Large Scale JavaScript on Client and Server

Module 3: Scalable JavaScript

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pluralsight
hardcore dev and IT training

Agenda

- **Scalable JavaScript**
  - What is Scalable JavaScript?
  - Improve
  - Optimize
  - Compose


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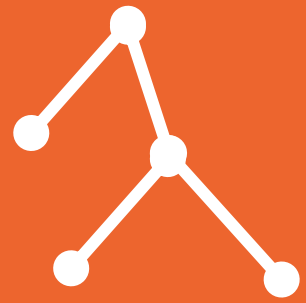
JavaScript Scalability Problems

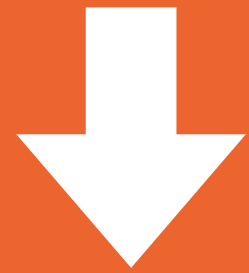
Runtime

Browser/Mobile Differences Matter



Parse

Every Line of Code is Expensive



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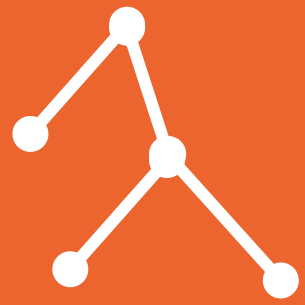
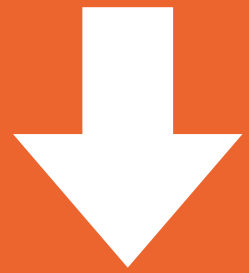
Empty Cache Still Common

JavaScript Scalability *Solutions*

Runtime



Parse



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Improve

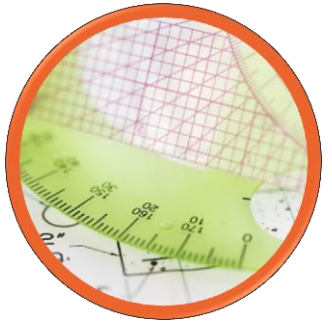
Optimize

Compose

IMPROVE

Write Less Code

App Architecture



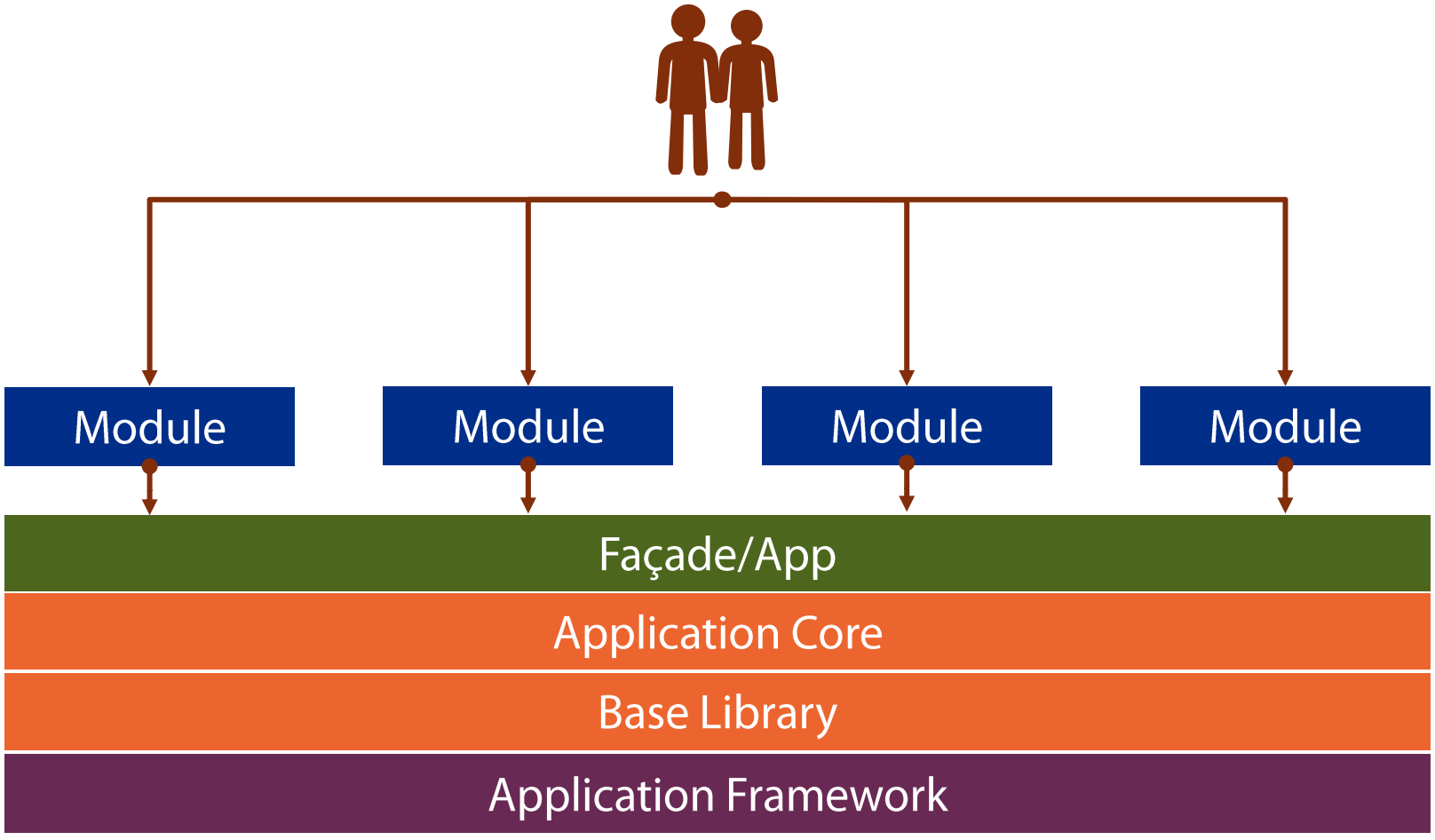
Smarter UI Coding

WRITING LESS CODE

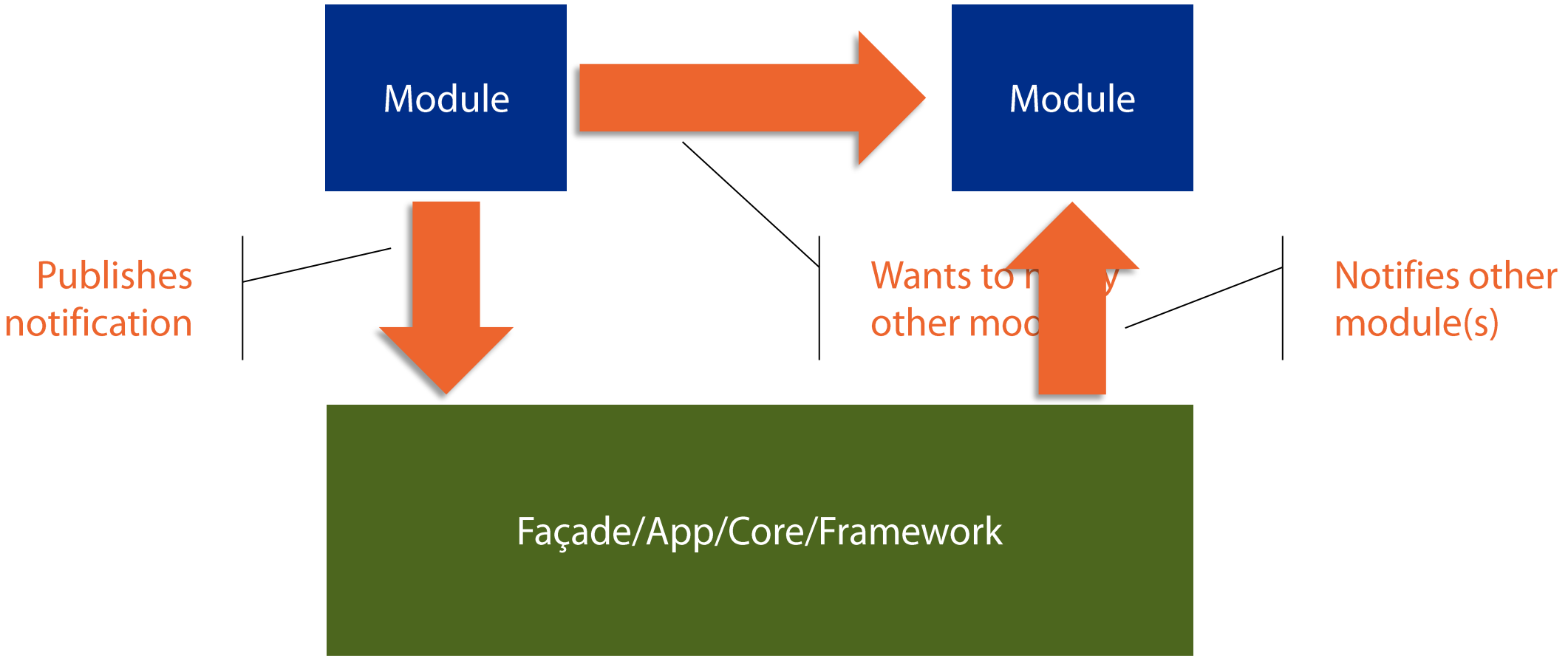
Code size impact performance

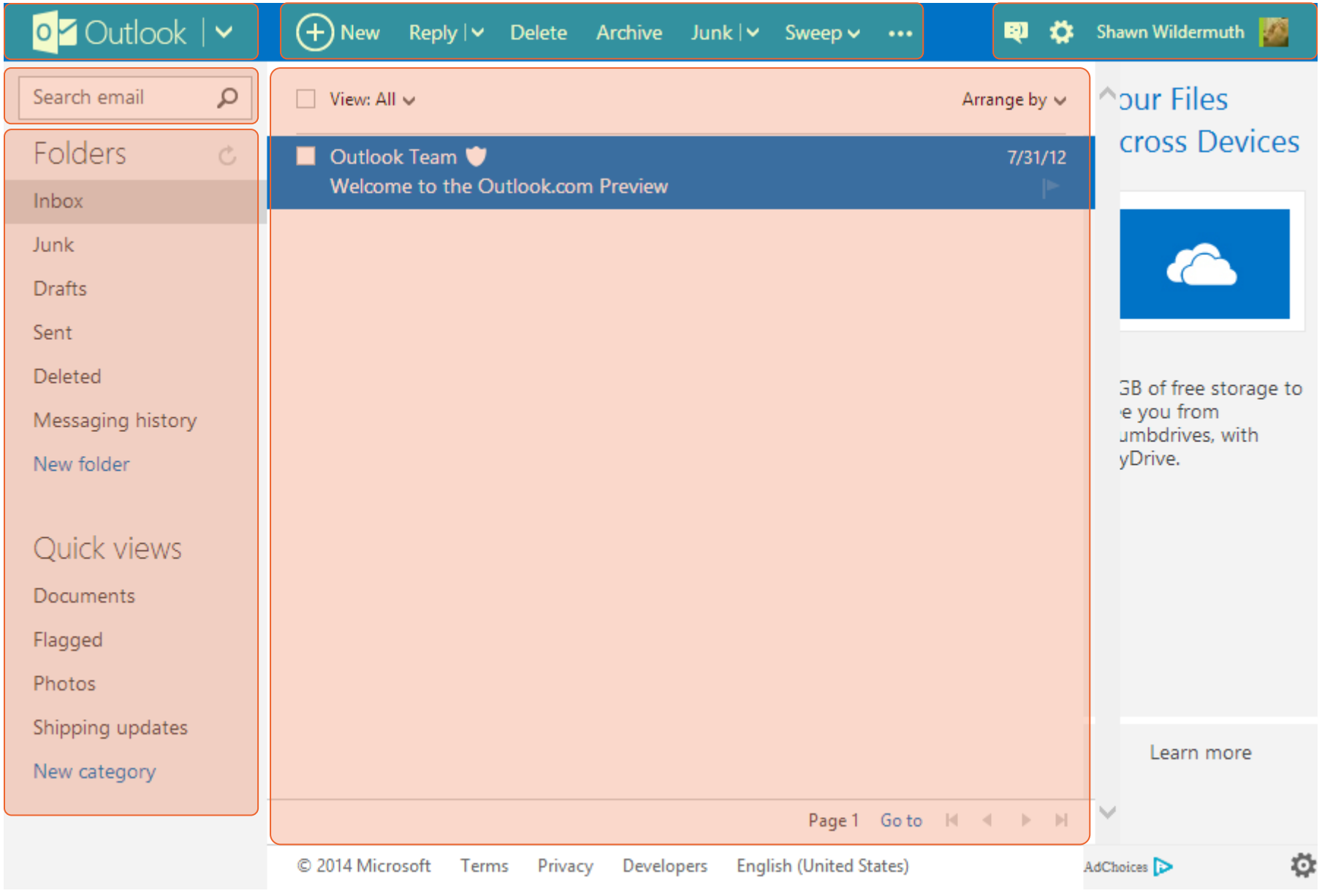
- Parsing is a bottleneck
    - Not linear with code size
    - JIT/Object Code not cached
- Running nothing is really quick
    - Deferring operations until necessary is important
    - The user will wait as they go; but not on page load

Smart Application Architecture



Smart Application Architecture




Outlook
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Delete
Archive
Junk
Sweep
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Search email
Folders
Inbox
Junk
Drafts
Sent
Deleted
Messaging history
New folder
Quick views
Documents
Flagged
Photos
Shipping updates
New category
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AdChoices

SMARTER UI CODE

Be Lazy

- Avoid pre-drawing hidden UI wherever possible
- Cache drawn HTML but remove from DOM
    - Have to manage invalidating your own cache though
- Redrawing usually cheaper than partial updates
- Do DOM Manipulation off DOM
    - (remove, edit, insert)
- Use InnerHTML to avoid construction DOM elements

Optimize

- **Make your source code as small as possible**
  - Improves parse performance
- **Automate**
  - Create a ‘Build’ step
- **Removing Debug Code Sections**
  - Use conditional compilation

min-i-fy

/min-uh-fahy/

Verb

1. The process of removing all unnecessary characters from source code without changing its functionality.

MINIFICATION BASICS

Compresses JS (et al.) into smaller package

- Is commodity – doesn't matter which you choose
- May need to plan for it in your codebase
  - Relying on function parameter names is the problem
- Should automate
  - VS Web Essentials, GruntJS, etc.

Before Minification

```
// test.js
(function ($) {
  $(document).ready(function () {
    init("start here");
  });

  function init(msg) {
    $(".btn").text(msg);
  }

})(jQuery);
```

After Minification

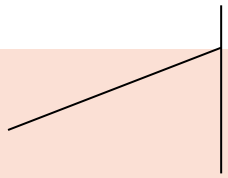
```
(function(n){function t(t){n(".btn").text(t)}n(document).ready(function(){t("start here")})})(jQuery);
```

After Minification

```
(function(n){
  function t(t){ n(".btn").text(t) }

  n(document).ready(function(){
    t("start here")
  })

})(jQuery);
```



Parameter, function, and variable names minified

MINIFICATION OPTIONS

If you're not already minifying, consider these options

- GruntJS – The JavaScript Task Runner
    - Contrib-Uglify – Plugin to do Minification
- Visual Studio + Web Essentials
- WebStorm + UglifyJS
- Sublime + Minify Package

GRUNTJS

Your JavaScript "Build" Step

Installing GruntJS

- **Install NodeJS (http://nodejs.org)**
  - It's just a runtime that GruntJS uses
- **Install GruntJS Globally**

```
> npm install –g grunt-cli
```

- **Install GruntJS Plugins locally**

```
> npm install grunt-contrib-jshint --save-dev
```

Using GruntJS

- **“grunt {Task}”**
  - Looks for gruntfile.js or gruntfile.coffee

```
// gruntfile.js
module.exports = function(grunt) {
  grunt.initConfig({
    // Add plugin configurations
    jshint: {
      all: ['public/js/*.js'],
      options: { multistr: true }
    },
  });
  // Load the plugins
  grunt.loadNpmTasks('grunt-contrib-jshint');
};
```

```
> grunt jshint
```

Using GruntJS

- **Can specify default task(s)**

```
// gruntfile.js
module.exports = function(grunt) {
  grunt.initConfig({
    // Add plugin configurations
    jshint: {
      all: ['public/js/*.js'],
      options: { multistr: true }
    },
  });
  // Load the plugins
  grunt.loadNpmTasks('grunt-contrib-jshint');

  grunt.registerTask('default', ['jshint']);
};
```

```
> grunt
```

Using GruntJS

- **UglifyJS plugin to GruntJS helps minification**

```
// gruntfile.js
module.exports = function(grunt) {
  grunt.initConfig({
    uglify: {
      build: {
        src: 'public/js/*.js',
        dest: 'public/js/build/all.min.js'
      }
    }
  });
};
```

Minifying is helpful, but removing code that is only used for debugging is also crucial in delivering only required JavaScript to the browser.

Conditional Compilation in JavaScript

- **Use GruntJS + UglifyJS to accomplish this:**

```
if (typeof DEBUG === undefined) DEBUG = true; // Force

DEBUG && console.log("some info");
if (DEBUG) {
  console.log("other info");
}

function foo() {
  console.log("initial");
}
foo();
```

```
function foo() {
    console.log("initial");
}
foo();
```

Conditional Compilation in JavaScript

- **Global Define and pruning dead code solves this:**

```
// gruntfile.js
...
uglify: {
  options: {
    compress: {
      global_defs: {
        DEBUG: false
      },
      dead_code: true
    }
  },
...
```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COMPOSE

Construct your JavaScript as necessary, instead of one code-base

- **Concatenate and Minify into logical code units**
- **Use JavaScript Loaders to do the heavy lifting**
- **May be combined with Dependency Injection**

Minify Into Packages

- Same GruntJS + UglifyJS solves this easily

```
// gruntfile.js
...
grunt.initConfig({
  uglify: {...},
    build: {
      files: {
        'build/main.min.js': ["js/main.js"],
        'build/base.min.js': ["js/destinations.js", "js/newtrip.js"]
      }
    }
  }
});
...
```

JAVASCRIPT LOADERS

A way to incrementally load JavaScript into the browser. Helps scale the size and timing of large scale web applications.

LazyLoadJS

- **Allows lazy loaded JavaScript:**

```
// main.js
// include lazyload.js
$("#loadButton").on("click", function () {

  LazyLoad.js(["js/build/trips.min.js"], function() {
    // Do Work
  });

});
```

Works well with Frameworks that already handle dependencies (e.g. AngularJS)

RequireJS

- **Mixes script loading and dependency management:**

```
// index.html
...
<script src="js/vendor/require.min.js"
        data-main="js/main"></script>
```

```
// main.js (or .min.js)
require(["destModule"], function(destModule) {
  // use destModule as necessary
});
```

Loads scripts when first required

```
// destModule.js
define([], function() { // module pattern
  ...
  return {
    cache: _cache,
  };
});
```

Dependencies and scripts are chained

RequireJS

- **Can be used to load as needed**
  - Still requires that you use RequireJS Modules:

```
// main.js
$("#loadButton").on("click", function () {

  require(["destModule"], function(destModule) {
    // use destModule as necessary
  });

});
```


ADAMS
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References

- **Joseph Smarr's High Performance JavaScript Slides**
  - http://www.slideshare.net/briandemant/smarr-oscon-2007
- **GruntJS**
  - http://gruntjs.com
- **Web Essentials**
  - http://bitly.com/vswebessentials
- **LazyLoadJS**
  - https://github.com/rgrove/lazyload/
- **RequireJS**
  - http://requirejs.org

Summary

- **Scalable JavaScript**
  - Knowing you have a problem is often the first task of scaling your JavaScript
  - Focusing on better code will make your application scale better
  - Being lazy about your execution is often a better approach
  - Minification will help you improve performance of downloads and parsing
  - Only loading the JavaScript required to do the job is also crucial
  - Late loading JavaScript as it is needed is another useful technique