Advanced Media for the Web

Media for the modern web

Session 504
Jer Noble
WebKit Engineer

<video>

<video>

 <table> <audio>

n> <video> <figure> <b

<svg> <img> <caption> <form>

<table>

<video>
<audio>
<figure>
<img>
<caption>

<table>

<audio>

n>

<video>

<figure>

<b

>

<caption>

<f

 <table> <audio>

n> <video> <figure> <b

<svg> <img> <caption> <form>

<video>

Mac Pro

Overview Performance Tech Specs Buy Now

Mac Pro

Built for creativity on an epic scale.

1999

```
<OBJECT CLASSID="clsid:02BF25D5-8C17-4B23-BC80-D3488ABDDC6B"
    CODEBASE="http://www.apple.com/qtactivex/qtplugin.cab"
    HEIGHT=480
    WIDTH=640>
    <PARAM NAME="src" VALUE="MyMovie.mov" >
    <EMBED SRC=“MyMovie.mov”
        HEIGHT=640
        WIDTH=480 TYPE="video/quicktime"
        PLUGINSPAGE="http://www.apple.com/quicktime/download/"
    />
</OBJECT>
```

2006

```
<OBJECT CLASSID="clsid:02BF25D5-8C17-4B23-BC80-D3488ABDDC6B"
    CODEBASE="http://www.apple.com/qtactivex/qtplugin.cab"
    HEIGHT=480
    WIDTH=640>
    <PARAM NAME="src" VALUE="MyMovie.mov" >
    <EMBED SRC="MyMovie.mov"
        HEIGHT=640
        WIDTH=480 TYPE="video/quicktime"
        PLUGINSPAGE="http://www.apple.com/quicktime/download/"
    />
</OBJECT>
```

2007

<video>

2009


3G
9:42 AM
9:42
Monday, June 8
slide to unlock

Past Sessions

Available at http://developer.apple.com/

Past Sessions

Available at http://developer.apple.com/

Delivering audio and video using web standards

Past Sessions

Available at http://developer.apple.com/

Delivering audio and video using web standards

Advanced HTML5 media controllers in Safari

Past Sessions

Available at http://developer.apple.com/

Delivering audio and video using web standards

Advanced HTML5 media controllers in Safari

Advanced effects with HTML5 media technologies

What You Will Learn

Narrowing platform differences

Stream adaptive media

Improve power efficiency

Coordinate events

What You Will Learn

Narrowing platform differences

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A Brief Rant About Plug-ins

A Brief Rant About Plug-ins
or
How I Learned to Stop Worrying and Love the DOM

What You Will Learn

Narrowing platform differences

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Coordinate events

Narrowing Platform Differences

Narrowing Platform Differences

Control media loading

Narrowing Platform Differences

Control media loading

Participate in layering

Control Media Loading

Preload

Control Media Loading

Preload

```
<video preload="none|metadata|auto">
```

Control Media Loading

Preload

```
<video preload="none|metadata|auto">
```

none	no media data

Control Media Loading

Preload

```
<video preload="none|metadata|auto">
```

none	no media data
metadata	only media metadata

Control Media Loading

Preload

```
<video preload="none|metadata|auto">
```

none	no media data
metadata	only media metadata
auto	enough media data to start playback

Control Media Loading

Preload values

	Accepted	Default

Control Media Loading

Preload values

	Accepted	Default

Control Media Loading

Preload values

	Accepted	Default
OS X	none, metadata, auto	auto

Control Media Loading

Preload values

	Accepted	Default
OS X	none, metadata, auto	auto
iOS 7	none	none

Control Media Loading

Preload values

NEW

	Accepted	Default
OS X	none, metadata, auto	auto
iOS 7	none	none
iOS 8	none, metadata	metadata

Control Media Loading

Rationale

Control Media Loading

Rationale

No change in behavior for most sites

Control Media Loading

Rationale

No change in behavior for most sites

Allows pages to request no loading of metadata

Control Media Loading

Rationale

No change in behavior for most sites

Allows pages to request no loading of metadata

Keeps user control over media loading

Control Media Loading

Rationale

No change in behavior for most sites

Allows pages to request no loading of metadata

Keeps user control over media loading

Makes iOS more like OS X

Control Media Loading

Breaking changes

<video> will begin to emit "loadedmetadata" events

Control Media Loading

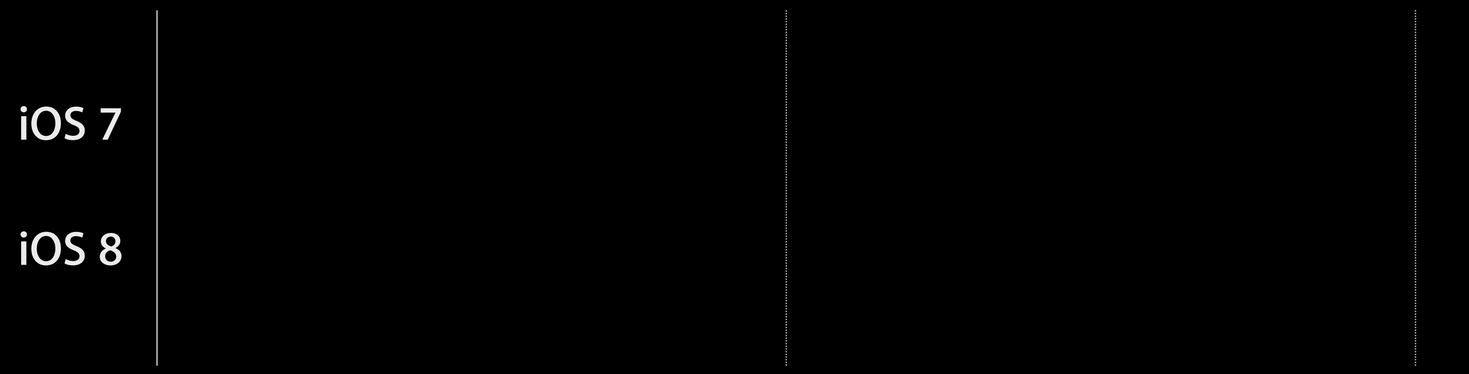
Breaking changes

```
<video controls
       onloadedmetadata = "this.controls = false">
```

Control Media Loading

Breaking changes

```
<video controls
       onloadedmetadata = "this.controls = false">
```



Control Media Loading

Breaking changes

```
<video controls
       onloadedmetadata = "this.controls = false">
```

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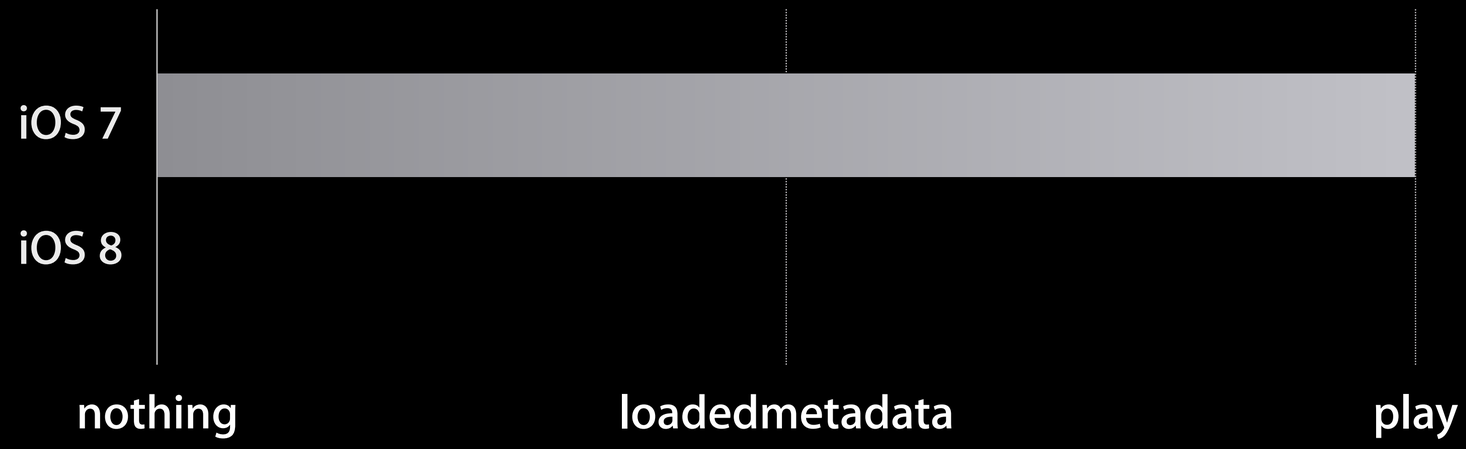
Breaking changes

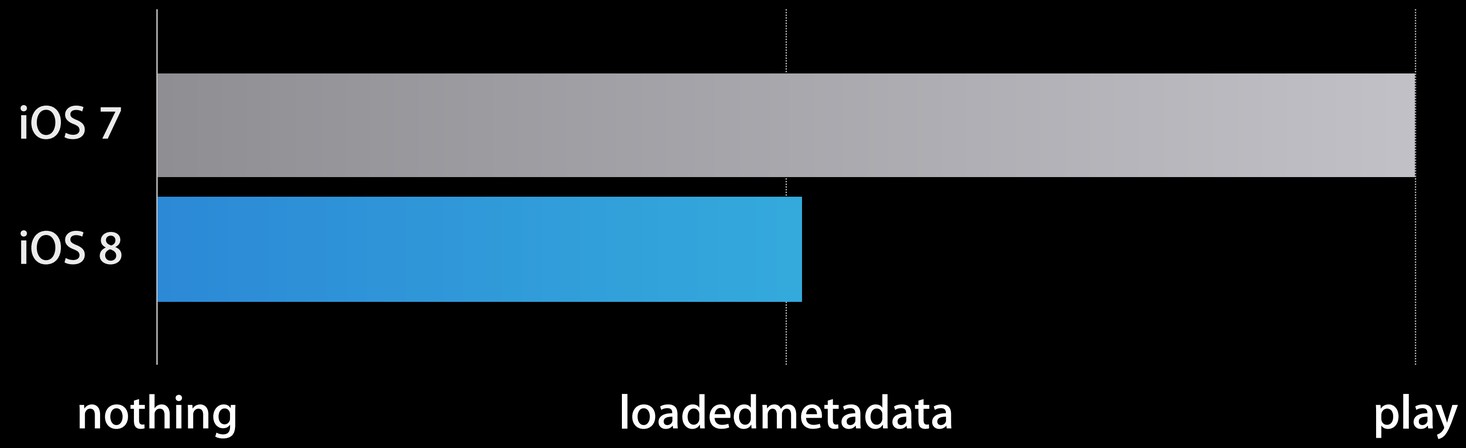
```
<video controls
       onloadedmetadata = "this.controls = false">
```



Control Media Loading

Breaking changes

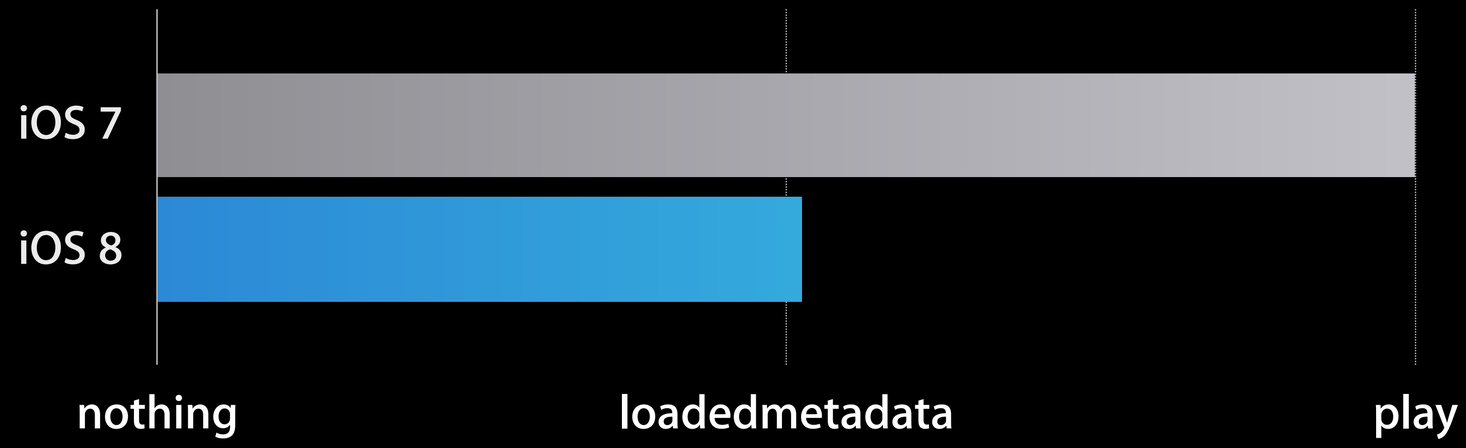
```
<video controls
       onloadedmetadata = "this.controls = false">
```



Control Media Loading

Breaking changes

```
<video controls
       onplay = "this.controls = false">
```



Control Media Loading

Breaking changes

```
<video controls
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```

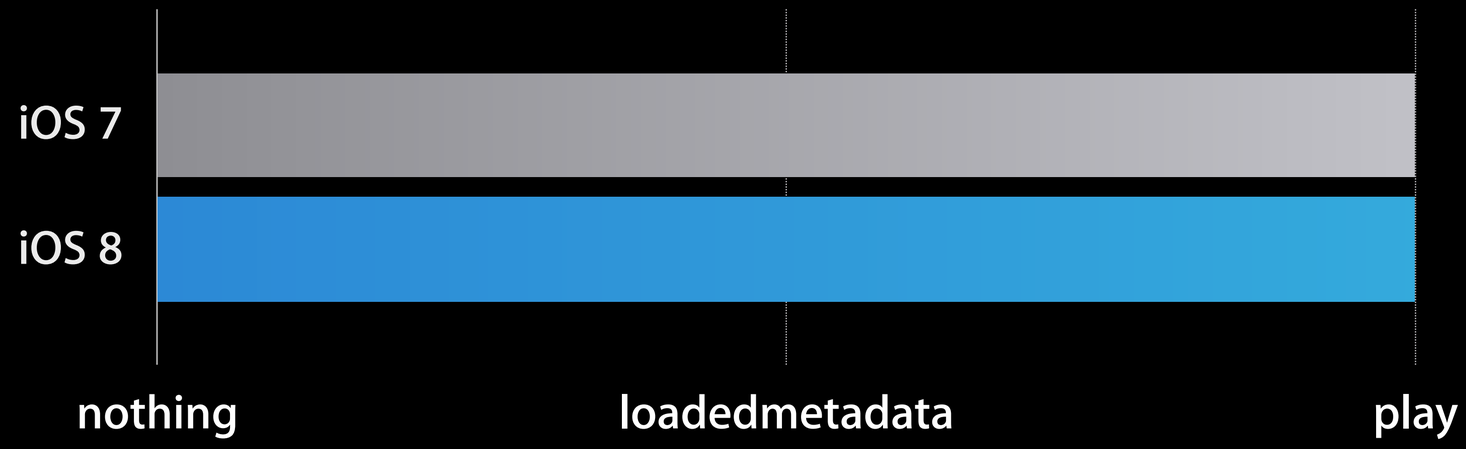

Participate in Layering

Participate in Layering

In iOS 7, <video> was layered topmost

Participate in Layering

In iOS 7, <video> was layered topmost

In iOS 8, <video> respects CSS layering

Participate in Layering

In iOS 7, <video> was layered topmost

In iOS 8, <video> respects CSS layering

Caveat—Websites depending on iOS 7 behavior will break

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Streaming

Responsive web design

Streaming

Responsive web design

The goal of responsive design is an optimal web experience across all devices

Streaming

Responsive web design

The goal of responsive design is an optimal web experience across all devices

The page “responds” to characteristics of those devices

Streaming

Responsive web design

The goal of responsive design is an optimal web experience across all devices

The page “responds” to characteristics of those devices

Viewport size is the most commonly used characteristic

Streaming

Responsive web design

The goal of responsive design is an optimal web experience across all devices

The page “responds” to characteristics of those devices

Viewport size is the most commonly used characteristic

Adaptive media uses viewport size and more

Streaming

Delivering adaptive media

Streaming

Delivering adaptive media

Viewport dimensions

Streaming

Delivering adaptive media

Viewport dimensions

Maximum video resolution

Streaming

Delivering adaptive media

Viewport dimensions

Maximum video resolution

Codec support

Streaming

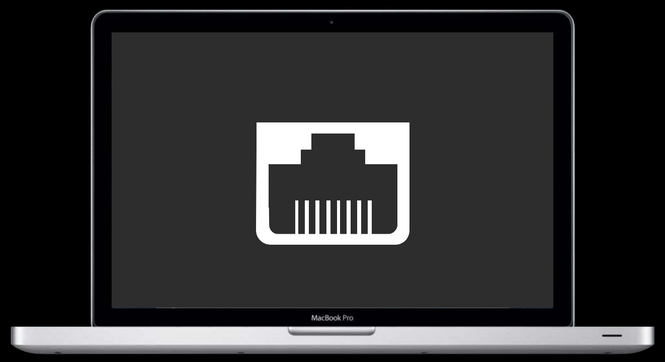
Delivering adaptive media

Viewport dimensions

Maximum video resolution

Codec support

Bandwidth availability


MacBook Pro


3G
9:42 AM


3G
9:42 AM

HTTP Live Streaming

HTTP Live Streaming

HLS

HTTP Live Streaming

HLS

Manifest-based

HTTP Live Streaming

HLS

Manifest-based

Master playlist describes each stream

HTTP Live Streaming

HLS

Manifest-based

Master playlist describes each stream

Browser chooses the appropriate stream

HTTP Live Streaming

HLS

Manifest-based

Master playlist describes each stream

Browser chooses the appropriate stream

Seamless stream switching

HTTP Live Streaming

HLS

Manifest-based

Master playlist describes each stream

Browser chooses the appropriate stream

Seamless stream switching

Native quality

Demo

HTTP Live Streaming

Brent Fulgham
WebKit Engineer

HTTP Live Streaming

Tech Note 2224—Best Practices for Creating and Deploying HLS Media
https://developer.apple.com/library/ios/technotes/tn2224/

HTTP Live Streaming Tools
https://developer.apple.com/downloads/

HTTP Live Streaming Developer Page
https://developer.apple.com/streaming/

Media Source Extensions

Media Source Extensions

MSE

Media Source Extensions

MSE

An extension to the HTML5 specification

Media Source Extensions

MSE

An extension to the HTML5 specification

<video src="myMovie.mp4">

Media Source Extensions

MSE

An extension to the HTML5 specification

<video src="mediasource://....">

Media Source Extensions

MSE

An extension to the HTML5 specification

<video src="mediasource://....">

Complete control over data loading

“With great power comes
great responsibility.”

Voltaire

“With great power comes
great responsibility.”

Uncle Ben

MSE

Requirements

MSE

Requirements

Fetch media explicitly

MSE

Requirements

Fetch media explicitly

Prefetch media manually

MSE

Requirements

Fetch media explicitly

Prefetch media manually

Monitor network conditions manually

MSE

Requirements

Fetch media explicitly

Prefetch media manually

Monitor network conditions manually

Monitor playback metrics manually

MSE

Requirements

Fetch media explicitly

Prefetch media manually

Monitor network conditions manually

Monitor playback metrics manually

Switch streams manually

HLS vs. MSE

System information

	HLS	MSE

HLS vs. MSE

System information

	HLS	MSE
CPU Activity	✓	✗

HLS vs. MSE

System information

	HLS	MSE
CPU Activity	✓	✗
Network Type	✓	✗

HLS vs. MSE

System information

	HLS	MSE
CPU Activity	✓	✗
Network Type	✓	✗
Battery	✓	✗

HLS vs. MSE

System information

	HLS	MSE
CPU Activity	✓	✗
Network Type	✓	✗
Battery	✓	✗
Available Memory	✓	✗

HLS vs. MSE

Complexity

HLS vs. MSE

Complexity

MSE requires a large JavaScript implementation

HLS vs. MSE

Complexity

MSE requires a large JavaScript implementation

HLS requires a single line of HTML

HLS vs. MSE

Complexity

MSE requires a large JavaScript implementation

HLS requires a single line of HTML

HLS is supported on iOS Safari

Desktop Browser Support

	HLS	MSE

Desktop Browser Support

	HLS	MSE
OS X Safari	✓	✓

Desktop Browser Support

	HLS	MSE
OS X Safari	✓	✓
iOS Safari	✓	✗

Desktop Browser Support

	HLS	MSE
OS X Safari	✓	✓
iOS Safari	✓	✗
Android Browser	✓	✗

Desktop Browser Support

	HLS	MSE
OS X Safari	✓	✓
iOS Safari	✓	✗
Android Browser	✓	✗
Internet Explorer	✗	✓

Desktop Browser Support

	HLS	MSE
OS X Safari	✓	✓
iOS Safari	✓	✗
Android Browser	✓	✗
Internet Explorer	✗	✓
Google Chrome	Future	✓

Desktop Browser Support

	HLS	MSE
OS X Safari	✓	✓
iOS Safari	✓	✗
Android Browser	✓	✗
Internet Explorer	✗	✓
Google Chrome	Future	✓
Firefox	Future	Future

Streaming

Streaming

No settled streaming technology

Streaming

No settled streaming technology

For Safari users, use HLS

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Increasing Power Efficiency

Increasing Power Efficiency

Increasing Power Efficiency

Increasing Power Efficiency

Increasing Power Efficiency

Apple devices have amazing battery life

Increasing Power Efficiency

Apple devices have amazing battery life

Last mile is up to you

Increasing Power Efficiency

Apple devices have amazing battery life

Last mile is up to you

Power use is easy to get wrong

Power

Best practices

Power

Best practices

Fullscreen mode

Power

Best practices

Fullscreen mode

Sleep cycles

Power

Fullscreen

Power

Fullscreen

Let apps nap

Power

Fullscreen

Let apps nap

Low-power compositing

Power

Pixel formats

Power

Pixel formats

R

G

B

Power

Pixel formats

R  8

G  8

B  8

Power

Pixel formats

Power

Pixel formats

Y

Power

Pixel formats

Y

UV

Power

Pixel formats

Y

4:

UV

2:2

Power

Pixel formats

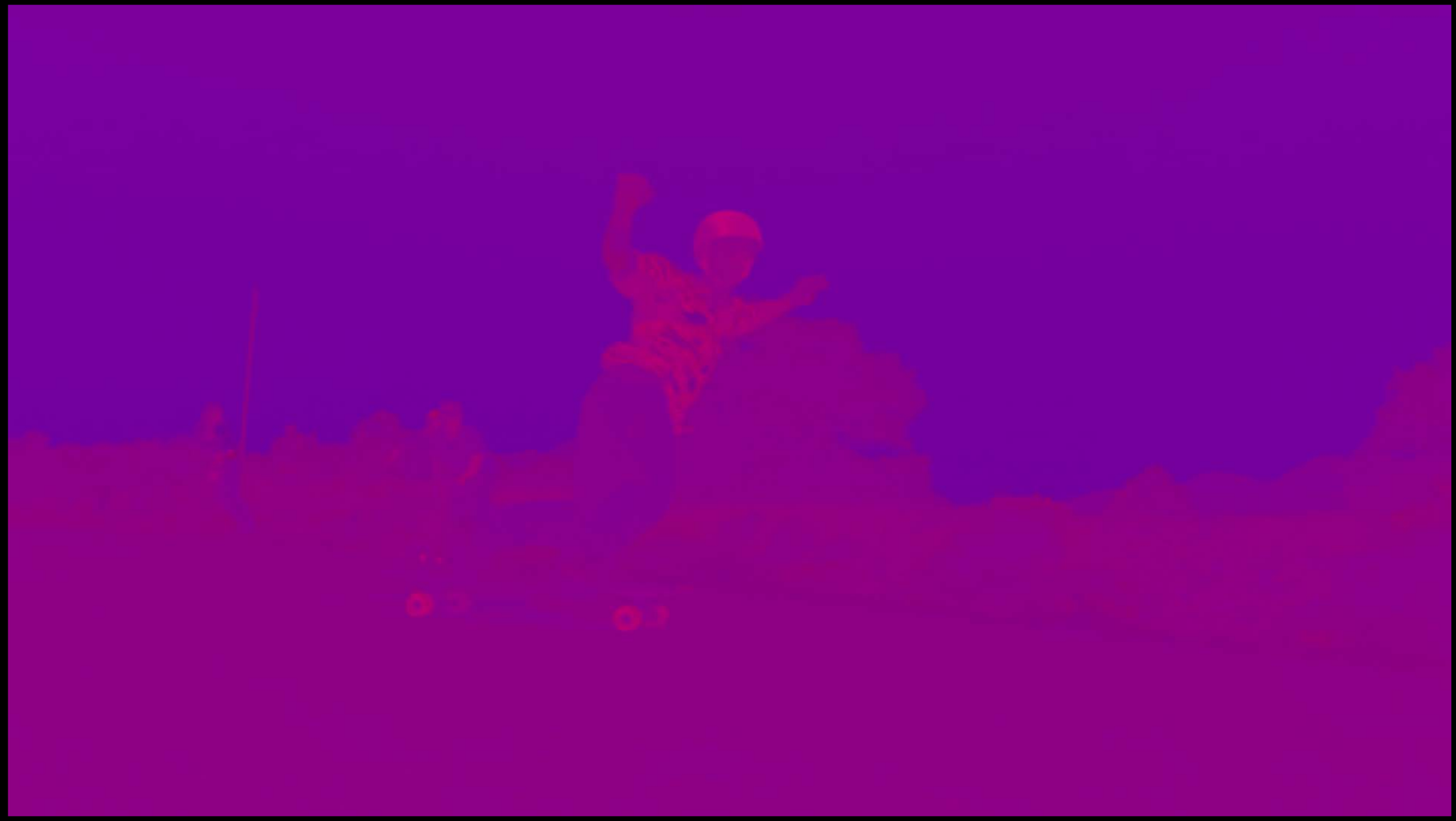
YUV 422

Power

Pixel formats

Power

Pixel formats



Power

Pixel formats

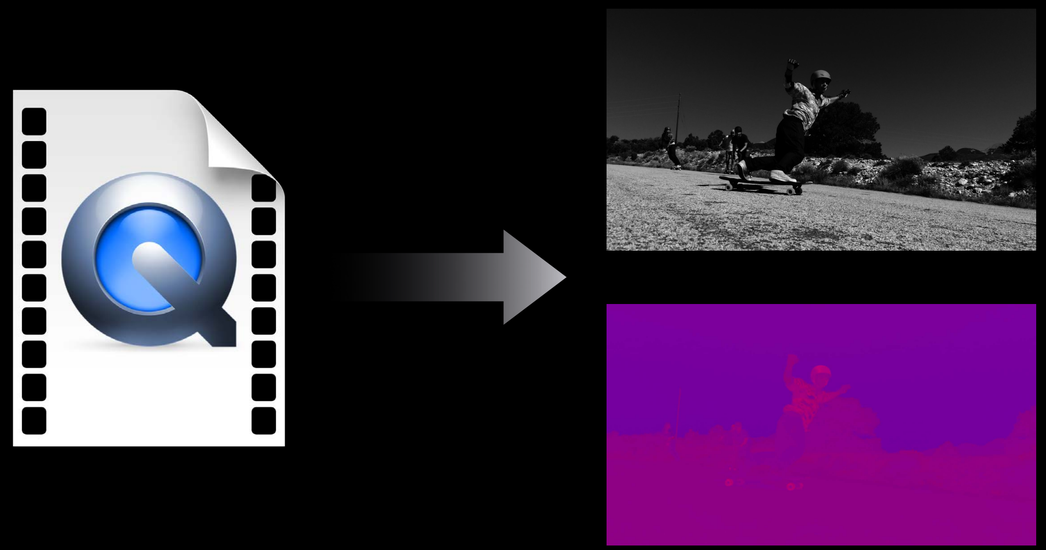
YUV 422

Power

Compositing

Power

Compositing



Power

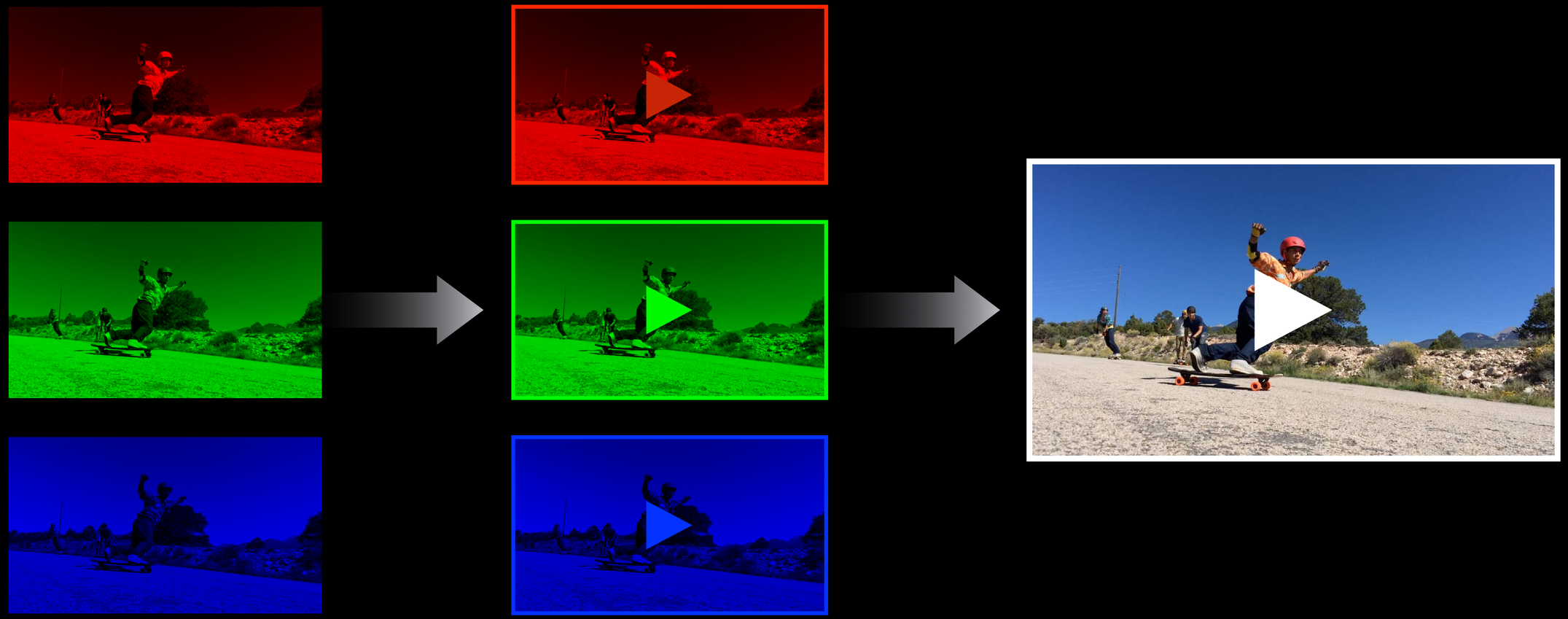
Compositing

Power

Compositing

Power

Compositing



Power

Low-power compositing

Power

Low-power compositing

Power

Low-power compositing

Low-Power Compositing

Prerequisites

Low-Power Compositing

Prerequisites

Use the Fullscreen API

Low-Power Compositing

Prerequisites

Use the Fullscreen API

Use a black background

Low-Power Compositing

Prerequisites

Use the Fullscreen API

Use a black background

Use display:none on your controls

Low-Power Compositing

Prerequisites

Use the Fullscreen API

Use a black background

Use display:none on your controls

Hide everything else

Low-Power Compositing

Fullscreen API

```
function fullscreenToggle() {
    if (this === document.webkitCurrentFullscreenElement)
        document.webkitCancelFullscreen();
    else
        this.webkitRequestFullscreen();
}
```

Low-Power Compositing

Hide everything else

Low-Power Compositing

Hide everything else

```
:-webkit-full-screen-ancestor >
```

Low-Power Compositing

Hide everything else

```
:-webkit-full-screen-ancestor >
   :not(:-webkit-full-screen-ancestor):not(:-webkit-full-screen)
```

Low-Power Compositing

Hide everything else

```
:-webkit-full-screen-ancestor >
   :not(:-webkit-full-screen-ancestor):not(:-webkit-full-screen)
   { display: none; }
```

Low-Power Compositing

Hide everything else

```
:-webkit-full-screen-ancestor >
   :not(:-webkit-full-screen-ancestor):not(:-webkit-full-screen)
   { display: none; }
```

Power

Best practices

Fullscreen mode

Sleep cycles

Power

Sleep

Power

Sleep

<video> playback will keep the system awake

Power

Sleep

<video> playback will keep the system awake

Only with specific criteria

Power

Stay awake

Power

Stay awake

Has video and audio track

Power

Stay awake

Has video and audio track

Is playing

Power

Stay awake

Has video and audio track

Is playing

Not looping

Power

Go to sleep

Has video and audio track

Is playing

Not looping

Power

Go to sleep

Has video and audio track

Is playing

Not looping

Power

Go to sleep

- ⊗ Has video and audio track
  Is playing
- ⊗ Not looping

Power

Go to sleep

- Has video and audio track
- Is playing
- Not looping

Power

Go to sleep

- ✓ Has video and audio track
- Is playing
- ✓ Not looping

Power

Stay awake

Has video and audio track

Is playing

Not looping

Power

Stay awake

Has video and audio track

Is playing

Not looping

Is visible

What You Will Learn

Narrowing platform differences

Stream adaptive media

Improve power efficiency

Coordinate events

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Timed Metadata

Timed Metadata

Data delivered along with media

Timed Metadata

Data delivered along with media

In the media's timeline

Timed Metadata

Examples of Timed Metadata

Timed Metadata

Examples of Timed Metadata

Caption tracks

Timed Metadata

Examples of Timed Metadata

Caption tracks

Subtitle tracks

Timed Metadata

Examples of Timed Metadata

Caption tracks

Subtitle tracks

Chapter tracks

Timed Metadata

Examples of Timed Metadata

Caption tracks

Subtitle tracks

Chapter tracks

Metadata tracks

Timed Metadata

API

Timed Metadata

API

Available through AVFoundation framework

Timed Metadata

API

Available through AVFoundation framework

Web apps can use TextTrack APIs

Timed Metadata

TextTrackCue

```
interface TextTrackCue {
```

Timed Metadata

TextTrackCue

```
interface TextTrackCue {
    attribute double startTime;
```

Timed Metadata

TextTrackCue

```
interface TextTrackCue {
    attribute double startTime;
    attribute double endTime;
```

Timed Metadata

TextTrackCue

```
interface TextTrackCue {
    attribute double startTime;
    attribute double endTime;
    attribute EventListener onenter;
```

Timed Metadata

TextTrackCue

```
interface TextTrackCue {
    attribute double startTime;
    attribute double endTime;
    attribute EventListener onenter;
    attribute EventListener onexit;
```

Timed Metadata

TextTrackCue

```
interface TextTrackCue {
    attribute double startTime;
    attribute double endTime;
    attribute EventListener onenter;
    attribute EventListener onexit;
}
```

Timed Metadata

WebKitDataCue

```
interface WebKitDataCue : TextTrackCue {
    readonly attribute DOMString type;
    attribute any value;
}
```

Timed Metadata

WebKitDataCue types

```
com.apple.quicktime.udta
com.apple.quicktime.mdta
com.apple.itunes
org.mp4ra
org.id3
```

Timed Metadata

WebKitDataCue values

```
value = {
    key: String
    data: String | Array | Number | ArrayBuffer | …
    locale: String
}
```

Timed Metadata

Use cases

Display current title information

Track enter and exit points

Demo

Timed Metadata

Brent Fulgham
WebKit Engineer

Summary

Summary

Safari on iOS is closer to Safari on OS X

Summary

Safari on iOS is closer to Safari on OS X

Use HLS to stream adaptive media

Summary

Safari on iOS is closer to Safari on OS X

Use HLS to stream adaptive media

Improve power efficiency in fullscreen

Summary

Safari on iOS is closer to Safari on OS X

Use HLS to stream adaptive media

Improve power efficiency in fullscreen

Event-driven media playback with Timed Metadata

More Information

Evangelism
evangelism@apple.com

Documentation
https://developer.apple.com/safari/

Apple Developer Forums
http://devforums.apple.com

Related Sessions

• Harnessing Metadata in Audiovisual Media	Pacific Heights	Tuesday 2:00PM
• Writing Energy Efficient Code, Part 1	Russian Hill	Wednesday 10:15AM
• Designing Responsive Web Experiences	Marina	Friday 10:15AM

Labs

• Safari and WebKit Lab	Media Lab B	Tuesday 4:30PM
• Safari and WebKit Lab	Media Lab B	Wednesday 4:30PM
• HTTP Live Streaming Lab	Media Lab A	Thursday 9:00AM
• Safari and WebKit Lab	Media Lab B	Thursday 2:00PM

WWDC14