

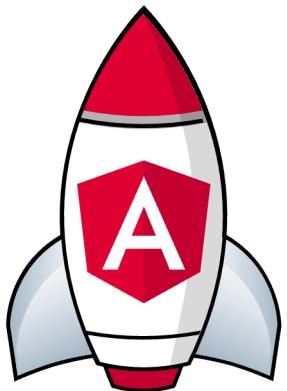


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Audit Tools Measurement

Alex Thalhammer

Outline 01 - UAAO-Framework & Audit Tools



- UAAO-Framework
- Audit Tools



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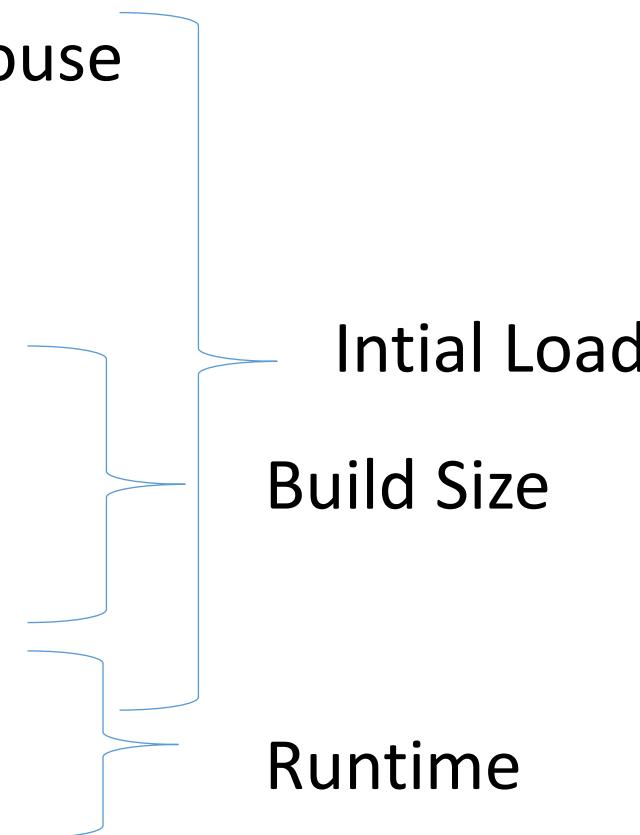


Image from: <https://bit.ly/ng-tools-img>

Audit Tools for Measurement

1. PageSpeed Insights & Chrome Lighthouse
2. WebPageTest.org
3. Perfume.js
4. Source Map Explorer
5. Webpack Bundle Analyzer
6. Import Graph Visualizer
7. Chrome DevTools
8. Angular DevTools Profiler

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- 
- Initial Load
- Build Size
- Runtime

#1: PageSpeed Insights vs Chrome Lighthouse

PageSpeed Insights

- Real user experience AND Lighthouse lab results
- Go to <https://pagespeed.web.dev> and enter URL
- Test is being run on Google servers
- New in 2023: also
 - Accessibility
 - Best Practices
 - SEO

Chrome Lighthouse extension

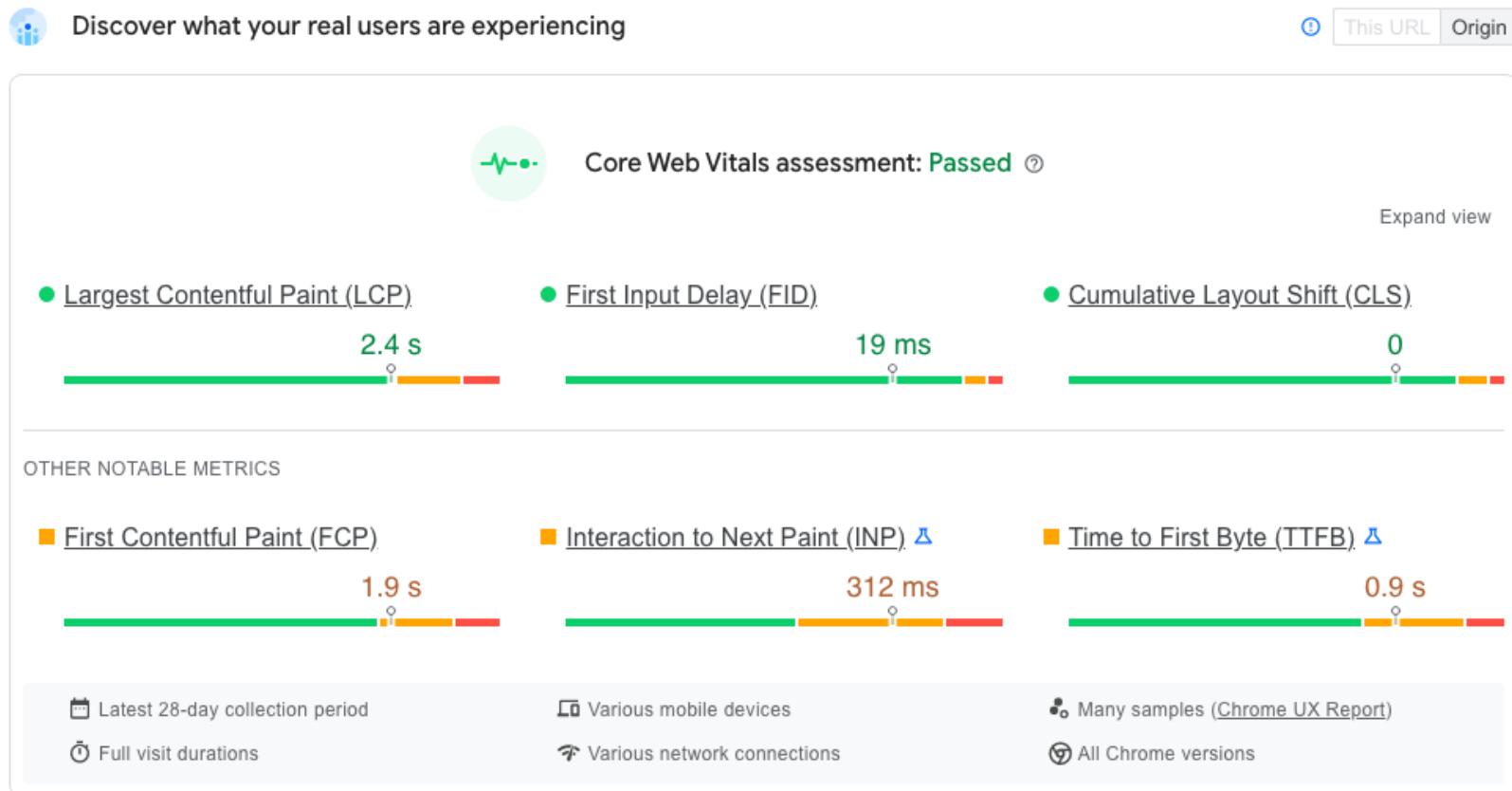
- Lighthouse web performance and other tests
 - Accessibility
 - Best Practices
 - SEO
 - **PWA**
- Install Chrome Lighthouse extension
- Open URL and run test on your localhost
(run in incognito mode, close other Apps)

#1: PageSpeed Insights & Chrome Lighthouse

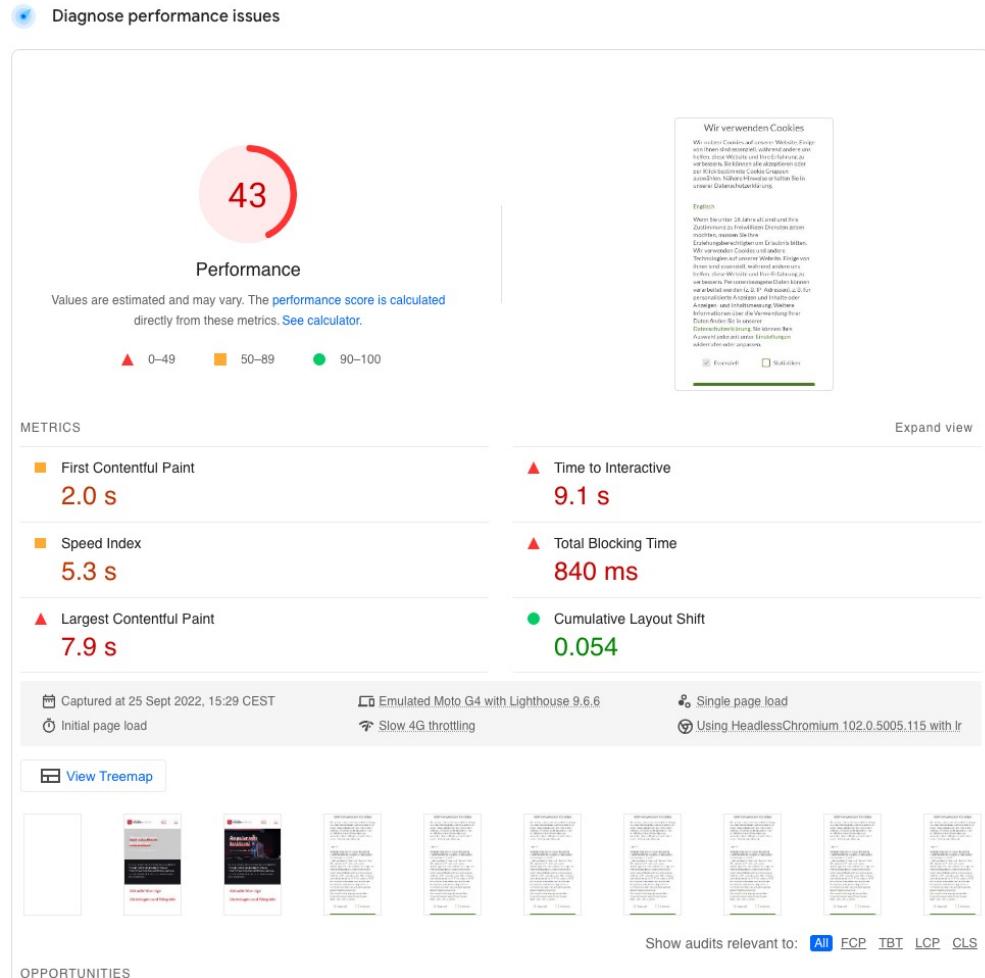
What's being measured?

- Time to First Byte (TTFB)
- First Contentful Paint (FCP)
- Speed Index (originally by WebPageTest)
- Largest Contentful Paint (LCP)
- Time to Interactive (TTI)
- Total Blocking Time (TBT) → TTI - FCP
- Cumulative Layout Shift (CLS)
- First Input Delay (FID)
- Interaction to Next Paint (INP) → new!

#1: PageSpeed Insights – Real Users (Origin)



#1: PageSpeed Insights – Lab Data (URL)



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#1: PageSpeed Score – Case Studies

Good examples

- Websites
 - [WP Rocket](#)
 - [Wikipedia](#)
- Angular Apps
 - ???

DEMO - PageSpeed Insights

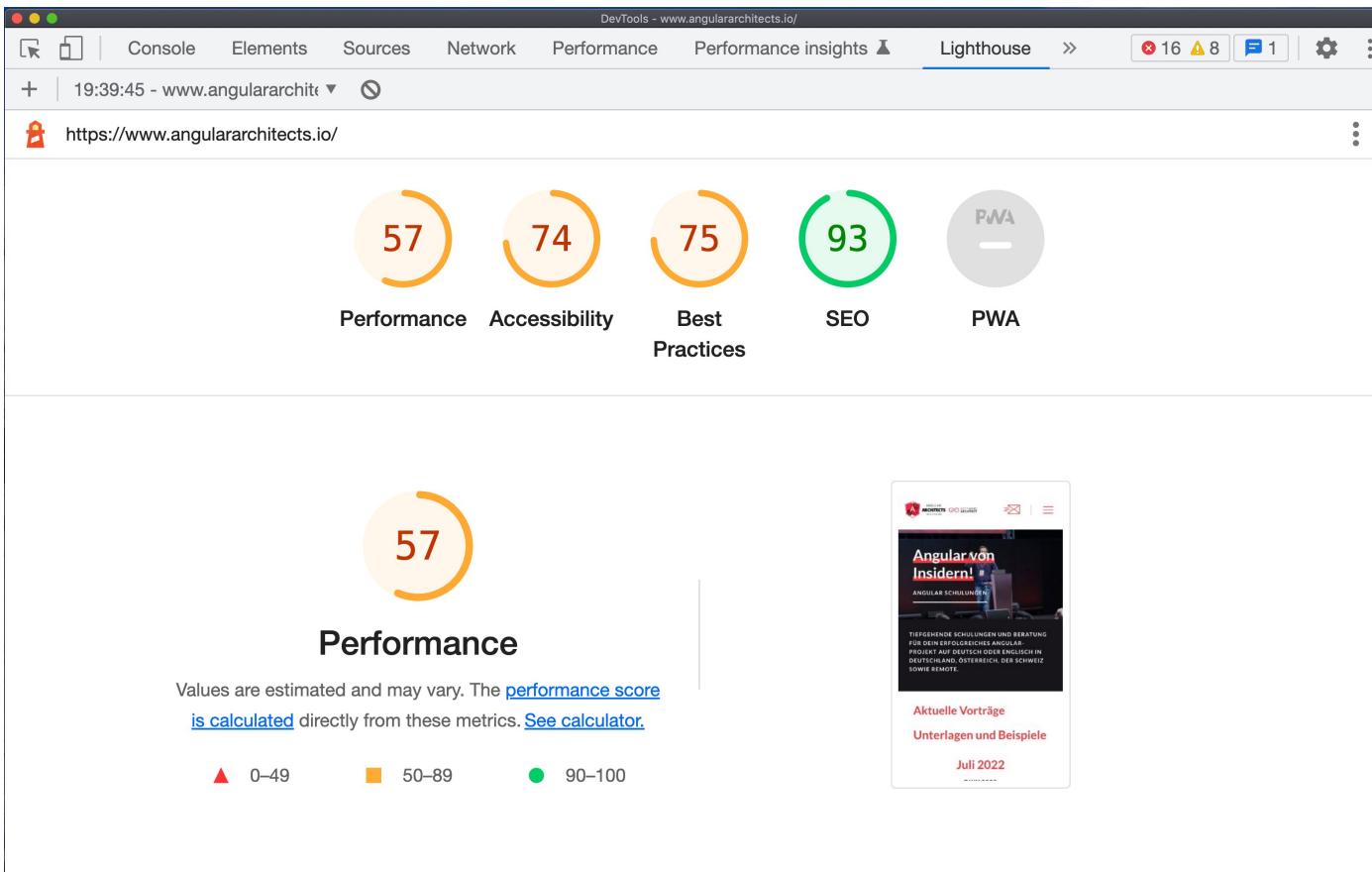
#1: Chrome Lighthouse – Getting Started

- Chrome Lighthouse is the tool to test NG App **during development**
- But we still need a **production build** to get useful results
- How can we run a production build on localhost?

#1: Chrome Lighthouse – Prod Build Localhost

1. Prod build
 1. ng / nx b(uild)
2. Serve the build on your localhost with
 - Using localhost tool like MAMP / WAMP / XAMPP
 - NPM serve
 - <https://www.npmjs.com/package/serve>
 - Or edit hosts file manually if you know how to do that 😊
3. Open in Chrome and run Lighthouse

#1: Chrome Lighthouse – Summary

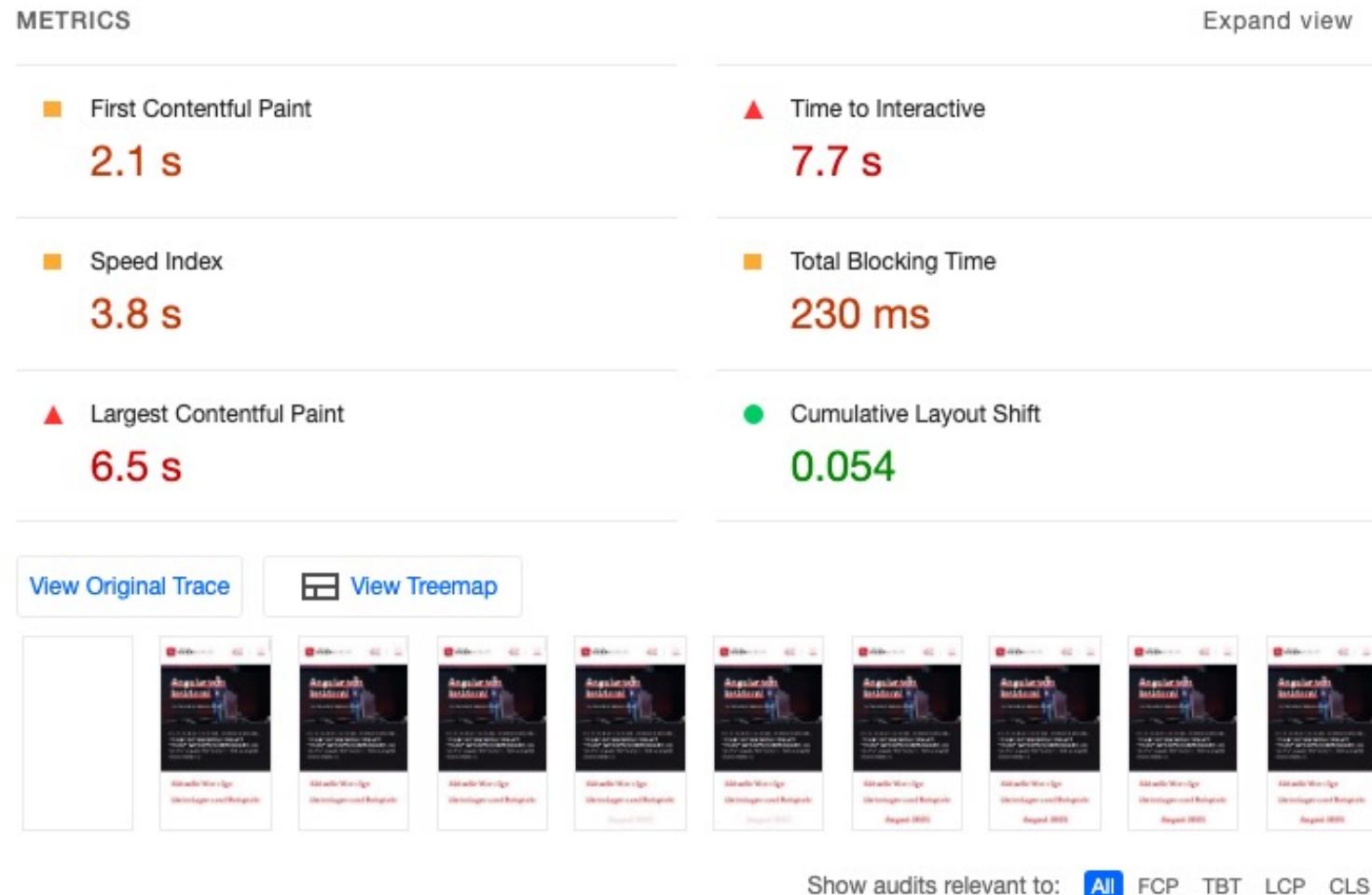


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#1: Chrome Lighthouse – Details



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DEMO - Chrome Lighthouse

#2: WebPageTest.org

- An alternative to Google's PageSpeed & Lighthouse
- Measures the same things (TTFB, FCP, Speed Index, LCP, TBT, CLS)
- Generates waterfall, screenshot, video & a content breakdown
- Runs multiple tests at once (e.g. 3 or 5)
- Choose test location and configure test machine
- Lots of further advanced settings, like HTTP Authentication

#2: WebPageTest – Summary

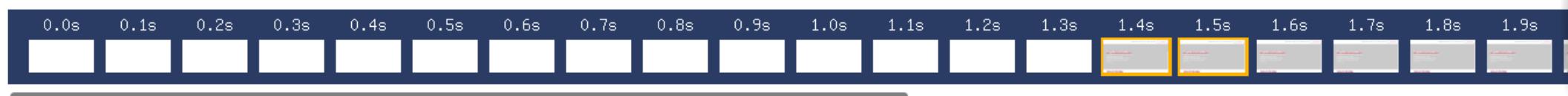
Observed Metrics (Based on Median Run by: ▶ Speed Index)

ⓘ Note: Metrics offered will vary.

FIRST VIEW (RUN 1)

First Byte	Start Render	FCP	Speed Index	LCP	CLS	TBT	Total Bytes
.479 s	1.400 s	1.370 s	3.112 s	3.307 s	.002	.482 s	1,976 KB

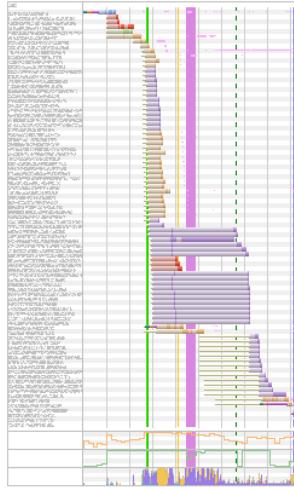
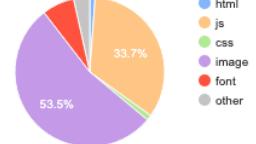
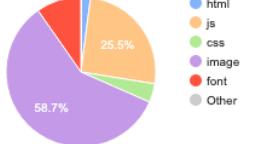
Visual Page Loading Process (Explore)



[Compare First Views](#)

[Plot Full Results](#)

#2: WebPageTest – Details

	Waterfall	Screenshot	Video																							
First View (4.583s) Timeline (view) Processing Breakdown Trace (view)			Filmstrip View - Watch Video																							
Content Breakdown	<p>Requests</p>  <table border="1"><thead><tr><th>Type</th><th>Percentage</th></tr></thead><tbody><tr><td>image</td><td>53.5%</td></tr><tr><td>js</td><td>33.7%</td></tr><tr><td>css</td><td>2.5%</td></tr><tr><td>font</td><td>2.5%</td></tr><tr><td>other</td><td>0.8%</td></tr></tbody></table> <p>Bytes</p>  <table border="1"><thead><tr><th>Type</th><th>Percentage</th></tr></thead><tbody><tr><td>image</td><td>58.7%</td></tr><tr><td>js</td><td>25.5%</td></tr><tr><td>css</td><td>2.5%</td></tr><tr><td>font</td><td>2.5%</td></tr><tr><td>other</td><td>0.8%</td></tr></tbody></table>	Type	Percentage	image	53.5%	js	33.7%	css	2.5%	font	2.5%	other	0.8%	Type	Percentage	image	58.7%	js	25.5%	css	2.5%	font	2.5%	other	0.8%	
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DEMO - WebPageTest

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Audit Tools PageSpeed

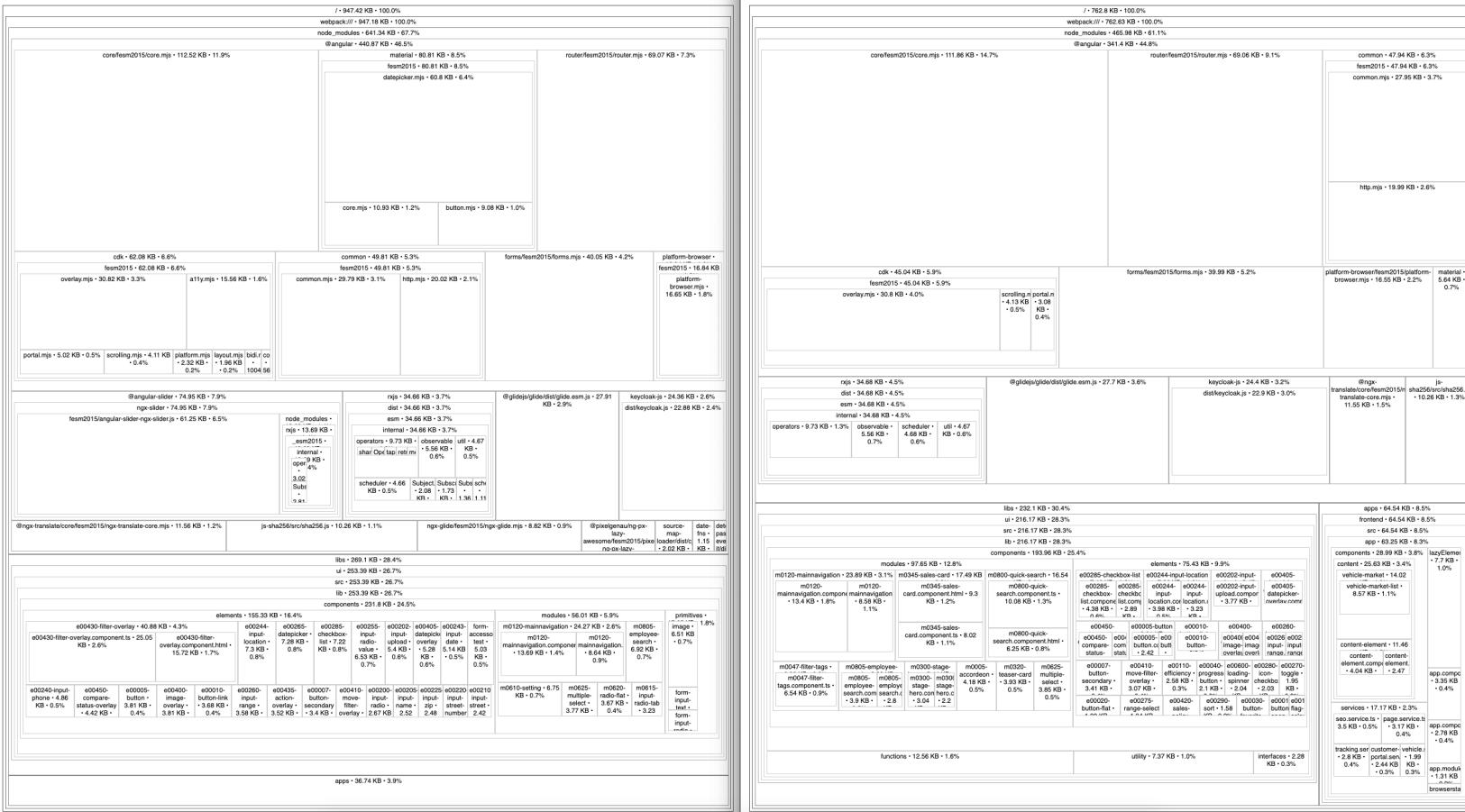
#3: Perfume.js

- Tiny, web performance monitoring library
 - <https://github.com/Zizzamia/perfume.js/>
- Reports field data back to analytics tool
 - ⏳ Supports latest Performance APIs for precise metrics
 - 🚀 Device data enrichment
 - 🔨 Cross browser tested
 - 💧 Filters out false positive/negative results
 - 👍 Only 5.1Kb gzip
 - 🏅 Web Vitals Score
 - 🛫 Flexible analytics tool
 - ⚡ Waste-zero ms with [requestIdleCallback](#) strategy built-in

#4: Source Map Explorer

- Needs generated source maps to work
 - Either set in build options (angular.json)
 - Or just use the build flag "--source-map"
- Analyzes a single js file
 - main bundle
 - vendor bundle (vendor chunk needs to be activated)
 - or lazy loading bundles
- Determines which file each byte in your minified code came from
- Shows you a treemap visualization where all the code is coming from

#4: Source Map Explorer (more accurate)



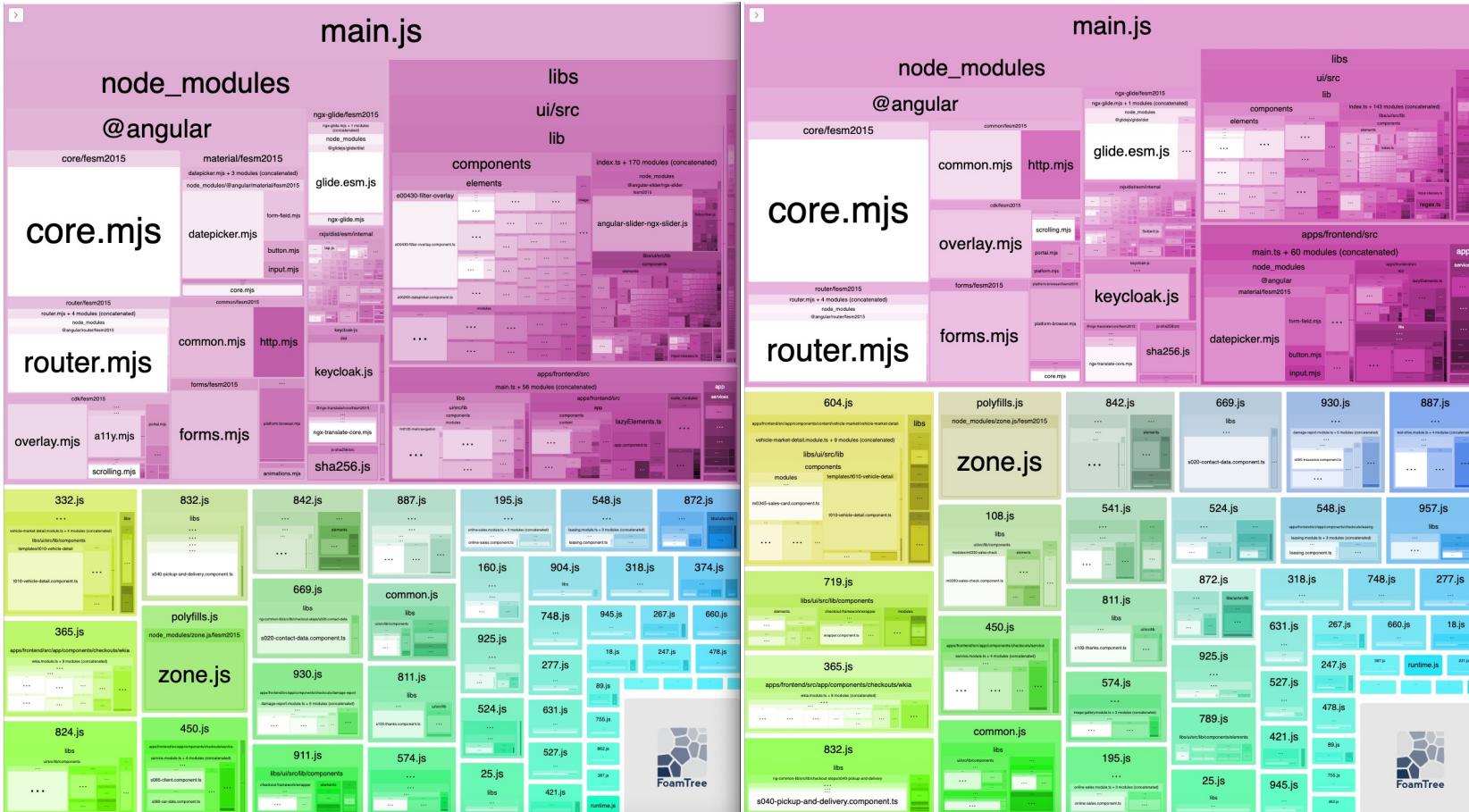
DEMO – Source Map Explorer

<https://www.npmjs.com/package/source-map-explorer>

#5: Webpack Bundle Analyzer

- Needs a generated stats.json to work
 - Either set in build options (angular.json)
 - Or just use the build flag "--stats-json"
- Analyzes the whole build
- Visualize size of all webpack output js files
 - Good to analyze lazy loading
- Interactive, zoomable and colorful treemap ☺

#5: Webpack Bundle Analyzer (colorful)



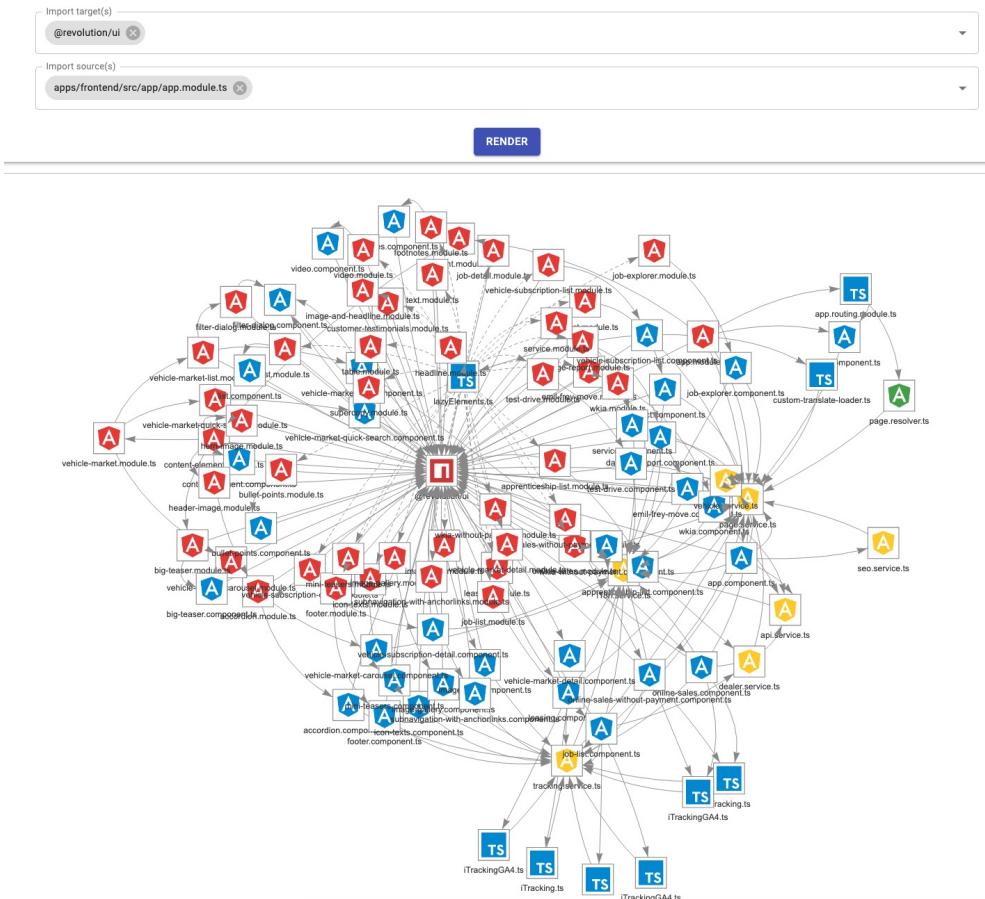
DEMO Webpack Bundle Analyzer

<https://github.com/webpack-contrib/webpack-bundle-analyzer>

#6: Import Graph Visualizer

- The Import Graph Visualizer is a development tool for filtering and visualizing import paths within a JavaScript/TypeScript application
- Allows filtering import paths by source and target modules
- Allows you to zoom in to a limited subsection of your app, which will likely be easier to analyze than the entire app as a whole

#6: Import Graph Visualizer – Example



#6: Import Graph Visualizer – How To

- `npm i -g @rx-angular/import-graph-visualizer`
- `npx import-graph-visualizer --entry-points path/to/entry/module --ts-config path/to/tsconfig`
- e.g. `npx import-graph-visualizer --entry-points src/main.ts --ts-config tsconfig.app.json`

DEMO – Import Graph Visualizer

<https://github.com/rx-angular/import-graph-visualizer#readme>

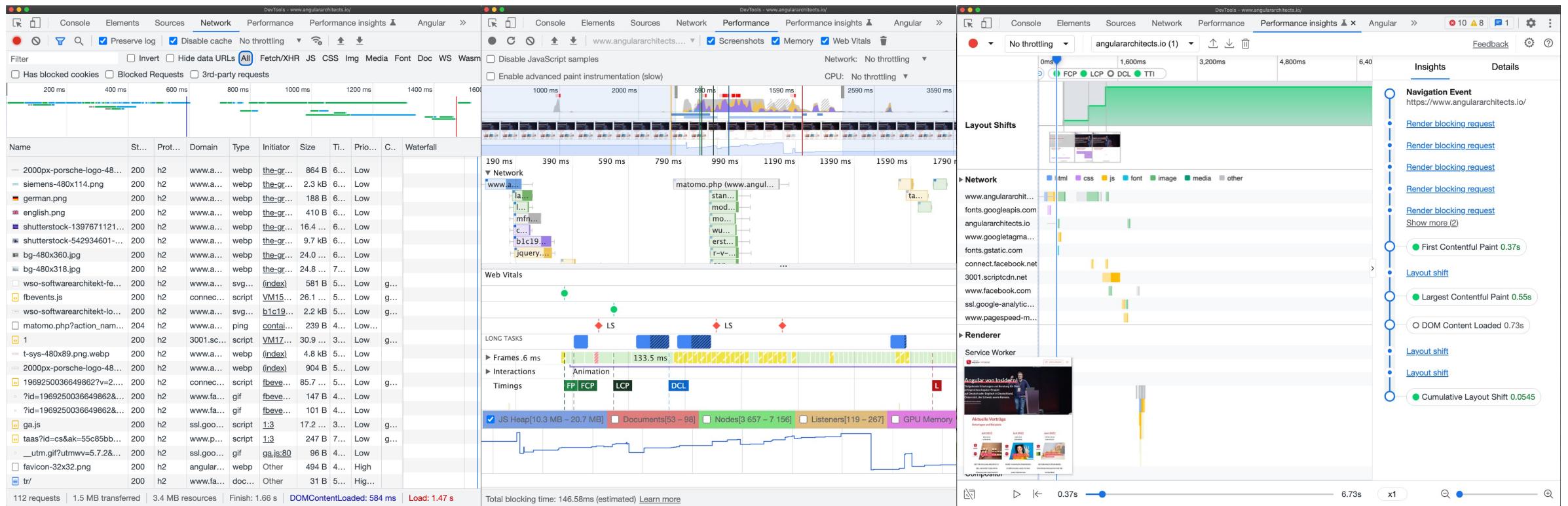
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Audit Tools for Build

#7: Google Chrome DevTools

- The Chrome DevTools are not only used for
 - Styling (Elements)
 - Debugging (Console)
- But also for Performance
 - Network
 - Performance
 - Memory
 - memory heap comparison
 - Performance Insights (Beta!)

#7: Google Chrome DevTools



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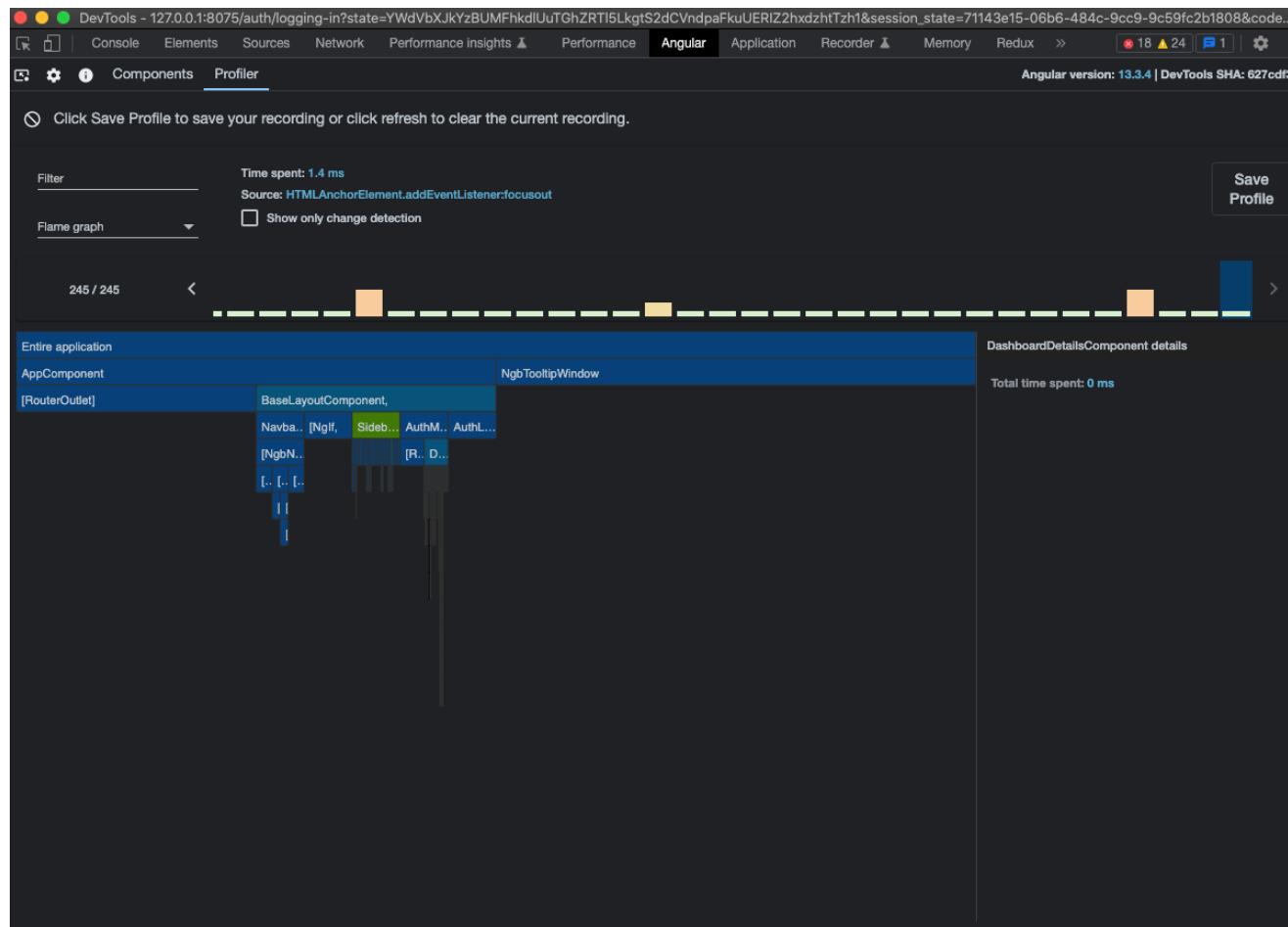
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DEMO – Chrome DevTools

#8: Angular DevTools Profiler

- The Angular DevTools extension can be added to Chrome here
 - <https://chrome.google.com/webstore/detail/angular-devtools/ienfalfjdbdpebioblackkekamfmbnh>
 - It features a component tree to inspect the components and
 - A Profiler
- Profiler shows individual change detection (CD) cycles
 - What triggered CD
 - How much time it took executing CD

#8: Angular DevTools Profiler – Example



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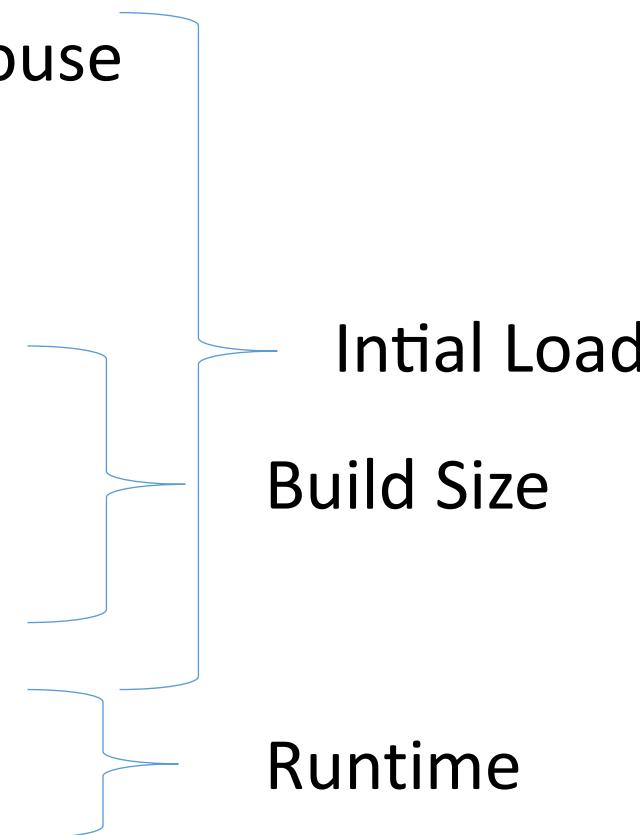


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DEMO – Angular DevTools

<https://chrome.google.com/webstore/detail/angular-devtools/ienfalfjdbdpebioblfackkekamfmbnh>

Recap

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References

- Google Web Dev
 - <https://pagespeed.web.dev>
 - <https://web.dev/metrics/>
- Improving Load Performance - Chrome DevTools 101
 - <https://www.youtube.com/watch?v=5fLW5Q5ODiE>
- How to analyze your JavaScript bundles
 - <https://www.youtube.com/watch?v=MxBCPc7bQvM>