have noticed in the previous exercise that our `PUT` route had no information about how to update the specified expression, just the id of which expression to update. It turns out that there was more information in the request in the form of a *query string*. Query strings appear at the end of the path in URLs, and they are indicated with a `?` character. For instance, in `/monsters/1?name=chimera&age=1`, the query string is `name=chimera&age=1` and the path is `/monsters/1/`

Query strings do not count as part of the route path. Instead, the Express server parses them into a JavaScript object and attaches it to the request body as the value of `req.query`. The `key: value` relationship is indicated by the `=` character in a query string, and key-value pairs are separated by `&`. In the above example route, the `req.query` object would be `{ name: 'chimera', age: '1' }`.

```
const monsters = { '1': { name: 'cerberus', age: '4'  } };
// PUT /monsters/1?name=chimera&age=1
app.put('/monsters/:id', (req, res, next) => {
  const monsterUpdates = req.query;
  monsters[req.params.id] = monsterUpdates;
  res.send(monsters[req.params.id]);
});
```

Here, we have a route for updating monsters by ID. When a PUT /monsters/1?name=chimera&age=1 request arrives, our callback function is called and, we create a `monsterUpdates` variable to store `req.query`. Since `req.params.id` is `'1'`, we replace `monsters['1']`'s value with `monsterUpdates` . Finally, Express sends back the new `monsters['1']`.

When updating, many servers will send back the updated resource after the updates are applied so that the client has the exact same version of the resource as the server and database.

Instructions

1.

Use `req.query` to update the proper element in the `expressions` array.

We've imported a helper function from **/utils.js** to help with this task.

You can use the `updateElement()` helper function in your `PUT /expressions/:id` route.

It takes three arguments:

- `id` (the ID number of the element)
- `queryArguments` (the new, updated expression object from `req.query`)
- `elementList` (the array which contains the element to update)

`updateElement()` updates that specific element in the `elementList` array (you'll pass in the `expressions` array), and then returns the updated element.

Be sure to check that an `expression` with the `id` you provide exists in the `expressions` array (`getIndexById()` can help)!

To test your functionality with the Express Yourself machine, make sure your server is running, get all expressions, and then use the UPDATE tab to select an individual expression, select updates, and send the PUT request.

Hint

Remember:

- `getIndexById` will return -1 if the expressions array doesn't contain an element with that id.
- `updateElement` will throw an error if you pass in an id that doesn't exist in the array

app.js

```
let expressionIdCounter = 0;
let animalIdCounter = 0;

const getElementById = (id, elementList) => {
  return elementList.find((element) => {
    return element.id === Number(id);
  });
};

const getIndexById = (id, elementList) => {
  return elementList.findIndex((element) => {
    return element.id === Number(id);
  });
};

const createElement = (elementType, queryArguments) => {
  if (queryArguments.hasOwnProperty('emoji') &&
      queryArguments.hasOwnProperty('name')) {
    let currentId;
    if (elementType === 'expressions') {
      expressionIdCounter += 1;
      currentId = expressionIdCounter;
    } else {
      animalIdCounter += 1;
      currentId = animalIdCounter;
    }
    return {
      'id':    currentId,
      'emoji': queryArguments.emoji,
      'name':  queryArguments.name,
    };
  } else {
    return false;
  }
};

const updateElement = (id, queryArguments, elementList) => {
  const elementIndex = getIndexById(id, elementList);
  if (elementIndex === -1) {
```

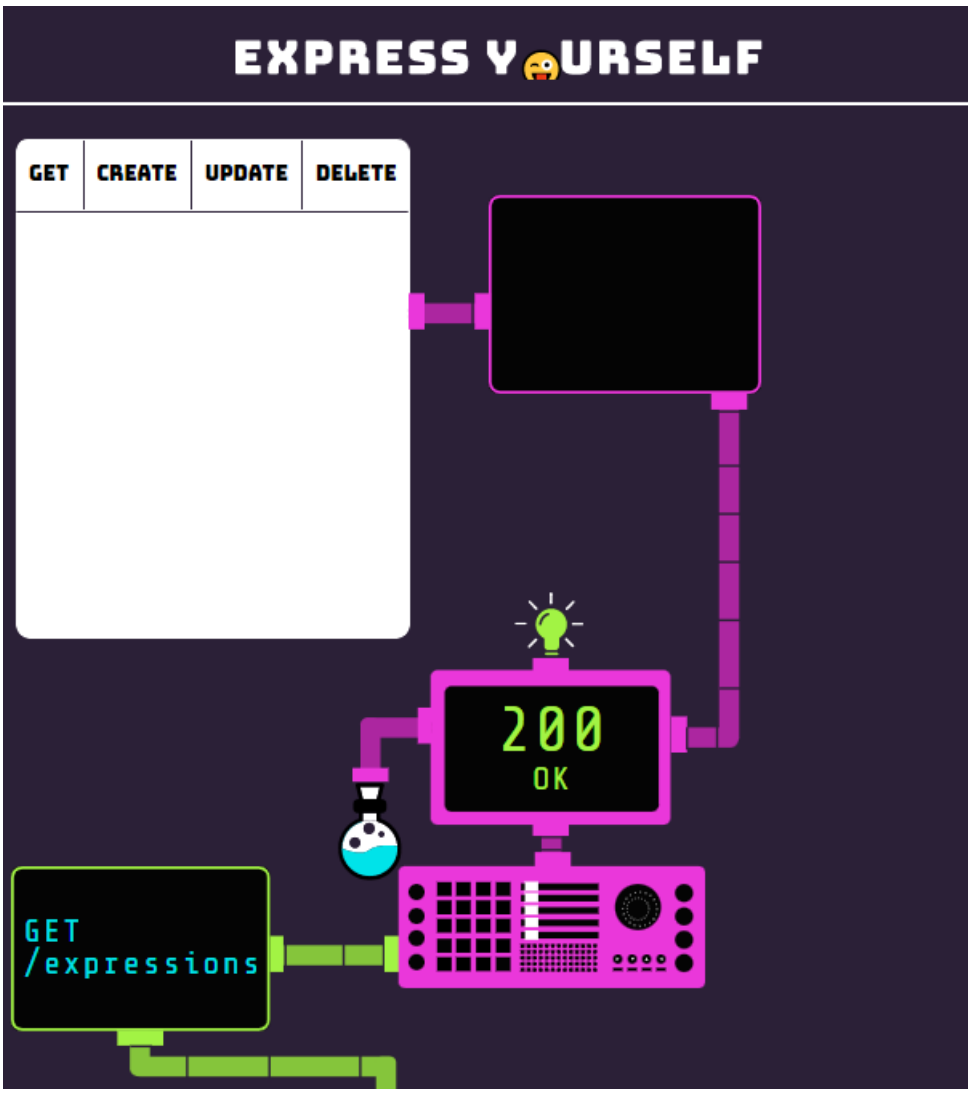
```
    throw new Error('updateElement must be called with a valid id parameter');
  }
  if (queryArguments.id) {
    queryArguments.id = Number(queryArguments.id);
  }
  Object.assign(elementList[elementIndex], queryArguments);
  return elementList[elementIndex];
};

const seedElements = (arr, type) => {
  if (type === 'expressions') {
    arr.push(createElement('expressions', {'emoji': '😀', 'name': 'happy'}));
    arr.push(createElement('expressions', {'emoji': '😎', 'name': 'shades'}));
    arr.push(createElement('expressions', {'emoji': '😴', 'name': 'sleepy'}));
  } else if (type === 'animals') {
    arr.push(createElement('animals', {'emoji': '🐶', 'name': 'Pupper'}));
    arr.push(createElement('animals', {'emoji': '🐍', 'name': 'Snek'}));
    arr.push(createElement('animals', {'emoji': '😺', 'name': 'Maru'}));
  } else {
    throw new Error(`seed type must be either 'expression' or 'animal'`);
  }
};

module.exports = {
  createElement: createElement,
  getIndexById: getIndexById,
  getElementById: getElementById,
  updateElement: updateElement,
  seedElements: seedElements,
};
```

utils.js

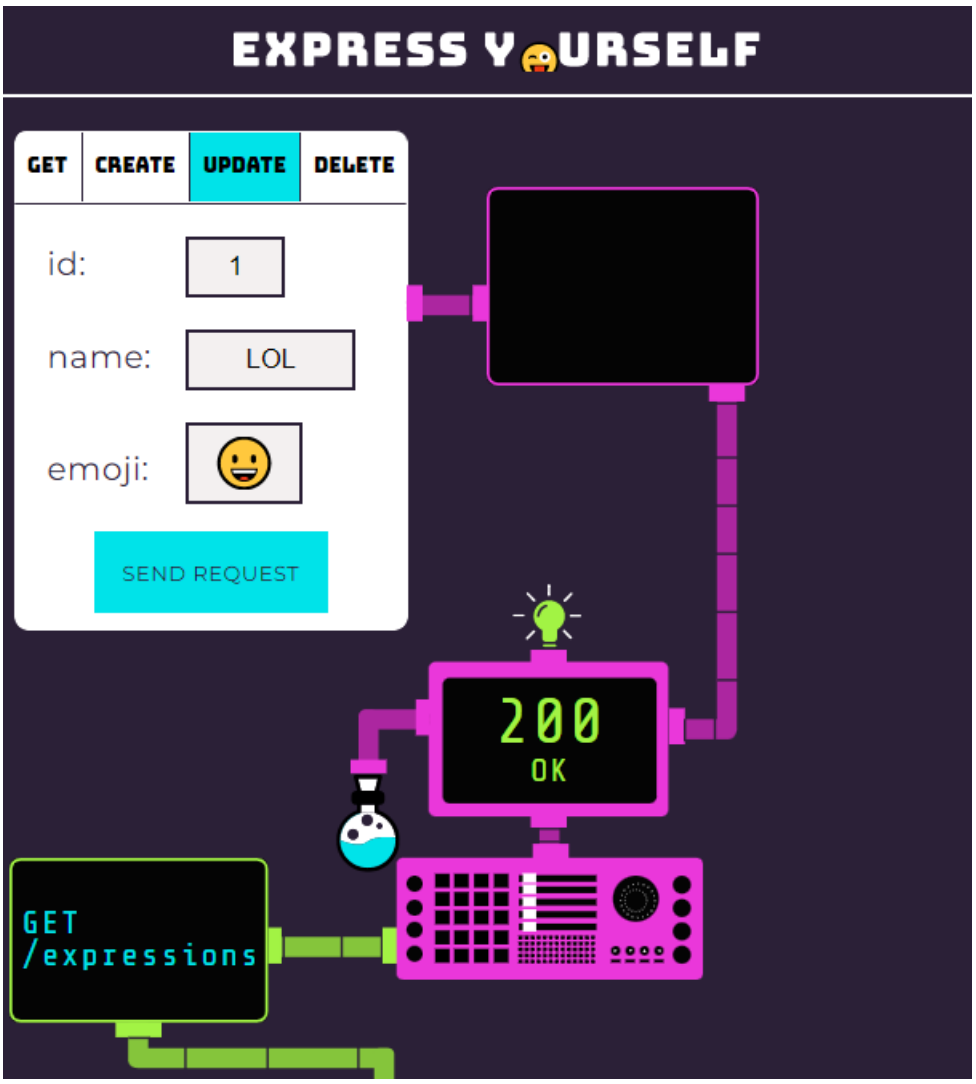
```
let expressionIdCounter = 0;
let animalIdCounter = 0;

const getElementById = (id, elementList) => {
  return elementList.find((element) => {
    return element.id === Number(id);
  });
```

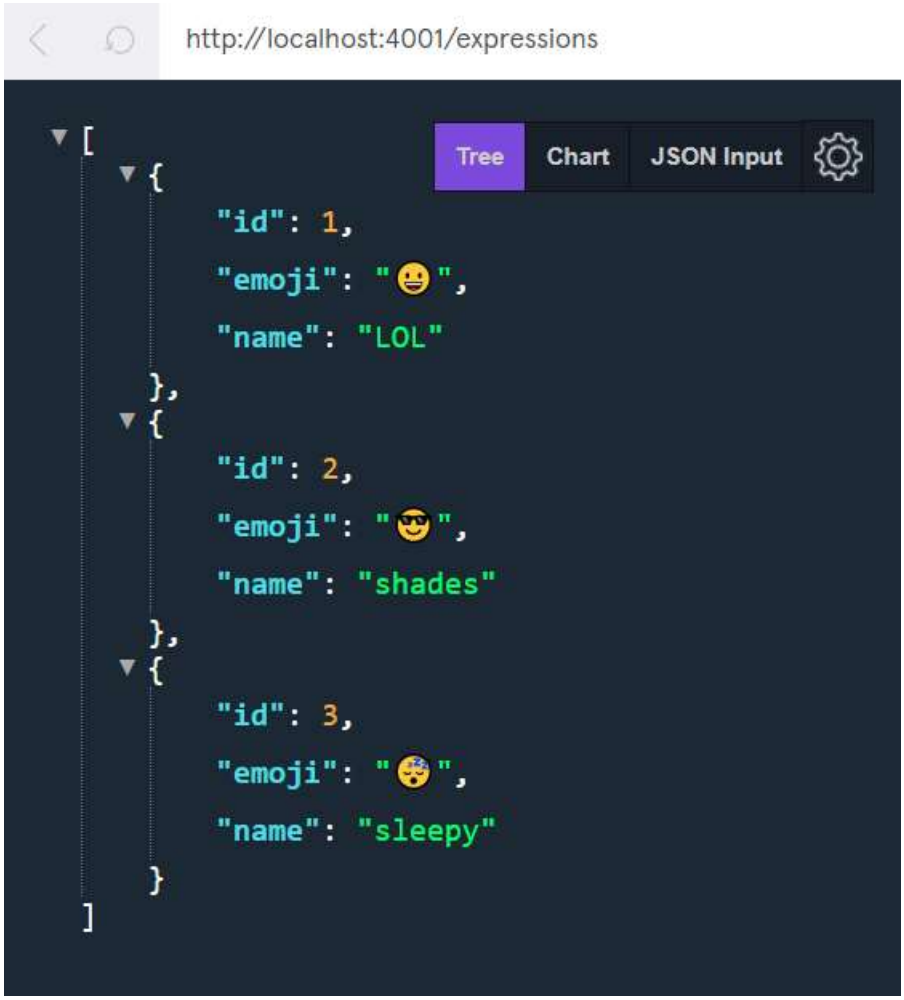
```
};

const getIndexById = (id, elementList) => {
  return elementList.findIndex((element) => {
    return element.id === Number(id);
  });
};

const createElement = (elementType, queryArguments) => {
  if (queryArguments.hasOwnProperty('emoji') &&
      queryArguments.hasOwnProperty('name')) {
    let currentId;
    if (elementType === 'expressions') {
      expressionIdCounter += 1;
      currentId = expressionIdCounter;
    } else {
      animalIdCounter += 1;
      currentId = animalIdCounter;
    }
    return {
      'id':    currentId,
      'emoji': queryArguments.emoji,
      'name':  queryArguments.name,
    };
  } else {
    return false;
  }
};

const updateElement = (id, queryArguments, elementList) => {
  const elementIndex = getIndexById(id, elementList);
  if (elementIndex === -1) {
    throw new Error('updateElement must be called with a valid id parameter');
  }
  if (queryArguments.id) {
    queryArguments.id = Number(queryArguments.id);
  }
  Object.assign(elementList[elementIndex], queryArguments);
  return elementList[elementIndex];
};
```

```
const seedElements = (arr, type) => {
  if (type === 'expressions') {
    arr.push(createElement('expressions', {'emoji': '😀', 'name': 'happy'}));
    arr.push(createElement('expressions', {'emoji': '😎', 'name': 'shades'}));
    arr.push(createElement('expressions', {'emoji': '😴', 'name': 'sleepy'}));
  } else if (type === 'animals') {
    arr.push(createElement('animals', {'emoji': '🐶', 'name': 'Pupper'}));
    arr.push(createElement('animals', {'emoji': '🐍', 'name': 'Snek'}));
    arr.push(createElement('animals', {'emoji': '😺', 'name': 'Maru'}));
  } else {
    throw new Error(`seed type must be either 'expression' or 'animal'`);
  }
};

module.exports = {
  createElement: createElement,
  getIndexById: getIndexById,
  getElementById: getElementById,
  updateElement: updateElement,
  seedElements: seedElements,
};
```


EXPRESS YOURSELF
GET
CREATE
UPDATE
DELETE
200
OK
GET
/expressions


Tree
Chart
JSON Input
[
{
"id": 1,
"emoji": "😀",
"name": "happy"
},
{
"id": 2,
"emoji": "😎",
"name": "shades"
},
{
"id": 3,
"emoji": "🥳",
"name": "sleepy"
}
]


EXPRESS YOURSELF
GET
CREATE
UPDATE
DELETE
id:
1
name:
LOL
emoji:
SEND REQUEST
200
OK
GET
/expressions

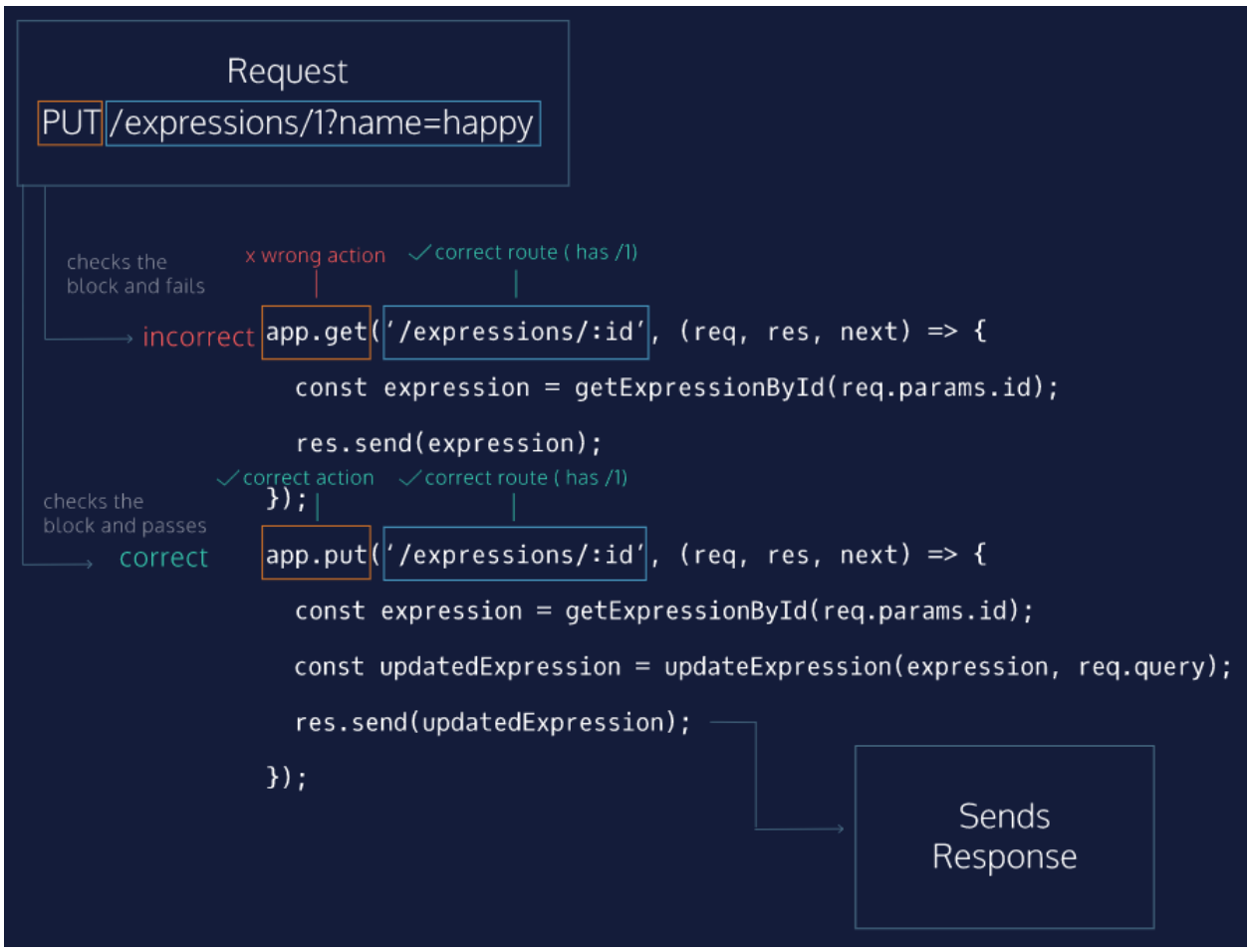


Matching By HTTP Verb

Express matches routes using both path and HTTP method verb. In the diagram to the right, we see a request with a PUT verb and `/expressions` (remember that the query is not part of the route path). The path for the first route matches, but the method verb is wrong, so the Express server will continue to the next registered route. This route matches both method and path, and so its callback is called, the necessary updating logic is executed, and the response is sent.

Instructions

Move on to the next exercise when you're ready.



Creating An Expression

`POST` is the HTTP method verb used for creating new resources.
Because `POST` routes create new data, their paths do not end with a route parameter, but instead end with the type of resource to be created.

For example, to create a new monster, a client would make a `POST` request to `/monsters`. The client does not know the `id` of the monster until it is created and sent back by the server, therefore POST `/monsters/:id` doesn't make sense because a client couldn't know the unique id of a monster before it exists.

Express uses `.post()` as its method for `POST` requests. POST requests can use many ways of sending data to create new resources, including query strings.

The HTTP status code for a newly-created resource is 201 Created.

Instructions

1.

Create a POST /expressions route. It should send create and add a new expression to the `expressions` array if it is a valid new expression (meaning it has an `emoji` and `name` key). It should send back the new element with a 201 status code if it is valid, and it should send a 400 status code if the object is not valid.

You can use the `createElement(elementType, objectToCreate)` helper function to create a valid expression. The first argument is the type of element, so it should be `'expressions'` in this case. The second argument should be the query object with an `emoji` and a `name` property. This function will return `false` if the `objectToCreate` does not contain all necessary key-value pairs, and it will return the newly-created element if `object to create` is valid. It does not add the created element to any arrays, you will need to do so yourself.

Don't forget to restart your server and test as you implement the functionality. To test your route, use the POST tab in the upper left corner. Select a name and emoji and send the request to see if your route works as intended.

Hint

You can use the `.push()` method of the `expressions` array to add a new element after it has been created, for example:

```
const newElement = createElement('emoji', {name: 'example',
emoji: ':)'});
if (newElement) {
  elements.push(newElement);
}
```

app.js

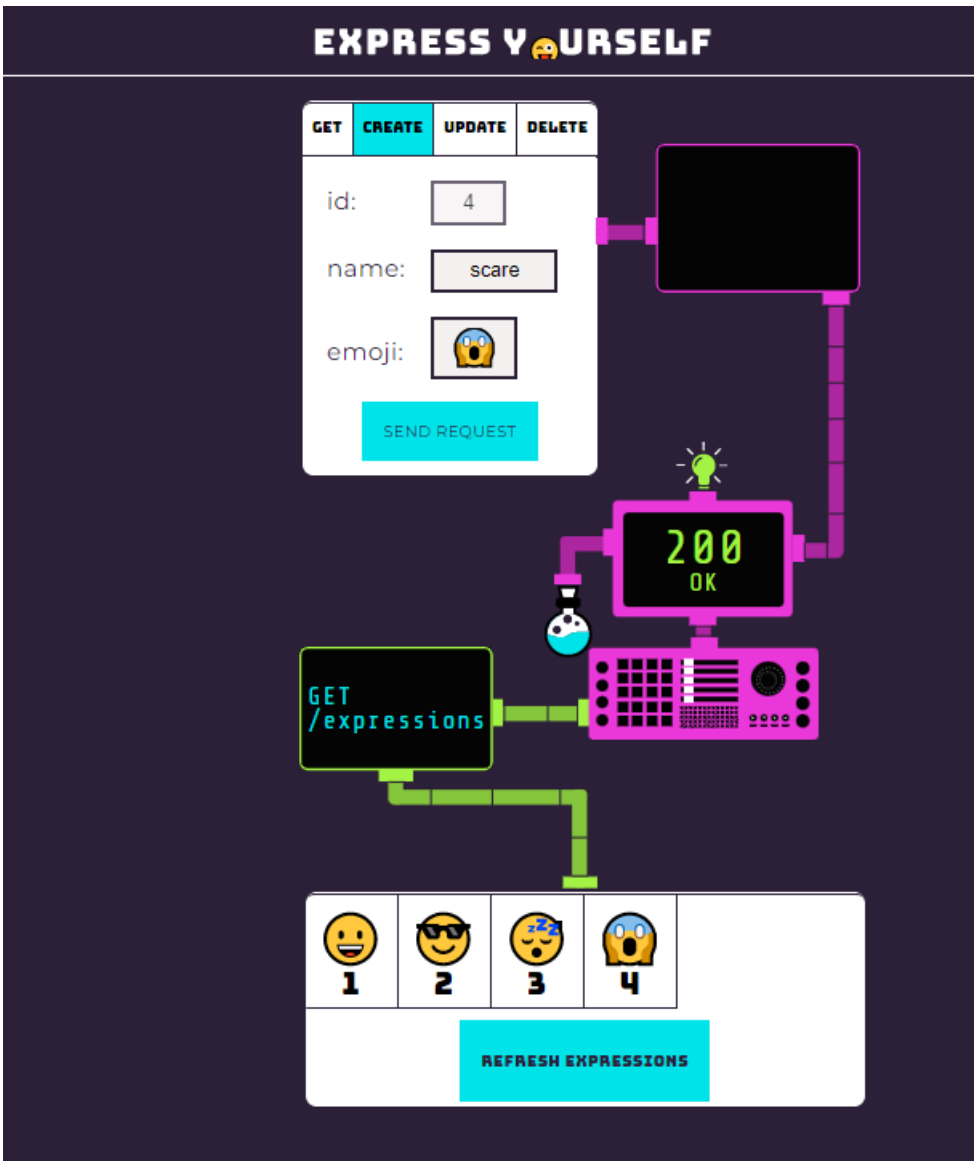
```
const express = require('express');
const app = express();

// Serves Express Yourself website
app.use(express.static('public'));

const { getElementById, getIndexById, updateElement,
        seedElements, createElement } = require('./utils');

const expressions = [];
seedElements(expressions, 'expressions');
```

```
const PORT = process.env.PORT || 4001;
// Use static server to serve the Express Yourself Website
app.use(express.static('public'));

app.get('/expressions', (req, res, next) => {
  res.send(expressions);
});

app.get('/expressions/:id', (req, res, next) => {
  const foundExpression = getElementById(req.params.id, expressions);
  if (foundExpression) {
    res.send(foundExpression);
  } else {
    res.status(404).send();
  }
});

app.put('/expressions/:id', (req, res, next) => {
  const expressionIndex = getIndexById(req.params.id, expressions);
  if (expressionIndex !== -1) {
    updateElement(req.params.id, req.query, expressions);
    res.send(expressions[expressionIndex]);
  } else {
    res.status(404).send();
  }
});

app.post('/expressions', (req, res, next) => {
  const receivedExpression = createElement('expressions', req.query);
  if (receivedExpression) {
    expressions.push(receivedExpression);
    res.status(201).send(receivedExpression);
  } else {
    res.status(400).send();
  }
});

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

utils.js

```
let expressionIdCounter = 0;
let animalIdCounter = 0;

const getElementById = (id, elementList) => {
  return elementList.find((element) => {
    return element.id === Number(id);
  });
};

const getIndexById = (id, elementList) => {
  return elementList.findIndex((element) => {
    return element.id === Number(id);
  });
};

const createElement = (elementType, queryArguments) => {
  if (queryArguments.hasOwnProperty('emoji') &&
      queryArguments.hasOwnProperty('name')) {
    let currentId;
    if (elementType === 'expressions') {
      expressionIdCounter += 1;
      currentId = expressionIdCounter;
    } else {
      animalIdCounter += 1;
      currentId = animalIdCounter;
    }
    return {
      'id':    currentId,
      'emoji': queryArguments.emoji,
      'name':  queryArguments.name,
    };
  } else {
    return false;
  }
};

const updateElement = (id, queryArguments, elementList) => {
  const elementIndex = getIndexById(id, elementList);
  if (elementIndex === -1) {
```

```
    throw new Error('updateElement must be called with a valid id parameter');
  }
  if (queryArguments.id) {
    queryArguments.id = Number(queryArguments.id);
  }
  Object.assign(elementList[elementIndex], queryArguments);
  return elementList[elementIndex];
};

const seedElements = (arr, type) => {
  if (type === 'expressions') {
    arr.push(createElement('expressions', {'emoji': '😀', 'name': 'happy'}));
    arr.push(createElement('expressions', {'emoji': '😎', 'name': 'shades'}));
    arr.push(createElement('expressions', {'emoji': '😴', 'name': 'sleepy'}));
  } else if (type === 'animals') {
    arr.push(createElement('animals', {'emoji': '🐶', 'name': 'Pupper'}));
    arr.push(createElement('animals', {'emoji': '🐍', 'name': 'Snek'}));
    arr.push(createElement('animals', {'emoji': '😺', 'name': 'Maru'}));
  } else {
    throw new Error(`seed type must be either 'expression' or 'animal'`);
  }
};

module.exports = {
  createElement: createElement,
  getIndexById: getIndexById,
  getElementById: getElementById,
  updateElement: updateElement,
  seedElements: seedElements,
};
```



Deleting Old Expressions

`DELETE` is the HTTP method verb used to delete resources.
Because `DELETE` routes delete currently existing data, their paths should usually end with a route parameter to indicate which resource to delete.

Express uses `.delete()` as its method for `DELETE` requests.

Servers often send a 204 No Content status code if deletion occurs without error.

Instructions

1.

Create a DELETE /expressions/:id route. It should send back a 404 response for a request with an invalid id, and it should delete the proper element from the `expressions` array and send a 204 status with a valid id.

To test your functionality, use the DELETE tab in the upper left. Select the ID to delete and send the request.

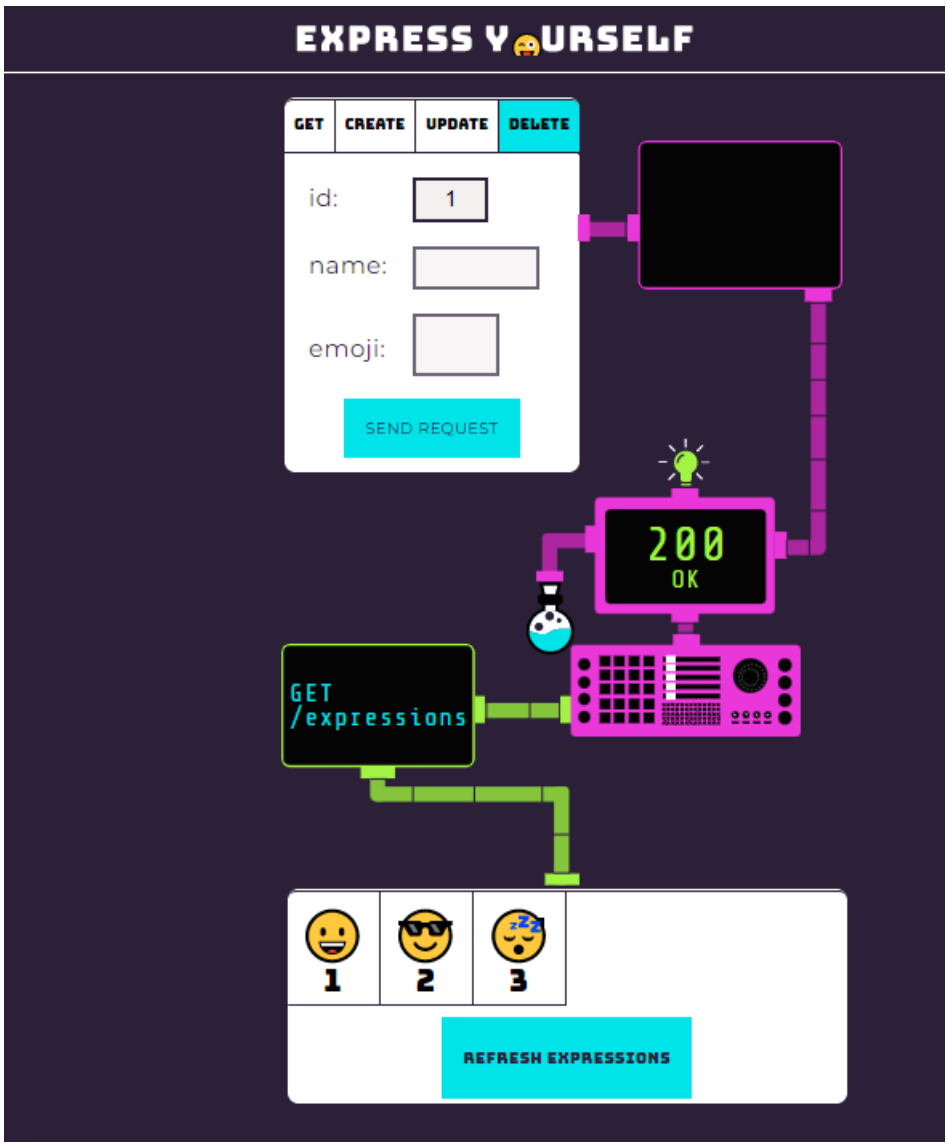
Hint

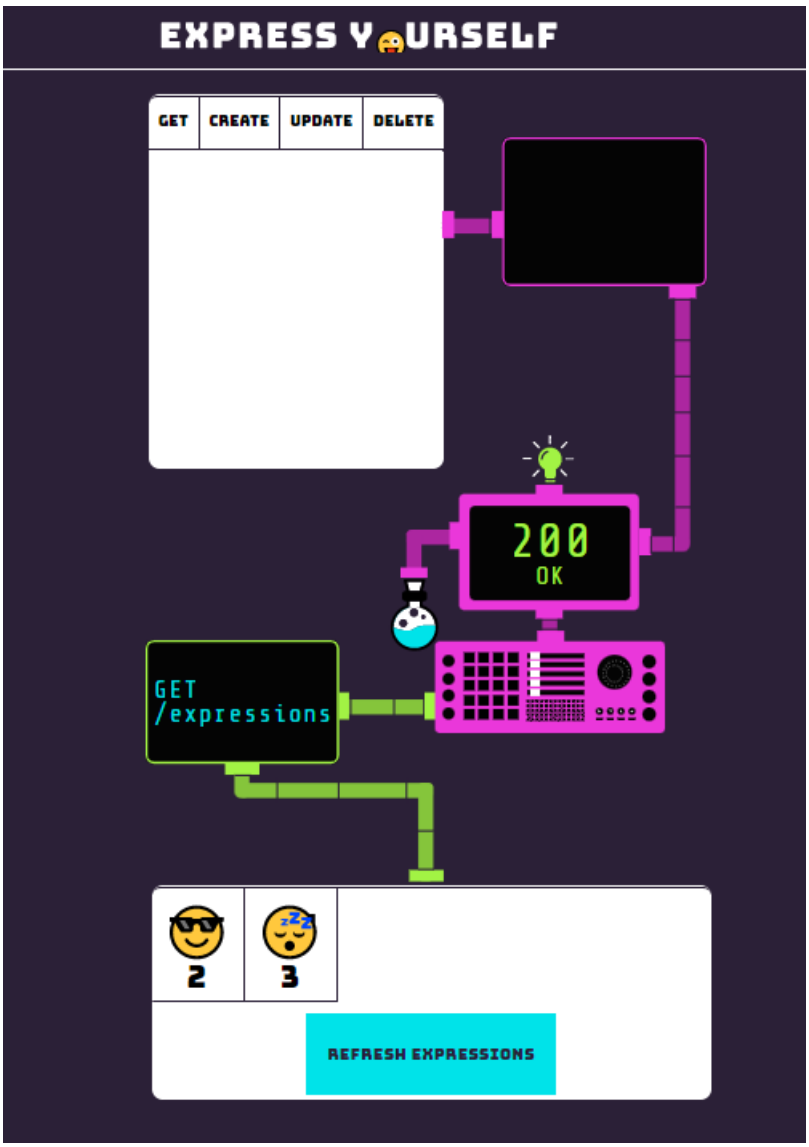
You can use `getIndexById` to find the index of the element to delete. `getIndexById` will return `-1` for a non-existent ID, and the proper index if it exists. Then you can use the splice method to remove the element.

app.js

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

// Serves Express Yourself website
app.use(express.static('public'));

const { getElementById, getIndexById, updateElement,
        seedElements, createElement } = require('./utils');

const expressions = [];
seedElements(expressions, 'expressions');

const PORT = process.env.PORT || 4001;
// Use static server to serve the Express Yourself Website
app.use(express.static('public'));

app.get('/expressions', (req, res, next) => {
  res.send(expressions);
});

app.get('/expressions/:id', (req, res, next) => {
  const foundExpression = getElementById(req.params.id, expressions);
  if (foundExpression) {
    res.send(foundExpression);
  } else {
    res.status(404).send();
  }
```

```
});

app.put('/expressions/:id', (req, res, next) => {
  const expressionIndex = getIndexById(req.params.id, expressions);
  if (expressionIndex !== -1) {
    updateElement(req.params.id, req.query, expressions);
    res.send(expressions[expressionIndex]);
  } else {
    res.status(404).send();
  }
});

app.post('/expressions', (req, res, next) => {
  const receivedExpression = createElement('expressions', req.query);
  if (receivedExpression) {
    expressions.push(receivedExpression);
    res.status(201).send(receivedExpression);
  } else {
    res.status(400).send();
  }
});

// Add your DELETE handler below:
app.delete('/expressions/:id', (req, res, next) => {
  const expressionIndex = getIndexById(req.params.id, expressions);
  if (expressionIndex !== -1) {
    expressions.splice(expressionIndex, 1);
    res.status(204).send();
  } else {
    res.status(404).send();
  }

});


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


EXPRESS YOURSELF
GET
CREATE
UPDATE
DELETE
id:
1
name:
emoji:
SEND REQUEST
200
OK
GET
/expressions
1
2
3
REFRESH EXPRESSIONS



Adding Animals Routes

Congratulations, you have made our glorious Express Yourself Machine fully operational! Not only that, you now have all the tools you need to create a basic CRUD API! Time to practice your skills with a new set of routes.

You are going to add an additional set of functionality to our machine: Animal Mode! This will involve creating similar GET, POST, PUT, and DELETE routes.

Instructions

1.

In your **app.js** file, Create a GET /animals route to return an array of all animals.

2.

Create a GET /animals/:id route to respond with a single animal.

3.

Create a PUT /animals/:id route to update an animal in `animals` and send back the updated animal.

4.

Create a POST /animals route to add new animals to the `animals` and respond with the new animal.

5.

Create a DELETE /animals/:id route to delete animals by ID.

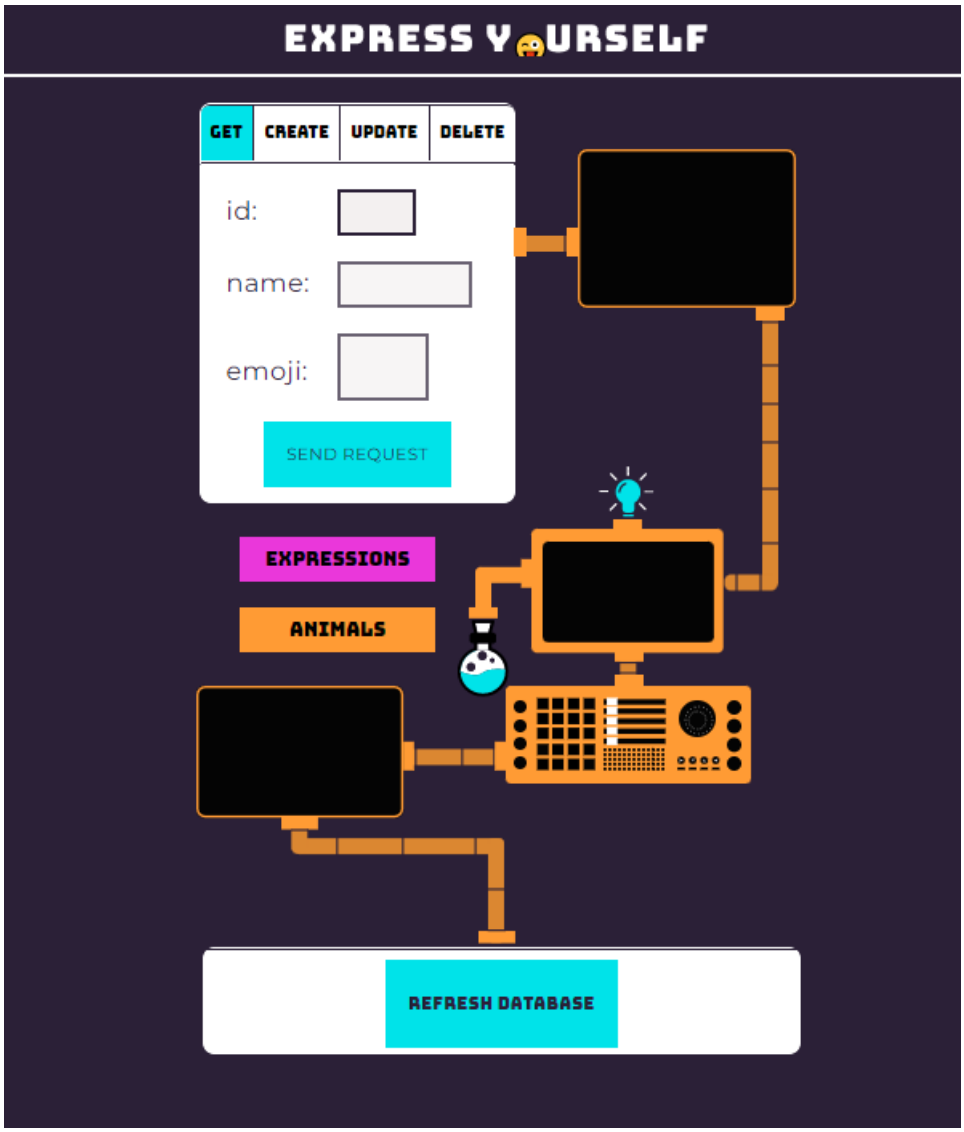
app.js

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

// Serves Express Yourself website
app.use(express.static('public'));

const { getElementById, getIndexById, updateElement,
        seedElements, createElement } = require('./utils');

const expressions = [];
seedElements(expressions, 'expressions');
const animals = [];
seedElements(animals, 'animals');

const PORT = process.env.PORT || 4001;
// Use static server to serve the Express Yourself Website
app.use(express.static('public'));

app.get('/expressions', (req, res, next) => {
  res.send(expressions);
});

app.get('/animals', (req, res, next) => {
  res.send(animals);
```

```
});

app.get('/expressions/:id', (req, res, next) => {
  const foundExpression = getElementById(req.params.id, expressions);
  if (foundExpression) {
    res.send(foundExpression);
  } else {
    res.status(404).send();
  }
});

app.get('/animals/:id', (req, res, next) => {
  const foundAnimal = getElementById(req.params.id, animals);
  if (foundAnimal) {
    res.send(foundAnimal);
  } else {
    res.status(404).send();
  }
});

app.put('/expressions/:id', (req, res, next) => {
  const expressionIndex = getIndexById(req.params.id, expressions);
  if (expressionIndex !== -1) {
    updateElement(req.params.id, req.query, expressions);
    res.send(expressions[expressionIndex]);
  } else {
    res.status(404).send();
  }
});

app.put('/animals/:id', (req, res, next) => {
  const animalIndex = getIndexById(req.params.id, animals);
  if (animalIndex !== -1) {
    updateElement(req.params.id, req.query, animals);
    res.send(animals[animalIndex]);
  } else {
    res.status(404).send();
  }
});
```

```
app.post('/expressions', (req, res, next) => {
  const receivedExpression = createElement('expressions', req.query);
  if (receivedExpression) {
    expressions.push(receivedExpression);
    res.status(201).send(receivedExpression);
  } else {
    res.status(400).send();
  }
});

app.post('/animals', (req, res, next) => {
  const receivedAnimal = createElement('animals', req.query);
  if (receivedAnimal) {
    animals.push(receivedAnimal);
    res.status(201).send(receivedAnimal);
  } else {
    res.status(400).send();
  }
});

app.delete('/expressions/:id', (req, res, next) => {
  const expressionIndex = getIndexById(req.params.id, expressions);
  if (expressionIndex !== -1) {
    expressions.splice(expressionIndex, 1);
    res.status(204).send();
  } else {
    res.status(404).send();
  }
});

app.delete('/animals/:id', (req, res, next) => {
  const animalIndex = getIndexById(req.params.id, animals);
  if (animalIndex !== -1) {
    animals.splice(animalIndex, 1);
    res.status(204).send();
  } else {
    res.status(404).send();
  }
});
```

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



Wrap Up

In this exercise, you were able to create a full server allowing users to implement all CRUD operations for two kinds of resources: Expressions and Animals! With these skills and knowledge of the HTTP request-response cycle, you could implement an API for any project needing CRUD functionality. You could build a trip planner, an address book, a grocery list, an image-sharing application, an anonymous message board, the sky's the limit!

Continue on to the next lesson to learn more about how to keep your code clean and modular with Express Routers!

Instructions

Great work! Move on to the next lesson when you're ready.

NEXT APPS THAT YOU CAN BUILD USING THIS KNOWLEDGE:

- **TRIP PLANNER.**
- **ADDRESS BOOK.**
- **GROCERY LIST.**
- **IMAGE-SHARING APPLICATION.**
- **ANONYMOUS MESSAGE BOARD.**