

A stylized illustration of a laptop with a dark screen and a light-colored base. The screen displays the text 'FRONT-END HANDBOOK' in a yellow, monospaced, all-caps font. The laptop is centered horizontally and has a small white dot at the top center of its bezel.

# FRONT-END HANDBOOK

*From*  
FRONTEND MASTERS  
*by Cody Lindley*

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# Front-End Developer Handbook

Written by [Cody Lindley](#) sponsored by — [Frontend Masters](#)

This is a guide that anyone could use to learn about the practice of front-end development. It broadly outlines and discusses the practice of front-end engineering: how to learn it and what tools are used when practicing it.

It is specifically written with the intention of being a professional resource for potential and currently practicing front-end developers to equip themselves with learning materials and development tools. Secondly, it can be used by managers, CTOs, instructors, and head hunters to gain insights into the practice of front-end development.

The content of the handbook favors web technologies (HTML, CSS, DOM, and JavaScript) and those solutions that are directly built on top of these open technologies. The materials referenced and discussed in the book are either best in class or the current offering to a problem.

The book should not be considered a comprehensive outline of all resources available to a front-end developer. The value of the book is tied up in a terse, focused, and timely curation of just enough categorical information so as not to overwhelm anyone on any one particular subject matter.

The intention is to release an update to the content yearly.

The handbook is divided into three parts.

## Part I. The Front-End Practice

Part one broadly describes the practice of front-end engineering.

## Part II: Learning Front-End Development

Part two identifies self-directed and direct resources for learning to become a front-end developer.

## Part III: Front-End Development Tools

Part three briefly explains and identifies tools of the trade.

**Download a .pdf, .epub, or .mobi file from:**

- <https://www.gitbook.com/book/frontendmasters/front-end-handbook/details>

**Contribute content, suggestions, and fixes on github:**

- <https://github.com/FrontendMasters/front-end-handbook>
- 



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# What Is a Front-End Developer?

A front-end developer architects and develops websites and applications using web technologies (i.e., HTML, CSS, DOM, and JavaScript), which run on the [web platform](#) or act as compilation input for non-web platform environments (i.e., [NativeScript](#)).

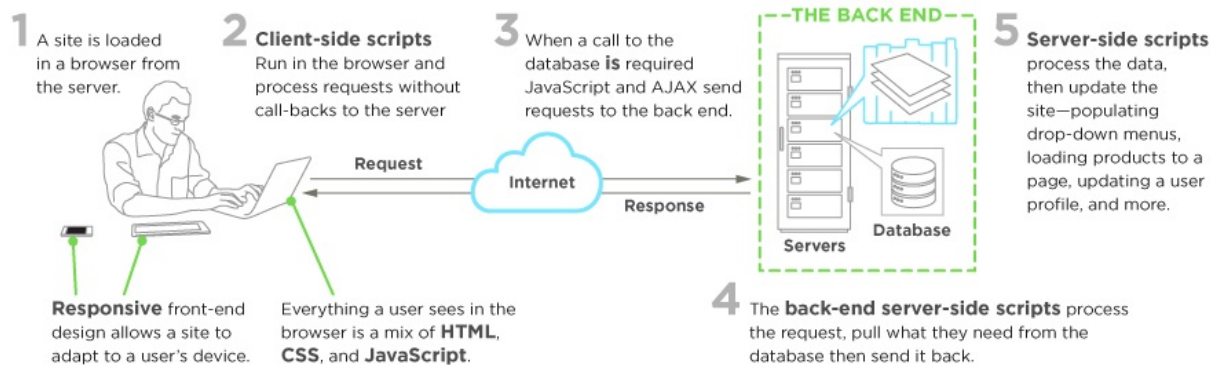


Image source: <https://www.upwork.com/hiring/development/front-end-developer/>

Typically, a person enters into the field of front-end development by learning to develop HTML, CSS, and JS code, which runs in a [web browser](#), [headless browser](#), [WebView](#), or as compilation input for a native runtime environment. The four run times scenarios are explained below.

A web browser is software used to retrieve, present, and traverse information on the WWW. Typically, browsers run on a desktop, laptop, tablet, or phone, but as of late a browser can be found on just about anything (i.e, on a fridge, in cars, etc.).

The most common web browsers are:

- [Chrome](#)
- [Internet Explorer](#)
- [Firefox](#)
- [Safari](#)

Headless browsers are a web browser without a graphical user interface that can be controlled from a command line interface for the purpose of web page automation (e.g., functional testing, scraping, unit testing, etc.). Think of headless browsers as a browser that you can run from the command line that can retrieve and traverse web pages.

The most common headless browsers are:

- [PhantomJS](#)

- [slimerjs](#)
- [trifleJS](#)

[Webviews](#) are used by a native OS, in a native application, to run web pages. Think of a [webview](#) like an iframe or a single tab from a web browser that is embedded in a native application running on a device (e.g., [iOS](#), [android](#), [windows](#)).

The most common solutions for [webview](#) development are:

- [Cordova](#) (typically for native phone/tablet apps)
- [NW.js](#) (typically used for desktop apps)
- [Electron](#) (typically used for desktop apps)

Eventually, what is learned from web browser development can be used by front-end developers to craft code for environments that are not fueled by a browser engine. As of late, development environments are being dreamed up that use web technologies (e.g., CSS and JavaScript), without web engines, to create truly native applications.

Some examples of these environments are:

- [NativeScript](#)
- [React Native](#)



# Part I. The Front-End Practice

Part one broadly describes the practice of front-end engineering.

# Front-End Jobs Titles

Below is a list and description of various front-end job titles. The common, or most used (i.e., generic), title for a front-end developer is, "front-end developer" or "front-end engineer". Note that any job that contains the word "front-end", "client-side", "web UI", "HTML", "CSS", or "JavaScript" typically infers that a person has some degree of HTML, CSS, DOM, and JavaScript professional know how.

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**Front-End Developer/Engineer** (aka Front-End Web Developer/Engineer, Client-Side Developer/Engineer, Front-End Software Developer/Engineer or UI Engineer)

The generic job title that describes a developer who is skilled to some degree at HTML, CSS, DOM, and JavaScript and implementing these technologies on the web platform.

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## **CSS/HTML Developer**

The front-end job title that describes a developer who is skilled at HTML and CSS, excluding JavaScript and Application know how.

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## **Front-End JavaScript (optionally...Application) Developer**

When the word "JavaScript Application" is included in the job title, this will denote that the developer should be an advanced JavaScript developer possessing advanced programming, software development, and application development skills (i.e will have solid experience building front-end applications).

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## **Front-End Web Designer**

When the word "Designer" is included in the job title, this will denote that the designer will possess front-end skills (i.e., HTML & CSS) but also professional design (Visual Design and Interaction Design) skills.

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## **Web/Front-End User Interface (aka UI) Developer/Engineer**

When the word "Interface" or "UI" is included in the job title, this will denote that the developer should possess interaction design skills in addition to front-end skills.

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### **Mobile/Tablet Front-End Developer**

When the word "Mobile" or "Tablet" is included in the job title, this will denote that the developer has experience developing front-ends that run on mobile or tablet devices (either natively or on the web platform, i.e., in a browser).

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### **Front-End SEO Expert**

When the word "SEO" is included in the job title, this will denote that the developer has extensive experience crafting front-end technologies towards an SEO strategy.

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### **Front-End Accessibility Expert**

When the word "Accessibility" is included in the job title, this will denote that the developer has extensive experience crafting front-end technologies that support accessibility requirements and standards.

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### **Front-End Dev. Ops**

When the word "DevOps" is included in the job title, this will denote that the developer has extensive experience with software development practices pertaining to collaboration, integration, deployment, automation, and measurement.

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### **Front-End Testing/QA**

When the word "Testing" or "QA" is included in the job title, this will denote that the developer has extensive experience testing and managing software that involves unit testing, functional testing, user testing, and A/B testing.

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Note that if you come across the "Full Stack" or the generic "Web Developer" terms in job titles these words may be used by an employer to describe a role that is responsible for all aspects of web/app development, i.e., both front-end (potentially including design) and back-

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end.

# Web Technologies Employed by Front-End Developers



Image source: <http://www.2n2media.com/compare-front-end-development-and-back-end-development>

The following web technologies are employed by front-end developers:

- Hyper Text Markup Language (aka HTML)
- Cascading Style Sheets (aka CSS)
- Document Object Model (aka DOM)
- JavaScript Programming Language (aka: ECMAScript 6, ES6, JavaScript 2015)
- Web APIs (aka HTML5 and friends or Browser APIs)
- Hypertext Transfer Protocol (aka HTTP)
- Uniform Resource Locators (aka URLs)
- JavaScript Object Notation (aka JSON)
- Web Content Accessibility Guidelines (aka WCAG) & Accessible Rich Internet Applications (aka ARIA)

These technologies are defined below with the relevant documentation and specifications. For a comprehensive list of all web related specifications have a look at [platform.html5.org](http://platform.html5.org).

## Hyper Text Markup Language (aka HTML)

HyperText Markup Language, commonly referred to as HTML, is the standard markup language used to create web pages. Web browsers can read HTML files and render them into visible or audible web pages. HTML describes the structure of a website semantically along with cues for presentation, making it a markup language, rather than a programming language.

— [Wikipedia](#)

Most relevant specifications / documentation:

- [All W3C HTML Spec](#)
- [The elements of HTML from the Living Standard](#)
- [Global attributes](#)
- [HTML5 from W3C](#) : 5th major revision of the core language of the World Wide Web
- [HTML attribute reference](#)
- [HTML element reference](#)
- [The HTML Syntax](#) from the Living Standard

### **Cascading Style Sheets (aka CSS)**

Cascading Style Sheets (CSS) is a style sheet language used for describing the look and formatting of a document written in a markup language. Although most often used to change the style of web pages and user interfaces written in HTML and XHTML, the language can be applied to any kind of XML document, including plain XML, SVG and XUL. Along with HTML and JavaScript, CSS is a cornerstone technology used by most websites to create visually engaging webpages, user interfaces for web applications, and user interfaces for many mobile applications.

— [Wikipedia](#)

Most relevant specifications / documentation:

- [All W3C CSS Specifications](#)
- [Cascading Style Sheets Level 2 Revision 2 \(CSS 2.2\) Specification](#)
- [CSS reference](#)
- [Selectors Level 3](#)

### **Document Object Model (aka DOM)**

The Document Object Model (DOM) is a cross-platform and language-independent convention for representing and interacting with objects in HTML, XHTML, and XML documents. The nodes of every document are organized in a tree structure, called the DOM tree. Objects in the DOM tree may be addressed and manipulated by using methods on the objects. The public interface of a DOM is specified in its application programming interface (API).

— [Wikipedia](#)

Most relevant specifications / documentation:

- [Document Object Model \(DOM\) Level 3 Events Specification](#)
- [DOM Living Standard](#)
- [W3C DOM4](#)

### JavaScript Programming Language (aka: ECMAScript 6, ES6, JavaScript 2015)

JavaScript is a high level, dynamic, untyped, and interpreted programming language. It has been standardized in the ECMAScript language specification. Alongside HTML and CSS, it is one of the three essential technologies of World Wide Web content production; the majority of websites employ it and it is supported by all modern web browsers without plug-ins. JavaScript is prototype-based with first-class functions, making it a multi-paradigm language, supporting object-oriented, imperative, and functional programming styles. It has an API for working with text, arrays, dates and regular expressions, but does not include any I/O, such as networking, storage or graphics facilities, relying for these upon the host environment in which it is embedded.

— [Wikipedia](#)

Most relevant specifications / documentation:

- [ECMAScript® 2015 Language Specification](#)

### Web APIs (aka HTML5 and friends)

When writing code for the Web using JavaScript, there are a great many APIs available. Below is a list of all the interfaces (that is, types of objects) that you may be able to use while developing your Web app or site.

— [Mozilla](#)

Most relevant documentation:

- [Web API Interfaces](#)

### Hypertext Transfer Protocol (aka HTTP)

The Hypertext Transfer Protocol (HTTP) is an application protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web.

— [Wikipedia](#)

Most relevant specifications:

- [Hypertext Transfer Protocol -- HTTP/1.1](#)
- [Hypertext Transfer Protocol version 2 draft-ietf-httpbis-http2-16](#)

### Uniform Resource Locators (aka URL)

A uniform resource locator (URL) (also called a web address) is a reference to a resource that specifies the location of the resource on a computer network and a mechanism for retrieving it. A URL is a specific type of uniform resource identifier (URI), although many people use the two terms interchangeably. A URL implies the means to access an indicated resource, which is not true of every URI. URLs occur most commonly to reference web pages (http), but are also used for file transfer (ftp), email (mailto), database access (JDBC), and many other applications.

— [Wikipedia](#)

Most relevant specifications:

- [Uniform Resource Locators \(URL\)](#)
- [URL Living Standard](#)

### JavaScript Object Notation (aka JSON)

It is the primary data format used for asynchronous browser/server communication (AJAJ), largely replacing XML (used by AJAX). Although originally derived from the JavaScript scripting language, JSON is a language-independent data format. Code for parsing and generating JSON data is readily available in many programming languages. The JSON format was originally specified by Douglas Crockford. It is currently described by two competing standards, RFC 7159 and ECMA-404. The ECMA standard is minimal, describing only the allowed grammar syntax, whereas the RFC also provides some semantic and security considerations. The official Internet media type for JSON is application/json. The JSON filename extension is .json.

— [Wikipedia](#)

Most relevant specifications:

- [Introducing JSON](#)
- [JSON API](#)



- [The JSON Data Interchange Format](#)

## **Web Content Accessibility Guidelines (aka WCAG) & Accessible Rich Internet Applications (aka ARIA)**

Accessibility refers to the design of products, devices, services, or environments for people with disabilities. The concept of accessible design ensures both “direct access” (i.e., unassisted) and "indirect access" meaning compatibility with a person's assistive technology (for example, computer screen readers).

— [Wikipedia](#)

- [Accessible Rich Internet Applications \(WAI-ARIA\) Current Status](#)
- [Web Accessibility Initiative \(WAI\)](#)
- [Web Content Accessibility Guidelines \(WCAG\) Current Status](#)

## Front-End Dev Skills



Image source: <http://blog.naustud.io/2015/06/baseline-for-modern-front-end-developers.html>

Basic to advanced HTML, CSS, DOM, JavaScript, HTTP/URL, and browser skills are assumed for any type of front-end developer.

Beyond HTML, CSS, DOM, JavaScript, HTTP/URL, and browser development, a front-end developer could be skilled in one or more of the following:

- Content Management Systems (aka CMS)
- Node.js
- Cross-Browser Testing
- Cross-Platform Testing
- Unit Testing
- Cross-Device Testing
- Accessibility / WAI-ARIA
- Search Engine Optimization (aka SEO)
- Interaction or User Interface Design
- User Experience
- Usability
- E-commerce Systems
- Portal Systems
- Wireframing
- CSS Layout / Grids
- DOM Manipulation (e.g., jQuery)

- Mobile Web Performance
- Load Testing
- Performance Testing
- Progressive Enhancement / Graceful Degradation
- Version Control (e.g., GIT)
- MVC / MVVM / MV\*
- Functional Programming
- Data Formats (e.g., JSON, XML)
- Data APIs (e.g Restful API)
- Web Font Embedding
- Scalable Vector Graphics (aka SVG)
- Regular Expressions
- Content Strategy
- Microdata / Microformats
- Task Runners, Build Tools, Process Automation Tools
- Responsive Web Design
- Object-Oriented Programming
- Application Architecture
- Modules
- Dependency Managers
- Package Managers
- JavaScript Animation
- CSS Animation
- Charts / Graphs
- UI Widgets
- Code Quality Testing
- Code Coverage Testing
- Code Complexity Analysis
- Integration Testing
- Command Line / CLI
- Templating Strategies
- Templating Engines
- Single Page Applications
- XHR Requests (aka AJAX)
- Web/Browser Security
- HTML Semantics
- Browser Developer Tools

# Front-End Developers Develop For...

A front-end developer crafts HTML, CSS, and JS that typically runs on the web platform (e.g. a web browser) on one of the following operating systems (aka OSs):

- Android
- Chromium
- iOS
- OS X
- Ubuntu (or some flavor of Linux)
- Windows Phone
- Windows

These operating systems typically run on one or more of the following devices:

- Desktop computer
- Laptop / Netbook computer
- Mobile phone
- Tablet
- TV
- Watch
- Things (i.e., anything you can imagine, car, refrigerator, lights, thermostat, etc.)

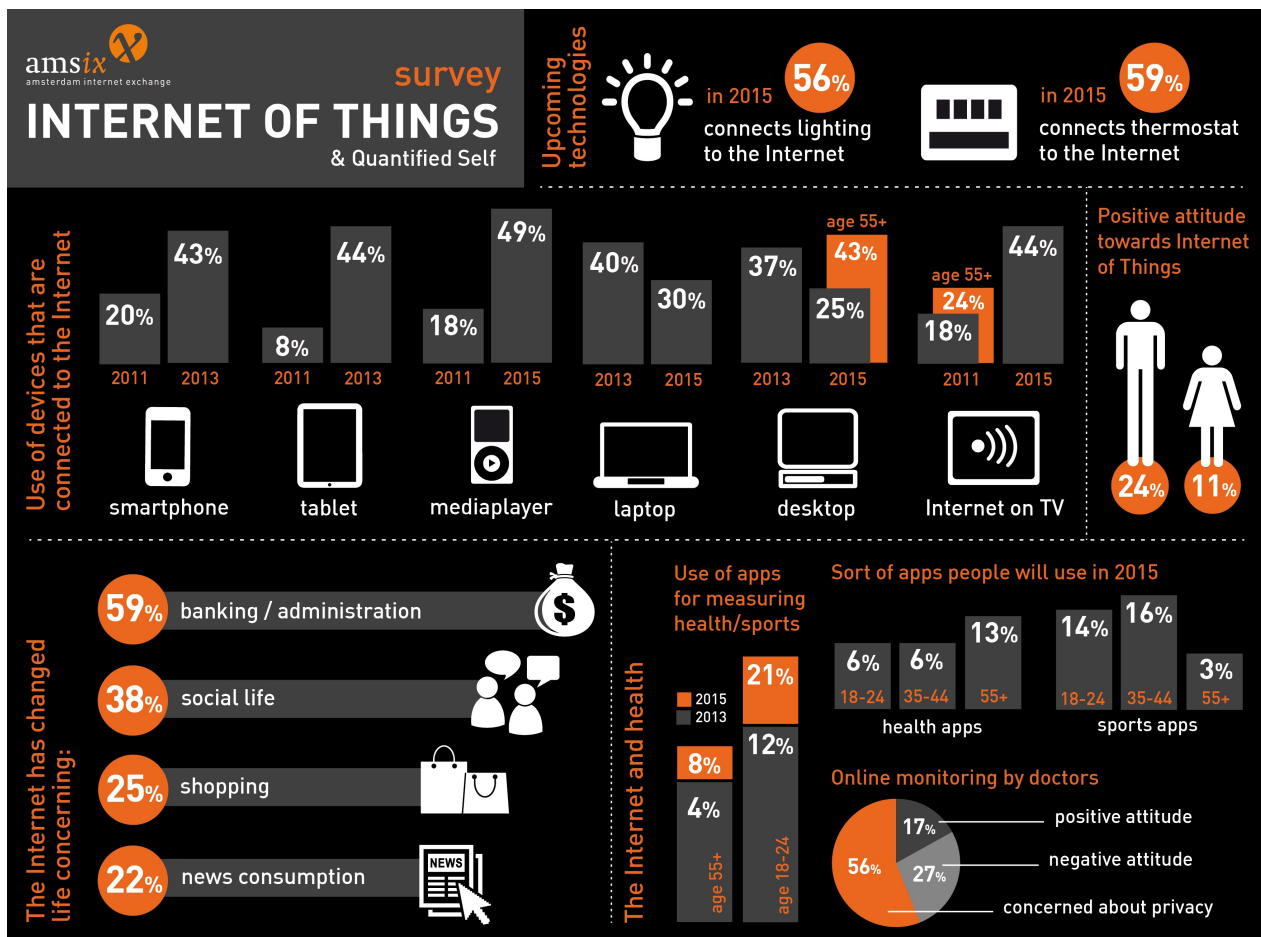


Image source: <https://ams-ix.net/newsitems/87>

Generally speaking, front-end technologies can run on the aforementioned operating systems and devices using the following run time scenarios:

- A web browser (examples: [Chrome](#), [IE](#), [Safari](#), [Firefox](#)) running on an OS.
- A [headless browser](#) (examples [phantomJS](#)) driven from a CLI running on an OS.
- A [WebView](#)/browser tab (think iframe) embedded within a native application as a runtime with bridge to native APIs. WebView applications typically contain a UI constructed from web technologies. (i.e., HTML, CSS, and JS). (examples: [Apache Cordova](#), [NW.js](#), [Electron](#))
- A native application built from web tech that is interpreted at runtime with a bridge to native APIs. The UI will make use of native UI parts (e.g., iOS native controls) not web technologies. (examples: [NativeScript](#), [React Native](#))

# Front-End on a Team

A front-end developer is typically only one player on a team that designs and develops web sites, web applications, or native applications running on web technologies. (Note: A developer who builds everything was once called a "web master" but as of late these rare and mythical developers are called "full-stack developers").

A bare bones team for building professional sites or software on the web will minimally contain the following roles.

- Visual Designer (i.e., fonts, colors, spacing, emotion, visuals concepts & themes)
- UI/Interaction Designer/Information Architect (i.e., wireframes, specifying all user interactions and UI functionality, structuring information)
- Front-End Developer (i.e., writes code that runs in client/on device)
- Back-End Developer (i.e., writes code that runs on server)

The roles are ordered according to overlapping skills. A front-end developer will typically have a good handle on UI/Interaction design as well as back-end development. It is not uncommon for team members to fill more than one role by taking on the responsibilities of an over-lapping role.

It is assumed that the team mentioned above is being directed by a project lead or some kind of product owner (i.e., stakeholder, project manager, project lead, etc.)

A larger web team might include the following roles not shown above:

- Visual Designers
- Interface Design/Interaction Designer/Information Design
- **SEO Strategist**
- Front-End Developer
- **DevOps Engineers**
- Back-End Developer
- **API Developer**
- **Database Administrator**
- **QA Engineer / Testers**

## Generalist Myth

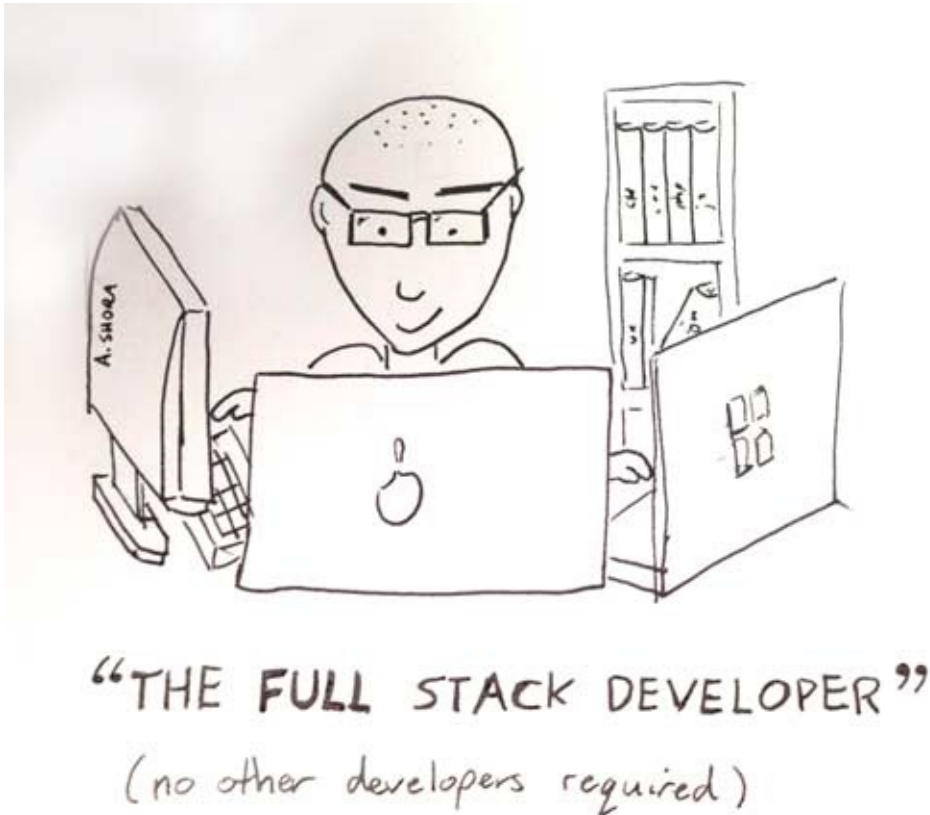


Image source: <http://andyshora.com/full-stack-developers.html>

The roles required to design and develop a web solution require a deep skill set and vast experience in the area of visual design, UI/interaction design, front-end development, and back-end development. Any person (aka generalist or full-stack developer/designer) who can fill one or more of these 4 roles at a professional level is a rare exception to the rule.

Pragmatically, you should seek to be, or seek to hire, an expert in one of these roles. Those who claim to operate at an expert level at one or more of these roles are exceptionally rare and more than likely mythical, given modern stacks.

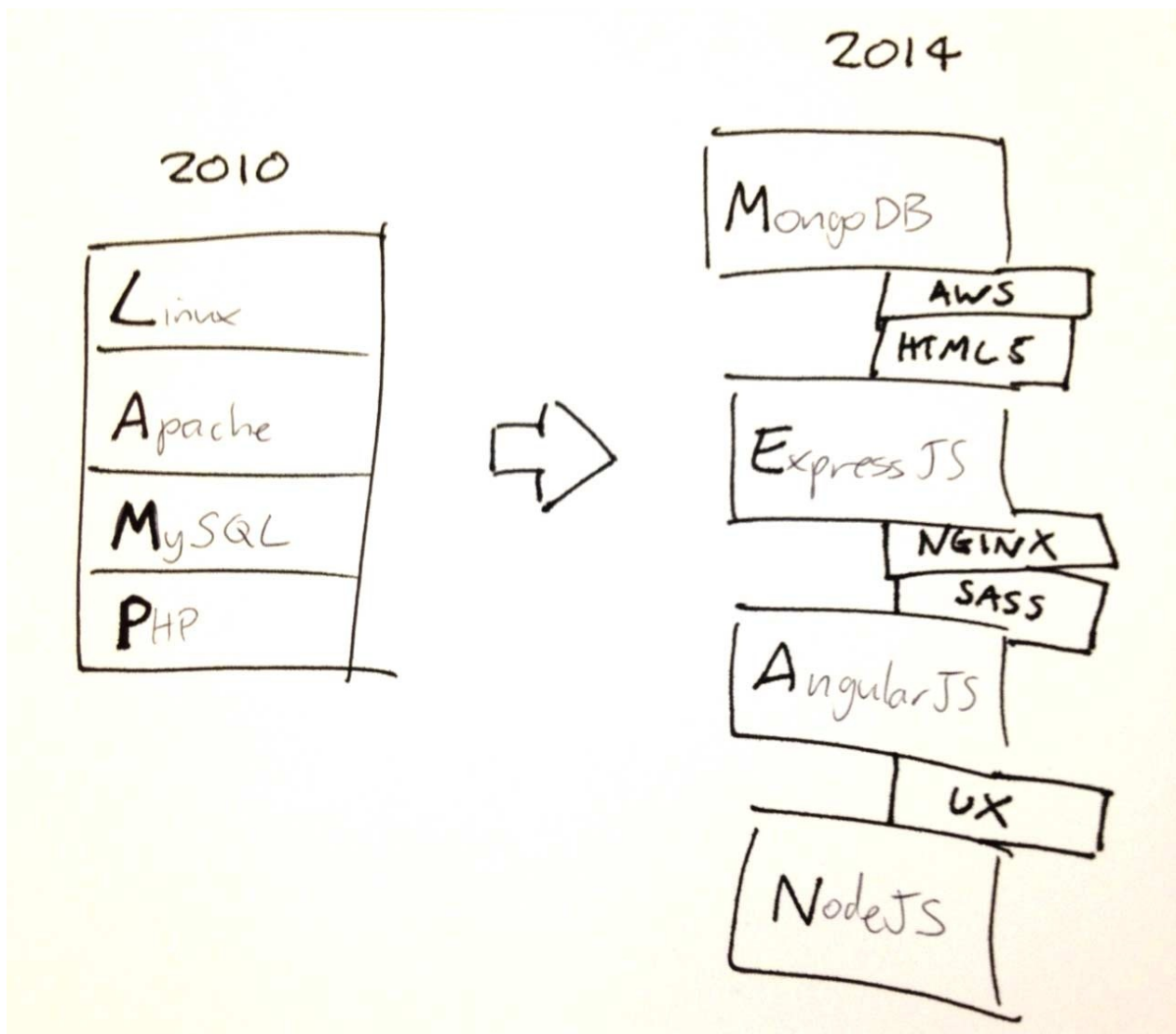


Image source: <http://andyshora.com/full-stack-developers.html>



# Front-End Interviews

Questions you may get asked:

- [10 Interview Questions Every JavaScript Developer Should Know](#)
- [Front-End Job Interview Questions](#)
- [Front End Web Development Quiz](#)
- [Interview Questions for Front-End-Developer](#)
- [JavaScript Web Quiz](#)

Questions you ask:

- [An open source list of developer questions to ask prospective employers](#)

# Front-End Job Boards

A plethora of technical job listing outlets exist. The narrowed list below are currently the most relevant resources for finding a specific front-end position/career.

- [angularjobs.com](https://angularjobs.com)
- [authenticjobs.com](https://authenticjobs.com)
- [careers.stackoverflow.com](https://careers.stackoverflow.com)
- [css-tricks.com/jobs](https://css-tricks.com/jobs)
- [frontenddeveloperjob.com](https://frontenddeveloperjob.com)
- [glassdoor.com](https://glassdoor.com)
- [jobs.emberjs.com](https://jobs.emberjs.com)
- [jobs.github.com](https://jobs.github.com)
- [weworkremotely.com](https://weworkremotely.com)

# Front-End Salaries

The national average in the U.S for a front-end developer is [\\$75k](#).

An experienced front-end developer potentially can live wherever they want (i.e., work remotely) and make over \$150k a year (visit [angel.co](http://angel.co), sign-up, review front-end jobs over \$150k).

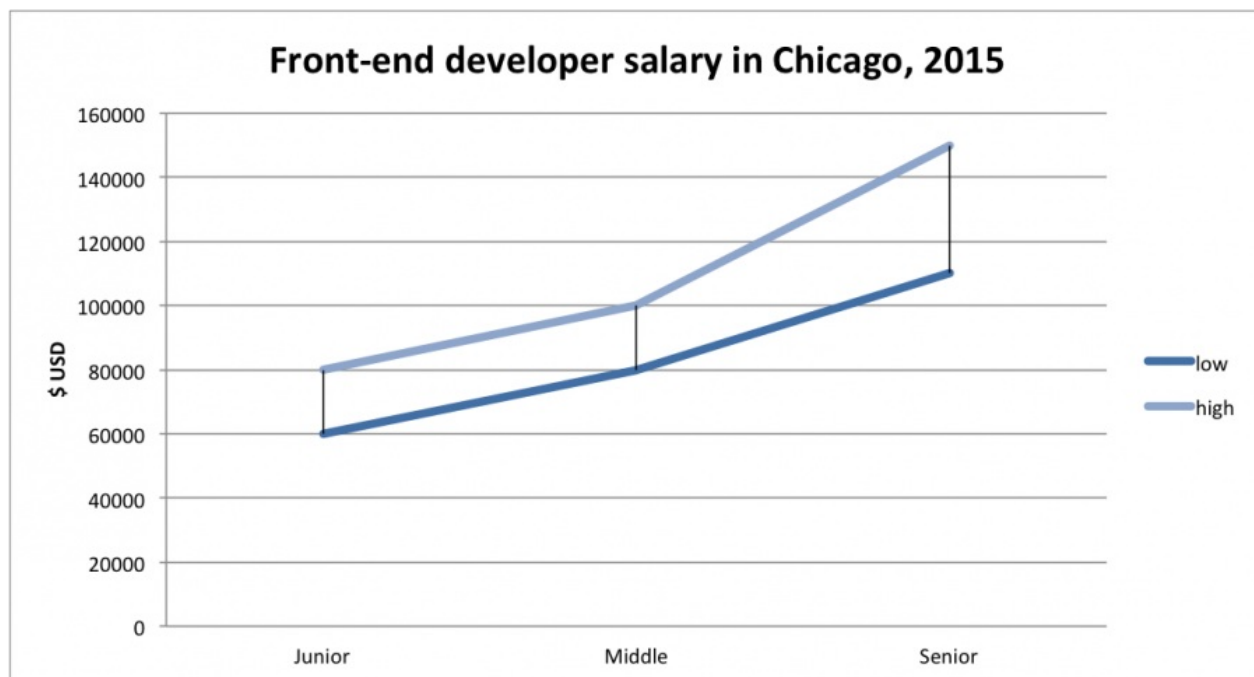


Image source: <http://intersog.com/blog/chicago-tech-salary-guide-2015/>

# How Front-End Developers Are Made

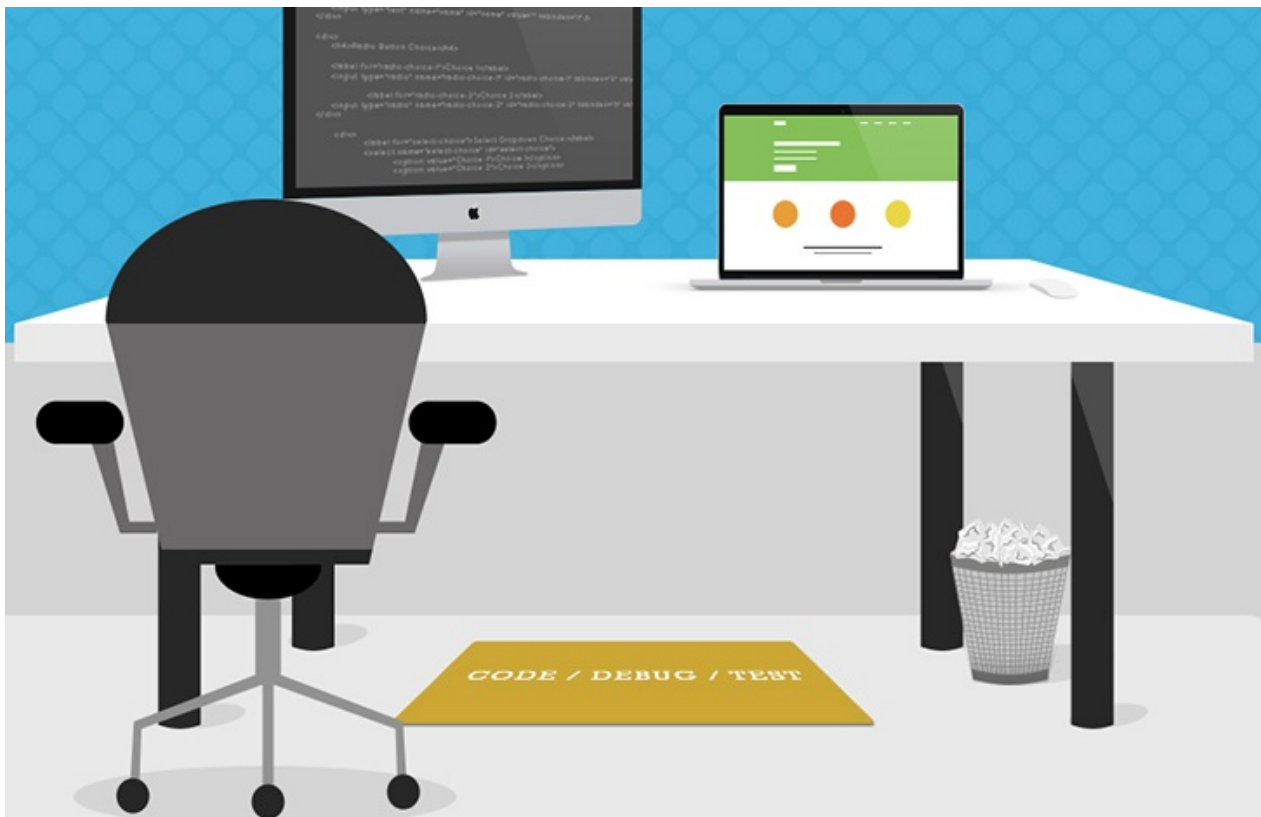


Image source: <http://cdn.skilledup.com/wp-content/uploads/2014/11/life-of-front-end-developer-infographic-Secondary.jpg>

How exactly does one become a front-end developer? Well, it's complicated. Still today you can't go to college and expect to graduate with a degree in front-end engineering. And, I rarely hear of or meet front-end developers who suffered through what is likely a deprecated computer science degree or graphic design degree to end up writing HTML, CSS, and JavaScript professionally. In fact, most of the people working on the front-end, even today, generally seem to be self taught and not traditionally trained as a programmer. Why is this the case?

A front-end developer is not a focused visual designer or an interaction designer. Design school is not exactly the place to hone front-end skills. A front-end developer is not exactly a traditionally trained computer science graduate either. Focusing on either doesn't prepare a person for front-end development. And, in fact, following the traditional paths for either in the higher education systems of America (i.e., College) can derail a person from potentially finding a doorway into a practice where actual experience is king. Today, if you want to be a front-end developer, you teach yourself or you take what is likely a non accredited program, course, bootcamp, or class.

A front-end engineer crafts the skeleton that the user interface rests upon. They must, at times, care as much about the interaction design as they do about the underlying code that creates the UI interactions. Therefore, many in practice today do not come to front-end engineering with programming skills, but, instead, from the other direction. That is, front-end development seems to be filled with more designer types turned developer than programmer types turned front-end developer. Of course, as JavaScript has grown up, so has the desire by more traditionally trained programmers to bring their knowledge to the front-end practice. If you are not aware, front-end developers have not always been considered by "real" programmers as, well, programmers. But times are a changing.

With all of that said, I believe that the path to a career as a front-end developer is very much an unknown process. What I can say is that to become a front-end engineer one must know and use HTML, CSS, DOM, and JavaScript at a deep level without ignoring interaction design or traditional programming know how. In fact, from my experience, the best front-end developers often have a mastery understanding of interaction design and programming, but from the context of the web platform (i.e., browsers, HTML, CSS, DOM, and JavaScript). And for whatever reason, this knowledge is often discovered/approached not given. That is to say, front-end engineering still seems very much to be a practice made up of self taught people, as opposed to a field that corresponds directly to an educational focus from an organized and accredited higher learning situation.

If you were to set out today to become a front-end developer I would loosely strive to follow the process outlined below. The process assumes you are your own best teacher.

1. Learn, roughly, how the web works. Make sure you know the "what" and "where" of Domains, DNS, URLs, HTTP, networks, browsers, servers/hosting, databases, JSON, data APIs, HTML, CSS, DOM, and JavaScript. The goal is to make sure you loosely know how it all works together and exactly what each part is doing. Focus on the high level outlines for front-end architectures. Start with simple web pages and briefly study [native web applications \(aka SPAs\)](#).
2. Learn HTML, CSS, Accessibility, and SEO.
3. Learn the fundamentals of UI design patterns, interaction design, user experience design, and usability.
4. Learn the fundamentals of programming
5. [Learn JavaScript](#)
6. Learn JSON and data APIs
7. Learn CLI/command line
8. Learn the practice of software engineering (i.e., Application design/architecture, templates, Git, testing, monitoring, automating, code quality, development methodologies).
9. Get opinionated and customize your tool box with whatever makes sense to your brain.
10. Learn Node.js

Where you actually stop in the process is what will separate a front-end HTML/CSS developer from an expert level front-end application/JavaScript developer.

A short word of advice on learning. [Learn the actual underlying technologies, before learning abstractions. Don't learn jQuery, learn the DOM. Don't learn SASS, learn CSS. Don't learn HAML, learn HTML. Don't learn CoffeeScript, learn JavaScript. Don't learn Handlebars, learn JavaScript ES6 templates. Don't just use Bootstrap, learn UI patterns. When getting your start, you should fear most things that conceal complexity.](#) Abstracts in the wrong hands can give the appearance of advanced skills, while all the time hiding the fact that a developer has an inferior understanding of the basics or underlying concepts. In short, a skilled front-end developer does not take a broken car to a mechanic, they are the mechanic.

The rest of this book points a reader to the resources and tools to follow my previously suggested process. It is assumed that you are not only learning, but also doing as you learn and investigate tools. Some suggest only doing. While others suggest only learning about doing. I suggest you find a mix of both that matches how your brain works and do that. But, for sure, it is a mix! So, don't just read about it, do it. Learn, do. Learn, do. Repeat indefinitely because things change fast. This is why learning the fundamentals, and not abstractions, are so important.

I should mention that lately a lot of non-accredited front-end code schools/bootcamps have emerged. These avenues of becoming a front-end developer are teacher directed in classroom (virtual and physical) courses, which follow a more traditional style of learning from an official instructor (i.e., syllabus, test, quizzes, projects, team projects, grades, etc.). I have more to say about these institutions in the direct learning section of this handbook. In brief, this is the web, everything you need to learn is on the web for the taking (costing little to nothing). However, if you need someone to tell you how to take what is actually free, and hold you accountable for learning it, you might consider an organized course. Otherwise, I am not aware of any other profession that is practically free for the taking with an internet connection and a burning desire for knowledge.

If you want to get started immediately I'd suggest the following general overviews of the practice of front-end development:

- [Frontend Guidelines](#) [read]
- [Being a web developer](#) [read]
- [Isobar Front-End Code Standards](#) [read]
- [Web Fundamentals](#) [read]
- [Front-End Curriculum](#) [read]
- [freeCodeCamp](#) [interact]
- [Planning a Front-end JS Application](#) [watch]
- [So, You Want to be a Front-End Engineer](#) [watch]
- [Front End Web Development Career Kickstart](#) [watch][\$]

- [Front End Web Development: Get Started](#) [watch][\$]
- [Front-End Web Development Quick Start With HTML5, CSS, and JavaScript](#) [watch][\$]
- [Introduction to Web Development](#) [watch][\$]
- [Foundations of Front-End Web Development](#) [watch][\$]
- [Lean Front-End Engineering](#) [watch][\$]
- [A Baseline for Front-End \[JS\] Developers: 2015](#) [read]
- [Learn Front End Web Development](#) [watch][\$]
- [Front-End Dev Mastery](#) [watch][\$]
- [Front-End Web Developer Nanodegree](#) [watch][\$]

## Part II: Learning

Part two identifies self-directed (i.e., at your own pace when you want) and directed (i.e., formal class room specific times and dates) resources for learning to become a front-end developer.

Note that just because a learning resource is listed, or a category of learning is documented, I am not suggesting that a front-end developer learn everything. That would be absurd. Choose your own slice of expertise within the profession. I'm providing the possibilities of what could be mastered in the field.



# Self Directed Learning

This section focuses on free and paid resources (video training, books, etc.) that an individual can use to direct their own learning process and career as a front-end developer.

The resources include free material and paid material. Paid material will be indicated with [\$].

The author believes that anyone with the right determination and dedication can teach themselves how to be a front-end developer. All that is required is a computer connected to the web and some cash for books and video training.

Below are a few video learning outlets (tech focused) I generally recommend pulling content from:

- [codecademy.com](https://www.codecademy.com)
- [codeschool.com](https://www.codeschool.com)
- [egghead.io](https://egghead.io)
- [eventedmind.com](https://www.eventedmind.com)
- [Frontend Masters](https://www.frontendmasters.com)
- [Khan Academy](https://www.khanacademy.com)
- [laracasts.com](https://laracasts.com)
- [lynda.com](https://www.lynda.com) [careful, quality varies]
- [mijingo.com](https://www.mijingo.com)
- [pluralsight.com](https://www.pluralsight.com) [careful, quality varies]
- [Tagtree](https://tagtree.com)
- [Treehouse](https://www.treehouse.io)
- [tutsplus.com](https://tutsplus.com)
- [Udacity](https://www.udacity.com) [careful, quality varies]

# Learn Internet/Web

The Internet is a global system of interconnected computer networks that use the Internet protocol suite (TCP/IP) to link several billion devices worldwide. It is a network of networks that consists of millions of private, public, academic, business, and government networks of local to global scope, linked by a broad array of electronic, wireless, and optical networking technologies. The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents and applications of the World Wide Web (WWW), electronic mail, telephony, and peer-to-peer networks for file sharing.

— [Wikipedia](#)

- [How Does the Internet work](#) - W3C [read]
- [How Does the Internet Work?](#) - Stanford Paper [read]
- [How the Internet Works](#) [watch]
- [How the Internet Works in 5 Minutes](#) [watch]
- [How the Web Works](#) [watch][\$]
- [What Is the Internet? Or, "You Say Tomato, I Say TCP/IP"](#) [read]

# Learn Web Browsers

A web browser (commonly referred to as a browser) is a software application for retrieving, presenting, and traversing information resources on the World Wide Web. An information resource is identified by a Uniform Resource Identifier (URI/URL) and may be a web page, image, video or other piece of content. Hyperlinks present in resources enable users easily to navigate their browsers to related resources. Although browsers are primarily intended to use the World Wide Web, they can also be used to access information provided by web servers in private networks or files in file systems.

— [Wikipedia](#)

The **most commonly used browsers** (on any device) are:

1. [Chrome](#) (engine: [Blink](#) + [V8](#))
2. [Firefox](#) (engine: [Gecko](#) + [SpiderMonkey](#))
3. [Internet Explorer](#) (engine: [Trident](#) + [Chakra](#))
4. [Safari](#) (engine: [Webkit](#) + [SquirrelFish](#))

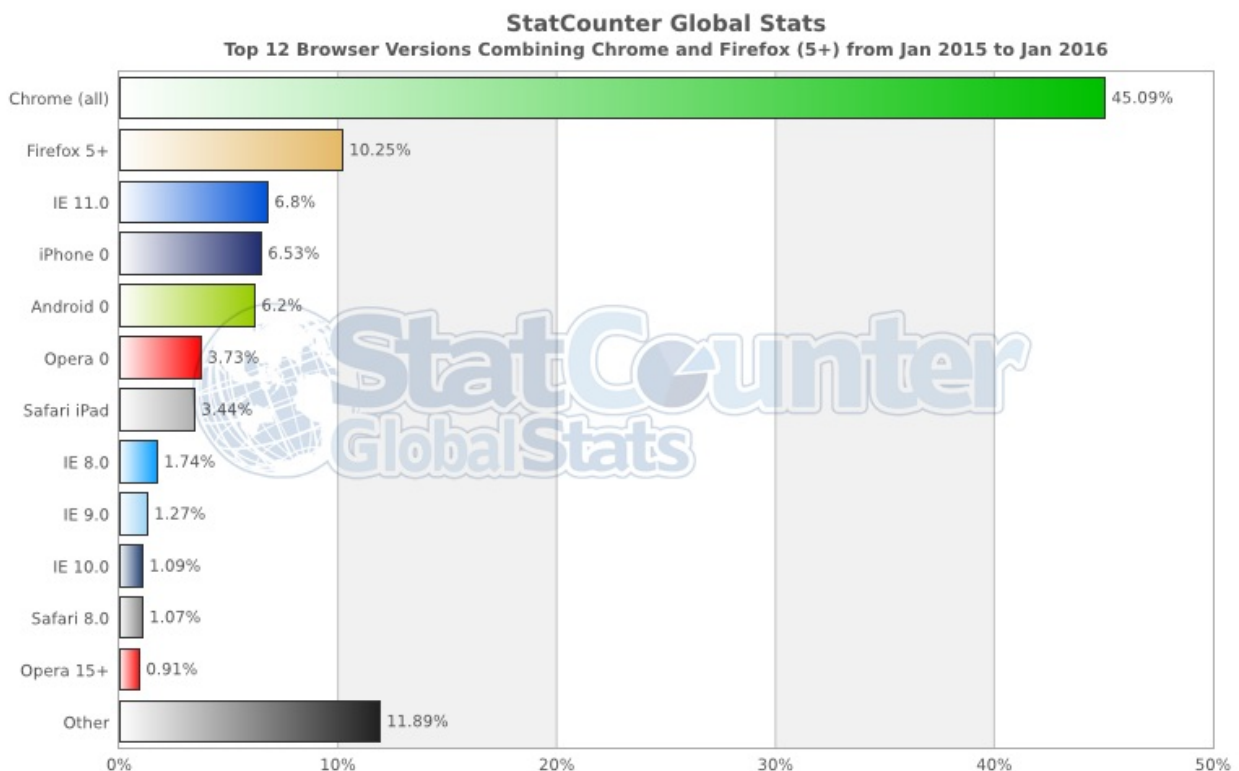


Image source: [http://gs.statcounter.com/#all-browser\\_version\\_partially\\_combined-ww-monthly-201501-201601-bar](http://gs.statcounter.com/#all-browser_version_partially_combined-ww-monthly-201501-201601-bar)

## Evolution of Browsers & Web Technologies (i.e., APIs)

- [evolutionoftheweb.com](#) [read]
- [Timeline of web browsers](#) [read]

### The Most Commonly Used Headless Browser Are:

- [PhantomJS](#) (engine: [Webkit](#) + [SquirrelFish](#))
- [SlimerJS](#) (engine: [Gecko](#) + [SpiderMonkey](#))
- [TrifleJS](#) (engine: [Trident](#) + [Chakra](#))

### How Browsers Work

- [20 Things I Learned About Browsers and the Web](#) [read]
- [Fast CSS: How Browsers Lay Out Web Pages](#) [read]
- [How Browsers Work: Behind the scenes of modern web browsers](#) [read]
- [So How Does the Browser Actually Render a Website](#) [watch]
- [What Every Frontend Developer Should Know About Webpage Rendering](#) [read]

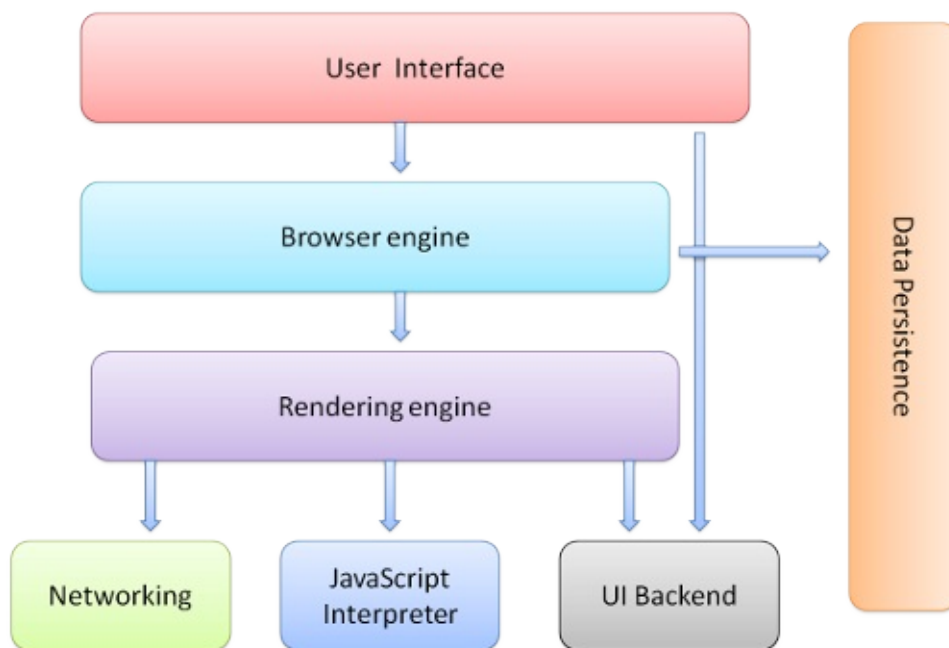


Image source: <http://www.html5rocks.com/en/tutorials/internals/howbrowserswork/>

### Optimizing for Browsers:

- [Browser Rendering Optimization](#) [watch]
- [Website Performance Optimization](#) [watch]

### Browser Security

- [Browser Security Handbook](#) [read]
- [Frontend Security](#) [watch]
- [HTML5 Security Cheatsheet](#) [read]

- [Security for Web Developers: Using JavaScript, HTML, and CSS](#) [read][<sup>\$</sup>]
- [The Tangled Web: A Guide to Securing Modern Web Applications](#) read

## Comparing Browsers

- [Comparison of Web Browsers](#) [read]

## Developing for Browsers

In the past, a front-end developer spent a lot of time making code work in several different browsers. This was once a bigger issue than it is today, unless you have to write code for older browsers (i.e., <IE8). This still remains an issue today, just not one that demands so much of the front-end developers time and brain cycles. The fact of the matter is modern abstractions (e.g., jQuery, pre-processors, transpilers) have done away with a lot of browser inconsistency issues.

## Evergreen Browsers

The latest versions of browsers are considered evergreen browsers. That is, in theory they are suppose to automatically update themselves silently without prompting the user. This move towards self updating browsers has been in reaction to the slow process of eliminating older browsers. Older browsers are complicated to develop for given their deviations from the commonalities between modern browsers (i.e., new specifications and this rate of change).

## Picking a Browser

As of today, most front-end developers use Chrome and the tools available to a developer, "Chrome Dev Tools". However, all of the browsers offer a flavor of developer tools. Picking one to use for development is a subjective matter. The more important issue is knowing which browsers you have to support and testing in each as you develop. Select whichever browser makes sense to your brain and gets the job done. I suggest using Chrome simply because the developer tools are consistently improving and at this time contain the most robust features.

## Browser Hacks

- [browserhacks.com](#) [read]

# Learn Domain Name System (aka DNS)

The Domain Name System (DNS) is a hierarchical distributed naming system for computers, services, or any resource connected to the Internet or a private network. It associates various information with domain names assigned to each of the participating entities. Most prominently, it translates domain names, which can be easily memorized by humans, to the numerical IP addresses needed for the purpose of computer services and devices worldwide. The Domain Name System is an essential component of the functionality of most Internet services because it is the Internet's primary directory service.

— [Wikipedia](#)

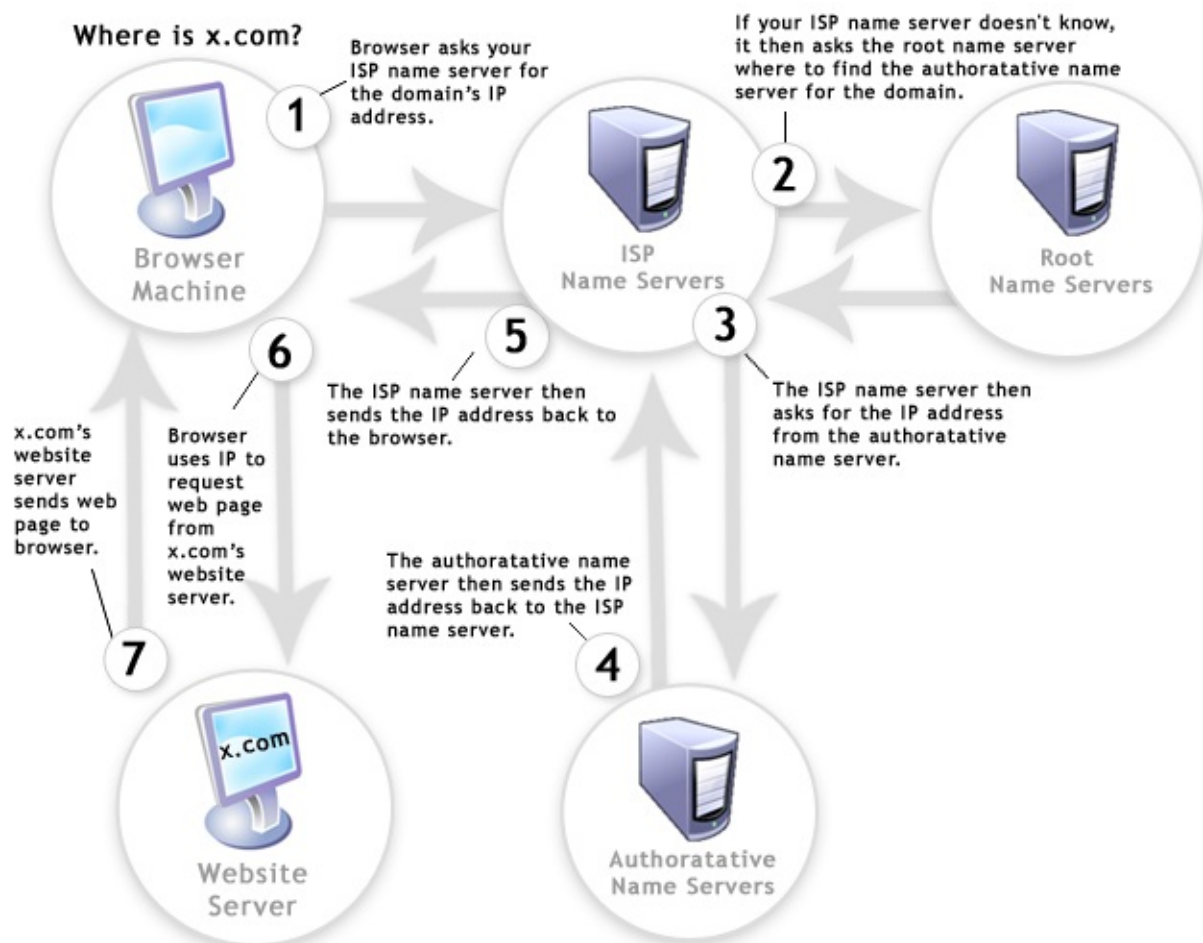


Image source: [http://www.digital-digest.com/blog/DVDGuy/wp-content/uploads/2011/11/how\\_dns\\_works.jpg](http://www.digital-digest.com/blog/DVDGuy/wp-content/uploads/2011/11/how_dns_works.jpg)

- [DNS Explained](#) [watch]
- [How DNS Works](#) [read]



# Learn HTTP/Networks (Including CORS & WebSockets)

**HTTP** - The Hypertext Transfer Protocol (HTTP) is an application protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web.

— [Wikipedia](#)

**CORS** - Cross-origin resource sharing (CORS) is a mechanism that allows restricted resources (e.g., fonts) on a web page to be requested from another domain outside the domain from which the resource originated.

— [Wikipedia](#)

**WebSockets** - WebSocket is a protocol providing full-duplex communication channels over a single TCP connection. The WebSocket protocol was standardized by the IETF as RFC 6455 in 2011, and the WebSocket API in Web IDL is being standardized by the W3C.

— [Wikipedia](#)

## HTTP

- [High Performance Browser Networking: What Every Web Developer Should Know About Networking and Web Performance](#) [read]
- [HTTP/2 Frequently Asked Questions](#) [read]
- [HTTP Fundamentals](#) [watch][\$]
- [HTTP: The Protocol Every Web Developer Must Know - Part 1](#) [read]
- [HTTP: The Protocol Every Web Developer Must Know - Part 2](#) [read]
- [HTTP Succinctly](#) [read]

## CORS

- [CORS in Action](#) [read][\$]
- [HTTP Access Control \(CORS\)](#) [read]
- [HTTP Status Codes in 60 Seconds](#) [watch]

## WebSockets

- [Connect the Web With WebSockets](#) [watch]
- [WebSocket: Lightweight Client-Server Communications](#) [read][\$]



- [The WebSocket Protocol](#) [read]

# Learn Web Hosting

A web hosting service is a type of Internet hosting service that allows individuals and organizations to make their website accessible via the World Wide Web. Web hosts are companies that provide space on a server owned or leased for use by clients, as well as providing Internet connectivity, typically in a data center. Web hosts can also provide data center space and connectivity to the Internet for other servers located in their data center, called colocation, also known as Housing in Latin America or France.

— [Wikipedia](#)

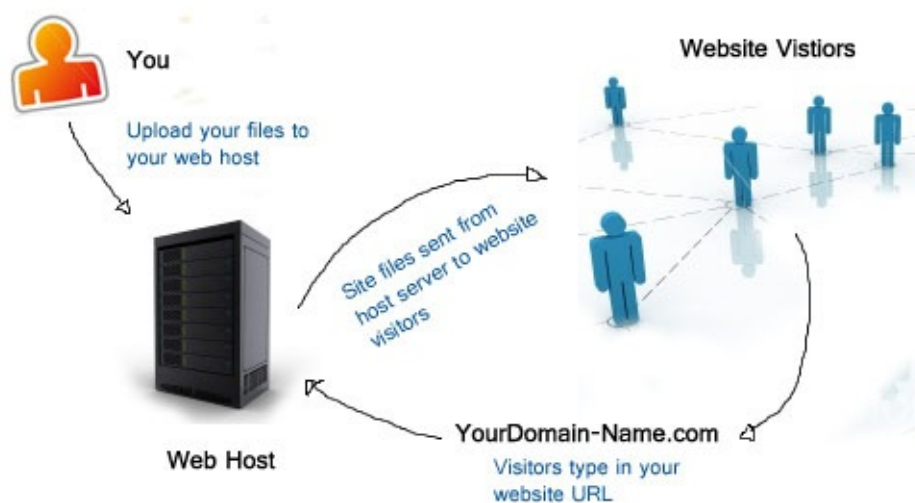


Image source: <http://www.alphaelite.com.sg/sitev2/images/stories/webhostdemo.jpg>

## General Learning:

- [Ultimate Guide to Web Hosting](#) [read]
- [Web Hosting Beginner Guide](#) [read]
- [Web Hosting for Dummies](#) [read][\$]

# Learn General Front-End Development

## General Learning:

- [A Baseline for Front-End \[JS\] Developers: 2015](#) [read]
- [Being a web developer](#) [read]
- [Foundations of Front-End Web Development](#) [watch][[\\$](#)]
- [freeCodeCamp](#) [interact]
- [Front-End Curriculum](#) [read]
- [Front-End Dev Mastery](#) [watch][[\\$](#)]
- [Front-End Web Developer Nanodegree](#) [watch][[\\$](#)]
- [Front End Web Development Career Kickstart](#) [watch][[\\$](#)]
- [Front End Web Development: Get Started](#) [watch][[\\$](#)]
- [Front-End Web Development Quick Start With HTML5, CSS, and JavaScript](#) [watch][[\\$](#)]
- [Frontend Guidelines](#) [read]
- [Introduction to Web Development](#) [watch][[\\$](#)]
- [Isobar Front-End Code Standards](#) [read]
- [Lean Front-End Engineering](#) [watch][[\\$](#)]
- [Learn Front End Web Development](#) [watch][[\\$](#)]
- [Planning a Front-End JS Application](#) [watch]
- [So, You Want to Be a Front-End Engineer](#) [watch]
- [Web Fundamentals](#) [read]

## General Front-End Newsletters, News Outlets, & Podcasts:

- [The Big Web Show](#)
- [Fresh Brewed Frontend](#)
- [Front-End Dev Weekly](#)
- [frontendfront.com](#)
- [Mobile Web Weekly](#)
- [Open Web Platform Daily Digest](#)
- [O'Reilly Web Platform Radar](#)
- [shoptalkshow.com](#)
- [The Web Ahead](#)
- [The Web Platform Podcast](#)
- [webtoolsweekly.com](#)

# Learn User Interface/Interaction Design

**User Interface Design** - User interface design (UI) or user interface engineering is the design of user interfaces for machines and software, such as computers, home appliances, mobile devices, and other electronic devices, with the focus on maximizing the user experience. The goal of user interface design is to make the user's interaction as simple and efficient as possible, in terms of accomplishing user goals (user-centered design).

— [Wikipedia](#)

**Interaction Design Pattern** - A design pattern is a formal way of documenting a solution to a common design problem. The idea was introduced by the architect Christopher Alexander for use in urban planning and building architecture, and has been adapted for various other disciplines, including teaching and pedagogy, development organization and process, and software architecture and design.

— [Wikipedia](#)

**User Experience Design** - User Experience Design (UXD or UED or XD) is the process of enhancing user satisfaction by improving the usability, accessibility, and pleasure provided in the interaction between the user and the product. User experience design encompasses traditional human–computer interaction (HCI) design, and extends it by addressing all aspects of a product or service as perceived by users.

— [Wikipedia](#)

**Human–Computer Interaction** - Human–computer interaction (HCI) researches the design and use of computer technology, focusing particularly on the interfaces between people (users) and computers. Researchers in the field of HCI both observe the ways in which humans interact with computers and design technologies that lets humans interact with computers in novel ways.

— [Wikipedia](#)

Minimally I'd suggest reading the following canonical texts on the matter so one can build proper user interfaces.

- [About Face: The Essentials of Interaction Design](#) [read][[\\$](#)]
- [Designing Interfaces](#) [read][[\\$](#)]
- [Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability](#) [read][[\\$](#)]



# Learn HTML & CSS

**HTML** - HyperText Markup Language, commonly referred to as HTML, is the standard markup language used to create web pages. Web browsers can read HTML files and render them into visible or audible web pages. HTML describes the structure of a website semantically along with cues for presentation, making it a markup language, rather than a programming language.

— [Wikipedia](#)

**CSS** - Cascading Style Sheets (CSS) is a style sheet language used for describing the look and formatting of a document written in a markup language. Although most often used to change the style of web pages and user interfaces written in HTML and XHTML, the language can be applied to any kind of XML document, including plain XML, SVG and XUL. Along with HTML and JavaScript, CSS is a cornerstone technology used by most websites to create visually engaging webpages, user interfaces for web applications, and user interfaces for many mobile applications.

— [Wikipedia](#)

Liken to constructing a house, one might consider HTML the framing and CSS to be the painting & decorating.

## General Learning:

- [Absolute Centering in CSS](#) [read]
- [codecademy.com HTML & CSS](#) [interact]
- [CSS Positioning](#) [watch][\$]
- [Front End Web Development: Get Started](#) [watch][\$]
- [Front-End Web Development Quick Start With HTML5, CSS, and JavaScript](#) [watch][\$]
- [HTML and CSS: Design and Build Websites](#) [read][\$]
- [HTML Document Flow](#) [watch][\$]
- [HTML Mastery: Semantics, Standards, and Styling](#) [read][\$]
- [Intro to HTML/CSS: Making webpages](#) [watch]
- [Learn to Code HTML & CSS](#) [read]
- [Learn CSS Layout](#) [read]
- [Semantic HTML: How to Structure Web Pages](#) [watch]
- [Solid HTML Form Structure](#) [watch]
- [Understanding the CSS Box Model](#) [watch]

## Mastering:

- [A Complete Guide to Flexbox](#) [read]
- [atozcss.com](#) [watch]
- [CSS Diner](#) [interact]
- [CSS Selectors from CSS4 till CSS1](#) [read]
- [CSS3 In-Depth](#) [watch][\$]
- [What the Flexbox?! A Simple, Free 20 Video Course That Will Help You Master CSS Flexbox](#) [watch]

### References/Docs:

- [CSS Triggers...a Game of Layout, Paint, and Composite](#)
- [cssvalues.com](#)
- [HTML Attribute Reference](#)
- [htmlelement.info](#)
- [MDN CSS Reference](#)
- [MDN HTML Element Reference](#)

### Glossary:

- [CSS Glossary - Programming Reference for CSS Covering Comments, Properties, and Selectors](#)
- [HTML Glossary Programming Reference for HTML elements](#)

### Standards/Specifications:

- [All W3C CSS Specifications](#)
- [All W3C HTML Spec](#)
- [Cascading Style Sheets Level 2 Revision 2 \(CSS 2.2\) Specification](#)
- [The Elements of HTML from the Living Standard](#)
- [Global Attributes](#)
- [The HTML Syntax](#) from the Living Standard
- [HTML5 from W3C](#) : 5th major revision of the core language of the World Wide Web
- [Selectors Level 3](#)

### Architecting CSS:

- [Atomic Design](#) [read]
- [OOCSS](#) [read]
- [SMACSS](#) [read][\$]
- [SMACSS](#) [watch][\$]

### Authoring Conventions:

- [cssguidelin.es](#) [read]

- [Frontend Guidelines Questionnaire](#) [read]
- [Google HTML/CSS Style Guide](#)
- [Idiomatic CSS](#) [read]
- [Standards for Developing Flexible, Durable, and Sustainable HTML and CSS](#) [read]

**HTML/CSS Newsletters:**

- [CSS Weekly](#)
- [HTML 5 Weekly](#)



# Learn Search Engine Optimization

Search engine optimization (SEO) is the process of affecting the visibility of a website or a web page in a search engine's unpaid results — often referred to as "natural," "organic," or "earned" results. In general, the earlier (or higher ranked on the search results page), and more frequently a site appears in the search results list, the more visitors it will receive from the search engine's users. SEO may target different kinds of search, including image search, local search, video search, academic search, news search and industry-specific vertical search engines.

— [Wikipedia](#)

## General Learning:

- [Google Search Engine Optimization Starter Guide](#) [read]
- [SEO Fundamentals From David Booth](#) [watch][\$]
- [SEO Fundamentals From Paul Wilson](#) [watch][\$]
- [SEO Tutorial for Beginners 2015](#) [read]
- [SEO for Web Designers](#) [watch][\$]

# Learn JavaScript

JavaScript is a high level, dynamic, untyped, and interpreted programming language. It has been standardized in the ECMAScript language specification. Alongside HTML and CSS, it is one of the three essential technologies of World Wide Web content production; the majority of websites employ it and it is supported by all modern web browsers without plug-ins. JavaScript is prototype-based with first-class functions, making it a multi-paradigm language, supporting object-oriented, imperative, and functional programming styles. It has an API for working with text, arrays, dates and regular expressions, but does not include any I/O, such as networking, storage or graphics facilities, relying for these upon the host environment in which it is embedded.

— [Wikipedia](#)

## General Learning:

- [codecademy.com JavaScript](#) [interact]
- [Crockford on JavaScript - Volume 1: The Early Years](#) [watch]
- [Crockford on JavaScript - Chapter 2: And Then There Was JavaScript](#) [watch]
- [Crockford on JavaScript - Act III: Function the Ultimate](#) [watch]
- [Crockford on JavaScript - Episode IV: The Metamorphosis of Ajax](#) [watch]
- [Crockford on JavaScript - Part 5: The End of All Things](#) [watch]
- [Crockford on JavaScript - Scene 6: Loopage](#) [watch]
- [JavaScript Enlightenment](#) [read]
- [JavaScript Modules](#) [read]
- [JavaScript Patterns](#) [read][\$]
- [JS.Next: ES6](#) [watch][\$]
- [The Principles of Object-Oriented JavaScript](#) [read][\$]
- [Professional JavaScript for Web Developers](#) [read][\$]
- [Setting up ES6](#)
- [Speaking JavaScript](#) [read]
- [Understanding ECMAScript 6](#) [read]
- [You Don't Know JS: Up & Going](#) [read]

## Mastering:

- [Advanced JavaScript](#) [watch][\$]
- [ECMA-262 by Dmitry Soshnikov](#) [read]
- [Eloquent JavaScript](#) [read]
- [Gentle explanation of 'this' keyword in JavaScript](#) [read]

- [Functional JavaScript: Introducing Functional Programming with Underscore.js](#) [read][ $\$$ ]
- [High Performance JavaScript \(Build Faster Web Application Interfaces\)](#) [read][ $\$$ ]
- [JavaScript Allongé](#) [read][ $\$$ ]
- [JavaScript with Promises](#) [read][ $\$$ ]
- [JavaScript Regular Expression Enlightenment](#) [read]
- [The Good Parts of JavaScript and the Web](#) [watch][ $\$$ ]
- [Test-Driven JavaScript Development](#) [read][ $\$$ ]
- [Using Regular Expressions](#) [watch][ $\$$ ]
- [You Don't Know JS: Async & Performance](#) [read]
- [You Don't Know JS: ES6 & Beyond](#) [read]
- [You Don't Know JS: Scope & Closures](#) [read]
- [You Don't Know JS: this & Object Prototypes](#) [read]
- [You Don't Know JS: Types & Grammar](#) [read]

#### **References/Docs:**

- [MDN JavaScript Reference](#)

#### **Glossary/Encyclopedia/Jargon:**

- [The JavaScript Encyclopedia](#)
- [JavaScript Glossary](#)
- [Simplified JavaScript Jargon](#)

#### **Standards/Specifications:**

- [ECMAScript® 2015 Language Specification](#)
- [Status, Process, and Documents for ECMA262](#)

#### **Style:**

- [Airbnb JavaScript Style Guide](#)
- [Node.js Style Guide](#)
- [Principles of Writing Consistent, Idiomatic JavaScript](#)

#### **JavaScript Newsletters, News, & Podcasts:**

- [Echo JS](#)
- [FiveJS](#)
- [JavaScript Jabber](#)
- [JavaScript Kicks](#)
- [JavaScript Live](#)
- [JavaScript Weekly](#)
- [JavaScript.com](#)



# Learn Web Animation

## General Learning:

- [Advanced SVG Animation](#) [\$][watch]
- [Adventures in Web Animations](#) [\$][watch]
- [Animating With Snap.svg](#) [\$][watch]
- [Animation in CSS3 and HTML5](#) [\$][watch]
- [Create Animations in CSS](#) [read & watch]
- [CSS Animation in the Real World](#) [\$][watch]
- [Foundation HTML5 Animation with JavaScript](#) [\$][read]
- [Learn to Create Animations in JavaScript](#) [read & watch]
- [State of the Animation 2015](#) [watch]
- [Web Animation using JavaScript: Develop & Design \(Develop and Design\)](#) [\$][read]

## Standards/Specifications:

- [Web Animations](#)

# Learn DOM, BOM, & jQuery

**DOM** - The Document Object Model (DOM) is a cross-platform and language-independent convention for representing and interacting with objects in HTML, XHTML, and XML documents. The nodes of every document are organized in a tree structure, called the DOM tree. Objects in the DOM tree may be addressed and manipulated by using methods on the objects. The public interface of a DOM is specified in its application programming interface (API).

— [Wikipedia](#)

**BOM** - The Browser Object Model (BOM) is a browser-specific convention referring to all the objects exposed by the web browser. Unlike the Document Object Model, there is no standard for implementation and no strict definition, so browser vendors are free to implement the BOM in any way they wish.

— [Wikipedia](#)

**jQuery** - jQuery is a cross-platform JavaScript library designed to simplify the client-side scripting of HTML. jQuery is the most popular JavaScript library in use today, with installation on 65% of the top 10 million highest-trafficked sites on the Web. jQuery is free, open-source software licensed under the MIT License.

— [Wikipedia](#)

The ideal path, but certainly the most difficult, would be to first learn JavaScript, then the DOM, then jQuery. However, do what makes sense to your brain. Most front-end developers learn about JavaScript and then DOM by way of first learning jQuery. Whatever path you take, just make sure JavaScript, then DOM, or jQuery don't become a black box.

## General Learning:

- [Codecademy.com jQuery](#) [watch]
- [The Document Object Model](#) [read]
- [HTML/JS: Making Webpages Interactive](#) [watch]
- [HTML/JS: Making Webpages Interactive with jQuery](#) [watch]
- [jQuery Enlightenment](#) [read]

## Mastering:

- [AdvancED DOM Scripting: Dynamic Web Design Techniques](#) [read][[\\$](#)]
- [Advanced JS Fundamentals to jQuery & Pure DOM Scripting](#) [watch][[\\$](#)]

- [Douglas Crockford: An Inconvenient API - The Theory of the DOM](#) [watch]
- [DOM Enlightenment](#) [read][[\\$](#)] or [read online for free](#)
- [Fixing Common jQuery Bugs](#) [watch][[\\$](#)]
- [jQuery-Free JavaScript](#) [watch][[\\$](#)]
- [jQuery Tips and Tricks](#) [watch][[\\$](#)]

#### **References/Docs:**

- [jQuery Docs](#)
- [MDN Browser Object Model](#)
- [MDN Document Object Model](#)
- [MDN Event reference](#)
- [MSDN Document Object Model \(DOM\)](#)

#### **Standards/Specifications:**

- [Document Object Model \(DOM\) Level 3 Events Specification](#)
- [Document Object Model \(DOM\) Technical Reports](#)
- [DOM Living Standard](#)
- [W3C DOM4](#)

# Learn Web Fonts & Icons

Web typography refers to the use of fonts on the World Wide Web. When HTML was first created, font faces and styles were controlled exclusively by the settings of each Web browser. There was no mechanism for individual Web pages to control font display until Netscape introduced the `<font>` tag in 1995, which was then standardized in the HTML 3.2 specification. However, the font specified by the tag had to be installed on the user's computer or a fallback font, such as a browser's default sans-serif or monospace font, would be used. The first Cascading Style Sheets specification was published in 1996 and provided the same capabilities.

The CSS2 specification was released in 1998 and attempted to improve the font selection process by adding font matching, synthesis and download. These techniques did not gain much use, and were removed in the CSS2.1 specification. However, Internet Explorer added support for the font downloading feature in version 4.0, released in 1997. Font downloading was later included in the CSS3 fonts module, and has since been implemented in Safari 3.1, Opera 10 and Mozilla Firefox 3.5. This has subsequently increased interest in Web typography, as well as the usage of font downloading.

— [Wikipedia](#)

## General Learning:

- [A Comprehensive Guide to Font Loading Strategies](#) [read]
- [Beautiful Web Type a Showcase of the Best Typefaces from the Google Web Fonts Directory](#) [read]
- [Quick Guide to Webfonts via @font-face](#) [read]
- [Responsive Typography](#) [watch][\$]
- [Typography for the Web](#) [watch][\$]



# Learn Accessibility

Accessibility refers to the design of products, devices, services, or environments for people with disabilities. The concept of accessible design ensures both “direct access” (i.e., unassisted) and “indirect access” meaning compatibility with a person's assistive technology (for example, computer screen readers).

Accessibility can be viewed as the “ability to access” and benefit from some system or entity. The concept focuses on enabling access for people with disabilities, or special needs, or enabling access through the use of assistive technology; however, research and development in accessibility brings benefits to everyone.

Accessibility is not to be confused with usability, which is the extent to which a product (such as a device, service, or environment) can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

Accessibility is strongly related to universal design which is the process of creating products that are usable by people with the widest possible range of abilities, operating within the widest possible range of situations. This is about making things accessible to all people (whether they have a disability or not).

— [Wikipedia](#)

## General Learning:

- [Foundations of UX: Accessibility](#) [watch][\$]
- [How HTML elements are supported by screen readers](#) [read]
- [Introduction to Web Accessibility](#) - Google Open Online Education [watch]
- [Introduction to Web Accessibility](#) - WAI [read]
- [Universal Design for Web Applications: Web Applications That Reach Everyone](#) [read] [\$]
- [Web Accessibility: Getting Started](#) [watch][\$]
- [A Web for Everyone](#) [read][\$]

## Standards/Specifications:

- [Accessible Rich Internet Applications \(WAI-ARIA\) Current Status](#)
- [Web Accessibility Initiative \(WAI\)](#)
- [Web Content Accessibility Guidelines \(WCAG\) Current Status](#)



# Learn Web/Browser APIs

The BOM and the DOM are not the only browser APIs that are made available on the web platform inside of browsers. Everything that is not specifically the DOM or BOM, but an interface for programming the browser could be considered a web or browser API (tragically in the past some of these APIs have been called HTML5 APIs which confuses their own specifics/standardize with the actual HTML5 specification specify the HTML5 markup language). Note that web or browser APIs do include device APIs (e.g.,

`Navigator.getBattery()` ) that are available through the browser on tablet and phones devices.

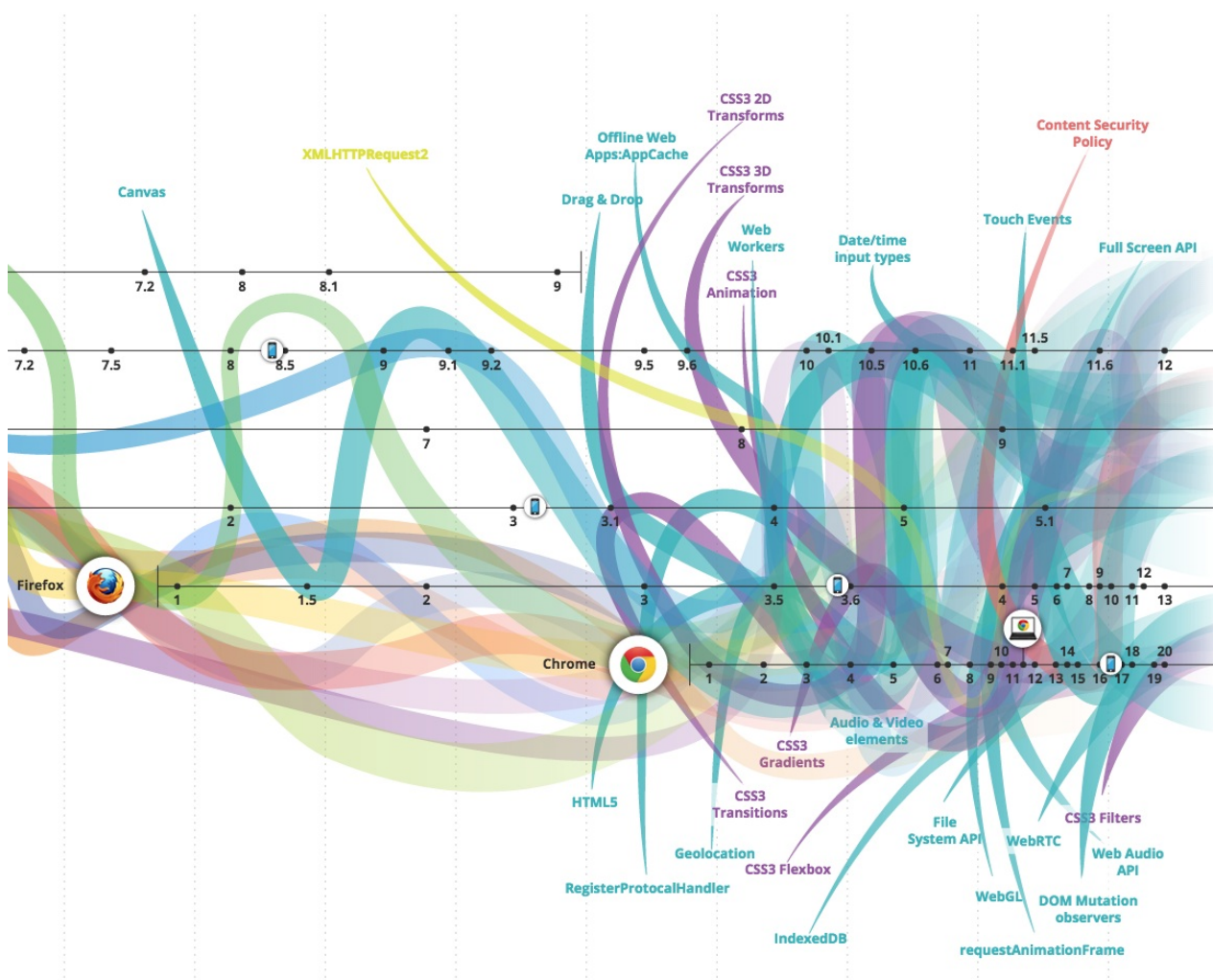


Image source: <http://www.evolutionoftheweb.com/>

You should be aware of and learn, where appropriate, web/browser APIs. A good tool to use to familiarize oneself with all of these APIs would be to investigate the [HTML5test.com](http://HTML5test.com) results for the 5 most current browsers.

**Learn:**

- [Dive Into HTML5](#) [read]
- [Pro HTML5 Programming](#) [read]

**Learn Audio:**

- [Add Sound to Your Site With Web Audio](#) [watch]
- [Fun With Web Audio](#) [watch]
- [HTML5 Canvas](#) [read]

**Learn Canvas:**

- [Web Audio API](#) [read]

Additionally, MDN has a great deal of information about web/browser APIs.

- [MDN Web API Reference](#)
- [MDN Web APIs Interface Reference - All Interfaces, Arranged Alphabetically](#)
- [MDN WebAPI - Lists Device Access APIs and Other APIs Useful for Applications](#)

Keep in mind that not every API is specified by the W3C or WHATWG.

In addition to MDN, you might find the following resources helpful:

- [The HTML 5 JavaScript API Index](#)
- [HTML5 Overview](#)
- [platform.html5.org](http://platform.html5.org)

# Learn JSON (JavaScript Object Notation)

JSON, (canonically pronounced sometimes JavaScript Object Notation), is an open standard format that uses human-readable text to transmit data objects consisting of attribute–value pairs. It is the primary data format used for asynchronous browser/server communication (AJAJ), largely replacing XML (used by AJAX).

Although originally derived from the JavaScript scripting language, JSON is a language-independent data format. Code for parsing and generating JSON data is readily available in many programming languages.

The JSON format was originally specified by Douglas Crockford. It is currently described by two competing standards, RFC 7159 and ECMA-404. The ECMA standard is minimal, describing only the allowed grammar syntax, whereas the RFC also provides some semantic and security considerations. The official Internet media type for JSON is application/json. The JSON filename extension is .json.

— [Wikipedia](#)

## General Learning:

- [Introduction to JavaScript Object Notation: A To-the-Point Guide to JSON](#) [read][\$]
- [json.com](#) [read]
- [What is JSON](#) [watch]

## References/Docs:

- [json.org](#) [read]

## Standards/Specifications:

- [ECMA-404 The JSON Data Interchange Format](#)
- [RFC 7159 The JavaScript Object Notation \(JSON\) Data Interchange Format](#)

## Architecting:

- [JSON API](#)

# Learn JS Templates

A JavaScript template is typically used, but not always with a [MV\\*](#) solution to separate parts of the view (i.e., the UI) from the logic and model (i.e., the data or JSON).

Note that JavaScript 2015 (aka ES6) has a native templating mechanism called "[Templates strings](#)".

- [Instant Handlebars.js](#) [read][\$]
- [JavaScript Templating with Handlebars](#) [watch][\$]
- [Learn Handlebars in 10 Minutes or Less](#) [read]

# Learn Static Site Generators

Static site generators, typically written using server side code (i.e., ruby, php, python, nodeJS, etc.), produces static HTML files from static text/data + templates that is indenting to be sent from a server to the client statically without a dynamic nature.

## General Learning:

- [Static Site Generators](#) [read]

# Learn Front-End Application Architecture

- [Build an App with React and Ampersand](#) [watch][ $\$$ ]
- [Building Modern Single-Page Web Applications](#) [watch][ $\$$ ]
- [Eloquent JavaScript: Modules](#) [read]
- [A Field Guide to Static Apps](#) [read]
- [Field Guide to Web Applications](#) [read]
- [Frontend Guidelines Questionnaire](#) [read]
- [Human JavaScript](#) [read]
- [JavaScript Application Design](#) [read][ $\$$ ]
- [Nicholas Zakas: Scalable JavaScript Application Architecture](#) [watch]
- [Organizing JavaScript Functionality](#) [watch][ $\$$ ]
- [Patterns for Large-Scale JavaScript Application Architecture](#) [read]
- [Programming JavaScript Applications](#) [read]
- [Terrific](#) [read]
- [UI Architecture](#) [watch][ $\$$ ]
- [Web UI Architecture](#) [watch][ $\$$ ]



# Learn Interface/API Design

## Data (Most Likely JSON) APIs

- [Build APIs You Won't Hate](#) [\$][read]
- [JSON API](#) [read]

## JavaScript APIs

- [Designing Better JavaScript APIs](#) [read]
- [Writing JavaScript APIs](#) [read]

# Learn Web Developer Tools

Web development tools allow web developers to test and debug their code. They are different from website builders and IDEs in that they do not assist in the direct creation of a webpage, rather they are tools used for testing the user facing interface of a website or web application.

Web development tools come as browser add-ons or built in features in web browsers. The most popular web browsers today like, Google Chrome, Firefox, Opera, Internet Explorer, and Safari have built in tools to help web developers, and many additional add-ons can be found in their respective plugin download centers.

Web development tools allow developers to work with a variety of web technologies, including HTML, CSS, the DOM, JavaScript, and other components that are handled by the web browser. Due to the increasing demand from web browsers to do more popular web browsers have included more features geared for developers.

— [Wikipedia](#)

While most browsers come equipped with web developer tools, the [Chrome developer tools](#) are currently the most talked about and widely used tools available.

I'd suggest learning and using the [Chrome web developer tools](#), simply because the best resources for learning web developer tools revolves around Chrome DevTools.

## Learn Chrome Web Developer Tools

- [Chrome Developer Tools](#) [watch][\$]
- [Explore and Master Chrome DevTools](#)
- [Using The Chrome Developer Tools](#) [watch][\$]

## Chrome Web Developer Tools Docs:

- [Command Line API Reference](#)
- [Keyboard & UI Shortcuts Reference](#)
- [Per-Panel Documentation](#)
- [Settings](#)

## News/Newsletters/Podcasts/Tips:

- [Dev Tips](#)



# Learn Command Line

A command-line interface or command language interpreter (CLI), also known as command-line user interface, console user interface, and character user interface (CUI), is a means of interacting with a computer program where the user (or client) issues commands to the program in the form of successive lines of text (command lines).

— [Wikipedia](#)

## General Learning:

- [The Bash Guide](#) [read]
- [Codecademy: Learn the Command Line](#) [watch]
- [The Command Line Crash Course](#) [read]
- [Command Line Power User](#) [watch]
- [Learn Enough Command Line to Be Dangerous](#) [read] [free to \$]
- [Meet the Command Line](#) [watch][\$]

## Mastering:

- [Advanced Command Line Techniques](#) [watch][\$]

# Learn Node.js

Node.js is an open-source, cross-platform runtime environment for developing server-side web applications. Node.js applications are written in JavaScript and can be run within the Node.js runtime on OS X, Microsoft Windows, Linux, FreeBSD, NonStop,[3] IBM AIX, IBM System z and IBM i. Its work is hosted and supported by the Node.js Foundation,[4] a collaborative project at Linux Foundation.[5]

Node.js provides an event-driven architecture and a non-blocking I/O API designed to optimize an application's throughput and scalability for real-time web applications. It uses Google V8 JavaScript engine to execute code, and a large percentage of the basic modules are written in JavaScript. Node.js contains a built-in library to allow applications to act as a web server without software such as Apache HTTP Server, Nginx or IIS.

— [Wikipedia](#)

## General Learning:

- [The Art of Node](#) [read]
- [Introduction to Node.js](#) [watch][\$]
- [Introduction to Node.js from Evented Mind](#) [watch][\$]
- [io.js and Node.js Next: Getting Started](#) [watch][\$]
- [Learn all the nodes](#) [watch]
- [The Node Beginner Book](#) [read][\$]
- [Nodeschool.io](#) [code]
- [Node.js Basics](#) [watch][\$]
- [Node.js in Practice](#) [read][\$]
- [Real-Time Web with Node.js](#) [watch][\$]

# Learn Module Loading and Dependency Management

## General Learning:

- [browserify-handbook](#) [read]
- [Choose ES6 modules Today!](#) [read]
- [Creating JavaScript Modules with Browserify](#) [watch][\$]
- [Start your own JavaScript library using webpack and ES6](#)
- [Webpack Fundamentals](#) [watch][\$]

## References/Docs:

- [browserify](#)
- [system.js](#)
- [webpack](#)

# Learn Package Manager

A package manager or package management system is a collection of software tools that automates the process of installing, upgrading, configuring, and removing software packages for a computer's operating system in a consistent manner. It typically maintains a database of software dependencies and version information to prevent software mismatches and missing prerequisites.

— [Wikipedia](#)

## General Learning:

- [Bower Fundamentals](#) [watch][\$]
- [The Mystical & Magical SemVer Ranges Used By npm & Bower](#) [read]
- [npm Basics](#) [watch][\$]
- [The npm Book](#) [read]
- [Package Managers: An Introductory Guide For The Uninitiated Front-End Developer](#) [read]
- [Up and Running with NPM, the Node Package Manager](#) [watch][\$]

## References/Docs:

- [bower](#)
- [jspm.io](#)
- [npm](#)

# Learn Version Control

A component of software configuration management, version control, also known as revision control or source control, is the management of changes to documents, computer programs, large web sites, and other collections of information. Changes are usually identified by a number or letter code, termed the "revision number," "revision level," or simply "revision." For example, an initial set of files is "revision 1." When the first change is made, the resulting set is "revision 2," and so on. Each revision is associated with a timestamp and the person making the change. Revisions can be compared, restored, and with some types of files, merged.

— [Wikipedia](#)

The current modern solution for version control is [Git](#). Learn it!

## General Learning:

- [codeschool.com](#) [interact]
- [Getting Git Right](#) [read]
- [Git Fundamentals](#) [watch][\$]
- [Pro Git](#) [read]
- [Ry's Git Tutorial](#) [read]

## Mastering:

- [Advanced Git Tutorials](#) [read]
- [Pro Git](#) [read]
- [Learn Git Branching](#) [interact]

## References/Docs:

- <https://git-scm.com/doc>



# Learn Build and Task Automation

Build automation is the process of automating the creation of a software build and the associated processes including: compiling computer source code into binary code, packaging binary code, and running automated tests.

— [Wikipedia](#)

## General Learning:

- [Getting Started with Gulp](#) [read][\$]
- [Gulp Basics](#) [watch][\$]
- [JavaScript Build Automation With Gulp.js](#) [watch][\$]
- [Learning Gulp - Getting Started with the Front End Factory](#) [read]
- [Rapid Gulp](#) [watch][\$]
- [Using npm as a Task Runner](#) [watch][\$]

## References/Docs:

- [Gulp](#)

Gulp is great. However, you might only need `npm run`. Before turning to additional complexity in your application stack ask yourself if `npm run` can do the job. If you need more, use both.

Read:

- [Build Tools vs npm Scripts: Why Not Both?](#)
- [Give Grunt the Boot! A Guide to Using npm as a Build Tool](#)
- [How to Use npm as a Build Tool](#)
- [Task Automation with npm Run](#)
- [Using npm as a Build System for Your next Project](#)

# Learn Site Performance Optimization

Web performance optimization, WPO, or website optimization is the field of knowledge about increasing the speed in which web pages are downloaded and displayed on the user's web browser. With the average internet speed increasing globally, it is fitting for website administrators and webmasters to consider the time it takes for websites to render for the visitor.

— [Wikipedia](#)

## General Learning:

- [Browser Rendering Optimization](#) [watch]
- [Even Faster Web Sites: Performance Best Practices for Web Developers](#) [read][\$]
- [High Performance Web Sites: Essential Knowledge for Front-End Engineers](#) [read][\$]
- [JavaScript Performance Rocks](#) [read]
- [PageSpeed Insights Rules](#) [read]
- [Performance Calendar](#) [read]
- [perf.rocks](#)
- [Using WebPageTest](#) [read][\$]
- [Web Performance Daybook Volume 2](#) [read][\$]
- [Web Performance: The Definitive Guide](#) [read]
- [Website Performance](#) [watch][\$]
- [Website Performance Optimization](#) [watch]

# Learn JS Testing

**Unit Testing** - In computer programming, unit testing is a software testing method by which individual units of source code, sets of one or more computer program modules together with associated control data, usage procedures, and operating procedures, are tested to determine whether they are fit for use. Intuitively, one can view a unit as the smallest testable part of an application.

— [Wikipedia](#)

**Functional Testing** - Functional testing is a quality assurance (QA) process and a type of black box testing that bases its test cases on the specifications of the software component under test. Functions are tested by feeding them input and examining the output, and internal program structure is rarely considered (not like in white-box testing). Functional testing usually describes what the system does.

— [Wikipedia](#)

**Integration Testing** - Integration testing (sometimes called integration and testing, abbreviated I&T) is the phase in software testing in which individual software modules are combined and tested as a group. It occurs after unit testing and before validation testing. Integration testing takes as its input modules that have been unit tested, groups them in larger aggregates, applies tests defined in an integration test plan to those aggregates, and delivers as its output the integrated system ready for system testing.

— [Wikipedia](#)

## General Learning:

- [Front-End First: Testing and Prototyping JavaScript Apps](#) [watch][[\\$](#)]
- [Let's Code: Test-Driven JavaScript](#) [watch][[\\$](#)]
- [JavaScript Testing Recipes](#) [read][[\\$](#)]
- [Testable JavaScript](#) [read][[\\$](#)]
- [Test-Driven JavaScript Development](#) [read][[\\$](#)]

# Learn Headless Browsers

A headless browser is a web browser without a graphical user interface.

Headless browsers provide automated control of a web page in an environment similar to popular web browsers, but are executed via a command line interface or using network communication. They are particularly useful for testing web pages as they are able to render and understand HTML the same way a browser would, including styling elements such as page layout, color, font selection and execution of JavaScript and AJAX which are usually not available when using other testing methods. Google stated in 2009 that using a headless browser could help their search engine index content from websites that use AJAX.

— [Wikipedia](#)

- [Getting Started with PhantomJS](#) [read][[\\$](#)]
- [PhantomJS Cookbook](#) [read][[\\$](#)]
- [PhantomJS for Web Automation](#) [watch]
- [Rapid PhantomJS](#) [watch][[\\$](#)]

# Learn Offline Development

Offline development (aka offline first) is an area of knowledge and discussion around development practices for devices that are not always connected to the Internet or a power source.

## General Learning:

- [Creating HTML5 Offline Web Applications](#) [read]
- [Everything You Need to Know to Create Offline-First Web Apps](#) [read]
- [Offline First](#) [read]
- [offlinefirst.org](#) [read]
- [Your First Offline Web App](#) [read]

# Learn Security

- [Browser Security Handbook](#) [read]
- [Frontend Security](#) [watch]
- [HTML5 Security Cheatsheet](#) [read]
- [Security for Web Developers: Using JavaScript, HTML, and CSS](#) [read][\$]
- [The Tangled Web: A Guide to Securing Modern Web Applications](#) [read][\$]
- [Web Security Basics](#) [read]

## Learn Multi-Thing Development



Image source: <http://bradfrost.com/blog/post/this-is-the-web/>

A site or application can run on a wide range of computers, laptops, tablets and phones, as well as a handful of other things (watches, thermostats, fridges, etc.). How you determine what things you'll support and how you will develop to support those things is called a multi-

thing development strategy. Below, I list the most common multi-thing development strategies.

- Build a [responsive \(RWD\)](#) web site/app for all things.
- Build a [RESS \(responsive web design with server-side components\)](#) web site/app for all things.
- Build an [adaptive/progressively](#) enhanced web site/app for all things.
- Build a website, web app, native app, or hybrid-native app for each individual thing or a grouping of things.
- Attempt to retrofit something you have already built using bits and parts from strategies 1, 2 or 3. This could be as simple as sprinkling in some screen-size agnostic UI parts or attempting to fully support other things with the entire UI.

### General Learning:

- [Adaptive Web Design](#) [read][\$]
- [Designing Multi-Device Experiences: An Ecosystem Approach to User Experiences across Devices](#) [read][\$]
- [Designing with Progressive Enhancement](#) [read][\$]
- [Mobile Web Development](#) [watch]
- [Responsive HTML Email Design](#) [watch][\$]
- [Responsive Images](#) [watch]
- [Responsive Typography](#) [watch][\$]
- [Responsive Web Design](#) [watch][\$]
- [Responsive Web Design Fundamentals](#) [watch]



# Directed Learning

This section focuses on directed learning via schools, courses, programs and bootcamps.

## Directed Learning

The table below contains instructor led, paid, front-end courses, programs, schools, and bootcamps.

If you can't afford a directed education, a self directed education using screencasts, books, and articles is a viable alternative to learn front-end development for the self-driven individual.

company	course	price	on site	remote
Austin Coding Academy	<a href="#">The Front End Track</a>	2,490 per session	Austin, TX	
Betamore	<a href="#">Front-end Web Development</a>	8,500	Baltimore, MD	
BLOC	<a href="#">Become a Frontend Developer</a>	4,999		yes
Codeup	<a href="#">Night Front-End Bootcamp</a>	8,500	San Antonio, Texas	
Codify Academy	<a href="#">Front-end Web Development</a>	4,000	multiple locations	
DecodeMTL	<a href="#">Learn Front-end Web Development</a>	2,500	Montreal, QC	
The Flatiron School	<a href="#">Introduction to Front-End Web Development</a>	3,500	New York, NY	
General Assembly	<a href="#">Frontend Web Development</a>	3,500	multiple locations	
HackerYou	<a href="#">Front-end Web Development Immersive</a>	7,000 - 7,910	Toronto, Canada	
Iron Yard	<a href="#">Front End Engineering</a>	12,000	multiple locations	
LearningFuze	<a href="#">Part-Time Front-End Development Course</a>	2,500	Irvine, CA	
The New York Code + Design Academy	<a href="#">Front End 101</a>	2,000	New York, NY	
Portland Code School	<a href="#">Advanced Front-end Developer Tools</a>	2,000	Portland, OR	
Thinkful	<a href="#">Frontend Web Development</a>	300 per month		yes
Udacity	<a href="#">Front-End Web Developer Nanodegree</a>	200 monthly	multiple locations	yes

# Front-End Developers to Learn From

The notion that you should follow an individual to learn about front-end development is slowly becoming pointless. The advanced practitioners of front-end development generate enough content that you can simply follow the community/leaders by paying attention to the front-end "news" outlets (via Newsletters, News outlet, & Podcasts).

# Front-End Newsletters, News Sites, & Podcasts

## General Front-End Newsletters, News, & Podcasts:

- [The Big Web Show](#)
- [Fresh Brewed Frontend](#)
- [Front-End Dev Weekly](#)
- [Front-End News in 5 Minutes](#)
- [frontendfront.com](#)
- [Mobile Web Weekly](#)
- [Open Web Platform Daily Digest](#)
- [O'Reilly Web Platform Radar](#)
- [shoptalkshow.com](#)
- [TTL](#)
- [Viewsources](#)
- [The Web Ahead](#)
- [Web Components Weekly](#)
- [Web Design Weekly](#)
- [The Web Platform Podcast](#)
- [webtoolsweekly.com](#)

## HTML/CSS Newsletters:

- [CSS Weekly](#)
- [HTML 5 Weekly](#)

## JavaScript Newsletters, News, & Podcasts:

- [Echo JS](#)
- [FiveJS](#)
- [JavaScript Jabber](#)
- [JavaScript Kicks](#)
- [JavaScript Live](#)
- [JavaScript Weekly](#)
- [JavaScript.com](#)

## Graphic and Animation Newsletters and Podcasts

- [Motion and Meaning](#)

- [Responsive Images Community Group Newsletter](#)
- [SVG Immersion Podcast](#)
- [Web Animation Weekly](#)

## Part III: Tools

Part three briefly explains and identifies tools of the trade.

Make sure you understanding the category that a set of tools falls within, before studying the tools themselves.

Note that just because a tool is listed, or a category of tools is documented, this does not equate to an assertion on my part that a front-end developer should learn it and use it.

Choose your own toolbox. I'm just providing the common toolbox options.

### THE FRONT-END SPECTRUM

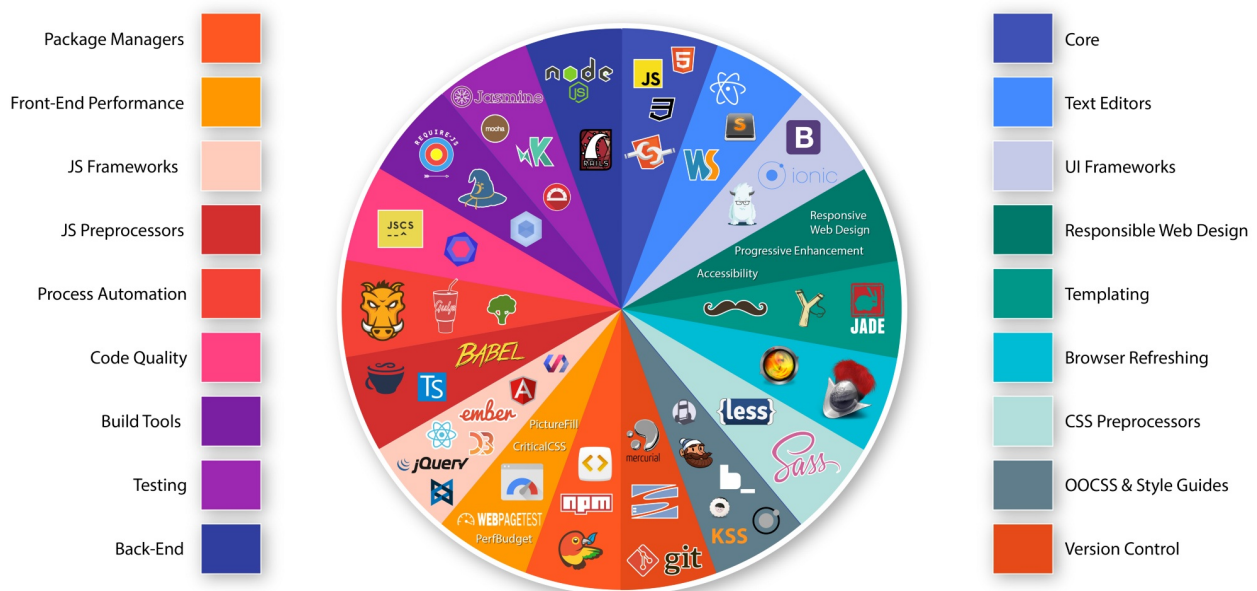


Image source: <https://medium.com/@withinsight1/the-front-end-spectrum-c0f30998c9f0>

# General Front-End Development Tools

## Development Tools:

- [Browsersync](#)
- [CodeKit](#)
- [ish. 2.0.](#)
- [placeholder.it](#)
- [Prepros](#)
- [screensiz.es](#)
- [Wraith](#)

## Online Code Editors:

- [CodePen](#)
- [es6fiddle.net](#)
- [JS Bin](#)
- [JSFiddle](#)
- [Liveweave](#)
- [Plunker](#)

## Tools for Finding Tools:

- [built with](#)
- [javascripting.com](#)
- [microjs.com](#)
- [stackshare.io](#)
- [stylesheets.co](#)
- [The Toolbox](#)
- [Unheap](#)



# Doc/API Browsing Tools

Tools to browser common developer documents and developer API references.

- [Dash](#) [OS X, iOS][\$]
- [DevDocs](#)
- [Velocity](#) [Windows][\$]
- [Zeal](#) [Windows, Linux]

# SEO Tools

- [Keyword Tool](#)
- [Google Webmasters Search Console](#)
- [Varvy SEO tool](#)

# Prototyping & Wireframing Tools

## Creating:

- [Balsamiq Mockups](#) [\$]
- [Justinmind](#) [\$]
- [UXPin](#) [free to \$]

## Collaboration / Presenting:

- [InVision](#) [free to \$]
- [Conceptboard](#) [free to \$]
- [myBalsamiq](#) [\$]

# Diagramming Tools

- [draw.io](#) [free to \$]
- [Cacoo](#) [free to \$]
- [gliffy](#) [free to \$]

# HTTP/Network Tools

- [Charles](#) [\$]
- [Chrome DevTools Network Panel](#)
- [Fiddler](#)
- [Postman](#)

# Learn Code Editors

A source code editor is a text editor program designed specifically for editing source code of computer programs by programmers. It may be a standalone application or it may be built into an integrated development environment (IDE) or web browser. Source code editors are the most fundamental programming tool, as the fundamental job of programmers is to write and edit source code.

— [Wikipedia](#)

Front-end code can minimally be edited with a simple text editing application like Notepad or TextEdit. But, most front-end practitioners use a code editor specifically design for editing a programming language.

Code editors come in all sorts of types and size, so to speak. Selecting one is a rather subjective engagement. Choose one, learn it inside and out, then get on to learning HTML, CSS, DOM, and JavaScript.

However, I do strongly believe, minimally, a code editor should have the following qualities (by default or by way of plugins):

1. Good documentation on how to use the editor
2. Report (i.e., hinting/linting/errors) on the code quality of HTML, CSS, and JavaScript.
3. Offer syntax highlighting for HTML, CSS, and JavaScript.
4. Offer code completion for HTML, CSS, and JavaScript.
5. Be customizable by way of a plug-in architecture
6. Have available a large repository of third-party/community plug-ins that can be used to customize the editor to your liking
7. Be small, simple, and not coupled to the code (i.e., not required to edit the code)

I personally use and recommend [Sublime Text](#) with the following plug-ins.

- [AutoFileName](#)
- [BracketHighlighter](#)
- [Color Highlighter](#)
- [CSS3](#)
- [HTMLAttributes](#)
- [HTML-CSS-JS Prettify](#)
- [Package Control](#)
- [SideBarEnhancements](#)
- [StringEncode](#)

- [SublimeLinter](#)
  - [SublimeLinter-json](#)
  - [SublimeLinter-jshint](#)
  - [SublimeLinter-html-tidy](#)
- [Terminal](#)

Here are some resources for learning Sublime:

- [Perfect Workflow in Sublime Text 2](#) [watch][requires login, but free]
- [Sublime Productivity](#) [read][\$]
- [Sublime Text 3 From Scratch](#) [watch][\$]
- [Sublime Text Power User Book](#) [read + watch][\$]

### Code Editors:

- [Atom](#)
- [Brackets](#)
- [Sublime Text](#) [\$]
- [WebStorm](#) [\$]
- [Visual Studio Code](#)

### Online Code Editors:

- [Cloud9](#) [free to \$]
- [Codeanywhere](#) [free to \$]
- [Koding](#) [free to \$]

### Sharable/Runnable Code Editors:

Used to share limited amounts of immediately runnable code. Not a true code editor but a tool that can be used to small amounts of immediately runnable code in a web browser.

- [CodePen](#) [free to \$]
- [es6fiddle.net](#)
- [jsbin.com](#) [free to \$]
- [jsfiddle.net](#)
- [liveweave.com](#)
- [Plunker](#)

# Browser Tools

## JS Browser Coding Utilities:

- [History.js](#)
- [html2canvas](#)
- [Platform.js](#)
- [URI.js](#)

## General Reference Tools to Determine If X Browser Supports X:

- [Big JS-Compatibility-Table](#)
- [Browser support for broken/missing images](#)
- [Browserscope](#)
- [caniuse.com](#)
- [Firefox Platform Status - Implementation & standardization roadmap for web platform features](#)
- [HTML5 Please](#)
- [HTML5 Test](#)
- [iwanttouse.com/](#)
- [jscs.info](#)
- [Platform Status](#)
- [webbrowsercompatibility.com](#)
- [whatwebcando.today](#)

## Browser Development/Debug Tools:

- [Chrome Developer Tools \(aka DevTools\)](#)
  - [Per-Panel Documentation](#)
  - [Command Line API Reference](#)
  - [Keyboard & UI Shortcuts Reference](#)
  - [Settings](#)
- [Firefox Developer Tools](#)
- [IE Developer tools \(aka F12 tools\)](#)
- [Opera Dragonfly](#)
- [Safari Web Inspector](#)
- [Vorlon.js](#)

## Synchronized Browser Tools:

- [Browsersync](#)



### **Browser Coding Tools to Determine If X Browser Supports X:**

- [ES Feature Tests](#)
- [Feature.js](#)
- [Modernizr](#)

### **Broad Browser Polyfills/Shims:**

- [console-polyfill](#)
- [HTML5 Cross Browser Polyfills](#)
- [socket.io](#)
- [SockJS](#)
- [webcomponents.js](#)
- [webshim](#)

### **Browser Hosted Testing/Automation:**

- [Browserling](#) [\$]
- [BrowserStack](#) [\$]
- [CrossBrowserTesting.com](#) [\$]
- [Sauce Labs](#) [\$]
- [Selenium](#)

### **Headless Browsers:**

- [PhantomJS](#)
- [slimerjs](#)
- [TrifleJS](#)

### **Headless Browser Automation:**

Used for functional testing and monkey testing.

- [CasperJS](#)
- [gremlins.js](#)
- [Nightmare](#)
- [NightwatchJS](#)

### **Browser Hacks:**

- [browserhacks.com](#)

# HTML Tools

## HTML Templates/Boilerplates/Starter Kits:

- [dCodes](#)
- [Email-Boilerplate](#)
- [HTML5 Boilerplate](#)
- [HTML5 Bones](#)
- [Mobile boilerplate](#)
- [Pears](#)
- [Web Starter Kit Boilerplate & Tooling for Multi-Device Development](#)

## HTML Polyfill:

- [html5shiv](#)

## Transpiling:

- [HAML](#)
- [jade](#)
- [Markdown](#)

## References:

- [Element attributes](#)
- [Elements](#)
- [HTML Arrows](#)
- [HTML Entity Lookup](#)
- [HTML Interfaces Browser Support](#)
- [HTMLelement.info](#)

## Linting/Hinting:

- [html5-lint](#)
- [HTMLHint](#)
- [html-inspector](#)

## Optimizer:

- [HTML Minifier](#)

## Online Creation/Generation/Experimentation Tools:

- [tablesgenerator.com](https://tablesgenerator.com)

### **Authoring Conventions:**

- [HTML Code Guide](#)
- [Principles of Writing Consistent, Idiomatic HTML](#)

### **Workflow:**

- [Emmet](#)

### **Trending HTML Repositories on GitHub This Month:**

<https://github.com/trending?l=html&since=monthly>

# CSS Tools

## Desktop & Mobile CSS Frameworks:

- [Base](#)
- [Bootstrap](#)
- [Concise](#)
- [Foundation](#)
- [Material Design Lite \(MDL\)](#)
- [Materialize](#)
- [Metro UI](#)
- [Pure.css](#)
- [Semantic UI](#)

## Mobile Only CSS Frameworks:

- [Ratchet](#)

## CSS Reset:

A CSS Reset (or “Reset CSS”) is a short, often compressed (minified) set of CSS rules that resets the styling of all HTML elements to a consistent baseline.

— [cssreset.com](#)

- [Eric Meyer's “Reset CSS” 2.0](#)
- [Normalize](#)

## Transpiling:

- [pleeease.io](#)
- [PostCSS & cssnext](#)
- [rework & myth](#)
- [Sass/SCSS](#)
- [Stylus](#)

## References:

- [css3test.com](#)
- [css3clickchart.com](#)
- [css4-selectors.com](#)
- [CSS TRIGGERS...A GAME OF LAYOUT, PAINT, AND COMPOSITE](#)

- [cssvalues.com](#)
- [MDN CSS Reference](#)
- [OverAPI CSS cheatsheet](#)

### **Linting/Hinting:**

- [CSS Lint](#)
- [stylelint](#)

### **Code Formatter/Beautifier:**

- [CSScomb](#)
- [CSSfmt](#)

### **Optimizer:**

- [clear-css](#)
- [cssnano](#)
- [CSSO](#)

### **Online Creation/Generation/Experimentation Tools:**

- [CSS Arrow Please](#)
- [CSS Matic](#)
- [Enjoy CSS](#)
- [Flexbox Playground](#)
- [flexplorer](#)
- [patternify.com](#)
- [patternizer.com](#)
- [Ultimate CSS Gradient Generator](#)

### **Architecting CSS:**

- [Atomic Design](#) [read]
- [OOCSS](#) [read]
- [SMACSS](#) [read][\$]

### **Authoring Conventions:**

- [CSS code guide](#) [read]
- [cssguidelin.es](#) [read]
- [Google HTML/CSS Style Guide](#)
- [Idiomatic CSS](#) [read]
- [MaintainableCSS](#) [read]

**Trending CSS Repositories on GitHub This Month:**

<https://github.com/trending?l=css&since=monthly>

# DOM Tools

## DOM Libraries/Frameworks:

- [clipboard.js](#)
- [jQuery](#)
- [Keypress](#)
- [Tether](#)
- [Zepto](#)

## DOM Performance Tools:

- [DOM Monster](#)

## References:

- [Events](#)
- [DOM Browser Support](#)
- [DOM Events Browser Support](#)
- [HTML Interfaces Browser Support](#)
- [MDN Document Object Model \(DOM\)](#)

## DOM Polyfills/Shims:

- [dom-shims](#)
- [Pointer Events Polyfill: a unified event system for the web platform](#)

## Virtual DOM:

- [jsdom](#)
- [virtual-dom](#)

# JavaScript Tools

## JS Utilities:

- [accounting.js](#)
- [async](#)
- [Chance](#)
- [format.js](#)
- [is.js](#)
- [lodash](#)
- [Math.js](#)
- [Moment.js](#)
- [Numeral.js](#)
- [string.js](#)
- [underscore.js](#)
- [wait](#)
- [xregexp.com](#)

## Transpiling (ESX to ESX):

- [Babel](#)

## JavaScript Compatibility Checker:

- [jscs.info/](#)

## Linting/Hinting:

- [eslint](#)
- [jshint](#)
- [JSLint](#)
  - [jslinterrors.com](#)

## Unit Testing:

- [Jasmine](#)
  - [Jest](#)
- [Mocha](#)
- [QUnit](#)

## Testing Assertions for Unit Testing:



- [Chai](#)
- [expect.js](#)
- [should.js](#)

#### **Test Spies, Stubs, and Mocks for Unit Testing:**

- [sinon.js](#)

#### **Code Style Linter:**

- [JSCS](#)

#### **Code Formater/Beautifier:**

- [esformatter](#)
- [js-beautify](#)
- [jsfmt](#)

#### **Performance Testing:**

- [benchmark.js](#)
- [jstperf](#)

#### **Visualization, Static Analysis, Complexity, Coverage Tools:**

- [Blanket.js](#)
- [Coveralls](#) [\$]
- [escomplex](#)
- [Esprima](#)
- [jscomplexity.org](#)
- [istanbul](#)
- [Plato](#)

#### **Optimizer:**

- [UglifyJS 2](#)

#### **Obfuscate:**

- [Javascript Obfuscator](#) [free to \$]
- [JScrambler](#) [\$]

#### **Sharable/Runnable Code Editors:**

- [es6fiddle.net](#)
- [jsbin.com](#) [free to \$]

- [jsfiddle.net](https://jsfiddle.net)

#### **Online Regular Expression Editors/Visual Tools:**

- [debuggex](https://debuggex.com/)
- [regex101](https://regex101.com/)
- [regexper](https://regexper.com/)
- [RegExr](https://regexr.com/)

#### **Authoring Conventions:**

- [Airbnb JavaScript Style Guide](https://airbnb.io/javascript/style/)
- [Khan JavaScript Style Guide](https://khan.github.io/javascript-style-guide/)
- [Principles of Writing Consistent, Idiomatic JavaScript](https://dmitrybaranovskiy.github.io/idiomatic-javascript/)

#### **Trending JS Repositories on GitHub This Month:**

<https://github.com/trending?l=javascript&since=monthly>

#### **Most Depended upon Packages on NPM:**

<https://www.npmjs.com/browse/depended>

# Static Site Generators Tools

## JS Site Generators:

- [Harp](#)
- [Metalsmith](#)

## JS Blog Site Generators:

- [Hexo](#)
- [HubPress](#)

## Site Generator Listings:

- [staticgen.com](#)
- [staticsitegenerators.net](#)

# App (Desktop, Mobile, Tablet, etc.) Tools

## Front-End App Frameworks:

- [AngularJS](#) & [Batarang](#)
- [Aurelia](#)
- [Backbone](#) & [Marionette](#)
- [Ember](#) & [Ember Inspector](#)
- [Polymer](#) & [Iron Elements](#) & [Paper Elements](#)
- [React](#) & [React-router](#) & [Flux](#) & [React Developer Tools](#)
- [Vue.js](#) & [vue-loader](#) & [vue-router](#)

## Full-Stack JS App Platforms:

- [Hoodie](#)
- [MEAN](#) (i.e., MongoDB, Express, AngularJS, and Node.js.)
- [Meteor](#)

## Mobile Web UI/Site/App Frameworks

These solutions can be used anywhere including in a WebView (i.e., web platform and browser engine) app:

- [Framework7](#)
- [Kendo UI Mobile](#)
- [Mobile Angular UI](#)
- [Ratchet](#)

## Native Hybrid Mobile WebView (i.e., Browser Engine Driven) Frameworks:

These solutions typically use [Cordova](#), [crosswalk](#), or a custom WebView as a bridge to native APIs.

- [ionic](#)
- [onsen.io](#)

## Native Hybrid Mobile Development Webview (i.e., Browser Engine Driven) Environments/Platforms/Tools:

These solutions typically use [Cordova](#), [crosswalk](#), or a custom WebView as a bridge to native APIs.

- [Adobe PhoneGap](#) [\$]

- [AppBuilder](#) [\$]
- [cocoon.io](#) [free to \$]
- [ionic hub](#) [free to \$]
- [kony](#) [\$]
- [manifoldJS](#)
- [Monaca](#) [\$]
- [Taco](#)

### **Native Desktop WebView (i.e., Browser Engine Driven) App Frameworks:**

- [Electron](#)
- [NW.js](#)

### **Native Mobile App Frameworks (Aka JavaScript Native Apps)**

These solutions use a JS engine at runtime to interpret JS and bridge that to native APIs. No browser engine or WebView is used. The UI is constructed from native UI components.

- [NativeScript](#)
- [React Native](#)
- [tabris.js](#) [free to \$]
- [trigger.io](#) [\$]

### **References:**

- [todomvc.com](#)
- [Frontend Guidelines Questionnaire](#)

### **App Seeds/Starters/Boilerplates:**

- [Angular 2 Webpack Starter](#)
- [Ember starter-kit](#)
- [NG6-starter](#)
- [hjs-webpack](#)
- [React Starter Kit](#)

# Scaffolding Tools

Client side Scaffolding is concerned with generating a starter template for the application as a whole, rather than [generating code to access a database](#).

- [Slush](#)
- [Yeoman](#)

# Templating Tools

## Just Templating:

- [doT.js](#)
- [Handlebars](#)
  - [htmlbars](#)
- [Hogan.js](#)
- [Mustache.js](#)
- [Nunjucks](#)
- [Transparency](#)

## Templating and Reactive Data Binding:

- [jquerymy.js](#)
- [knockout](#)
- [paperclip.js](#)
- [ractive.js](#)
- [react.js](#)
- [riot](#)
- [Rivets.js](#)
- [RxJS](#)
- [vue.js](#)

## Templating to Virtual DOM:

- [JSX](#)
- [t7](#)

# UI Widgets & Components Tools

## Desktop & Mobile:

- [Bootstrap](#)
- [Kendo UI](#) [free to \$]
- [Material ui](#)
- [Materialize](#)
- [Metro UI](#)
- [Office UI Fabric](#)
- [Polymer Paper Elements](#)
- [Semantic UI](#)
- [Webix](#) [\$]

## Desktop (NW.js and Electron):

- [Photon](#)
- [React UI Components for OS X El Capitan and Windows 10](#)

## Mobile Focused:

- [Framework7](#)
- [Kendo UI Mobile](#)
- [Mobile Angular UI](#)
- [Ratchet](#)



# Data Visualization (e.g., Charts) Tools

## JS Libraries:

- [d3](#)
- [sigma.js](#)

## Widgets & Components:

- [amCharts](#) [\$]
- [C3.js](#)
- [Chartist.js](#)
- [Chart.js](#)
- [Epoch](#)
- [FusionCharts](#) [\$]
- [Google Charts](#)
- [Highcharts](#) [Non-commercial free to \$]
- [ZingChart](#) [free to \$]

## Services:

- [ChartBlocks](#) [free to \$]
- [Datawrapper](#)
- [infogr.am](#) [free to \$]
- [plotly](#) [free to \$]

# Graphics (e.g., SVG, canvas, webgl) Tools

## General:

- [Fabric.js](#)
- [Two.js](#)

## Canvas:

- [EaselJS](#)
- [Paper.js](#)

## SVG:

- [d3](#)
- [Raphaël](#)
- [Snap.svg](#)
- [svg.js](#)

## WebGL:

- [pixi.js](#)
- [three.js](#)

# Animation Tools

- [Dynamics.js](#)
- [GreenSock-JS](#)
- [snabbt.js](#)
- [TweenJS](#)
- [Velocity.js](#)

## **Polyfills/Shims:**

- [web-animations-js](#)

# JSON Tools

## Online Editors:

- [JSONmate](#)

## Query Tools:

- [DefiantJS](#)
- [JSON Mask](#)
- [ObjectPath](#)

## Generating Mock JSON Tools:

- [JSON Generator](#)
- [Mockaroo](#)

## Online JSON Mocking API Tools:

- [FillText.com](#)
- [JSONPlaceholder](#)
- [mockable.io](#)
- [Mocky](#)

## Local JSON Mocking API Tools:

- [json-server](#)

## JSON Specifications/Schemas:

- [json-schema.org](#) & [jsonschema.net](#)
- [{json:api}](#)

# Testing Framework Tools

- [Intern](#)
- [Karma](#)
- [NightWatch.js](#)

## Front-End Data Storage Tools

- [AlaSQL](#)
- [Dexie.js](#)
- [ForerunnerDB](#)
- [localForage](#)
- [LokiJS](#)
- [Lovefield](#)
- [Pouchdb](#)
- [YDN-DB](#)

# Module/Package Loading Tools

- [Browserify](#)
- [Rollup](#)
- [SystemJS](#)
- [webpack](#)

## Module/Package Pepository Tools

- [Bower](#)
- [jspm.io](#)
- [NPM](#)
- [spmjs](#)



# Web/Cloud/Static Hosting Tools

- [AWS](#) [\$]
- [DigitalOcean](#) [\$]
- [DIVSHOT](#) [free to \$]
- [Heroku](#) [free to \$]
- [Modulus](#) [\$]
- [netlify](#) [free to \$]
- [Surge](#) [free to \$]

# Project Management & Code Hosting Tools

- [Assembla](#) [free to \$]
- [Bitbucket](#) [free to \$]
- [Codebase](#) [\$]
- [Github](#) [free to \$]
- [Unfuddle](#) [\$]

# Collaboration & Communication Tools

- [Google Hangouts](#)
- [Skype](#) [free to \$]
- [Slack](#) & [screenhero](#) [free to \$]

## Code/GitHub Collaboration & Communication:

- [Gitter](#) [free to \$]

# Content Management Hosted/API Tools

## API CMS (i.e., Content Delivery CMS) Tools:

- [Contentful](#) [\$]
- [Cosmic JS](#) [free to \$]
- [prismic.io](#) [free to \$]

## Hosted CMS Tools:

- [Cushy CMS](#) [free to \$]
- [LightCMS](#) [\$]
- [Page Lime](#) [\$]
- [Surreal CMS](#) [\$]

## Static CMS Tools:

- [webhook.com](#)

# Back-end as a service (aka BAAS) tools for front-end developers

## Data/back-end management as a service:

- [Back&](#) [free to \$]
- [Firebase](#) [free to \$]
- [Kinvey](#) [free'ish to \$]
- [Pusher](#) [free to \$]

## User Management as a Service:

- [Auth0](#) [\$]
- [Hull](#) [\$]
- [UserApp](#) [free to \$]

# Offline Tools

- [Hoodie](#)
- [Offline.js](#)
- [PouchDB](#)
- [upup](#)

# Security Tools

## Coding Tool:

- [DOMPurify](#)
- [XSS](#)

## References:

- [HTML5 Security Cheatsheet](#)

# Tasking (aka Build) Tools

## Tasking/Build Tools:

- [Grunt](#)
- [Gulp](#)

## Tasking/Build and More Tools:

- [Brunch](#)
- [Mimosa](#)



# Deployment Tools

- [Bamboo](#) [\$]
- [Codeship](#) [free to \$]
- [FTPLOY](#) [free to \$]
- [Travis CI](#) [free to \$]
- [Springloops](#) [free to \$]
- [Surge](#)
- [Sync Ninja](#)

# Site/App Monitoring Tools

## Uptime:

- [Pingdom](#) [free to \$]
- [Uptime Robot](#)
- [Uptrends](#) [\$]

## General:

- [New Relic](#)

# JavaScript Error Reporting/Monitoring

- [errorception](#) [\$]
- [Raygun](#) [\$]
- [Sentry](#) [free to \$]
- [TrackJS](#) [\$]

# Performance Tools

## Reporting:

- [Chrome Devtools Timeline](#)
- [GTmetrix](#)
- [sitespeed.io](#)
- [Speed Curve \[\\$\]](#)
- [Web Page Test](#)
- [WEIGHTOF.IT](#)

## JS Tools:

- [imagemin](#)
- [ImageOptim-CLI](#)

## Budgeting:

- [performancebudget.io](#)

## References/Docs:

- [Jank Free](#)
- [Performance of ES6 features relative to the ES5](#)