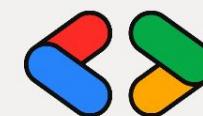


Turbocharge Your Web Performance: Faster Bundles, Smoother Rendering, and Best Practices - **Angular**

Chiara Ricciardi
Nicola Di Iorio
Mattia Iannone



Google
Developer
Groups

**Non dimenticare le
prestazioni sul web.**



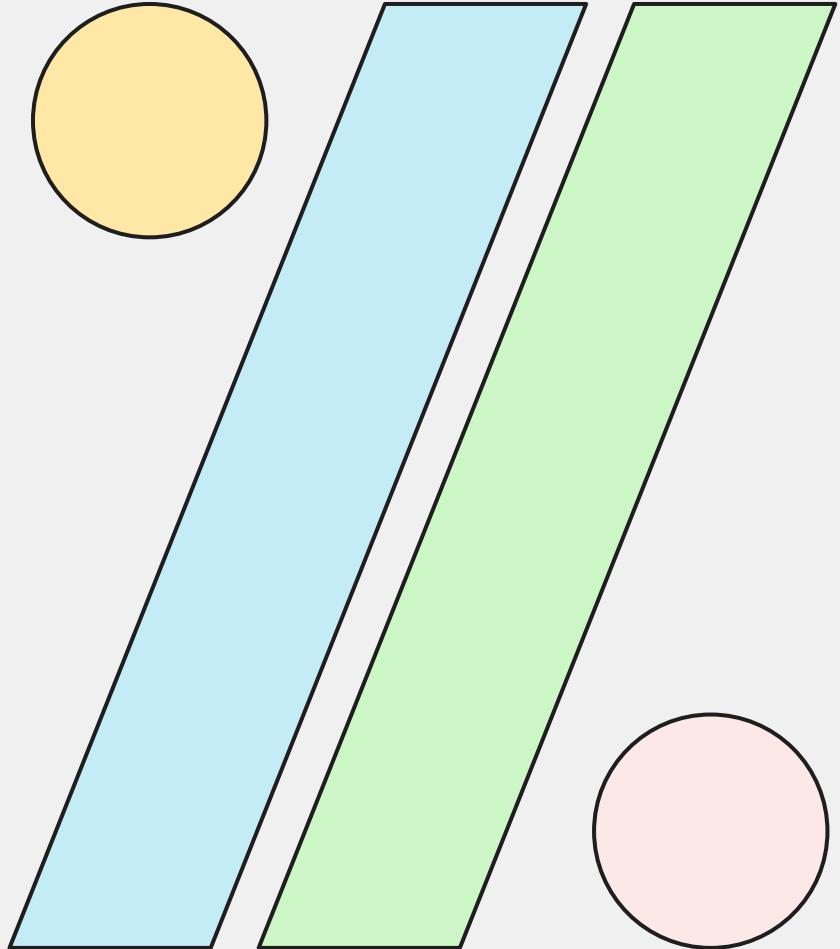
Google Developer Groups





70%

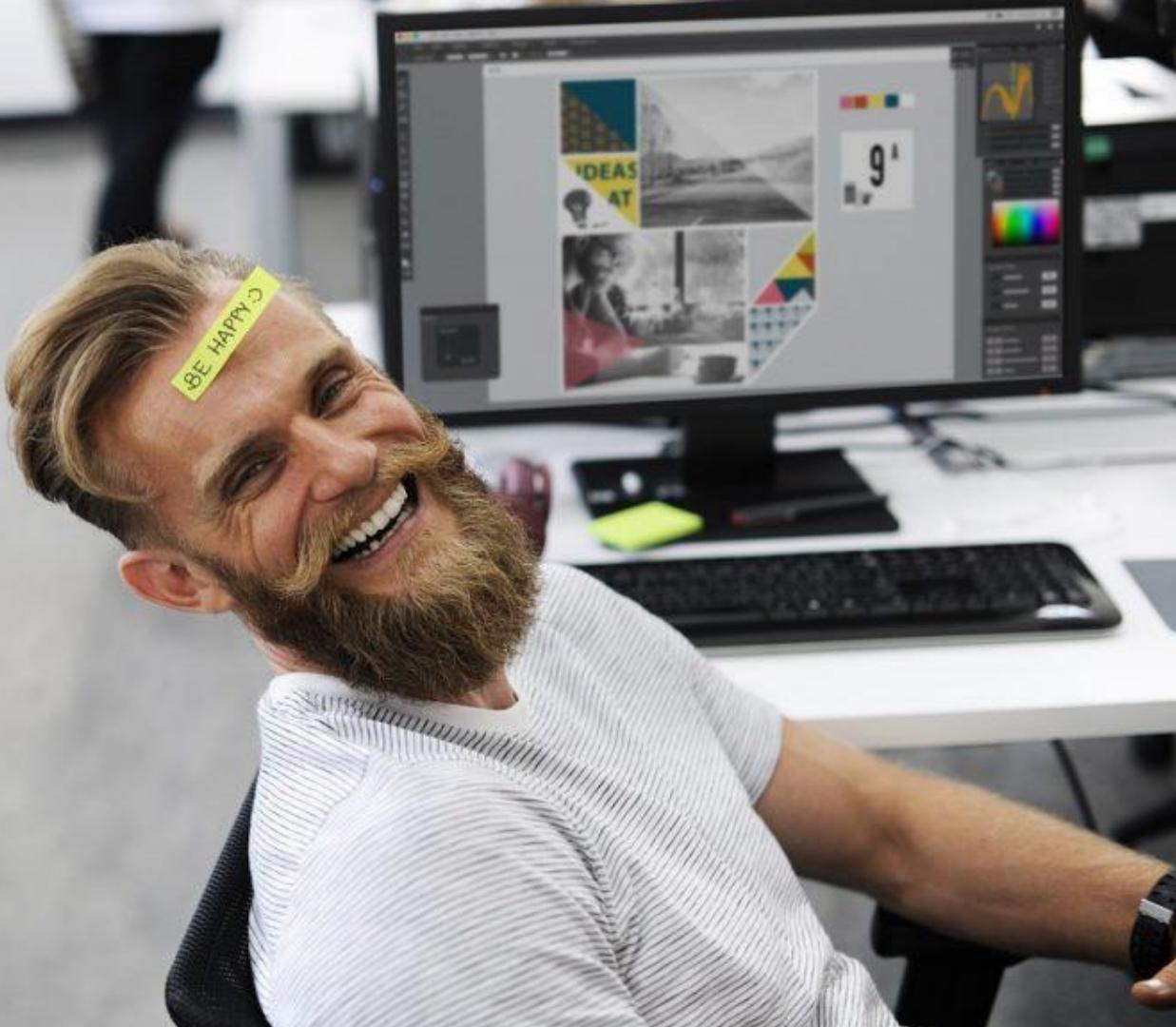
degli utenti
riscontrano **lentezza**
sul web



Un sito
performante è
il primo punto
di contatto con
i clienti.

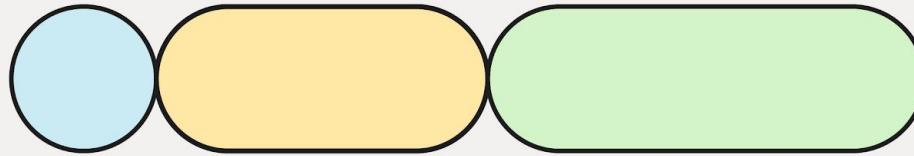
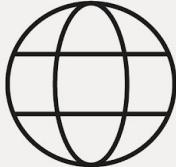


**Un'esperienza
positiva può
generare
recensioni e
condivisioni
entusiastiche
sul brand**

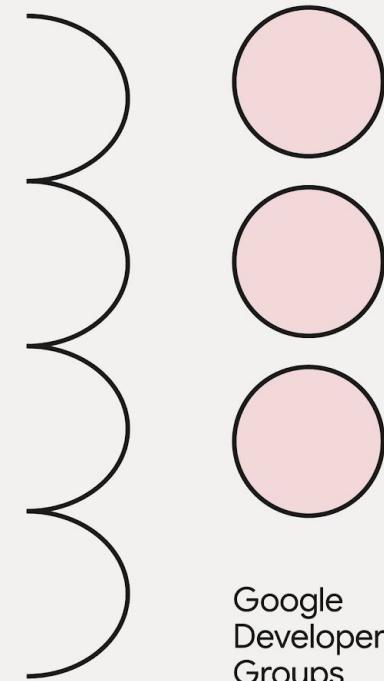


**Le ottimizzazioni
non sono un lusso,
ma una necessità**





Come rendere
performante un sito?



Google
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Groups

Diamo prima un'occhiata a questi due pre-requisiti:

(1)

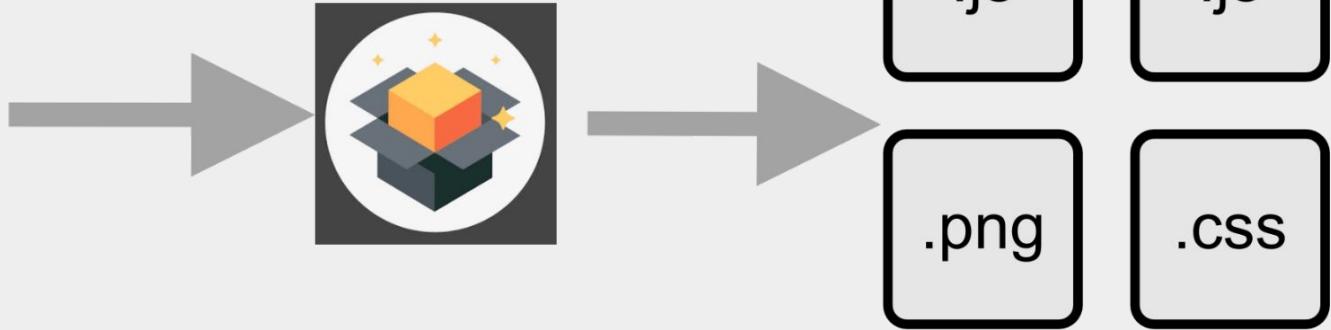
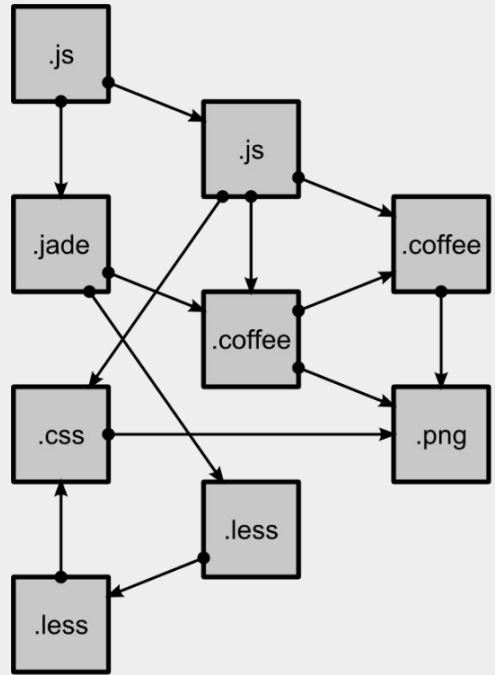
Bundle



(2)



Angular







Modules



Data binding



Components



Directives



Templates



Services



app.component.ts

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

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.css']
})
export class AppComponent {
  message = '';
  showInput = true;
}
```

app.component.html

```
<div>
  <h1>Data Binding e Condizioni con ngIf e ngModel</h1>

  <div *ngIf="showInput">
    <label for="messageInput">Inserisci un messaggio:</label>
    <input type="text" id="messageInput" [(ngModel)]="message">
  </div>

  <p *ngIf="message">Hai scritto: {{ message }}</p>

  <button (click)="showInput = !showInput">
    {{ showInput ? 'Nascondi input' : 'Mostra input' }}
  </button>
</div>
```



Modules



Data binding



Components



Directives



Templates



Services



app.module.ts

```
import { NgModule } from '@angular/core';
import { BrowserModule } from '@angular/platform-browser';
import { AppComponent } from './app.component';
import { TitleService } from './title.service'; // Importa il servizio

@NgModule({
  declarations: [
    AppComponent
  ],
  imports: [
    BrowserModule
  ],
  providers: [TitleService], // Registra il servizio
  bootstrap: [AppComponent]
})
export class AppModule { }
```



Modules



Data binding



Components



Directives



Templates



Services



app.service.ts

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

@Injectable({
  providedIn: 'root'
})
export class TitleService {
  private title: string = 'Titolo fornito dal servizio';

  getTitle(): string {
    return this.title;
  }
}
```



NASA CURIOSITY

Il nostro progetto...

Astronomy Picture of the Day



Aurora Australis and the International Space Station

This image from the International Space Station was taken on August 11, 2012, orbiting about 400 kilometers above the Indian Ocean. In the upper left, the bright light of the aurora australis is visible against the dark void of space. Aboard ISS, the crew can see the Earth's horizon as a thin blue line. The aurora is a high-altitude atmospheric glow caused by charged particles from solar storms hitting atoms in the extremely rarefied air at altitudes as low as 60 km at the foot of the auroral curtains. Green emissions from atomic collisions are the most common, but red and purple also appear. At the bottom right, the dark silhouette of the International Space Station is visible against the bright glow of Earth's atmosphere. The station is about 400 kilometers above the surface of the planet, so it appears as a small dot. As the ISS orbits at an altitude of about 400 km, it passes over the aurora australis about once every 90 minutes. This view from the orbital laboratory reveals the starry sky from the perspective of the crew members.

Jupiter



Another is the PIA1390 from the Sun and the Earth project. It is a picture of a much closer than 8.3 times that of the other element of the same observation. The image shows the large planet Jupiter and its four largest satellites, Ganymede, Europa, Callisto, and Io, in the foreground. The background is the dark void of space. The image was taken by the Hubble Space Telescope on June 1, 2009, at a distance of 4.2 million miles (6.7 million km) from the planet. The image was taken by the Hubble Space Telescope on June 1, 2009, at a distance of 4.2 million miles (6.7 million km) from the planet. The image was taken by the Hubble Space Telescope on June 1, 2009, at a distance of 4.2 million miles (6.7 million km) from the planet.

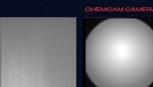
Related photos



Curiosity Rover



CHEMCAM CAMERA



2012-08-06
Close-up

PHAZ CAMERAS

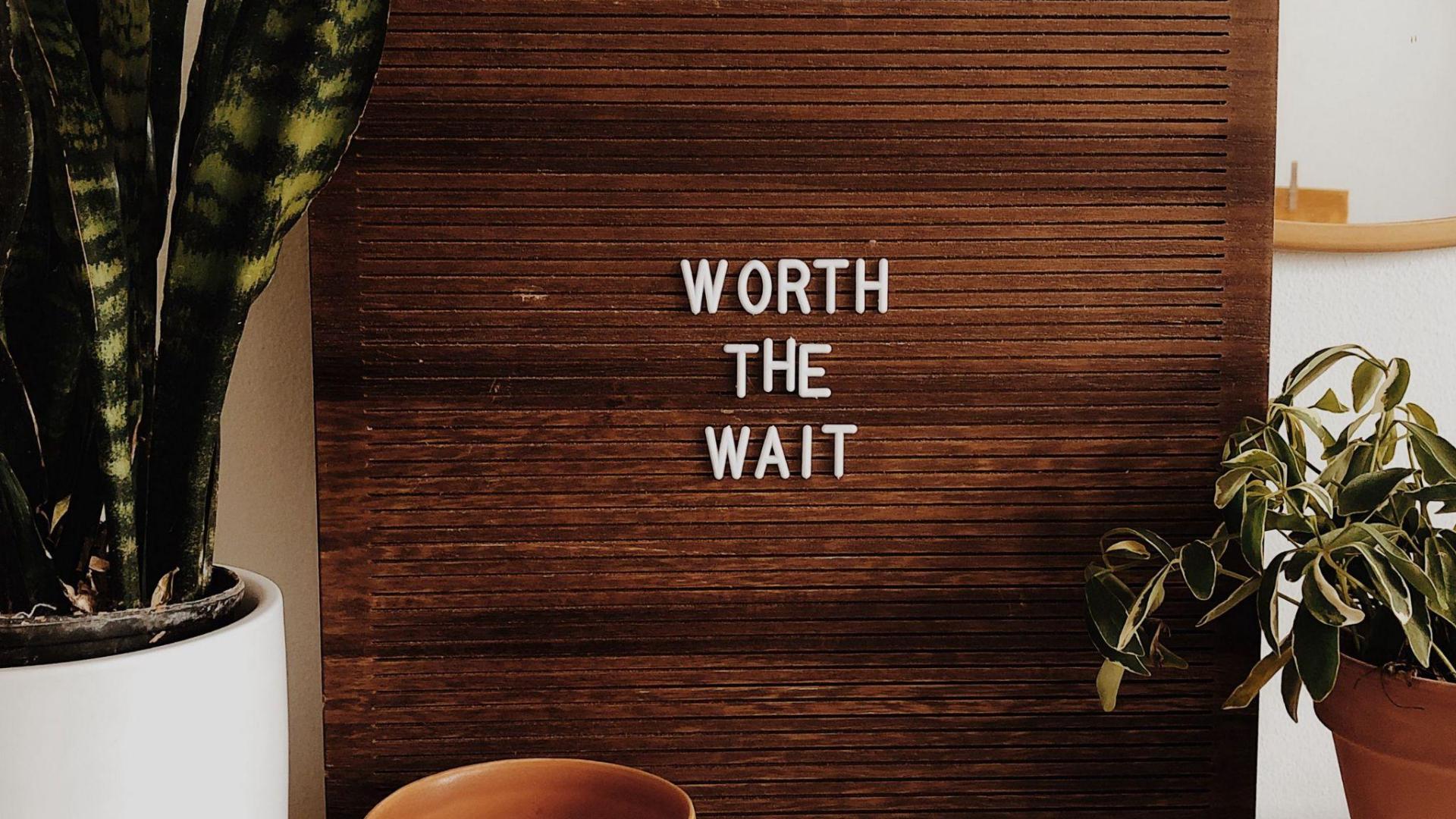


2012-08-06
Close-up

Soluzioni tecniche utilizzate

- (1) Deferrable views
- (2) Lazy loading
- (3) Code splitting
- (4) Preloading strategies
- (5) Standalone components

WORTH
THE
WAIT



Deferrable views

Le **deferrable views** possono essere utilizzate per differire il caricamento di componenti, direttive e pipe e qualsiasi CSS associato all'interno di un template fino a quando non si verificano determinate condizioni.

In angular è possibile utilizzare la direttiva strutturale **@defer** per differire il caricamento.

```
 1  cricciardi
 2  <h3 class="text-danger text-center" #fhaz>FHAZ CAMERA</h3>
 3  @defer (on viewport(fhaz)) {
 4    <app-mars-gallery-fhaz-list class="row mb-5 mt-2"></app-mars-gallery-fhaz-list>
 5  }
 6
 7  cricciardi
 8  <h3 class="text-danger text-center" #rhaz>RHAZ CAMERA</h3>
 9  @defer (on viewport(rhaz)) {
10    <app-mars-gallery-rhaz-list class="row mb-5 mt-2"></app-mars-gallery-rhaz-list>
11  }
12
13  cricciardi
14  <h3 class="text-danger text-center" #mardi>MARDI CAMERA</h3>
15  @defer (on viewport(mardi)) {
16    <app-mars-gallery-mardi-list class="row mb-5 mt-2"></app-mars-gallery-mardi-list>
17  } @loading {
18    <div class="spinner-border" role="status">
19      <span class="sr-only">Caricamento...</span>
20    </div>
21  }
22
23  <div class="container">
24    <div class="row justify-content-center mt-5">
25      <h1 class="text-white text-center mb-5">Curiosity Rover</h1>
26      <img ngSrc="curiosity.png" priority width="1074" height="700" alt="">
27
28      <h3 class="text-danger text-center mt-5">CHEMCAM CAMERA</h3>
29      <app-mars-gallery-chemcam-list class="row mb-5 mt-2"></app-mars-gallery-chemcam-list>
30
31      <h3 class="text-danger text-center">FHAZ CAMERA</h3>
32      <app-mars-gallery-fhaz-list class="row mb-5 mt-2"></app-mars-gallery-fhaz-list>
33
34      <h3 class="text-danger text-center">RHAZ CAMERA</h3>
35      <app-mars-gallery-rhaz-list class="row mb-5 mt-2"></app-mars-gallery-rhaz-list>
36
37      <h3 class="text-danger text-center">MARDI CAMERA</h3>
38      <app-mars-gallery-mardi-list class="row mb-5 mt-2"></app-mars-gallery-mardi-list>
39    </div>
40  </div>
```

Defer

```
template: `<div class="container">
<div class="row justify-content-center mt-5">
  <h1 class="text-white text-center mb-5">Curiosity Rover</h1>
  <img ngSrc="curiosity.png" priority width="1074" height="700" alt="">

  <h3 class="text-danger text-center mt-5" #chemcam>CHEMCAM CAMERA</h3>
  @defer (on viewport(chemcam)) {
    <app-mars-gallery-chemcam-list class="row mb-5 mt-2"></app-mars-gallery-chemcam-list>
  }
<h3 class="text-danger text-center" #fhaz>FHAZ CAMERA</h3>
<app-mars-gallery-fhaz-list class="row mb-5 mt-2"></app-mars-gallery-fhaz-list>

<h3 class="text-danger text-center" #rhaz>RHAZ CAMERA</h3>
<app-mars-gallery-rhaz-list class="row mb-5 mt-2"></app-mars-gallery-rhaz-list>

<h3 class="text-danger text-center" #mardi>MARDI CAMERA</h3>
<app-mars-gallery-mardi-list class="row mb-5 mt-2"></app-mars-gallery-mardi-list>
```

Initial chunk files	Names	Raw size
styles.css	styles	583.12 kB
scripts.js	scripts	107.58 kB
polyfills.js	polyfills	93.00 kB
main.js	main	64.18 kB
chunk-6KDGZDMF.js	-	2.00 kB
Initial total		849.88 kB
Lazy chunk files	Names	Raw size
chunk-Y4EMPK6A.js	mars-gallery-chemcam-list-component	4.44 kB

Lazy loading

Il **Lazy Loading Module Based** in Angular è una tecnica utilizzata per caricare i moduli (o parti dell'applicazione) solo quando sono effettivamente necessari, anziché caricarli tutti all'inizio dell'applicazione.

```
ts app.routes.ts ×  
1 import { Routes } from '@angular/router';  
1+ usages  ± iannons *  
2 export const routes: Routes = [  
3   {  
4     path: '',  
5     redirectTo: 'home',  
6     pathMatch: 'full',  
7   },  
8   {  
9     path: 'mars-gallery',  
10    loadChildren: () => import('./pages/mars-gallery/mars-gallery.module')  
11      .then((m :{MarsGalleryModule: MarsGalleryModule} ) => m.MarsGalleryModule)  
12  },  
13  {  
14    path: 'home',  
15    loadChildren: () => import('./pages/home/home.module')  
16      .then((m :{HomeModule: HomeModule} ) => m.HomeModule)  
17  },  
18 ]
```

```
ts app.routes.ts ×  
1 import {Routes} from "@angular/router";  
1+ usages  ± cricciardi  
2 import { HomeComponent} from "./pages/home/home.component";  
3 import { MarsGalleryComponent} from "./pages/mars-gallery/mars-gallery.component";  
4 import { SolarSystemComponent} from "./pages/solar-system/solar-system.component";  
5  
6 export const routes: Routes = [  
7   {  
8     path: '',  
9     redirectTo: 'home',  
10    pathMatch: 'full',  
11  },  
12  {  
13    path: 'home',  
14    component: HomeComponent,  
15  },  
16  {  
17    path: 'mars-gallery',  
18    component: MarsGalleryComponent,  
19  },  
20 ]
```

Lazy loading

Lazy loading

```
> fast-render@0.0.0 start_lazy_loading
> ng serve --project images-at-light-speed-lazy-loading --port 4202

Initial chunk files | Names | Raw size
styles.css | styles | 583.05 kB |
scripts.js | scripts | 107.58 kB |
polyfills.js | polyfills | 93.00 kB |
main.js | main | 5.31 kB |

| Initial total | 788.94 kB

Lazy chunk files | Names | Raw size
chunk-NWJMZX7.js | solar-system-module | 37.90 kB |
chunk-7UQA5UY5.js | mars-gallery-module | 20.33 kB |
chunk-F6AF3LSJ.js | home-module | 5.73 kB |
chunk-B25M3FVI.js | - | 1.68 kB |
chunk-JP3WZFTZ.js | - | 326 bytes |

Application bundle generation complete. [1.151 seconds]
```

No lazy loading

```
> fast-render@0.0.0 start_unoptimized_project
> ng serve --project images-at-light-speed-unoptimized --port 4200

Initial chunk files | Names | Raw size
styles.css | styles | 583.09 kB |
scripts.js | scripts | 107.58 kB |
polyfills.js | polyfills | 93.00 kB |
main.js | main | 71.02 kB |

| Initial total | 854.68 kB

Application bundle generation complete. [1.086 seconds]
```

Preloading strategies

La **Preloading Strategy** permette di caricare in anticipo (in background) i moduli che sono stati impostati per il lazy loading.

Questo caricamento avviene subito dopo che l'applicazione è stata inizialmente caricata, senza bloccare l'interazione dell'utente.

```
 1 import {NgModule} from '@angular/core';
 2 import {CommonModule, NgOptimizedImage} from '@angular/common';
 3 import {PreloadAllModules, RouterModule, withPreloading} from '@angular/router';
 4 import {routes} from './app.routes';
 5 import {BrowserModule} from '@angular/platform-browser';
 6 import {BrowserAnimationsModule} from "@angular/platform-browser/animations";
 7 import {provideHttpClient} from '@angular/common/http';
 8 import {AppComponent} from './app.component';

 9
10 1+ usages  ± cricciardi
11 @NgModule({
12   declarations: [AppComponent],
13   imports: [
14     CommonModule,
15     NgOptimizedImage,
16     BrowserModule,
17     BrowserAnimationsModule,
18     RouterModule.forRoot(routes, {preloadingStrategy: PreloadAllModules})
19   ],
20   providers: [provideHttpClient()],
21   bootstrap: [AppComponent],
22 })
23
24 import {HomeModule} from './pages/home/home.module';
25 import {MarsGalleryModule} from './pages/mars-gallery/mars-gallery.module';
26 import {SolarSystemModule} from './pages/solar-system/solar-system.module';
27 import {AppComponent} from './app.component';

28
29 1+ usages  ± cricciardi
30 @NgModule({
31   declarations: [AppComponent],
32   imports: [
33     HomeModule,
34     MarsGalleryModule,
35     SolarSystemModule,
36     CommonModule,
37     NgOptimizedImage,
38     BrowserModule,
39     BrowserAnimationsModule,
40     RouterModule.forRoot(routes)
41   ],
42   providers: [provideHttpClient()],
43   bootstrap: [AppComponent],
44 })
```

Standalone components

I componenti standalone sono dei componenti, direttive e pipe che possono essere utilizzati autonomamente, senza dipendere fortemente da strutture modulari o contesti specifici del framework.

Con i componenti standalone, si semplifica l'architettura dell'applicazione migliorando la modularità e la leggerezza del codice.

In **angular** un componente standalone non ha bisogno di essere dichiarato in nessun modulo e si gestisce le proprie dipendenze autonomamente senza passare per un modulo.

```
9  @Component({
10  selector: 'app-earth-images',
11  standalone: true,
12  imports: [ListImagesComponent],
13  template: `
14    <h3 class="text-danger text-center mt-5">{{Planets.EARTH}}</h3>
15    <p class="card-text text-center text-white">
16      Earth is the third planet from the Sun and the only astronomical
17      object known to harbor life. This is enabled by Earth being an ocean world,
18      the only one in the Solar System sustaining liquid surface water. Almost all of Earth's water is con-
19      cerning 70.8% of Earth's crust. The remaining 29.2% of Earth's crust is land, most of which is loca-
20      tions of Earth's land is somewhat humid and covered by vegetation, while large sheets of ice at Earth's
21      rivers and atmospheric water combined. Earth's crust consists of slowly moving tectonic plates, whic-
22      Earth has a liquid outer core that generates a magnetosphere capable of deflecting most of the destri-
23    </p>
24    <app-list-images [nasaApi$]="nasaApi$"></app-list-images>
25  `
26})
27 export class EarthImagesComponent implements OnInit {
28   public nasaApis: Observable<INasaApiResponse> | undefined;
29   public readonly Planets = Planets;
30 }
```

```
8  @Component({
9  selector: 'app-earth-images',
10 templateUrl: './earth-images.component.html',
11 styleUrls: ['./earth-images.component.scss'
12 })
13 export class EarthImagesComponent implements OnInit {
14   public nasaApi$: Observable<INasaApiResponse> | undefined;
15   public readonly Planets = Planets;
16
17 no usages  ↳ cricciardi
18 constructor(private marsGalleryService: MarsGalleryService) {
19 }
20
21 no usages  ↳ cricciardi
22 ngOnInit(): void {
23   this.nasaApis = this.marsGalleryService.getNASAImagesBySearch(Planets.EARTH).pipe(
24     catchError((error: HttpErrorResponse) => {
25       console.error(error);
26       return throwError(errorFactory(() => error));
27     })
28   );
29 }
```

A large pile of cut firewood, consisting of many logs of various sizes, is stacked in a dark, enclosed space, possibly a storage area or a woodshed. The wood is light-colored with visible grain and some darker, charred areas from previous use.

Divide et impera

Code splitting

L'idea principale del **code splitting** (divisione del codice) è dividere il codice dell'applicazione in blocchi più piccoli (o "chunk") che vengono caricati dinamicamente quando sono effettivamente necessari.

È una strategia utilizzata nelle applicazioni web per migliorare le performance caricando solo il codice necessario per una determinata parte dell'applicazione.

```
55  public loadJupiterImagesComponent() : void {
56    import('./components/jupiter-images/jupiter-images.component').then(({JupiterImagesComponent}) : void => {
57      this.uploadComponent = JupiterImagesComponent;
58    });
59  }
60
61  1+ usages ▾ cricciardi
62  public loadMarsImagesComponent() : void {
63    import('./components/mars-images/mars-images.component').then(({MarsImagesComponent}) : void => {
64      this.uploadComponent = MarsImagesComponent;
65    });
66  }
67
68  1+ usages ▾ cricciardi
69  public loadSaturnImagesComponent() : void {
70    import('./components/saturn-images/saturn-images.component').then(({SaturnImagesComponent}) : void => {
71      this.uploadComponent = SaturnImagesComponent;
72    });
73
74  1+ usages ▾ cricciardi
75  public loadUranusImagesComponent() : void {
76    import('./components/uranus-images/uranus-images.component').then(({UranusImagesComponent}) : void => {
77      this.uploadComponent = UranusImagesComponent;
78    });
79  }
```

```
1  import {Component} from '@angular/core';
2  import {Planets} from './enum/planets';
3
4  1+ usages ▾ c.ricciardi
5  @Component({
6    selector: 'app-solar-system',
7    templateUrl: './solar-system.component.html',
8    styleUrls: ['./solar-system.component.scss']
9  })
10 export class SolarSystemComponent {
11   protected readonly Planets = Planets;
12   public listOfPlanets : string[] = Object.values(Planets);
13   public planetSelected: string | undefined;
14
15   1+ usages ▾ c.ricciardi
16   loadComponent(planet: string) : void {
17     this.planetSelected = planet;
18   }
19 }
```

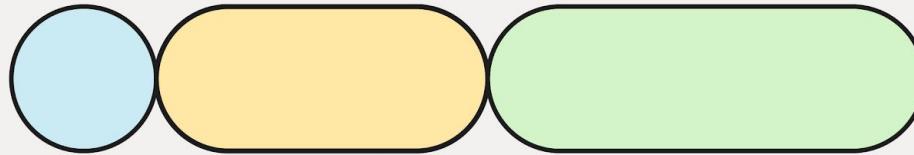
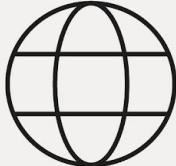
Code splitting

Con code splitting

```
1  <div class="container justify-content-center align-items-center d-flex mt-5 pe-0">
2    <div class="row d-flex justify-content-between">
3      @for (planet of listOfPlanets; track planet) {
4        <div class="cursor-pointer d-flex justify-content-center col-lg-1 col-md-2 col-3">
5          <p class="text-white planets-hover" (click)="loadComponent(planet)">
6            {{ planet }}
7          </p>
8        </div>
9      }
10    </div>
11  </div>
12  <div class="container mt-2">
13    <div class="row justify-content-center">
14      <div class="col-md-6 col-sm-12">
15        <ol>
16          @for (planet of listOfPlanets; track planet) {
17            <li class="{{planet?.toLowerCase()}}"
18              [ngClass]="planetSelected == planet ? 'planet-selected' : '' "></li>
19          }
20        </ol>
21      </div>
22      <ng-container *ngComponentOutlet="uploadComponent"></ng-container>
23    </div>
24  </div>
```

Senza code splitting

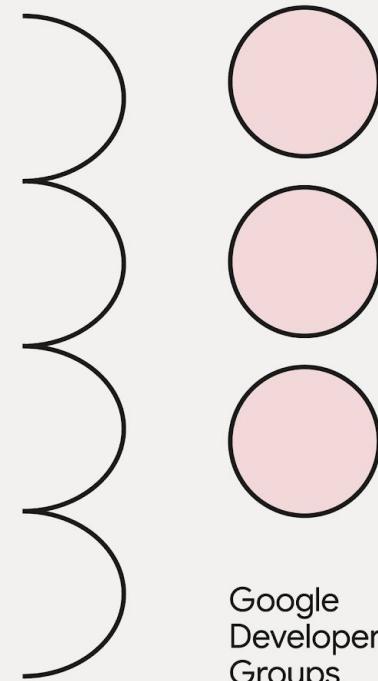
```
21  @if (planetSelected == Planets.SUN) {
22    <app-sun-images></app-sun-images>
23  }
24  @if (planetSelected == Planets.MERCURY) {
25    <app-mercury-images></app-mercury-images>
26  }
27  @if (planetSelected == Planets.VENUS) {
28    <app-venus-images></app-venus-images>
29  }
30  @if (planetSelected == Planets.EARTH) {
31    <app-earth-images></app-earth-images>
32  }
33  @if (planetSelected == Planets.MARS) {
34    <app-mars-images></app-mars-images>
35  }
36  @if (planetSelected == Planets.JUPITER) {
37    <app-jupiter-images></app-jupiter-images>
38  }
39  @if (planetSelected == Planets.SATURN) {
40    <app-saturn-images></app-saturn-images>
41  }
42  @if (planetSelected == Planets.URANUS) {
43    <app-uranus-images></app-uranus-images>
44  }
45  @if (planetSelected == Planets.NEPTUNE) {
46    <app-neptune-images></app-neptune-images>
47  }
48  </div>
49 </div>
```



Analizzare un sito web

=

Analizzare il bundle



Google
Developer
Groups

Analizzare il bundle è il 1[^] step

LCP

Largest Contentful Paint



FID

First Input Delay



Google Developer Groups

Astronomy Picture of the Day



Find the Man in the Moon

Have you ever seen the Man in the Moon? This common question plays on the ability of humans to see pareidolia -- imagining familiar icons where they don't actually exist. The textured surface of Earth's full Moon is home to numerous identifications of iconic objects, not only in modern western culture but in world folklore throughout history. Examples, typically dependent on

Human-readable

Blocked requests 3rd-party requests

50 ms 100 ms 150 ms 200 ms 250 ms 300 ms 350 ms 400 ms 450 ms 500 ms 550 ms 600 ms 650 ms 700 ms 750 ms 800 ms

Name	Headers	Preview	Response	Initiator	Timing	Cookies
polyfills.js						
main.js						
scripts.js						
env.mjs						
@angular_platform-browser...						
@angular_core.js?v=9d966...						
@angular_router.js?v=9d966...						
@angular_common_http.js?...						
@ng-bootstrap_ng-boots...						
@angular_common.js?v=9d...						
chunk-X4J2j2CT.js?v=9d96...						
chunk-ORIJCG6B.js?v=9d9...						
chunk-5CWANZSO.js?v=9d...						
chunk-Lj2OTCV2.js?v=9d96...						
chunk-ZCVCC5YH.js?v=9d9...						
chunk-XVLRW3HB.js						
detect_angular_for_extensi...						
rjs.js?v=d9d668d8						
chunk-HTINLFBU.js						
backend_bundle.js						
chunk-CPK6XMAW.js						
chunk-5W7VCBU1.js						
chunk-NEEETBZD.js						

24 / 31 requests | 72.2 kB / 658 ▶ Line 1, Column 1

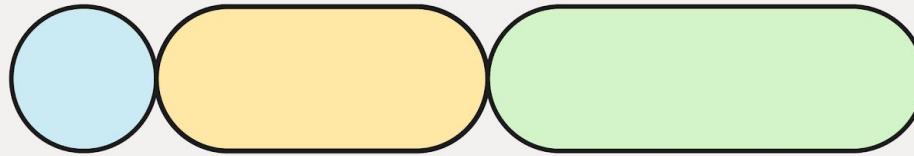
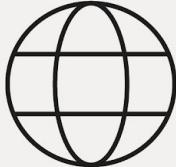
Coverage

Il riquadro **Coverage** in Chrome DevTools può aiutare a trovare codice JavaScript inutilizzato.
Rimuovere il codice non utilizzato può accelerare il caricamento della pagina.

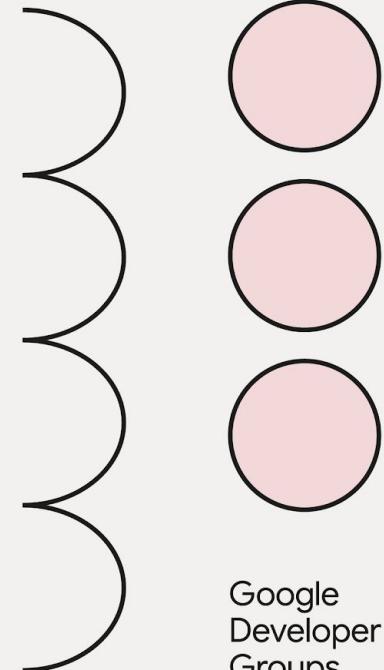
The screenshot shows the Chrome DevTools Coverage panel for the URL www.google.com/. The Coverage tab is selected, displaying a script with red vertical bars indicating unexecuted code. Below the script, a table provides a summary of usage statistics for various resources:

URL	Type	Total Bytes	Unused Bytes	Usage	Visualization
/m=cdos,hsm,jsa,mb4ZUb,d JS (pe...	JS	875,692	441,873	50.5%	<div style="width: 50.5%; background-color: red;"></div>
/m=B2qlPe,DhPYme,GU4Gal JS (pe...	JS	501,534	294,703	58.8%	<div style="width: 58.8%; background-color: red;"></div>
/rs=AA2YrTvBynad-nWEyxl JS (pe...	JS	212,521	151,436	71.3%	<div style="width: 71.3%; background-color: red;"></div>
https://www.google.com/	CSS+...	187,022	93,763	50.1%	<div style="width: 50.1%; background-color: red;"></div>
https://ap.../cb=gapi.loaded_	JS (pe...	121,628	76,488	62.9%	<div style="width: 62.9%; background-color: red;"></div>
/m=CnSW2d,DPre,P10Owf, JS (pe...	JS (pe...	24,381	18,501	75.9%	<div style="width: 75.9%; background-color: red;"></div>

878 kB of 2.1 MB (42%) used so far, 1.2 MB unused.



È sufficiente questo
mezzo per analizzare
un bundle?



Google
Developer
Groups

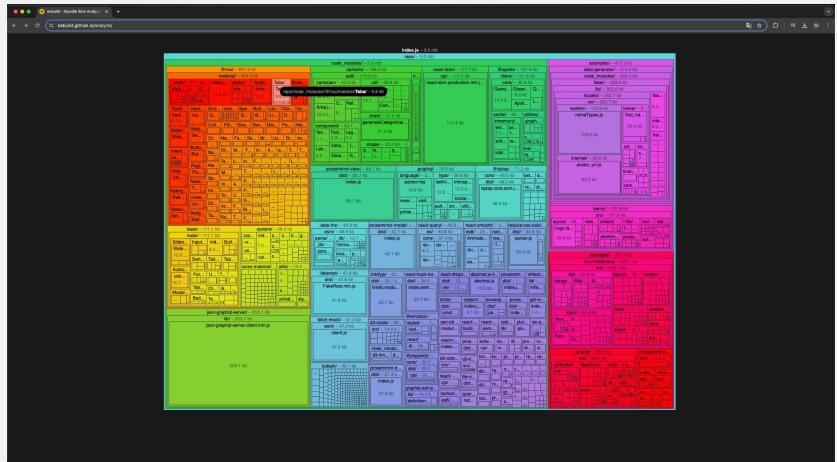


Treemap chart

È una rappresentazione grafica e interattiva del **bundle** e di cosa lo costituisce.

Viene creato mettendo in **pausa** i bundle generati dal bundler, mappando ognuno con il nome del rispettivo modulo.

Viene messa in risalto la dimensione di ogni modulo.



Bundler

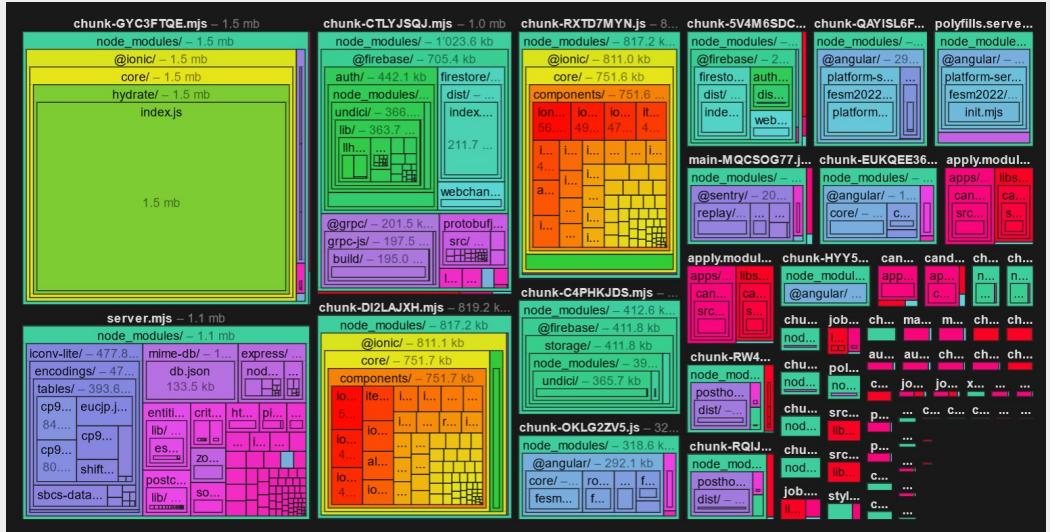


La scelta può essere cruciale in base al contesto.



Bundle-specific

stats.json

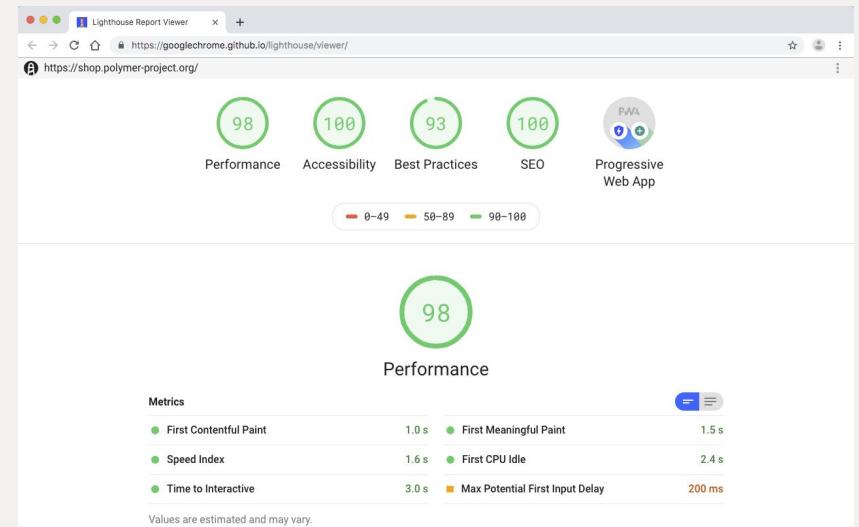


Lighthouse

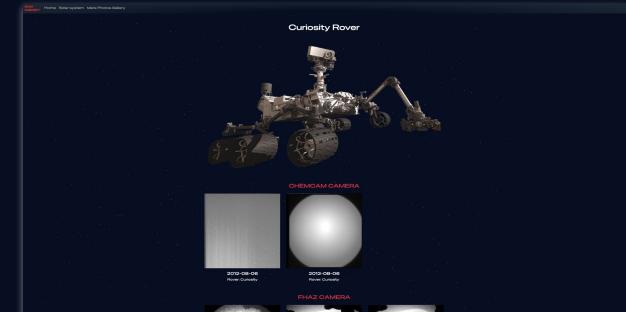
Lighthouse è uno strumento open source e automatizzato per migliorare le prestazioni, la qualità e la correttezza delle app web.

Quando esegue la revisione di una pagina, Lighthouse esegue una serie di test e genera un report sulla qualità del funzionamento della pagina.

Molto utile per valutare l'esperienza utente!



Risultati



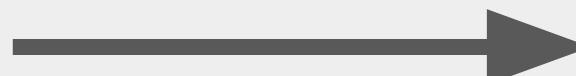
Unoptimized

URL	Type	Total Bytes	Unused Bytes	Usage Visualization
► http://localhost:4200/@fs/Users/iannonss/WebstormProjects/f... /chunk-2CVCC5YH.js?v=edfb10e	JS (per function)	174,821	115,867 66.3%	
► http://localhost:4200/scripts.js	JS (per function)	344,394	88,783 25.8%	
► http://localhost:4200/@fs/Users/iannonss/WebstormProjects/f... /chunk-5CWANZSO.js?v=edfb10e	JS (per function)	178,509	83,772 46.9%	
► http://localhost:4200/@fs/Users/iannonss/WebstormProjects/f... /@angular_router.js?v=6b34e9	JS (per function)	205,942	65,944 32%	
► http://localhost:4200/@fs/Users/iannonss/WebstormProjects/f... /chunk-ORHJCG5B.js?v=edfb10e	JS (per function)	79,022	48,881 61.9%	
chrome-extension://ienfarjdbdpbeiboblfackkekamf.../app/backero_ourbie.js	JS (per function)	88,802	48,383 55.1%	
► http://localhost:4200/main.js	JS (per function)	176,837	35,805 20.2%	
chrome-extension://ienfarjdbdpbeiboblfackkekamf.../page_bundle.js	JS (per function)	22,001	20,100 91.4%	
► http://localhost:4200/polyfills.js	JS (per function)	417,982	27,549 6.6%	
► http://localhost:4200/@fs/Users/iannonss/WebstormProjects/fas... /chunk-X4I2J2CT.js?v=edfb10e	JS (per function)	60,683	22,889 37.7%	
► http://localhost:4200/@vite/client	JS (per function)	135,796	14,790 10.9%	

Optimized

URL	Type	Total Bytes	Unused Bytes	Usage Visualization
► https://localhost:4201/@vite/client	JS (per function)	135,796	14,790 10.9%	
► http://localhost:4201/chunk-XVLRW3HB.js	JS (per function)	12,735	3,226 25.3%	
► http://localhost:4201/chunk-CPK6XM4W.js	JS (per function)	10,174	2,949 29%	
► http://localhost:4201/chunk-5W7VCBUL.js	JS (per function)	22,199	2,376 10.7%	
► chrome-extension://ienfarjdbdpbeiboblfackkekamf.../detect.angular_for_extension_icon_bundle.js	JS (per function)	2,254	920 40.8%	
http://localhost:4201/@fs/Users/iannonss/WebstormProjects/fast-render/node_modules/.../env.m.../env.m	JS (per function)	4,021	306 7.6%	
http://localhost:4201/main.js	JS (per function)	13,529	27 0.2%	
http://localhost:4201/chunk_NEEFETRZD.js	JS (per function)	2,762	0 0%	
► http://localhost:4201/chunk-HTINLFBU.js	JS (per function)	1,696	0 0%	
http://localhost:4201/@fs/Users/iannonss/WebstormProjects/fast-render/.an... /rxjs.js?v=26227e98	JS (per function)	4,822	0 0%	
http://localhost:4201/@fs/Users/iannonss/Webstorm.../@angular_platform_browser.js?v=26227e98	JS (per function)	2,478	0 0%	

176,837 Bytes
20,2% inutilizzati



13,529 Bytes
0,2% inutilizzati

Unoptimized

```
> fast-render@0.0.0 start_unoptimized_project
> ng serve --project images-at-light-speed-unoptimized --port 4200
```

Initial chunk files	Names	Raw size
styles.css	styles	583.09 kB
scripts.js	scripts	107.58 kB
polyfills.js	polyfills	93.00 kB
main.js	main	71.02 kB
	Initial total	854.68 kB

```
Application bundle generation complete. [1.086 seconds]
```

71,02 kb → 4.83 kb

main.js

Optimized

```
> fast-render@0.0.0 start_optimized_project
> ng serve --project images-at-light-speed-optimized --port 4201
```

Initial chunk files	Names	Raw size
styles.css	styles	583.10 kB
scripts.js	scripts	107.58 kB
polyfills.js	polyfills	93.00 kB
main.js	main	4.83 kB
	Initial total	788.50 kB

Lazy chunk files	Names	Raw size
chunk-5W7VCBUI.js	solar-system-component	9.08 kB
chunk-XVLRW3HB.js	home-component	5.02 kB
chunk-4HKJ36T6.js	mars-gallery-chemcam-list-component	4.47 kB
chunk-57EYPRYR.js	mars-gallery-mardi-list-component	4.43 kB
chunk-3W7UUUV5U.js	mars-gallery-rhaz-list-component	4.41 kB
chunk-CPK6XM4W.js	mars-gallery-component	4.41 kB
chunk-X3U05CEZ.js	mars-gallery-fhaz-list-component	4.33 kB
chunk-HKRRJEWT.js	earth-images-component	3.18 kB
chunk-3RIWRSSR.js	mercury-images-component	3.04 kB
chunk-2KTWR7DC.js	uranus-images-component	2.94 kB
chunk-XUD7W7MO.js	mars-images-component	2.94 kB
chunk-JDJHT66N.js	jupiter-images-component	2.93 kB
chunk-PFPNB435.js	neptune-images-component	2.92 kB
chunk-OSAA4PVP.js	venus-images-component	2.79 kB
chunk-AHICW2EM.js	saturn-images-component	2.73 kB
...and 5 more lazy chunks files. Use "--verbose" to show all the files.		

```
Application bundle generation complete. [1.158 seconds]
```

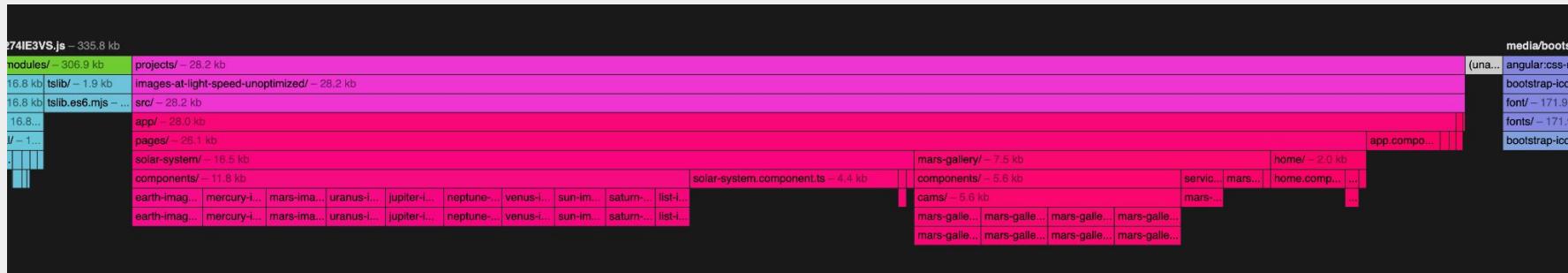
Unoptimized



Optimized



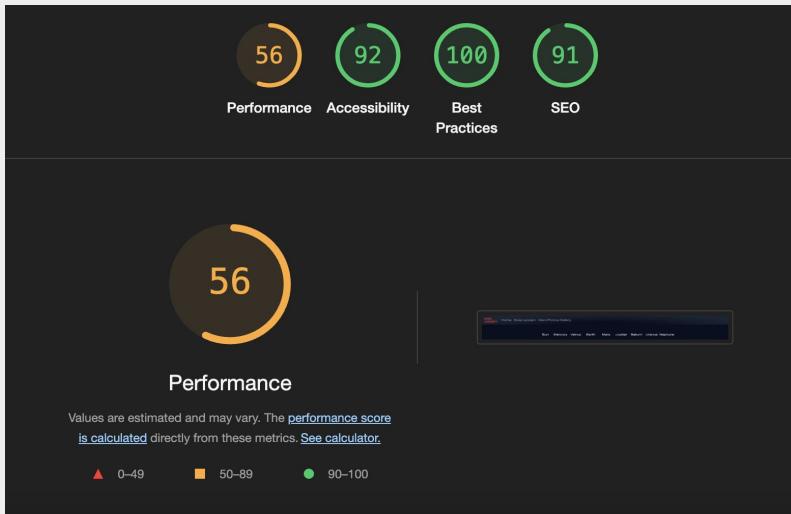
Unoptimized



Optimized

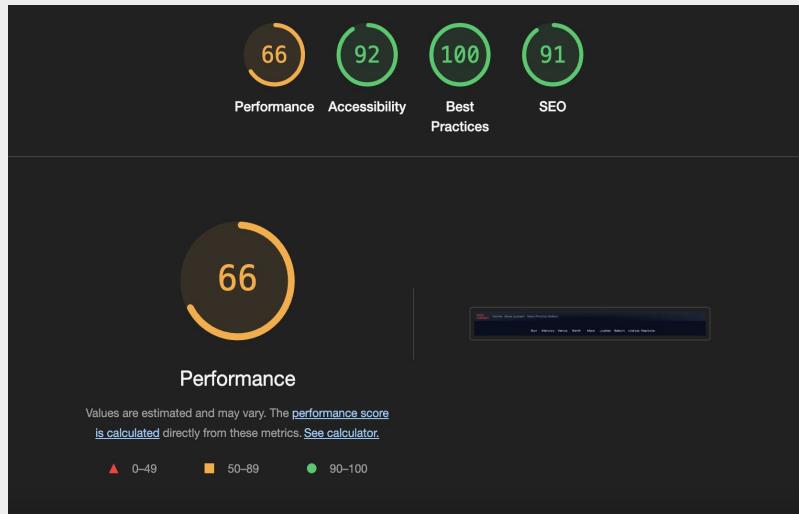


Unoptimized



Senza code splitting

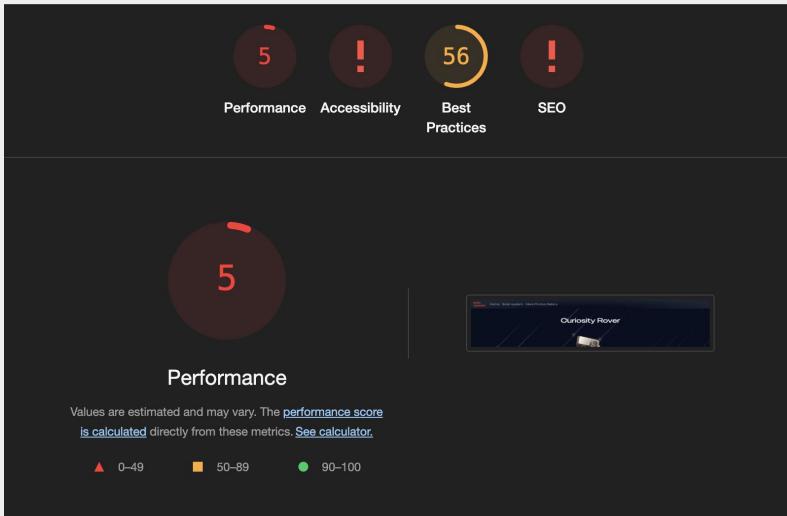
Optimized



Con code splitting

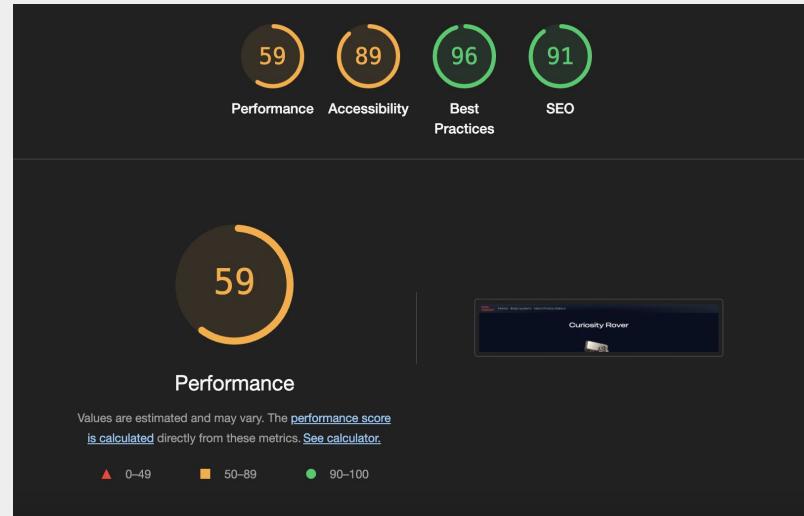
+18%~

Unoptimized



Senza @defer

Optimized



Con @defer

+1000%~

Elimina l'ammontare di javascript in eccesso.

```
40
41     $(function(){cards();});
42     $(window).on('resize', function(){cards();});
43     function cards(){
44         var width = $(window).width();
45         if(width < 750){
46             cardssmallscreen();
47         } else{
48             cardsbigscreen();
49         }
50     }
51     function cardssmallscreen(){
52         var cards = $('.card').length;
53         var height = 0;
54         var card2 = 2;
55         i = 1; i<=cards; i++){
56             $(".card")[i].style.height = height + 'px';
57             height += 100;
58         }
59     }
60     function cardsbigscreen(){
61         var cards = $('.card').length;
62         var height = 0;
63         var card2 = 2;
64         i = 1; i<=cards; i++){
65             $(".card")[i].style.height = height + 'px';
66             height += 100;
67         }
68     }
69     cards();
70 }
```

When you delete a block of code
that you thought was useless



Google Developer Groups

Grazie dell'attenzione

Non dimenticare le
prestazioni sul web.



Google Developer Groups

Le ottimizzazioni
non sono un lusso,
ma una **necessità**



Google Developer Groups

Soluzioni tecniche utilizzate

- (1) Deferrable views
- (2) Lazy loading
- (3) Code splitting
- (4) Preloading strategies
- (5) Standalone components

Bundler



La scelta può essere cruciale in base al contesto.

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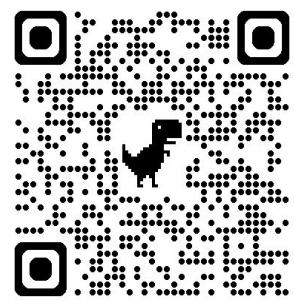
Bundle-specific



+1000%



Chiara Ricciardi [in](#)



Nicola Di Iorio [in](#)



iannonoss [GitHub](#)

