BLG 411E – Software Engineering

Recitation Session 3

Node.js

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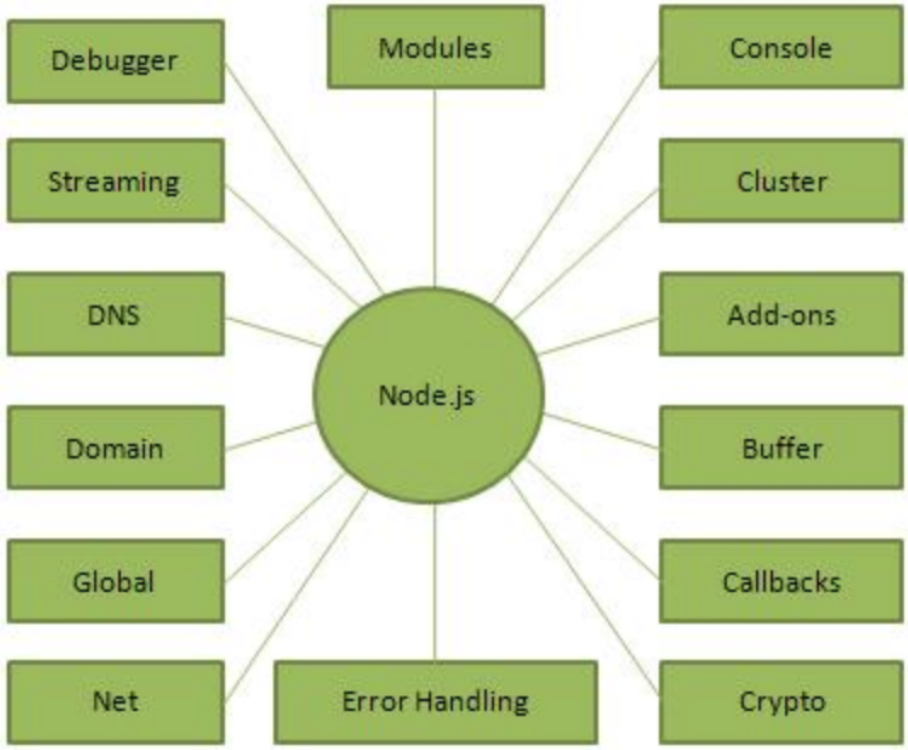
Outline

- JavaScript-based framework/platform
- Used for web applications
- Asynchronous, Event-driven, non-blocking I/O
- Single threaded
- Open source
- **Prerequisites:**
  - JavaScript, HTML, CSS, AJAX



- Use a text editor
  - Windows Notepad, OS Edit command, vim or vi etc.
  - example.js
- Download Node.js archive
  - Windows: node-v6.3.1-x64.msi
  - Linux: node-v6.3.1-linux-x86.tar.gz
  - Mac: node-v6.3.1-darwin-x86.tar.gz

Installation on UNIX/Linux/Mac OS X

- cd /tmp
- wget http://nodejs.org/dist/v6.3.1/node-v6.3.1-linux-x64.tar.gz
- tar xvfz node-v6.3.1-linux-x64.tar.gz
- mkdir -p /usr/local/nodejs
- mv node-v6.3.1-linux-x64/* /usr/local/nodejs

- Add PATH
  - export PATH=$PATH:/usr/local/nodejs/bin

REPL (Read Eval Print Loop) Terminal

REPL Examples

```
node
>1+3
4
>x=10
10
>var y=10
undefined
>x+y
20
> var sum = _
undefined
> console.log(sum)
20
```

Example commands:

- ctrl + c
- ctrl + c twice
- ctrl + d
- Up/Down Keys
- tab Keys
- .help
- .break
- .save filename
- .load filename

Node Package Manager (NPM)

- Node.js packages/modules
- Enabling to install packages from command line

npm installation

npm - -version
2.7.1
sudo npm install npm -g

Module installation, uninstallation

npm install express -g
npm ls -g to check installed modules
npm uninstall express

Callback

- Completion of I/O operations

Blocking code example

callback.js - /Users/mugeerel/Desktop/nodejs/Callback - Geany

input.txt × callback.js ×

```
1  var fs = require("fs");
2
3  var data = fs.readFileSync('input.txt');
4
5  console.log(data.toString());
6  console.log("Program Ended");
7
```

Callback — -bash — 72×18

~/Desktop/nodejs/Callback — -bash

```
Muge-MacBook-Pro:Callback mugeerel$ node callback.js
HELLO WORLD!!!

Program Ended
```

Non-Blocking code example

callback_non_blocking.js - /Users/mugeerel/Desktop/nodejs/Callback - Geany

input.txt × callback_non_blocking.js ×

```
1  var fs = require("fs");
2
3  fs.readFile('input.txt', function (err, data) {
4     if (err) return console.error(err);
5     console.log(data.toString());
6  });
7
8  console.log("Program Ended");
9
```

Callback — -bash — 72×18

~/Desktop/nodejs/Callback — -bash

```
Muge-MacBook-Pro:Callback mugeerel$ node callback_non_blocking.js
Program Ended
HELLO WORLD!!!
```

EventEmitter Class

emit,on example

EventEmitter.js

```
1  // Import events module
2  var events = require('events');
3
4
5  // Create an eventEmitter object
6  var eventEmitter = new events.EventEmitter();
7
8  // Create an event handler as follows
9  var connectHandler = function connected() {
10    console.log('connection succesful.');
11
12    // Fire the data_received event
13    eventEmitter.emit('data_received');
14 }
15
16 // Bind the connection event with the handler
17 eventEmitter.on('connection', connectHandler);
18
19 // Bind the data_received event with the anonym
20 eventEmitter.on('data_received', function(){
21    console.log('data received succesfully.');
22 });
23
24 // Fire the connection event
25 eventEmitter.emit('connection');
26
27 console.log("Program Ended.");
```

EventEmitter — -bash — 61×18

~/Desktop/nodejs/EventEmitter — -bash

```
Muge-MacBook-Pro:EventEmitter mugeerel$ node EventEmitter.js
connection succesful.
data received succesfully.
Program Ended.
Muge-MacBook-Pro:EventEmitter mugeerel$
```

Buffer example

buffer.js

```
1  buf = new Buffer(26);
2  for (var i = 0 ; i < 26 ; i++) {
3    buf[i] = i + 97;
4  }
5
6  console.log( buf.toString('ascii'));       // outputs:
7  console.log( buf.toString('ascii',0,5));   // outputs:
8  console.log( buf.toString('utf8',0,5));    // outputs:
9  console.log( buf.toString(undefined,0,5)); // encoding
10
11 var buffer1 = new Buffer('HELLO WORLD!!!');
12 var buffer2 = new Buffer('HELLO BLG411E');
13 var buffer3 = Buffer.concat([buffer1,buffer2]);
14 console.log("buffer3 content: " + buffer3.toString());
15
16 var result = buffer1.compare(buffer2);
17
18 if(result < 0) {
19    console.log(buffer1 +" comes before " + buffer2);
20 }else if(result == 0){
21    console.log(buffer1 +" is same as " + buffer2);
22 }else {
23    console.log(buffer1 +" comes after " + buffer2);
24 }
```

Buffers — -bash — 61×18

~/Desktop/nodejs/Buffers — -bash

```
Muge-MacBook-Pro:Buffers mugeerel$ node buffer.js
abcdefghijklmnopqrstuvwxyz
abcde
abcde
abcde
buffer3 content: HELLO WORLD!!!HELLO BLG411E
HELLO WORLD!!! comes after HELLO BLG411E
Muge-MacBook-Pro:Buffers mugeerel$
```

Read/Write example

master_exec.js × | master_fork.js × | master_spawn.js × | support.js × | stream.js ×

```
1  var fs = require("fs");
2  var data = '';
3
4  /*Reading a file*/
5
6  // Create a readable stream
7  var readerStream = fs.createReadStream('input.txt');
8
9  // Set the encoding to be utf8.
10 readerStream.setEncoding('UTF8');
11
12 // Handle stream events --> data, end, and error
13 readerStream.on('data', function(chunk) {
14    data += chunk;
15 });
16
17 readerStream.on('end',function(){
18    console.log(data);
19 });
20
21 readerStream.on('error', function(err){
22    console.log(err.stack);
23 });
24
25 /*Writing to file*/
26
27 var data = 'FALL 2017,';
28
29 // Create a writable stream
30 var writerStream = fs.createWriteStream('output.txt');
31
32 // Write the data to stream with encoding to be utf8
33 writerStream.write(data,'UTF8');
34
35 // Mark the end of file
36 writerStream.end();
37
38 // Handle stream events --> finish, and error
39 writerStream.on('finish', function() {
40     console.log("Writing to file completed.");
41 });
42
43 writerStream.on('error', function(err){
44    console.log(err.stack);
45 });
46 console.log("Program Ended");
```

input.txt

```
HELLO BLG411E!!!
```

output.txt

```
FALL 2017,
```

File&Streams — -bash — 80×24

~/Desktop/nodejs/File&Streams — -bash

```
cdLast login: Tue Oct 17 13:27:14 on console
Muge-MacBook-Pro:~ mugeerel$ cd Desktop
Muge-MacBook-Pro:Desktop mugeerel$ cd nodejs/File\&Streams/
Muge-MacBook-Pro:File&Streams mugeerel$ node stream.js
Program Ended
Writing to file completed.
FALL 2017,HELLO BLG411E!!!

Muge-MacBook-Pro:File&Streams mugeerel$
```

File Operations

Syn, Asyn, Stat example

fileoperations.js

```
1  var fs = require("fs");
2
3  // Asynchronous read
4  fs.readFile('input.txt', function (err, data) {
5      if (err) {
6          return console.error(err);
7      }
8      console.log("Asynchronous read: " + data.toString());
9  });
10
11
12 // Synchronous read
13 var data = fs.readFileSync('input.txt');
14 console.log("Synchronous read: " + data.toString());
15
16 fs.stat('input.txt', function (err, stats) {
17     if (err) {
18         return console.error(err);
19     }
20     console.log(stats);
21     console.log("Got file info successfully!");
22
23     // Check file type
24     console.log("isFile ? " + stats.isFile());
25     console.log("isDirectory ? " + stats.isDirectory());
26 });
27
28 console.log("Program Ended");
29
```

File&Streams — -bash — 55×26

~/Desktop/nodejs/File&Streams — -bash

```
Muge-MacBook-Pro:File&Streams mugeerel$ node fileoperat
ions.js
Synchronous read: HELLO BLG411E!!!

Program Ended
Stats {
  dev: 16777220,
  mode: 33188,
  nlink: 1,
  uid: 501,
  gid: 20,
  rdev: 0,
  blksize: 4096,
  ino: 24068339,
  size: 17,
  blocks: 8,
  atime: 2017-10-15T10:38:26.000Z,
  mtime: 2017-10-15T10:34:14.000Z,
  ctime: 2017-10-15T10:34:14.000Z,
  birthtime: 2017-10-15T10:34:14.000Z }
Got file info successfully!
isFile ? true
isDirectory ? false
Asynchronous read: HELLO BLG411E!!!

Muge-MacBook-Pro:File&Streams mugeerel$
```

Timeout

Timeout and Interval example

timeout.js

```
1  function printHello(){
2      console.log( "Hello, World!");
3  }
4  // Now call above function after 2 seconds
5  setTimeout(printHello, 2000);
6
7  setInterval(printHello, 2000); //periodic
8
```

~/Desktop/nodejs/Timeout — node timeout.js

```
Muge-MacBook-Pro:Timeout mugeerel$ node timeout.js
Hello, World!
Hello, World!
Hello, World!
Hello, World!
Hello, World!
Hello, World!
Hello, World!
Hello, World!
```

Running command in a shell and buffering the output

master_exec.js × master_fork.js × master_spawn.js × support.js ×

```
1  const fs = require('fs');
2  const child_process = require('child_process');
3
4  for(var i=0; i<3; i++) {
5     var workerProcess = child_process.exec('node support.js '+i,function
6        (error, stdout, stderr) {
7
8        if (error) {
9           console.log(error.stack);
10          console.log('Error code: '+error.code);
11          console.log('Signal received: '+error.signal);
12       }
13       console.log('stdout: ' + stdout);
14       console.log('stderr: ' + stderr);
15    });
16
17    workerProcess.on('exit', function (code) {
18       console.log('Child process exited with exit code '+code);
19    });
20 }
21
```

support.js

LF Line Endings | Unicode (UTF-8) File Encoding | JavaScript Syntax Style | Get Info

```
1 console.log("Child Process " + process.argv[2] + " executed." );
```

ChildProcess — -bash — 80×24

~/Desktop/nodejs/ChildProcess — -bash

```
Muge-MacBook-Pro:ChildProcess mugeerel$ node master_exec.js
Child process exited with exit code 0
Child process exited with exit code 0
stdout: Child Process 1 executed.

stderr:
Child process exited with exit code 0
stdout: Child Process 2 executed.

stderr:
stdout: Child Process 0 executed.

stderr:
Muge-MacBook-Pro:ChildProcess mugeerel$
```

Child Process
Spawn

Creating a new process

master_exec.js × master_fork.js × master_spawn.js × support.js ×

```
1  const fs = require('fs');
2  const child_process = require('child_process');
3
4  for(var i = 0; i<3; i++) {
5      var workerProcess = child_process.spawn('node', ['support.js', i]);
6
7      workerProcess.stdout.on('data', function (data) {
8          console.log('stdout: ' + data);
9      });
10
11     workerProcess.stderr.on('data', function (data) {
12         console.log('stderr: ' + data);
13     });
14
15     workerProcess.on('close', function (code) {
16         console.log('child process exited with code ' + code);
17     });
18 }
19
```

ChildProcess — -bash — 80×24

~/Desktop/nodejs/ChildProcess — -bash

```
Muge-MacBook-Pro:ChildProcess mugeerel$ node master_spawn.js
stdout: Child Process 2 executed.

stdout: Child Process 1 executed.

child process exited with code 0
stdout: Child Process 0 executed.

child process exited with code 0
child process exited with code 0
Muge-MacBook-Pro:ChildProcess mugeerel$
```

Creating a child process

master_exec.js | master_fork.js | master_spawn.js | support.js

```
1  const fs = require('fs');
2  const child_process = require('child_process');
3
4  for(var i=0; i<3; i++) {
5      var worker_process = child_process.fork("support.js", [i]);
6
7      worker_process.on('close', function (code) {
8          console.log('child process exited with code ' + code);
9      });
10 }
11
```

ChildProcess — -bash — 80×24

~/Desktop/nodejs/ChildProcess — -bash

```
Muge-MacBook-Pro:ChildProcess mugeerel$ node master_fork.js
Child Process 0 executed.
Child Process 2 executed.
Child Process 1 executed.
child process exited with code 0
child process exited with code 0
child process exited with code 0
Muge-MacBook-Pro:ChildProcess mugeerel$
```

Hello World

WebServer.js

```
1  var http = require('http');
2  var fs = require('fs');
3  var url = require('url');
4
5  // Create a server
6  http.createServer( function (request, response) {
7     // Parse the request containing file name
8     var pathname = url.parse(request.url).pathname;
9
10    // Print the name of the file for which request is made.
11    console.log("Request for " + pathname + " received.");
12
13    // Read the requested file content from file system
14    fs.readFile(pathname.substr(1), function (err, data) {
15       if (err) {
16          console.log(err);
17          // HTTP Status: 404 : NOT FOUND
18          // Content Type: text/plain
19          response.writeHead(404, {'Content-Type': 'text/html'});
20       }else {
21          //Page found
22          // HTTP Status: 200 : OK
23          // Content Type: text/plain
24          response.writeHead(200, {'Content-Type': 'text/html'});
25
26          // Write the content of the file to response body
27          response.write(data.toString());
28       }
29       // Send the response body
30       response.end();
31    });
32 }).listen(8081);
33
34 // Console will print the message
35 console.log('Server running at http://127.0.0.1:8081/');
36
```

127.0.0.1:8081/index.htm

Hello World!

WebServer&json — node WebServer.js — 59×14

~/Desktop/nodejs/WebServer&json — node WebServer.js

```
Last login: Sun Oct 15 13:47:45 on ttys002
Muge-MacBook-Pro:~ mugeerel$ cd Desktop
Muge-MacBook-Pro:Desktop mugeerel$ cd nodejs/WebServer\&jso
n/
Muge-MacBook-Pro:WebServer&json mugeerel$ node WebServer.js

Server running at http://127.0.0.1:8081/
Request for /index.htm received.
```

Express

- A framework that enables robust features for web and mobile applications
- Based on HTTP method and URL:
  - **GET:** read only access to resource
  - **PUT:** create a new resource
  - **DELETE:** remove a resource
  - **POST:** update existing resource or create a new resource
- Offers dynamic HTML pages that take arguments

Installation

```
npm install express - -save
npm install body-parser - -save
npm install cookie-parser - -save
npm install multer - -save
```

Name & Password: index.htm

WebServer2.js × index.htm ×

```
1
2   <!DOCTYPE html>
3   <html lang="eng">
4     <head>
5       <meta charset="iso-8859-9">
6       <title>Web Server</title>
7       <meta name="viewport" content="width=device-width, initial-scale=1, maximum-scale=1, user-scalable=no"/>
8
9       <meta name="apple-mobile-web-app-capable" content="yes">
10      <meta name="apple-mobile-web-app-status-bar-style" content="black-translucent">
11    </head>
12    <body>
13        <form action = "http://127.0.0.1:8081/process_get" method = "GET">
14          User Name : <input type = "text" name = "name">  <br>
15          Password  : <input type = "password" name = "password"> <br>
16          <input type = "submit" value = "Submit">
17      </form>
18    </body>
19  </html>
20
```

Express

Name & Password: / index.htm

WebServer2.js × index.htm ×

```
1  var express = require('express');
2  var app = express();
3  var bodyParser = require('body-parser');
4
5  // Create application/x-www-form-urlencoded parser
6  var urlencodedParser = bodyParser.urlencoded({ extended: false
7
8  app.use(express.static('public'));
9  app.get('/index.htm', function (req, res) {
10     res.sendFile( __dirname + "/" + "index.htm" );
11 })
12
13 app.get('/process_get', function (req, res) {
14    // Prepare output in JSON format
15    response = {
16       name:req.query.name,
17       password:req.query.password
18    };
19    console.log(response);
20    res.end(JSON.stringify(response));
21 })
22
23 app.post('/process_post', urlencodedParser, function (req, res) {
24    // Prepare output in JSON format
25    response = {
26       name:req.body.name,
27       password:req.body.password
28    };
29    console.log(response);
30    res.end(JSON.stringify(response));
31 })
32
33 var server = app.listen(8081, function () {
34    var host = server.address().address
35    var port = server.address().port
36    console.log("Example app listening at http://%s:%s", host, port)
37
```

127.0.0.1:8081/index.htm

User Name : BLG411E

Password : •••••

Submit

```
Last login: Mon Oct 16 11:14:41 on ttys001
Muge-MacBook-Pro:~ mugeerel$ cd Desktop
Muge-MacBook-Pro:Desktop mugeerel$ cd nodejs/WebServe
Muge-MacBook-Pro:WebServer&json mugeerel$ node WebSer
Example app listening at http://:::8081
```

Express

Name & Password: / process_get?name=BLG411E&password=12345

WebServer2.js

```
1  var express = require('express');
2  var app = express();
3  var bodyParser = require('body-parser');
4
5  // Create application/x-www-form-urlencoded parser
6  var urlencodedParser = bodyParser.urlencoded({ extended: fa
7
8  app.use(express.static('public'));
9  app.get('/index.htm', function (req, res) {
10    res.sendFile( __dirname + "/" + "index.htm" );
11 })
12
13 app.get('/process_get', function (req, res) {
14    // Prepare output in JSON format
15    response = {
16       name:req.query.name,
17       password:req.query.password
18    };
19    console.log(response);
20    res.end(JSON.stringify(response));
21 })
22
23 app.post('/process_post', urlencodedParser, function (req, res) {
24    // Prepare output in JSON format
25    response = {
26       name:req.body.name,
27       password:req.body.password
28    };
29    console.log(response);
30    res.end(JSON.stringify(response));
31 })
32
33 var server = app.listen(8081, function () {
34    var host = server.address().address
35    var port = server.address().port
36    console.log("Example app listening at http://%s:%s", host, port)
```

127.0.0.1:8081/process_get?name=BLG411E&password=12345

```
{"name":"BLG411E","password":"12345"}
```

```
Last login: Mon Oct 16 11:14:41 on ttys001
Muge-MacBook-Pro:~ mugeerel$ cd Desktop
Muge-MacBook-Pro:Desktop mugeerel$ cd nodejs/WebServe
Muge-MacBook-Pro:WebServer&json mugeerel$ node WebSer
Example app listening at http://:::8081
{ name: 'BLG411E', password: '12345' }
```

REST Architecture

- REpresentational State Transfer
- Web based architecture
- REST Server and REST Client
- HTTP methods (GET, PUT, DELETE, POST)
- Resource is identified with global ids
- JSON format is most popular one

REST Example /listUsers

WebServer3.js × users.json ×

```
1  var express = require('express');
2  var app = express();
3  var fs = require("fs");
4
5  app.get('/listUsers', function (req, res) {
6      fs.readFile( __dirname + "/" + "users.json", 'utf8', function (err, data) {
7          console.log( data );
8          res.end( data );
9      });
10 })
11
12 app.get('/:id', function (req, res) {
13     // First read existing users.
14     fs.readFile( __dirname + "/" + "users.json", 'utf8', function (err, data) {
15        var users = JSON.parse( data );
16        var user = users["user" + req.params.id]
17        console.log( user );
18        res.end( JSON.stringify(user));
19     });
20 })
21
22 app.delete('/deleteUser', function (req, res) {
23
24     // First read existing users.
25     fs.readFile( __dirname + "/" + "users.json", 'utf8', function (err, data) {
26         data = JSON.parse( data );
27         delete data["user" + 2];
28
29         console.log( data );
30         res.end( JSON.stringify(data));
31     });
32 })
```

127.0.0.1:8081/listUsers

```
{
   "user1" : {
      "name" : "muge",
          "password" : "12345",
          "degree" : "PhD Candidate",
          "id": 1
   },
   "user2" : {
      "name" : "beyza",
          "password" : "54321",
          "degree" : "PhD Candidate",
          "id": 2
   },
   "user3" : {
      "name" : "bilge",
          "password" : "345",
          "degree" : "PhD Candidate",
          "id": 3
   }
}
```

REST Example: /:id

WebServer3.js × users.json ×

```
1  var express = require('express');
2  var app = express();
3  var fs = require("fs");
4
5  app.get('/listUsers', function (req, res) {
6      fs.readFile( __dirname + "/" + "users.json", 'utf8'
7          console.log( data );
8          res.end( data );
9      });
10 })
11
12 app.get('/:id', function (req, res) {
13     // First read existing users.
14     fs.readFile( __dirname + "/" + "users.json", 'utf8'
15         var users = JSON.parse( data );
16         var user = users["user" + req.params.id]
17         console.log( user );
18         res.end( JSON.stringify(user));
19     });
20 })
21
22 app.delete('/deleteUser', function (req, res) {
23
24     // First read existing users.
25     fs.readFile( __dirname + "/" + "users.json", 'utf8'
26         data = JSON.parse( data );
27         delete data["user" + 2];
28
29         console.log( data );
30         res.end( JSON.stringify(data));
31     });
32 })
```

127.0.0.1:8081/1

```
{"name":"muge","password":"12345","degree":"PhD Candidate","id":1}
```

Database connection

Requirements:

1. Nodejs (npm i knex mysql express body-parser - -save)
2. MySQL etc.
3. HTTP API to write database
4. HTML and JS files to POST to the API
5. Knex migration to create user table in database
6. Use migration to add name and password to user table in database

Database connection
3. HTTP API to write database

index.htm, app.js under public folder

index.html - /Users/mugeerel/Desktop/nodejs/Databas

app.js | index.html | index.js | knexfile.js | store.js

```
1  <!DOCTYPE html>
2  <html>
3  <head>
4    <title>Node database tutorial</title>
5  </head>
6  <body>
7    <form class="CreateUser">
8      <h1>Create a new user</h1>
9      <input type="text" class="username" placeholder="username">
10     <input type="password" class="password" placeholder="password">
11     <input type="submit" value="Create user">
12   </form>
13   <script src="/app.js"></script>
14 </body>
15 </html>
16
```

app.js

LF | Unicode (UTF-8) | JavaScript

Line Endings | File Encoding | Syntax Style

<Outline Menu>

```
1  const CreateUser = document.querySelector('.CreateUser')
2  CreateUser.addEventListener('submit', (e) => {
3    e.preventDefault()
4    const username = CreateUser.querySelector('.username').value
5    const password = CreateUser.querySelector('.password').value
6    post('/createUser', { username, password })
7  })
8  function post (path, data) {
9    return window.fetch(path, {
10     method: 'POST',
11     headers: {
12       'Accept': 'application/json',
13       'Content-Type': 'application/json'
14     },
15     body: JSON.stringify(data)
16   })
17 }
```

Database connection

4. HTML and JS files to POST to the API

index.js, store.js, knexfile.js

app.js | index.html | index.js | knexfile.js | store.js

```
1  const express = require('express')
2  const bodyParser = require('body-parser')
3  const store = require('./store')
4  const app = express()
5  app.use(express.static('public'))
6  app.use(bodyParser.json())
7
8  app.post('/createUser', (req, res) => {
9    store
10     .createUser({
11       username: req.body.username,
12       password: req.body.password
13     })
14     .then(() => res.sendStatus(200))
15 })
16 app.listen(8081, () => {
17   console.log('Server running on http://localhost:8081')
18 })
19
```

store.js

LF | Unicode (UTF-8) | JavaScript | Get Info

Line Endings | File Encoding | Syntax Style

```
1  const knex = require('knex')(require('./knexfile'))
2
3  module.exports = {
4    createUser ({ username, password }) {
5      console.log(`Add user ${username} with password ${password}`)
6      return knex('user').insert({
7        username,
8        password
9      })
10   }
11 }
```

knexfile.js

LF | Unicode (UTF-8) | JavaScript

Line Endings | File Encoding | Syntax Style

```
1  module.exports = {
2    client: 'mysql',
3    connection: {
4      user: 'root',
5      password: 'password',
6      database: 'tutorial_database'
7    }
8  }
9
```

Creating a user table

knex migrate:make create_user_table

- migrations/20171015114925_create_user_table.js
  - new migration file to add, modify, delete a table or column
  - checking schema changes instead of using MySQL directly
  - using js file instead of SQL
  - keep database schema up to date for all developers

Database connection

5. Knex migration to create user table in database

- up method: create table
- down method: delete function for roll back

modify migrations/20171015114925_create_user_table.js

app.js × | index.html × | index.js × | knexfile.js × | store.js × | 20171015114925...e_user_table.js ×

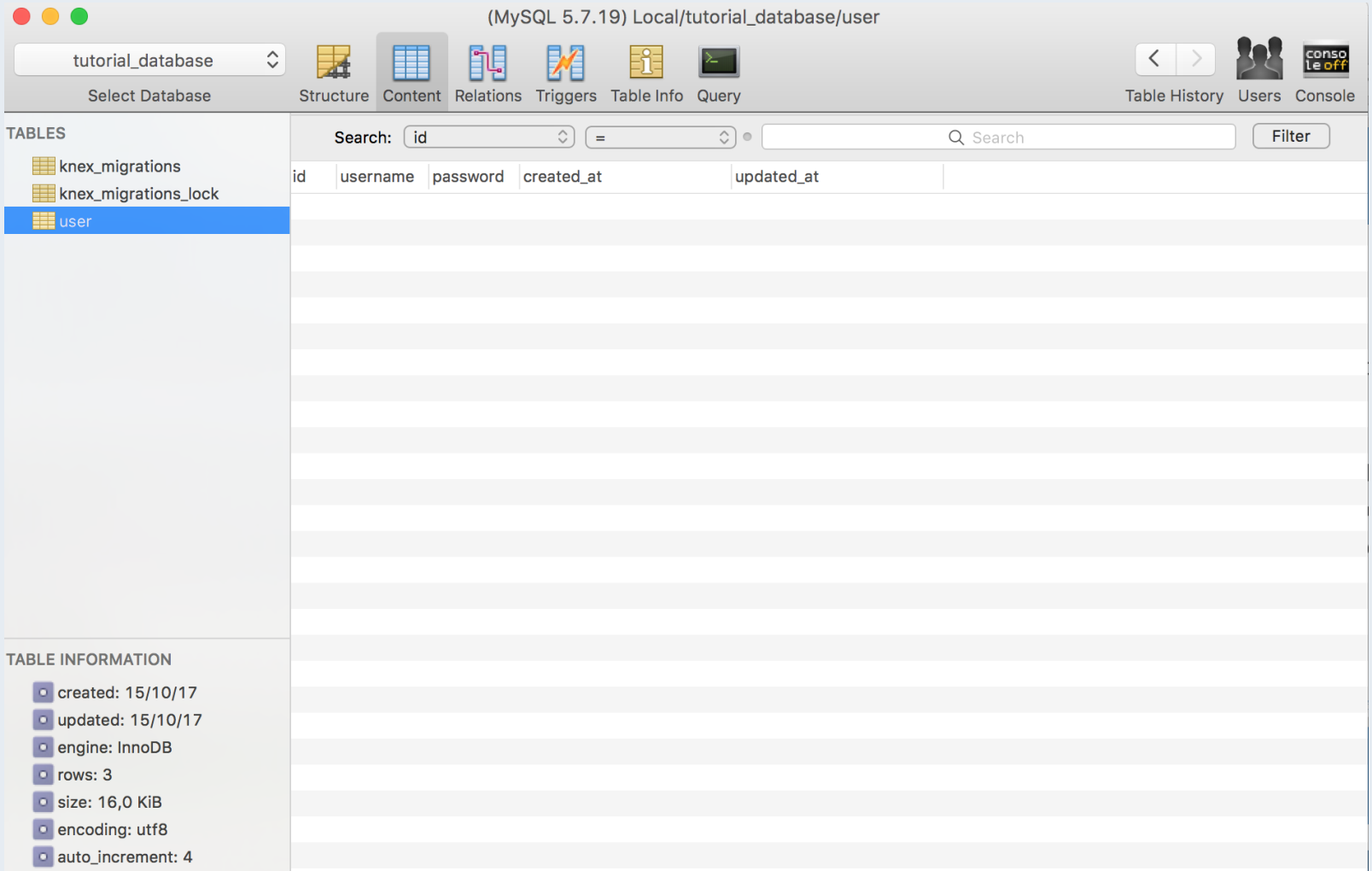
```
1
2  exports.up = function(knex, Promise) {
3    return knex.schema.createTable('user', function (t) {
4      t.increments('id').primary()
5      t.string('username').notNullable()
6      t.string('password').notNullable()
7      t.timestamps(false, true)
8    })
9  };
10
11 exports.down = function(knex, Promise) {
12   return knex.schema.dropTableIfExists('user')
13 };
14
```

Database connection

6. User migration to add name and password to user table

Run migration

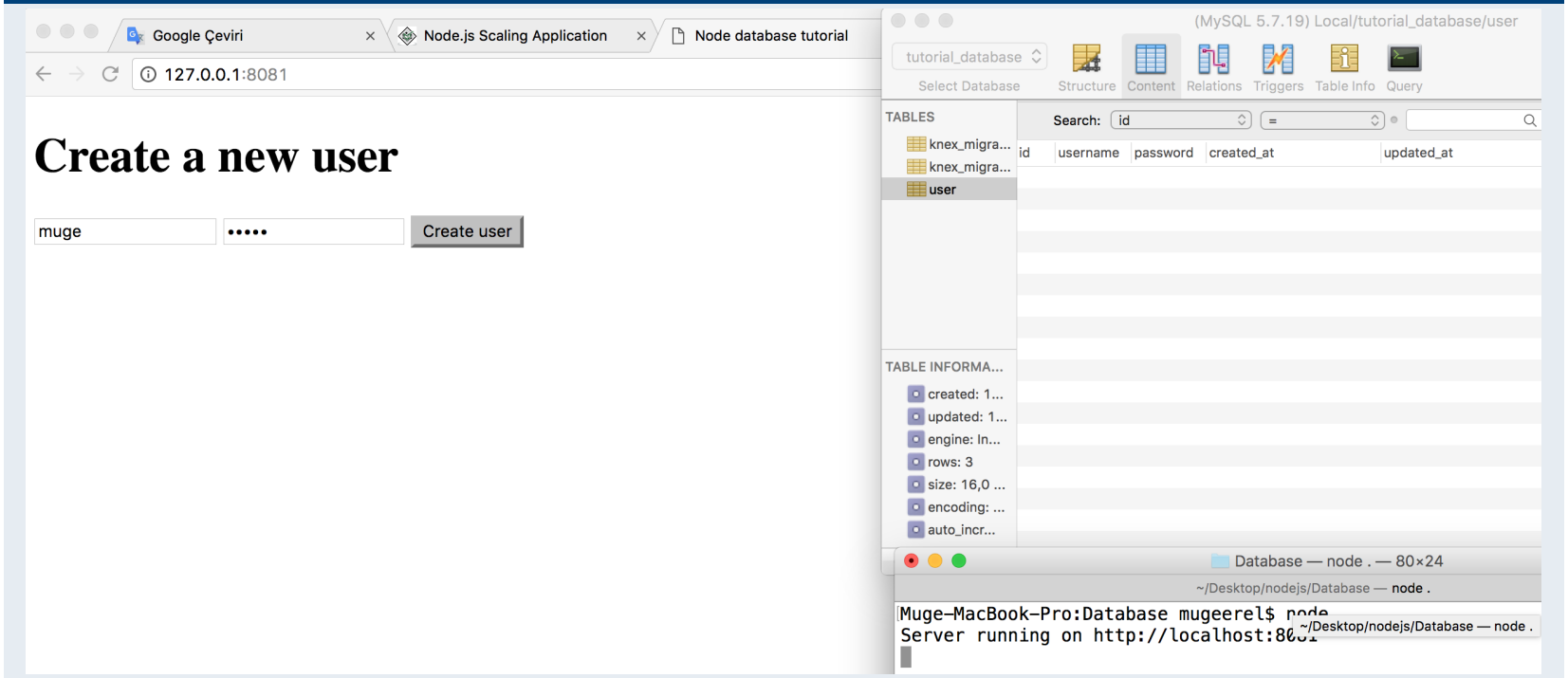
knex migrate:latest



Database connection

6. User migration to add name and password to user table

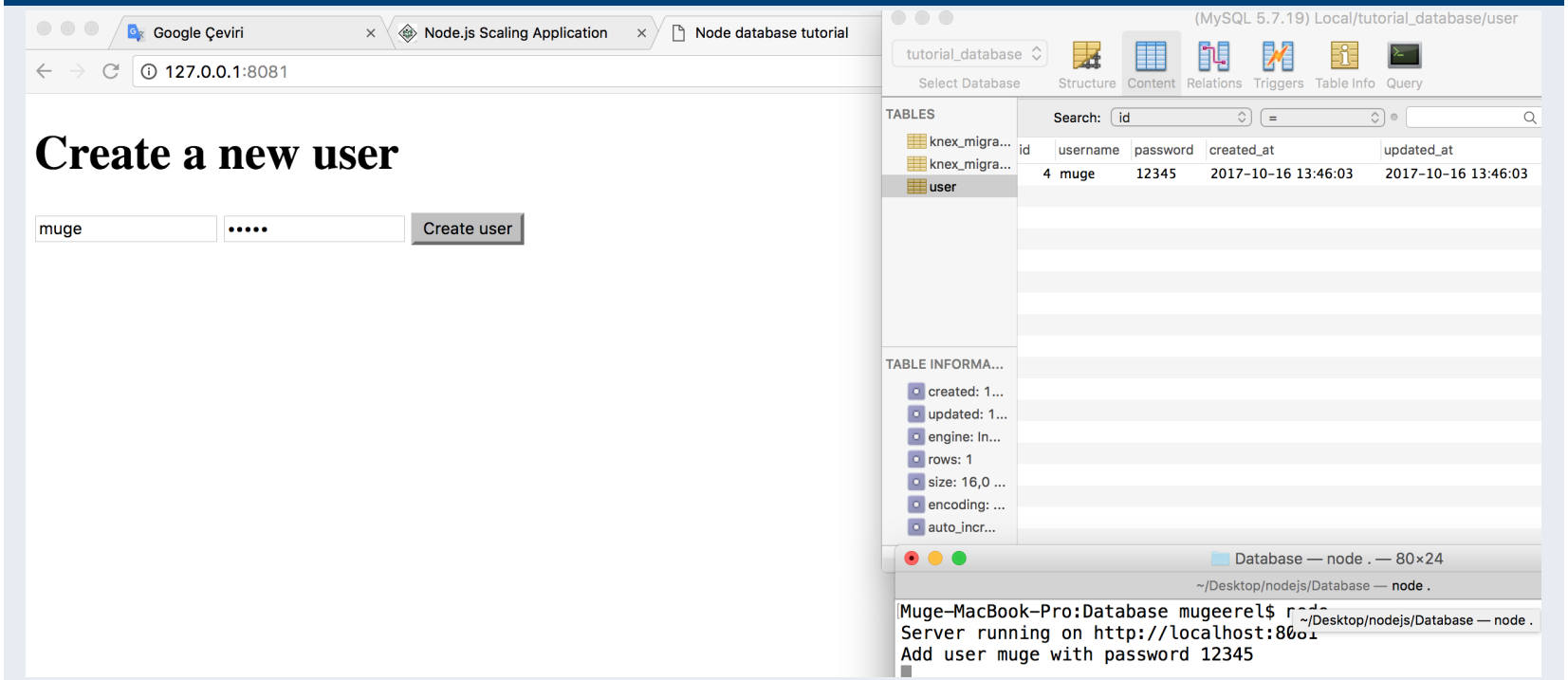
Add user to database



Database connection

6. User migration to add name and password to user table

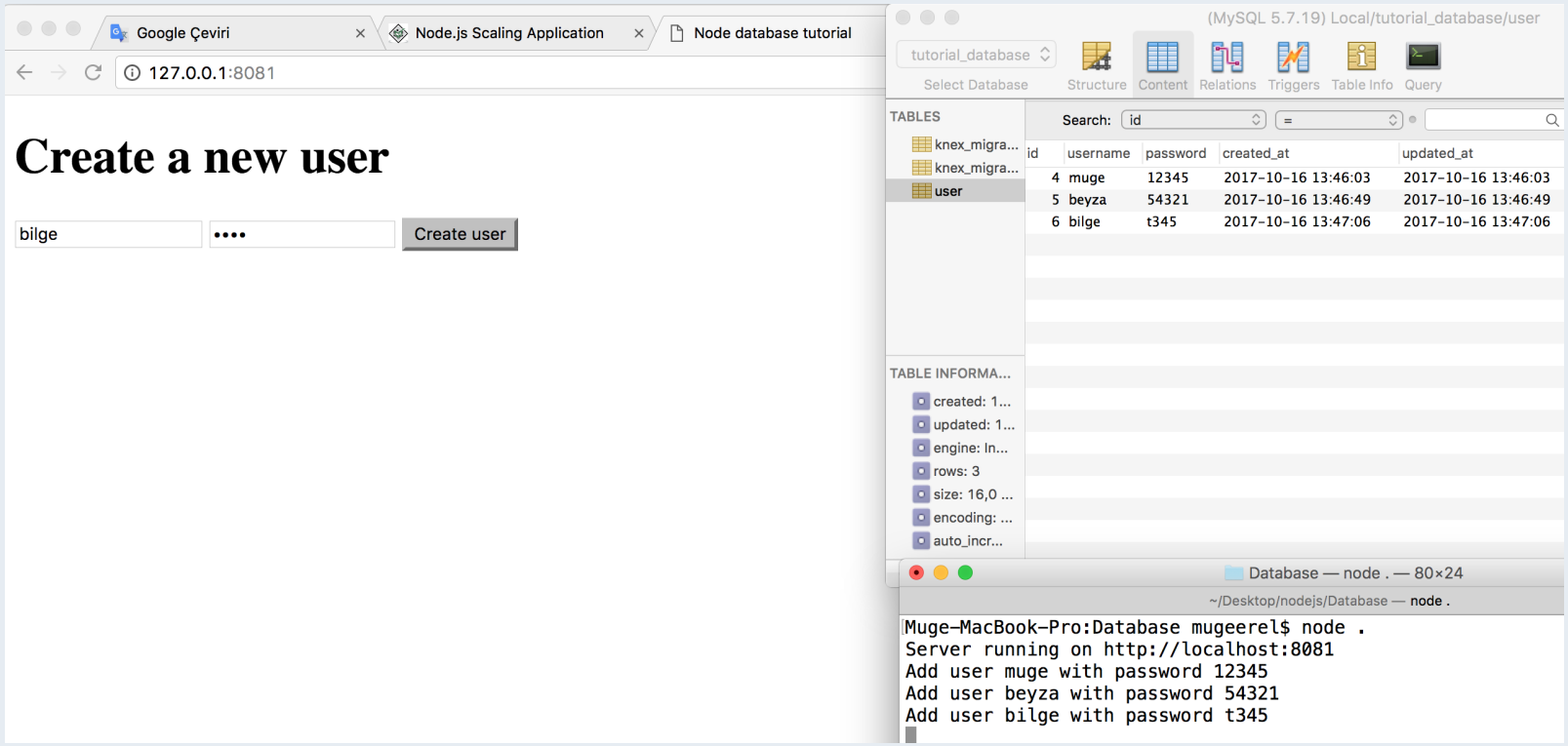
Add user to database



Database connection

6. User migration to add name and password to user table

Add user to database



References and Further Reading

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