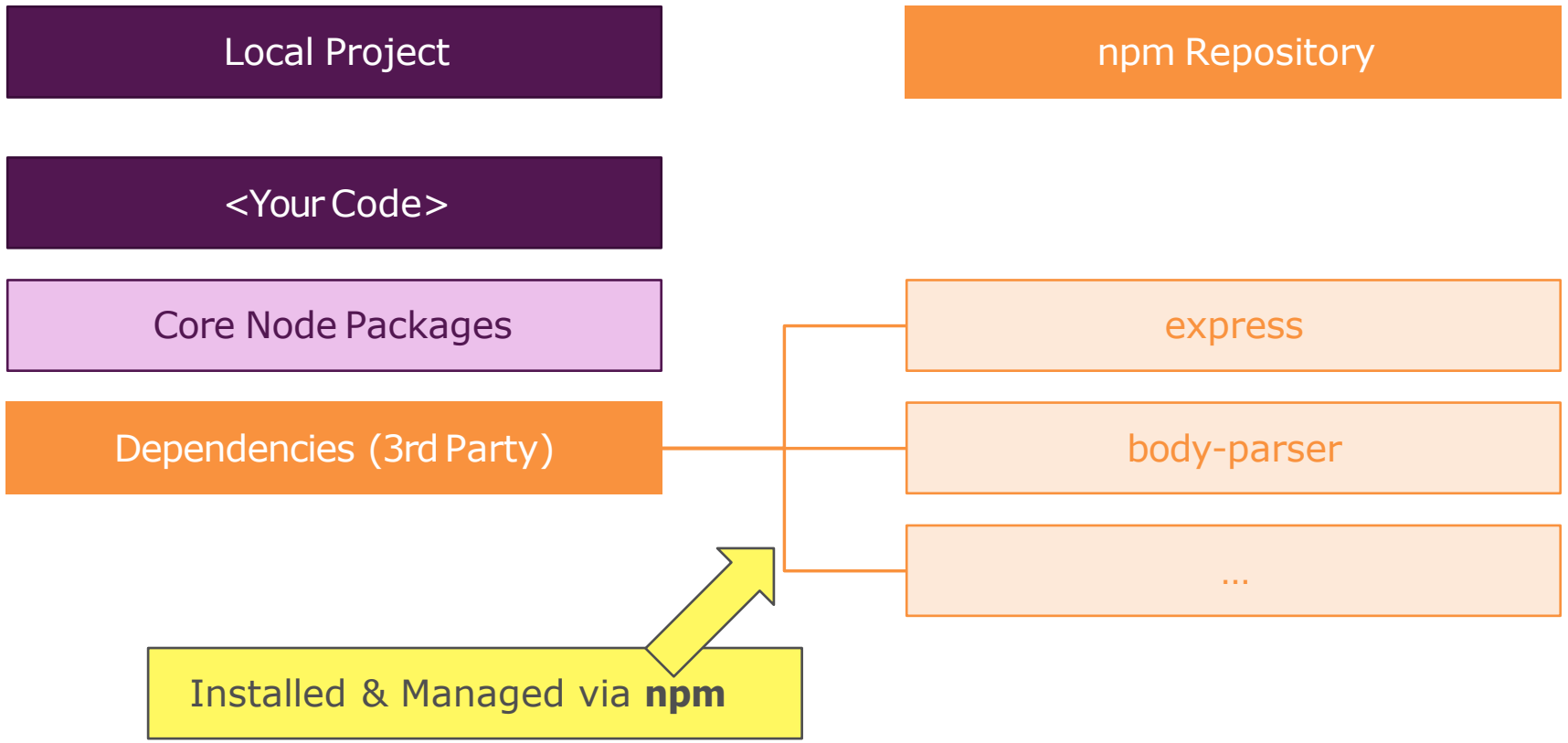
NPM & Modules

npm & packages Intro



What is npm?

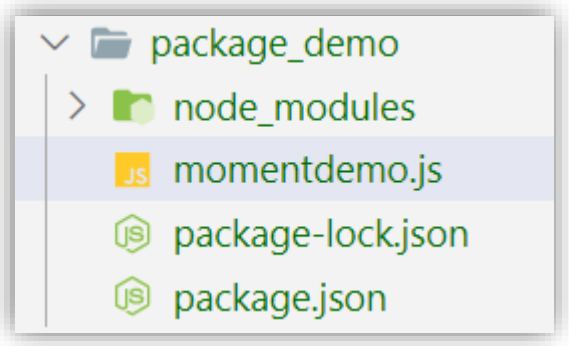
- **npm** is the standard package manager for Node.js. It also manages downloads of dependencies of your project.
- www.npmjs.com hosts thousands of free packages to download and use.
- The NPM program is installed on your computer when you install Node.js.
  - `npm -v // will print npm version`

- What is a package?
  - A package in Node.js contains all the files you need for a module.
  - Modules are JavaScript libraries you can include in your project.

  - A package contains:
    - JS files
    - `package.json` (manifest)
    - `package-lock.json` (maybe)

Create & use a new package

```
npm init // will create package.json
```



- When we install a package:
  - Notice dependencies changes in `package.json`
  - notice folder: `node_modules`
  - This structure separate our app code to the dependencies. Later when we share/deploy our application, there's no need to copy `node_modules`, run: `npm install` will read all dependencies and install them locally.

package.json Manifest

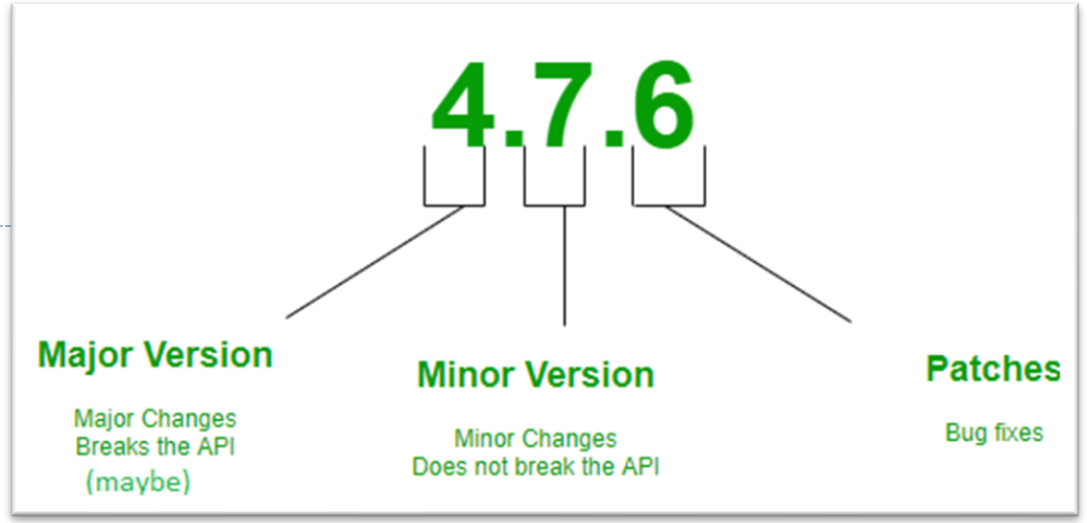
- The `package.json` file is kind of a manifest for your project.
- It can do a lot of things, completely unrelated.
- It's a central repository of configuration for installed packages.
- The only requirement is that it respects the JSON format.

- `version`: indicates the current version
- `name`: the application/package name
- `description`: a brief description of the app/package
- `main`: the entry point for the application
- `scripts`: defines a set of node scripts you can run
- `dependencies`: sets a list of npm packages installed as dependencies
- `devDependencies`: sets a list of npm packages installed as development dependencies

```
{
    "name": "package_demo",
    "version": "1.0.0",
    "description": "",
    "main": "index.js",
    "scripts": {
        "start": "node momentdemo.js"
     },
    "author": "Rujuan Xing",
    "license": "ISC",
    "dependencies": {
        "moment": "^2.29.1"
    },
    "devDependencies": {
        "eslint": "^7.28.0"
    }
}
```

Semantic Versioning

- The Semantic Versioning concept is simple: all versions have 3 digits: `x.y.z`.
  - the first digit is the major version
  - the second digit is the minor version
  - the third digit is the patch version



- When you make a new release, you don't just up a number as you please, but you have rules:
  - you up the **major** version when you make incompatible API changes
  - you up the **minor** version when you add functionality in a backward-compatible manner
  - you up the **patch** version when you make backward-compatible bug fixes

More details about Semantic Versioning

- Why is that so important?
  - Because `npm` set some rules we can use in the `package.json` file to choose which versions it can update our packages to, when we run `npm update`.

- The rules use those symbols:
  - **^**: it's ok to automatically update to anything within this major release. If you write `^0.13.0`, when running `npm update`, it can update to `0.13.1`, `0.14.2`, and so on, but not to `1.14.0` or above.
  - **~**: if you write `~0.13.0` when running `npm update` it can update to patch releases: `0.13.1` is ok, but `0.14.0` is not.
  - **>**: you accept any version higher than the one you specify

package-lock.json

- Introduced by NPM version 5 to capture the exact dependency tree installed at any point in time.
- Describes the exact tree
- Guarantee the dependencies on all environments.
- Don’t modify this file manually.
- Always use npm CLI to change dependencies, it’ll automatically update package-lock.json

```
{
  "name": "lesson03-demo",
  "version": "1.0.0",
  "lockfileVersion": 1,
  "requires": true,
  "dependencies": {
    "moment": {
      "version": "2.24.0",
      "resolved": "https://registry.npmjs.org/moment/-
/moment-2.24.0.tgz",
      "integrity": "sha512-
bV7f+6l2QigeBBZSM/6yTNq4P2fNpSWj/0e7jQcy87A8e7o2nAfP/34/2ky5
Vw4B9S446EtIhodAzkFCcR4dQg=="
    }
  }
}
```

More About Packages

- Development Dependencies: Needed only while I'm developing the app. It's not needed for running the app.
  - `npm install mocha --save-dev`

```
// notice devDependencies entry now in package.json
```

- Global Dependencies: Available to all applications
  - `npm install -g nodemon`
  - `nodemon app.js //auto detects changes and restarts your project`

HTTP

Node as a Web Server

- Node started as a Web server and evolved into a much more generalized framework.
- Node `http` module is designed with streaming and low latency in mind.
- Node is very popular today to create and run Web servers.

Web Server Example

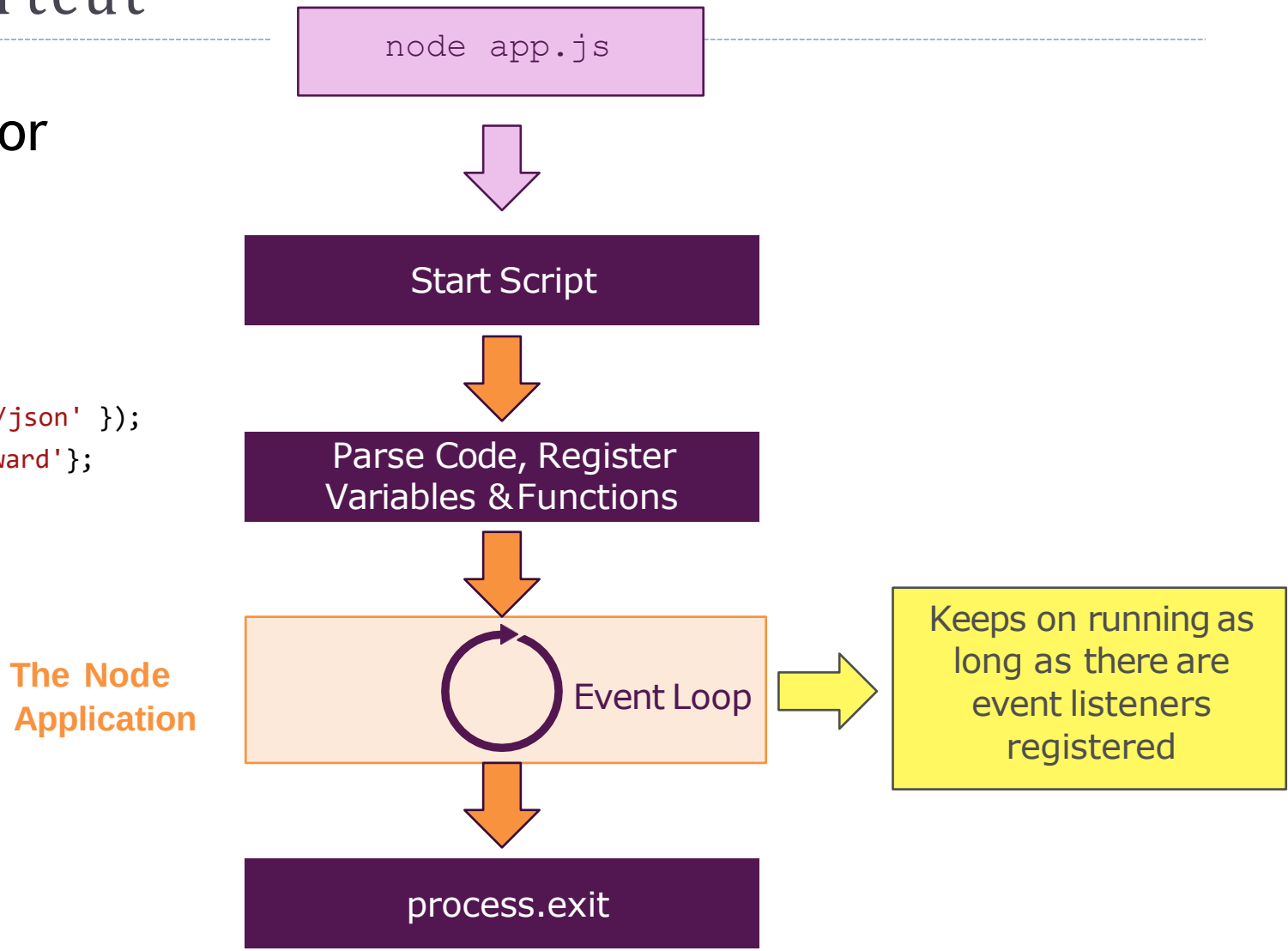
```
const http = require('http');
const server = http.createServer();

server.on('request', function(req, res) {
                        res.writeHead(200, {'Content-Type': 'text/plain'});
                        res.write('Hello World!');
                        res.end();
                    });
server.listen(3000);
```

After we run this code. The node program doesn’t stop. it keeps waiting for request

Web Server Example Shortcut

Passing a callback function to `createServer()` is a shortcut for listening to "request" event.

```
const http = require('http');
http.createServer(function (req, res) {
      res.writeHead(200, { 'Content-Type': 'application/json' });
      const person = { firstname: 'Josh', lastname: 'Edward'};
      res.end(JSON.stringify(person));
}).listen(3000, '127.0.0.1');
```



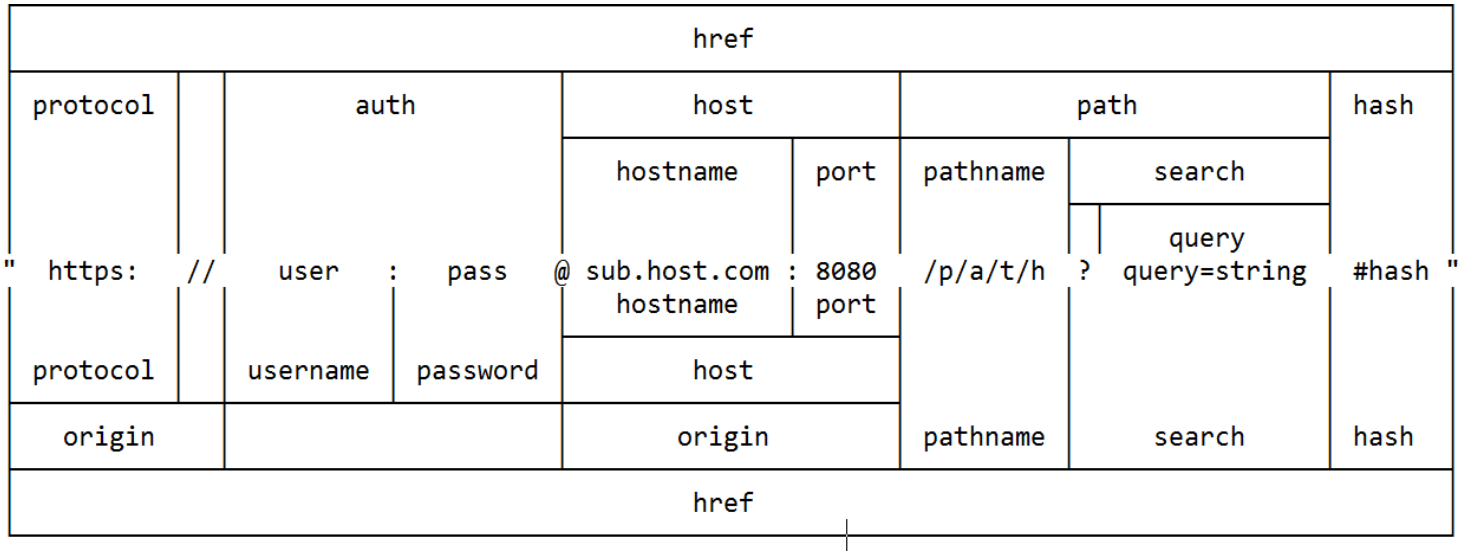
Understanding Request & Response

- A request message from a client to a server includes, within the first line of that message, the method to be applied to the resource, the identifier of the resource, and the protocol version in use.
- After receiving and interpreting a request message, a server responds with an HTTP response message.

```
const http = require('http');
http.createServer((req, res) => {
    console.log(req.url, req.method, req.headers);
    res.setHeader('Content-Type', 'text/html');
    res.write('My First Page');
    res.write('Hello From Node.js');
    res.end();
}).listen(3000);
```

HTTP Request: Reading Get and Post Data

- Handling basic GET & POST requests is relatively simple with Node.js.
- We use the `url` module to parse and read information from the URL.
- The `url` module uses the WHATWG URL Standard (https://url.spec.whatwg.org/)



Using URL Module

- Parsing the URL string using the WHATWG API:

```
const url = require('url');
const myURL =
    new URL('https://user:pass@sub.host.com:8080/p/a/t/h?course1=nodejs&course2=angular#hash');
console.log(myURL);
```

```
URL {
  href: 'https://user:pass@sub.host.com:8080/p/a/t/h?course1=nodejs&course2=angular#hash',
  origin: 'https://sub.host.com:8080',
  protocol: 'https:',
  username: 'user',
  password: 'pass',
  host: 'sub.host.com:8080',
  hostname: 'sub.host.com',
  port: '8080',
  pathname: '/p/a/t/h',
  search: '?course1=nodejs&course2=angular',
  searchParams: URLSearchParams { 'course1' => 'nodejs', 'course2' => 'angular' },
  hash: '#hash'
}
```

Parsing the Query String

```
const url = require('url');
const myURL =
    new URL('https://user:pass@sub.host.com:8080/p/a/t/h?course1=nodejs&course2=angular#hash');
let params = myURL.searchParams;
console.log(params);
console.log(params.get('course1'), params.get('course2’));
```

```
URLSearchParams { 'course1' => 'nodejs', 'course2' => 'angular' }
nodejs angular
```