

# Application Delivery Fundamentals



## Angular 8

New Features and Improvements

High performance. Delivered.

Parameswari Ettiappan

consulting | technology | outsourcing



# Angular 8

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## Goals

- CROSS PLATFORM
  - Progressive Web Apps
  - Native
  - Desktop
- SPEED AND PERFORMANCE
  - Code Generation(Template to code)
  - Universal
  - Code Splitting



# Angular 8

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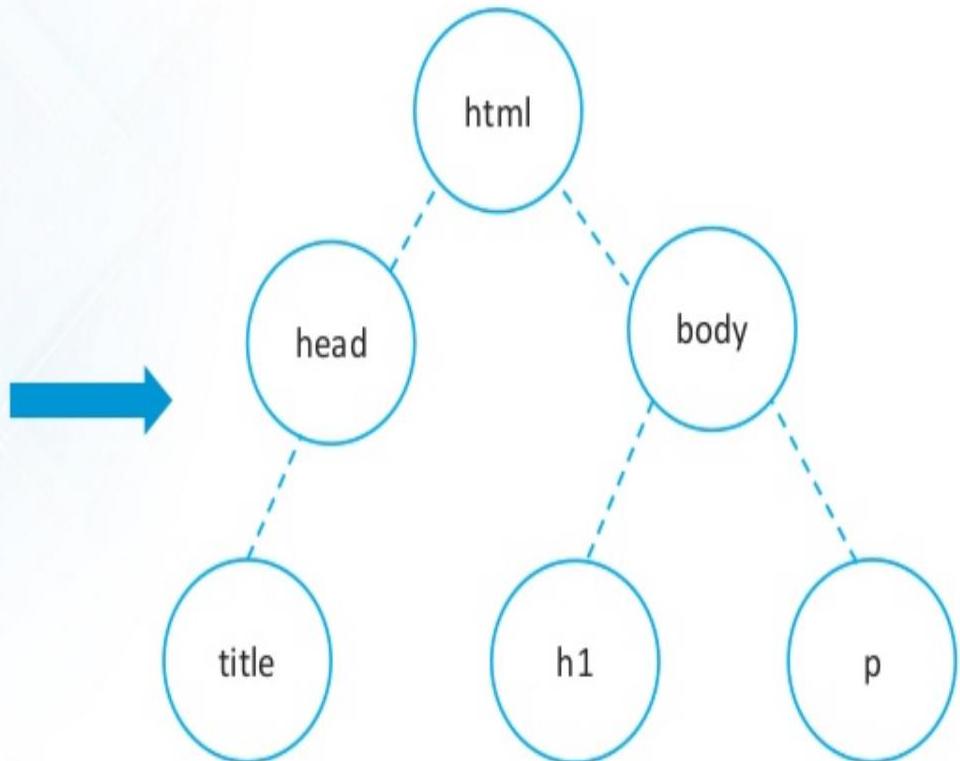
## Goals

- PRODUCTIVITY
  - Templates
  - Angular CLI
  - IDEs
- FULL DEVELOPMENT STORY
  - Testing
  - Animation
  - Accessibility(RPA enabled components)

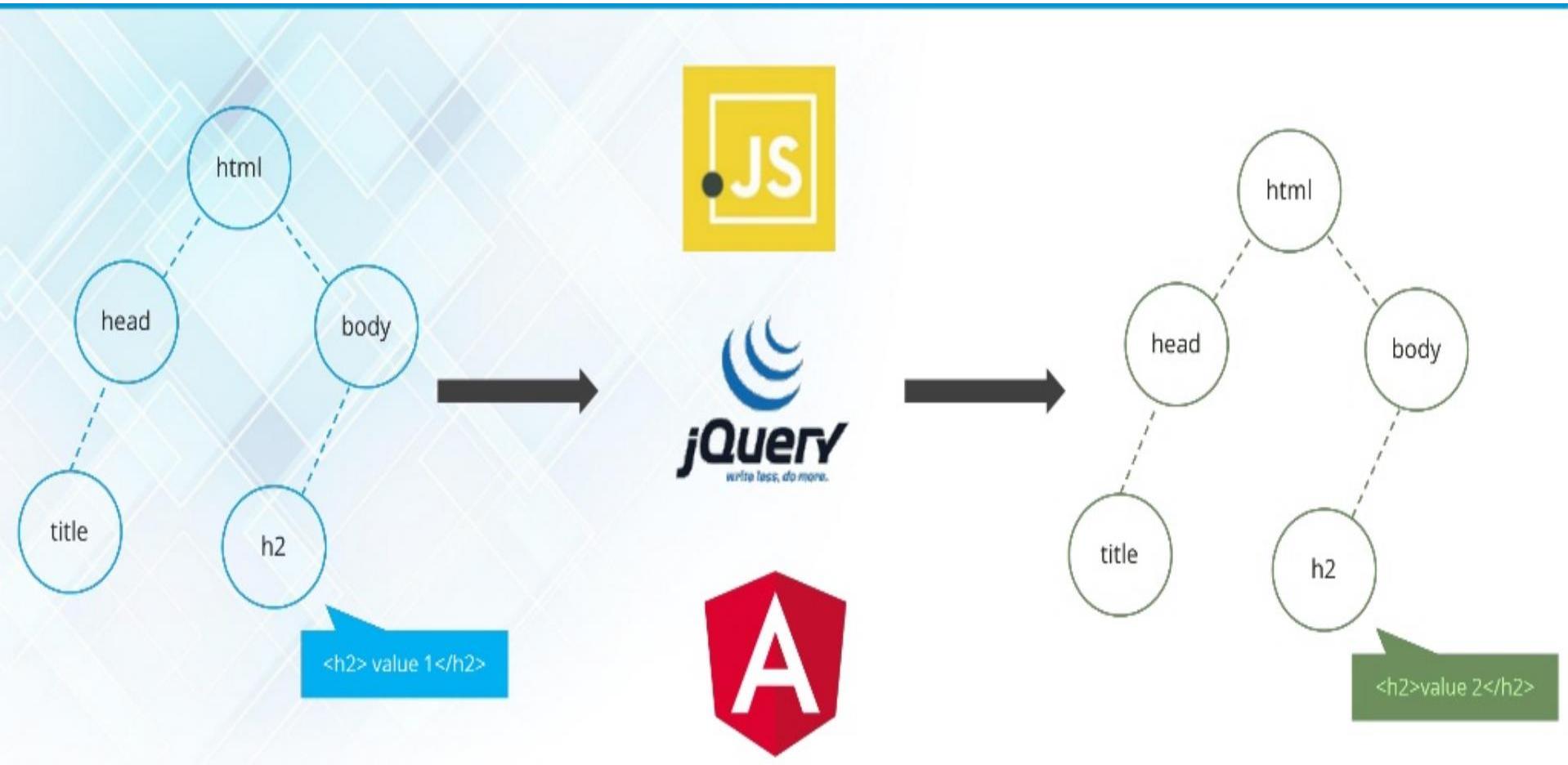


```
<html>
  <head>
    <title> Angular 2 Tutorial </title>
  </head>
  <body>
    <h1> Welcome to Angular 2 Tutorial </h1>
    <p>Angular is a development platform for creating
       applications using modern web standards.</p>
  </body>
</html>
```

HTML Markup



DOM Tree of the HTML document





- JavaScript is a programming language designed for use in a web browser.
- Used for manipulating DOM
- Example:

`Document.body.style.background = red;`

- jQuery is a library built in JavaScript to automate and simplify common tasks.
- Used for manipulating DOM
- Example:

`$(‘body’).css(‘background’, ‘#ccc’);`

# Demands of Modern Front-end Applications



- Step 1. Verify you have a working & stable data API.
- Step 2. Select software management tools(github,slack etc.,)
- Step 3. Create a foundational specification(device,browser, language,cultures etc.,)
- Step 4. Select a software development process
- Step 5. Select a development platform & a host platform (i.e. staging & production platforms)
- Step 6. Select package managers (node and bower)

# Demands of Modern Front-end Applications



- Step 7. Select site & user analytic tools(Chart analytics and user analytics)
  - analytics tools example
  - site analytics chartbeat
  - user analytics mixpanel
- Step 8. Select error, quality, and style code enforcement tools
- error, quality, and style enforcement code tools
  - example
- linters/hinters      CSSLint, HTMLhint, JShint
- code style checker      JavaScript Code Style
- code editor configuration file      .editorconfig

# Demands of Modern Front-end Applications



- Step 9. Select an automated task running tool
- The most common JavaScript task runners are Grunt.js, Gulp.js, or npm run using your package.json file.

# Demands of Modern Front-end Applications



- Step 10. Select application architecture/structure (and corresponding tools/solutions)
- app architecture/structure example
- MV\* AngularJS
- templates MVVM from AngularJS
- module communication AngularJS \$rootScope.\$broadcast and \$scope.\$on for a PubSub communication.
- data abstraction Kendo UI dataSource
- app structure NG seed
- routing AngularUI Router
- dependency management AngularJS Dependency Injection
- widgets/components Kendo UI (using built-in directives)
- css UI frameworks Material Design for Angular

# Demands of Modern Front-end Applications

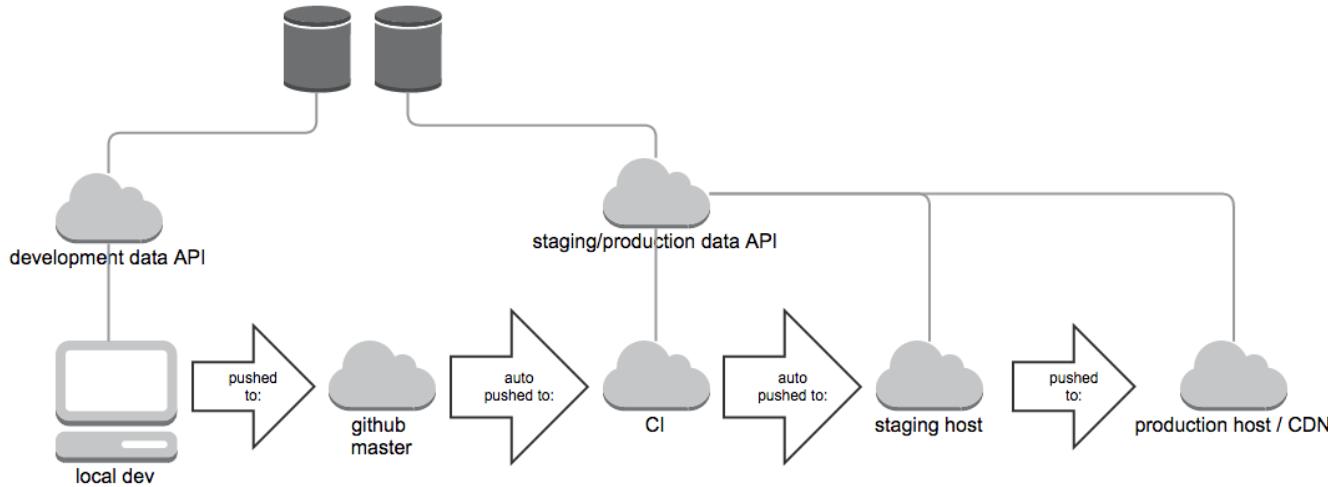


- Step 11. Select testing methodologies & tools
- testing tools example
- test runner (for unit testing) karma
- unit testing framework mocha
- unit testing assertions chai
- unit testing mocking sinon.js
- unit testing coverage blanketjs
- browser testing platform (for unit & functional testing)  
browserstack
- browser automation framework (for functional testing)  
nightwatch.js

# Demands of Modern Front-end Applications



- Step 12. Select code quality/complexity tools
- quality/complexity example
- JavaScript Source Analysis Plato
- Step 13. Define deployment strategy



# Demands of Modern Front-end Applications



- Step 14. Select package monitoring solution
- A tool like gemnasium can monitor both your npm package.json file as well as your bower.json file.
- Step 15. Select a JavaScript error monitoring solution
- Step 16. Select a performance monitoring solution
- Use something like Pingdom to capture uptime and performance stats.

# What is a Functional Requirement?



- In software engineering, a functional requirement defines a system or its component.
- It describes the functions a software must perform. A function is nothing but inputs, its behavior, and outputs.
- It can be a calculation, data manipulation, business process, user interaction, or any other specific functionality which defines what function a system is likely to perform.
- Functional software requirements help you to capture the intended behavior of the system.
- This behavior may be expressed as functions, services or tasks or which system is required to perform.

# What is a Functional Requirement?



- Example of Functional Requirements
- The software automatically validates customers against the ABC Contact Management System
- The Sales system should allow users to record customers sales
- The background color for all windows in the application will be blue and have a hexadecimal RGB color value of 0x0000FF.
- Only Managerial level employees have the right to view revenue data.
- The software system should be integrated with banking API
- The software system should pass Section 508 accessibility requirement.

# What is Non-Functional Requirement?



- A non-functional requirement defines the quality attribute of a software system.
- They represent a set of standards used to judge the specific operation of a system. Example, how fast does the website load?
- A non-functional requirement is essential to ensure the usability and effectiveness of the entire software system.
- Failing to meet non-functional requirements can result in systems that fail to satisfy user needs.
- Non-functional Requirements allows you to impose constraints or restrictions on the design of the system across the various agile backlogs.
- Example, the site should load in 3 seconds when the number of simultaneous users are > 10000. Description of non-functional requirements is just as critical as a functional requirement.

# What is Non-Functional Requirement?



- Examples of Non-functional requirements
- Here, are some examples of non-functional requirement:
- Users must change the initially assigned login password immediately after the first successful login. Moreover, the initial should never be reused.
- Employees never allowed to update their salary information. Such attempt should be reported to the security administrator.
- Every unsuccessful attempt by a user to access an item of data shall be recorded on an audit trail.
- A website should be capable enough to handle 20 million users without affecting its performance
- The software should be portable. So moving from one OS to other OS does not create any problem.
- Privacy of information, the export of restricted technologies, intellectual property rights, etc. should be audited.

# Functional vs Non Functional Requirements



| Parameters     | Functional Requirement      | Non-Functional Requirement             |
|----------------|-----------------------------|--|
| What it is     | Verb                        | Attributes                             |
| Requirement    | It is mandatory             | It is non-mandatory                    |
| Capturing type | It is captured in use case. | It is captured as a quality attribute. |
| End-result     | Product feature             | Product properties                     |
| Capturing      | Easy to capture             | Hard to capture                        |

# Functional vs Non Functional Requirements



|                 |  |  |
|-----------------|--|--|
| Objective       | Helps you verify the functionality of the software.                        | Helps you to verify the performance of the software.                               |
| Area of focus   | Focus on user requirement  | Concentrates on the user's expectation.  |
| Documentation   | Describe what the product does   | Describes how the product works  |
| Type of Testing | Functional Testing like System, Integration, End to End, API testing, etc. | Non-Functional Testing like Performance, Stress, Usability, Security testing, etc. |
| Test Execution  | Test Execution is done before non-functional testing.                      | After the functional testing   |
| Product Info    | Product Features   | Product Properties   |

# Advantages of Functional Requirement



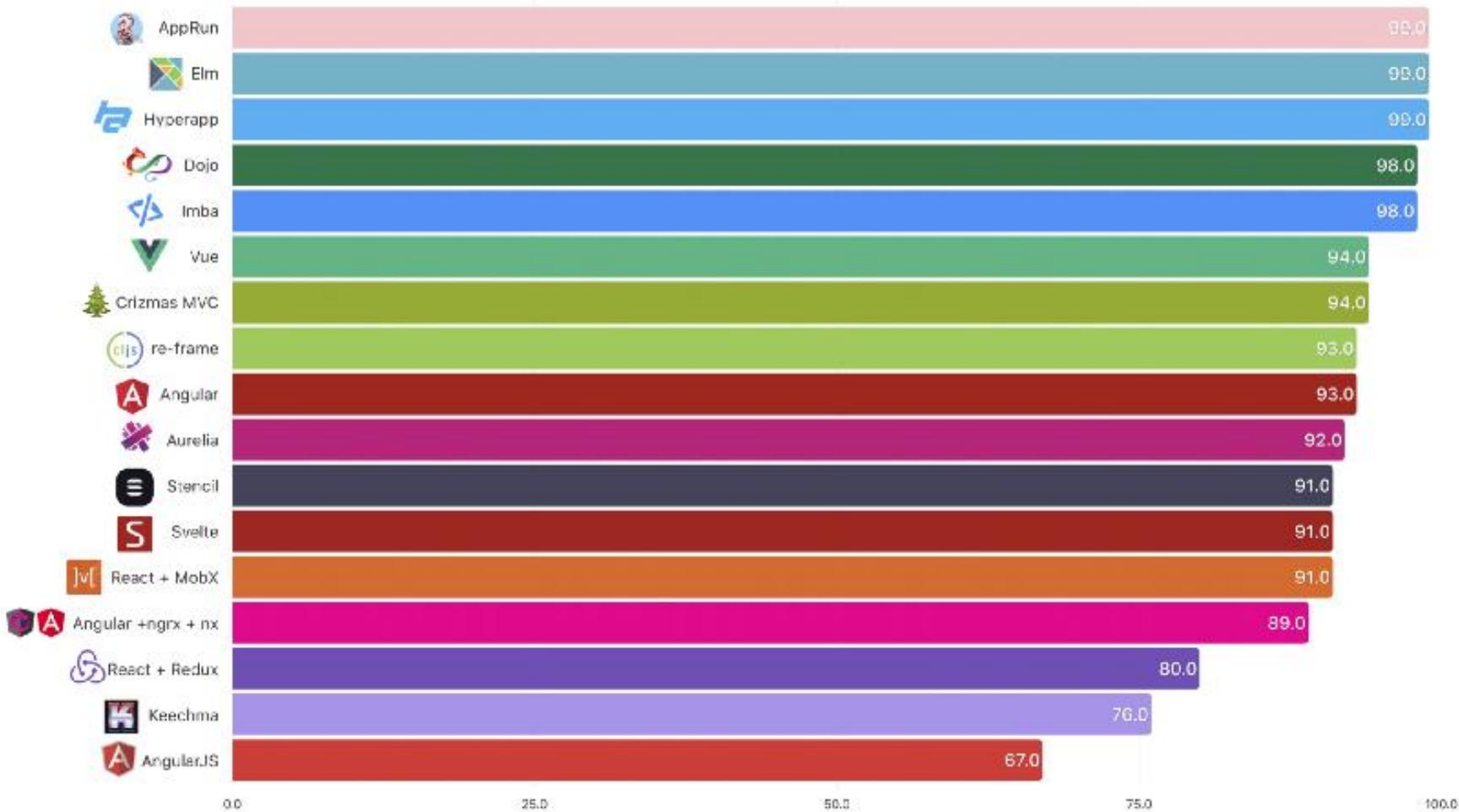
- Here, are the pros/advantages of creating a typical functional requirement document-
- Helps you to check whether the application is providing all the functionalities that were mentioned in the functional requirement of that application
- A functional requirement document helps you to define the functionality of a system or one of its subsystems.
- Functional requirements along with requirement analysis help identify missing requirements. They help clearly define the expected system service and behavior.
- Errors caught in the Functional requirement gathering stage are the cheapest to fix.
- Support user goals, tasks, or activities for easy project management
- Functional requirement can be expressed in Use Case form or user story as they exhibit externally visible functional behavior.

# Advantages of Non-Functional Requirement



- Benefits/pros of Non-functional testing are:
- The nonfunctional requirements ensure the software system follow legal and compliance rules.
- They ensure the reliability, availability, and performance of the software system
- They ensure good user experience and ease of operating the software.
- They help in formulating security policy of the software system.







|             | Community                          | Size   | Ecosystem        | Learnability |
|-------------|------------------------------------|--------|------------------|--------------|
| Angular.js  | 48,787 stars<br>1,449 contributors | 80 kb  | 1,877 ngModules  | Difficult    |
| Backbone.js | 24,650 stars<br>285 contributors   | 61 kb  | 257 backplugs    | Easy         |
| React.js    | 41,038 stars<br>666 contributors   | 450 kb | 4,442 components | Difficult    |
| Ember.js    | 16,115 stars<br>580 contributors   | 269 kb | 725 emberaddons  | Easy         |
| Aurelia.js  | 5,958 stars<br>30 contributors     | 295 kb | 12 plugins       | Easy         |

# 1. React



- Usage Statistics
- 475k websites on the web are powered by React.
- 64.8% of javascript developers are currently using React.
- Ranked 1st most popular front-end javascript framework in State Of JS survey.
- Github – 120.5k stars, 21k forks and 1200 contributors.

# 1. React



- Why REACT Is One Of The Top JavaScript Frameworks For 2019?
- High performance – React is renowned for its high efficiency and flexibility. It can be easily integrated with other frameworks without any hassle. Can be used for both client side as well as server side.
- Abundant Resources – As react is maintained by Facebook, there is a huge trove of documentation and resources available on the web which makes learning curve of react much smoother than its chief rival AngularJS.
- Backward Compatibility – Transitioning or migrating from older to new versions is fairly easy in react using CodeMods.
- Easy to maintain component structure – Component based architecture of ReactJS helps in increasing the reusability of code and makes maintenance of large scale projects quite a bit easier.
- Rich community – React has close to 1300 contributors on GitHub which is more than any other library/framework.
- Unidirectional Data Flow – One way/Unidirectional downward only data binding in react via flux controls helps to make sure that any changes made to child element structure don't affect the parent element structure

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# 1. React



- Cons Of Using REACT
- Bloated and complex – Many developers might find react too complex and bloated for their purpose as compared to Vue JS. Added complexity that comes along with react might be unnecessary for small scale projects
- JSX – The use of JSX adds another layer of complexity. JSX is a pre-processor, it adds XML syntax extension to JS. Although JSX helps to code react in a safer and faster manner, it is difficult to grasp for new developers.
- Need for Assembly-Tools – React requires a wide array of assembly tools to function properly and be compatible with other libraries and frameworks.
- SEO problems – webpages built with react are known to face issues with indexing by search engine crawlers/bots.



## 1.React

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- PROMINENT USERS
- LambdaTest, Netflix, Yahoo, Airbnb, Instagram, Facebook, WhatsApp , Sberbank, PayPal, Microsoft, BBC,



## 2.Vue

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- Usage Statistics
- 64k websites are powered by Vue.
- 28.8% of javascript developers are currently using vue.
- Ranked 2nd most popular front-end javascript framework in State Of JS survey.
- Github – 125k stars, 18k forks and 253 contributors.



## 2. Vue

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- Why VUE.JS Is One Of The Top JavaScript Frameworks For 2019?
- Fast Configuration: Vue has an inbuilt MVC model which makes configuration quick and easy compared to angular and react.
- Flexibility: Flexibility and modular nature of Vue helps developers with past experiences on other frameworks and libraries to quickly adopt Vue with minimal effort.
- Easy Learning curve: Learning curve of Vue is much easier than Angular and react. Only knowledge of HTML and JavaScript is required.
- Lightweight Size: Vue is highly lightweight and compact in size compare to all other major JavaScript frameworks like angular and react. Compressed version of Vue is only 18 kb in size.
- Integration Capability: Vue can be used to build both SPAs and large-scale complex applications as well with easy integration with server-side frameworks like Laravel, Symfony Django etc.
- Transitions: Vue makes it easy to add transitions to elements when they are added or removed from the DOM.



## 2. Vue

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- Cons Of Using VUE
- Poor Support: Vue doesn't offer a big resource collection to new users on a scale similar to that of angular and react. Considering a comparatively lower market share, developers who are new to Vue js might not find adequate support and resources.
- Small Community:: A large chunk of Vue developer community is from non-English speaking eastern European countries. Community engagement used to be fairly low, However that is expected to change in 2019 as Vue saw a mammoth rise in popularity by the end of 2018.



## 2. Vue

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- **PROMINENT CLIENTS**
- StackOverflow, 9gag, Adobe, Xiaomi, Grammarly, Alibaba.



## 3. Angular

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- Usage Statistics
- 350k websites on the web are powered by AngularJS/Angular2+ versions.
- 23.9% of javascript developers are currently using Angular.
- Ranked 3rd most popular front-end javascript framework in State Of JS survey.
- Github – 44.5k stars, 11.5k forks and 840 contributors.



## 3. Angular

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- Why ANGULAR Is One Of The Top JavaScript Frameworks For 2019?
- Data binding Apart from 2-way binding, angular 2 and beyond support 3 other types of data-binding namely – one-way property binding, event binding and interpolation.
- Enhanced RXJS has led to lightning fast compilation time of approx. 2.9 sec and modified start HttpClient.
- Abundant resources and support: Google offers a rich treasure trove of resources and rolls out new updates and improvements every 6 months.
- Support for Progressive web applications: Angular is the first framework to integrate features for development of progressive web applications.
- MVVM (Model-View-ViewModel) allows developers to work on the same application and data pool in isolation.
- Native mobile app: NativeScript powered by angular enables development of native mobile apps for both iOS and android.



### 3. Angular

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- Difficult Syntax: Angular has made a big leap in terms of syntax complexity after adopting TypeScript in angular2 and beyond. Yet it poses a steep learning curve for anyone making a transition from vanilla JS or jQuery.
- Migration: It is complex to migrate from older angular version especially from AngularJS to angular 7.
- Steep learning curve: out of the three top javascript front-end frameworks, Angular has the steepest learning curve and suffers from a very high rate of abandonment. A large base of angular users has moved to Vue and react.
- Knowledge of MVC: A crucial prerequisite for using angular is the need to have a thorough understanding of model view controller architecture



### 3. Angular

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- **PROMINENT CLIENTS**
- **Upwork, Freelancer, Udemy, YouTube, Paypal, Nike, Google, Telegram, Weather, iStockphoto, AWS, Crunchbase.**



## 4. Ember

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- Usage Statistics
- 7k websites on the web are powered by Ember.
- 6.3% of javascript developers are currently using Ember. Its popularity has stagnated over the last few years.
- Ranked 4rd most popular front-end JavaScript framework in State Of JS survey.
- Github – 20k stars, 4k forks and 750 contributors.



## 4. Ember

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- Why EMBER Is One Of The Top JavaScript Frameworks For 2019?
- Ember templates: One of the most striking features of ember is templates which help to create stunning UI. Templates are coded with Handlebars language which drastically reduces the necessary code. Templates are updated automatically as soon as moderation is made to their underlying data.
- Ember CLI: Ember-CLI is a command line addon that is packed alongside Ember stack. Ember-CLI provides support for techs like Sass/Less, CoffeeScript, Handlebars etc.
- Ember is shipped with Inspector tool to helps with debugging
- Convention over Configuration: Ember is based on Convention over Configuration (CoC). This helps devs to focus more on functionality and building apps faster and worrying less about planning High performance.



## 4. Ember

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- Problems With Ember
- Losing Market share: Ember has seen massive stagnation over past 5 years and faces obscurity in future. Big companies like Netflix and Airbnb have dumped ember and moved to other frameworks like react.
- Lack of Up to date resources: Ember has a very poor support offering due to a shrinking community and is plagued with outdated resources.
- Too complex to be implemented in small projects. Takes too much time to configure and use which eats away into productivity.
- In comparison to react and Vue, ember is extremely complicated and difficult to learn especially for beginners.



## 4. Ember

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- **PROMINENT USERS**
- Apple music, Groupon, Vine, Twitch, Chipotle, Atlas.io, sitepoint



## 5. Polymer

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- **Usage Statistics**
- **4k websites on the internet are powered by Polymer.**
- **3.8% of javascript developers are currently using Polymer.**
- **Ranked 6th most popular front-end javascript framework in State Of JS survey.**
- **Github – 20k stars, 1.9k forks and 140 contributors.**



## 5. Polymer

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- **Why POLYMER Is One Of The Top JavaScript Frameworks For 2019?**
- **Polymer.js enables developers to build their own custom HTML elements.**
- **Lightning Speed** – compared to other front end JavaScript frameworks, polymer clocks lightning fast speed especially on chrome and safari browser.
- **Supports both One-way and two-way data binding.**
- **Cross browser compatibility:** polymer was designed especially with keeping cross browser compatibility testing in mind.



## 5. Polymer

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- **Problems With Polymer**
- **Unlike its peers, it lacks server-side rendering.**
- **Not abundant resources:** As compared to react Vue and angular, polymer has scarce resources available on the net and has a very small community which has shunted its growth in popularity .



## 5. Polymer

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- **PROMINENT CLIENTS**
- **Google Apps like youtube, play music, Electronic Arts, ING, Coca Cola, McDonald's, IBM, General Electric**



# Why Angular?



# Why Angular?

edureka!



|                      | jQuery | Angular |
|----------------------|--------|---------|
| DOM Manipulation     | ✓      | ✓       |
| RESTful API          | ✗      | ✓       |
| Animation Support    | ✓      | ✓       |
| Deep Linking Routing | ✗      | ✓       |
| Form Validation      | ✗      | ✓       |
| 2 Way Data Binding   | ✗      | ✓       |
| AJAX/JSONP           | ✓      | ✓       |



# What is a Single Page Application?



# What is SPA?

A Single Page Application is a web application that requires only a single page load in a web browser.

- Whole page is not reloaded every time
- Your browser fully renders the DOM once
- Later any server interactions is performed by JavaScript which modifies the view

The screenshot shows the Gmail inbox interface. On the left, a sidebar menu includes 'COMPOSE' (red button), 'Inbox (2)', 'Starred', 'Sent Mail', 'Drafts', 'Less ▾', 'Important', 'Chats', 'All Mail' (bolded), 'Spam', 'Trash', and 'Categories'. A blue arrow points from the 'Categories' link to the 'mail categories' label below. The main area displays two emails in the inbox:

- Ashish Bakshi: Angular 4 is fun -- Thanks and regards, Ashish Bakshi
- Andy from Google: John, get more out of your new Google Account - Hi John,

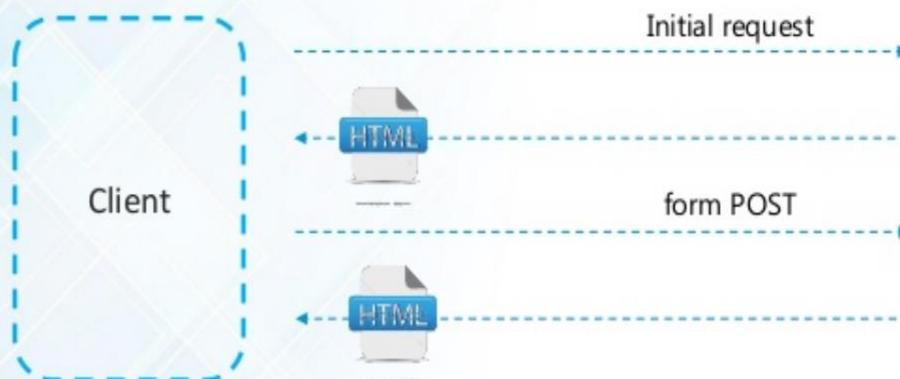
Below the inbox, it says "0 GB (0%) of 15 GB used" and has a "Manage" link. A blue arrow points from the 'Inbox' label in the top right to the 'mail inbox' label below. At the bottom right, there are links for "Terms · Privacy".



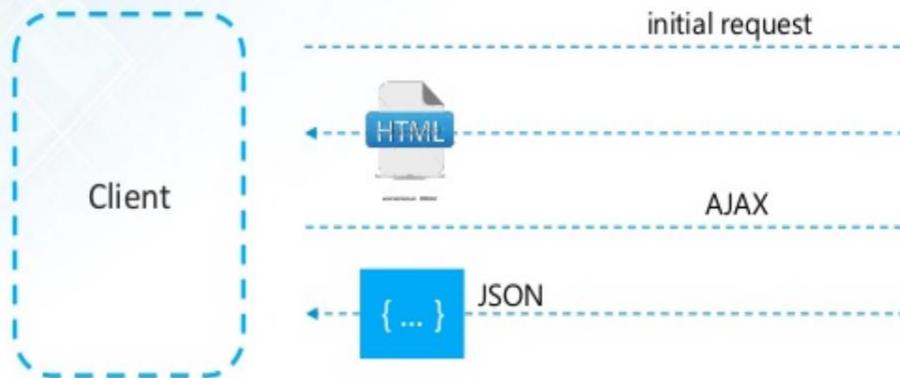
edureka!

## Traditional Way Vs Single Page Application

Traditional Way  
Life Cycle



Single Page Application  
Life Cycle





# Angular Introduction



# Angular Introduction

edureka!

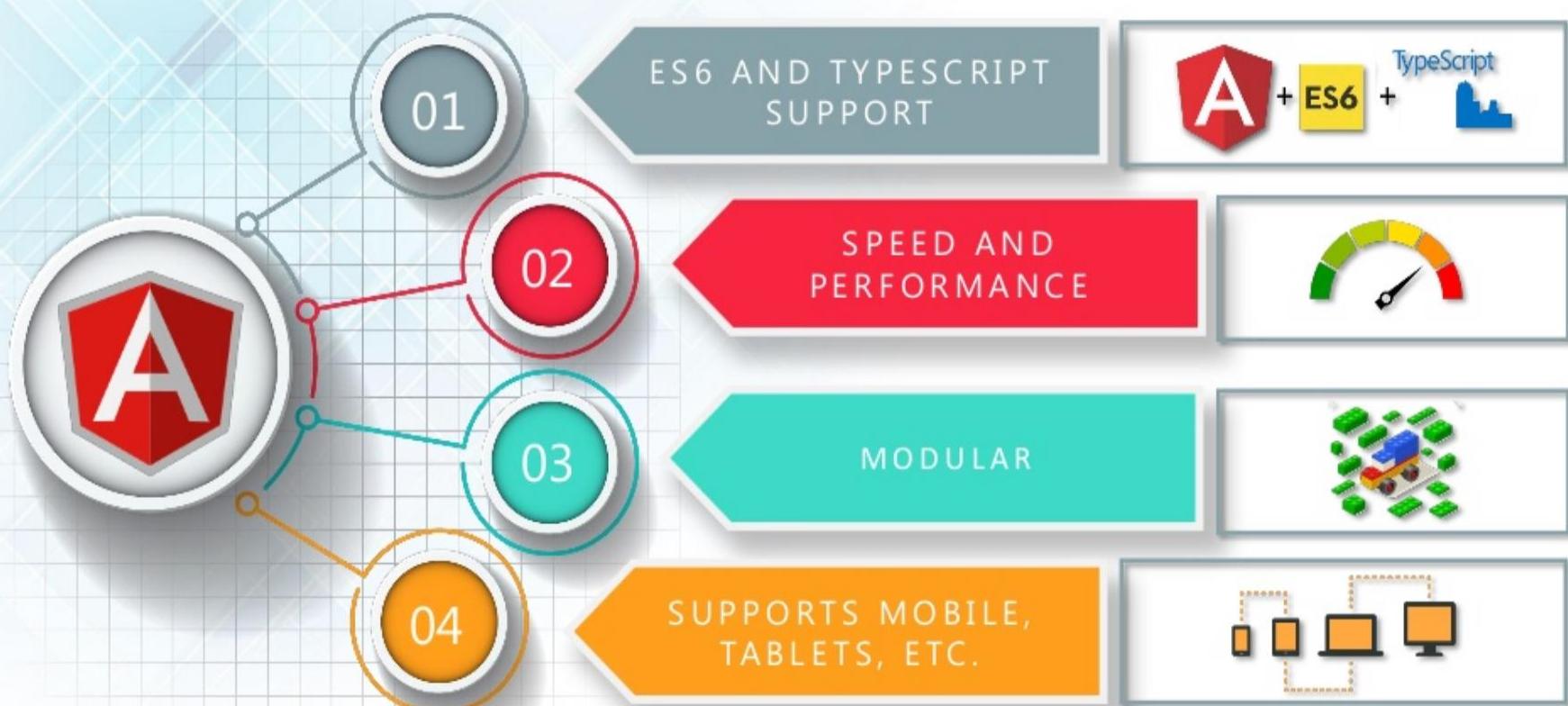




# Angular Features



# Angular Features





# Angular Installation



# IDEs and Tools

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## IDEs

- Amexio Canvas Web Based Drag and Drop IDE by MetaMagic
  - Amexio Canvas is Drag and Drop Environment to create Fully Responsive Web and Smart Device HTML5/Angular Apps. Code will be auto generated and hot deployed by the Canvas for live testing. Out of the box 50+ Material Design Theme support. Commit your code to GitHub public or private repository.
- Angular IDE by Webclipse
  - Built first and foremost for Angular. Turnkey setup for beginners; powerful for experts.
- IntelliJ IDEA
  - Capable and Ergonomic Java \* IDE
- Visual Studio Code
  - VS Code is a Free, Lightweight Tool for Editing and Debugging Web Apps.
- WebStorm
  - Lightweight yet powerful IDE, perfectly equipped for complex client-side development and server-side development with Node.js



# IDEs and Tools

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- Tooling
- Angular CLI
  - The official Angular CLI makes it easy to create and develop applications from initial commit to production deployment. It already follows our best practices right out of the box!
- Angular Playground
  - UI development environment for building, testing, and documenting Angular applications.
- Angular Universal
  - Server-side Rendering for Angular apps.
- Augury
  - A Google Chrome Dev Tools extension for debugging Angular applications.



# IDEs and Tools

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- Celerio Angular Quickstart
  - Generate an Angular CRUD application from an existing database schema
- Codemlyzer
  - Static analysis for Angular projects.
- Compodoc
  - This tool generates dedicated documentation for Angular applications.
- Lite-server
  - Lightweight development only Node.js® server
- NinjaCodeGen - Angular CRUD Generator
  - Generate several types of CRUD apps complete with e2e testing using template-sets for Angular, Material Design, Bootstrap, Kendo UI, Ionic, ...



# IDEs and Tools

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- Nx
  - Nx (Nrwl Extensions for Angular) is an open source toolkit built on top of Angular CLI to help enterprise teams develop Angular at scale.
- Protractor
  - The official end to end testing framework for Angular apps
- UI-jar - Test Driven Style Guide Development
  - A drop in module to automatically create a living style guide based on the test you write for your components.
- Universal for ASP.NET
  - This package provides facilities for developers building Angular applications on ASP.NET.



# IDEs and Tools

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- Angular Fire
  - The official library for Firebase and Angular
- AngularCommerce
  - Angular Commerce is a solution for building modern e-commerce applications with power of Google Firebase. Set of components is design agnostic and allows to easily extend functionality.
- Apollo
  - Apollo is a data stack for modern apps, built with GraphQL.
- Meteor
  - Use Angular and Meteor to build full-stack JavaScript apps for Mobile and Desktop.
- ngrx
  - Reactive Extensions for Angular
- ngx-api-utils
  - ngx-api-utils is a lean library of utilities and helpers to quickly integrate any HTTP API (REST, Ajax, and any other) with Angular.



# IDEs and Tools

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- UI Components
- ag-Grid
  - A datagrid for Angular with enterprise style features such as sorting, filtering, custom rendering, editing, grouping, aggregation and pivoting.
- Amexio - Angular Extensions
  - Amexio (Angular MetaMagic EXtensions for Inputs and Outputs) is a rich set of Angular components powered by Bootstrap for Responsive Design.
  - UI Components include Standard Form Components, Data Grids, Tree Grids, Tabs etc. Open Source (Apache 2 License) & Free and backed by MetaMagic Global Inc



# IDEs and Tools

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- Angular Material
  - Material Design components for Angular
- Ant Design Mobile of Angular (`ng-zorro-antd-mobile`)
  - A set of enterprise-class mobile UI components based on Ant Design Mobile and Angular
- Material Community Components
  - Material components made by the community



# IDEs and Tools

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- Ant Design of Angular (ng-zorro-antd)
  - A set of enterprise-class UI components based on Ant Design and Angular
- Blox Material
  - A lightweight Material Design library for Angular, based upon Google's Material Components for the Web
- Clarity Design System
  - UX guidelines, HTML/CSS framework, and Angular components working together to craft exceptional experiences
- DevExtreme
  - 50+ UI components including data grid, pivot grid, scheduler, charts, editors, maps and other multi-purpose controls for creating highly responsive web applications for touch devices and traditional desktops.



# IDEs and Tools

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# IDEs and Tools

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- Essential JS 2
  - Essential JS 2 for Angular is a collection modern TypeScript based true Angular Components. It has support for Ahead Of Time (AOT) compilation and Tree-Shaking. All the components are developed from the ground up to be lightweight, responsive, modular and touch friendly.
- Ignite UI for Angular
  - Ignite UI for Angular is a dependency-free Angular toolkit for building modern web apps.
- jQWidgets
  - Angular UI Components including data grid, tree grid, pivot grid, scheduler, charts, editors and other multi-purpose components
- Kendo UI
  - A professional grade library of Angular UI components written in TypeScript that includes our Data Grid, TreeView, Charts, Editors, DropDowns, DatePickers, and many more. Features include support for AOT compilation, Tree Shaking for high-performance, localization, and accessibility.



# IDEs and Tools

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- ng-bootstrap
  - The Angular version of the Angular UI Bootstrap library. This library is being built from scratch in Typescript using the Bootstrap 4 CSS framework.
- ng-lightning
  - Native Angular components & directives for Lightning Design System
- ngx-bootstrap
  - Native Angular directives for Bootstrap
- Onsen UI
  - UI components for hybrid mobile apps with bindings for both Angular & AngularJS.
- Prime Faces
  - PrimeNG is a collection of rich UI components for Angular

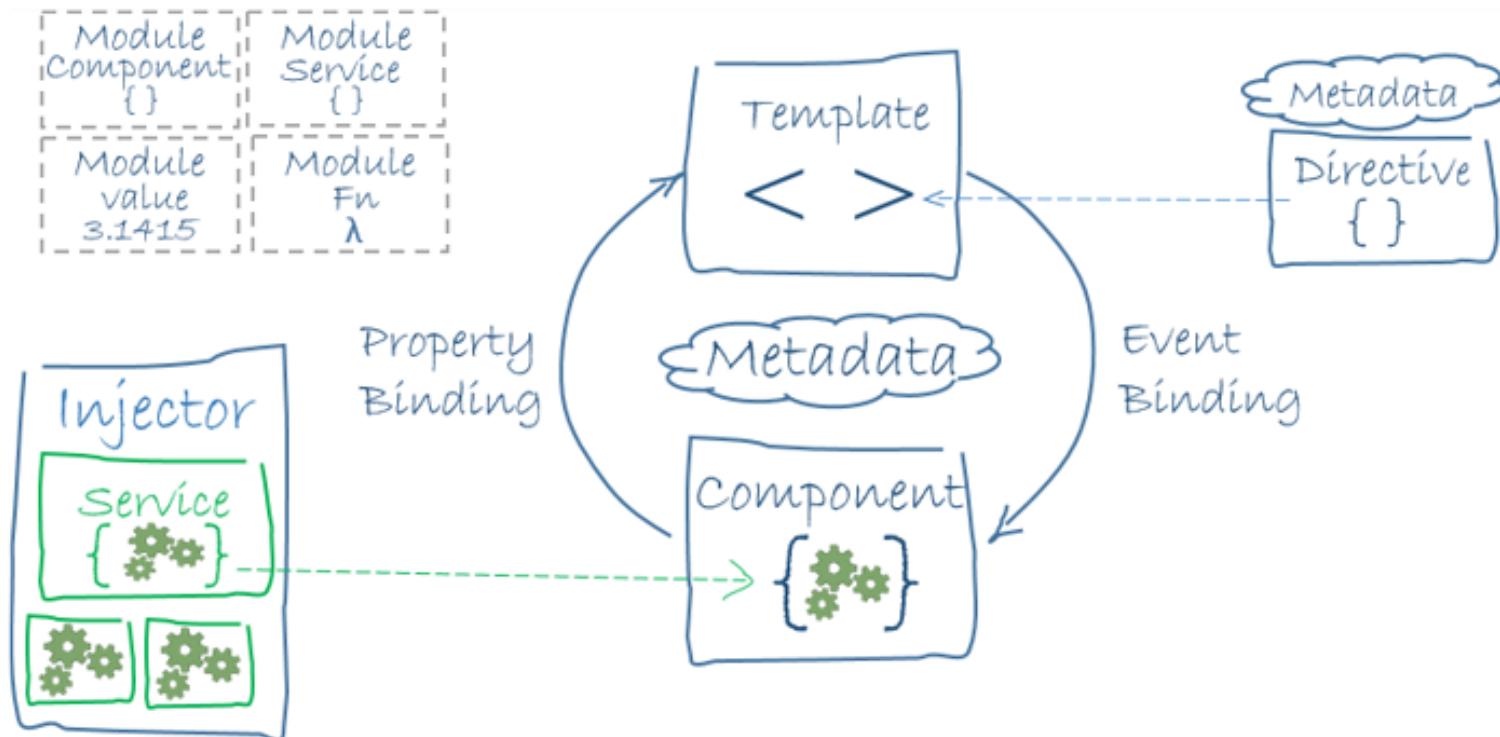


# The Angular Journey





# Architecture overview





## Architecture overview

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- Angular is a platform and framework for building client applications in HTML and TypeScript.
- Angular is written in TypeScript. It implements core and optional functionality as a set of TypeScript libraries that you import into your apps.
- The basic building blocks of an Angular application are NgModules, which provide a compilation context for components.
- NgModules collect related code into functional sets; an Angular app is defined by a set of NgModules.



## Architecture overview

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- An app always has at least a root module that enables bootstrapping, and typically has many more feature modules.
- Components define views, which are sets of screen elements that Angular can choose among and modify according to your program logic and data.
- Components use services, which provide specific functionality not directly related to views. Service providers can be injected into components as dependencies, making your code modular, reusable, and efficient.



# Architecture overview

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- Both components and services are simply classes, with decorators that mark their type and provide metadata that tells Angular how to use them.
- The metadata for a component class associates it with a template that defines a view. A template combines ordinary HTML with Angular directives and binding markup that allow Angular to modify the HTML before rendering it for display.
- The metadata for a service class provides the information Angular needs to make it available to components through dependency injection (DI).
- An app's components typically define many views, arranged hierarchically. Angular provides the Router service to help you define navigation paths among views. The router provides sophisticated in-browser navigational capabilities.



# Architecture overview

---

- Modules
- Angular NgModules differ from and complement JavaScript (ES2015) modules.
- An NgModule declares a compilation context for a set of components that is dedicated to an application domain, a workflow, or a closely related set of capabilities.
- An NgModule can associate its components with related code, such as services, to form functional units.
- Every Angular app has a root module, conventionally named AppModule, which provides the bootstrap mechanism that launches the application.
- An app typically contains many functional modules.



# Architecture overview

---

- Components
- Every Angular application has at least one component, the root component that connects a component hierarchy with the page document object model (DOM).
- Each component defines a class that contains application data and logic, and is associated with an HTML template that defines a view to be displayed in a target environment.
- The `@Component()` decorator identifies the class immediately below it as a component, and provides the template and related component-specific metadata.
- Decorators are functions that modify JavaScript classes. Angular defines a number of decorators that attach specific kinds of metadata to classes, so that the system knows what those classes mean and how they should work.



## Architecture overview

---

- Templates, directives, and data binding
- A template combines HTML with Angular markup that can modify HTML elements before they are displayed.
- Template directives provide program logic, and binding markup connects your application data and the DOM.  
There are two types of data binding:
  - Event binding lets your app respond to user input in the target environment by updating your application data.
  - Property binding lets you interpolate values that are computed from your application data into the HTML.



## Architecture overview

---

- Services and dependency injection
- For data or logic that isn't associated with a specific view, and that you want to share across components, you create a service class.
- A service class definition is immediately preceded by the `@Injectable()` decorator. The decorator provides the metadata that allows your service to be injected into client components as a dependency.
- Dependency injection (DI) lets you keep your component classes lean and efficient. They don't fetch data from the server, validate user input, or log directly to the console; they delegate such tasks to services.



# Architecture overview

---

- Routing
- The Angular Router NgModule provides a service that lets you define a navigation path among the different application states and view hierarchies in your app. It is modeled on the familiar browser navigation conventions:
- Enter a URL in the address bar and the browser navigates to a corresponding page.
- Click links on the page and the browser navigates to a new page.
- Click the browser's back and forward buttons and the browser navigates backward and forward through the history of pages you've seen.



# Building Blocks of Angular

Module

Component

Metadata

Template

Data Binding

Services

Directives



# Building Blocks of Angular

edureka!

Module

Component

Metadata

Template

Data Binding

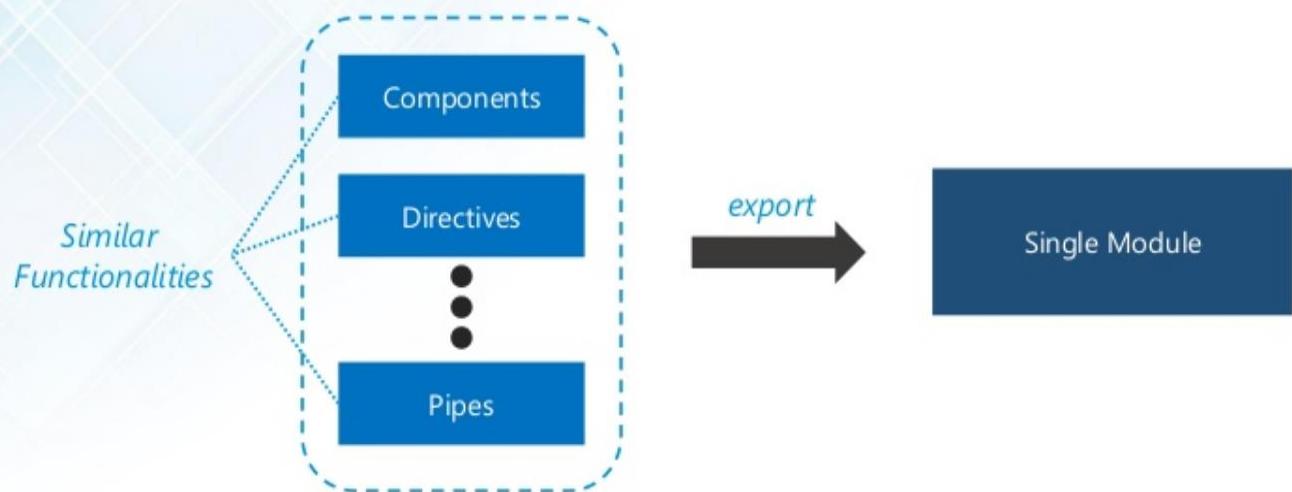
Services

Directives

Module is a class with  
@NgModule metadata

Every Angular app has at  
least one root module

Encapsulation of different  
similar functionalities





# Building Blocks of Angular

edureka!

Module

Component

Metadata

Template

Data Binding

Services

Directives

```
import { BrowserModule } from '@angular/platform-browser';
import { NgModule } from '@angular/core';
import { FormsModule } from '@angular/forms';
import { HttpClientModule } from '@angular/http';

import { AppComponent } from './app.component';
import { TaskComponent } from './task/task.component';

@NgModule({
  declarations: [
    AppComponent,
    TaskComponent
  ],
  imports: [
    BrowserModule,
    FormsModule,
    HttpClientModule
  ],
  providers: [],
  bootstrap: [AppComponent]
})
export class AppModule { }
```

Decorator

Declaring all the components

Importing Modules

Provide Services to all module's component



# Building Blocks of Angular

edureka!

Module

Component

Metadata

Template

Data Binding

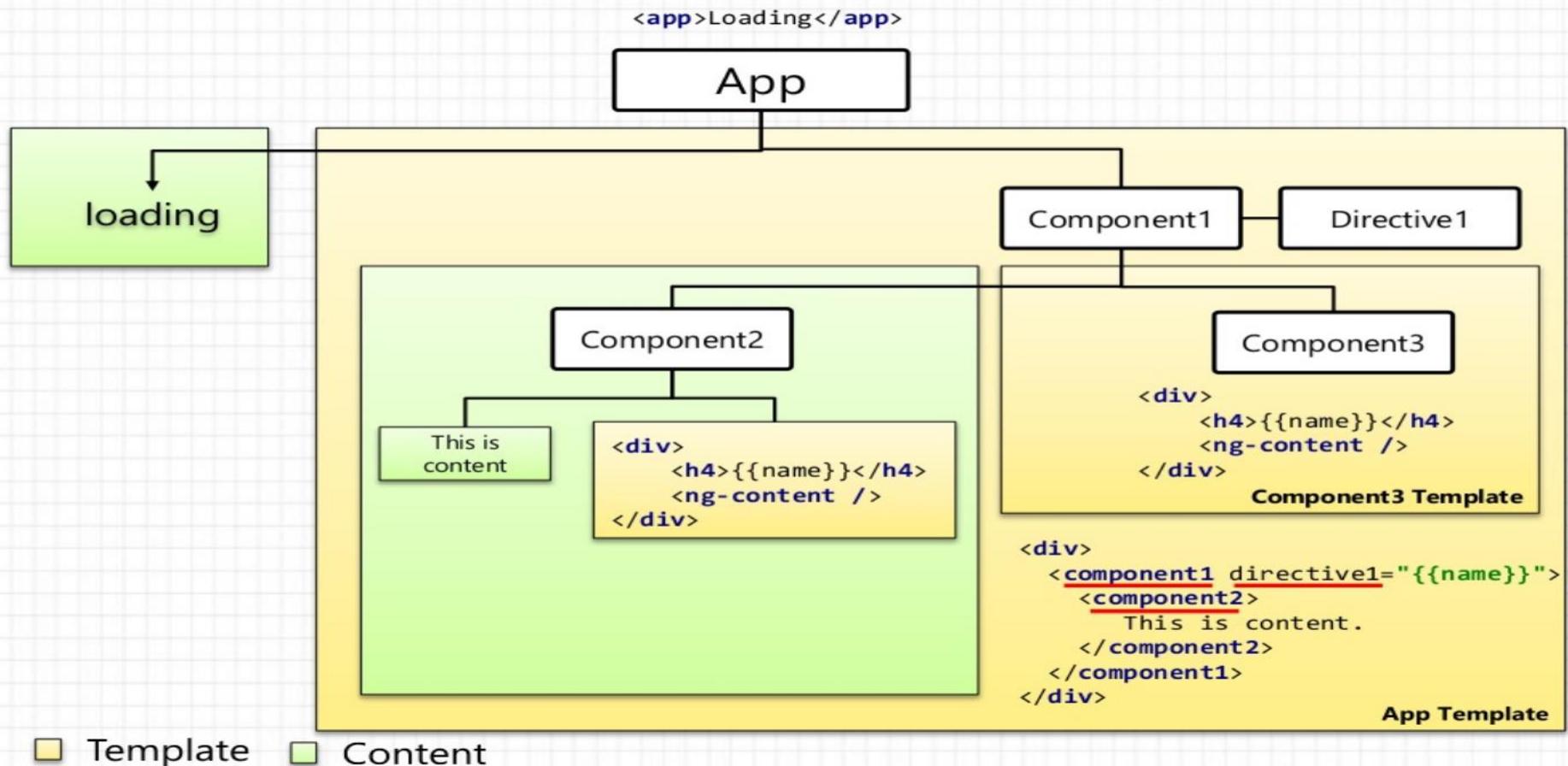
Services

Directives

The screenshot shows the homepage of theguardian.com. At the top, there is a navigation bar with links for sign in, search, jobs, more, International edition, and the main logo 'theguardian'. Below the navigation bar, there is a breadcrumb trail 'home > tech' and a menu bar with links for UK, world, sport, football, opinion, culture, business, lifestyle, and all. A red arrow points from the word 'Nav Bar' to this menu area. The main content area features a green sidebar with the heading 'technology' and a news article about a drone incident at Heathrow. To the right of the sidebar, there are two news cards: one showing a plane on a runway and another showing a person holding a Samsung Galaxy S8 smartphone. A green arrow points from the word 'News Feed' to the second news card.



# Tree Components





# Building Blocks of Angular

edureka!

Module

Component

Metadata

Template

Data Binding

Services

Directives

```
import { Component, OnInit } from '@angular/core';
@Component({
  selector: 'app-example',
  templateUrl: './example.component.html',
  styleUrls: ['./example.component.css']
})
export class ExampleComponent implements OnInit {
  constructor() { }
  ngOnInit() {
  }
}
```

Importing Component Decorator → `import { Component, OnInit } from '@angular/core';`

Decorator → `@Component({`

Meta Data → `selector: 'app-example',`  
`templateUrl: './example.component.html',`  
`styleUrls: ['./example.component.css']`

Exporting Component Class → `export class ExampleComponent implements OnInit {`



# Building Blocks of Angular

Module

Component

**Metadata**

Template

Data Binding

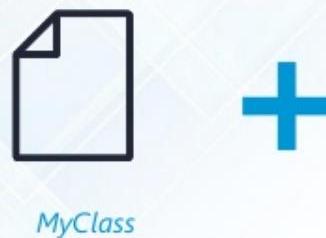
Services

Directives

Metadata describes how  
to process the class

Decorator is used to  
attach metadata

Example:





# Building Blocks of Angular

edureka!

Module

Component

Metadata

Template

Data Binding

Services

Directives

```
@Component({  
  selector: 'app-example',  
  templateUrl: './example.component.html',  
  styleUrls: ['./example.component.css'],  
  providers: [ExampleService]  
})
```

Decorator that specifies how to process an Angular Class

Creates an instance of the component

HTML template for the component

CSS Styling

Provides Service for the Component



# Component Metadata

- **Names:**

- selector? : string
- exportAs? : string

- **Binding:**

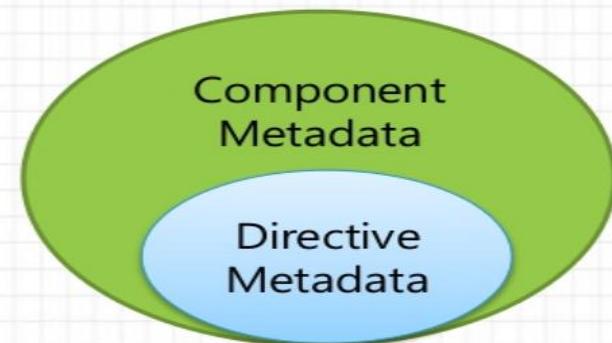
- inputs? : string[]
- outputs? : string[]
- host? : {[key: string]: string}
- changeDetection?: ChangeDetectionStrategy

- **Injector:**

- providers? : any[]
- viewProviders? : any[]
- directives? : Array<Type | any[]>
- pipes? : Array<Type | any[]>
- queries? : {[key: string]: any}

- **View:**

- templateUrl? : string
- template? : string
- styleUrls? : string[]
- styles? : string[]
- encapsulation?: ViewEncapsulation





# Building Blocks of Angular

edureka!

Module

Component

Metadata

Template

Data Binding

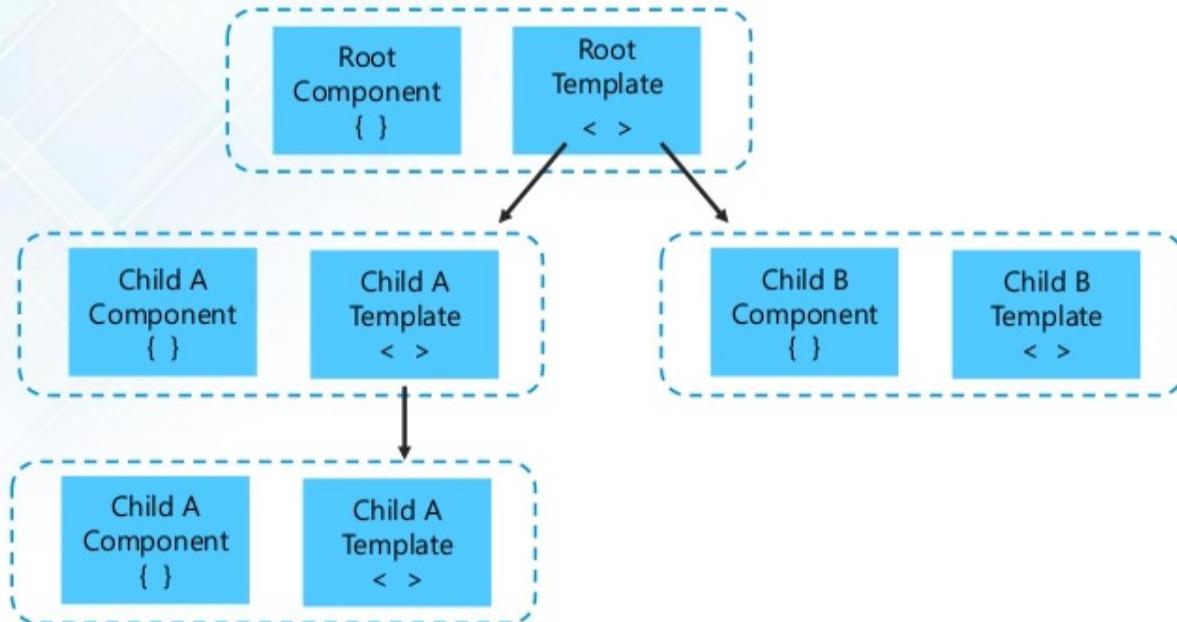
Services

Directives

Used to define view of a component

Looks like HTML, except for a few differences.

Describes how the component is rendered on the page.





# Building Blocks of Angular

edureka!

Module

Component

Metadata

Template

Data Binding

Services

Directives

## TYPES OF DATA BINDING

Data binding plays an important role in communication between a template and its component

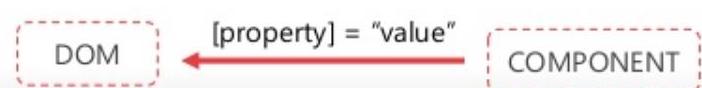
### INTERPOLATION

01



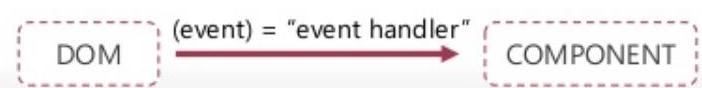
### PROPERTY BINDING

02



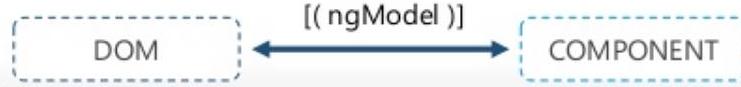
### EVENT BINDING

03



### 2 WAY DATA BINDING

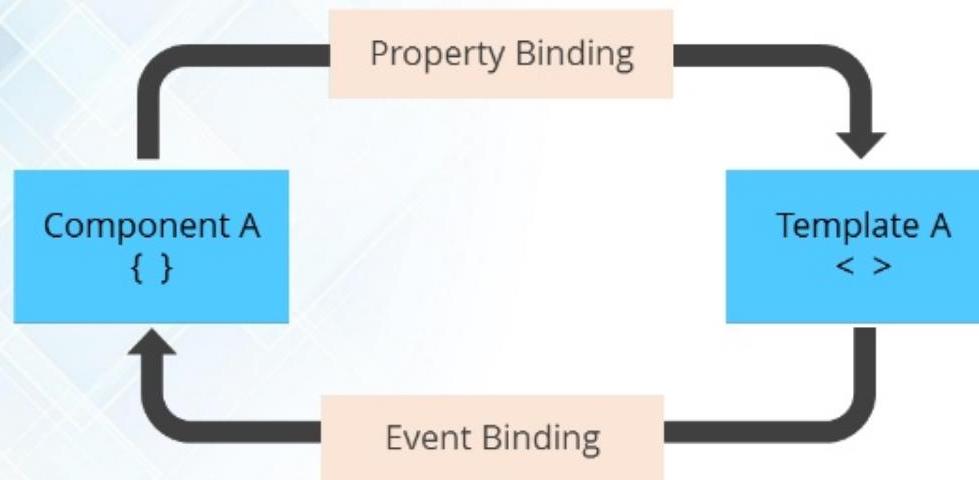
04





# Building Blocks of Angular

edureka!

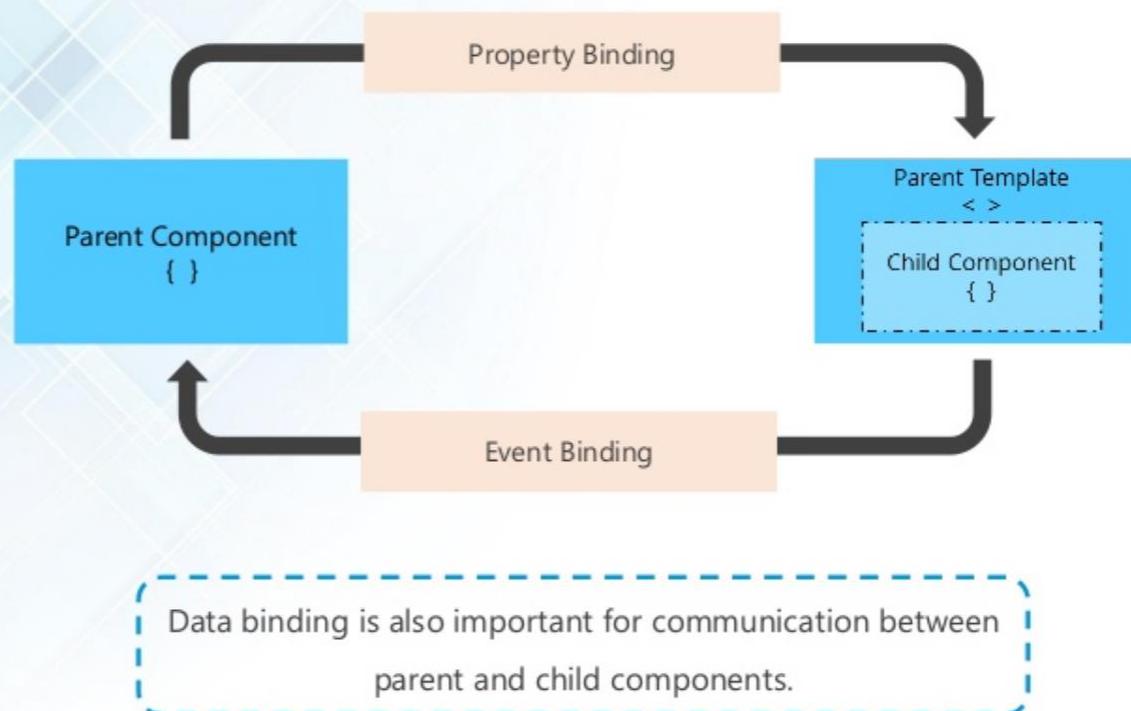


Data binding plays an important role in communication  
between a template and its component.



# Building Blocks of Angular

edureka!





# Building Blocks of Angular

Module

Component

Metadata

Template

Data Binding

Services

Directives

Service is a broad category encompassing any value, function, or feature that your application needs.

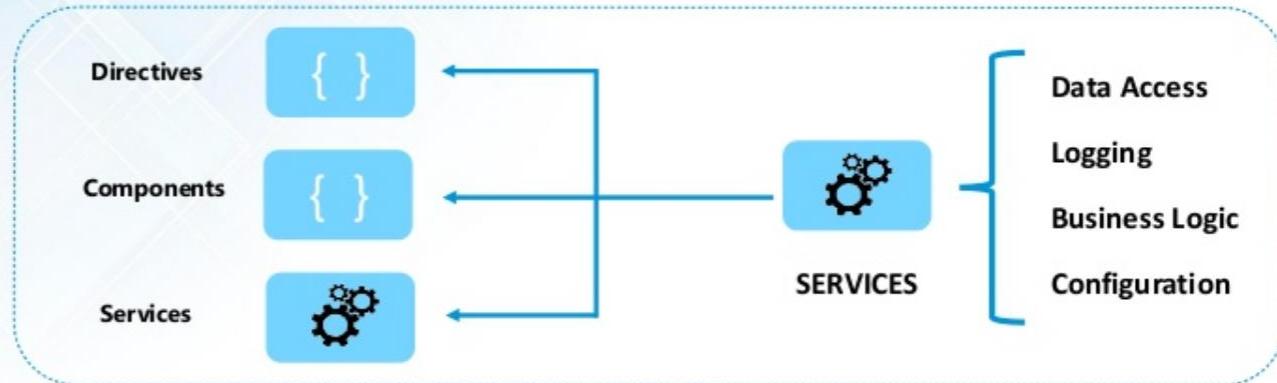
Example:

logging service

data service

message bus

tax calculator





# Building Blocks of Angular

edureka!

Module

Component

Metadata

Template

Data Binding

Services

Directives

```
import { Injectable } from '@angular/core';

@Injectable()
export class ExampleService {

  movies: string[] = ["Inception", "Dark Knight", "Shutter Island"];

  constructor() { }

  getMovies(): string[]
  {
    return this.movies;
  }
}
```

Service Class

Service Method for retrieving data



# Building Blocks of Angular

Module

Component

Metadata

Template

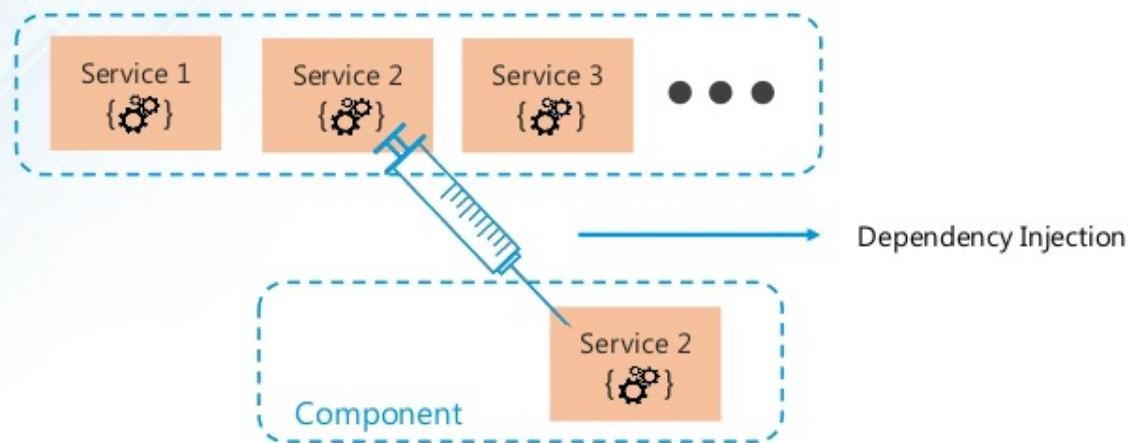
Data Binding

**Services**

Directives

Creates a new instance of class along with its required dependencies

Used to provide services to a component





# Building Blocks of Angular

Module

Component

Metadata

Template

Data Binding

Services

Directives

```
import { Component, OnInit } from '@angular/core';
import {ExampleService} from '../example.service';

@Component({
  selector: 'app-example',
  templateUrl: './example.component.html',
  styleUrls: ['./example.component.css'],
  providers: [ExampleService]
})
export class ExampleComponent implements OnInit {

  movies: string[];
  constructor(private exampleService: ExampleService) {}

  ngOnInit() {
    this.movies = this.exampleService.getMovies();
  }

}
```

Importing Service Class

Injecting Service into the Component

Retrieving data



# Building Blocks of Angular

edureka!

Module

Component

Metadata

Template

Data Binding

Services

Directives

Changes the appearance or behavior of a DOM element

1

COMPONENTS

Directives with a template

2

STRUCTURAL DIRECTIVE

Adds & removes DOM elements  
to change DOM layout

3

ATTRIBUTE DIRECTIVE

Changes the appearance or  
behavior of an element



# Building Blocks of Angular

edureka!

Module

Component

Metadata

Template

Data Binding

Services

Directives

2

STRUCTURAL DIRECTIVE

Adds & removes DOM elements  
to change DOM layout

```
<ul>
  <li *ngFor = "let movie of movies">{{movie}}</li>
</ul>
```

Iterating over  
the movies list



# Building Blocks of Angular

edureka!

Module

Component

Metadata

Template

Data Binding

Services

Directives

3

ATTRIBUTE DIRECTIVE

Changes the appearance or behavior of an element

```
import { Directive, ElementRef, HostListener } from '@angular/core';  
  
@Directive({  
    selector: '[appBoldText]'  
})  
export class BoldTextDirective {  
  
    constructor(private elementRef: ElementRef) {}  
  
    @HostListener('mouseenter') onMouseEnter() {  
        this.elementRef.nativeElement.style.fontWeight = 'bold';  
    }  
  
    @HostListener('mouseleave') onMouseLeave() {  
        this.elementRef.nativeElement.style.fontWeight = null;  
    }  
}
```

Importing Directive, ElementRef & HostListener

Directive Metadata

Injecting ElementRef to access the DOM elements

Bold the text on cursor hover

Un-bold the text



| Angular JS   | Angular 2  |
|--|--|
| Released by Google in the year 2010.                                 | Released in Sept 2016.   |
| JavaScript-based framework for creating SPA.                         | Complete re-write of AngularJS version.  |
| Still supported but no longer will be developed.                     | It's updated version regularly released because of Semantic Versioning.                              |
| The architecture of AngularJS is based on MVC.                       | The architecture of Angular 2 is based on service/controller.  |
| AngularJS was not developed with a mobile base in mind.              | Angular 2 is a mobile-oriented framework.  |
| AngularJS code can write by using only ES5, ES6, and Dart.           | We can use ES5, ES6, Typescript to write an Angular 2 code.  |
| Based on controllers whose scope is now over.                        | Nowadays, the controllers are replaced by components, and Angular two is completely component based. |
| Factory, service, provider, value and constant are used for services | The class is the only method to define services in Angular2  |
| Run on only client-side  | Runs on client-side & server-side  |
| ng-app and angular bootstrap function are used to initialize         | bootstrapmodule() function is used to initialize   |



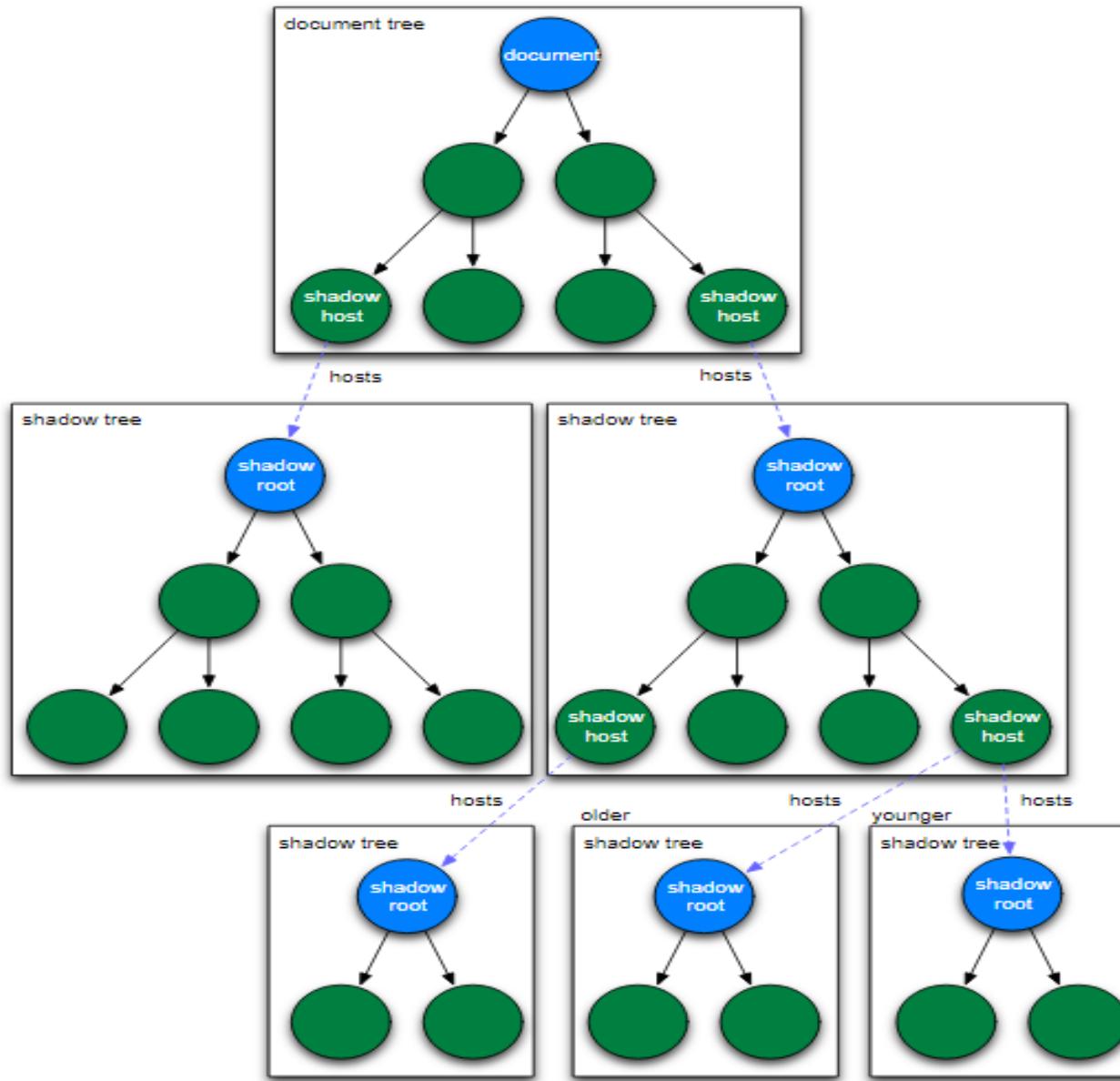
| Angular 2   | Angular 4   |
|---|---|
| The code generated using Angular 2 is bigger, and the file size is also larger. | Angular 4.0 has reduced the bundled file size by 60%. Thus code generated is reduced which helps to accelerate the application performance. |
| Angular two is not backward compatible with Angular JS.                         | Angular four is backward compatible with Angular 2 for most applications.   |
| There is no specific no proper disapproval phases to adjust codes.              | There will be proper disapproval phases to allow developers to adjust their code  |
| There is no animation feature offers in Angular 2.                              | Animation features are pulled out of @angular/core and included into their package  |

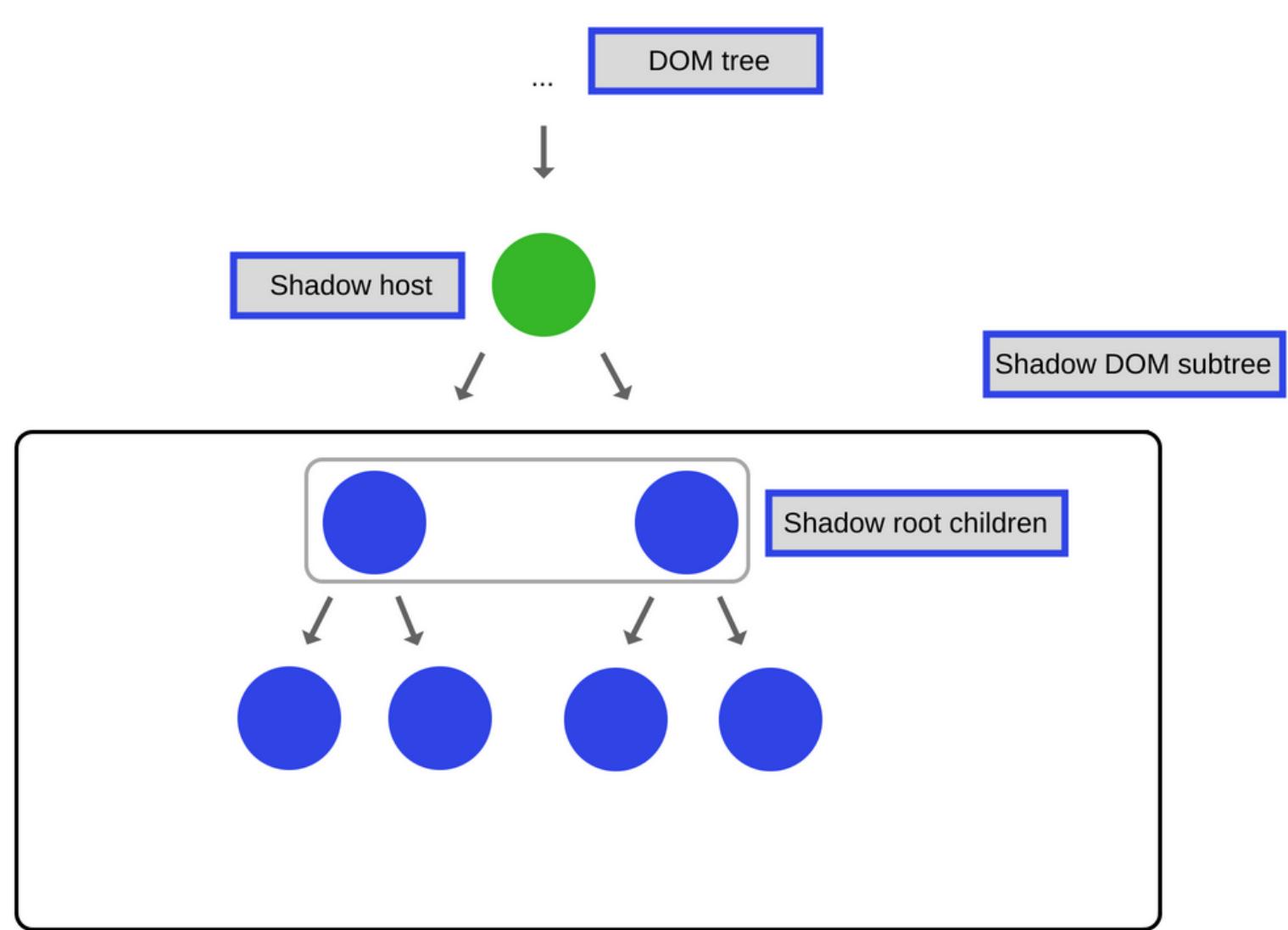


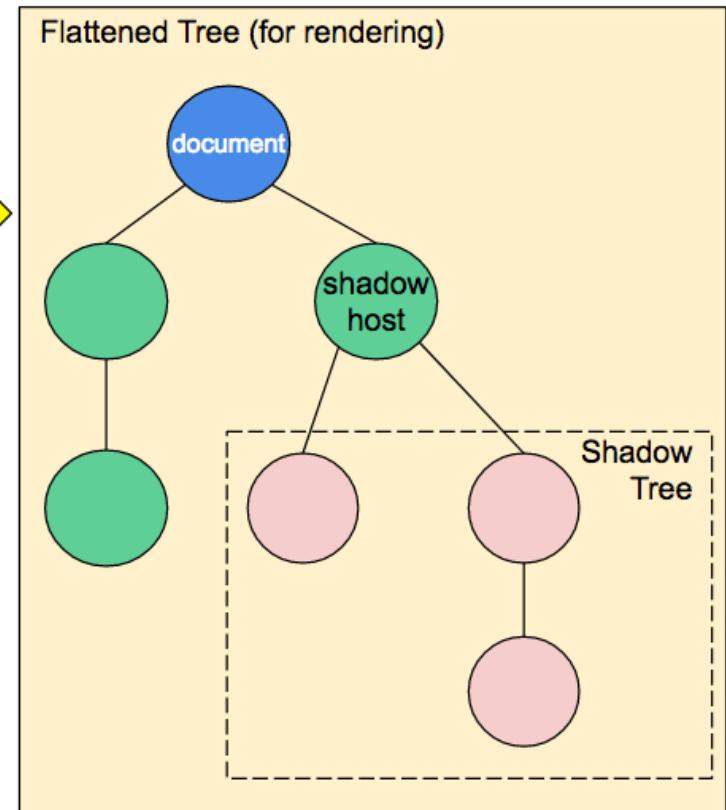
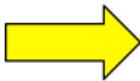
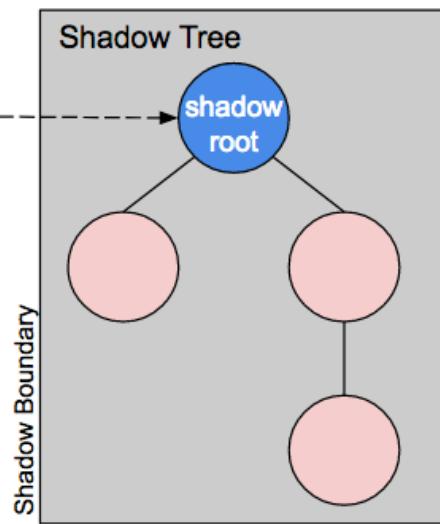
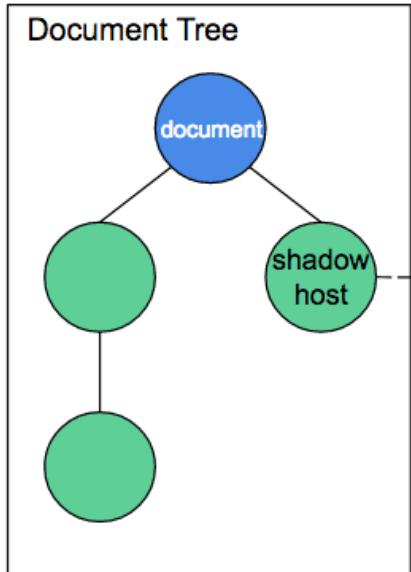
| Angular 4   | Angular 5   |
|---|---|
| Support for Router ParamMap   | New Router Lifecycle Event  |
| Dynamic Components with NgComponentOutlet   | Compiler Improvements   |
| TypeScript 2.4 with this version that functions as a JavaScript superset that can be used for optional static typing, interfaces, and classes | Angular 5 comes with build optimizer which is a part of the platform's command like a tool. |
| HTTP Request Simplified   | Optimization with HttpClient Feature  |
| Includes Animation Package  | Internationalized Date & Currency   |

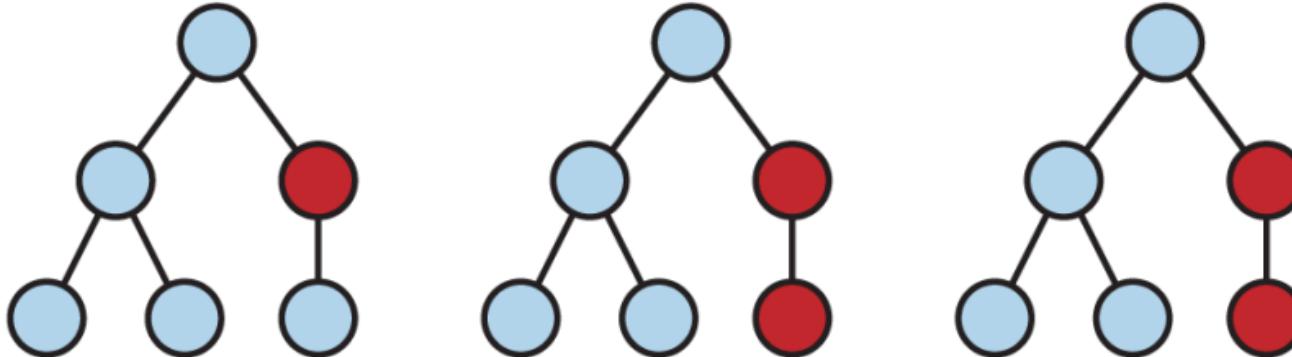


| Technology       | React                    | AngularJS                    | Angular 2                    |
|------------------|--------------------------|------------------------------|------------------------------|
| Author           | Facebook community       | Google                       | Google                       |
| Type             | Open source JS library   | Fully-featured MVC framework | Fully-featured MVC framework |
| Toolchain        | High                     | Low                          | High                         |
| Language         | JSX                      | JavaScript, HTML             | TypeScript                   |
| Learning Curve   | Low                      | High                         | Medium                       |
| Packaging        | Strong                   | Weak                         | Medium                       |
| Rendering        | Server Side              | Client Side                  | Server Side                  |
| App Architecture | None, combined with Flux | MVC                          | Component-based              |
| Data Binding     | Uni-directional          | Bi-directional               | Bi-directional               |
| DOM              | Virtual DOM              | Regular DOM                  | Regular DOM                  |
| Latest Version   | 15.4.0 (November 2016)   | 1.6.0                        | 2.2.0 (November 2016)        |









# Virtual DOM

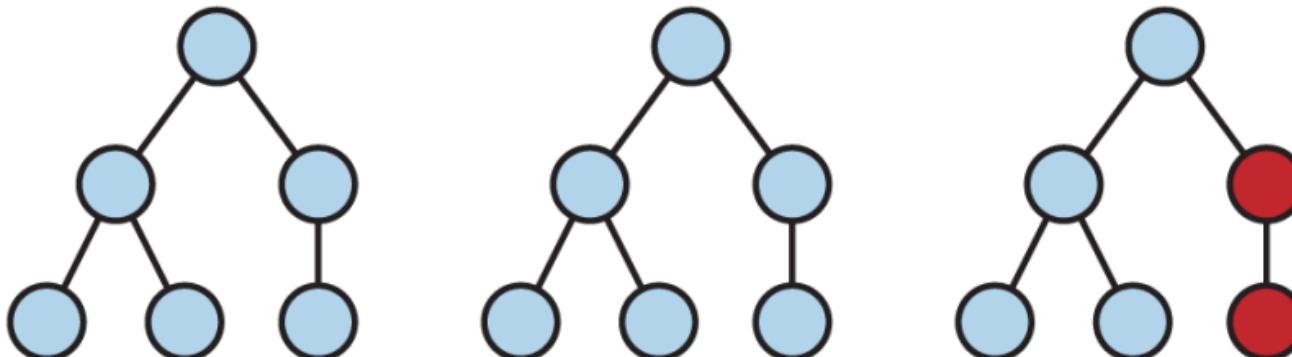
## State Change



## Compute Diff



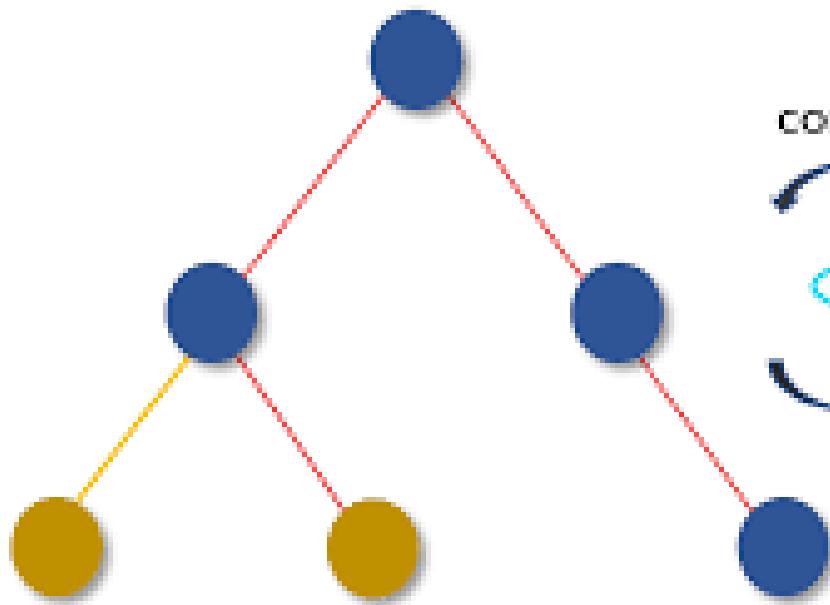
## Re-render



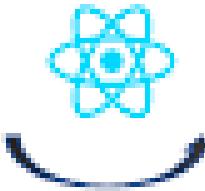
# Browser DOM



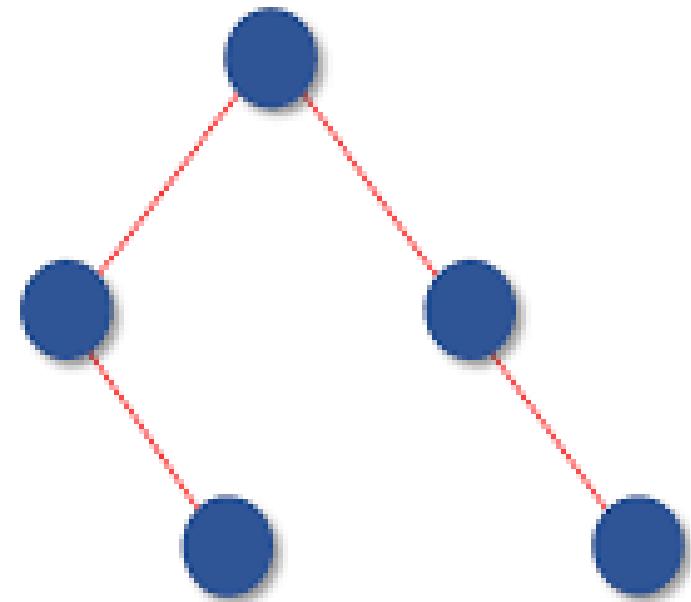
Virtual DOM



compare

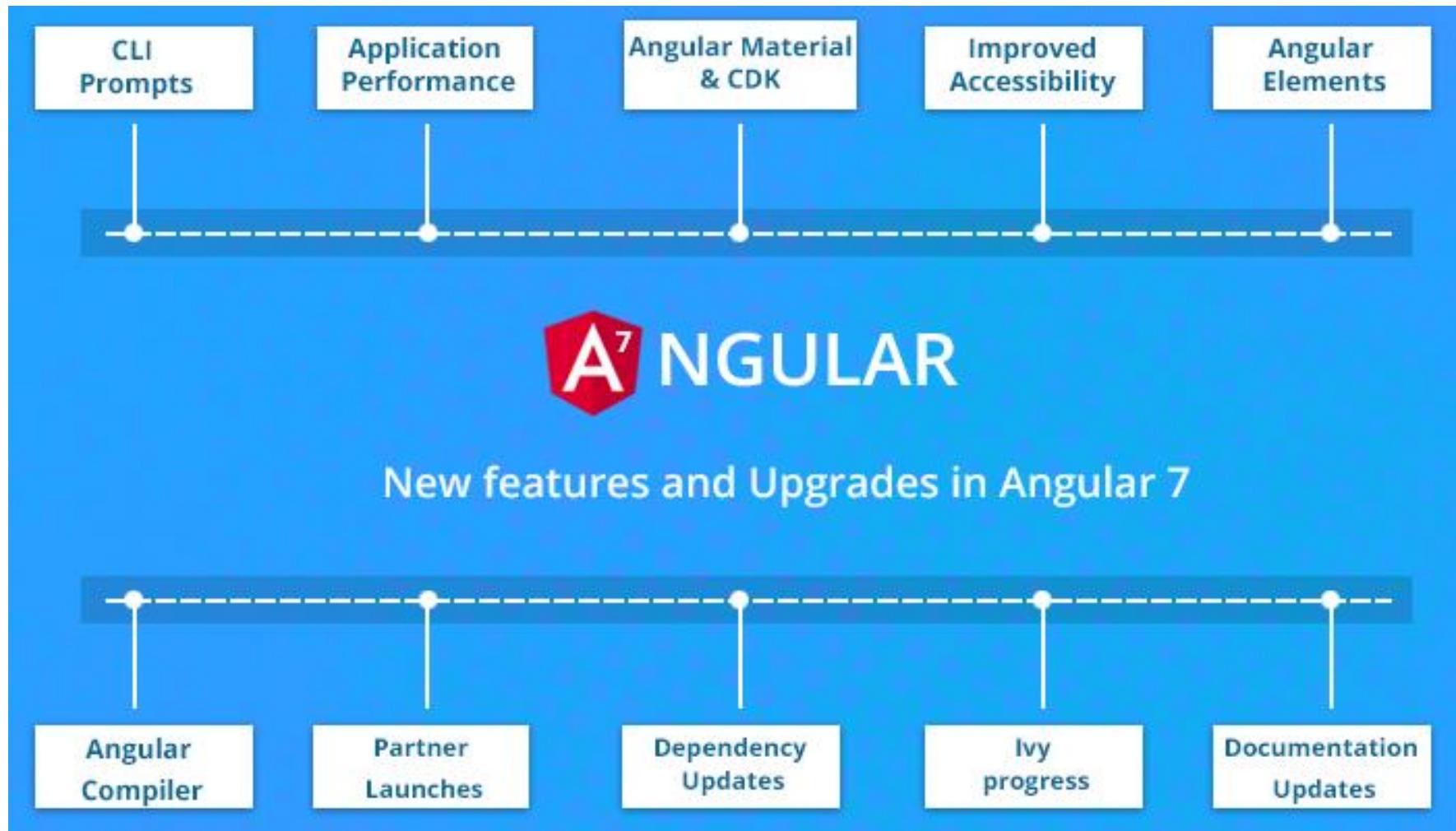


Real DOM





# Angular 7





# Angular 8

## The Top Features of Angular 8





# Angular 8



Differential Loading



Ivy Rendering Engine



Bazel Support



Builders API

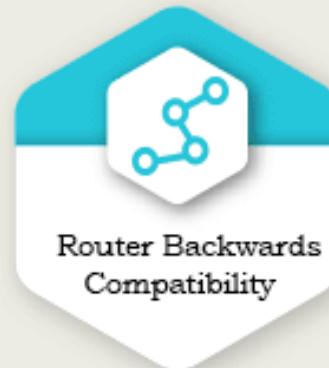
## Top Features of Angular 8



Support for \$location



Web Workers



Router Backwards  
Compatibility



Opt-In Usage Sharing



# Angular 8

---

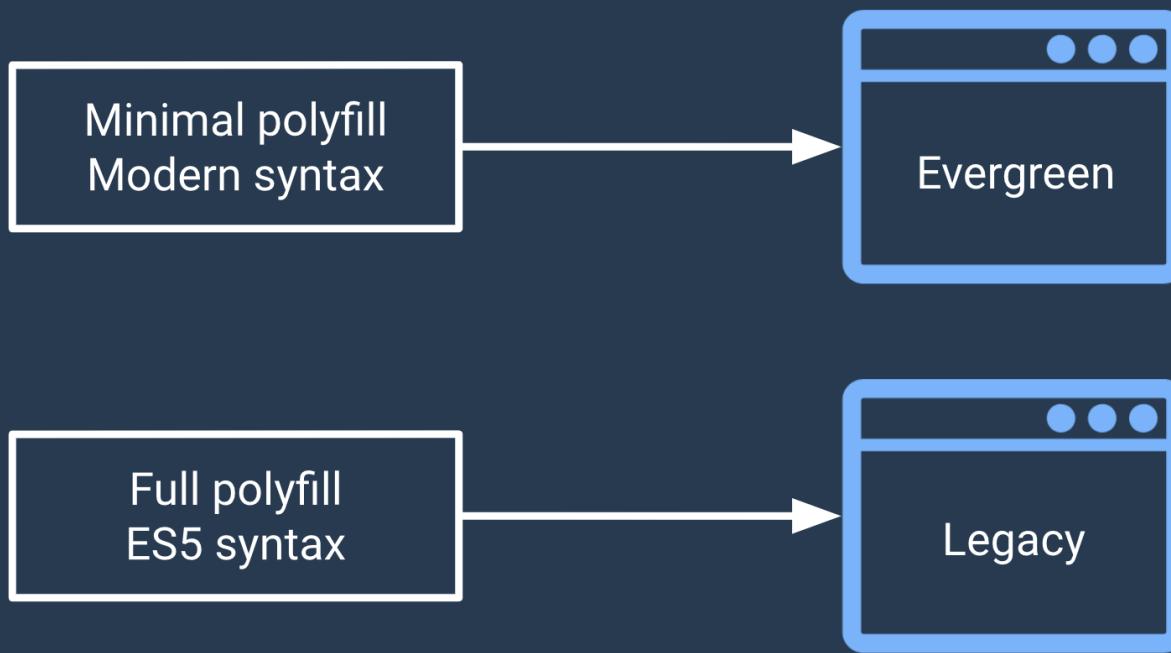
- Angular has a wide ecosystem including:
- High-quality and large community
- Deep Integration
- Fast-growing tools like Bazel
- State management libraries of different flavors
- Code Quality toolings, such as Codelyzer
- UI libraries, Components, Directives, Pipes, etc.
- Large IDE plugins repositories
- Testing Frameworks and utility libraries



- **Differential Loading**
- In spite of angular being a complete framework with its own package for a network request, form validation, and many more, Angular has one disadvantage-the app/bundle size.
- The challenge that we were facing with Angular 7 was the large bundle size due to the conversion of modern JS/TS code in JS. After the conversion, the final application bundle is created for all the browsers (new and old) concerning the app performance on all the browsers.
- This challenge of large bundle size was overcome in Angular 8 by reducing the bundle size by the concept of differential loading.
- When we build apps with ng build, two separate bundles are created for the production dedicated to the older and newer browsers respectively. The correct bundle gets loaded automatically by the browser, thus improving the performance for Angular 8 by loading less code by the newer browsers.



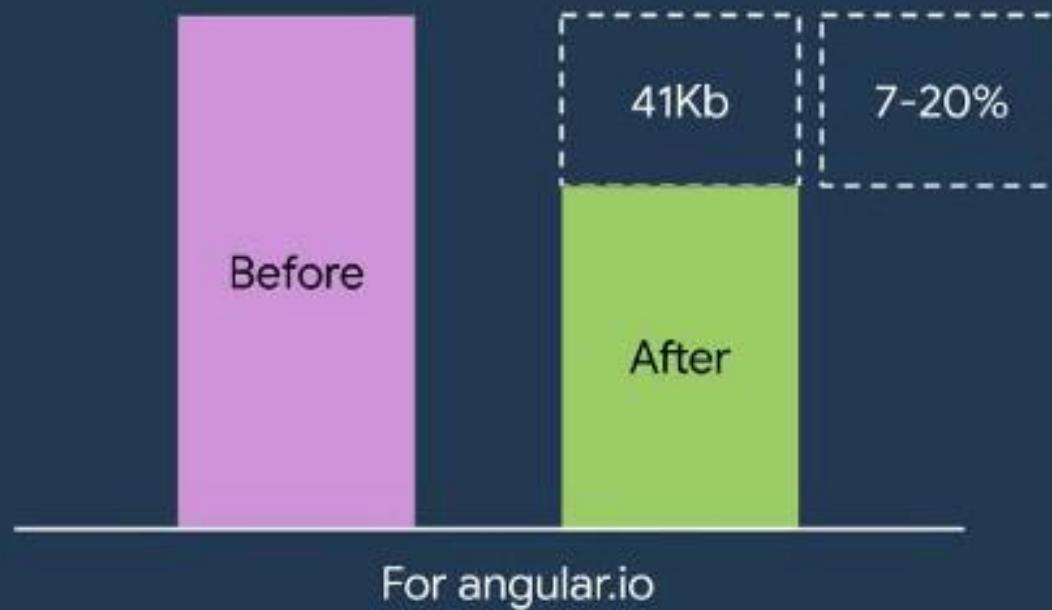
# Smaller apps with Differential Loading





A

# Differential Loading Savings





# Angular 8

---

- Ivy Renderer
- According to a source, 63% of all US traffic comes from smartphones and tablets. It is further forecasted that the number will increase to 80% by the end of this year.
- One of the biggest challenges for a front end developer is increasing the loading speed of the website. Unfortunately, mobile devices always stay behind in this race either due to slow or bad internet connectivity thus making it more challenging for the developers.
- But we never run out of solutions. We can use CDN, PWA, and others for loading the application faster. But if you want to have some out of the box solution, then reducing the bundle size is the ultimate solution and thus, IVY comes into the picture.
- IVY is meant to build a next-generation rendering pipeline for Angular 8.0
- Ivy is an angular renderer that uses incremental DOM. Ivy modifies the working of the framework without any changes to the Angular applications. On completion of IVY, the angular applications become small, simple, and faster.



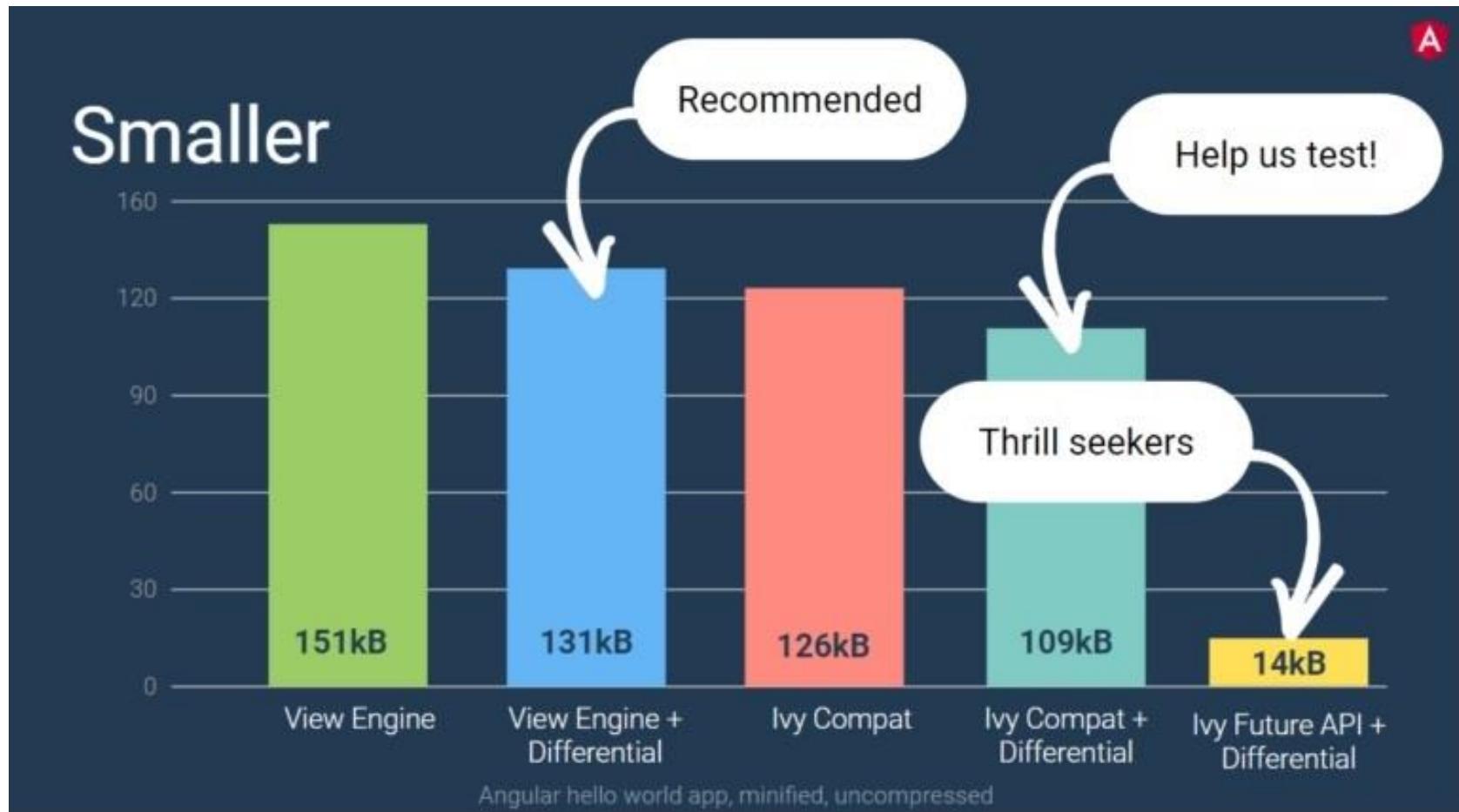
# Angular 8

---

- IVY consists of two main concepts:
- 1.Tree Shakable 2. **Low Memory Footprint**:
- Tree shakable: To focus only on the code in use, the unused code is removed. This results in faster runtime and smaller bundles.
- Local: For a faster compilation, the changing components are recompiled.
- The benefits of Ivy are:
  - Bundles are smaller
  - Templates are debuggable
  - Tests are faster
  - Builds are faster
  - Lots of bugs fixed



# Angular 8





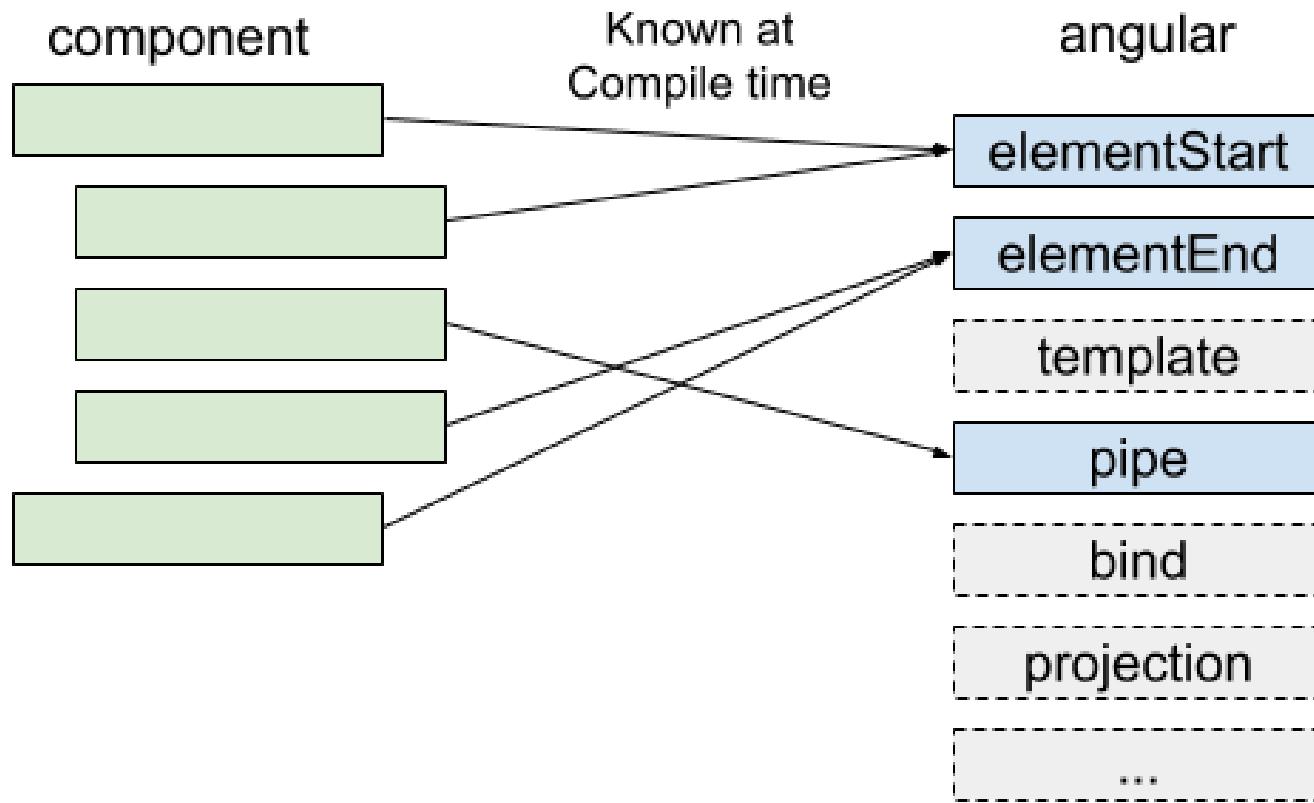
# Angular 8

---

- It rewrites the Angular compiler and runtime code to reach:
- Better compatibility with tree-shaking
- Improved build times
- Improvised build sizes
- Loaded with features like lazy loading of components rather than modules.



# Angular 8





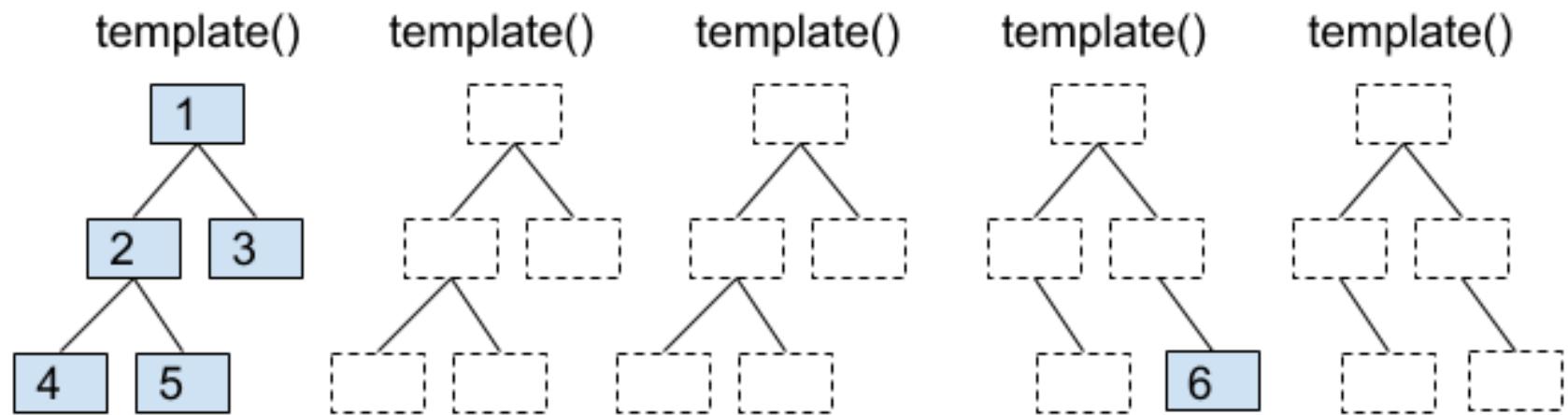
# Angular 8

---

- **Low Memory Footprint:**
- Incremental DOM doesn't need any memory to rerender the view if it doesn't change the DOM so it allocates the memory when the DOM nodes are added or removed.
- since most of render/template calls don't change anything result in huge memory savings.



# Angular 8





# Angular 8

---

- If we want to include the Ivy for a new application, we can create new projects with enable-ivy options
- `ng new ivy-project --enable-ivy`
- This command intimate Angular CLI store the following configuration in the `tsconfig.json` file.
- `"angularCompilerOptions": {`
- `"enableIvy": true`
- `}`
- The above configuration can manually add in any existing angular application after the upgrade that application into Angular 8.
- One recommendation that if we want to use Ivy for our application, then run the application in debug mode with AOT compilation mode.
- `ng serve --aot`



# Angular 8

---

- Web Workers
- With the newest release of Angular v8, web workers can now be easily integrated with Angular.
- “Web workers is an asynchronous system, or protocol, for web pages to execute tasks in the background, independently from the main thread and website UI.”
- It is an isolated environment that is insulated from the window object, the document object, direct internet access and is best suited for long-running or demanding computational tasks.”
- Have you built an application that includes a lot of calculations on UI? Are you experiencing the UI to be slow?
- Having heavy calculations, data table manipulations, and other complex computations results in a laggy UI.
- JavaScript running on the main thread is not the only thing. Other things like calculations also run on it thus resulting in a bad user experience. Thus, web workers come into the picture to resolve this issue.



# Angular 8

---

- Therefore you can say if your application is unresponsive while processing data, web workers are helpful.
- Due to JavaScript being single-threaded, there is a possibility of asynchronous data calls to take place.
- Facilitating to run the CPU intensive computations in the background thread, Web workers are used.
- This is achieved by freeing the main thread and updating the user interface.
- Put simply, web workers are useful if heavy computations are offloaded to another thread.



# Angular 8

---

- Lazy Loading
- Lazy loading helps in bringing down the size of large files. The required files are lazily loaded.
- Previously in the older versions of Angular, `@loadChildren` property was used by the route configuration.
- This property accepts a string. If any typo occurred or any module name has been recorded wrong, Angular doesn't consider this as wrong.
- It accepts the value that was there until we try building it.
- To overcome this, dynamic imports in router configuration is added in Angular 8 thus enabling the usage of import statement for lazy loading the module.
- Thus, errors will be easily recognized and we can put a stop on waiting till the build time to recognize the errors in the code.



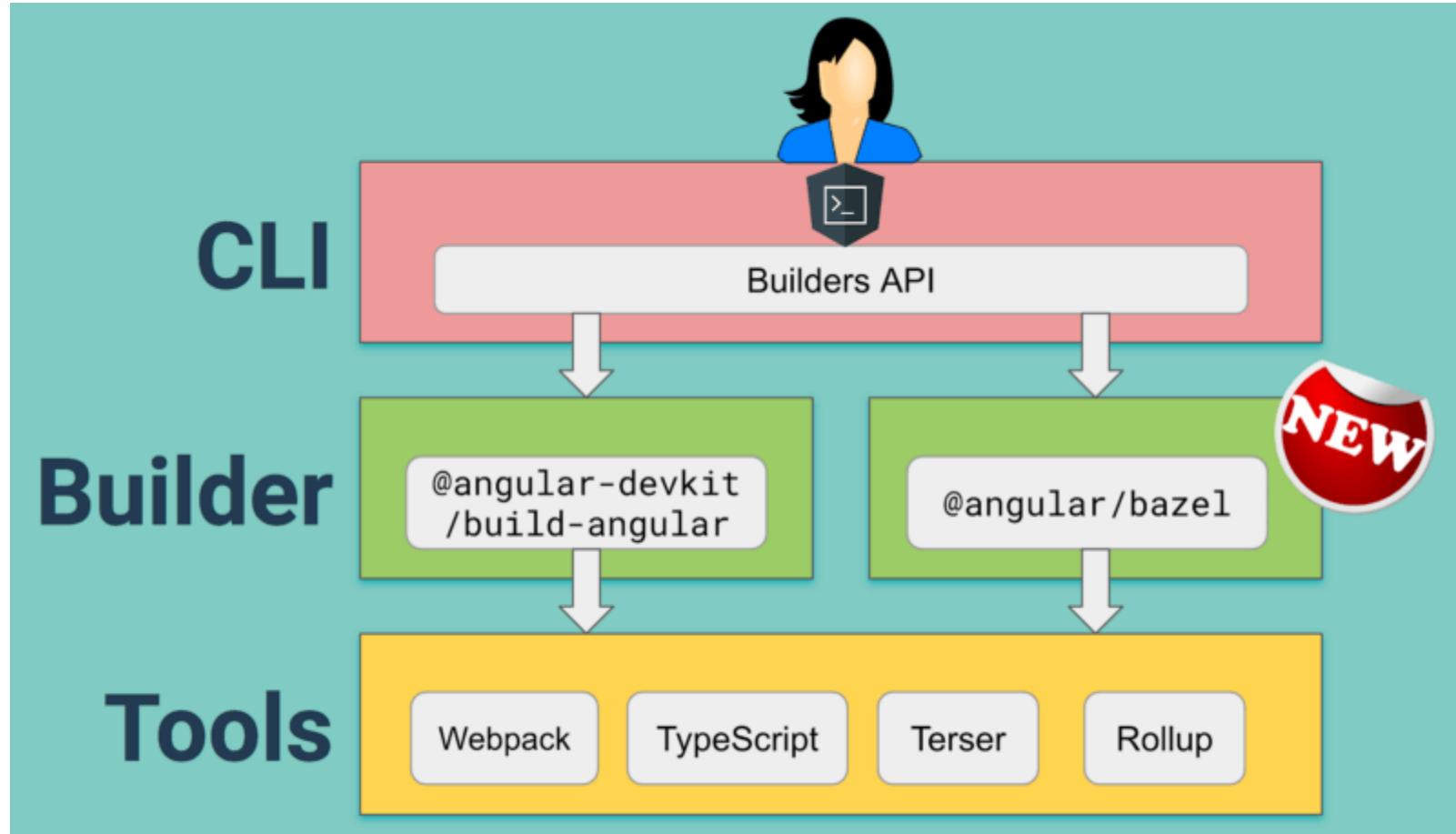
# Angular 8

---

- Bazel Support
- Now increase the possibilities to build your CLI application with Bazel.
- The Angular framework is built with Bazel. Since it is expected to be included in version 9, it is available as opt-in in Angular 8.
- The main advantages of Bazel are:
- Using the same tool in building backends and frontends.
- The build time is faster
- Incremental build for the modified part.
- Ejection of hidden Bazel files that are hidden by default.
- Cache on the build farm
- Dynamic imports for the lazy loaded modules.



# Angular 8





# Angular 8

---

- CLI Improvements
- With continuous improvement in the Angular CLI, the ng build, ng test and ng run has accorded themselves by 3rd-party libraries and tools.
- For example, with the help of a deploy command, the new capabilities are already in use by AngularFire.
- Angular CLI is equipped with commands such as ng new, serve, test, build and add for quicker development experience.
- With the new ng deploy in the house, developers can deploy their final app to the cloud. Just a few clicks from their command-line interface and the work is done.
- One important thing to remember, add a builder as it accords your project's deployment capability to a specific hosting provider. But, this has to be done before using the command.
- With Angular 8, it has added new features to ngUpgrade. This new feature will make the life of developers easier for upgrading their Angular.js apps to Angular 8.



# Angular 8

---

- TypeScript 3.4
- The most important part is TypeScript 3.4 as it is required to run your Angular 8 project.
- A new flag is introduced in TypeScript 3.4 known as – incremental.
- From the last compilation, the TypeScript is asked to save the information of the project graph by the incremental.
- Every time –incremental invokes TypeScript, it will utilize the information for detecting the cheapest way of type-checking and emit changes to your project.



# Angular 8

---

- Dart-sass for Sass file
- To create the Sass file, Angular has finally discarded node-sass for dart-sass. Dart is perceived to be superfast by many experts and it's now all set to replace Ruby – the legend for the reference implementation
- The generated Sass file would usually remain unchanged; however, there are possibilities of compiler becoming a bit strict. Moreover, with the fibers in place the speed could double too.
- Dart is the default now, which is a big change in itself. However, you can still use node-sass given that you install it explicitly.



# Installation

---

- `npm install -g @angular/cli`
- `ng new ng7`
- `ng serve -o`



# Lifecycle Hooks

- Angular calls lifecycle hook methods on directives and components as it **creates**, **changes**, and **destroys** them.

## **Creates:**

- OnInit
- AfterContentInit
- AfterViewInit

## **Changes:**

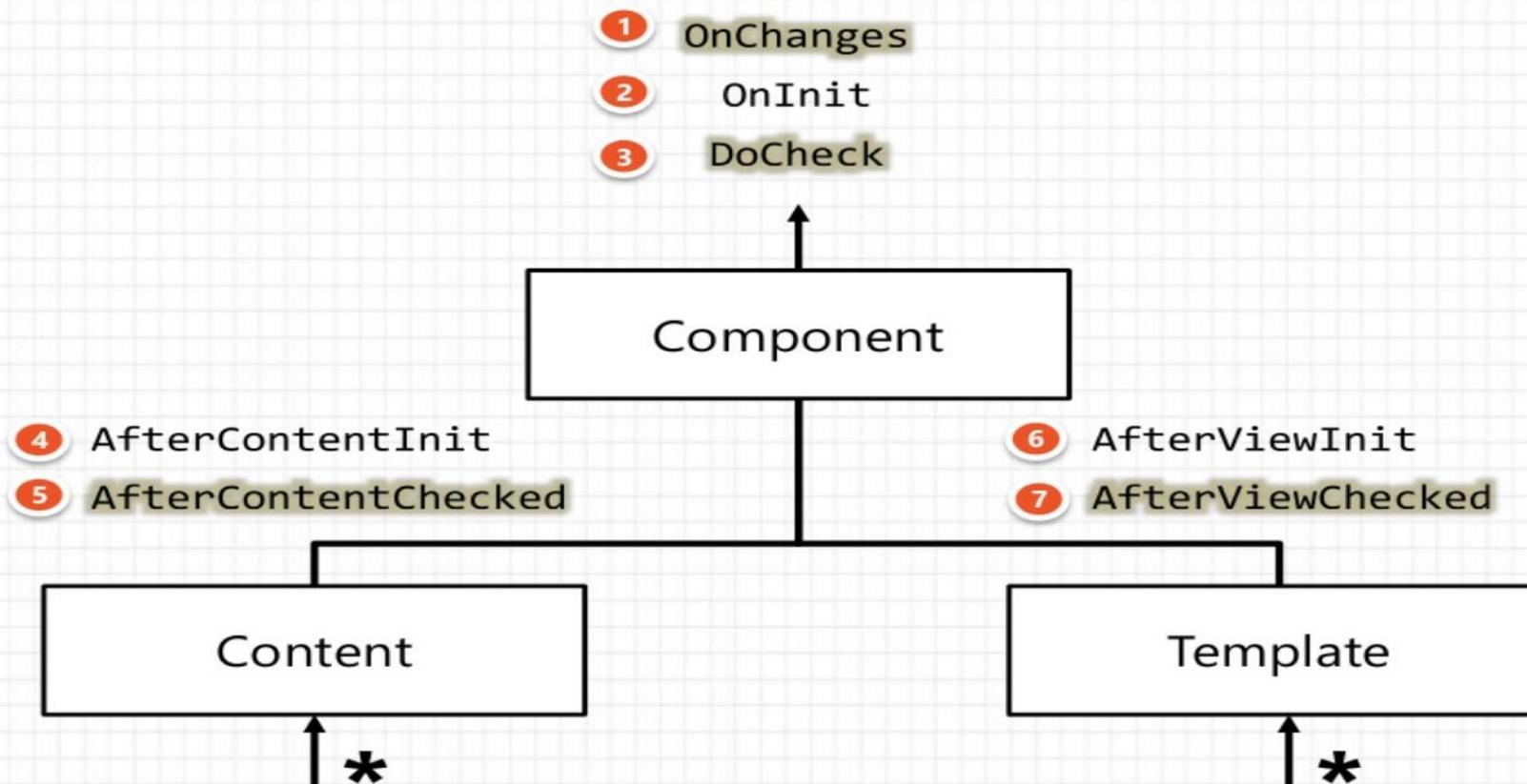
- DoCheck
- OnChanges
- AfterContentChecked
- AfterViewChecked

## **Destroys:**

- OnDestroy



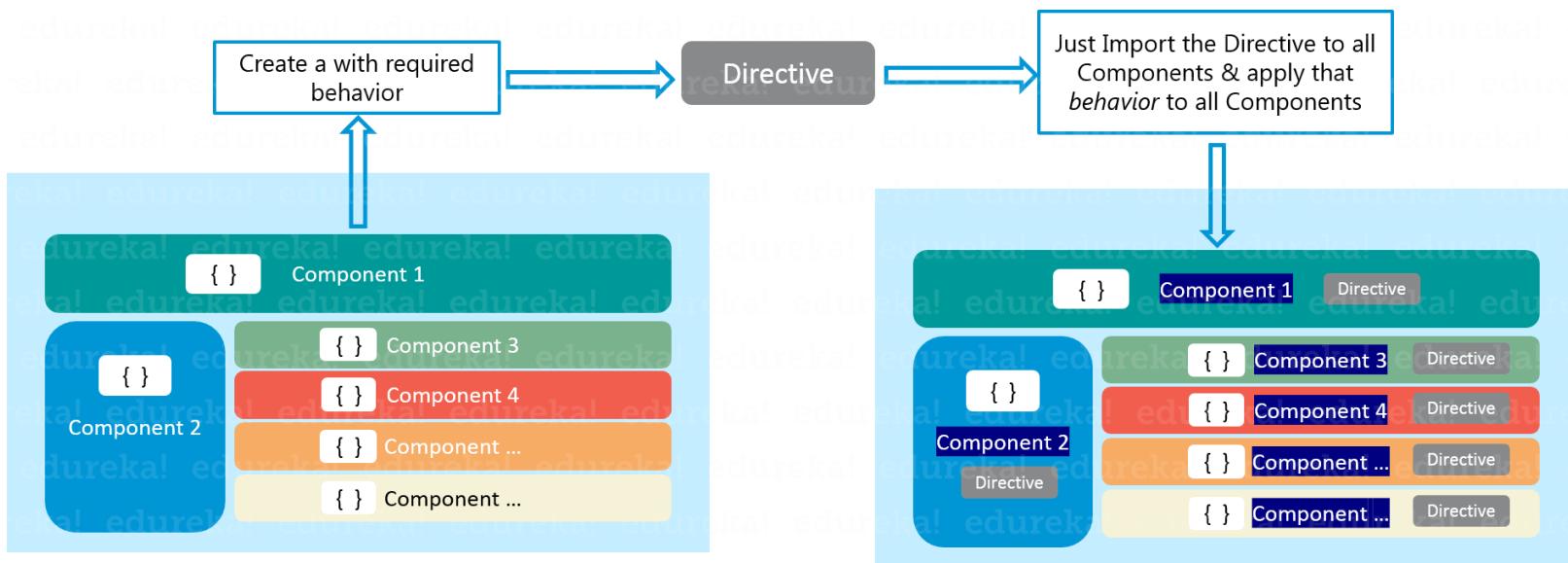
# Hooks Order





# Angular Directives

edureka!



**Directives can be imported anywhere providing similar functionality**



# Angular production Deployment

```
Maven Repository: org.projectlombok | React App | localhost:6070/getuserbyname/u | Angular - Deployment | Insuranceapp + - _ X
← lite-server
}

F:\daimlerang2019\insuranceapp>lite-server --baseDir="dist/insuranceapp" --port 7070
Did not detect a `bs-config.json` or `bs-config.js` override file. Using lite-server defaults...
** browser-sync config **
{
  injectChanges: false,
  files: [ './**/*.{html,htm,css,js}' ],
  watchOptions: { ignored: 'node_modules' },
  server: {
    baseDir: 'dist/insuranceapp',
    middleware: [ [Function], [Function] ]
  }
}
[Browsersync] Access URLs:
-----
      Local: http://localhost:3002
      External: http://172.29.53.177:3002
-----
        UI: http://localhost:3003
UI External: http://localhost:3003
-----
[Browsersync] Serving files from: dist/insuranceapp
[Browsersync] Watching files...
19.11.11 21:06:38 200 GET /index.html
19.11.11 21:06:48 200 GET /runtime-es2015.js
19.11.11 21:06:50 200 GET /main-es2015.js
Type here to search  ↪  ⌂  P  F  📁  📥  📱  🌐  WS  🖼  ⚡  🛡  21:07  ENG  11/11/2019
```





# Angular production Deployment

```
G angular production deploy ng se x | A Insuranceapp x Insuranceapp x +  
Administrator: Node.js command prompt - serve -s dist/insuranceapp  
Your environment has been set up for using Node.js 12.13.0 (x64) and npm.  
C:\Windows\System32>cd F:\daimlerang2019\insuranceapp  
C:\Windows\System32>f:  
F:\daimlerang2019\insuranceapp>serve -s dist/insuranceapp
```

Serving!

- Local: http://localhost:5000
- On Your Network: http://172.29.53.177:5000

Copied local address to clipboard!

```
Windows Type here to search 09:56 02/12/2019 135
```



```
F:\aspireangular2020\mvpapp>npm install -g firebase-tools
C:\Users\Balasubramaniam\AppData\Roaming\npm\firebase -> C:\Users\Balasubramaniam\AppData\Roaming\npm\node_modules\fire
base-tools\lib\bin\firebase.js

> protobufjs@6.8.8 postinstall C:\Users\Balasubramaniam\AppData\Roaming\npm\node_modules\firebase-tools\node_modules\p
rotobufjs
> node scripts/postinstall

npm WARN optional SKIPPING OPTIONAL DEPENDENCY: fsevents@2.1.2 (node_modules\firebase-tools\node_modules\fsevents):
npm WARN notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@2.1.2: wanted {"os":"darwin","arch":"
any"} (current: {"os":"win32","arch":"x64"})

+ firebase-tools@7.12.1
added 515 packages from 321 contributors in 64.928s

F:\aspireangular2020\mvpapp>firebase login
i  Firebase optionally collects CLI usage and error reporting information to help improve our products. Data is colle
cted in accordance with Google's privacy policy (https://policies.google.com/privacy) and is not used to identify you
.

? Allow Firebase to collect CLI usage and error reporting information? Yes
i  To change your data collection preference at any time, run `firebase logout` and log in again.

Visit this URL on this device to log in:
```



```
F:\aspireangular2020\mvpapp>firebase login
i  Firebase optionally collects CLI usage and error reporting information to help improve our products. Data is collected in accordance with Google's privacy policy (https://policies.google.com/privacy) and is not used to identify you
.

? Allow Firebase to collect CLI usage and error reporting information? No

Visit this URL on this device to log in:
https://accounts.google.com/o/oauth2/auth?client\_id=563584335869-fgrhgmd47bqnekij5i8b5pr03ho849e6.apps.googleusercontent.com&scope=email%20openid%20https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fcloudplatformprojects.readonly%20https%3A%2F%2Fwww.googleapis.com%2Fauth%2Ffirebase%20https%3A%2F%2Fwww.googleapis.com%2Fauth%2Fcloud-platform&response\_type=code&state=178659043&redirect\_uri=http%3A%2F%2Flocalhost%3A9005

Waiting for authentication...
+  Success! Logged in as parameswaribala@gmail.com

F:\aspireangular2020\mvpapp>
```



# Angular Universal

---

- A normal Angular application executes within the browser, rendering pages within the DOM in response to user actions.
- Angular Universal executes on the server, generating static application pages that later get bootstrapped on the consumer.
- This implies that the appliance usually renders additional quickly, giving users an opportunity to look at the appliance layout before it becomes totally interactive.



# Walmart.com

## SSR

### Home Page



## CSR



### Category Page



### Search Page





Administrator: Node.js command prompt

Terminate batch job (Y/N)? y

```
F:\daimlerang2019\insuranceuniversalapp>ng add @nguniversal/express-engine --clientProject insuranceapp
Skipping installation: Package already installed
CREATE src/main.server.ts (361 bytes)
CREATE src/app/app.server.module.ts (427 bytes)
CREATE tsconfig.server.json (273 bytes)
CREATE webpack.server.config.js (1466 bytes)
CREATE server.ts (1980 bytes)
UPDATE package.json (2064 bytes)
UPDATE angular.json (4713 bytes)
UPDATE src/main.ts (451 bytes)
UPDATE src/app/app.module.ts (3325 bytes)
npm WARN @angular/platform-server@8.2.14 requires a peer of @angular/animations@8.2.14 but none is installed. You must
install peer dependencies yourself.
npm WARN @angular/platform-server@8.2.14 requires a peer of @angular/common@8.2.14 but none is installed. You must ins
tall peer dependencies yourself.
npm WARN @angular/platform-server@8.2.14 requires a peer of @angular/compiler@8.2.14 but none is installed. You must i
nstall peer dependencies yourself.
npm WARN @angular/platform-server@8.2.14 requires a peer of @angular/core@8.2.14 but none is installed. You must insta
ll peer dependencies yourself.
npm WARN @angular/platform-server@8.2.14 requires a peer of @angular/platform-browser@8.2.14 but none is installed. Yo
u must install peer dependencies yourself.
npm WARN @angular/platform-server@8.2.14 requires a peer of @angular/platform-browser-dynamic@8.2.14 but none is insta
lled. You must install peer dependencies yourself.
npm WARN optional SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.9 (node_modules\webpack-dev-server\node_modules\fsevents)
:
```



Type here to search



00:09  
03/12/2019



Administrator: Node.js command prompt

npm ERR! C:\Users\Balasubramaniam\AppData\Roaming\npm-cache\\_logs\2019-12-02T18\_50\_27\_706Z-debug.log

F:\daimlerang2019\insuranceuniversalapp>npm run build:ssr

```
> insuranceuniversalapp@0.0.0 build:ssr F:\daimlerang2019\insuranceuniversalapp
> npm run build:client-and-server-bundles && npm run compile:server
```

```
> insuranceuniversalapp@0.0.0 build:client-and-server-bundles F:\daimlerang2019\insuranceuniversalapp
> ng build --prod && ng run insuranceapp:server:production --bundleDependencies all
```

Generating ES5 bundles for differential loading...

ES5 bundle generation complete.

```
chunk {2} polyfills-es2015.2987770fde9daa1d8a2e.js (polyfills) 36.4 kB [initial] [rendered]
chunk {3} polyfills-es5.6696c533341b95a3d617.js (polyfills-es5) 122 kB [initial] [rendered]
chunk {0} runtime-es2015.edb2fcf2778e7bf1d426.js (runtime) 1.45 kB [entry] [rendered]
chunk {0} runtime-es5.edb2fcf2778e7bf1d426.js (runtime) 1.45 kB [entry] [rendered]
chunk {1} main-es2015.8c0c5c281b25bdbd5035.js (main) 1.47 MB [initial] [rendered]
chunk {1} main-es5.8c0c5c281b25bdbd5035.js (main) 1.57 MB [initial] [rendered]
chunk {4} styles.f8bfe2e61b3f4fbc4a5c.css (styles) 226 kB [initial] [rendered]
Date: 2019-12-02T18:51:55.010Z - Hash: c8bc909a93cd5ce795f8 - Time: 27327ms
```

WARNING in budgets, maximum exceeded for initial. Budget 2 MB was exceeded by 550 kB.

Hash: ae0c42b588269b42af2

Time: 14770ms

Built at: 12/03/2019 12:22:12 AM



00:22  
03/12/2019 ENG 20



Administrator: Node.js command prompt - node dist/server.js

F:\daimlerang2019\insuranceuniversalapp>node dist/server.js

Node Express server listening on http://localhost:4000

Angular is running in the development mode. Call enableProdMode() to enable the production mode.





## OKTA ODIC CONNECTION

```
F:\boaangular2019\loanapp>cd..
```

```
F:\boaangular2019>cd loanappoauth
```

```
F:\boaangular2019\loanappoauth>npm i angular-oauth2-oidc@5.0.2
npm WARN axobject-query@2.1.1 requires a peer of eslint@^5 || ^6 but none is installed. You must install peer dependencies yourself.
npm WARN angular-oauth2-oidc@5.0.2 requires a peer of @angular/common@>=6.0.0 < 8.0.0 but none is installed. You must install peer dependencies yourself.
npm WARN angular-oauth2-oidc@5.0.2 requires a peer of @angular/core@>=6.0.0 < 8.0.0 but none is installed. You must install peer dependencies yourself.
npm [WARN optional] SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.9 (node_modules\webpack-dev-server\node_modules\fsevents)
:
npm [WARN notsup] SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.9: wanted {"os":"darwin","arch":"any"} (current: {"os":"win32","arch":"x64"})
npm [WARN optional] SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.9 (node_modules\watchpack\node_modules\fsevents):
npm [WARN notsup] SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.9: wanted {"os":"darwin","arch":"any"} (current: {"os":"win32","arch":"x64"})
npm [WARN optional] SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.9 (node_modules\karma\node_modules\fsevents):
npm [WARN notsup] SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.9: wanted {"os":"darwin","arch":"any"} (current: {"os":"win32","arch":"x64"})
npm [WARN optional] SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.9 (node_modules\@angular\compiler-cli\node_modules\fsevents):
npm [WARN notsup] SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.9: wanted {"os":"darwin","arch":"any"} (current: {"os":"win32","arch":"x64"})
npm [WARN optional] SKIPPING OPTIONAL DEPENDENCY: fsevents@2.1.2 (node_modules\fsevents):
```



# Alternative approach OKTA ODIC CONNECTION

Administrator: Node.js command prompt

```
F:\boaangular2019\loanappoauth>npm i @okta(okta-angular@1.0.7
npm WARN angular-oauth2-oidc@5.0.2 requires a peer of @angular/common@>=6.0.0 < 8.0.0 but none is installed. You must
install peer dependencies yourself.
npm WARN angular-oauth2-oidc@5.0.2 requires a peer of @angular/core@>=6.0.0 < 8.0.0 but none is installed. You must in
stall peer dependencies yourself.
npm WARN axobject-query@2.1.1 requires a peer of eslint@^5 || ^6 but none is installed. You must install peer depen
dencies yourself.
npm WARN @okta(okta-angular@1.0.7 requires a peer of @angular/common@>=4 <7 but none is installed. You must install pe
er dependencies yourself.
npm WARN @okta(okta-angular@1.0.7 requires a peer of @angular/core@>=4 <7 but none is installed. You must install peer
dependencies yourself.
npm WARN @okta(okta-angular@1.0.7 requires a peer of @angular/platform-browser@>=4 <7 but none is installed. You must
install peer dependencies yourself.
npm WARN @okta(okta-angular@1.0.7 requires a peer of @angular/router@>=4 <7 but none is installed. You must install pe
er dependencies yourself.
npm [WARN] optional SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.9 (node_modules\webpack-dev-server\node_modules\fsevents)
:
npm [WARN] notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.9: wanted {"os":"darwin","arch":"
any"} (current: {"os":"win32","arch":"x64"})
npm [WARN] optional SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.9 (node_modules\watchpack\node_modules\fsevents):
npm [WARN] notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.9: wanted {"os":"darwin","arch":"
any"} (current: {"os":"win32","arch":"x64"})
npm [WARN] optional SKIPPING OPTIONAL DEPENDENCY: fsevents@1.2.9 (node_modules\karma\node_modules\fsevents):
npm [WARN] notsup SKIPPING OPTIONAL DEPENDENCY: Unsupported platform for fsevents@1.2.9: wanted {"os":"darwin","arch":"
any"} (current: {"os":"win32","arch":"x64"})
```





# AOT

- Faster rendering With AOT, the browser downloads a pre-compiled version of the application. The browser loads executable code so it can render the application immediately, without waiting to compile the app first.
- Fewer asynchronous requests The compiler inlines external HTML templates and CSS style sheets within the application JavaScript, eliminating separate ajax requests for those source files.
- Smaller Angular framework download size There's no need to download the Angular compiler if the app is already compiled. The compiler is roughly half of Angular itself, so omitting it dramatically reduces the application payload.
- Detect template errors earlier The AOT compiler detects and reports template binding errors during the build step before users can see them.
- Better security AOT compiles HTML templates and components into JavaScript files long before they are served to the client. With no templates to read and no risky client-side HTML or JavaScript evaluation, there are fewer opportunities for injection attacks.



# Choosing Compiler

---

- Choosing a compiler
- Angular offers two ways to compile your application:
  - Just-in-Time (JIT), which compiles your app in the browser at runtime.
  - Ahead-of-Time (AOT), which compiles your app at build time.



# Choosing Compiler

---

- JIT compilation is the default when you run the ng build (build only) or ng serve (build and serve locally) CLI commands:

- ng build
  - ng serve

For AOT compilation, include the --aot option with the ng build or ng serve command:

- ng build --aot
  - ng serve --aot



## How AOT Works

---

- The Angular AOT compiler extracts metadata to interpret the parts of the application that Angular is supposed to manage.
- You can specify the metadata explicitly in decorators such as `@Component()` and `@Input()`, or implicitly in the constructor declarations of the decorated classes.
- The metadata tells Angular how to construct instances of your application classes and interact with them at runtime.



## How AOT Works

---

- The Angular compiler extracts the metadata once and generates a factory for TypicalComponent.
- When it needs to create a TypicalComponent instance, Angular calls the factory, which produces a new visual element, bound to a new instance of the component class with its injected dependency.



# How AOT Works

---

- There are three phases of AOT compilation.
- Phase 1 is code analysis. In this phase, the TypeScript compiler and AOT collector create a representation of the source. The collector does not attempt to interpret the metadata it collects. It represents the metadata as best it can and records errors when it detects a metadata syntax violation.
- Phase 2 is code generation. In this phase, the compiler's StaticReflector interprets the metadata collected in phase 1, performs additional validation of the metadata, and throws an error if it detects a metadata restriction violation.
- Phase 3 is template type checking. In this optional phase, the Angular template compiler uses the TypeScript compiler to validate the binding expressions in templates. You can enable this phase explicitly by setting the `fullTemplateTypeCheck` configuration option;



# Jquery in Angular

---

- npm install --save jquery
- angular.json
- "scripts": [  
• "node\_modules/jquery/dist/jquery.min.js"  
• ]
- app.component.html
- <div id="elementId">
- <h1>Welcome</h1>
- </div>



# Jquery in Angular

---

- app.component.ts
- import {Component, OnInit} from '@angular/core';
- declare var \$: any;
- @Component({
- selector: 'app-root',
- templateUrl: './app.component.html',
- styleUrls: ['./app.component.css']
- })
- export class AppComponent implements OnInit {
- ngOnInit(): void {
- \$(document).ready(() => {
- \$('#elementId').css({'background-color': 'yellow', 'font-size': '200%'});
- });
- }
- }



# Angular Optimization Techniques

---

- #1 Angular Command Line Interface (CLI)
- #2 Tree-shaking
- #3 JIT (Just-in-Time) Compilation
- #4 AOT (Ahead-of-Time) Compilation
- #5 Prod Flag
- #6 UglifyJS and Build Optimizer Flag
- #7 Build Optimizer and Vendor-Chunk
- #8 Package.json



# Angular Optimization Techniques

---

- #9 Third-Party Tools (gulp and grunt)
- 10 .htaccess file

# What is a Reusable Component?



- Angular was designed to promote code reuse. As a result, the recommended component architecture relies on two different kinds of components:
- Container components (or “smart” components) know how to get data and work with services
- Presentation components (“dumb” or “lazy” components) that have to be fed with data

# What is a Reusable Component?



- Container components are tied to the business logic of your application.
- They are not meant to be shared or reused.
- Instead, what they do is get data from the server and pass it down to presentation components.

# What is a Reusable Component?



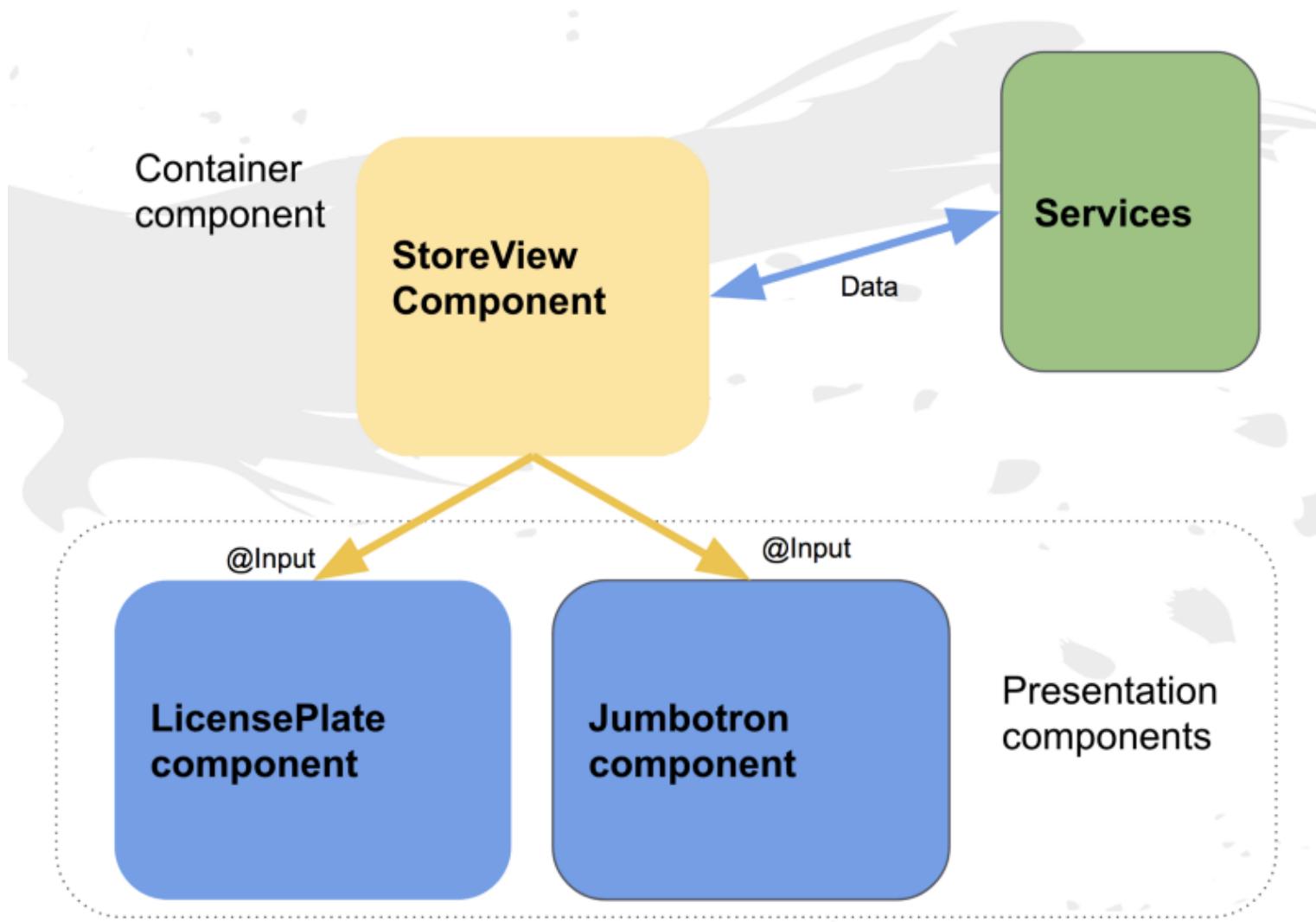
- Presentation components do not know about any service.
- They are pure, simple UI components that just need some input data to render.
- Buttons, tabs, headers, tables are all great candidates to be used as presentation components.
- As a result, such components are reusable because they are coded in a way that is not tied to any runtime context.

# What is a Reusable Component?



- Presentation components are really just an HTML template that has to be filled with data.
- They can also emit events that container components would catch in order to make the actual business logic happen.

# What is a Reusable Component?





# Sharable Components

- ng generate library [name of the library]
- ng generate component [component name] --project [name of library]
- public API of your library is defined in projects/[name of library]/src/public\_api.ts.
- Update
- ng build [name of library]
- Npm login
- cd dist/[name of library]
- npm publish
- Ensure that package.json has unique name(otherwise 403 error)



Debugging Memory Leaks in Angular | Loanapp | Successfully published bankinglib | bankinglib - npm

npmjs.com/package/bankinglib

Apps Insert title here Empire New Tab How to use Assertions Browser Automation node.js - How can I... Freelancer-dev-810... Courses New Tab hi Airtel 4G Hotspot nt8F83

## bankinglib

0.0.1 • Public • Published an hour ago

Readme Admin 1 Dependency 0 Dependents 1 Versions

# Bankinglib

This library was generated with [Angular CLI](#) version 8.2.14.

## Code scaffolding

Run `ng generate component component-name --project bankinglib` to generate a new component. You can also use `ng generate directive|pipe|service|class|guard|interface|enum|module --project bankinglib`.

Note: Don't forget to add `--project bankinglib` or else it will be added to the default project in your `angular.json` file.

install

```
> npm i bankinglib
```

version license  
0.0.1 none

last publish  
an hour ago

collaborators



This website stores cookies on your computer. These cookies are used to collect information about how you interact with our website and allow us to remember you. We use this information in order to improve and customize your browsing experience and for analytics and metrics about our visitors both on this website and other media. To find out more about the cookies we use, see our [Privacy Policy](#).

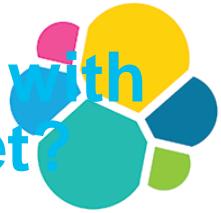
If you decline, your information won't be tracked when you visit this website. A single cookie will be used in your browser to remember your preference not to be tracked.

Accept Decline

Type here to search

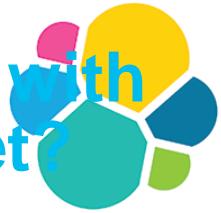
21:17 05/12/2019

# What if I want to share my component locally with other applications, not publicly on the internet?



- Angular Multi-Application Project Creation
- A workspace is a set of Angular applications and libraries. The angular.json file at the root level of an Angular workspace provides workspace-wide and project-specific (application or library) configuration defaults for build and development tools.

# What if I want to share my component locally with other applications, not publicly on the internet?



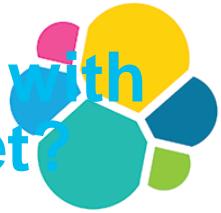
- Create a Workspace
- `ng new angularworkspace --createApplication=false --directory=frontend --interactive=false`
- `cd frontend`
- `ng generate application administration --style=scss --routing=true`
- `ng generate application gatling --style=scss --routing=true`

# What if I want to share my component locally with other applications, not publicly on the internet?



- ng generate library tools
- ng generate library vendors
- Create a Shared Service
  - ng generate service userservice --project=tools
  - Update the AppComponent  
projects/administration/src/app/app.component.ts to use this service:
  - import {userservice } from 'projects/tools/src/lib/hello-world.service';

# What if I want to share my component locally with other applications, not publicly on the internet?



- Launch The Applications
- `ng serve --project=administration`



# Angular Elements

---

- Angular Elements allow us to create reusable Angular components, which can be used outside of the Angular application.
- You can use an Angular Element in any other application such as normal HTML, React, etc.
- Essentially, Angular Elements are normal components, which are packaged as Custom Elements.



# Angular Elements

---

- Step 1
- **npm install @angular/elements**
- To work with older browsers, we need polyfill. So, let us install that also as shown below:
- npm install @webcomponents/custom-elements
- After installing polyfill, open polyfills.ts file and add these two entries:
- import '@webcomponents/custom-elements/src/native-shim';
- import '@webcomponents/custom-elements/custom-elements.min';



# Angular Elements

---

- Step 2:
- Create the Component
- Step 3:
- Register the Component
- Step 4:
- Create Element from the component
- Step 5:
- Use Custom Element
- `ng build --prod --output-hashing none && node build-elements.js`



# Angular Interceptors

---

- Interceptors are the mechanism where we can operate on the outgoing request and the incoming response.
- Interceptors are the layer between our Angular application and the back-end services.
- Whenever the request is made from the application, the interceptor catches the request, transforms it, and passes to the back end.
- The same happens with the response; whenever it receives the response, we can make changes to the response and use them in the application.



# Angular Interceptors

---

- To set up interceptor, we need a class which will be injectable class and implementing the `HttpInterceptor`.
- When we implement this Interface, then we have a method called `intercept` which has the body like below.
- `intercept(req: HttpRequest<any>, next: HttpHandler): Observable<HttpEvent<any>> {}`
- It has two parameters "req" and "next" which are `HttpRequest` and `HttpHandler` respectively.

# Debugging



# Augury

Screenshot of the Augury browser extension interface showing the Angular application structure and component details for the 'Loanapp' component.

The browser tabs show:

- Debugging Memory Leaks in Anc
- Successfully published bankinglii
- Angular Augury
- Loanapp

The main content area displays the application's landing page with a Bank of America logo, a large "TITLE LOANS UP TO \$2500 NEED CASH?" banner, and an advertisement for "Warrah Home Loans".

The Augury toolbars at the bottom include:

- Elements, Sources, Network, Console, Memory, Performance, Application, Security, Audits, Lucid, **Augury** (selected)
- Component Tree, Router Tree, NgModules
- Angular Version: 8.2.14

The Component Tree sidebar shows the component hierarchy:

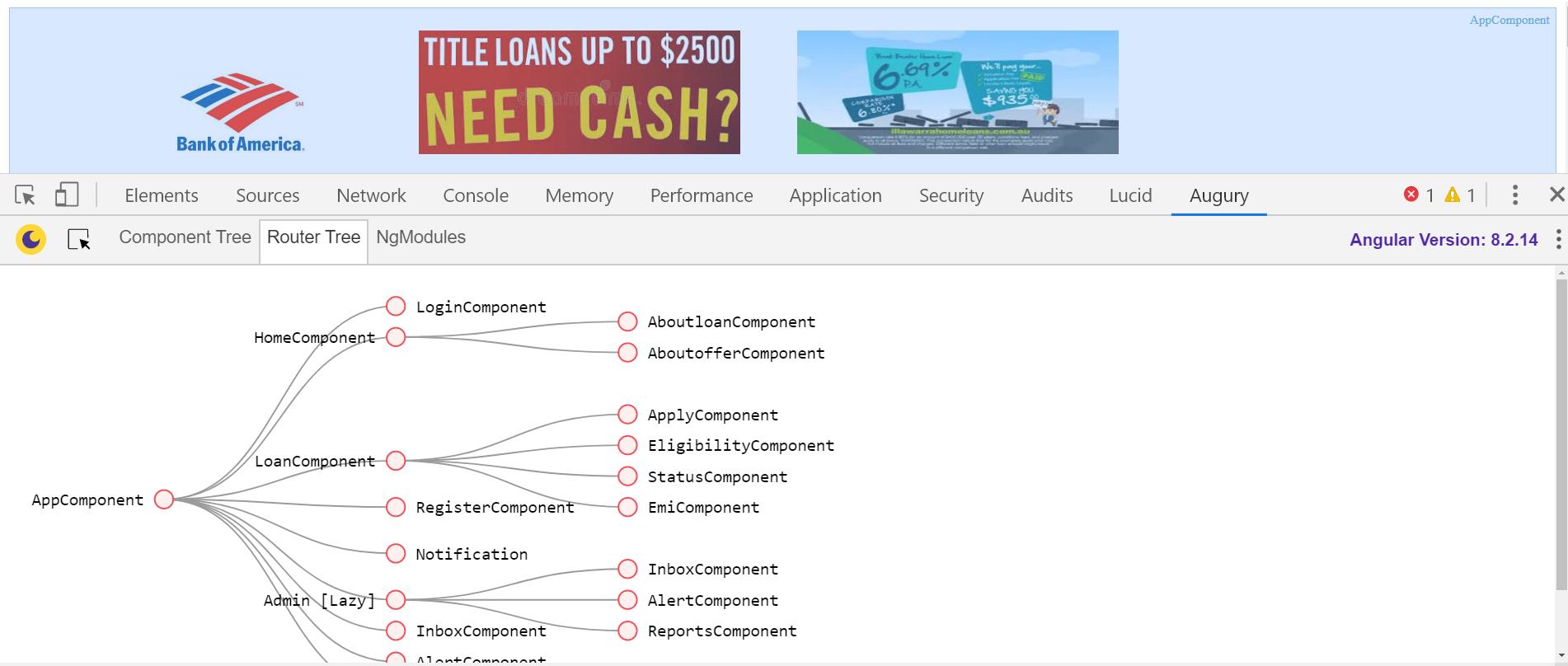
- AppComponent
  - MenuComponent
    - Menubar
      - div
    - router-outlet
  - LoginComponent
    - a
    - form
      - MatFormField
        - input
        - label
        - div
      - MatFormField
      - MatButton
      - MatButton

The Augury panel on the right shows the properties and injector graph for the MenuComponent:

- Properties**: menuService: {}, router: Object, \_menuArr: Array[4]
- Injector Graph**: ( \$\$el in Console )
- Change Detection**: Default
- State**: (empty)



# Augury





# Augury

The screenshot shows a web browser window with the Augury extension installed. The main content area displays a Bank of America advertisement for "TITLE LOANS UP TO \$2500 NEED CASH?". The Augury interface is overlaid at the bottom, showing the following details for the "AppModule":

| Imports  | Exports | Providers   | Declarations   | ProvidersInDeclarations |
|--|---------|---|--|-------------------------|
| BrowserModule<br>AppRoutingModule<br>MenubarModule<br>FormsModule<br>ReactiveFormsModule<br>HttpClientModule<br>MatFormFieldModule<br>MatInputModule<br>BrowserAnimationsModule<br>MatButtonModule<br>MatIconModule<br>FormsModule<br>ReactiveFormsModule<br>AdminModule | None    | MenuService<br>UserService<br>LoginGuard<br>AuthService | AppComponent<br>MenuComponent<br>HomeComponent<br>AboutloanComponent<br>AboutofferComponent<br>LoanComponent<br>ApplyComponent<br>EligibilityComponent<br>StatusComponent<br>EmiComponent<br>LoginComponent<br>RegisterComponent<br>NotificationComponent<br>EqualValidator<br>ParentComponent<br>ChildComponent | None                    |



# Add debugger in ts file

Screenshot of a browser developer tools window showing the Sources tab with the app.component.ts file open. The code is paused at line 16, column 5, where the word "debugger;" is highlighted. A blue arrow points from the top right towards this line. The status bar at the bottom indicates "Paused in debugger".

The code in app.component.ts:

```
7 })
8 export class AppComponent {
9   title = 'loanapp';
10  //one way binding
11  private logoPath='./assets/boa.jpg';
12  private banner1='./assets/banner.jpg';
13  private banner2='./assets/banner2.jpg';
14  constructor()
15  {
16    debugger;
17  }
18 }
```

The sidebar on the right shows the "Debugger paused" state with the following details:

- Debugger paused
- Watch
- Call Stack
  - AppComponent
  - createClass
  - createDirectiveInst...
  - createViewNodes

At the bottom, the status bar shows "Line 16, Column 5" and "(source mapped from main.js)".



# Console Debugging

The screenshot shows the WebStorm IDE interface with the following details:

- File Menu:** File, Edit, View, Navigate, Code, Refactor, Run, Tools, VCS, Window, Help.
- Title Bar:** boaangular2019 [F:\boaangular2019] - ...\\loanapp\\src\\main.ts
- Toolbar:** Add Configuration..., Git: (checkmarks), Terminal.
- Sidebar:** Project (1: Project), Z: Structure, 2: Favorites.
- Project Tree:** services (app.component.css, app.component.html, app.component.spec.ts, app.component.ts, app.module.ts, app-routing.module.ts), assets, environments (favicon.ico, index.html, main.ts), polyfills.ts, styles.css, test.ts, typings.d.ts, .bitmap, .editorconfig, .gitignore.
- Code Editor:** The main.ts file is open, showing the following code:

```
import { enableProdMode } from '@angular/core';
import { platformBrowserDynamic } from '@angular/platform-browser-dynamic';
import { enableDebugTools } from "@angular/platform-browser";
import { AppModule } from './app/app.module';
import { environment } from './environments/environment';
import { ApplicationRef } from "@angular/core";

if (environment.production) {
  enableProdMode();
}

//for profiling
platformBrowserDynamic().bootstrapModule(AppModule).then((module) => {
  let applicationRef = module.injector.get(ApplicationRef);
  let appComponent = applicationRef.components[0];
  enableDebugTools(appComponent);
}).catch(err => console.error(err));
```
- Bottom Status Bar:** 6: TODO, 9: Version Control, Terminal, Event Log (1).
- System Tray:** Externally added files can be added to Git // View Files // Always Add // Don't Ask Again (today 20:10), 6:48, LF, UTF-8, EditorConfig, Git: master, 22:09, ENG, 05/12/2019, 26.



- Angular offers a precious tool: `ng.profiler`
- `ng.profiler.timeChangeDetection()`
- ran 489 change detection cycles
- 1.02 ms per check
- You can see how many change detection cycles it ran (it should be at least 5 cycles or during at least 500ms), and the time per cycle.
- You can also record the CPU profile during these checks to analyze them with `ng.profiler.timeChangeDetection({ record: true })`.



TITLE LOANS UP TO \$2500  
NEED CASH?



Elements Console Sources Network Memory Performance Application Security Audits Lucid Augury

✖ 2 ⚠ 1 | ⋮ X

[WDS] Live Reloading enabled. client:52

✖ ▶ Uncaught TypeError: Cannot convert undefined or null to object reactTraverser.js:6

at Function.keys (<anonymous>)  
at [reactTraverser.js:6](#)

> ng.profiler() VM8937:1

✖ ▶ Uncaught TypeError: ng.profiler is not a function VM8937:1

at <anonymous>:1:4

> ng.profiler.timeChangeDetection()

ran 390 change detection cycles platform-browser.js:2287

1.28 ms per check platform-browser.js:2288

↳ ▶ ChangeDetectionPerfRecord {msPerTick: 1.283935897439593, numTicks: 390} ⓘ

msPerTick: 1.283935897439593  
numTicks: 390

▶ \_\_proto\_\_: Object

>



Administrator: Node.js command prompt

```
10% building 4/4 modules 0 active
i  wds: Project is running at http://localhost:4200/webpack-dev-server/
i  wds: webpack output is served from /
i  wds: 404s will fallback to //index.html

chunk {main} main.js, main.js.map (main) 152 kB [initial] [rendered]
chunk {polyfills} polyfills.js, polyfills.js.map (polyfills) 336 kB [initial] [rendered]
chunk {polyfills-es5} polyfills-es5.js, polyfills-es5.js.map (polyfills-es5) 655 kB [initial] [rendered]
chunk {runtime} runtime.js, runtime.js.map (runtime) 6.15 kB [entry] [rendered]
chunk {styles} styles.js, styles.js.map (styles) 733 kB [initial] [rendered]
chunk {vendor} vendor.js, vendor.js.map (vendor) 7.75 MB [initial] [rendered]
Date: 2019-12-06T01:53:12.483Z - Hash: 0d56f2be39a138c9fbab - Time: 16267ms
** Angular Live Development Server is listening on localhost:4200, open your browser on http://localhost:4200/ **
i  wdm: Compiled successfully.
[07:23:12] I/launcher - Running 1 instances of WebDriver
[07:23:12] I/direct - Using ChromeDriver directly...
```

```
DevTools listening on ws://127.0.0.1:64842/devtools/browser/ef029325-9f3e-47d3-a08c-abc92bc024ef
Jasmine started
```

```
workspace-project App
  ✓ should display welcome message
```

```
Executed 1 of 1 spec SUCCESS in 3 secs.
[07:23:23] I/launcher - 0 instance(s) of WebDriver still running
[07:23:23] I/launcher - chrome #01 passed
```

```
F:\boaangular2019\loanapp>
```



07:23 06/12/2019 ENG 25



# Automation Testing

Develop



Deploy



Deliver





# Automation Testing



Catch **Bugs** before your application steps into production



WEB APPLICATIONS

build / lint

test

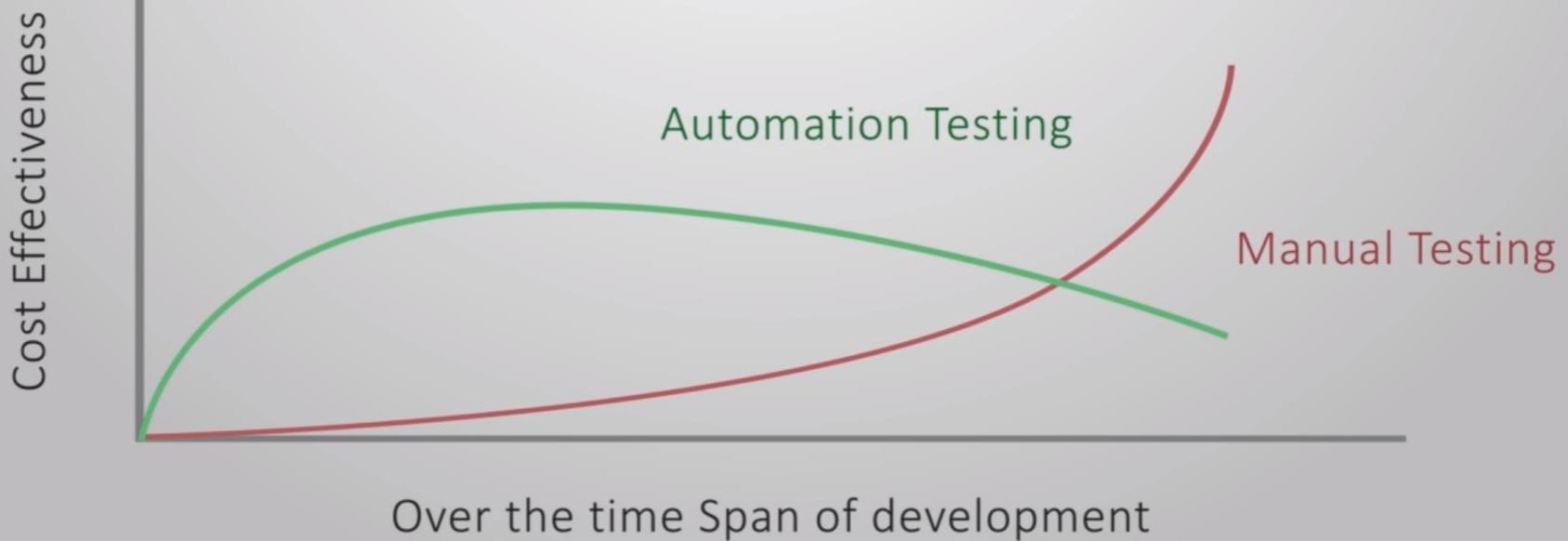
deploy





# Automation Testing

Reduced Business Expenses & Time





# Automation Testing

Write More **Code** . .



Application Code

Application Code and  
Testing Code



# Automation Testing

START  
UP!





# Automation Testing

Lets Get Started





# Jasmine Unit Testing

---

- Jasmine is one of the popular JavaScript unit testing frameworks which is capable of testing synchronous and asynchronous JavaScript code.
- It is used in BDD (behavior-driven development) programming which focuses more on the business value than on the technical details



# Suite

---

- A Jasmine suite is a group of test cases that can be used to test a specific behavior of the JavaScript code (a JavaScript object or function).
- This begins with a call to the Jasmine global function describe with two parameters – first parameter represents the title of the test suite and second parameter represents a function that implements the test suite.
- //This is test suite
- describe("Test Suite", function() {
- //.....
- });



# Spec

---

- A Jasmine spec represents a test case inside the test suite.
- This begins with a call to the Jasmine global function it with two parameters – first parameter represents the title of the spec and second parameter represents a function that implements the test case.
- In practice, spec contains one or more expectations.
- Each expectation represents an assertion that can be either true or false.
- In order to pass the spec, all of the expectations inside the spec have to be true. If one or more expectations inside a spec is false, the spec fails.



# Spec

---

- //This is test suite
- describe("Test Suite", function() {
- it("test spec", function() {
- expect( expression ).toEqual(true);
- });
- });



# Spec

File Edit View Selection Find Packages Help

Project

simple calculator

- lib
- calculator.js
- calculator.spec.js**
- main.js
- simple-calculator.html
- spec-runner.html
- style.css

calculator.spec.js

```
1 describe('calculator.js', function() {
2     it('should add numbers to total', function() {
3         // TODO: Expectations
4     });
5
6     it('should subtract numbers from total', function() {
7         // TODO: Expectation
8     );
9
10    it('should multiply total by number', function() {
11        // TODO: Expectation
12    );
13
14    it('should divide total by number', function() {
15        // TODO: Expectation
16    );
17 });
18
```



# Spec

```
simple calculator
  lib
    calculator.js
  calculator.spec.js
  main.js
  simple-calculator.html
  spec-runner.html
  style.css

13      expect(calculator.total).toBe(25);
14    });
15  });
16
17  it('should multiply total by number', function() {
18    const calculator = new Calculator();
19    calculator.total = 100;
20    calculator.multiply(2);
21
22    expect(calculator.total).toBe(200);
23  });
24
25  it('should divide total by number', function() {
26    const calculator = new Calculator();
27    calculator.total = 200;
28    calculator.divide(2);
29
30    expect(calculator.total).toBe(100);|
31  });

< >
```



# Jasmine functions

- Suite (describe):  
Groups related specs.

- Spec (it):  
Groups expectations.

- Expectations (expect):  
Test the state of the code.

```
describe('test.js', function() {  
  it('Should be true', () => {  
    expect(true).toBe(true);  
  });  
});
```

# Setup and Teardown



- For setup and tear down purpose, Jasmine provides two global functions at suite level i.e. `beforeEach()` and `afterEach()`.
- `beforeEach()`
- The `beforeEach` function is called once before each spec in the `describe()` in which it is called.
- `afterEach()`
- The `afterEach` function is called once after each spec.



## What is a matcher?

- \* it is just a function
- \* Implements a boolean comparison between the actual value and the expected value.

```
expect(/*Actual value*/calculator.total)
  .toBe(/*expected value*/5);
```

-> boolean comparison -> true / false  
-> actual value with the expected value  
(calculator.total === 5) -> true / false

- \* A matcher is responsible for reporting to jasmine if the expectation is true or false. -> passing or failing spec.

# Jasmine Matchers



| MATCHER         | PURPOSE   |
|-----------------|---|
| toBe()          | passed if the actual value is of the same type and value as that of the expected value. It compares with === operator |
| toEqual()       | works for simple literals and variables; should work for objects too  |
| toMatch()       | to check whether a value matches a string or a regular expression   |
| toBeDefined()   | to ensure that a property or a value is defined   |
| toBeUndefined() | to ensure that a property or a value is undefined   |

# Jasmine Matchers



---

|                   |   |
|-------------------|---|
| toBeNull()        | to ensure that a property or a value is null.                       |
| toBeTruthy()      | to ensure that a property or a value is true                        |
| toBeFalsy()       | to ensure that a property or a value is false                       |
| toContain()       | to check whether a string or array contains a substring or an item. |
| toBeLessThan()    | for mathematical comparisons of less than                           |
| toBeGreaterThan() | for mathematical comparisons of greater than                        |
| toBeCloseTo()     | for precision math comparison                                       |
| toThrow()         | for testing if a function throws an exception                       |
| toThrowError()    | for testing a <i>specific</i> thrown exception                      |



```
calculator.spec.js
```

```
it('should divide total by number', function() {
  const calculator = new Calculator();
  calculator.total = 200;
  calculator.divide(2);

  expect(calculator.total).toBe(100);
});

// toBe

it('should initialize the total', function() {
  const calculator = new Calculator();

  expect(calculator.total).toBe(0);
});
```



Deep equality comparison:

- \* Equal keys and Equal values

```
{ __someKey: 'some value', ... }  
{ someKey: 'some value' ... }
```

=> true



```
expect(calculator.total).toBe(100);
});

it('should initialize the total', function() {
  const calculator = new Calculator();

  expect(calculator.total).toBe(0);
}

it('has constructor', function() {
  const calculator = new Calculator();
  const calculator2 = new Calculator();

  expect(calculator).toEqual(calculator2);
}
);
});
```

# Disable Suites and Specs



```
1 Disabled spec: A spec that will report as pending  
2 and will not be executed.  
3  
4 2 Common cases!  
5  
6 1. Changes in the code.  
7 2. TDD -> Test driven development.
```



# Jasmine matchers

- `toBe()`:

Expects the actual value to be equal  
`(==)` to the expected value.

- `toEqual()`:

Similar to the `toBe` method but it uses  
deep equality comparison.

- `toBeFalsy()`:

Expects the actual value to be falsy.

```
describe('test.js', function() {
  it('is true', function() {
    expect(true).toBe(true);
  });

  it('has same keys and values', function() {
    expect(obj1).toEqual(obj2);
  });

  it('is falsy', function() {
    expect(0).toBeFalsy();
  });
});
```



# Jasmine matchers

- `toBeTruthy()`:

Expects the actual value to be truthy.

- `toBeNull()`:

Expects the actual value to be null.

- `toBeDefined()`:

Expects the actual value to be defined.

```
describe('test.js', function() {  
  it('is truthy', function() {  
    expect({}).toBeTruthy();  
  });  
  
  it('is null', function() {  
    expect(result).toBeNull();  
  });  
  
  it('is defined', function() {  
    expect(result).toBeDefined();  
  });  
});
```



# Jasmine matchers

- `toThrow()`:

Expects a function to throw something.

- `toThrowError()`:

Expects a function to throw an error.

- `toMatch()`:

Expects the actual value to match a regular expression.

```
describe('test.js', function() {
  it('throws', function() {
    const err = function(message) {
      throw new Error(message);
    };
    expect(err).toThrow();
  });

  it('throws an error', function() {
    const err = function(message) {
      throw new Error();
    };
    expect(err).toThrowError();
  });

  it('matches regex', function() {
    const STR = 'my string';
    expect(STR).toMatch(/string$/);
  });
});
```



## Jasmine functions

- Disabled suite (`xdescribe`):  
Any specs inside the disabled suite  
are skipped.
- Pending spec (`xit`):  
A pending spec does not run, but it  
will show up in the results as pending.

```
xdescribe('test.js', function() {  
  xit('Should be true', () => {  
    expect(true).toBe(true)  
  });  
});
```

# Disable Suites and Specs



- //disable suite
- xdescribe("MathUtils", function() {
- 
- });
- describe("MathUtils", function() {
- //Spec for sum operation
- //disable spec
- xit("should be able to calculate the sum of two numbers",  
function() {
- expect(10).toBeSumOf(7, 3);
- });
- });

# Working with Jasmine Spies



- Jasmine has test double functions called spies.
- A spy can stub any function and tracks calls to it and all arguments.
- A spy only exists in the describe or it block in which it is defined, and will be removed after each spec.
- To create a spy on any method, use `spyOn(object, 'methodName')` call.
- There are two matchers `toHaveBeenCalled` and `toHaveBeenCalledWith` which should be used with spies.

# Working with Jasmine Spies



- `toHaveBeenCalled` matcher will return true if the spy was called; and `toHaveBeenCalledWith` matcher will return true if the argument list matches any of the recorded calls to the spy.

# Working with Jasmine Spies



| TRACKING PROPERTY     | PURPOSE  |
|-----------------------|--|
| .calls.any()          | returns false if the spy has not been called at all, and then true once at least one call happens. |
| .calls.count()        | returns the number of times the spy was called   |
| .calls.argsFor(index) | returns the arguments passed to call number index  |
| .calls.allArgs()      | returns the arguments to all calls   |
| .calls.all()          | returns the context (the this) and arguments passed all calls                                      |
| .calls.mostRecent()   | returns the context (the this) and arguments for the most recent call                              |
| .calls.first()        | returns the context (the this) and arguments for the first call                                    |
| .calls.reset()        | clears all tracking for a spy  |



# Organizing your specs

- `beforeAll()`:

Runs **once** before all of the specs in the `describe` are run.

- `afterAll()`:

Runs **once** after all of the specs in the `describe` are run.

```
describe('test.js', function() {
  beforeAll(function() {
    this.boolean = true;
  });

  afterAll(function() {
    this.boolean = false;
  });

  describe('someMethod()', function() {
    it('is true', function() {
      expect(this.boolean).toBe(true);
    });
  });
});
```



# Jasmine organizing your specs

- `beforeEach()`:

Runs before each of the specs in the `describe` in which it is called.

- `afterEach()`:

Runs after each of the specs in the `describe` in which it is called.

```
describe('test.js', function() {  
  describe('someMethod()', function() {  
    beforeEach(function() {  
      this.boolean = true;  
    });  
  
    afterEach(function() {  
      this.boolean = false;  
    });  
  
    it('is true', function() {  
      expect(this.boolean).toBe(true);  
    });  
  })  
});
```



# Angular Test bed

---

- . The TestBed creates a dynamically-constructed Angular test module that emulates an Angular @NgModule
- The TestBed.configureTestingModule() method takes a metadata object that can have most of the properties of an @NgModule.

# ComponentFixture



- The ComponentFixture is a test harness for interacting with the created component and its corresponding element.
- Access the component instance through the fixture and confirm it exists with a Jasmine expectation:
  - content\_copy
  - const component = fixture.componentInstance;
  - expect(component).toBeDefined();



| Properties          | Description   |
|---------------------|---|
| componentInstance   | The instance of the component class created by TestBed.createComponent.   |
| <u>debugElement</u> | <p>The <a href="#">DebugElement</a> associated with the root element of the component.</p> <p>The <a href="#">debugElement</a> provides insight into the component and its DOM element during test and debugging. It's a critical property for testers. The most interesting members are covered <a href="#">below</a>.</p> |
| nativeElement       | The native DOM element at the root of the component.  |
| changeDetectorRef   | <p>The <a href="#">ChangeDetectorRef</a> for the component.</p> <p>The <a href="#">ChangeDetectorRef</a> is most valuable when testing a component that has the <a href="#">ChangeDetectionStrategy.OnPush</a> method or the component's change detection is under your programmatic control.</p>                           |



| Methods           | Description   |
|-------------------|---|
| detectChanges     | <p>Trigger a change detection cycle for the component.</p> <p>Call it to initialize the component (it calls <code>ngOnInit</code>) and after your test code, change the component's data bound property values. Angular can't see that you've changed <code>personComponent.name</code> and won't update the name binding until you call <code>detectChanges</code>.</p> <p>Runs <code>checkNoChanges</code> afterwards to confirm that there are no circular updates unless called as <code>detectChanges(false)</code>;</p>   |
| autoDetectChanges | <p>Set this to true when you want the fixture to detect changes automatically.</p> <p>When <code>autodetect</code> is true, the test fixture calls <code>detectChanges</code> immediately after creating the component. Then it listens for pertinent zone events and calls <code>detectChanges</code> accordingly. When your test code modifies component property values directly, you probably still have to call <code>fixture.detectChanges</code> to trigger data binding updates.</p> <p>The default is false. Testers who prefer fine control over test behavior tend to keep it false.</p> |
| checkNoChanges    | Do a change detection run to make sure there are no pending changes. Throws an exception if there are.  |
| isStable          | If the fixture is currently <i>stable</i> , returns true. If there are async tasks that have not completed, returns false.  |
| whenStable        | Returns a promise that resolves when the fixture is stable.<br>To resume testing after completion of asynchronous activity or asynchronous change detection, hook that promise. See <a href="#">above</a> .   |
| destroy           | Trigger component destruction.  |



# Code Coverage

---

- Ng test –code-coverage



# Fragile Test

---

- `Expect(result).toContain(expectedvalue)`



## TestBed with Services

---

- let service: ValueService;
- beforeEach(() => {
- TestBed.configureTestingModule({ providers: [ValueService] });
- });



# TestBed with Services

---

- `beforeEach(() => {`
- `TestBed.configureTestingModule({ providers: [ValueService] });`
- `service = TestBed.get(ValueService);`
- `});`



# Spec Parallel Execution

---

- capabilities: {
- browserName: 'chrome',
- 'shardTestFiles': true,
- 'maxInstances': 2
- },
-



# Spec Parallel Execution

```
Administrator: Node.js command prompt
F:\aspireangular2020\mvpapp>ng e2e --devServerTarget="" --webdriver-update=false --host=localhost --port=5000
[02:24:32] I/launcher - Running 2 instances of WebDriver
DevTools listening on ws://127.0.0.1:58793/devtools/browser/7acf24ec-3414-40e7-839a-a4be87776ee7
DevTools listening on ws://127.0.0.1:58799/devtools/browser/20d8948c-689d-43df-a96b-61bcc1d7e35a
.[02:25:20] I/testLogger -
-----
[02:25:20] I/testLogger - [chrome #01-0] PID: 25644
[chrome #01-0] Specs: F:\aspireangular2020\mvpapp\e2e\src\app.e2e-spec.ts
[chrome #01-0]
[chrome #01-0] [02:24:33] I/direct - Using ChromeDriver directly...
[chrome #01-0] Jasmine started
[chrome #01-0] Jasmine started
[chrome #01-0] {
[chrome #01-0]   baseUrl: 'http://localhost:5000',
[chrome #01-0]   default: { baseUrl: 'http://localhost:5000' }
[chrome #01-0] }
[chrome #01-0]
[chrome #01-0] workspace-project App
[chrome #01-0]   ✓ should display welcome message
[chrome #01-0]
[chrome #01-0] workspace-project App
[chrome #01-0]   ✓ should display welcome message
[chrome #01-0]
```



# HTML Report

**Protractor Test Report**

**Passed: 2** **Time Elapsed: 0h 0min 8s**

1/31/2020, 11:23:00 PM

2 TestSuites

100%

Passed

2 TestCases

100%

Passed

► Environment

Browser: chrome 79.0.3945.130 Platform: Windows

**TestSuite:** workspace-project App 1

**TestCase:** should display welcome message Passed

Time elapsed: 4 seconds



# Skip current project deployment with ng e2e

```
ng e2e --devServerTarget="" --webdriver-update=false --host=localhost --port=5000
```

```
F:\aspireangular2020\mvpapp>ng e2e --devServerTarget="" --webdriver-update=false --host=localhost --port=5000
[20:57:17] I/launcher - Running 1 instances of WebDriver
[20:57:18] I/direct - Using ChromeDriver directly...
```

```
DevTools listening on ws://127.0.0.1:50559/devtools/browser/d8c00351-5d76-4941-a046-45e67fc910d8
```

```
Jasmine started
```

```
{
  baseUrl: 'http://localhost:5000',
  default: { baseUrl: 'http://localhost:5000' }
}
```

```
workspace-project App
```

```
  ✓ should display welcome message
```

```
workspace-project App
```

```
  ✓ it should navigate after successful login
```

```
Executed 2 of 2 specs SUCCESS in 12 secs.
```

```
[20:58:40] I/launcher - 0 instance(s) of WebDriver still running
```

```
[20:58:40] I/launcher - chrome #01 passed
```

```
F:\aspireangular2020\mvpapp>
```

# Questions

