Express JS

Lesson 03 :Working with Express.js

Lesson Objectives

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Response-render,locals,status,json,redirect
Types of middleware
Application level middleware

Lesson Objectives

Express-json,session,logger,compress
Router level middleware
Built-in middleware
Third party middleware
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Working with MongoDb

Introduction

- ➢If we try to create apps by only using core Node.js modules we will end up by writing the same code repeatedly for similar tasks such as
  - Parsing of HTTP request bodies
  - Parsing of cookies
  - Managing sessions
  - Organizing routes with a chain of if conditions based on URL paths and HTTP methods of the requests
  - Determining proper response headers based on data types
- ➢Developers have to do a lot of manual work themselves, such as interpreting HTTP methods and URLs into routes, and parsing input and output data.
- ➢Express.js solves these and many other problems using abstraction and code organization.

Introduction toExpress.js

- Express.js is a web framework based on the core Node.js http module and Connect components
- Express.js framework provides a model-view-controller-like structure for your web apps with a clear separation of concerns (views, routes, models)
- Express.js systems are highly configurable, which allows developers to pick freely whatever libraries they need for a particular project
- Express.js framework leads to flexibility and high customization in the development of web applications.
- In Express.js we can define middleware such as error handlers, static files folder, cookies, and other parsers.
- Middleware is a way to organize and reuse code, and, essentially, it is nothing more than a function with three parameters: request, response, and next.

Connect module

➢Connect is a module built to support interception of requests in a modular approach.

```
var connect = require('connect');
var app = connect();
var logger = function(req, res, next) {
    console.log(req.method, req.url);
    next();
};
var helloWorld = function(req, res, next) {
    res.setHeader('Content-Type', 'text/plain');
    res.end('Hello World');
};
var byeWorld = function(req, res, next) {
    res.setHeader('Content-Type', 'text/plain');
    res.end('Bye World');
};
app.use(logger);
app.use('/hello',helloWorld);
app.use('/bye',byeWorld);
app.listen(3000);
console.log('Server running at localhost:3000');
```

Express.js Installation

- The Express.js package comes in two flavors:
- *express-generator*: a global NPM package that provides the command-line tool for rapid app creation (scaffolding)
- *express*: a local package module in your Node.js app's node_modules folder

app.js

➢App.js is the main file in Express framework. A typical structure of the main Express.js file consists of the following areas

- 1. Require dependencies
- 2. Configure settings
- 3. Connect to database (optional)
- 4. Define middleware
- 5. Define routes
- 6. Start the server

➢The order here is important, because requests travel from top to bottom in the chain of middleware.

app.js

➢First the dependencies need to be included with require()

```
var express = require('express');
var http = require(http');
var path = require('path');
var cookieParser = require('cookie-parser');
var bodyParser = require('body-parser');
```

➢Then Express.js object is instantiated (Express.js uses a functional pattern):

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

app.js

➢One of the ways to configure Express.js settings is to use app.set(), with the name of the setting and the value.

```
const express=require('express');
const path=require('path');
//init app
const app=express();

//Load View Engine
app.set('views',path.join(__dirname,'views'));
app.set('view engine','pug');
```

➢Middleware is the backbone of the Express.js framework and it comes in two flavors.

- Defined in external (third-party) modules, such as bodyParser.json from Connect/Express.js body-parser: app.use(bodyParser.json());
- Defined in the app or its modules, such as app.use(function(req, res, next){...});

app.js

➢Routes are processed in the order they are defined. Usually, routes are put after middleware, but some middleware may be placed following the routes. A good example of such middleware, found after a routes, is error handler.

➢The way routes are defined in Express.js is with helpers app.VERB(url, fn1, fn2, ..., fn), where fnNs are request handlers, url is on a URL pattern in RegExp, and VERB values are as follows:

- all: catch every request (all methods)
- get: catch GET requests
- post: catch POST requests
- put: catch PUT requests
- del: catch DELETE requests

app.js

➢Finally to start the server, we need to use createServer method from the core http module. In this method, the system passes the Express.js app object with all the settings and routes

```
http.createServer(app).listen(app.get('port'), function(){
    console.log('Express server listening on port ' + app.get('port'));
});
```

Steps for creating Express.js Application

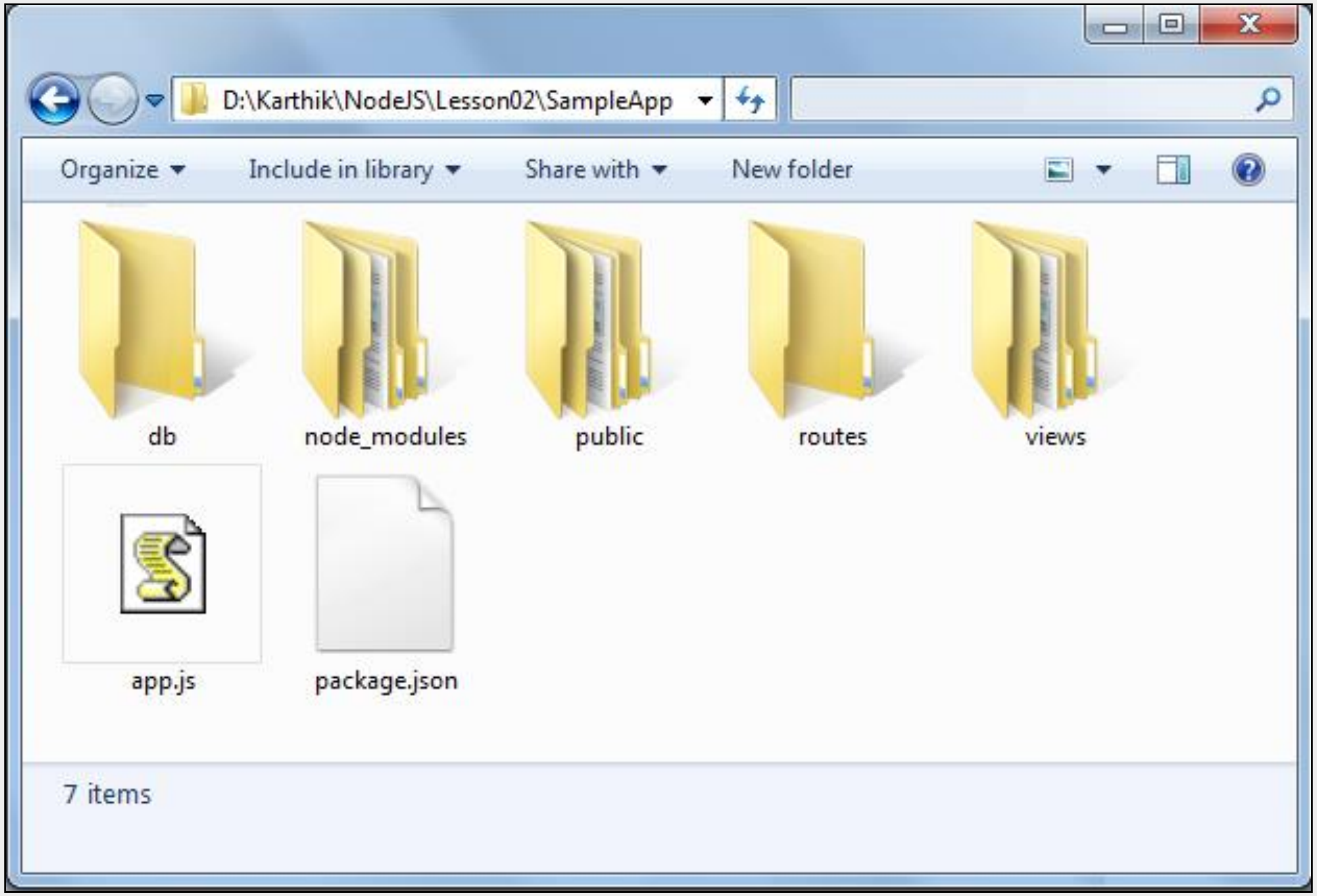
- Step – 1 : Create a folder named SampleApp
- Step – 2 : Create package.json with the following schema

```
{  "name": "node",
"version": "1.0.0",
"description": "",  "main":
"app.js",  "scripts": {
"start": "node app"  },
"author": "Rahul Vikash",
"license": "ISC",
"dependencies": {    "body-
parser": "^1.18.2",
"express": "^4.16.3",
"mongoose": "^5.0.16",
"nodeman": "^1.1.2",
"pug": "^2.0.3"  }}
```

Steps for creating Express.js Application

- Step – 3 : Install the dependencies using npm install command
- Step – 4 : Create the following folders under SampleApp folder
  - **public** : All the static (front-end) files like HTML
  - **public/css** : Stylesheet files
  - **public/img :** images
  - **public/js** : Scripts
  - **db** : Seed data and scripts for MongoDB
  - **views** : Jade/pug (or any other template engine) files
  - **views/includes** : Partial / include files
  - **routes :** Node.js modules that contain request handlers
- Step – 5 : Create the main file named app.js

Steps for creating Express.js Application



Steps for creating Express.js Application

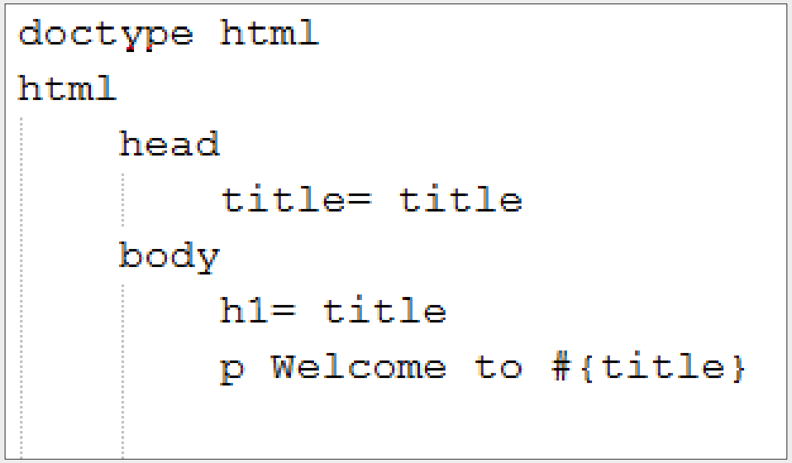
➢Step – 6 : Type the following contents in app.js

```
const express=require('express');
const path=require('path');
//init app
const app=express();

//Load View Engine
app.set('views',path.join(__dirname,'views'));
app.set('view engine','pug');
```

Steps for creating Express.js Application

➢Step – 7 : Create index.jade under views folder and type the following contents

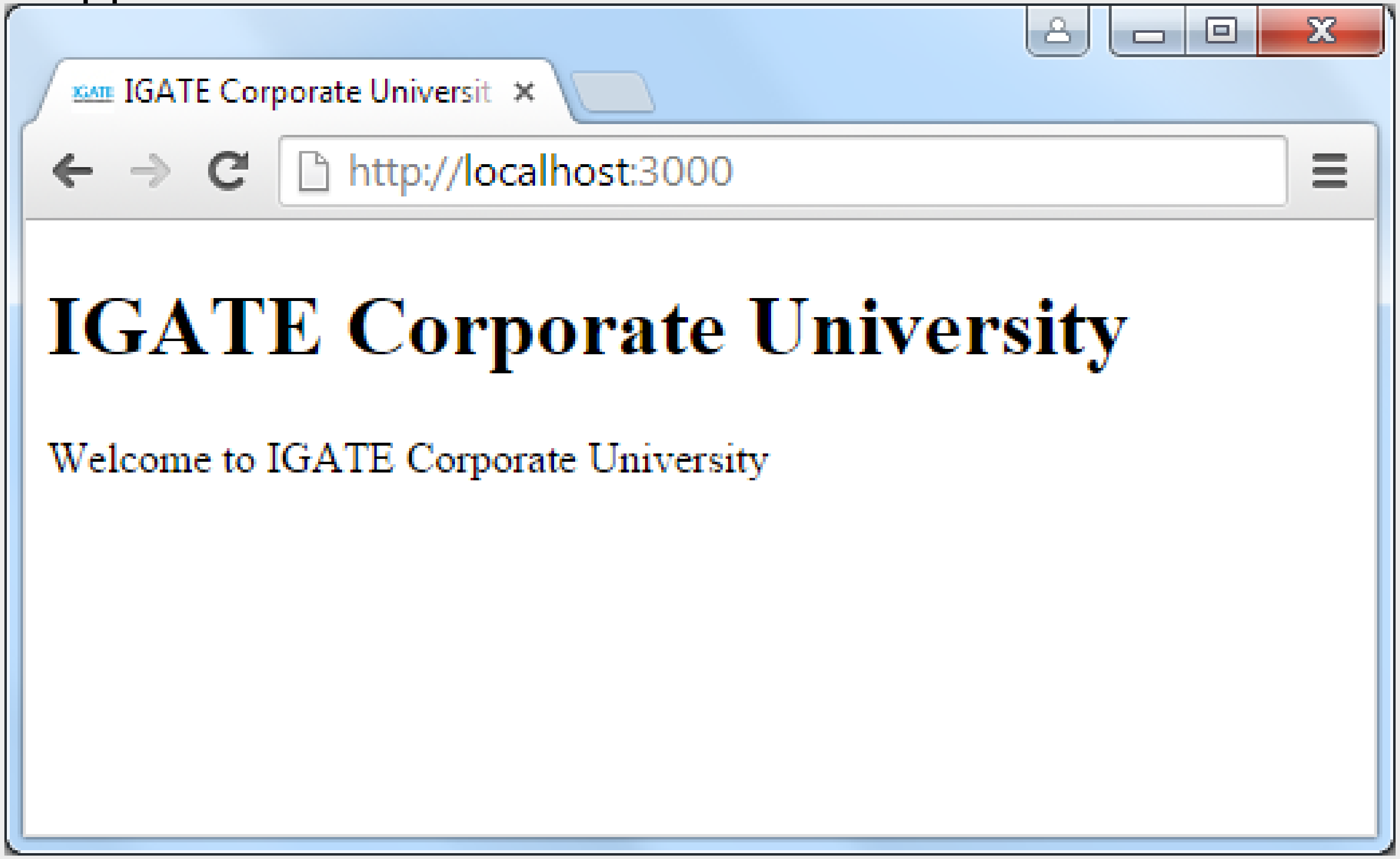


```
doctype html
html
    head
        title= title
    body
        h1= title
        p Welcome to #{title}
```

➢Step – 8 : Start the app by typing *npm start* in command prompt.

Steps for creating Express.js Application

➢Step – 9 : Open browser and type *http://localhost:3000* to view the SampleApp



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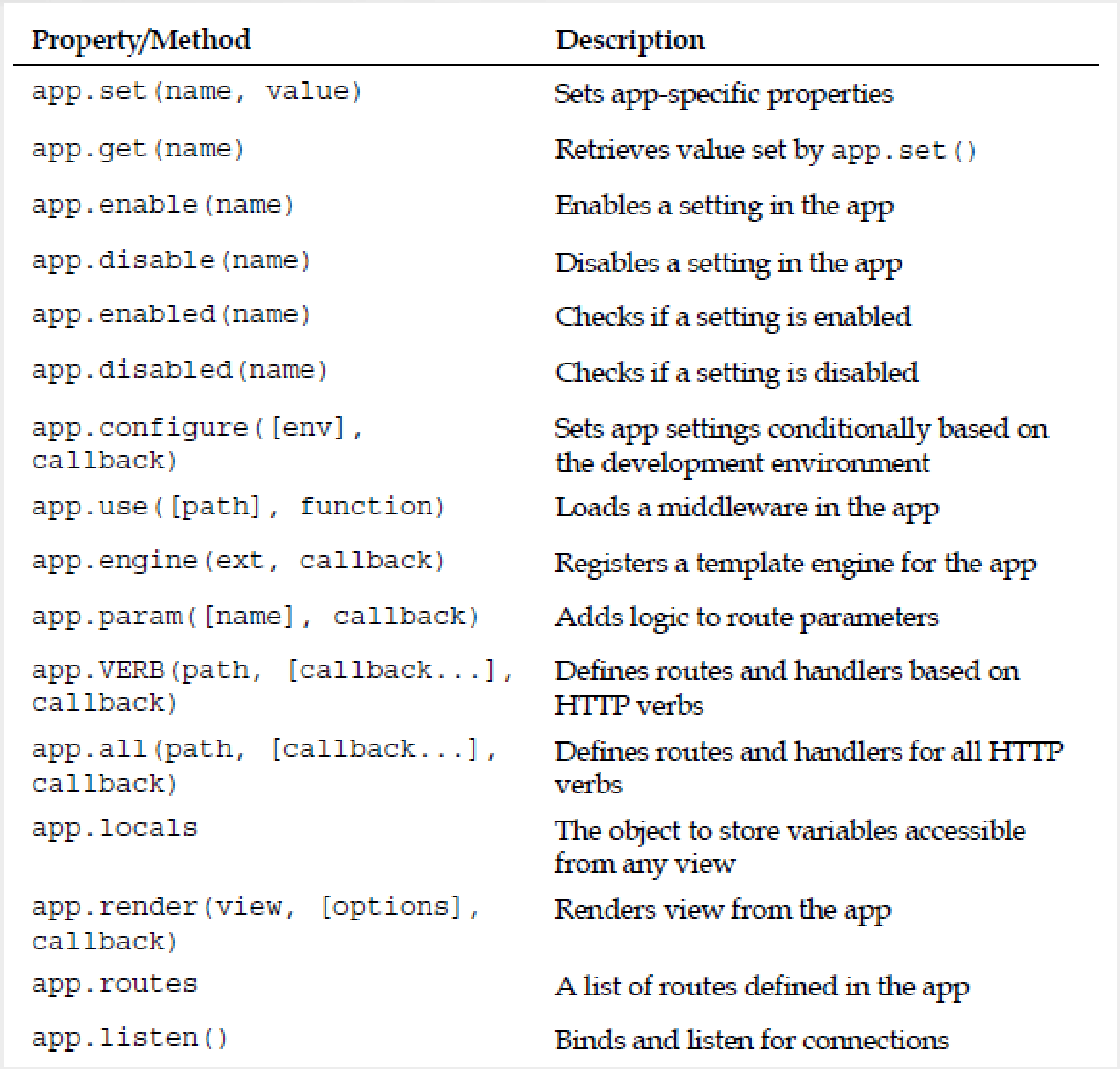
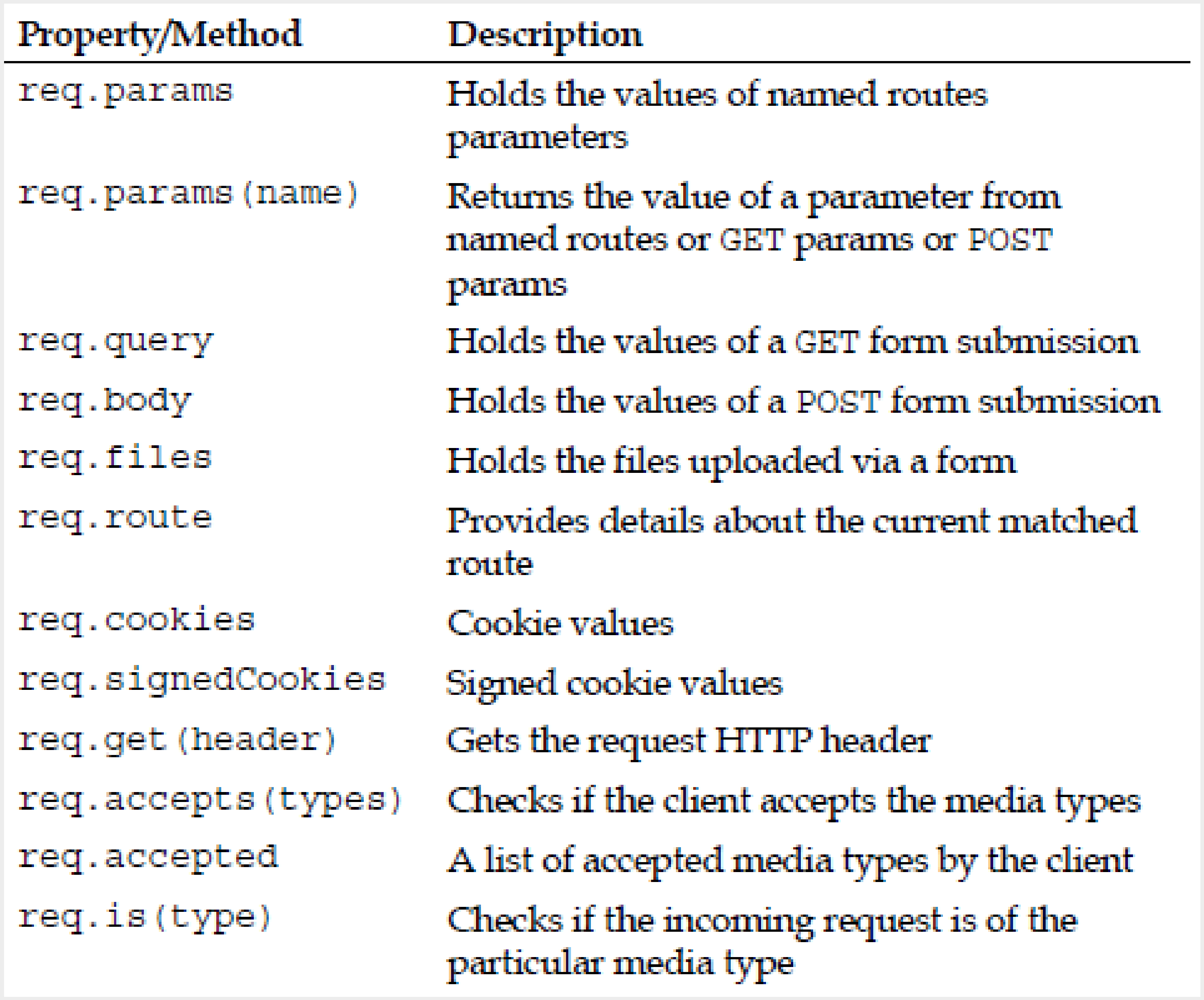
Welcome to IGATE Corporate University

application object properties & methods



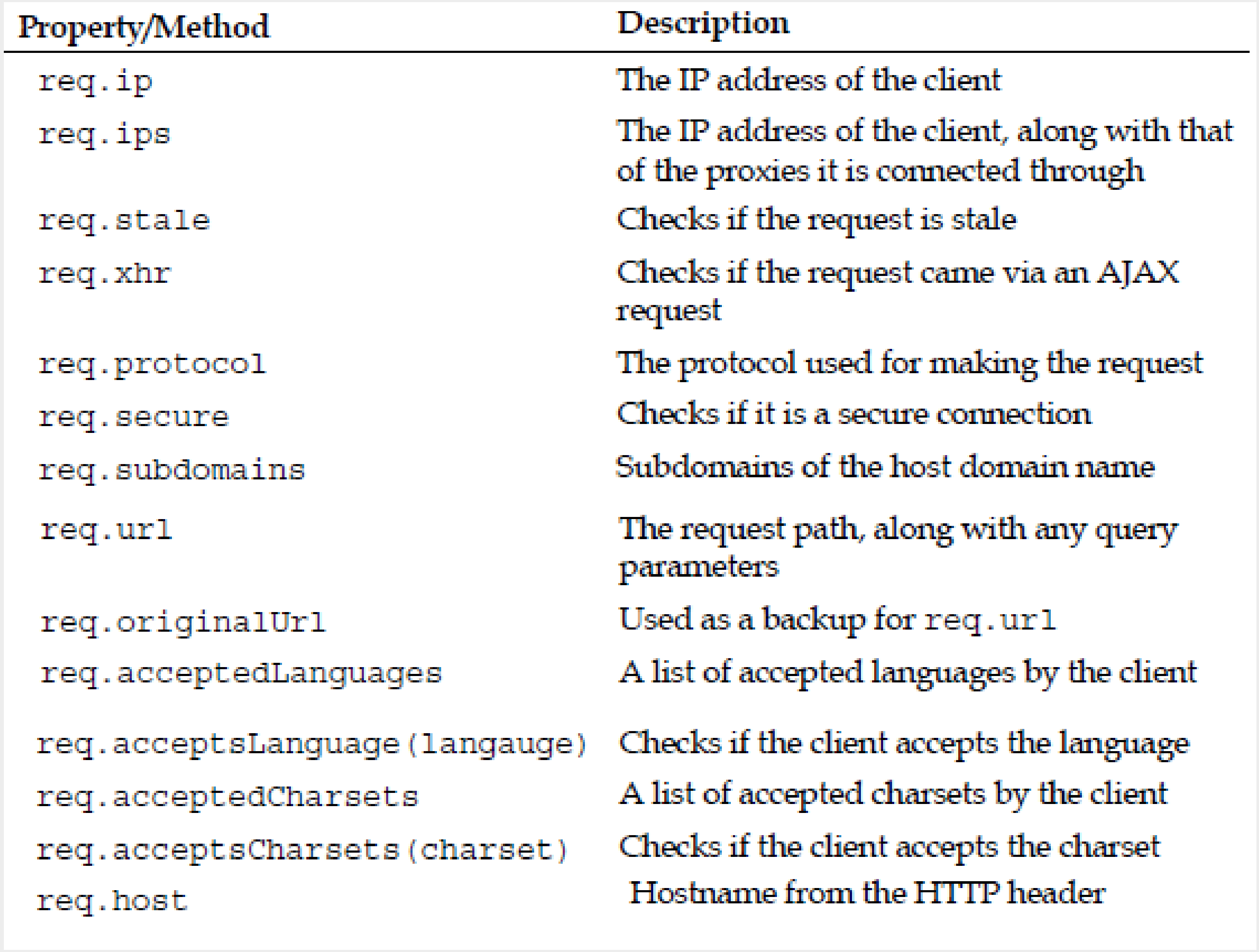
Property/Method	Description
`app.set(name, value)`	Sets app-specific properties
`app.get(name)`	Retrieves value set by `app.set()`
`app.enable(name)`	Enables a setting in the app
`app.disable(name)`	Disables a setting in the app
`app.enabled(name)`	Checks if a setting is enabled
`app.disabled(name)`	Checks if a setting is disabled
`app.configure([env], callback)`	Sets app settings conditionally based on the development environment
`app.use([path], function)`	Loads a middleware in the app
`app.engine(ext, callback)`	Registers a template engine for the app
`app.param([name], callback)`	Adds logic to route parameters
`app.VERB(path, [callback...], callback)`	Defines routes and handlers based on HTTP verbs
`app.all(path, [callback...], callback)`	Defines routes and handlers for all HTTP verbs
`app.locals`	The object to store variables accessible from any view
`app.render(view, [options], callback)`	Renders view from the app
`app.routes`	A list of routes defined in the app
`app.listen()`	Binds and listen for connections

request object properties & methods



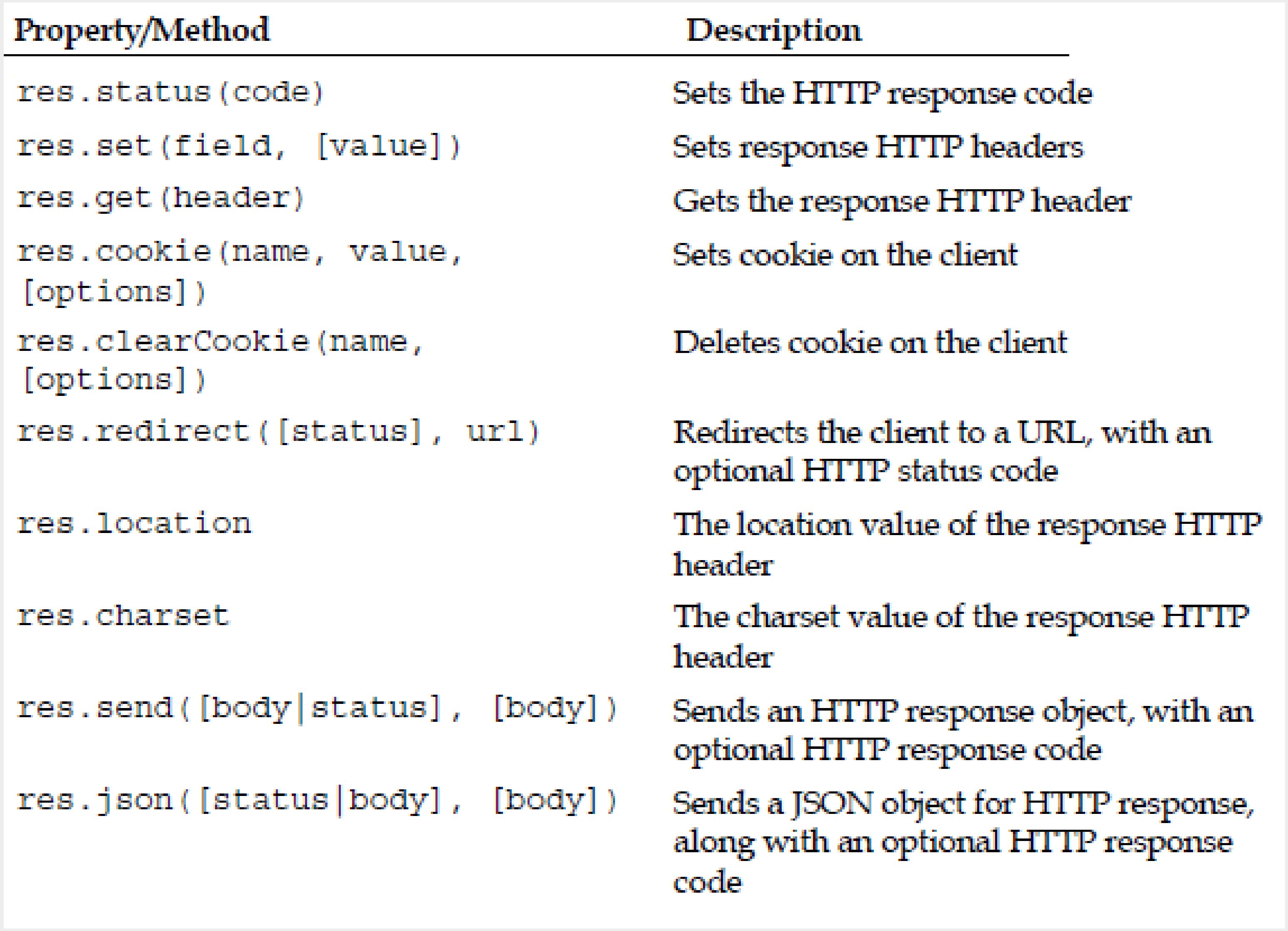
Property/Method	Description
`req.params`	Holds the values of named routes parameters
`req.params(name)`	Returns the value of a parameter from named routes or GET params or POST params
`req.query`	Holds the values of a GET form submission
`req.body`	Holds the values of a POST form submission
`req.files`	Holds the files uploaded via a form
`req.route`	Provides details about the current matched route
`req.cookies`	Cookie values
`req.signedCookies`	Signed cookie values
`req.get(header)`	Gets the request HTTP header
`req.accepts(types)`	Checks if the client accepts the media types
`req.accepted`	A list of accepted media types by the client
`req.is(type)`	Checks if the incoming request is of the particular media type

request object properties & methods



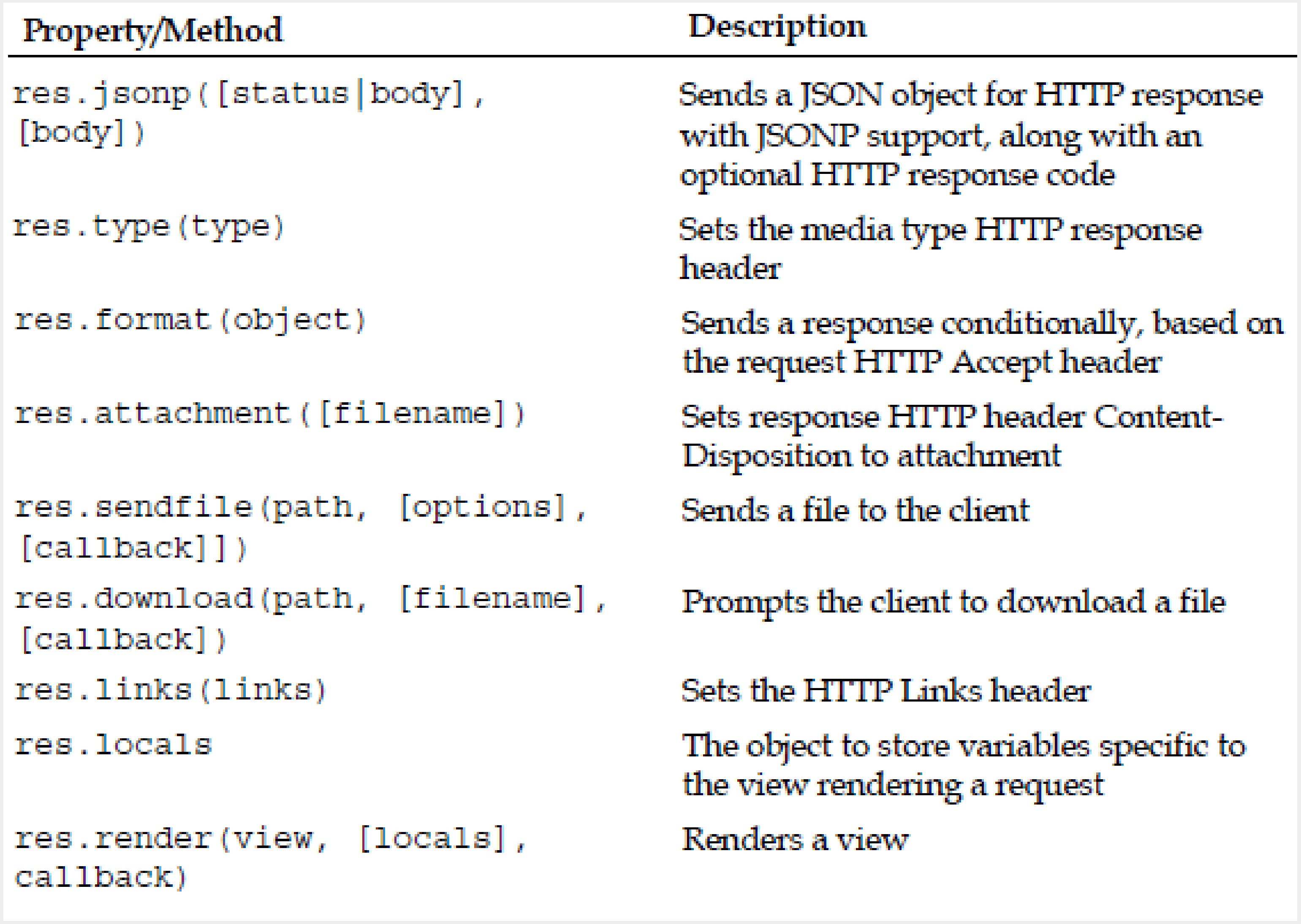
Property/Method	Description
`req.ip`	The IP address of the client
`req.ips`	The IP address of the client, along with that of the proxies it is connected through
`req.stale`	Checks if the request is stale
`req.xhr`	Checks if the request came via an AJAX request
`req.protocol`	The protocol used for making the request
`req.secure`	Checks if it is a secure connection
`req.subdomains`	Subdomains of the host domain name
`req.url`	The request path, along with any query parameters
`req.originalUrl`	Used as a backup for `req.url`
`req.acceptedLanguages`	A list of accepted languages by the client
`req.acceptsLanguage(langauge)`	Checks if the client accepts the language
`req.acceptedCharsets`	A list of accepted charsets by the client
`req.acceptsCharsets(charset)`	Checks if the client accepts the charset
`req.host`	Hostname from the HTTP header

response object properties & methods



Property/Method	Description
`res.status(code)`	Sets the HTTP response code
`res.set(field, [value])`	Sets response HTTP headers
`res.get(header)`	Gets the response HTTP header
`res.cookie(name, value, [options])`	Sets cookie on the client
`res.clearCookie(name, [options])`	Deletes cookie on the client
`res.redirect([status], url)`	Redirects the client to a URL, with an optional HTTP status code
`res.location`	The location value of the response HTTP header
`res.charset`	The charset value of the response HTTP header
`res.send([body|status], [body])`	Sends an HTTP response object, with an optional HTTP response code
`res.json([status|body], [body])`	Sends a JSON object for HTTP response, along with an optional HTTP response code

response object properties & methods

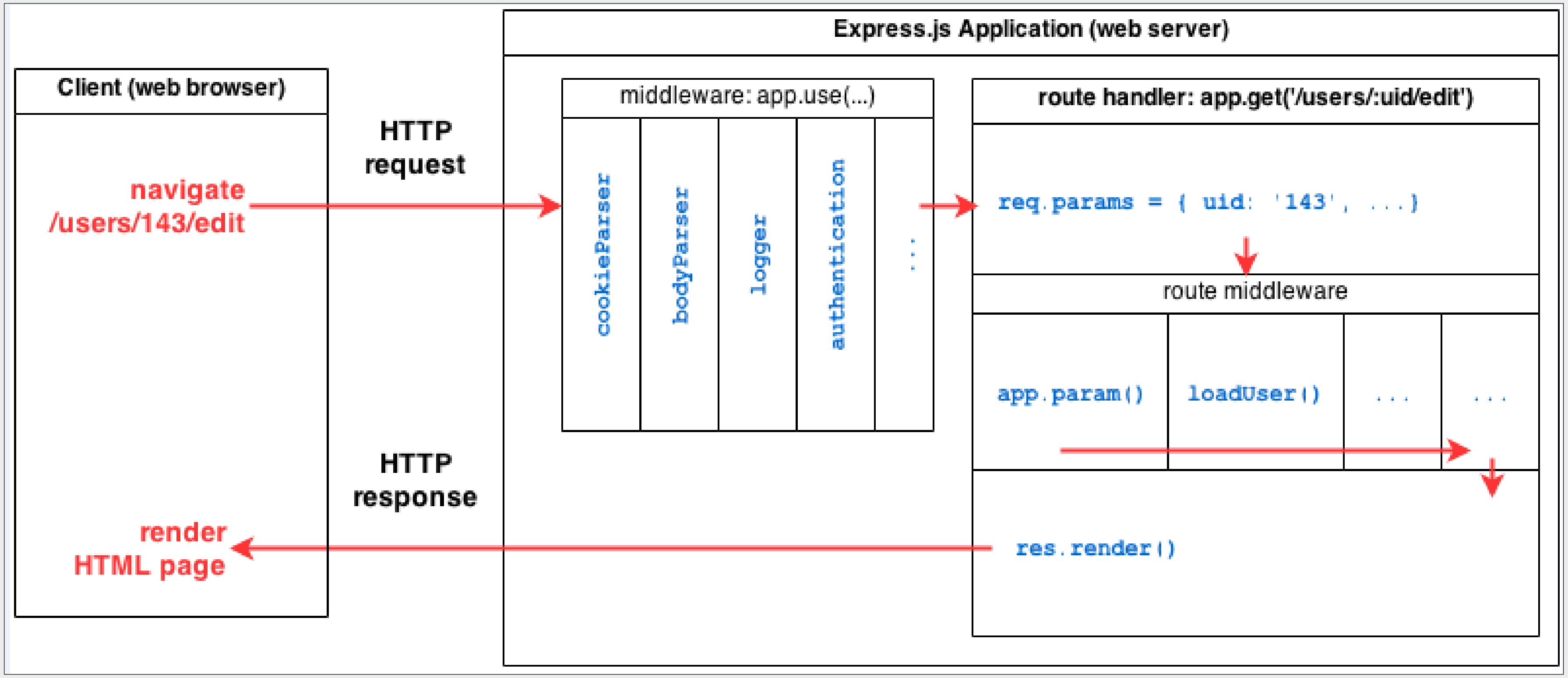


Property/Method	Description
`res.jsonp([status|body], [body])`	Sends a JSON object for HTTP response with JSONP support, along with an optional HTTP response code
`res.type(type)`	Sets the media type HTTP response header
`res.format(object)`	Sends a response conditionally, based on the request HTTP Accept header
`res.attachment([filename])`	Sets response HTTP header Content-Disposition to attachment
`res.sendfile(path, [options], [callback]])`	Sends a file to the client
`res.download(path, [filename], [callback])`	Prompts the client to download a file
`res.links(links)`	Sets the HTTP Links header
`res.locals`	The object to store variables specific to the view rendering a request
`res.render(view, [locals], callback)`	Renders a view

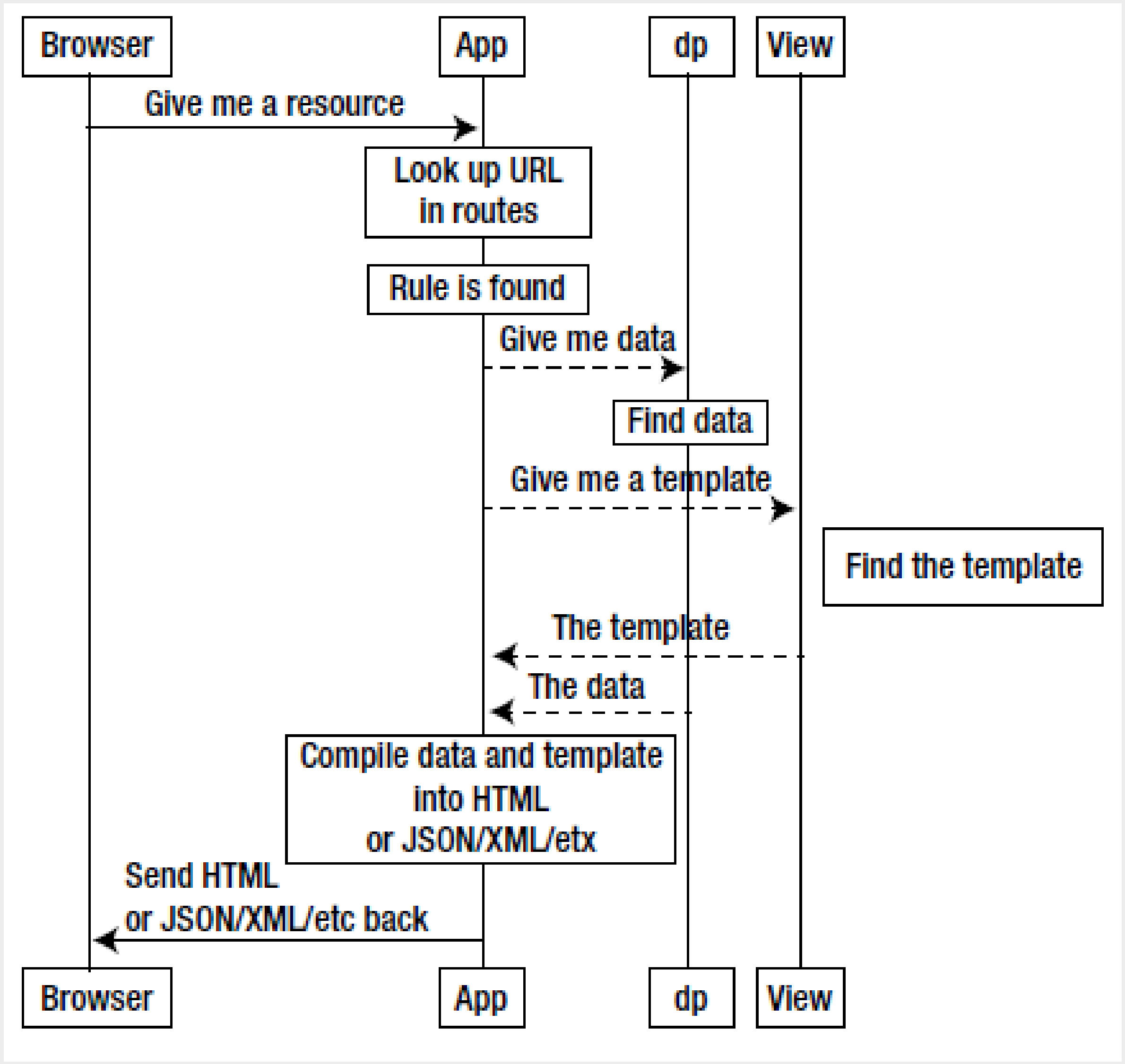
How Express.js works

- Express.js usually has an entry point aka, a main file. Most of the time, this is the file that we start with the node command or export as a module. In the main file we do the following
  - Include third-party dependencies as well as our own modules, such as controllers, utilities, helpers, and models
  - Configure Express.js app settings such as template engine and its file extensions
  - Connect to databases such as MongoDB, Redis, or MySQL (optional)
  - Define middlewares and routes
  - Start the app and Export the app as a module (optional)
- When the Express.js app is running, it's listens to requests. Each incoming request is processed according to a defined chain of middleware and routes, starting from top to bottom.
- Routes / middleware that are higher in the file have precedence over the lower definitions.

How Express.js works



Request flow in Express



Request flow in Express

➢In Express server the request flow will be :

- Route → Route Handler → Template → HTML

➢The route defines the URL schema. It captures the matching request and passed on control to the corresponding route handler

➢The route handler processes the request and passes the control to a template.

➢The template constructs the HTML for the response and sends it to the browser.

➢The route handler need not always pass the control to a template, it can optionally send the response to a request directly.

Using middleware

- ➢A middleware is a JavaScript function to handle HTTP requests to an Express app.
- ➢It can manipulate the request and the response objects or perform an isolated action, or terminate the request flow by sending a response to the client, or pass on the control to the next middleware.
- ➢A middleware can:
  - Execute any code.
  - Make changes to the request and the response objects.
  - End the request-response cycle.
  - Call the next middleware in the stack.
- ➢If the current middleware does not end the request-response cycle, it must call next() to pass control to the next middleware, otherwise the request will be left hanging.

Types of middleware

- An Express application can use the following kinds of middleware:
- Application-level middleware
- Router-level middleware
- Built-in middleware
- Third-party middleware

Application level middleware

➢Application level middleware are bound to an instance of express, using app.use() and app.VERB().

```
var app = express();
/*  a middleware with no mount path; gets executed for every request to the app  */
app.use(function (req, res, next) {
        console.log('Time:', Date.now());        next();
});
/* a middleware mounted on /user/:id; will be executed for any type of HTTP request to
/user/:id */
app.use('/user/:id', function (req, res, next) {
        console.log('Request Type:', req.method);      next();
});
/* a route and its handler function (middleware system) which handles GET requests to
/user/:id  */
app.get('/user/:id', function (req, res, next) {
        res.send('USER');
});
```

Router level middleware

➢Router level middleware are loaded using router.use() and router.VERB().

```
var app = express();
var router = express.Router();
/* a middleware with no mount path, gets executed for every request to the router */
router.use(function (req, res, next) {
        console.log('Time:', Date.now());
        next();
});
/* a middleware sub-stack which handles GET requests to /user/:id */
router.get('/user/:id', function (req, res, next) {
        // if user id is 0, skip to the next router
        if (req.params.id == 0) next('route');
        // else pass the control to the next middleware in this stack
        else next(); //
}, function (req, res, next) {
        // render a regular page
        res.render('regular');
});
/* mount the router on the app */
app.use('/', router);
```

External middleware

➢The Express core is minimal, yet the team behind it provides various predefined middleware to handle common web development features.

➢Those middleware vary in size and functionality and extend Express to provide a better framework support.

➢The popular Express middleware are as follows:

- **morgan**: This is an HTTP request logger middleware.
- **body-parser**: This is a body-parsing middleware that is used to parse the request body, and it supports various request types.
- **method-override:** This is a middleware that provides HTTP verb support such as PUT or DELETE in places where the client doesn't support it.
- **cookie-parser:** This is a cookie-parsing middleware that populates the req.cookies object.
- **express-session**: This is a session middleware used to support persistent sessions.

Built-in middleware

➢Except for express.static, all of Express' previously included middleware are now in separate repo.

➢express.static is based on serve-static, and is responsible for serving the static assets of an Express application. We can have more than one static directory per app.

```
var options = {
  dotfiles: 'ignore',
  etag: false,
  extensions: ['htm', 'html'],
  index: false,
  maxAge: '1d',
  redirect: false,
  setHeaders: function (res, path, stat) {
    res.set('x-timestamp', Date.now())
  }
};
app.use(express.static('public', options));
```

Third-party middleware

- Express is a routing and middleware web framework with minimal functionality of its own. Functionality to Express apps are added via third-party middleware.
- Install the node module for the required functionality and loaded it in your app at the application level or at the router level.

```
$ npm install cookie-parser
```

```
var express = require('express');
var app = express();
var cookieParser = require('cookie-parser');

// load the cookie parsing middleware
app.use(cookieParser());
```

Express 4.0 Router

- Express 4.0 comes with the new Router.
- Router is like a mini express application. It doesn't bring in views or settings, but provides us with the routing APIs like .use, .get, .param, and route.
- Creating instance of Router for application frontend routes

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

// home page route (http://localhost:3000)
router.get('/', function(req, res) {
     res.send('Home page!');
});

// about page route (http://localhost:3000/about)
router.get('/about', function(req, res) {
   res.send('About page!');
});

// apply the routes to our application
app.use('/', router);
```

Express 4.0 Router

➢Route middleware in Express is a way to do something before a request is processed.

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

// route middleware that will happen on every request
router.use(function(req, res, next) {

    // log each request to the console
    console.log(req.method, req.url);

    // continue doing what we were doing and go to the route
    next();
});
// apply the routes to our application
app.use('/', router);
```

Express 4.0 Router

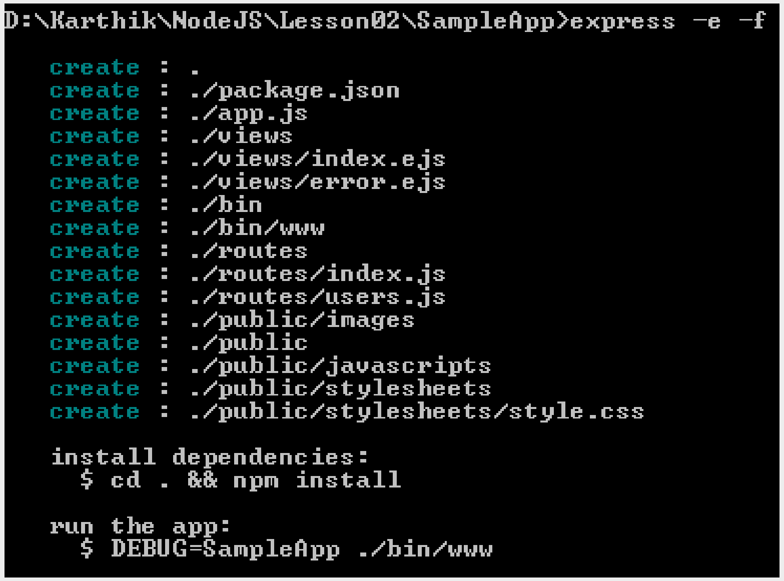
➢Route with parameters & Route Middleware for parameter

```
var router = express.Router();
// route middleware to validate :name
router.param('name', function(req, res, next, name) {
   // do validation on name here
  console.log('doing name validations on ' + name);

   // once validation is done save the new item in the req
   req.name = name;
   // go to the next thing
   next();
});

// route with parameters (http://localhost:3000/hello/:name)
router.get('/hello/:name', function(req, res) {
   res.send('hello ' + req.params.name + '!');
});

// apply the routes to our application
app.use('/', router);
```

Express.js Scaffolding

➢To generate a application skeleton for Express.js app, we need to run a terminal command express [options] [dir | appname] the options for which are the following:

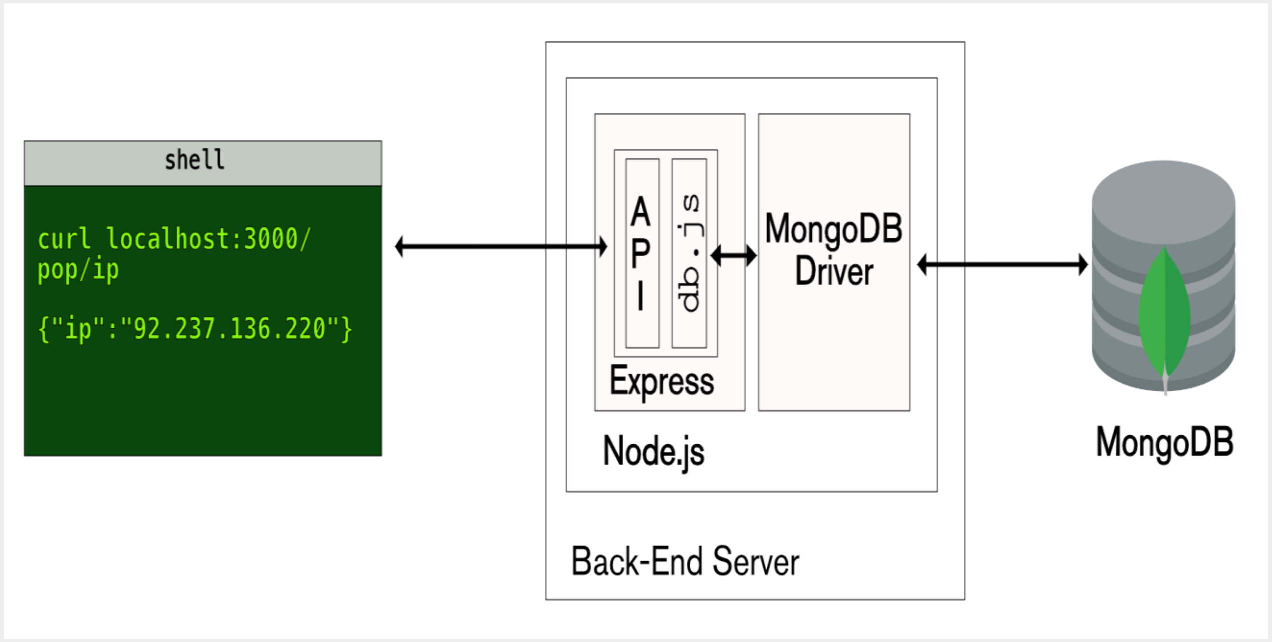
- -e, --ejs: add EJS engine support (by default, Jade is used)
- -c <engine>, --css <engine>: add stylesheet <engine> support, such as LESS, Stylus or Compass (by default, plain CSS is used)
- -f, --force: force app generation on a nonempty directory



```
D:\Karthik\NodeJS\Lesson02\SampleApp>express -e -f

   create : .
   create : ./package.json
   create : ./app.js
   create : ./views
   create : ./views/index.ejs
   create : ./views/error.ejs
   create : ./bin
   create : ./bin/www
   create : ./routes
   create : ./routes/index.js
   create : ./routes/users.js
   create : ./public/images
   create : ./public
   create : ./public/javascripts
   create : ./public/stylesheets
   create : ./public/stylesheets/style.css

   install dependencies:
     $ cd . && npm install

   run the app:
     $ DEBUG=SampleApp ./bin/www
```

Express With Mongo Db

Working with Express with MongoDb



```
curl localhost:3000/
pop/ip

{"ip":"92.237.136.220"}
```

MongoDB is a database. This is the place where you store information for your web websites (or applications).

Express With Mongo Db

Connection with MongoDb

```
const mongoose=require('mongoose');
var bodyParser = require('body-parser');
//Connecting Mongodb server
mongoose.connect('mongodb://localhost/nodekb');
```

Express With Mongo Db

CRUD is an acronym for Create, Read, Update and Delete. It is a set of operations we get servers to execute (POST, GET, PUT and DELETE respectively). This is what each operation does:

Create (POST) - Make something
Read (GET)_- Get something
Update (PUT) - Change something
Delete (DELETE)- Remove something

Demo

Express02
express03-staticdb
Expresswithmongo
expresswithroute

Lab

Lab 3