Angular Performance Tuning

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Quick Wins

- Bundling
- Minification
- enableProdMode()

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Contents

- Lazy Loading and Preloading
- Performance for Data Binding with OnPush
- AOT and Tree Shaking

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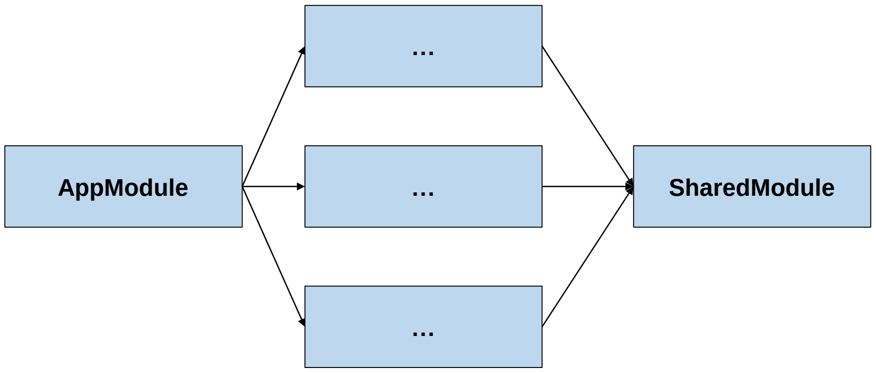
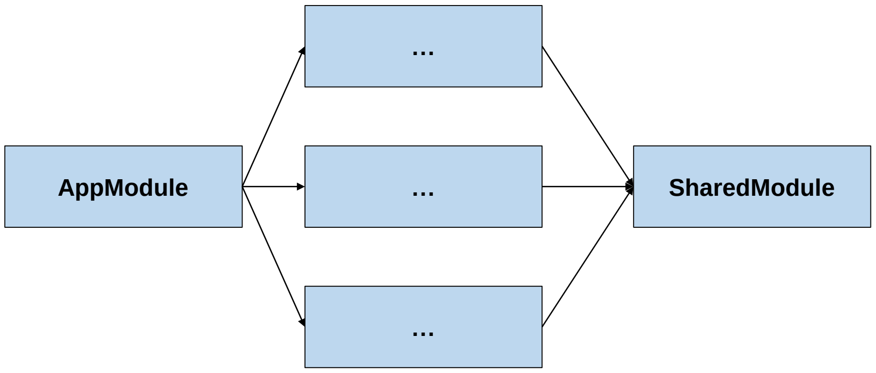
Lazy Loading

Module Structure



Root Module **Feature Modules** **Shared Module**

Lazy Loading



Root Module | Feature Modules | Shared Module

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Root Module with Lazy Loading

```
const APP_ROUTE_CONFIG: Routes = [
    {
        path: 'home',
        component: HomeComponent
    },
    {
        path: 'flights',
        loadChildren:
            './[…]flight-booking.module#FlightBookingModule'
    }
];
```

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Routes for "lazy" Module

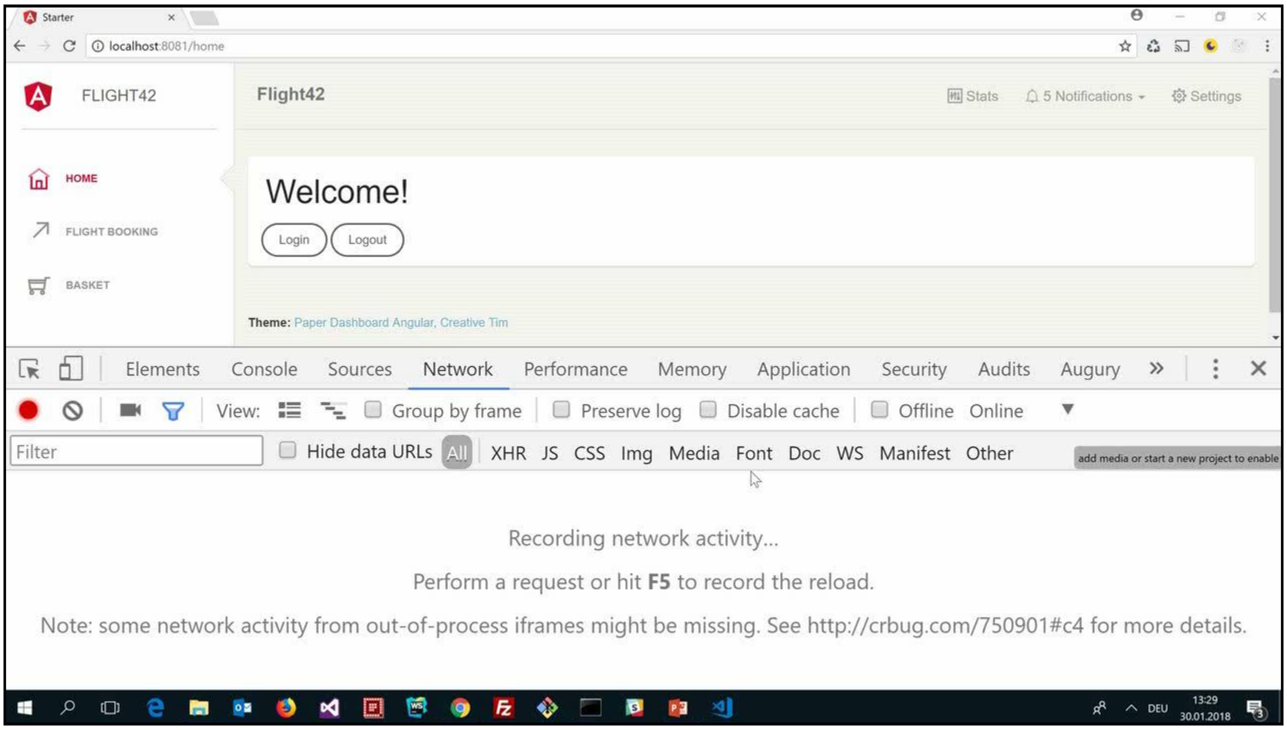
```
const FLIGHT_ROUTES =    [
    {
        path: '',
        component: FlightBookingComponent,
        […]
    },
    […]
}
```

Routes for "lazy" Module

```
const FLIGHT_ROUTES =    [
    {
        path: 'subroute',
        component: FlightBookingComponent,
        […]
    },
    […]
}
```

flight-booking/ subroute

Triggers Lazy Loading w/ loadChildren



Recording network activity...

Perform a request or hit **F5** to record the reload.

Note: some network activity from out-of-process iframes might be missing. See http://crbug.com/750901#c4 for more details.

Lazy Loading

- Lazy Loading means: Loading it later
- Better startup performance
- Delay during execution for loading on demand

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Preloading

Idea

- Module that might be needed later are loaded after the application started
- When module is needed it is available immediately

Activate Preloading

```
…
imports: [
    […]
    RouterModule.forRoot(
        ROUTE_CONFIG,
        { preloadingStrategy: PreloadAllModules });
]
…
```

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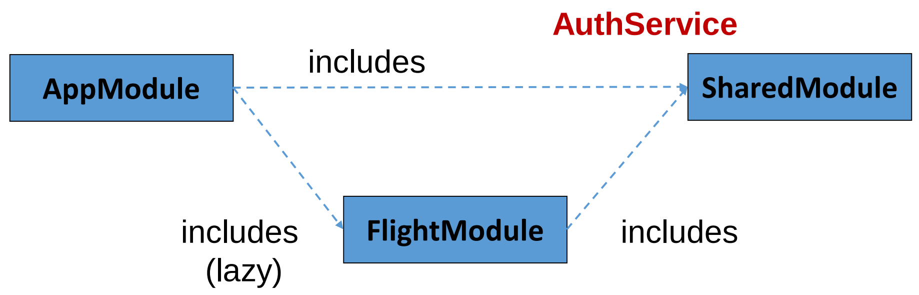
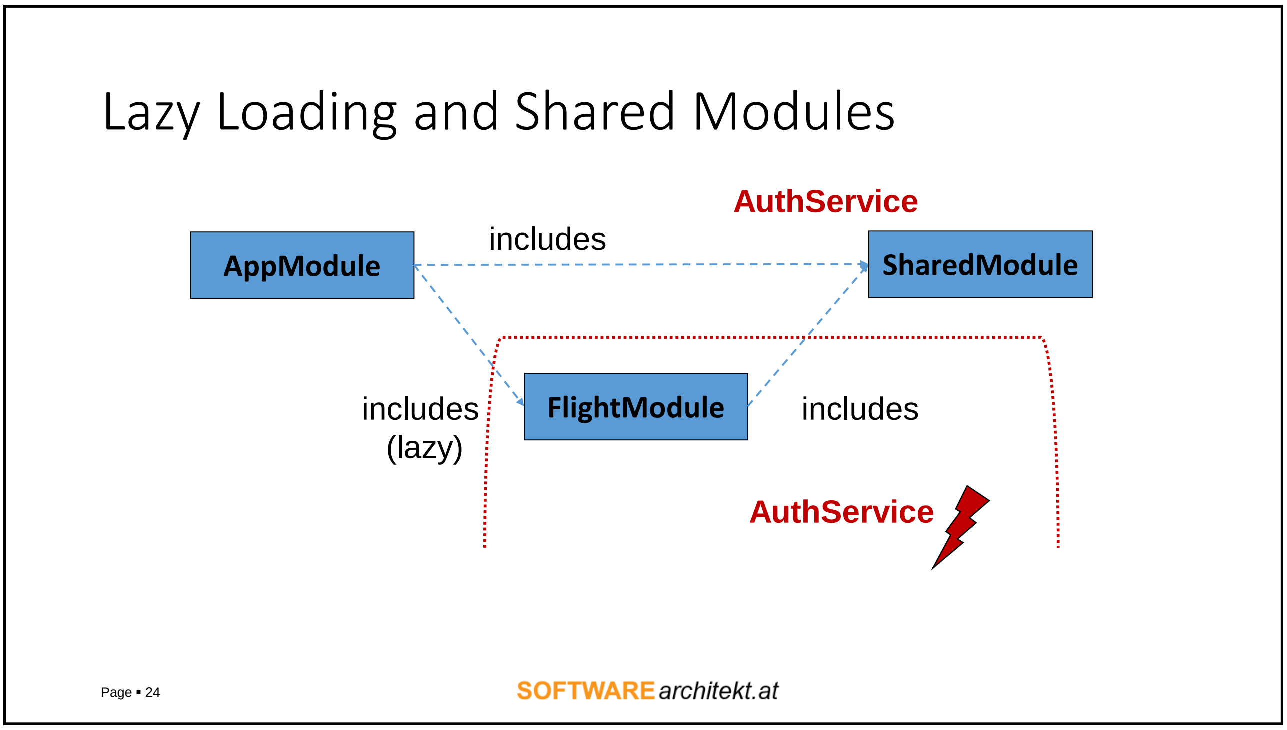
Lazy Loading and Shared Modules

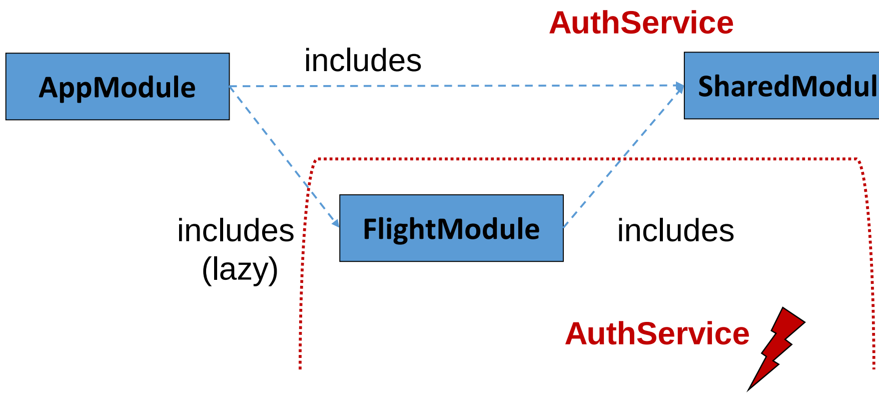
DEMO

Lazy Loading and Shared Modules





Lazy Loading and Shared Modules



Page ▪ 24

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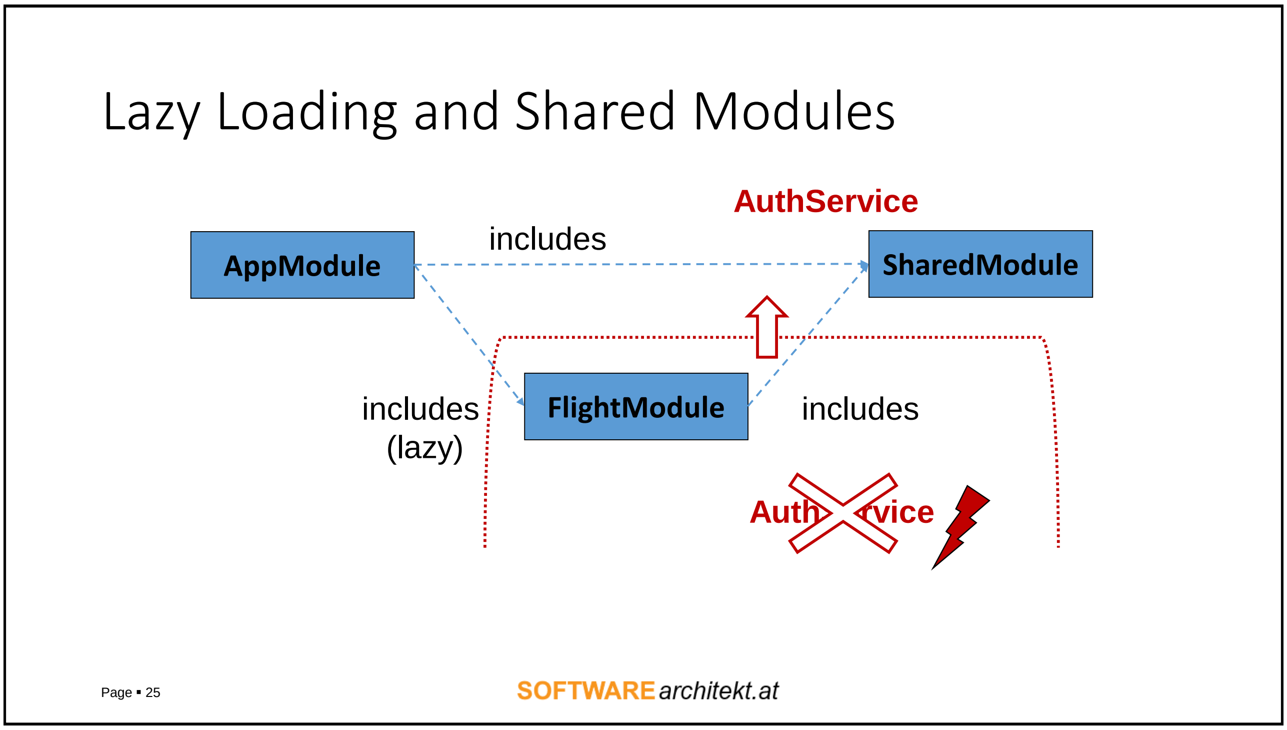
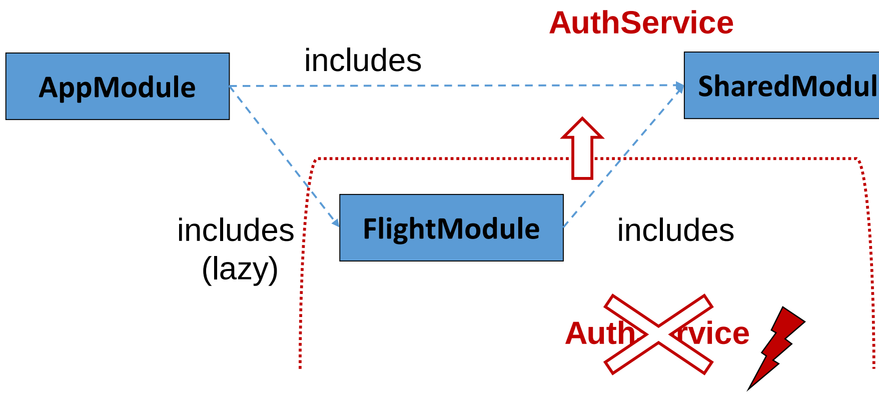


Lazy Loading and Shared Modules



Page ▪ 25

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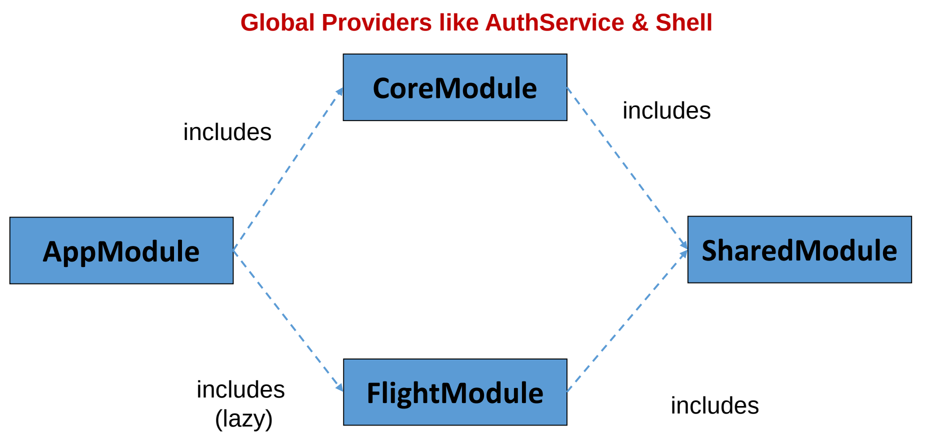
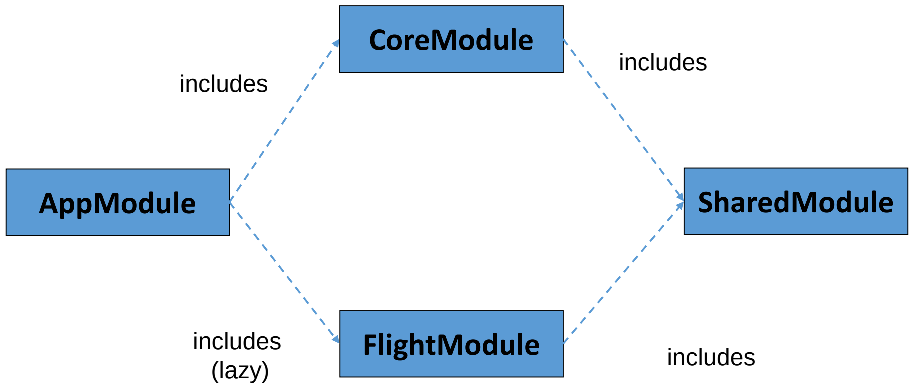
Solution



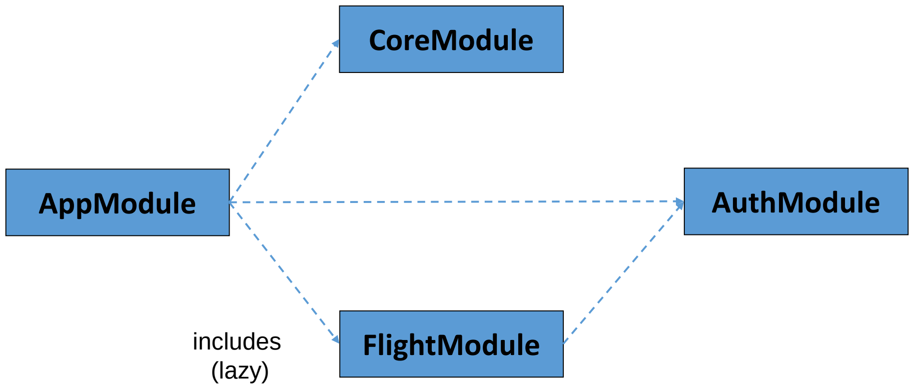
Only import CoreModule into AppModule!

DEMO

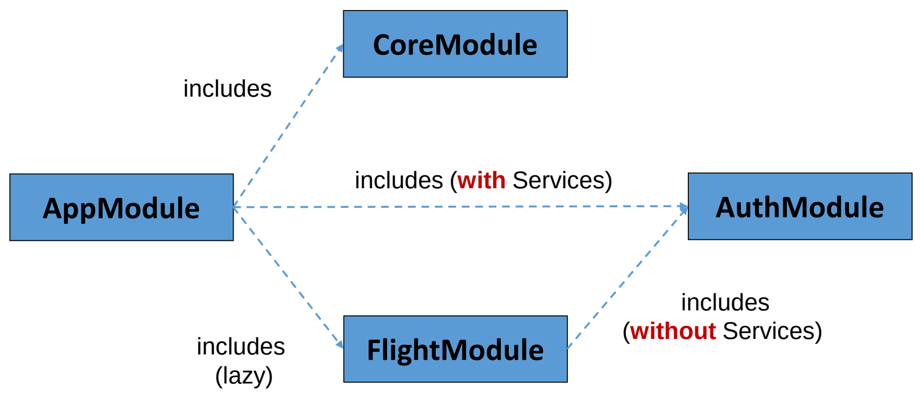
Huge CoreModule?



Solution (for Libraries)



Solution (for Libraries)



Auth Module

```
@NgModule({
    […],
    providers: []
})
export class AuthModule {
}
```

Auth Module

```
@NgModule({
    […],
    providers: []
})
export class AuthModule {
    static forRoot(): ModuleWithProviders {
        return {
            ngModule: AuthModule,
            providers: [AuthService, […]]
        }
    }
}
```

DEMO

Performance-Tuning with OnPush

DEMO

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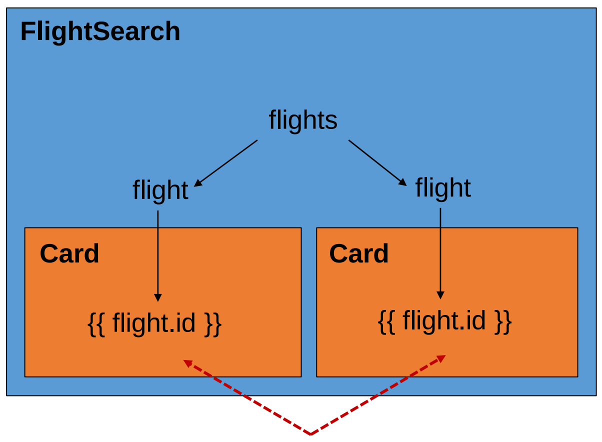
OnPush



Angular just checks when "notified"

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"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
- Trigger it manually
  - Don't do this at home ;-)
  - At least: Try to avoid this

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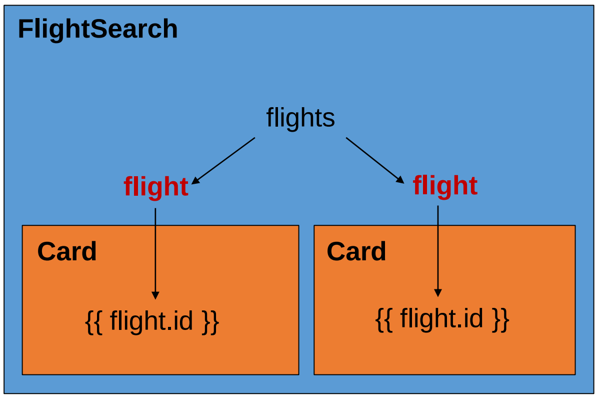
Activate OnPush

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

Change Inputs

$flight_{old}$ === $flight_{new}$

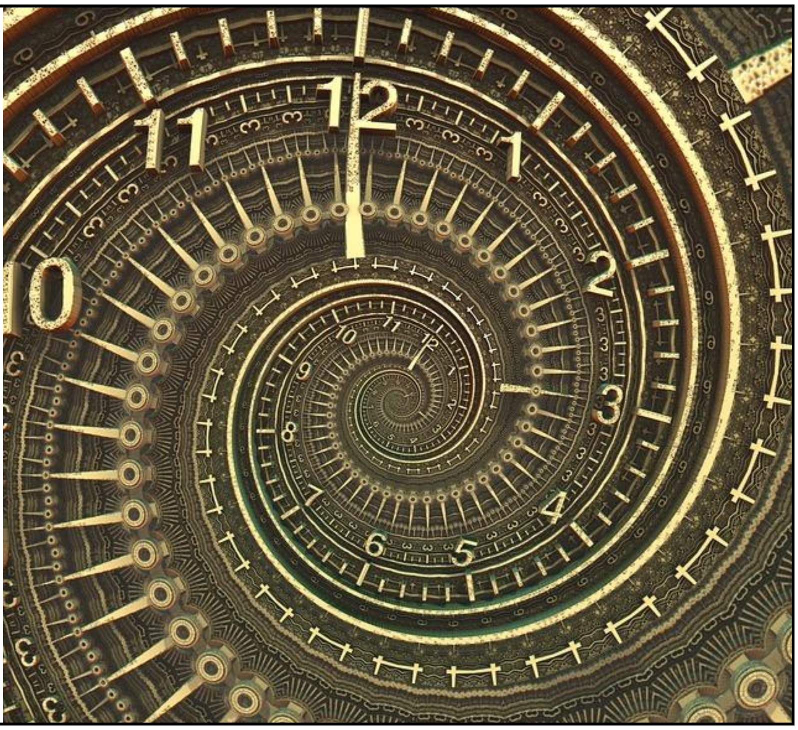


Observables and OnPush

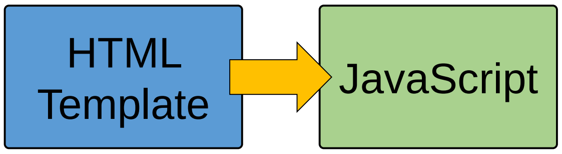
```
<flight-card
        [item]="flight$ | async" […]>
</flight-card>
```

DEMO

Ahead of Time (AOT) Compilation



Angular Compiler



Template Compiler

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Approaches

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

Advantages of AOT

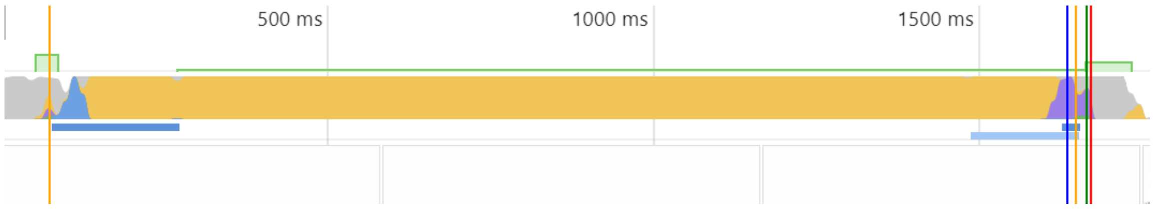
- Better Startup-Performance
- Smaller Bundles: You don't need to include the compiler!
- Tools can easier analyse the code
  - Remove not needed parts of frameworks
  - Tree Shaking

Angular CLI

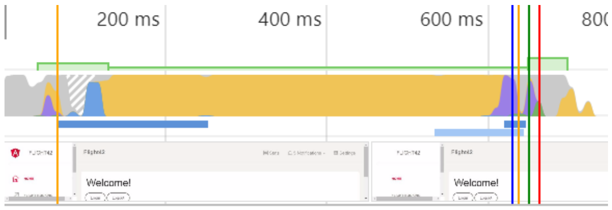
- ng build --prod
- @ngtools/webpack with AotPlugin
- Soon AngularCompilerPlugin
- Can be used without CLI too

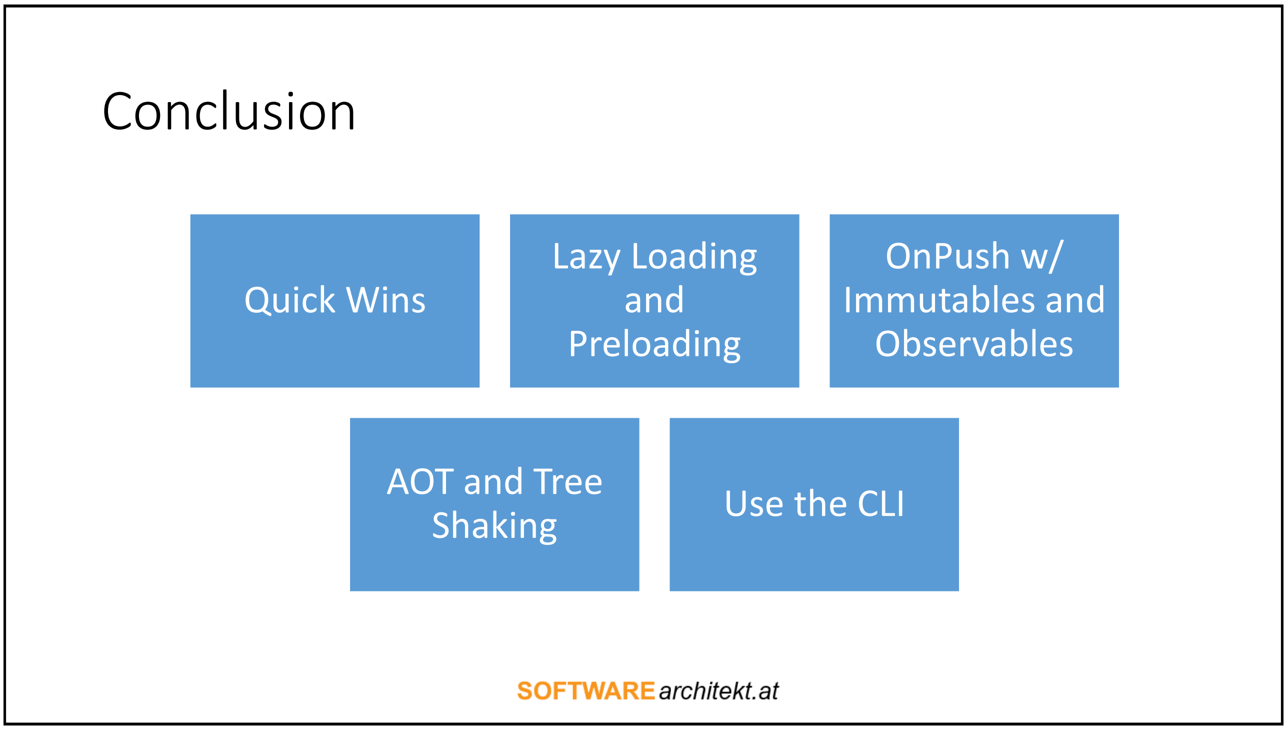
DEMO

Flight Search (Prod Build w/o AOT)



Flight Search (Prod Build w/ AOT)





Conclusion

- Quick Wins
- Lazy Loading and Preloading
- OnPush w/ Immutables and Observables
- AOT and Tree Shaking
- Use the CLI

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