Exercise 1

Create a simple JSON HTTP server

Prior Knowledge
Unix Command Line Shell
Some simple JavaScript (node.js)

Learning Objectives
Understand the basics of a Web Server

Software Requirements
Node.js
Npm
A Text Editor (e.g. Atom)

Creating a node.js program

1. Node.js is an effective framework for writing server-side programs using the JavaScript language. In this exercise we are going to create a simple program that returns a random number between 1 and 100.

   Because we expect the result to be read by a machine not a human, we will return this as a JSON not as an HTML.

2. Make a directory called ex1. You can do this by starting a terminal window and typing:
   ```
   mkdir ~/ex1
   cd ~/ex1
   ```

   Hint: if you prefer to use the Ubuntu window system to do this, you may.

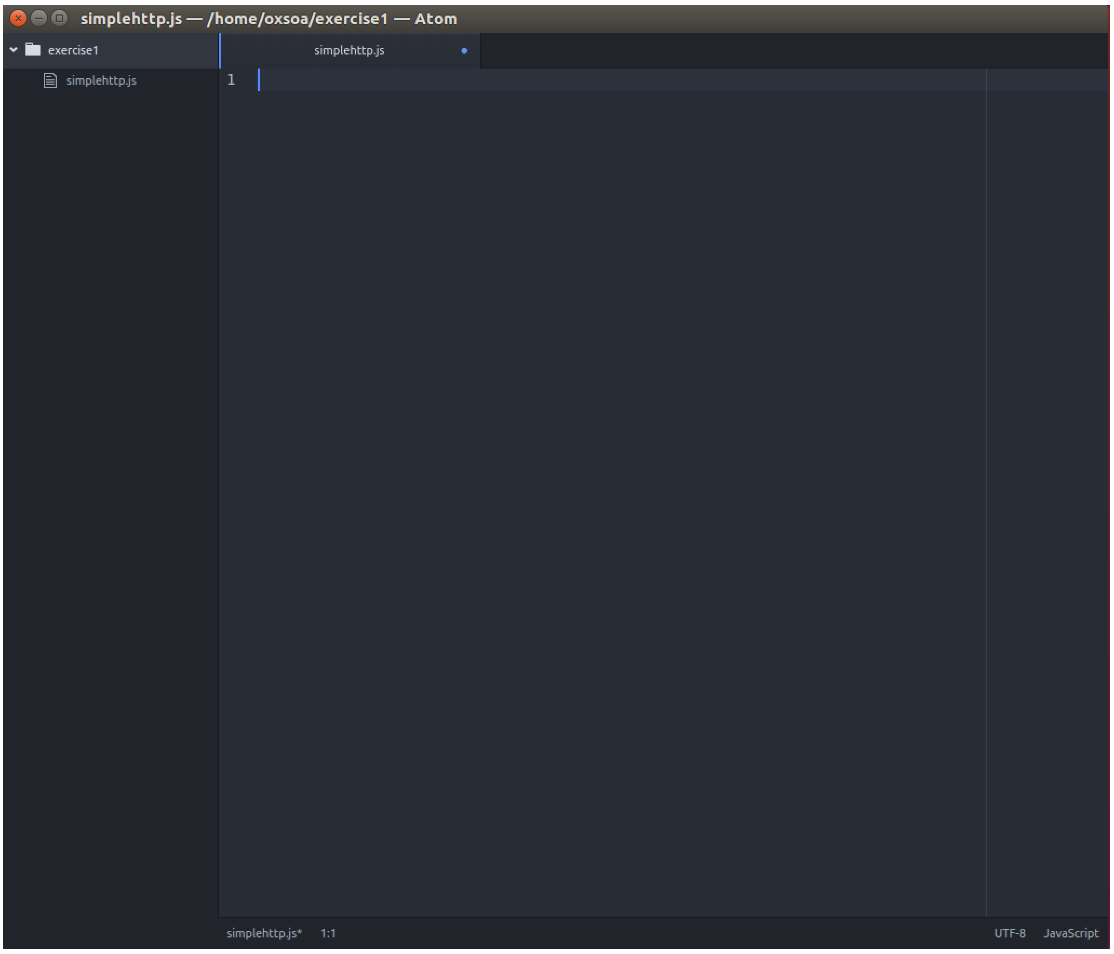
3. Now we need to create a file and code the server.
   In the terminal window type:
   ```
   atom simplehttp.js
   ```

   Hint: There is a harmless bug with Atom on the 16.04 Ubuntu. You can simply close the bug notification window.

   Hint: If you have another text editor on Ubuntu that you prefer, switch to that instead.

© Paul Fremantle 2016. Licensed under the This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. See http://creativecommons.org/licenses/by-nc-sa/4.0/

4. You should see an Atom editor window:



5. Type (or copy and paste) the following code:

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

app.get("/",function(req,res){
    obj = {random : Math.floor((Math.random() * 100) + 1)};
      res.json(obj);
});

var server = app.listen(8080, function() {
    console.log("Random server listening on port 8080");
});
```

If you copy and past please make sure you understand the code.
The code is at http://freo.me/ex1-js

6. This uses a library called express.js which is a very popular framework for writing REST applications in JS. This code creates an HTTP server that responds to any HTTP GET request in the same way. It will instantiate a JavaScript object containing a random number and then return that as a JSON string.

© Paul Fremantle 2016. Licensed under the This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. See http://creativecommons.org/licenses/by-nc-sa/4.0/

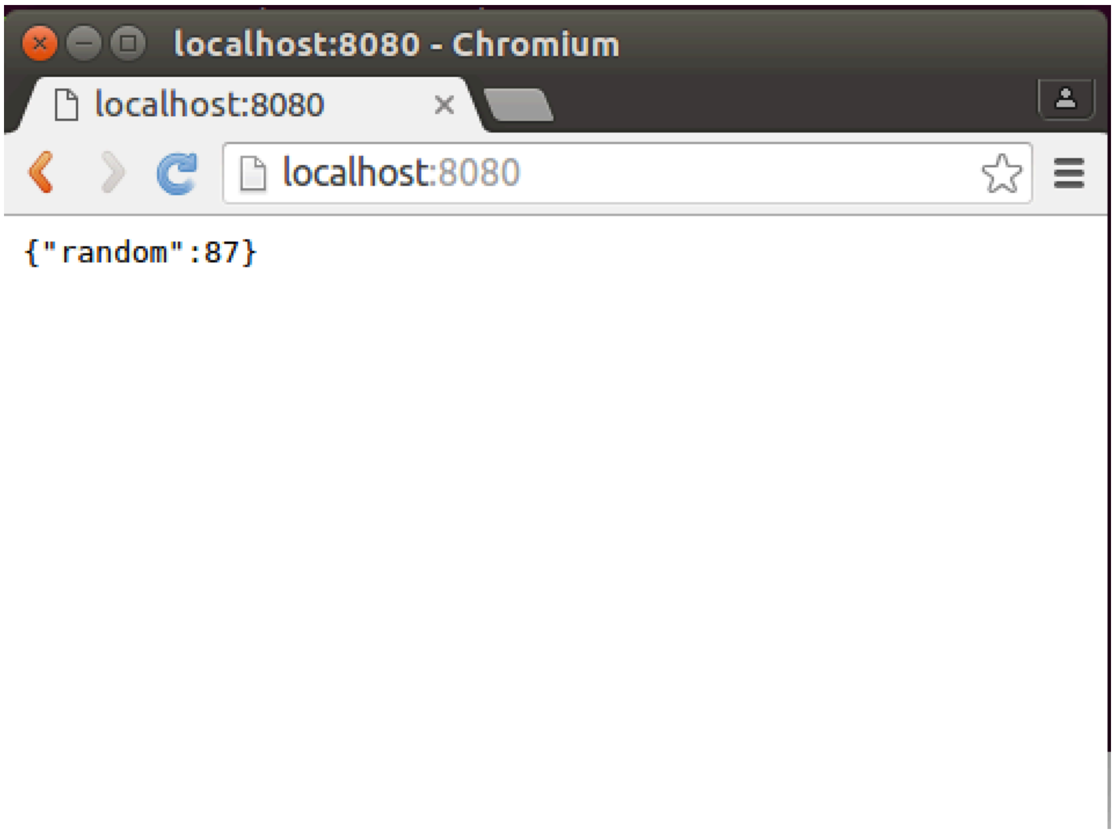
7. To run this code, you need to type the following into a terminal window:
   ```
   cd ~/ex1
   npm install express
   node simplehttp.js
   ```

   This will install express.js (if it isn't already).

   You should see the server respond:
   ```
   oxsoa@oxsoa:~/ex1$ nodejs simplehttp.js
   Server listening on: http://localhost:8080
   ```

8. You can test this code by pulling up a browser window (e.g. Chromium or Firefox) and then browsing to http://localhost:8080

   The result is this:



```
{"random":87}
```

© Paul Fremantle 2016. Licensed under the This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. See http://creativecommons.org/licenses/by-nc-sa/4.0/

9. However, we do not want a human-/browser-enabled service. We want to call this service from machine-based clients. Let's first try curl (a command-line URL / HTTP tool).

   Type:
   ```
   curl http://localhost:8080
   ```

   You should see:
   ```
   curl http://localhost:8080
   {"random":71}oxsoa@oxsoa:~/ex1$
   ```

   Hint: Because the HTTP response has no '\n' line ending, the result is a bit hard to read as the next line merges with the output.

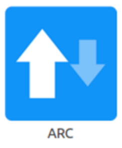
10. curl provides a useful debug facility. If you turn on verbose output, you can see the actual network messages as they are sent on the wire:

    curl –v http://localhost:8080
    You should see output similar to this:
    ```
    * Rebuilt URL to: http://localhost:8080/
    *   Trying 127.0.0.1...
    * Connected to localhost (127.0.0.1) port 8080 (#0)
    > GET / HTTP/1.1
    > Host: localhost:8080
    > User-Agent: curl/7.47.0
    > Accept: */*
    >
    < HTTP/1.1 200 OK
    < Content-Type: application/json
    < Date: Tue, 24 May 2016 09:04:03 GMT
    < Connection: keep-alive
    < Content-Length: 13
    <
    * Connection #0 to host localhost left intact
    {"random":33}oxsoa@oxsoa:~/ex1$
    ```

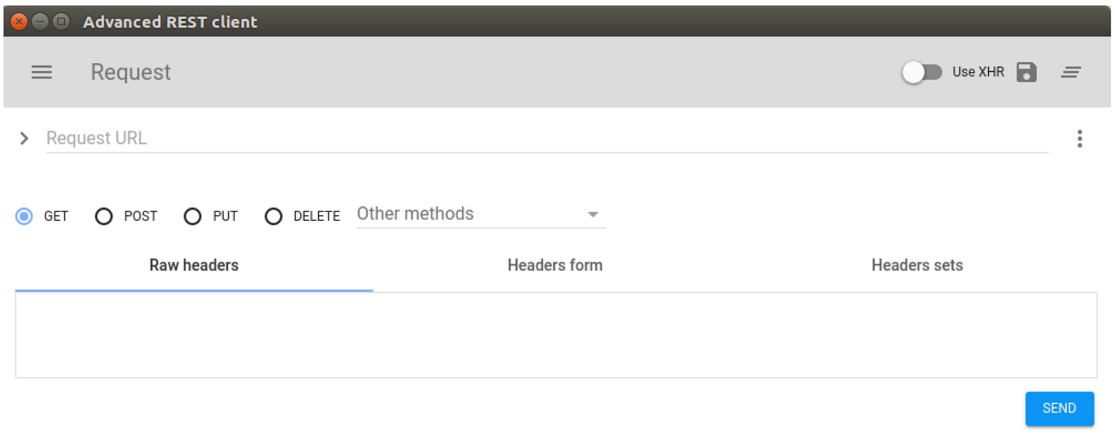
    The lines beginning with > indicate that these are sent to the server and < are received from the service.

© Paul Fremantle 2016. Licensed under the This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. See http://creativecommons.org/licenses/by-nc-sa/4.0/

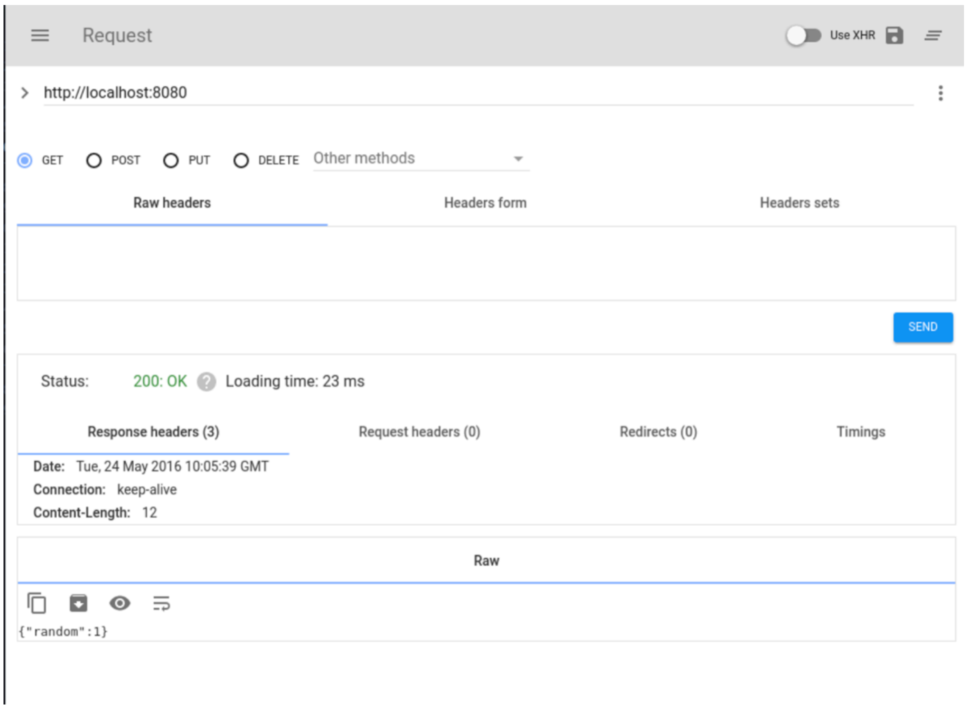
11. Another way of testing this is to use a tool called the Advanced Rest Client (ARC) in Chrome/Chromium. Start Chromium and open up a new window or tab. In the corner is a little button called Apps Apps
    Click on that and then choose the ARC button:



12. You should see a window like this:



13. Type http://localhost:8080 into the Request URL field and then click Send. You should see:



http://localhost:8080

Status: 200: OK Loading time: 23 ms

```
Date: Tue, 24 May 2016 10:05:39 GMT
Connection: keep-alive
Content-Length: 12
```

```
{"random":1}
```

© Paul Fremantle 2016. Licensed under the This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. See http://creativecommons.org/licenses/by-nc-sa/4.0/

14. *Automated testing of the service*

    We want this service to meet a set of behavior requirements. To ensure this, we can use a set of tests. There are a number of testing frameworks for SOA services. For this example, we are going to use a JavaScript tool called Frisby (http://frisbyjs.com/), which builds on top of another node.js test framework called Jasmine.

    I have written a test script for this service. It is available as a gist on Github. You can download it onto your VM using the following command:

    ```
    cd ~/ex1
    ex
    ```

    The test script looks like this:

    ```
    var frisby = require('frisby');

    frisby.create('Test Random Number service')
      .get('http://localhost:8080/')
      .expectStatus(200)
      .expectHeaderContains('Content-Type',
    'application/json')
      .expectJSONTypes( {
        random: Number
        }
      )
      .expectJSON({
        random: function(v) {
    expect(v).toBeGreaterThan(0);expect(v).toBeLessThan(101);
    }
      })
    .toss();
    ```

    The test does an HTTP GET on the URL and then validates the following aspects:
    a. The return code is 200
    b. The Content-Type header is “application/json”
    c. The JSON type of the result is a number
    d. The JSON contains a tag called random, with a value >0 and <101

15. You can run this test using:

    ```
    jasmine-node .
    ```

16. *Does the result match your expectations?*

© Paul Fremantle 2016. Licensed under the This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. See http://creativecommons.org/licenses/by-nc-sa/4.0/

17. Let's fix the server so that it passes the test. I'll leave this up to you, with a hint.

    The hint is that response.setHeader('header_name', 'header_value') is the way of setting headers on HTTP responses in nodejs.

    Hint: you will need to stop and restart the node server once you have edited the code.

18. Once the tests are passing, this exercise is complete.

    Recap:
    We have created a simple http server that returns a JSON output. We have tested this service in a number of ways – including via browser, ARC, curl and through a proper automated test.

    In our next exercise we will create a client for this service.

© Paul Fremantle 2016. Licensed under the This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. See http://creativecommons.org/licenses/by-nc-sa/4.0/