Power and Performance

Optimizing your website for great battery life and responsive scrolling

Session 607

Simon Fraser
Safari and WebKit Engineer

These are confidential sessions—please refrain from streaming, blogging, or taking pictures

Safari File Edit View History Bookmarks Develop Window Help

Tue 2:07 PM

Life near the North Pole – travel tips and articles – Lonely Planet

www.lonelyplanet.com/norway/travel-tips-and-articles/75943

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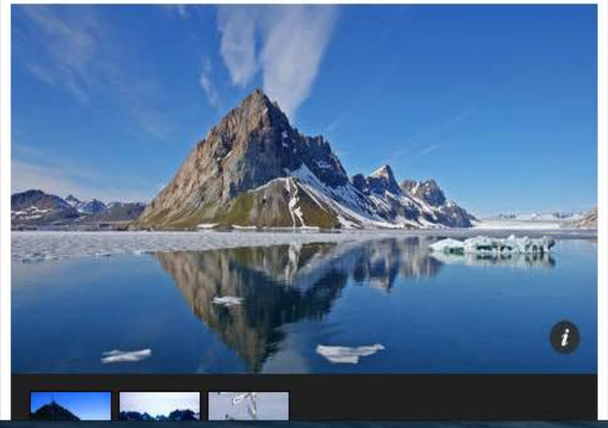
THINGS TO DO

- All things to do (1,150)
- Activities (187)
- Entertainment (140)
- Restaurants (308)
- Shopping (56)

Sep 14, 2010 4:07:15 AM

Life near the North Pole

Anthony Ham
Lonely Planet Author



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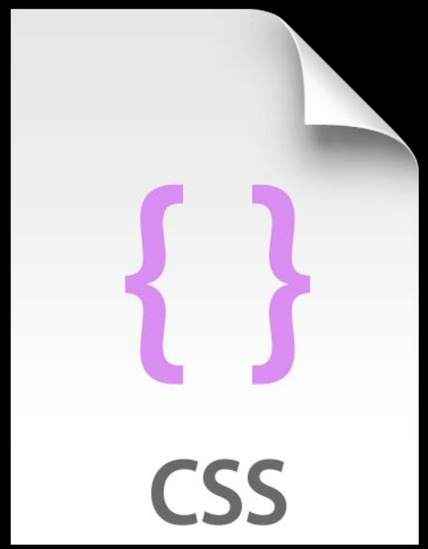

CSS

HTML

IMAGE

What You Will Learn

What You Will Learn

- New power-saving features in Safari

What You Will Learn

- New power-saving features in Safari
- Making power-efficient webpages

What You Will Learn

- New power-saving features in Safari
- Making power-efficient webpages
- Safari responsive scrolling

Safari Power-Saving Features

Power-Saving Features

Power-Saving Features

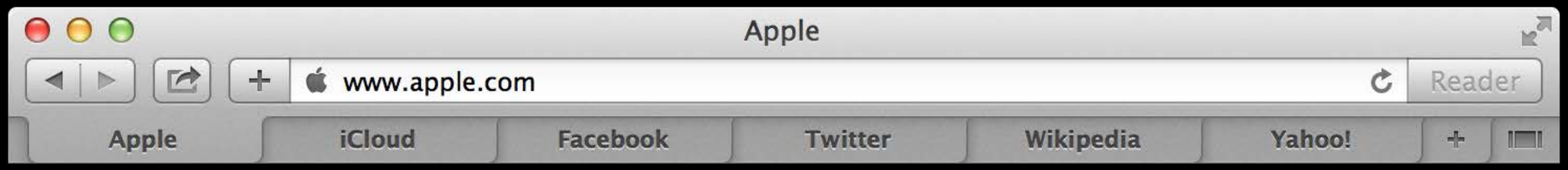
- App Nap for Safari tabs

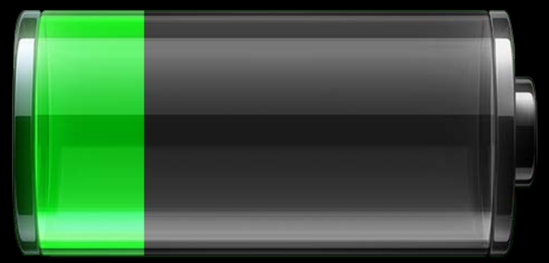
Power-Saving Features

- App Nap for Safari tabs
- Power Saver

App Nap for Safari Tabs

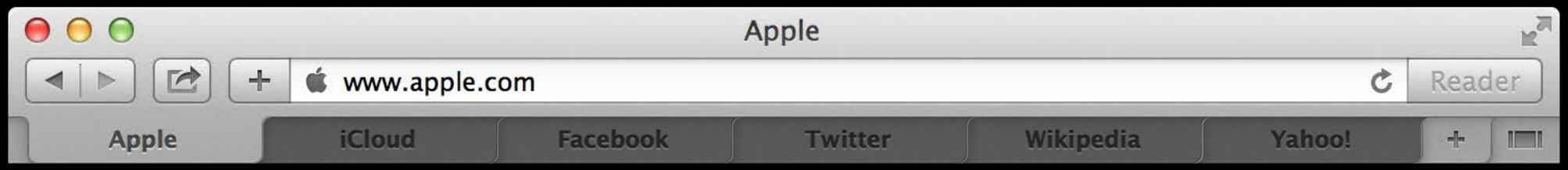
New in Safari 7





App Nap for Safari Tabs

New in Safari 7



What Is App Nap for Safari Tabs?

What Is App Nap for Safari Tabs?

- Each tab has its own Safari Web Content process

What Is App Nap for Safari Tabs?

- Each tab has its own Safari Web Content process
- App Nap is applied to the Safari Web Content process for that tab

What Is App Nap for Safari Tabs?

- Each tab has its own Safari Web Content process
- App Nap is applied to the Safari Web Content process for that tab
- Saves power by napping background tabs

When Are Tabs Napped?

When Are Tabs Napped?

- Tab is not visible
  - Background tab
  - Minimized window
  - In another space
  - Screen saver is on
  - Occluded window

When Are Tabs Napped?

- Tab is not visible
  - Background tab
  - Minimized window
  - In another space
  - Screen saver is on
  - Occluded window
- Idle windows

Effects of App Nap for Safari Tabs

Effects of App Nap for Safari Tabs

- JavaScript timers are rate-limited

Effects of App Nap for Safari Tabs

- JavaScript timers are rate-limited
  - `setTimeout()`, `setInterval()`

Effects of App Nap for Safari Tabs

- JavaScript timers are rate-limited
  - `setTimeout()`, `setInterval()`
  - `requestAnimationFrame()`

Effects of App Nap for Safari Tabs

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- Napping prevented when

Effects of App Nap for Safari Tabs

- JavaScript timers are rate-limited
  - `setTimeout()`, `setInterval()`
  - `requestAnimationFrame()`
- Napping prevented when
  - Playing audio

Effects of App Nap for Safari Tabs

- JavaScript timers are rate-limited
  - `setTimeout()`, `setInterval()`
  - `requestAnimationFrame()`
- Napping prevented when
  - Playing audio
  - Loading

What You Should Do

What You Should Do

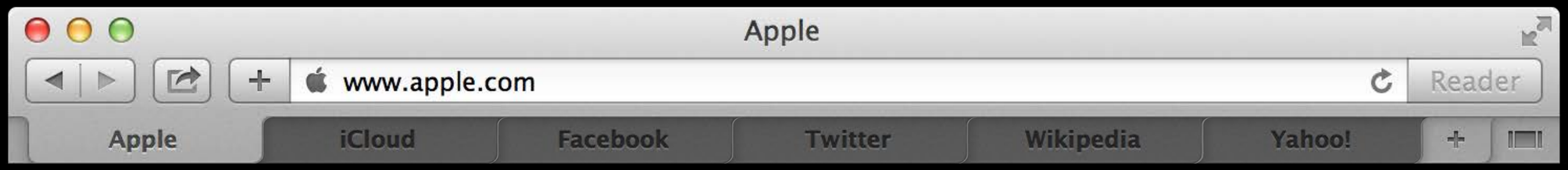
- Often nothing

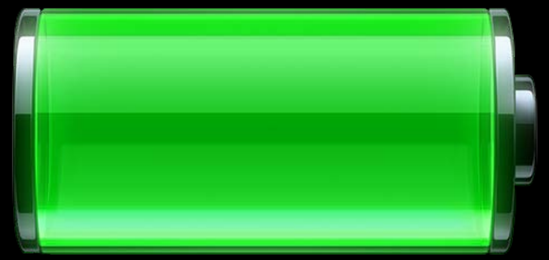
What You Should Do

- Often nothing
- But be prepared for timer rate-limiting

App Nap for Safari Tabs

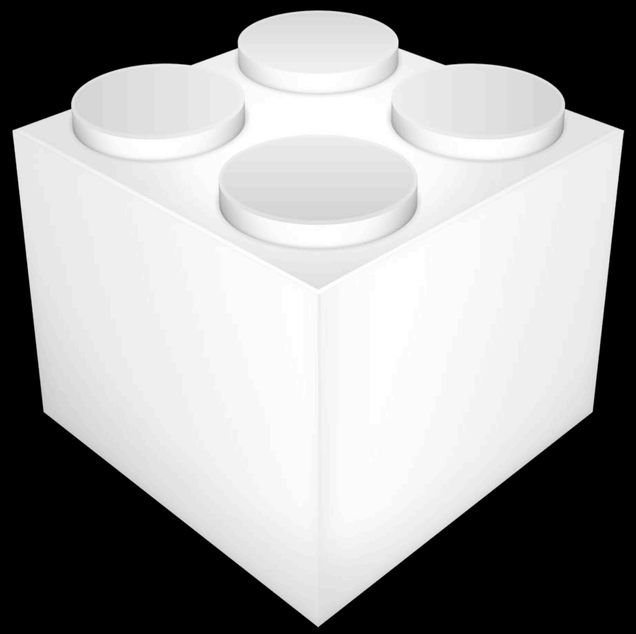
New in Safari 7

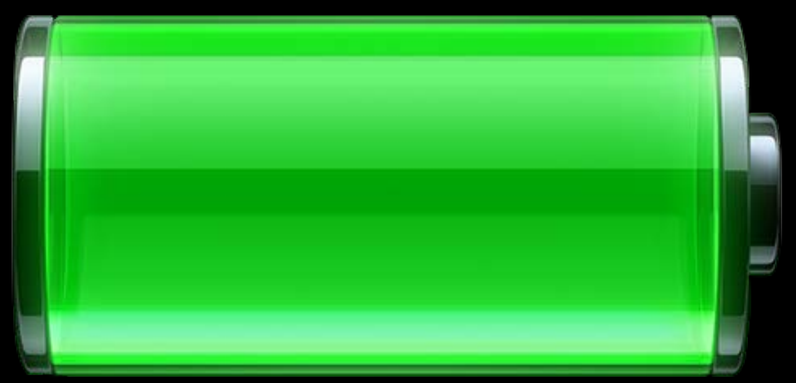




Safari Power Saver

New in Safari 7





Up to

35%

Reduction In CPU Power Usage

Testing conducted by Apple in June 2013 using production 1.8GHz Intel Core i5-based 13-inch MacBook Air systems with 4GB of RAM and prerelease OS X v10.9. Tested with prerelease Safari 7.0 with Power Saver on (default) vs. off. Systems tested with WPA2 Wi-Fi network connection while running on battery power. Performance will vary based on system configuration, application workload, and other factors.

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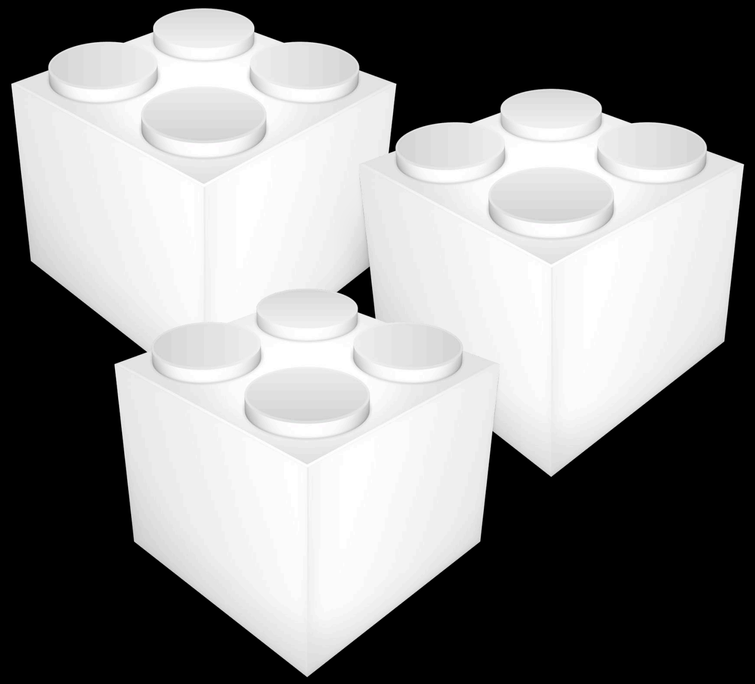
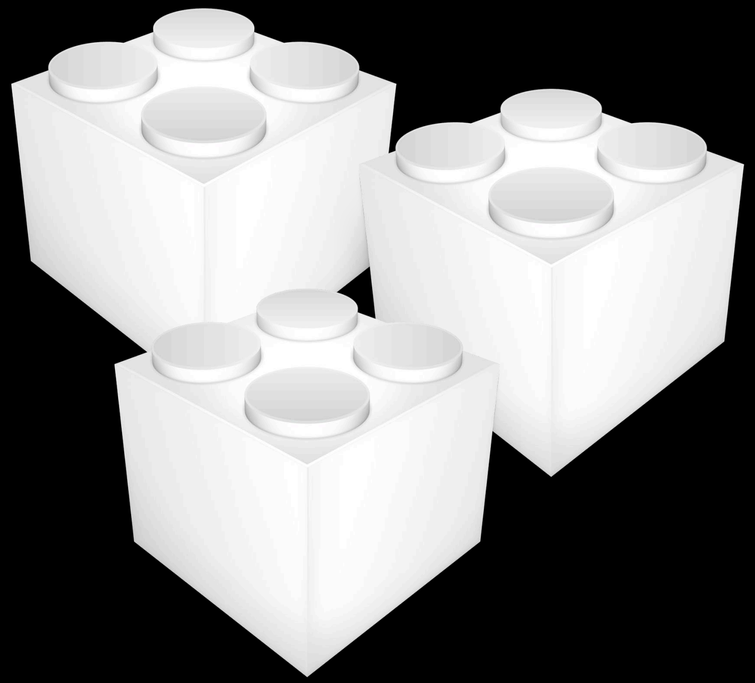
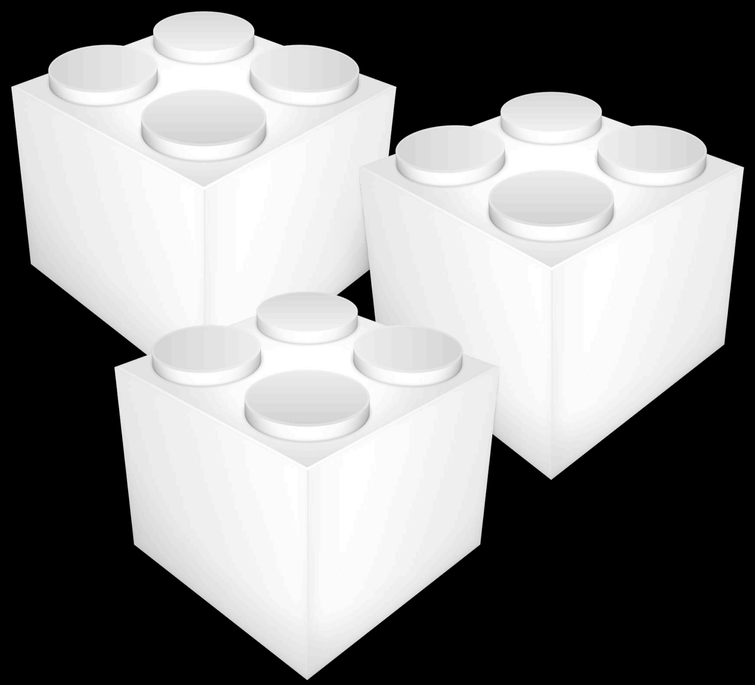
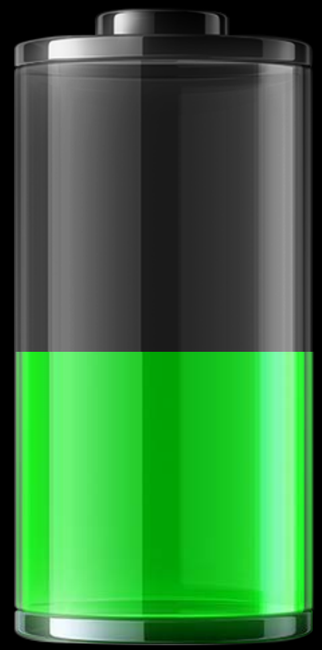
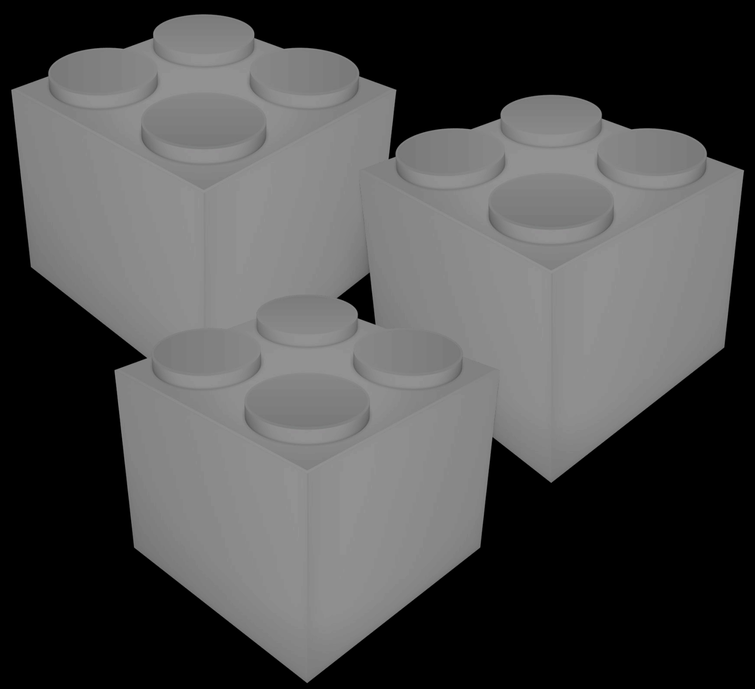
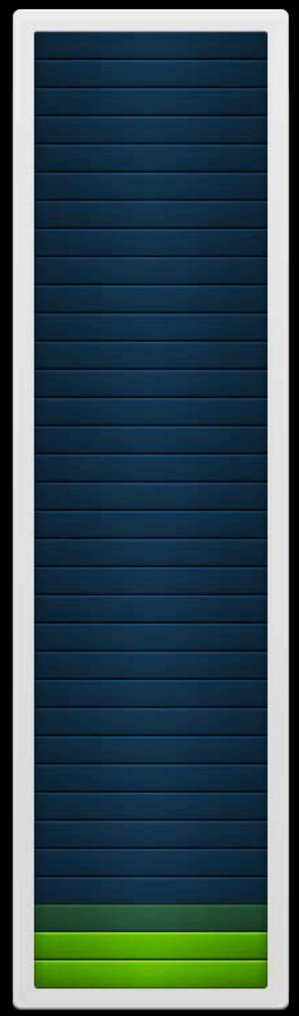


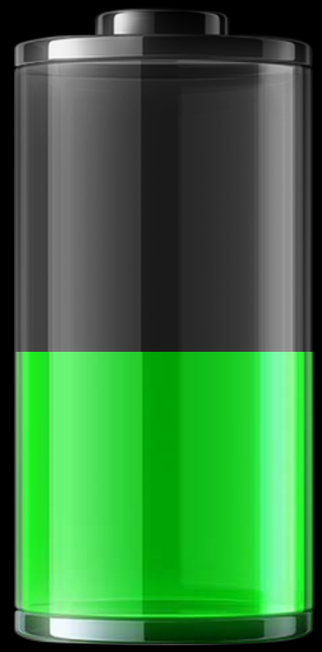


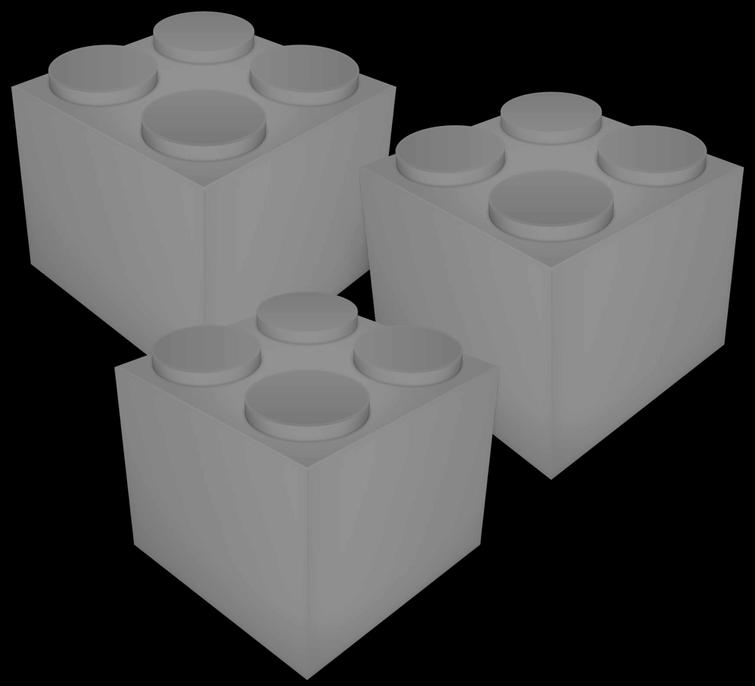


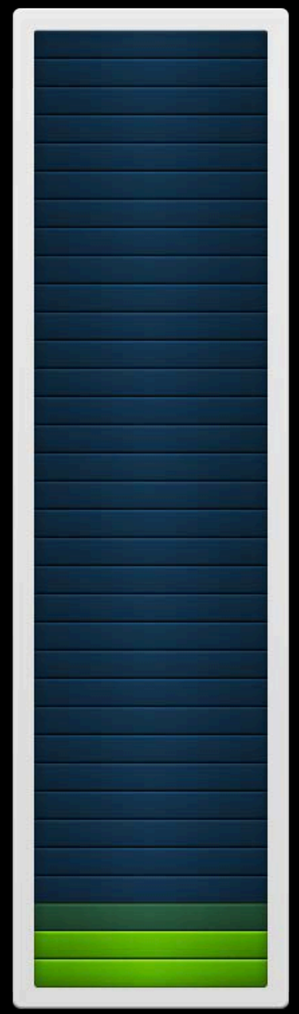


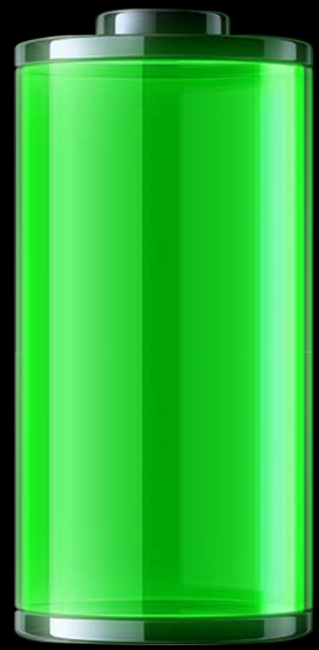












Smart Power-Saving

Smart Power-Saving

- “Primary” plug-ins continue to play

Smart Power-Saving

- “Primary” plug-ins continue to play
- Plug-ins that are not being used for visual purposes continue to play

Smart Power-Saving

- “Primary” plug-ins continue to play
- Plug-ins that are not being used for visual purposes continue to play
- Remember the user’s choice

How Safari Power Saver Works

How Safari Power Saver Works

- What happens to a plug-in when power-saved:

How Safari Power Saver Works

- What happens to a plug-in when power-saved:
  - Runs until it has drawn a useful snapshot

How Safari Power Saver Works

- What happens to a plug-in when power-saved:
  - Runs until it has drawn a useful snapshot
  - Replaced with the snapshot

How Safari Power Saver Works

- What happens to a plug-in when power-saved:
  - Runs until it has drawn a useful snapshot
  - Replaced with the snapshot
  - If the user clicks the snapshot, plug-in is re-created

Fashion

Jewelery

Travel...

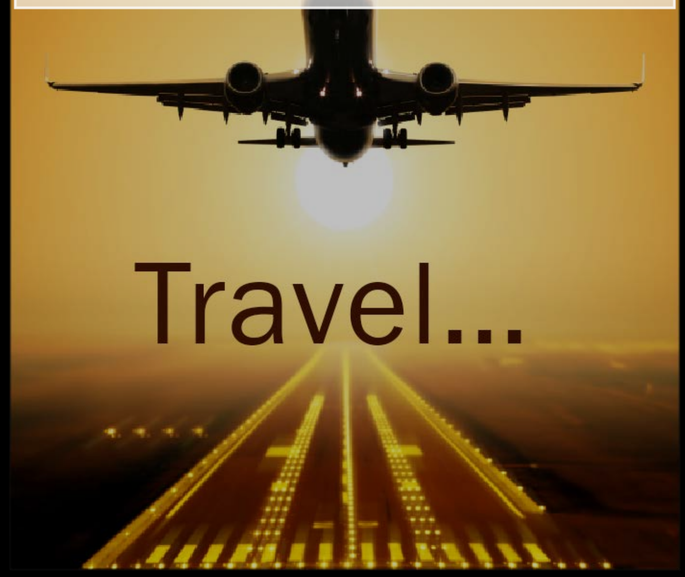
Electronics

Fashion

Safari Power Saver
Click to Start Flash Plug-in

Jewelery

Safari Power Saver
Click to Start Flash Plug-in



Travel...

Safari Power Saver
Click to Start Flash Plug-in

Electronics

What You Should Do

What You Should Do

- Use fewer plug-ins

What You Should Do

- Use fewer plug-ins
  - Don’t use a plug-in when you could use an existing web feature

What You Should Do

- Use fewer plug-ins
  - Don’t use a plug-in when you could use an existing web feature
- Be prepared for plug-ins to be destroyed and re-created

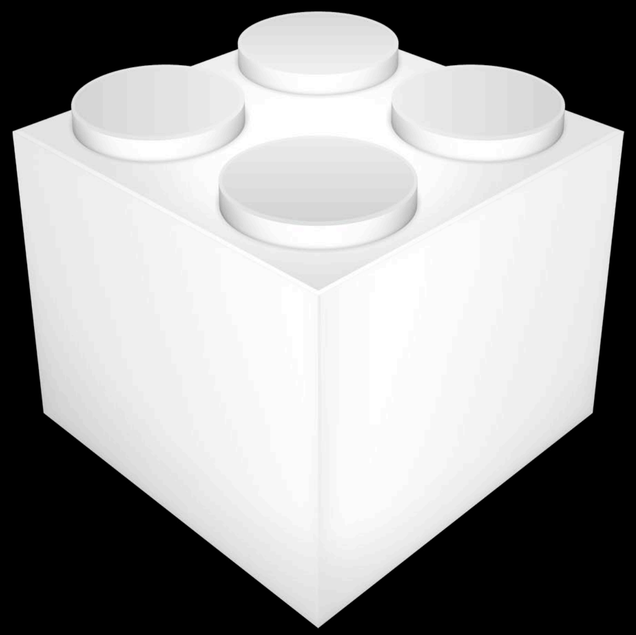
What You Should Do

- Use fewer plug-ins
  - Don’t use a plug-in when you could use an existing web feature
- Be prepared for plug-ins to be destroyed and re-created
  - Request state from the page, not vice versa

Safari Power Saver

New in Safari 7

NEW



Making Power-Efficient Webpages

How to detect and fix problems

Making Power-Efficient Webpages

Making Power-Efficient Webpages

- New web API

Making Power-Efficient Webpages

- New web API
- Tools to detect power-hungry pages

Making Power-Efficient Webpages

- New web API
- Tools to detect power-hungry pages
- Common mistakes

Making Power-Efficient Webpages

- New web API
- Tools to detect power-hungry pages
- Common mistakes

Web APIs for Power-Smart Pages

Web APIs for Power-Smart Pages

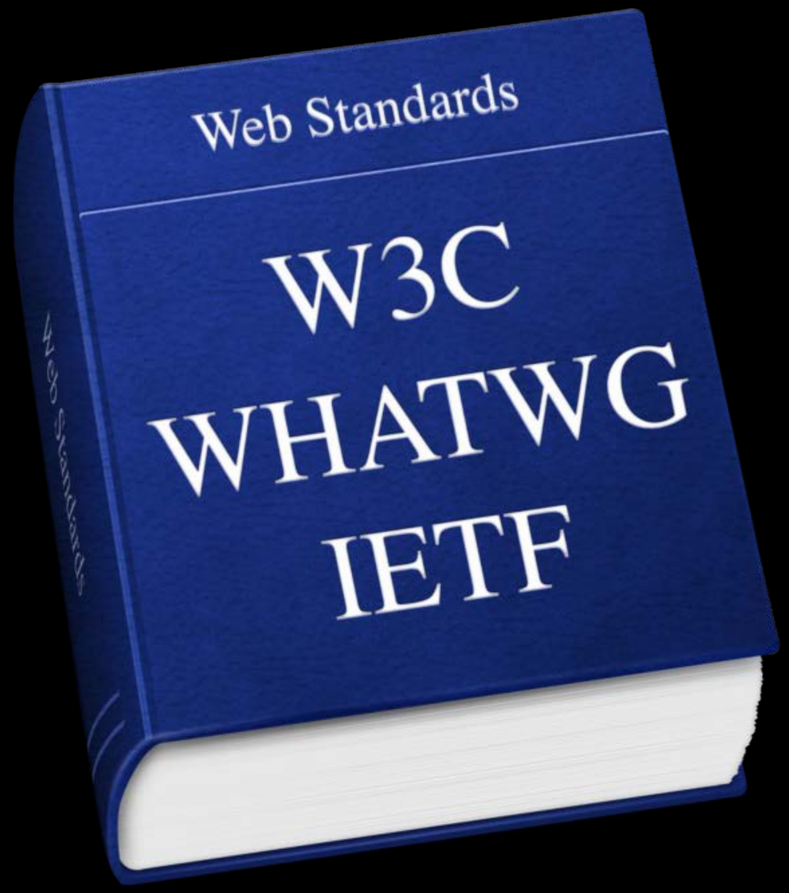
- Page Visibility

Web APIs for Power-Smart Pages

- Page Visibility
- `requestAnimationFrame()`

Page Visibility

Page Visibility

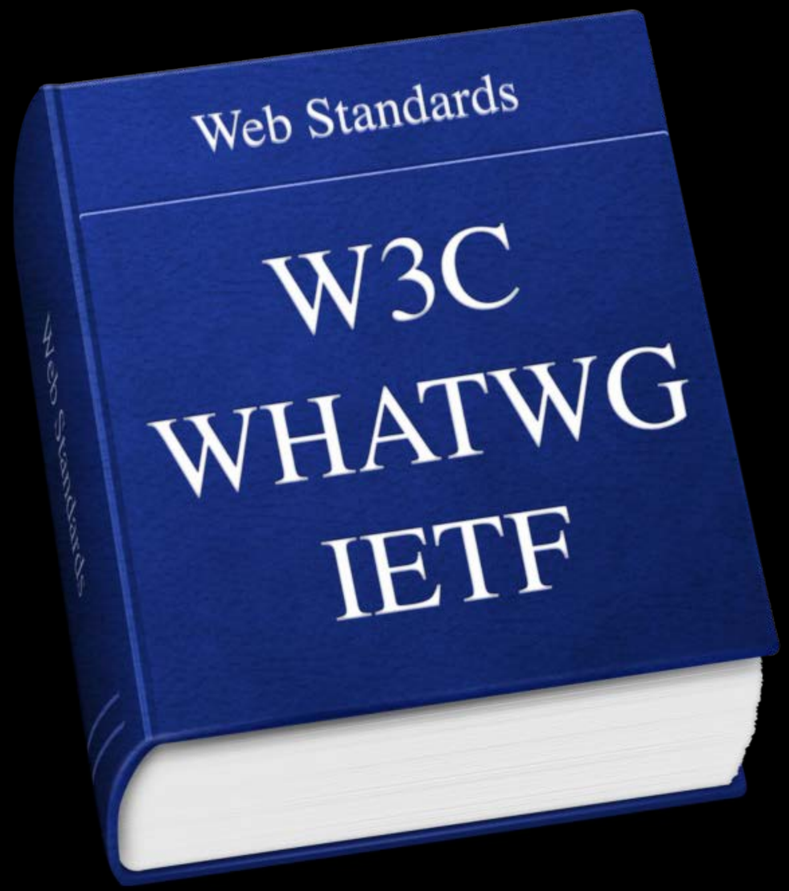


Page Visibility

- Web API for content to detect when:
  - Page is hidden
  - Visibility changes

Page Visibility

- Web API for content to detect when:
  - Page is hidden
  - Visibility changes
- Pages hidden in:
  - Background tabs
  - Minimized windows
  - Occluded windows



Page Visibility

Page Visibility

- When hidden:

Page Visibility

- When hidden:
  - JavaScript timers are rate-limited

Page Visibility

- When hidden:
  - JavaScript timers are rate-limited
  - `requestAnimationFrame()` is paused

Page Visibility

- When hidden:
  - JavaScript timers are rate-limited
  - `requestAnimationFrame()` is paused
  - CSS Transitions and Animations paused

Page Visibility

- Query current state

```
document.hidden
document.visibilityState
    “hidden”, “visible”, “prerender”
```

Page Visibility

- Query current state

```
document.hidden
document.visibilityState
    “hidden”, “visible”, “prerender”
```

Page Visibility

- Query current state

```
document.hidden
document.visibilityState
    “hidden”, “visible”, “prerender”
```

Page Visibility

- Query current state

```
document.hidden
document.visibilityState
    “hidden”, “visible”, “prerender”
```

- Listen for state changes

```
document.addEventListener('visibilitychange', function(event) {
    if (document.hidden) {
        ...
    }
}, false);
```

Page Visibility

- Query current state

```
document.hidden
document.visibilityState
    “hidden”, “visible”, “prerender”
```

- Listen for state changes

```
document.addEventListener('visibilitychange', function(event) {
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Page Visibility

- Query current state

```
document.hidden
document.visibilityState
    “hidden”, “visible”, “prerender”
```

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```
document.addEventListener('visibilitychange', function(event) {
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        ...
    }
}, false);
```

Page Visibility

NEW

Safari 6.1

Safari 7

iOS7

Scripted Animation

Scripted Animation

- Problems using JavaScript timers for animation

Scripted Animation

- Problems using JavaScript timers for animation
  - How often to run?

Scripted Animation

- Problems using JavaScript timers for animation
  - How often to run?
  - Browser can’t know that you’re just animating

requestAnimationFrame()

requestAnimationFrame()

- Web API for animation:

```
window.requestAnimationFrame(callback);
```

requestAnimationFrame()

- Web API for animation:

```
window.requestAnimationFrame(callback);
window.cancelAnimationFrame(id);
```

requestAnimationFrame()

- Web API for animation:

```
window.requestAnimationFrame(callback);
window.cancelAnimationFrame(id);
```

- Advantages

requestAnimationFrame()

- Web API for animation:

```
window.requestAnimationFrame(callback);
window.cancelAnimationFrame(id);
```

- Advantages
  - Display-refresh friendly

requestAnimationFrame()

- Web API for animation:

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window.requestAnimationFrame(callback);
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- Advantages
  - Display-refresh friendly
  - Pausable

requestAnimationFrame()

- Web API for animation:

```
window.requestAnimationFrame(callback);
window.cancelAnimationFrame(id);
```

- Advantages
  - Display-refresh friendly
  - Pausable

Before requestAnimationFrame()

```
function doAnimation() {
    // Compute offset into animation
    // using new Date().
    …
    // Update visuals.
    …
    // Use setTimeout() to get called in about 16ms.
    setTimeout(doAnimation, 16);
}
```

With requestAnimationFrame()

```
function doAnimation(currentTime) {
    // Compute offset into animation using currentTime.
    // currentTime is milliseconds since the document started to load.
    …
    // Update visuals.
    …
    // Optionally, queue up another callback.
    requestAnimationFrame(doAnimation);
}
```

With requestAnimationFrame()

```
function doAnimation(currentTime) {
    // Compute offset into animation using currentTime.
    // currentTime is milliseconds since the document started to load.
    …
    // Update visuals.
    …
    // Optionally, queue up another callback.
    requestAnimationFrame(doAnimation);
}
```

With requestAnimationFrame()

```
function doAnimation(currentTime) {
    // Compute offset into animation using currentTime.
    // currentTime is milliseconds since the document started to load.
    …
    // Update visuals.
    …
    // Optionally, queue up another callback.
    requestAnimationFrame(doAnimation);
}
```

requestAnimationFrame()

Safari 6.1

Safari 7

iOS7

What You Should Do

What You Should Do

- Use Page Visibility to stop doing work in hidden pages

What You Should Do

- Use Page Visibility to stop doing work in hidden pages
- If you have to do JavaScript animation, use `requestAnimationFrame()`

What You Should Do

- Use Page Visibility to stop doing work in hidden pages
- If you have to do JavaScript animation, use `requestAnimationFrame()`
- Separate business logic from visual updates

What You Should Do

- Use Page Visibility to stop doing work in hidden pages
- If you have to do JavaScript animation, use `requestAnimationFrame()`
- Separate business logic from visual updates
  - Remember that transitions and animations are affected by visibility

Demo

Page Visibility

Tim Horton
Safari and WebKit Engineer

Making Power-Efficient Webpages

- New web API
- Tools to detect power-hungry pages
- Common mistakes

Making Power-Efficient Webpages

- New web API
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- Common mistakes

How to Detect Power-Hungry Webpages

How to Detect Power-Hungry Webpages

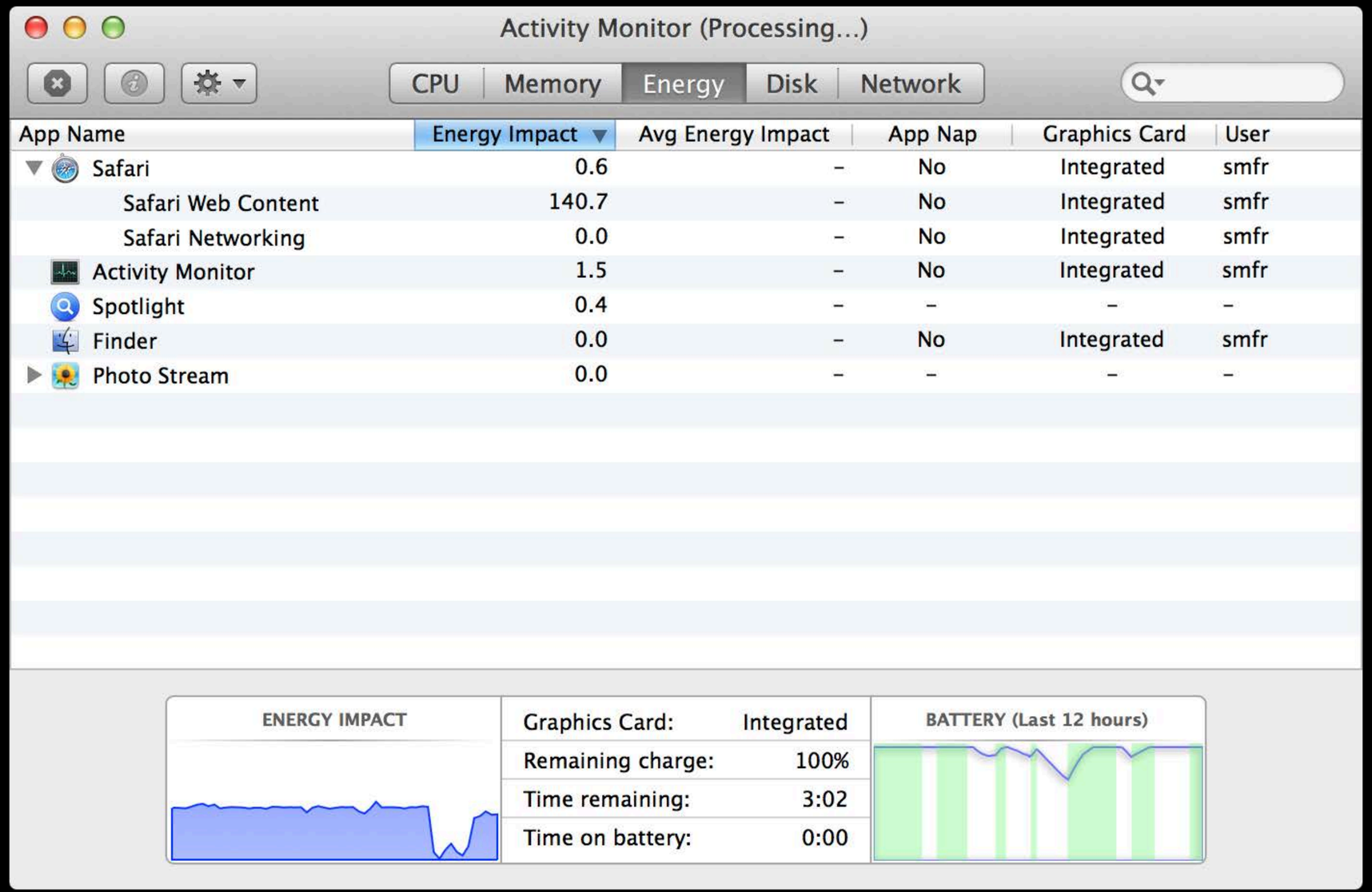
- System tools

How to Detect Power-Hungry Webpages

- System tools
- Web Inspector

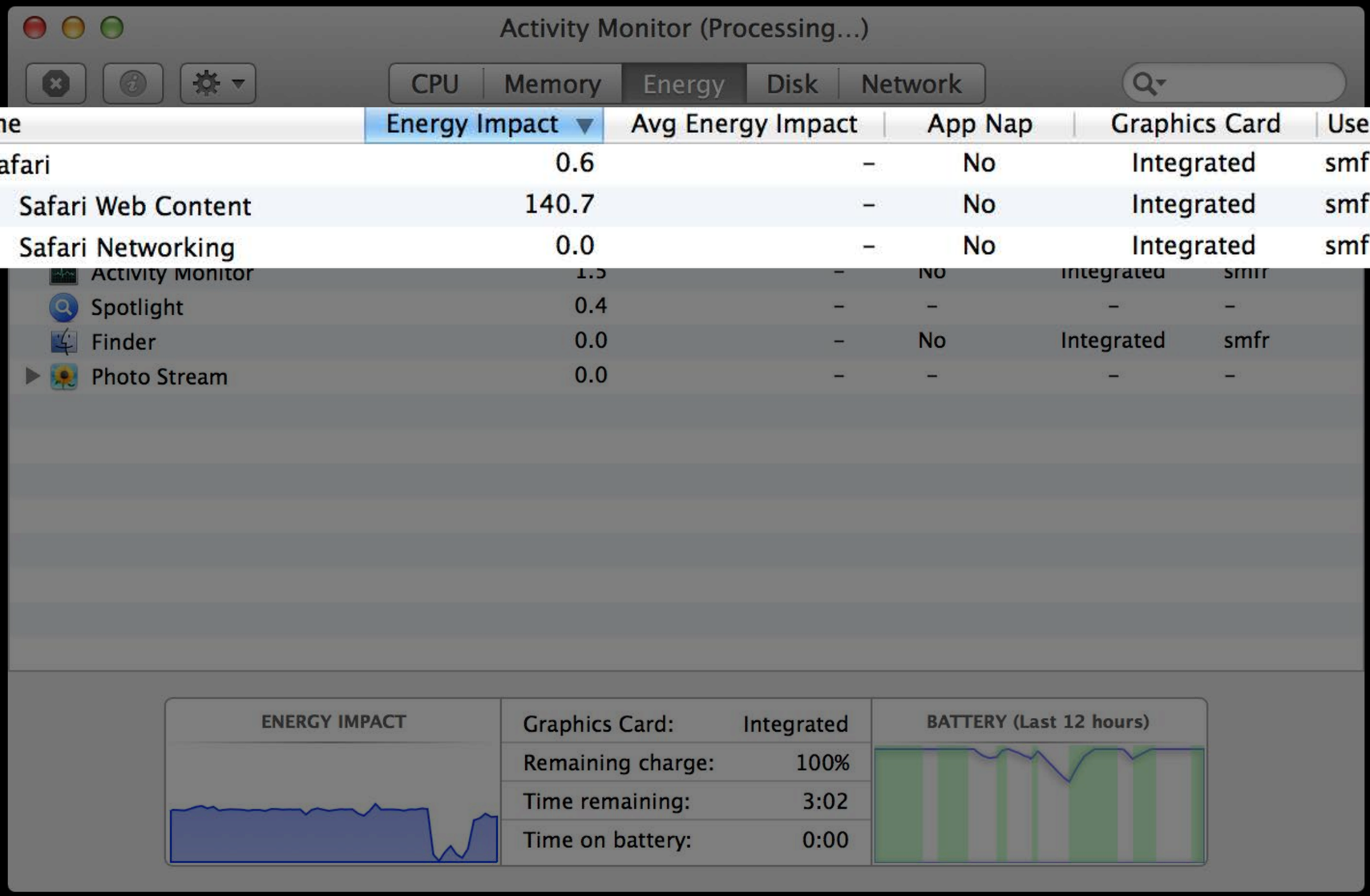
Detecting Power-Hungry Pages

Activity Monitor



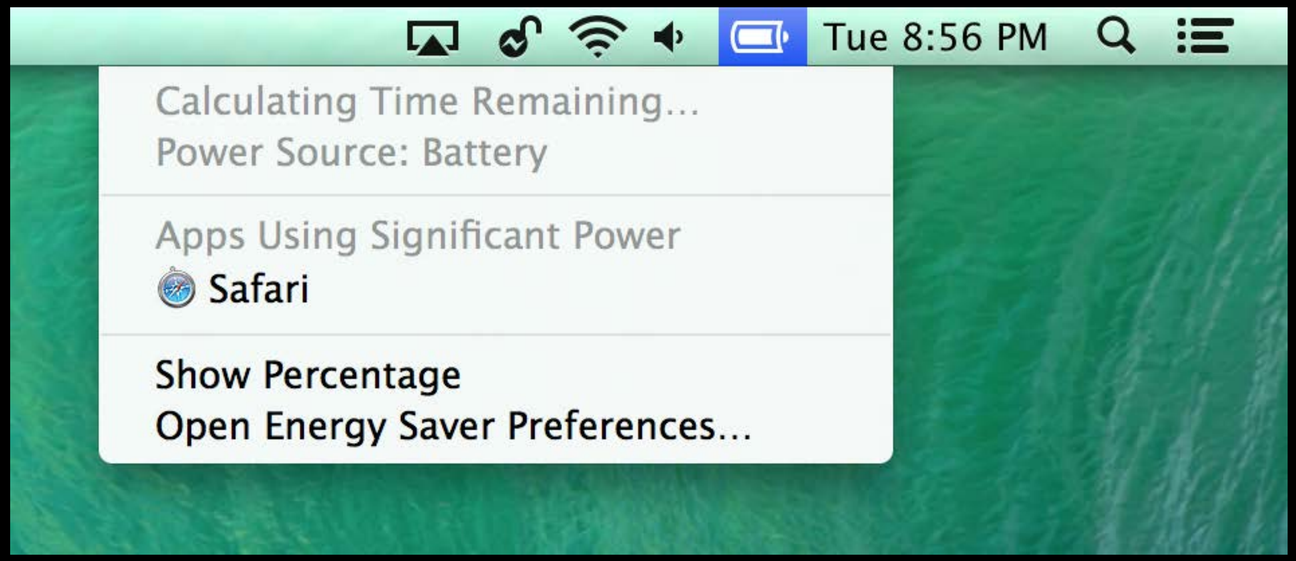
Detecting Power-Hungry Pages

Activity Monitor



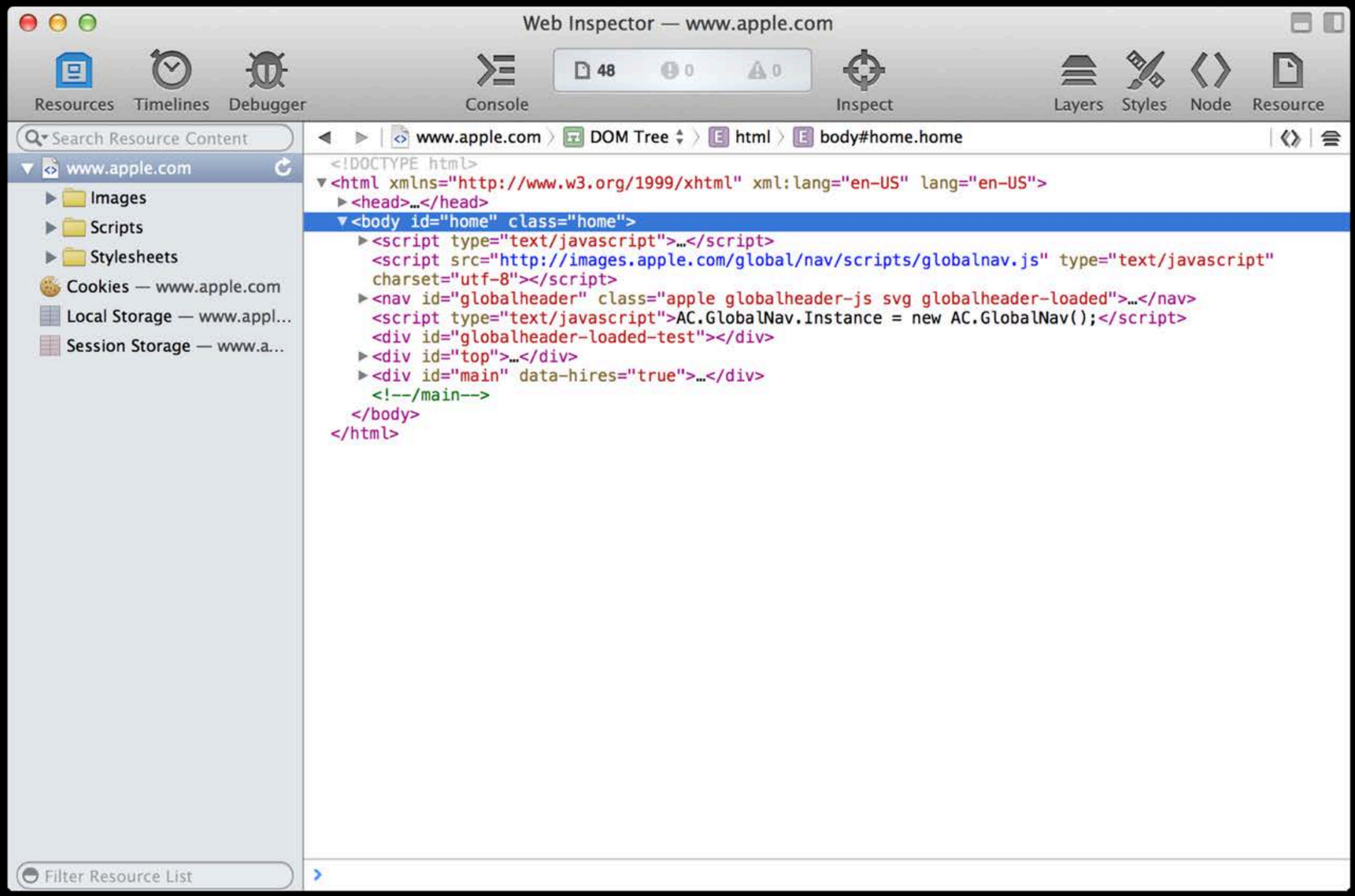
Detecting Power-Hungry Pages

Battery Menu



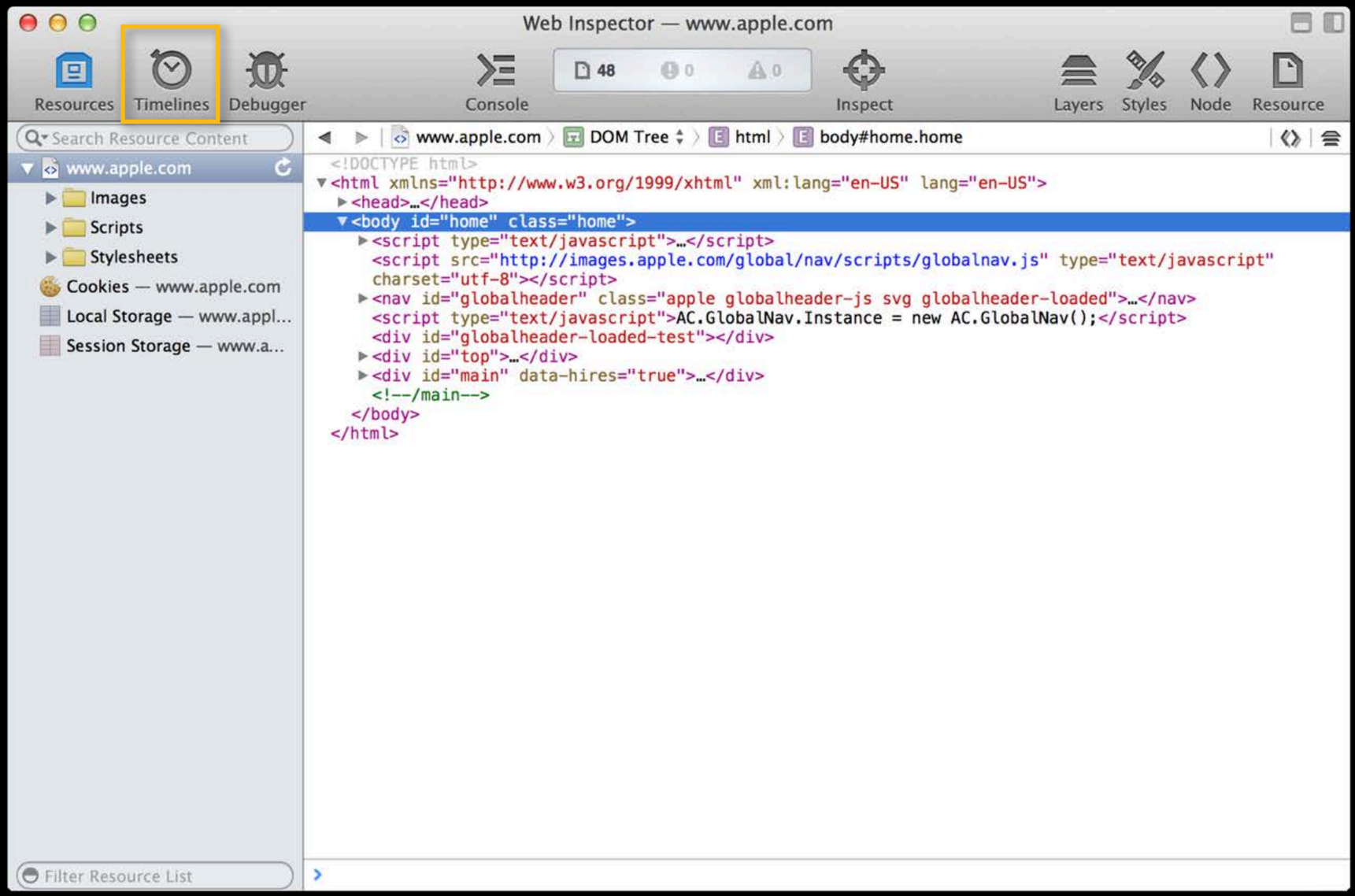
Detecting Power-Hungry Pages

Safari Web Inspector



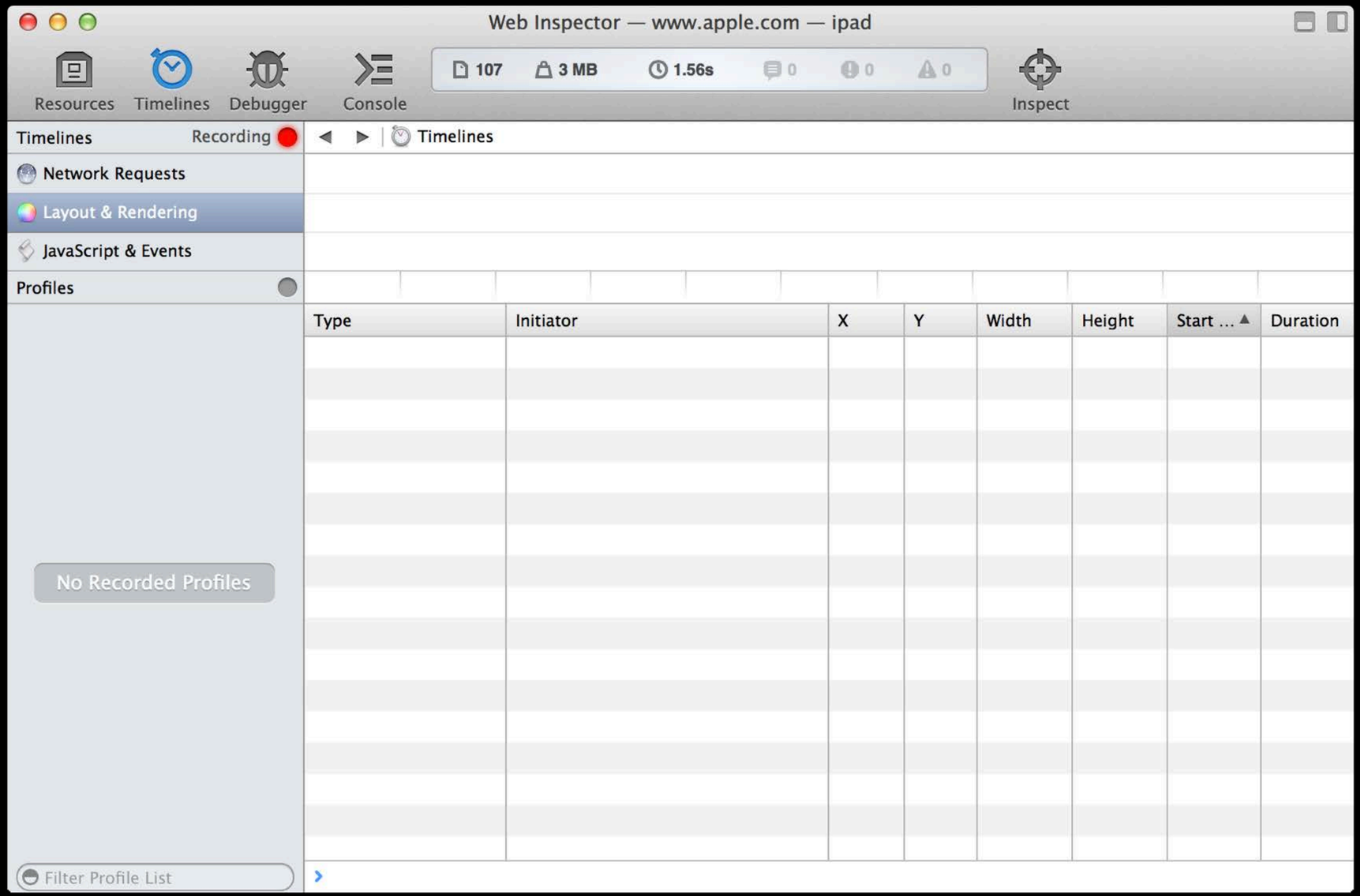
Detecting Power-Hungry Pages

Safari Web Inspector



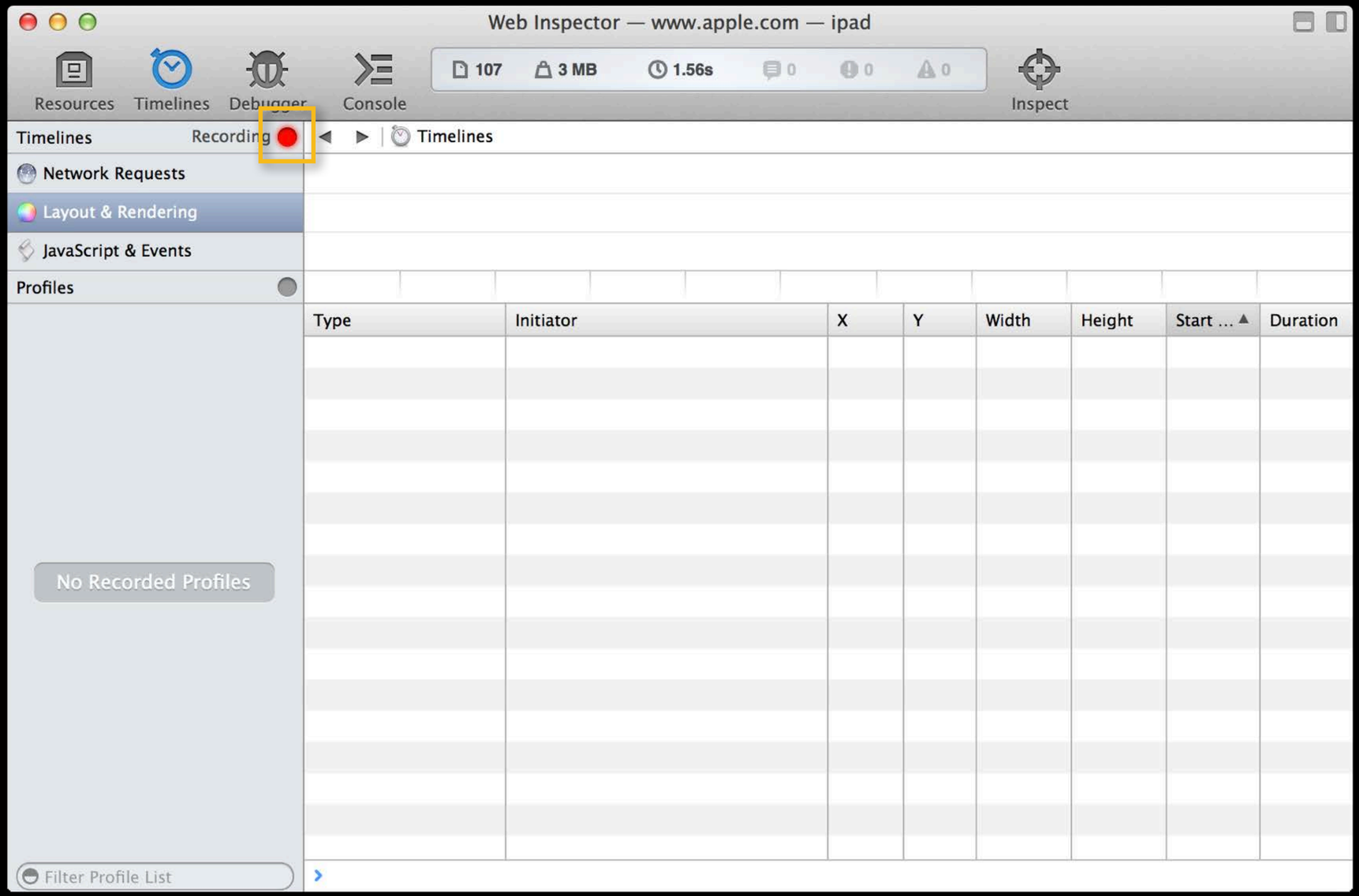
Detecting Power-Hungry Pages

Safari Web Inspector



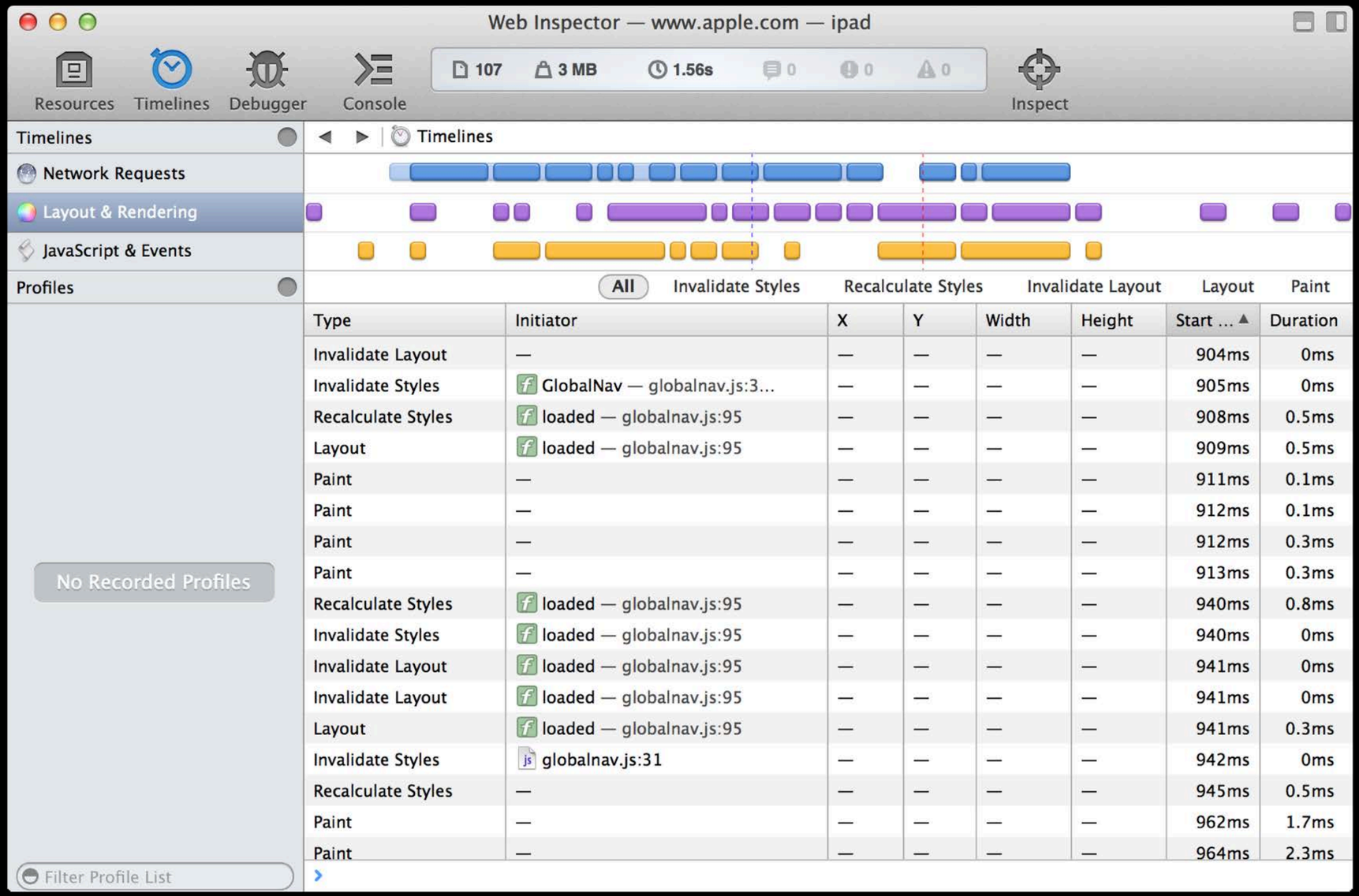
Detecting Power-Hungry Pages

Safari Web Inspector



Detecting Power-Hungry Pages

Safari Web Inspector



Type	Initiator	X	Y	Width	Height	Start … ▲	Duration
Invalidate Layout	—	—	—	—	—	904ms	0ms
Invalidate Styles	GlobalNav — globalnav.js:3…	—	—	—	—	905ms	0ms
Recalculate Styles	loaded — globalnav.js:95	—	—	—	—	908ms	0.5ms
Layout	loaded — globalnav.js:95	—	—	—	—	909ms	0.5ms
Paint	—	—	—	—	—	911ms	0.1ms
Paint	—	—	—	—	—	912ms	0.1ms
Paint	—	—	—	—	—	912ms	0.3ms
Paint	—	—	—	—	—	913ms	0.3ms
Recalculate Styles	loaded — globalnav.js:95	—	—	—	—	940ms	0.8ms
Invalidate Styles	loaded — globalnav.js:95	—	—	—	—	940ms	0ms
Invalidate Layout	loaded — globalnav.js:95	—	—	—	—	941ms	0ms
Invalidate Layout	loaded — globalnav.js:95	—	—	—	—	941ms	0ms
Layout	loaded — globalnav.js:95	—	—	—	—	941ms	0.3ms
Invalidate Styles	globalnav.js:31	—	—	—	—	942ms	0ms
Recalculate Styles	—	—	—	—	—	945ms	0.5ms
Paint	—	—	—	—	—	962ms	1.7ms
Paint	—	—	—	—	—	964ms	2.3ms

Making Power-Efficient Webpages

- New web API
- Tools to detect power-hungry pages
- Common mistakes

Making Power-Efficient Webpages

- New web API
- Tools to detect power-hungry pages
- Common mistakes

Avoid Power-Hungry Mistakes

Avoid Power-Hungry Mistakes

- Causing too much layout

Avoid Power-Hungry Mistakes

- Causing too much layout
- Painting too much

Things That Can Force Layout

Things That Can Force Layout

`offsetLeft`, `offsetTop`, `offsetWidth`, `offsetHeight`

`clientLeft`, `clientTop`, `clientWidth`, `clientHeight`

`scrollLeft`, `scrollTop`, `scrollWith`, `scrollHeight`

`scrollX`, `scrollY`, `scrollBy()`, `scrollTo()`

`document.width`, `document.height`

`image.width`, `image.height`

`getClientRects()`, `getBoundingClientRect()`

`getPropertyCSSValue()`

`innerText`

Web Inspector — site.html

Resources | Timelines | Debugger | Console | 2 | 10 KB | 63.7ms | 0 | 0 | 0 | Inspect

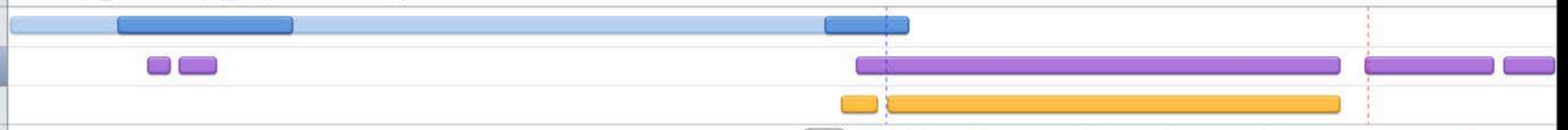
Timelines

- Network Requests
- Layout & Rendering
- JavaScript & Events

Profiles

- JavaScript Profile 1

Timelines › Layout & Rendering



All | Invalidate Styles | Recalculate Styles | Invalidate Layout | Layout | Paint

Type	Initiator	Width	Height	Area	Start Time ▲	Duration
Recalculate Styles	repositionBoxes — script.js:119	—	—	—	45.1ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	45.1ms	0ms
Layout	repositionBoxes — script.js:119	752px	711px	534672px²	45.4ms	0.3ms
Invalidate Styles	repositionBoxes — script.js:120	—	—	—	45.9ms	0ms
Recalculate Styles	repositionBoxes — script.js:119	—	—	—	46.0ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	46.1ms	0ms
Layout	repositionBoxes — script.js:119	752px	711px	534672px²	46.3ms	0.3ms
Invalidate Styles	repositionBoxes — script.js:120	—	—	—	46.8ms	0ms
Recalculate Styles	repositionBoxes — script.js:119	—	—	—	46.9ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	47.0ms	0ms
Layout	repositionBoxes — script.js:119	752px	711px	534672px²	47.3ms	0.3ms
Invalidate Styles	repositionBoxes — script.js:120	—	—	—	47.7ms	0ms
Recalculate Styles	repositionBoxes — script.js:119	—	—	—	47.8ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	47.9ms	0ms
Layout	repositionBoxes — script.js:119	752px	711px	534672px²	48.2ms	0.3ms
Invalidate Styles	repositionBoxes — script.js:120	—	—	—	48.6ms	0ms
Recalculate Styles	repositionBoxes — script.js:119	—	—	—	48.7ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	48.8ms	0ms
Layout	repositionBoxes — script.js:119	752px	711px	534672px²	49.1ms	0.3ms
Invalidate Styles	repositionBoxes — script.js:120	—	—	—	49.6ms	0ms
Recalculate Styles	repositionBoxes — script.js:119	—	—	—	49.7ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	49.8ms	0ms
Layout	repositionBoxes — script.js:119	752px	711px	534672px²	50.0ms	0.3ms
Invalidate Styles	repositionBoxes — script.js:120	—	—	—	50.5ms	0ms
Recalculate Styles	repositionBoxes — script.js:119	—	—	—	50.6ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	50.7ms	0ms
Layout	repositionBoxes — script.js:119	752px	711px	534672px²	50.9ms	0.3ms

Filter Profile List

Web Inspector — site.html

Resources Timelines Debugger Console 2 10 KB 63.7ms 0 0 0 Inspect

Timelines

Network Requests

Layout & Rendering

JavaScript & Events

Profiles

JavaScript Profile 1

Timelines › Layout & Rendering

All Invalidate Styles Recalculate Styles Invalidate Layout Layout Paint

Type	Initiator	Width	Height	Area	Start Time ▲	Duration
Recalculate Styles	repositionBoxes — script.js:119	—	—	—	45.1ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	45.1ms	0ms
Layout	repositionBoxes — script.js:119	752px	711px	534672px²	45.4ms	0.3ms
Invalidate Styles	repositionBoxes — script.js:120	—	—	—	45.9ms	0ms
Recalculate Styles	repositionBoxes — script.js:119	—	—	—	46.0ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	46.1ms	0ms

Invalidate Styles	repositionBoxes — script.js:120	—	—	—
Recalculate Styles	repositionBoxes — script.js:119	—	—	—
Invalidate Layout	repositionBoxes — script.js:119	—	—	—
Layout	repositionBoxes — script.js:119	752px	711px	534672px²

Recalculate Styles	repositionBoxes — script.js:119	—	—	—	47.8ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	47.9ms	0ms
Layout	repositionBoxes — script.js:119	752px	711px	534672px²	48.2ms	0.3ms
Invalidate Styles	repositionBoxes — script.js:120	—	—	—	48.6ms	0ms
Recalculate Styles	repositionBoxes — script.js:119	—	—	—	48.7ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	48.8ms	0ms
Layout	repositionBoxes — script.js:119	752px	711px	534672px²	49.1ms	0.3ms
Invalidate Styles	repositionBoxes — script.js:120	—	—	—	49.6ms	0ms
Recalculate Styles	repositionBoxes — script.js:119	—	—	—	49.7ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	49.8ms	0ms
Layout	repositionBoxes — script.js:119	752px	711px	534672px²	50.0ms	0.3ms
Invalidate Styles	repositionBoxes — script.js:120	—	—	—	50.5ms	0ms
Recalculate Styles	repositionBoxes — script.js:119	—	—	—	50.6ms	0.2ms
Invalidate Layout	repositionBoxes — script.js:119	—	—	—	50.7ms	0ms

Filter Profile List

Forcing Layout in a Loop

```
for (...) {
     totalHeight += currElement.offsetHeight;
     ...
     currElement.style.top = totalHeight + 'px';
}
```

Forcing Layout in a Loop

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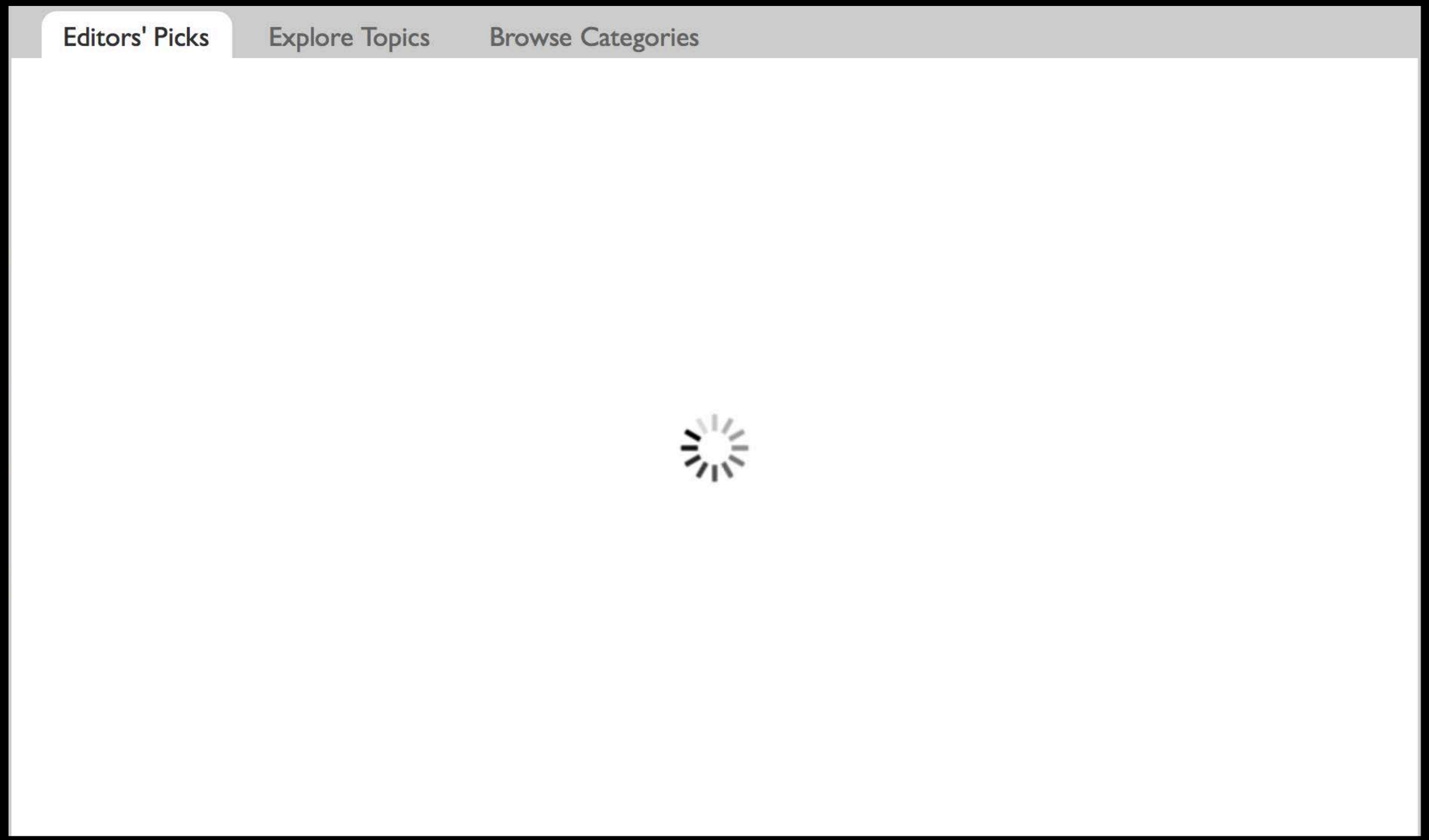
Too Much Painting

Too Much Painting



Too Much Painting

Too Much Painting

- Animated images
  - Don’t leave “loading” animated GIFs in the `background-image` style

Too Much Painting

- Animated images
  - Don’t leave “loading” animated GIFs in the `background-image` style
- Even if they are not visible in the window

Web Inspector — tweeter.com

Resources | Timelines | Debugger | Console | 40 | – | – | 0 | 0 | 1 | Inspect

Timelines — Recording

- Network Requests
- Layout & Rendering
- JavaScript & Events

Profiles

No Recorded Profiles

Filter Profile List

Timelines › Layout & Rendering

All | Invalidate Styles | Recalculate Styles | Invalidate Layout | Layout | Paint

Type	Initiator	Width	Height	Area	Start Time ▲	Duration
Paint	—	32px	32px	1024px²	2.10s	0.6ms
Paint	—	32px	32px	1024px²	2.22s	0.4ms
Paint	—	32px	32px	1024px²	2.30s	0.6ms
Paint	—	32px	32px	1024px²	2.40s	0.6ms
Paint	—	32px	32px	1024px²	2.50s	0.6ms
Paint	—	32px	32px	1024px²	2.60s	0.6ms
Paint	—	32px	32px	1024px²	2.70s	0.6ms
Paint	—	32px	32px	1024px²	2.80s	0.6ms
Paint	—	32px	32px	1024px²	2.90s	0.4ms
Paint	—	32px	32px	1024px²	3.00s	0.6ms
Paint	—	32px	32px	1024px²	3.10s	0.7ms
Paint	—	32px	32px	1024px²	3.20s	0.7ms
Paint	—	32px	32px	1024px²	3.30s	0.7ms
Paint	—	32px	32px	1024px²	3.40s	0.6ms
Paint	—	32px	32px	1024px²	3.50s	0.6ms
Paint	—	32px	32px	1024px²	3.60s	0.7ms
Paint	—	32px	32px	1024px²	3.70s	0.5ms
Paint	—	32px	32px	1024px²	3.80s	0.6ms
Paint	—	32px	32px	1024px²	3.90s	0.7ms
Paint	—	32px	32px	1024px²	4.00s	0.6ms
Paint	—	32px	32px	1024px²	4.10s	0.4ms
Paint	—	32px	32px	1024px²	4.20s	0.6ms
Paint	—	32px	32px	1024px²	4.30s	0.6ms
Paint	—	32px	32px	1024px²	4.40s	0.6ms
Paint	—	32px	32px	1024px²	4.50s	0.6ms

Main Frame

Web Inspector — tweeter.com

Resources Timelines Debugger Console 40 – – 0 0 1 Inspect

Timelines Recording

Network Requests

Layout & Rendering

JavaScript & Events

Profiles

Timelines › Layout & Rendering

All Invalidate Styles Recalculate Styles Invalidate Layout Layout Paint

Type	Initiator	Width	Height	Area	Start Time ▲	Duration
Paint	—	32px	32px	1024px²	2.10s	0.6ms
Paint	—	32px	32px	1024px²	2.22s	0.4ms
Paint	—	32px	32px	1024px²	2.30s	0.6ms
Paint	—	32px	32px	1024px²	2.40s	0.6ms
Paint	—	32px	32px	1024px²	2.50s	0.6ms
Paint	—	32px	32px	1024px²	2.60s	0.6ms
Paint	—	32px	32px	1024px²	3.70s	0.5ms
Paint	—	32px	32px	1024px²	3.80s	0.6ms
Paint	—	32px	32px	1024px²	3.90s	0.7ms
Paint	—	32px	32px	1024px²	4.00s	0.6ms
Paint	—	32px	32px	1024px²	4.10s	0.4ms
Paint	—	32px	32px	1024px²	4.20s	0.6ms
Paint	—	32px	32px	1024px²	4.30s	0.6ms
Paint	—	32px	32px	1024px²	4.40s	0.6ms
Paint	—	32px	32px	1024px²	4.50s	0.6ms

Filter Profile List

Main Frame

Paint	—	32px	32px	1024px²
Paint	—	32px	32px	1024px²
Paint	—	32px	32px	1024px²
Paint	—	32px	32px	1024px²
Paint	—	32px	32px	1024px²
Paint	—	32px	32px	1024px²

Use the Right Tool for the Job

Use the Right Tool for the Job

- Animation

Use the Right Tool for the Job

- Animation
  - CSS Transitions and Animations

Use the Right Tool for the Job

- Animation
  - CSS Transitions and Animations
  - `requestAnimationFrame()`

Use the Right Tool for the Job

- Animation
  - CSS Transitions and Animations
  - `requestAnimationFrame()`
- Responsive layouts

Use the Right Tool for the Job

- Animation
  - CSS Transitions and Animations
  - `requestAnimationFrame()`
- Responsive layouts
  - CSS Media Queries

Use the Right Tool for the Job

- Animation
  - CSS Transitions and Animations
  - `requestAnimationFrame()`
- Responsive layouts
  - CSS Media Queries
  - CSS Flexible Boxes

Use the Right Tool for the Job

- Animation
  - CSS Transitions and Animations
  - `requestAnimationFrame()`
- Responsive layouts
  - CSS Media Queries
  - CSS Flexible Boxes
- CSS `calc()`

Safari Extensions

Safari Extensions

- Efficiency even more important

Safari Extensions

- Efficiency even more important
  - Scripts can be injected into every page

Safari Extensions

- Efficiency even more important
  - Scripts can be injected into every page
- Use Page Visibility

Safari Extensions

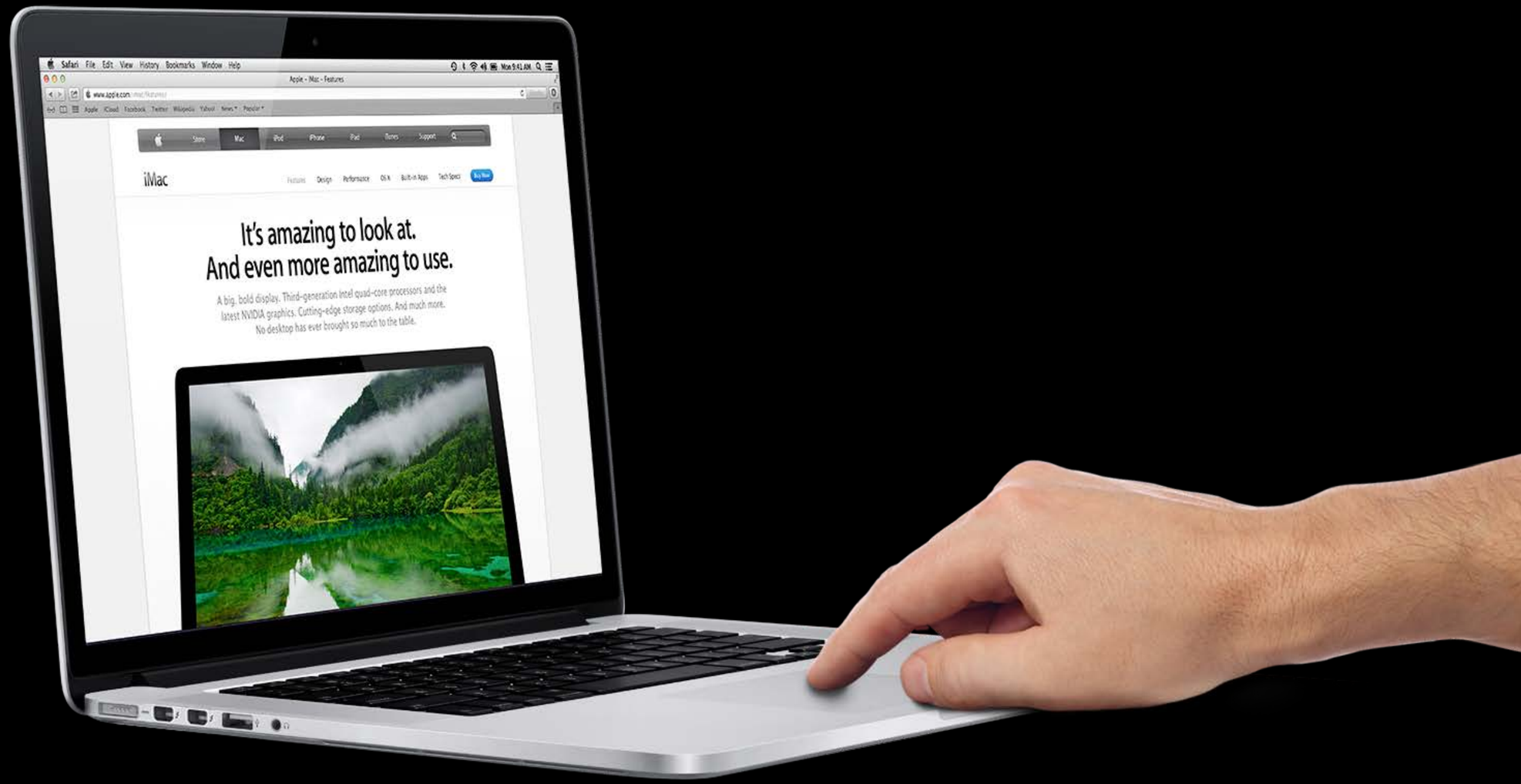
- Efficiency even more important
  - Scripts can be injected into every page
- Use Page Visibility
  - Avoid doing work in hidden pages

Safari Extensions

- Efficiency even more important
  - Scripts can be injected into every page
- Use Page Visibility
  - Avoid doing work in hidden pages
  - Only show UI for visible pages

Safari Responsive Scrolling

People Love to Scroll



Legacy Scrolling

Legacy Scrolling

- Every scroll requires painting

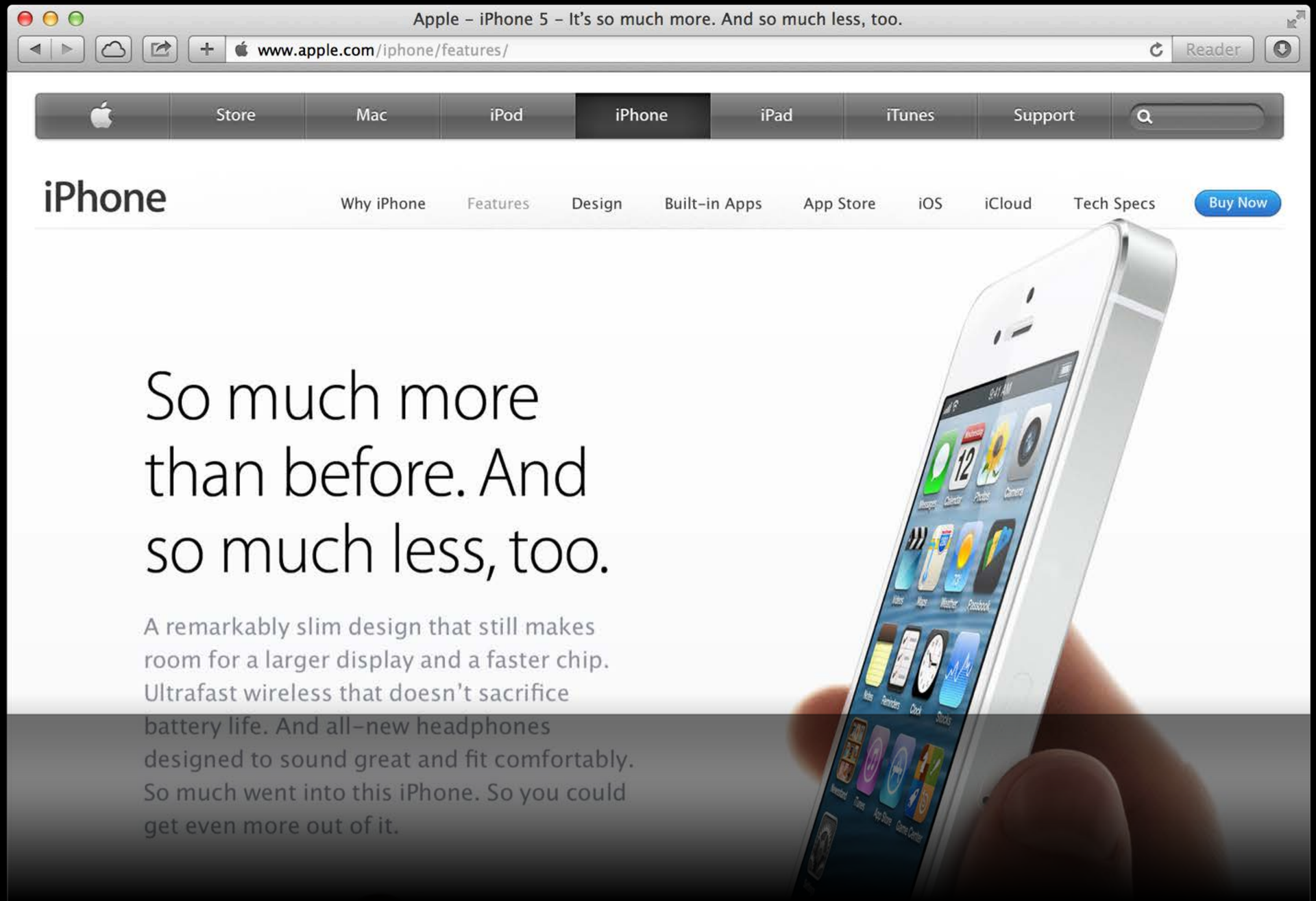
Legacy Scrolling

- Every scroll requires painting
- Scrolling happens synchronously

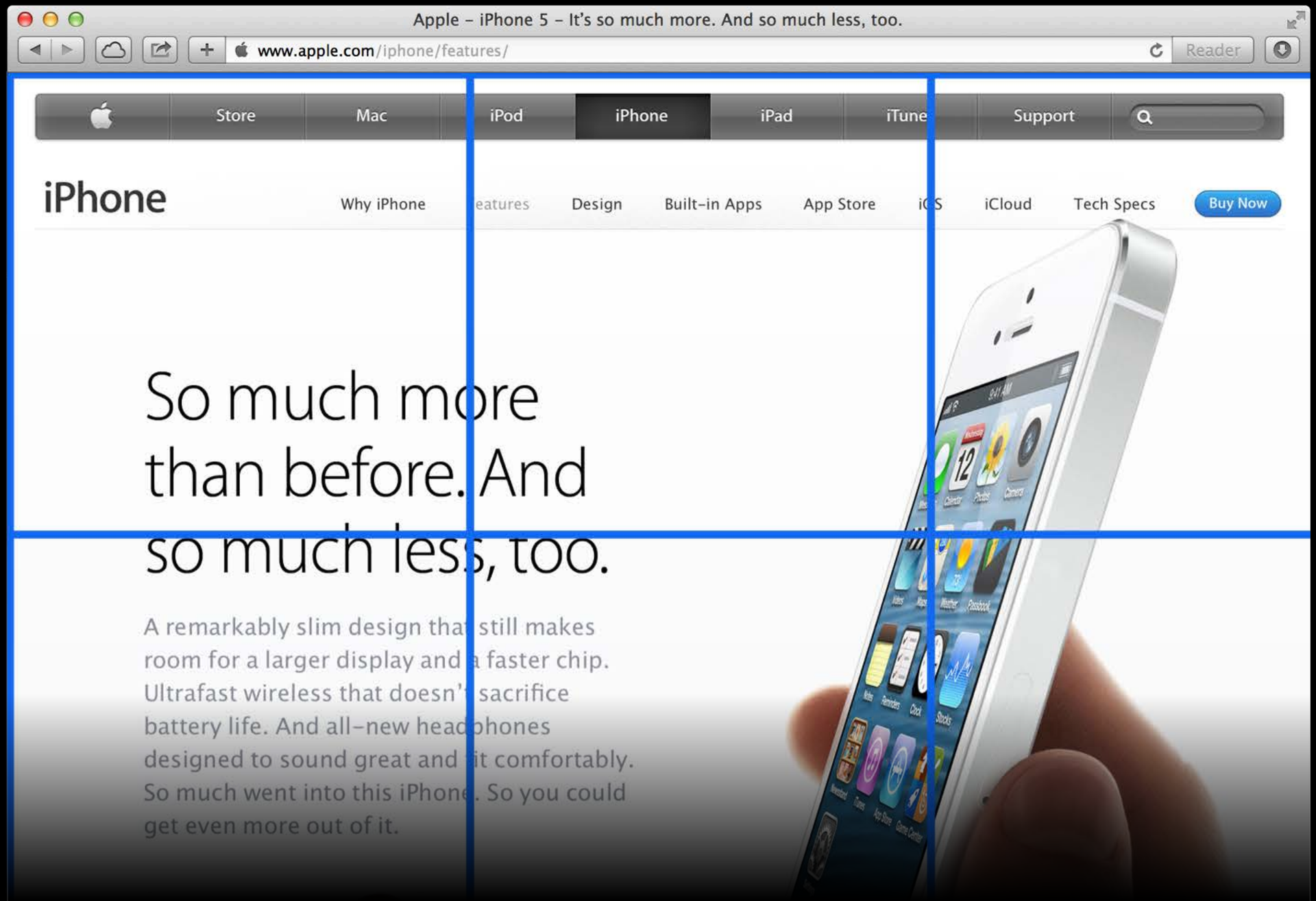
Legacy Scrolling

- Every scroll requires painting
- Scrolling happens synchronously
- Webpage can interfere with scrolling

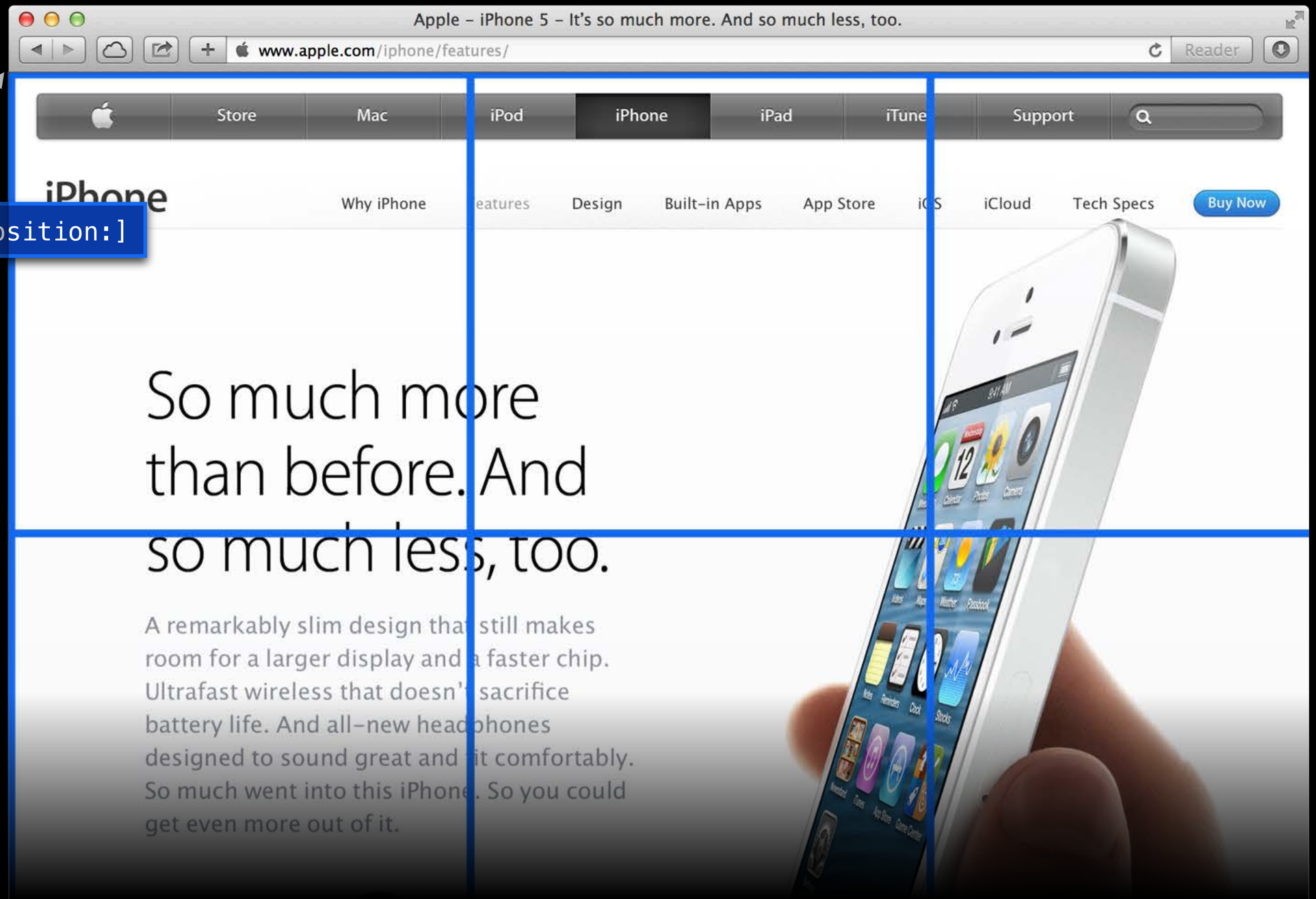
Safari Responsive Scrolling



Safari Responsive Scrolling

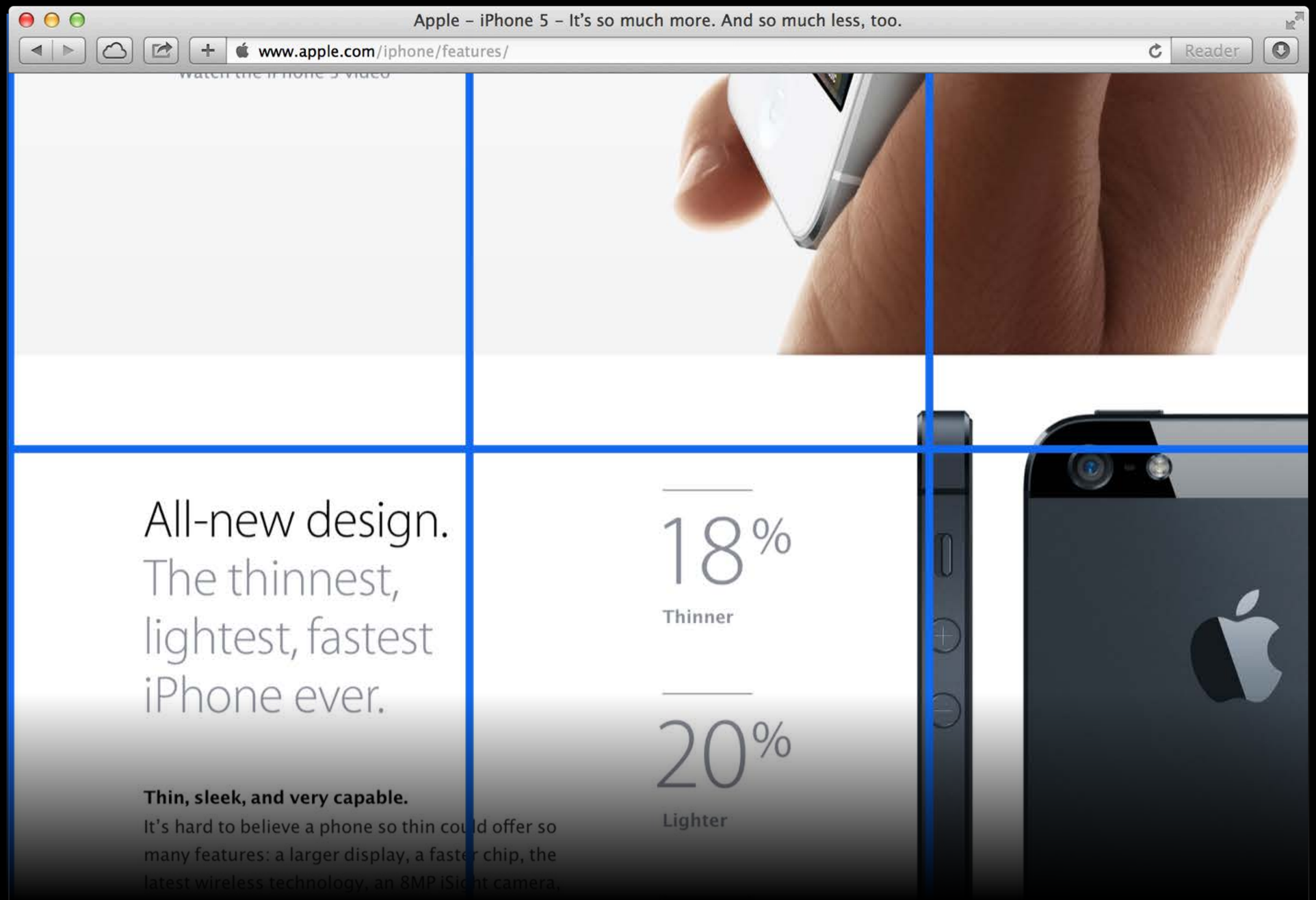


Safari Responsive Scrolling

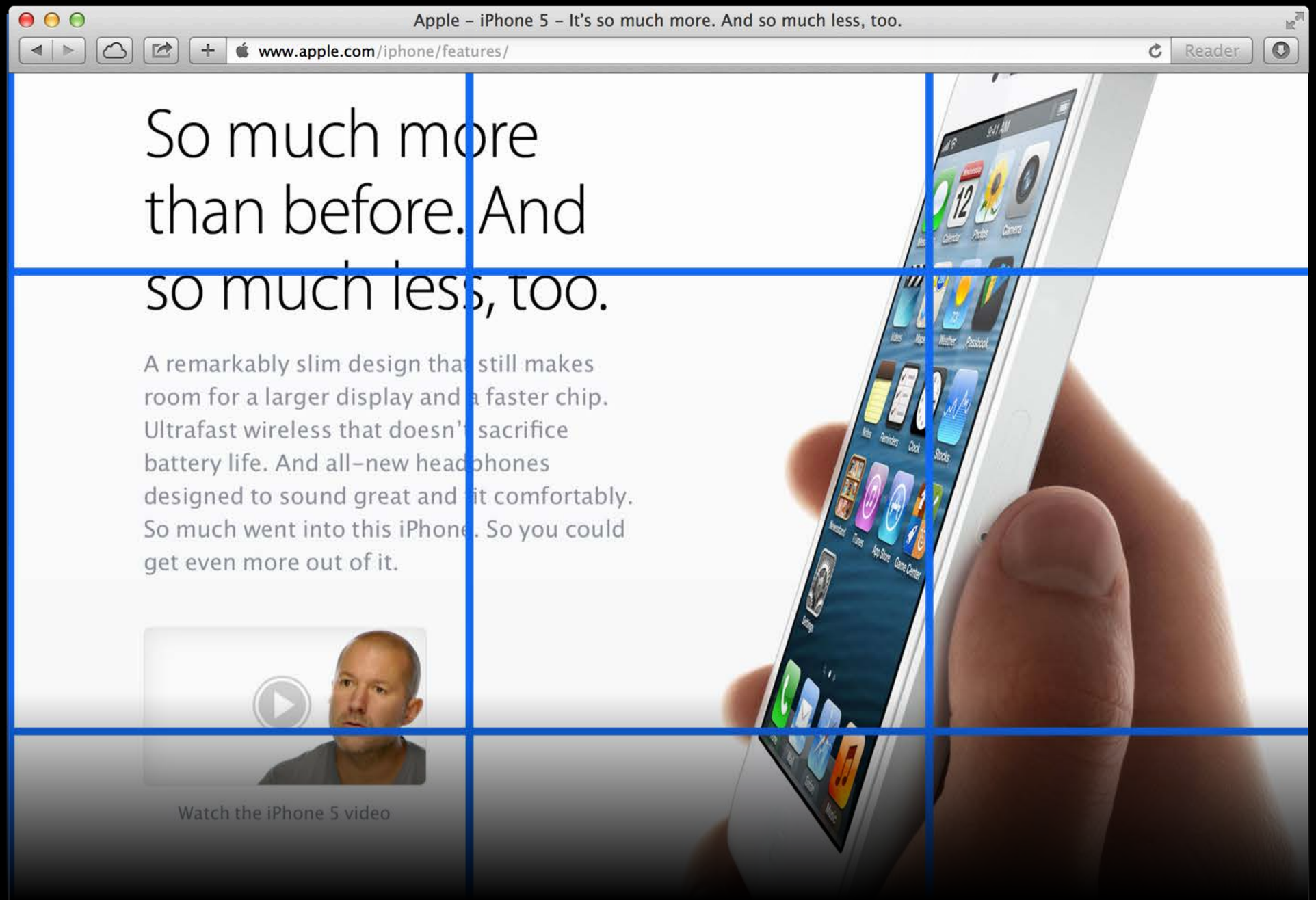


[layer setPosition:]

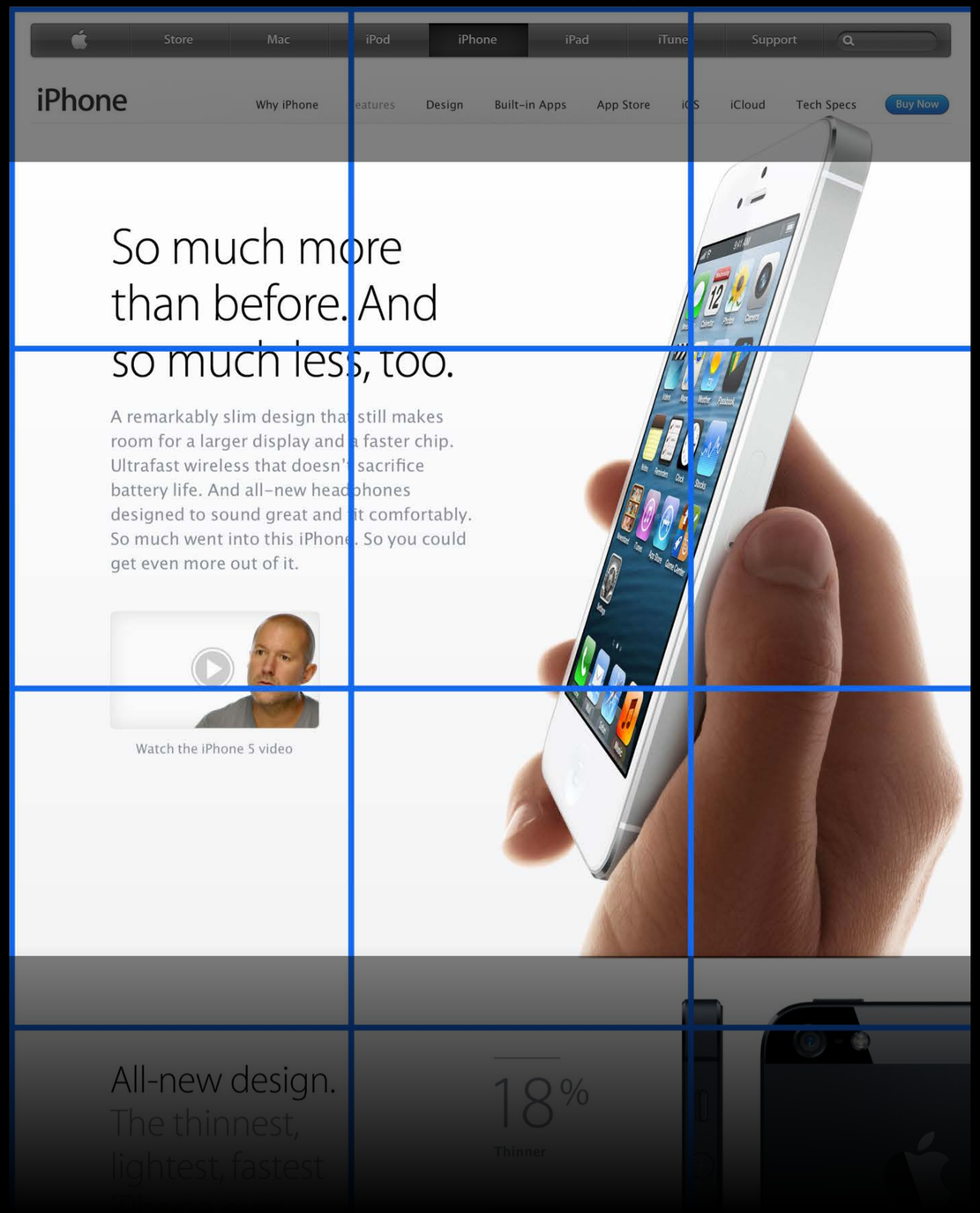
Safari Responsive Scrolling



Safari Responsive Scrolling

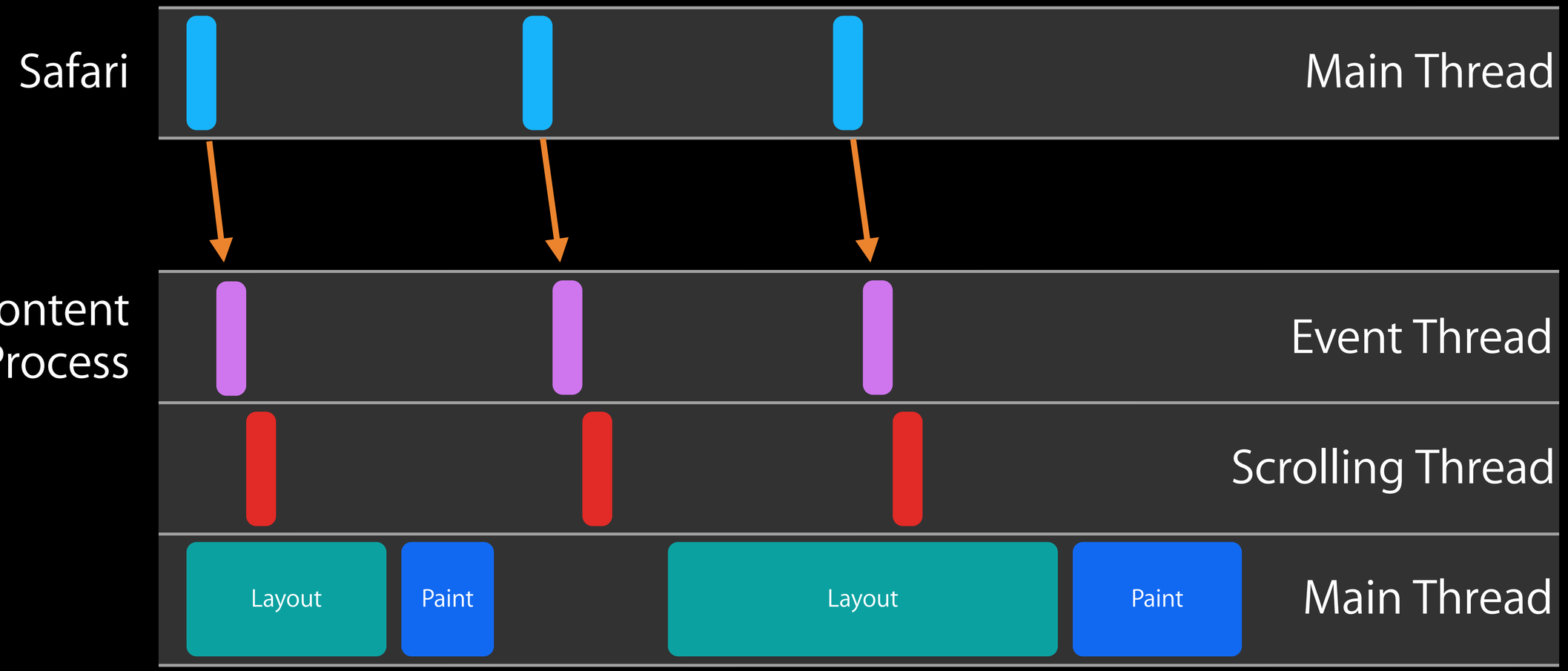


Safari Responsive Scrolling



Safari Responsive Scrolling

Threading model



Safari Responsive Scrolling

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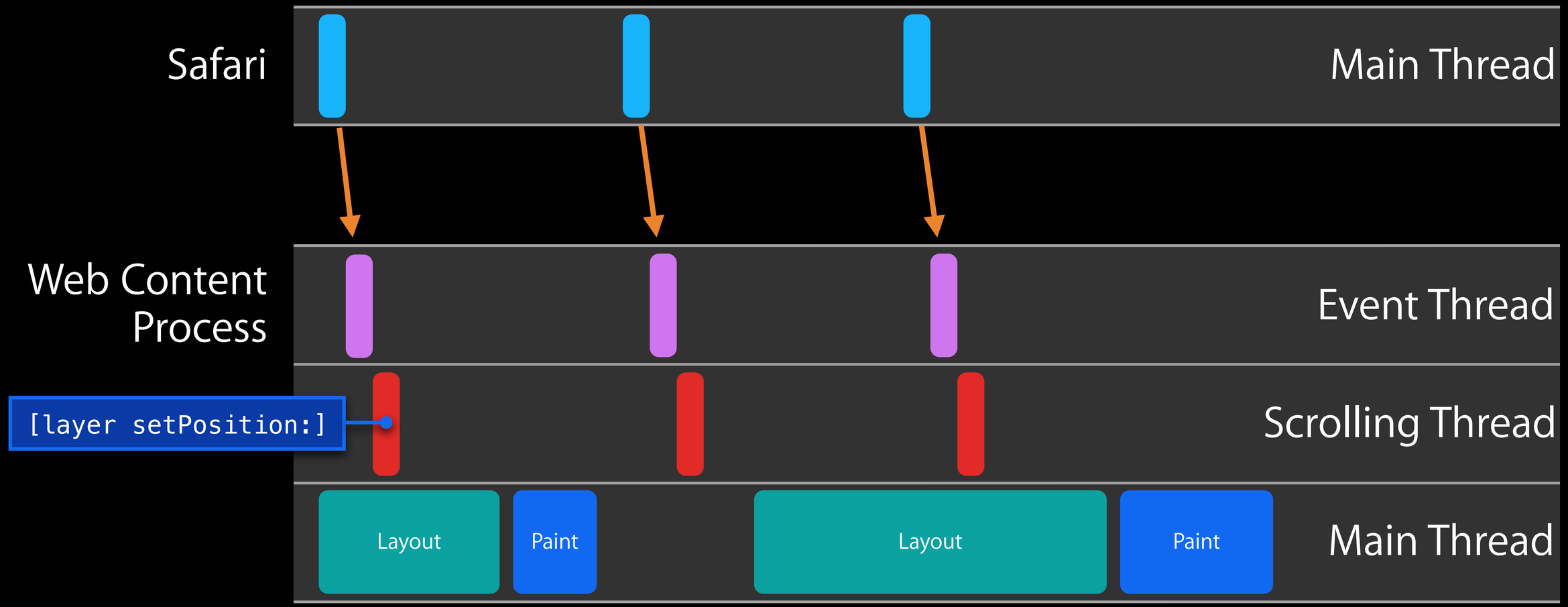


Special Scrolling Behaviors

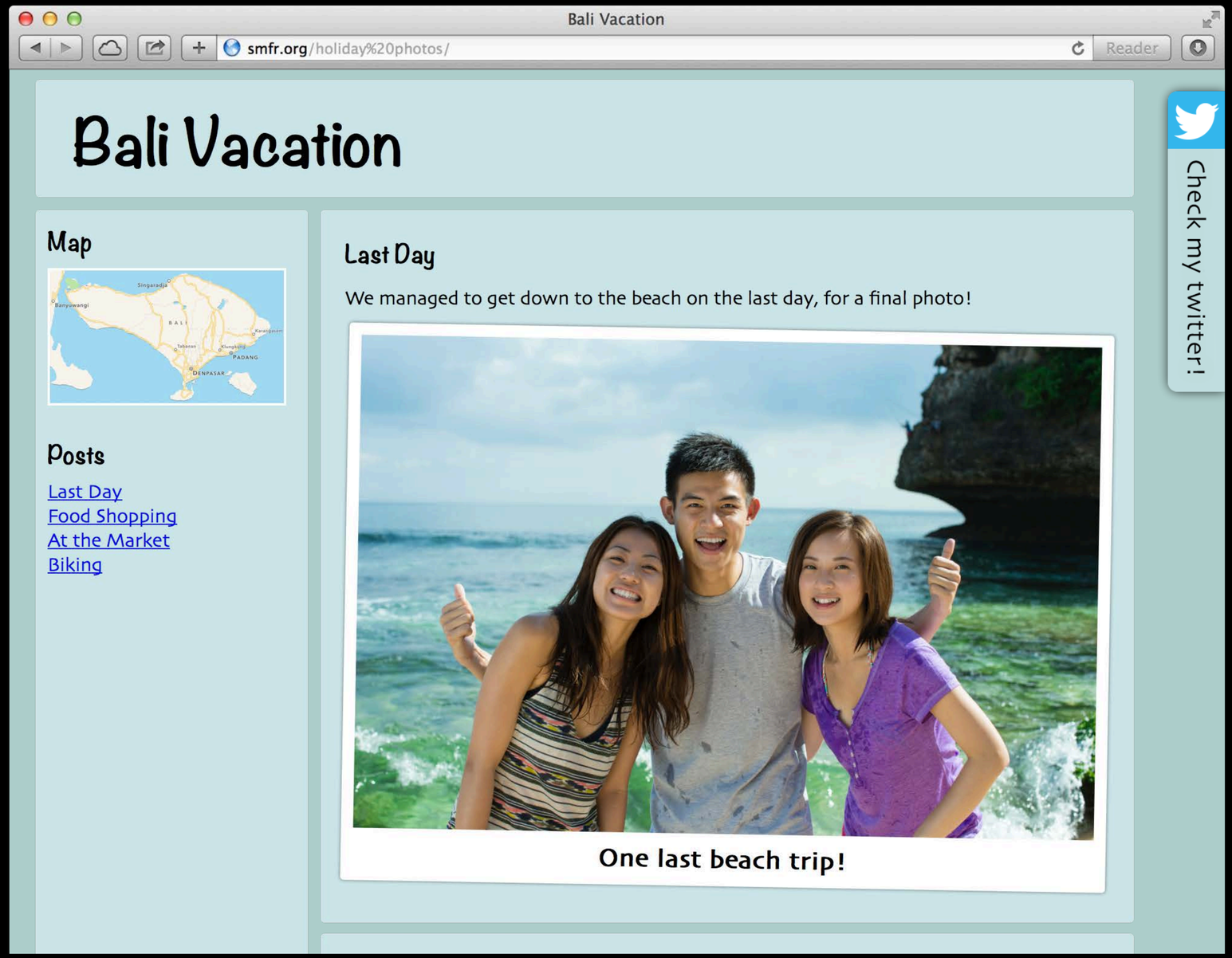
Special Scrolling Behaviors

- Fixed position

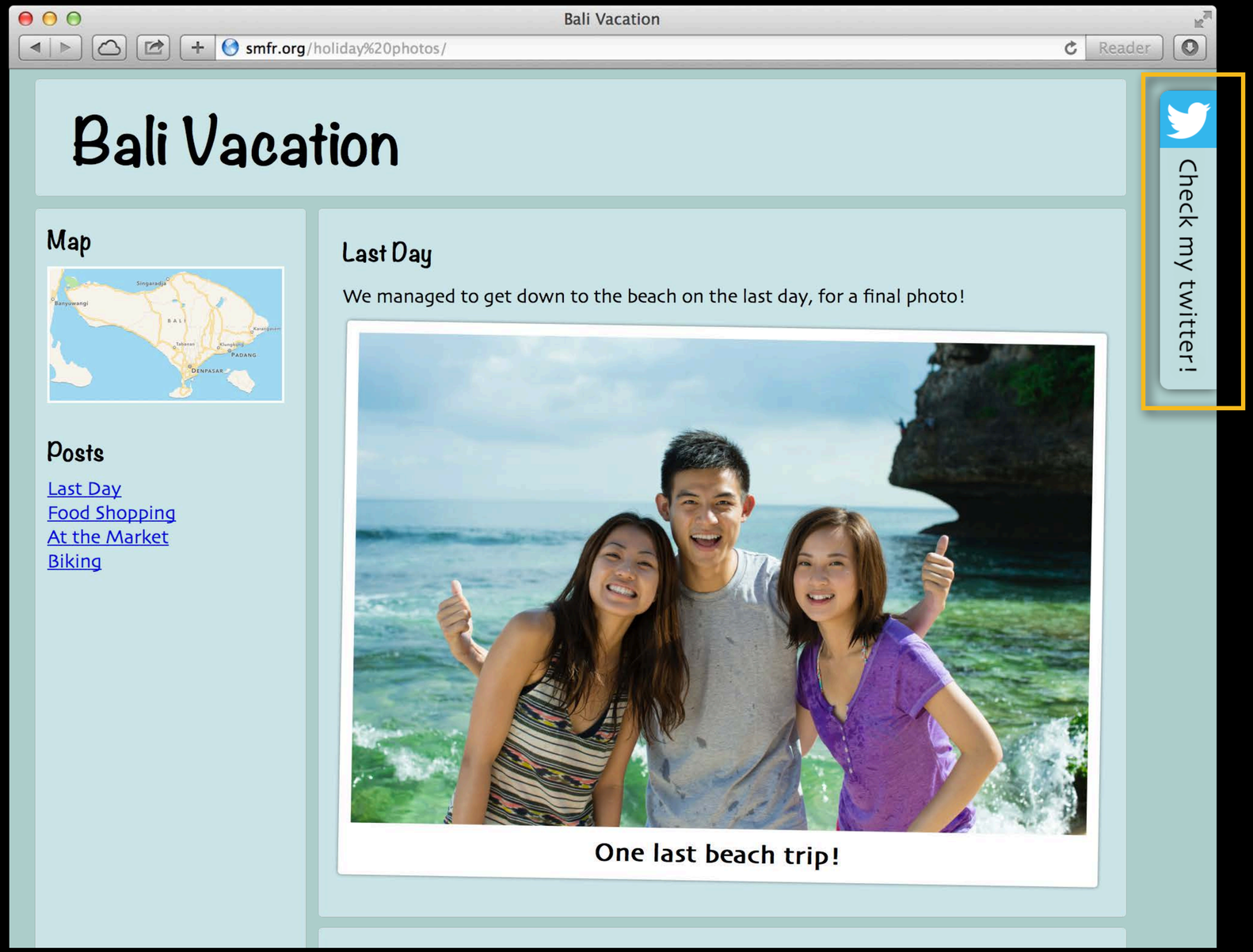
Special Scrolling Behaviors

- Fixed position
  - `position:fixed`

Fixed Position



Fixed Position



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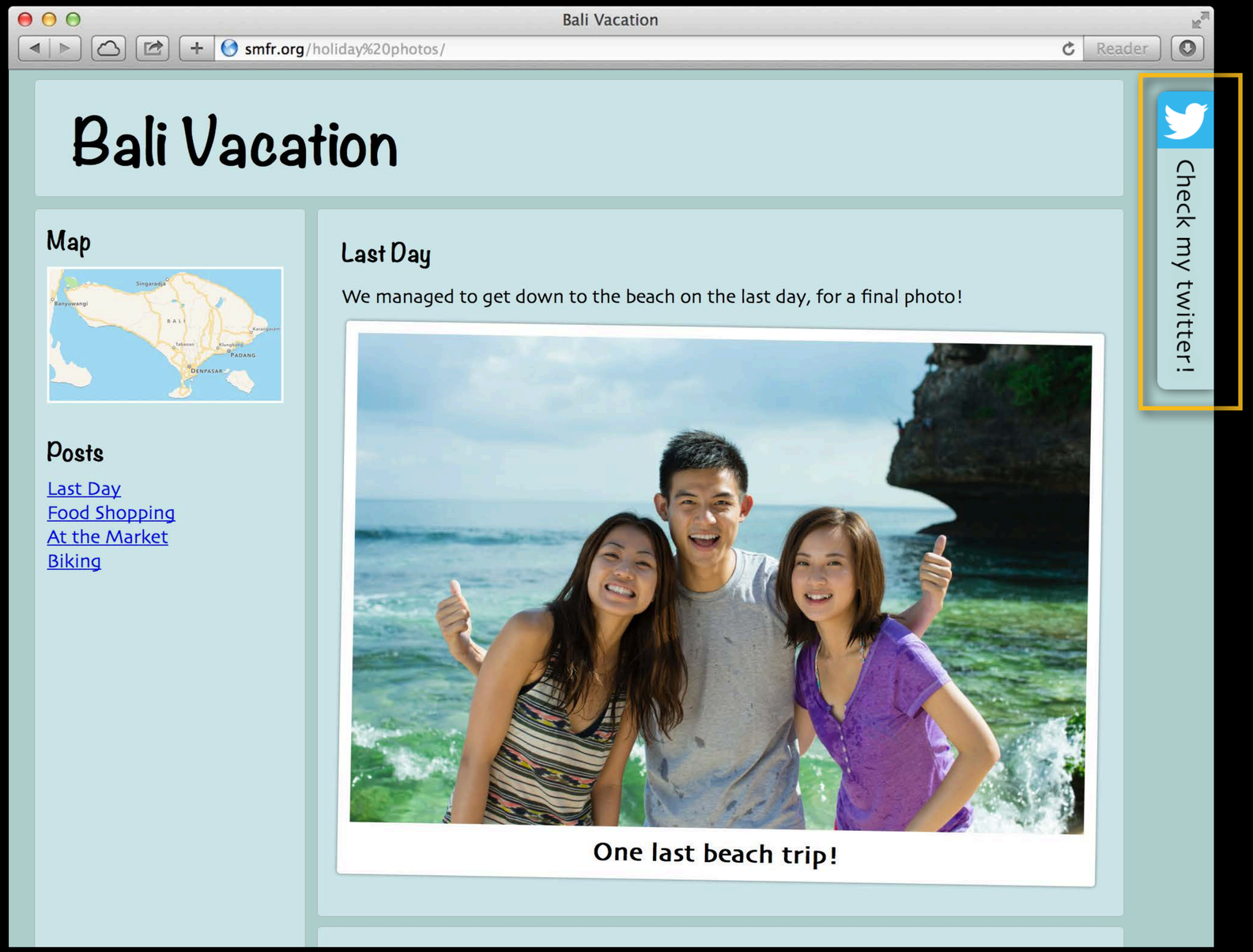
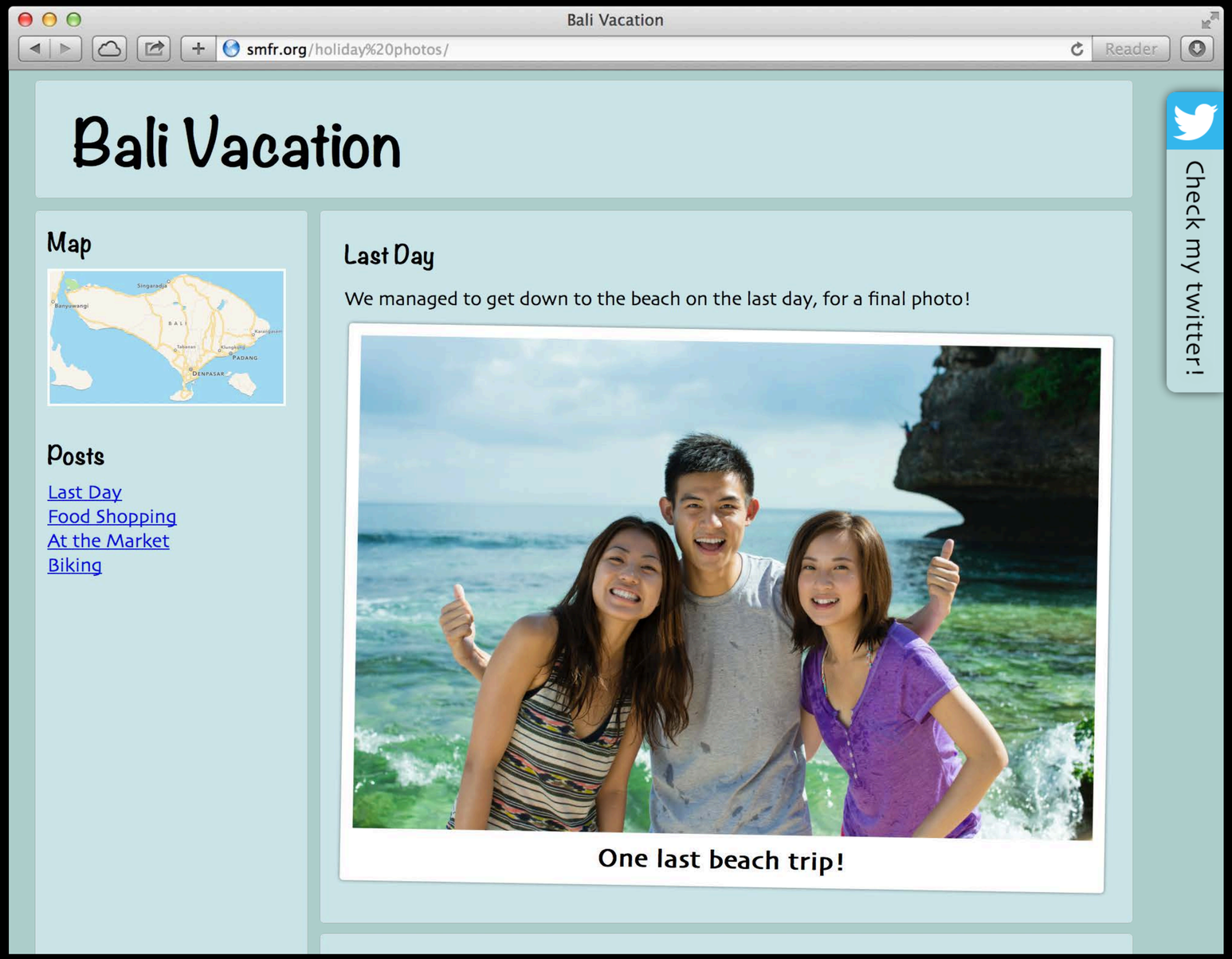
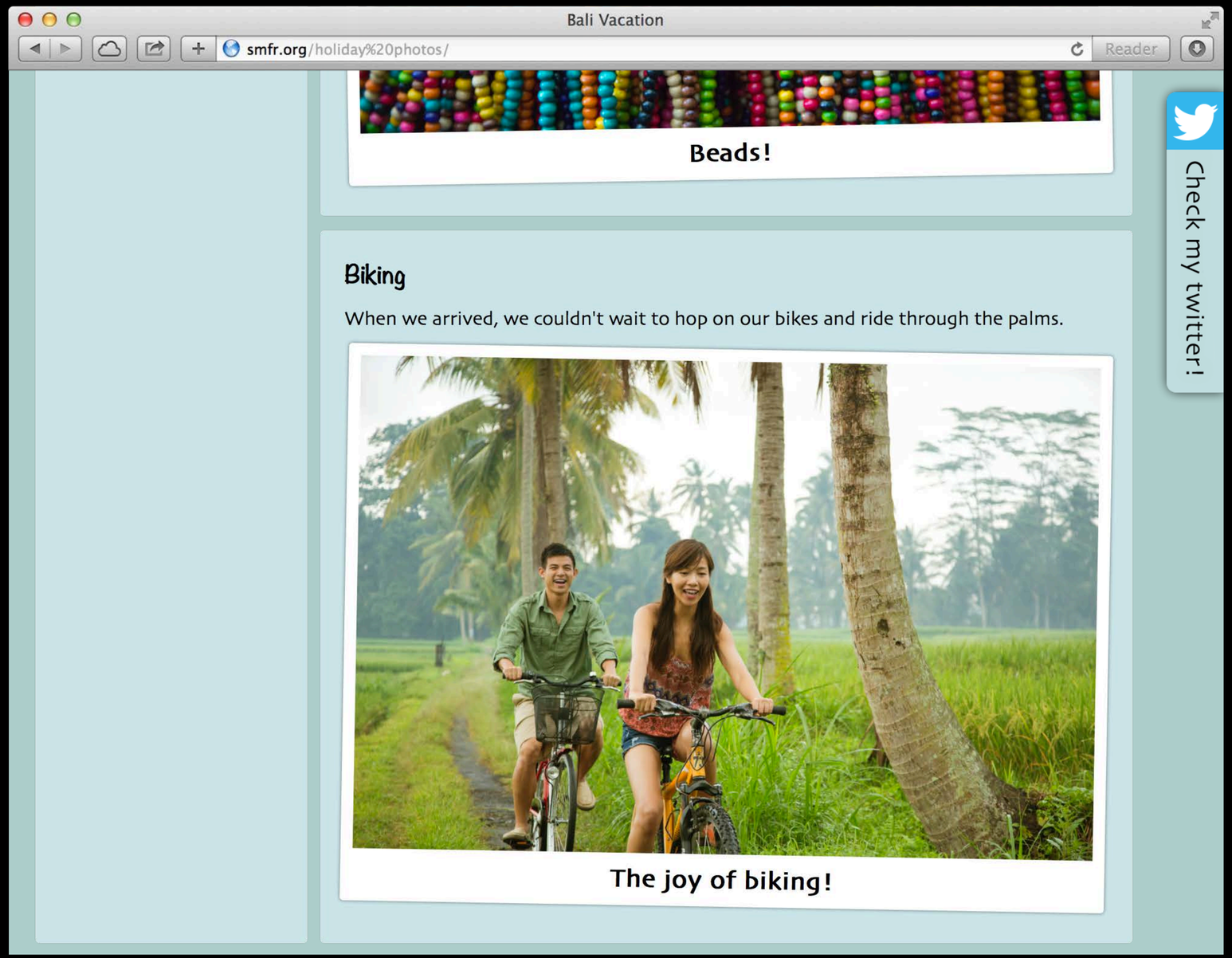


Fixed Position




```
#social-links {
  position: fixed;
  right: 0;
  top: 50px;
}
```

Fixed Position

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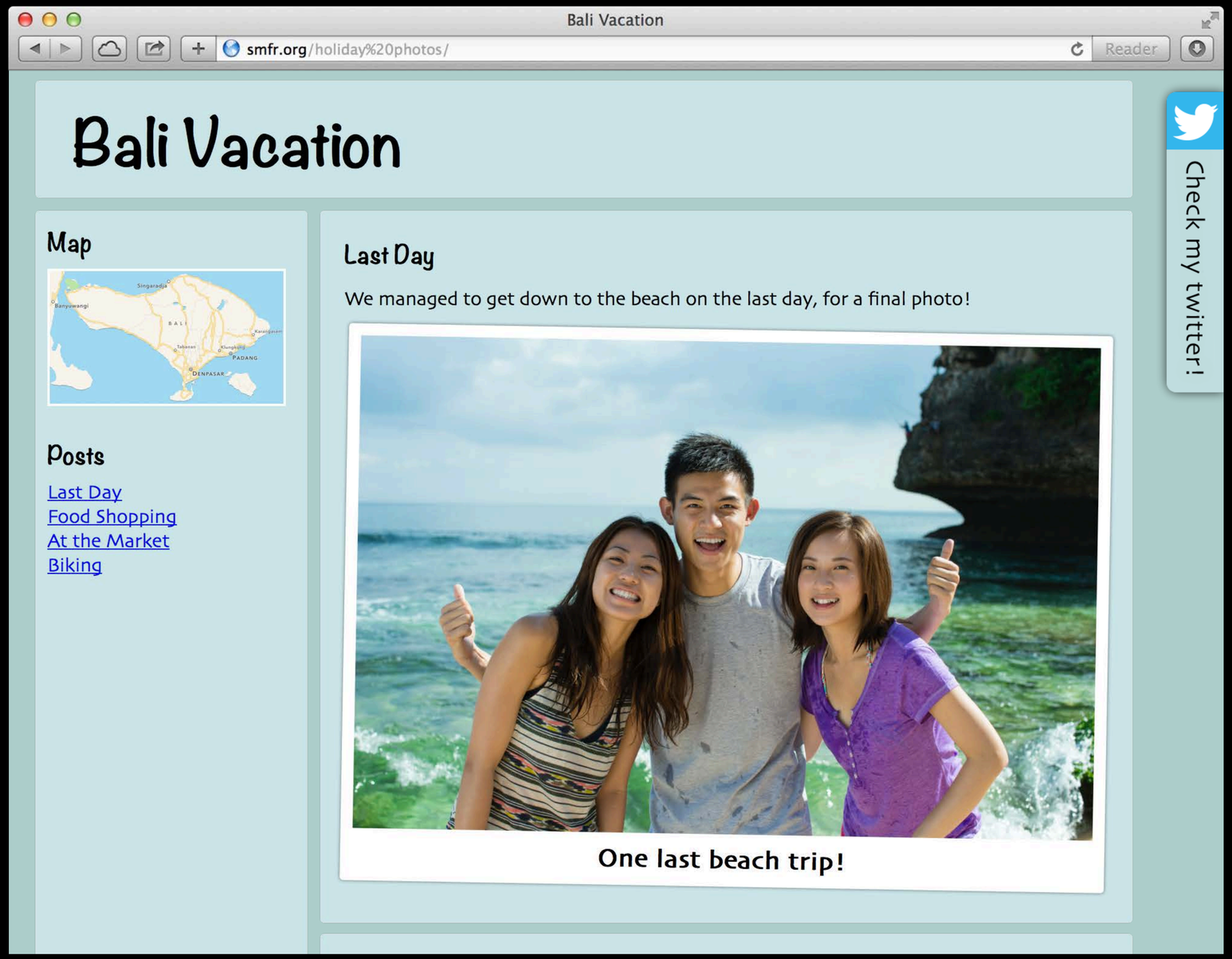


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Special Scrolling Behaviors

- Fixed position
  - `position:fixed`

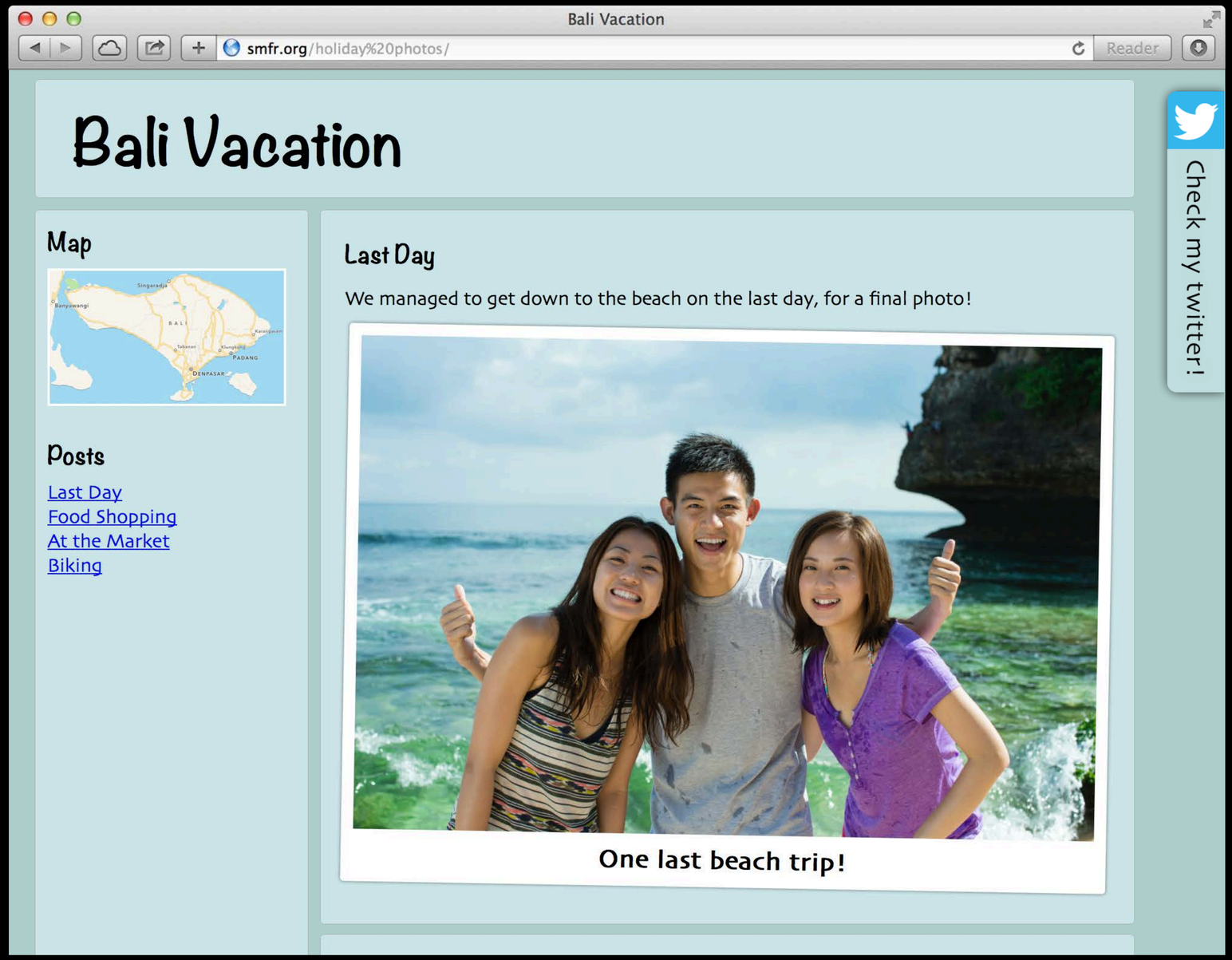
Special Scrolling Behaviors

- Fixed position
  - `position:fixed`
- Fixed backgrounds

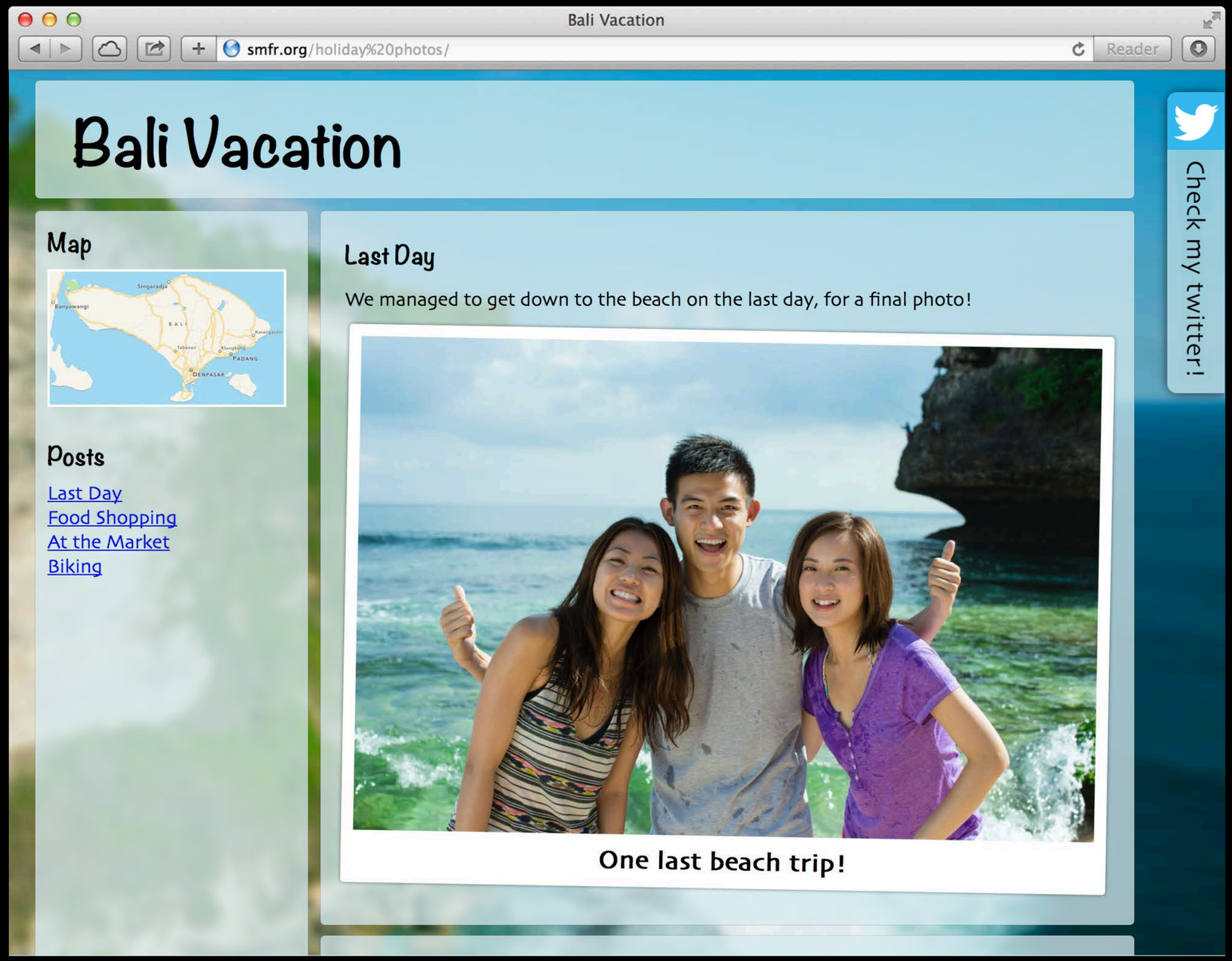
Special Scrolling Behaviors

- Fixed position
  - `position:fixed`
- Fixed backgrounds
  - `background-attachment:fixed`

Fixed Backgrounds



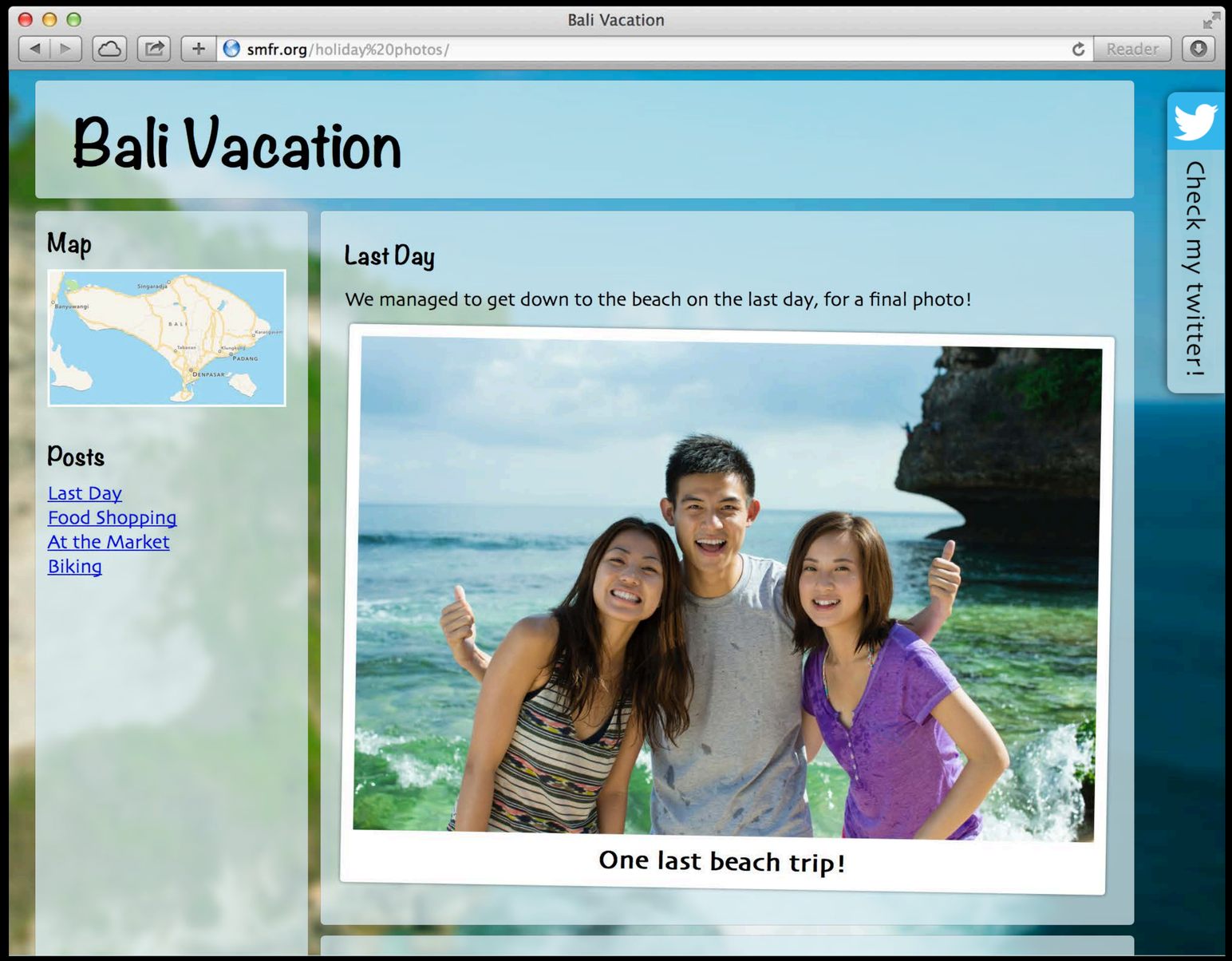
Fixed Backgrounds




```
body {
  background-image:
    url('beach.jpg)';

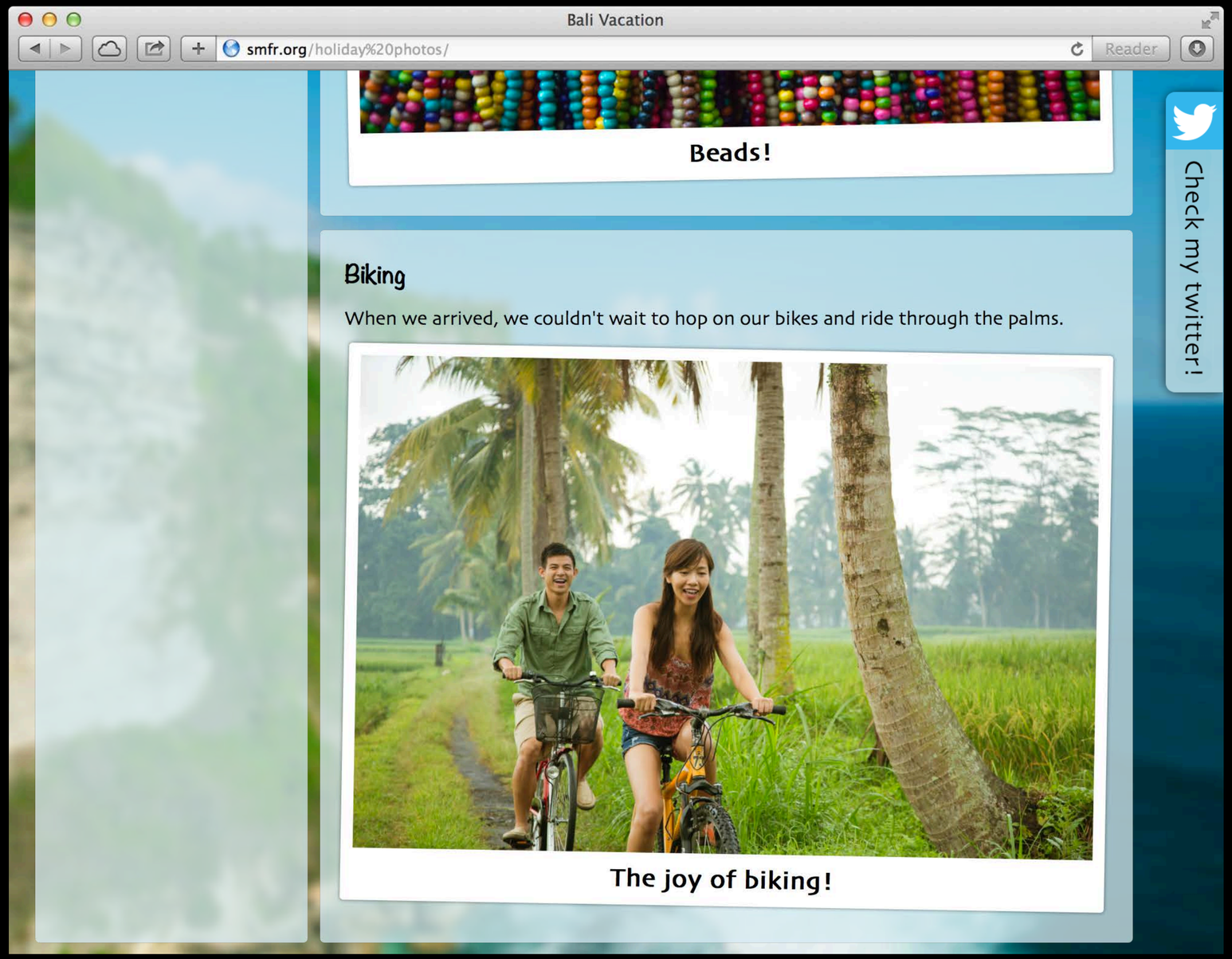

}
```

Fixed Backgrounds




```
body {
  background-image:
    url('beach.jpg)';
  background-attachment:
    fixed;
}
```

Fixed Backgrounds

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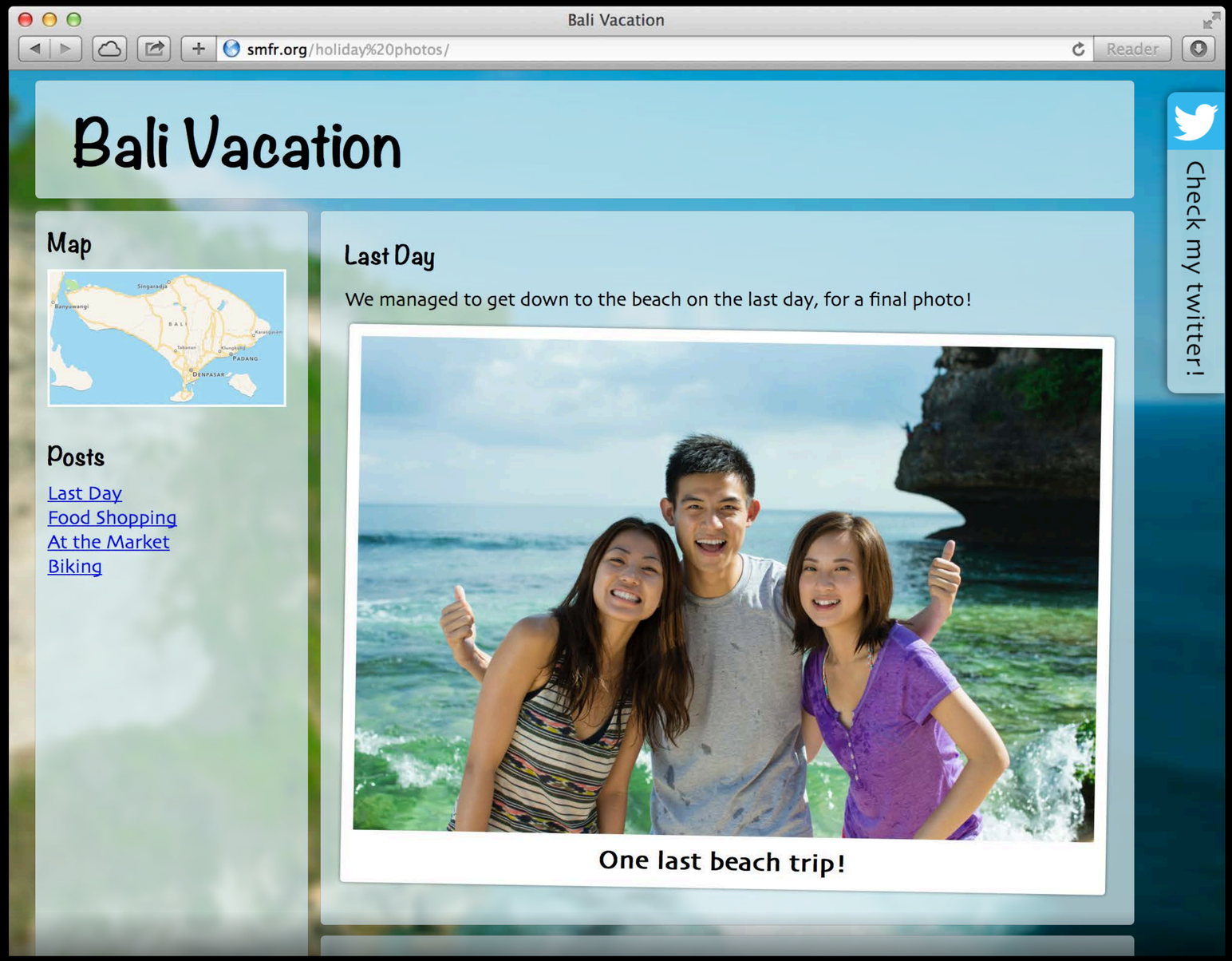
Fixed Backgrounds

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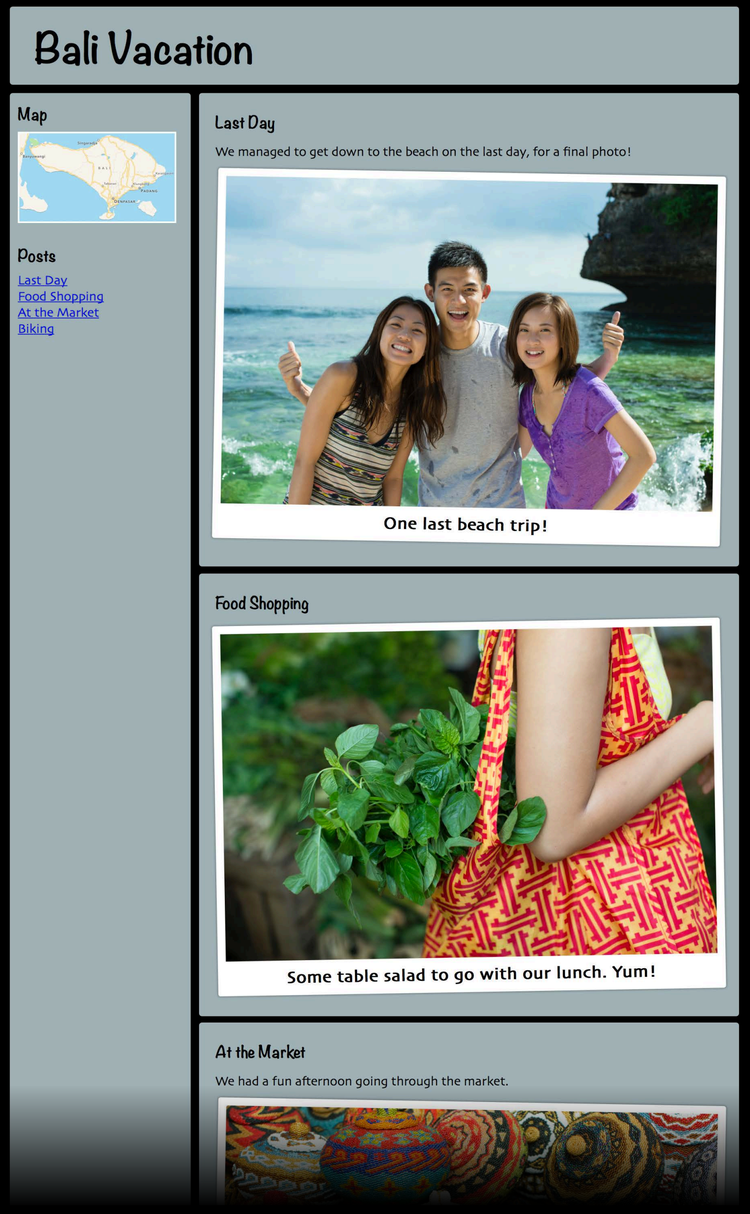

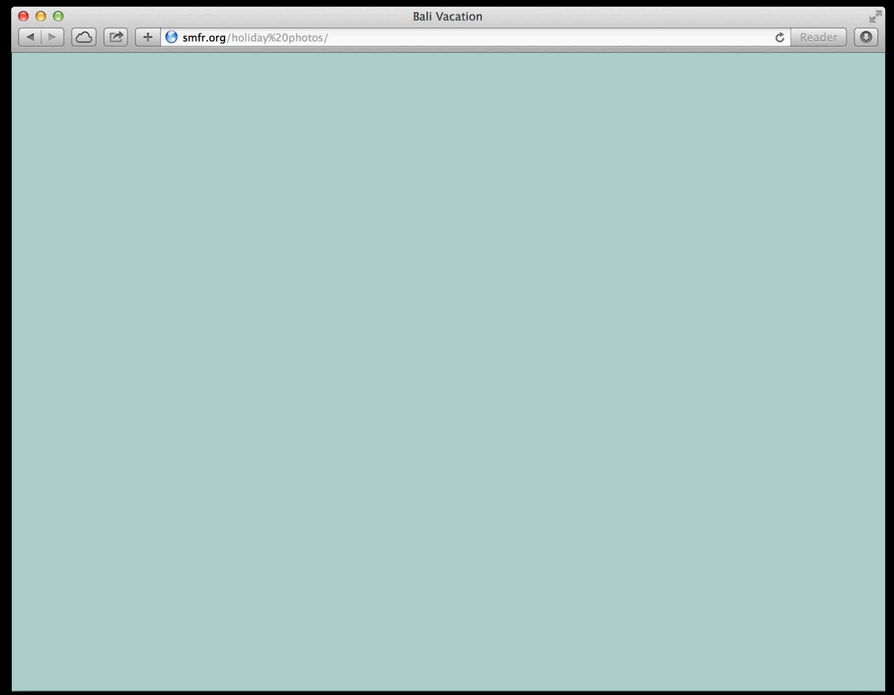

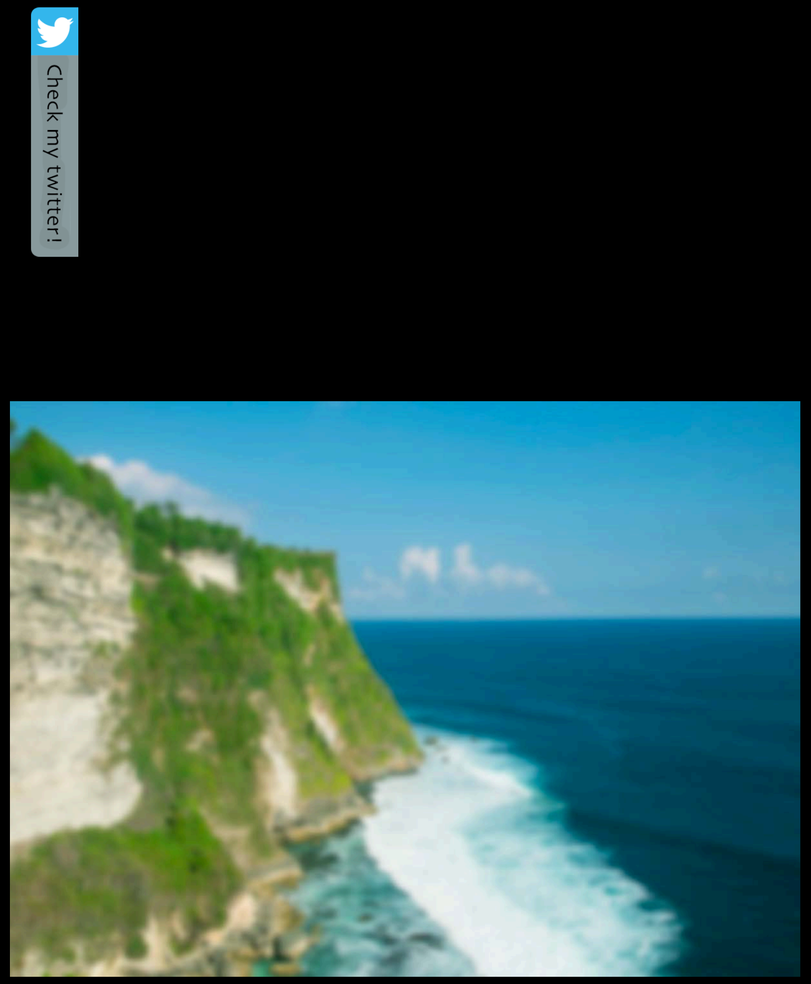

Fixed Backgrounds

Fixed Backgrounds

- Only use on the page background

Fixed Backgrounds

- Only use on the page background
  - On `<html>` or `<body>`

Fixed Backgrounds

- Only use on the page background
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  - Backgrounds on just one or the other, not both

Fixed Backgrounds

- Only use on the page background
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W3C Recommendation

14.2 The background

Authors may specify the background of an element (i.e., its rendering surface) as either a color or an image. In terms of the box model, "background" refers to the background of the content, padding and border areas. Border colors and styles are set with the border properties. Margins are always transparent.

Background properties are not inherited, but the parent box's background will shine through by default because of the initial 'transparent' value on 'background-color'.

The background of the root element becomes the background of the canvas and covers the entire canvas, anchored (for 'background-position') at the same point as it would be if it was painted only for the root element itself. The root element does not paint this background again.

For HTML documents, however, we recommend that authors specify the background for the BODY element rather than the HTML element. For documents whose root element is an HTML "HTML" element or an XHTML "html" element that has computed values of 'transparent' for 'background-color' and 'none' for 'background-image', user agents must instead use the computed value of the background properties from that element's first HTML "BODY" element or XHTML "body" element child when painting backgrounds for the canvas, and must not paint a background for that child element. Such backgrounds must also be anchored at the same point as they would be if they were painted only for the root element.

Fixed Backgrounds

CSS 2.1

W3C Recommendation

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Responsive Scrolling and Scroll Events

Responsive Scrolling and Scroll Events

- Scroll events are asynchronous

Responsive Scrolling and Scroll Events

- Scroll events are asynchronous
- But often used for sticky behavior

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White & Silver
From $329

2 Choose a model:

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Pizza Cupertino, CA

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Reader

yelp

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Log In

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pizza Cupertino, CA

Showing 1-10 of 39

Browse Category: Pizza

Hide Filters

Sort By
- **Best Match**
- Highest Rated
- Most Reviewed

Cities
- Cupertino
- Saratoga
- Sunnyvale
- Santa Clara

More Cities

Distance
- Bird's-eye View
- **Driving (5 mi.)**
- Biking (2 mi.)
- Walking (1 mi.)
- Within 4 blocks

Price
- $
- $$
- $$$
- $$$$

Features
- Offering a Deal
- Open Now 4:42 pm
- Take-out
- Good for Kids

More Features

Category
- Pizza
- Restaurants
- Italian
- Food

More Categories

1. 212 New York **Pizza**

193 reviews

$ • Pizza

$15 for $30 Deal

19998 Homestead Rd
Cupertino, CA 95014
(408) 257-5555

Came here last week with a co-worker for an extended lunch, and had some great-tasting **pizza**! Had a half-Sopranos-Half 5-spice Picante. I liked the Sopranos better, but that's not to say

2. **Pizza** My Heart

142 reviews

$ • Pizza

20530 Stevens Creek Blvd
Cupertino, CA 95014
(408) 253-6000

I love **Pizza** My Heart! I stop by once a week and get a slice of the delicious pepperoni mushroom or plain pepperoni **pizza**. The **pizza's** are always hot and perfectly seasoned with the right

3. J T McHart's **Pizza** Restaurant

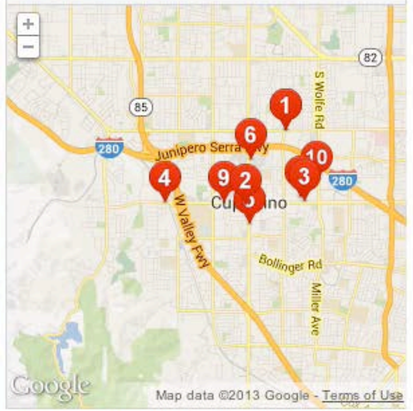
317 reviews

$$ • Pizza

19732 Stevens Creek Blvd
Cupertino, CA 95014
(408) 255-0500

← Mo' Map

Redo search when map moved



Ads by Google related to: **pizza Cupertino, CA**

Round Table **Pizza**
Immediate coupon for $5 off your online order of $20.

Special Scrolling Behaviors

- Fixed position
  - `position:fixed`
- Fixed backgrounds
  - `background-attachment:fixed`

Special Scrolling Behaviors

- Fixed position
  - `position:fixed`
- Fixed backgrounds
  - `background-attachment:fixed`
- Sticky position

Sticky Position

Sticky Position

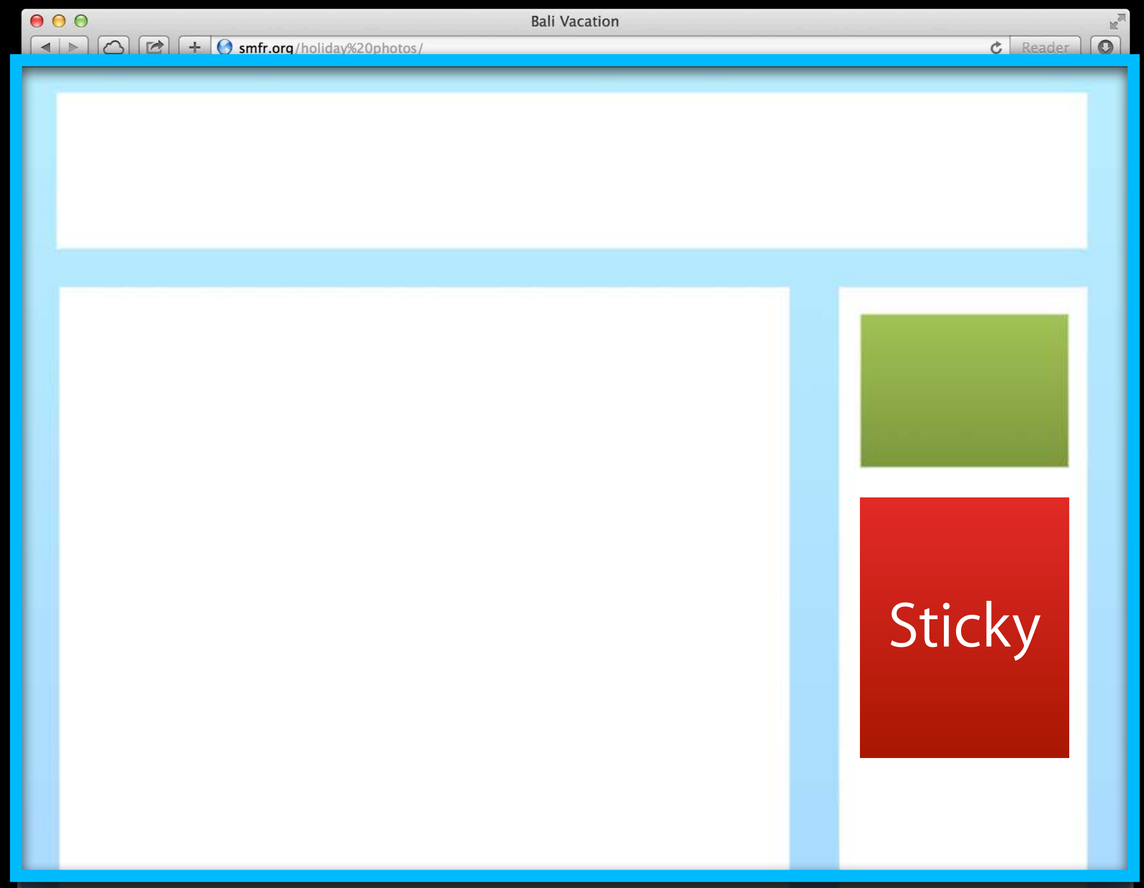
- CSS value:
  - `position:-webkit-sticky`

Sticky Position

- CSS value:
  - `position:-webkit-sticky`
- Use for an element which:
  - Takes up space
  - Stays in the viewport or scrollable ancestor

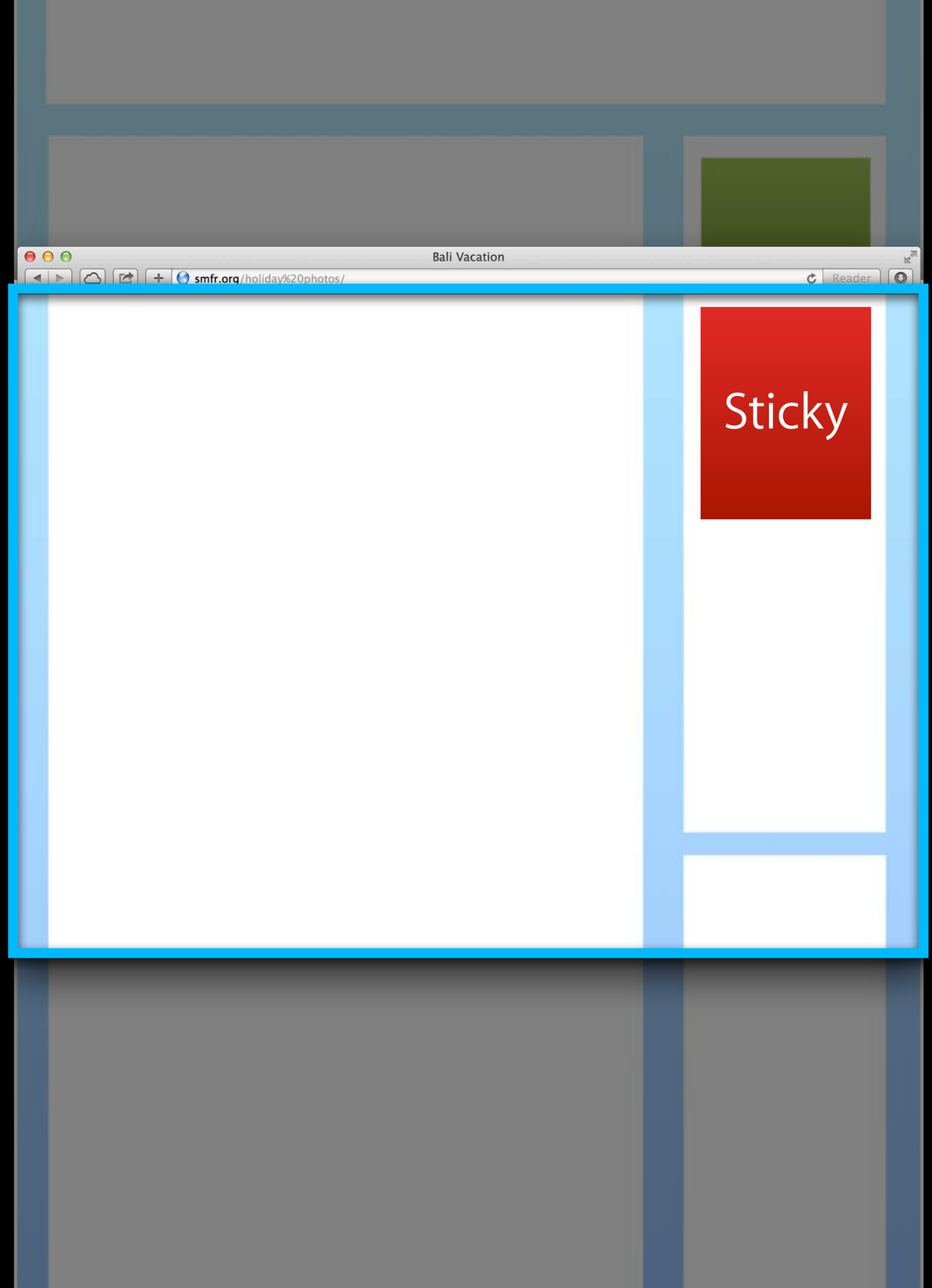
Sticky Position

- In-flow positioned
  - Like position:relative



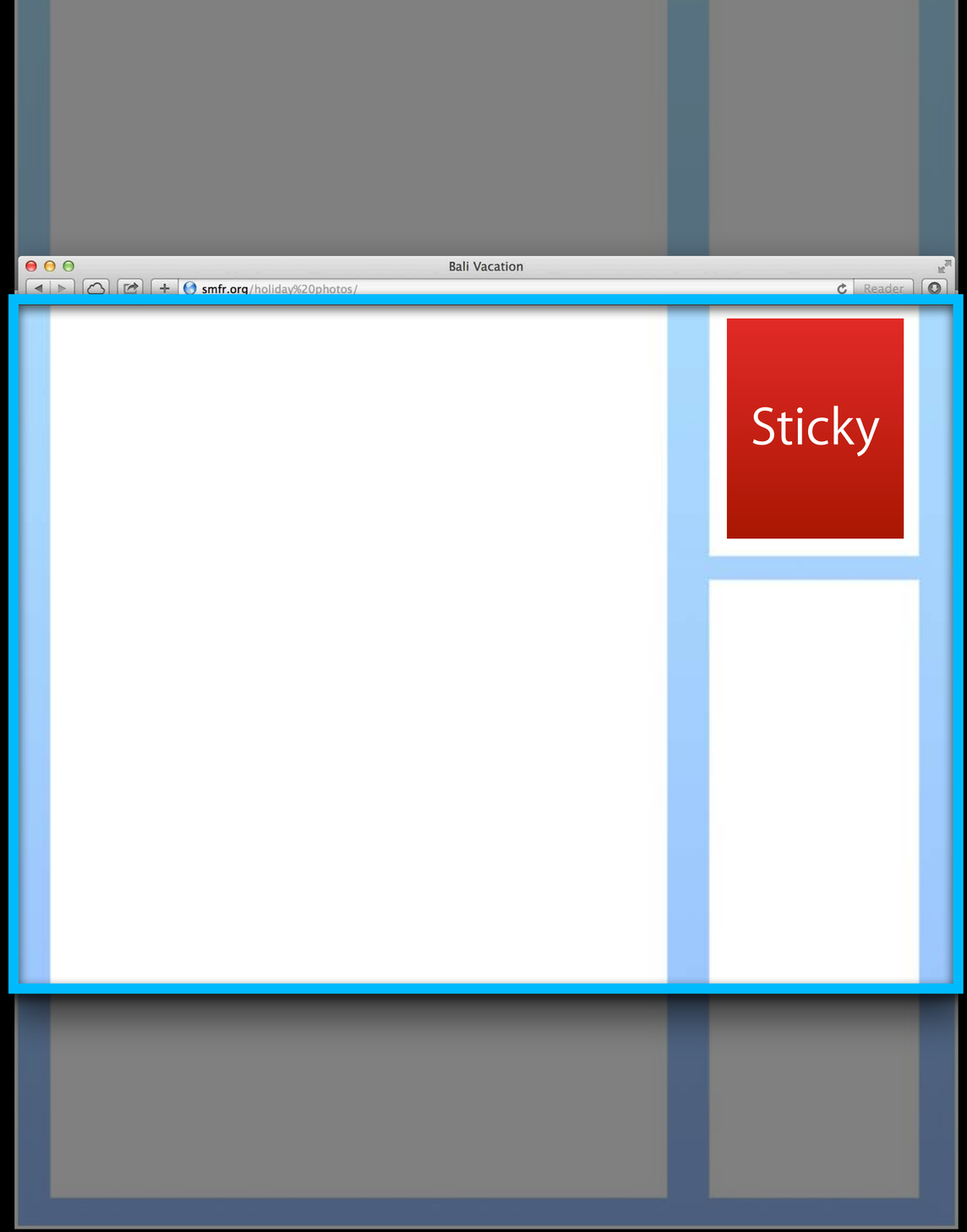
Sticky Position

- Constrained by viewport
  - Like position:fixed



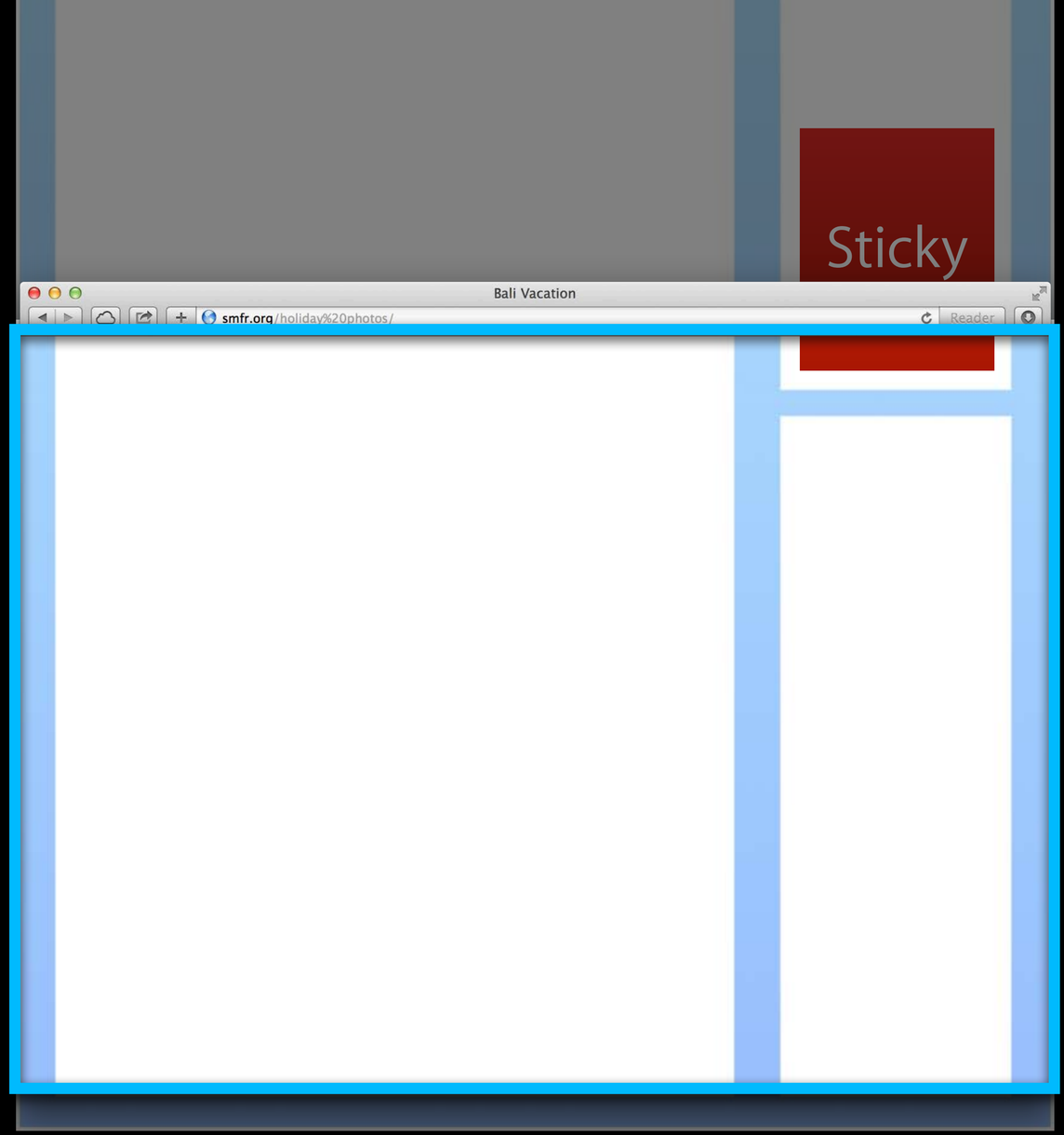
Sticky Position

- Constrained by containing block



Sticky Position

- Constrained by containing block



Sticky Position

Sticky Position

```
#side-box {
     position: -webkit-sticky;
     top: 10px;
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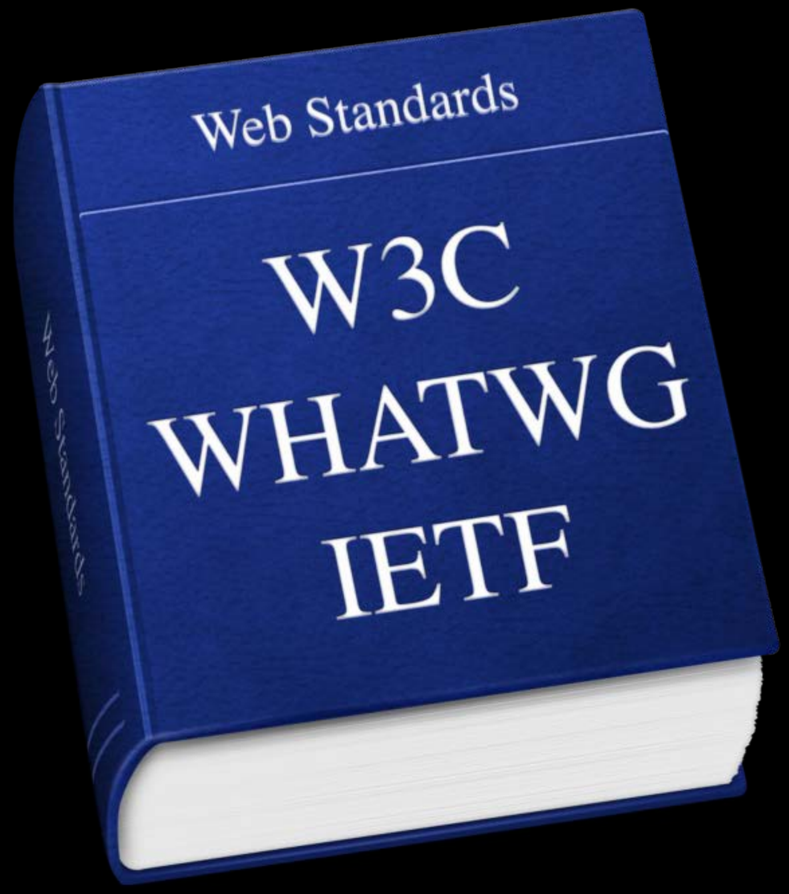

Sticky Position

NEW

Safari 6.1

Safari 7

iOS7

What You Should Do

What You Should Do

- Fixed backgrounds

What You Should Do

- Fixed backgrounds
  - Use only on <body>

What You Should Do

- Fixed backgrounds
  - Use only on <body>
- Event handlers

What You Should Do

- Fixed backgrounds
  - Use only on <body>
- Event handlers
  - Avoid mousewheel handlers

What You Should Do

- Fixed backgrounds
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  - Avoid mousewheel handlers
  - Reduce dependence on scroll events

What You Should Do

- Fixed backgrounds
  - Use only on <body>
- Event handlers
  - Avoid mousewheel handlers
  - Reduce dependence on scroll events
    - Use position:-webkit-sticky

What You Should Do

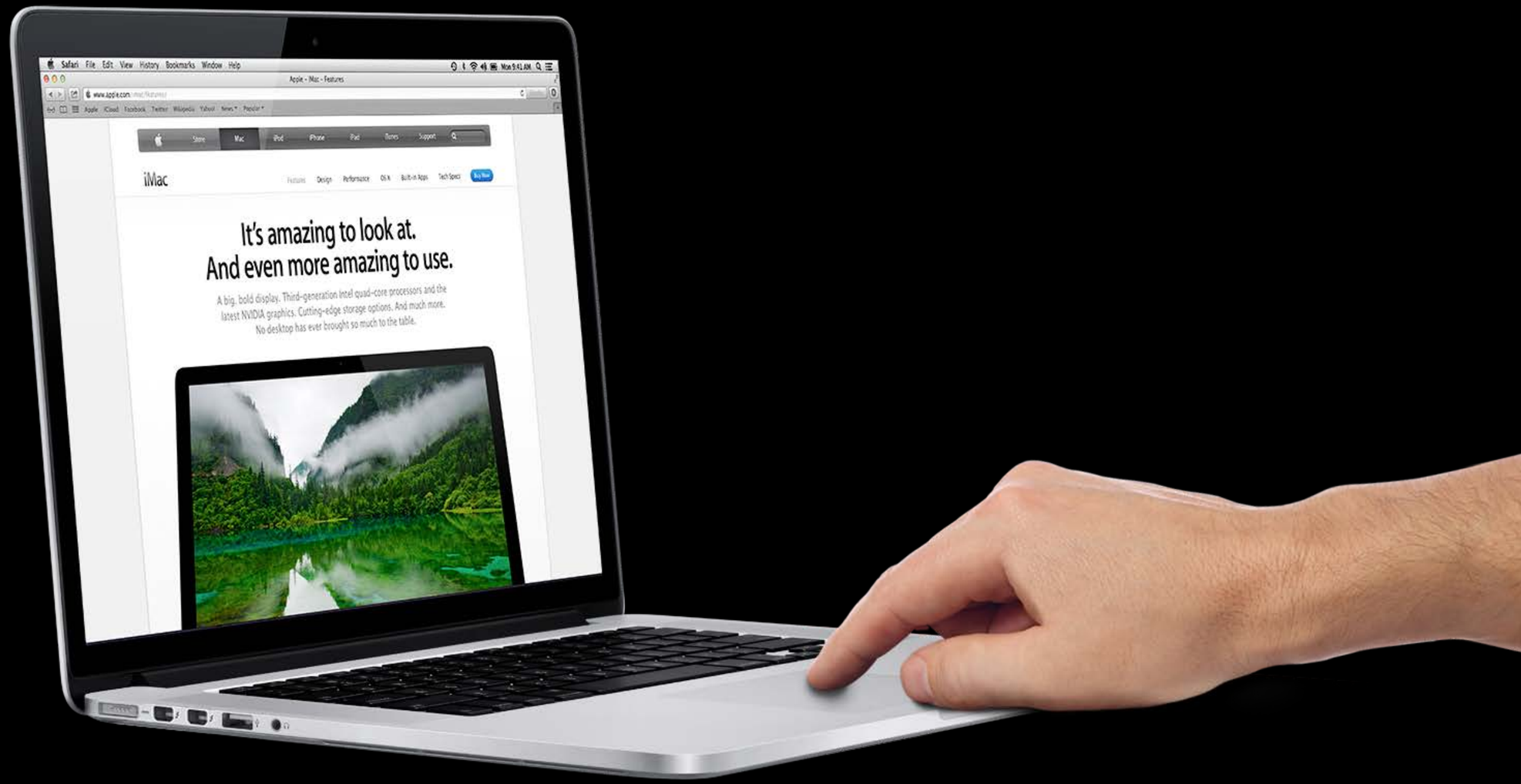
- Fixed backgrounds
  - Use only on `<body>`
- Event handlers
  - Avoid `mousewheel` handlers
  - Reduce dependence on scroll events
    - Use `position:-webkit-sticky`
- Don’t rely on `overflow:scroll`, `<frame>` or `<iframe>`

Demo

Fast scrolling, sticky position

Tim Horton
Safari and WebKit Engineer

Safari Responsive Scrolling



Summary

Summary

Summary

- Safari
  - App Nap for Safari tabs
  - Power Saver
  - Responsive scrolling

Summary

- Safari
  - App Nap for Safari tabs
  - Power Saver
  - Responsive scrolling
- Webpages
  - Reduce work in background pages
  - Make power-efficient web content
  - Get responsive scrolling

More Information

John Geleynse
Director, Technology Evangelism
geleynse@apple.com

Documentation
Safari Dev Center
Safari Extensions Development Guide
https://developer.apple.com/devcenter/safari/

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

Related Sessions

What's New in Safari and WebKit for Web Developers	Mission Tuesday 9:00AM	
Getting to Know Web Inspector	Russian Hill Tuesday 10:15AM	
Getting the Most Out of Web Inspector	Russian Hill Tuesday 11:30AM	
Maximizing Battery Life on OS X	Mission Tuesday 11:30AM	
Improving Power Efficiency with App Nap	Pacific Heights Wednesday 10:15AM	

Labs

Web Content Optimization Lab	Media Lab A Wednesday 10:15AM
Web Content Optimization Lab	Media Lab A Thursday 12:45AM
Safari and WebKit Open Lab	Media Lab A Thursday 9:00AM
Safari and WebKit Open Lab	Media Lab A Friday 9:00AM
Safari and Web Tools Lab	Media Lab A Friday 2:00PM

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