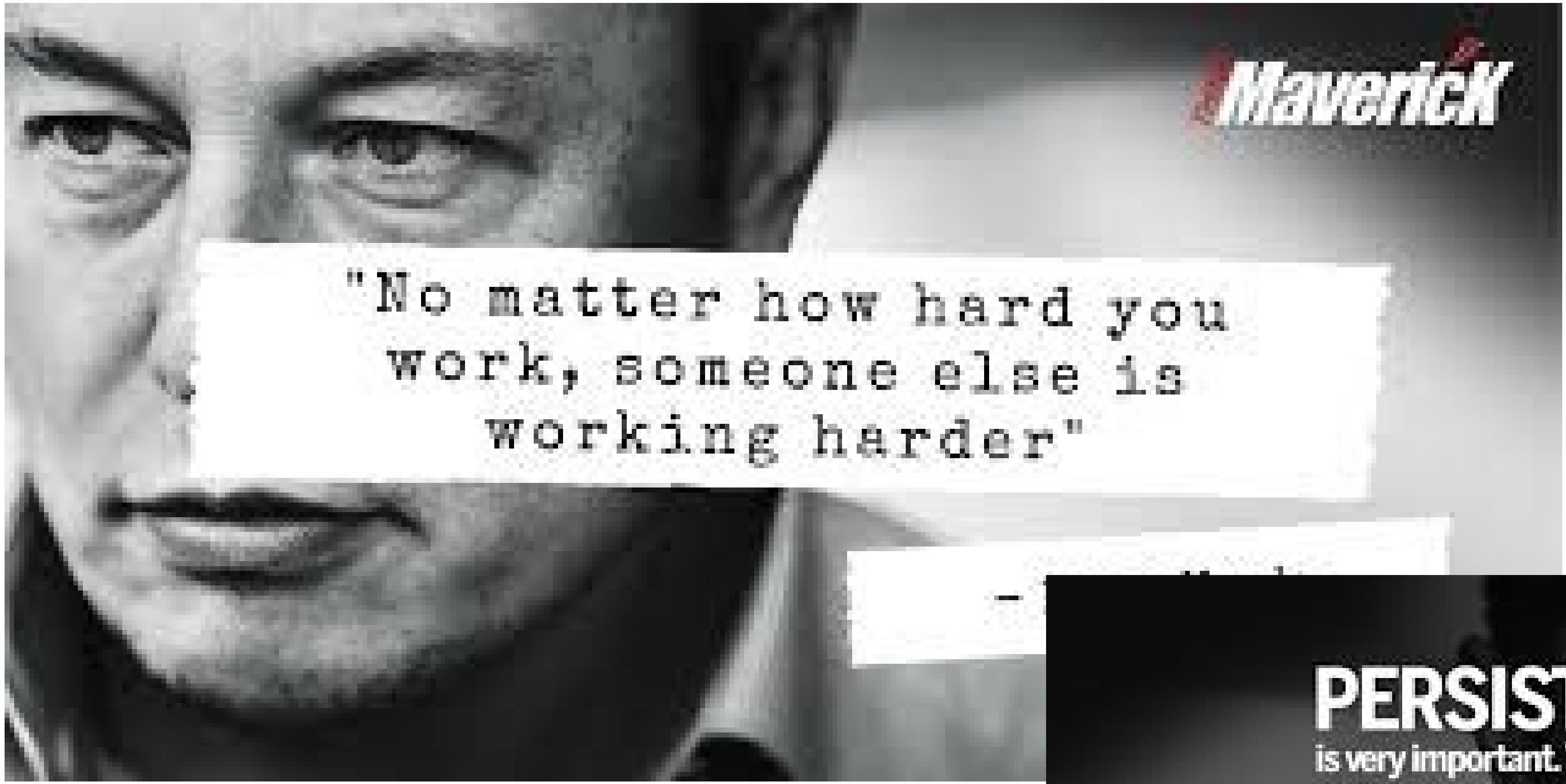
Modern web application development

I didn't know how to do it so I tried, failed, failed, failed and then got it right.

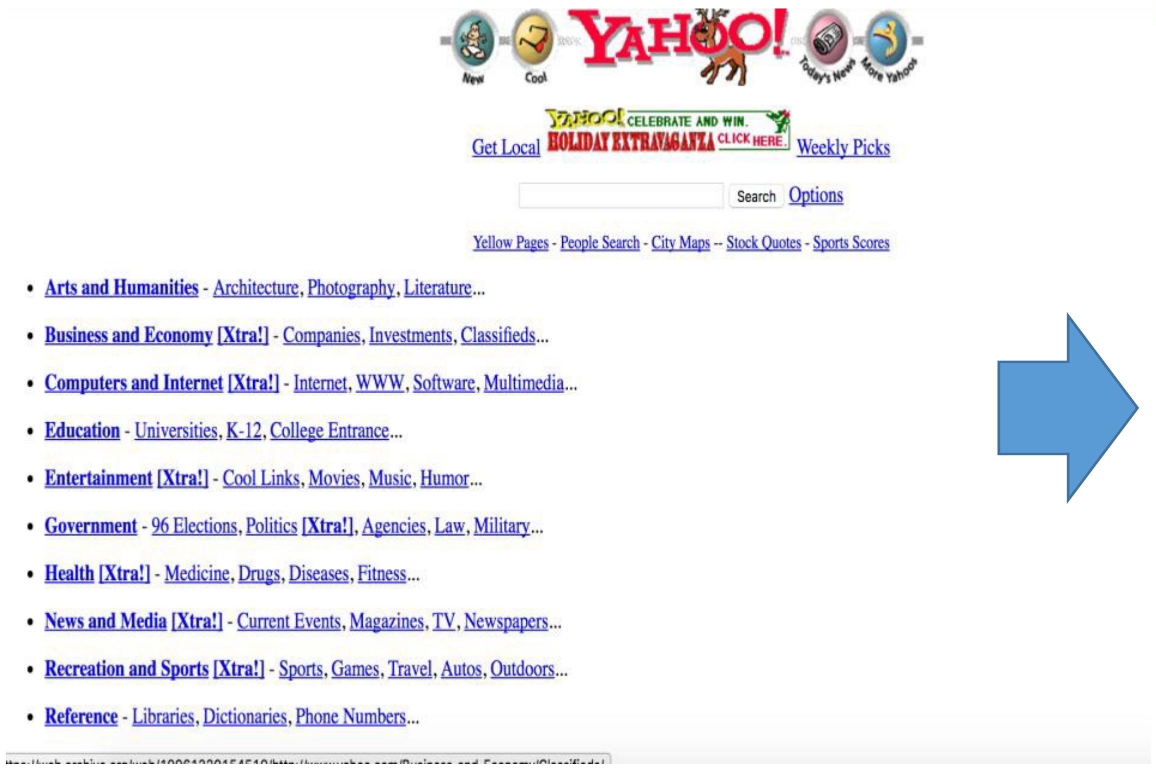
@happy__trader


Maverick
"No matter how hard you work, someone else is working harder"
-

PERSISTENCE
is very important. You should not
GIVE UP
unless you are forced to give up
Elon Musk Quotes via GeckoandFly

Web evolution

- Web has evolved from simple static pages to **complex real time** pages

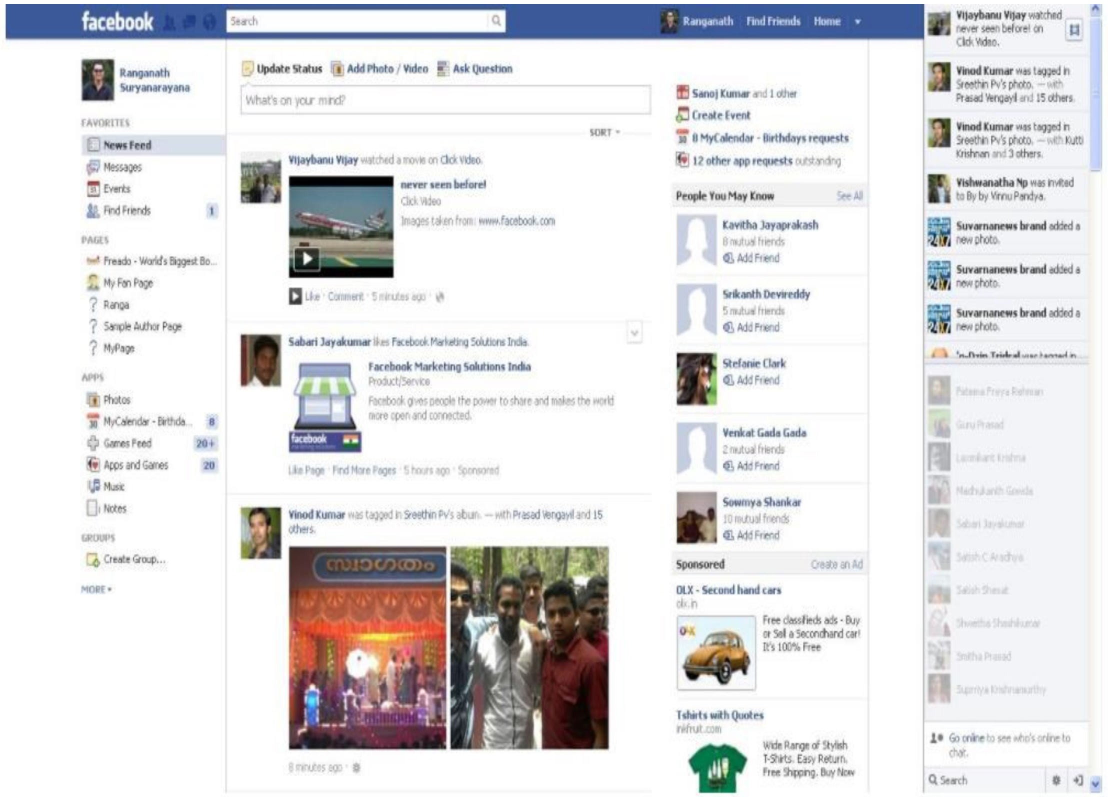


Get Local Weekly Picks

Search Options

Yellow Pages - People Search - City Maps -- Stock Quotes - Sports Scores

- Arts and Humanities - Architecture, Photography, Literature...
- Business and Economy [Xtra!] - Companies, Investments, Classifieds...
- Computers and Internet [Xtra!] - Internet, WWW, Software, Multimedia...
- Education - Universities, K-12, College Entrance...
- Entertainment [Xtra!] - Cool Links, Movies, Music, Humor...
- Government - 96 Elections, Politics [Xtra!], Agencies, Law, Military...
- Health [Xtra!] - Medicine, Drugs, Diseases, Fitness...
- News and Media [Xtra!] - Current Events, Magazines, TV, Newspapers...
- Recreation and Sports [Xtra!] - Sports, Games, Travel, Autos, Outdoors...
- Reference - Libraries, Dictionaries, Phone Numbers...



Vijaybanu Vijay watched a movie on Click Video.
never seen before!
Click Video
Images taken from: www.facebook.com
Like · Comment · 5 minutes ago

Sabari Jayakumar likes Facebook Marketing Solutions India.
Facebook Marketing Solutions India
Product/Service
Facebook gives people the power to share and makes the world more open and connected.
Like Page · Find More Pages · 5 hours ago · Sponsored

Vinod Kumar was tagged in Sreethin Pv's album. — with Prasad Vengayil and 15 others.
8 minutes ago

Sanoj Kumar and 1 other
Create Event
0 MyCalendar - Birthdays requests
12 other app requests outstanding

People You May Know See All
Kavitha Jayaprakash
8 mutual friends
Add Friend
Srikanth Devireddy
5 mutual friends
Add Friend
Stefanie Clark
Add Friend
Venkat Gada Gada
2 mutual friends
Add Friend
Sowmya Shankar
10 mutual friends
Add Friend

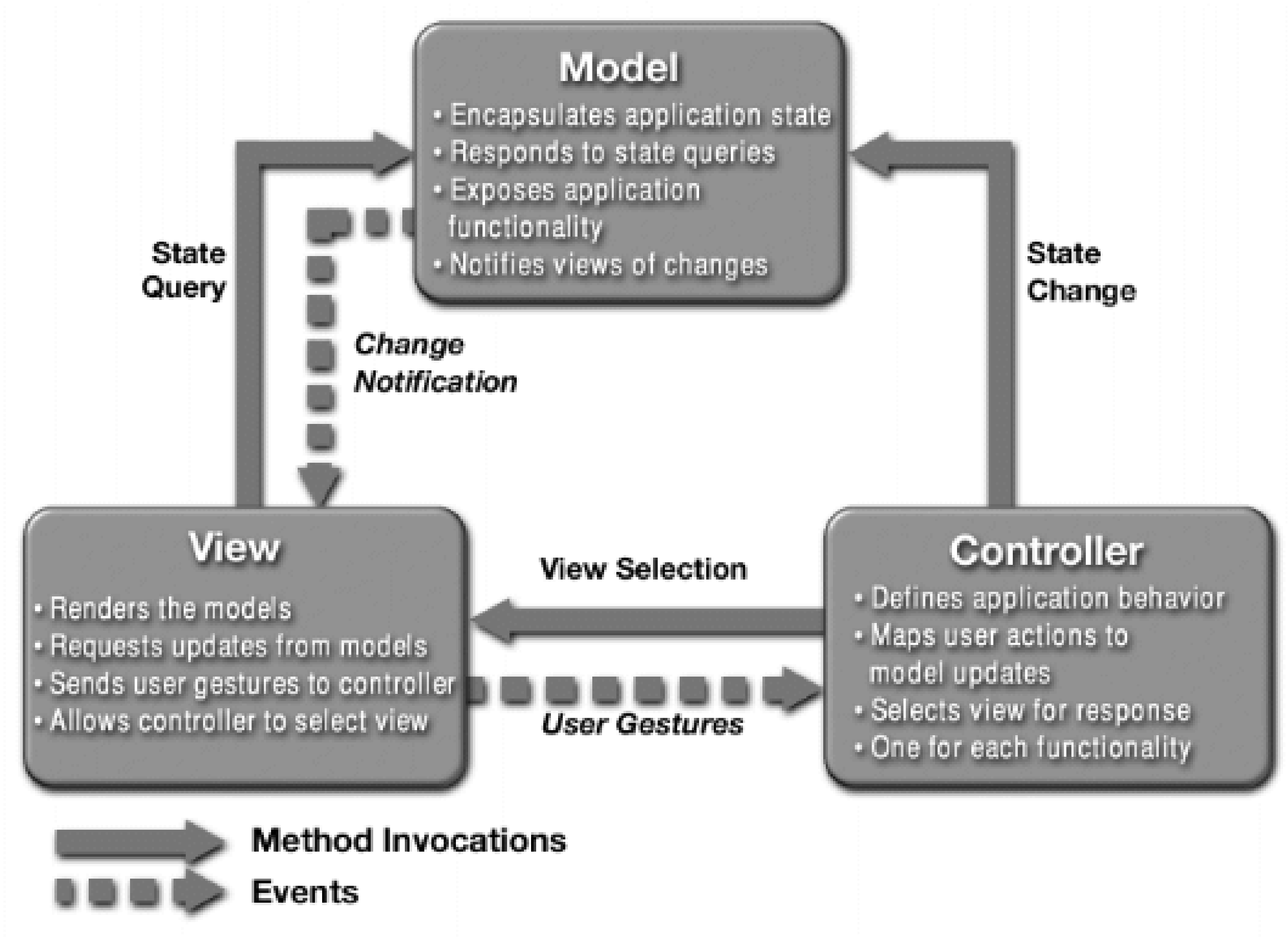
Sponsored Create an Ad
OLX - Second hand cars
olx.in
Free classifieds ads - Buy or Sell a Secondhand car! It's 100% Free
Tshirts with Quotes
inkfruit.com
Wide Range of Stylish T-Shirts. Easy Return. Free Shipping. Buy Now

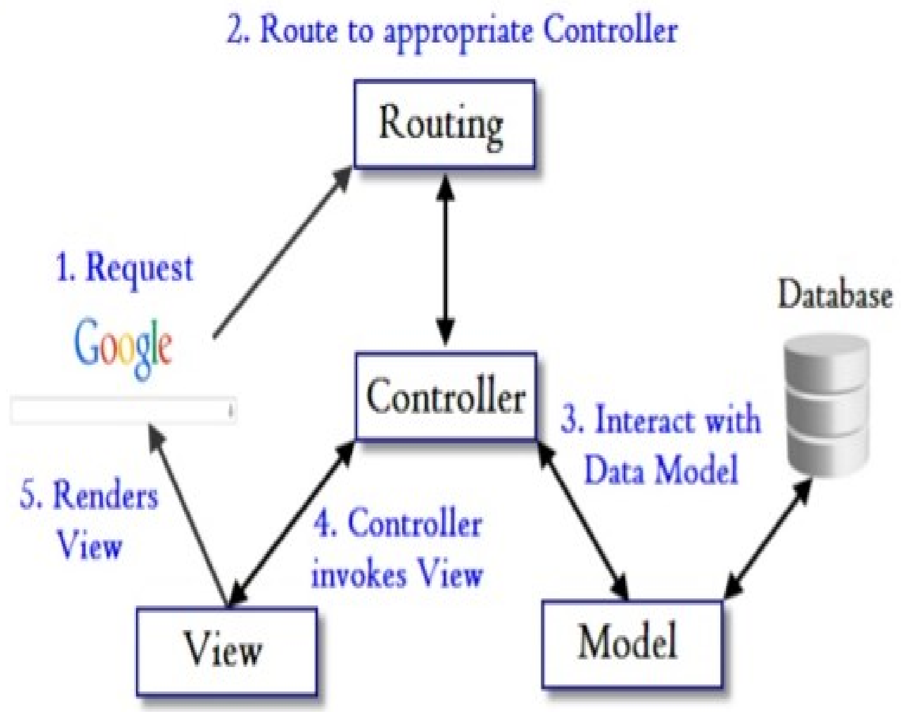
Vijaybanu Vijay watched never seen before! on Click Video.
Vinod Kumar was tagged in Sreethin Pv's photo. — with Prasad Vengayil and 15 others.
Vinod Kumar was tagged in Sreethin Pv's photo. — with Kutti Krishnan and 3 others.
Vishwanatha Np was invited to By by Vinnu Pandya.
Suvarnanews brand added a new photo.
Suvarnanews brand added a new photo.
Suvarnanews brand added a new photo.

Fatema Freya Rehman
Guru Prasad
Laxmikant Krishna
Madhukanth Gowda
Sabari Jayakumar
Satish C Aradhya
Satish Shenoi
Shwetha Shashikumar
Smitha Prasad
Supriya Krishnamurthy

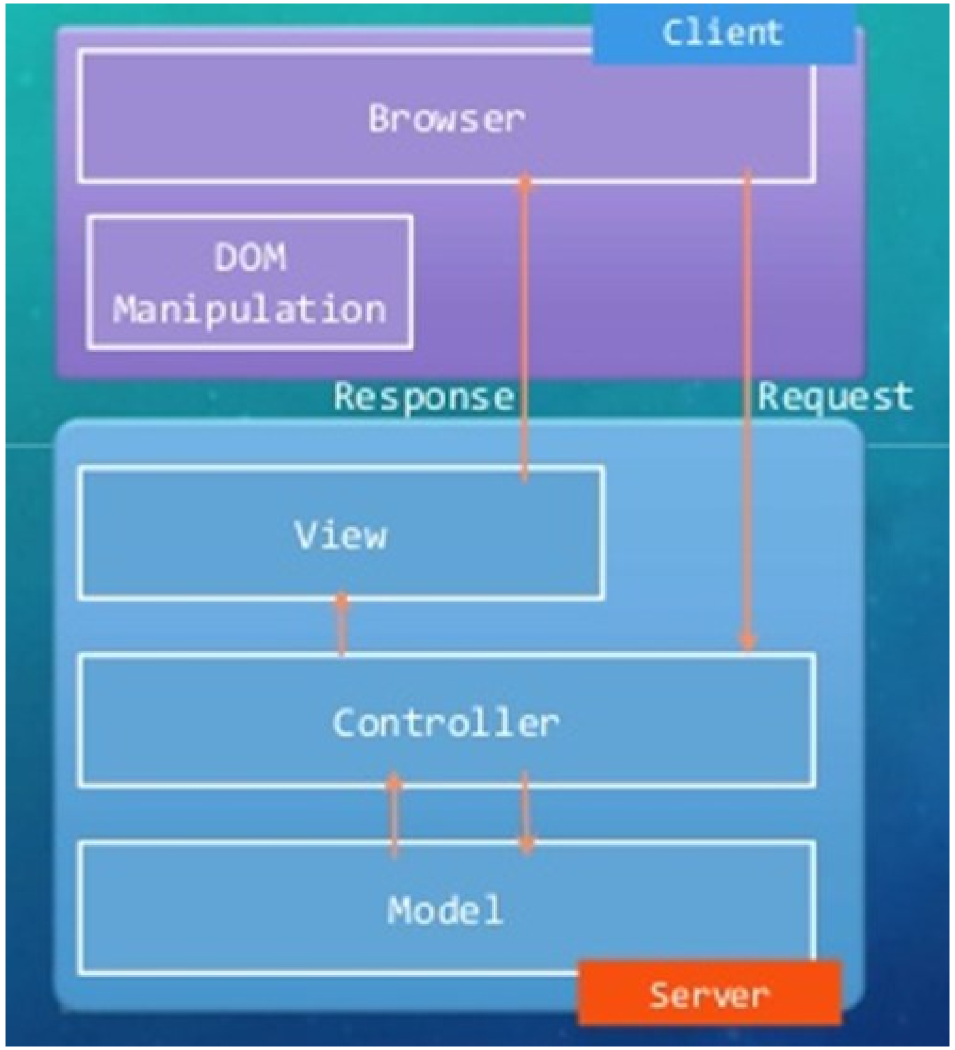
Go online to see who's online to chat.
Search

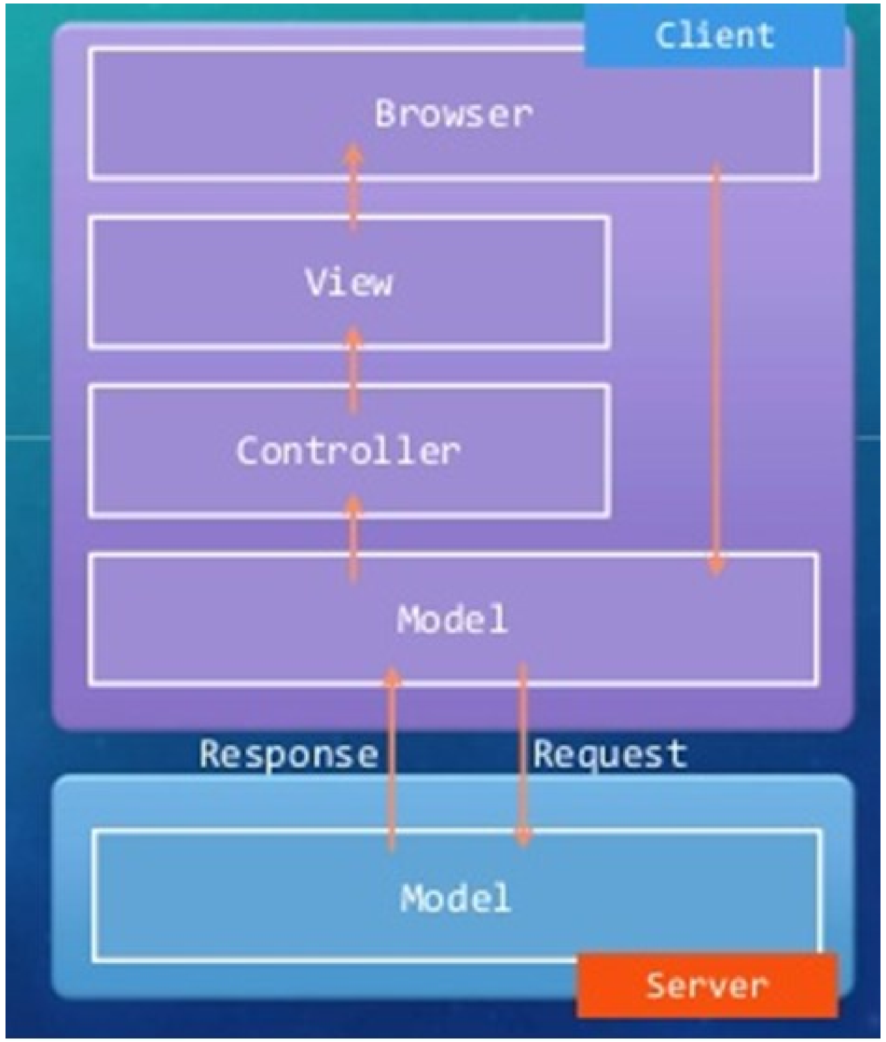
MVC


Model
• Encapsulates application state
• Responds to state queries
• Exposes application functionality
• Notifies views of changes
State Query
Change Notification
State Change
View
• Renders the models
• Requests updates from models
• Sends user gestures to controller
• Allows controller to select view
View Selection
User Gestures
Controller
• Defines application behavior
• Maps user actions to model updates
• Selects view for response
• One for each functionality
Method Invocations
Events


2. Route to appropriate Controller
Routing
1. Request
Google
Controller
3. Interact with Data Model
Database
5. Renders View
4. Controller invokes View
View
Model

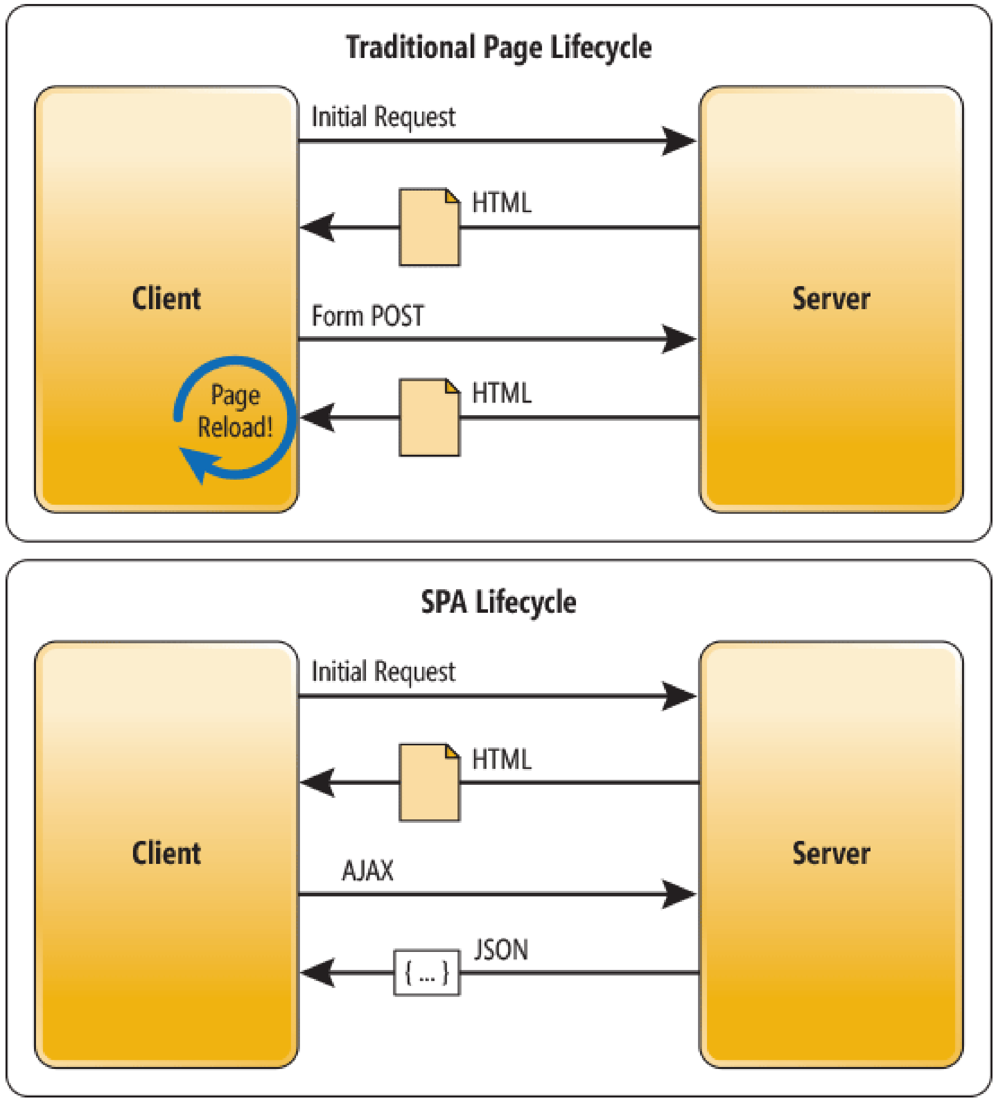
Server side MVC and Client side MVC





Single Page Application (SPA) vs MPA

- SPA interacts with the user by dynamically rewriting the current page rather than loading entire new pages from a server
- appropriate resources are dynamically loaded and added to the page as necessary, usually in response to user actions
- SPA needs a Client-side routing that allows you to navigate around a web page
- SPA offers native application like experience

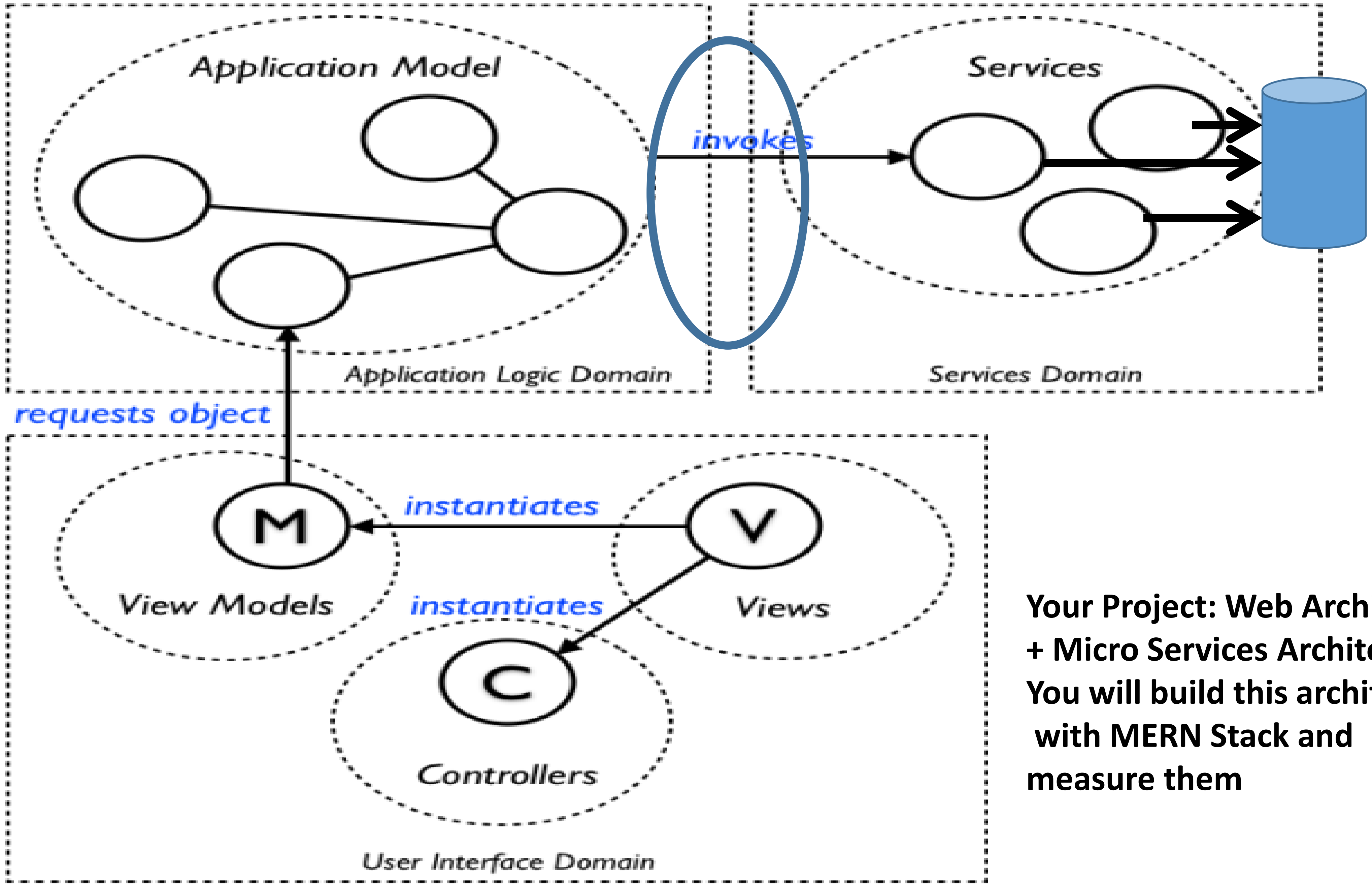


Single Page Application

- Advantage
  - Single Page Apps are smooth and fast.
  - They are easier to develop, deploy and debug.
  - Can be transited to mobile apps by reusing the same backend code.
- Disadvantages
  - SPAs perform poor on the search engine. But now, with isomorphic rendering/server-side rendering even SPAs can be optimized for search engine too.
  - They are less secure compared to traditional multi-page apps because of its cross-site scripting.

SPA and Client side framework

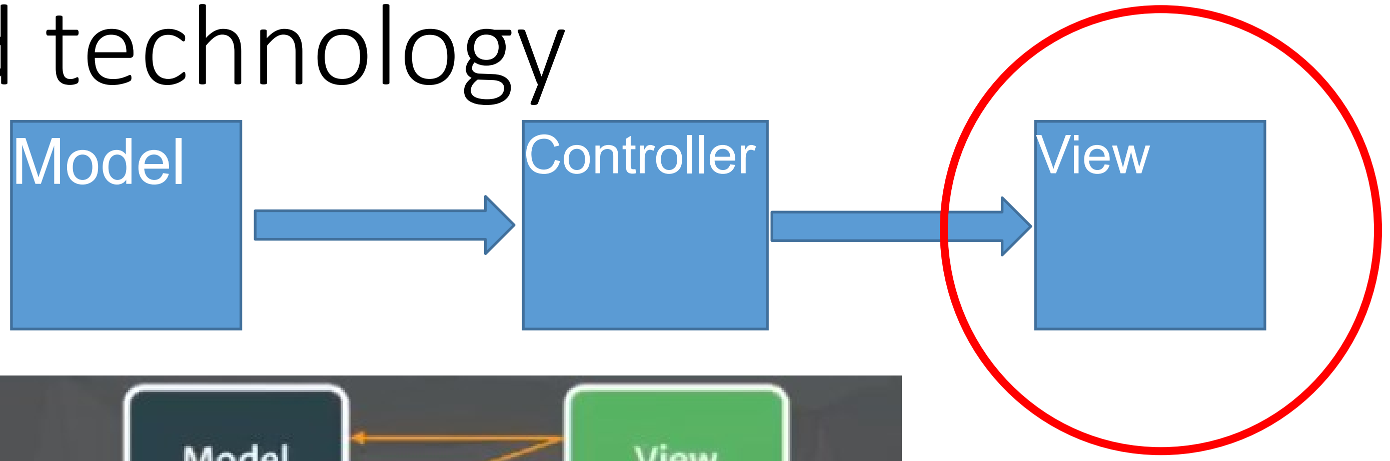
- Framework can manage large complex application
- Client-side frameworks
- React, AngularJS, Backbone, Ember, ExtJS, Knockout,MetroJS, Vue.JS etc.
- React
  - UI building library developed by Facebook
  - Using Virtual Dom for Dom manipulation
  - Create the new concepts such as Flux
- AngularJS
  - All-in-one web application framework developed by Google
  - Data binding, Directive, Routing, Security etc

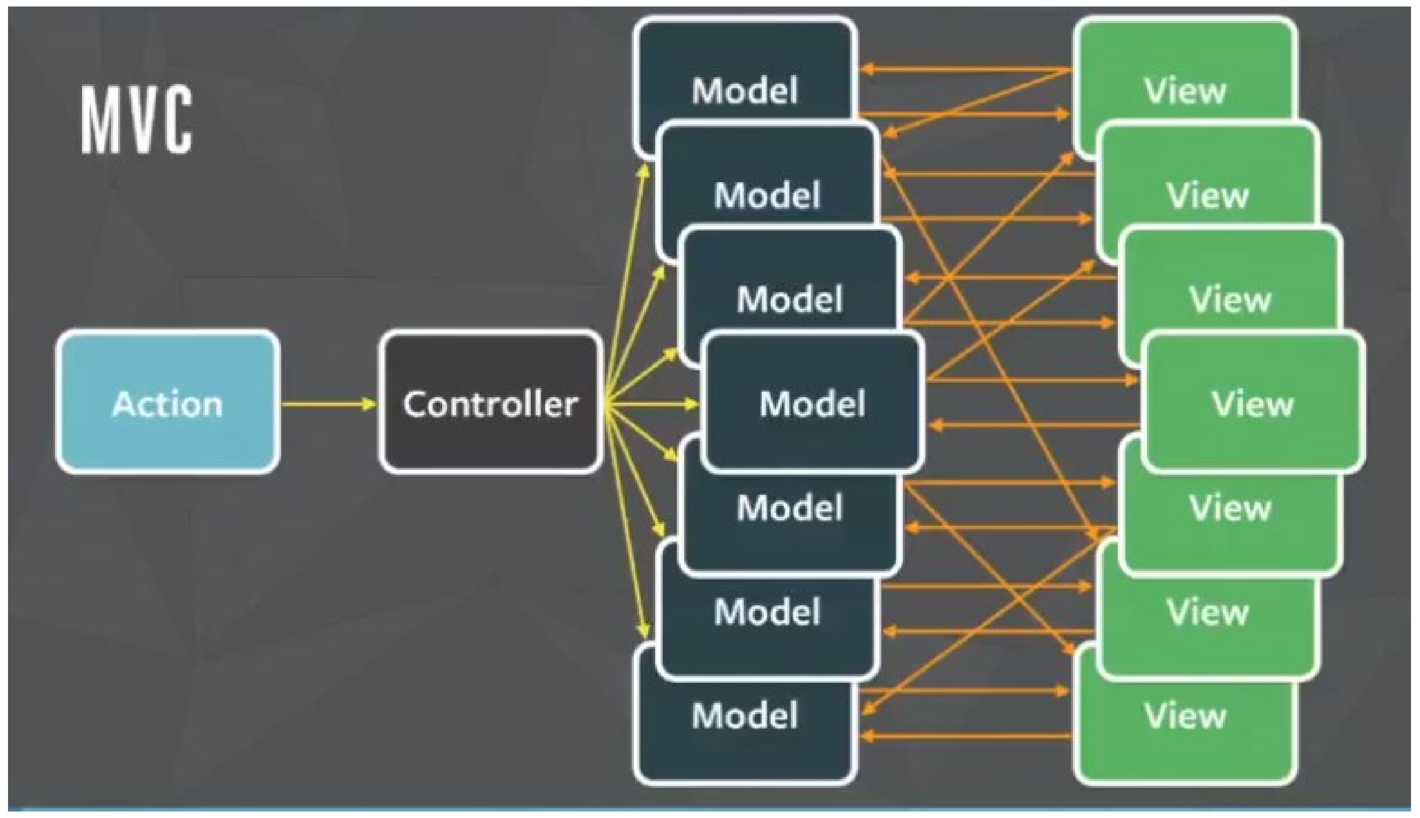


Your Project: Web Architecture + Micro Services Architecture You will build this architecture with MERN Stack and measure them

Problems with old technology

- MVC does not scale
- Typical MVC architecture





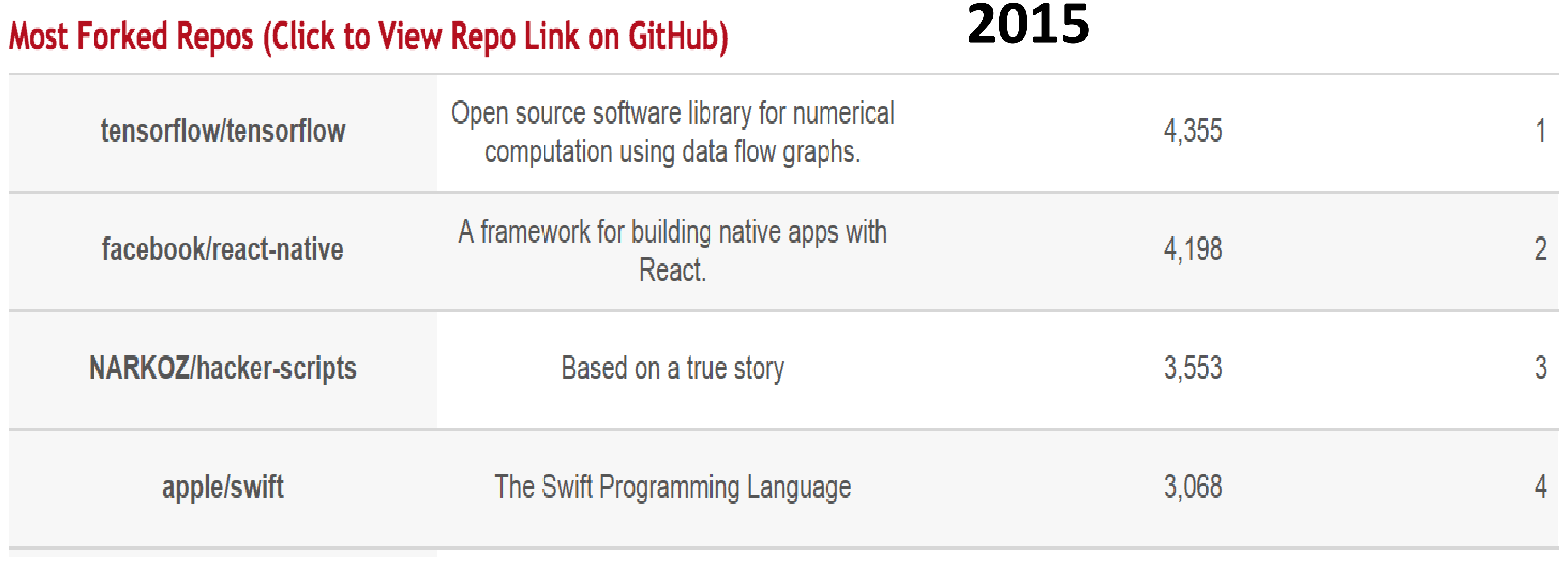
Problems with old technology (Contd)

- Complexity of two-way data binding
- Bad UX from using "cascading updates" of DOM tree
- A lot of data on a page changing over time
- Complexity of Facebook's UI architecture

Client side frameworks

- **ReactJS** **https://facebook.github.io/react/**
- https://reactjs.org/
- **Javascript library for building user interfaces**
- **Components** (collection of HTML, CSS, JS) **are the building blocks of React**
- Developed and maintained by facebook
- **Key Features**
  - **Virtual DOM**
  - **JSX**
  - **Components**
  - **Unidirectional data flow**

2015



Most Forked Repos (Click to View Repo Link on GitHub)

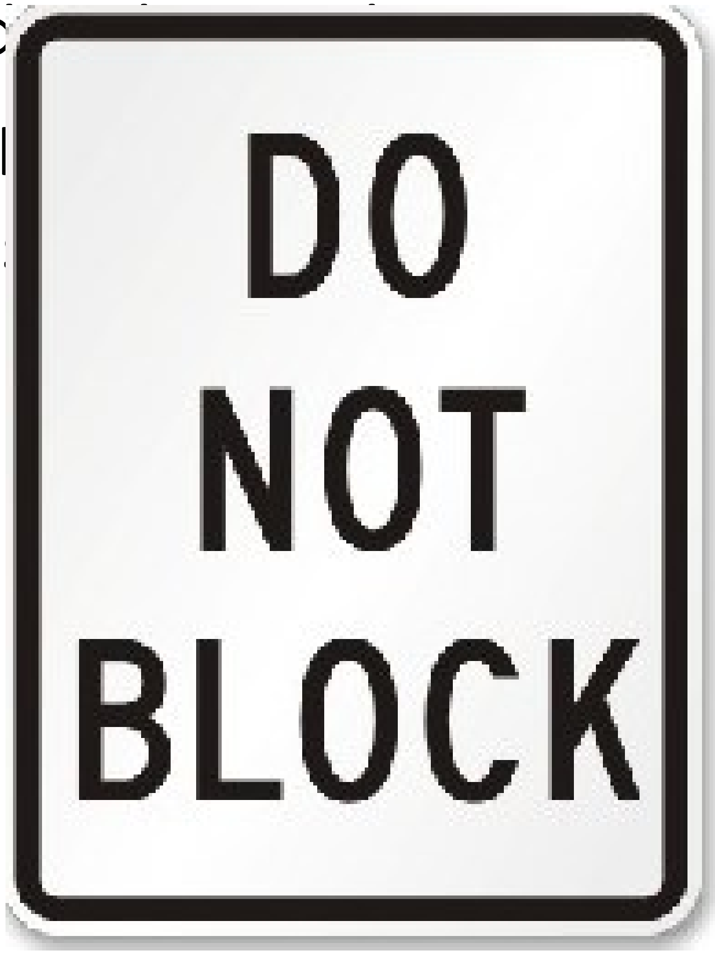
tensorflow/tensorflow	Open source software library for numerical computation using data flow graphs.	4,355	1
facebook/react-native	A framework for building native apps with React.	4,198	2
NARKOZ/hacker-scripts	Based on a true story	3,553	3
apple/swift	The Swift Programming Language	3,068	4

Who uses React?

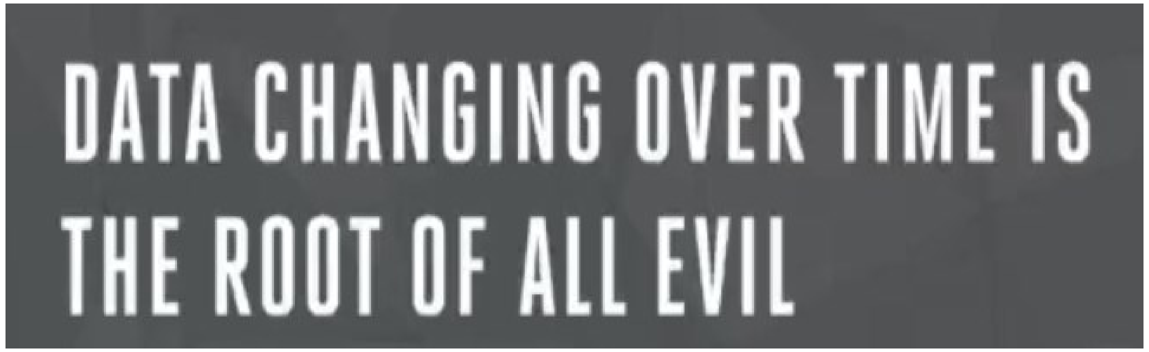
- https://github.com/facebook/react/wiki/Sites-Using-React

Why use React?

- Easy to read anc
- Concept of com web development
- If your page use **lata** or **real time data** - React is the way to go



Data Mutation is problem


DATA CHANGING OVER TIME IS THE ROOT OF ALL EVIL

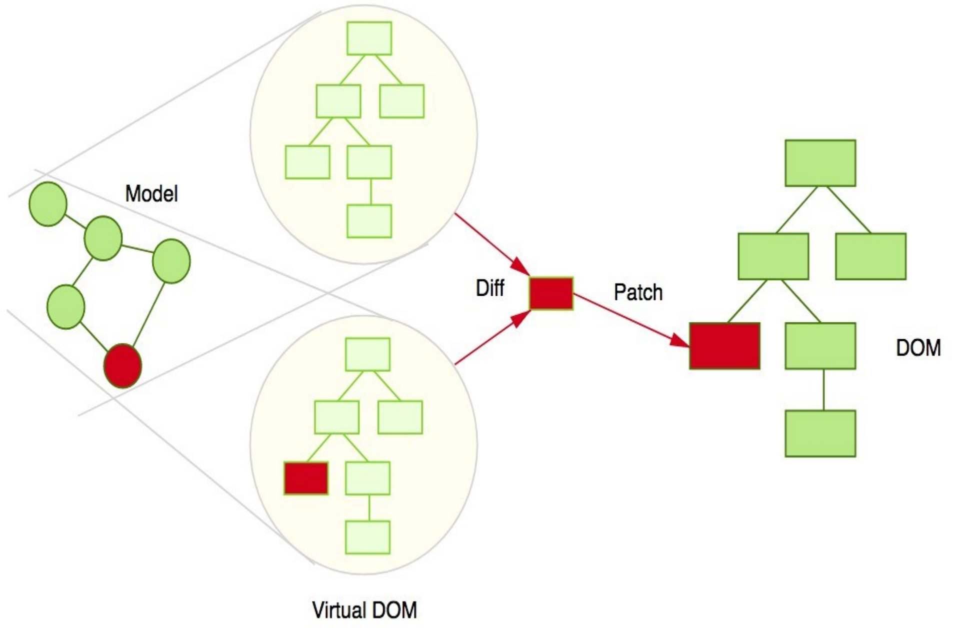
- When data changes, refresh
- When data changes,
  React re-renders the component
- But Stateful Browser DOM
- Reacts builds a new virtual DOM subtrees
- Computes the minimal set of DOM mutations and put them in a queue and Batch executes all updates

Source: Facebook

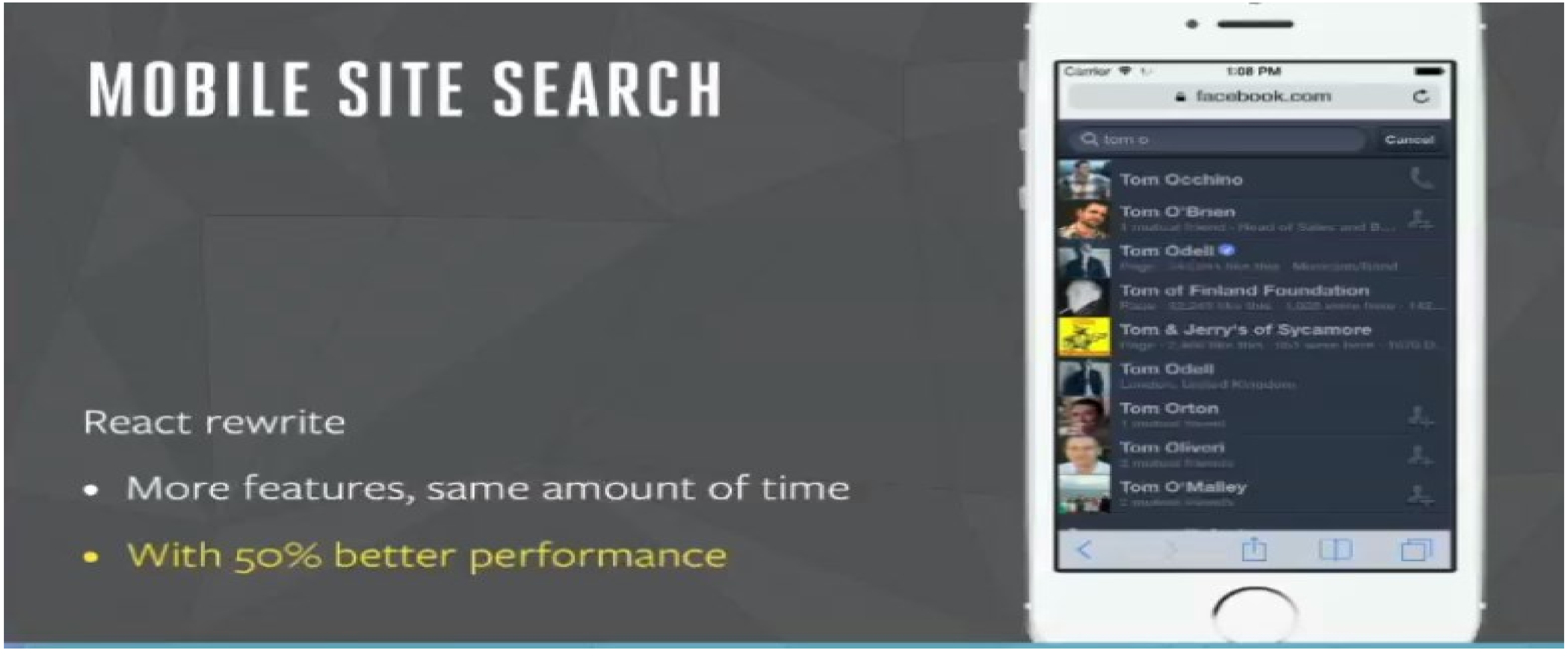
ReactJS

- Virtual DOM. Keeping state of DOM is hard
- Efficient diff algorithm
- Batched update operations
- Efficient update of sub tree only
- Uses observable instead of dirty checking to detect change

- AngularJS uses dirty checking runs in cycle after a specified time checking the whole model reduces the performance and thus makes the application slow.



React: 50% better performance



MOBILE SITE SEARCH

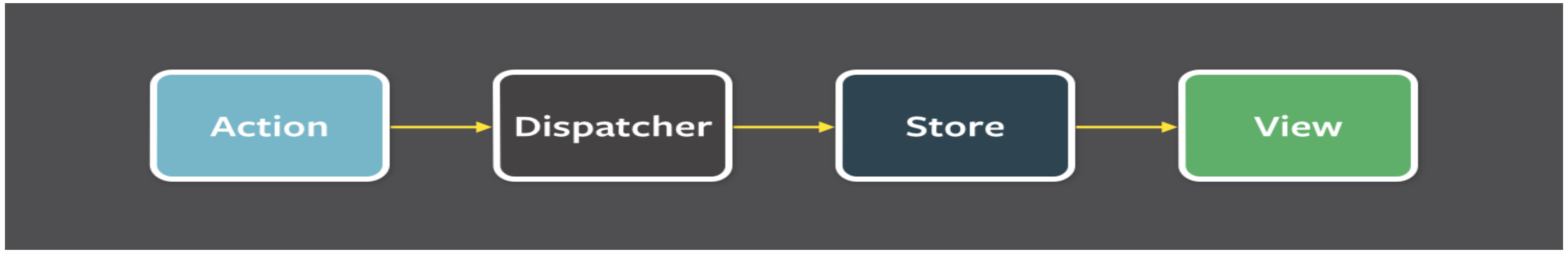
React rewrite

- More features, same amount of time
- With 50% better performance

Source: Facebook

Two way vs. Unidirectional data flow

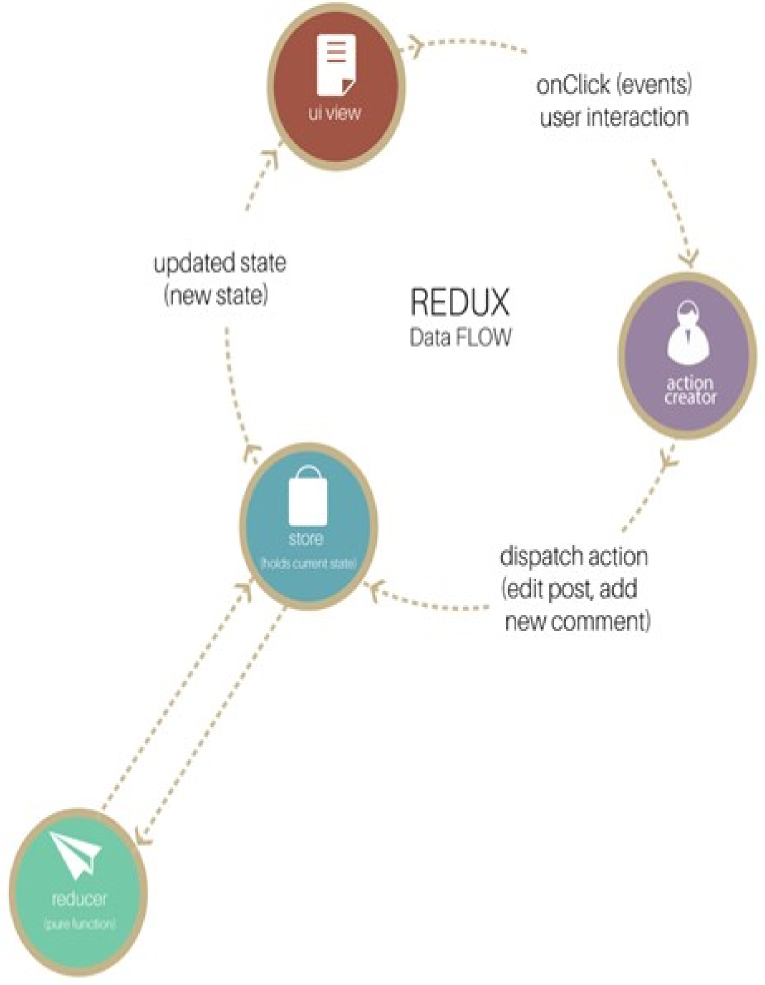
- In two way data binding
  - the view is updated when the state changes, and vice versa.
  - For example, when you change a model in AngularJS the view automatically reflects the changes.
  - it can lead to cascading updates and changing one model may trigger more updates.
  - View $\Leftrightarrow$ State
- Unidirectional data flow
  - Mutation of data is done via actions. So, new data always enters into the store through actions.
  - View components subscribe to the stores and automatically re-render themselves using the new data. So, the data flow looks like this :

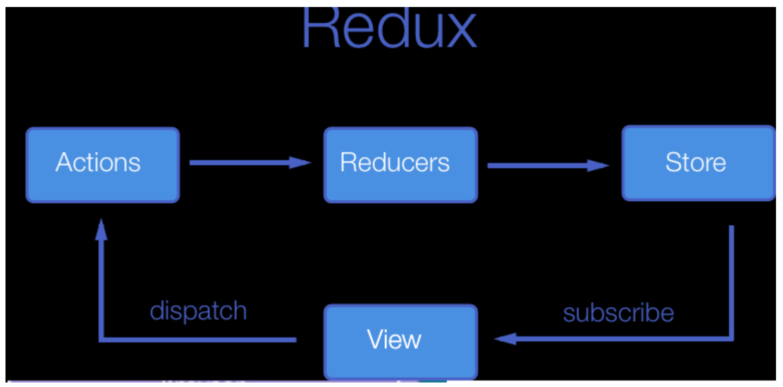


Source: Facebook

Redux

- Redux is a state container for JavaScript apps, often called a Redux *store*. It stores the whole state of the app in an immutable object tree.
- Actions: Actions are how the application interacts with the store. The application sends an action with some attached data. These actions are than handles by a so called **reducer**.
- Store: This structure stores the complete state of our application. Given only the content of the store, the application should be able to save and recover the current state of the application
- Reducer: The Reducer is a function that takes the current state and an action and transforms it to a new state.





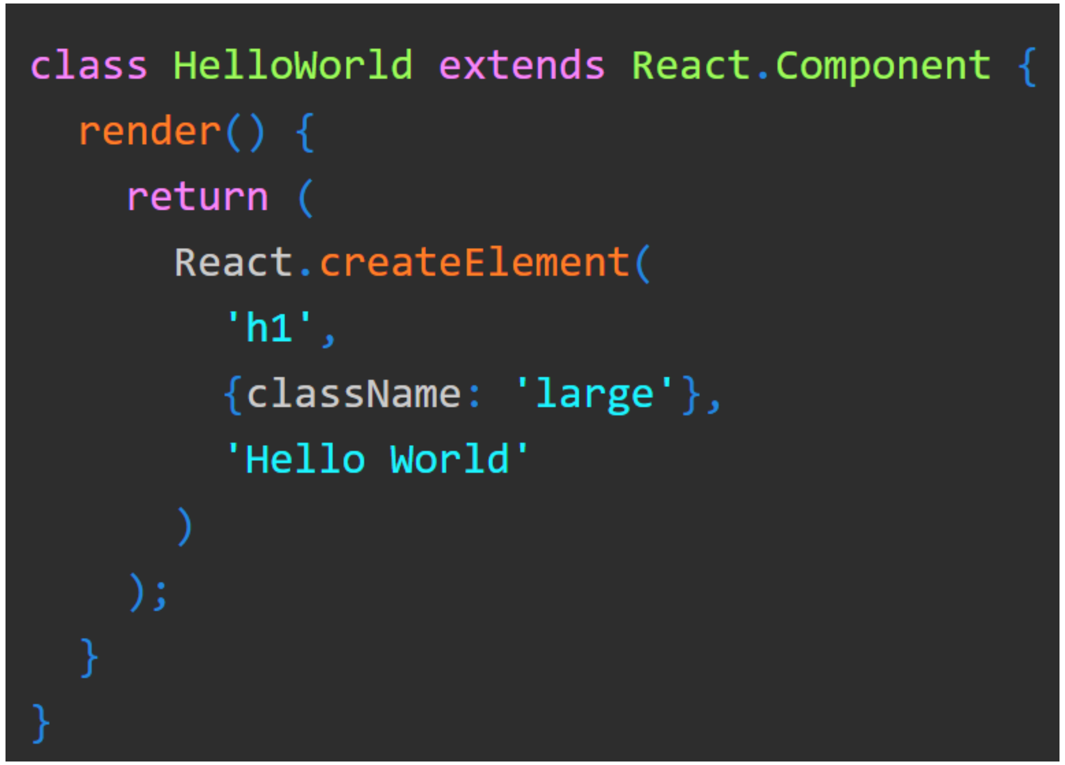
Redux

- The state is read-only: The state of the application can only be changed via actions. This is very useful for debugging, since the changing state flow is much more clear.
- The Redux store API is tiny and has only four methods:
  - store.getState() - Returns the current state object tree.
  - store.dispatch(action) - Dispatch an action to change the state.
  - store.subscribe(listener) - Listen to changes in the state tree.
  - store.replaceReducer(nextReducer) - Replaces the current reducer with another. This method is used in advanced use cases such as code splitting

Simple Redux Tutorial: https://appdividend.com/2017/08/23/redux-tutorial-example-scratch/

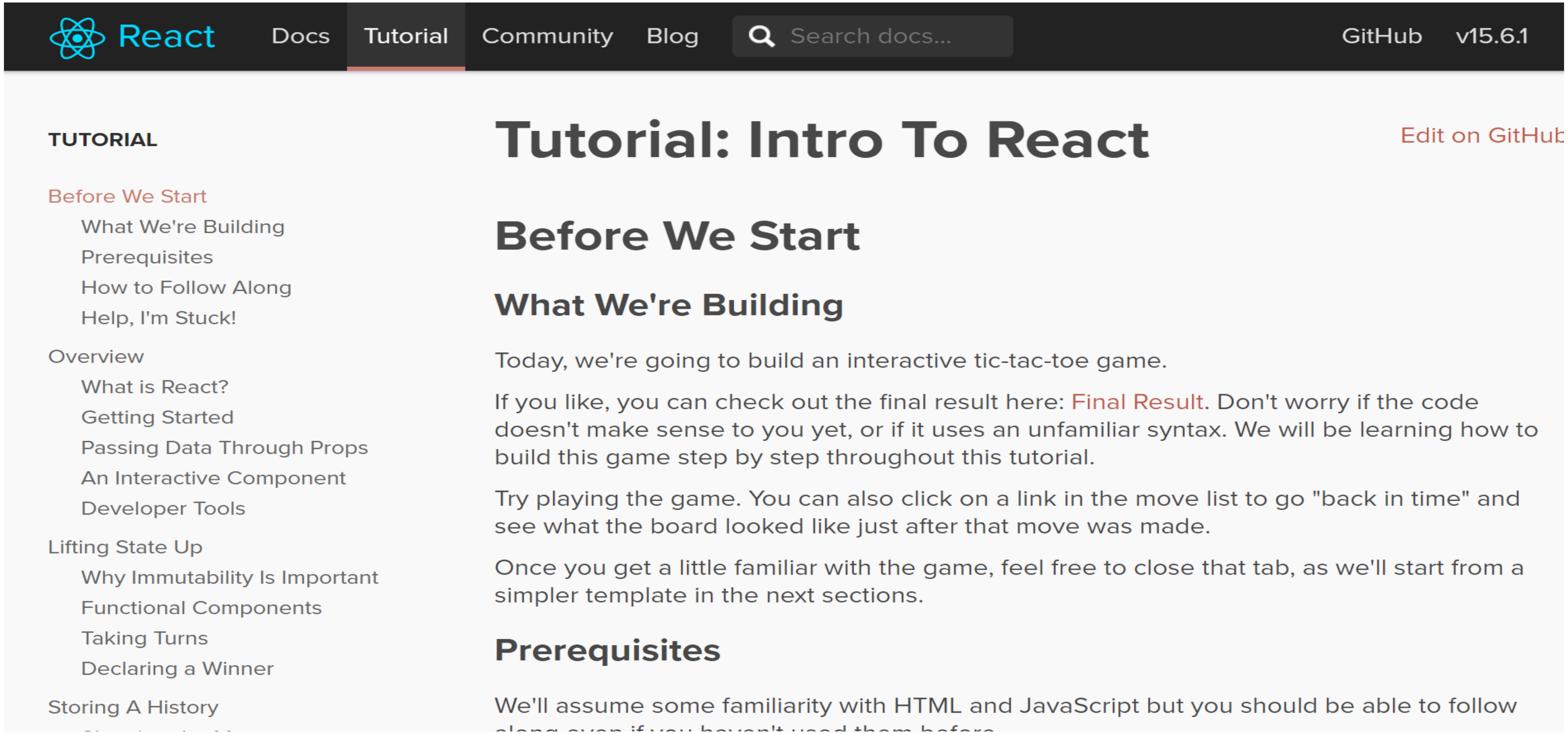
JSX (JavaScript eXtension)

- **JavaScript eXtension**, or more commonly **JSX**, is a React extension that allows us to write JavaScript that *looks like* HTML.
- JSX is a preprocessor step that adds XML syntax to JavaScript
  - Not mandatory to use with React
  - Makes React more elegant



```
class HelloWorld extends React.Component {
  render() {
    return (
      React.createElement(
        'h1',
        {className: 'large'},
        'Hello World'
      )
    );
  }
}
```

https://reactjs.org/tutorial/tutorial.html



TUTORIAL

Tutorial: Intro To React

Before We Start

What We're Building

Today, we're going to build an interactive tic-tac-toe game.

If you like, you can check out the final result here: Final Result. Don't worry if the code doesn't make sense to you yet, or if it uses an unfamiliar syntax. We will be learning how to build this game step by step throughout this tutorial.

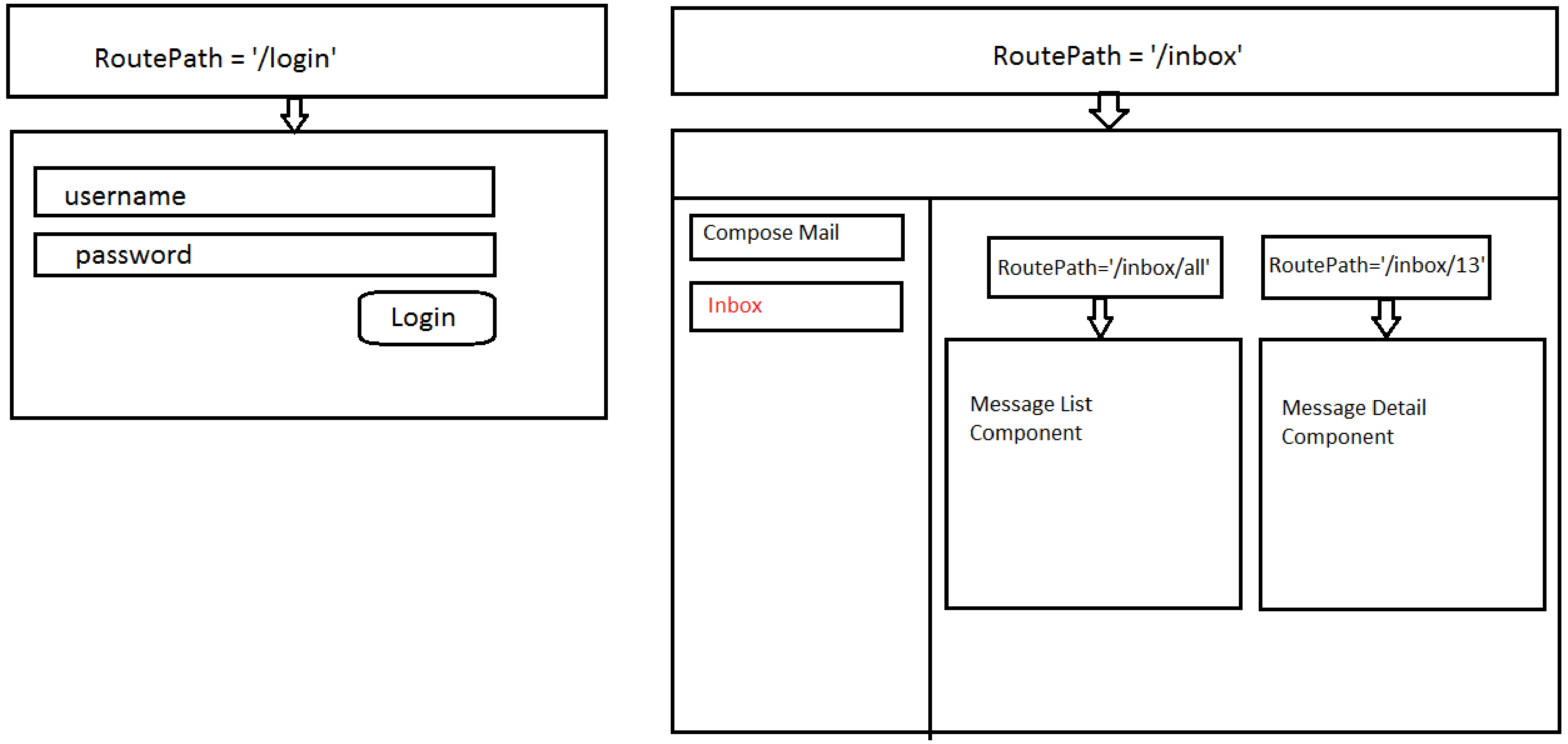
Try playing the game. You can also click on a link in the move list to go "back in time" and see what the board looked like just after that move was made.

Once you get a little familiar with the game, feel free to close that tab, as we'll start from a simpler template in the next sections.

Prerequisites

We'll assume some familiarity with HTML and JavaScript but you should be able to follow

Composition of Components


RoutePath = '/login'
username
password
Login
RoutePath = '/inbox'
Compose Mail
Inbox
RoutePath='/inbox/all'
RoutePath='/inbox/13'
Message List Component
Message Detail Component