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Isomorphic JavaScript and MeteorJS

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This study was written to give a brief introduction of isomorphic JavaScript and MeteorJS platform. First, the basic concept of isomorphic JavaScript and how it is revolutionizing modern web applications is explained. How to write applications with less and more modular as well as maintainable code is also covered.

The second part of the thesis focuses on Meteor platform which is built according to the principles of isomorphic JavaScript. The main functionality of Meteor, its core components and how we can use them to make modern, real-time reactive applications are discussed. Also, the main principals of MeteorJs are introduced and examples of some real -world projects built on Meteor are provided. Finally, the thesis focuses on the strengths of Meteor when making real-time web applications.

A complete web application was also build in Meteor platform to show and explain the practical aspect of development with Meteor and the last part of the this report describes all essential parts of Meteor app and how a modern web app with many reactive features was built.

Keywords	Meteor, JavaScript, Isomorphic

Contents

List of abbreviations

API Application programming interface is a particular way and specifications that software can follow to interact with each other.

AJAX Asynchronous JavaSCript and XML

Cordova is platform to build mobile applications which allows us to use HTML, JavaScript and CSS.

DOM Document object model is hierarchical representation of HTML element in browser.

DDP Distributed data protocol is used for querying and updating server-side database. It was created by Meteor team.

GraphQL GrapgQL is query language for APIs.

HTML Hyper text markup language displays the structure of Web pages and it is building blocks of web page.

HTTP Hyper test transfer protocol is foundation of data communication for worldwide web.

iOS iOS is mobile operating system developed by Appple Inc. and is use only for its hardware.

Javascript A high level dynamic cross-platform scripting language.

MongoDB MongoDB is document database and stores data in JSON like documents, its free and open source.

MDG Meteor development group is core team behind development of Meteor and Apollo.

npm Node package manager is online repository for open source Node.js packages and projects.

Node.js Node.js is a open source, cross platform JavaScript runtime environment built on Chrome’s V8 engine.

React It is an open source library to develop user interface and maintained by Facebook.

REST Representational state transfer describes how one system can communicate state with another.

SPA Single page Application is a web application that that consists on a single page and dynamically change the page.

Swift Swift is powerful programming language developed by Apple Inc. for iOS, macOS, watchOS, tvOS.

SEO	Search engine optimization
UI	A user interface is visual part of a software and with it humans interacts with computer.

1. Introduction

Isomorphic derives from the Greek words "isos" for "equal" and "morph" for "shape". Isomorphism describes how we can see two sides of a thing in different contexts but should, however, get the same thing in the end. Therefore, if an application uses the same JavaScript code on client and server, it is called isomorphic.[1]

Spike Berhm of Airbnb made the term isomorphic popular and recently it has also been emerged as universal JavaScript. In this study, I will dive deeper and analyze the term isomorphism and why a platform like Meteor is a solution for a modern web application and why we should use Meteor. This study also discusses what best use cases for Meteor are as well and the advantages and disadvantages of Meteor.

Isomorphic JavaScript frameworks are becoming very popular and solving todays web apps problems. Isomorphic JavaScript apps can render on client and on server as well. Therefore, data driven apps where tons of data is being uploaded every second on servers solves the main problem of SEO.

Isomorphism sits between server and client and in this modern approach server does little work and sends just data and most of heavy work is done by client so when ever the data changes it renders to show changes on client with out many trips to server .

JavaScript is is not only the native language of web, it is also the future programming language. The web is becoming bigger and more popular, and so is JavaScript. Because of its popularity, it is getting increasingly attention of big market players and expert developers. There are multiple examples but I will just give two as Angular is developed by Google and React and React native is developed by Facebook. These companies also made them open source so they get a great community of the world’s best developers who are also contributing to them.

2. Famous isomorphic JavaScript frameworks

There are many famous isomorphic JavaScript frameworks. Following are a few examples of them.

2.1. Rendr

Rendr allows Backbone.js plus Handlebars.js to build applications that can also fully render on server as well on the client at same time. Airbnb team built it while making their mobile application. To give seamless user experience and to make fluid UI, more code is moving to the client. In some cases, the server is just set of JSON endpoints and used to host files. Some of the design goals of Render are to write logic agnostic to an environment, so there should not be serve side rendering; it is a library and not a framework. It helps Airbnb to reduce initial page load drastically and it also fully crawlable by search engines. [2]

2.2. Brisket

There are several other great isomorphic JavaScript frameworks, but Brisket offers the best perceived speed, the greatest code freedom, and the strongest search engine optimization. It delivers HTML from the server and, at the same time, behaves like a single-page application in the browser. It is a framework for building single page application and it also uses same JavaScript on server and client. [3]

Bloomberg was the company who started to use and bring isomorphic JavaScript methodologies while developing their own framework. Whatever they learnt while building their web application, they were sharing their experiences with other developers. They developed the app while making the framework. [4]

Bloomberg is using Brisket in all their web apps and they also made it open source. Apps build with brisket has huge advantage in productivity as it is very speedy to build apps with it and take advantage of Render by Airbnb to get best SEO results. Even though Render helped to make an app without losing SEO, they keep developing for their own solution to make Brisket the best tool to solve their problems.

2.3. Derby

Derby is full stack framework and it is easy to build realtime web applications in it. Derby uses Node.js and also runs in browsers. It is consists of many Node modules and we can use their functionality with npm and browserify. Derby apps have full MVC structure and Racer is their template and style based view model and it works application logic and routes. It renders the same template in server and browser and there is a live binding between view and model so that when data changes, the view also updates.

2.4. React

React is a open source JavaScript library for building great user interfaces. It is build and maintained by FaceBook.Currently it is also one of the most famous library for building UI. Users can also build isomorphic JavaScript web applications with react, webppack, node.js . If NodeJS is used for backend, then JavaScript code is written on both client and server side and it has the capability to share code between frontend and backend to reduce the code duplication.

There is package called universal-react which provides a boilerplate to write isomorphic React apps. It includes all the features to which gives basic start to developers to write isomorphic React apps. However, it is not the only way to do it as many developers have their own way of implementing it.

3. Evolution of JavaScript

JavaScript was created just in 10 days and it had many technical wrong implementation and design errors. It was quite buggy and had a reputation of being a toy to change colors dynamically or add animation to pages. Traditionally in old web applications JavaScript was used to create interactivity and animation and was used for image slider and form validation. The first version of JavaScript lacked many important components of a good programing language but later it evolved into complete language.

After years of advances in web development, technologies like jQuery and AJAX were introduced. They showed how useful and powerful JavaScript can be and what kind of potential it has. Later it got an active community of developers and the software market got involved in its development.

Fast internet, mobile phone, and internet accessibility for everyone at every place create huge user base and user data. The web is not a simple source of random information such as a server using a programming language like Ruby, Python or PHP. For example, generating an HTML page was mostly static and sent to a client just to visit that page for information or send email.

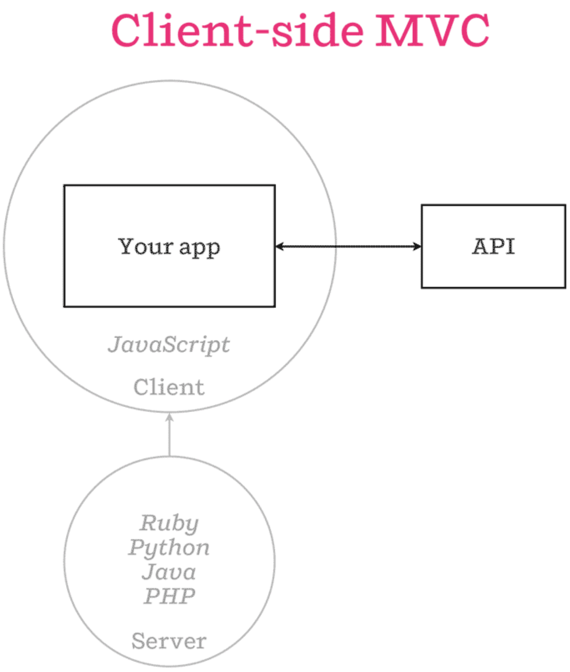


Figure 1 Client side MVC [5]

In modern isomorphic JavaScript web applications, server and client shares the same code as described in figure below.

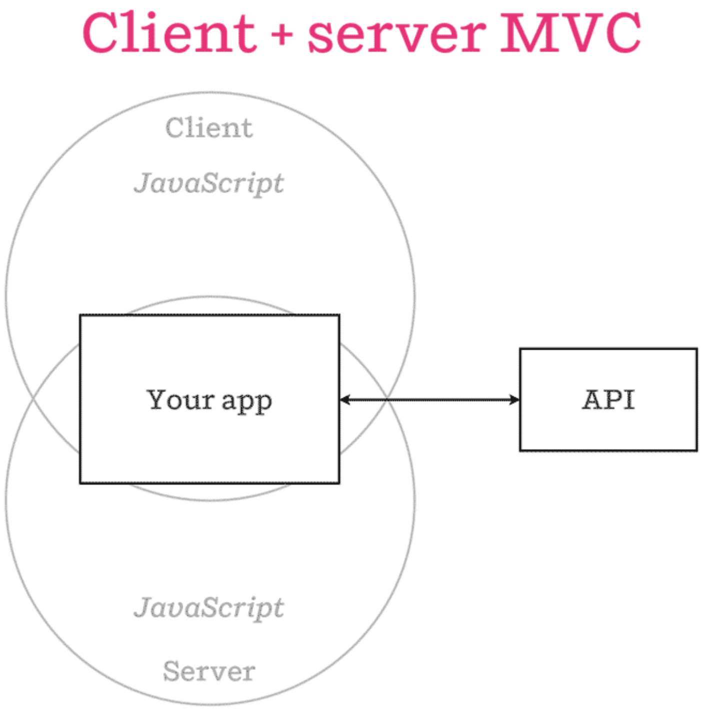


Figure 2 Client Server MVC [6]

The web has become so powerful that you can do almost anything in it. Now we can perform countless tasks such as play video games, watch live video streaming, listen to audio, or chat, buy any item from e-store and upload or access data on cloud regardless of its size. To perform all these tasks, we must be able to write web applications which can handle all these tasks and can perform the functionality which users want.

Modern JavaScript is extremely powerful and after ECMAScript 2105(ES6) it has become more mature and very popular in developers. Its new features such as spread operator, fat arrow functions, modules, generators and promises made it easy to write simple code for complex problems.

The rise of collaboration tools for open source software made it easy to create communities of developers, because now they can see the problems and collaborate to find a solution. Now there is a JavaScript library for almost every problem. Most of these libraries are open source so these collaboration tools not only helped to evolve and create new JavaScript libraries; they have also made JavaScript more popular.

4. Single page applications

SPAs (single page application) are web applications that have a single HTML page. When a user interacts with them, they update the web page and provide a dynamic interaction with users. Most of time SPAs use AJAX heavily and the server can communicate with the client without doing a full-page refresh and can update the page with new data.

There are many libraries and frameworks such as AngularJs, BackboneJS and EmberJs which are used to make SPAs. SPAs are capable of easier data transfers and deceases cost of page loading. Gmail, slack, yelp, and Medium are a few examples of SPAs.

5. Limitations of single page applications

The biggest drawback of SPAs is that the application that only runs in browsers cannot serve content to web crawlers. Therefore, search engines cannot find much content and developers must work too hard for SEO optimization.

If the client and the server do all the rendering, it might take some time to load all the resources for web application. This could delay loading of a page for a few seconds resulting in bad user experience. Single page apps are slow and therefore, the server-side rendering improves loading time significantly.

Complex applications which duplicate code between client and server are mostly in different programming languages. This makes it difficult to maintain and because the

UI code is not compiled, it is not easy to debug. Also, because pages do not refresh or reload, JavaScript memory leaks can also happen.

6. Why isomorphic JavaScript is a solution for modern web applications

The rise of client-side JavaScript web applications having only a script tag and an empty body, slowed down initial page loads. This also resulted in JavaScript memory leaks, poor crawlability for search engines creating difficulties.

Isomorphic JavaScript is fixing most of these problems. They support SEO and there is no duplication of code. Initial page loads are also faster and the use of JavaScript on frontend and backend also saves a lot of time and money. Developers write less code and these apps are modular and easy to maintain.

Today, there are many apps handling huge amount of data. If we look at Facebook and Instagram, we can see the vast number of pictures, likes, comments and videos uploaded every second. To handle all this data and show all data changes in real-time was not possible with traditional web technologies, the only solution is isomorphic JavaScript.

7. MeteorJS

Meteor is a complete open source, reactive, full stack JavaScript framework build on top of Node.js that allows developers to build single page apps for desktop and mobile. Meteor is probably the most well-known isomorphic JavaScript project today. Meteor is a collection of tools that developers use to build web applications that are fast and secure.Meteor ecosystem combines all tools necessary for building and deploying applications. It allows developers to develop in one language, JavaScript for all environments: server, client and Mobile applications. It is perfect example of Isomorphic JavaScript as it uses isomorphic API to write same code in JavaScript to run on server and client.

Meteor has an active team of developers, and it raised $31.2 M in three rounds from nine investors. Meteor is a simple yet efficient platform for building modern websites. [7]

The core concept of Meteor is reactivity. Real time syncing of data is built into Meteor at the core, but it does it in a different way. Instead of polling the server for updates every few seconds, a Meteor app maintains a low-data connection to a server using a protocol called DDP. DDP allows the server to send data to the client the instant it changes, since it had a continuous connection with it. Reactivity encompasses more than this, though. When a client changes a piece of data, Meteor renders the required UI change before the data gets sent to the server. This means that changes seem to happen instantly, as the app doesn't have to wait for a round trip to the server to complete.

Meteor has interesting features such as templating system called Blaze and a database on the client called Minimongo. It integrates MongoDB on backend and Minimongo on frontend so it helps to mitigate latency which leads to better user experience and more satisfying results.

Meteor has synchronous style coding that provides an easy to read code structure which is better than asynchronous call back functions. It has good router packages which provide server-side routing. Meteor is built from the ground up to support real-time apps, and the team is building an entire ecosystem of tools including package manager and deployment tools.

Meteor offers good experience for web and mobile, changes made by a user are instantly visible and data updates live on screen. Developers write less code to accomplish their job compared with other framework.

7.1. Principles of Meteor

- Data on the Wire. Meteor does not send HTML over the network. The server sends data and lets the client render it.

- One Language. Meteor lets you write both the client and the server parts of your application in JavaScript. At the moment, Meteor default database is Mongo db which has a syntax is similar to JavaScript.

- Database is vital to achieve the same results with less code. We can use the same methods to get our database either from the client or the server side.

- Latency Compensation. On the browser client, Meteor prefetches data and simulates it even before the server responds to make it look like server method calls return instantly to give better user experience.

- Full Reactivity. In Meteor, we can make entire application in real-time and for that we do not have to write specific modules because it is the default. All layers, from database to template, whenever a change occurs in data update themselves automatically.

- Embrace the Ecosystem. Anybody can contribute and it integrates with other open source tools and frameworks.

- Simplicity Equals Productivity. From the day one Meteor main goal was to keep it simple and make a platform where developers do not have to reinvent the wheel.

[8]

8. Core projects

8.1 Blaze

Meteor Blaze is a powerful library and we write reactive HTML templates to create user interfaces.It is very easy to get started as it does not have a lot of concepts to learn. It has two main parts, a template compiler and a reactive DOM engine.

Blaze's simplicity is made possible by Tracker, a lightweight library to make the user interface of application. The database changes tracker will automatically keep track when to recalculate the template helper function.

Developers do not need to do explicit data binding and not declare when to update the DOM, Tracker perform all these tasks under the hood making less thinking and less typing approach for developers. [9]

8.2. Tracker

Meteor Tracker is a tiny but powerful library for transparent reactive programming in JavaScript.

Meteor has a simple dependency tracking system which allows it to automatically re-run templates and other computations.

The mechanism is simple and efficient and unlike other systems, developers do not have to manually declare these dependencies. [10]

8.3. Distributed Data Protocol

DDP, the Distributed Data Protocol, is a simple protocol for getting data from a server, and receiving live updates when that data changes. It solves the biggest problem of querying server-side database and whenever database changes it will push changes to the client.

DDP is web socket based and to communicate, it sends JSON messages such as” REST for web sockets". Like REST, it is simple and has a very practical approach to providing an API. But it is web socket-based, unlike REST, allowing it to be used to deliver live updates as data changes. To communicate it sends Json messages. Also, its specs are precise and compact. [11]

8.4. Meteor Livequery

Meteor Livequery is a family of live database connectors. These connectors let you perform "live queries" against your favorite database: queries that not only return the result of the query at the time it is made, but allow you to go on to return a stream of create, update, and delete messages that inform you of any changes. [12]

8.5 Build system

Meteor build system is the command line tool and it compiles, runs, deploys, and publishes Meteor packages and applications. It does the same job as other tools such as Grunt, Gulp, Webpack. Internally it uses Babel and UglifyJS to gives the best and seamless experience.

The main task of it is to run “build plugins” and these plugins define various parts of application build process. Another task is that it minifies and concatenates all project’s files for production mode. For production, all files are reduced to a necessary code to run the app. [13]

9. Applications built with Meteor

Meteor is quite popular in startup world and many startups are building their ideas on Meteor platform. It shows it is production ready and startups and investors have trust on Meteor as a mature and trustworthy platform. Though corporate companies are skeptical to adopt Meteor, however in startups its very popular and many startups have built their product with Meteor and also have got investments from famous angel investors.Below are a few examples of products built with Meteor.

Mazda car configurator http://configurator.mazda.nl/

It is a car configurator app for Mazda Netherland.

Code fights https://codefights.com/

Code fights is programming learning website which gamifies programming through online programming challenges.

Workpop https://www.workpop.com/

It is hiring web platform where different businesses can hire workers of daily wage bases.

Telescope http://www.telescopeapp.org/

It is free and open source and it is used to make social web apps.

Possible https://pozible.com/

It is Australia’s very famous crowdfunding app.

Rocket.chat https://rocket.chat/

It is app for group messaging and communication.

Few other example are following

https://respond.ly/

http://blonk.co/

http://www.dispatch.me/

10. Advantages of using Meteor

10.1. Cost

One of the biggest advantage of Meteor is that it is quite cheap compared to other frameworks. A company does not need to hire backend and frontend developers separately because a Meteor developer can develop both backend and front end by himself as server and client share the same code. Development in Meteor is very rapid so a developer can quickly build a prototype. Less code and less time means that production costs also decrease.

Meteor is beginner friendly and easy to learn. Instead of hiring senior developers, companies can hire junior develops or fresh graduates, and train them to become productive quickly. Companies also spend too much money on fixing the bugs and refactoring the code. Because Meteor code is very modular and server and client share the same code, it is relatively easy and quick to refactor and fix the code.

Meteor also supports mobile application development with Cordova and developers can use the same code to develop mobile applications with little modifications

10.2. Atmosphere

Atmosphere is same to Meteor as npm to Node.js. It is a package catalogue for Meteor package and has thousands of packages. Developers do not have to write code from scratch for many parts of web applications as there are thousands of packages already available. Developers can take advantage of these prewritten code pieces and make their development quick and easy.

With release of 1.3 version of Meteor, it now has full support for npm. Developers should use Atmosphere packages as core features of Meteor, such as dip, and blaze. If a developer only needs general JavaScript packages, he or she can use npm packages.

10.3. UI layers

Meteor officially supports three UI libraries Blaze, React and Angular. This is one of the greatest advantages of Meteor: we can use either of the two most popular UI libraries besides blaze. React and Angular are quite popular and Meteor fully supports them. So by using Meteor we are not only limiting to Meteor ecosystem, rather we have an option to use React and Angular. Both are open source and have their own developer community. There are also many tools and packages developed around them so we can use and take advantage of these tools.

10.4. Open Source

Meteor is free and open source so everyone can develop a web application the way they want. Flow router, Telescope, Iron router, Reaction commerce, and Auto form are the most famous open source projects built with Meteor. By using Meteor, developers can also take benefit of the entire Meteor ecosystem.

Meteor not only helps us to use their platform free of cost but also gives us freedom and flexibility to choose the best solution for our business.

10.5. Security

Meteor is very secure and it has taken important steps to make the applications built with Meteor secure. Meteor published a guide how to follow standards and procedures to build a completely secure application.

10.6. Mobile applications

Traditionally, web developers had to learn Objective C to build a native app for iOS, the main language that the iOS operating system runs on. Recently, Apple introduced a new programming language called Swift, which is easier for beginners and new mobile developers to learn and develop; still, to build an iOS application in Swift involves learning a new language and creates another entry barrier, which can be difficult if user is used to programming in JavaScript. Developing iOS mobile app is only the start of the journey. If you want to build the same application for Android smartphone and tablet users, then developers have to create a new Android app with the same functionality and features. The traditional method of building iOS and Android apps can be a huge time consuming for developers. This is because you need to develop a wide range of new skills to bring your app to both mobile platforms. [14]

Another biggest advantage of using Meteor is that developers can build Android and iPhone compatible applications without learning swift or Android. So, developers do not have to write different code for different platform mobile application rather the same code for web application can be used for mobile with Cordova integration. Companies do not need to hire mobile developers for different mobile platforms.

So, after building iOS and Android mobile app developers also want to update and add new features or fix the bugs or change the design of the app. It requires to submitting the app again to App store approve changes. Then all the users of that app have to update their mobile apps. It is very time consuming and any change in app takes a lot of time and effort to get approved. Meteor fixed this problem by bundling JavaScript and HTML code so with Meteor’s hot code push which is allowed by Apple, developers can update their app and new version is automatically available to all users of app without submitting the app to the App store for approval. Hot code push function immediately deploys changes to users of all platforms.

10.7. Apollo

Facebook introduced innovative and promising technology called GraphQL. It is an application layer query language that interprets a string by a server, which then returns the required data in a specified format. [15]

Many expert developers think GraphQL is better alternative to REST. MDG build Apollo which consists of a collection of libraries, including client and server.

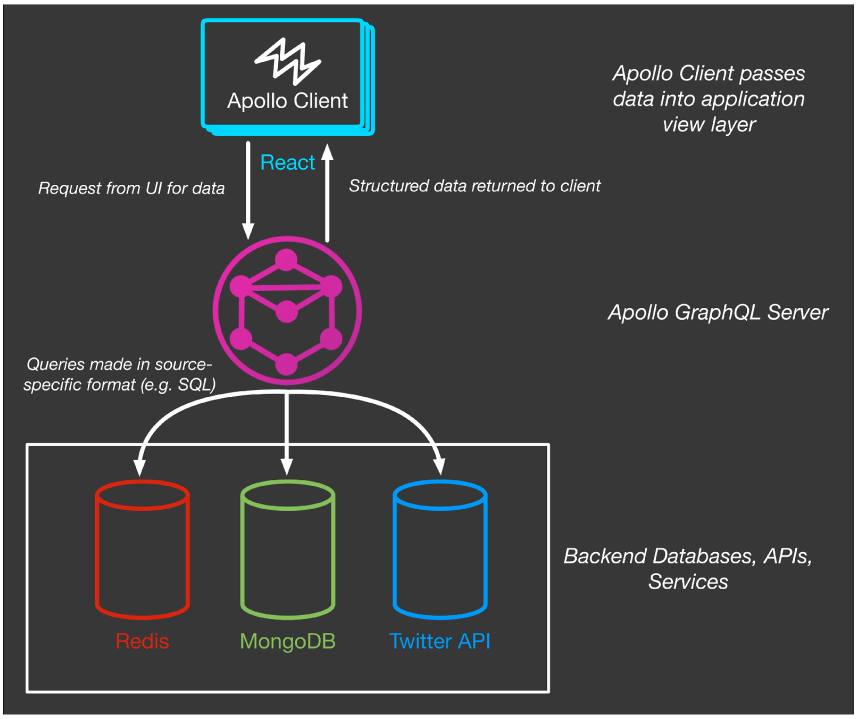

Apollo Client
Apollo Client passes data into application view layer
React
Request from UI for data
Structured data returned to client
Apollo GraphQL Server
Queries made in source-specific format (e.g. SQL)
Redis
MongoDB
Twitter API
Backend Databases, APIs, Services

Figure 3 Apollo Layout [16]

Apollo Server operates between your databases/APIs and your client, while Apollo Client connects with your view layer. The queries from client to server are made in GraphQL syntax. The Server translates those queries into the appropriate syntax for each source and returns JSON data to the client.[17]

10.8. Easy to learn

Meteor is very easy to learn as it only uses one language. Novice developers or students must only know the basics of JavaScript, HTML, CSS, MongoDB and they can start building web applications. Also, Meteor platform is full stack and gives all technologies to a beginner to start building web applications. There is also an official Meteor forum where users can get all kind of feedback and help.

Another advantage of Meteor for beginners is that they can start building prototypes or small applications very early and quickly which keeps them motivated. Programming is hard to learn and even building a small project gives a student motivation and courage to learn more.

10.9. Deployment

Deployment has always been the most significant phase of any startup or for a developer to deploy their final product. When it comes to deployment, Meteor also wins as there are many options available to deploy applications. Meteor also gives us Galaxy Meteor’s official deployment platform. It lets us to focus on building an application rather than deployment.

Here are some of Galaxy's features:

- One command application deployment from the command-line.
- Push-button scaling via a web interface; just click an up or down arrow.
- Monitor your application's logs and performance via an easy-to-use, web-based interface.
- Free SSL support (via Let's Encrypt) with the click of a button.
- Hands-off, fully automated load-balancing.
- Automatic SEO via Prerender.io. [18]

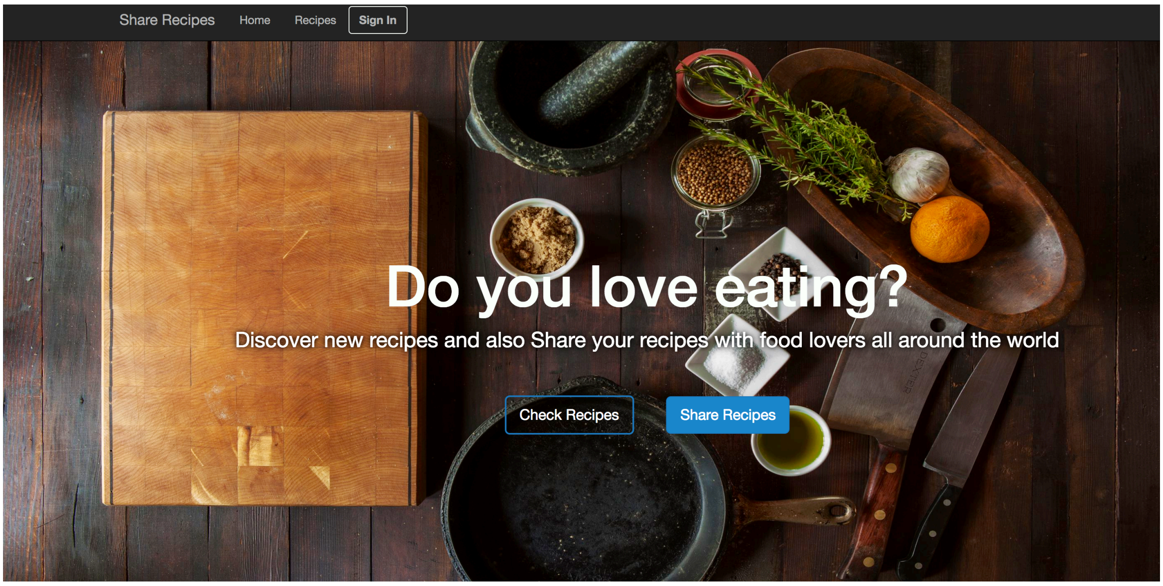
Galaxy uses a suit for easy and convenient deployment and developers can run and manage apps of any size and scale. Galaxy is optimizing for Meteor apps so it gives the best results as compared to other options available. Developers do not need to worry about scaling the application as it is handled by Galaxy.

11. Recipe sharing web application built with Meteor

URL: http://mymeteorapps.com/

Github Link : https://github.com/soni1/foody

A recipe sharing web application was built with Meteor to support this study. It was completely built with Meteor platform. In this web application user can register to share his or her recipe and the user can also comment, rate and like other users' recipes. The user does not need to register or log in to check other people's recipes. The user can add a recipe with one picture and list of ingredients and the time required to cook it, then other users can comment, like and rate the recipe.



Do you love eating?

Discover new recipes and also Share your recipes with food lovers all around the world

Figure 4 Home page of app

Meteor is full stack platforms so it provides all the tools to write client side and the server code. To extend its functionality, a few packages were used.

- Twitter bootstrap was used to make HTML and CSS skeleton and styling of app.

- Blaze was used to make its reactive UI. UI of application is in default view library of Meteor called blaze, it is very powerful library to write reactive HTML templates. It is quite similar to Handlebars.

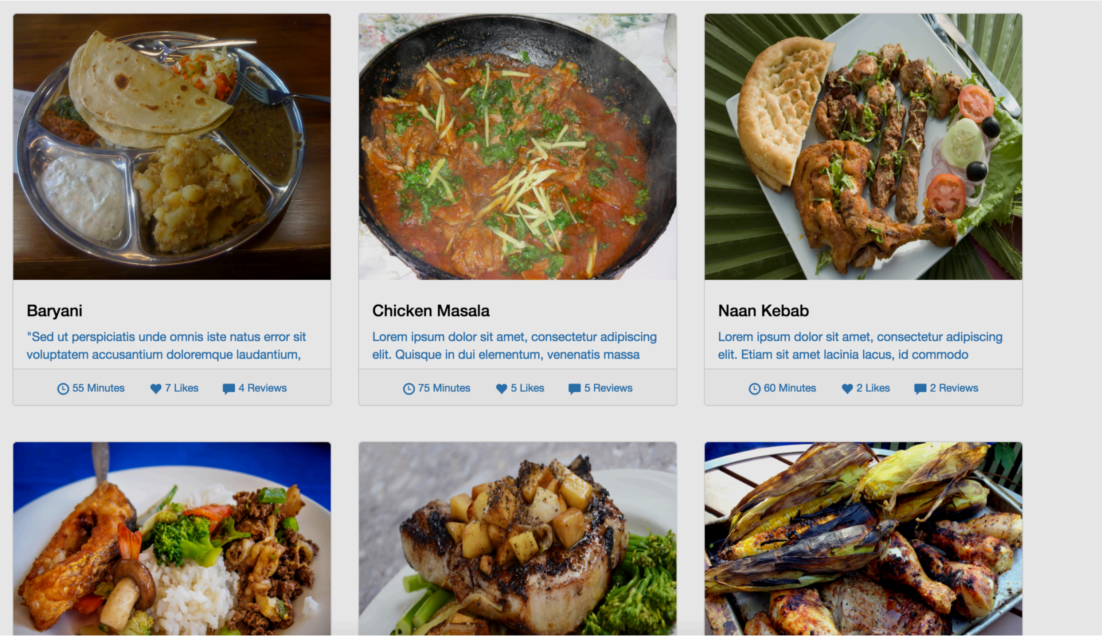
- Simple schema was used to make schema of database. This helped to validate and organize the MongoDB .

- Auto form was used for quick and responsive forms. They get validation based on the schema.

- Iron router was used to make routes of the pages, it is an effective way of managing navigation and routing.

- User accounts: bootstrap package was used for sign in and sign up templates. This package depends on Meteor core user accounts package.

- In recipe page list, all shared recipes are shown with their picture. A short description of total likes, total time to cook, and total reviews are indicated, and the user can like the recipe by clicking on like button. It shows users the amount of likes instantly without reloading the page.



Baryani

"Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium,

55 Minutes 7 Likes 4 Reviews

Chicken Masala

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Quisque in dui elementum, venenatis massa

75 Minutes 5 Likes 5 Reviews

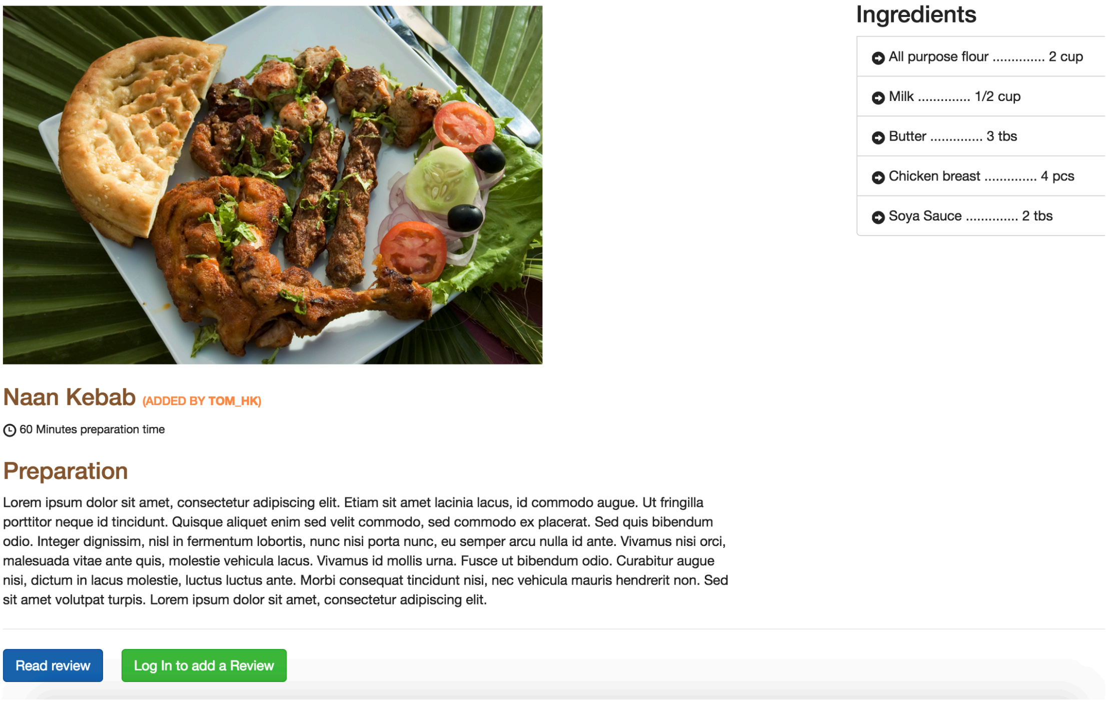
Naan Kebab

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam sit amet lacinia lacus, id commodo

60 Minutes 2 Likes 2 Reviews

Figure 5 Recipe page with list of all shared recipes

If the user clicks on any recipe, a detailed page of that recipe opens. The user can see the complete recipe with its ingredients and read all reviews and reply to them.



Ingredients

- All purpose flour .... 2 cup
- Milk .... 1/2 cup
- Butter .... 3 tbs
- Chicken breast .... 4 pcs
- Soya Sauce .... 2 tbs

Naan Kebab (ADDED BY TOM_HK)

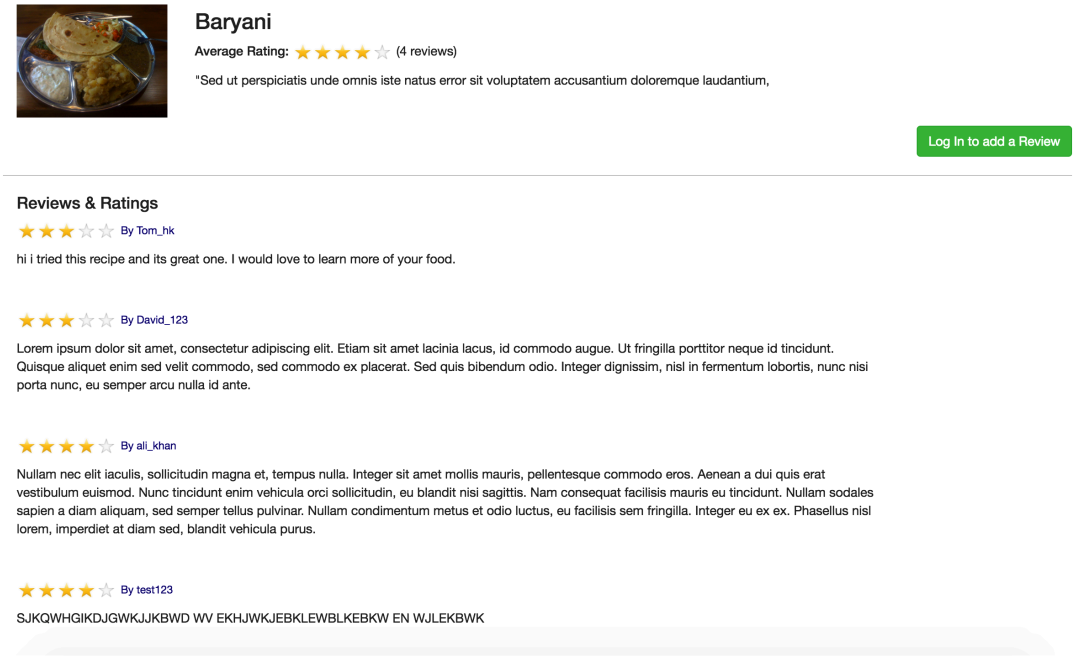
60 Minutes preparation time

Preparation

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam sit amet lacinia lacus, id commodo augue. Ut fringilla porttitor neque id tincidunt. Quisque aliquet enim sed velit commodo, sed commodo ex placerat. Sed quis bibendum odio. Integer dignissim, nisl in fermentum lobortis, nunc nisi porta nunc, eu semper arcu nulla id ante. Vivamus nisi orci, malesuada vitae ante quis, molestie vehicula lacus. Vivamus id mollis urna. Fusce ut bibendum odio. Curabitur augue nisi, dictum in lacus molestie, luctus luctus ante. Morbi consequat tincidunt nisi, nec vehicula mauris hendrerit non. Sed sit amet volutpat turpis. Lorem ipsum dolor sit amet, consectetur adipiscing elit.

Figure 6 Recipe detailed page with its complete detail

If the user is logged, in he or she can also comment and rate the recipe and check other reviews. If he or she clicks on “Read review ” button, a complete list of all review will be displayed.



Baryani

Average Rating: ★★★★☆ (4 reviews)

"Sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium,

Reviews & Ratings

★★★☆☆ By Tom_hk

hi i tried this recipe and its great one. I would love to learn more of your food.

★★★☆☆ By David_123

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam sit amet lacinia lacus, id commodo augue. Ut fringilla porttitor neque id tincidunt. Quisque aliquet enim sed velit commodo, sed commodo ex placerat. Sed quis bibendum odio. Integer dignissim, nisl in fermentum lobortis, nunc nisi porta nunc, eu semper arcu nulla id ante.

★★★★☆ By ali_khan

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★★★★☆ By test123

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Figure 7 List of reviews and rating for a recipe

For database, MongoDB was used as it is also the default database for Meteor. Although users are free to choose other databases, to keep things simple, I chose MongoDB for this study.

Reactivity and handling real-time changes in an easy way is the core of Meteor. Therefore, writing the code for comments and voting was the most useful feature as the page does not have to reload to show the changes. Meteor encourages to write modular code so you can easily find client-side code in client folder and server code in server folder. Most of the code is written into their relevant files and folders named on the component files and folders.

It did not take long to build the app or the basic working prototype, though it took some time to add more features and to refactor the code. Availability of different packages made it easy to add new functionalities.

12. Conclusion

Based on this study it seems that JavaScript has evolved into the most powerful programming language and it will likely be the future of web development. Today server, client, router and even database are written in JavaScript. When we look at projects at Github and questions asked on stack overflow, JavaScript seem quite popular. New features in ES6 has made it easy for developers to write more powerful, readable, and concise code. Because JavaScript is the native language of a web browser, it will be crucial to all web related technologies.

Meteor is a great platform and it is ahead of many new frameworks offering good tools to make web apps. It has an active team of developers moving in the right direction. On the other hand, many developers still think Meteor still missing key components of becoming a real Framework. They believe Meteor should have its own router, forms and offer official support for data bases other than MongoDB.

Meteor has a few shortcomings in it as no technology is perfect, however it will gain more adaptation if it properly fixes server-side rendering, offers official router and also provides support for other databases.

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