DAWE
Vídeo y audio

Trabajo con vídeo (y audio) en HTML5

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Introducción

- Containers, códecs y formatos
- Elemento <video>
- API de vídeo
- Integración de <video>, API de Video y Canvas
- Elemento <audio>

Containers, códecs y formatos

- Se suele hablar, incorrectamente, de ficheros de vídeo como ficheros AVI o ficheros MP4
- En realidad, AVI y MP4 son formatos de contenedor
- Un contenedor como AVI o MP4 guarda internamente canales de audio y vídeo que pueden estar codificados en distintos formatos (con distintos códecs)

códec: COdificador-DECodificador

Elemento <video> en HTML5

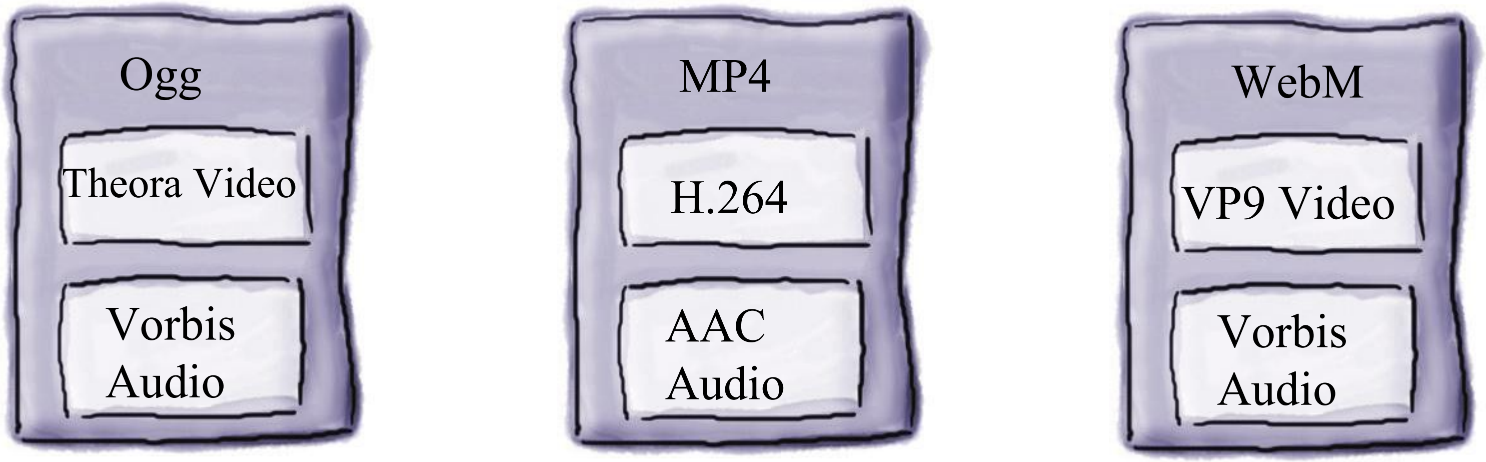
- Podría ser tan sencillo como:

```
<video src="clip.webm"></video>
```

- Pero no lo es...

Elemento <video> en HTML5

- El estándar HTML5 define la etiqueta <video> pero no define ni contenedores ni códecs.
- Lo cual, generó una guerra...



Ogg

Theora Video

Vorbis Audio

MP4

H.264

AAC Audio

WebM

VP9 Video

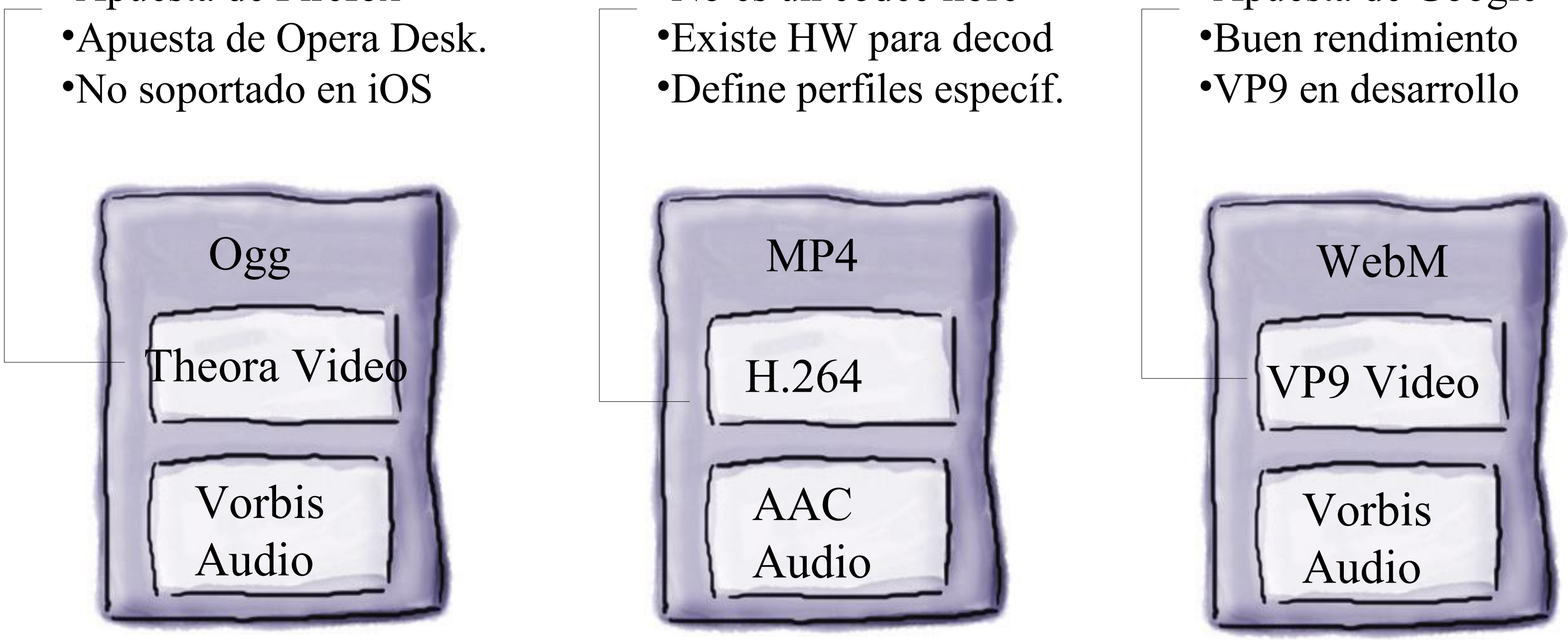
Vorbis Audio

Elemento <video> en HTML5

- Libre
- Apuesta de Firefox
- Apuesta de Opera Desk.
- No soportado en iOS

- Cubierto por patentes
- No es un codec libre
- Existe HW para decod
- Define perfiles específ.

- Libre (comprado a On2)
- Apuesta de Google
- Buen rendimiento
- VP9 en desarrollo



Ogg

Theora Video

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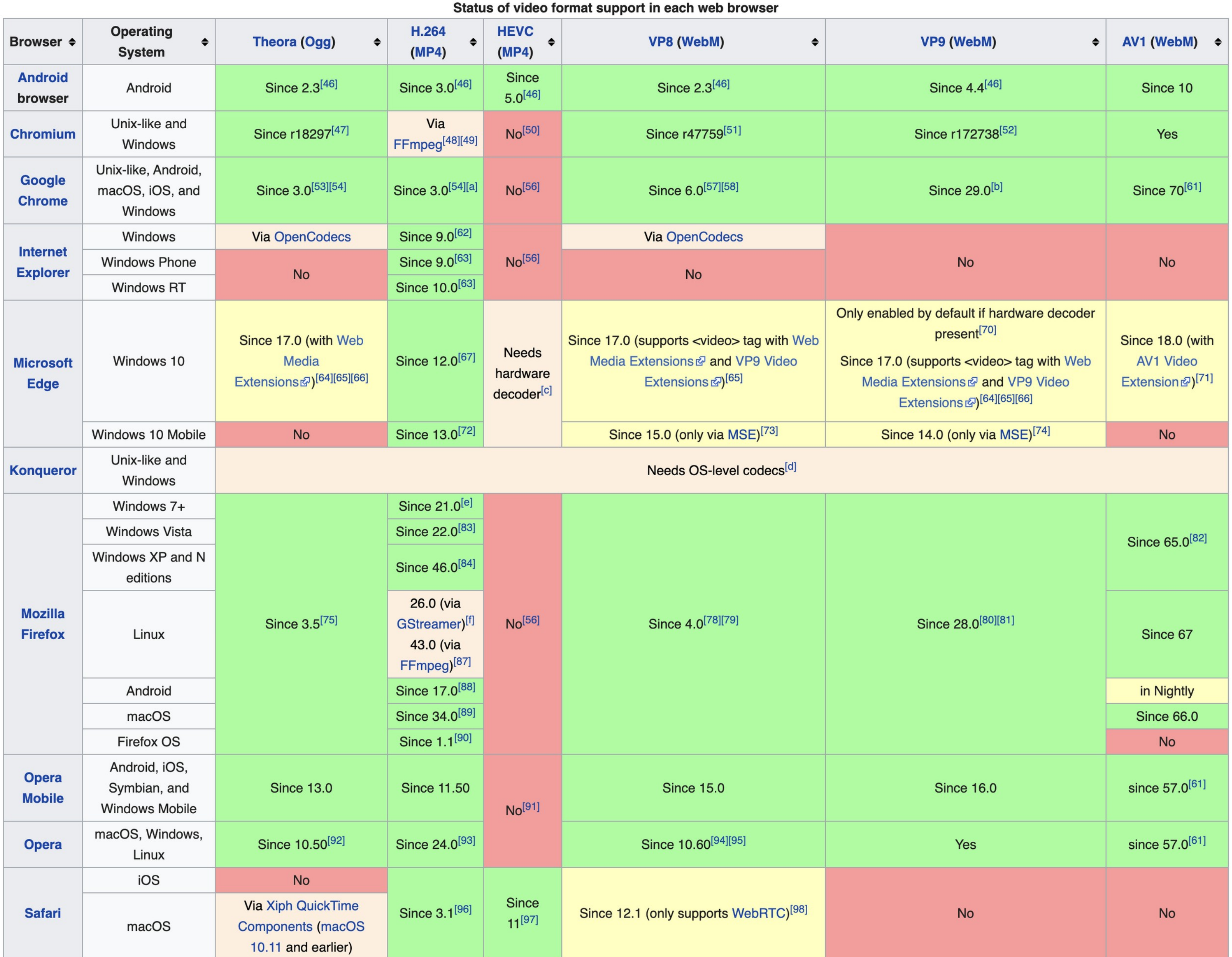
Son códecs con codificación *lossy*

Elemento <video> en HTML5

https://en.wikipedia.org/wiki/HTML5_video



Status of video format support in each web browser

Browser	Operating System	Theora (Ogg)	H.264 (MP4)	HEVC (MP4)	VP8 (WebM)	VP9 (WebM)	AV1 (WebM)
Android browser	Android	Since 2.3[46]	Since 3.0[46]	Since 5.0[46]	Since 2.3[46]	Since 4.4[46]	Since 10
Chromium	Unix-like and Windows	Since r18297[47]	Via FFmpeg[48][49]	No[50]	Since r47759[51]	Since r172738[52]	Yes
Google Chrome	Unix-like, Android, macOS, iOS, and Windows	Since 3.0[53][54]	Since 3.0[54][a]	No[56]	Since 6.0[57][58]	Since 29.0[b]	Since 70[61]
Internet Explorer	Windows	Via OpenCodecs	Since 9.0[62]	No[56]	Via OpenCodecs	No	No
	Windows Phone	No	Since 9.0[63]		No		
	Windows RT		Since 10.0[63]				
Microsoft Edge	Windows 10	Since 17.0 (with Web Media Extensions)[64][65][66]	Since 12.0[67]	Needs hardware decoder[c]	Since 17.0 (supports <video> tag with Web Media Extensions and VP9 Video Extensions)[65]	Only enabled by default if hardware decoder present[70] Since 17.0 (supports <video> tag with Web Media Extensions and VP9 Video Extensions)[64][65][66]	Since 18.0 (with AV1 Video Extension)[71]
	Windows 10 Mobile	No	Since 13.0[72]		Since 15.0 (only via MSE)[73]	Since 14.0 (only via MSE)[74]	No
Konqueror	Unix-like and Windows	Needs OS-level codecs[d]					
Mozilla Firefox	Windows 7+	Since 3.5[75]	Since 21.0[e]	No[56]	Since 4.0[78][79]	Since 28.0[80][81]	Since 65.0[82]
	Windows Vista		Since 22.0[83]				
	Windows XP and N editions		Since 46.0[84]				
	Linux		26.0 (via GStreamer)[f] 43.0 (via FFmpeg)[87]				Since 67
	Android		Since 17.0[88]				in Nightly
	macOS		Since 34.0[89]				Since 66.0
	Firefox OS		Since 1.1[90]				No
Opera Mobile	Android, iOS, Symbian, and Windows Mobile	Since 13.0	Since 11.50	No[91]	Since 15.0	Since 16.0	since 57.0[61]
Opera	macOS, Windows, Linux	Since 10.50[92]	Since 24.0[93]		Since 10.60[94][95]	Yes	since 57.0[61]
Safari	iOS	No	Since 3.1[96]	Since 11[97]	Since 12.1 (only supports WebRTC)[98]	No	No
	macOS	Via Xiph QuickTime Components (macOS 10.11 and earlier)					

Elemento <video> en HTML5

- Podría ser tan sencillo como:

  <video src="clip.webm"></video>

- Pero no lo es...

```
<video width="320" height="240" controls>
 <source src="clip.mp4" type="video/mp4; codecs=avc1.42E01E,mp4a.40.2">
 <source src="clip.webm" type="video/webm; codecs=vp8,vorbis">
 <source src="clip.ogv" type="video/ogg; codecs=theora,vorbis">
</video>
```

http://wiki.whatwg.org/wiki/Video_type_parameters

Elemento <video> en HTML5

```
<video controls autoplay loop preload  width="480"
height="360" poster="images/poster.jpg" id="video">

 <source src="clip.mp4" type="video/mp4;
                              codecs=avc1.42E01E,mp4a.40.2">
 <source src="clip.webm" type="video/webm; codecs=vp8,vorbis">
 <source src="clip.ogv" type="video/ogg; codecs=theora,vorbis">


 </video>
```

Video API

Propiedades

videoWidth loop
videoHeight muted
currentTime
paused
duration readyState
ended seeking
error volume

Métodos

play()
pause()
load()
canPlayType()

Eventos

progress loadeddata
error loadedmetadata
timeupdate volumechange
ended play pause abort waiting

Video API: Ejemplo (I)

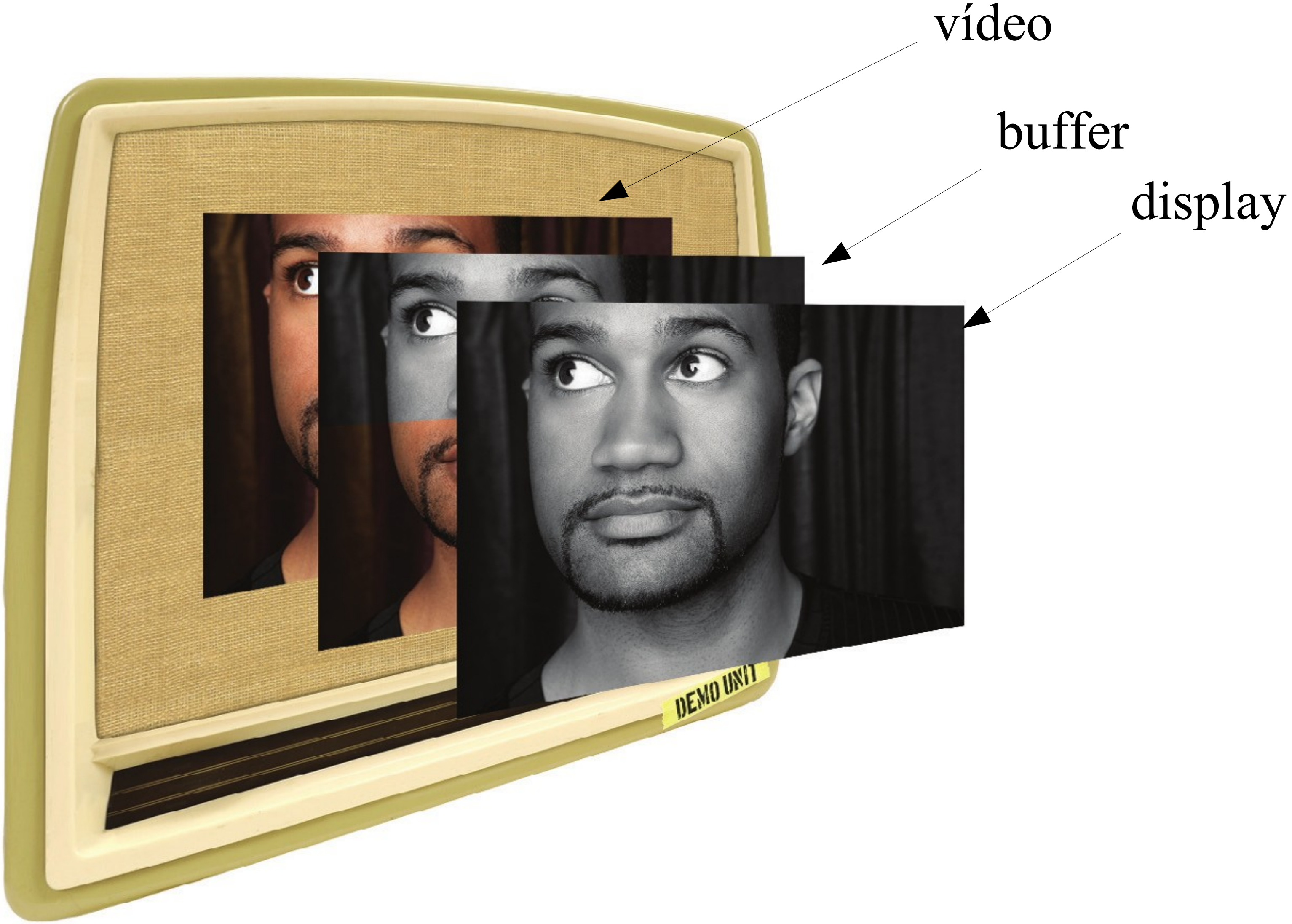
```
var position = -1;
var playlist;
var video;
window.onload = function() {
        playlist = ["video/uno.mp4","video/dos.mp4", "video/tres.mp4"];
        video = document.getElementById("video");
        video.addEventListener("ended", nextVideo, false);
        nextVideo();
}

function nextVideo(){
     position++;
     if (position >=  playlist.length) position = 0;
     video.src = playlist[position];
     video.load();
     video.play();
}
```

Video API: Ejemplo (II)

```
window.onload = function() {
// ...
      playlist = ["video/uno","video/dos", "video/tres"];
// ...
}
function nextVideo(){
// ...
    video.src = playlist[position] + getFormatExtension();
// ...
}
function getFormatExtension() {
   if (video.canPlayType("video/mp4") != "") {
         return ".mp4";
   } else if (video.canPlayType("video/ogg") != "") {
      return ".ogv";
   } else if (video.canPlayType("video/webm") != "") {
      return ".webm";
   }
}
```

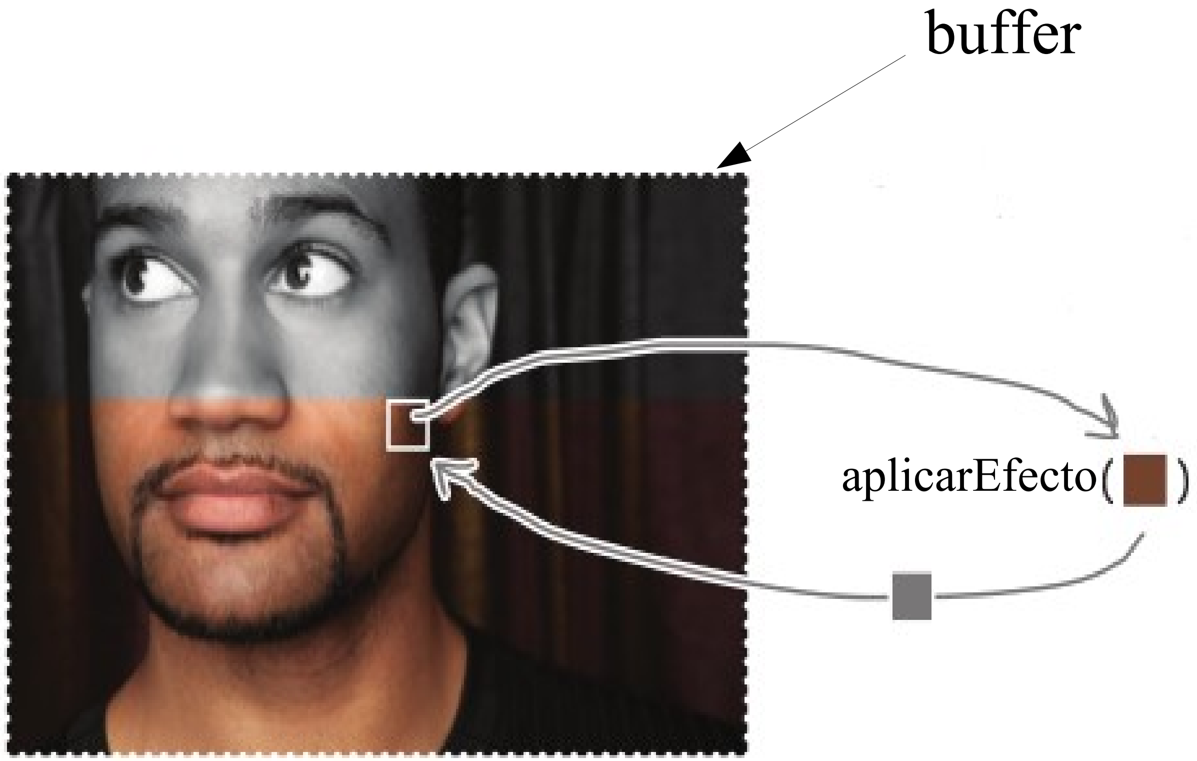
Si canPlayType() devuelve "" : no hay soporte
“maybe” : quizás pueda visualizarlo
“probably” : casi seguro que pueda visualizarlo

Video API + Canvas



Fuente: Head First HTML5 (O'Reilly)

Video API + Canvas



buffer

aplicarEfecto(■)

Fuente: Head First HTML5 (O'Reilly)

Video API + Canvas

```
<div id="videoDiv">
<video id="video" width="720" height="480"></video>
<canvas id="buffer" width="720" height="480"></canvas>
<canvas id="display" width="720" height="480"></canvas>
</div>
```

Fuente: Head First HTML5 (O'Reilly)

Video API + Canvas

```
div#videoDiv {
  position: relative;
  width: 720px;
  height: 480px;
  top: 180px;
  left: 190px;
}

video {
  background-color: black;
}

div#videoDiv canvas {
  position: absolute;
  top: 0px;
  left: 0px;
}
```

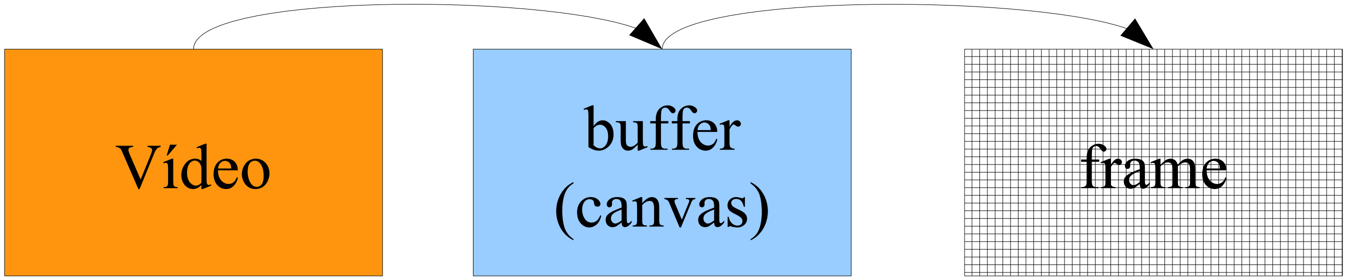
Fuente: Head First HTML5 (O'Reilly)

Video API + Canvas

```
video.addEventListener("play", procesarFrame, false);


function procesarFrame() {
var video = document.getElementById("video");
if (video.paused || video.ended) {
    return;
}
var bufferCanvas = document.getElementById("buffer");
var displayCanvas = document.getElementById("display");
var buffer = bufferCanvas.getContext("2d");
var display = displayCanvas.getContext("2d");
// ... sigue ...
```

Fuente: Head First HTML5 (O'Reilly)

Video API + Canvas



```
buffer.drawImage(video, 0, 0, bufferCanvas.width, bufferCanvas.height);
var frame = buffer.getImageData(0, 0, bufferCanvas.width, bufferCanvas.height);
var length = frame.data.length / 4;
```

Fuente: Head First HTML5 (O'Reilly)

Video API + Canvas

r	g	b	a	r	g	b	a	r	g	b	a	..	..

```
for (var i = 0; i < length; i++) {
        var r = frame.data[i * 4 + 0];
        var g = frame.data[i * 4 + 1];
        var b = frame.data[i * 4 + 2];

        aplicarEfecto(i, r, g, b, frame.data);
}
display.putImageData(frame, 0, 0);

setTimeout(procesarFrame, 0);
```

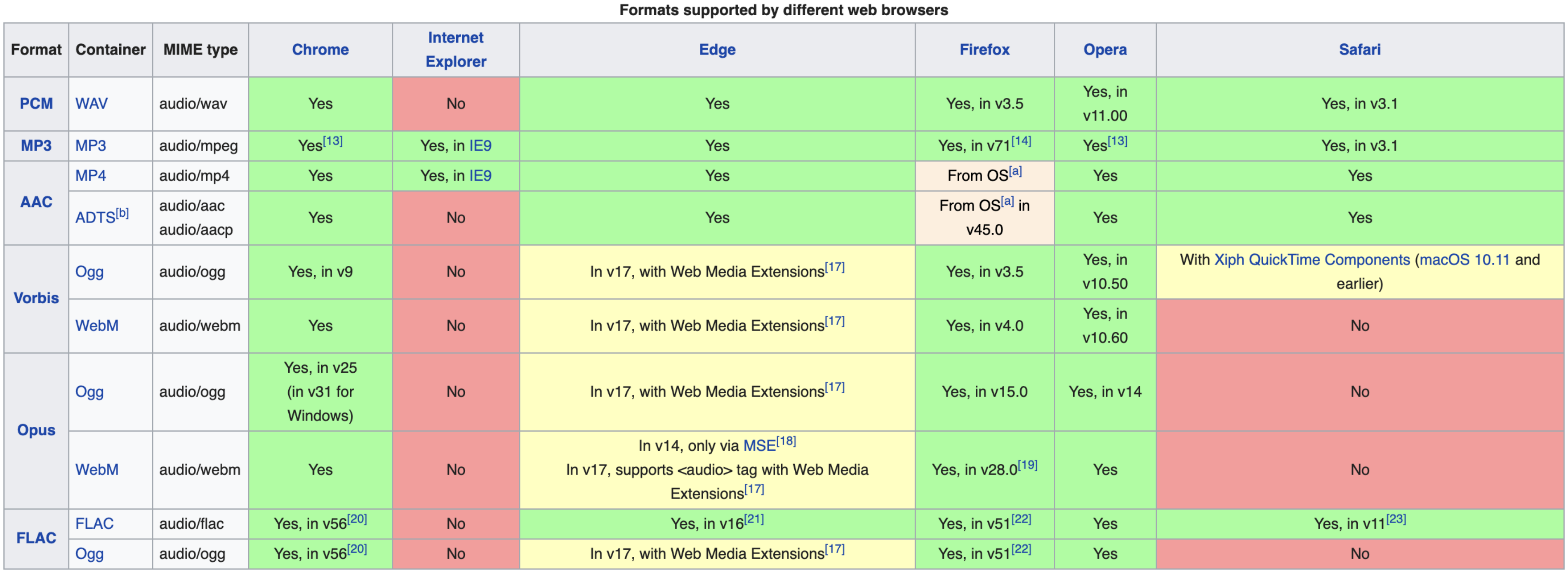
Fuente: Head First HTML5 (O'Reilly)

Video API + Canvas

```
function aplicarEfecto(pos, r, g, b, data) {
    var gris = (r + g + b) / 3;
    data[pos * 4 + 0] = gris;
    data[pos * 4 + 1] = gris;
    data[pos * 4 + 2] = gris;
}
```

Fuente: Head First HTML5 (O'Reilly)

Elemento <audio> en HTML5



Formats supported by different web browsers

Format	Container	MIME type	Chrome	Internet Explorer	Edge	Firefox	Opera	Safari
PCM	WAV	audio/wav	Yes	No	Yes	Yes, in v3.5	Yes, in v11.00	Yes, in v3.1
MP3	MP3	audio/mpeg	Yes[13]	Yes, in IE9	Yes	Yes, in v71[14]	Yes[13]	Yes, in v3.1
AAC	MP4	audio/mp4	Yes	Yes, in IE9	Yes	From OS[a]	Yes	Yes
	ADTS[b]	audio/aac audio/aacp	Yes	No	Yes	From OS[a] in v45.0	Yes	Yes
Vorbis	Ogg	audio/ogg	Yes, in v9	No	In v17, with Web Media Extensions[17]	Yes, in v3.5	Yes, in v10.50	With Xiph QuickTime Components (macOS 10.11 and earlier)
	WebM	audio/webm	Yes	No	In v17, with Web Media Extensions[17]	Yes, in v4.0	Yes, in v10.60	No
Opus	Ogg	audio/ogg	Yes, in v25 (in v31 for Windows)	No	In v17, with Web Media Extensions[17]	Yes, in v15.0	Yes, in v14	No
	WebM	audio/webm	Yes	No	In v14, only via MSE[18] In v17, supports <audio> tag with Web Media Extensions[17]	Yes, in v28.0[19]	Yes	No
FLAC	FLAC	audio/flac	Yes, in v56[20]	No	Yes, in v16[21]	Yes, in v51[22]	Yes	Yes, in v11[23]
	Ogg	audio/ogg	Yes, in v56[20]	No	In v17, with Web Media Extensions[17]	Yes, in v51[22]	Yes	No

http://en.wikipedia.org/wiki/HTML5_Audio

```
<audio controls>
  <source src="horse.ogg" type="audio/ogg">
  <source src="horse.mp3" type="audio/mpeg">
  Tu navegador no soporta la etiqueta audio.
</audio>
```