

Cross platform web app development

Tomás Pérez - [@tomasperezv](#)

José M. Pérez - [@jmperezperez](#)



Contents

Web development in Spotify

- Why and how
- Benefits and learnings

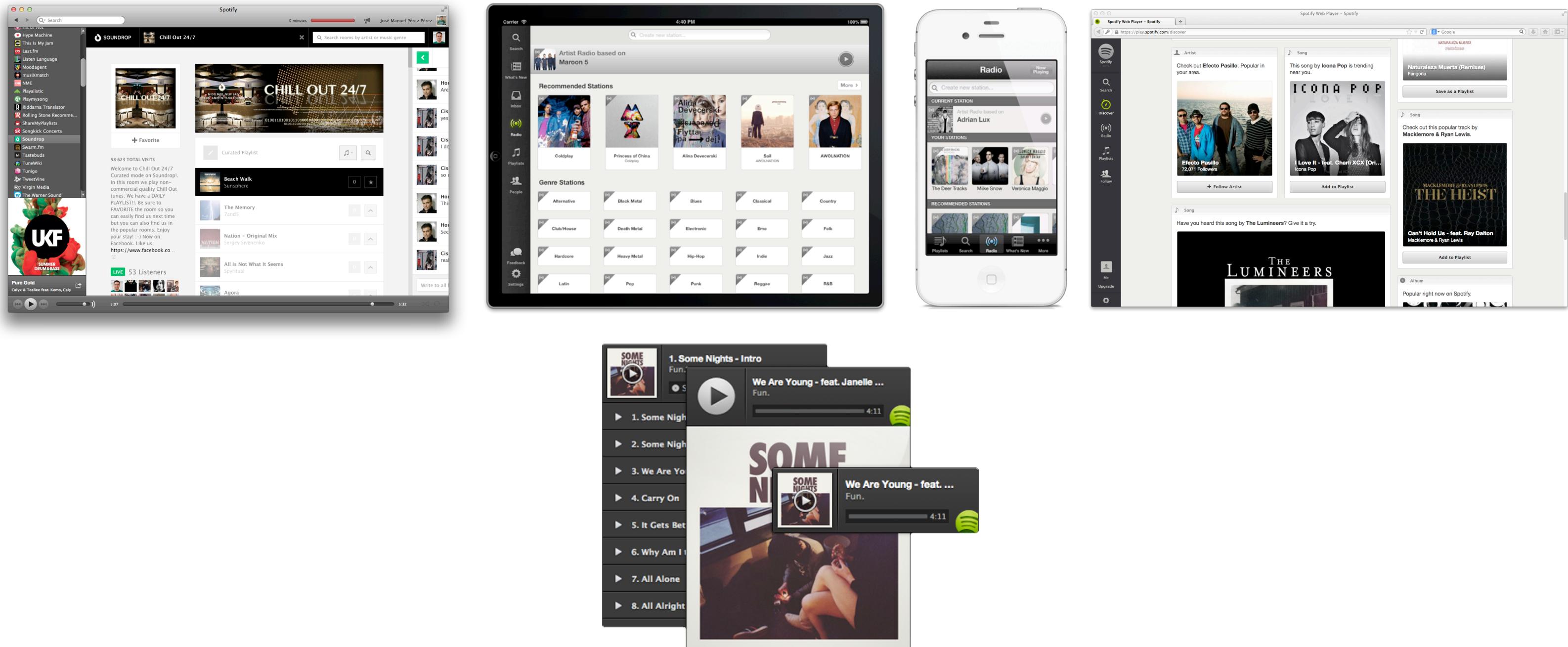
Key web technologies that we use

- IFRAMES and postMessage: security and performance
- Communication between different tabs

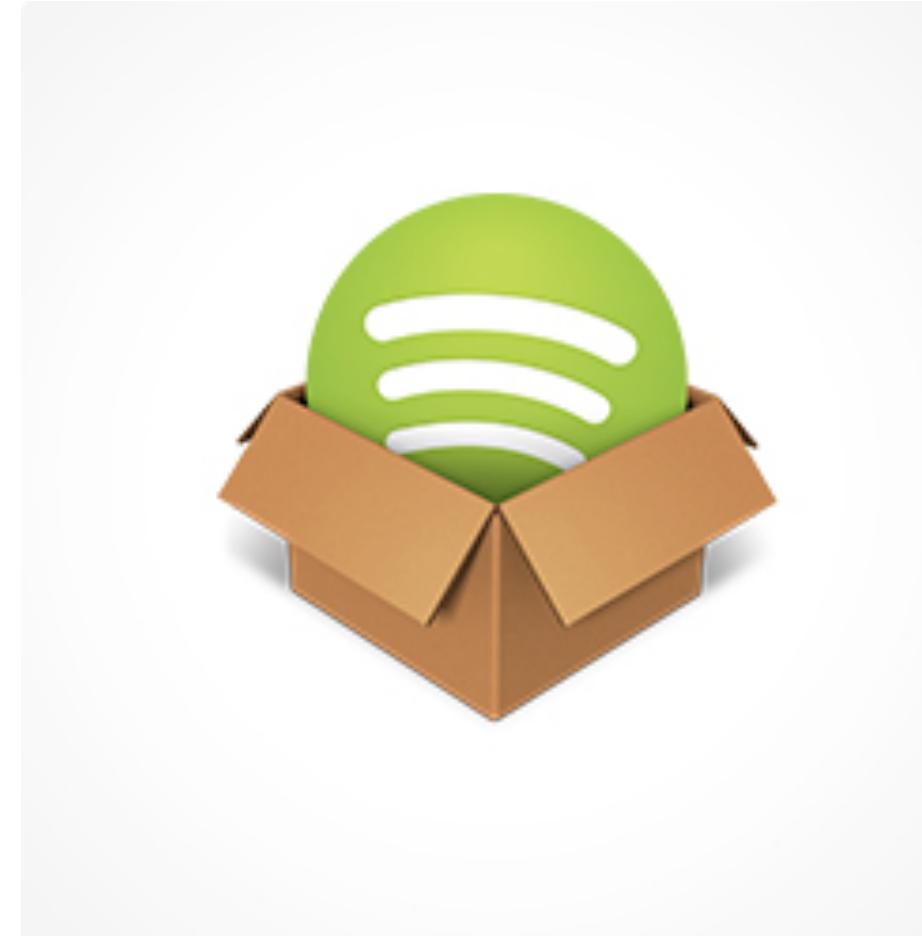
Summary

Questions

Spotify <3 web



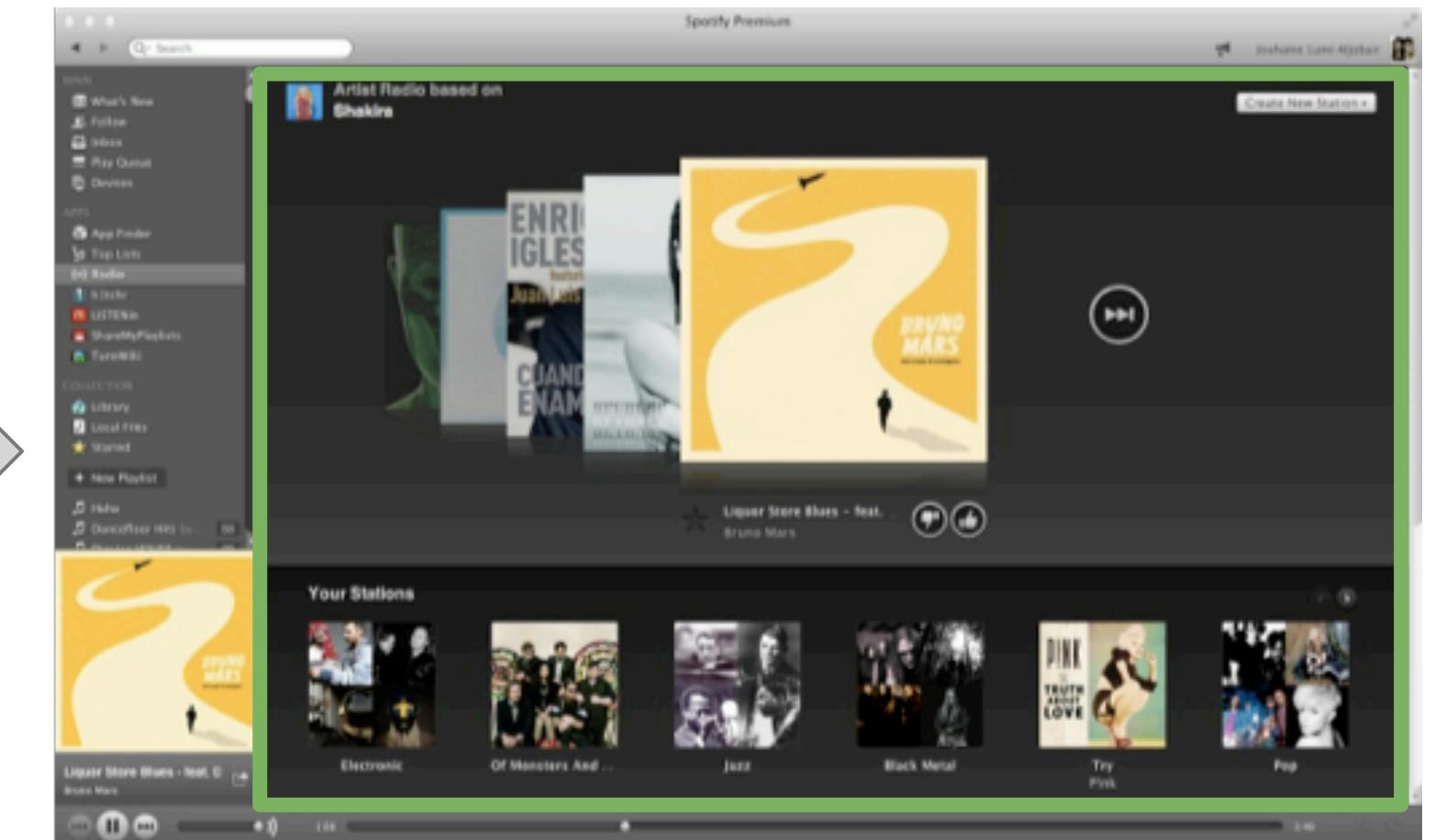
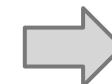
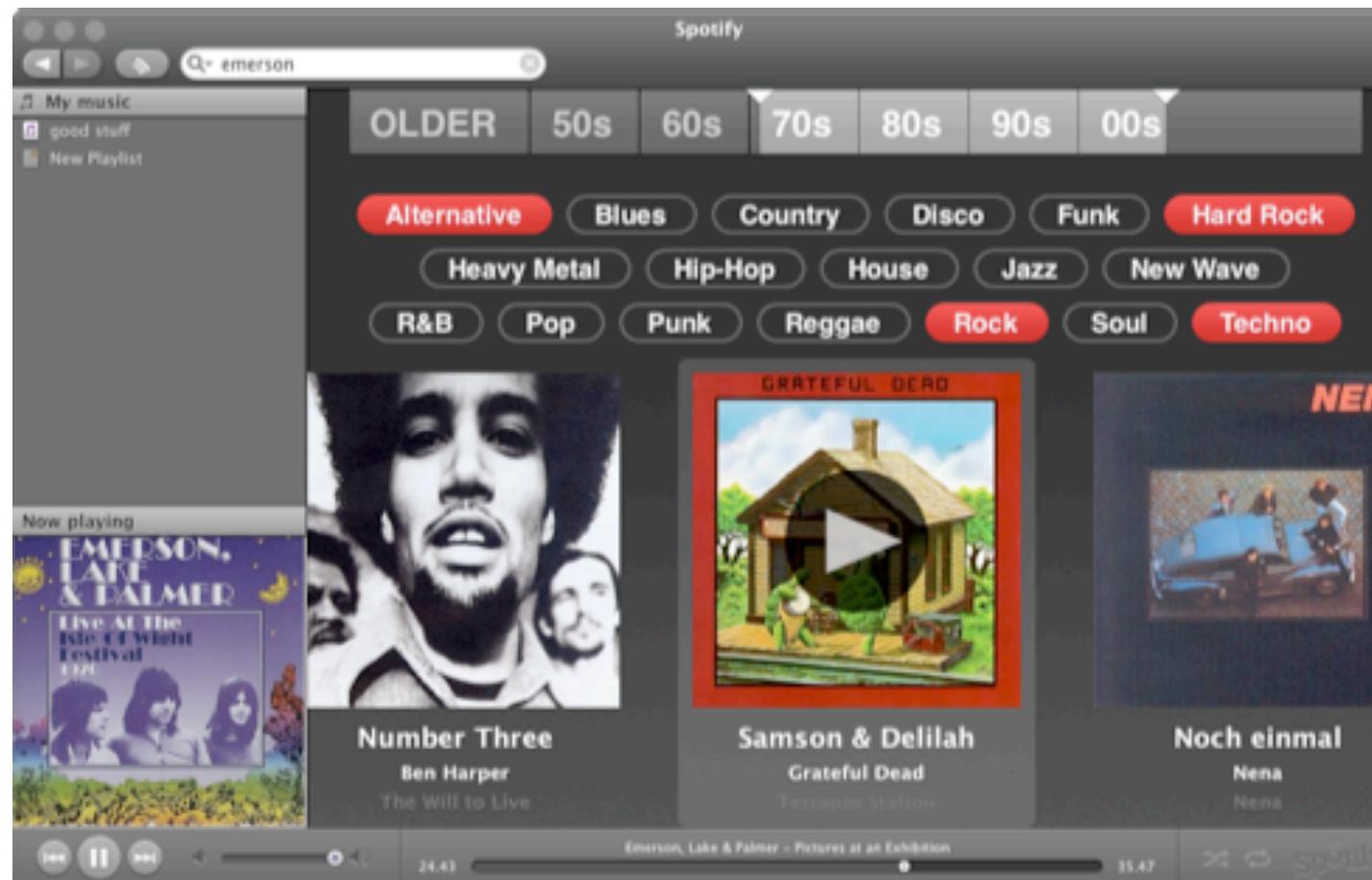
Beginnings of Spotify



Giving web a try

- Using CEF to move features to web
- Write features as webapps
- Sandboxed environment

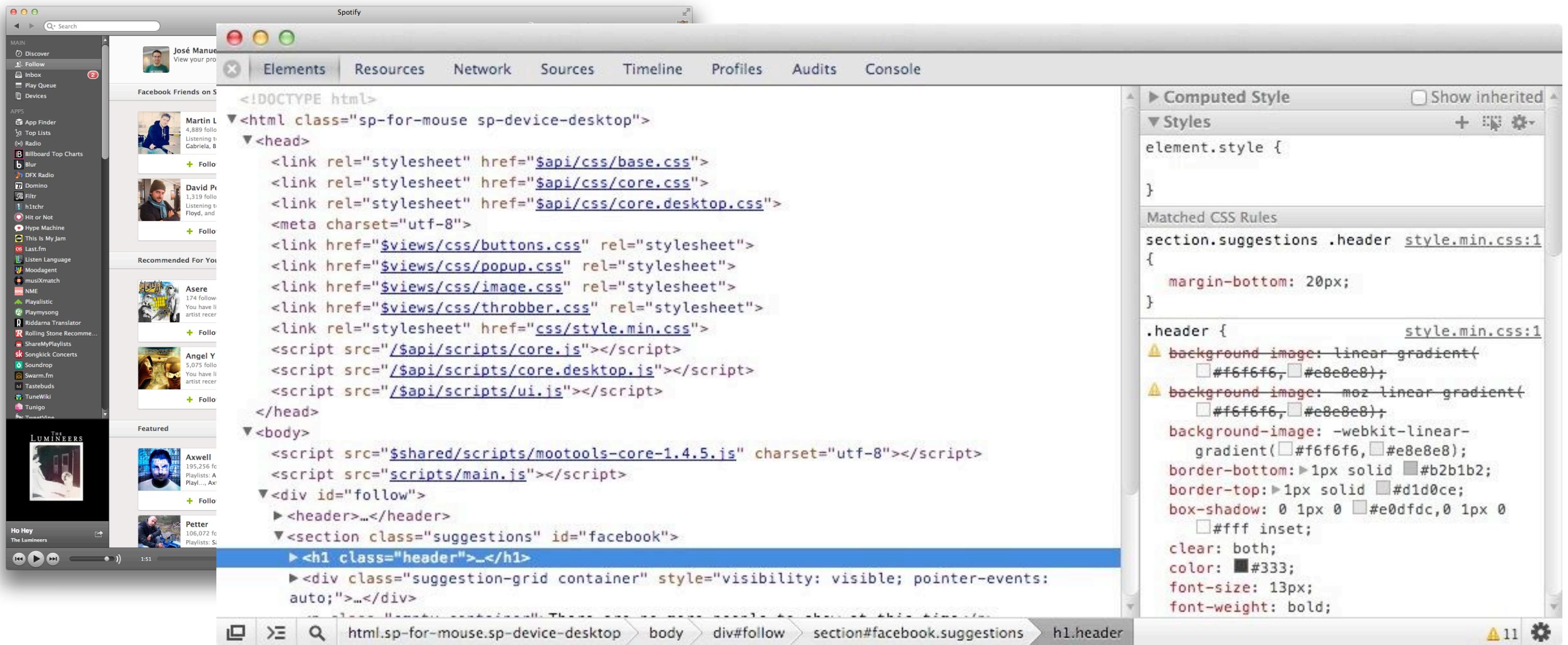
Giving web a try (2)



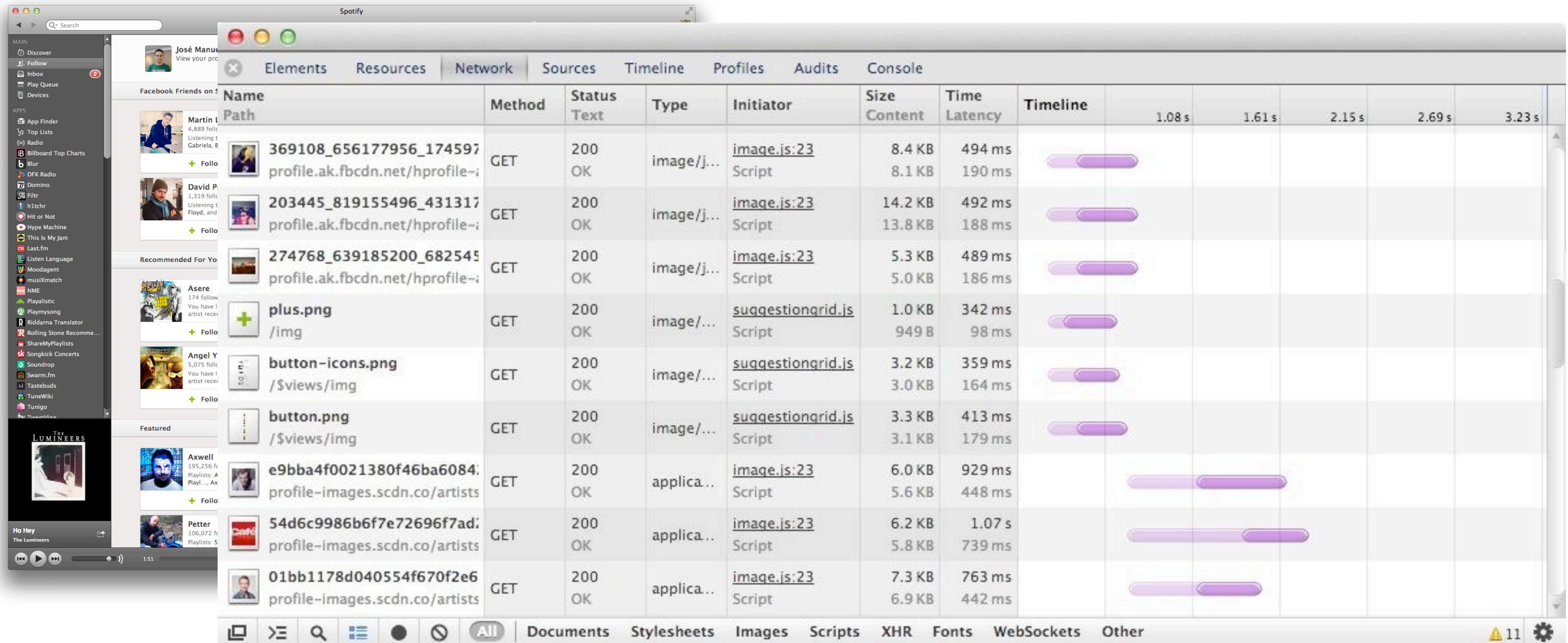
What is a Spotify app?

- HTML
- CSS
- JS
- manifest.json

What is a Spotify app? - Developer tools



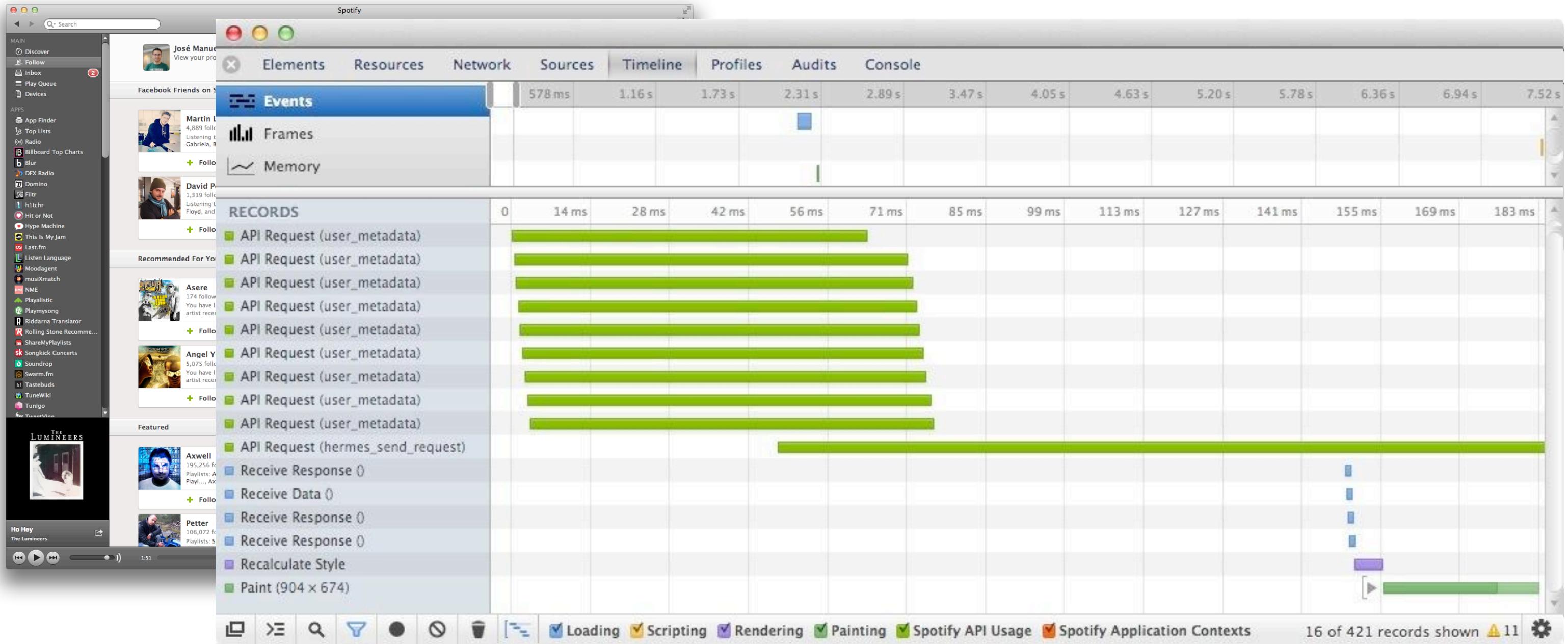
What is a Spotify app? - Developer tools



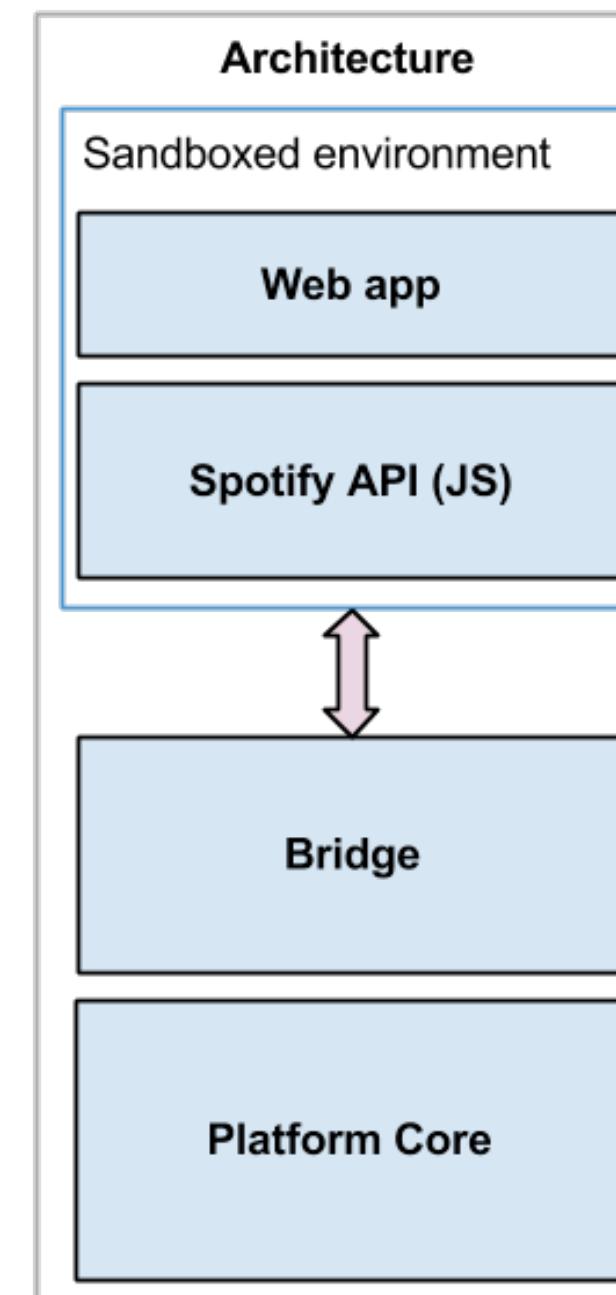
The screenshot shows the Spotify application interface with developer tools overlaid. The main Spotify window displays a user profile and a sidebar with various features like Discover, Follow, and Play Queue. The developer tools are open, showing the Network tab with a list of network requests. The requests are listed in a table with columns for Name, Path, Method, Status, Type, Initiator, Size, Time, and Timeline. Most requests are for images and scripts from Spotify's content delivery network (profile.ak.fcdn.net). The Timeline column shows the duration of each request, with many taking between 100ms and 1s.

Name	Path	Method	Status	Type	Initiator	Size	Time	Timeline
			Text			Content	Latency	
Martin L	369108_656177956_174597	GET	200 OK	image/j...	image.js:23	8.4 KB	494 ms	1.08 s
	profile.ak.fcdn.net/hprofile-...			Script		8.1 KB	190 ms	
David P	203445_819155496_431317	GET	200 OK	image/j...	image.js:23	14.2 KB	492 ms	1.61 s
	profile.ak.fcdn.net/hprofile-...			Script		13.8 KB	188 ms	
Aseré	274768_639185200_682545	GET	200 OK	image/j...	image.js:23	5.3 KB	489 ms	2.15 s
	profile.ak.fcdn.net/hprofile-...			Script		5.0 KB	186 ms	
plus.png	/img	GET	200 OK	image/...	suggestiongrid.js	1.0 KB	342 ms	2.69 s
				Script		949 B	98 ms	
button-icons.png	/\$views/img	GET	200 OK	image/...	suggestiongrid.js	3.2 KB	359 ms	3.23 s
				Script		3.0 KB	164 ms	
button.png	/\$views/img	GET	200 OK	image/...	suggestiongrid.js	3.3 KB	413 ms	
				Script		3.1 KB	179 ms	
Axwell	e9bba4f0021380f46ba6084:	GET	200 OK	applica...	image.js:23	6.0 KB	929 ms	
	profile-images.scdn.co/artists			Script		5.6 KB	448 ms	
Petter	54d6c9986b6f7e72696f7ad:	GET	200 OK	applica...	image.js:23	6.2 KB	1.07 s	
	profile-images.scdn.co/artists			Script		5.8 KB	739 ms	
	01bb1178d040554f670f2e6	GET	200 OK	applica...	image.js:23	7.3 KB	763 ms	
	profile-images.scdn.co/artists			Script		6.9 KB	442 ms	

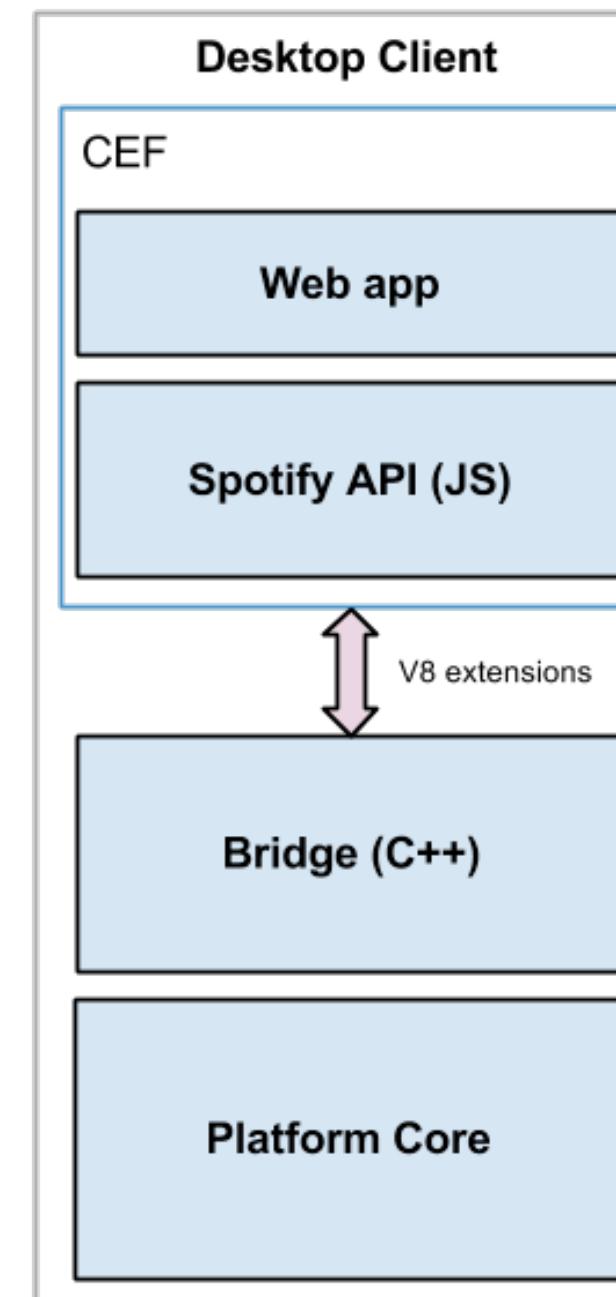
What is a Spotify app? - Developer tools



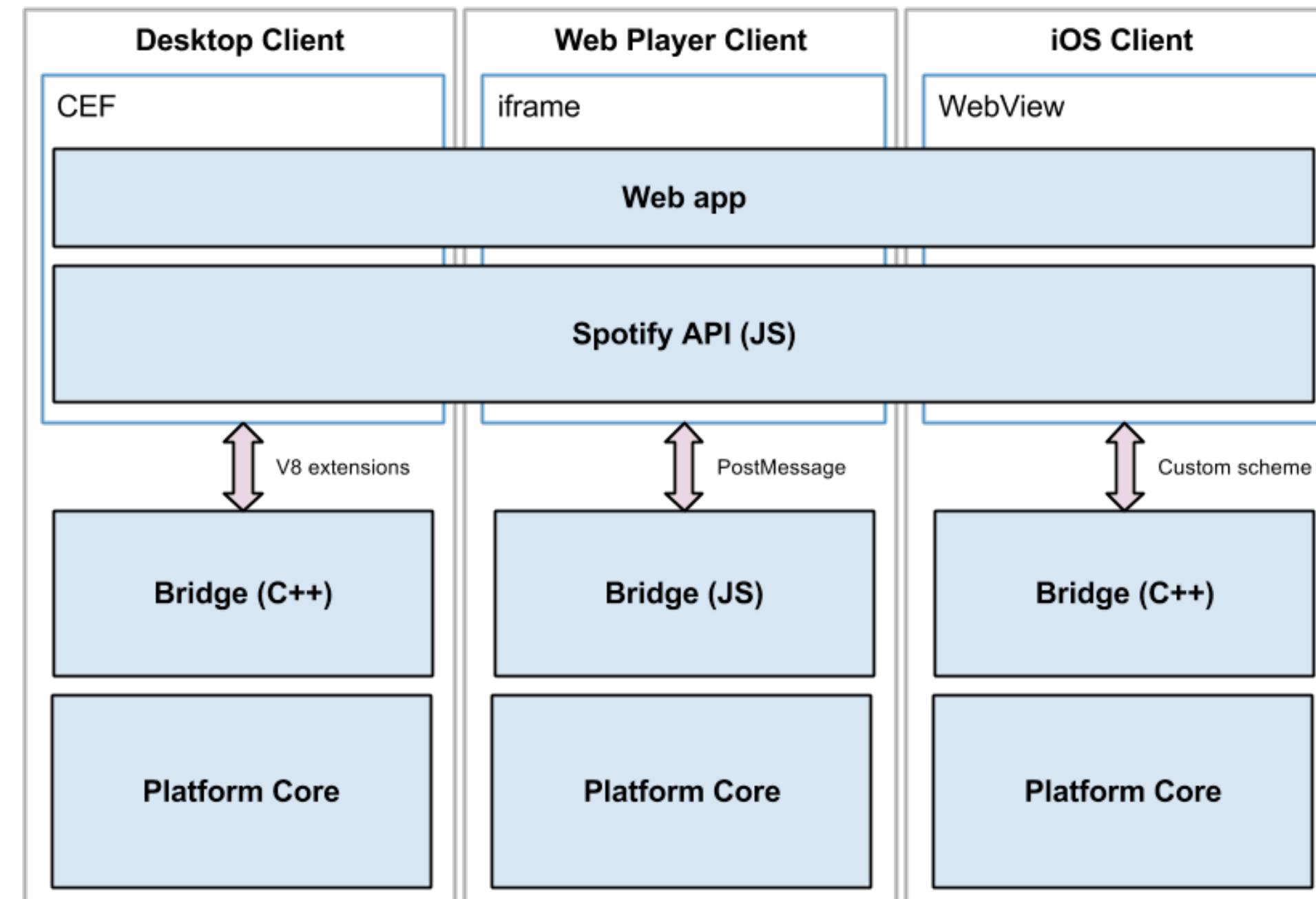
Architecture of the Spotify Apps Platform - overview



Architecture of the Spotify Apps Platform - desktop



Architecture of the Platform - all clients



Multiple platforms



Spotify Web Player - Spotify
<https://play.spotify.com/songkick/17047284>
The Unplanned Macklemore
sk songkick
Sunday 13 October 2013
Bob Dylan with Bob Dylan & His Band
Stockholm Waterfront
Nils Ericsons Plan
Stockholm, Sweden
Venue info and map
Tickets and more
I'm going I might go
Songs by Bob Dylan
Hurricane 8:33
Like a Rolling Stone 6:10
The Times They Are A... 2:58
Don't Think Twice, It's... 3:38
Lay, Lady, Lay 3:17
66 upcoming concerts by Bob Dylan
THU Bob Dylan 27 Cruzan Amphitheatre
Bob Dylan Like a Rolling Stone Jun
FRI Bob Dylan 28 Midflorida Credit Union Amphitheatre at the Florida State Fairgrounds
Bob Dylan 28 Midflorida Credit Union Amphitheatre at the Florida State Fairgrounds Jun
SUN Bob Dylan 30 Aaron's Amphitheatre at Lakewood
Bob Dylan 30 Aaron's Amphitheatre at Lakewood Jun
MON Bob Dylan 1 The Lawn at Riverfront Park
Bob Dylan 1 The Lawn at Riverfront Park Jul
Create your personalized concert calendar now
Start tracking concerts
New Release
You listened to B...
The Velvet Underground Coldplay Simon & Garfunkel
POWERED BY echonest

Spotify
<spotify.app:songkick:17047284>
José Manuel Pérez Pérez
MAIN
Discover Follow Inbox Play Queue Devices iPhone Simulator
APPs
App Finder Top Lists Radio Billboard Top Charts Blur DFX Radio Domino Filtr h1tchr Hit or Not Hype Machine This Is My Jam Last.fm Listen Language Moodagent musixmatch Playalistic PlaymySong Riddarna Translator Rolling Stone Recomme... ShareMyPlaylists Songkick Concerts Soundrop Swarm.fm TasteBuds TuneWiki Tuning
sk songkick
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Bob Dylan 1 The Lawn at Riverfront Park Jul
Create your personalized concert calendar now
Start tracking concerts
The Lumineers Coldplay The Velvet Underground Simon & Garfunkel
Ho Hey The Lumineers
POWERED BY echonest

Releasing Spotify Apps

- Decoupled system
- Provides gradual roll-out, and availability depending on platform and country

Benefits

- Feature ownership by teams
- Fast development pace due to fewer dependencies
- Less hassle to deploy. Makes it easy to tweak a feature after being released
- 3rd party app development

Only benefits?

- Performance in views with a lot of data on mobile
- Time to render

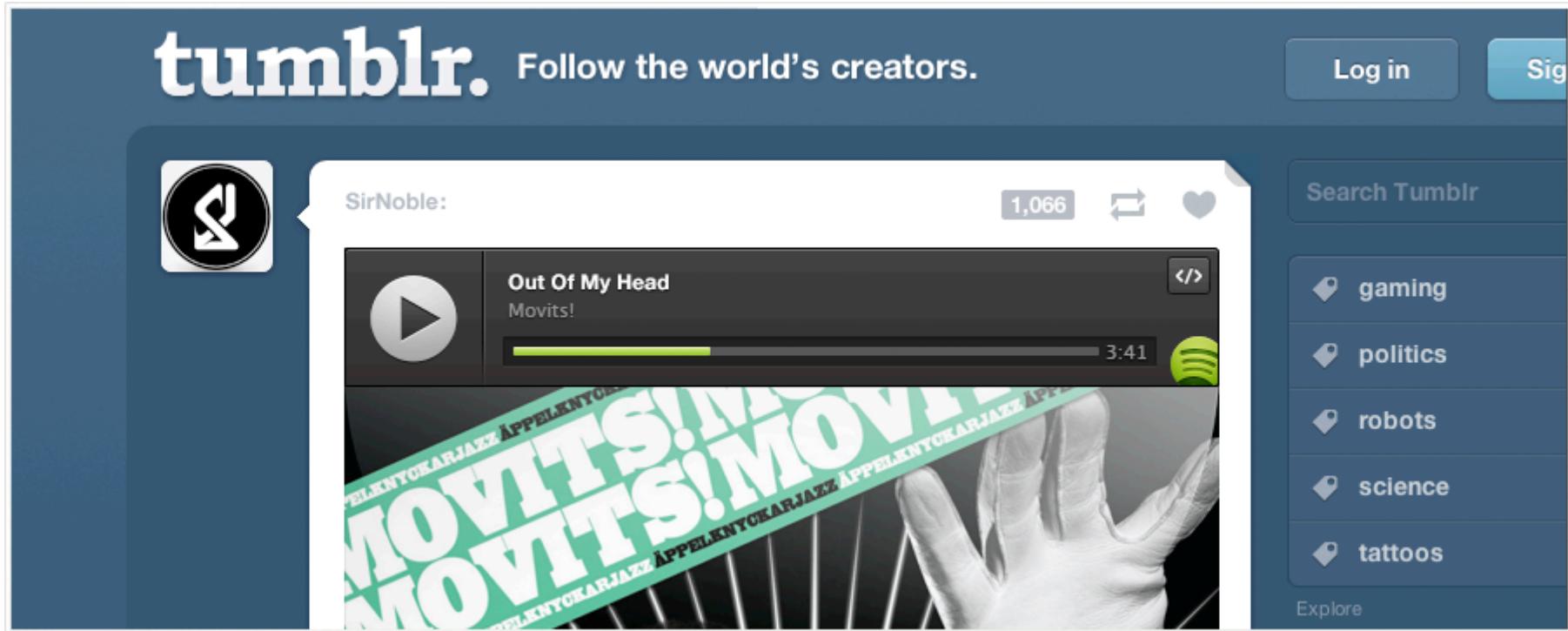
Spotify Embedded Platform

Tomás Pérez

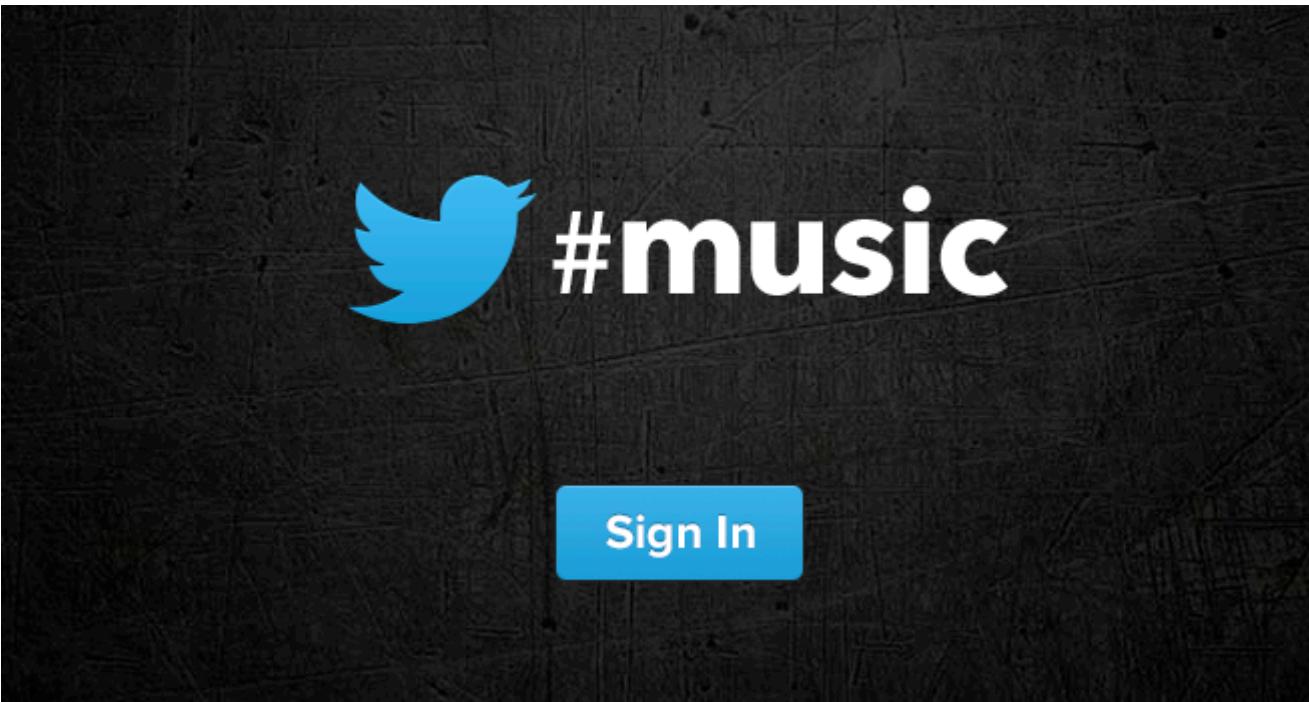
twitter.com/tomasperezv
github.com/tomasperezv



Spotify Embedded Platform



Spotify Embedded Platform



Content

Platform architecture

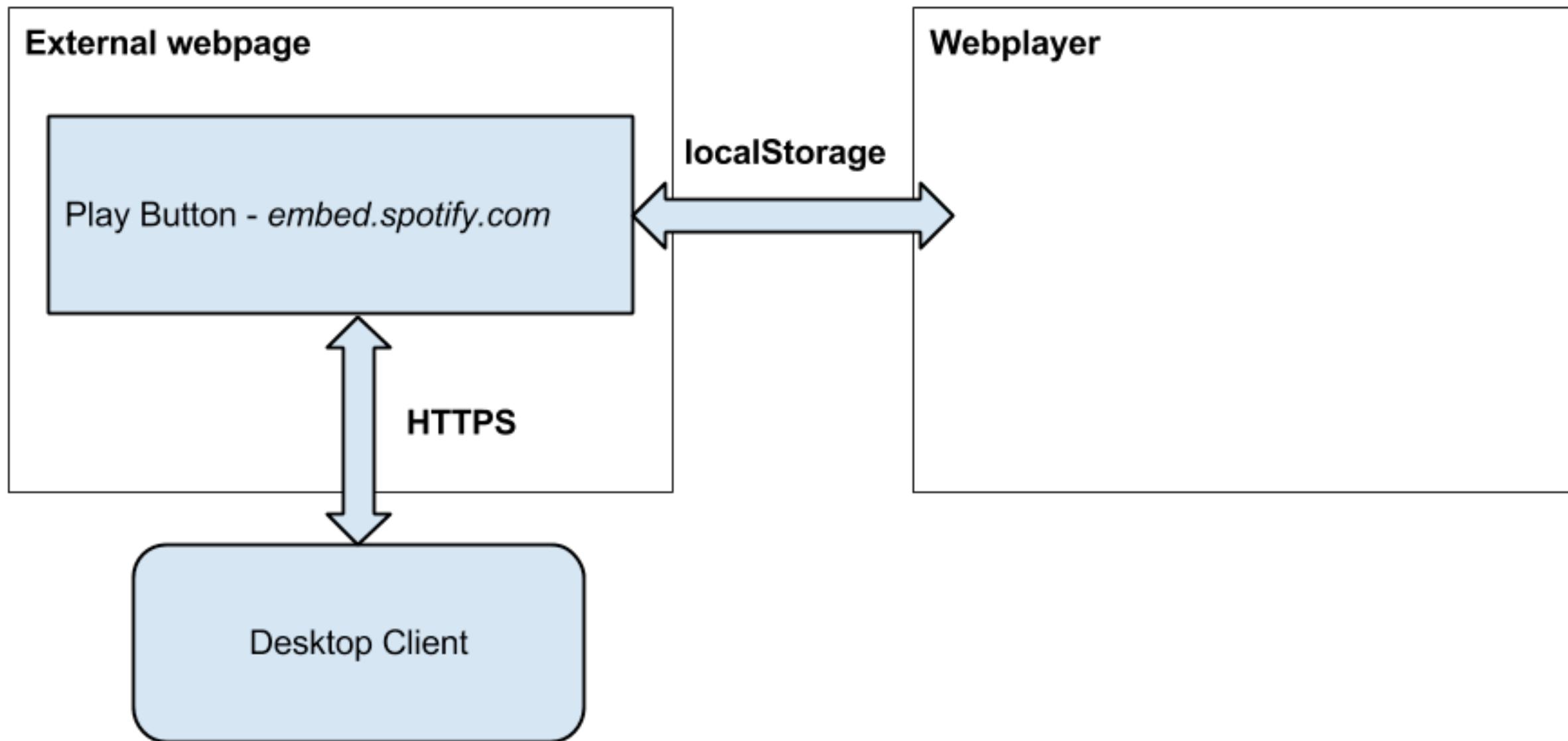
- Iframes and postMessage: security and performance

Remote control technology

- Communication between different tabs
- Performance of the communication channel

Performance improvements

Architecture of the Platform



Sandboxed platform using IFrames

Good

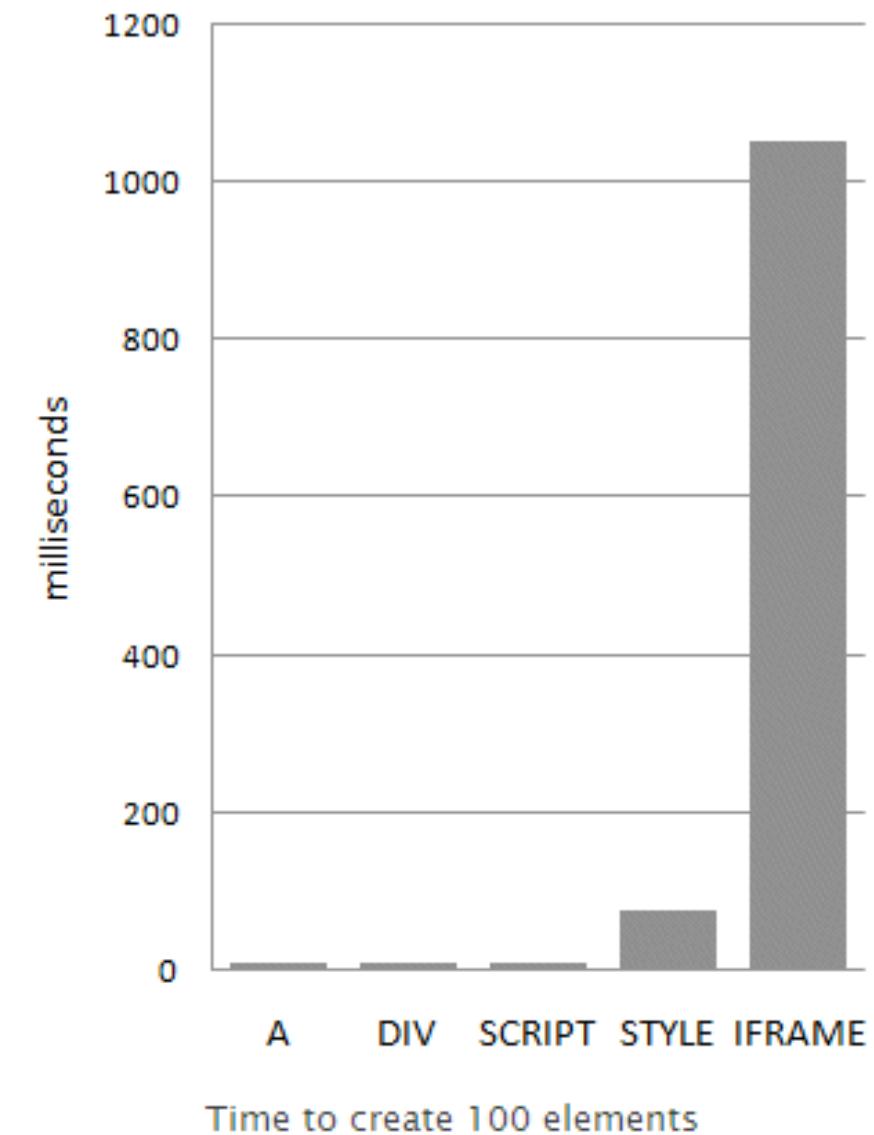
- Separated execution context
- Better security and privacy
- We control the release process

Bad

- More difficult communication
- IFrames are expensive

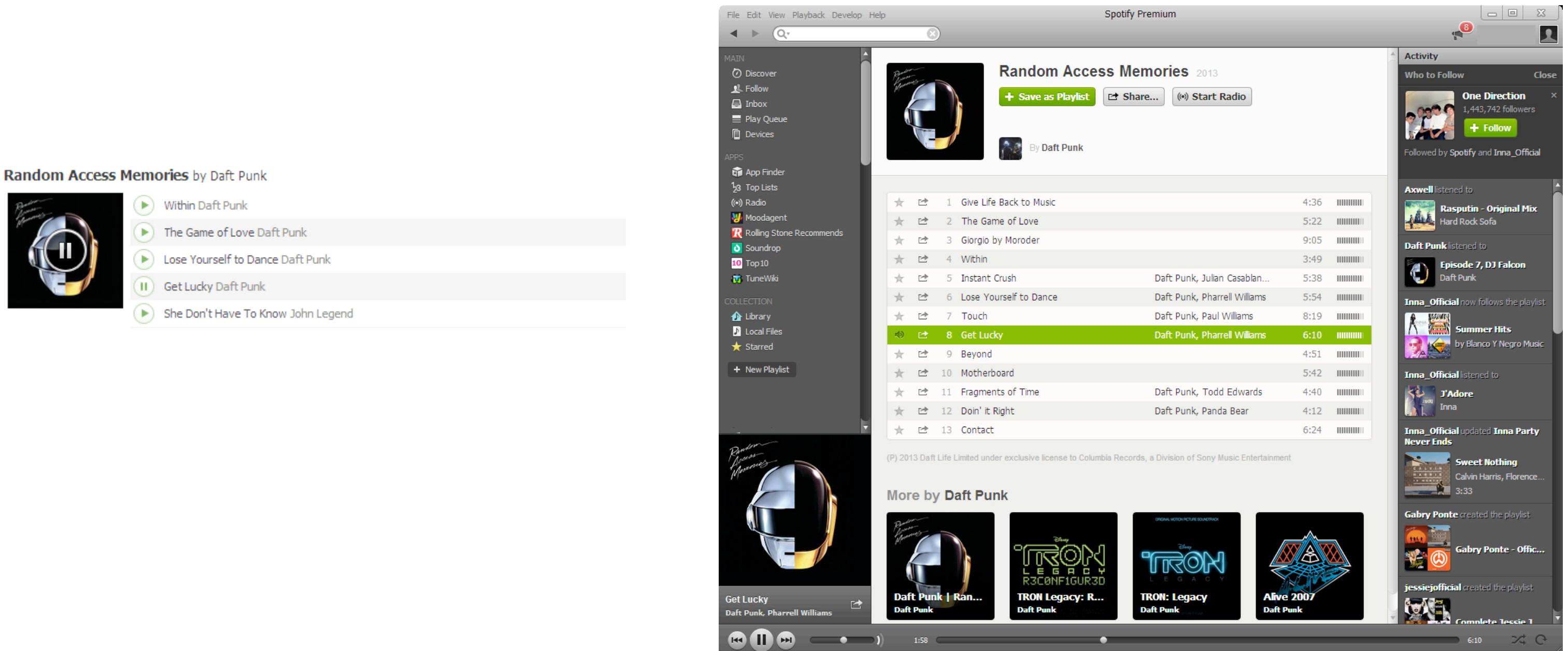
How expensive are IFrames?

A lot(*):



(*) <http://www.stevesouders.com/blog/2009/06/03/using-iframes-sparingly/>

Custom widgets in partner pages



Custom widgets in partner pages

Random Access Memories by Daft Punk



- Within Daft Punk
- The Game of Love Daft Punk
- Lose Yourself to Dance Daft Punk
- Get Lucky Daft Punk
- She Don't Have To Know John Legend

Get Lucky - Daft Punk - Sp

https://play.spotify.com/album/4m2880jivSbbyEGAKfITCa

Spotify BETA

Search

Discover

Radio

Collection

Follow

Me

Song

You listened to K... Jazz Magnetism a song you might

Random Access Memories

+ Add to Collection Share... Start Radio

Daft Punk

New Release

Since you listened to Armin Van Buuren's album A State Of Trance

1 Give Life Back to Music 4:36

2 The Game of Love 5:22

3 Giorgio by Moroder 9:05

4 Within 3:49

5 Instant Crush Daft Punk, Julia... 5:38

6 Lose Yourself to Dance Daft Punk, Phar... 5:54

7 Touch Daft Punk, Paul... 8:19

8 Get Lucky Daft Punk, Phar... 6:10

9 Beyond 4:51

10 Motherboard 5:42

11 Fragments of Time Daft Punk, Tod... 4:40

12 Doin' it Right Daft Punk, Pan... 4:12

13 Contact 6:24

(P) 2013 Daft Life Limited under exclusive license to Columbia Records, a Division of Sony Music Entertainment

More by Daft Punk

A State Of Trance Armin Van Buuren

Daft Punk | Ran... Daft Punk

TRON LEGACY R3C0NFIGUR3D Daft Punk

TRON LEGACY Daft Punk

Random Access Memories

Get Lucky

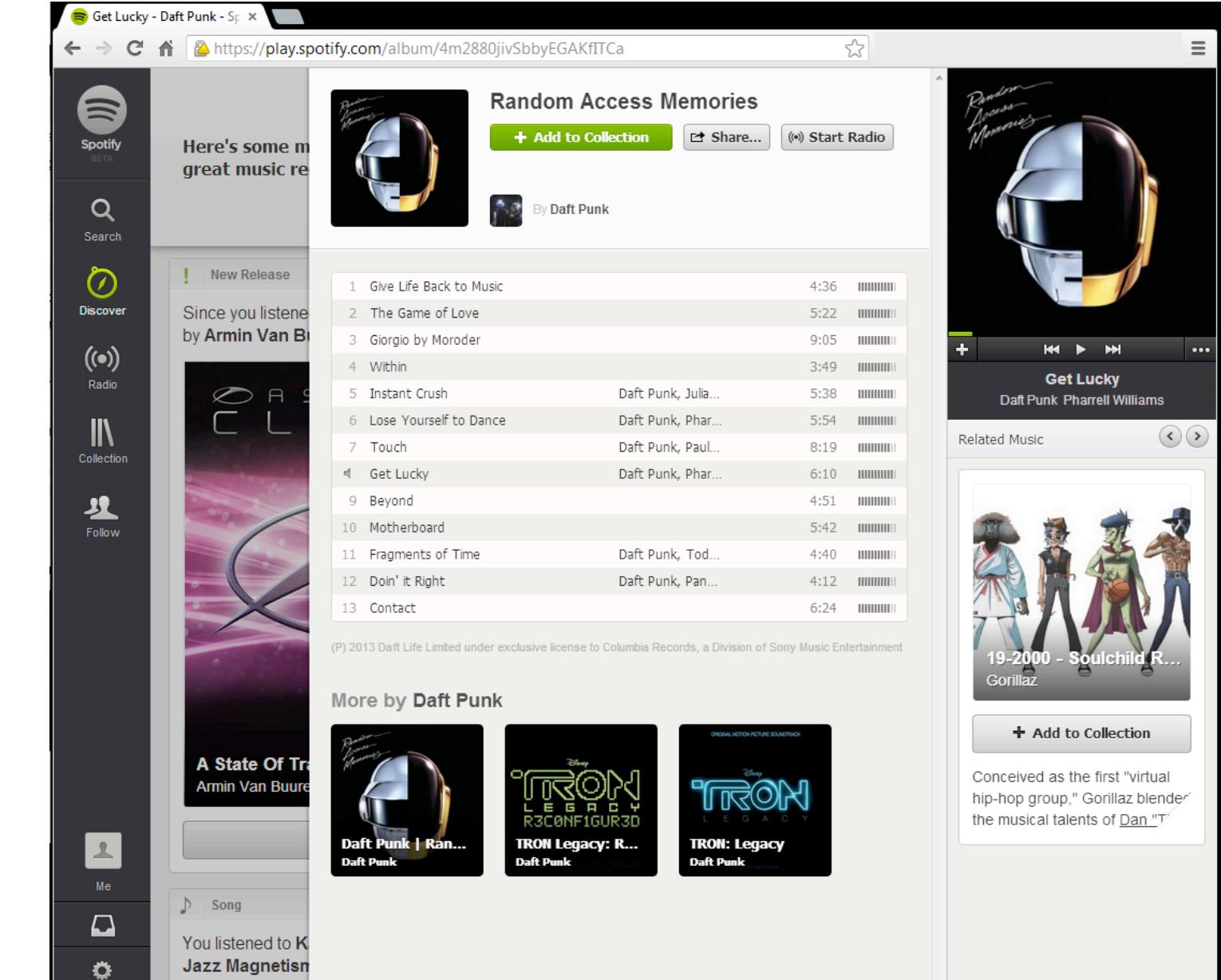
Daft Punk Pharrell Williams

Related Music

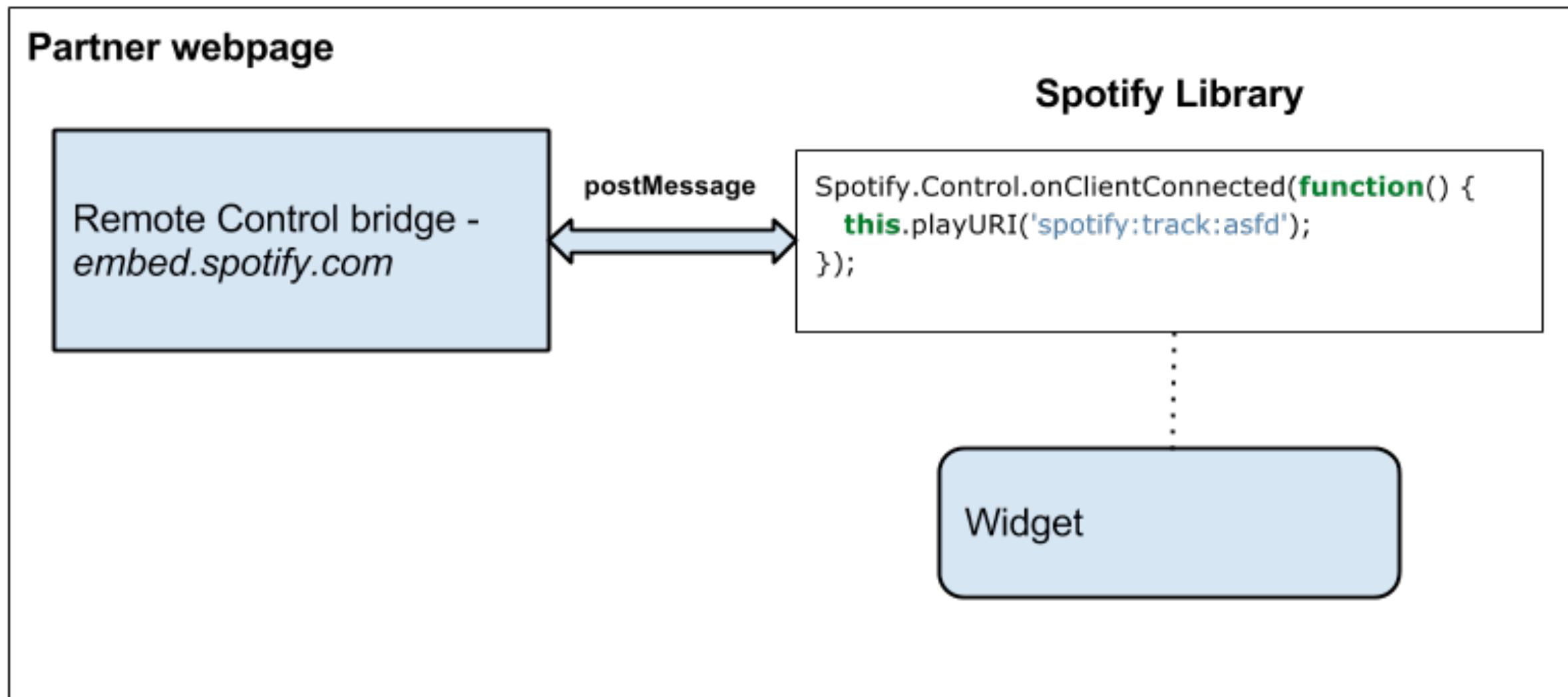
19-2000 - Soulchild R... Gorillaz

+ Add to Collection

Conceived as the first "virtual hip-hop group," Gorillaz blends the musical talents of Dan "T"

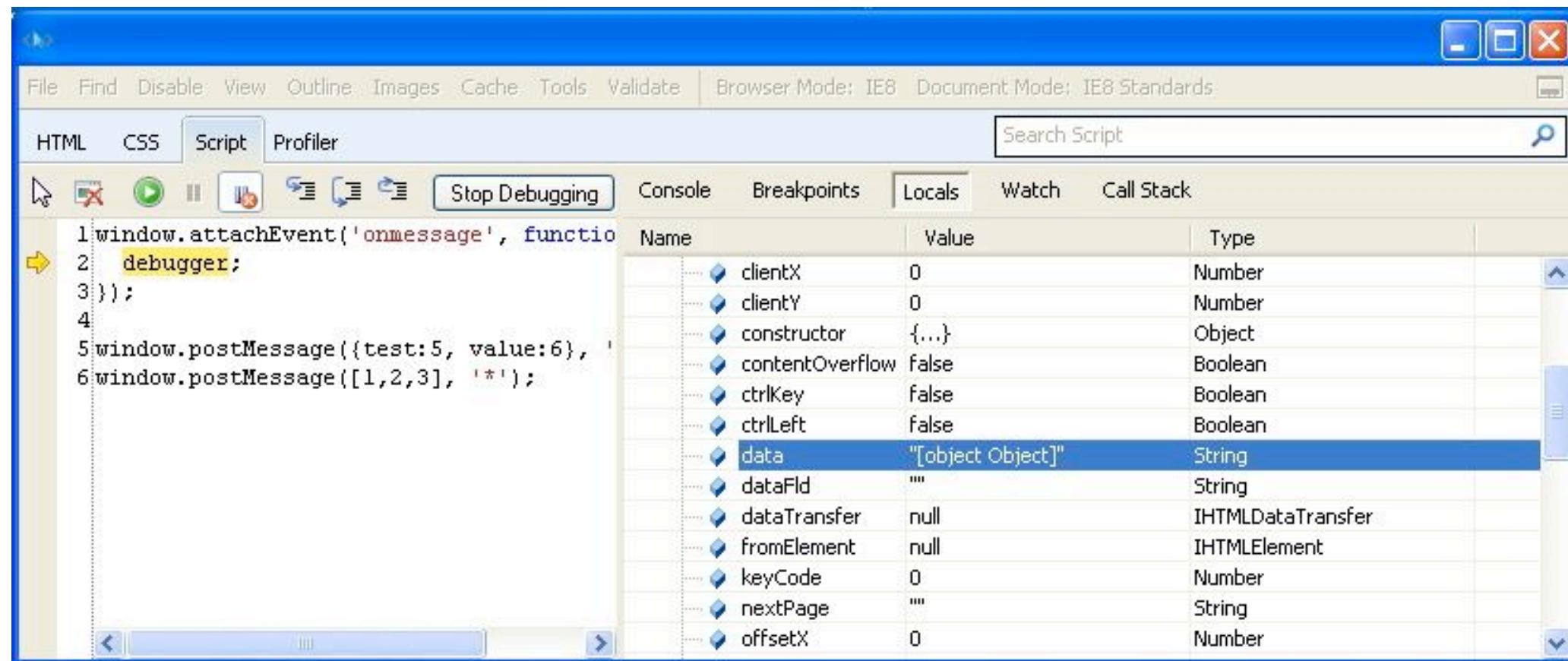


Cross-origin communication using postMessage



Sending: content of the message

```
frame.contentWindow.postMessage(message, ...);
```

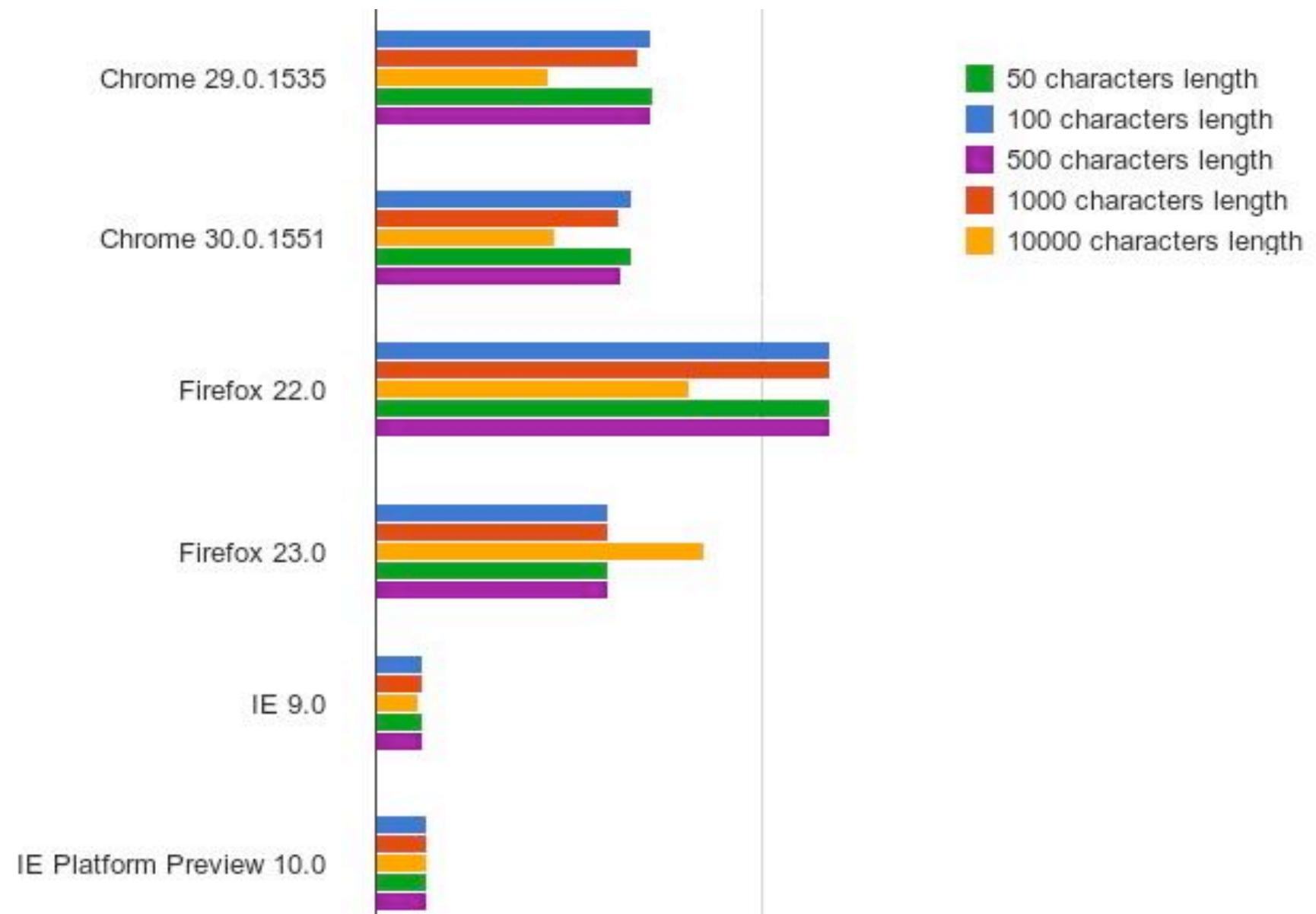


Security

```
frame.contentWindow
  .postMessage(..., 'https://embed.spotify.com');
```

```
window.addEventListener('message', function(messageEvt) {
  if (messageEvt.origin === 'https://valid-domain.com') {
    ...
  }
});
```

postMessage transfer rate



Remote controlling Spotify Clients

Client Desktop: based on long polling + https

Webplayer: communication with another browser window or tab

- server side
- postMessage
 - Cookies
 - **localStorage**

Is localStorage always available?

`window.localStorage`

`Storage`

`constructor: StorageConstructor`

`length: 0`

Is localStorage always available?

```
localStorage.setItem('key', 'value')
```

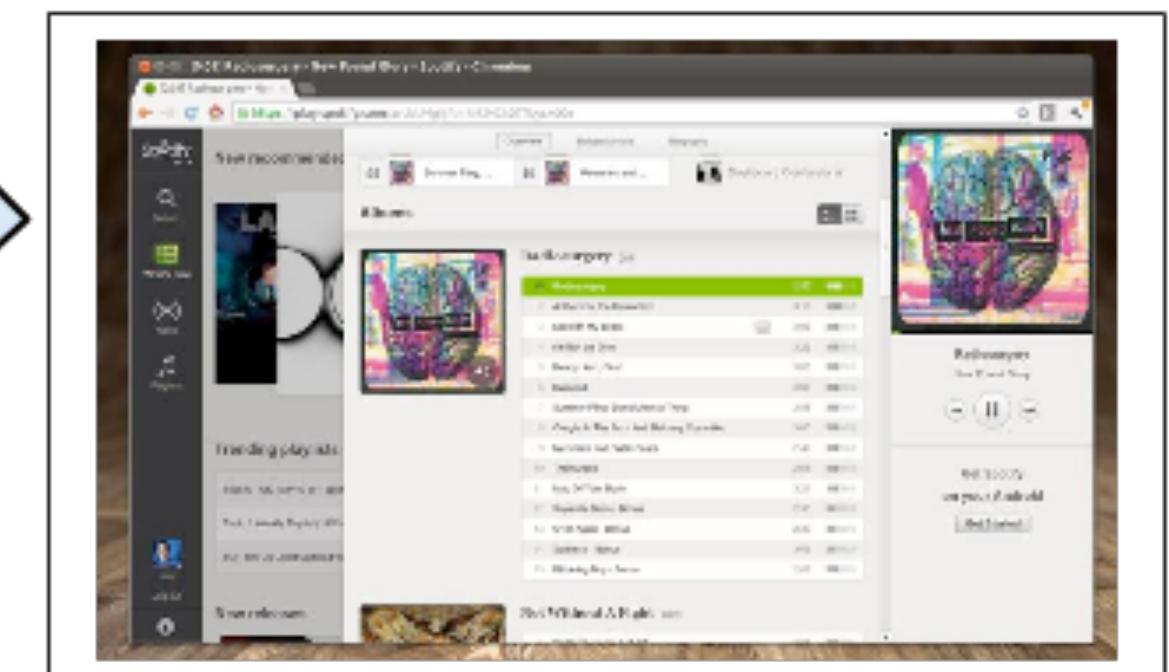
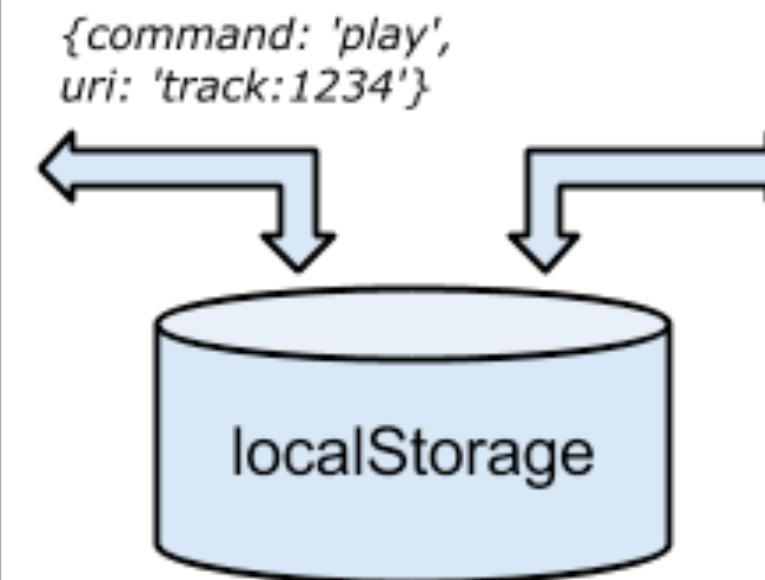
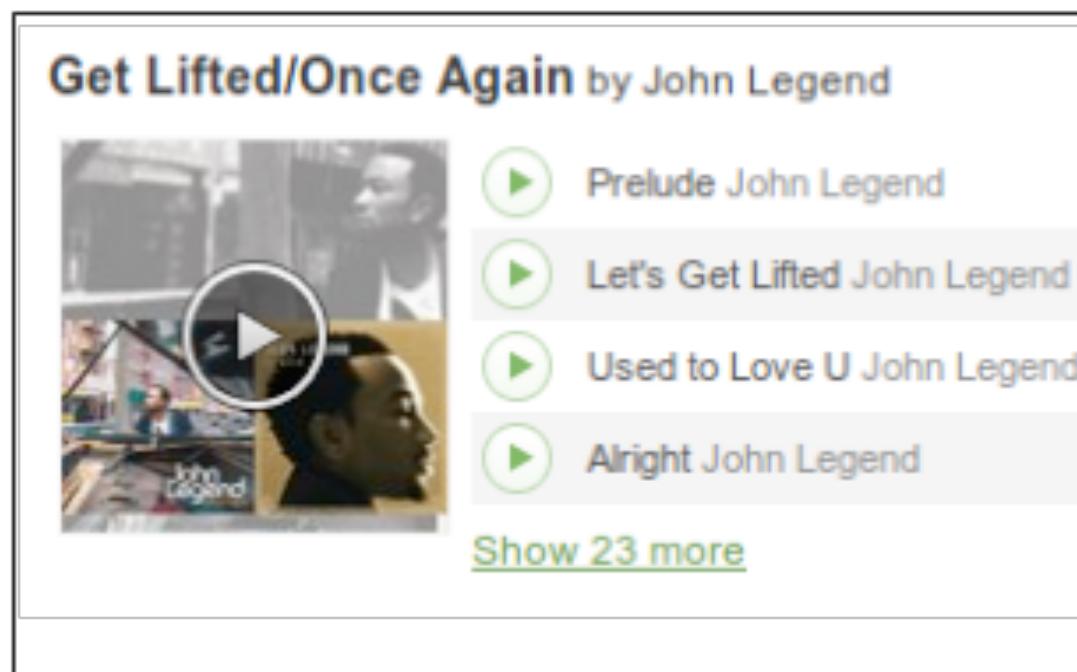
```
DOMException
```

```
code: 22
```

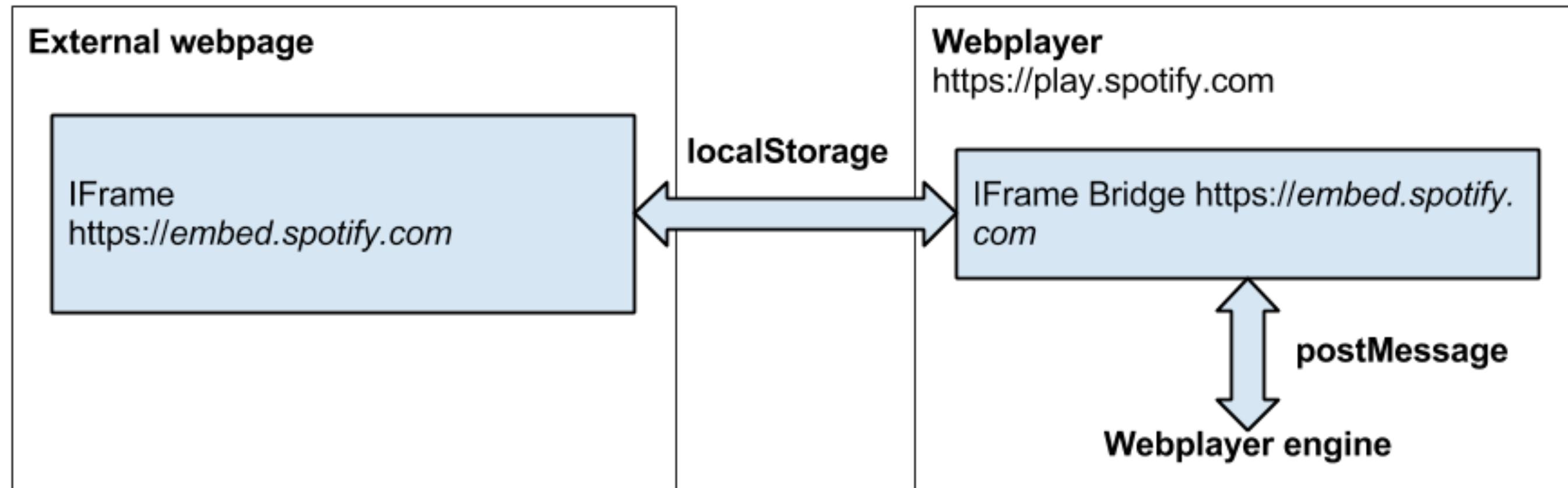
```
constructor: DOMExceptionConstructor
```

```
message: "QUOTA_EXCEEDED_ERR: DOM Exception 22"
```

Communication between different tabs



Communication between different tabs

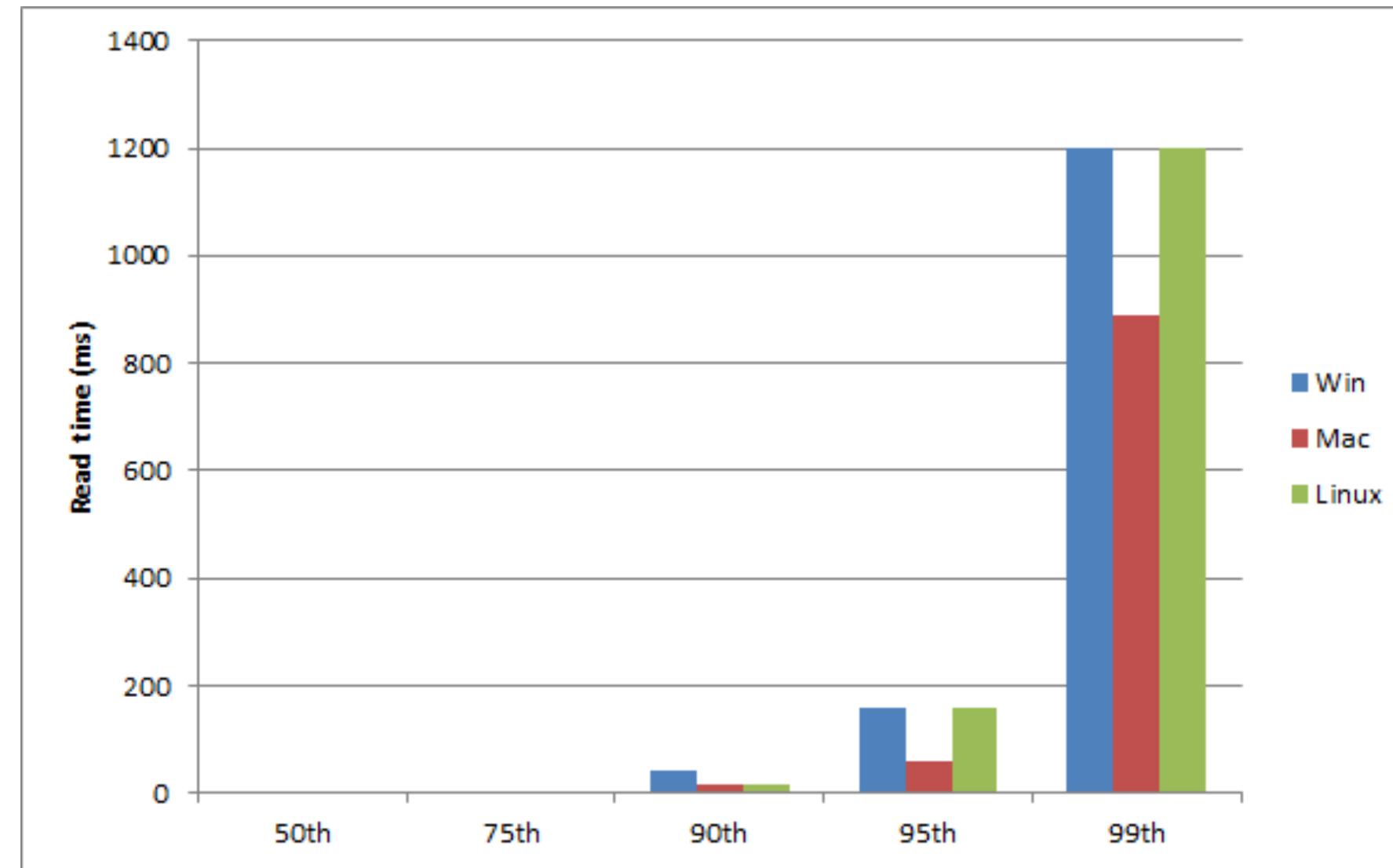


localStorage locks

The UI Thread is stopped for some operations

Firefox and Chrome wait until the first read is requested, then load all the items

localStorage locks



<http://calendar.perfplanet.com/2012/is-localstorage-performance-a-problem/>

localStorage notifications via the storage event

```
window.addEventListener('storage', function() {}, false);
```

The event change is only emitted when the values actually change: use a timestamp if needed.

```
{key: 'command', value: 'play', timestamp: 1373021690574}
```

Can we trigger the event manually?

```
var evt = document.createEvent('StorageEvent');  
evt.initStorageEvent('storage', ...);  
window.dispatchEvent(evt);
```

Yes... although not to communicate between different windows.

localStorage communication strategies

Options:

- A) Create a new item every time, but remove it once it's received.
- B) New item, don't remove once it's received, instead do it regularly.
- C) Reuse always the same item (use timestamp)

Notification delay

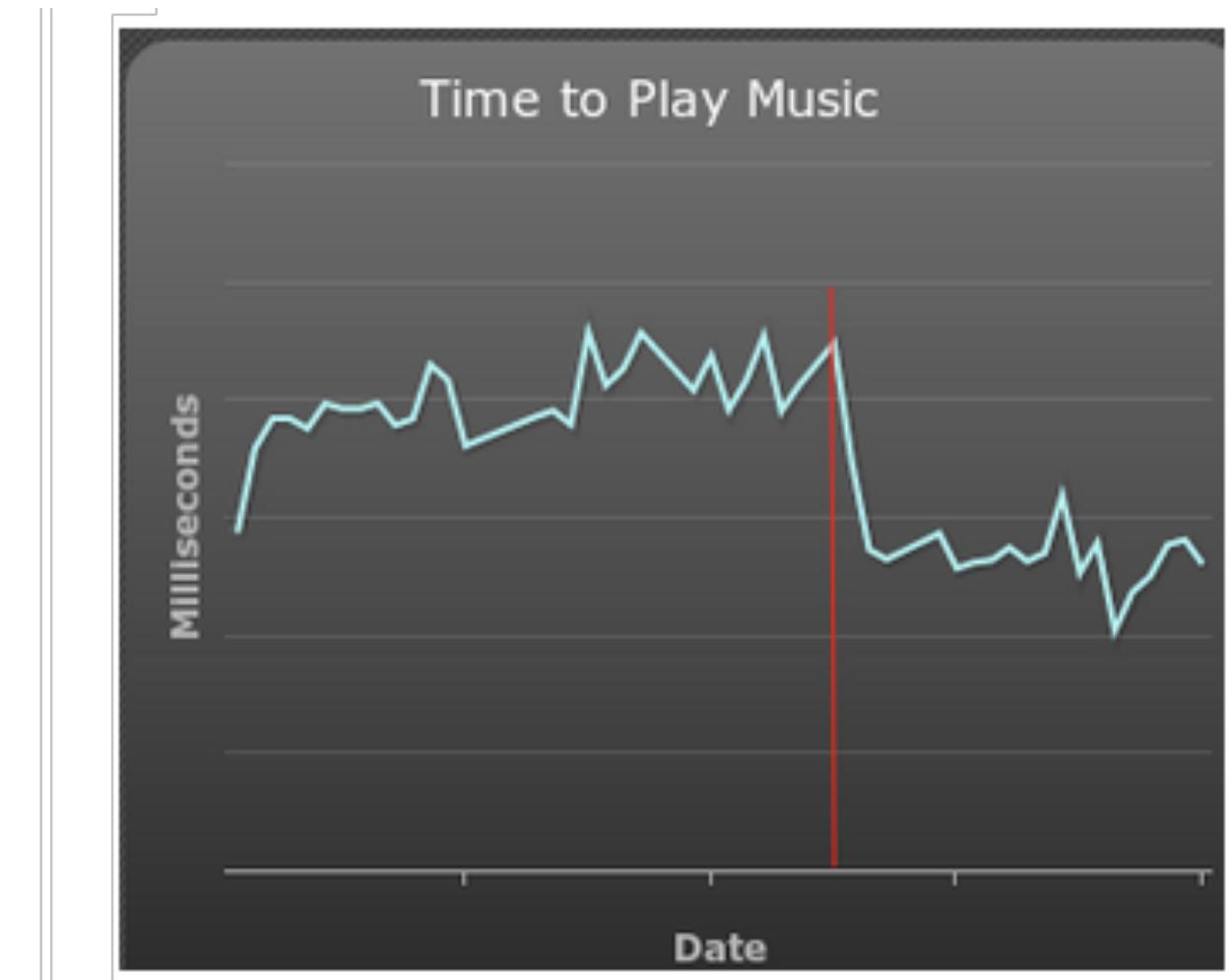
Chrome ~2 milliseconds

IE10 ~34 milliseconds

Performance improvements

Prefetch / Prerender

- Rendering pages
`<link rel="prerender" href="...">`
- Fetching static resources
`<link rel="prefetch" href="...">`



Potential improvements

Batching postMessages

Webworkers

Conclusions

- Web apps have been a good choice to extend our functionality in multiple platforms.
- Web technologies make relatively easy to create complex integrations to improve the user experience.
- It is very important to monitor and analyze carefully the performance.



Questions?

Tomás Pérez

[@tomasperezv](#)

José M. Pérez

[@jmperezperez](#)

Slides, code examples and reference

[github.com/tomasperezv/spainjs-2013](#)

Thanks!

