ANGULAR
ARCHITECTS
INSIDE KNOWLEDGE

Performance Tuning

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Turbo Button
HIGHSCREEN
386 SX-33
POWER
HDD
TURBO
RESET

Masterplan

- New performance workshop
- 3days
- Under construction this summer ☺

15facts in 15min

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Topics

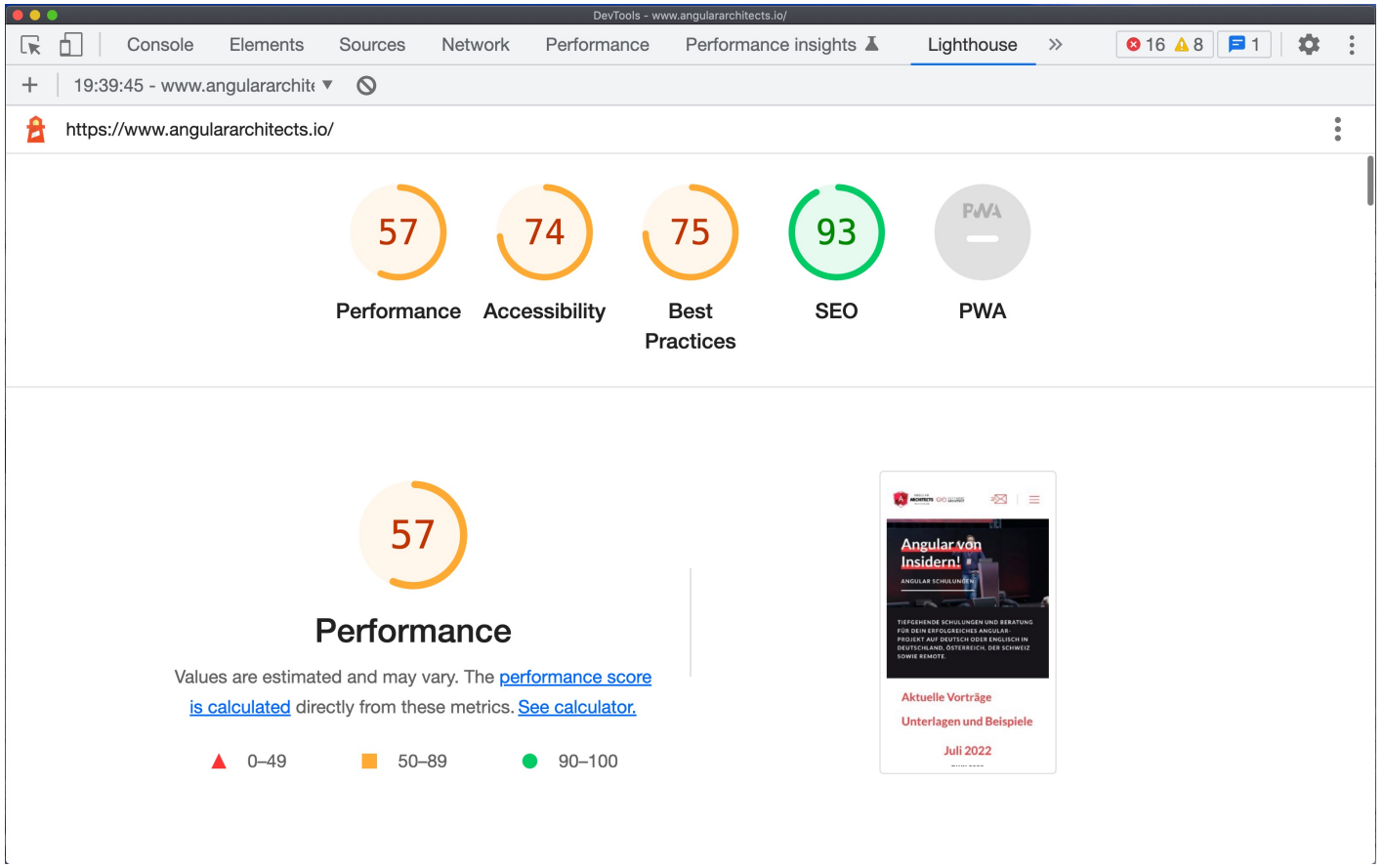
Tools

InitialLoad

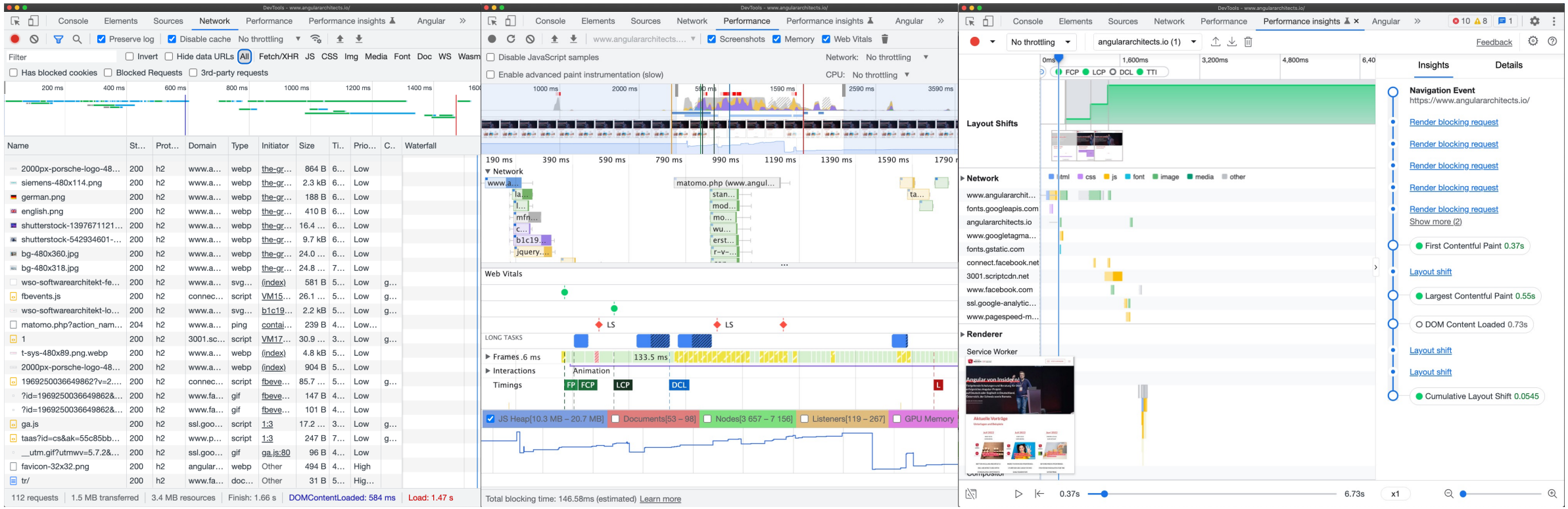
Runtime

Image from: https://bit.ly/ng-tools-img

#1: Google Chrome Lighthouse / PageSpeed



#2: Google Chrome DevTools



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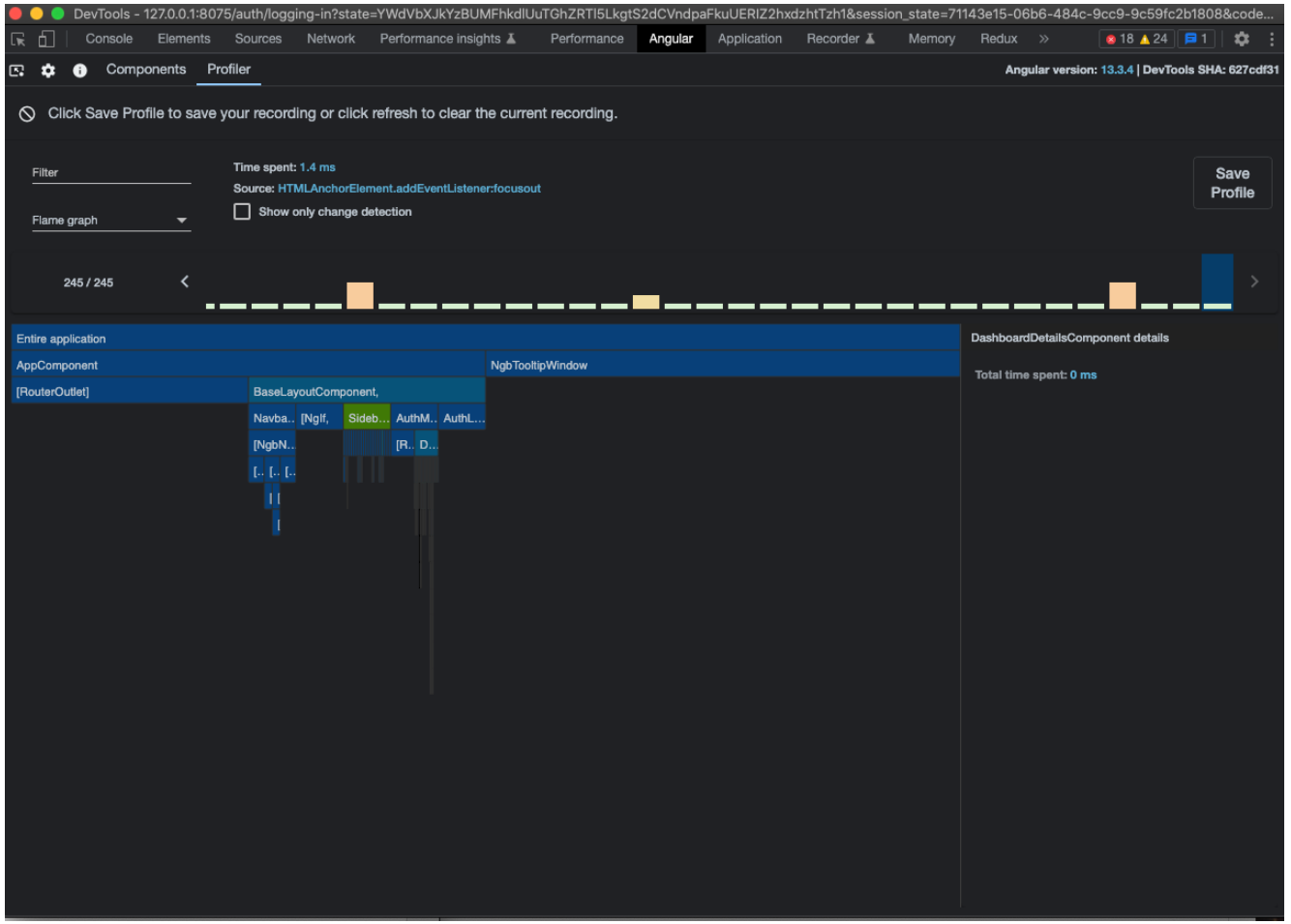
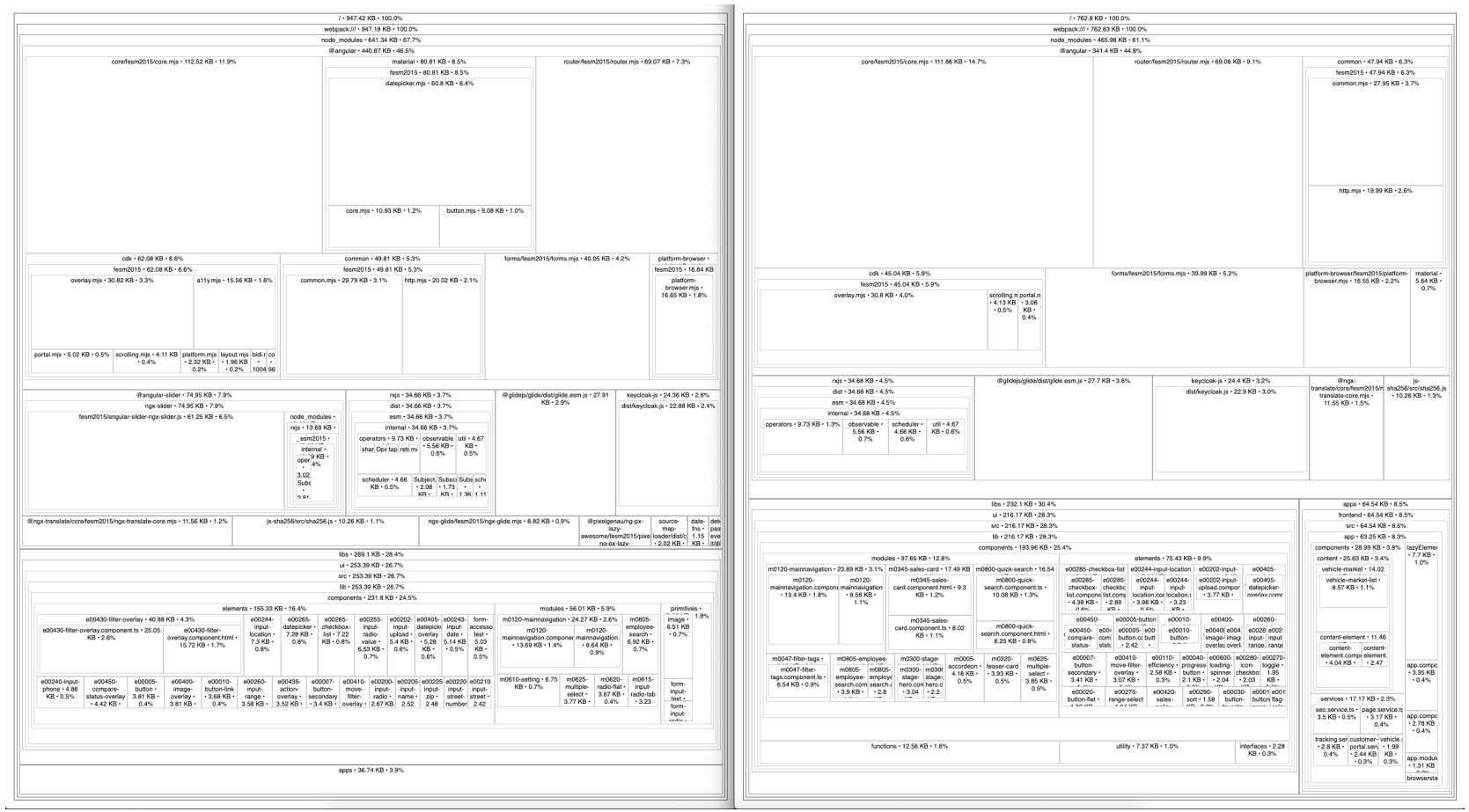
#3: Angular DevTools Profiler



#4: Sourcemap Explorer (more accurate)



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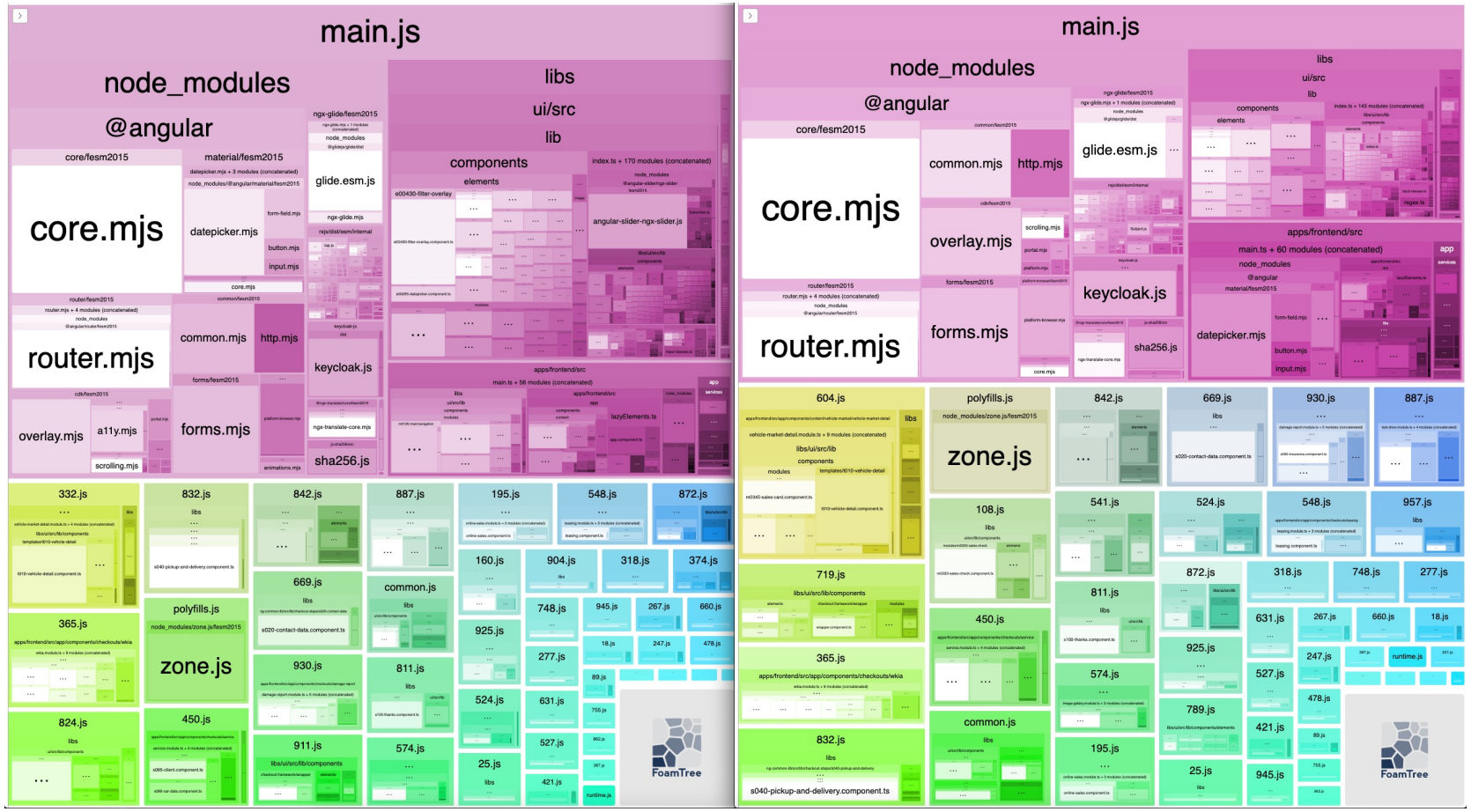
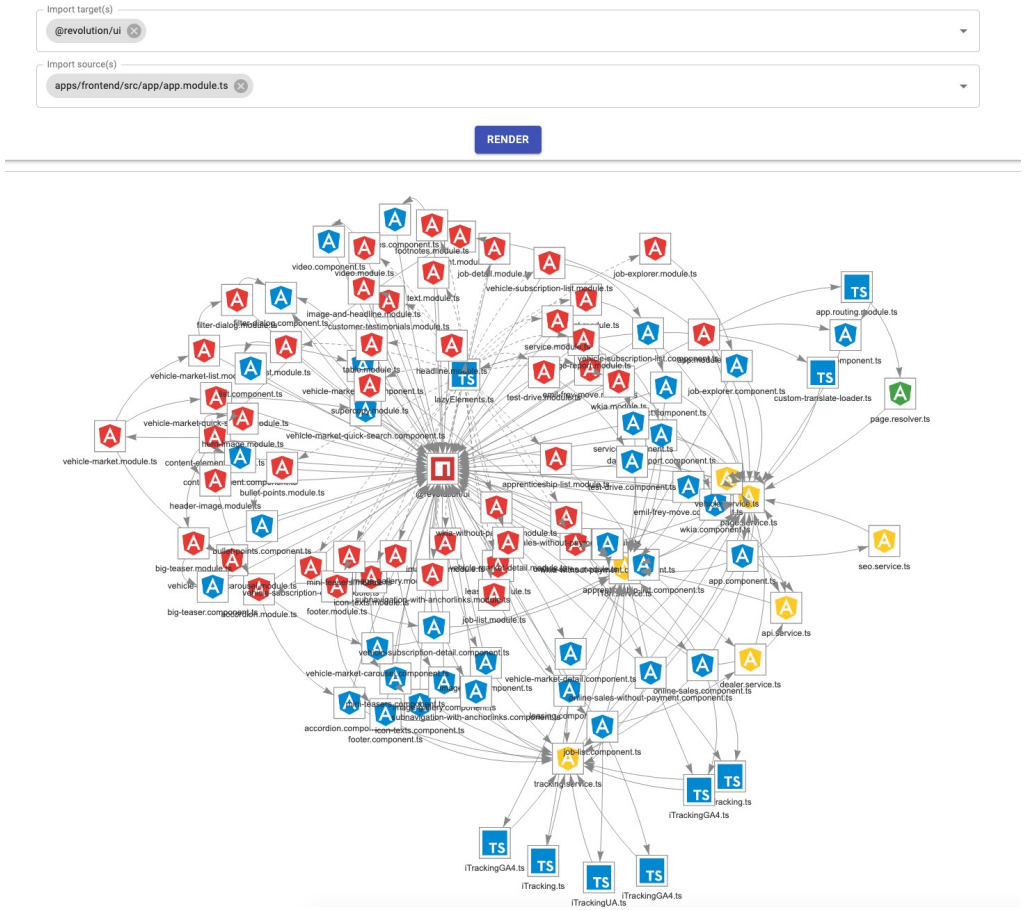
#4.5: Webpack Bundle Analyzer (colorful)



#5: rx-angular/import-graph-visualizer



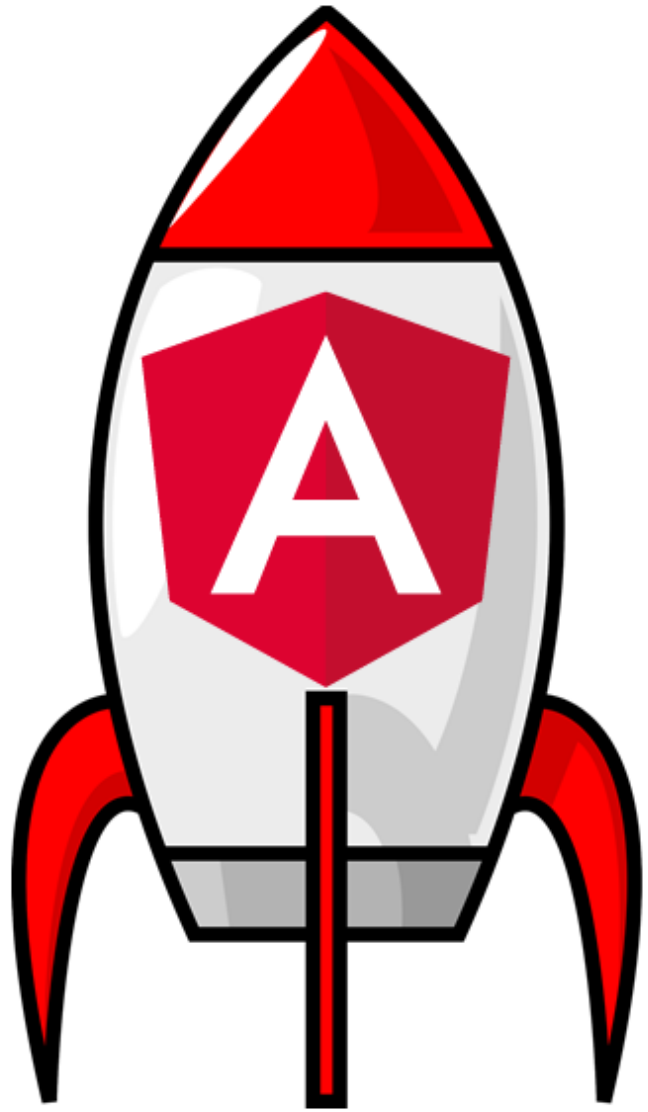


Image from: https://bit.ly/ng-initial-load

#6: Use web performance best practices

- Problem: *Slow infrastructure & too large assets / waiting for responses*
- Identify: Using Lighthouse & PageSpeed / seeing loading spinners
- Solution:
  - Use performant infrastructure (CDN?), cache static files, use service workers…
  - Optimize assets (use correctly sized images and srcsets (responsive sizes), use .webp & vector graphics where it makes sense)
  - Optimistic updates

#7: Avoid large 3rd party libs / CSS frameworks

- Problem: *Importing large 3rd party libraries that are not treeshakable*
- Identify: Find with sourcemap or wba
  - E.g. moment & lodash
- Solution: Remove or replace that lib / framework
  - E.g. date-fns & lodash-es

Lazy Loading

#8: Use Lazy Loading a lot - but carefully ;-)

- Problem: *Loading to much source (libs / components) at startup*
- Identify: Not using lazy loading throughout the App
- Solution: Implement lazy loading whereever you can
  - Maybe use a CustomPreloadStrategy if App is very big
  - **But** don't lazyload the initial feature, because it will be delayed then ;-)

#9: Load everything below the fold lazily

- Problem: *Bad PageSpeed Score*
- Identify: Initial load is too slow (Using Lighthouse / PageSpeed)
- Solution: Use custom lazy loading of content below the fold

#10: Server-side rendering (Angular Universal)

- Problem: *After download rendering on the client takes too much time*
- Identify: After .js files have been loaded js main thread takes too long
- Solution: Use Angular Universal so that the page is rendered on the server and then served to the client

#10.5: Prerender important routes (Universal)

- Problem: *Server response takes to long cos page has to be rendered*
- Identify: Long server response time when using Universal SSR
- Solution: Prerender the important pages on the server and then serve it rendered to the user
  - Built-in Angular Universal since V11

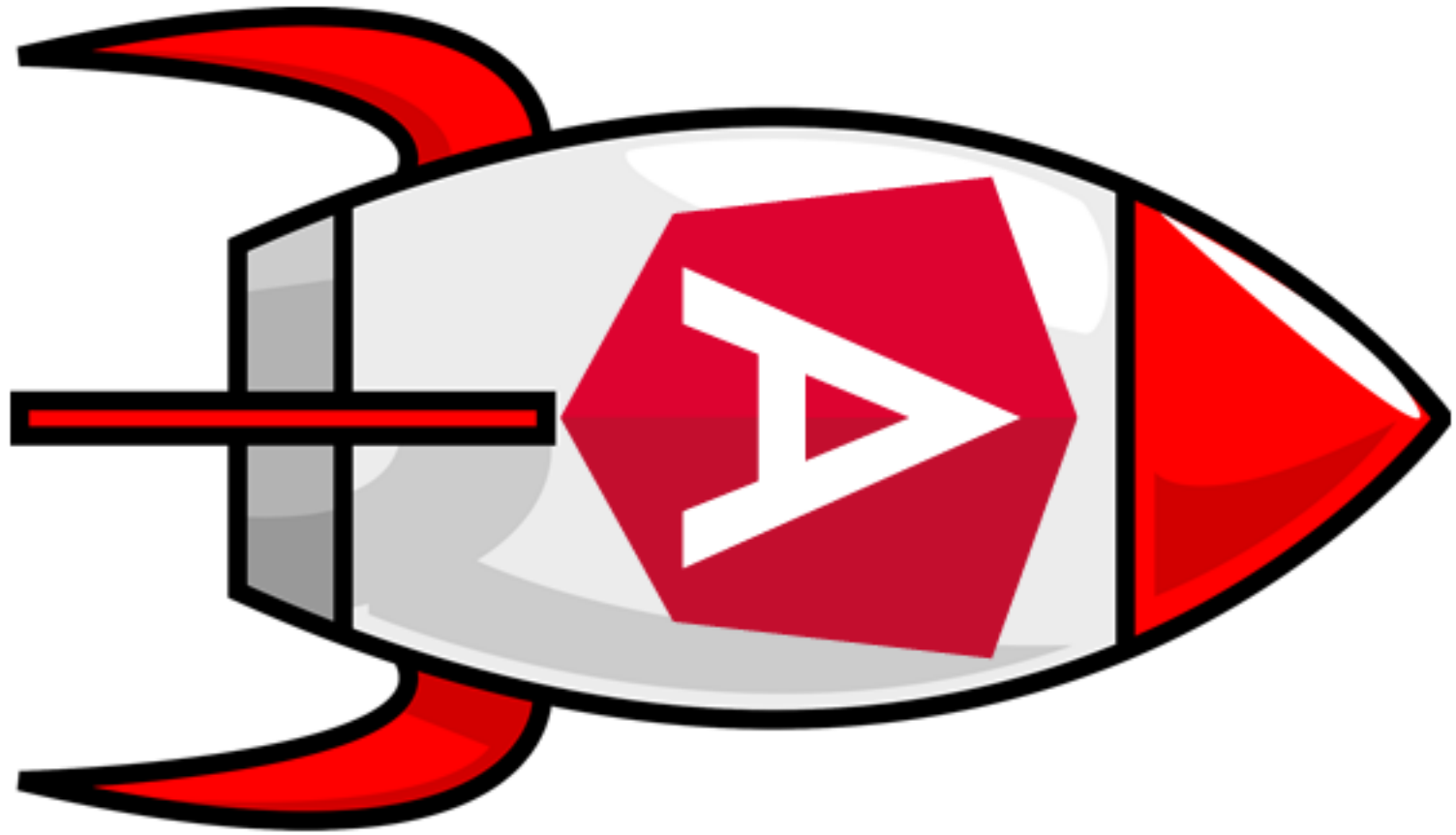


Image from: https://bit.ly/ng-initial-load

Performance-Tuning with OnPush

#11: O.B. change detection

- Problem: *Local state change triggers change detection in other comps*
- Identify: Use the infamous blink() or the Angular DevTools Profiler
  - E.g. Input field keydown triggers change detection in other components
- Solution: ChangeDetectionStrategy.OnPush as default

```
1       "schematics": {
2         "@schematics/angular:component": {
3           "styleext": "scss",
4           "changeDetection": "OnPush"
5         }
6       },
```

angular.json hosted with ❤ by GitHub

#11.5: detectChanges() vs markForCheck()

- Use cdr.**detectChanges() to trigger CD immediately** when you've updated the model after angular has run it's change detection, or if the update hasn't been in Angular world at all

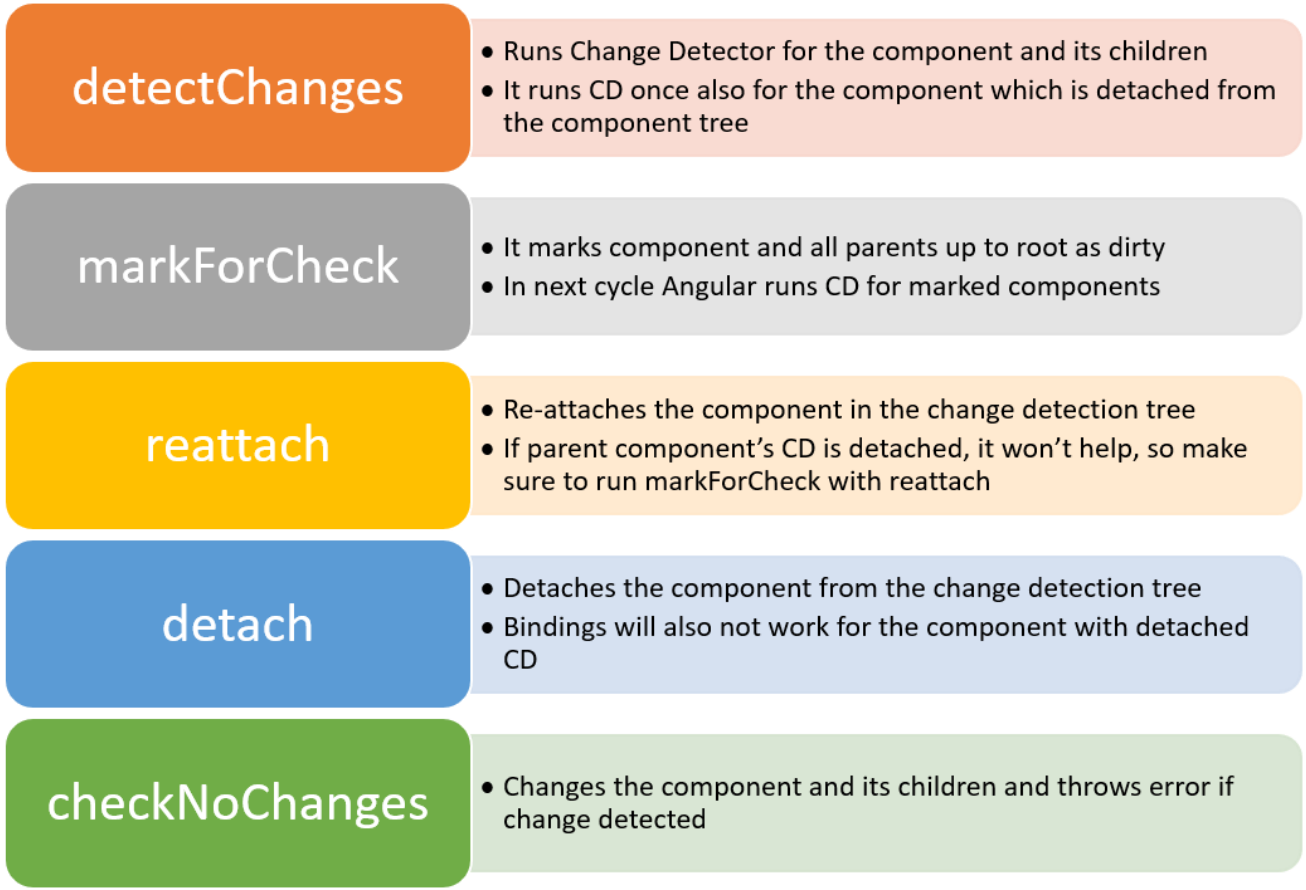
- Use cdr.**markForCheck() to mark for check in next CD cycle** if you're using **OnPush** and you're bypassing the ChangeDetectionStrategy by mutating some data or you've updated the model inside a **setTimeout**

#12: Zone pollution by 3rd party libs (charts)

#12: Zone pollution by 3rd party libs (charts)

- Problem: *Callbacks that trigger redundant change detection cycles*
- Identify: Use the infamous blink() or the Angular DevTools Profiler
  - E.g. MouseEvent listeners, setTimeout or requestAnimationFrame()
- Solution: Run outside of NG Zone
  - Inject (private ngZone: NgZone)
  - Call this.ngZone.runOutsideAngular(() => doStuff)
- Alternative: Using cdr.detach() for components

#12.5: ChangeDetectorRef API, once more



#13: Optimization with state or Flags

- Problem: *Redundant calculations for conditions*
- Identify: Methods being executed in ***ngIf** statements
- Solution: Use StateManagement like Subjects or use boolean flags or strings, that only change when they should

#13.5: Optimization with Angular Pipes

- Problem: *Redundant calculations for content or formatting*
- Identify: Methods being executed in string interpolations in the template or similar things slowing change detection cycles
- Solution: Use (pure) Angular Pipes

#14: Using trackBy in ngFor

- Problem: *Angular will replace all items in ***ngFor** upon changes*
- Identify: Easy - search for "*ngFor"
- Solution: Use the trackBy function

```
<li *ngFor="let dashboard of dashboards; trackBy: trackByDashboardId"

trackByDashboardId(index: number, item: Dashboard): number {
  return item.id;
}
```

#15: Large component trees

- Problem: *Too many (100+) components are loaded*
- Identify: Lots of components slowing down frame rate
- Solution: On demand component rendering
  - E.g. Pagination or Angular CDKs <cdk-virtual-scrolling-component>

One more thing

- Unsubscribe from all Observables in your App
  - Except Angular Router Params

Any questions or remarks?