NODE PROGRAM

EXPRESS.JS

NODE.JS VERSION: 5.1
LAST UPDATED: JAN 2016

EXPRESS

EXPRESS IS THE MOST POPULAR WEB APPLICATION FRAMEWORK FOR NODE

IT IS EASY TO WORK WITH AS IT TIES INTO NODE'S FUNCTIONAL PARADIGM

- DELIVER STATIC CONTENT (OR CONSIDER USING NGINX)
- MODULARIZE BUSINESS LOGIC

INSTALLING DEPENDENCY

```
$ npm install express --save
```

INSTALLING SCAFFOLDING

INSTALL EXPRESS.JS COMMAND-LINE GENERATOR:

```
$ npm install -g express-generator
```

USING THE GENERATOR

```
$ express todo-list-app
```

- `app.js`: MAIN FILE, HOUSES THE EMBEDDED SERVER AND APPLICATION LOGIC
- `public/`: CONTAINS STATIC FILES TO BE SERVED BY THE EMBEDDED SERVER
- `routes/`: HOUSES CUSTOM ROUTING FOR THE EMBEDDED

CONFIGURING EXPRESS

THE EXPRESS SERVER NEEDS TO BE CONFIGURED BEFORE IT CAN START

MANAGE CONFIGURATION VIA THE `set` METHOD:

```
var app = express();
app.set('port', process.env.PORT || 3000);
app.set('views', 'views'); // the directory the templates are stored in
app.set('view engine', 'jade');
```

NODE.JS MIDDLEWARE PATTERN

WHAT IS MIDDLEWARE

MIDDLEWARE PATTERN IS A SERIES OF PROCESSING UNITS CONNECTED TOGETHER, WHERE THE OUTPUT OF ONE UNIT IS THE INPUT FOR THE NEXT ONE. IN NODE.JS, THIS OFTEN MEANS A SERIES OF FUNCTIONS IN THE FORM:

```
function(args, next) {
  next(output) // error or real output
}
```

CONNECT MIDDLEWARE

EXAMPLE:

```
app.use(function middleware1(req, res, next) {
  // middleware 1
  next();
});
app.use(function middleware2(req, res, next) {
  // middleware 2
  next();
});
```

MIDDLEWARE ORDER

MIDDLEWARE ARE EXECUTED IN THE ORDER SPECIFIED:

```
app.use(express.logger('dev'));
app.use(express.basicAuth('test', 'pass'));
app.use(express.json());
```

CREATING MIDDLEWARE

CUSTOM MIDDLEWARE IS EASY TO CREATE:

```
app.use(function (req, res, next) {
  // modify req or res
  // execute the callback when done
  next();
});
```

CONNECT FRAMEWORK

EXPRESS LEVERAGES THE CONNECT FRAMEWORK TO PROVIDE MIDDLEWARE
FUNCTIONALITY.

MIDDLEWARES ARE USED TO MANAGE HOW A REQUEST SHOULD BE HANDLED.

MOST POPULAR AND USEFUL CONNECT/EXPRESS MIDDLEWARE

```
$ npm install <package_name> --save
```

- BODY-PARSER REQUEST PAYLOAD
- COMPRESSION GZIP
- CONNECT-TIMEOUT SET REQUEST TIMEOUT
- COOKIE-PARSER COOKIES
- COOKIE-SESSION SESSION VIA COOKIES STORE

CONNECT/EXPRESS MIDDLEWARE

- CSURF CSRF
- ERRORHANDLER ERROR HANDLER
- EXPRESS-SESSION SESSION VIA IN-MEMORY OR OTHER STORE
- METHOD-OVERRIDE HTTP METHOD OVERRIDE
- MORGAN SERVER LOGS
- RESPONSE-TIME

CONNECT/EXPRESS MIDDLEWARE

- SERVE-FAVICON FAVICON
- SERVE-INDEX
- SERVE-STATIC STATIC CONTENT
- VHOST

OTHER POPULAR MIDDLEWARE

- COOKIES AND KEYGRIP: ANALOGOUS TO `cookieParser`
- RAW-BODY
- CONNECT-MULTIPARTY, CONNECT-BUSBOY
- QS: ANALOGOUS TO `query`
- ST, CONNECT-STATIC ANALOGOUS TO `staticCache`

OTHER POPULAR MIDDLEWARE

- EXPRESS-VALIDATOR: VALIDATION
- LESS: LESS CSS
- PASSPORT: AUTHENTICATION LIBRARY
- HELMET: SECURITY HEADERS
- CONNECT-CORS: CORS
- CONNECT-REDIS

TEMPLATE ENGINE

SETTING THE `view engine` VARIABLE TO `jade` FOR INSTANCE, WOULD TRIGGER THE FOLLOWING FUNCTION CALL INTERNALLY

```
app.set('view engine', 'jade'); // shorthand

// does the same as the above
app.engine('jade', require('jade').__express);
```

TEMPLATE ENGINE

CUSTOM CALLBACKS CAN BE DEFINED TO PARSE TEMPLATES

```
app.engine([format], function (path, options, callback) {
  // template parsing logic goes here
});
```

NOTE: CUSTOM CALLBACKS ARE USEFUL IF THE TEMPLATE ENGINE DOESN'T EXPORT AN __EXPRESS FUNCTION

RUNNING EXPRESS

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

var app = express();

// ...

var server = http.createServer(app);
server.listen(app.get('port'), function () {
  // Do something... maybe log some info?
});
```

DEMO

🖥️

RESTFUL API

HTTPS://GITHUB.COM/AZAT-CO/REST-API-EXPRESS

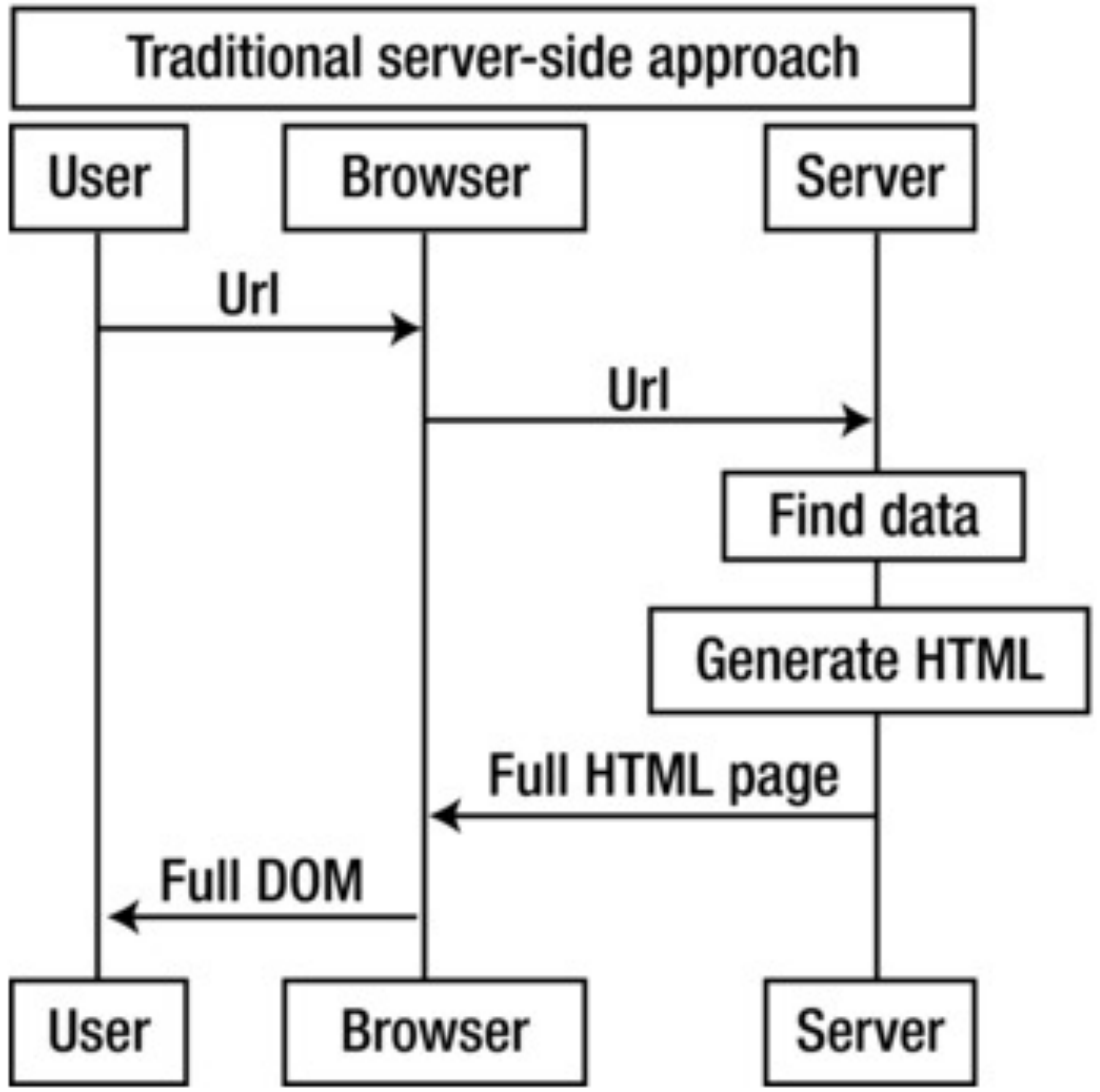
ALTERNATIVES

- SAILS
- LOOPBACK 👈
- METEOR
- HAPI
- RESTIFY

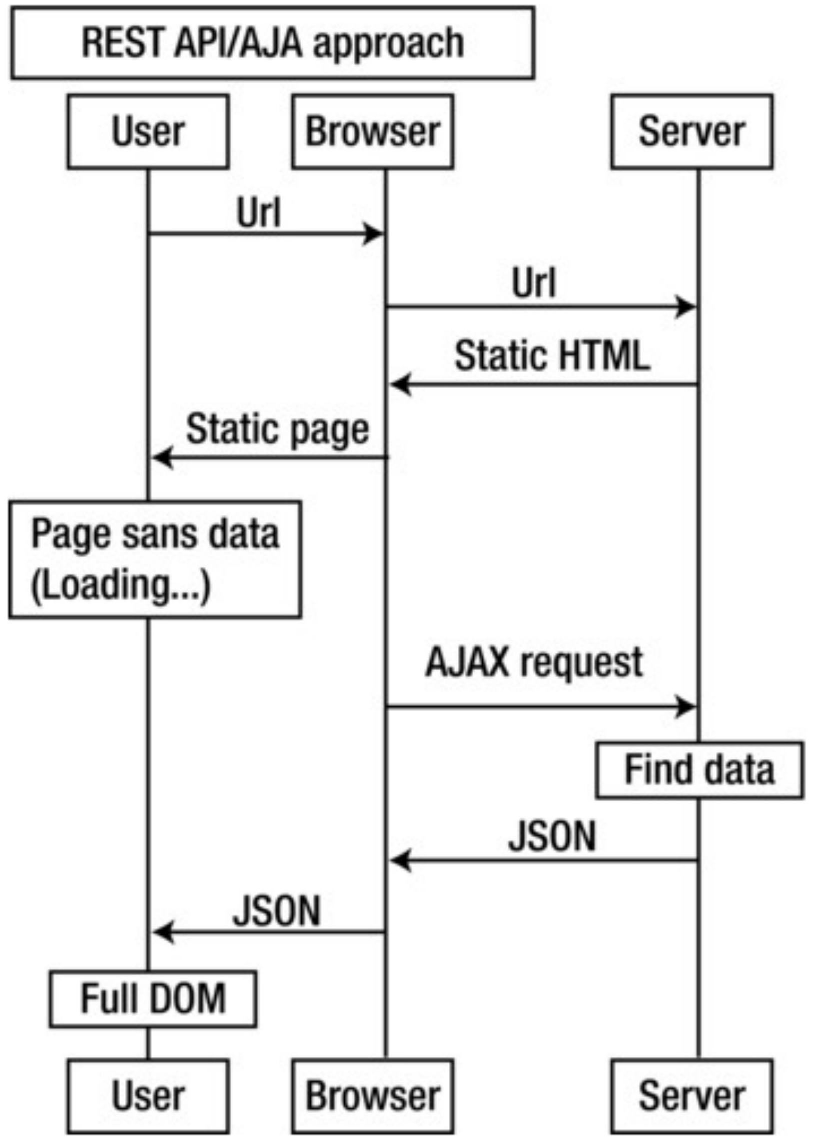
REGISTRY OF HAND-PICKED NODE FRAMEWORKS: NODEFRAMEWORK.COM

BUILDING A RESTFUL API

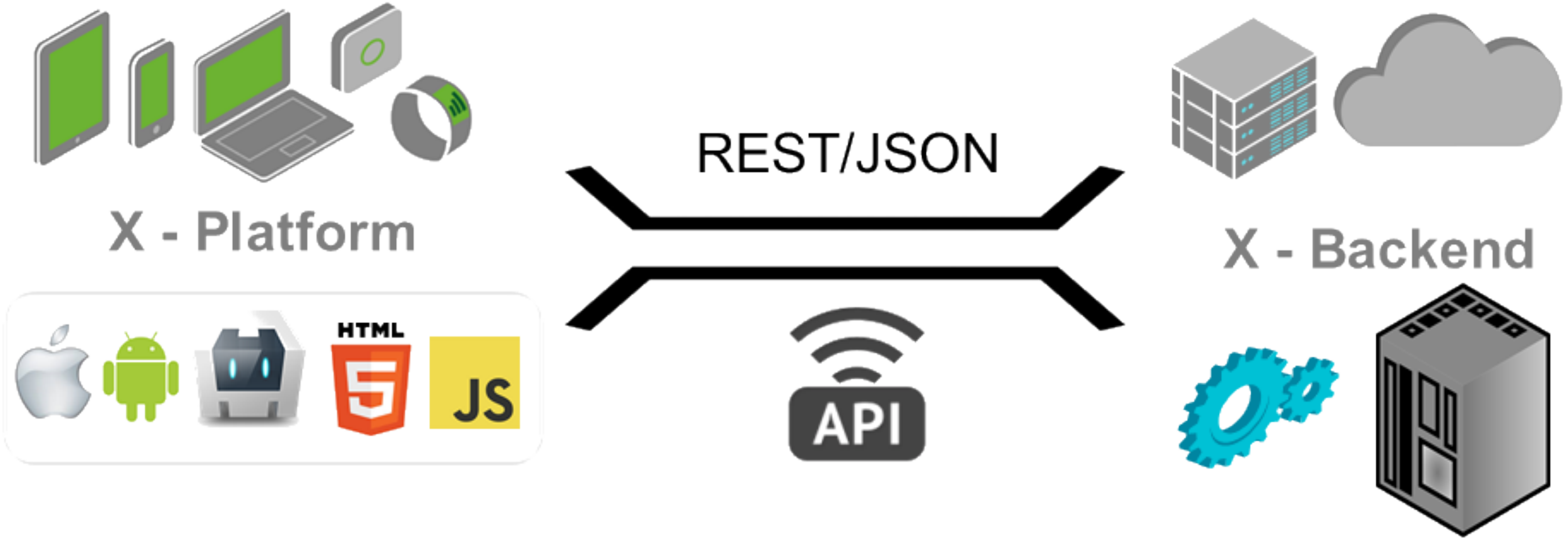
TRADITIONAL WEB APP



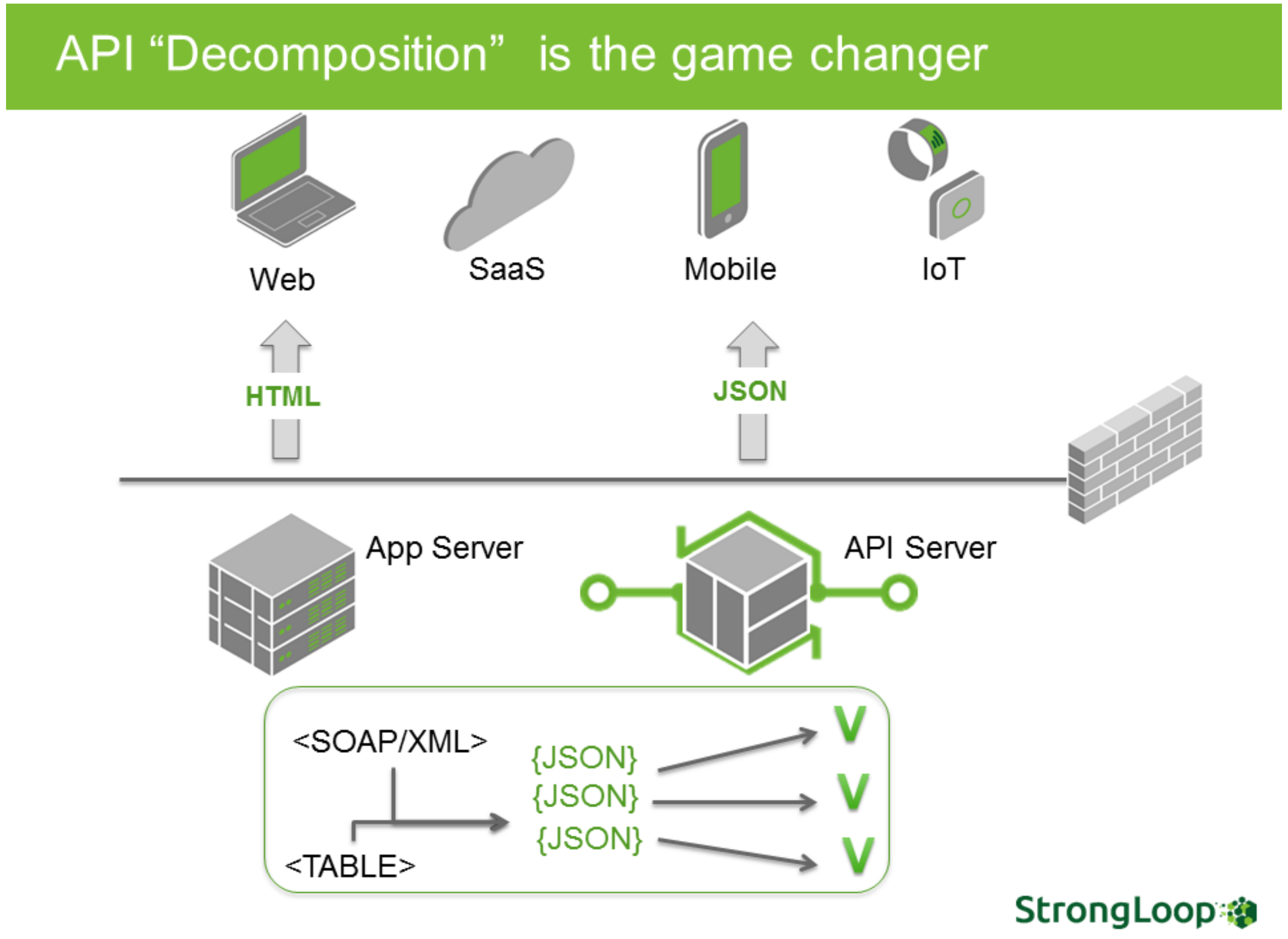
API + AJAX/XHR WEB APP



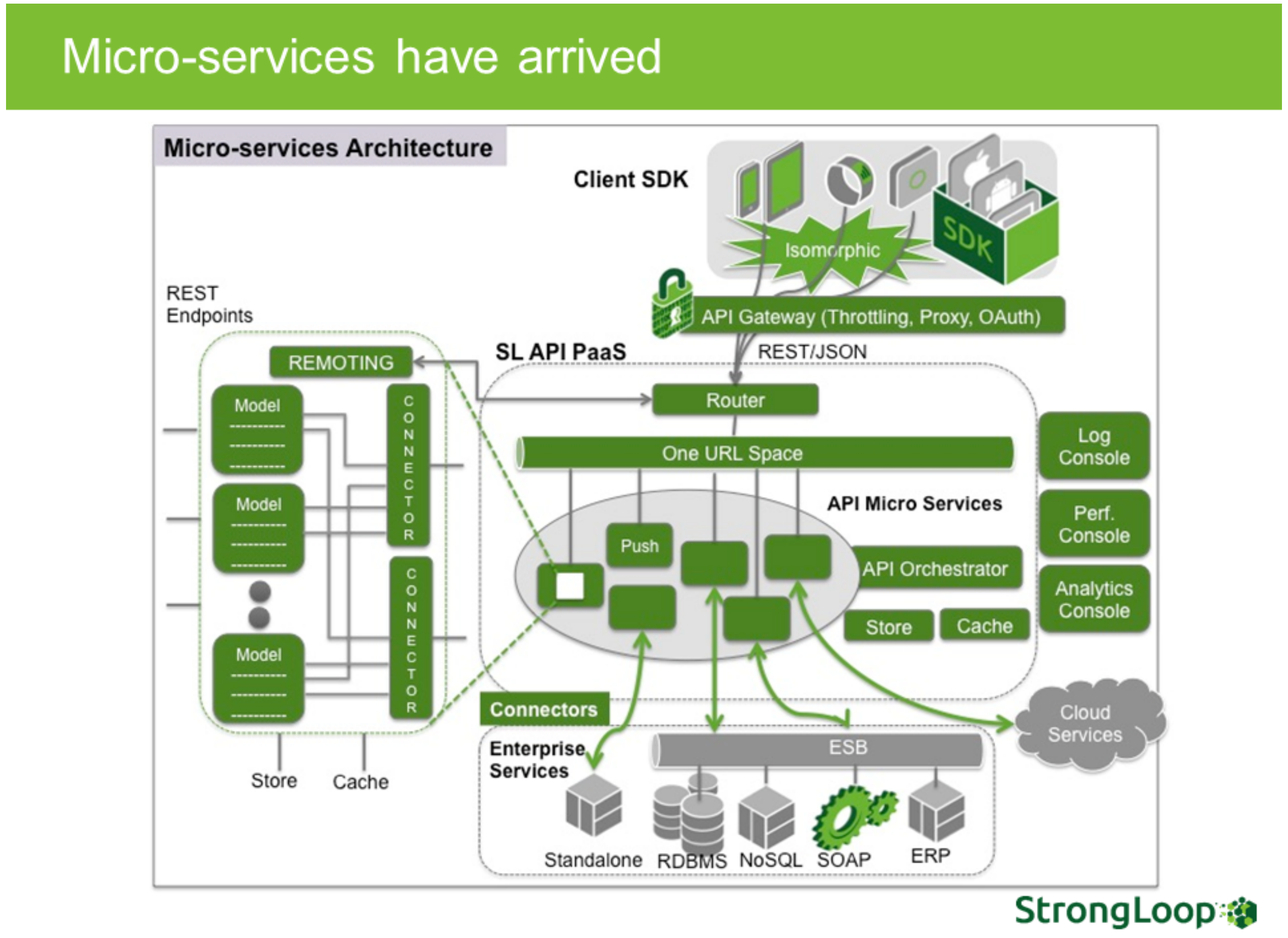
NODE, SPAS AND REST



API DECOMPOSITION



MICROSERVICES



REST BASICS

REPRESENTATIONAL STATE TRANSFER (REST) IS AN ARCHITECTURAL PATTERN FOR DEVELOPING NETWORK APPLICATIONS

REST SYSTEMS AIM TO KEEP THINGS SIMPLE WHEN CONNECTING TO AND EXCHANGING DATA BETWEEN MACHINES

WHY HTTP?

HTTP IS THE IDEAL PROTOCOL FOR REST, GIVEN ITS STATELESS NATURE AND CLIENT-SERVER ARCHITECTURE

- REST IS FAR SIMPLER COMPARED TO REMOTE PROCEDURE CALLS (RPC) AND WEB SERVICES (SOAP, UDDI, ETC)
- RPCS AND WEB SERVICES RELY ON COMPLEX VOCABULARIES FOR COMMUNICATION
- EACH NEW OPERATION IS A NEW VOCABULARY ENTRY.

REST VERBS

REST USES HTTP REQUESTS (AND VERBS) FOR CRUD OPERATIONS

- GET
- PUT
- POST
- DELETE

REST VERBS

AND SOMETIMES...

- PATCH
- HEAD
- OPTIONS

COMMON ENDPOINTS

```
GET    /tickets      - Retrieve a list of tickets
GET    /tickets/12  - Retrieve a specific ticket
POST   /tickets      - Create a new ticket
PUT    /tickets/12  - Update ticket #12
DELETE /tickets/12  - Delete ticket #12
PATCH   /tickets/12  - Partially update ticket #12
OPTIONS /tickets/12  - What can I do to ticket #12?
HEAD    /tickets/12  - What headers would I get if I tried to get ticket #12?
```

"RESOURCES"

RESOURCES ARE ENTITIES THAT CAN BE STORED ON A COMPUTER, SUCH AS:

- FILES
- DATABASE ENTRIES
- PROCESSED OUTPUT FROM FUNCTIONS

"RESOURCES"

REST USES HTTP REQUESTS AND RESPONSES TO PROVIDE REPRESENTATIONS OF RESOURCES

FOR EXAMPLE, THE CURRENT VERSION OF A FILE AVAILABLE FOR DOWNLOAD VIA ITS URL IS A REPRESENTATION OF A FILE RESOURCE

MODIFYING A RESOURCE, SUCH AS CHANGING THE CONTENTS OF A FILE OR DELETING IT, IS ALSO A RESOURCE STATE THAT CAN BE

EXPRESS EXAMPLES

GET

TO ALLOW RETRIEVAL BY ID...

```
app.get('/users/:id', function (req, res) {
  var id = req.params.id;
  // code to retrieve a single user
  res.send(user);
});
```

GET

GET HANDLERS CAN ALSO BE USED TO RETRIEVE A COLLECTION OF RESOURCES

```
app.get('/users', function (req, res) {
  // code to retrieve multiple users
  res.send(users);
});
```

POST

TO CREATE A RESOURCE...

```
app.post('/users', function (req, res) {
  var username = req.body.username;
  var email = req.body.email;
  // ...
  // code to create a new user
  res.send(user);
});
```

OR MAYBE JUST SEND BACK THE ENDPOINT TO GET THE USER...

```
res.send('/api/user/' + user.id);
```

PUT

TO UPDATE A RESOURCE (OR CREATE IF IT DOESN'T EXIST, PERHAPS)...

```
app.put('/users/:id', function (req, res) {
  var id = req.params.id;
  // check if the user exists
  ...
  if (exists) {
    // code to modify the user
  } else {
    // code to create the user
  }
  res.send(user);
});
```

DELETE

TO DELETE A RESOURCE, CREATE A DELETE HANDLER FOR THE DESIRED URI

```
app.delete('/users/:id', function (req, res) {
  var id = req.params.id;
  // code to delete the user
  res.send(user); // or maybe the URL to create a new user?
});
```

NOTE: `del` **IS <u>DEPRECATED</u>.**

HTTP REQUESTS

A CLIENT'S HTTP REQUEST IS ACCESSIBLE FROM WITHIN ROUTING HANDLERS

IT IS THE FIRST ARGUMENT IN THE HANDLER'S CALLBACK

```
app.get('/users/:id', function (req, res) {
  // 'req' is the request object
});
```

NOTE: ACCESS TO THE REQUEST OBJECT GRANTS INSIGHT INTO THE CLIENT'S HTTP REQUEST, PROVIDING DATA ON THE REQUEST HEADER, BODY, ET AL.

ACCESSING ROUTE PARAMETERS

A URI SEGMENT CAN BE PARAMETERIZED BY PREFIXING IT WITH A SEMI-COLON

```
app.get('/users/:id/:another/:segment', function (req, res) { ... });
```

HANDLERS SIGNATURES

- `function(request, response, next) {}`: REQUEST HANDLER SIGNATURE
- `function(error, request, response, next) {}`: ERROR HANDLER SIGNATURE

URL PARAMETERS

THESE DYNAMIC PARAMETERS CAN THEN BE ACCESSED VIA THE REQUEST'S PARAMS OBJECT

GET /USERS/:ID

```
req.params.id;
```

URL PARAMETERS

GET /USERS/:ID/:SOME/:FILTER

```
req.params.id;
req.params.some;
req.params.filter;
```

QUERY STRINGS

EXPRESS CONVERTS A URL'S QUERY STRING INTO JSON

IT CAN BE ACCESSED VIA THE REQUEST'S QUERY OBJECT GET HTTP://LOCALHOST:3000/?NAME=BRUCE+WAYNE&AGE=40&OCCUPATION=BATMAN

```
req.query.name;       // "Bruce Wayne"
req.query.age;        // "40"
req.query.occupation; // "Batman"
```

REQUEST BODY

ENABLE THE `json()` AND `urlencoded()` MIDDLEWARE TO CONVERT RAW FORM DATA INTO JSON

```
$ npm install body-parser --save
```

REQUEST BODY

IMPORT MIDDLEWARE:

```
var bodyParser = require('body-parser')
```

PARSE `application/json`

```
app.use(bodyParser.json());
```

PARSE `application/x-www-form-urlencoded`

```
app.use(bodyParser.urlencoded({extended: false}))
```

ACCESSING FORM DATA

FORM DATA IS THEN ACCESSIBLE VIA THE REQUEST'S BODY OBJECT (ULRENCODED)

```
// POST name=Bruce+Wayne&age=40&occupation=Your+Average+Businessman

req.body.name;
req.body.age;
req.body.occupation;
```

FILE UPLOADS

FILE UPLOADS FROM WEB FORMS (MULTIPART/FORM-DATA) CAN BE PARSED WITH THESE LIBRARIES:

- HTTPS://GITHUB.COM/EXPRESSJS/MULTER
- HTTPS://GITHUB.COM/YAHOO/EXPRESS-BUSBOY
- HTTPS://GITHUB.COM/MSCDEX/CONNECT-BUSBOY
- HTTPS://GITHUB.COM/ANDREWRK/NODE-MULTIPARTY

PARSING JSON

PARSE VARIOUS DIFFERENT CUSTOM JSON TYPES AS JSON

```
app.use(bodyParser.json({ type: 'application/*+json' }))
```

PARSING BUFFER

PARSE SOME CUSTOM THING INTO A BUFFER

```
app.use(bodyParser.raw({ type: 'application/vnd.custom-type' }))
```

PARSING HTML

PARSE AN HTML BODY INTO A STRING

```
app.use(bodyParser.text({ type: 'text/html' })
```

HTTP VERBS AND ROUTES

- `app.get(urlPattern, requestHandler[, requestHandler2, ...])`
- `app.post(urlPattern, requestHandler[, requestHandler2, ...])`
- `app.put(urlPattern, requestHandler[, requestHandler2, ...])`
- `app.delete(urlPattern, requestHandler[,`

REQUEST

- `request.params`: PARAMETERS MIDDLWARE
- `request.param`: EXTRACT ONE PARAMETER
- `request.query`: EXTRACT QUERY STRING PARAMETER
- `request.route`: RETURN ROUTE STRING
- `request.cookies`: COOKIES, REQUIRES COOKIEPARSER
- `request.signedCookies`: SIGNED COOKIES, REQUIRES

REQUEST HEADER SHORTCUTS

- `request.get(headerKey)`: VALUE FOR THE HEADER KEY
- `request.accepts(type)`: CHECKS IF THE TYPE IS ACCEPTED
- `request.acceptsLanguage(language)`: CHECKS LANGUAGE
- `request.acceptsCharset(charset)`: CHECKS

REQUEST HEADER SHORTCUTS

- `request.ips`: IP ADDRESSES (WITH TRUST-PROXY ON)
- `request.path`: URL PATH
- `request.host`: HOST WITHOUT PORT NUMBER
- `request.fresh`: CHECKS FRESHNESS
- `request.stale`: CHECKS STALENESS
- `request.xhr`: TRUE FOR AJAX-Y REQUESTS

REQUEST HEADER SHORTCUTS

- `request.protocol`: RETURNS HTTP PROTOCOL
- `request.secure`: CHECKS IF PROTOCOL IS `https`
- `request.subdomains`: ARRAY OF SUBDOMAINS
  - `request.originalUrl`: ORIGINAL URL

HTTP RESPONSES

THE RESPONSE OBJECT IS ALSO ACCESSIBLE VIA ROUTING HANDLERS IN EXPRESS

IT IS THE SECOND ARGUMENT IN THE HANDLER'S CALLBACK

```
app.get('/users/:id', function (req, res) {
  // 'res' is the response object
});
```

THE RESPONSE OBJECT CAN BE USED TO MODIFY AN HTTP RESPONSE BEFORE SENDING IT OUT

EXPRESS RESPONSE METHOD

- `response.redirect(status, url)`: REDIRECT REQUEST
- `response.send(status, data)`: SEND RESPONSE
- `response.json(status, data)`: SEND JSON AND FORCE PROPER HEADERS
- `response.sendfile(path, options,`

HTTP STATUS CODES

TO SPECIFY A STATUS CODE, USE THE RESPONSE OBJECT'S STATUS FUNCTION

```
app.get('/user/:id', function (req, res) {
  // logic to check for user
  if (!exists) {
    res.status(404);
  } else if (authorized) {
    res.status(200);
  } else {
    res.status(401);
  }
  // ...
});
```

HTTP STATUS CODES

- 2XX: FOR SUCCESSFULLY PROCESSED REQUESTS
- 3XX: FOR REDIRECTIONS OR CACHE INFORMATION
- 4XX: FOR CLIENT-SIDE ERRORS
- 5XX: FOR SERVER-SIDE ERRORS

NOTE: FOR 3XX STATUS CODES, THE CLIENT MUST TAKE ADDITIONAL ACTION FOLLOWING THE COMPLETION OF THE

SENDING A RESPONSE

USE THE RESPONSE OBJECT'S SEND FUNCTION TO SEND THE CLIENT A RESPONSE

```
app.get('...', function (req, res) {
  res.send('Hello World!');
});
```

SENDING A RESPONSE

THE CONTENT-TYPE IS DETERMINED GIVEN THE TYPE OF ARGUMENT PASSED

```
res.send('Hello World!');         // Content-type: text/plain
res.send([ 5, 7, 9 ]);            // Content-type: application/json
res.send({ name: 'John Doe' }); // Content-type: application/json
```

SENDING A RESPONSE

THE CONTENT-TYPE CAN ALSO BE HARDCODED

```
res.set('Content-Type', 'text/plain');
res.send('Just regular text, no html expected!');
```

SENDING AN EMPTY RESPONSE

```
res.status(404).end();
```

SESSIONS

HTTP IS A STATELESS PROTOCOL - INFORMATION ABOUT A CLIENT IS NOT RETAINED OVER SUBSEQUENT REQUESTS

USE SESSIONS TO OVERCOME THIS PROBLEM

ENABLE THE `cookieParser` AND `session` MIDDLEWARES TO PROCESS COOKIES

SESSIONS

```
app.use(express.cookiesParser());
app.use(express.session({ secret: 'notastrongsecret' }));
```

THE SESSION IS NOW ACCESSIBLE VIA `request.session`

```
app.get('...', function (req, res) {
  var session = req.session;
});
```

REDIS STORE WITH EXPRESS

```
$ npm install connect-redis express-session
```

```
var session = require('express-session'),
  RedisStore = require('connect-redis')(session);

app.use(session({
  store: new RedisStore(options),
  secret: 'keyboard cat'
}));
```

LOAD-BALANCING

- CLUSTERS
- NGINX
- HAPROXY
- VARNISH

QUESTIONS AND EXERCISES

❓ 🙋👍

WORKSHOP

🔨

```
$ npm i -g expressworks
$ npm i -g meanworks
```