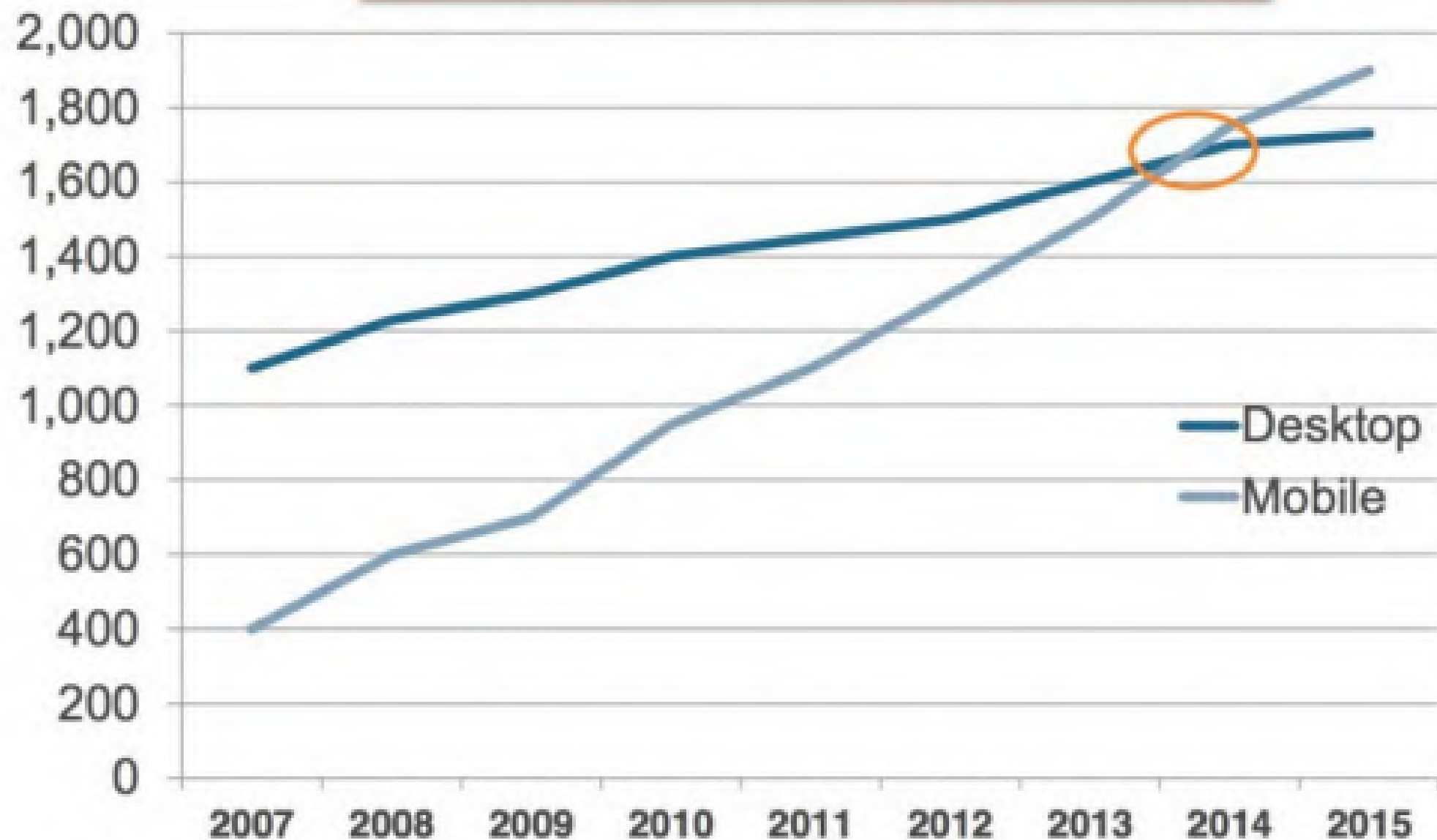


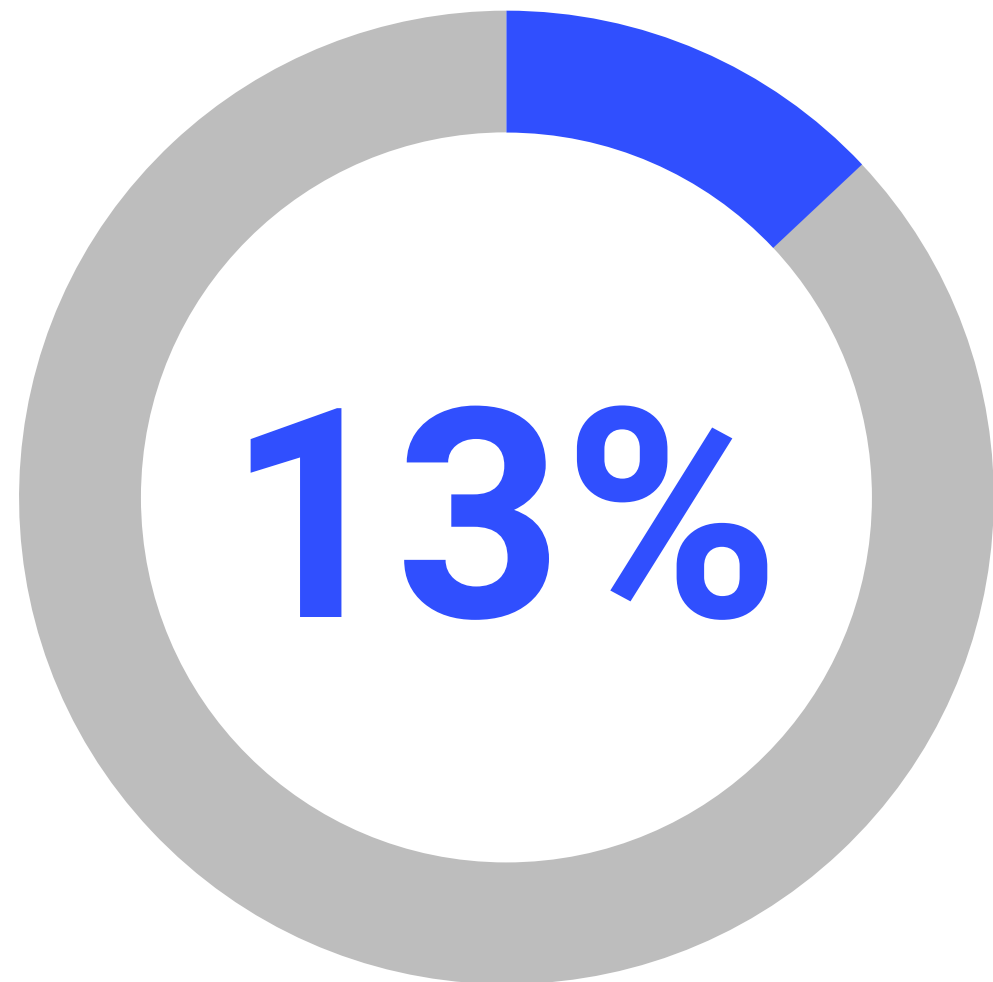
PWA

移动Web的现在与未来

Michael Yeung
Google 开发者平台工程师

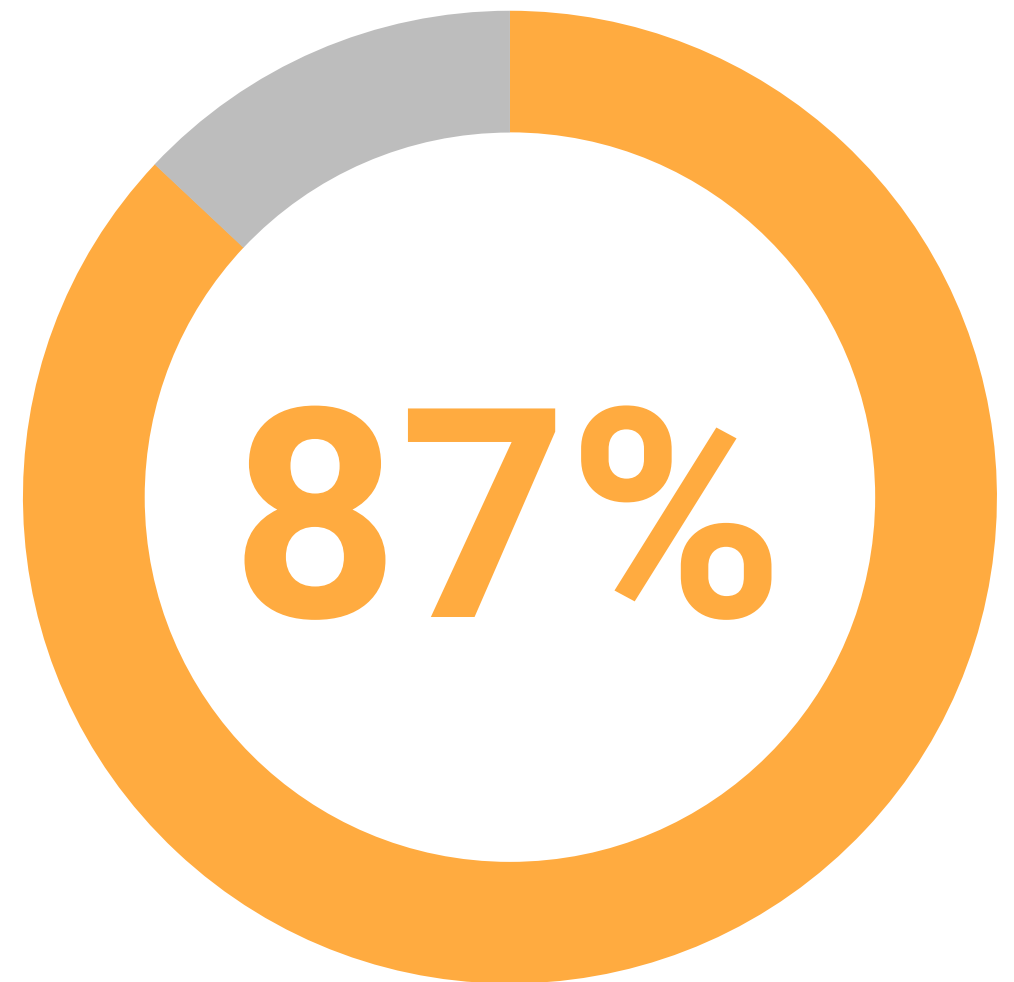
Number of Global Users (Millions)





Mobile web

VS.



Apps

Source: comScore Mobile Metrix, U.S., Age 18+, June 2015

80%
of time spent is in
users' top 3 apps

Source: comScore Mobile Metrix, U.S., Age 18+, June 2015

ZERO

**Number of apps the average
user installs per month**

Source: comScore Mobile Metrix, U.S., Age 18+, June 2015

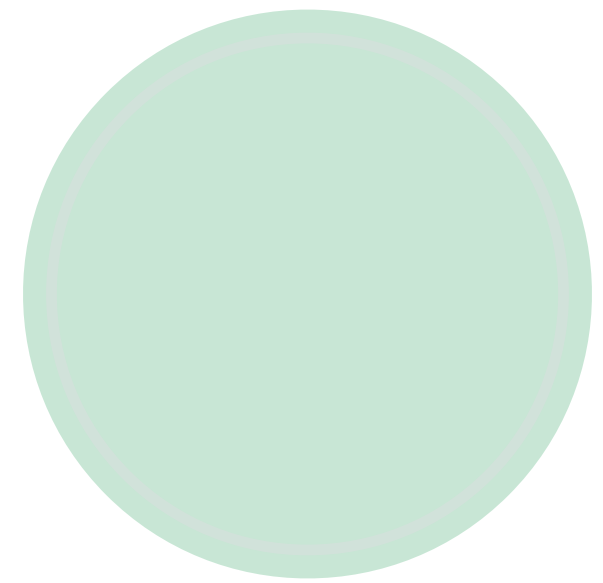
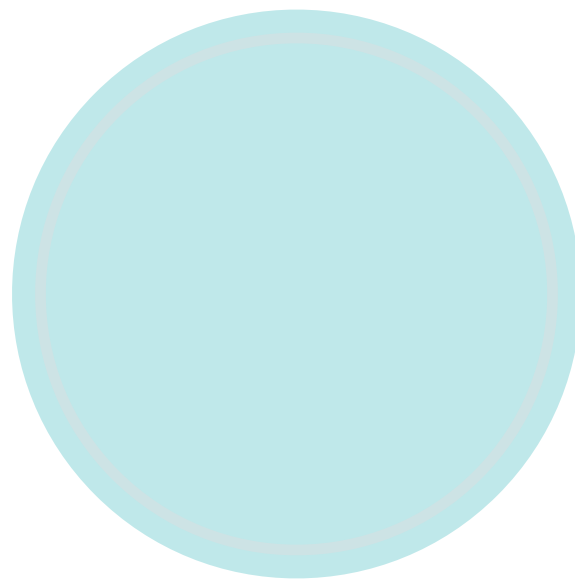
Progressive Web Apps

means radically improving
web user experiences

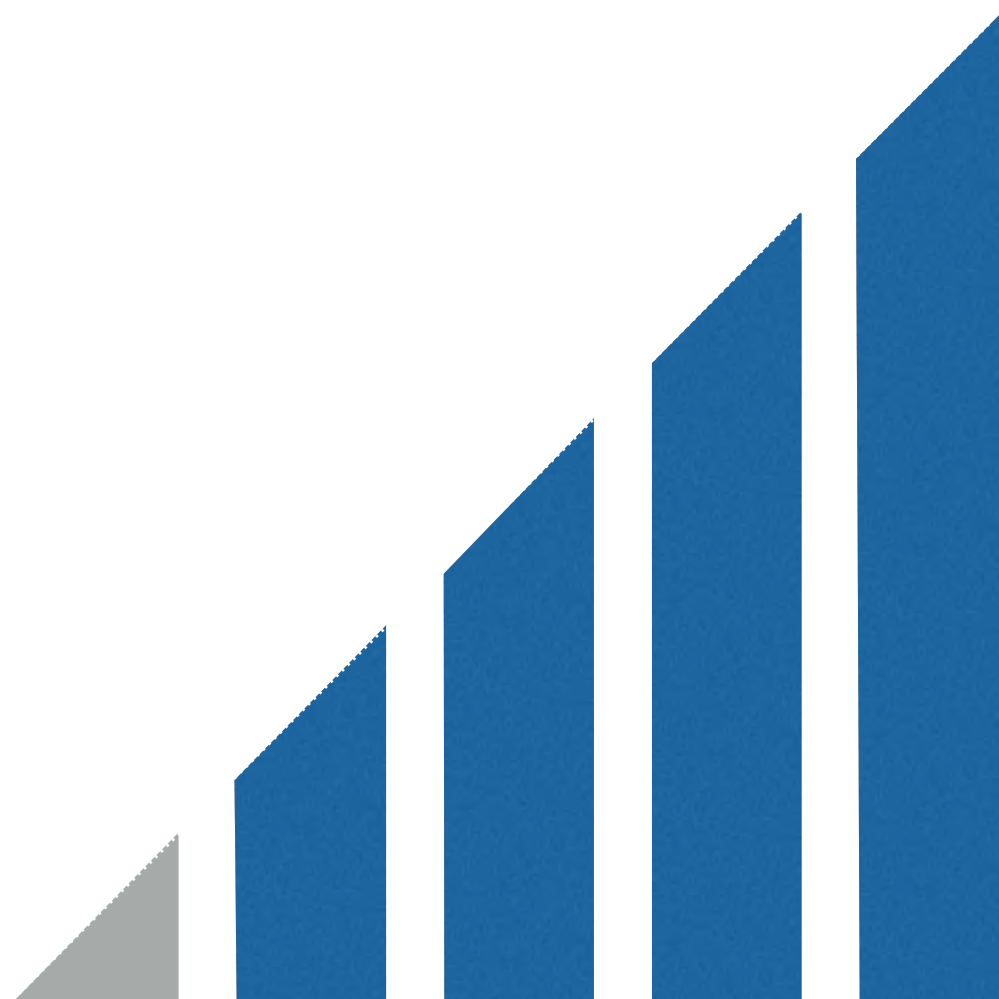
User Experiences Need to Be...



Reliable



Lie-Fi



Reliability means always providing a reasonable UX



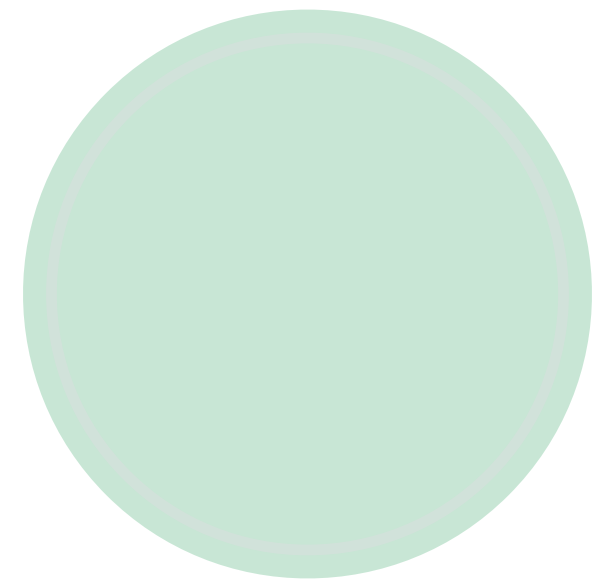
User Experiences Need to Be...



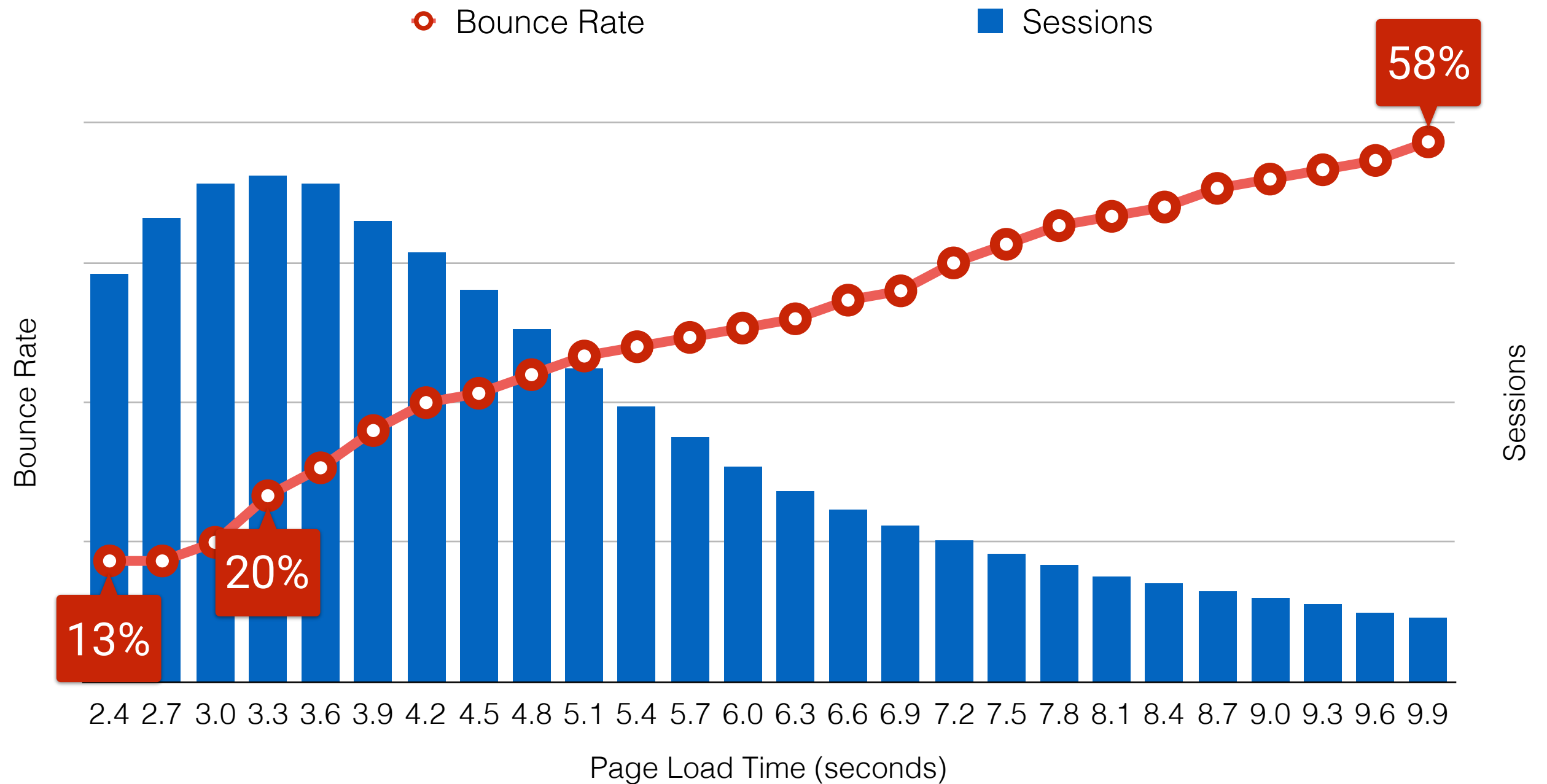
Reliable



Fast



Time is Money



User Experiences Need to Be...



Reliable



Fast

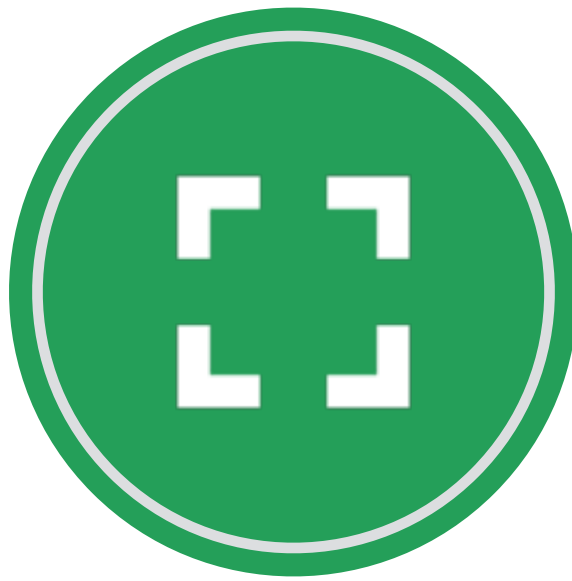


Engaging

Engaging



Home Screen

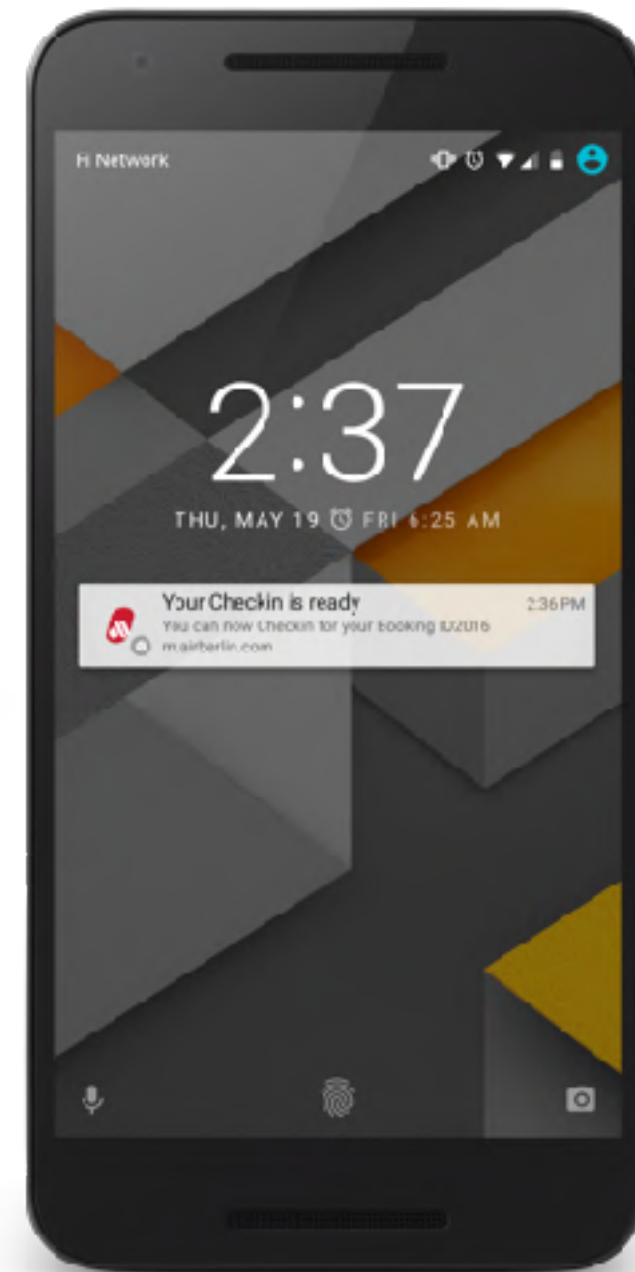


Immersive



Notifications

Web Push Notifications



01

TRENDING

Westworld is probably a lot bigger than we realized

HBO's "Westworld" continues to tease
viewers offscreen too with some







Where to buy the Nintendo NES Classic Edition

On the lookout for the NES Classic Edition?



Home



DEVICES

ROOMS



Tech Today



Where to buy the



Progressive Web Apps are...



Reliable



Fast



Engaging



Logos displayed on the map include:

- North America:** Pinterest, The Weather Company, Lyft, Fandango, Pure Formula, Expedia, Forbes, c|net, L'Oréal Paris, The Washington Post, Interjet, Viva, Terra, OLX, Infobae.
- Europe:** Independent, FT, TUI, XING, Trivago, Zalando, Airberlin, MyNet, Wego, Nivea, CNN, Air France, The Guardian.
- Asia:** ABTO@mail.ru, DHgate, Rakuten, Suumo, NIKKEI, Gotcha! mail, AllExpress, Goibibo, MakeMyTrip, RedBus, Flipkart, Voot, OLA, OLX, Kompas.com, Bukalapak, Kaskus.
- South America:** Terra, OLX, Infobae.
- Africa:** Jumia Travel, Ekonga.
- Australia:** Gumtree.

Progressive Web Apps

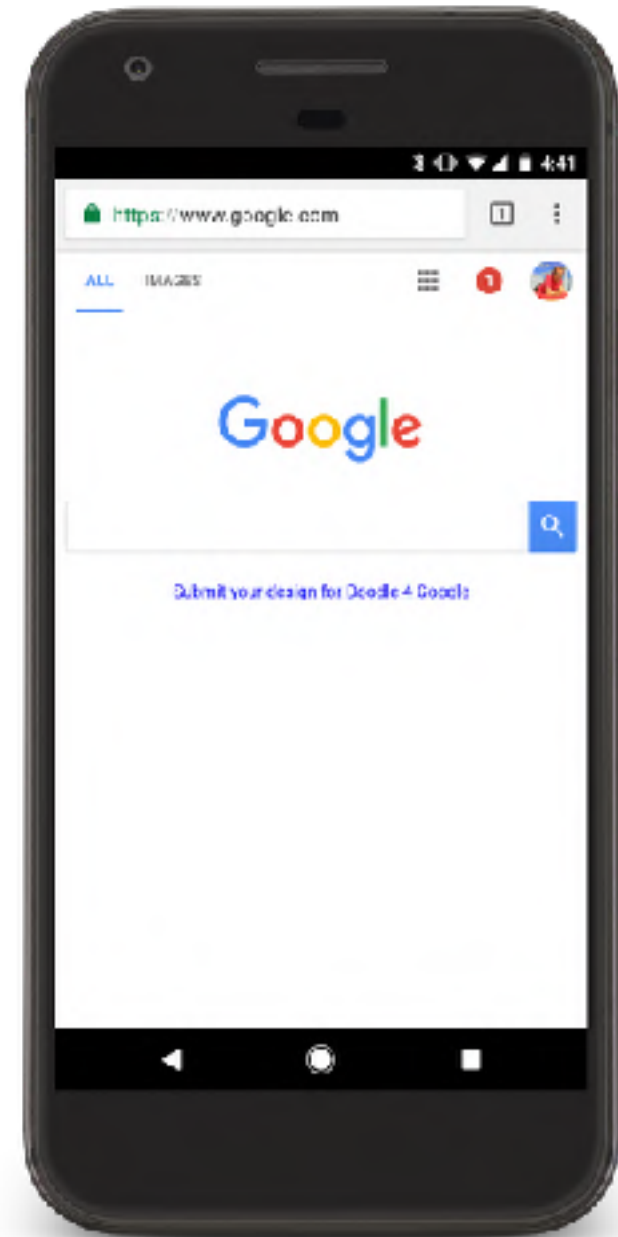
are progressive.

(Not everything works everywhere yet,
but user experience is the key.)

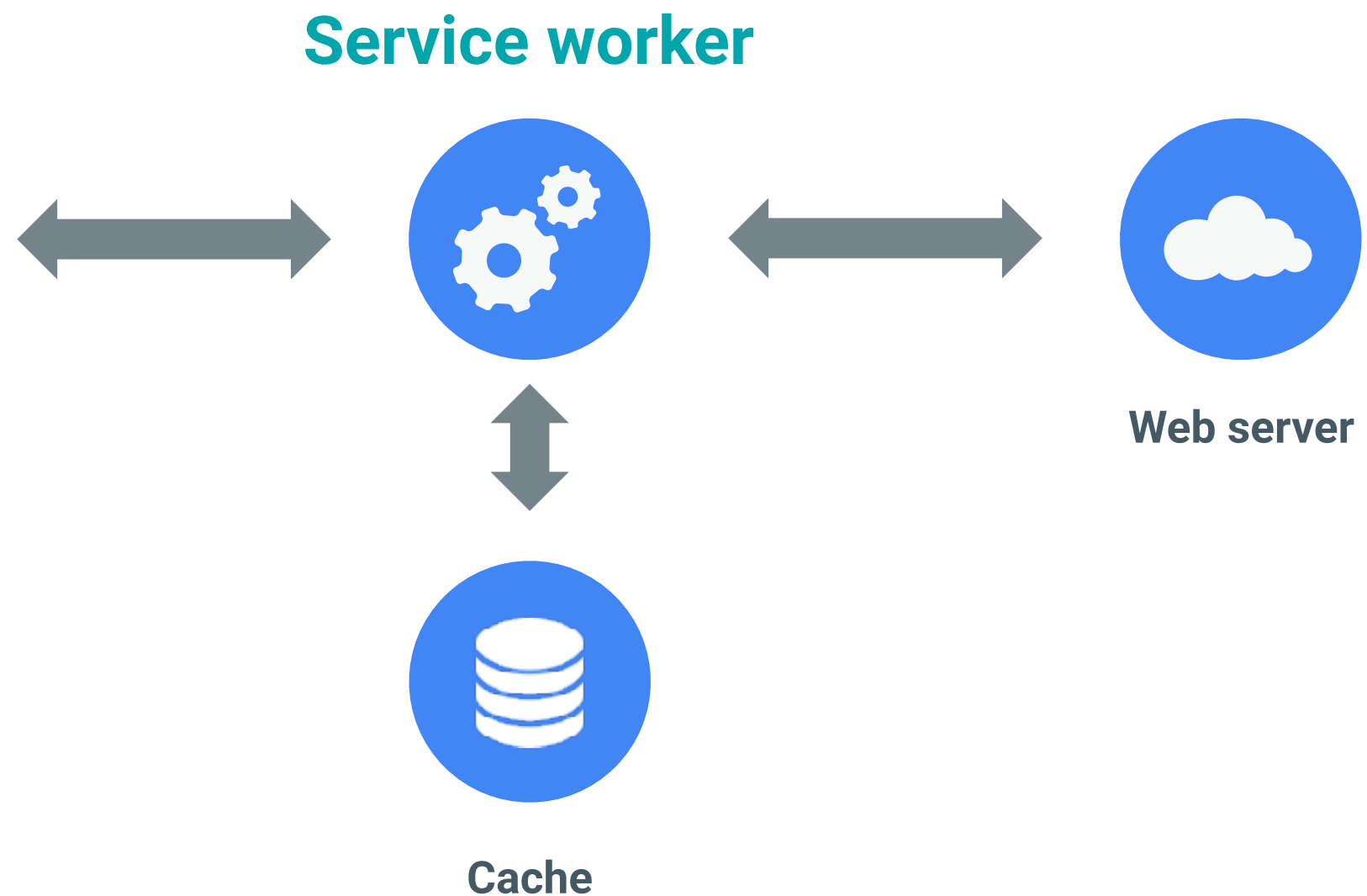
Start Secure



HTTPS: Secure connection between site and users



Service Workers: A client-side Javascript proxy



https://caniuse.com

Can I use service worker ? [Settings](#)

1 result found

Detected your country as "Hong Kong". Would you like to import usage data for that country?

[Import](#)

[No thanks](#)

Service Workers - WD

Global

61.23% + 9.38% = 73.61%

Method that enables applications to take advantage of persistent background processing, including hooks to enable bootstrapping of web applications while offline.

Current aligned	Usage relative	Date relative	Show all								
iOS Safari *	Opera Mini *	Android Browser *	Blackberry Browser	Opera Mobile *	Chrome for Android	Firefox for Android	IE Mobile	UC Browser for Android	Samsung Internet	QQ Browser	Baidu Browser
9.2		4.4									
10.2		4.4.4							4		
10.3	all	56	10	37	57	52	11	11.4	5	1.2	7.12
11											

[Notes](#)

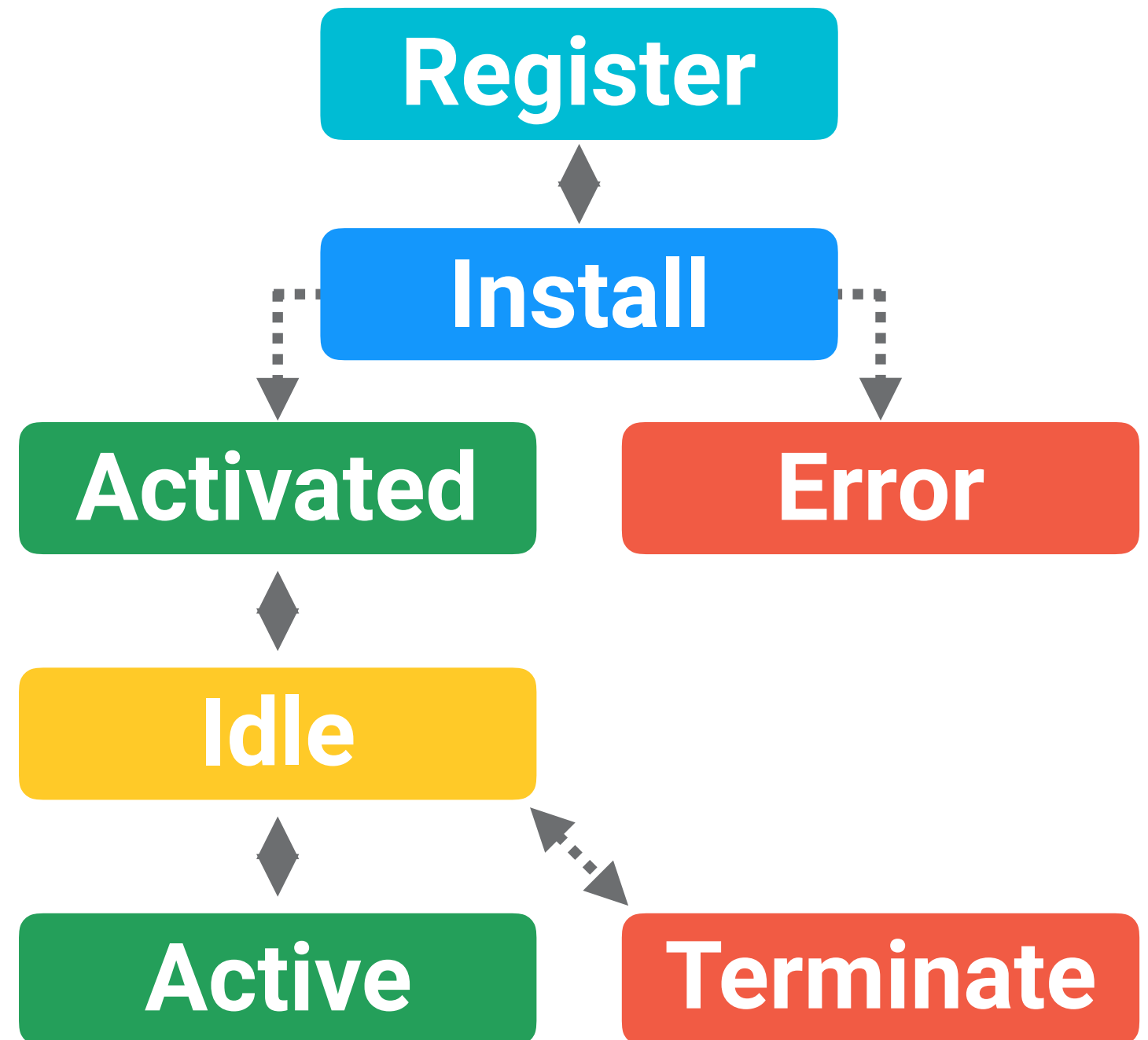
[Known issues \(0\)](#)

[Resources \(8\)](#)

[Feedback](#)

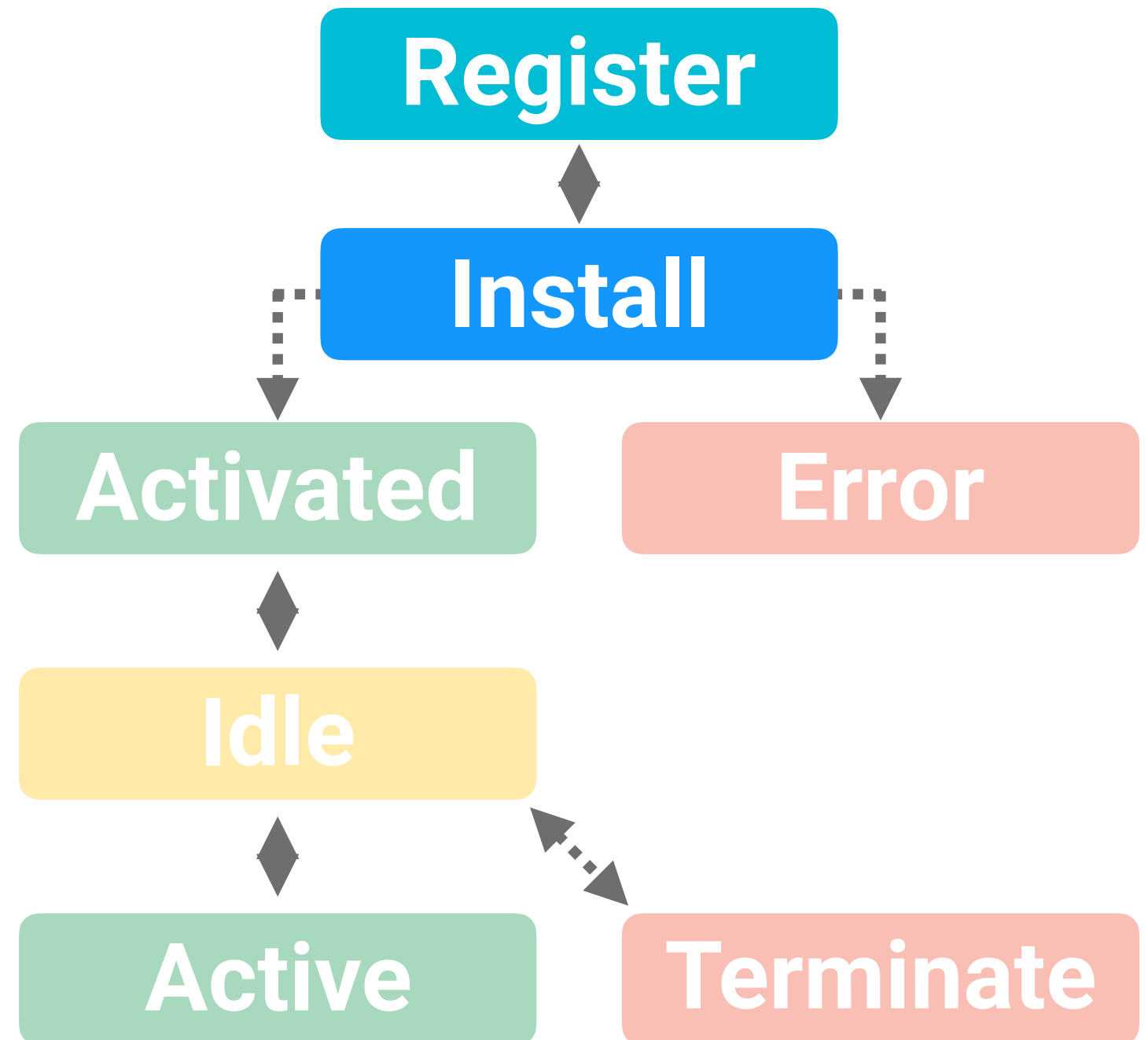
Service Worker Lifecycle

- Adds app-like lifecycle to a page
- Wakes up only when the OS says so
- Only responds to system events



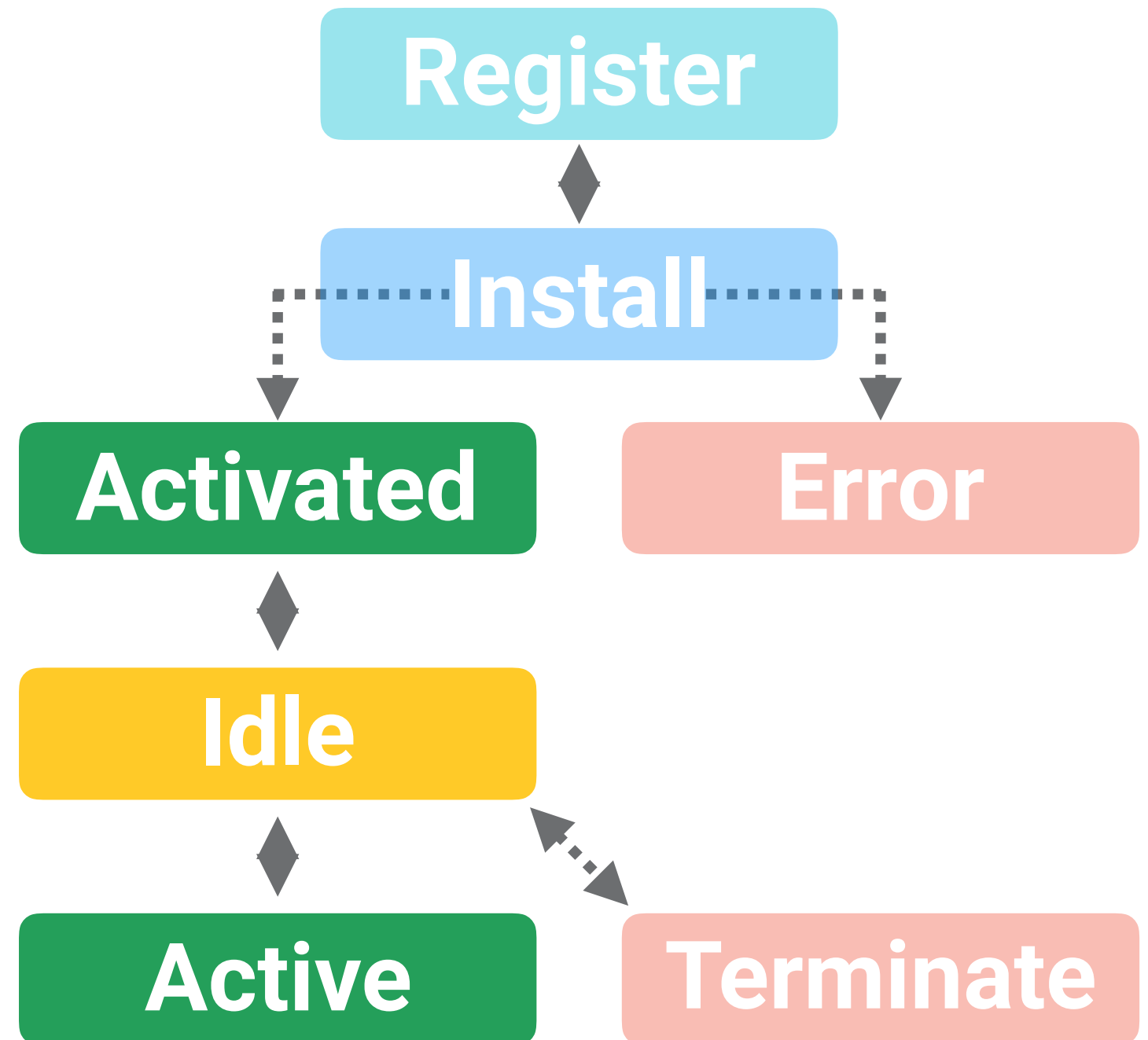
Service Worker Lifecycle

- Adds app-like lifecycle to a page
- Wakes up only when the OS says so
- Only responds to system events



Service Worker Lifecycle

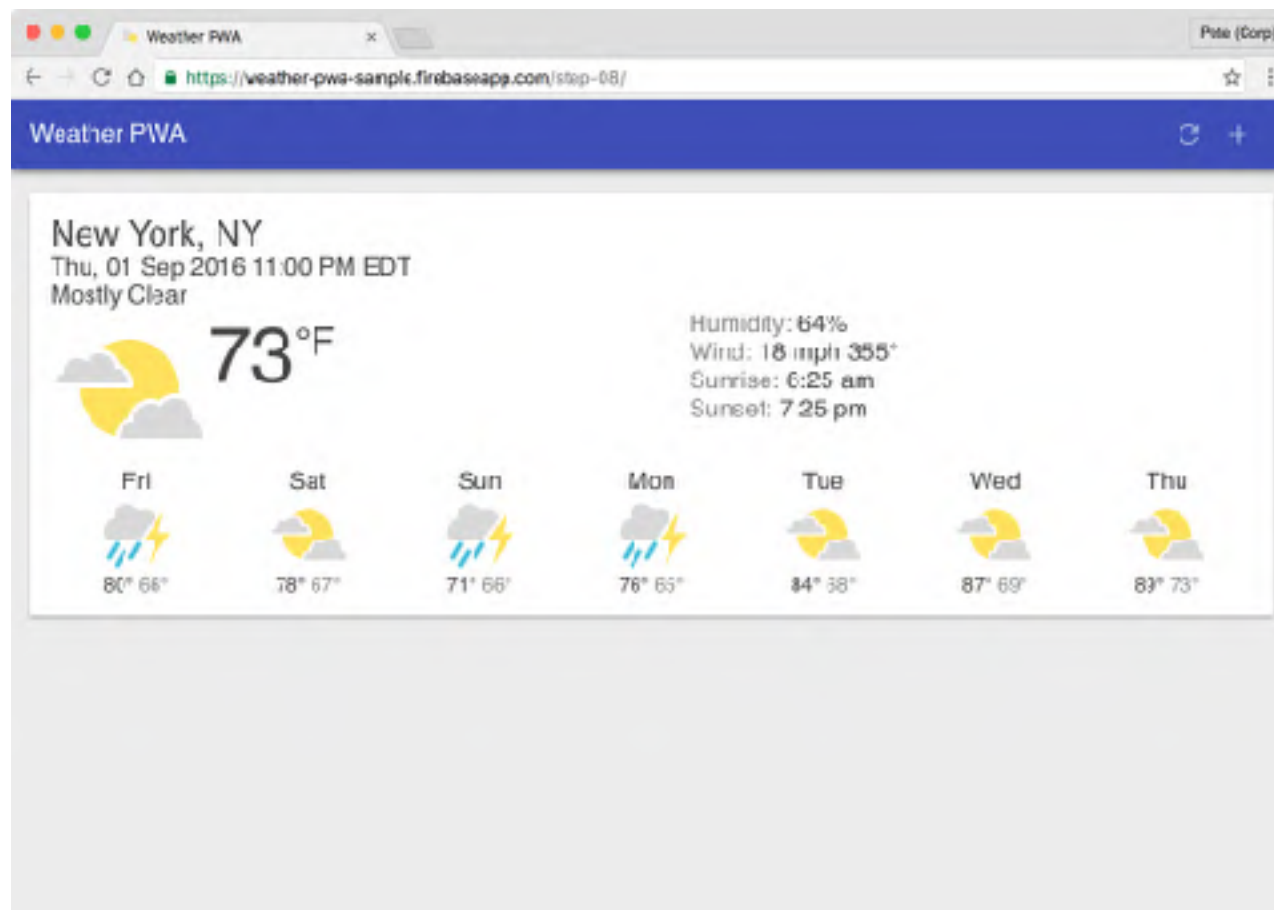
- Adds app-like lifecycle to a page
- Wakes up only when the OS says so
- Only responds to system events



Service Worker
is for the SECOND LOAD.

Service Worker Lifecycle

Install

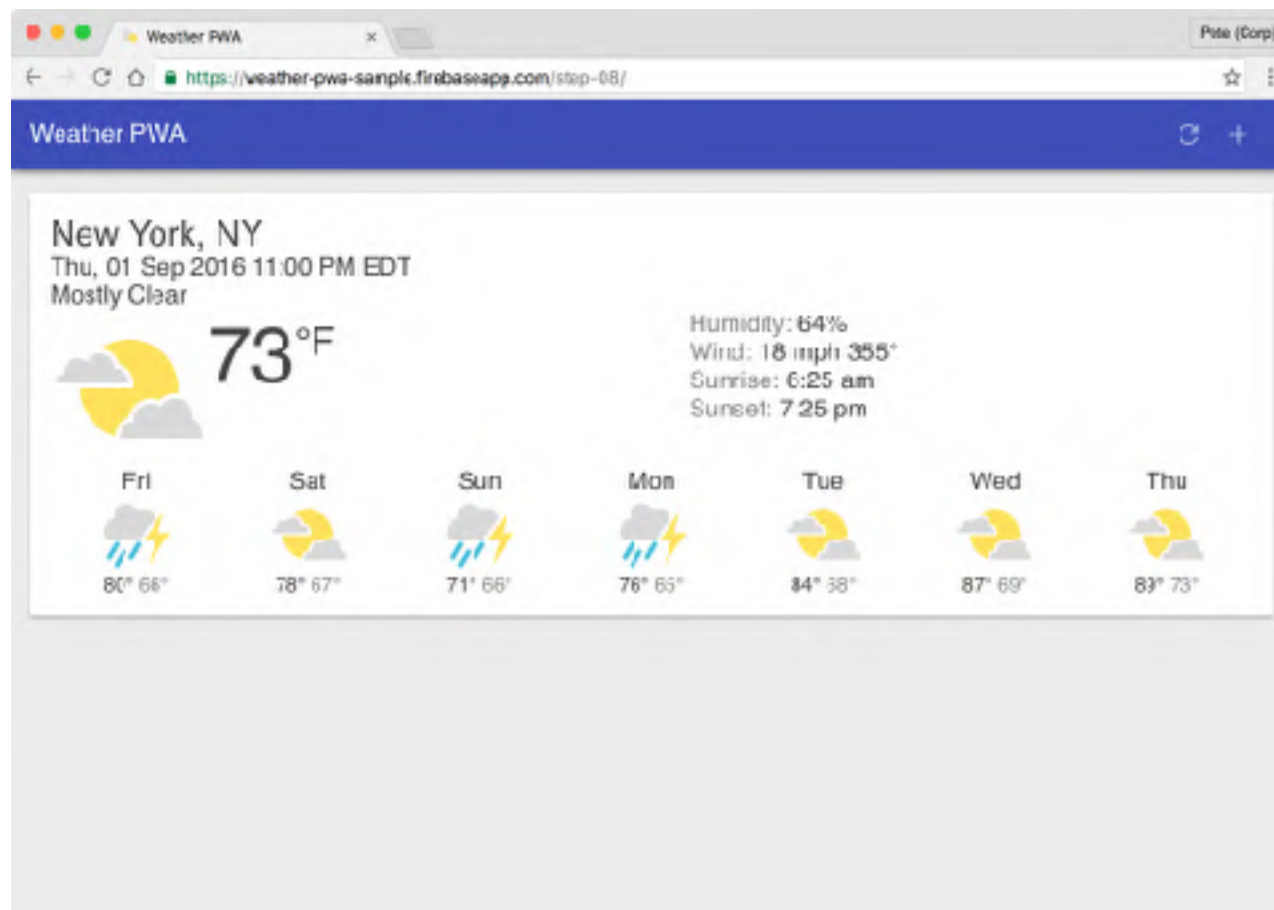


install

idle

1st Page Load

Service Worker Lifecycle Install



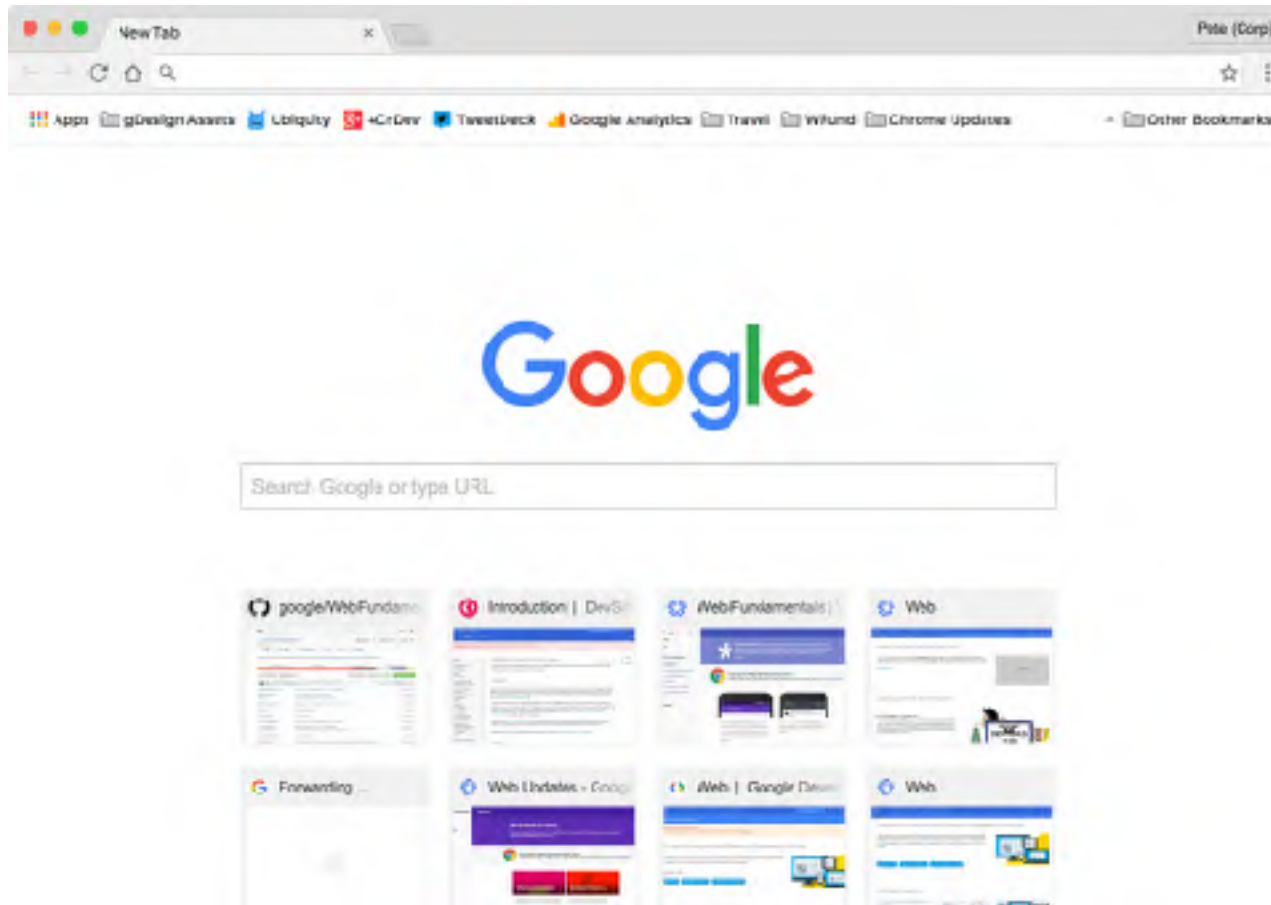
activated

check for
update

2nd Page Load

Service Worker Lifecycle

Install



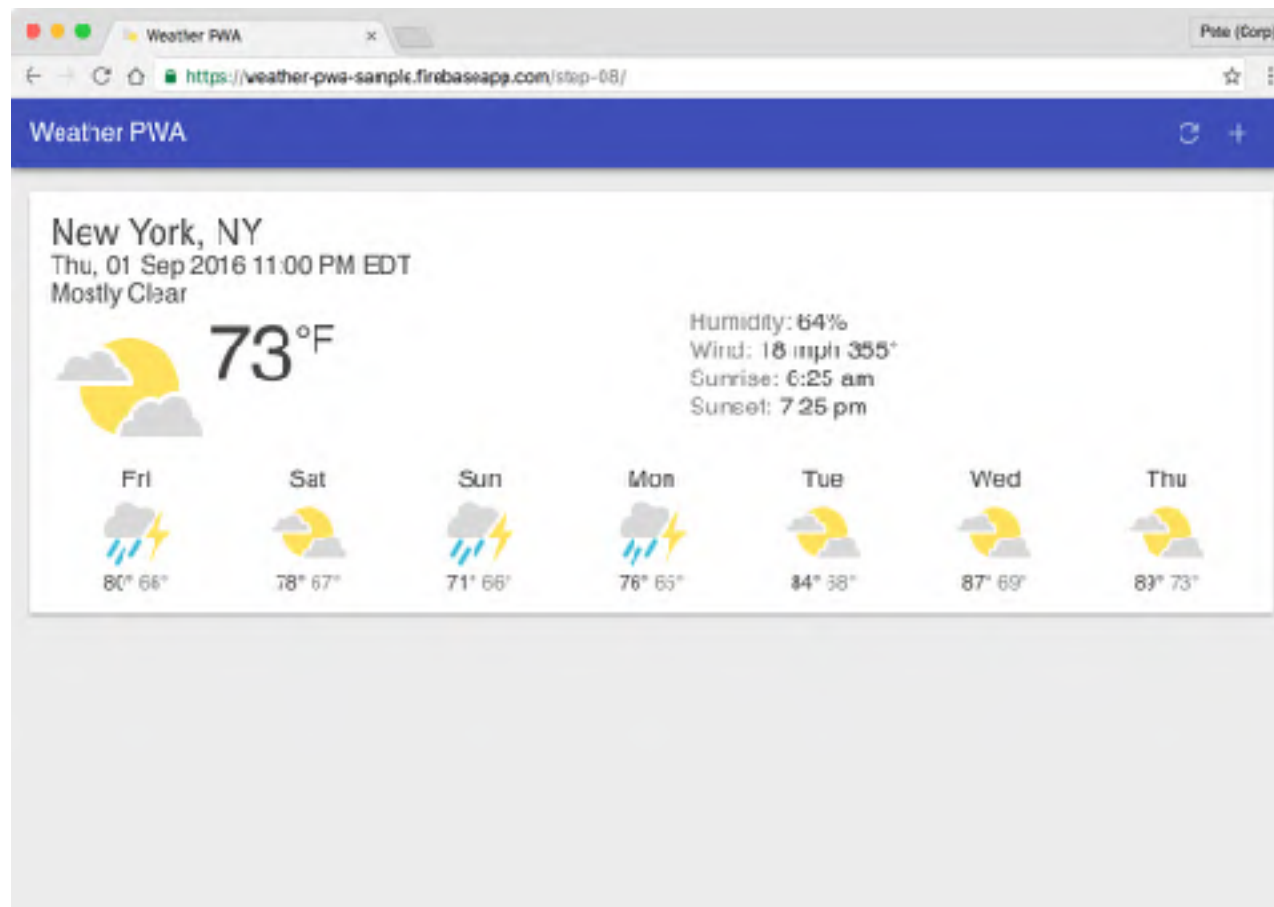
activated

idle

terminated

Close Page

Service Worker Lifecycle Update

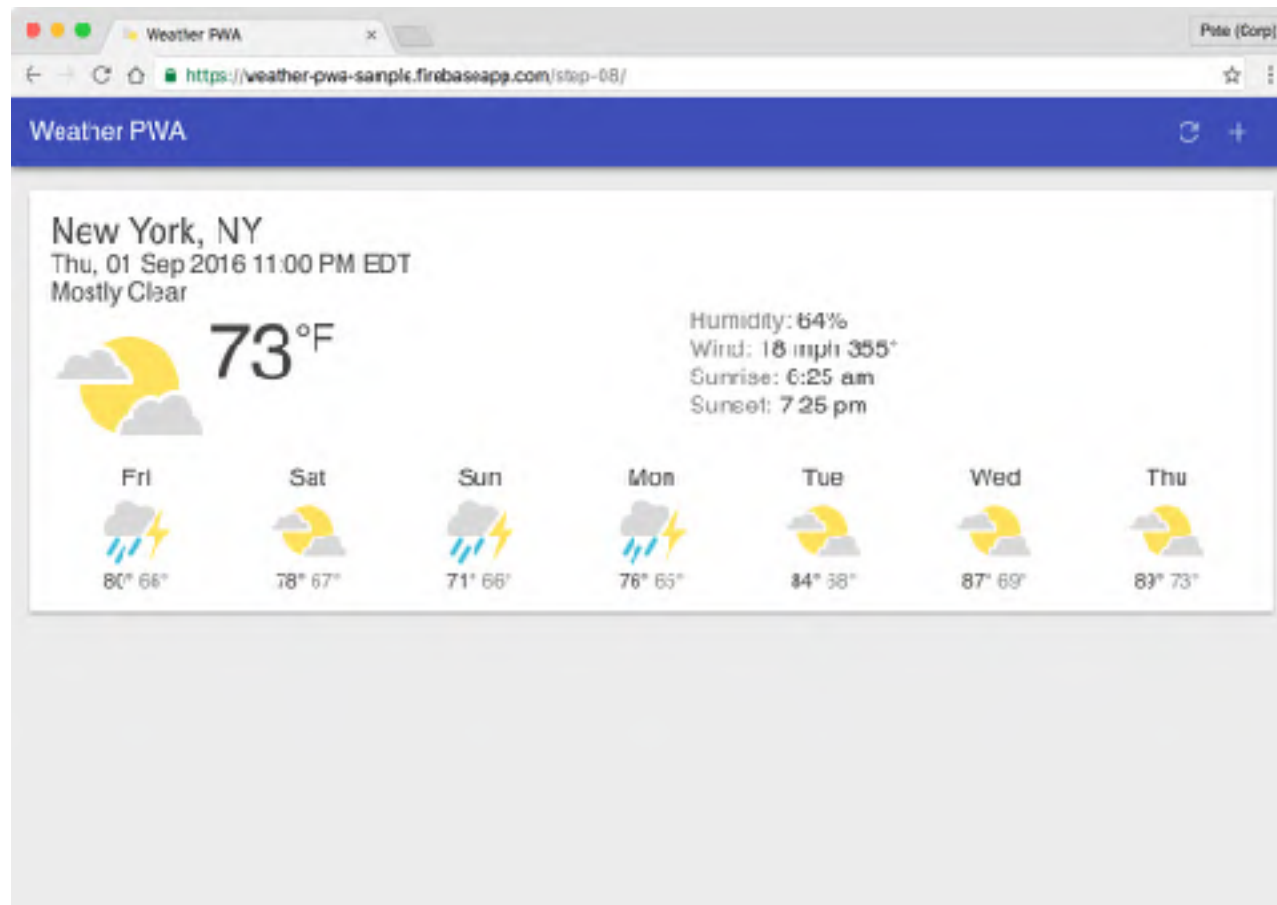


activated

check for
update

Load Page with Service Worker

Service Worker Lifecycle Update



activated

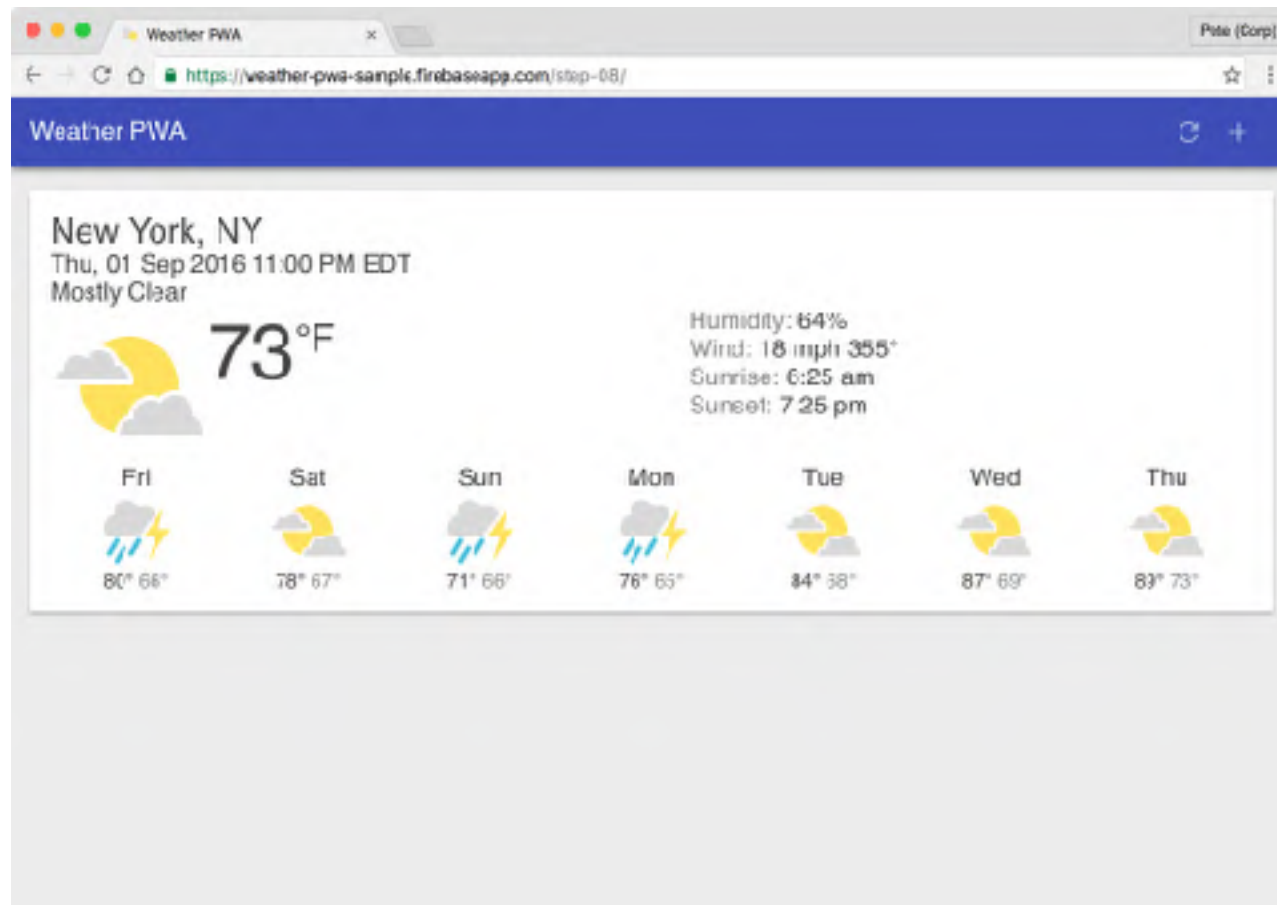
check for
update

install

idle

Load Page with Service Worker

Service Worker Lifecycle Update



activated

check for
update

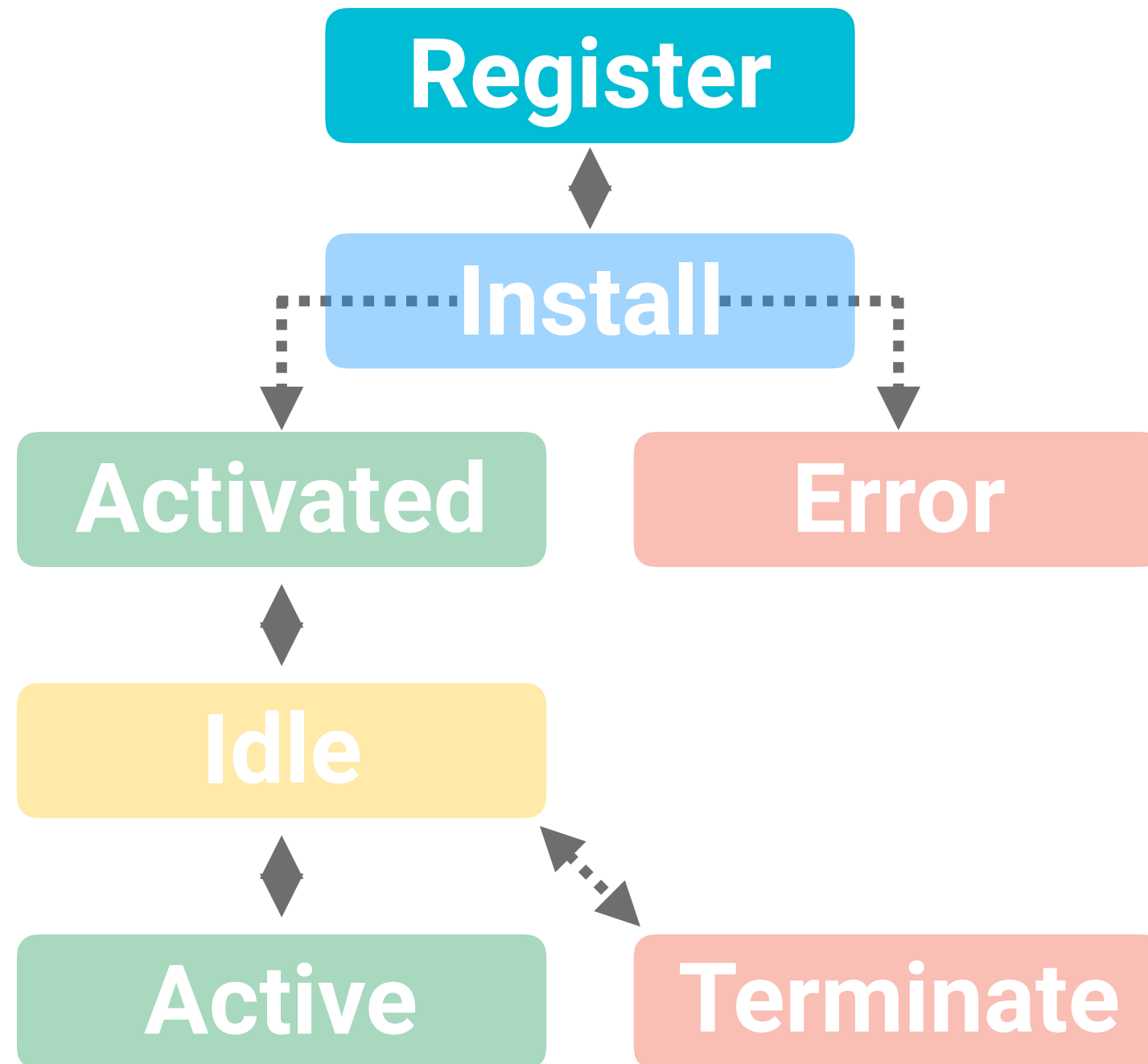
install

idle

Load Page with Service Worker

Implementing a Service Worker

Registration



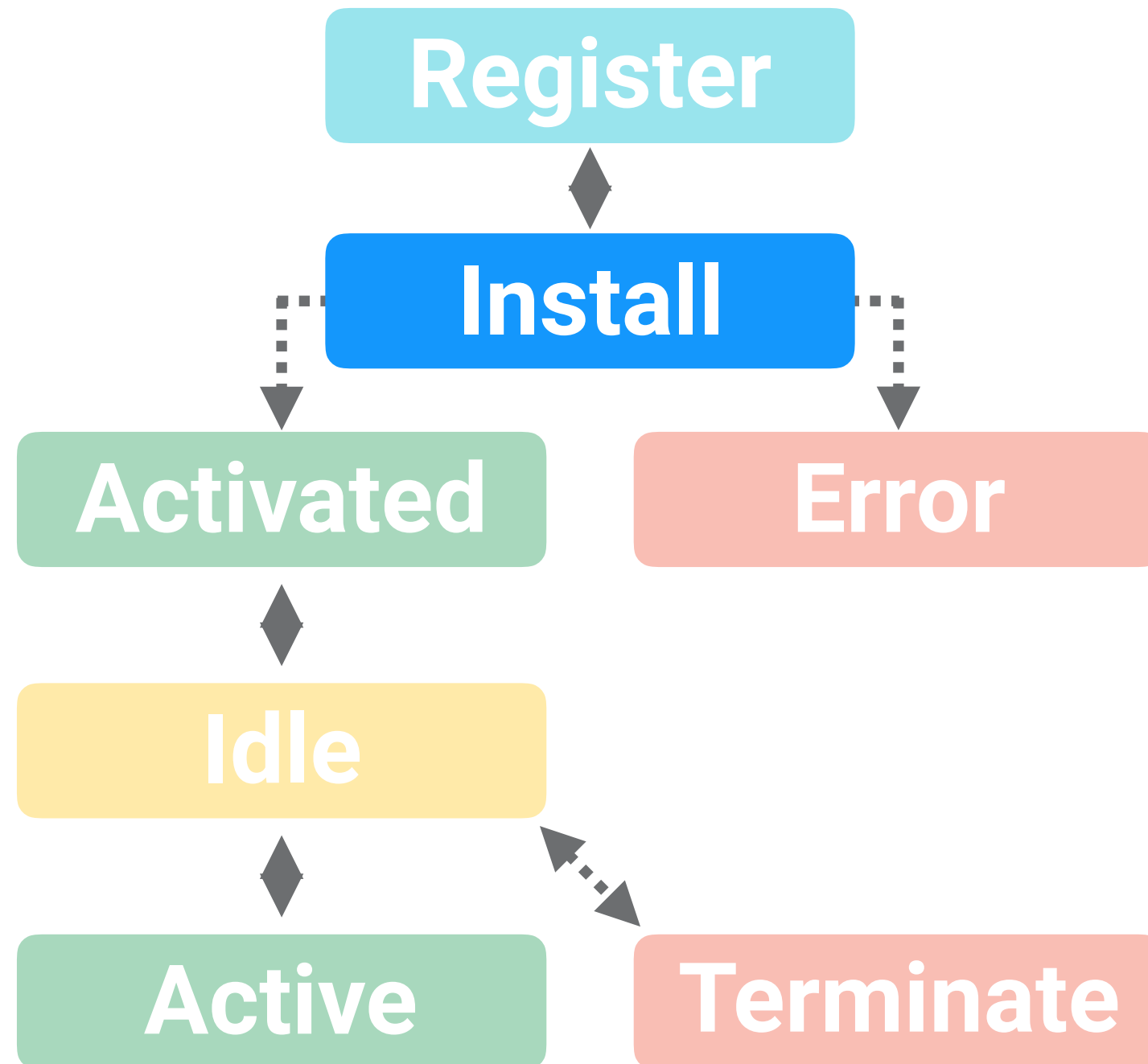
Register the Service Worker

```
if ('serviceWorker' in navigator) {  
  navigator.serviceWorker.register('/service-worker.js')  
    .then(function(reg) {  
      console.log('Service Worker Registered', reg);  
    })  
    .catch(function(err) {  
      console.log('Error registering Service Worker',  
err);  
    });  
}
```

Register the Service Worker

```
if ('serviceWorker' in navigator) {  
  navigator.serviceWorker.register('/service-worker.js')  
    .then(function(reg) {  
      console.log('Service Worker Registered', reg);  
    })  
    .catch(function(err) {  
      console.log('Error registering Service Worker',  
err);  
    });  
}
```

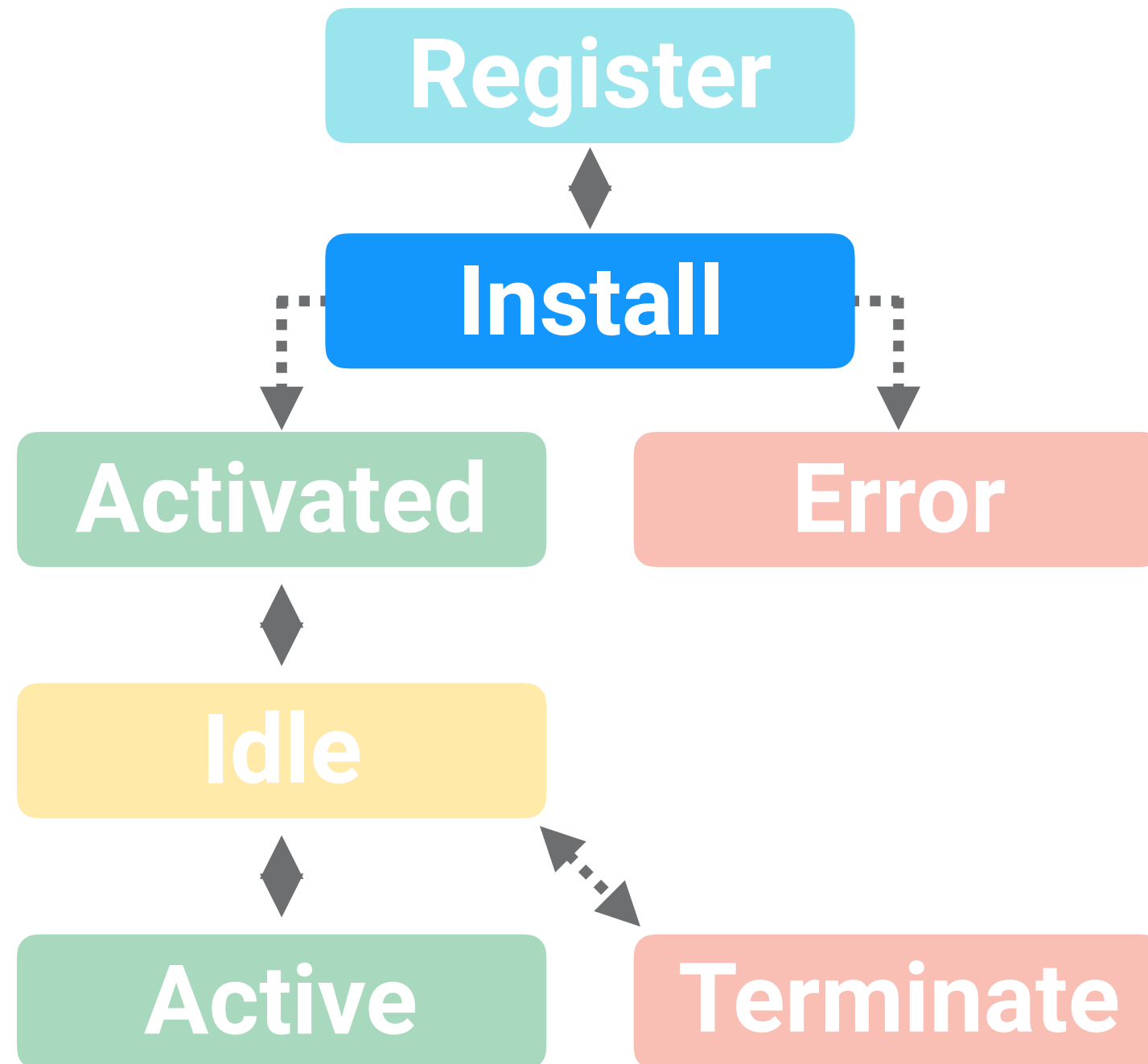

Install Event Handler



Add an install Event handler

```
self.addEventListener('install', function(event) {  
    return self.skipWaiting();  
});
```

Pre-fetch app resources



Pre-fetch the app resources

```
var cacheName = 'app-shell-cache-v1';  
var filesToCache = ['/', '/index.html', ...];  
  
self.addEventListener('install', function(event) {  
  event.waitUntil(  
    caches.open(cacheName).then(function(cache) {  
      return cache.addAll(filesToCache);  
    }).then(function() {  
      return self.skipWaiting();  
    })  
  );  
});
```

Pre-fetch the app resources

```
var cacheName = 'app-shell-cache-v1';
var filesToCache = ['/', '/index.html', ...];

self.addEventListener('install', function(event) {
  event.waitUntil(
    caches.open(cacheName).then(function(cache) {
      return cache.addAll(filesToCache);
    }).then(function() {
      return self.skipWaiting();
    })
  );
});
```

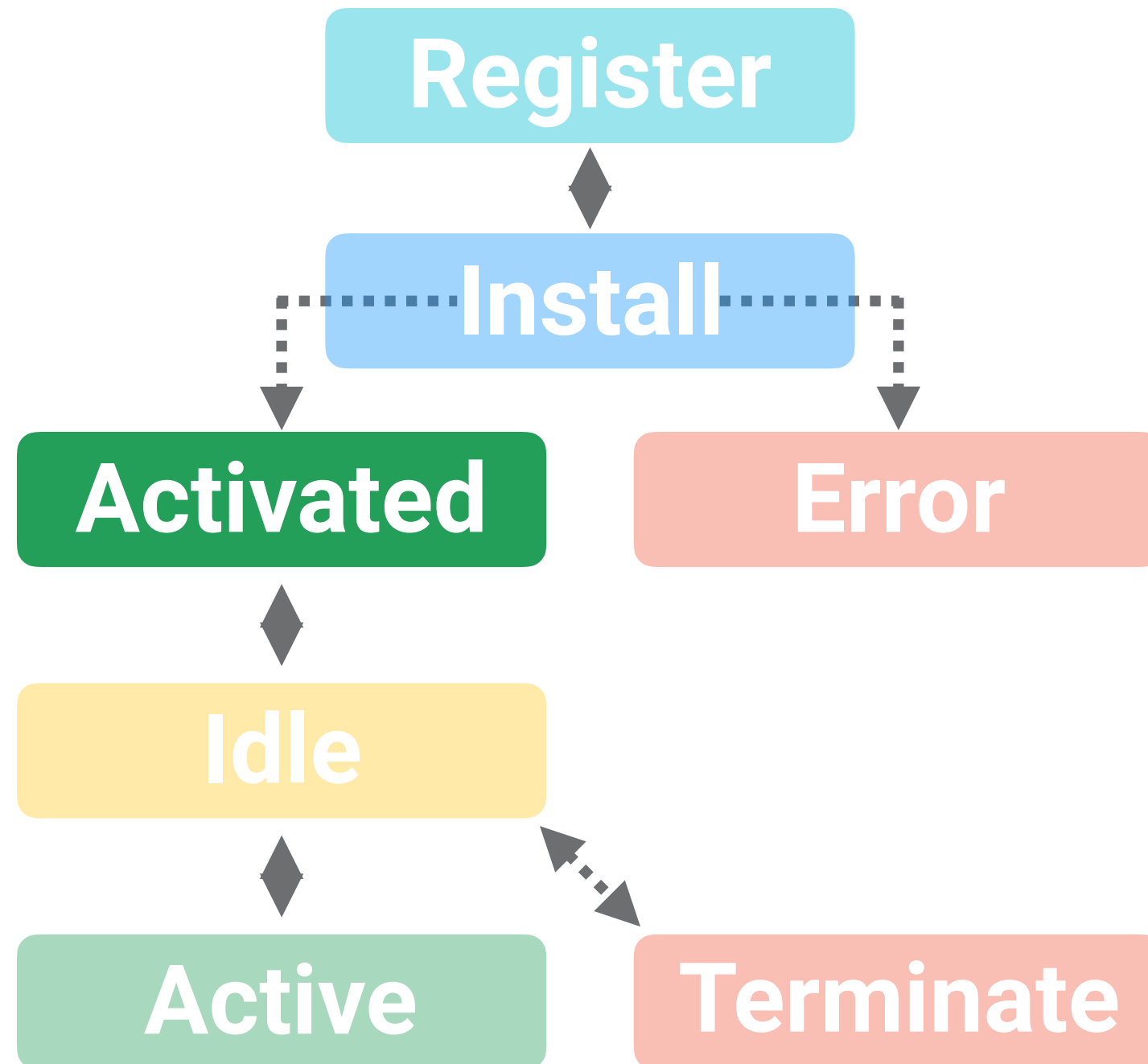
Pre-fetch the app resources

```
var cacheName = 'app-shell-cache-v1';  
var filesToCache = ['/', '/index.html', ...];  
  
self.addEventListener('install', function(event) {  
  event.waitUntil(  
    caches.open(cacheName).then(function(cache) {  
      return cache.addAll(filesToCache);  
    }).then(function() {  
      return self.skipWaiting();  
    })  
  );  
});
```

Pre-fetch the app resources

```
var cacheName = 'app-shell-cache-v1';  
var filesToCache = ['/', '/index.html', ...];  
  
self.addEventListener('install', function(event) {  
  event.waitUntil(  
    caches.open(cacheName).then(function(cache) {  
      return cache.addAll(filesToCache);  
    }).then(function() {  
      return self.skipWaiting();  
    })  
  );  
});
```

Activate Event Handler



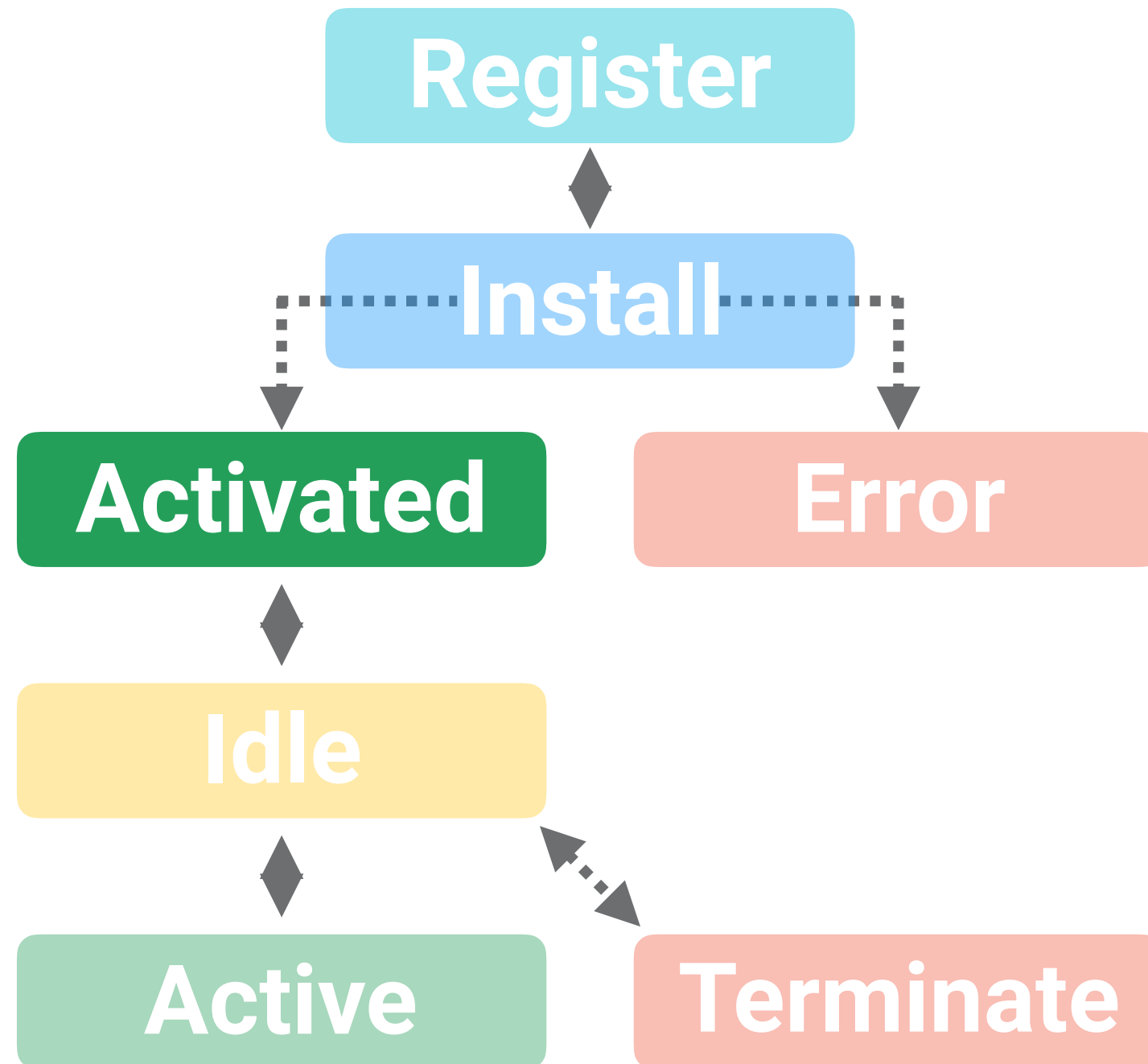
Add activate Event handler

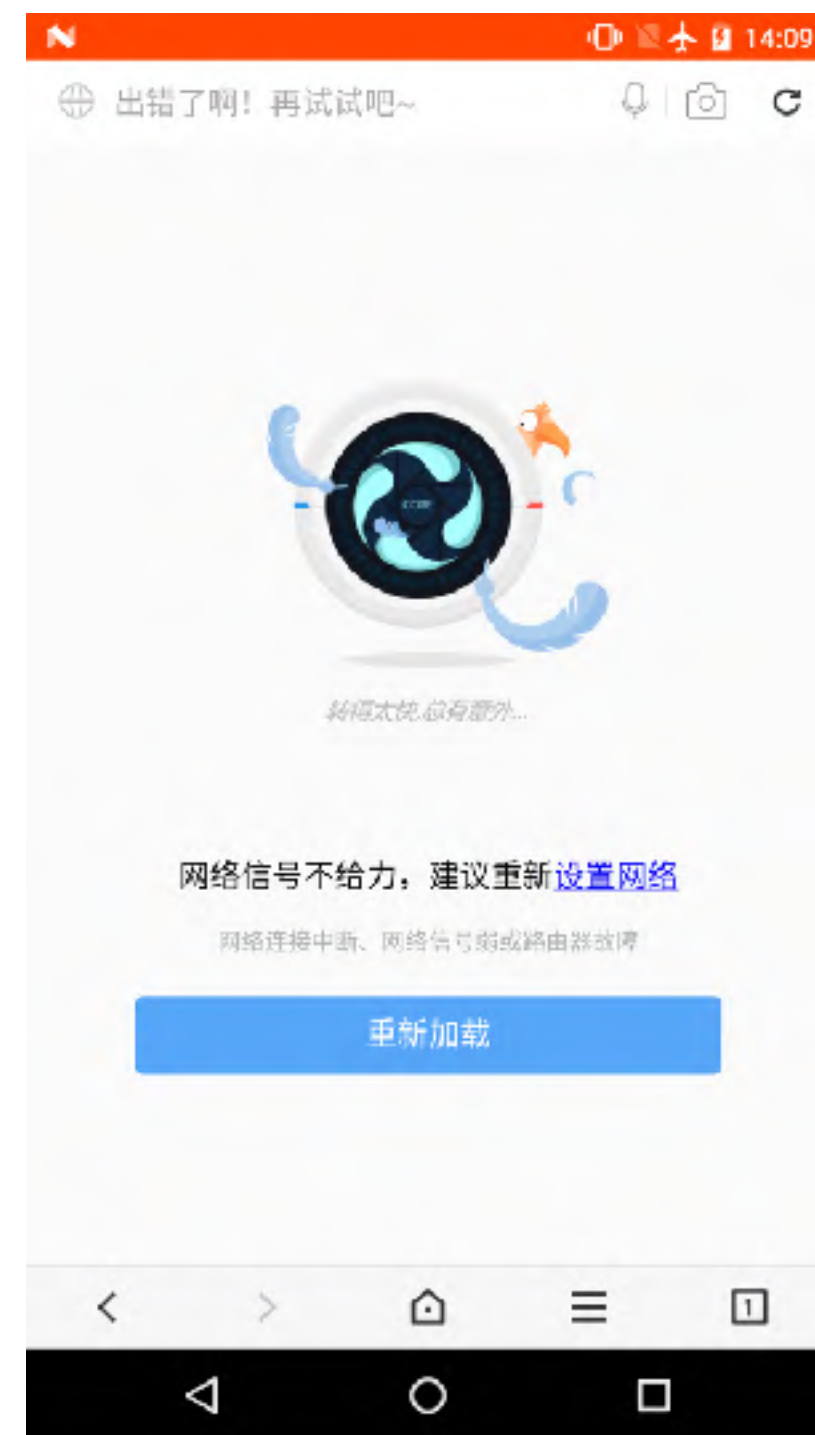
```
self.addEventListener('activate', function(e) {  
  e.waitUntil(  
    caches.keys().then(function(keyList) {  
      return Promise.all(keyList.map(function(key) {  
        if (key !== cacheName) {  
          return caches.delete(key);  
        }  
      }));  
    })  
  );  
  return self.clients.claim();  
});
```

Add activate Event handler

```
self.addEventListener('activate', function(e) {  
  e.waitUntil(  
    caches.keys().then(function(keyList) {  
      return Promise.all(keyList.map(function(key) {  
        if (key !== cacheName) {  
          return caches.delete(key);  
        }  
      }));  
    }));  
  });  
  return self.clients.claim();  
});
```

Not done yet...





Add fetch Event handler

```
self.addEventListener('fetch', function(e) {  
  e.respondWith(  
    caches.match(e.request).then(function(response) {  
      return response || fetch(e.request);  
    })  
  );  
});
```

Add fetch Event handler

```
self.addEventListener('fetch', function(e) {  
  e.respondWith(  
    caches.match(e.request).then(function(response) {  
      return response || fetch(e.request);  
    })  
  );  
});
```

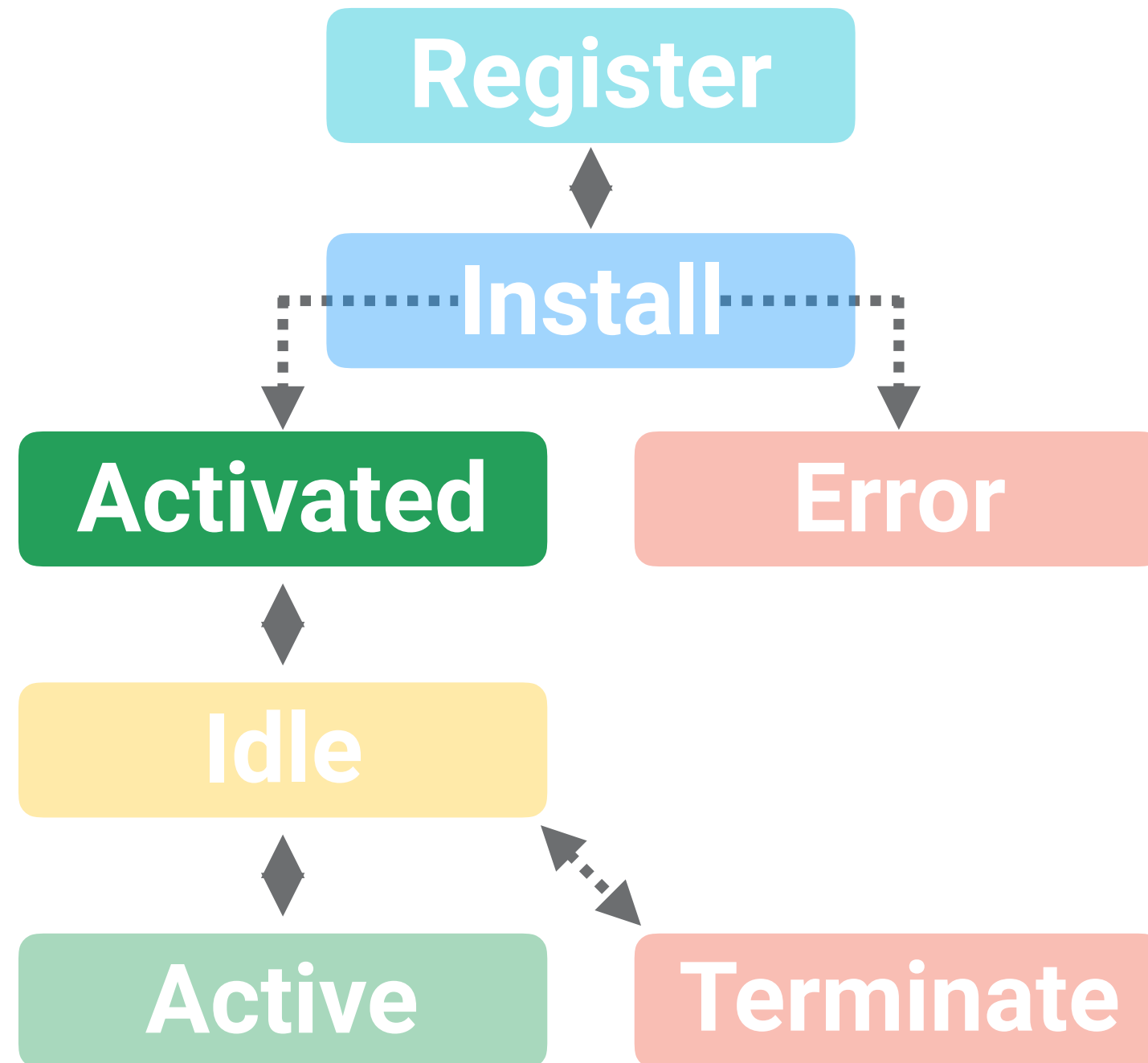
Add fetch Event handler

```
self.addEventListener('fetch', function(e) {  
  e.respondWith(  
    caches.match(e.request).then(function(response) {  
      return response || fetch(e.request);  
    })  
  );  
});
```

Add fetch Event handler

```
self.addEventListener('fetch', function(e) {  
  e.respondWith(  
    caches.match(e.request).then(function(response) {  
      return response || fetch(e.request);  
    })  
  );  
});
```


Ready to go!



Caching Strategies

YOU are in control of the
network

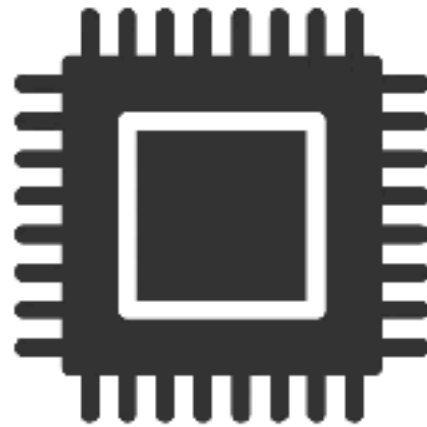
Cache, Falling Back to Network



Page



Network



ServiceWorker



Cache

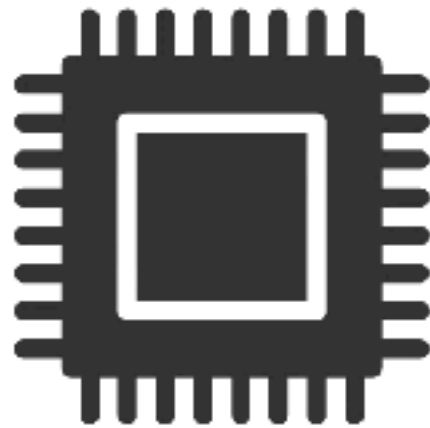
Network, Falling Back to Cache



Page



Cache



ServiceWorker

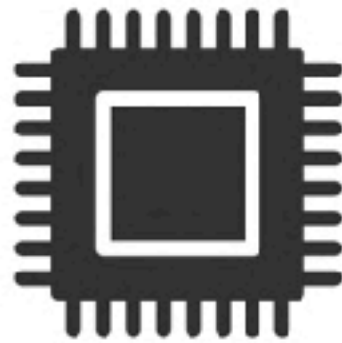


Network

Cache then Network



Page



ServiceWorker



Cache



Network

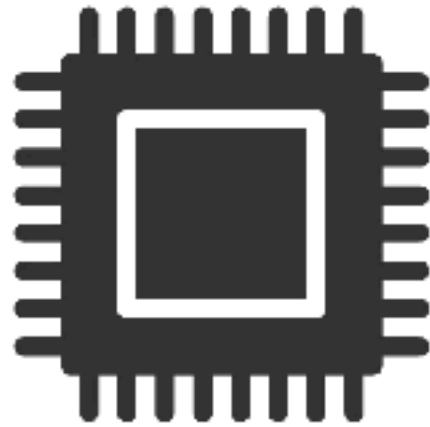
Generic Fallback



Page



Cache

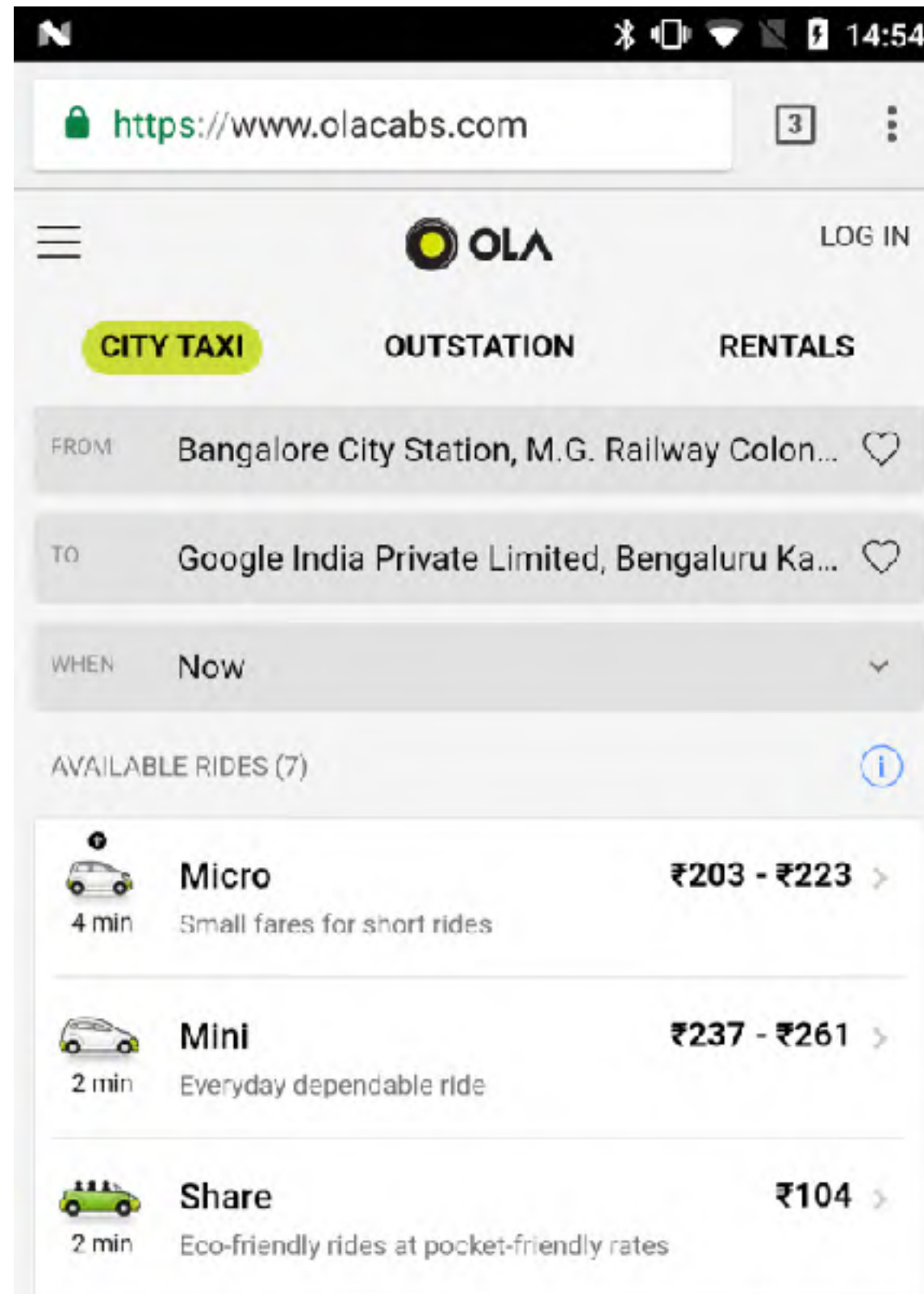


ServiceWorker

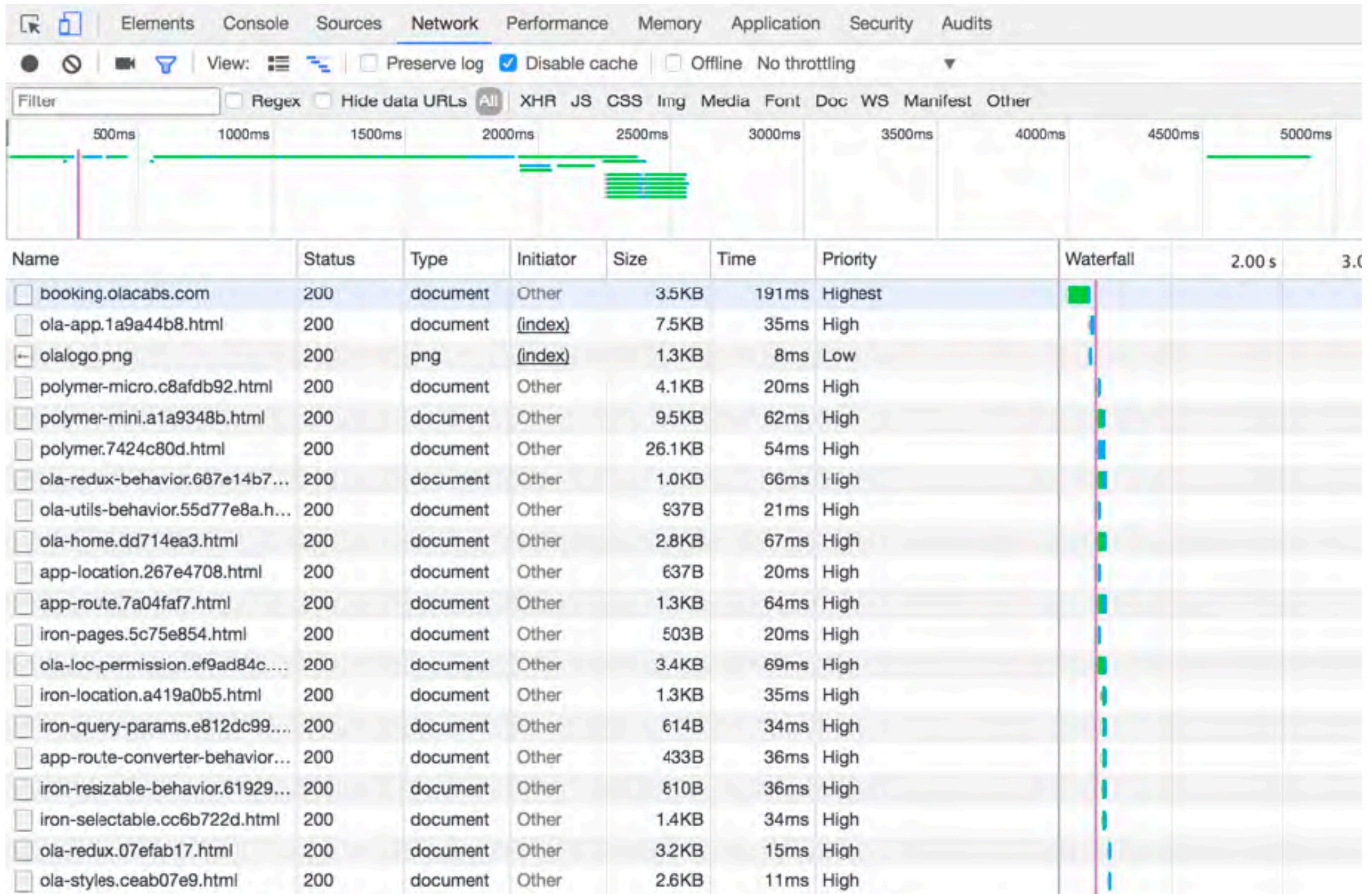


Network

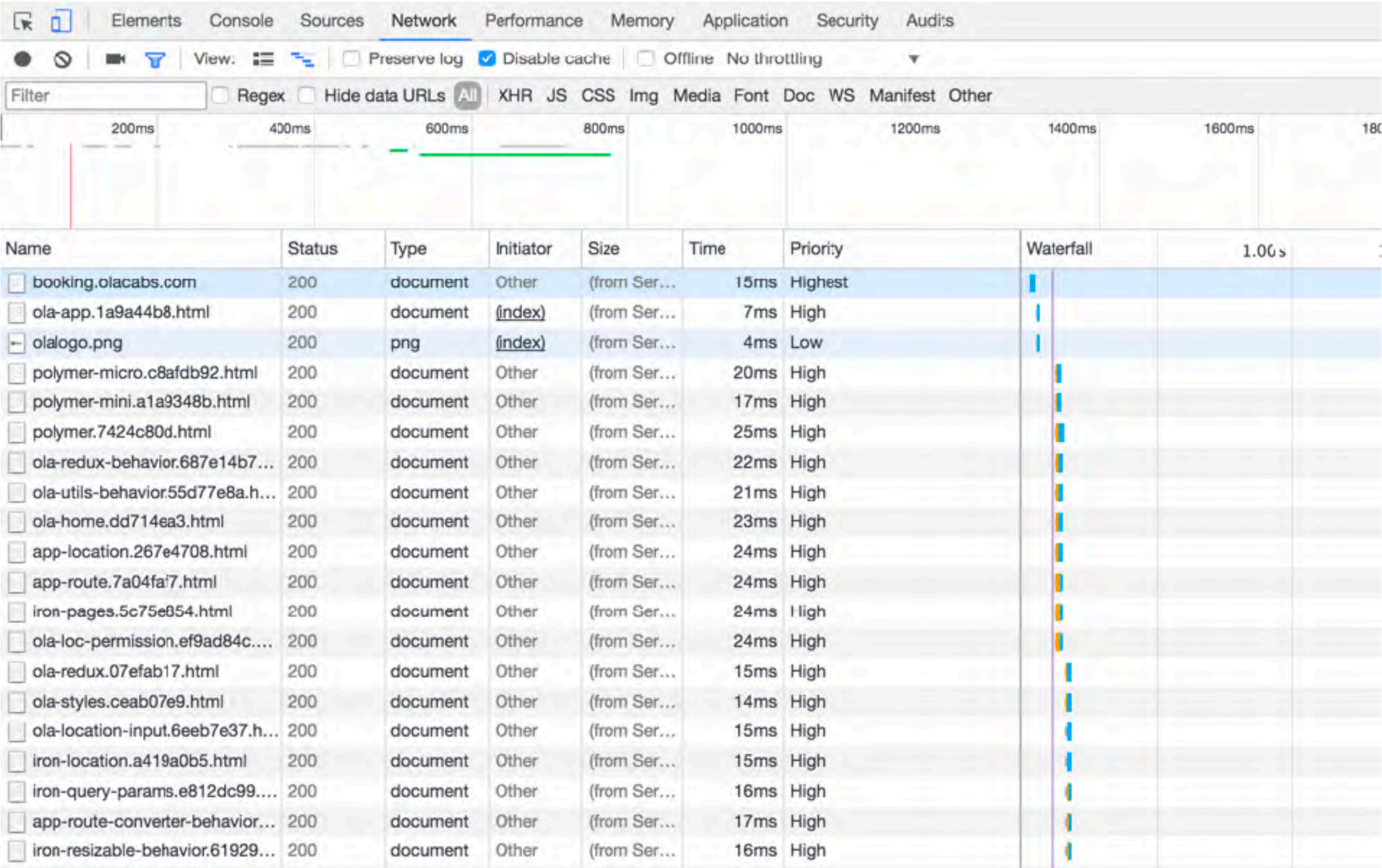
Ola Cabs



Ola Cabs - Before



Ola Cabs - After



The screenshot displays the Chrome DevTools Network tab. The top toolbar includes tabs for Elements, Console, Sources, Network (selected), Performance, Memory, Application, Security, and Audits. Below the tabs, there are icons for recording, pausing, and a filter icon. The 'View' section shows 'Preserve log' (unchecked), 'Disable cache' (checked), 'Offline' (unchecked), and 'No throttling' (selected). A 'Filter' input field is present, followed by checkboxes for 'Regex', 'Hide data URLs', and 'All' (selected). Below these are filters for XHR, JS, CSS, Img, Media, Font, Doc, WS, Manifest, and Other. A timeline at the top shows a scale from 0 to 1800ms. The main area contains a waterfall chart and a table of network requests.

Name	Status	Type	Initiator	Size	Time	Priority	Waterfall	1.00 s
<input type="checkbox"/> booking.olacabs.com	200	document	Other	(from Ser...	15ms	Highest		
<input type="checkbox"/> ola-app.1a9a44b8.html	200	document	(index)	(from Ser...	7ms	High		
<input type="checkbox"/> olalogo.png	200	png	(index)	(from Ser...	4ms	Low		
<input type="checkbox"/> polymer-micro.c8afdb92.html	200	document	Other	(from Ser...	20ms	High		
<input type="checkbox"/> polymer-mini.a1a9348b.html	200	document	Other	(from Ser...	17ms	High		
<input type="checkbox"/> polymer.7424c80d.html	200	document	Other	(from Ser...	25ms	High		
<input type="checkbox"/> ola-redux-behavior.687e14b7...	200	document	Other	(from Ser...	22ms	High		
<input type="checkbox"/> ola-utils-behavior.55d77e8a.h...	200	document	Other	(from Ser...	21ms	High		
<input type="checkbox"/> ola-home.dd714ea3.html	200	document	Other	(from Ser...	23ms	High		
<input type="checkbox"/> app-location.267e4708.html	200	document	Other	(from Ser...	24ms	High		
<input type="checkbox"/> app-route.7a04fa17.html	200	document	Other	(from Ser...	24ms	High		
<input type="checkbox"/> iron-pages.5c75e854.html	200	document	Other	(from Ser...	24ms	High		
<input type="checkbox"/> ola-loc-permission.ef9ad84c....	200	document	Other	(from Ser...	24ms	High		
<input type="checkbox"/> ola-redux.07efab17.html	200	document	Other	(from Ser...	15ms	High		
<input type="checkbox"/> ola-styles.ceab07e9.html	200	document	Other	(from Ser...	14ms	High		
<input type="checkbox"/> ola-location-input.6eeb7e37.h...	200	document	Other	(from Ser...	15ms	High		
<input type="checkbox"/> iron-location.a419a0b5.html	200	document	Other	(from Ser...	15ms	High		
<input type="checkbox"/> iron-query-params.e812dc99....	200	document	Other	(from Ser...	16ms	High		
<input type="checkbox"/> app-route-converter-behavior...	200	document	Other	(from Ser...	17ms	High		
<input type="checkbox"/> iron-resizable-behavior.61929...	200	document	Other	(from Ser...	16ms	High		

Tools

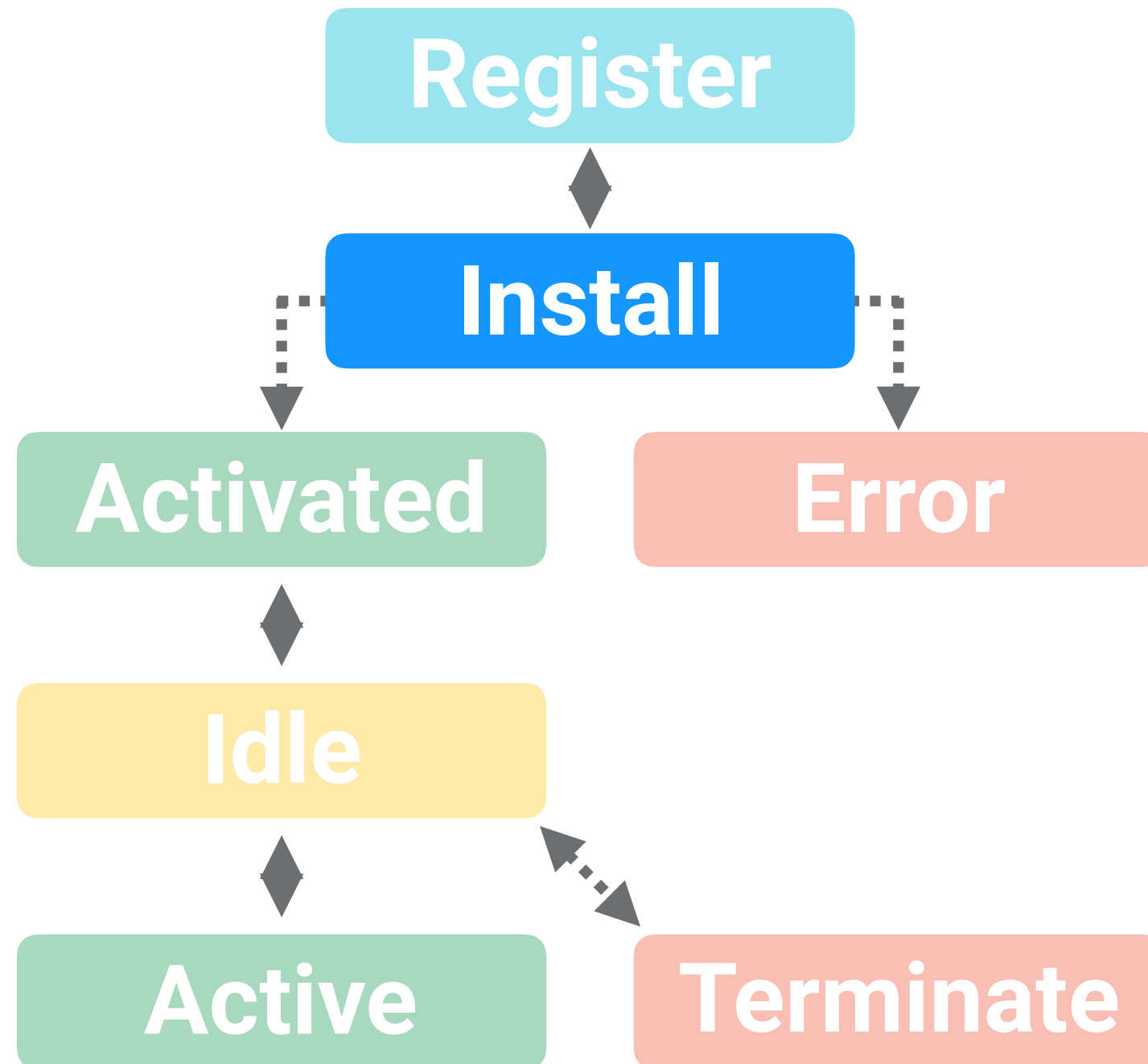
Making your life easier :)



Workbox

workboxjs.org

Pre-caching without Workbox



service-worker.js

```
const VERSION = 1;

const urls = [ '/', 'index.html', 'main.abc123.css', 'app.
347bac.js' ];

self.addEventListener('install', event => {
  event.waitUntil(
    caches.open(`cache-${VERSION}`)
      .then(cache => cache.addAll(urls));
  );
});
```

service-worker.js

```
const VERSION = 1;

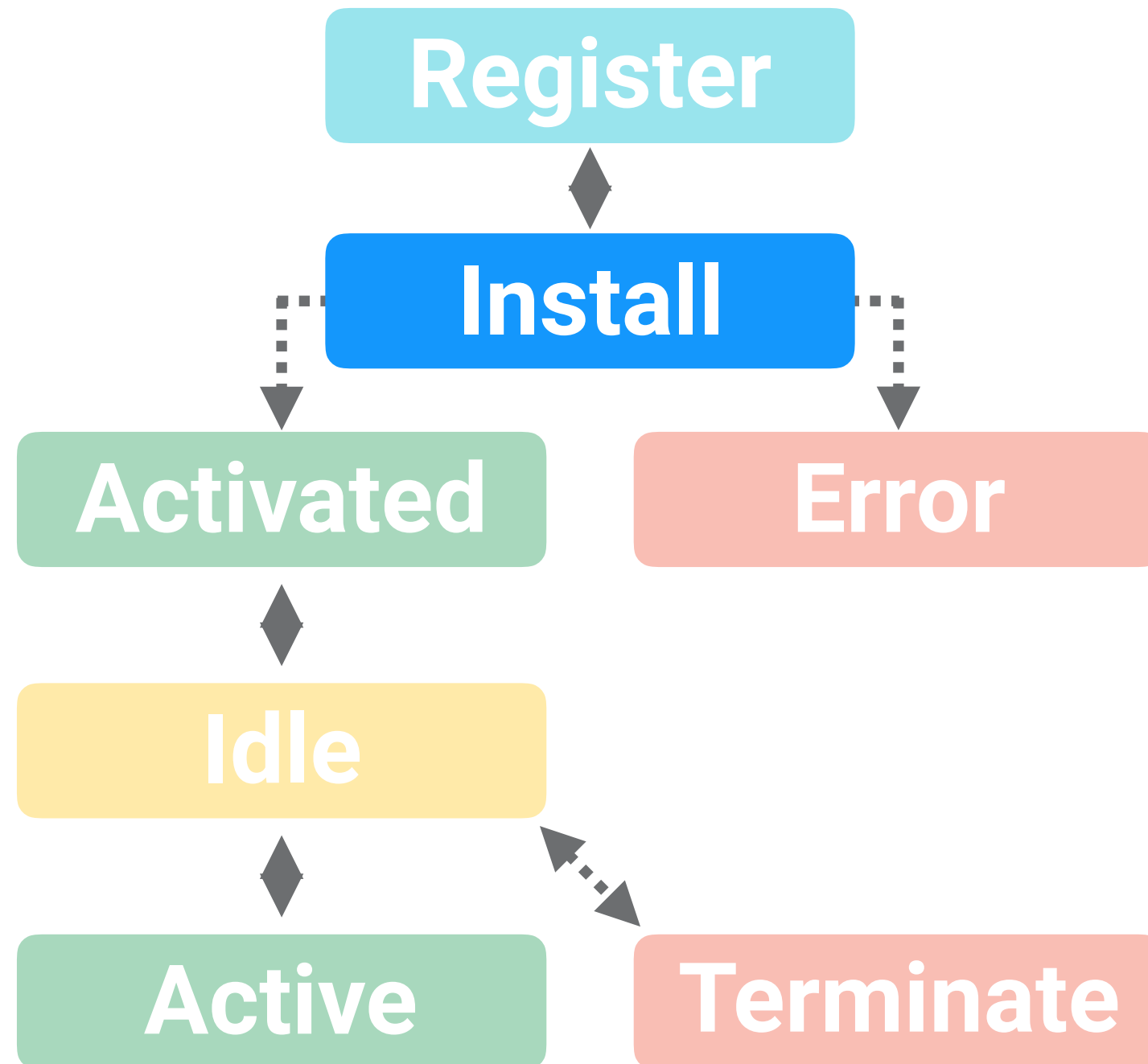
const urls = [ '/', 'index.html', 'main.abc123.css', 'app.
347bac.js' ];

self.addEventListener('install', event => {
  event.waitUntil(
    caches.open(`cache-${VERSION}`)
      .then(cache => cache.addAll(urls));
  );
});
```


A close-up, high-angle shot of Spider-Man in his iconic red and blue suit. He is looking down with a serious expression over a sprawling city at night, with lights from buildings and streets visible in the background. The text "WITH GREAT POWER COMES GREAT RESPONSIBILITY.." is overlaid in white, bold, sans-serif font across the center of the image.

WITH GREAT POWER COMES GREAT RESPONSIBILITY..

Pre-caching using workbox-build



src/service-worker.js

```
// In src/service-worker.js, precache() is passed an
```

```
// empty array as a placeholder.
```

```
workboxSW.precache([]);
```

```
// Other Workbox code goes here.
```

build/service-worker.js

// In build/service-worker.js, precache() is passed a manifest of

// URLs and revision info.

```
workboxSW.precache([  
  {url: '/index.html', revision: '123bcd'},  
  {url: '/app.js', revision: 'def456'},  
  {url: '/styles.css', revision: '876abc'},  
  // etc.  
]);
```

// Other Workbox code goes here.

build.js

```
workboxBuild.injectManifest({  
  swSrc: 'src/service-worker.js',  
  swDest: 'build/service-worker.js',  
  globDirectory: 'build/',  
  globPatterns: [  
    'static/{js,css,data}/**/!(*map*)',  
    'static/images/priority/*'  
  ],  
  templatedUrls: {  
    '/': ['pages/index.html']  
  },  
});
```

build.js

```
workboxBuild.injectManifest({  
  swSrc: 'src/service-worker.js',  
  swDest: 'build/service-worker.js',  
  globDirectory: 'build/',  
  globPatterns: [  
    'static/{js,css,data}/**/!(*map*)',  
    'static/images/priority/*'  
  ],  
  templatedUrls: {  
    '/': ['pages/index.html']  
  },  
});
```

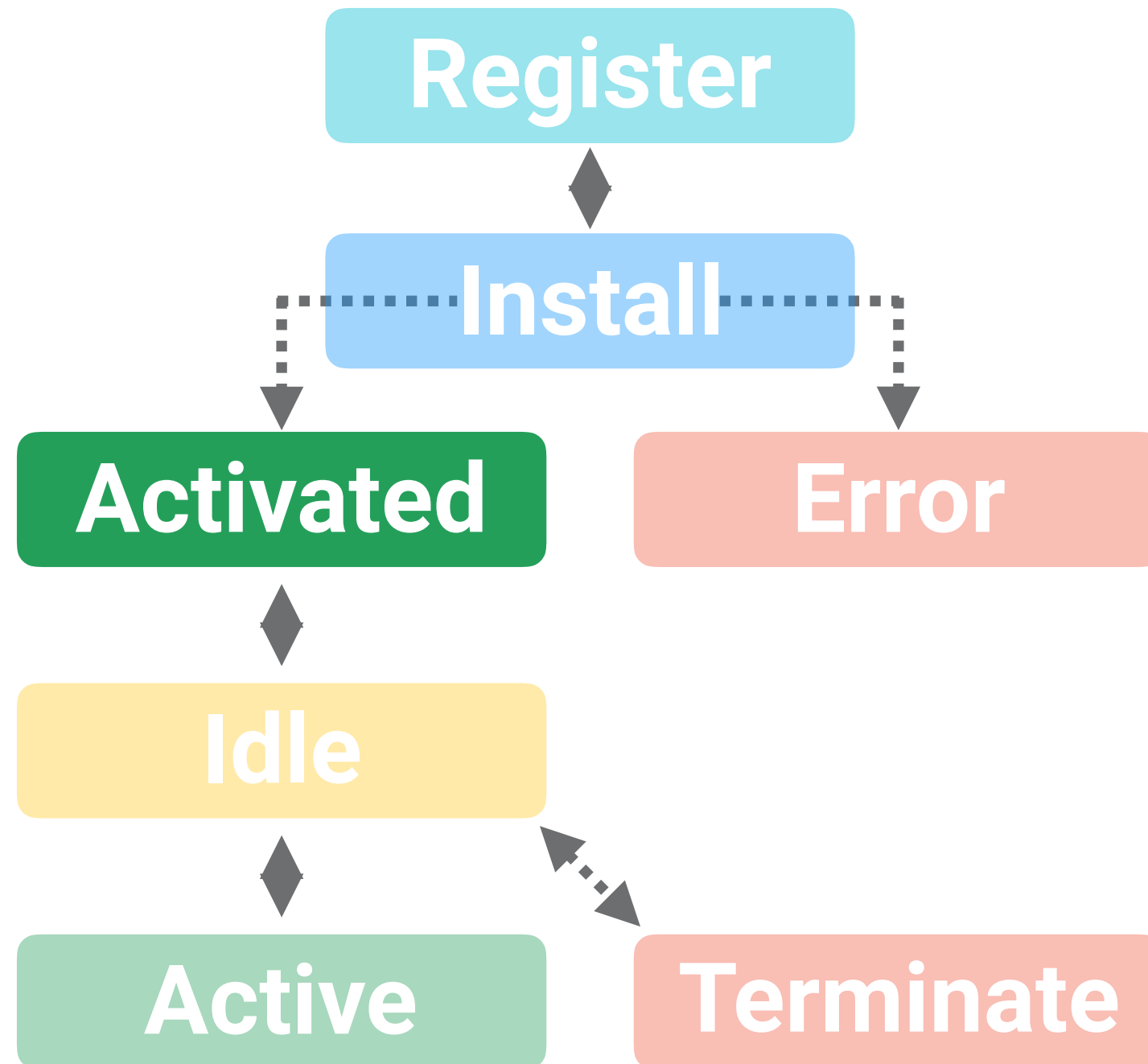
build.js

```
workboxBuild.injectManifest({  
  swSrc: 'src/service-worker.js',  
  swDest: 'build/service-worker.js',  
  globDirectory: 'build/',  
  globPatterns: [  
    'static/{js,css,data}/**/!(*map*)',  
    'static/images/priority/*'  
  ],  
  templatedUrls: {  
    '/': ['pages/index.html']  
  },  
});
```

build.js

```
workboxBuild.injectManifest({  
  swSrc: 'src/service-worker.js',  
  swDest: 'build/service-worker.js',  
  globDirectory: 'build/',  
  globPatterns: [  
    'static/{js,css,data}/**/!(*map*)',  
    'static/images/priority/*'  
  ],  
  templatedUrls: {  
    '/': ['pages/index.html']  
  },  
});
```

Run-time caching without Workbox



service-worker.js

```
const runtimeCaching = async request => {  
  const cache = await caches.open('images-cache');  
  const fetchResponse = await fetch(request);  
  
  await cache.put(request, fetchResponse.clone());  
  
  return fetchResponse;  
};
```


service-worker.js

```
const runtimeCaching = async request => {  
  const cache = await caches.open('images-cache');  
  const fetchResponse = await fetch(request);  
  
  await cache.put(request, fetchResponse.clone());  
  
  return fetchResponse;  
};
```

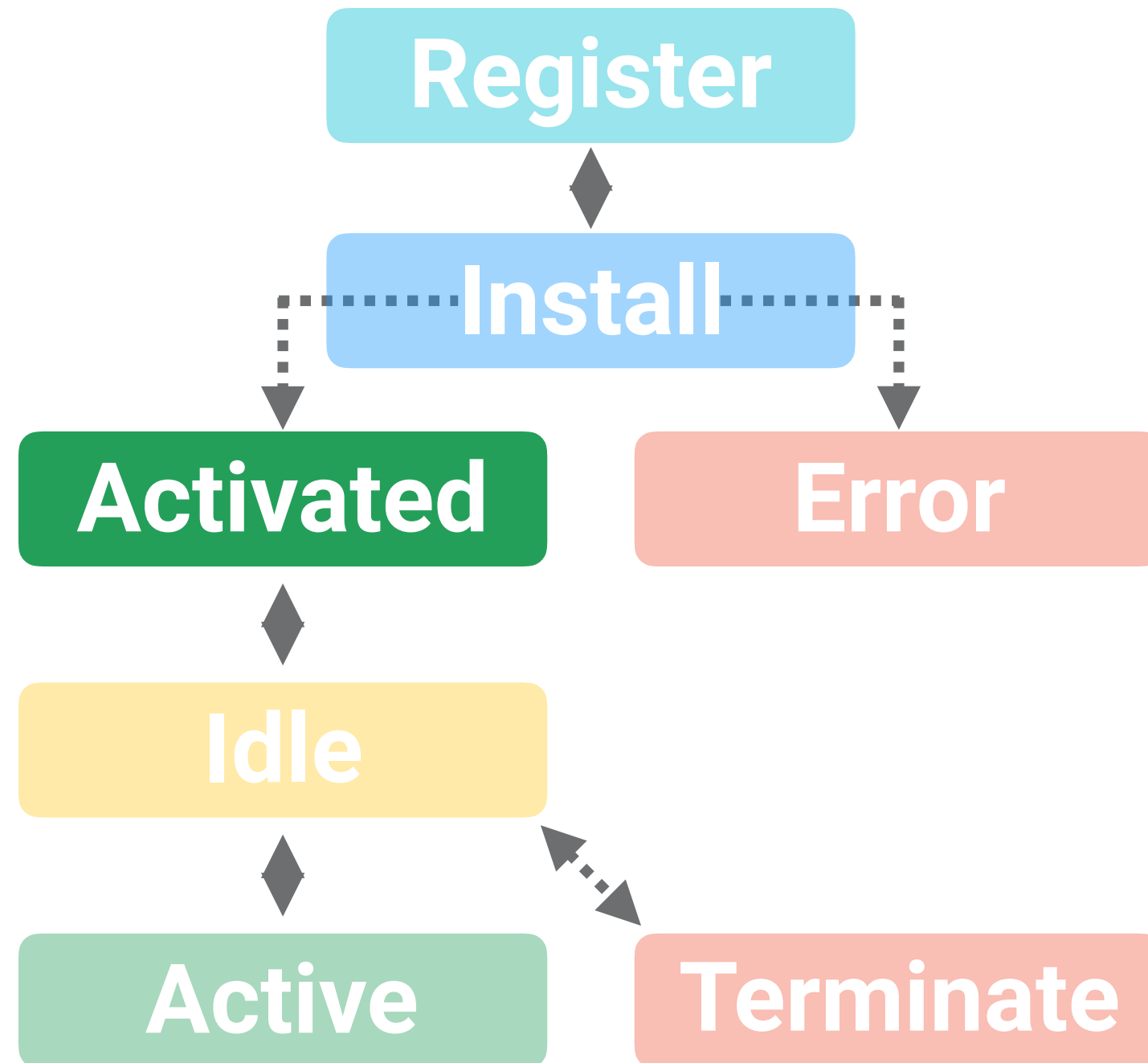
service-worker.js

```
self.addEventListener('fetch', event => {  
  const request = event.request;  
  
  if (request.url.endsWith('.png')) {  
    event.respondWith(  
      runtimeCaching(request)  
    );  
  }  
});
```

service-worker.js

```
self.addEventListener('fetch', event => {  
  const request = event.request;  
  
  if (request.url.endsWith('.png')) {  
    event.respondWith(  
      runtimeCaching(request)  
    );  
  }  
});  
  
else if (request.url.endsWith('.css')) {...}  
else if (request.url.includes('fonts')) {...}  
else if (request.url.includes('api_endpoint')) {...}
```

Run-time caching using workbox-sw



service-worker.js

```
workbox.router.registerRoute(  
  new RegExp( '\\.png$' ),  
  
  workbox.strategies.cacheFirst({  
    cacheName: 'images-cache',  
    cacheExpiration: {maxEntries: 10},  
  })  
);
```

service-worker.js

```
workbox.router.registerRoute(  
  new RegExp( '\\.png$' ),  
  
  workbox.strategies.cacheFirst({  
    cacheName: 'images-cache',  
    cacheExpiration: {maxEntries: 10},  
  })  
);
```

service-worker.js

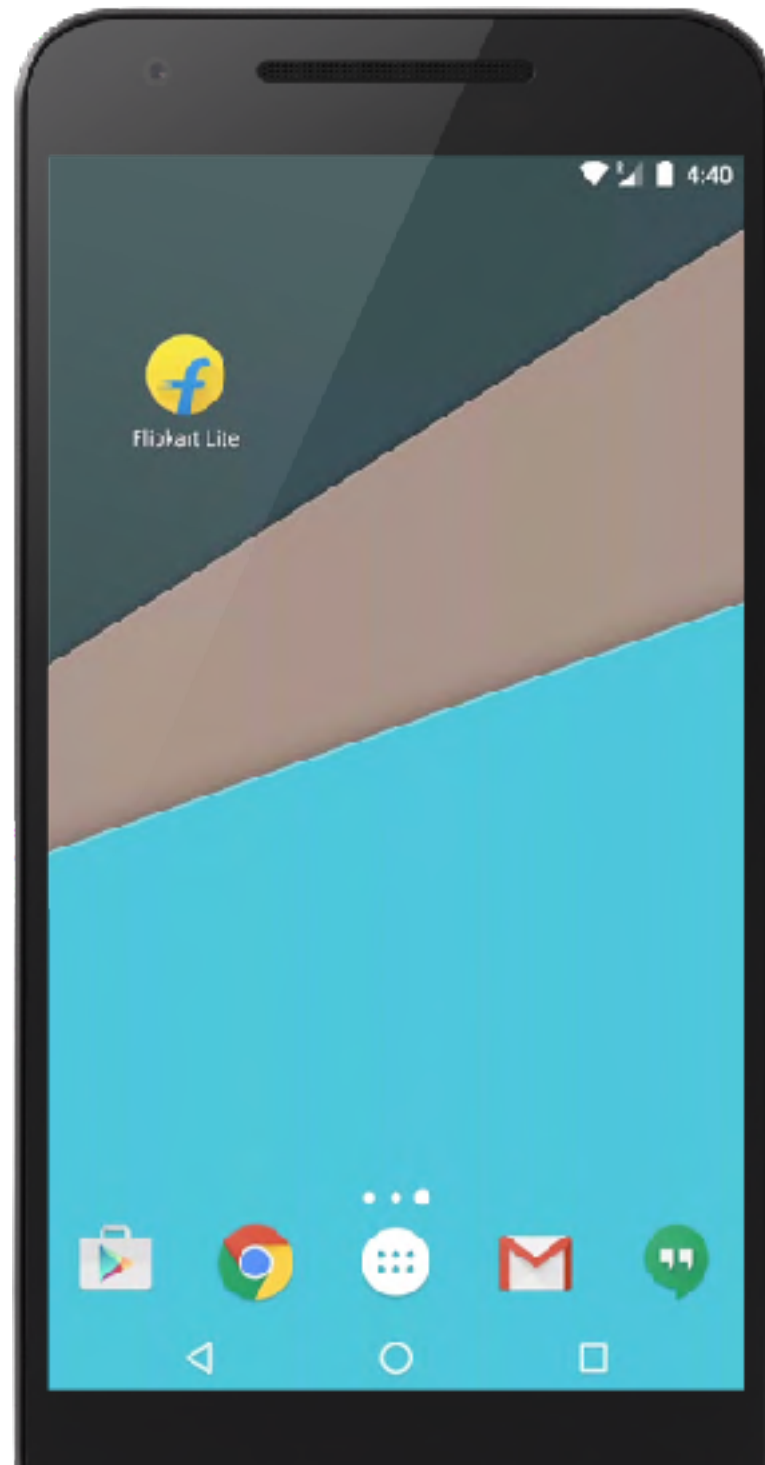
```
workbox.router.registerRoute(  
  new RegExp( '\\.png$' ),  
  
  workbox.strategies.cacheFirst({  
    cacheName: 'images-cache',  
    cacheExpiration: {maxEntries: 10},  
  })  
);
```

service-worker.js

```
workbox.router.registerRoute(  
  new RegExp( '\\.png$' ),  
  
  workbox.strategies.cacheFirst({  
    cacheName: 'images-cache',  
    cacheExpiration: {maxEntries: 4},  
  })  
);
```


Service Workers

The core underpinning PWAs



THANKS!

