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Open Source Frameworks for Responsive Design and SharePoint Development

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Introduction

Gartner says that by the year 2018, more than fifty percent of consumers will primarily use a tablet or smart phone for their online activities. The daily average time spent on mobile devices has long surpassed television viewing in the US. Changing user behavior influenced by the confluence of devices in the market has resulted in users "multi-screening", i.e. accessing the same site from multiple devices such as mobile and desktops in a single day.

Thus, as the number of mobile devices and tablets increase, creating user experiences targeting a single device is becoming increasingly difficult, paving the way for 'Responsive Website Design' or 'RWD' as it is popularly known. **This white paper discusses the technicalities of using open source frameworks with SharePoint for responsive design UI and development.**

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2
Page

Frameworks for Development with SharePoint

SharePoint is a secure place to store, organize, share and access information from most devices. More often than not, developers use the Server-Side Object Model (SSOM) for designing list-based web pages. However, this is time-consuming to create and slow to load. The preferred option, therefore, is to use Client-Side Object Model (CSOM). CSOM uses code that runs outside of the SharePoint server.

CSOM concept was originally introduced in SharePoint 2010 and has been retained in subsequent versions of SharePoint. It empowers developers to perform core SharePoint functionality by using C# (Managed Client Object Model), JavaScript and Silver light. CSOM takes off where traditional web services stop as most of these did not provide full functionality, with developers having to create custom web solutions for use with client applications. This was not the ideal solution, especially in scenarios where SharePoint is hosted in a cloud environment and access to some of the content was restricted. Instead, developing client applications with new Client Object Model (OM) is an attractive alternative.

REST (Representational State Transfer)

SharePoint 2013 introduced Representational State Transfer (REST) service which adds the capability to remotely interact with SharePoint sites. With REST it is possible to interact directly with SharePoint objects by using any technology that supports standard REST capabilities. Thus, developers can interact remotely, perform Create, Read, Update, and Delete (CRUD) operations from their apps for SharePoint solutions, and client applications. The client.svc web service in SharePoint handles the HTTP request and serves the appropriate response in either Atom or JSON (JavaScript Object Notation) format and the client application can then parse that response.

A great advantage of REST is that there is no need to add references to SharePoint 2013 libraries or client assemblies. Instead, you make HTTP requests to the appropriate endpoints to retrieve or update SharePoint entities, such as web object, list object, and list item object.

Example for accessing a specific site:

http://server/site/_api/web

In the above example, server represents the name of the server, and site represents the name of, or path to, the specific site.

Understanding Responsive Design

SharePoint 2013 offered a feature called Device Channels, which made it possible to design a unique master page for a specific device with access to the SharePoint site. With this feature, it was possible to create separate master pages for each device. However, this was a cumbersome and expensive process, in terms of the time spent on design, implementation, and testing. An alternate solution for creating multiple device channels is **Responsive Web Design (RWD).**

Responsive Web Design (RWD) adapts a layout to the viewing environment by using fluid, proportion-based grids, flexible images, and CSS3 media queries. It then pushes a client-side solution presenting different page structures to different devices, with some elements hidden or moved around to suite the screen size. The approach suggests that design and development should respond to the user's behavior and environment, based on screen size, platform and orientation. This approach makes content and navigation components available for easy reading with minimal resizing and scrolling irrespective of the end-device. <u>RWD's key advantage is, therefore, its ability to work on any screen size, large or small, mobile or desktop.</u>

Responsive Design and SharePoint

Creating responsive SharePoint web pages will depend on master pages and page layouts. Firstly, prior to implementation of responsive design on Share Point web pages, we need to understand end-user requirements and the following design elements need to be finalized:

- Should navigation be floating, drop down, collapse, off-canvas or menu-driven? And, which navigation elements should be hidden/shown on target devices?
- How to display content and web part zones, i.e. questions such as 'how will these changes affect page layout?' need to be answered.
- Page layout, i.e. portrait or landscape, should be decided.

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3
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Client Side Rendering

One of my favorite SharePoint features is Client Side Rendering (CSR). CSR was originally introduced in SharePoint 2013 as a technique for displaying data, replacing Extensible Stylesheet Language Transformations (XSLT). It continues to allow us to style SharePoint elements using JavaScript, rather than having to write XSLT. Developers can use it to style complete List Views, Fields, Search Results and more, which makes it a lot simpler and more intuitive, especially for those who have not developed with SharePoint earlier. To simplify, CSR gets the JS object with raw data as input and renders HTML string based on the same. After the HTML string is completed the same is inserted into the Document Object Model (DOM).

CSR also provides the ability to customize list views and forms display, using JavaScript and HTML without managed code. As it works with the client rather than the server, CSR uses client-side technologies, such as HTML and JavaScript.

Given below is an example of how to customize a SharePoint list view using CSR.

Based on the column value we can apply color to the list item row using CSR as follows:

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5
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AngularJS

AngularJS is an open source JavaScript MVC framework, maintained by Google, designed to simplify front-end development. The framework consists of a tightly integrated tool set that helps to build well structured, rich, client-side applications in a modular fashion, with less code and more flexibility. AngularJS makes it easy to bind JavaScript objects with HTML UI elements and is a preferred option for creating single page applications that only require HTML, CSS, and JavaScript on the client side. AngularJS automatically handles java script code suitable for each browser making it cross-browser compliant.

AngularJS is used by thousands of developers around the world for its rich features and at the highest level, Angular does look like any another templating system. However, its difference lies in its bi-directional data binding feature that makes it a good fit for application development. Angular JS's templates are compiled in the browser and the compilation step produces a live view.
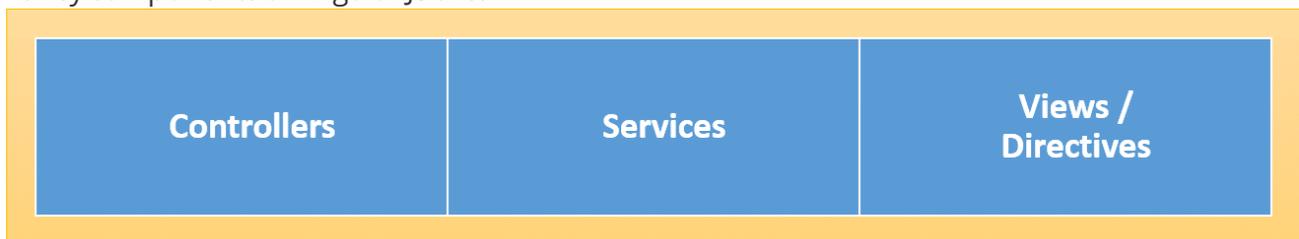
AngularJS has no dependency on a jQuery library, but it can be used with a jQuery library. Its security features can:

- Prevent HTML injection attacks.
- Prevent Cross-site scripting (CSS) attacks.
- Prevent CSRF (Cross-site request forgery) or XSRF (a type of malicious exploit of a website whereby unauthorized commands are transmitted from a user that the website trusts).

Also, AngularJS is designed to be compatible with other security measures like Content Security Policy (CSP), HTTPS (SSL/TLS) and server-side authentication and authorization that greatly reduces possible attacks.

AngularJS's compilation process takes place in the web browser and no server side or pre-compilation step is involved. AngularJS provides built-in validation directives to validate from the client's side. This makes it easy to handle client-side form validations without adding a lot of extra effort. AngularJS form validations are based on the HTML5 form validators.

The key components of Angular JS are:

Controllers	Services	Views / Directives

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6
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AngularJS is very useful when developing an interactive dashboard with multiple areas/sections in a page. It can also be used to develop an entry screen UI, where the user is adding multiple items to the cart before clicking on submit and, on submission, it saves the data in a SharePoint list.

Overall, AngularJS is a framework to build large scale and high-performance web applications while keeping them easy-to-maintain.

SharePoint and Angular JS example:

An example of creating a small web part to add records to SharePoint list using AngularJS and Bootstrap frameworks.
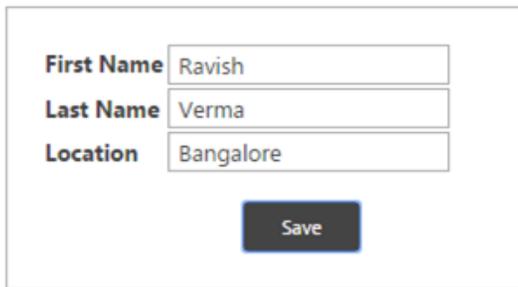
There is a SharePoint list "Customer Information" with three columns:
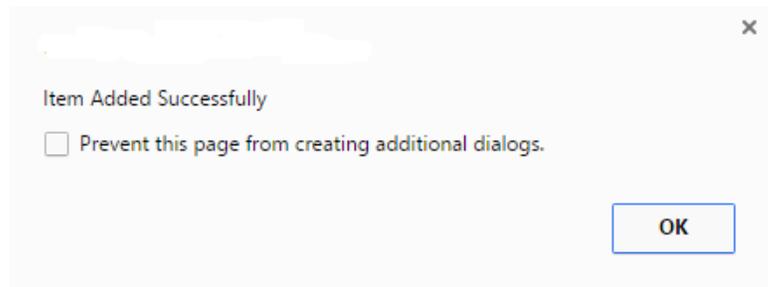
- First name,
- Last name, and
- Address

An interface using AngulrarJS and Bootstrap has been created for adding records to the SharePoint list. To achieve this, the web part page and content editor web part have been used to add the code. The output will appear as follows:

Content Editor

Using Angular js, add items to SharePoint List

First Name	Ravish
Last Name	Verma
Location	Bangalore

Save

Item Added Successfully

☐ Prevent this page from creating additional dialogs.

OK

The 'save' operation would save the data in the SharePoint list and a screen shot for the data entry in the list will be as shown below.

Customer Information

⊕ new item or edit this list

All Items ··· Find an item

✓	Title		FirstName	LastName	Location
	Mr ❈	···	Ravish	Verma	Bangalore

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7
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KnockoutJS

Knockout (KO) is a JavaScript library that helps to create rich, responsive displays and editor-user interfaces with a clean, underlying data model which works directly with web applications. Using KO with any web application is very simple, clean, and straightforward but remains powerful in the context of dynamic UI creation. It provides a two-way data binding mechanism between data model and user interface – any changes to data model are automatically reflected in the DOM user interface and any changes to the DOM are automatically reflected in the data model.

Also, Knockout.js is compatible with several other client-side and server-side technologies and it can act as a supplement to other web technologies such as jQuery, Moo-tools, etc.

Knockout.JS provides the following benefits:

- UI elements can be connected easily with data models.
- Simple process to create complex dynamic data models.
- Automatically updates UI when data model is changed and vice-versa when UI is changed, data model has changed automatically.
- Extends custom behavior very easily.
- All mainstream browsers are supported (IE, Firefox, Chrome, Safari)

Knockout.js uses a Model-View-View-Model (MVVM) design pattern in which the model is stored data, and the View is the visual representation of that data (UI) and View-model acts as the intermediary between the model and the view.
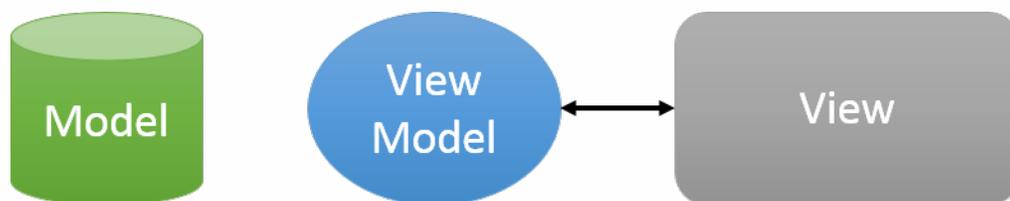
The View-model is a JavaScript representation of the model data, along with associated functions for manipulating the data. Knockout.js creates a direct connection between the View Model and the view, which helps to detect changes to the underlying model and automatically updates the right element of the UI.

Bootstrap

Bootstrap is a CSS framework that helps in designing web applications. It is one of the easiest CSS frameworks which assumes that the developer has limited design knowledge and offers CSS style sheets with inbuilt jQuery support and some popular JavaScript tools. Bootstrap is a front-end framework which offers the following features:

- Global styles for the body to reset type and background, link styles, grid system, along with two simple layouts.
- Styles for common HTML elements like typography, code, tables, forms, and buttons, and a great icon set.
- Basic styles for common interface components like tabs and pills, navbar, alerts, page headers, etc.
- JavaScript plugins for tool tips, popovers, modals, and more.

Node.js

Node.js is a powerful open source JavaScript-based framework/platform built on Google Chrome's JavaScript V8 Engine. It is used to develop intensive web applications like video streaming sites, single page and multiple page web applications. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient, perfect for data-intensive real-time applications that run across distributed devices. Node.js is an open source, cross-platform run-time environment for server-side and networking applications. Node.js applications are written in JavaScript, and can be run within the Node.js run-time on OS X, Microsoft Windows, and Linux. Node.js also provides a rich library of various JavaScript modules, which eases the development of web application using Node.js to a great extent.

Following are some of its important features:

- **Asynchronous and event driven -** All APIs of Node.js library are asynchronous. This essentially means that a Node.js based server never waits for an API to return data. The server moves to the next API after calling it and a notification mechanism of Events of Node.js helps the server to get a response from the previous API call.
- **Very fast -** Being built on Google Chrome's V8 JavaScript Engine, Node.js library is very fast in code execution.
- **Single threaded but highly scalable -** Node.js uses a single threaded model with event looping.
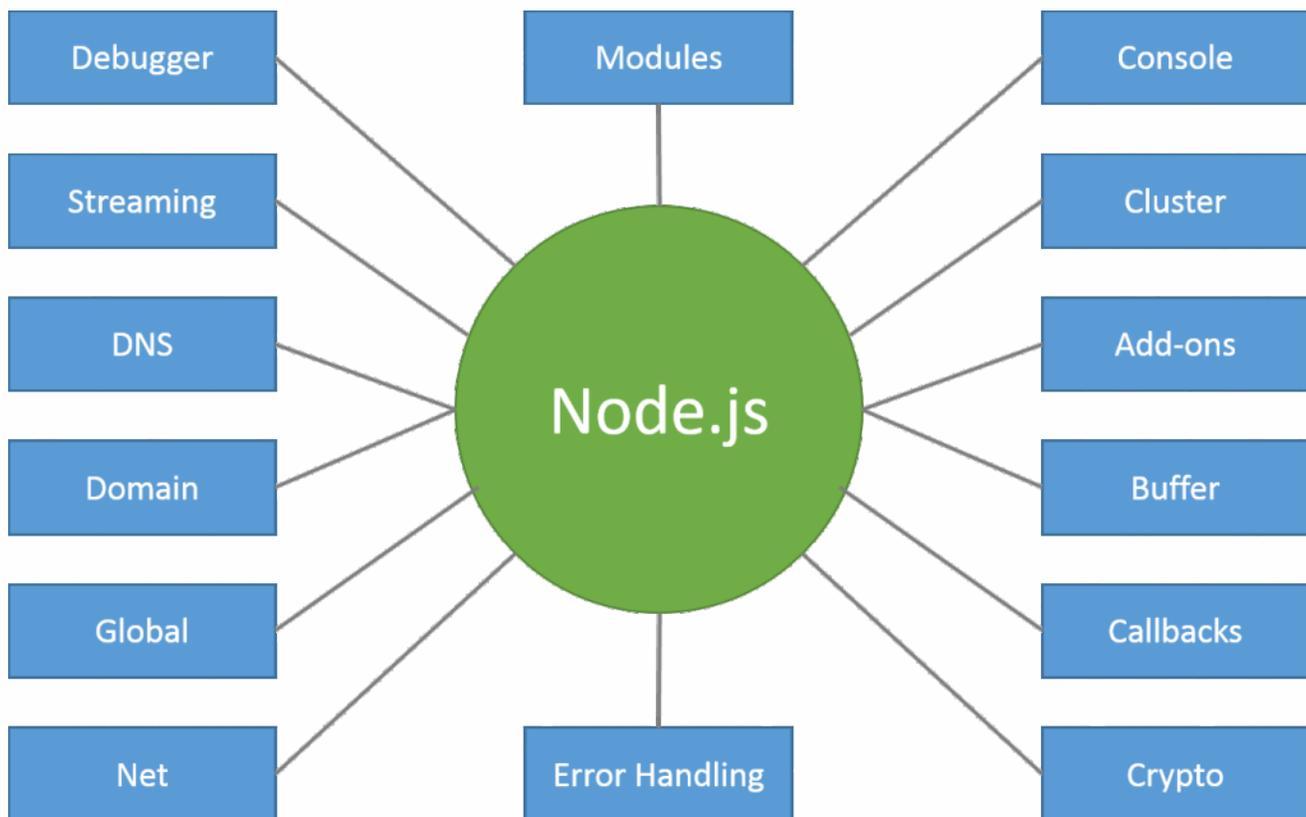
Event mechanism helps server to respond in a non-blocking ways and makes server highly scalable as opposed to traditional servers which create limited threads to handle requests. Node.js uses a single threaded program and the same program can service a much larger number of requests when compared to traditional servers like Apache HTTP.

- **No Buffering -** Node.js applications never buffer data. These applications simply output the data in chunks.

Following are the areas where Node.js is most useful:

- I/O bound Applications
- Data Streaming Applications
- Data Intensive Real-time Applications (DIRT)
- JSON APIs based Applications
- Single Page Applications

The following diagram depicts some important parts of Node.js

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10
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Which framework is best suited for SharePoint Development?

All these open sources plugins or libraries, make the development process simpler and faster with reduced effort in comparison to server-side coding. These open sources plugins/libraries can be used in both cloud and on-premises SharePoint versions. Most of these plugins and libraries follow the standard MVC design pattern, so it is easy to maintain a software product which is built using open sources frameworks. More importantly, open sources frameworks do not require licensing, making them cost effective.

However, in my opinion, REST (Representational State Transfer) can be advocated as the best framework for SharePoint development, as SharePoint has native support for REST API. SharePoint provides in-house REST web services, which can be used for different types of operation in SharePoint. REST in SharePoint is robust, fast and can talk to cross-platform components.

AngularJS is also a popular framework, which can be used extensively for SharePoint development along with REST API. In brief, all other frameworks such as Node, Knockout, Angular use REST API as the supporting protocol to read and write data from SharePoint. Frameworks like Bootstrap are basically used for 'look and feel' customization which is actually a fast and easy way of SharePoint user interface development.

Microsoft is coming up with a new SharePoint development framework, for which the preview has already been released and hopefully this will be an ideal framework for SharePoint development. For now, REST is quite the best.

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11
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