COMPUTER SCIENCE

WEB APPLICATION TECHNOLOGIES

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Describe how HTML5, CSS, JavaScript, and jQuery all work in web applications. Describe server-and client-side interactions

Introduction

In the current realm of web application development, creating an interactive and visually engaging applications requires a compatible integration of various web development technologies such as HTML5, CSS, JavaScript and jQuery. Each of these technologies plays a key role in shaping the structure, style and interactivity of web pages. HTML5 serves as the foundation, providing a semantic structure for content, while CSS is used to design and enhance the visual presentation with its styling capabilities. JavaScript is a powerful scripting language which enables client-side interactivity by dynamically manipulating the Document Object Model (DOM). Additionally, jQuery, a versatile JavaScript library simplifies common tasks in DOM manipulation. Since server-side languages handle both client-side and server-side operations, such as data processing and database interactions, it is essential to comprehend the server-side dynamics. The foundation of contemporary web application development is the complex interaction between client-side and server-side components. This investigation aims to reveal the ways in which HTML5, CSS, JavaScript, and jQuery work together to create responsive and feature-rich web experiences.

HTML5

HTML is the standard mark up language for web page creation. It allows creation and structure of sections, paragraphs and link using HTML elements. HTML5 is the newer version of HTML, it is able to enhance interactivity of web pages to users. initially HTML was primarily used for the creation of animations, audio, and video. Today, it offers far more advanced features like local storage, offline capability, and geolocation on any client-side database. Because it is more interactive, HTML5 can offer new elements for drawing graphics, new drag-and-drop APIs, improved form handling, better page structure, the ability to search your geological location, and much more. HTML5 also establishes stronger requirements for these features.

Numerous features, including audio and video, drag and drop, canvas-2D/3D graphics, location-based services, web workers, new input types, and form elements are all possible with HTML5.

HTML5 utilizes the <canvas> element and JavaScript for drawing graphics, including 2D/3D graphics, enabling the combination of video and animations on webpages through efficient rendering methods for boxes, texts, drawing paths, and images. SVG (Scalable Vector Graphics) defines vector-based graphics, ensuring image quality preservation even after compression and enlargement; SVG images are scalable, searchable, scripted, indexable, and compressible. HTML5 establishes standards for multimedia files on webpages, eliminating the need for plugins by supporting non-proprietary formats through the use of <audio>, <source>, and <video> tags, allowing seamless embedding and accessibility of multimedia files without the requirement for specific players. HTML5's Geo Location API allocates user locations, making a portable device's geographic information available to web applications, facilitating location-based services for mobile browsers and applications through GPS and JavaScript extensions; the HTML5 API allows identification of a user's browsing location if the user grants permission. HTML5 introduces new procedures enabling websites or web applications to operate without a network connection through the use of the cache interface, offering advantages such as offline browsing, reduced server load, and increased speed; additionally, Application Cache (AppCache) allows web applications to function as desktop applications. HTML5 introduces novel procedures enabling websites or web applications to function without a network connection, leveraging the cache interface for offline browsing, resulting in advantages such as reduced server load and increased speed; furthermore, HTML5's Application Cache (AppCache) allows web applications to act as desktop applications by enabling the storage of data and programming code. HTML5 introduces Web Storage, a feature that enables the storage of data within the user's browser, surpassing the capabilities of older cookies; this includes support for client-side SQL databases and offline applications, offering improved safety and speed, allowing the storage of large amounts of data without impacting website performance, and facilitating data access through webpages in pairs of value/name. Lastly, the user can enter alphanumeric data from the client's side with HTML5's multiple input types, which include email, number, date, colour, Tel, range, and time. The values are then forwarded to the server side for processing and results are later displayed on the web page on the client side. (Ashis Kumar Ratha, 2018)

CSS

A language called Cascading Style Sheets (CSS) is used to style webpages and web applications. It facilitates creating the more appealing, be it the website or the online application. It is one of the most widely used frameworks for website design. It is often included in HTML script.

CSS is an easy beautifying language used to make web pages presentable. CSS is responsible for styling the webpages in a way that they look catchy when shown to user. CSS is widely used in web applications from adding text style like font size, colour and also allowing us to specify the line spacing of the text. It is also used for styling a layout by allowing us to specify the background image of our page or component, it also allows us to create animation on web, add transition which allow us to smooth a particular action. CSS is designed in a such a way that it can be easily understood and. CSS is basically used to beautify the rendered content of the HTML. HTML and CSS generally go hand in hand. (Akshat Gupta, 2019)

Additionally, CSS is used to create Responsive Web Designs in web applications. Responsiveness helps attaining a perfect layout capable of adjusting to different screen sizes and orientation enabling the layout to switch the page resolution, media and animation size automatically. Responsiveness is one of the key factors involved in developing front-end as it makes the website more user friendly, requires less maintenance, and cuts the need of additional domain names. It makes use of various frameworks such as Bootstrap to create these responsive web designs. Bootstrap is one of the most popular front-end frameworks used in achieving a user-friendly and responsive layout. It supports compatibility for most browsers-Chrome, Safari, Firefox, and many more. It consists of a responsive fluid grid system which fittingly scales until twelve columns according to different devices and their screen sizes. This grid system uses a combination of sequenced rows and columns used in creating responsive layout of the page. Media queries can also be used to create responsive web designs. Media queries is a module of CSS3 used to achieve responsiveness when applied to CSS styles. It is generally used to easily alter the styles such as height, width and orientation depending upon the device type or specific features like screen resolution or browser viewport. Lastly it uses flow layout. At the point when a user limits the browser window, particular contents which were visible when maximized are not displayed and the user then needs to navigate in order to view the content using the horizontal or vertical bars causing unnecessary inconvenience. Flow layout can be used to overcome this by floating all involved DIV modules to the left and then

express the width in percentage. This makes CSS become very critical for enhancing user experience by creating a visually appealing and responsive web application. (Ghate, 2021)

JavaScript

Programming and majority of the dynamic behaviour on a web page is done with JavaScript. JavaScript enables the webpage to carry out certain functions, such as displaying an alert upon button click in a web application. JavaScript is employed to enable user interaction using client-side scripting. JavaScript is used, for instance, to determine whether a user has provided a valid email address in a form field (a client-side technique). Programming languages like JavaScript are used to provide websites some interactive features. It enables communication between the user and the browser. An interpreted language called JavaScript is built into a number of popular and practical browsers, including Internet Explorer, Netscape, Google Chrome, Firefox, and others.

JavaScript instructs the browser on how to modify the webpage in reaction to actions (such as clicking on an item or altering the value entered in a form). JavaScript enhances the built-in control and functionality of a browser. JavaScript can be used to address support gaps in browsers or troubleshoot issues with them. Certain browser layout difficulties using CSS can be resolved with JavaScript. JavaScript can be used to determine the size of the browser window as well as the location and area of any element on the website. One can avoid element overlap by using this information. These days, JavaScript is utilized on practically every website on the internet for more sophisticated and powerful functionality, and it is supported by all current web browsers. User-initiated events, such button clicks and link navigation, are captured by JavaScript. (Ullah, 2020)

jQuery

The goal of the JavaScript library jQuery is straightforward: By simplifying a lot of tasks, it aims to make web developers' work easier. While it currently offers extensive cross-browser normalization, jQuery was originally developed as a tool to fix cross-browser incompatibilities and facilitate JavaScript development. As browsers have developed and patched compatibility problems, jQuery has gotten lighter, faster, and more adept at doing its job of offering an API that makes writing JavaScript simpler. It has been demonstrated that jQuery can condense a

large amount of standard JavaScript code into a few lines, or in many situations, just one line of jQuery-enabled code. The trade-off is that your consumers will need to download and install other relevant downloads in addition to the larger and more complicated jQuery library as part of the resources required for them to utilize your application or website. With more and more individuals having access to high-speed Internet these days, this is less of a trade-off. While still pitiful in the US compared to some other countries, high-speed internet has gradually increased in speed. Taking the larger picture into account, the extra download isn't that significant. Redundancy is eliminated whenever possible in jQuery in an effort to lower obstacles to JavaScript development. The primary goal of jQuery 1.9 and earlier is to standardize cross-browser JavaScript programming in important domains where browsers would otherwise diverge, such Microsoft's Event API and the W3C Event API, as well as other, more corrective duties like determining the location of the mouse pointer after an event has occurred. jQuery 2.0 can release itself from a lot of old baggage that concentrated on bridging things like event compatibility between Internet Explorer and everyone else, thanks to the normalization efforts being made in the browsers. It is no longer necessary to bridge event support when using the correct Document Type Declaration because the most recent version of Internet Explorer has the standard event API in strict standards rendering mode. If you need to work with older Internet Explorer versions, like IE8, you should use jQuery 1.9. All current browser versions, including Safari, Firefox, Google Chrome, and Internet Explorer, are compatible with jQuery 1.9 and 2.0. (York, 2015)

Server and client-side interactions

The main component is the asynchronous use of the XML Http Request API, which is available in all modern web browsers. This permits a client-side web page to use a script language function to ask a web server for some information without interfering with user activities. Short XML messages are used by the web server to return the requested data, and the web browser uses a particular script function to interpret the response and update the page accordingly.

When using typical web apps, the user must wait for the current action to finish before initiating the next one. In addition, the server typically processes a large amount of data and communicates with the client on a frequent basis. The fact that the server just needs to generate and send brief XML messages rather than entire web pages reduces both the amount of information transferred and the length of time spent in the server. Compared to traditional applications, AJAX-based web pages can accommodate more interaction since more simultaneous requests can be handled with the remaining operating time and bandwidth.(Paulson, 2005) To make using AJAX easier, a number of developer tools have surfaced. Direct Web Remoting is one of them. This makes it possible for the client-side JavaScript code to use the server-side Java classes transparently. To do this, JavaScript code that wraps AJAX-based requests to the server's Java classes is generated dynamically. Data transfer between a server and clients is accelerated as a result.(Garrett, 2005)

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