



ANGULAR  
**ARCHITECTS**  
INSIDE KNOWLEDGE

# Performance Tuning

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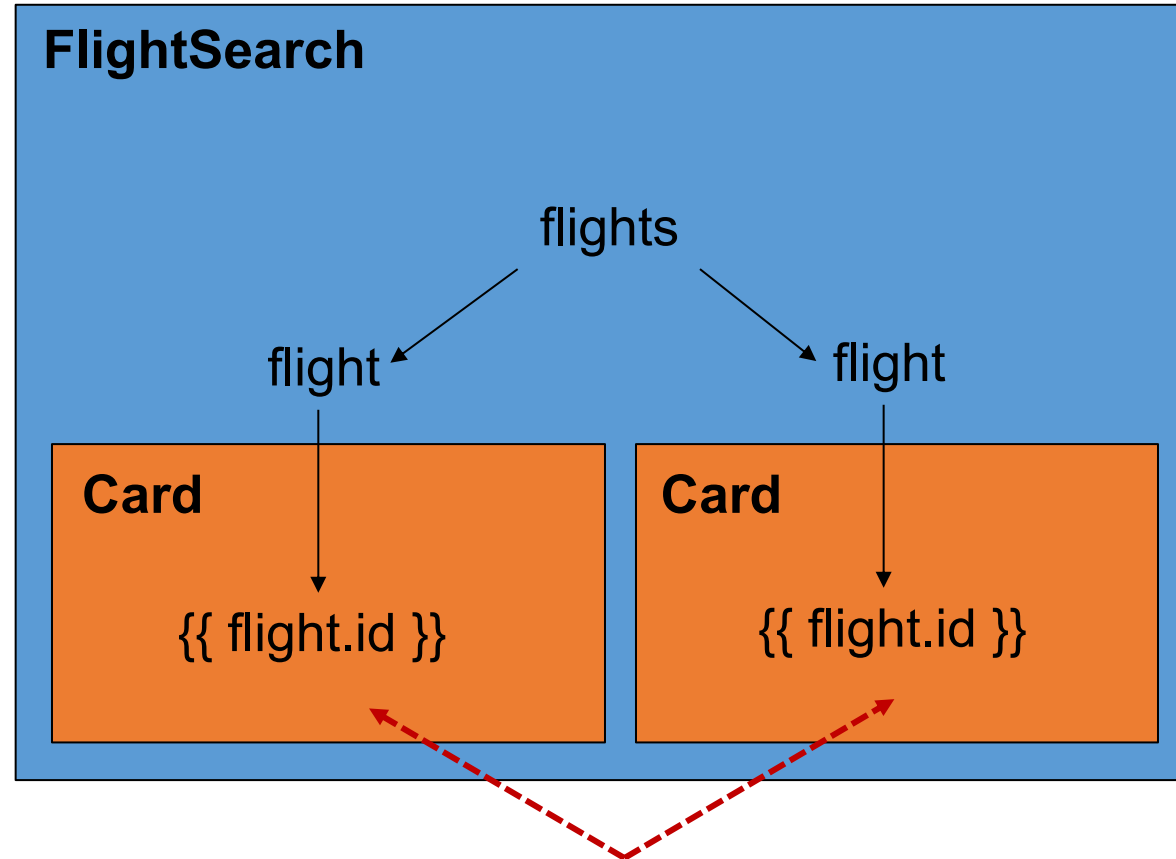


# Performance- Tuning with OnPush

# DEMO



# OnPush



Angular just checks when “notified”

# "Notify" about change?

- Change bound data (@Input)
  - OnPush: Angular just compares the object reference!
  - e. g. `oldFlight === newFlight`
- Raise event within the component
- Notify a bound observable
  - `{{ flights$ | async }}`
- Trigger it manually
  - Don't do this at home ;-)
  - At least: Try to avoid this





# Activate OnPush

```
@Component({  
  [...]  
  changeDetection: ChangeDetectionStrategy.OnPush  
})  
export class FlightCard {  
  [...]  
  @Input() flight;  
}
```



# DEMO

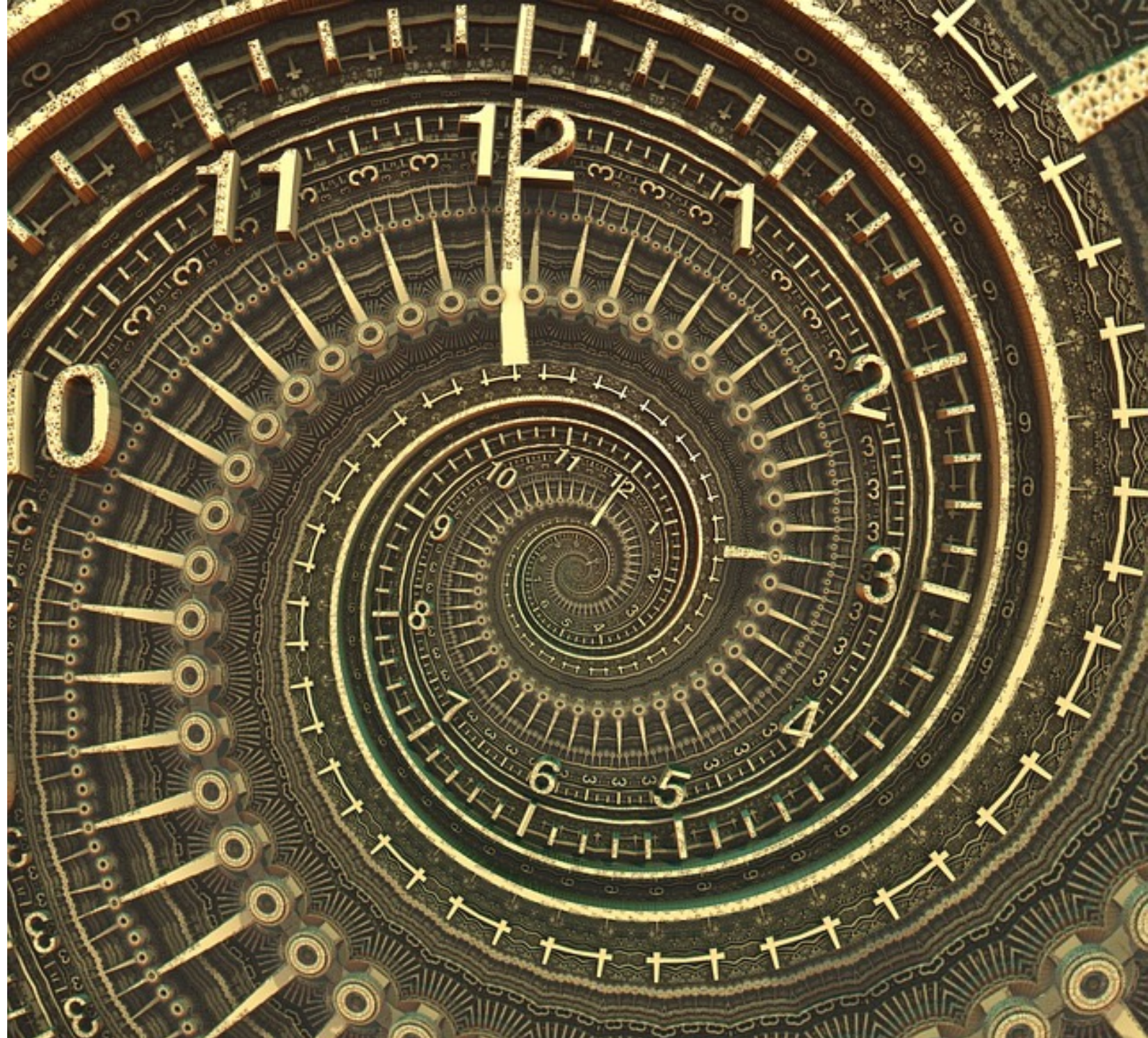


# LAB

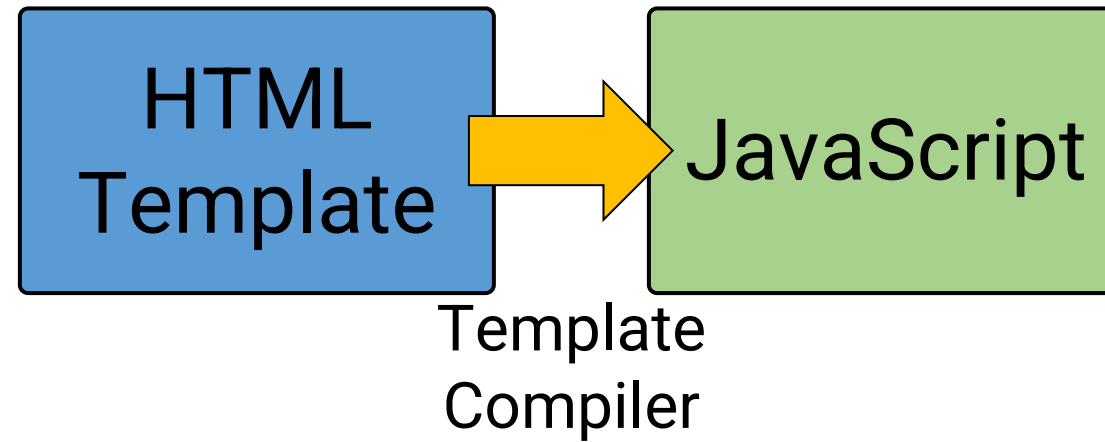




# Ahead of Time (AOT) Compilation



# Angular Compiler





# Approaches

- JIT: Just in Time, at runtime
- AOT: Ahead of Time, during build



# Advantages of AOT

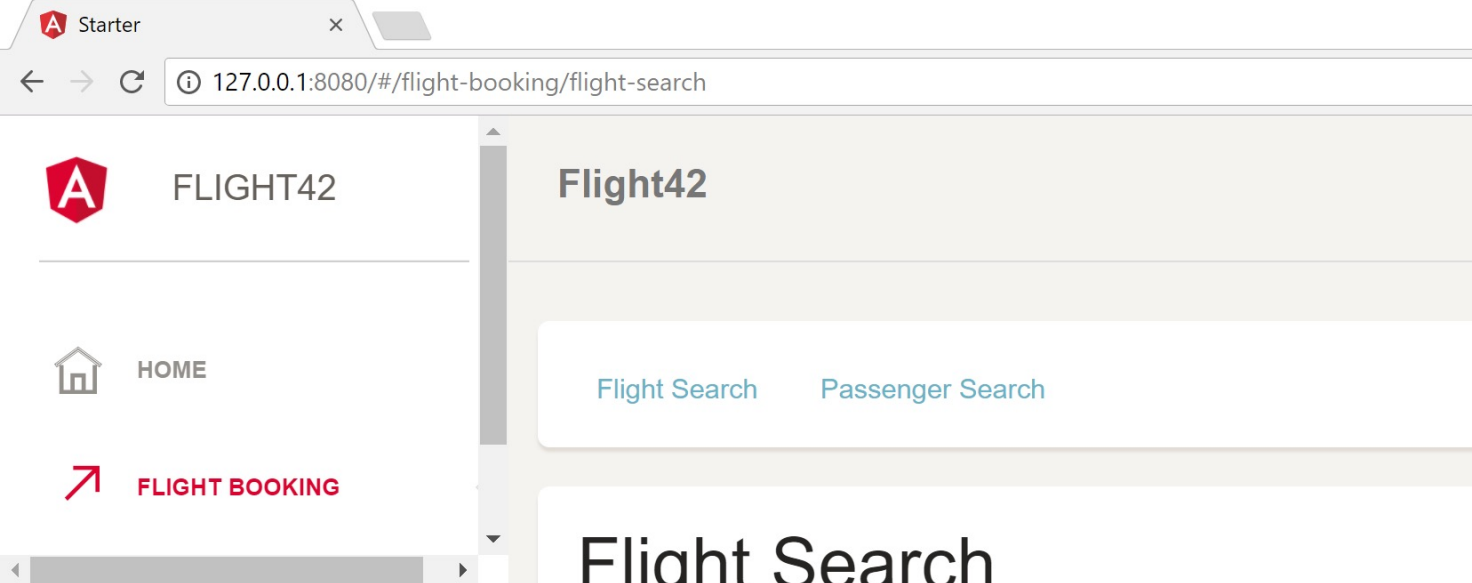
- Better Startup-Performance
- Smaller Bundles: You don't need to include the compiler!
- Tools can easier analyse the code
  - Remove unneeded parts of frameworks
  - Tree Shaking

# Angular CLI

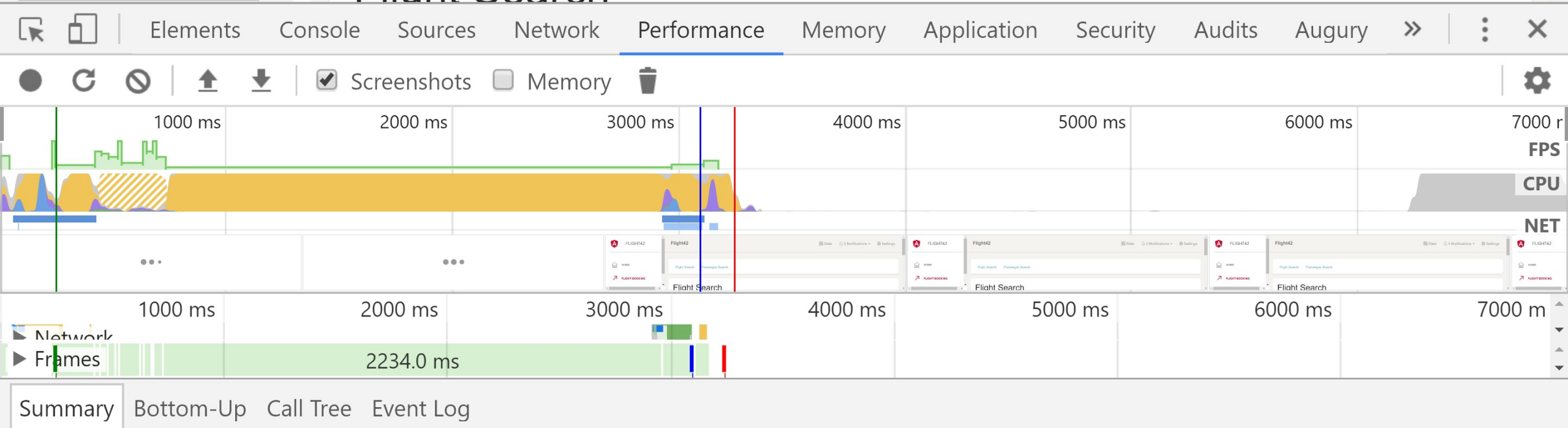
- `ng build --prod`
- `@ngtools/webpack` with `AngularCompilerPlugin`
- Can be used without CLI too

# DEMO

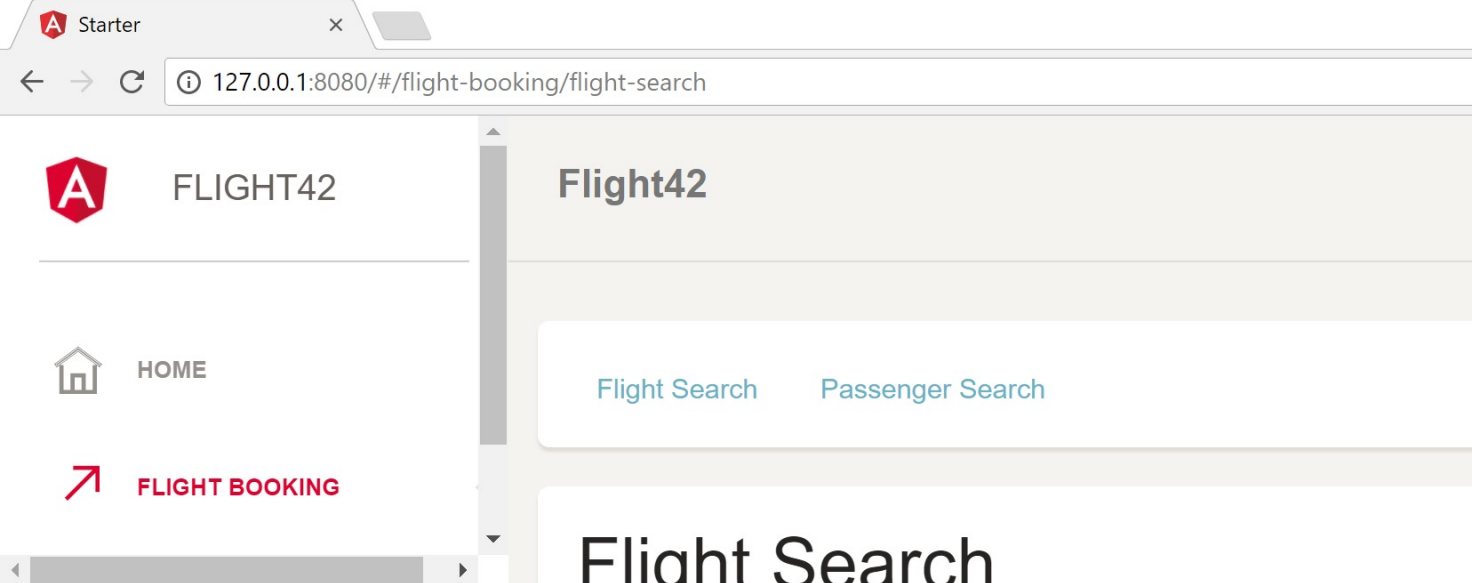




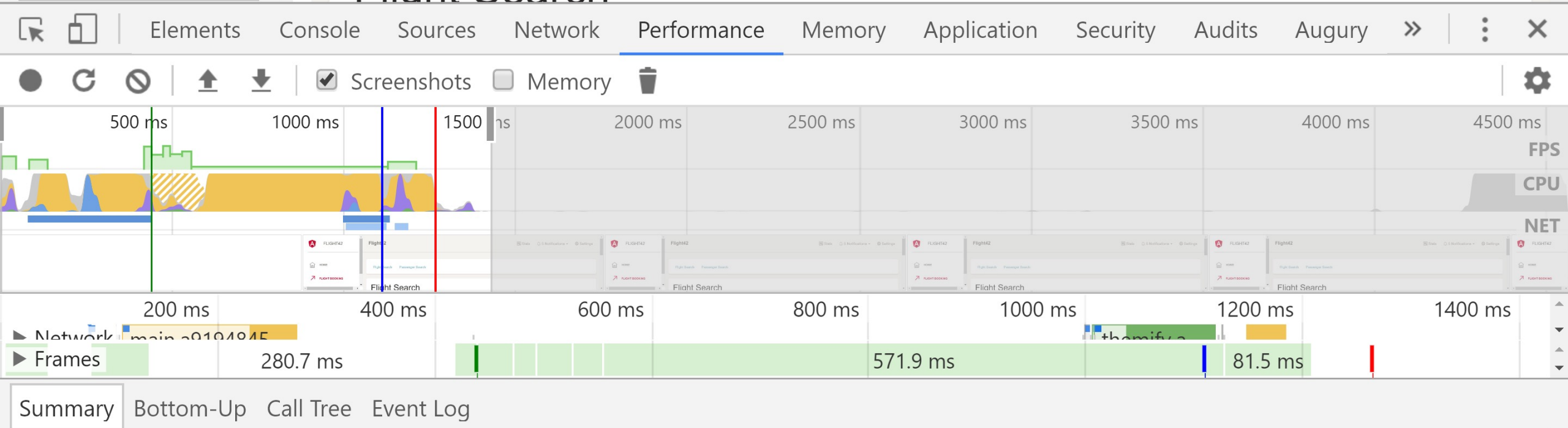
**Production Mode without AOT  
(no lazy loading)**







**Production Mode with AOT  
(no lazy loading)**

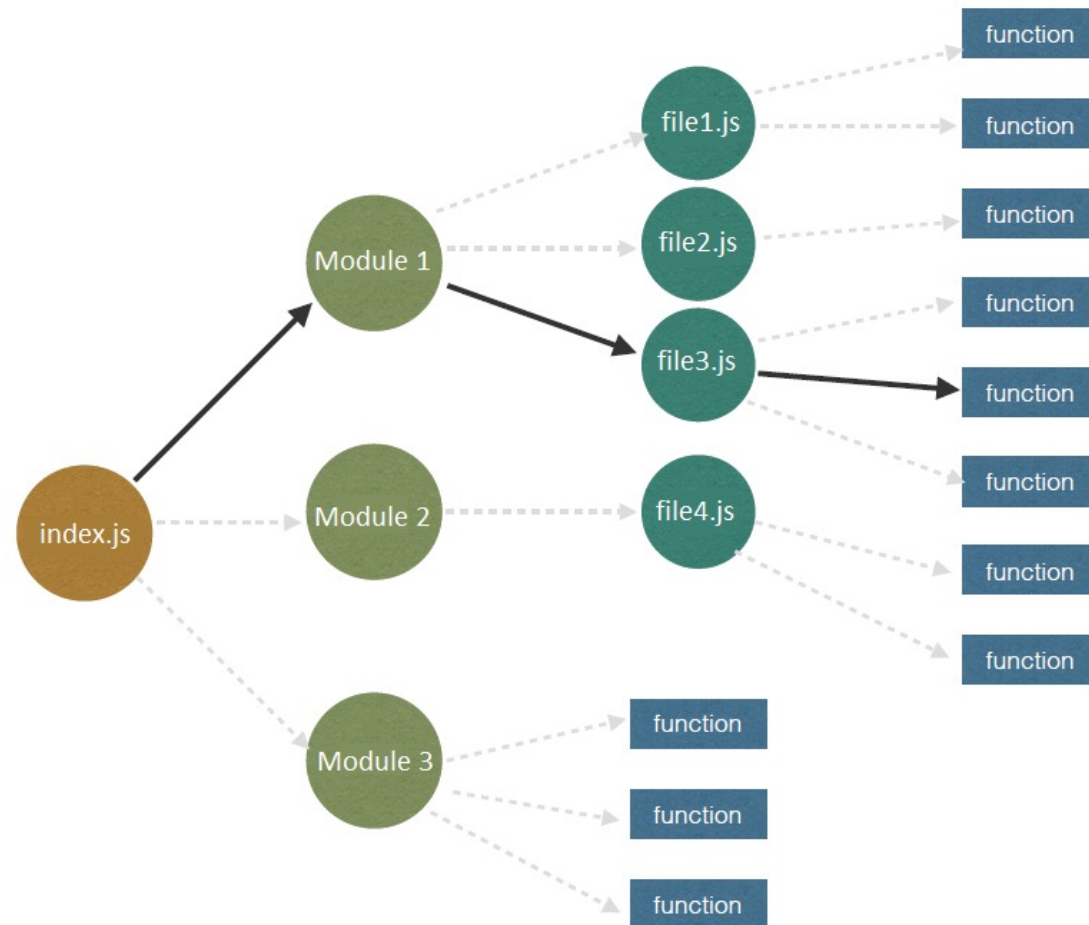


# Ivy makes AOT the default 😊

- Ivy also does a lot of under the hood optimization
- No breaking changes, nothing to do from our side 😊
- Angular ViewEngine itself was not tree-shakable
- Angular Ivy is tree-shakable 😊
- Default since NG 10, for libs default since NG 12

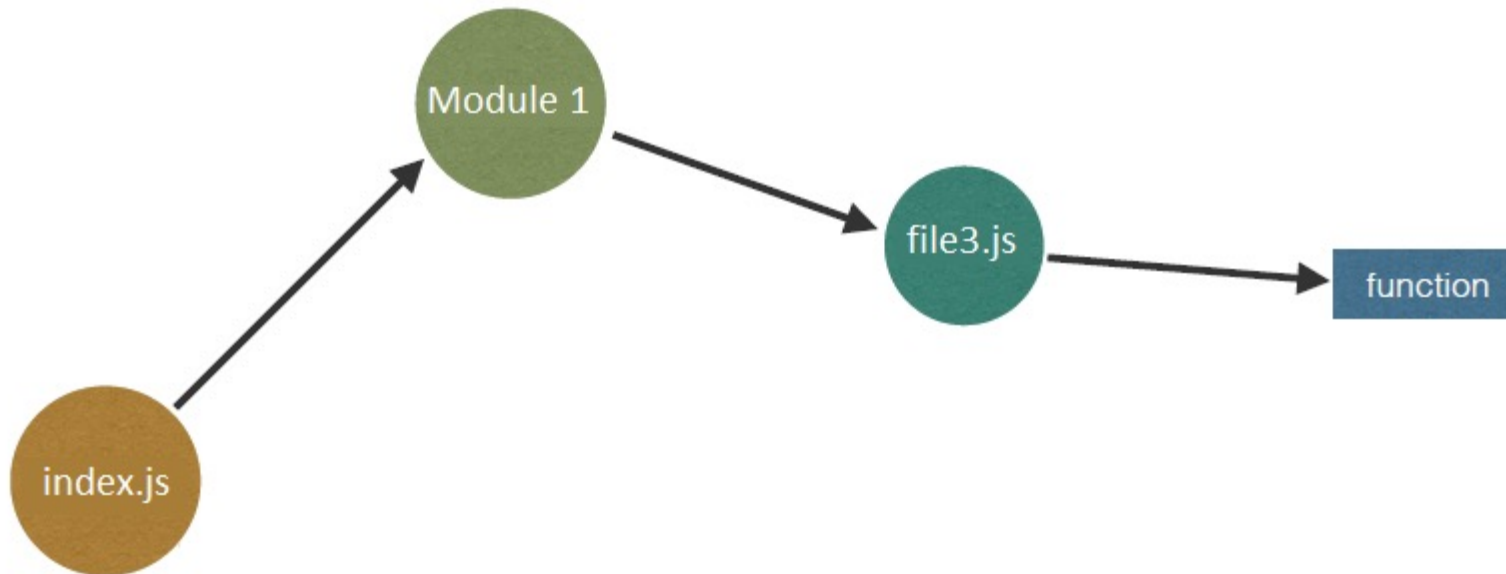
# Tree Shaking

## Before Tree Shaking



# Tree Shaking

After Tree Shaking



# Webpack Bundle Analyzer

## Bundles without AOT and Tree Shaking

vendor.978ac3ef762178ef4aa8.bundle.js

node\_modules

JIT Compiler

@angular

platform-browser-dynamic

esm5

platform-browser-dynamic.js  
+ 1 modules

core

esm5

core.js

router

esm5

router.js +  
23 modules

common

esm5

common.js

http.js

forms

esm5

forms.js +  
2 modules

platform-browser

esm5

platform-browser.js

http

esm5

http.js

rxjs

\_esm5

add

delay.js + 2

modules

switchMap.js

+ 2 modules

fromEvent.js

+ 2 modules

mergeMap.js

+ 2 modules

share.js

+ 4 modules

merge.js

+ 2 modules

Subscriber.js

+ 1 modules

mergeMap.js

+ 1 modules

AsyncAction.js

+ 1 modules

ReplaySubject.js

+ 3 modules

Subscription.js

+ 1 modules

Subject.js

+ 1 modules

Observable.js

+ 1 modules

src

main.ts  
+ 68  
modules

polyfills.7c4efb87d4ba5dbbc58c.bundle.js

node\_modules

zone.js

dist

zone.js

core-js

modules



FoamTree

# DEMO





# Conclusion

Lazy Loading

Preloading

OnPush w/  
Immutables and  
Observables

AOT and Tree  
Shaking



# For performance deep dive

Watch this (starting at 8:30):

[https://drive.google.com/file/d/15fmyedJPYSOlV\\_0YvFtg26XGS8tZpZ03/view](https://drive.google.com/file/d/15fmyedJPYSOlV_0YvFtg26XGS8tZpZ03/view)

Repo: <https://github.com/jeffbcross/victor-videos/>

