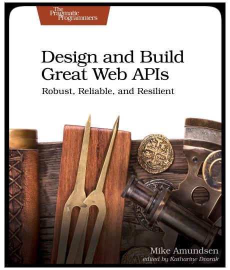
Building Great Web APIs
Part One

@mamund
Mike Amundsen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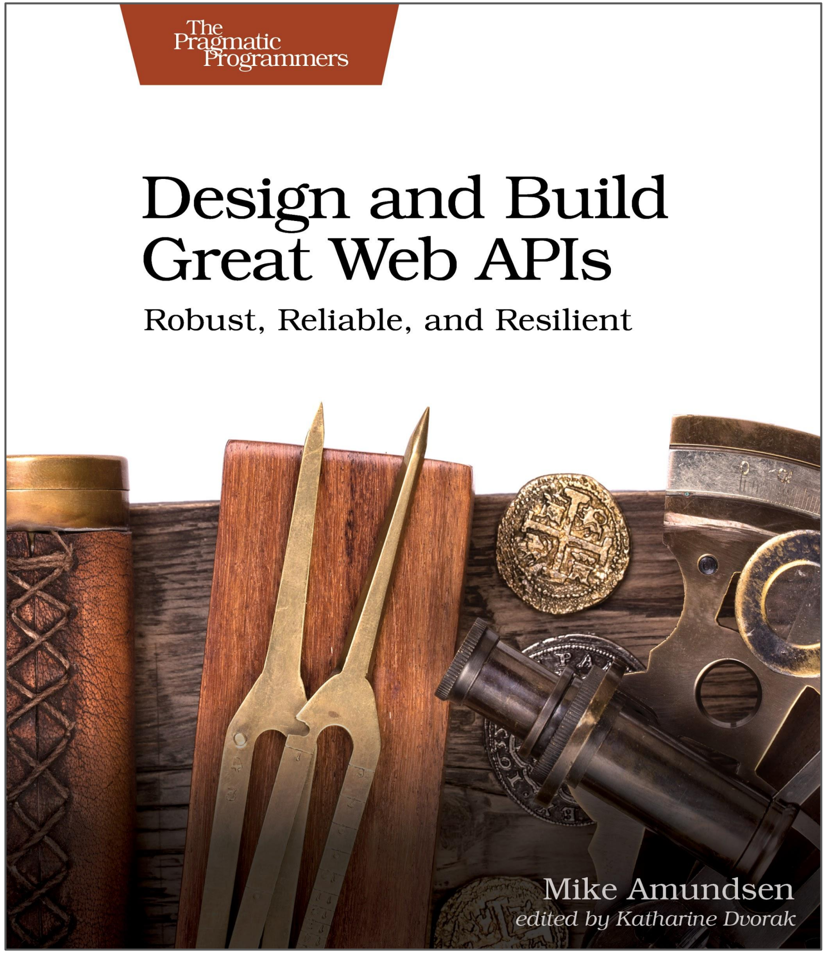
Design and Build Great Web APIs
Robust, Reliable, and Resilient
Mike Amundsen
edited by Katharine Dvorak

Mike Amundsen
@mamund

g.mamund.com/GreatWebAPIs

"From design to code to test to deployment, unlock hidden business value and release stable and scalable web APIs that meet customer needs and solve important business problems in a consistent and reliable manner."

-- Pragmatic Publishers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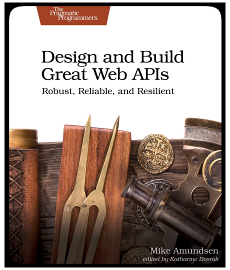
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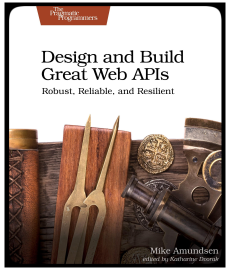
Logistics and Preparation

- Introductions
- Workshop Outline
- Zooming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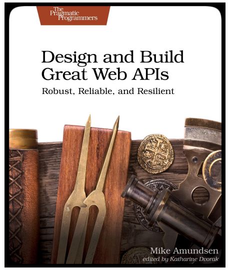
Introductions

- Name
- Current work
- What you're hoping to learn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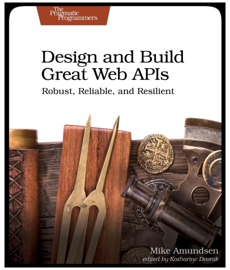
API Design Workshop

- Part One (today)
  - Three-Phase Implementation
  - Sketching and Prototyping
  - Building APIs w/ NodeJS/Express/DARRT
  - Overnight Assignment
- Part Two (tomorrow)
  - Assignment Review
  - Deploying APIs w/ Heroku
  - Open Question Time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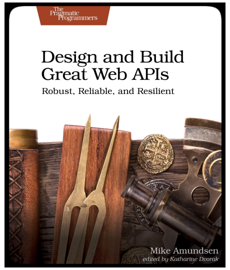
Zooming

- Share video feed on whenever possible
- Mute your microphone when not talking
- Raise your hand to share, ask questions, etc.
- Add background questions/comments in chat window
- If you need to leave your desk, turn video off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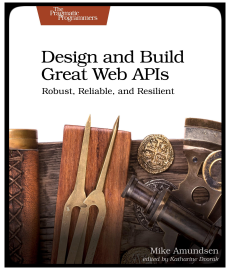
Three-Phase Implementation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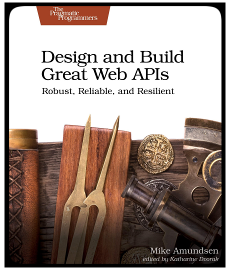
Three-Phase API Implementation

- To reduce cost and risk, take a three-phase approach
- **Sketching** - disposable experiments
- **Prototyping** - testable examples
- **Building** - production implementation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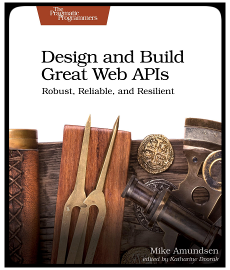
Reduce Cost and Risk in API Implementation

- Implementation can be costly
- Mistakes may be uncovered along the way
- Uncover mistakes early when they are inexpensive to fix
- Put off writing code for as long as possible.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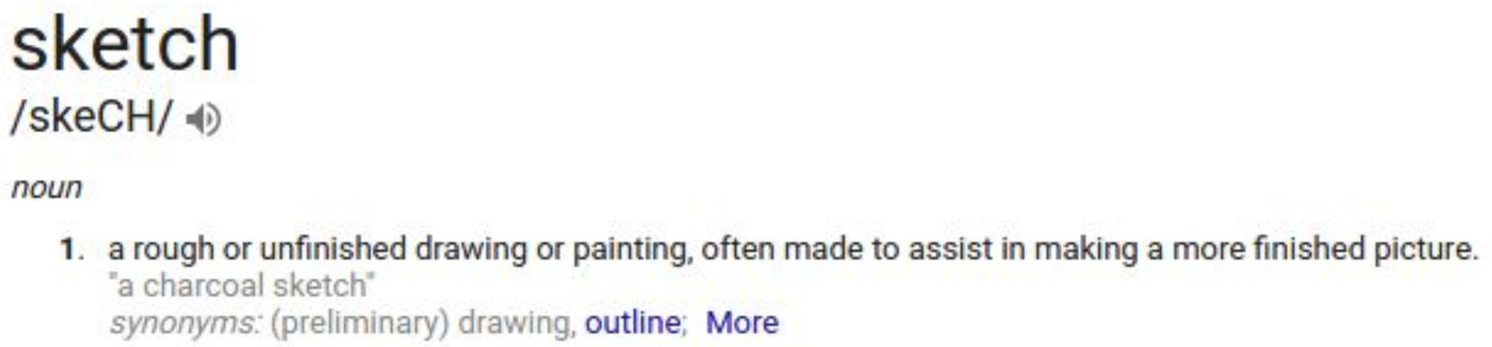
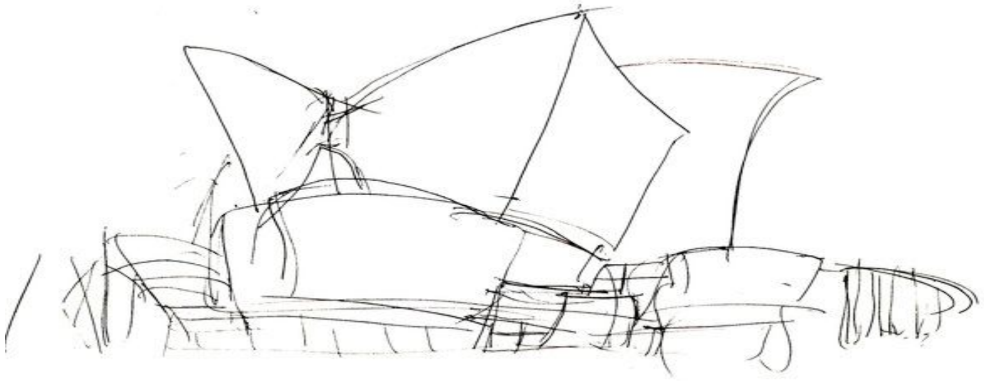


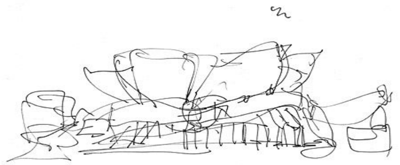
sketch

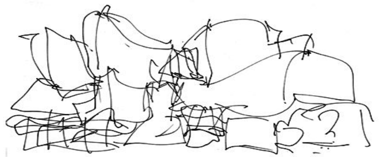
/skeCH/

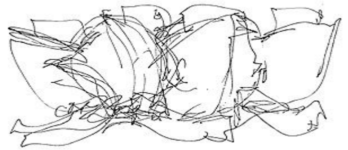
noun

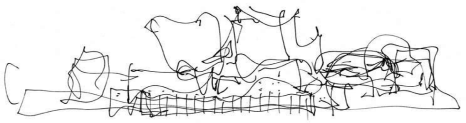
1. a rough or unfinished drawing or painting, often made to assist in making a more finished picture.
   "a charcoal sketch"
   synonyms: (preliminary) drawing, outline; More

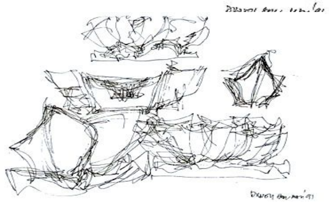





F Gehry Disney Hall Midblock

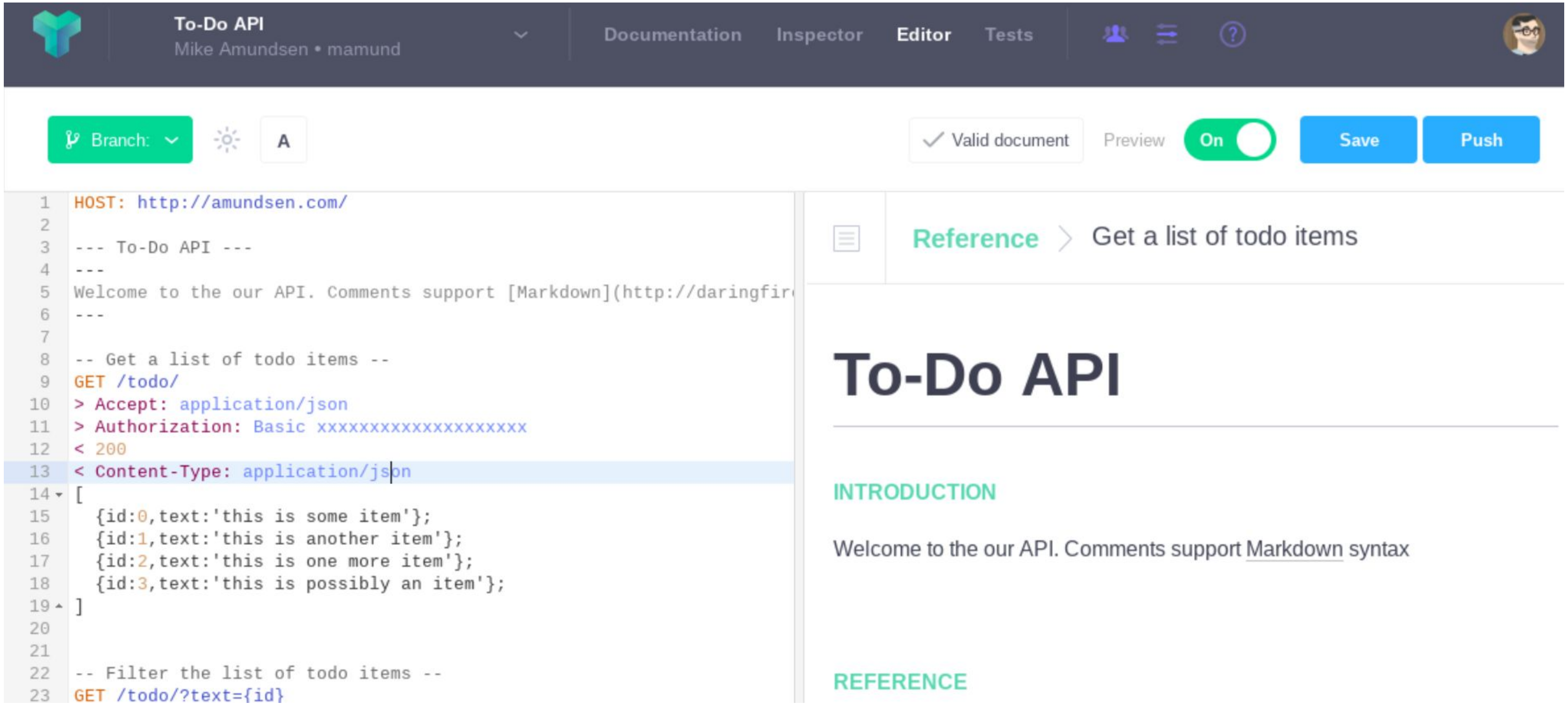



F Gehry Disney Hall Oct '91.



Sketching APIs

- Sketches are terse, rough drawings
- They give the general idea of a thing
  but lack important details.
- Usually, one can glean the basics from a sketch but
- Sketches usually are just explorations of ideas,
  not fully-formed items.



```
HOST: http://amundsen.com/

--- To-Do API ---
---
Welcome to the our API. Comments support [Markdown](http://daringfir
---

-- Get a list of todo items --
GET /todo/
> Accept: application/json
> Authorization: Basic xxxxxxxxxxxxxxxxxxxx
< 200
< Content-Type: application/json
[
  {id:0,text:'this is some item'};
  {id:1,text:'this is another item'};
  {id:2,text:'this is one more item'};
  {id:3,text:'this is possibly an item'};
]


-- Filter the list of todo items --
GET /todo/?text={id}
```

Reference > Get a list of todo items

To-Do API

INTRODUCTION

Welcome to the our API. Comments support Markdown syntax

REFERENCE

Sketches are made to be thrown away.

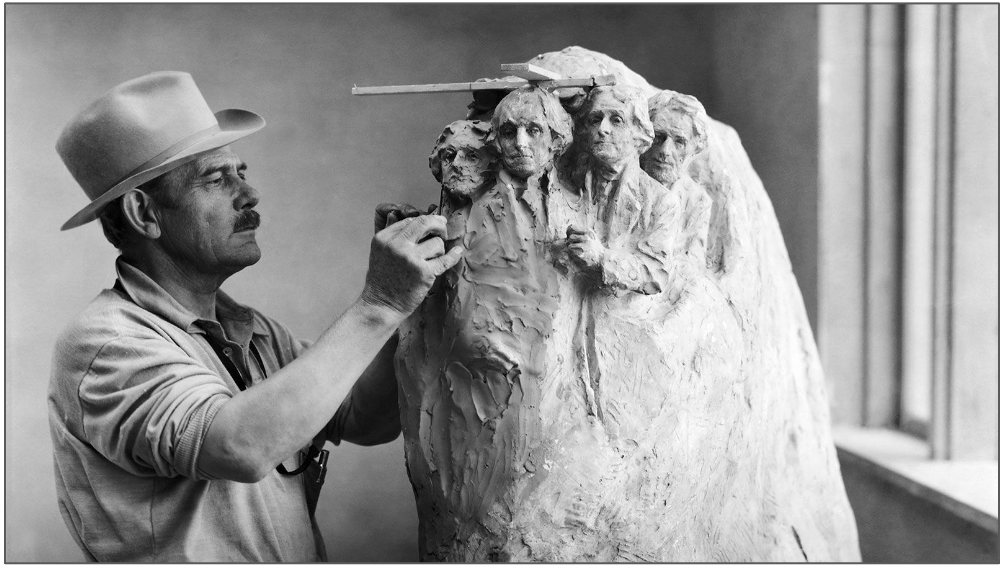
pro·to·type

/ˈprōdəˌtīp/

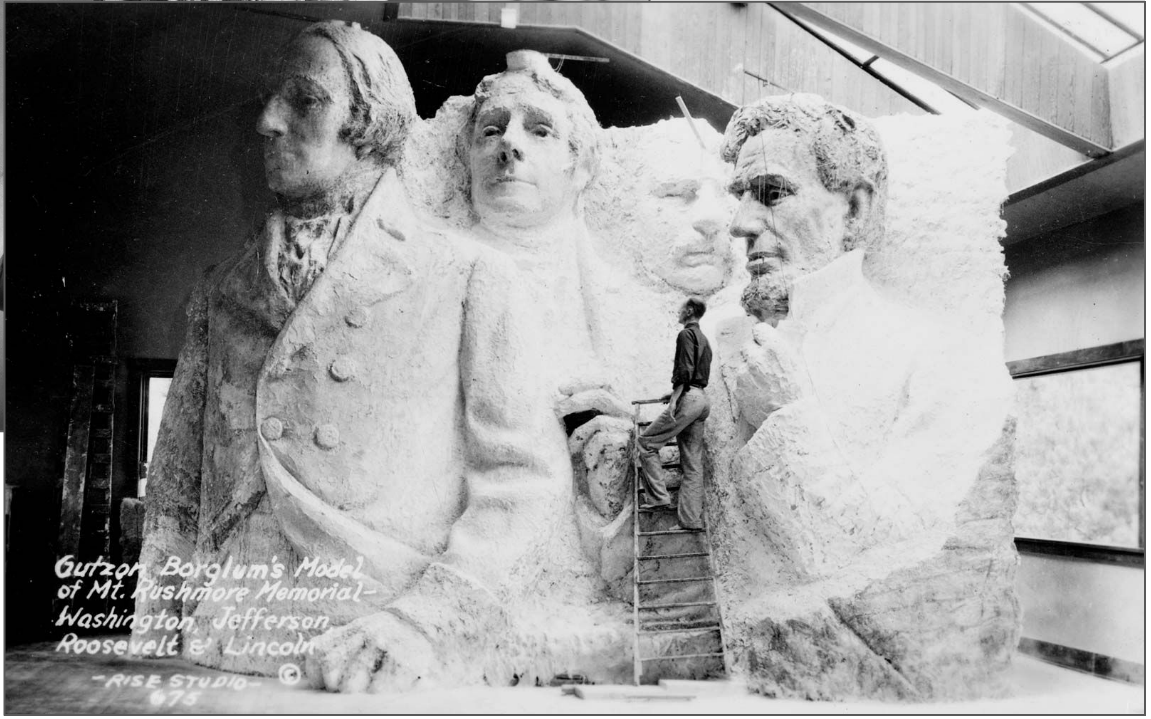
noun

1. a first, typical or preliminary model of something, especially a machine, from which other forms are developed or copied.
   "the firm is testing a prototype of the weapon"

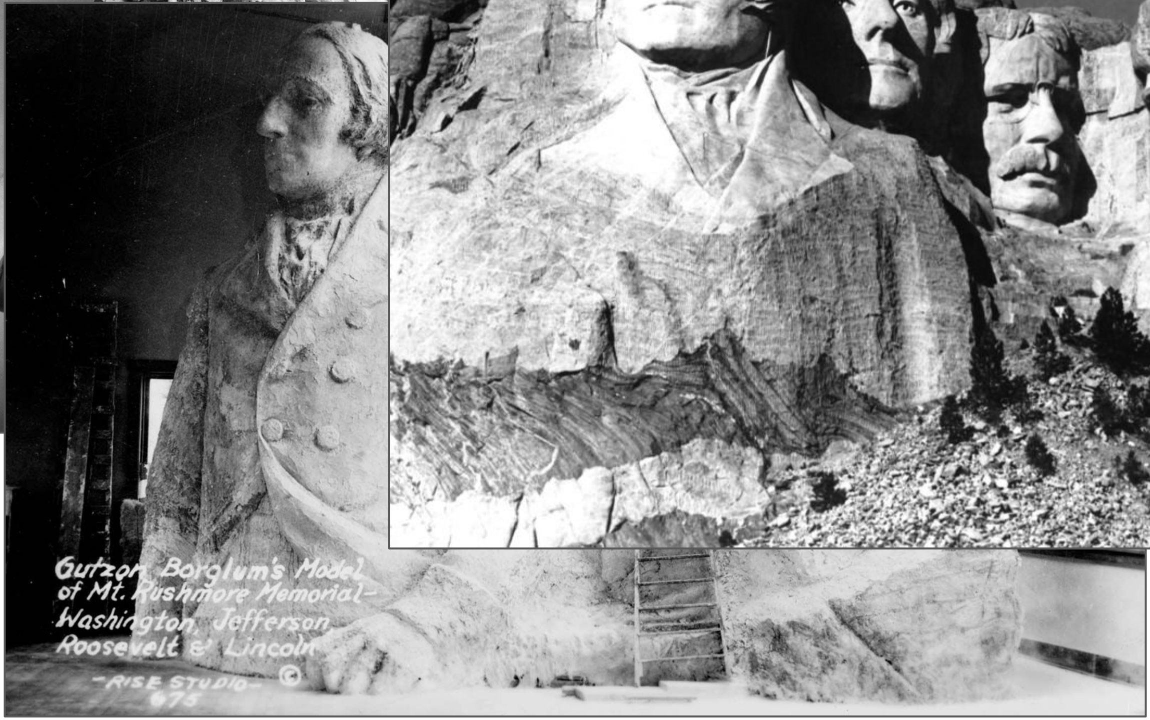
Borglum's Prototypes

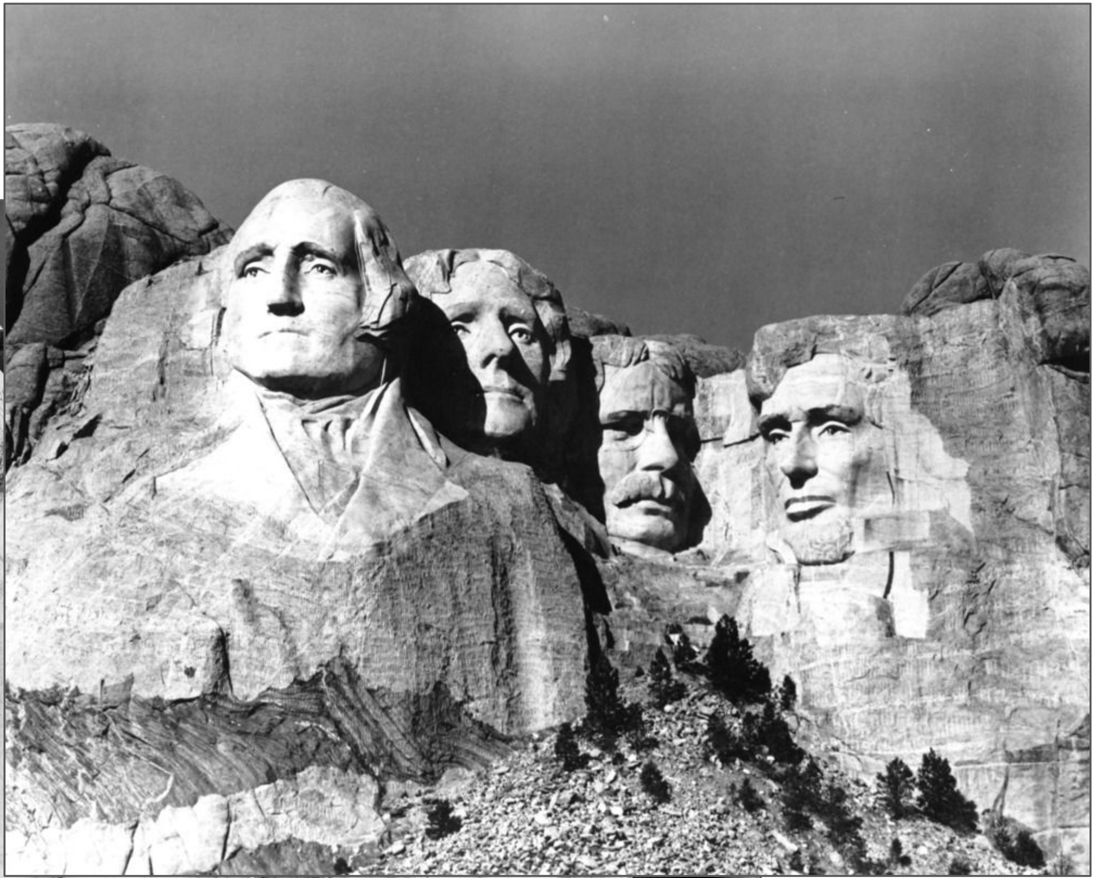


Borglum's Prototypes


Gutzon Borglum's Model of Mt. Rushmore Memorial - Washington, Jefferson Roosevelt & Lincoln
-RISE STUDIO- ©
675

Borglum's Prototypes

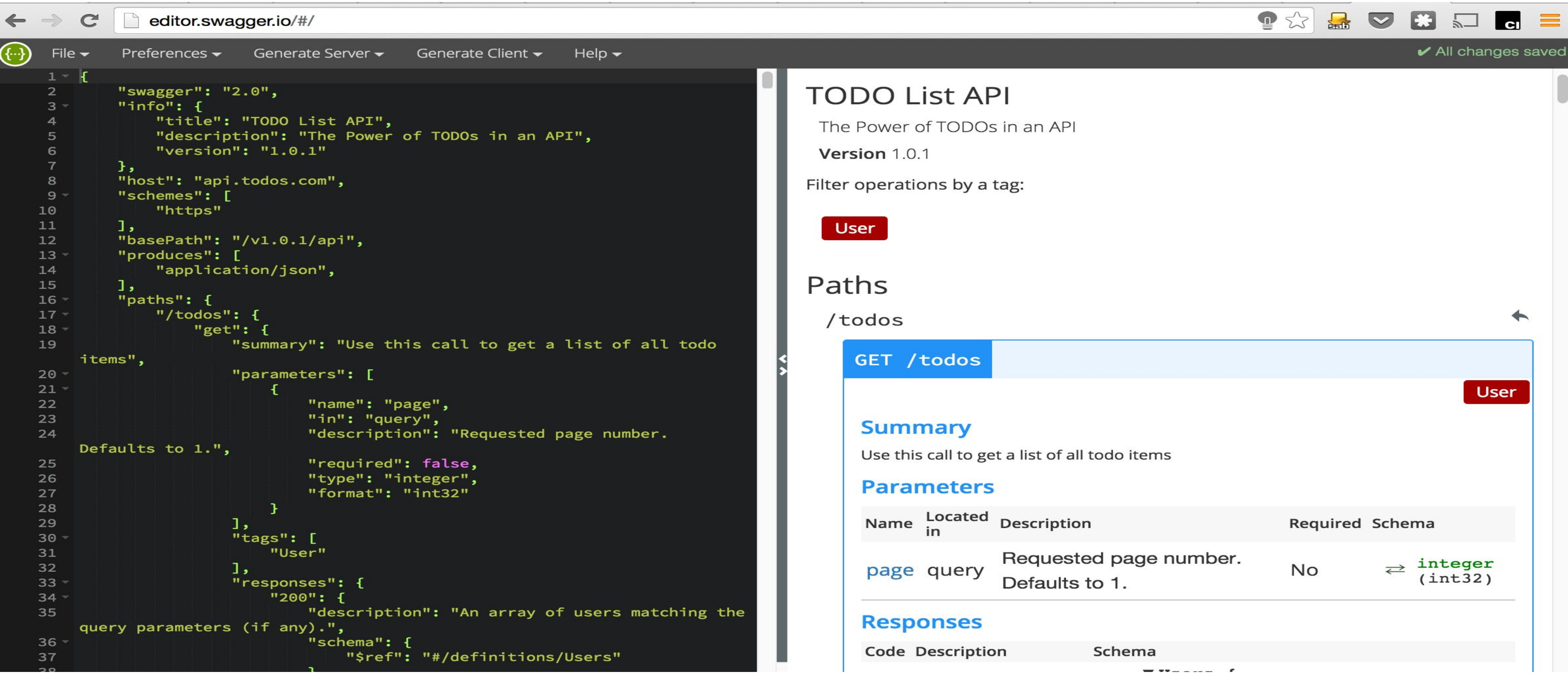




Prototyping APIs

- Prototypes look like the real thing, but are not. They’re "fakes."
- They let you work up something with all the details of a real API, but without the actual functionality behind it.
- They’re an inexpensive way to work out the details
- Use them to discover challenges before you go into production.

Swagger Editor



```
{
    "swagger": "2.0",
    "info": {
        "title": "TODO List API",
        "description": "The Power of TODOs in an API",
        "version": "1.0.1"
    },
    "host": "api.todos.com",
    "schemes": [
        "https"
    ],
    "basePath": "/v1.0.1/api",
    "produces": [
        "application/json",
    ],
    "paths": {
        "/todos": {
            "get": {
                "summary": "Use this call to get a list of all todo
items",
                "parameters": [
                    {
                        "name": "page",
                        "in": "query",
                        "description": "Requested page number.
Defaults to 1.",
                        "required": false,
                        "type": "integer",
                        "format": "int32"
                    }
                ],
                "tags": [
                    "User"
                ],
                "responses": {
                    "200": {
                        "description": "An array of users matching the
query parameters (if any).",
                        "schema": {
                            "$ref": "#/definitions/Users"
```

TODO List API

The Power of TODOs in an API

Version 1.0.1

Filter operations by a tag:

User

Paths

/todos

GET /todos

User

Summary

Use this call to get a list of all todo items

Parameters

Name	Located in	Description	Required	Schema
page	query	Requested page number. Defaults to 1.	No	integer (int32)

Responses

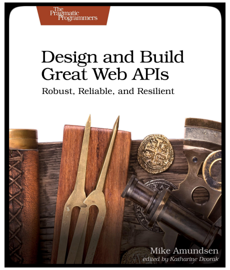
Code	Description	Schema

Prototyping APIs

- Use tools like NodeJS express,
  or other code-generating platforms.
- It’s also a good idea to use service-virtualization
frameworks to mock up the response data.
- If possible, include access-control checking when
  running tests against the prototype.
- If possible use existing production-level API
  consumers to test out the prototype.

Prototypes are made to be tested.

Let's Discuss!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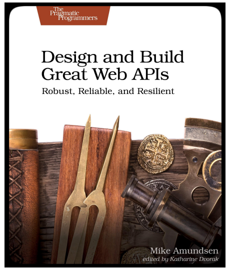
BREAK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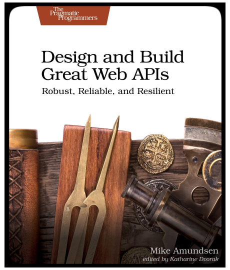
Prototyping with OpenAPI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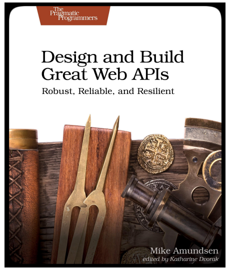
Exercise: Prototyping your API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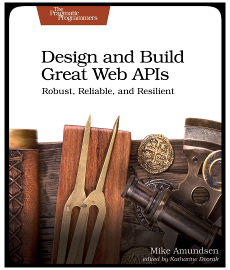
Exercise: Prototyping your API

- Start with your ALPS API Description (from repo)
  - https://github.com/mamund/2020-04-goto-chicago-api-build
- Hand-Roll your OpenAPI Document
  - `info`
  - `paths`
  - `components`
- Validate your OpenAPI Document w/ SwaggerHub
  - https://app.swaggerhub.com/home
- Generate Docs using Redoc HTML page (from the repo)
  -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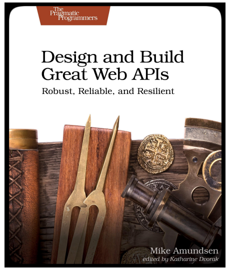
Exercise: Stand-Up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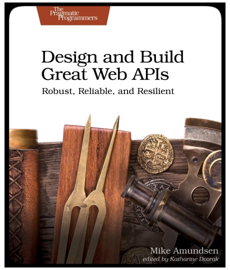
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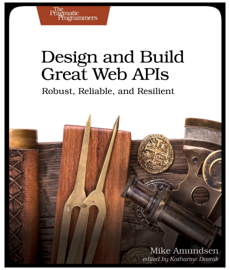
Building w/ NodeJS/Express/DARRT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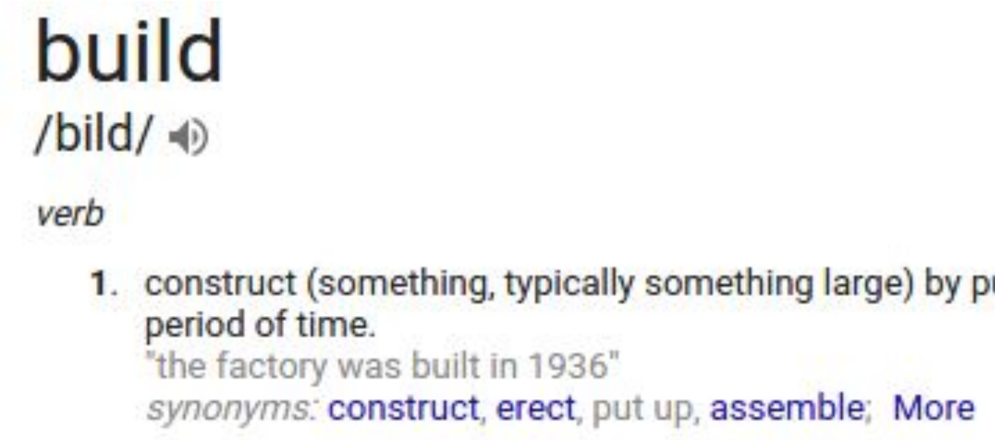
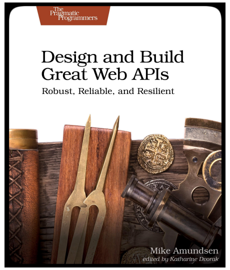


build

/bild/

verb

1. construct (something, typically something large) by putting parts or material together over a period of time.
"the factory was built in 1936"
synonyms: construct, erect, put up, assemble; More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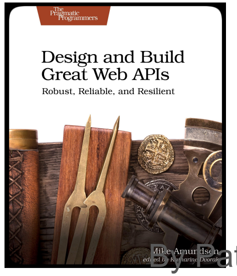

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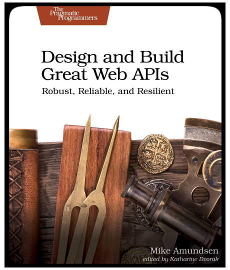
Building APIs

- API builds are the real thing
- Production-ready, access-controlled, resilient, scalable.
- Building the production implementation means
  - Working out all the kinks
  - Supporting all the use-cases identified during the sketch and prototype phases.



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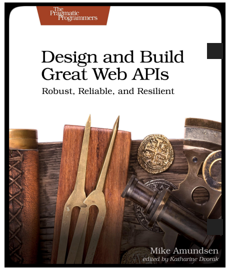
Building APIs

- Each implementation has their own challenges to overcome.
- Each deserves their own guidance and style-guides.
  - Gateway Policies
  - ESB Rules
  - Scripting (NodeJS)
  - Code (Java/C#)
- All require exhaustive testing at the unit, acceptance, and integration levels.
- All require detailed access control.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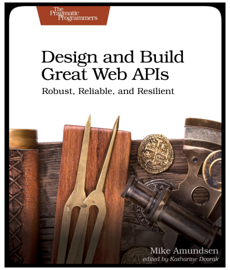
Production APIs are made last.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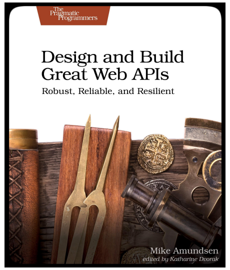
Building APIs : DARRT

- Simple process for publishing running interfaces
- Data
- Actions
- Resources
- Representations
- Transitions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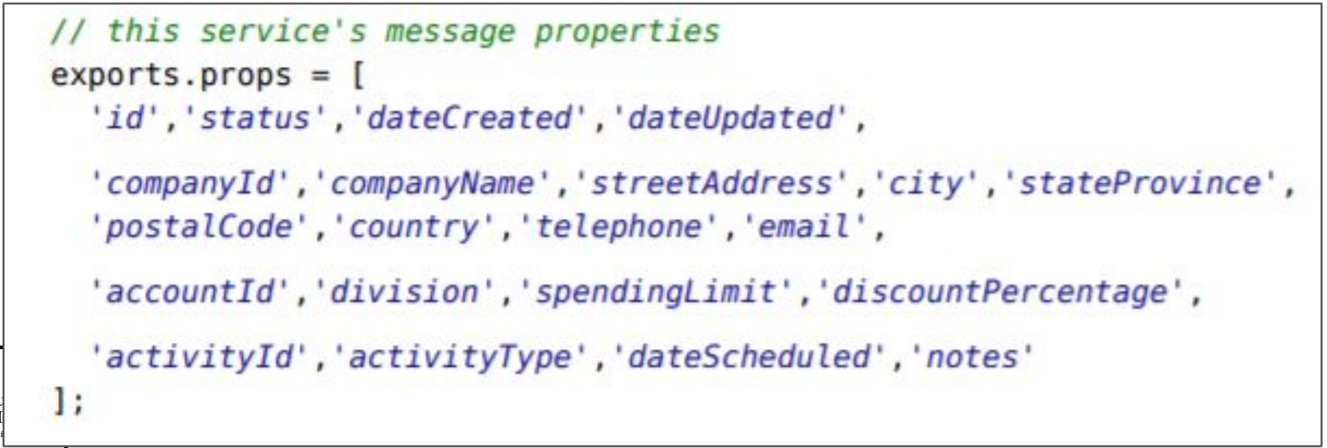
Building APIs : DARRT : Data

- The state properties to pass in messages
  - `properties, requireds, enums, defaults`

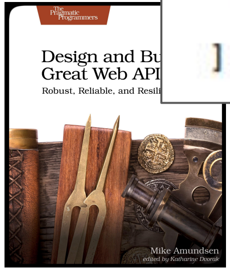


```
// this service's message properties
exports.props = [
  'id','status','dateCreated','dateUpdated',

  'companyId','companyName','streetAddress','city','stateProvince',
  'postalCode','country','telephone','email',

  'accountId','division','spendingLimit','discountPercentage',

  'activityId','activityType','dateScheduled','notes'
];
```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Building APIs : DARRT : Data

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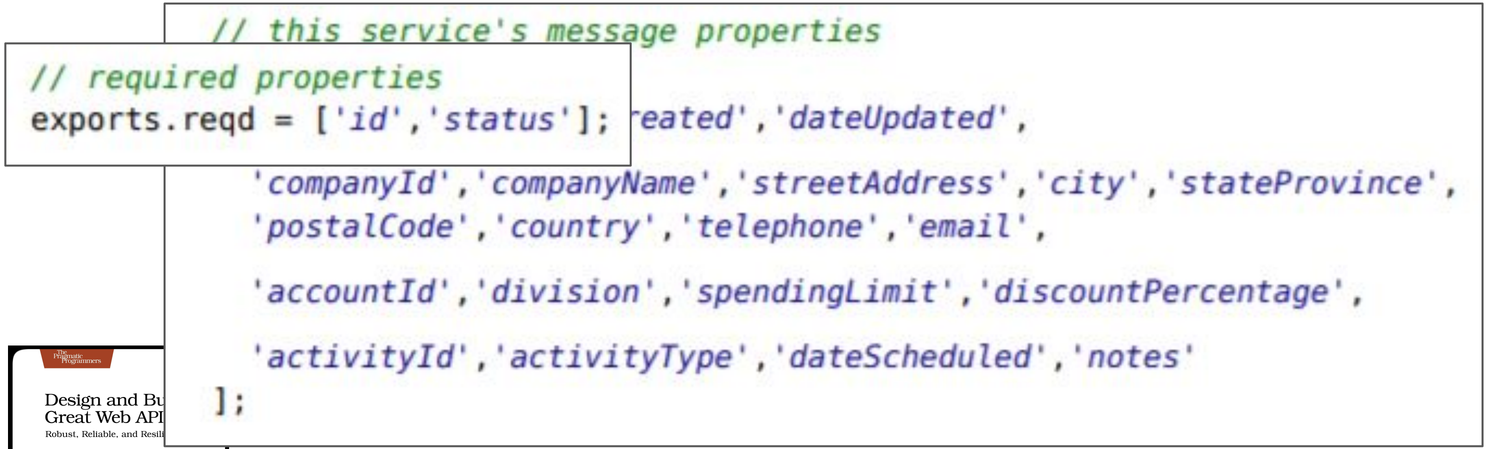
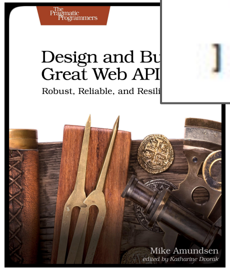


```
// this service's message properties
                                  eated','dateUpdated',
  'companyId','companyName','streetAddress','city','stateProvince',
  'postalCode','country','telephone','email',

  'accountId','division','spendingLimit','discountPercentage',

  'activityId','activityType','dateScheduled','notes'
];
```

```
// required properties
exports.reqd = ['id','status'];
```



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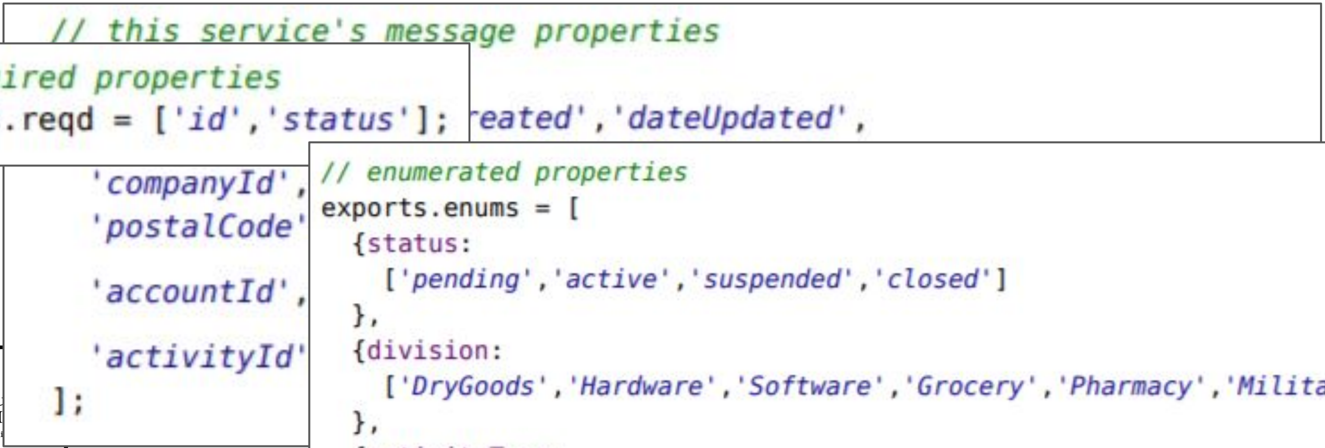

```
// this service's message properties

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    'postalCode'

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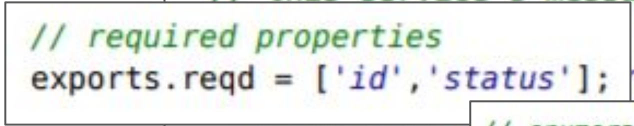

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exports.reqd = ['id','status'];
```
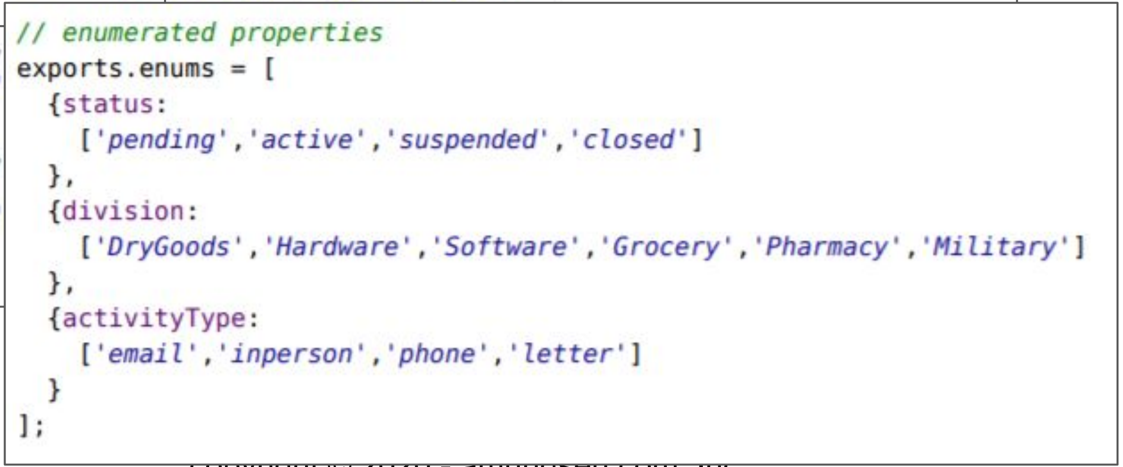
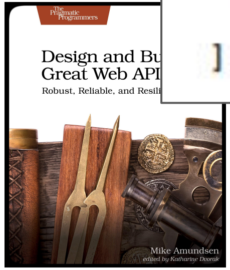



```
// enumerated properties
exports.enums = [
  {status:
    ['pending','active','suspended','closed']
  },
  {division:
    ['DryGoods','Hardware','Software','Grocery','Pharmacy','Military']
  },
  {activityType:
    ['email','inperson','phone','letter']
  }
];
```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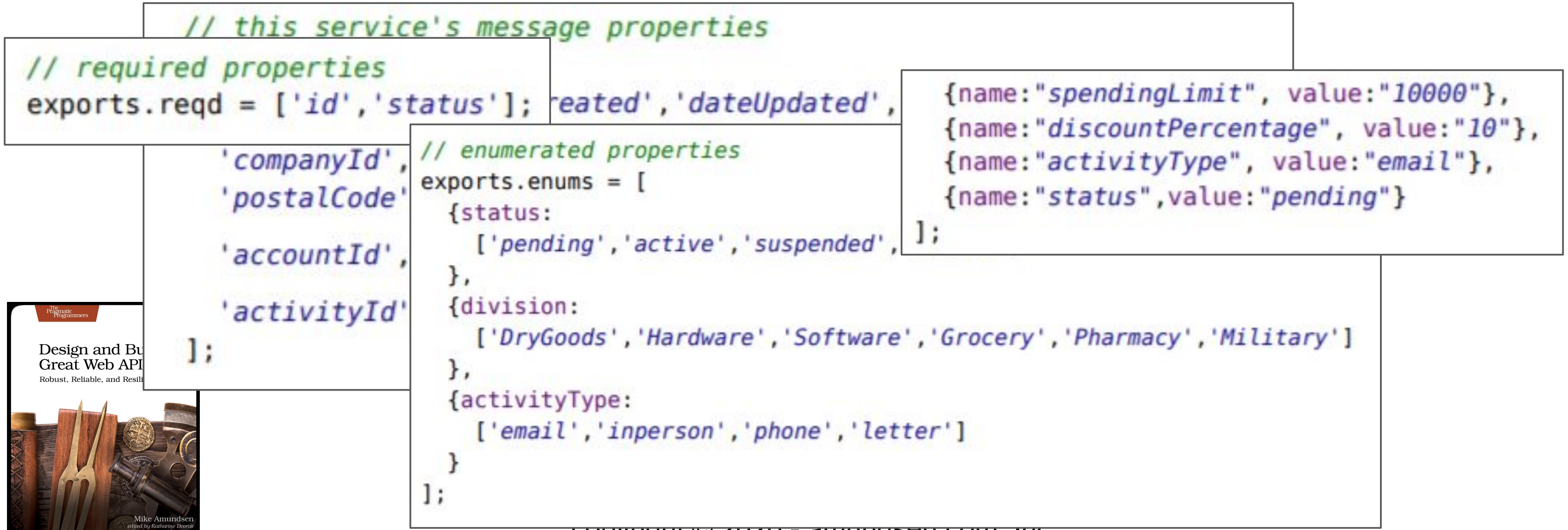
Building APIs : DARRT : Data

- The state properties to pass in messages
    - `properties, requireds, enums, defaults`

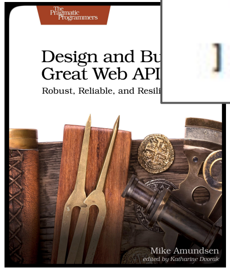


```
// this service's message properties
        reated','dateUpdated',
    'companyId',
    'postalCode'

    'accountId',

    'activityId'
];
```

```
// required properties
exports.reqd = ['id','status'];
```

```
// enumerated properties
exports.enums = [
  {status:
    ['pending','active','suspended',
  },
  {division:
    ['DryGoods','Hardware','Software','Grocery','Pharmacy','Military']
  },
  {activityType:
    ['email','inperson','phone','letter']
  }
];
```

```
  {name:"spendingLimit", value:"10000"},
  {name:"discountPercentage", value:"10"},
  {name:"activityType", value:"email"},
  {name:"status",value:"pending"}
];
```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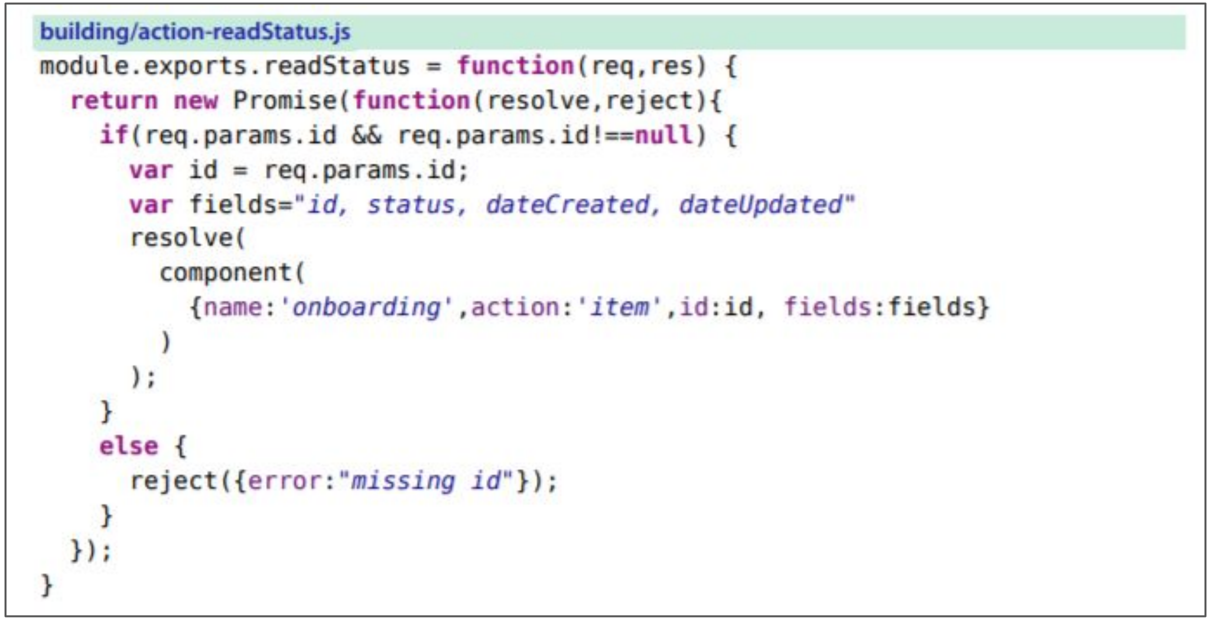
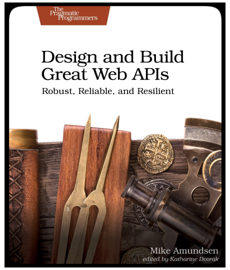
Building APIs : DARRT : Actions

- The actual operations for the interface
  - appovePayroll, updateCustomer, setStatus



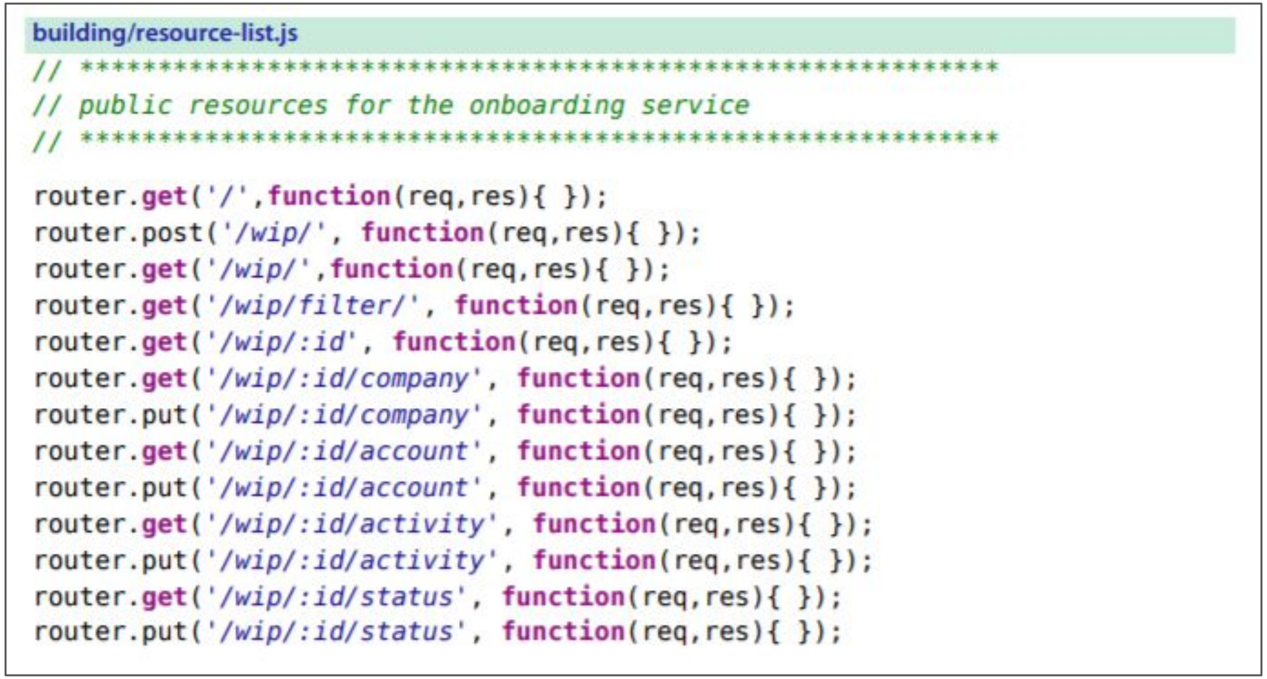
building/action-readStatus.js

```
module.exports.readStatus = function(req,res) {
  return new Promise(function(resolve,reject){
    if(req.params.id && req.params.id!==null) {
      var id = req.params.id;
      var fields="id, status, dateCreated, dateUpdated"
      resolve(
        component(
          {name:'onboarding',action:'item',id:id, fields:fields}
        )
      );
    }
    else {
      reject({error:"missing id"});
    }
  });
}
```



Building APIs : DARRT : Resources

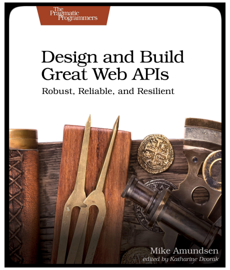
- The HTTP resources to access the operations



building/resource-list.js

```
// *************************************************************
// public resources for the onboarding service
// *************************************************************

router.get('/',function(req,res){ });
router.post('/wip/', function(req,res){ });
router.get('/wip/',function(req,res){ });
router.get('/wip/filter/', function(req,res){ });
router.get('/wip/:id', function(req,res){ });
router.get('/wip/:id/company', function(req,res){ });
router.put('/wip/:id/company', function(req,res){ });
router.get('/wip/:id/account', function(req,res){ });
router.put('/wip/:id/account', function(req,res){ });
router.get('/wip/:id/activity', function(req,res){ });
router.put('/wip/:id/activity', function(req,res){ });
router.get('/wip/:id/status', function(req,res){ });
router.put('/wip/:id/status', function(req,res){ });
```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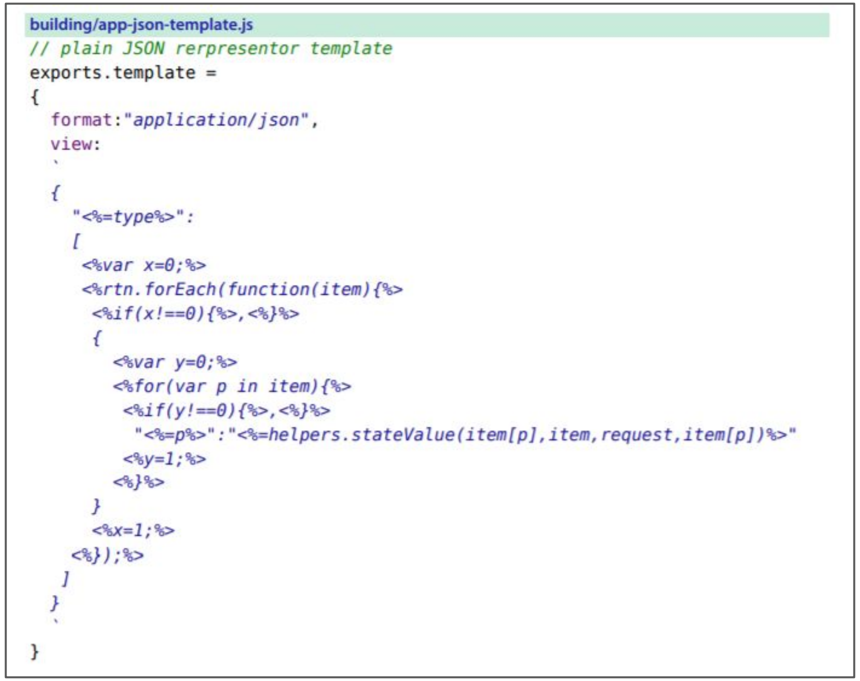
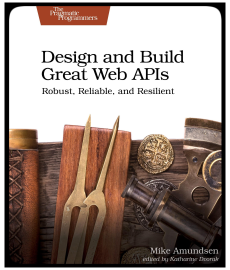
Building APIs : DARRT : Representations

- The format/media-type of resource responses



building/app-json-template.js

```
// plain JSON rerpresentor template
exports.template =
{
  format:"application/json",
  view:
  `
  {
    "<%=type%>":
    [
     <%var x=0;%>
     <%rtn.forEach(function(item){%>
      <%if(x!==0){%>,<%}%>
      {
        <%var y=0;%>
        <%for(var p in item){%>
         <%if(y!==0){%>,<%}%>
          "<%=p%>":"<%=helpers.stateValue(item[p],item,request,item[p])%>"
         <%y=1;%>
        <%}%>
      }
      <%x=1;%>
    <%});%>
   ]
  }
  `
}
```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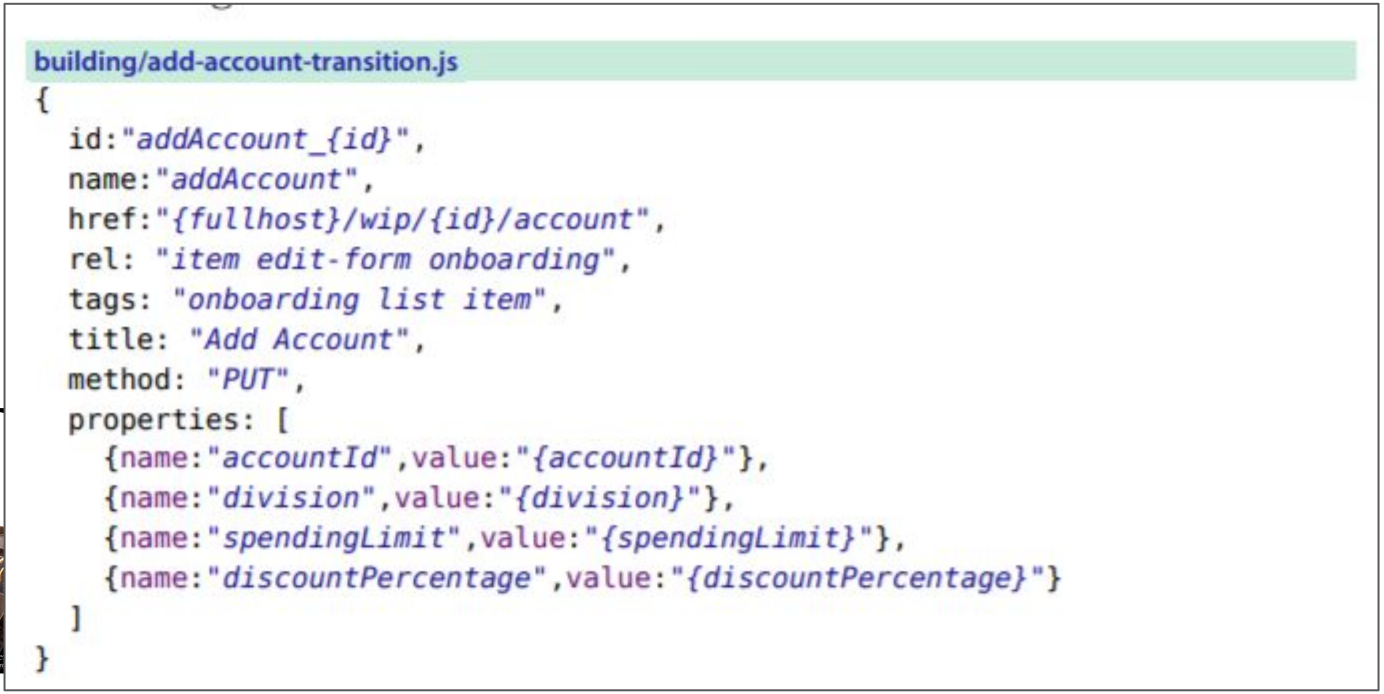
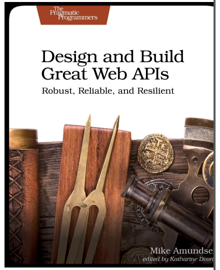
Building APIs : DARRT : Transitions

- The public expression of actions



building/add-account-transition.js

```
{
  id:"addAccount_{id}",
  name:"addAccount",
  href:"{fullhost}/wip/{id}/account",
  rel: "item edit-form onboarding",
  tags: "onboarding list item",
  title: "Add Account",
  method: "PUT",
  properties: [
    {name:"accountId",value:"{accountId}"},
    {name:"division",value:"{division}"},
    {name:"spendingLimit",value:"{spendingLimit}"},
    {name:"discountPercentage",value:"{discountPercentage}"}
  ]
}
```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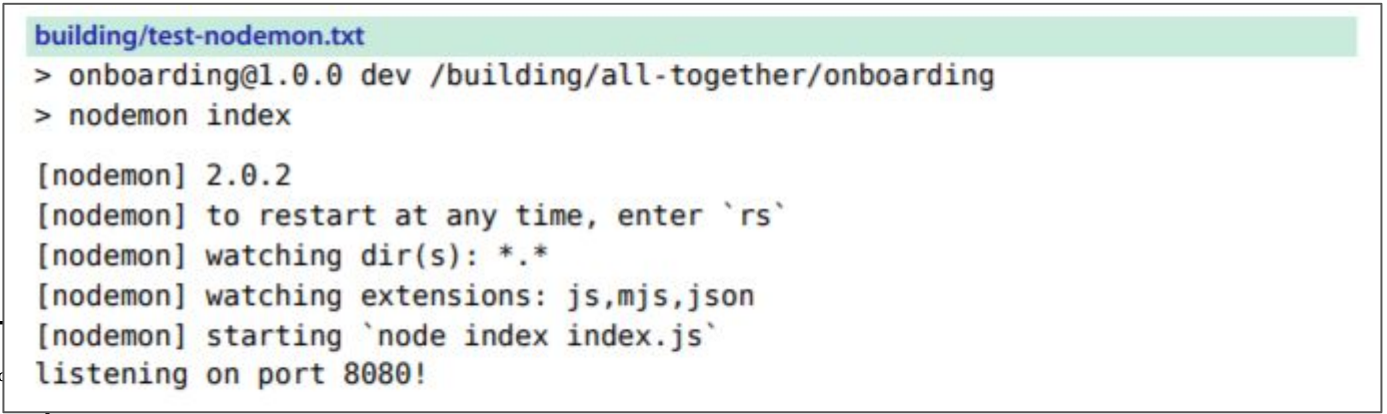
Building APIs : Putting it all together

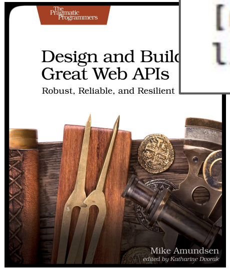
- Use **`nodemon`** when testing your service locally



building/test-nodemon.txt

```
> onboarding@1.0.0 dev /building/all-together/onboarding
> nodemon index

[nodemon] 2.0.2
[nodemon] to restart at any time, enter `rs`
[nodemon] watching dir(s): *.*
[nodemon] watching extensions: js,mjs,json
[nodemon] starting `node index index.js`
listening on port 8080!
```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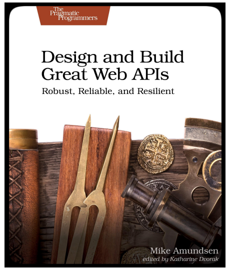
Let's Discuss!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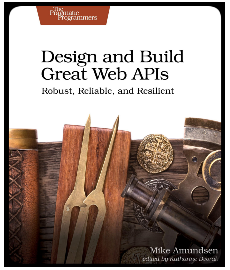
Exercise: Installing Tools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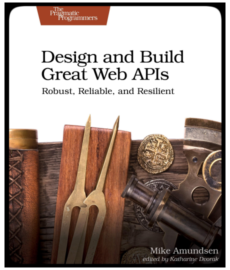
Exercise: Installing Tools

- Use the Installing document in the course repo as a guide
  - Skip Postman/Newman for this course
- Curl
- Git
- Github/SSH
- NodeJS/npm
  - `npm install -g nodemon`
- Heroku Client
  - You'll need to start an account
- FORK the API-Starter kit
  - https://github.com/api-tool-kit/api-starter-kit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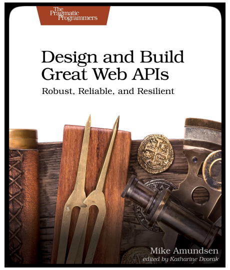
Your Assignment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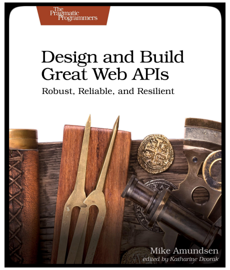
Overnight Assignment for API Design

- Start from your ALPS Description
- Using the API Starter Kit…
  - Update `data.js`, `actions.js`, & `resources.js` as needed
- Use `npm run dev` to validate the API Project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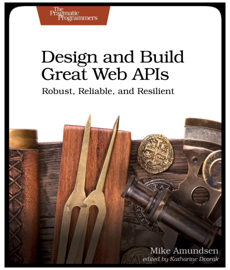
Building Great Web APIs
Part One

@mamund
Mike Amundsen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