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INTRODUCTION

Many tools have been developed in the past to improve existing technologies and ease the process of development, operation, and maintenance. In particular, four tools – AJAX, JQUERY, BOOTSTRAP, and ANGULAR JS have completely transformed the way in which websites are developed and networking and background processes take place. They grew quickly and now have a vast online community. It is because of their reliance and performance that even big companies like Google and Facebook have adopted these tools into their algorithms and code.

AJAX – Asynchronous JavaScript and XML

AJAX is a web development technique used to create faster and more interactive web applications with the help of XML, HTML, CSS, and JavaScript. It is used to send and retrieve data in the background without refreshing a web page. It reloads only a part of the web page- the important parts- not the entire website.

Developed By: Jesse James Garrett

Year: 2005

Filenames and Extensions: .js

Browser Support

AJAX is supported by the following browsers: Mozilla Firefox 1.0 and above, Netscape 7.1+, Apple Safari 1.2 and above, Microsoft Internet Explorer 5 and above, and Opera 7.6 and above.

Technologies Used

- HTML, XHTML, and CSS – these technologies are used for displaying content and style i.e. presentation
- DOM – used for dynamic display and interaction with data
- XML or JSON - For carrying data to and from server
- ASP or JSP – server related functions
- XMLHttpRequest - For asynchronous communication between client and server

- JavaScript - it is used to bring the above technologies together. It is used for client-side validation in a HTML form before sending the data to a server

Features

- Ajax uses XHTML for content, CSS for presentation, along with Document Object Model and JavaScript for dynamic content display.
- Conventional web applications transmit information to and from the sever using synchronous requests. It means you fill out a form, hit submit, and get directed to a new page with new information from the server.
- With AJAX, when you hit submit, JavaScript will make a request to the server, interpret the results, and update the current screen. In the purest sense, the user would never know that anything was even transmitted to the server.
- XML is commonly used as the format for receiving server data, although any format, including plain text, can be used.
- It is independent of web server software and is data-driven as opposed to page-driven.
- A user can continue to use the application while the client program requests information from the server in the background. This is how Facebook and Twitter show "5 new stories" while using the website, and this number is updated even without manually refreshing the page.
- Clicking is not required, mouse movement is a sufficient event trigger.

Applications that Use AJAX

- Gmail
- Facebook
- Twitter
- Google
- Youtube

Advantages of AJAX

- It is independent of server technology.
- Apart from obtaining the XMLHTTP object, all processing is same for all browser types, because JavaScript is used.
- It allows you to develop faster and more interactive web applications.
- AJAX based application use less server bandwidth, because there is no need to reload the complete page, only the important parts of the page.

Disadvantages of AJAX

- Possible network latency problems. People should be given feedback about the processing.
- Security is less as anyone can view the source code written for AJAX.
- The back-button problem: People think that when they press back button, they will return to the last change they made, but in AJAX this doesn't hold.
- Search engines may not be able to index all content published with AJAX.

JQUERY

JQuery is a JavaScript library that makes manipulating HTML and making AJAX requests much simpler. A library is a collection of tools that allow us to implement functionalities or effects without the need to write all the code that is really needed to do it, so JQuery is a JavaScript. Its motto is "Write Less, Do More." It is open-source and free to use. It is currently maintained by a team of developers led by Timmy Willison (with the jQuery selector engine, Sizzle, being led by Richard Gibson).

Developed By: John Resig

Year: 2006

Browser Support

jQuery 3.0 and newer versions support "current−1 versions" (meaning the current stable version of the browser and the version that preceded it) of Firefox (and ESR), Chrome, Safari, and Edge as well as Internet Explorer 9 & newer. On mobiles, it supports iOS 7 & newer and Android 4.0 & newer.

Features

- Separation of JavaScript and HTML: The jQuery library provides simple syntax for adding event handlers to the DOM using JavaScript, rather than adding HTML event attributes to call JavaScript functions. Thus, it encourages developers to completely separate JavaScript code from HTML markup.
- Brevity and clarity: jQuery promotes brevity and clarity with features like "chainable" functions and shorthand function names.
- Elimination of cross-browser incompatibilities: The JavaScript engines of different browsers differ slightly so JavaScript code that works for one browser may not work for another. Like other JavaScript toolkits, jQuery handles all these cross-browser inconsistencies and provides a consistent interface that works across different browsers.
- Extensibility: New events, elements, and methods can be easily added and then reused as a plugin.
- Easy and Lightweight: It has predefined methods using which you can perform any task easily compare to JavaScript. It is a very lightweight library - about 19KB in size (minified and zipped).
- HTML and CSS Manipulation: It has predefined CSS() method to manipulate style for any HTML elements.
- jQuery makes it easy to select DOM elements, traverse them and modify their content.
- Event handling: It supports event handling like click mouse button.
- AJAX Support: you can develop a responsive and feature-rich site using AJAX technology.
- Built-in Animation: It has a predefined method animate() for creating custom animation on web-pages.

Applications that Use JQUERY

- Google
- Microsoft
- IBM

Advantages of JQUERY

- It is independent of server technology. It reduces the load from your server and saves bandwidth.
- jQuery is flexible and fast for web development. It comes with an MIT license.
- It has an excellent online support community and is Open Source.
- It has predefined plugins that help build more reliable products and bugs are resolved quickly. Also, it has excellent integration with AJAX.

Disadvantages of JQUERY

- One of the main disadvantages of jQuery is the large number of published versions in the short time.
- It does not matter if you are running the latest version of jQuery, you will have to host the library yourself (and update it constantly), or download the library from Google (attractive, but can bring incompatibility problems with the code).
- If jQuery is improperly implemented as a framework, the development environment can get out of control.
- Not backward compatible: Each new version is not compatible with earlier versions. For example, some new version no longer supports a selector, i.e. the new jQuery retained no support for them, but simply removed them. This may affect the developers who have written code or plug-in.
- With the use of multiple plug-ins on the same page, it is easy to encounter conflicts, especially when plugins rely on the same event or selector. It is really difficult to debug and solve these problems.

BOOTSTRAP

Bootstrap is a free and open source HTML, CSS, and JavaScript framework developed by Twitter for creating responsive web applications. It is a front-end focused, free to use and share library which is used for designing websites and applications.

Bootstrap was originally named "Twitter Blueprint." In the beginning, it was just made as a framework to endorse and support consistency across internal tools. Before Bootstrap, there were several libraries that were being used for the development of interfaces. A large number of libraries caused a lot of inconsistencies. Along with the actual developer, Mark Otto and a few colleagues (several other team members from Twitter) contributed to this project in the Twitter "Hack Week." Bootstrap was then introduced as an open source project.

Developed By: Mark Otto and Team (Twitter)

Year: August 19, 2011

Browser Support

Bootstrap supports the latest, stable releases of all major browsers and platforms. On Windows, it is supported by Internet Explorer 10-11 / Microsoft Edge.

Technologies Used

Bootstrap contains a variety of design templates, which are based on and work with the following:

- HTML
- CSS
- Less (Version 3)
- Sass (Version 4)
- JavaScript Extensions (Optional)

Features

- Being easy to get started with is probably the first quality which makes Bootstrap very appealing.
- Bootstrap not only offers LESS files but also includes the old CSS files.
- Despite the fact that Bootstrap is designed in responsive 12-column grids, layouts, and components, it is also very easy to customize. Whether you need a fixed grid or a responsive one, it can be made possible by making a few changes. Offsetting and nesting of columns are also easy to do in both CPU-based and mobile-based browser grids.
- Using responsive utility classes, a particular piece of content can be made to appear or hide only on devices depending on the size of the screen being used. This feature is extremely helpful for designers who want to make a mobile and tablet-friendly version of their websites
- Scaffolding − Bootstrap provides a basic structure with grid system, link styles, and background.
- CSS − Bootstrap comes with the feature of global CSS settings, fundamental HTML elements styled and enhanced with extensible classes, and an advanced grid system.
- Components − Bootstrap contains over a dozen reusable components built to provide iconography, dropdowns, navigation, alerts, pop-overs, and much more.
- JavaScript Plugins − Bootstrap contains over a dozen custom jQuery plugins. You can easily include them all, or one by one.

Applications that Use BOOTSTRAP

Ecommerce sites such as Flipkart and Amazon use BOOTSTRAP

Advantages of BOOTSTRAP

- It supports responsive and customizable design, with a consistent UI that looks good out of the box.
- It automatically adapts to different screen sizes on desktops, laptops, tablets, mobiles phones, etc. to provide optimal viewing and interaction experience.
- It saves development time as there are a lot of free professional templates, themes, and plugins.
- It has a large support with excellent documentation, vast online community and web forums.
- Great standardized platform with all the basic styles and components needed (layout grid, panels, tables, buttons, modals, form styles) to build on which saves a lot of time.
- Support for all major browsers and fixes CSS compatibility issues.
- Several JavaScript plugins are included using jQuery.
- Icons are included (now as a font file for infinite scaling).

Disadvantages of BOOTSTRAP

- One of the biggest drawbacks is its free availability. Since it is a "Free for all" program, there are higher chances of people using common themes on their individual websites.
- Now, there is big competition to develop the most unique and different website using the same library that maybe 10,000+ people are already using or have used. Due to increased use in this modern day and time where websites have such a big part of a person's everyday life, it has become quite easy to determine which websites and applications have used the same template unless they have been heavily and massively customized.

Angular JS

AngularJS is a JavaScript-based open-source front-end web application framework mainly maintained by Google and by a community of individuals and corporations to address many of the challenges encountered in developing single-page applications. It is the leading framework for building JavaScript heavy single page web-based applications.

The JavaScript components complement Apache Cordova, a framework used for developing cross-platform mobile apps. It aims to simplify both the development and the testing of such applications by providing a framework for client-side model-view-controller (MVC) and model-view-viewmodel (MVVM) architectures, along with components commonly used in rich Internet applications.

Developed By: Misko Hevery and Adam Abrons

Year: 2009

Browser Support

Recent versions of Angular supports all latest versions of all major browsers like Firefox, Chrome, Safari, iOS and Android. However, in Internet Explorer, Angular is only supported by versions 9, 10, and 11. In IE8, often developers have observed that the application is not properly rendered.

Technologies Used

- Karma – It is one of the favorite testing frameworks for AngularJS development. It provides the perfect testing environment allowing you to test the app on real browsers and real devices such as phones and tablets.
- Protractor – It is an end-to-end test framework. This Node.js program is built on top of WebDriverJS. It runs tests in a real browser interacting with the app as any normal user would.
- Jasmine – This behavior driven testing framework does not rely on browsers, DOM, or any JavaScript framework. It is thus ideally suited for any Node.js projects, or anywhere else where JavaScript runs.

Features

- AngularJS is an efficient framework that can create Rich Internet Applications (RIA).
- AngularJS provides developers an option to write client-side applications using JavaScript in a clean Model View Controller (MVC) way.
- AngularJS is open source, completely free, and used by thousands of developers around the world. It is licensed under the Apache license version 2.0.
- Data-binding − It is the automatic synchronization of data between model and view components.
- Services − AngularJS comes with several built-in services such as http to make a XMLHttpRequests. These are singleton objects which are instantiated only once in app.
- Filters − These select a subset of items from an array and returns a new array.
- Directives − Directives are markers on DOM elements such as elements, attributes, CSS, and more. These can be used to create custom HTML tags that serve as new, custom widgets. AngularJS has built-in directives such as ngBind, ngModel, etc.
- Templates − These are the rendered view with information from the controller and model. These can be a single file (such as index.html) or multiple views in one page using partials.
- Deep Linking allows us to encode the state of application in the URL so that it can be bookmarked. The application can then be restored from the URL to the same state.
- Dependency Injection − AngularJS has a built-in dependency injection subsystem that helps the developer to create, understand, and test the applications easily.

Applications that Use AngularJS

- The Guardian
- Paypal
- jetBlue
- Lego
- Netflix

Advantages of AngularJS

- It is independent of server technology and it provides the capability to create Single Page Application in a very clean and maintainable way.

- It provides data binding capability to HTML. Thus, it gives users a rich and responsive experience.
- AngularJS code is unit testable and it uses dependency injection and make use of separation of concerns.
- AngularJS provides reusable components with which developers can achieve more functionality with short code.
- On the top of everything, AngularJS applications can run on all major browsers and smart phones, including Android and iOS-based phones/tablets.

Disadvantages of AngularJS

- It is not very secure. Being JavaScript-only framework, applications written in AngularJS are not safe. Server-side authentication and authorization are a must to keep an application secure.
- AngularJS is not degradable. If the user of your application disables JavaScript, then nothing would be visible, except the basic page.

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