# Delivering Web Content on High Resolution Displays

Session 602

**Beth Dakin**
Safari & WebKit Engineer

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

Finder
File
Edit
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Mon 10:50 AM
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Messages
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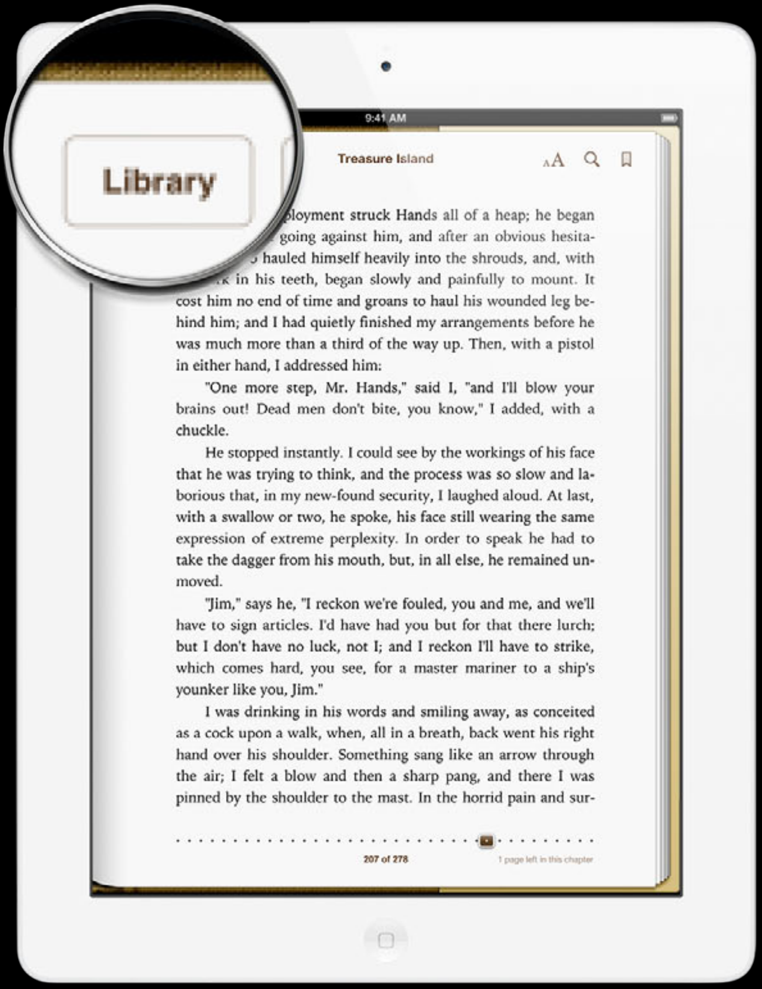


ployment struck Hands all of a heap; he began
going against him, and after an obvious hesita-
hauled himself heavily into the shrouds, and, with
in his teeth, began slowly and painfully to mount. It cost him no end of time and groans to haul his wounded leg behind him; and I had quietly finished my arrangements before he was much more than a third of the way up. Then, with a pistol in either hand, I addressed him:

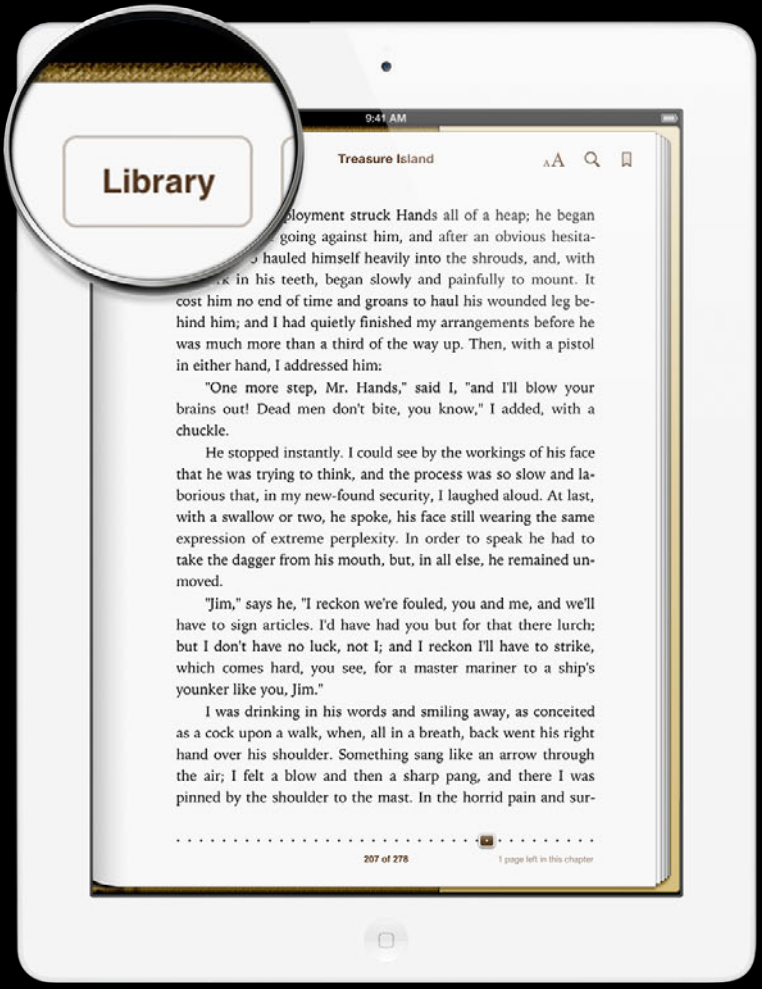
"One more step, Mr. Hands," said I, "and I'll blow your brains out! Dead men don't bite, you know," I added, with a chuckle.

He stopped instantly. I could see by the workings of his face that he was trying to think, and the process was so slow and laborious that, in my new-found security, I laughed aloud. At last, with a swallow or two, he spoke, his face still wearing the same expression of extreme perplexity. In order to speak he had to take the dagger from his mouth, but, in all else, he remained unmoved.

"Jim," says he, "I reckon we're fouled, you and me, and we'll have to sign articles. I'd have had you but for that there lurch; but I don't have no luck, not I; and I reckon I'll have to strike, which comes hard, you see, for a master mariner to a ship's younker like you, Jim."

I was drinking in his words and smiling away, as conceited as a cock upon a walk, when, all in a breath, back went his right hand over his shoulder. Something sang like an arrow through the air; I felt a blow and then a sharp pang, and there I was pinned by the shoulder to the mast. In the horrid pain and sur-

The new iPad



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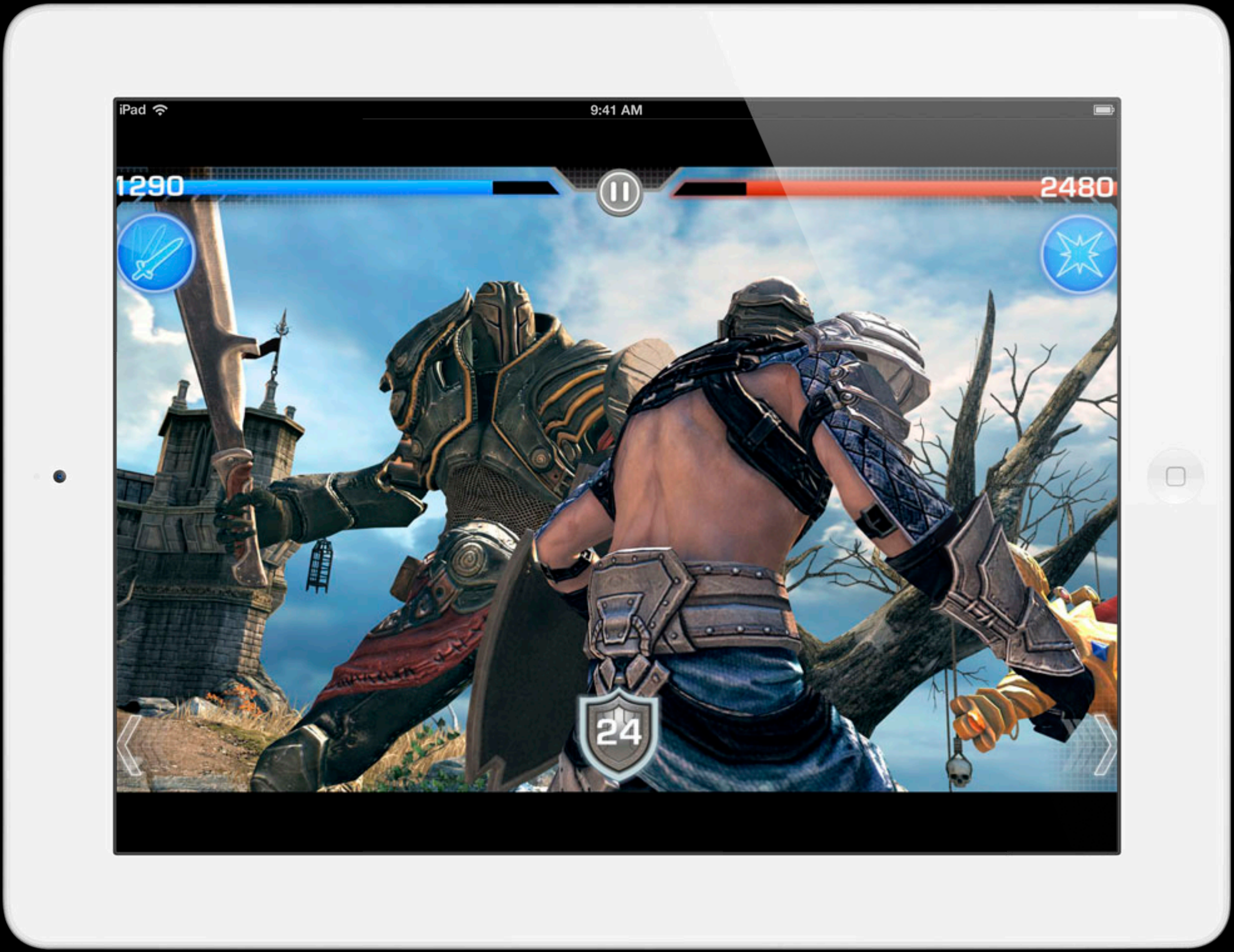
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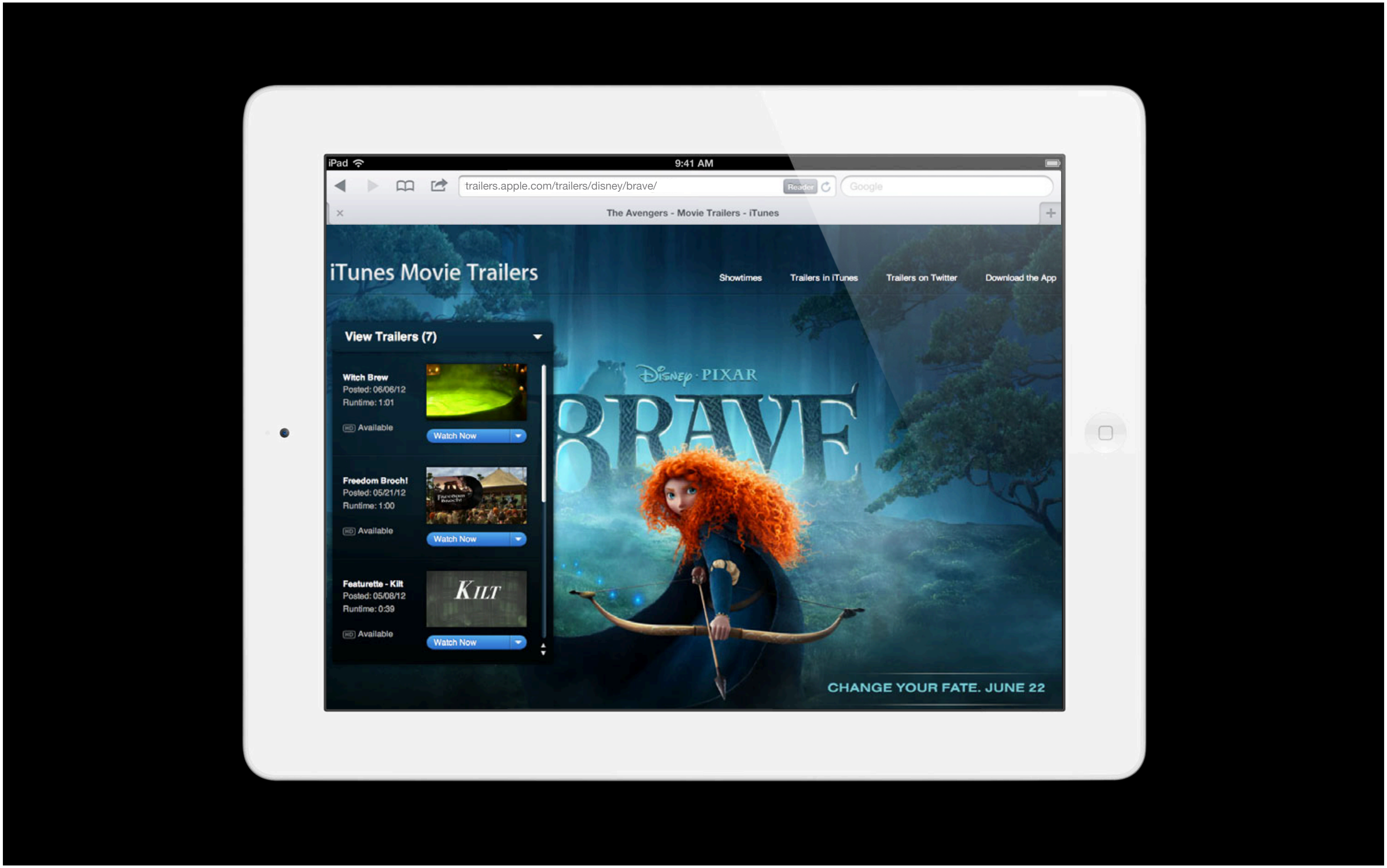
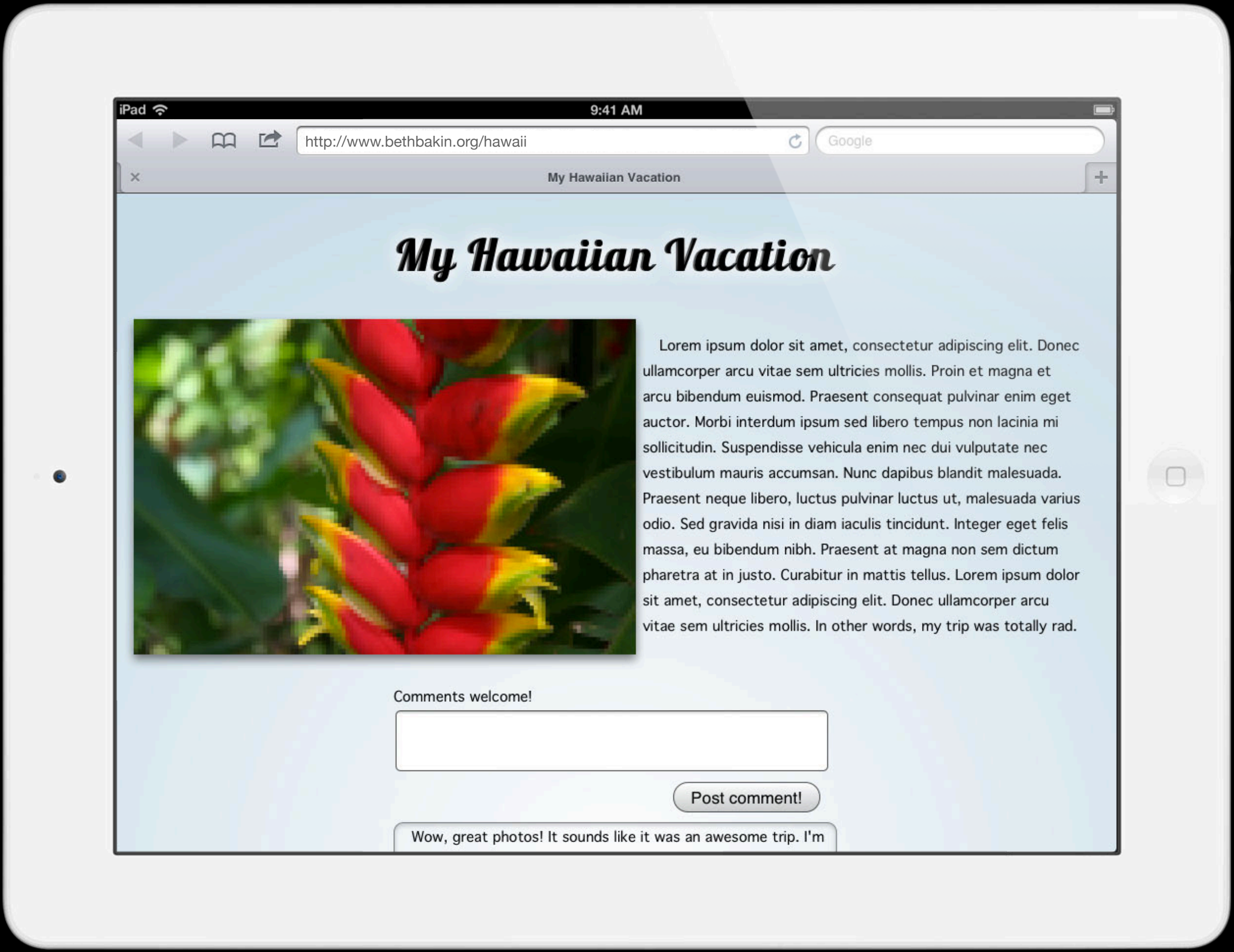


Witch Brew
Posted: 06/06/12
Runtime: 1:01
HD Available

Freedom Broch!
Posted: 05/21/12
Runtime: 1:00
HD Available

Featurette - Kilt
Posted: 05/08/12
Runtime: 0:39
HD Available



# My Hawaiian Vacation

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Comments welcome!

Wow, great photos! It sounds like it was an awesome trip. I'm

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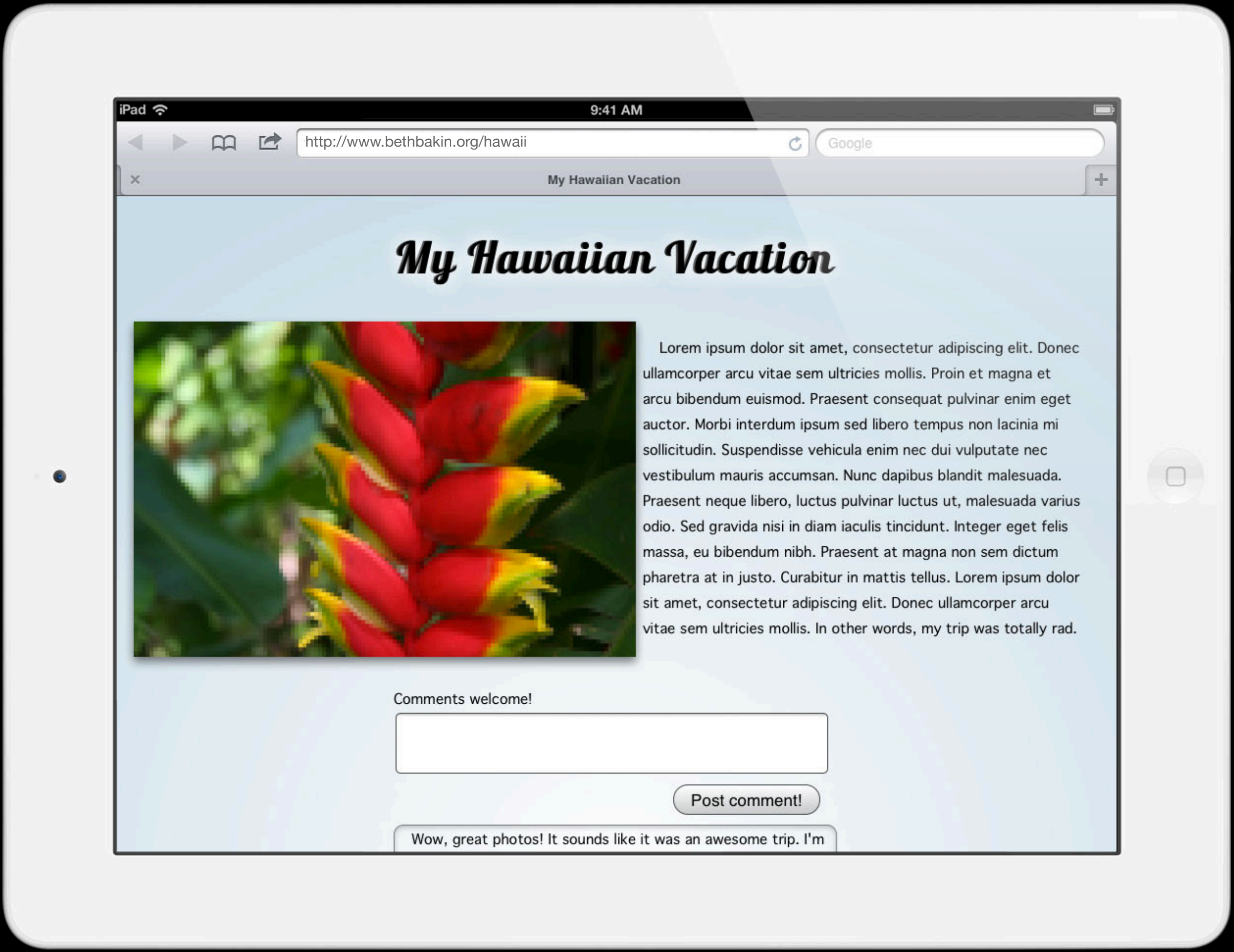

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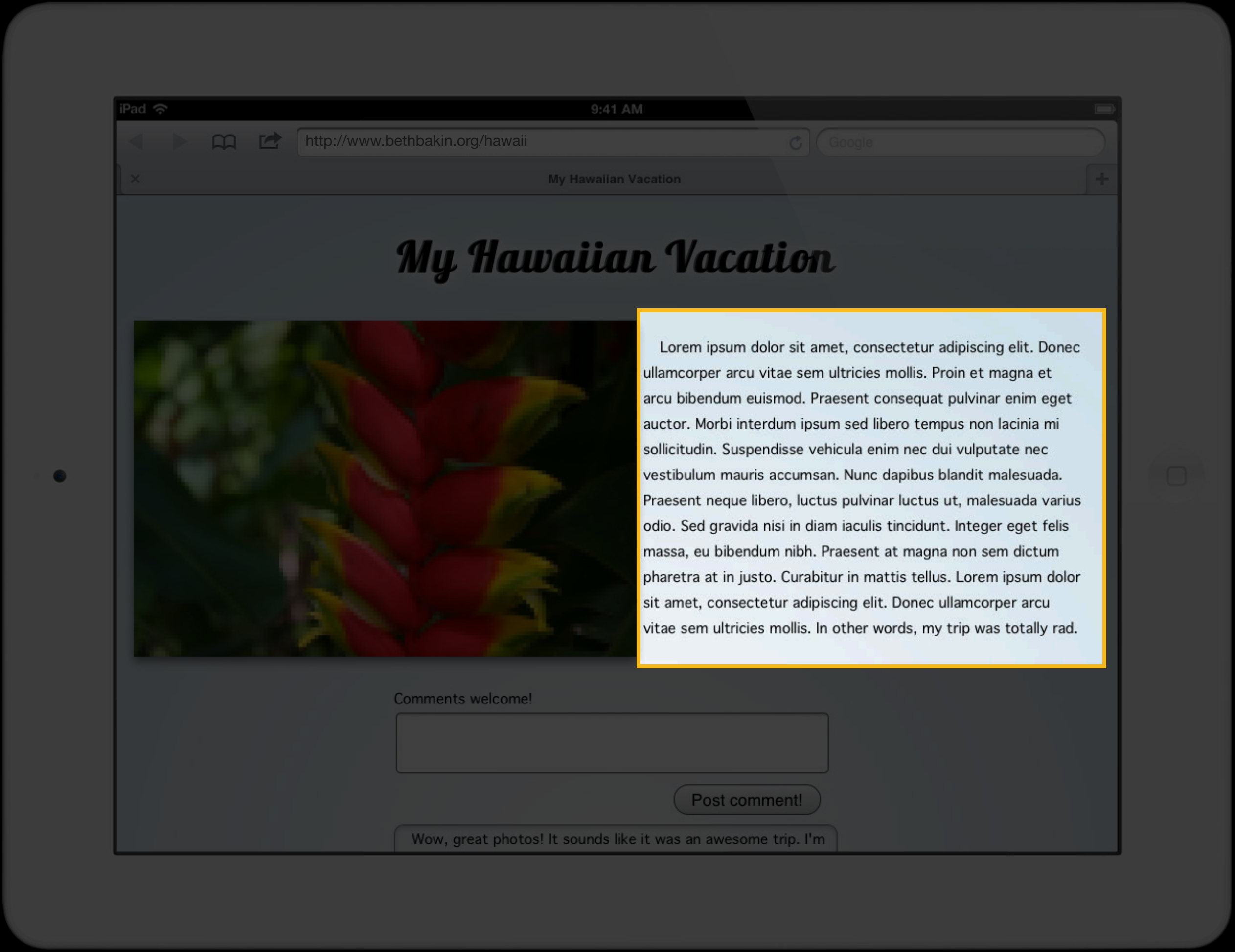

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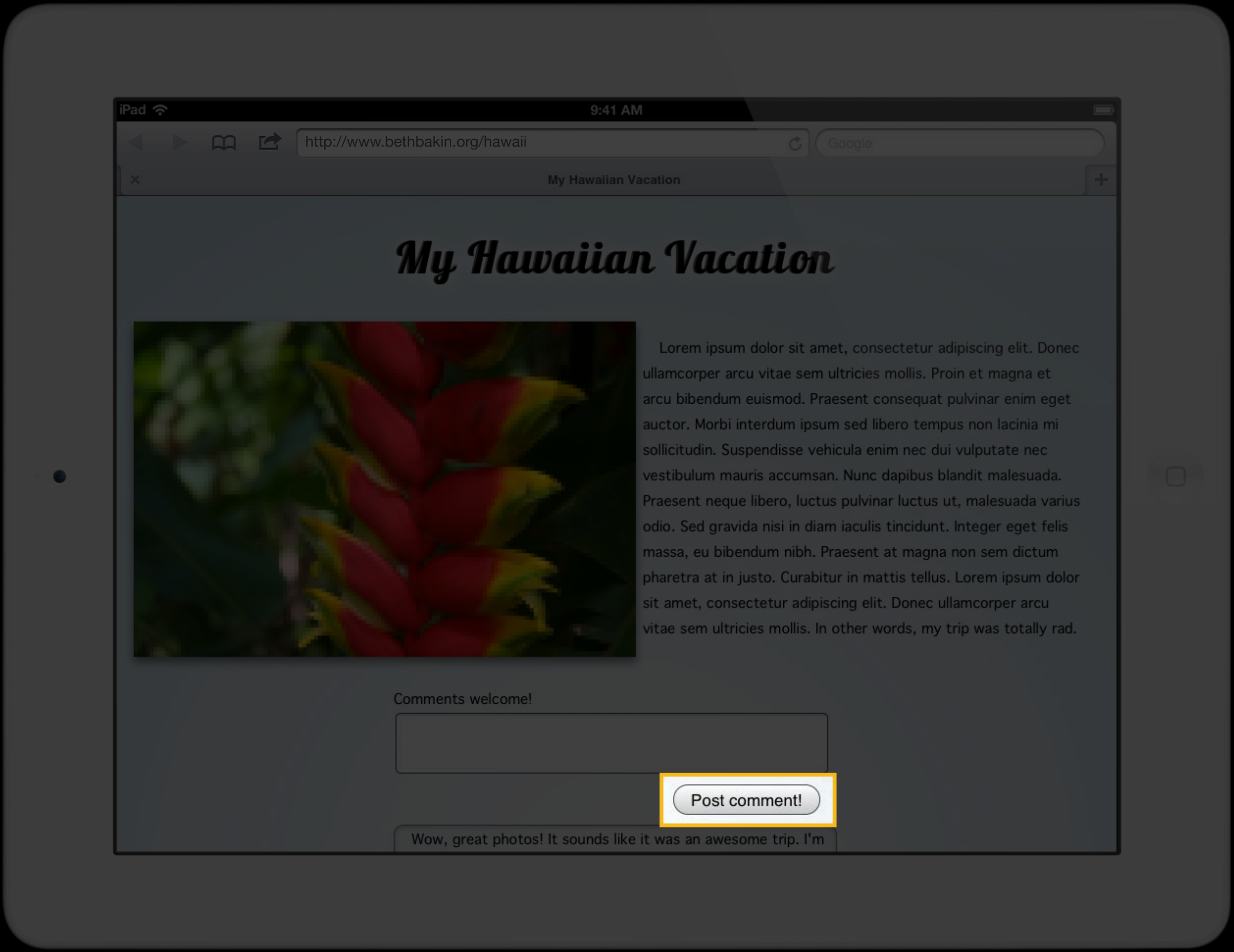

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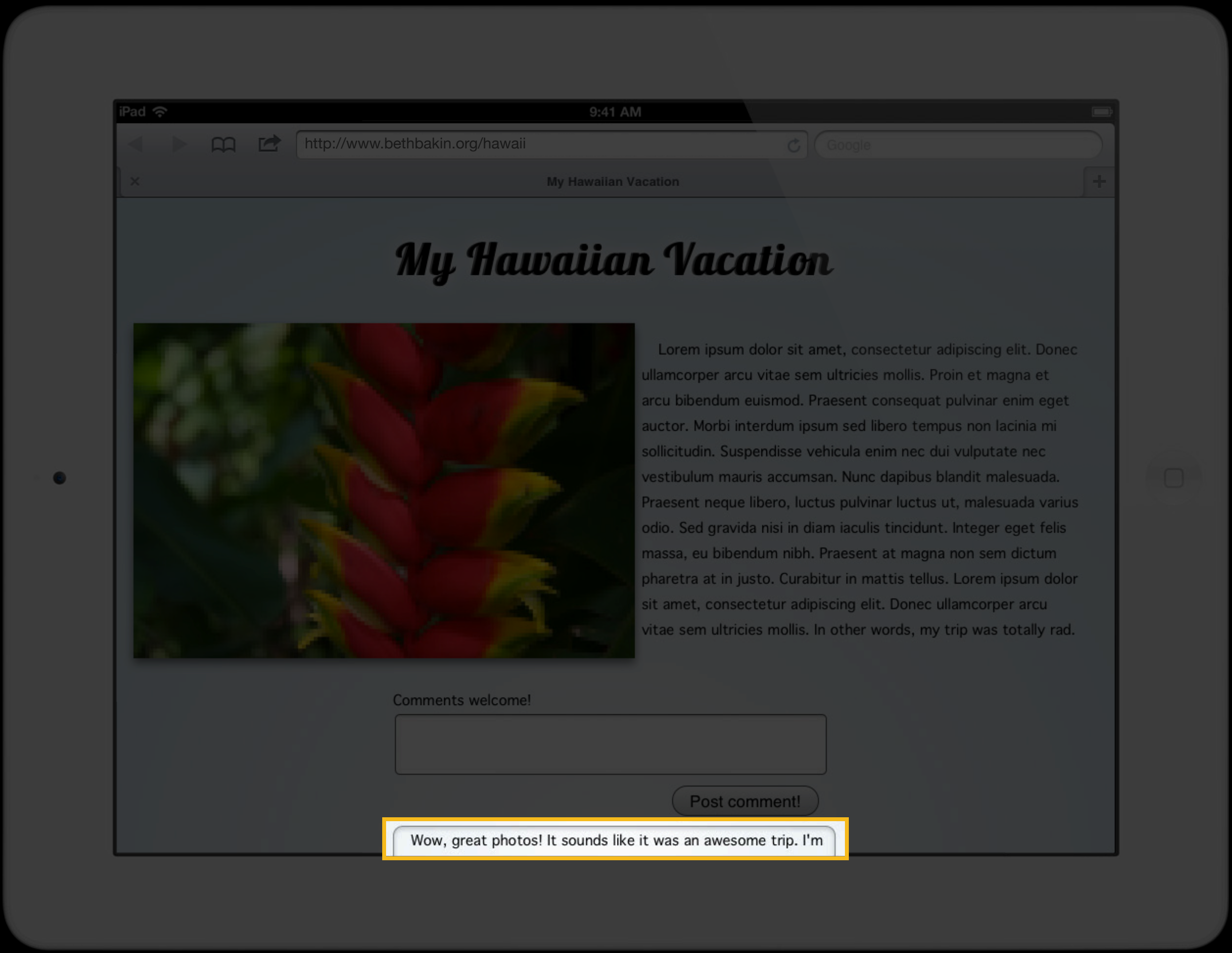

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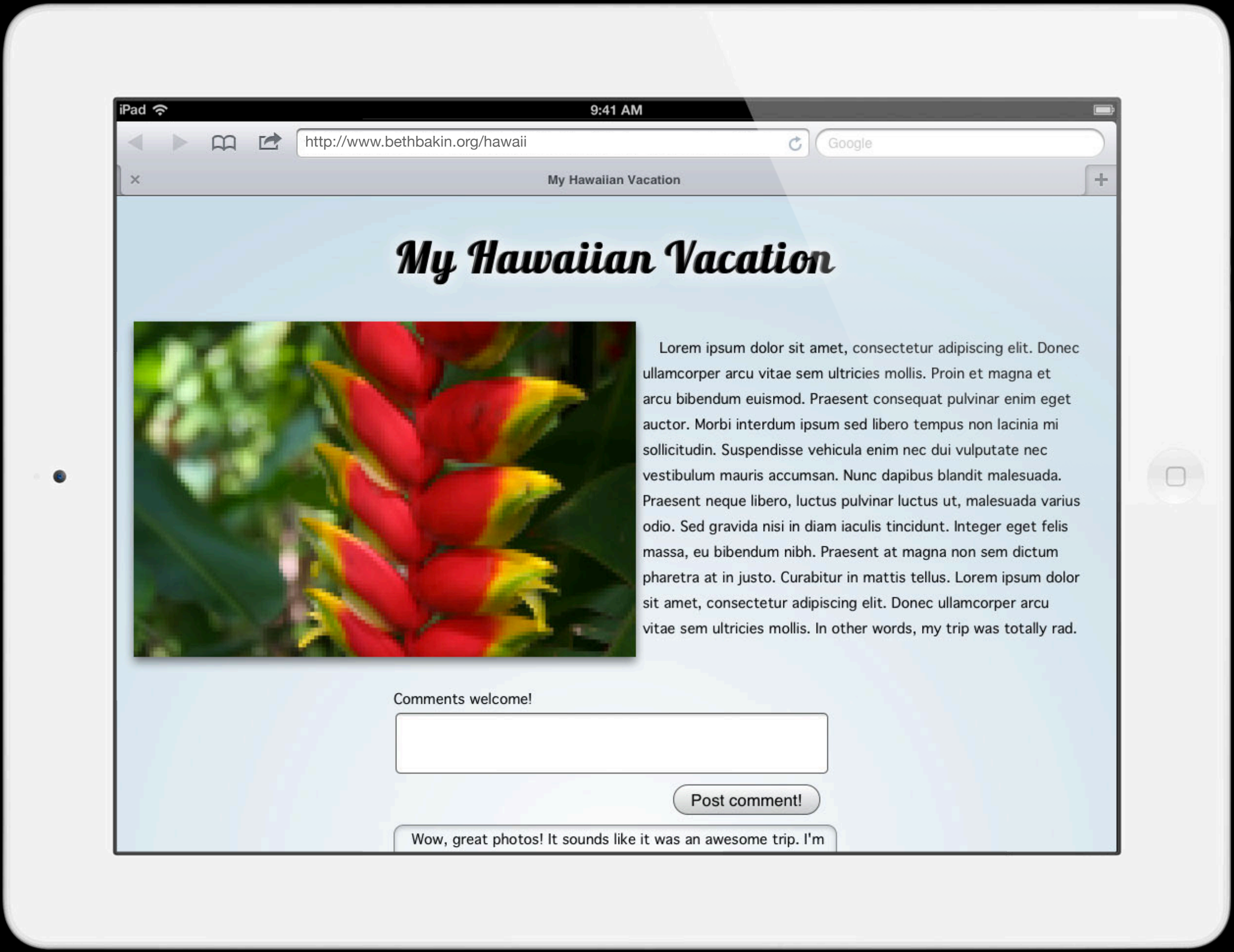

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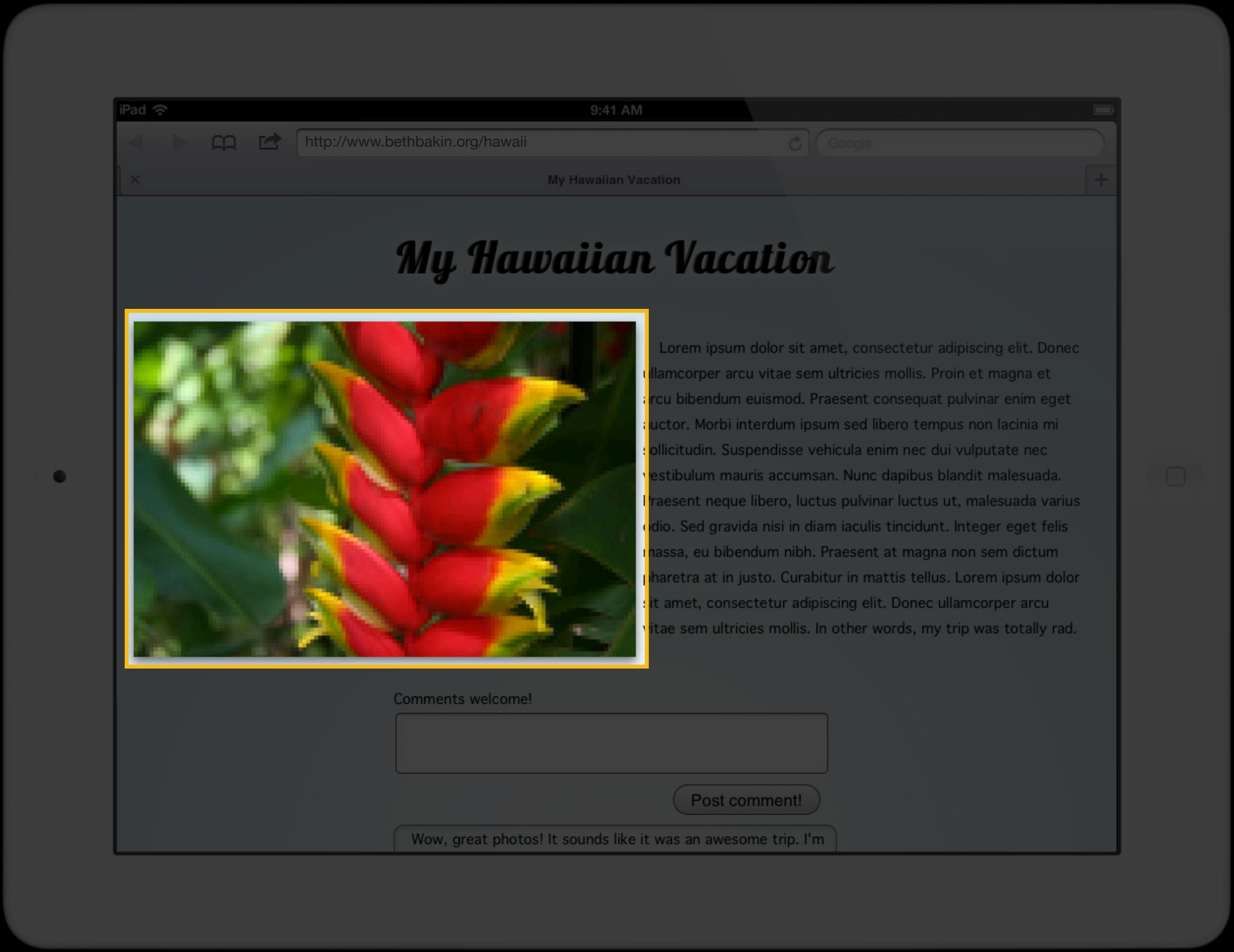

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# What You Will Learn

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- Understanding web content on high resolution displays

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- Banishing blurry images

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- Understanding web content on high resolution displays
- Banishing blurry images
- High Resolution `<canvas>`
- Leveraging the power of WebKit

# Understanding Web Content on High Resolution Displays

# Understanding Web Content on High Resolution Display

# Understanding Web Content on High Resolution Display

- Software scale factor

# Understanding Web Content on High Resolution Display

- Software scale factor
- Why do images require special attention?

# Understanding Web Content on High Resolution Display

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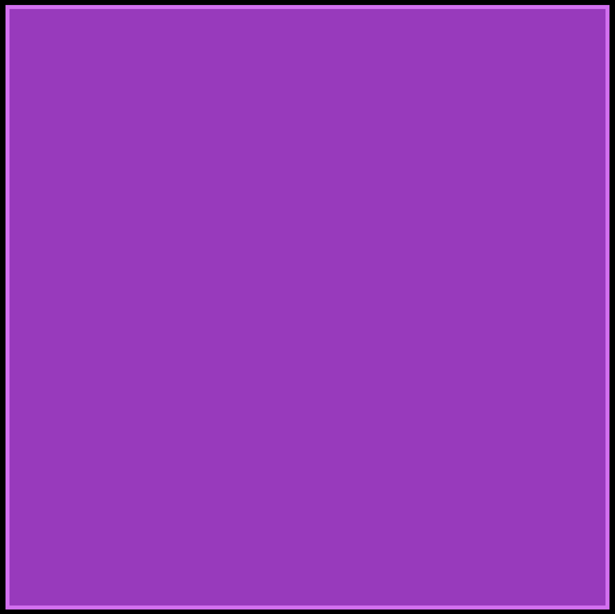
- Why do images require special attention?

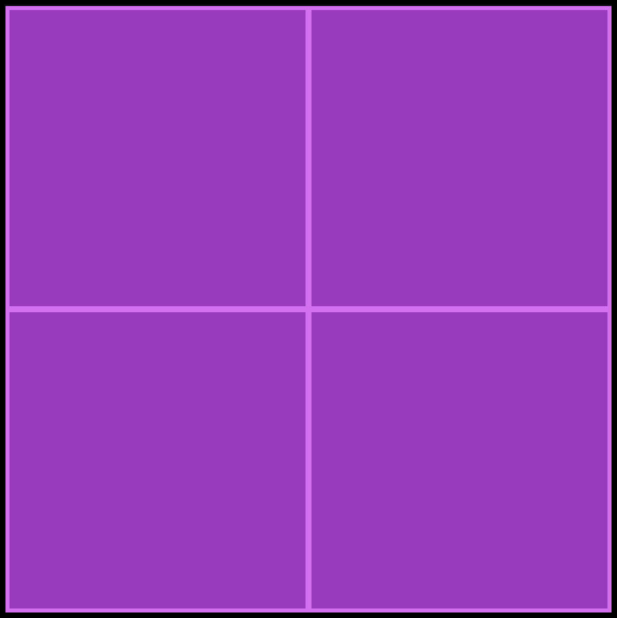
# Software Scale Factor

## Standard display



# Software Scale Factor

## Retina display



iPad
9:41 AM
Messages
FaceTime
Photos
Camera
Maps
YouTube
Clock
Photo Booth
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Contacts
Notes
Reminders
Newsstand
iTunes
App Store
Game Center
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Videos
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Notes
Reminders
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Mail
Videos
Music

[redacted]

# 1 px ≠ 1 pixel

CSS pixels are not device pixels

# Device Pixels vs. CSS Pixels

## Gesture zooming

# Device Pixels vs. CSS Pixels

## Gesture zooming

# Device Pixels vs. CSS Pixels

## Viewport

# Device Pixels vs. CSS Pixels

## Viewport

```
<div style="width:320px; …">Width of 320px!</div>
```

# Device Pixels vs. CSS Pixels

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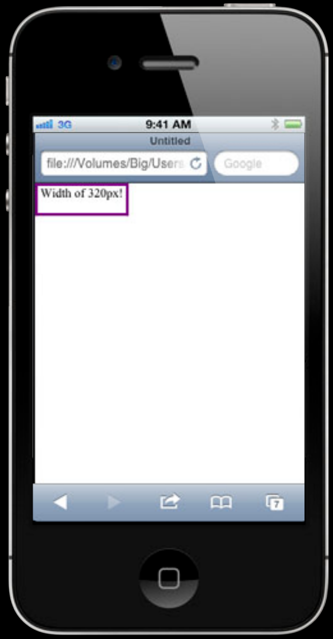
<div style="width:320px; …">Width of 320px!</div>
```



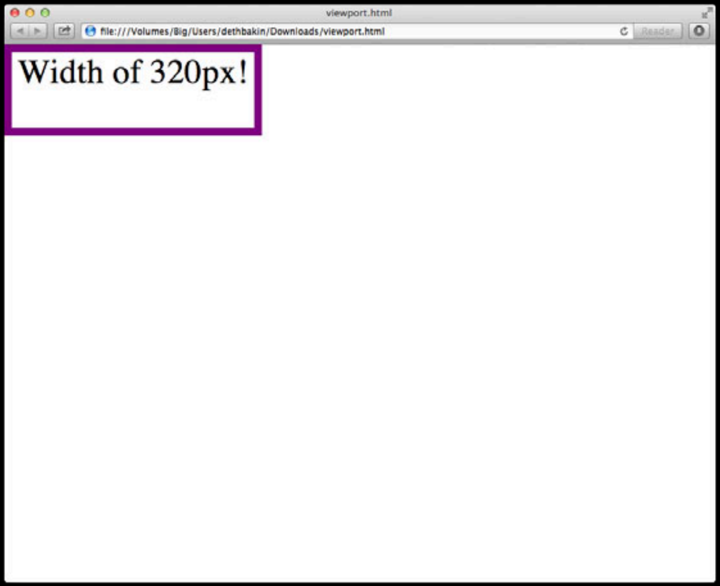
Width of 320px!

# Device Pixels vs. CSS Pixels

## Viewport

# Device Pixels vs. CSS Pixels

## Viewport

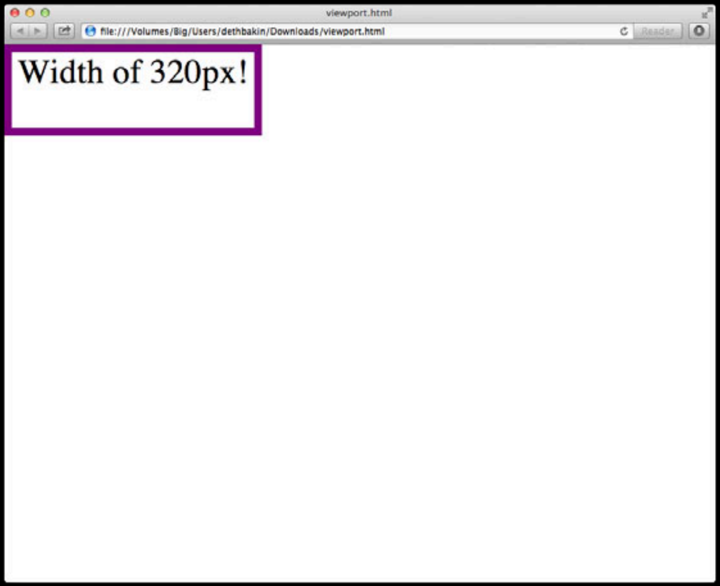


file:///Volumes/Big/Users/dethbakin/Downloads/viewport.html

Width of 320px!

# Device Pixels vs. CSS Pixels

## Viewport

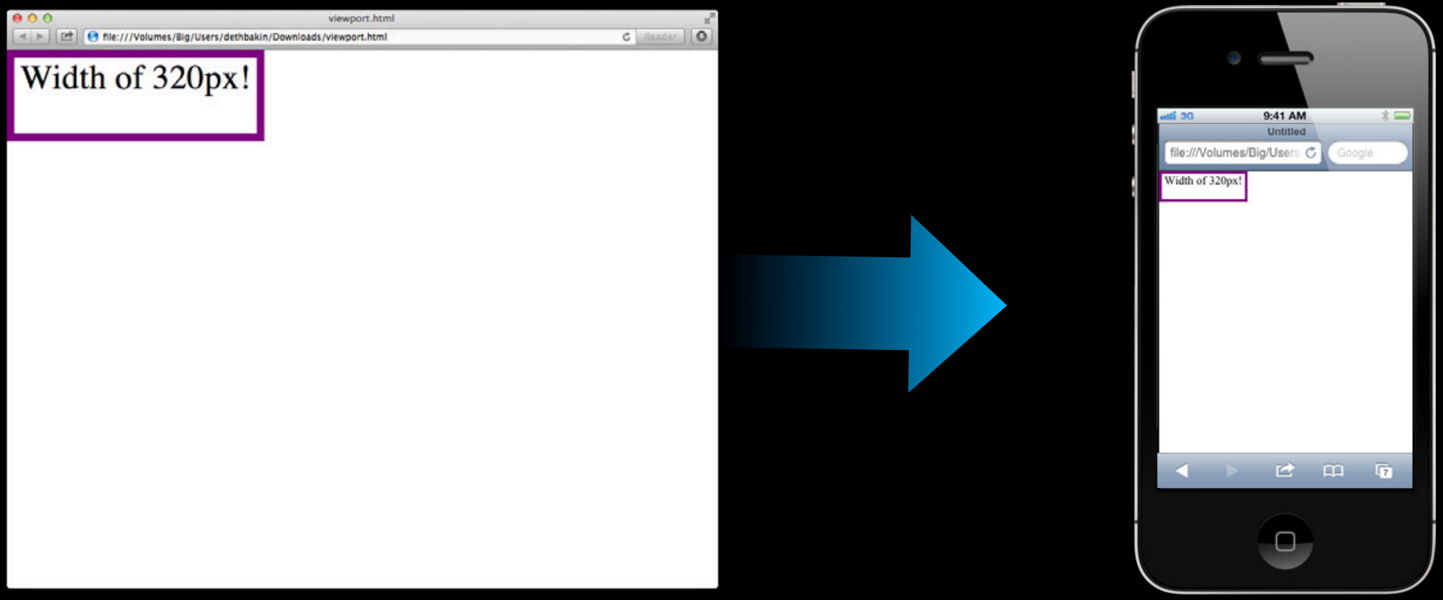


Width of 320px!

We assume 980px width…

# Device Pixels vs. CSS Pixels

## Viewport



Width of 320px!

viewport.html
file:///Volumes/Big/Users/dethbakin/Downloads/viewport.html
Reader
3G
9:41 AM
Untitled
file:///Volumes/Big/Users
Google

We assume 980px width…

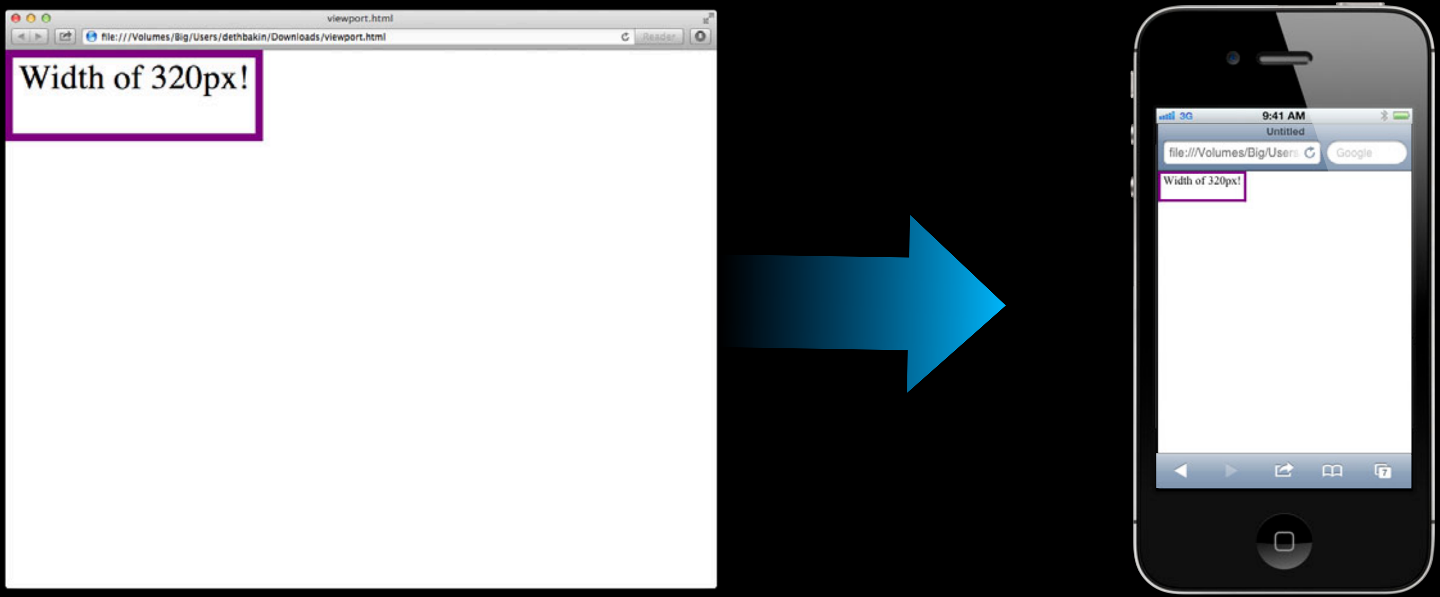
…then scale down to 320px
(for iPhone)

# Device Pixels vs. CSS Pixels

## Viewport

Default Viewport Settings

`width:980px   scale:320/980 = 0.32653`


viewport.html
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Reader
Width of 320px!
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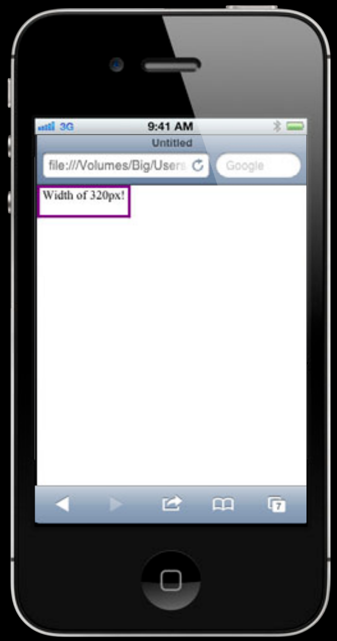

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# Device Pixels vs. CSS Pixels

## Viewport

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<meta name=”viewport” content=”width=320” />
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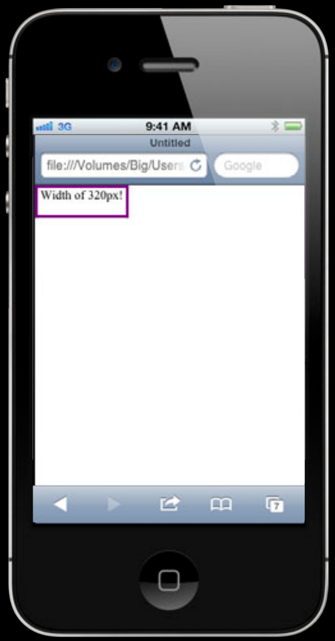

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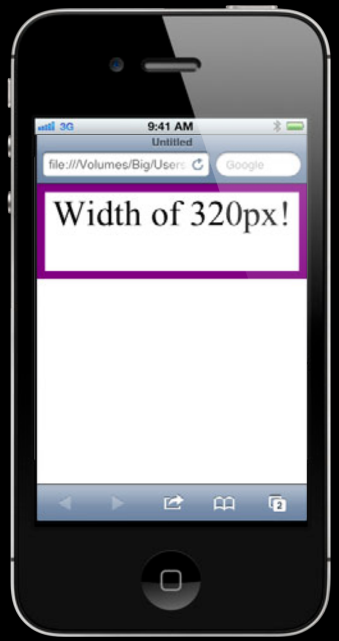


Width of 320px!

# Software Scale Factor

# Software Scale Factor

- CSS pixels are relative units inside the WebView

# Software Scale Factor

- CSS pixels are relative units inside the WebView
- All UI currently has a 2× scale factor on retina displays

# Understanding Web Content on High Resolution Displays

- Software scale factor
- Why do images require special attention?

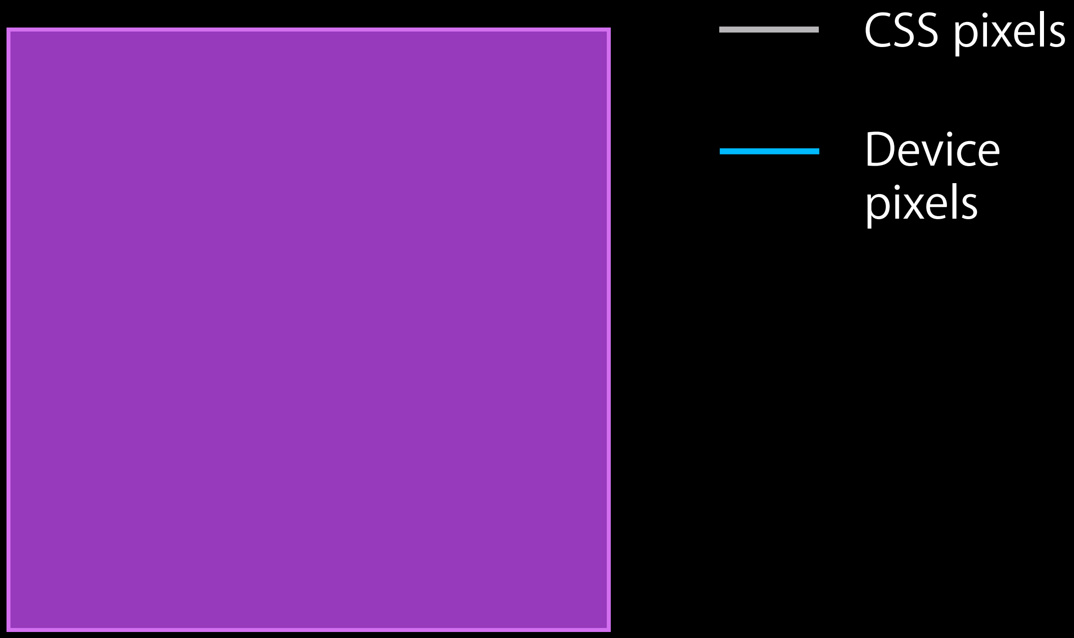
# Understanding Web Content on High Resolution Displays

- Software scale factor
- Why do images require special attention?

# What Is Actually Happening?

## With an unzoomed <div> on a standard display

```
<div style="width:10px; height:10px; …"></div>
```



━ CSS pixels

━ Device pixels

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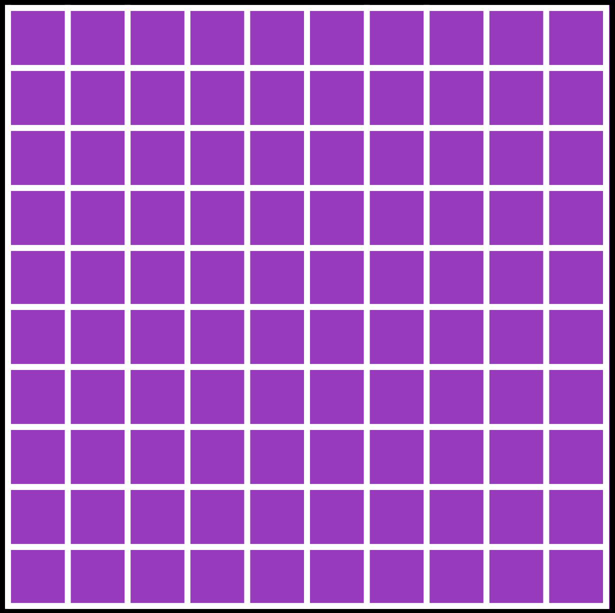

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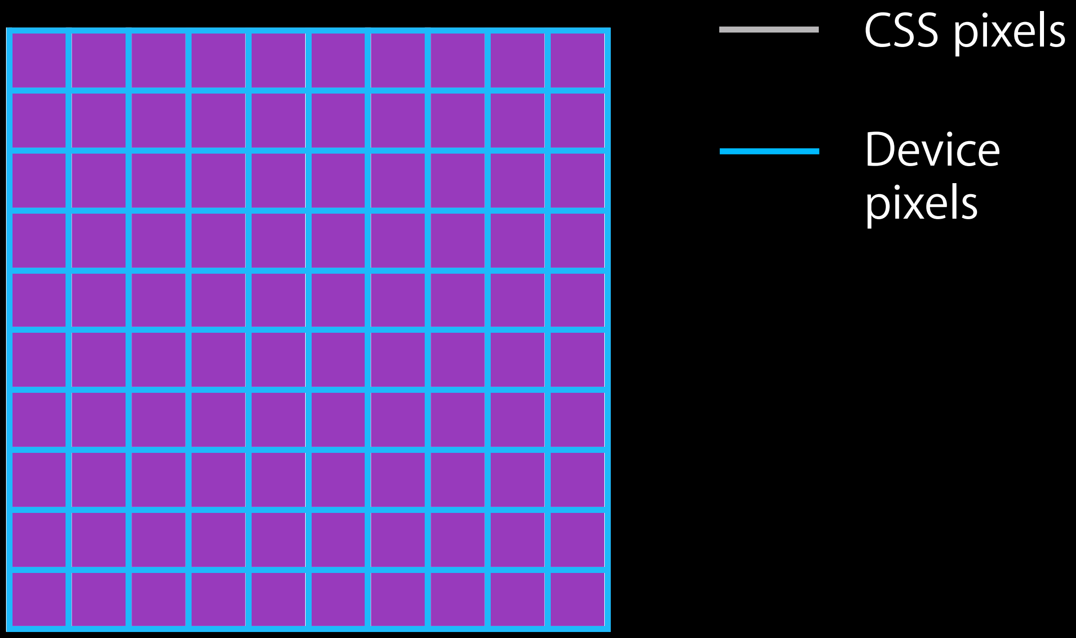

# What Is Actually Happening?

## With an unzoomed <div> on a high resolution display

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CSS pixels
Device pixels

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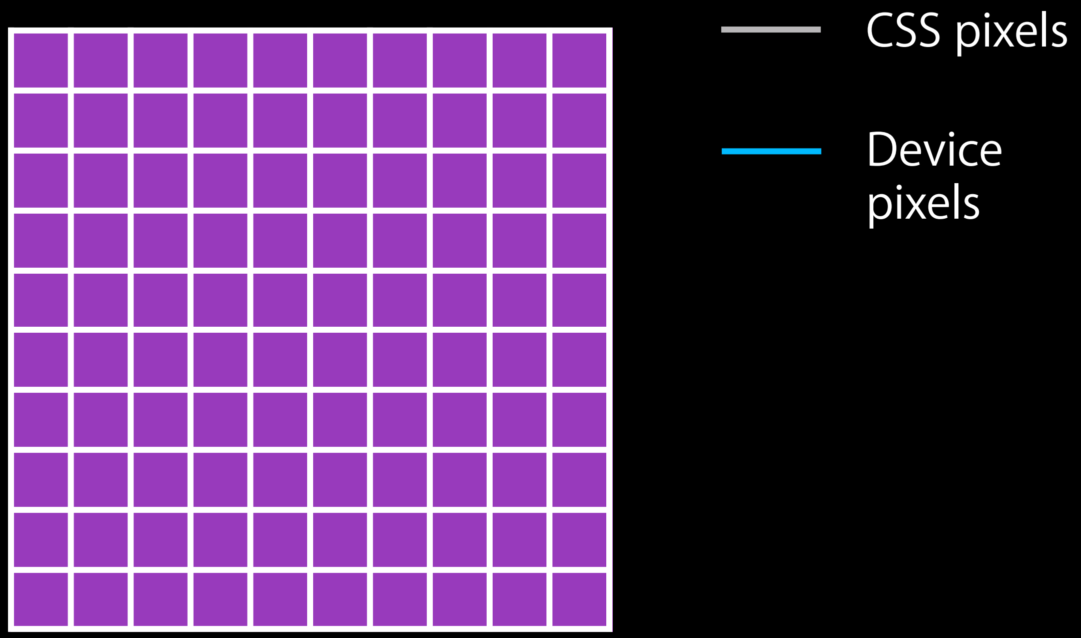

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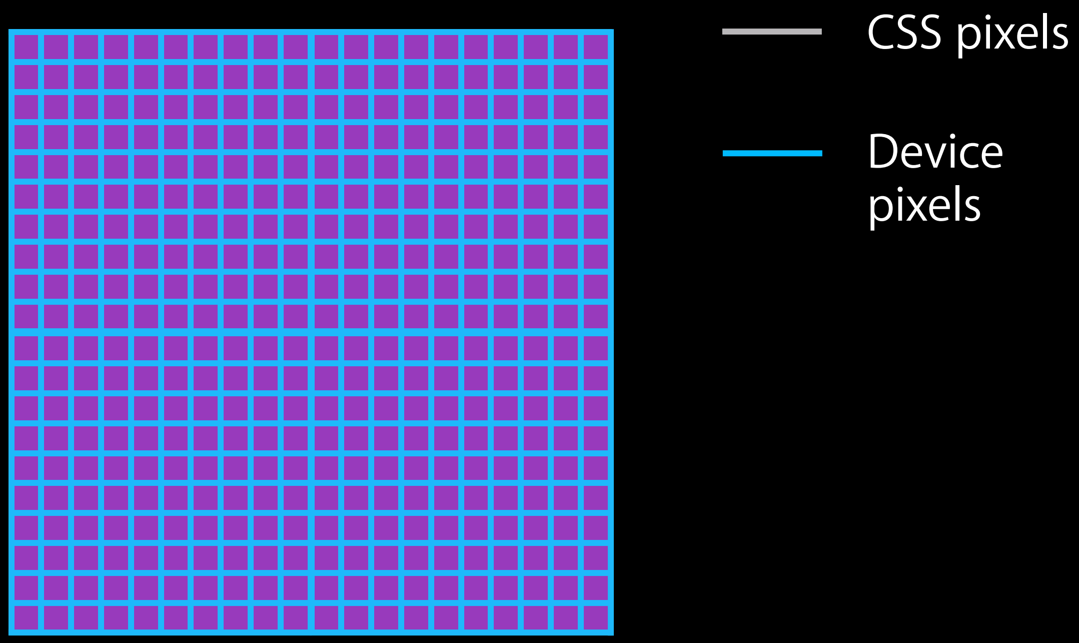
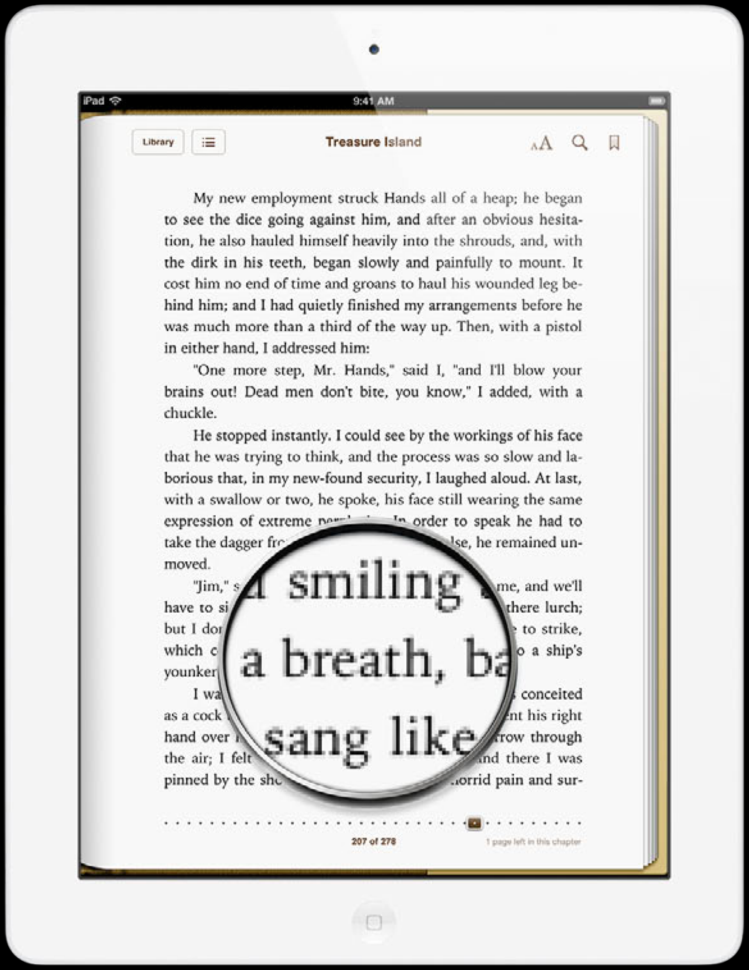


iPad 2



My new employment struck Hands all of a heap; he began to see the dice going against him, and after an obvious hesitation, he also hauled himself heavily into the shrouds, and, with the dirk in his teeth, began slowly and painfully to mount. It cost him no end of time and groans to haul his wounded leg behind him; and I had quietly finished my arrangements before he was much more than a third of the way up. Then, with a pistol in either hand, I addressed him:

"One more step, Mr. Hands," said I, "and I'll blow your brains out! Dead men don't bite, you know," I added, with a chuckle.

He stopped instantly. I could see by the workings of his face that he was trying to think, and the process was so slow and laborious that, in my new-found security, I laughed aloud. At last, with a swallow or two, he spoke, his face still wearing the same
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take the dagger fr else, he remained un-
moved.

"Jim," s l smiling a me, and we'll
have to si there lurch;
but I dor to strike,
which c a breath, ba o a ship's
younker
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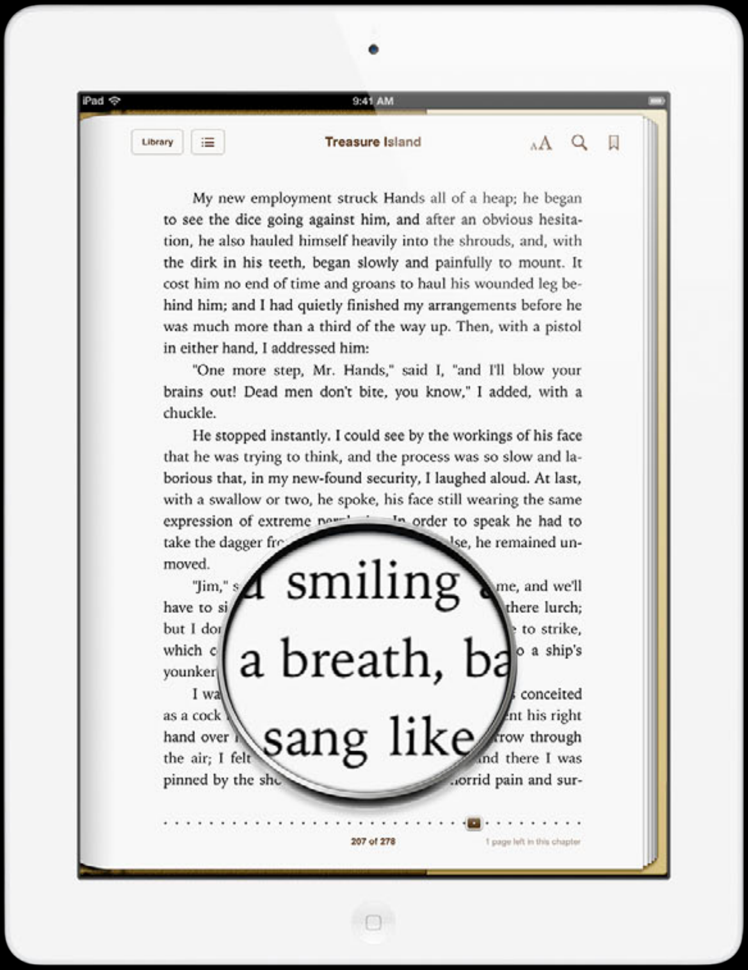
The new iPad


iPad
9:41 AM
Library
Treasure Island

My new employment struck Hands all of a heap; he began to see the dice going against him, and after an obvious hesitation, he also hauled himself heavily into the shrouds, and, with the dirk in his teeth, began slowly and painfully to mount. It cost him no end of time and groans to haul his wounded leg behind him; and I had quietly finished my arrangements before he was much more than a third of the way up. Then, with a pistol in either hand, I addressed him:

"One more step, Mr. Hands," said I, "and I'll blow your brains out! Dead men don't bite, you know," I added, with a chuckle.

He stopped instantly. I could see by the workings of his face that he was trying to think, and the process was so slow and laborious that, in my new-found security, I laughed aloud. At last, with a swallow or two, he spoke, his face still wearing the same
expression of extreme per In order to speak he had to
take the dagger fr else, he remained un-
moved.

"Jim," s a smiling a me, and we'll
have to si there lurch;
but I dor to strike,
which c a breath, ba o a ship's
younker
I wa conceited
as a cock nt his right
hand over sang like throw through
the air; I felt and there I was
pinned by the sho horrid pain and sur-

207 of 278
1 page left in this chapter

# What Is Actually Happening?

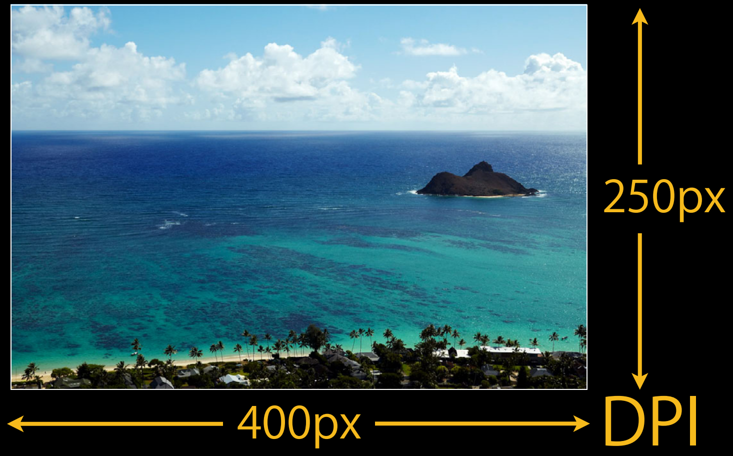
## Images

# What Is Actually Happening?

## Images

# What Is Actually Happening?

## Images



250px

400px

DPI

# What Is Actually Happening?

## Images

# What Is Actually Happening?

## Images

- Will look best in 400×250 device pixels

```
<img src=”Hawaii.jpg” width=”400” height=”250”/>
```

# What Is Actually Happening?

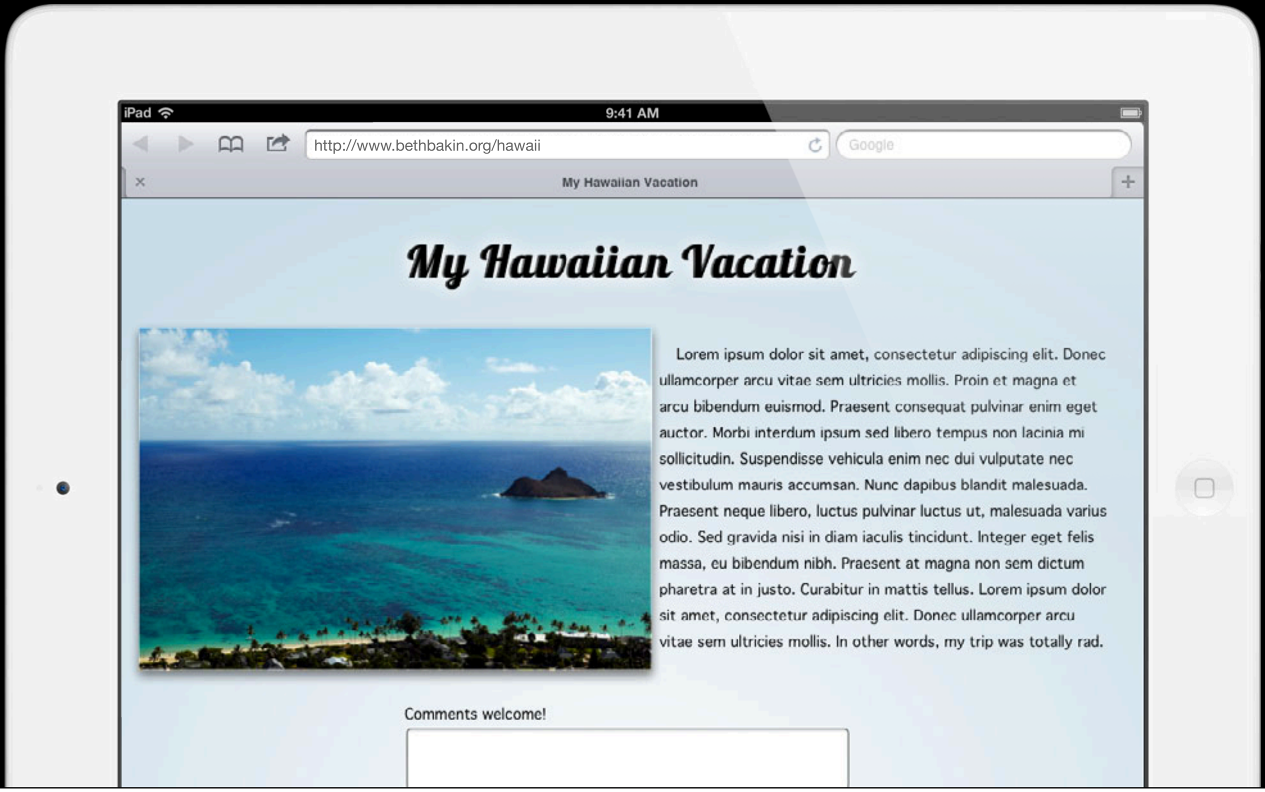
## With an unzoomed <img> on a standard display

```
<img src=”Hawaii.jpg” width=”400” height=”250”/>
```

# What Is Actually Happening?

## With an unzoomed <img> on a standard display

```
<img src=”Hawaii.jpg” width=”400” height=”250”/>
```



My Hawaiian Vacation

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec ullamcorper arcu vitae sem ultricies mollis. Proin et magna et arcu bibendum euismod. Praesent consequat pulvinar enim eget auctor. Morbi interdum ipsum sed libero tempus non lacinia mi sollicitudin. Suspendisse vehicula enim nec dui vulputate nec vestibulum mauris accumsan. Nunc dapibus blandit malesuada. Praesent neque libero, luctus pulvinar luctus ut, malesuada varius odio. Sed gravida nisi in diam iaculis tincidunt. Integer eget felis massa, eu bibendum nibh. Praesent at magna non sem dictum pharetra at in justo. Curabitur in mattis tellus. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec ullamcorper arcu vitae sem ultricies mollis. In other words, my trip was totally rad.

Comments welcome!

# What Is Actually Happening?

## With an unzoomed <img> on a standard display

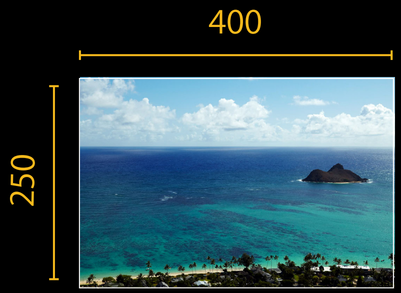
```
<img src=”Hawaii.jpg” width=”400” height=”250”/>
```

# What Is Actually Happening?

## With an unzoomed <img> on a standard display

```
<img src=”Hawaii.jpg” width=”400” height=”250”/>
```

CSS Size

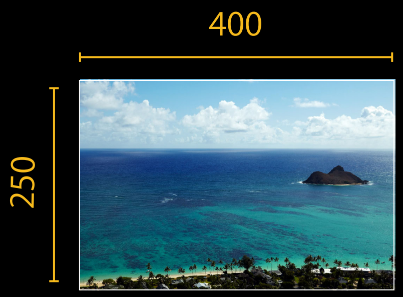


# What Is Actually Happening?

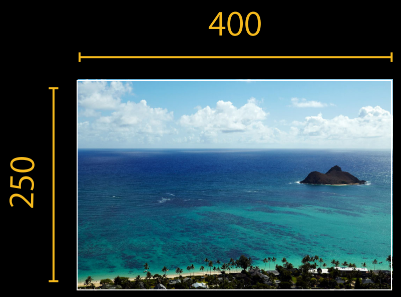
## With an unzoomed <img> on a standard display

```
<img src=”Hawaii.jpg” width=”400” height=”250”/>
```

CSS Size



Device Size



# What Is Actually Happening?

## With an unzoomed <img> on a standard display

```
<img src=”Hawaii.jpg” width=”400” height=”250”/>
```

CSS Size

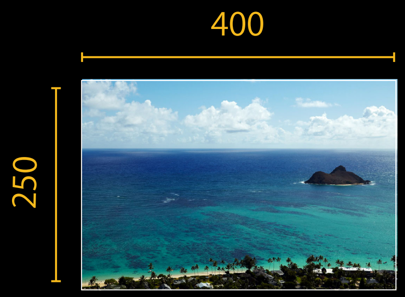
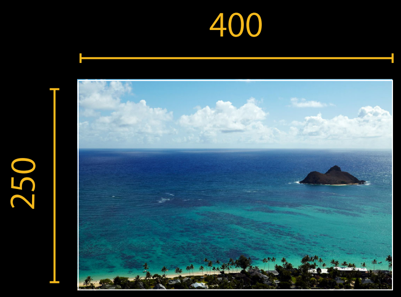
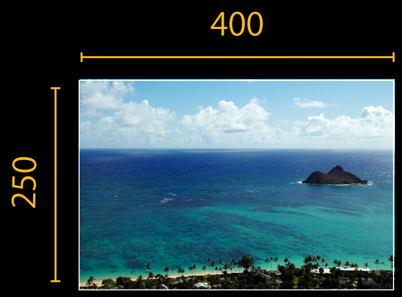


Image Size



Device Size



# What Is Actually Happening?

## With an unzoomed <img> on a high resolution display

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<img src=”Hawaii.jpg” width=”400” height=”250”/>
```

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## With an unzoomed <img> on a high resolution display

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<img src=”Hawaii.jpg” width=”400” height=”250”/>
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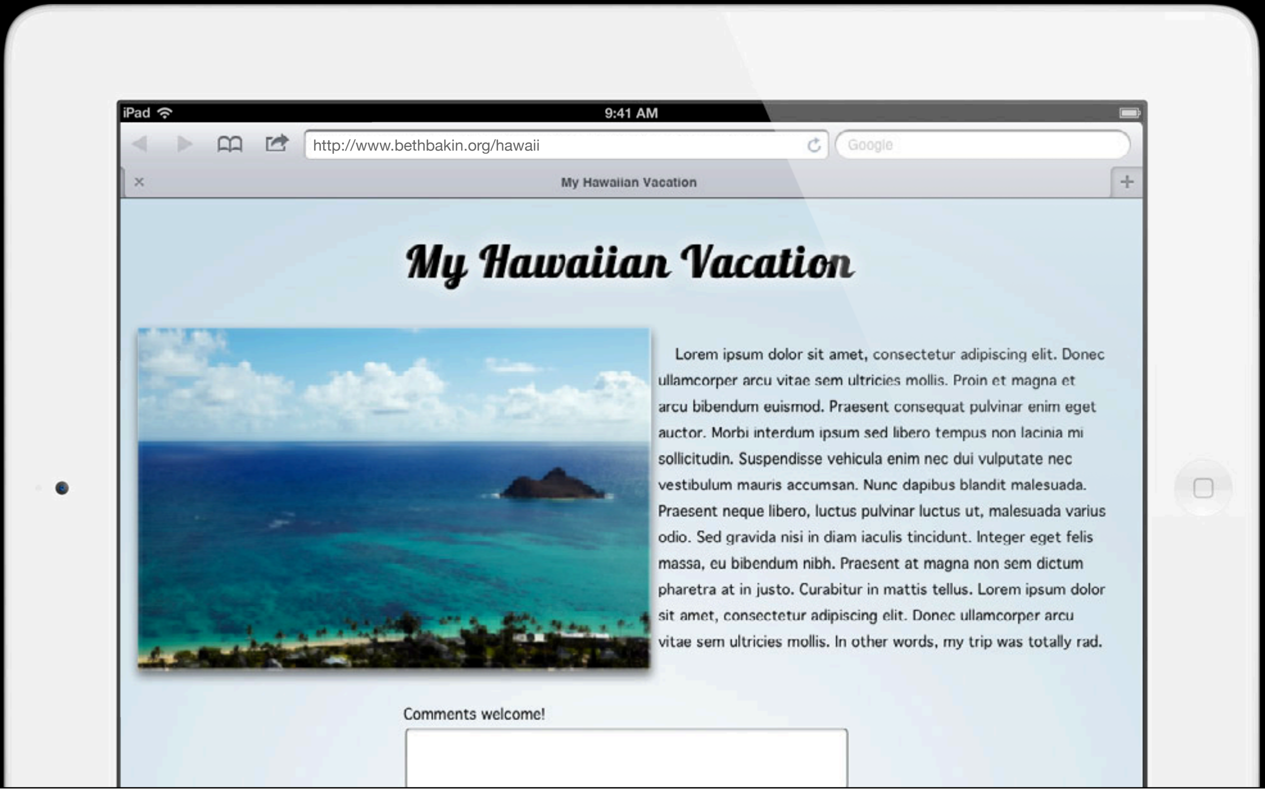

My Hawaiian Vacation

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec ullamcorper arcu vitae sem ultricies mollis. Proin et magna et arcu bibendum euismod. Praesent consequat pulvinar enim eget auctor. Morbi interdum ipsum sed libero tempus non lacinia mi sollicitudin. Suspendisse vehicula enim nec dui vulputate nec vestibulum mauris accumsan. Nunc dapibus blandit malesuada. Praesent neque libero, luctus pulvinar luctus ut, malesuada varius odio. Sed gravida nisi in diam iaculis tincidunt. Integer eget felis massa, eu bibendum nibh. Praesent at magna non sem dictum pharetra at in justo. Curabitur in mattis tellus. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec ullamcorper arcu vitae sem ultricies mollis. In other words, my trip was totally rad.

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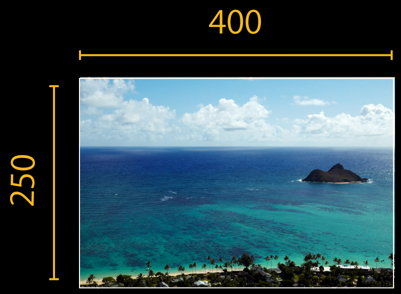
CSS Size



# What Is Actually Happening?

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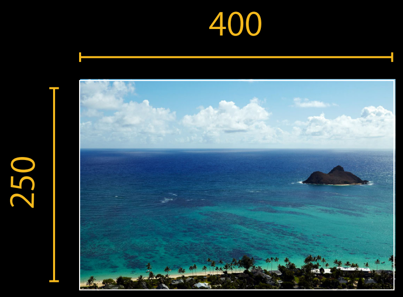
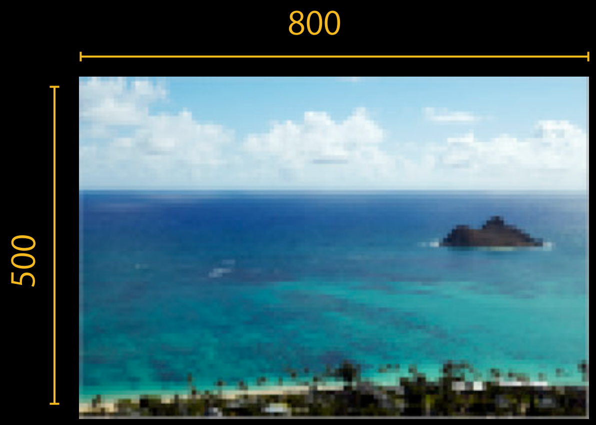
<img src=”Hawaii.jpg” width=”400” height=”250”/>
```

CSS Size



Device Size



# What Is Actually Happening?

## With an unzoomed <img> on a high resolution display

```
<img src="Hawaii.jpg" width="400" height="250"/>
```

CSS Size

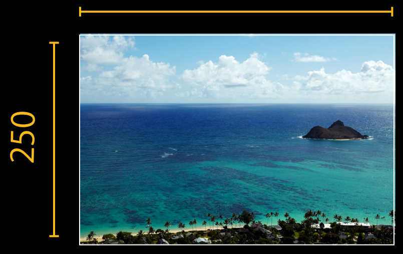
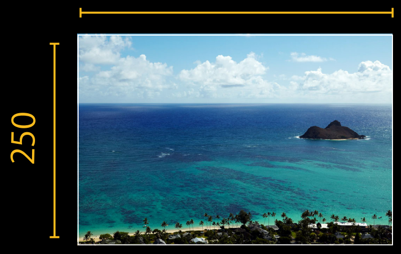
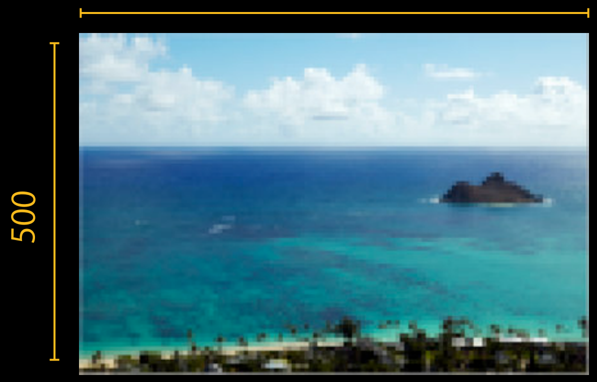


Image Size



Device Size

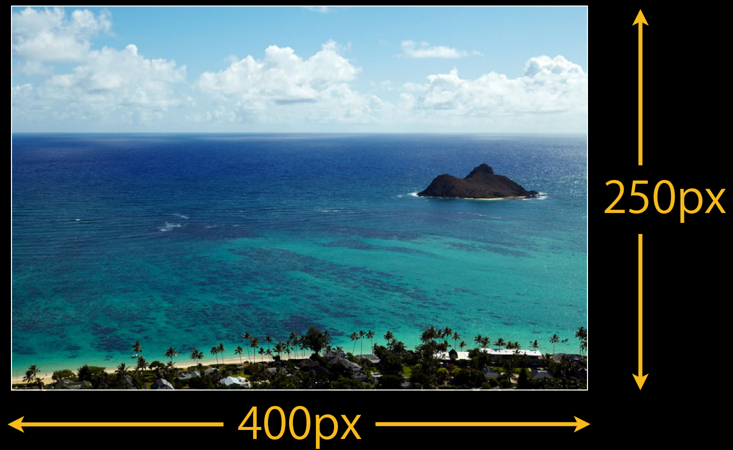


# Banishing Blurry Images

## Techniques for integrating high resolution artwork

# Banishing Blurry Images

# Banishing Blurry Images



# Banishing Blurry Images

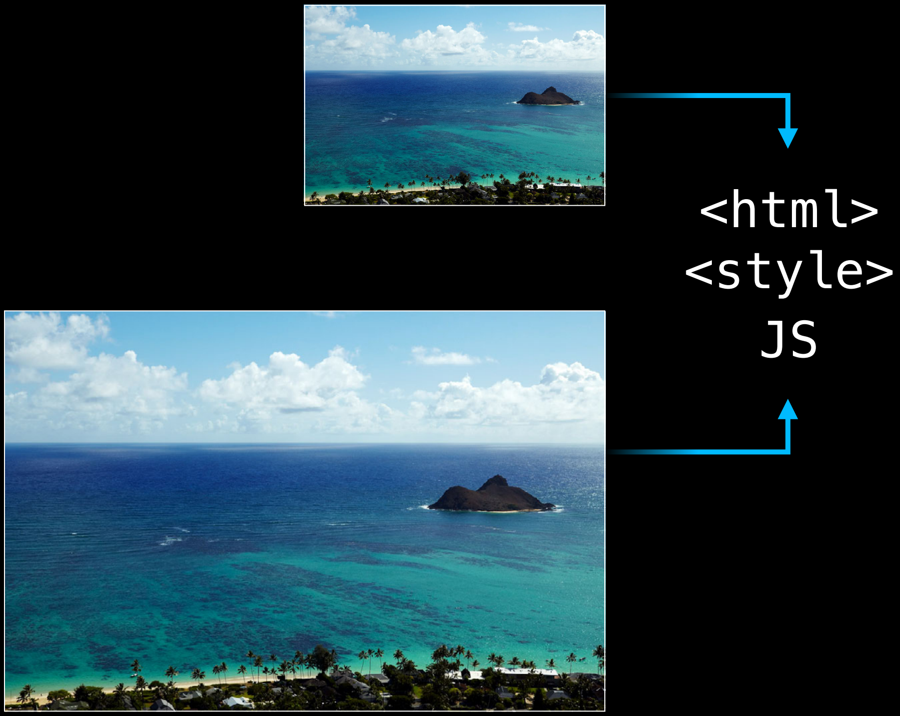
# Banishing Blurry Images

500px

800px

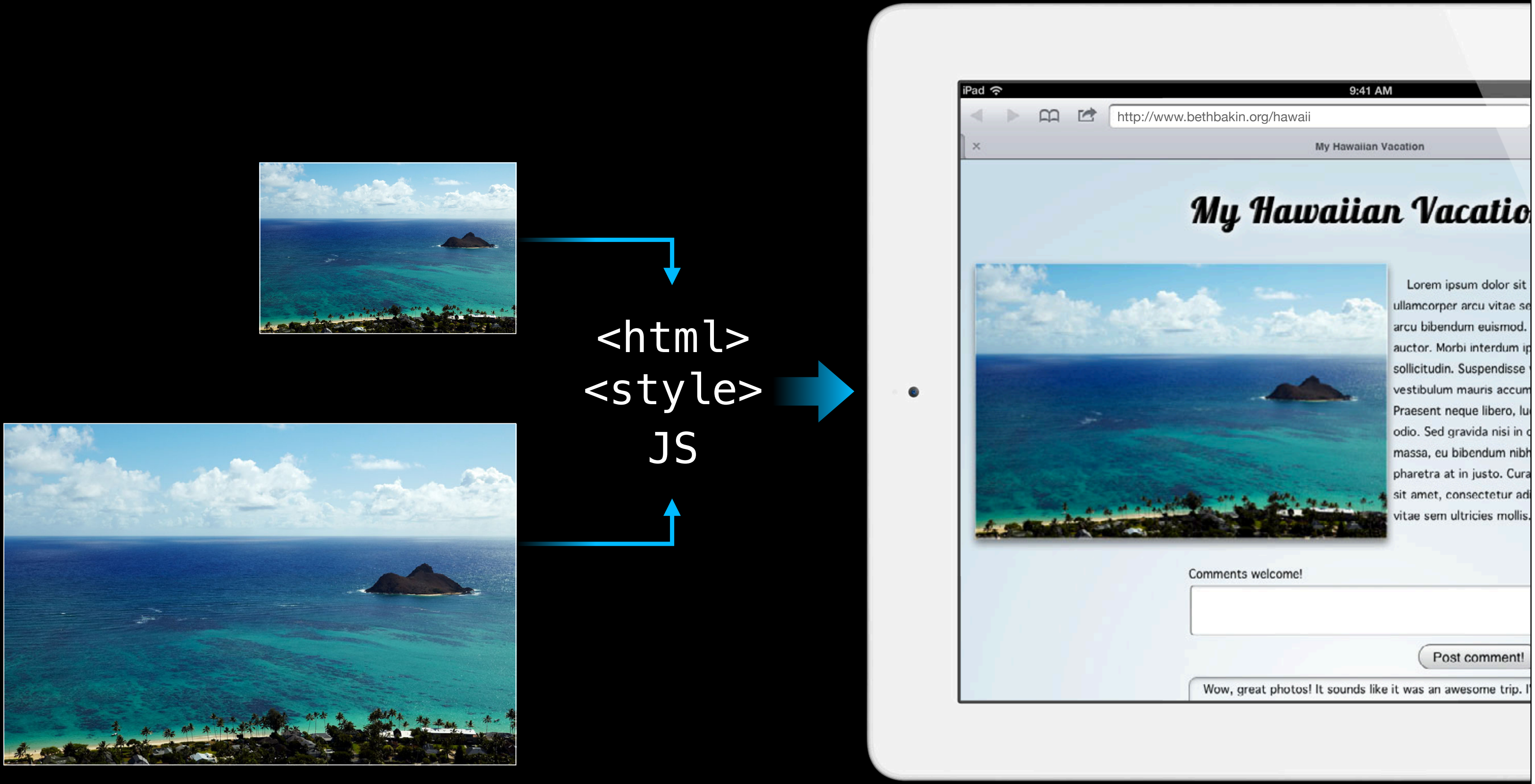
# Banishing Blurry Images

# Banishing Blurry Images



<html>
<style>
JS

# Banishing Blurry Images



<html>
<style>
JS

iPad 9:41 AM

http://www.bethbakin.org/hawaii

My Hawaiian Vacation

My Hawaiian Vacatio

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sollicitudin. Suspendisse
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Comments welcome!

Post comment!

Wow, great photos! It sounds like it was an awesome trip. I

# Banishing Blurry Images

# Banishing Blurry Images

- CSS sizing

# Banishing Blurry Images

- CSS sizing
- Querying for device scale

# Banishing Blurry Images

- CSS sizing
- Querying for device scale
- Image set

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | | | |
| Querying | | | |
| Image Set | | | |

# Banishing Blurry Images

- CSS sizing
- Querying for device scale
- Image set

# Banishing Blurry Images

- CSS sizing
- Querying for device scale
- Image set

# CSS Sizing

## With <img>

```
<img src=”Hawaii.jpg” width=”400” height=”250”/>
```

CSS Size

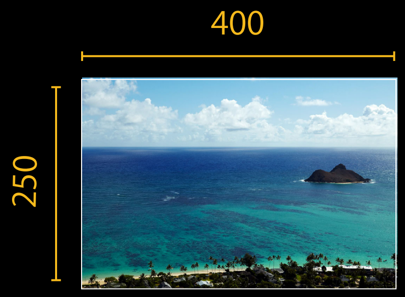
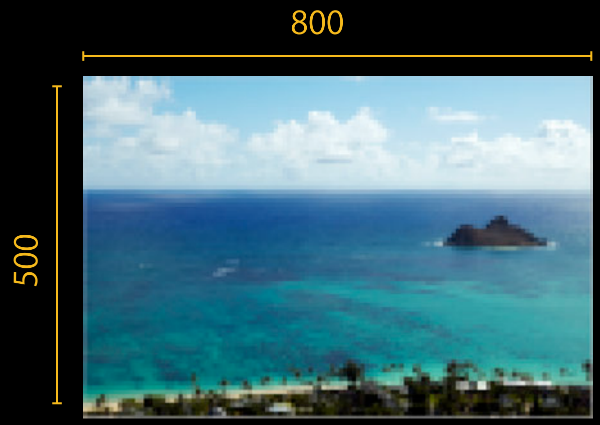


Image Size

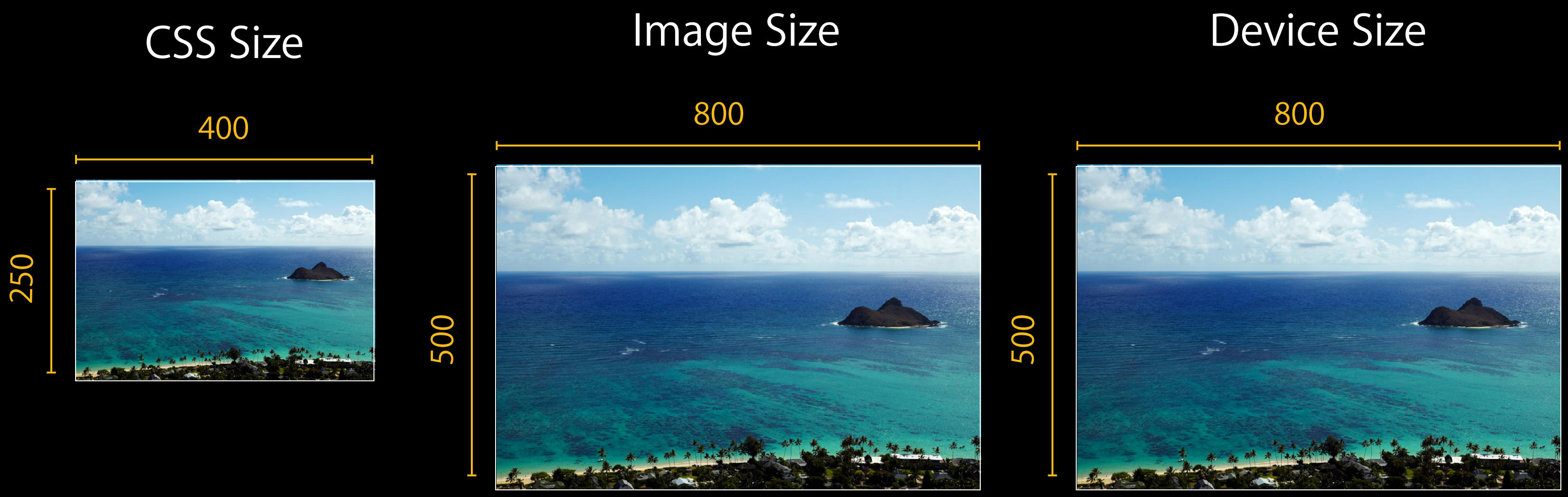
Device Size



# CSS Sizing

## With <img>

```
<img src=”Hawaii-high-res.jpg” width=”400” height=”250”/>
```



CSS Size

400

250

Image Size

800

500

Device Size

800

500

# CSS Sizing

## With CSS images

# CSS Sizing

## With CSS images

- Content images

```
#hawaii {
    content: url(Hawaii-hi-res.jpg);
    width: 400px; height: 250px;
}
```

# CSS Sizing

## With CSS images

- Content images

```
width, height
```

- Background images

```
div.hawaiian {
    background-image: url(Hawaii-hi-res.jpg);
    background-size: 400px 250px;
}
```

# CSS Sizing

## With CSS images

- Content images

```
width, height
```

- Background images

```
background-size
```

- Border images

```
.framed {
    border-image-source: url(Frame-hi-res.jpg);
    border-image-slice: 20 20 20 20;
    border-width: 10px 10px 10px 10px;
}
```

# CSS Sizing

## With CSS images

- Content images

```
width, height
```

- Background images

```
background-size
```

- Border images

```
.framed {
    border-image-source: url(Frame-hi-res.jpg);
    border-image-slice: 20 20 20 20;
    border-width: 10px 10px 10px 10px;
}
```

# CSS Sizing

## With CSS images

- Content images

```
width, height
```

- Background images

```
background-size
```

- Border images

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.framed {
    border-image-source: url(Frame-hi-res.jpg);
    border-image-slice: 20 20 20 20;
    border-width: 10px 10px 10px 10px;
}
```

# CSS Sizing

## With CSS images

- Content images

```
width, height
```

- Background images

```
background-size
```

- Border images

```
.framed {
    border-image-source: url(Frame-hi-res.jpg);
    border-image-slice: 20 20 20 20;
    border-width: 10px 10px 10px 10px;
}
```

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | | | |
| Querying | | | |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | | | |
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# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ | | |
| Querying | | | |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | | |
| Querying | | | |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | | |
| Querying | | | |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | |
| Querying | | | |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | |
| Querying | | | |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | | | |
| Image Set | | | |

# Banishing Blurry Images

- CSS sizing
- Querying for device scale
- Image set

# Banishing Blurry Images

- CSS sizing
- Querying for device scale
- Image set

# Media Queries

```
<style>
    @media screen {
        /* fancy CSS for the screen version */
    }

    @media print {
        /* plain CSS for the printed version */
    }
</style>
```

# Media Queries

## Review

```
<style>
   @media screen and (device-width: 320px) {
      /* For iPhone */
     body {
         width: 320px;
         margin: 0px;
       }
   }

   @media screen and (device-width: 768px) {
      /* For iPad */
     body {
         width: 768px;
         margin: 0px;
       }
   }
</style>
```

# Media Queries

## For high resolution images

```
<style>
    #main {
      …
      background-size: 400px 250px;
    }

    @media screen and (-webkit-device-pixel-ratio: 1) {
       /* Image for normal displays. */
       #main {
         background-image: url(Hawaii.jpg);
       }
    }

    @media screen and (-webkit-min-device-pixel-ratio: 2) {
      /* Image for high resolution displays. */
       #main {
         background-image:url(Hawaii-hi-res.jpg);
       }
    }
</style>
```

# Media Queries

## For high resolution images

```
<style>
    #main {
      …
      background-size: 400px 250px;
    }

   @media screen and (-webkit-device-pixel-ratio: 1) {
       /* Image for normal displays. */
       #main {
         background-image: url(Hawaii.jpg);
       }
   }

   @media screen and (-webkit-min-device-pixel-ratio: 2) {
      /* Image for high resolution displays. */
       #main {
         background-image:url(Hawaii-hi-res.jpg);
       }
   }
</style>
```

# Media Queries

## For high resolution images

```
<style>
    #main {
      …
      background-size: 400px 250px;
    }

    @media screen and (-webkit-device-pixel-ratio: 1) {
       /* Image for normal displays. */
       #main {
         background-image: url(Hawaii.jpg);
       }
    }

    @media screen and (-webkit-min-device-pixel-ratio: 2) {
      /* Image for high resolution displays. */
       #main {
         background-image:url(Hawaii-hi-res.jpg);
       }
    }
</style>
```

# Media Queries

## For high resolution images

```
<style>
    #main {
      …
      background-size: 400px 250px;
      background-image: url(Hawaii.jpg);
    }

    @media screen and (-webkit-min-device-pixel-ratio: 2) {
      /* Image for high resolution displays. */
       #main {
         background-image:url(Hawaii-hi-res.jpg);
       }
    }
</style>
```

# Media Queries

## For high resolution images

```
<style>
    #main {
      …
      background-size: 400px 250px;
      background-image: url(Hawaii.jpg);
    }

    @media screen and (-webkit-min-device-pixel-ratio: 2) {
      /* Image for high resolution displays. */
       #main {
         background-image:url(Hawaii-hi-res.jpg);
       }
    }
</style>
```

# Media Queries

## For high resolution images

```
<style>
  @media screen and (-webkit-min-device-pixel-ratio: 2) {
      /* Image for high resolution displays. */
       #main {
         background-image:url(Hawaii-hi-res.jpg);
       }
   }

    #main {
      …
      background-size: 400px 250px;
      background-image: url(Hawaii.jpg);
    }
</style>
```

# Media Queries

## For high resolution images

```
<style>
  @media screen and (-webkit-min-device-pixel-ratio: 2) {
      /* Image for high resolution displays. */
       #main {
         background-image:url(Hawaii-hi-res.jpg);
       }
   }

    #main {
      …
      background-size: 400px 250px;
      background-image: url(Hawaii.jpg);
    }
</style>
```

# Media Queries

## For high resolution images

```
<style>
  @media screen and (-webki     device-pix      o: 2) {
      /* Image for high reso       display
       #main {
         background-image:url(H      hi-       g);
       }
    }

    #main {
      …
      background-size: 400px 250
      background-image: url(Hay       g);
    }
</style>
```

# Media Queries

## For high resolution images

```
<style>
   #main {
      …
      border-width: 10px 10px 10px 10px;
      border-image-source: url(Frame.jpg);
      border-image-slice: 10 10 10 10;
   }

   @media screen and (-webkit-min-device-pixel-ratio: 2) {
       #main {
          border-image-source: url(Frame-hi-res.jpg);
          border-image-slice: 20 20 20 20;
       }
   }
</style>
```

# Media Queries

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# Media Queries

## For high resolution images

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<style>
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      border-width: 10px 10px 10px 10px;
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   }

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       #main {
          border-image-source: url(Frame-hi-res.jpg);
          border-image-slice: 20 20 20 20;
       }
   }
</style>
```

# Querying with JavaScript

## Evaluating media queries through JavaScript

```
<script>
function addImages() {

  var image = new Image();

  if ('styleMedia' in window
  && window.styleMedia.matchMedia("screen and
                                  (-webkit-min-device-pixel-ratio: 2)")){
     // Load high resolution images
     image.src = "myPhoto-retina.jpg";
  } else {
     image.src = “myPhoto.jpg;”
  }

  document.body.appendChild(image);
}
</script>
```

# Querying with JavaScript

## window.devicePixelRatio

```
<script>
function addImages() {

  var image = new Image();

  if (window.devicePixelRatio >= 2){
     // Load high resolution images
     image.src = "myPhoto-retina.jpg";
  } else {
     image.src = “myPhoto.jpg;”
  }

  document.body.appendChild(image);
}
</script>
```

# Querying with JavaScript

## Listening for changes

```
<script>

  function reload() {
     // Reload images based on window.devicePixelRatio
     …
  }

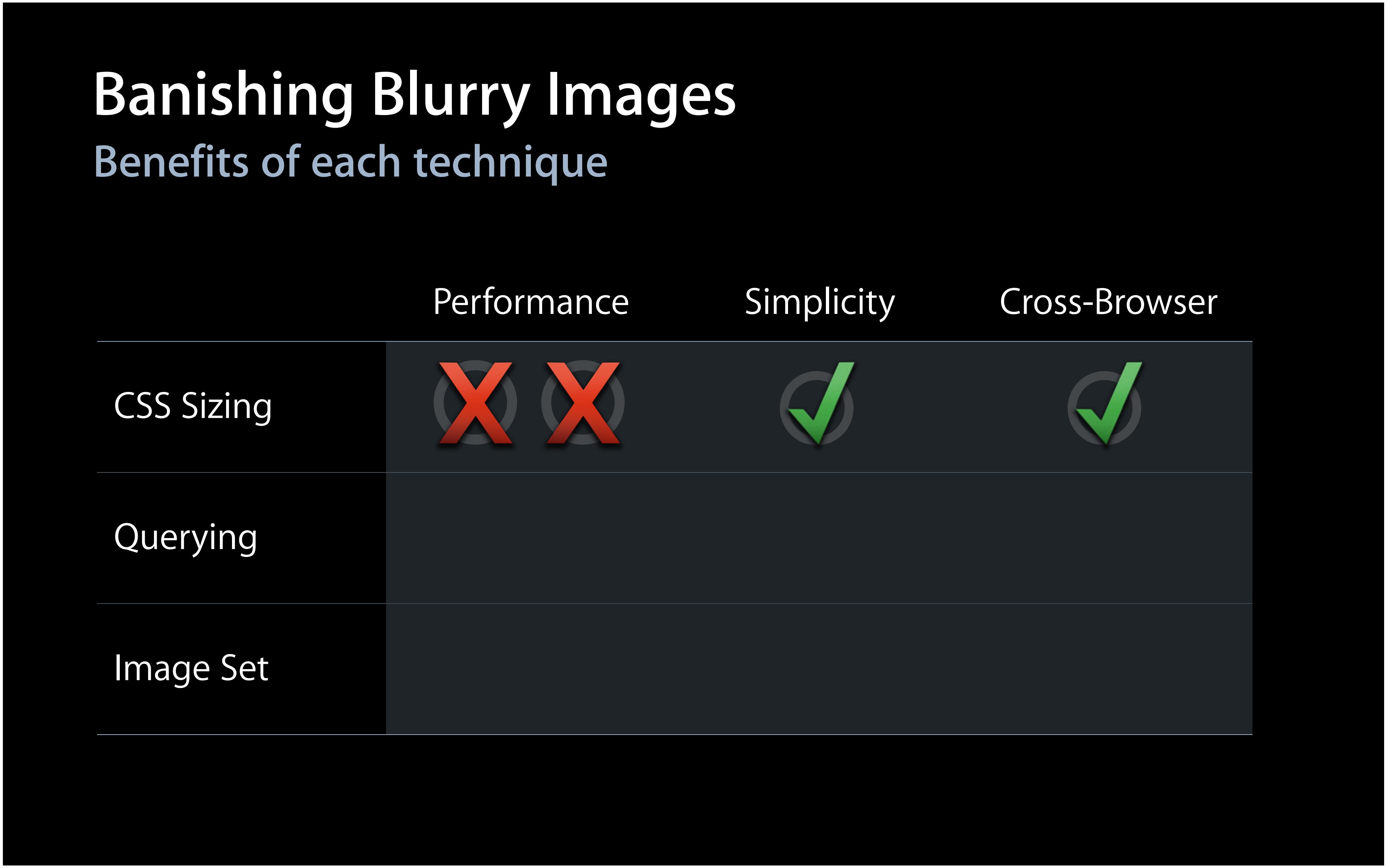

 window.matchMedia("(-webkit-device-pixel-ratio:1)").addListener(reload);

</script>
```

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | | | |
| Image Set | | | |



# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | | | |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | | |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | | |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | ✗ | |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

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|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | ✗ | |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | ✗ | ✓ |
| Image Set | | | |

# Banishing Blurry Images

- CSS sizing
- Querying for device scale
- Image set

# Banishing Blurry Images

- CSS sizing
- Querying for device scale
- Image set

# Banishing Blurry Images

## Image set

```
<style>
    #main {
      …
      background-size: 400px 250px;
      background-image: url(Hawaii.jpg);
    }

   @media screen and (-webkit-min-device-pixel-ratio: 2) {
      /* Image for high resolution displays. */
       #main {
         background-image:url(Hawaii-hi-res.jpg);
       }
   }
</style>
```

# Banishing Blurry Images

## Image set

```
div.hawaiian {
    background-image: -webkit-image-set(url(Hawaii.jpg) 1x,
                                         url(Hawaii-hi-res.jpg) 2x);
    background-size: 400px 250px;
}
```

# Banishing Blurry Images

## Image set

```
div.hawaiian {
    background-image: -webkit-image-set(url(Hawaii.jpg) 1x,
                                         url(Hawaii-hi-res.jpg) 2x);
    background-size: 400px 250px;
}
```

# Banishing Blurry Images

## Media queries with border-image

```
<style>
   #main {
      …
      border-width: 10px 10px 10px 10px;
      border-image-source: url(Frame.jpg);
      border-image-slice: 10 10 10 10;
   }

   @media screen and (-webkit-min-device-pixel-ratio: 2) {
       #main {
          border-image-source: url(Frame-hi-res.jpg);
          border-image-slice: 20 20 20 20;
       }
   }
</style>
```

# Banishing Blurry Images

## Image set for border-image

```
#main {
    border-image-source: -webkit-image-set(url(Frame.jpg) 1x,
                                           url(Frame-hi-res.jpg) 2x);
    border-width: 10px 10px 10px 10px;
    border-image-slice: 10 10 10 10;
}
```

# Banishing Blurry Images

## Image set for border-image

```
#main {
    border-image-source: -webkit-image-set(url(Frame.jpg) 1x,
                                           url(Frame-hi-res.jpg) 2x);
    border-width: 10px 10px 10px 10px;
    border-image-slice: 10 10 10 10;
}
```

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | ✗ | ✓ |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | ✗ | ✓ |
| Image Set | | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | ✗ | ✓ |
| Image Set | ✓ | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | ✗ | ✓ |
| Image Set | ✓ | | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | ✗ | ✓ |
| Image Set | ✓ | ✓ | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | ✗ | ✓ |
| Image Set | ✓ | ✓ | |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | ✗ | ✓ |
| Image Set | ✓ | ✓ | ✗ |

# Banishing Blurry Images

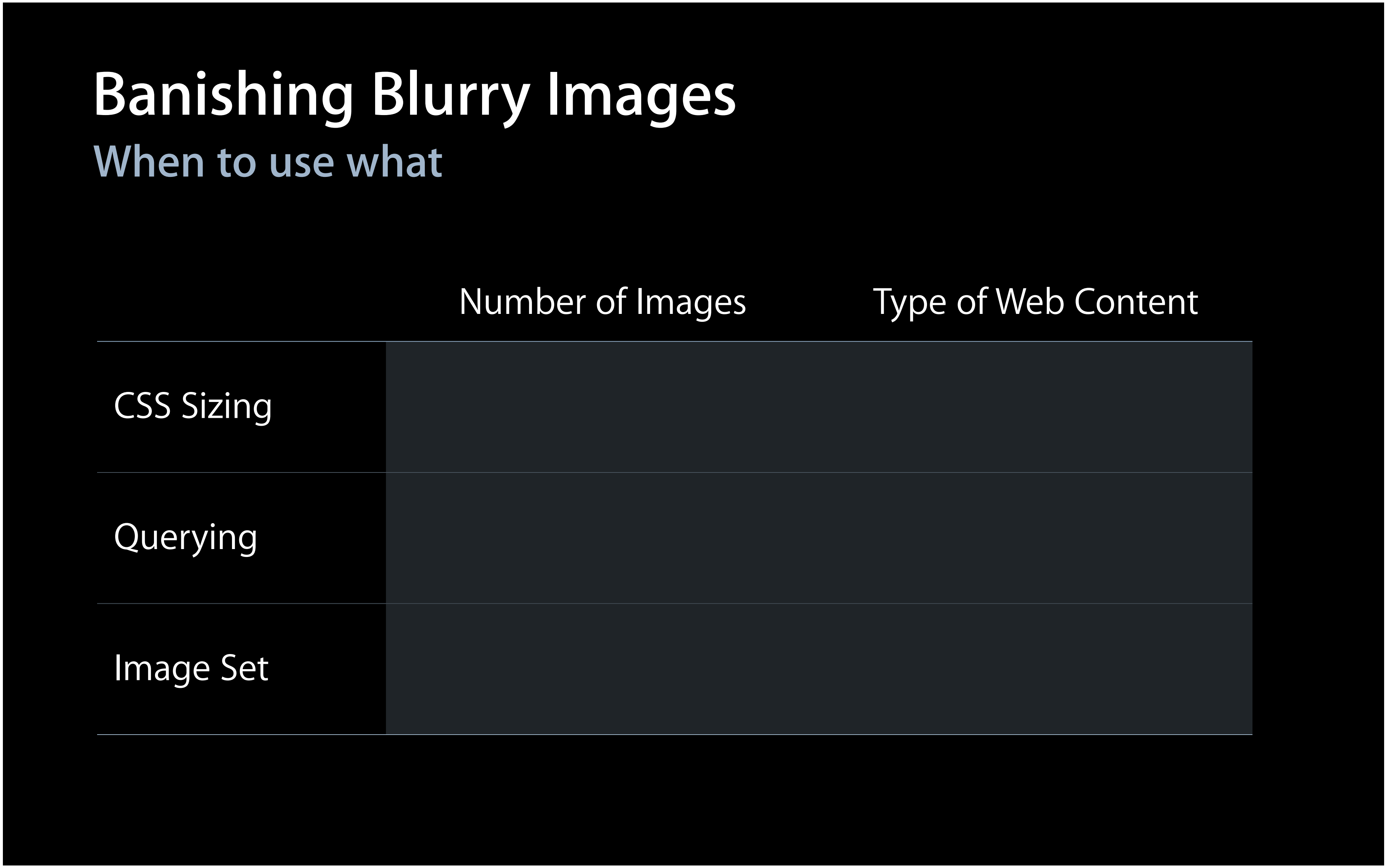
## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | ✗ | ✓ |
| Image Set | ✓ | ✓ | ✗ |

# Banishing Blurry Images

## Benefits of each technique

| | Performance | Simplicity | Cross-Browser |
|---|---|---|---|
| CSS Sizing | ✗ ✗ | ✓ | ✓ |
| Querying | ✓ | ✗ | ✓ |
| Image Set | ✓ | ✓ | ✓ |



# Banishing Blurry Images

## When to use what

| | Number of Images | Type of Web Content |
|---|---|---|
| CSS Sizing | | |
| Querying | | |
| Image Set | | |

# Banishing Blurry Images

## When to use what

| | Number of Images | Type of Web Content |
|---|---|---|
| CSS Sizing | Small number of local images | Apps, books |
| Querying | | |
| Image Set | | |

# Banishing Blurry Images

## When to use what

| | Number of Images | Type of Web Content |
|---|---|---|
| CSS Sizing | Small number of local images | Apps, books |
| Querying | Many images | Websites, apps, and books |
| Image Set | | |

# Banishing Blurry Images

## When to use what

| | Number of Images | Type of Web Content |
|---|---|---|
| CSS Sizing | Small number of local images | Apps, books |
| Querying | Many images | Websites, apps, and books |
| Image Set | Many images | Anything targeting WebKit |

# Banishing Blurry Images

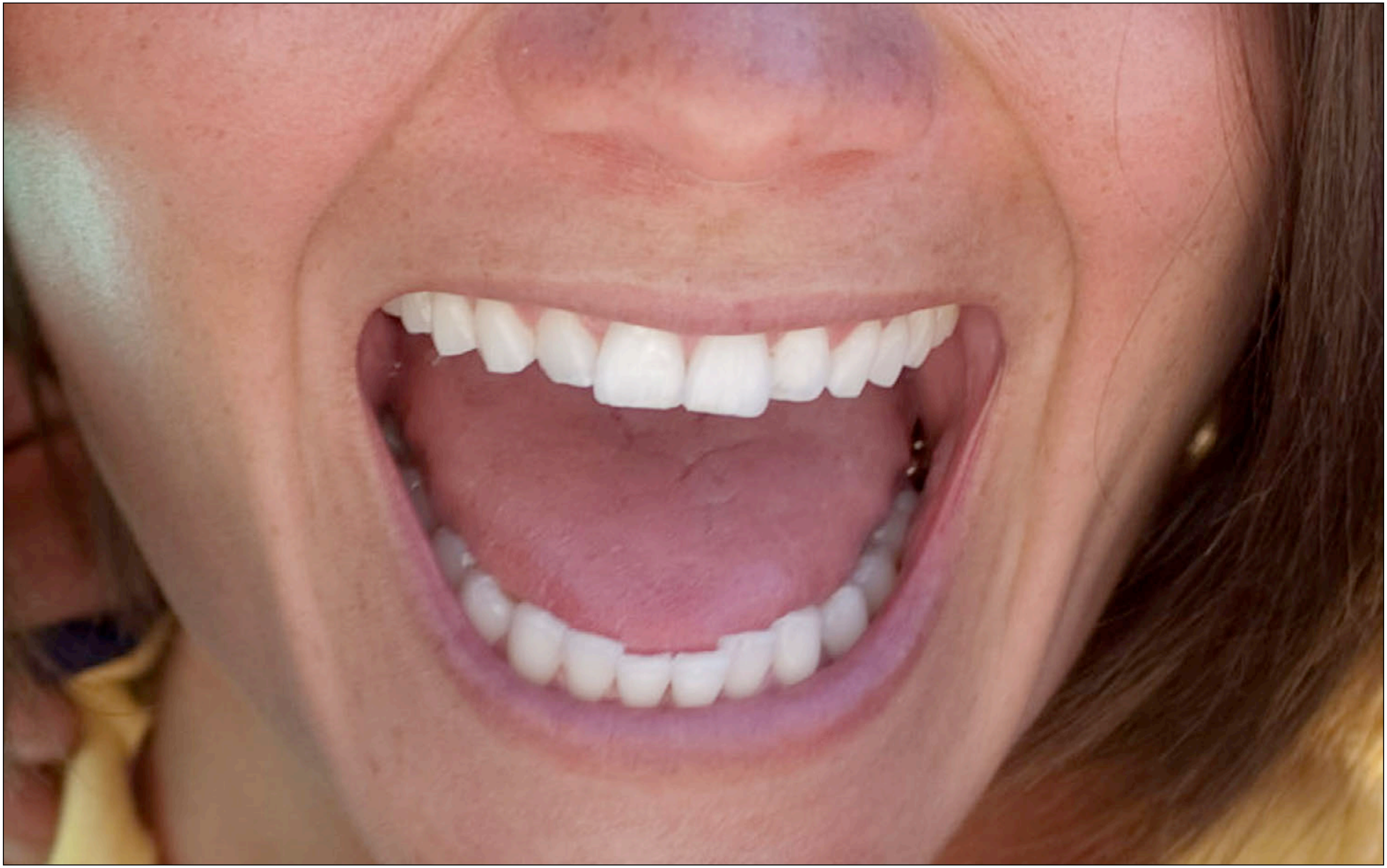
- CSS sizing
- Querying for device scale
- Image set

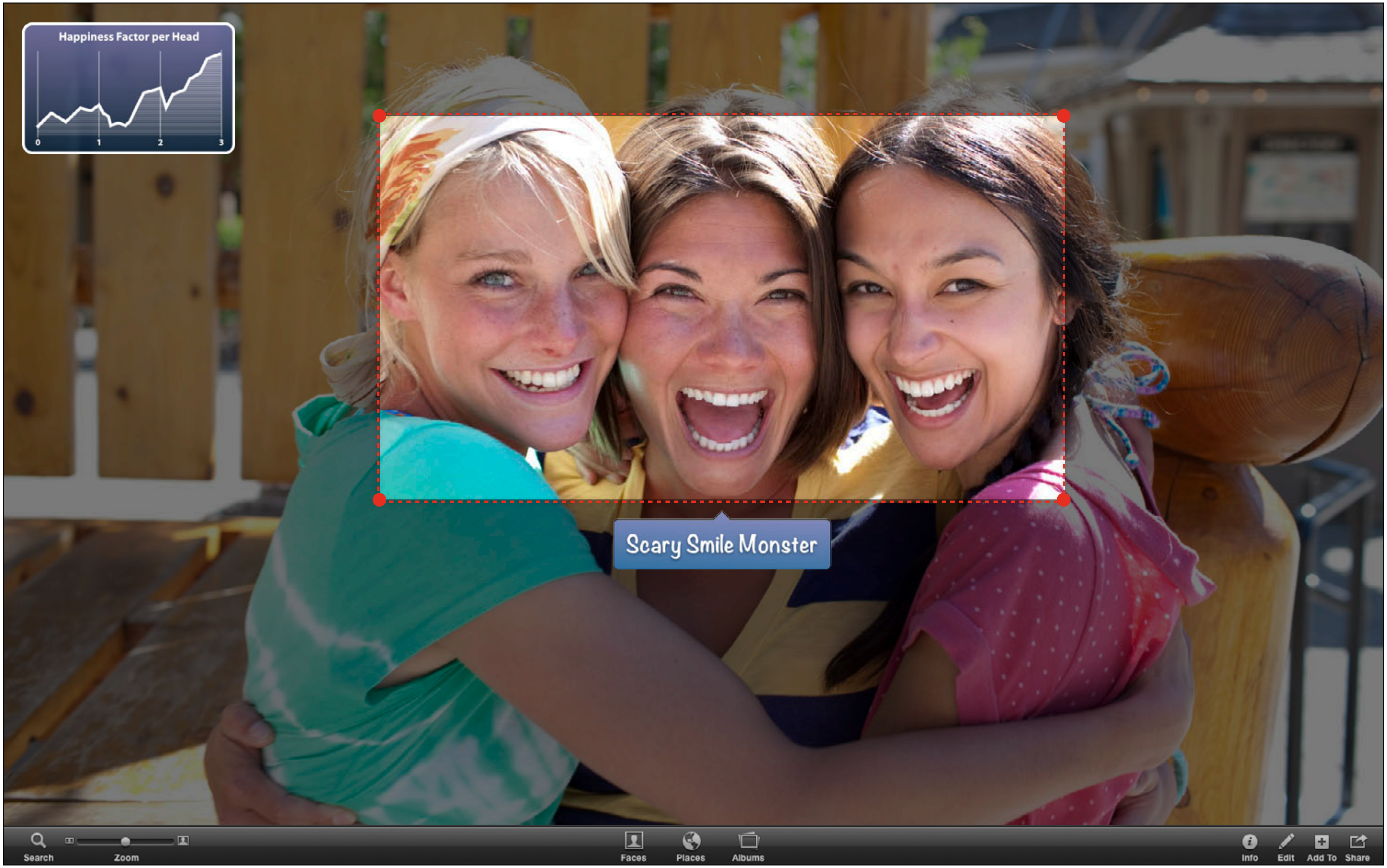
# High Resolution Canvas

**Dean Jackson**

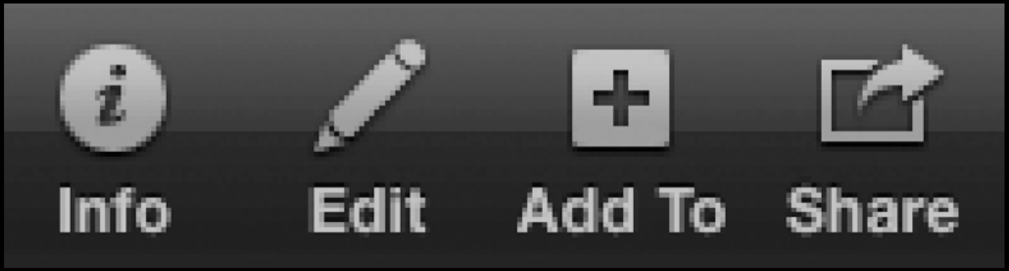
Safari & WebKit Engineer

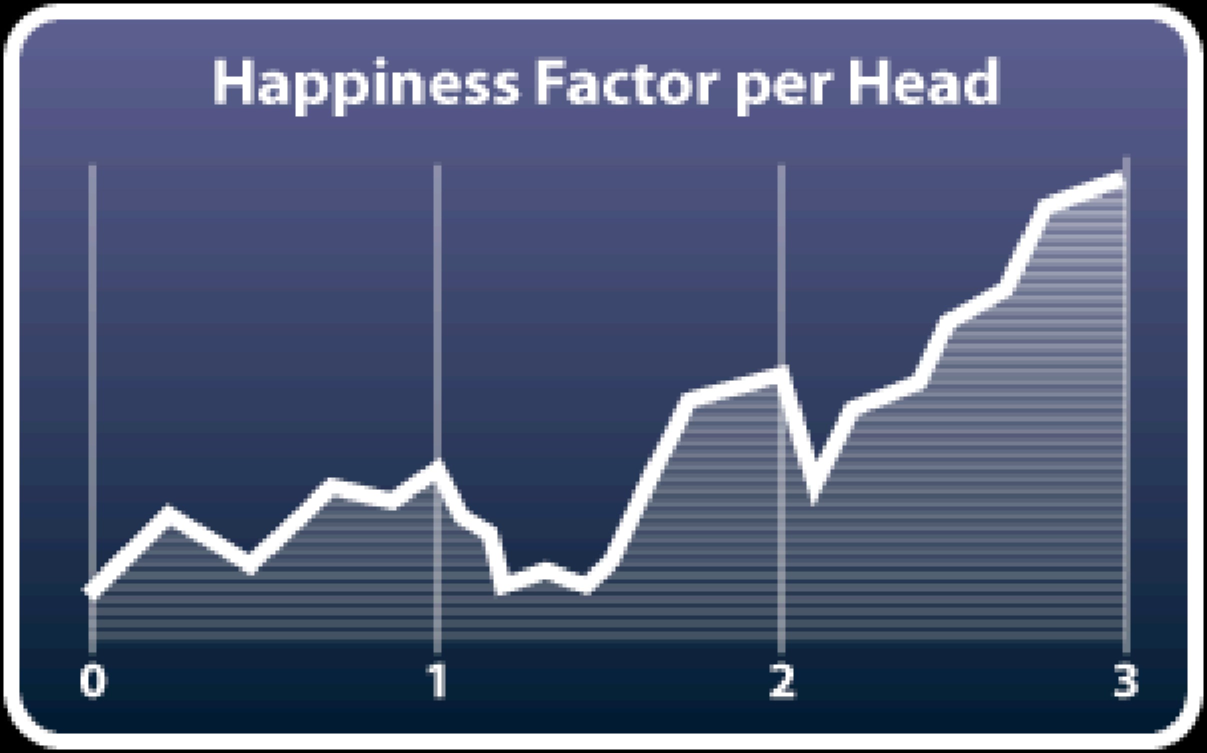
[redacted]




Happiness Factor per Head
0
1
2
3
Scary Smile Monster
Search
Zoom
Faces
Places
Albums
Info
Edit
Add To
Share

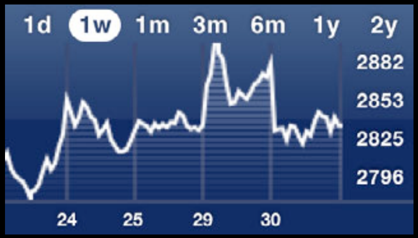
Scary Smile Monster


Info
Edit
Add To
Share


Happiness Factor per Head
0
1
2
3

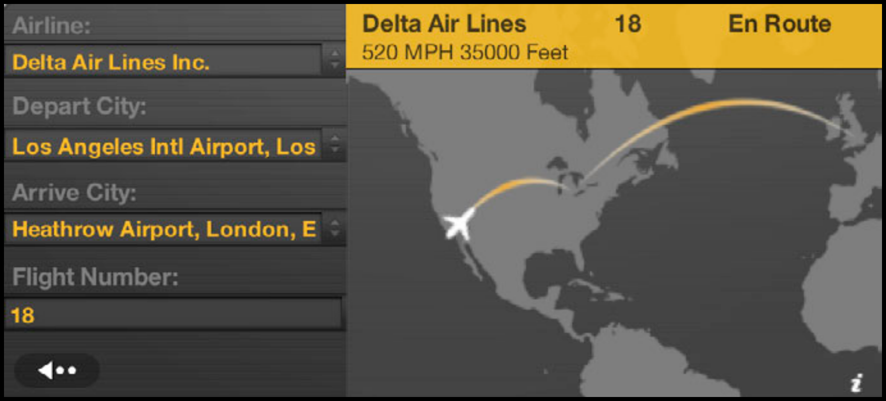
# HTML Canvas

# HTML Canvas



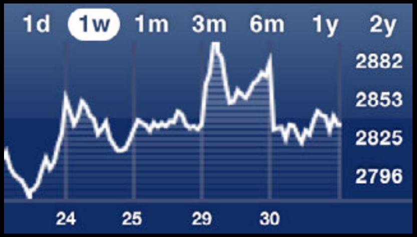
# HTML Canvas

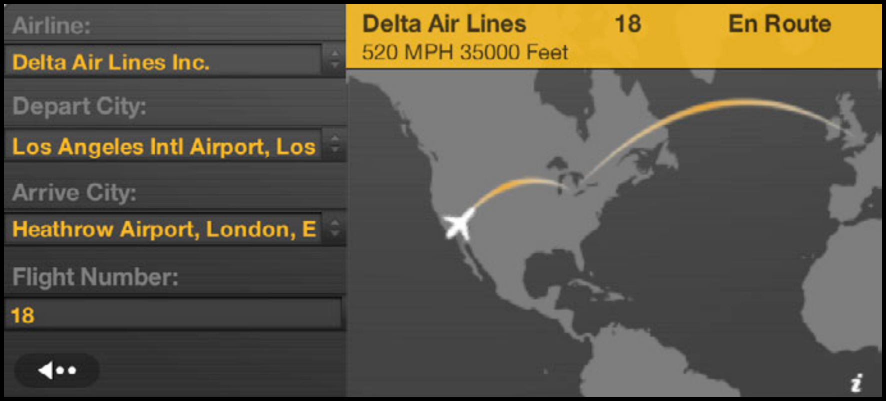
1d
1w
1m
3m
6m
1y
2y
2882
2853
2825
2796
24
25
29
30


Airline:
Delta Air Lines Inc.
Depart City:
Los Angeles Intl Airport, Los
Arrive City:
Heathrow Airport, London, E
Flight Number:
18

Delta Air Lines 18 En Route
520 MPH 35000 Feet

# HTML Canvas




Airline:
Delta Air Lines Inc.

Depart City:
Los Angeles Intl Airport, Los

Arrive City:
Heathrow Airport, London, E

Flight Number:
18

Delta Air Lines 18 En Route
520 MPH 35000 Feet

# Canvas in High Resolution

## What are we going to cover?

# Canvas in High Resolution

## What are we going to cover?

1. How does a canvas behave on a retina display?

# Canvas in High Resolution

## What are we going to cover?

1. How does a canvas behave on a retina display?
2. Creating the best looking canvas in any resolution

# Canvas in High Resolution

## What are we going to cover?

1. How does a canvas behave on a retina display?

2. Creating the best looking canvas in any resolution

3. Any code changes for advanced use

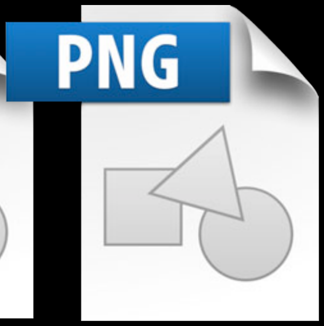
# Canvas in High Resolution

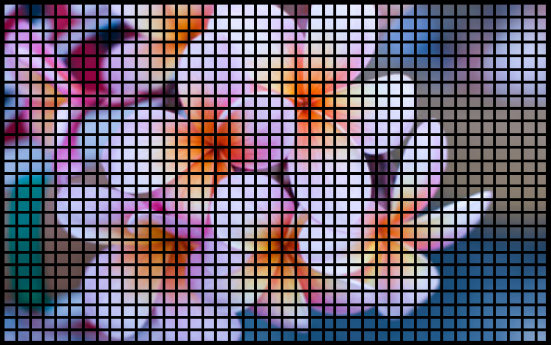
## What are we going to cover?

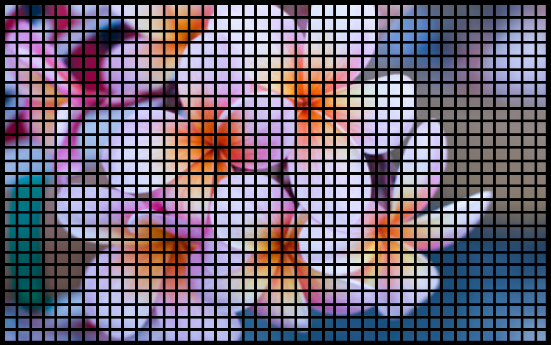
1. How does a canvas behave on a retina display?
2. Creating the best looking canvas in any resolution
3. Any code changes for advanced use

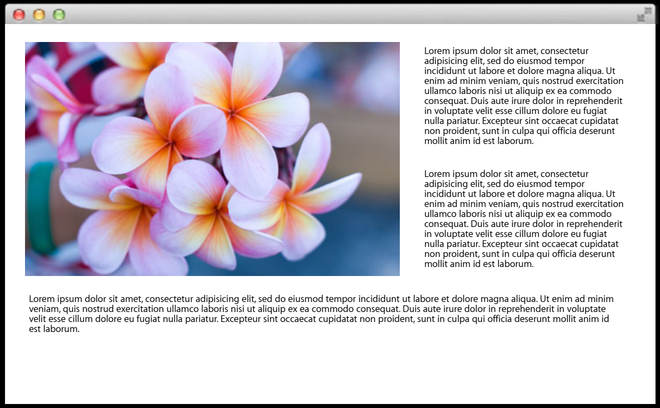
[redacted]

JPEG


PNG







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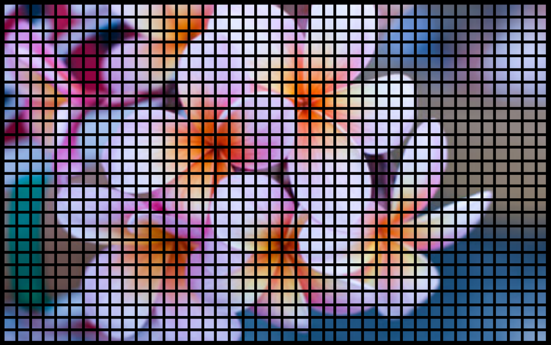

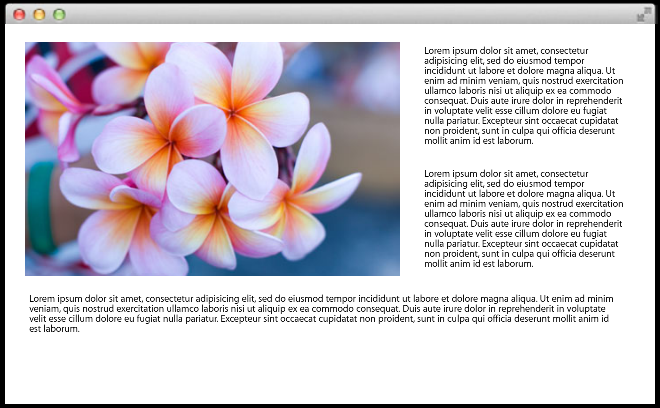

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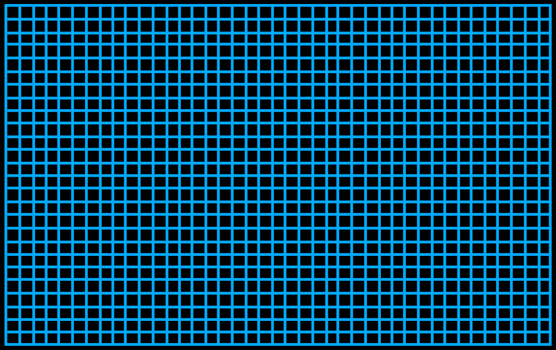
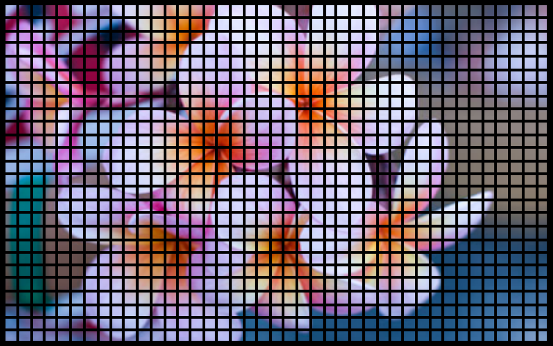
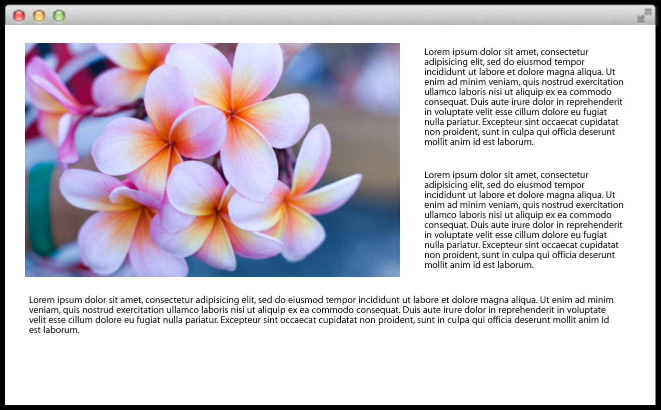


```
canvas.width = 400;
canvas.height = 250;
```





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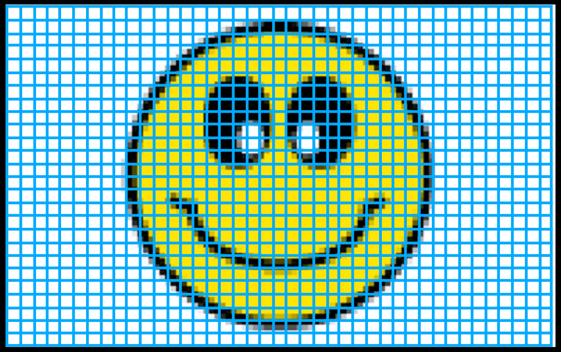
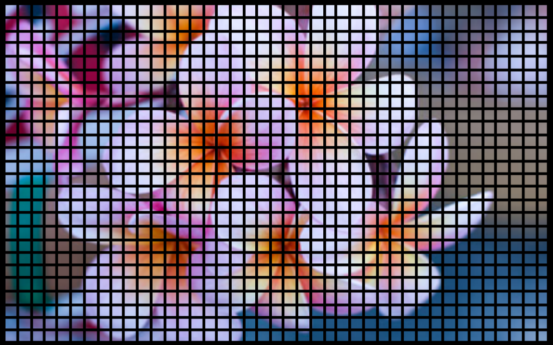
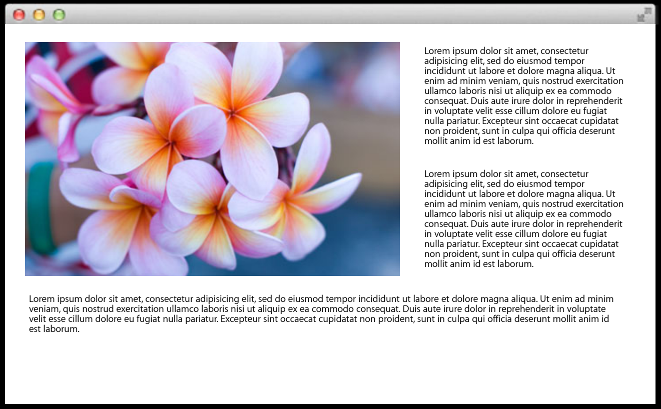


```
ctx = canvas.getContext(“2d”);
ctx.fillStyle = “yellow”;
ctx.beginPath();
...
```





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Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

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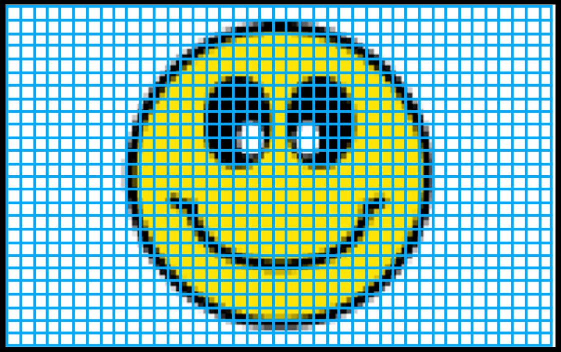

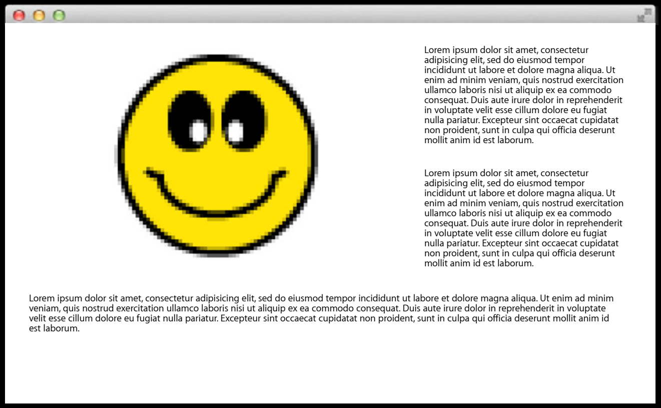

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Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

[redacted]

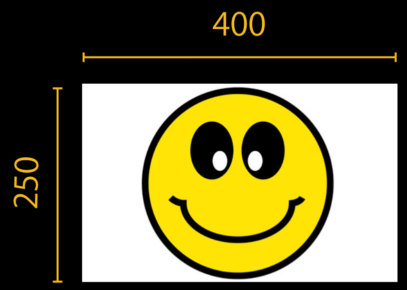
# Same Number

Image Pixels → Display Pixels

# Normal Resolution Display

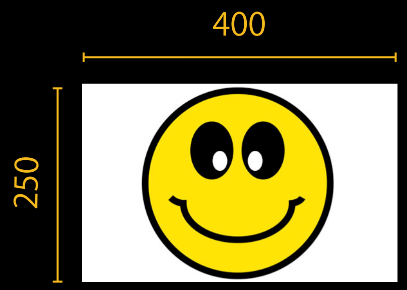
# Normal Resolution Display

CSS Size

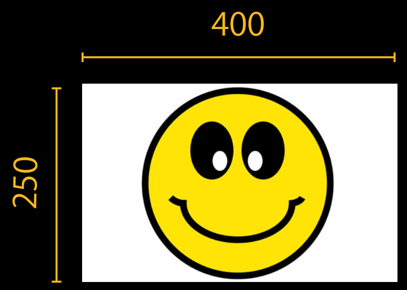


# Normal Resolution Display

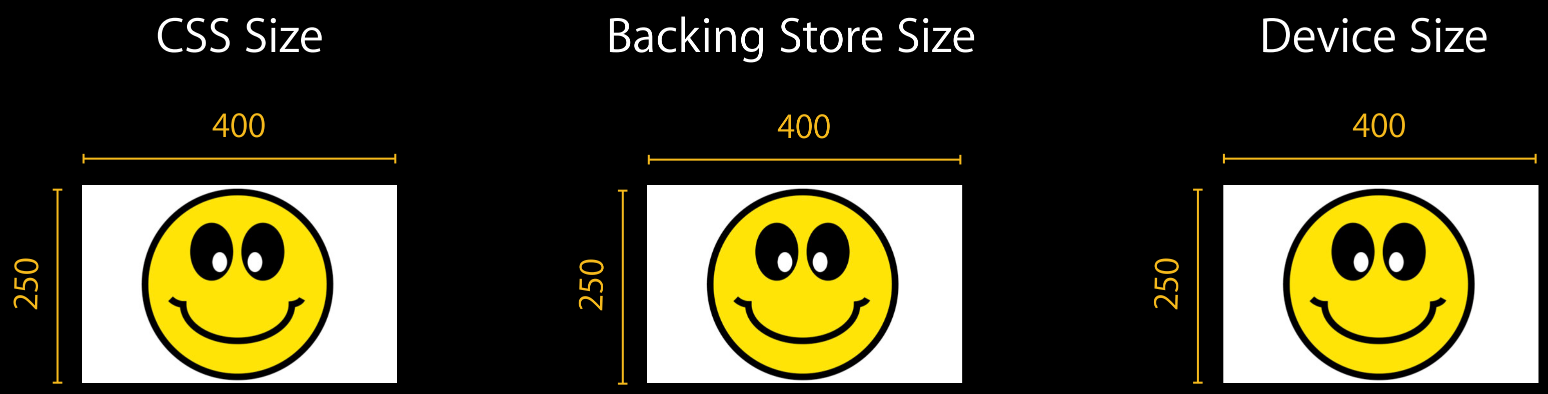
CSS Size



Device Size



# Normal Resolution Display



# Normal Resolution Display

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;

function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = CANVAS_CSS_WIDTH;
  canvas.height = CANVAS_CSS_HEIGHT;
}
```

# Normal Resolution Display

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;

function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = CANVAS_CSS_WIDTH;
  canvas.height = CANVAS_CSS_HEIGHT;
}
```

# Normal Resolution Display

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;
```

NOTE: CSS Pixels

```
function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = CANVAS_CSS_WIDTH;
  canvas.height = CANVAS_CSS_HEIGHT;
}
```

# Normal Resolution Display

```
var CANVAS_CSS_WIDTH = 400;
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function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = CANVAS_CSS_WIDTH;
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```

# Normal Resolution Display

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;

function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = CANVAS_CSS_WIDTH;
  canvas.height = CANVAS_CSS_HEIGHT;
}
```

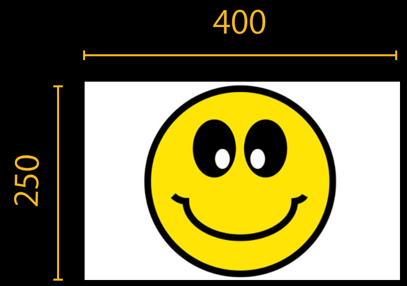
# Normal Resolution Display (Drawing)

```
function draw() {
 // ...
 context.fillRect(10, 10, 30, 30);
 // ...
}
```

# Canvas on a Retina Display

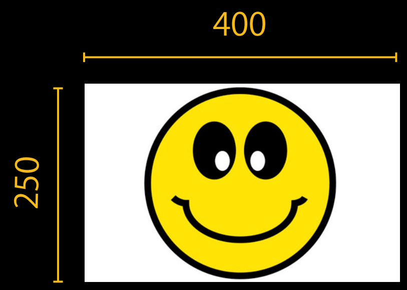
# Canvas on a Retina Display

CSS Size

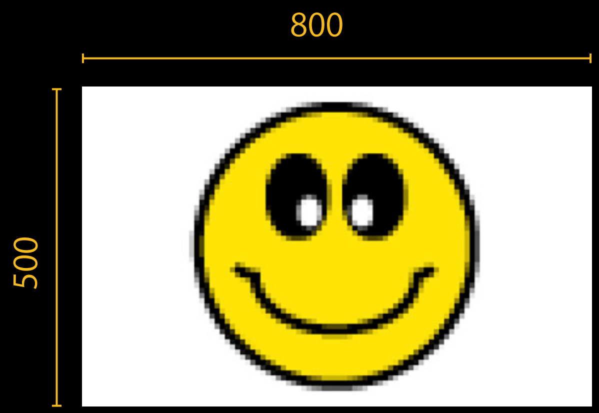


# Canvas on a Retina Display

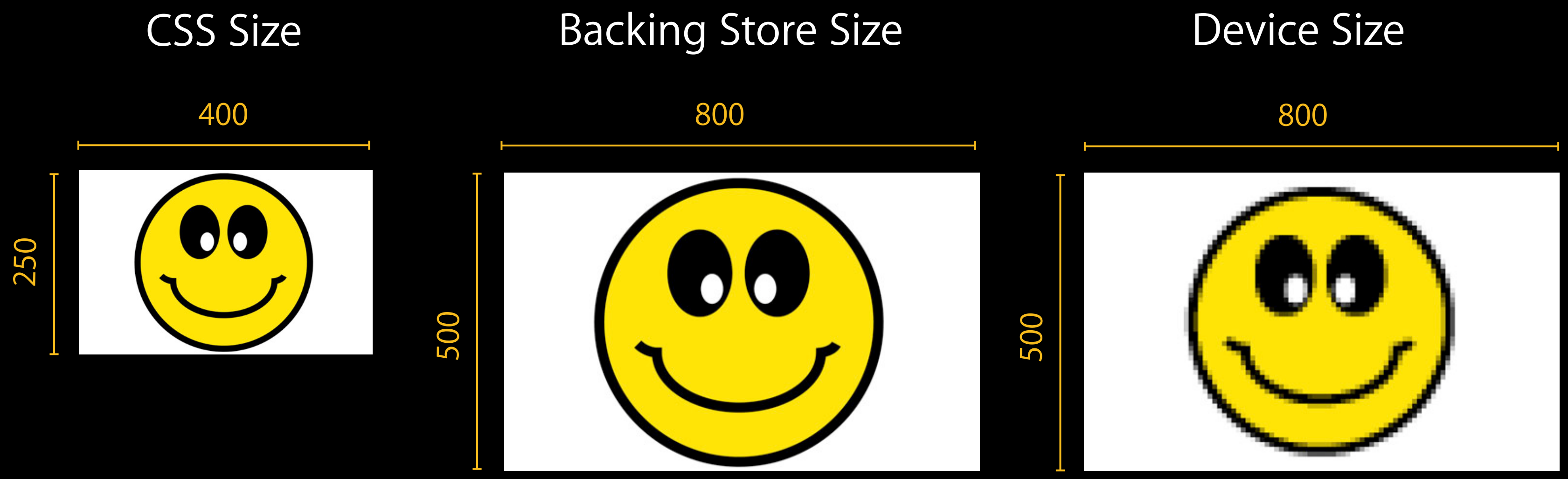
CSS Size



Device Size



# Canvas on a Retina Display

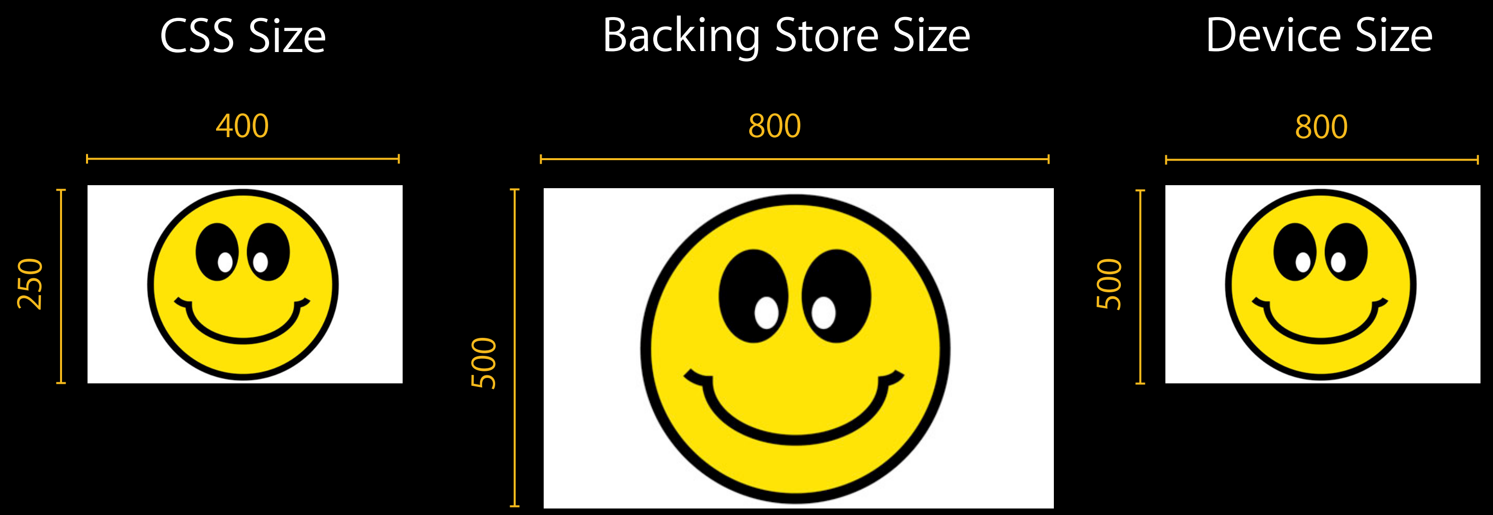


CSS Size

Backing Store Size

Device Size

# Canvas on a Retina Display



CSS Size

Backing Store Size

Device Size

# Retina on OS X

# Retina on OS X

New

# Retina on OS X

- For our 400×250 CSS px canvas, we want 800×500 px backing store

# Retina on OS X

- For our 400×250 CSS px canvas, we want 800×500 px backing store
- Great news! You don’t have to do anything.

# Retina on OS X

New

- For our 400×250 CSS px canvas, we want 800×500 px backing store
- Great news! You don’t have to do anything.

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;

function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = CANVAS_CSS_WIDTH;
  canvas.height = CANVAS_CSS_HEIGHT;
}
```

# Retina on OS X

- For our 400×250 CSS px canvas, we want 800×500 px backing store
- Great news! You don't have to do anything.

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;
```

```
function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = CANVAS_CSS_WIDTH;
  canvas.height = CANVAS_CSS_HEIGHT;
}
```

# Retina on OS X

- For our 400×250 CSS px canvas, we want 800×500 px backing store
- Great news! You don’t have to do anything.

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;

function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = CANVAS_CSS_WIDTH;
  canvas.height = CANVAS_CSS_HEIGHT;
}
```

# Retina on OS X

- For our 400×250 CSS px canvas, we want 800×500 px backing store
- Great news! You don’t have to do anything.

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;

function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = CANVAS_CSS_WIDTH;
  canvas.height = CANVAS_CSS_HEIGHT;
}
```

Allocates 800×500

# Retina on OS X (Drawing)

- Drawing operations are already initialized for bigger backing store

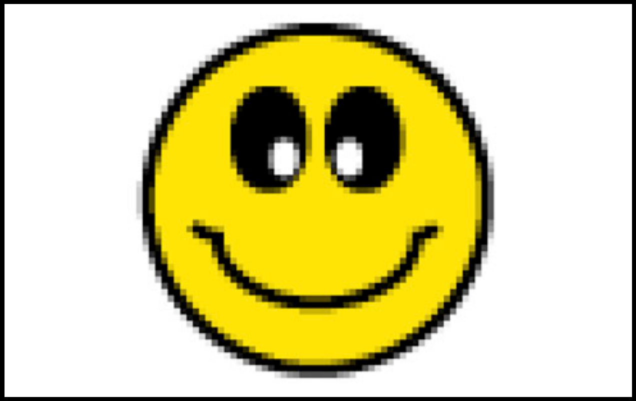
```
function draw() {
 // ...
 context.fillRect(10, 10, 30, 30);  // will cover 60x60 in backing store
 // ...
}
```

# Canvas on OS X

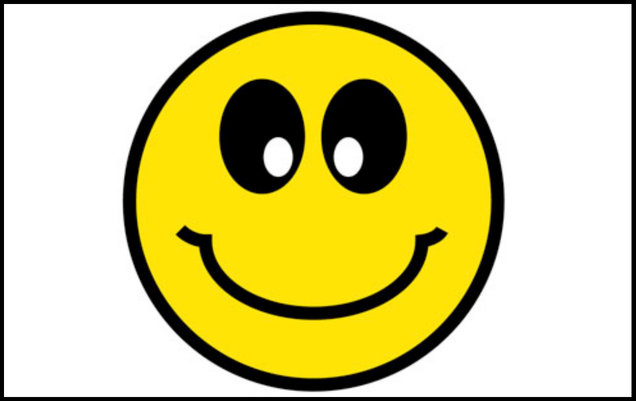
# Canvas on OS X

Normal Resolution

# Canvas on OS X



Normal Resolution



Retina

[redacted]

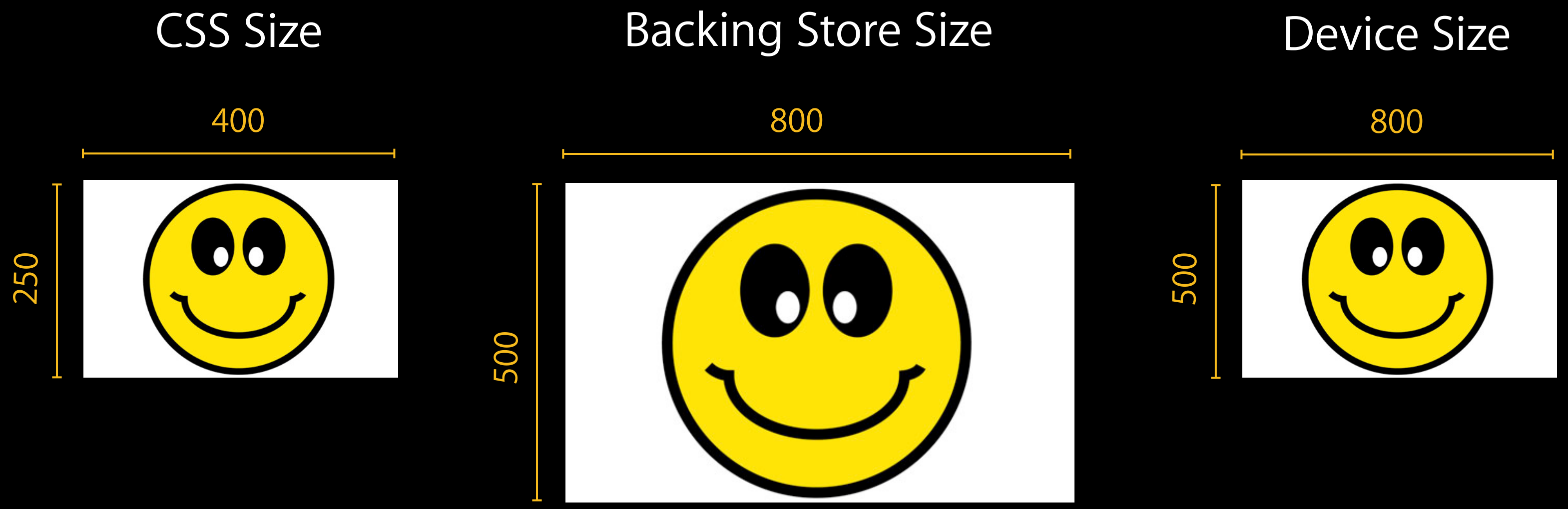
N
NE
E
SE
S
SW
W
NW

N
W
E
S

iOS

# Canvas on a Retina Display

# Canvas on a Retina Display



CSS Size

400

250

Backing Store Size

800

500

Device Size

800

500

# Retina on iOS

# Retina on iOS

- For our 400×250 CSS pixel canvas, we want 800×500 pixel backing store

# Retina on iOS

- For our 400×250 CSS pixel canvas, we want 800×500 pixel backing store
- The system will not allocate it for you

# Retina on iOS

- For our 400×250 CSS pixel canvas, we want 800×500 pixel backing store
- The system will not allocate it for you
- We need to allocate a bigger backing store

# Detecting Retina Displays

window.devicePixelRatio

# Detecting Retina Displays

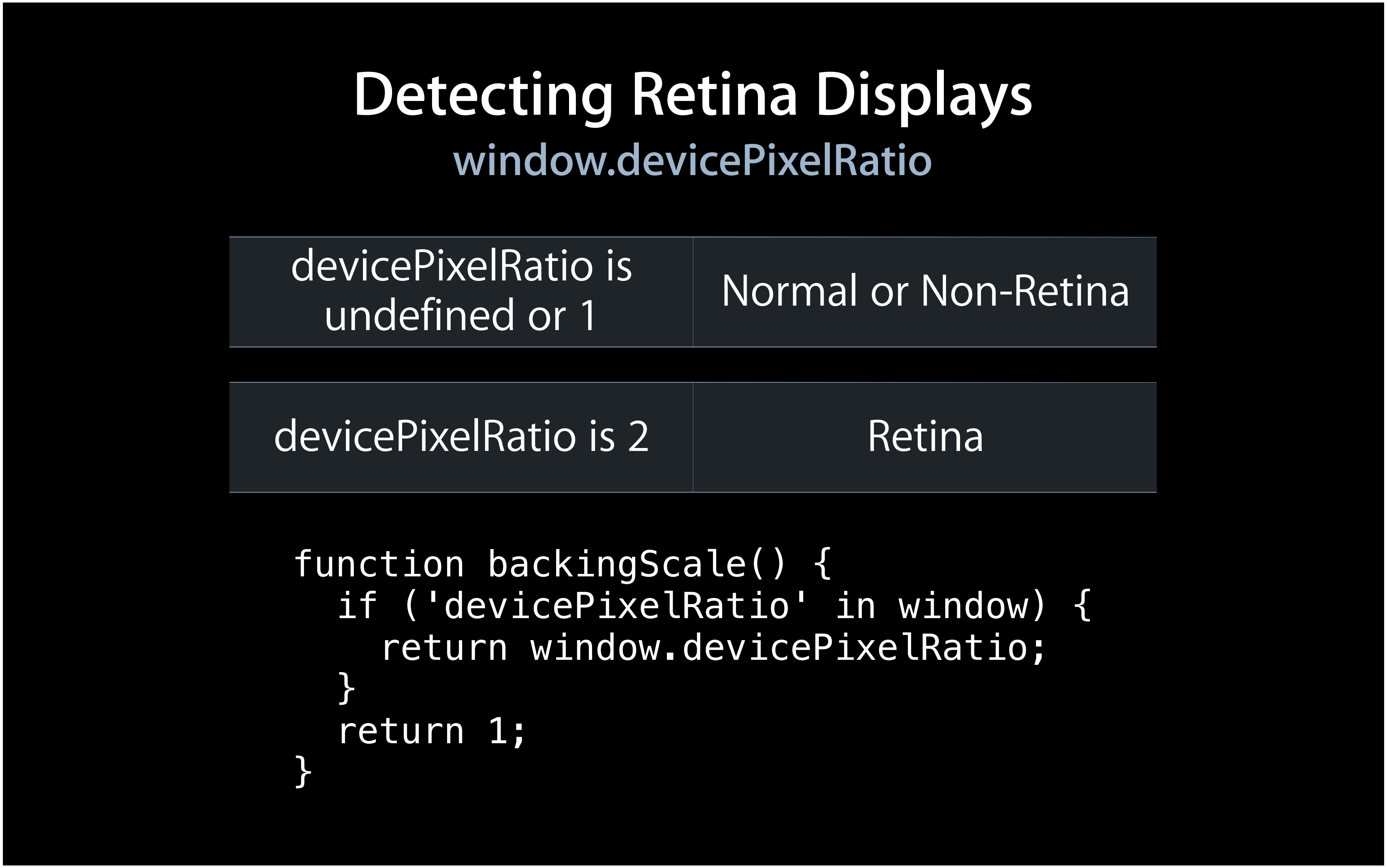
## window.devicePixelRatio

| | |
|---|---|
| devicePixelRatio is undefined or 1 | Normal or Non-Retina |

# Detecting Retina Displays

## window.devicePixelRatio

| | |
|---|---|
| devicePixelRatio is undefined or 1 | Normal or Non-Retina |
| devicePixelRatio is 2 | Retina |



# Detecting Retina Displays

## window.devicePixelRatio

| | |
|---|---|
| devicePixelRatio is undefined or 1 | Normal or Non-Retina |
| devicePixelRatio is 2 | Retina |

```
function backingScale() {
  if ('devicePixelRatio' in window) {
    return window.devicePixelRatio;
  }
  return 1;
}
```

# Retina on iOS

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;
var BACKING_SCALE = backingScale();

function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = BACKING_SCALE * CANVAS_CSS_WIDTH;
  canvas.height = BACKING_SCALE * CANVAS_CSS_HEIGHT;
}
```

# Retina on iOS

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;
var BACKING_SCALE = backingScale();

function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = BACKING_SCALE * CANVAS_CSS_WIDTH;
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```

# Retina on iOS

```
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var BACKING_SCALE = backingScale();

function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = BACKING_SCALE * CANVAS_CSS_WIDTH;
  canvas.height = BACKING_SCALE * CANVAS_CSS_HEIGHT;
}
```

# Retina on iOS

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var CANVAS_CSS_WIDTH = 400;
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  var canvas = document.getElementById("myCanvas");
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  canvas.height = BACKING_SCALE * CANVAS_CSS_HEIGHT;
}
```

# Retina on iOS

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;
var BACKING_SCALE = backingScale();

function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = BACKING_SCALE * CANVAS_CSS_WIDTH;
  canvas.height = BACKING_SCALE * CANVAS_CSS_HEIGHT;
}
```

2×400
2×250

# Oops!

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;
var BACKING_SCALE = backingScale();

function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = BACKING_SCALE * CANVAS_CSS_WIDTH;
  canvas.height = BACKING_SCALE * CANVAS_CSS_HEIGHT;
}
```

# Oops!

```
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var BACKING_SCALE = backingScale();

function init() {
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  canvas.width = BACKING_SCALE * CANVAS_CSS_WIDTH;
  canvas.height = BACKING_SCALE * CANVAS_CSS_HEIGHT;
}
```

# Oops!

```
var CANVAS_CSS_WIDTH = 400;
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var BACKING_SCALE = backingScale();

function init() {
  var canvas = document.getElementById("myCanvas");
  canvas.width = BACKING_SCALE * CANVAS_CSS_WIDTH;
  canvas.height = BACKING_SCALE * CANVAS_CSS_HEIGHT;
}
```

Manually doubling the backing store will allocate 4× too much on OS X

# Detecting Backing Store Auto-doubling

webkitBackingStorePixelRatio

# Detecting Backing Store Auto-doubling

## webkitBackingStorePixelRatio

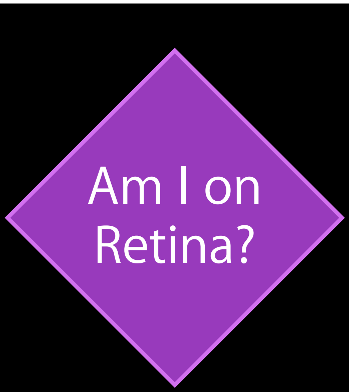
| | | |
|---|---|---|
| webkitBackingStorePixelRatio is undefined or 1 | Does not Auto-double | Non-Retina and iOS |

# Detecting Backing Store Auto-doubling

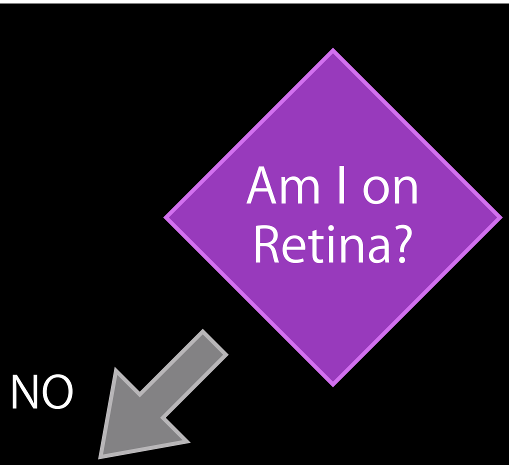
## webkitBackingStorePixelRatio

| | | |
|---|---|---|
| webkitBackingStorePixelRatio is undefined or 1 | Does not Auto-double | Non-Retina and iOS |
| webkitBackingStorePixelRatio is 2 | Auto-doubles | OS X Retina |

[redacted]

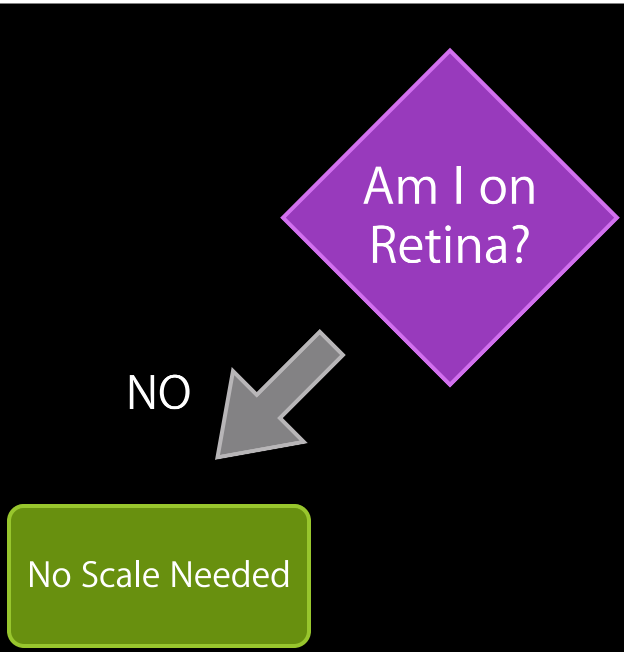


Am I on Retina?



Am I on Retina?

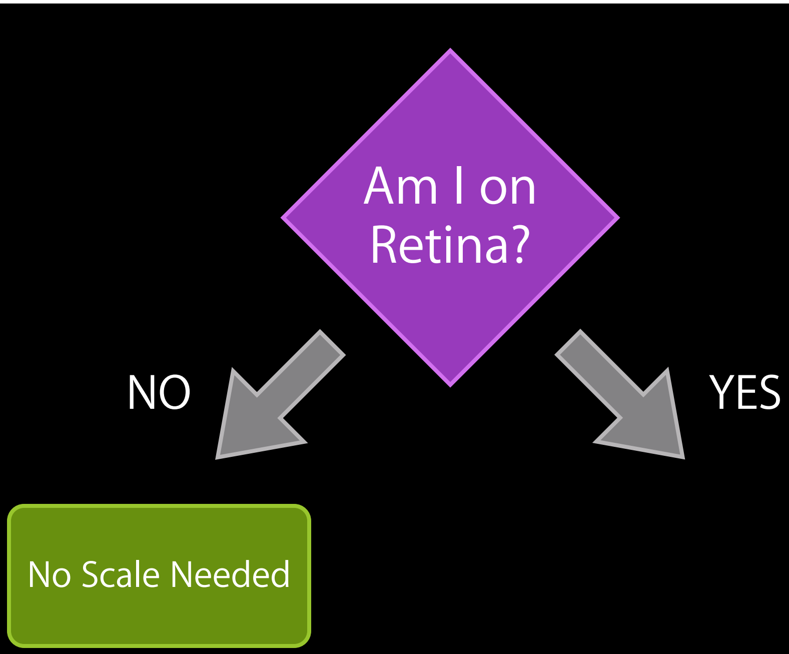
NO



Am I on Retina?

NO

No Scale Needed

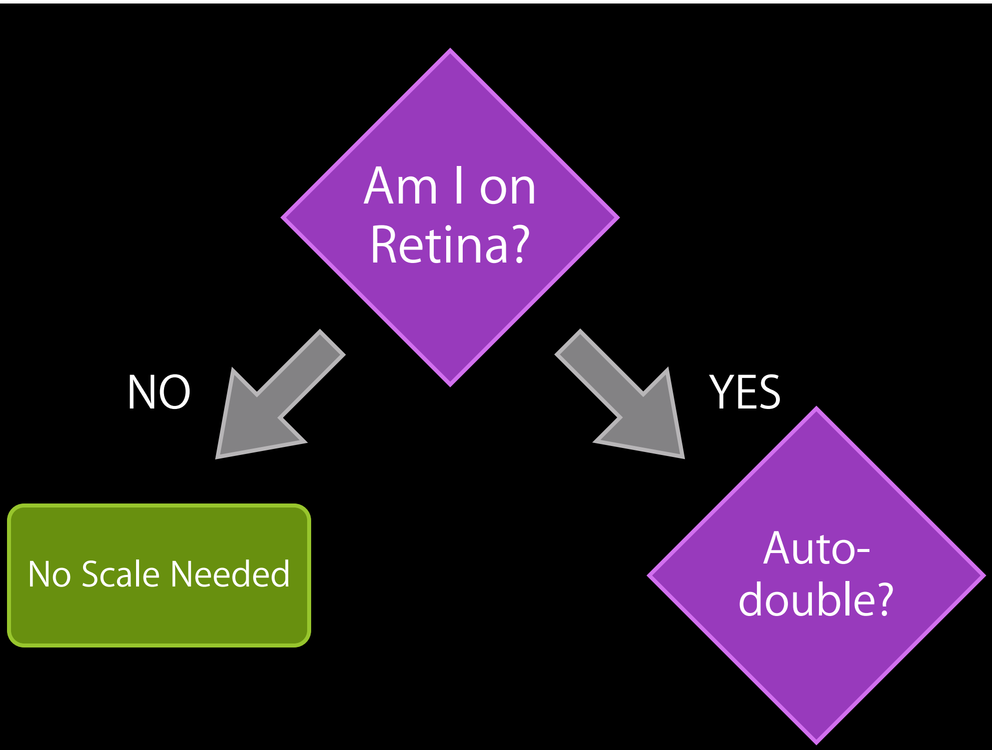


Am I on Retina?

NO

YES

No Scale Needed



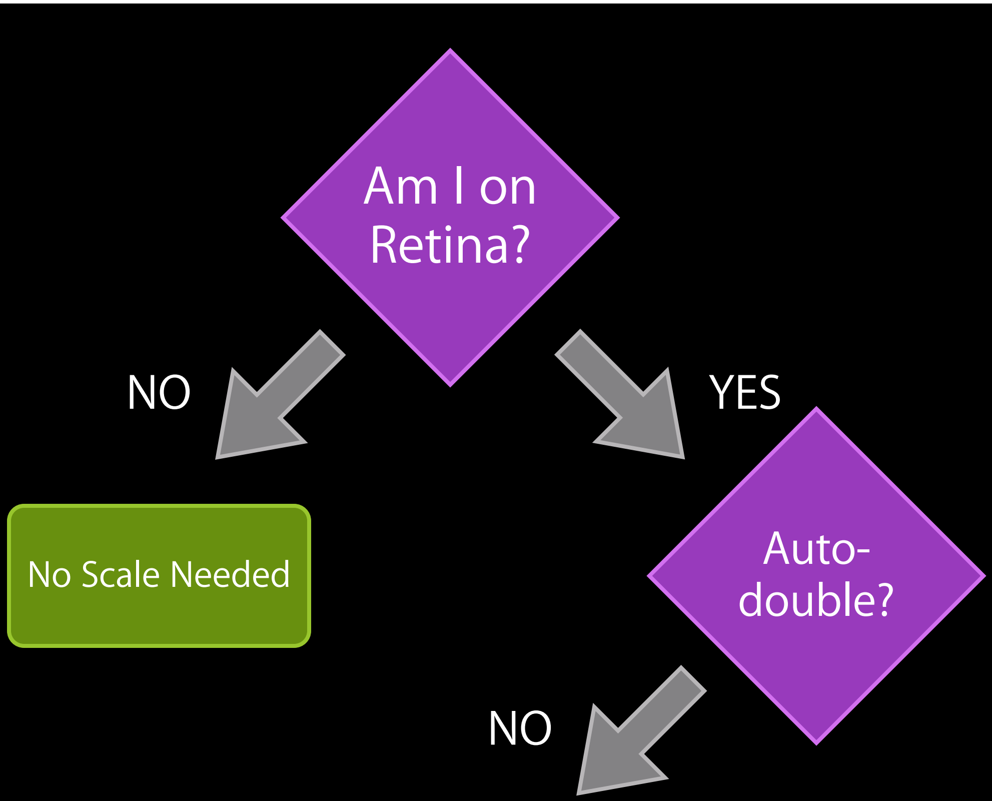
Am I on Retina?

NO

YES

No Scale Needed

Auto-double?



Am I on Retina?

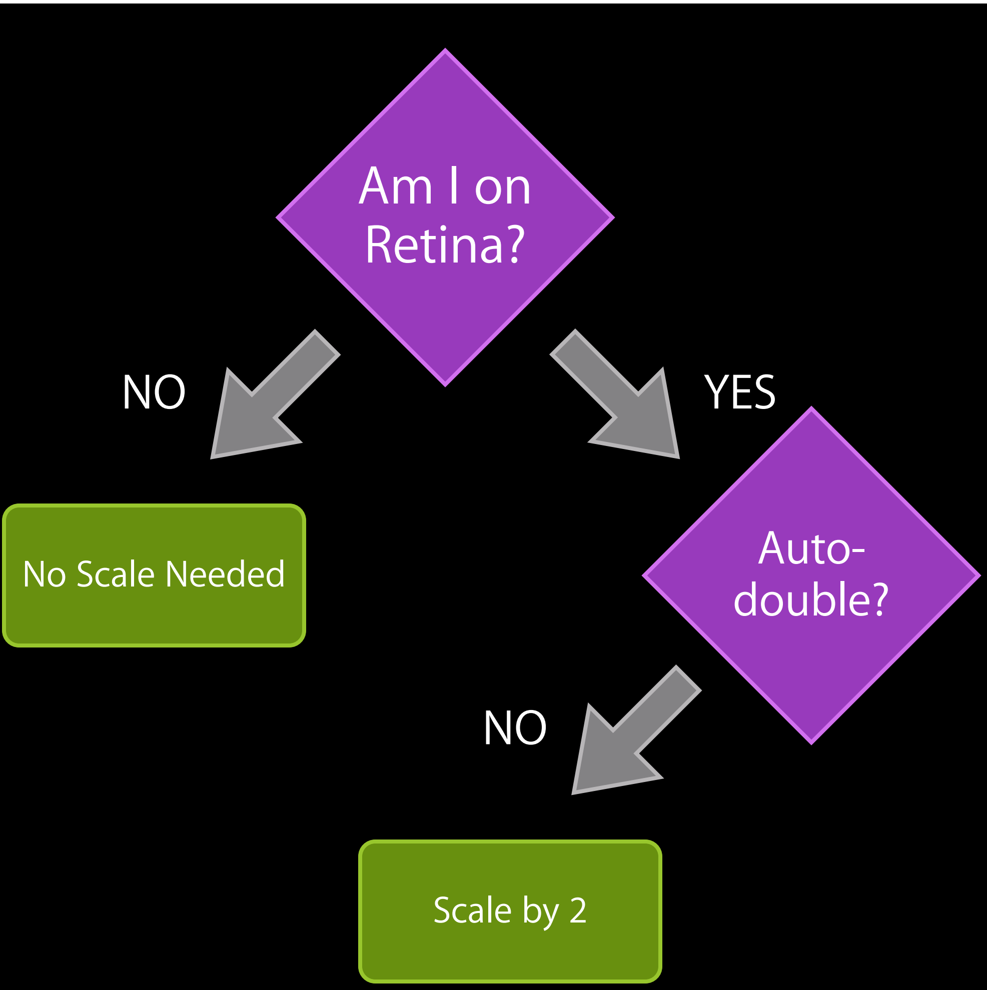
NO

YES

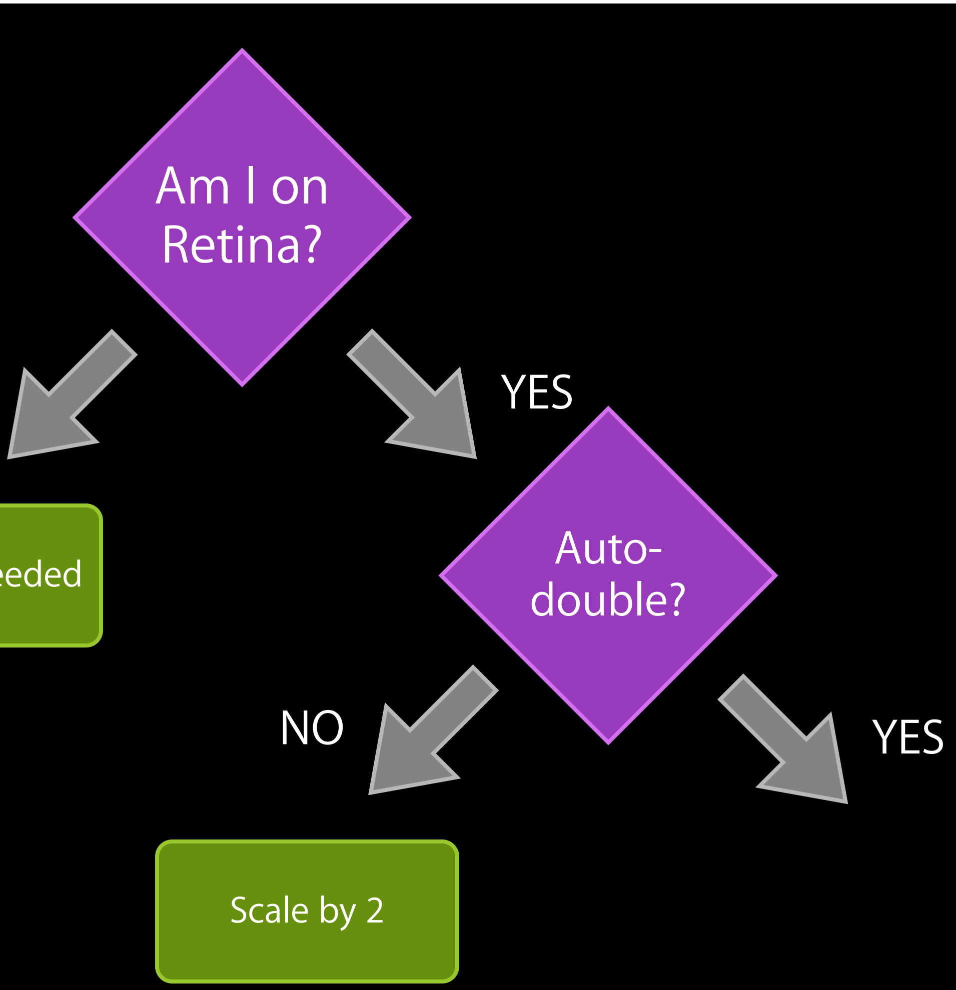
No Scale Needed

Auto-double?

NO



iOS Retina



Am I on Retina?

NO

YES

No Scale Needed

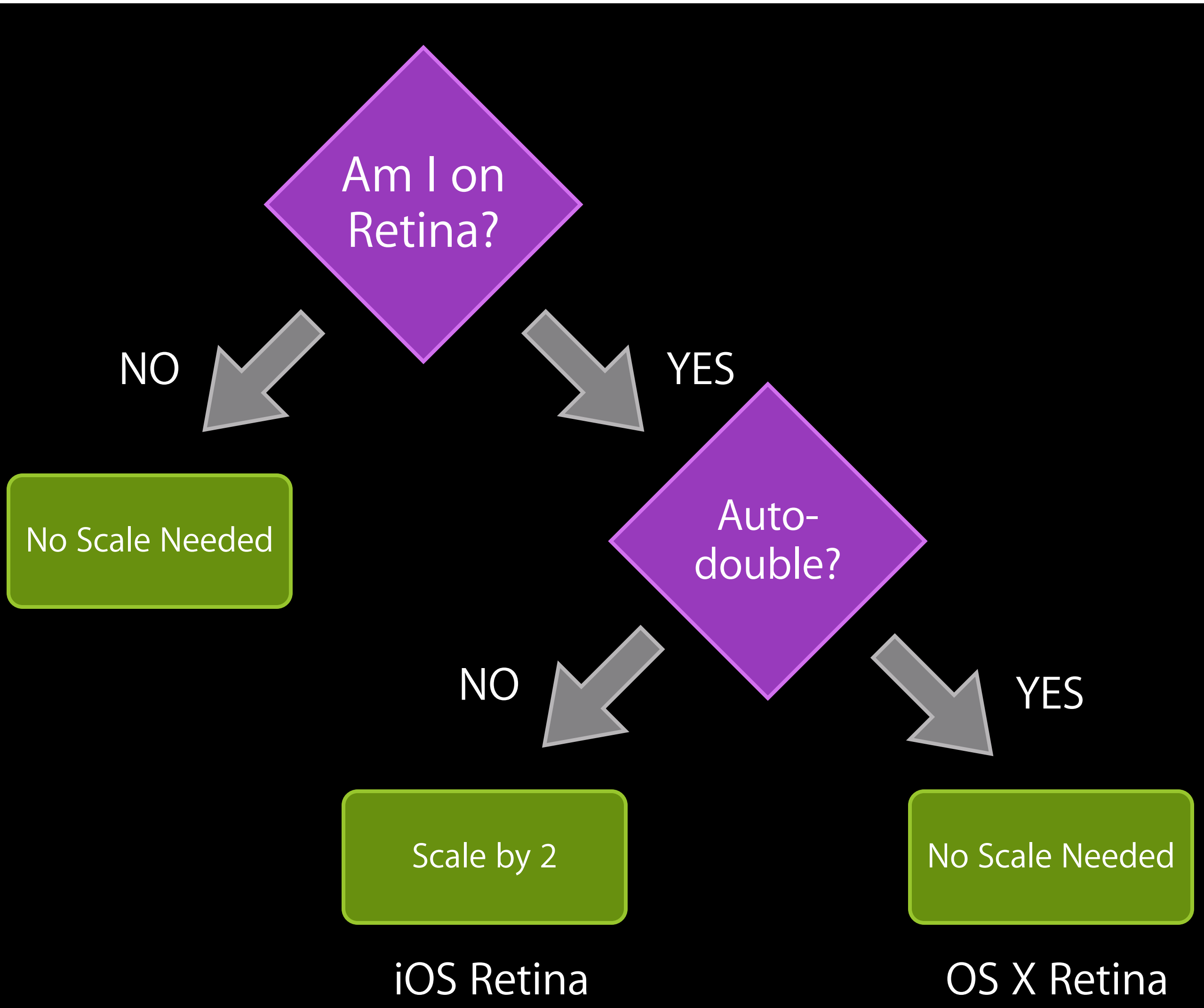
Auto-double?

NO

YES

Scale by 2

iOS Retina



Am I on Retina?

NO

No Scale Needed

YES

Auto-double?

NO

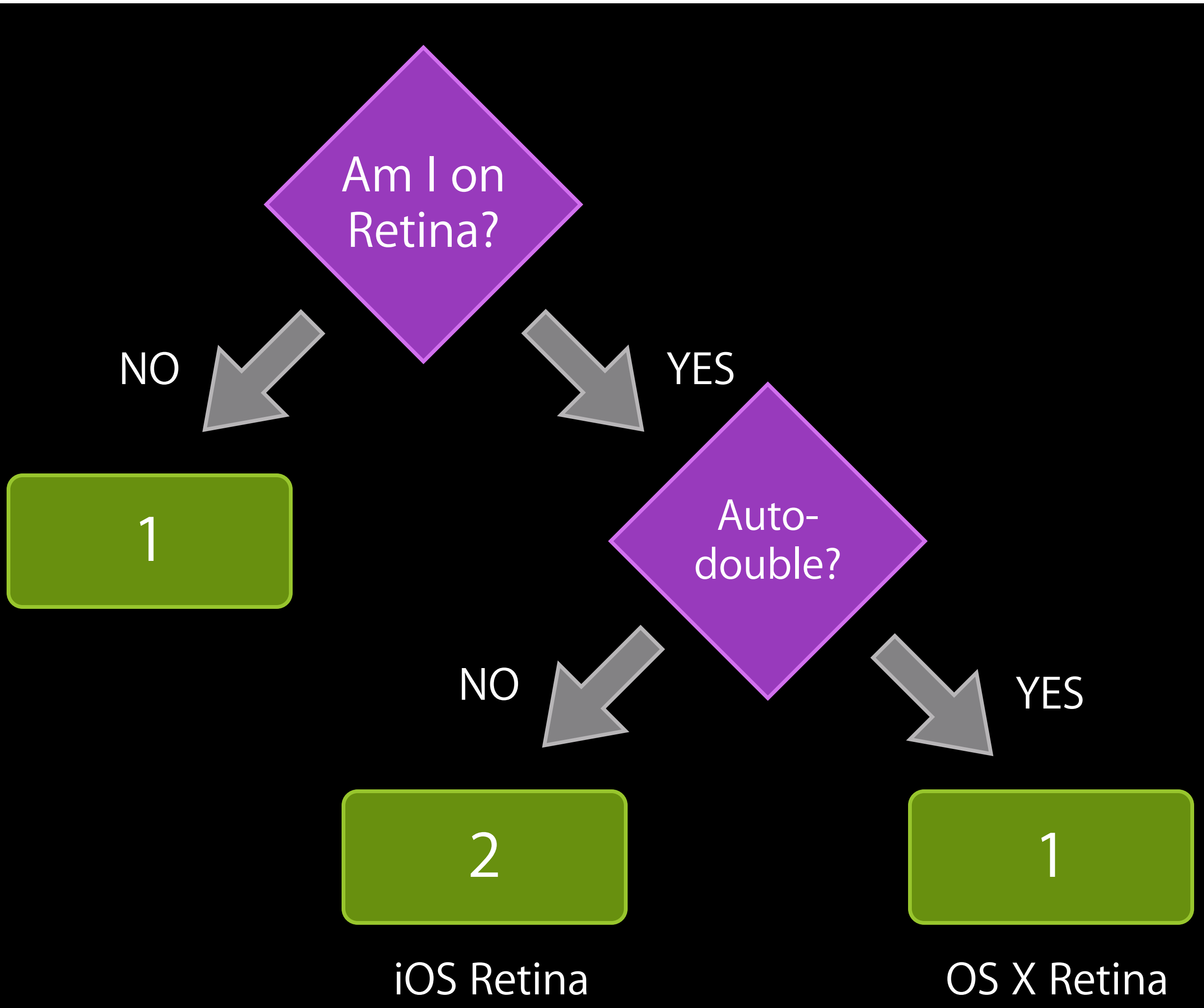
Scale by 2

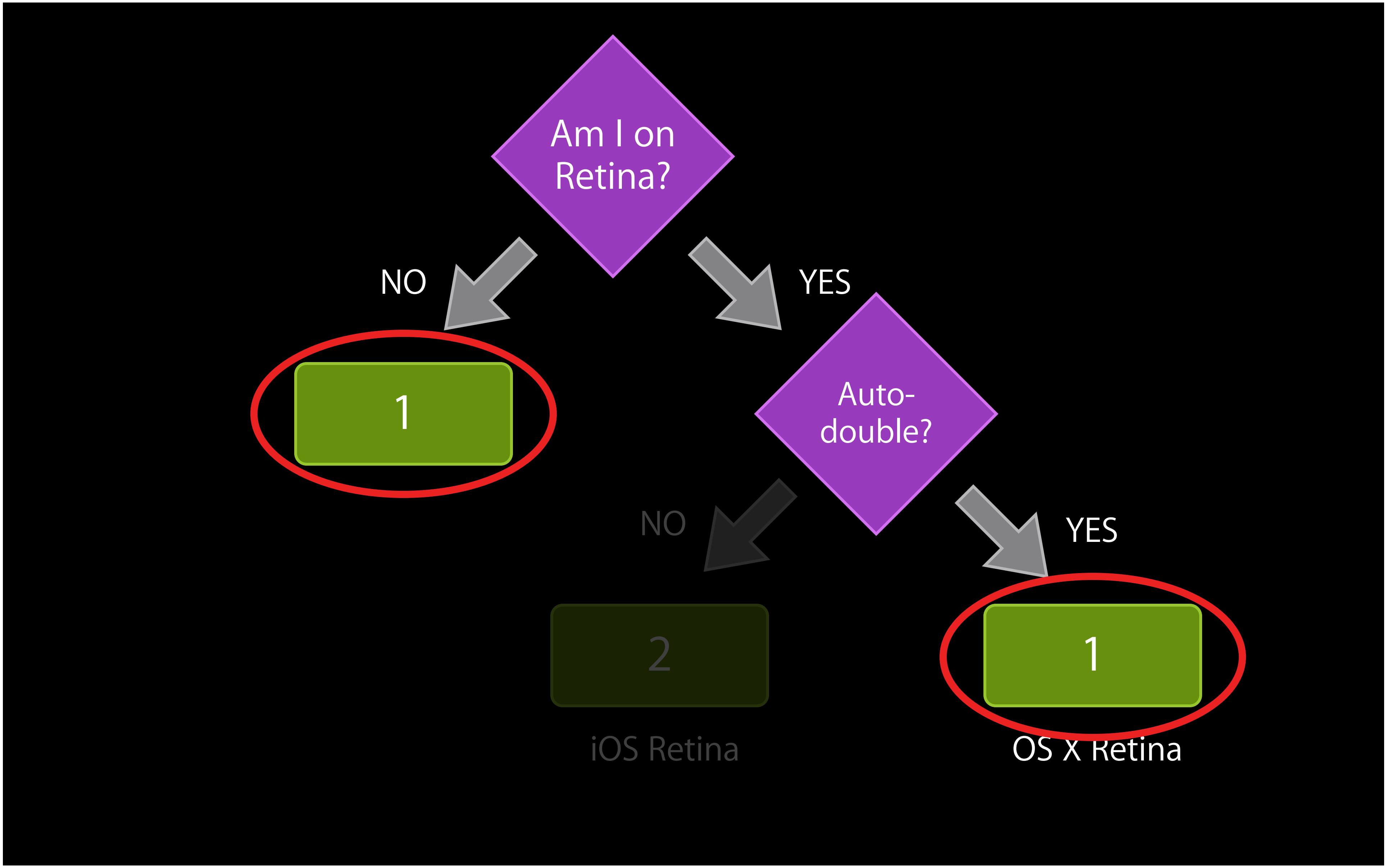
iOS Retina

YES

No Scale Needed

OS X Retina


Am I on Retina?
NO
YES
1
Auto-double?
NO
YES
2
1
iOS Retina
OS X Retina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YES
1
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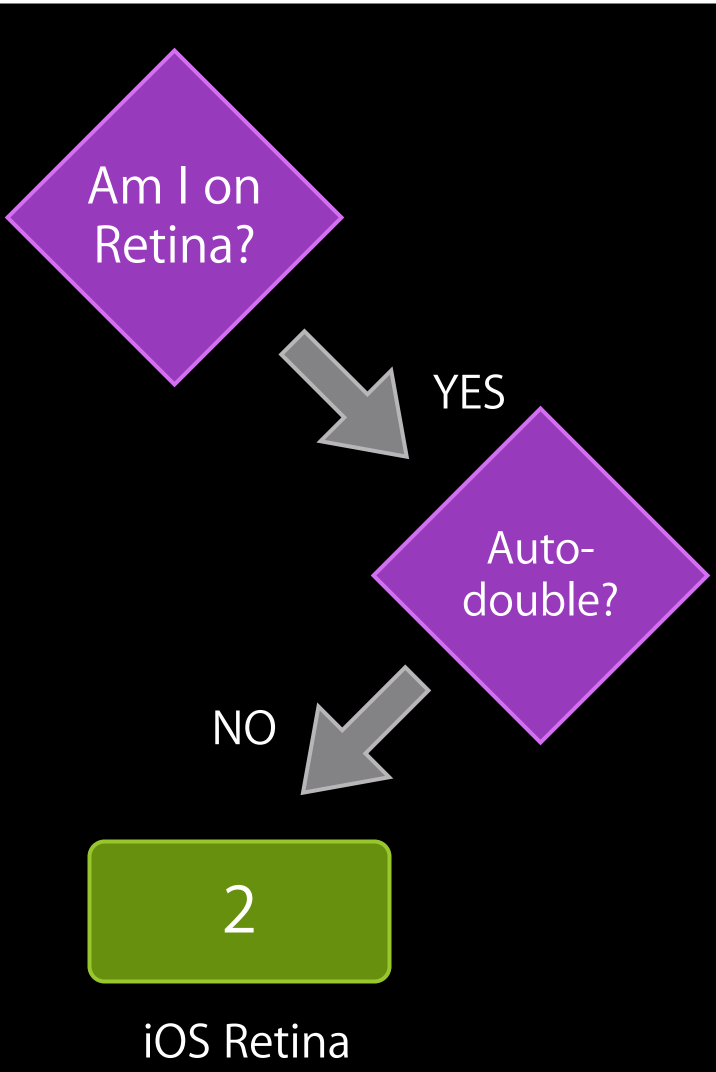
YES
2
1
iOS Retina
OS X Retina



Am I on Retina?

YES

Auto-double?

NO

2

iOS Retina

```
function backingScale(context) {

  if (window.devicePixelRatio > 1 &&
      context.webkitBackingStorePixelRatio < 2) {
    return window.devicePixelRatio;
  }

  return 1;

}
```

```
var CANVAS_CSS_WIDTH = 400;
var CANVAS_CSS_HEIGHT = 250;
var BACKING_SCALE;

function init() {
  var canvas = document.getElementById("myCanvas");
  var context = canvas.getContext("2d");

  BACKING_SCALE = backingStore(context);

  canvas.width = BACKING_SCALE * CANVAS_CSS_WIDTH;
  canvas.height = BACKING_SCALE * CANVAS_CSS_HEIGHT;
}
```

```
var CANVAS_CSS_WIDTH = 400;
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  BACKING_SCALE = backingStore(context);

  canvas.width = BACKING_SCALE * CANVAS_CSS_WIDTH;
  canvas.height = BACKING_SCALE * CANVAS_CSS_HEIGHT;
}
```

```
function draw(context) {
  context.save();
  context.scale(BACKING_SCALE, BACKING_SCALE);

  // ...
  context.fillRect(10, 10, 30, 30);
  // ...

  context.restore();
}
```

```
function draw(context) {
  context.save();
  context.scale(BACKING_SCALE, BACKING_SCALE);

  // ...
  context.fillRect(10, 10, 30, 30);
  // ...

  context.restore();
}
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function draw(context) {
  context.save();
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  context.fillRect(10, 10, 30, 30);
  // ...

  context.restore();
}
```

```
function draw(context) {
  context.save();
  context.scale(BACKING_SCALE, BACKING_SCALE);

  // ...
  context.fillRect(10, 10, 30, 30);
  // ...

  context.restore();
}
```

# Considerations

# Considerations

- Increased memory use

# Considerations

- Increased memory use
- Drawing performance

# Considerations

- Increased memory use
- Drawing performance
- Some code/API changes

# Summary

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- We want the optimal backing store size for display size

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- Check if you are on Retina (you’ll need 2× backing store)

# Summary

- We want the optimal backing store size for display size
- Check if you are on Retina (you’ll need 2× backing store)
- Check if the system will double automatically, otherwise do it manually

# Canvas in High Resolution

## What are we going to cover?

1. How does a canvas behave on a retina display?
2. Creating the best looking canvas in any resolution
3. Any code changes for advanced use

# Canvas in High Resolution

## What are we going to cover?

1. How does a canvas behave on a retina display?
2. Creating the best looking canvas in any resolution
3. Any code changes for advanced use

# Getting and Setting Pixels Directly

```
getImageData(x, y, width, height)
putImageData(data, x, y, width, height)
```

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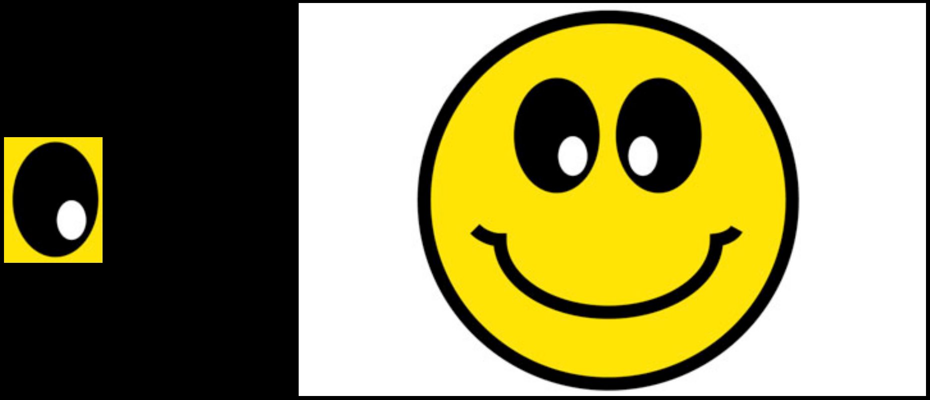
```

# Getting and Setting Pixels Directly

```
getImageData(x, y, width, height)
putImageData(data, x, y, width, height)
```

CSS Pixels



# Direct Access to the Pixels…Really!

New

# Direct Access to the Pixels…Really!

## Parameters in CSS Pixels

```
getImageData(x, y, width, height)
putImageData(data, x, y, width, height)
```

## Parameters in Backing Store Pixels

```
webkitGetImageDataHD(x, y, width, height)
webkitPutImageDataHD(data, x, y, width, height)
```

# Drawing Images into a Canvas

# Drawing Images into a Canvas

- Always specify your desired output width and height

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- Always specify your desired output width and height
- Beware of `drawImage(image, x, y)`

# Drawing Images into a Canvas

- Always specify your desired output width and height
- Beware of `drawImage(image, x, y)`
- Even more important when the input image is a canvas

# Extracting the Canvas as a URL

```
canvas.toDataURL()
```

# Extracting the Canvas as a URL

```
canvas.toDataURL()
```

# Extracting the Canvas as a URL

```
canvas.toDataURL()
```

```
data:image/png;base64,UEsDBAoAAAAAAPOExUAAAAAAAAAAAAAAAAAP
ABwAbGlja2FibGUtaWNvbnMvVVQJAAO5mM5PL57OT3V4CwABBPUBAAAEFA
AAAFBLAwQUAAAACADMhsVAJdZXwBUBAACSAgAAGQAcAGxpY2thYmxlLWlj
b25zL2J1dHRvbi5zdmdVVAkAAzCczk9ynM5PdXgLAAEE9QEAAAQUAAAAjZ
LRbsIgFIbvfYqT441LqFCaVbYUL3az59CWtkRWDGVW336nWrMtUWNC8vMH
vv/AgaI/NHD8cl2vsY1x/875MAzLIVv60HAphOC0+FgzfDhjxqTDGikIod
M4XoGUFSm7scJTZ3tzCZ8hk1lTRfBVhqbySAcU42CRJ7ldHEncilecAroo
9+Dr+vexPPy6JPSOx80hma7kPKNSSEZ6QsCv8MtX8UNNs0VU4KRPEbTG6j
MmVwxkvvoLUxkdFpG8osV/H+Tzi3k1x4WzbQrmDLCYKvYUvJ4m9bYpqUym
UQI9A4KobbOafwObjG/dvlPnecTOt+Z8fDB74zGuVLq6pKJl8/Epg9jt25
T7u7lFpzuXYw/bT37AVBLAwQUAAAACADshsVATg2wWS0BAABzAgAAGgAcA
GxpY2tYmxlLWljb25zL2J1dHRvbjIuc3ZnVVQJAANrnM5Pa5zOT3V4CwAB
BPUBAAAEFAAAAJVSQW6DMBC85xWrzSWVIDamSWkFOfTSUw99AgEDVlyMjB
snfX2XBJRUSirVsrQe2zOeHTnt9zUcPnXbZ9g4170w5r1+nhpbM0E55zRD
YS9kv7VHDIMY6AZ8TXECW5mAGkpq35Y0FKrVub2zealkq0DVWZYjwDhEGX
IqYhTOZ7RkVCEZzoJ9M50YKq50POCwMNrYDG29XURiHYingMoDArtNi27Q
eBwIHlC50FL22+2pFzY1k9bjLSsLB16VriFlTpYaqeqGnokFgqVAEoRKaZ
3hl9WL+dTu1Ttd7hqgJN5hHfDRMY0PWPEgFvD8eL37Pan5Rjl5BqHp8kK5
IyWyFCtk3bWmlYOoVizkxnOkySZUDjyxcXufdnoT9mtzovdPd2UUZ7p8JU
2sx9QSwMEFAAAAAgA74bFQNQkXzmwAQAAAwMAAB8AHABsaWNrYWJsZS1pY
29ucy9idXR0b25sYWJlbC5odG1sVVQJAANynM5PcpzOT3V4CwABBPUBAAA
EFAAAAGVSTY/bIBC951dMfSHRKnbcVfrhOq7UVu2l9z1UPWAgNi0BBOM4b
rf/fcF2urH2gGDevDc8mClfccNwsAJaPKlqVV43QXm1AihRohLVV6rZAJ/
MpcwmIKY8DkpAFB8SFBfMmPdJtQopgNrwAf6OxxBQ9rtxptO8gL6VKD7Mi
RN1jdQF7Cbg36Tl8pzWzX+1NV6iNIFGa29U9yxX4ogFvNnZyxVBY5dALzm
2BdzvbrBWyKYNwjy/AW89dk6t6w7R6NSfm02sOt4F2mydsILiS9XWyz+iA
GY0Uqmv+WMI58x+/3yZpZxL3WxHu/m7G//hG7dUySa8lgmNwi0qHelJqqE
A8r1jklP45qjmgiw4/fy62ii+KOtbyk0fPtteIA8r7rUKD7iymFHGLToON
qTMxkZPLWdOWqzCzHSnYC/tXeCuyYyDd+yQtIi2yDICd7BWhtHYu7Q1HuH
xEUhEVIzIJvVWSVyTgmx+7H4GOinu929fv8+UPAsnlKE8/eU/ei1tiA95U
```

# Extracting the Canvas as a URL

```
canvas.toDataURL()
```

Output is in CSS pixels
(not auto-doubled)

data:image/png;base64,UEsDBAoAAAAAAPOExUAAAAAAAAAAAAAAAAAP
ABwAbGlja2FibGUtaWNvbnMvVVQJAAO5mM5PL57OT3V4CwABBPUBAAAEFA
AAAFBLAwQUAAAACADMhsVAJdZXwBUBAACSAgAAGQAcAGxpY2thYmxlLWlj
b25zL2J1dHRvbi5zdmdVVAkAAzCczk9ynM5PdXgLAAEE9QEAAAQUAAAAjZ
LRbsIgFIbvfYqT441LqFCaVbYUL3az59CWtkRWDGVW336nWrMtUWNC8vMH
vv/AgaI/NHD8cl2vsY1x/875MAzLIVv60HAphOC0+FgzfDhjxqTDGikIod
M4XoGUFSm7scJTZ3tzCZ8hk1lTRfBVhqbySAcU42CRJ7ldHEncilecAroo
9+Dr+vexPPy6JPSOx80hma7kPKNSSEZ6QsCv8MtX8UNNs0VU4KRPEbTG6j
MmVwxkvvoLUxkdFpG8osV/H+Tzi3k1x4WzbQrmDLCYKvYUvJ4m9bYpqUym
UQI9A4KobbOafwObjG/dvlPnecTOt+Z8fDB74zGuVLq6pKJl8/Epg9jt25
T7u7lFpzuXYw/bT37AVBLAwQUAAAACADshsVATg2wWS0BAABzAgAAGgAcA
GxpY2tYmxlLWljb25zL2J1dHRvbjIuc3ZnVVQJAANrnM5Pa5zOT3V4CwAB
BPUBAAAEFAAAAJVSQW6DMBC85xWrzSWVIDamSWkFOfTSUw99AgEDVlyMjB
snfX2XBJRUSirVsrQe2zOeHTnt9zUcPnXbZ9g4170w5r1+nhpbM0E55zRD
YS9kv7VHDIMY6AZ8TXECW5mAGkpq35Y0FKrVub2zealkq0DVWZYjwDhEGX
IqYhTOZ7RkVCEZzoJ9M50YKq50POCwMNrYDG29XURiHYingMoDArtNi27Q
eBwIHlC50FL22+2pFzY1k9bjLSsLB16VriFlTpYaqeqGnokFgqVAEoRKaZ
3hl9WL+dTu1Ttd7hqgJN5hHfDRMY0PWPEgFvD8eL37Pan5Rjl5BqHp8kK5
IyWyFCtk3bWmlYOoVizkxnOkySZUDjyxcXufdnoT9mtzovdPd2UUZ7p8JU
2sx9QSwMEFAAAAAgA74bFQNQkXzmwAQAAAwMAAB8AHABsaWNrYWJsZS1pY
29ucy9idXR0b25sYWJlbC5odG1sVVQJAANynM5PcpzOT3V4CwABBPUBAAA
EFAAAAGVSTY/bIBC951dMfSHRKnbcVfrhOq7UVu2l9z1UPWAgNi0BBOM4b
rf/fcF2urH2gGDevDc8mClfccNwsAJaPKlqVV43QXm1AihRohLVV6rZAJ/
MpcwmIKY8DkpAFB8SFBfMmPdJtQopgNrwAf6OxxBQ9rtxptO8gL6VKD7Mi
RN1jdQF7Cbg36Tl8pzWzX+1NV6iNIFGa29U9yxX4ogFvNnZyxVBY5dALzm
2BdzvbrBWyKYNwjy/AW89dk6t6w7R6NSfm02sOt4F2mydsILiS9XWyz+iA
GY0Uqmv+WMI58x+/3yZpZxL3WxHu/m7G//hG7dUySa8lgmNwi0qHelJqqE
A8r1jklP45qjmgiw4/fy62ii+KOtbyk0fPtteIA8r7rUKD7iymFHGLTo0N
qTMxkZPLWdOWqzCzHSnYC/tXeCuyYyDd+yQtIi2yDICd7BWhtHYu7Q1HuH
xEUhEVIzIJvVWSVyTgmx+7H4GOinu929fv8+UPAsnlKE8/eU/ei1tiA95U

# Summary

- New methods for extracting backing store pixels
- Always specify your destination width and height
- toDataURL() output is in CSS pixels

# Canvas in High Resolution

## What did we cover?

1. How to create the best looking canvas in any resolution
2. How to scale the backing store
3. Code changes for advanced use

# Leveraging the Power of WebKit

**Beth Dakin**
Safari & WebKit Engineer

# Leveraging the Power of WebKit

# Leveraging the Power of WebKit

- Make image-free glossy buttons

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- Make image-free glossy buttons
- Let text be text

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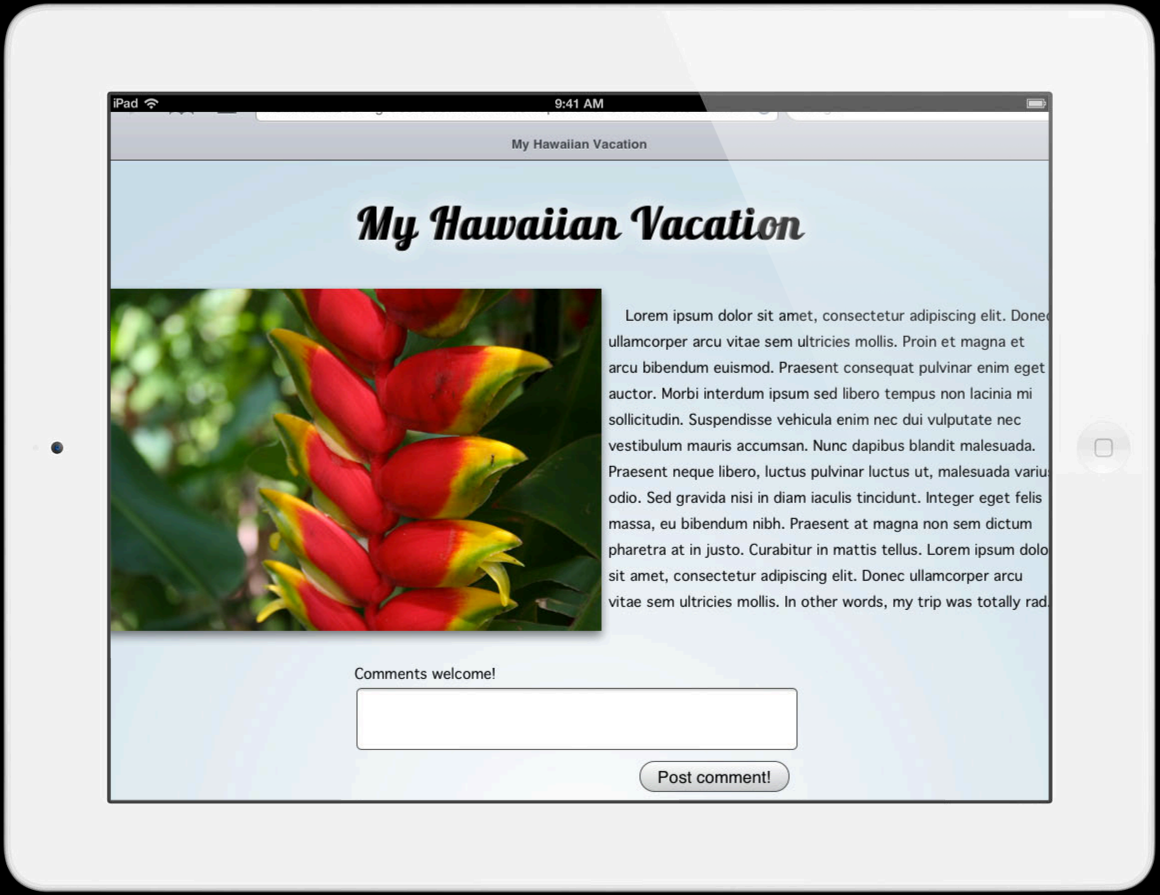
# Making Image-Free Glossy Buttons



My Hawaiian Vacation

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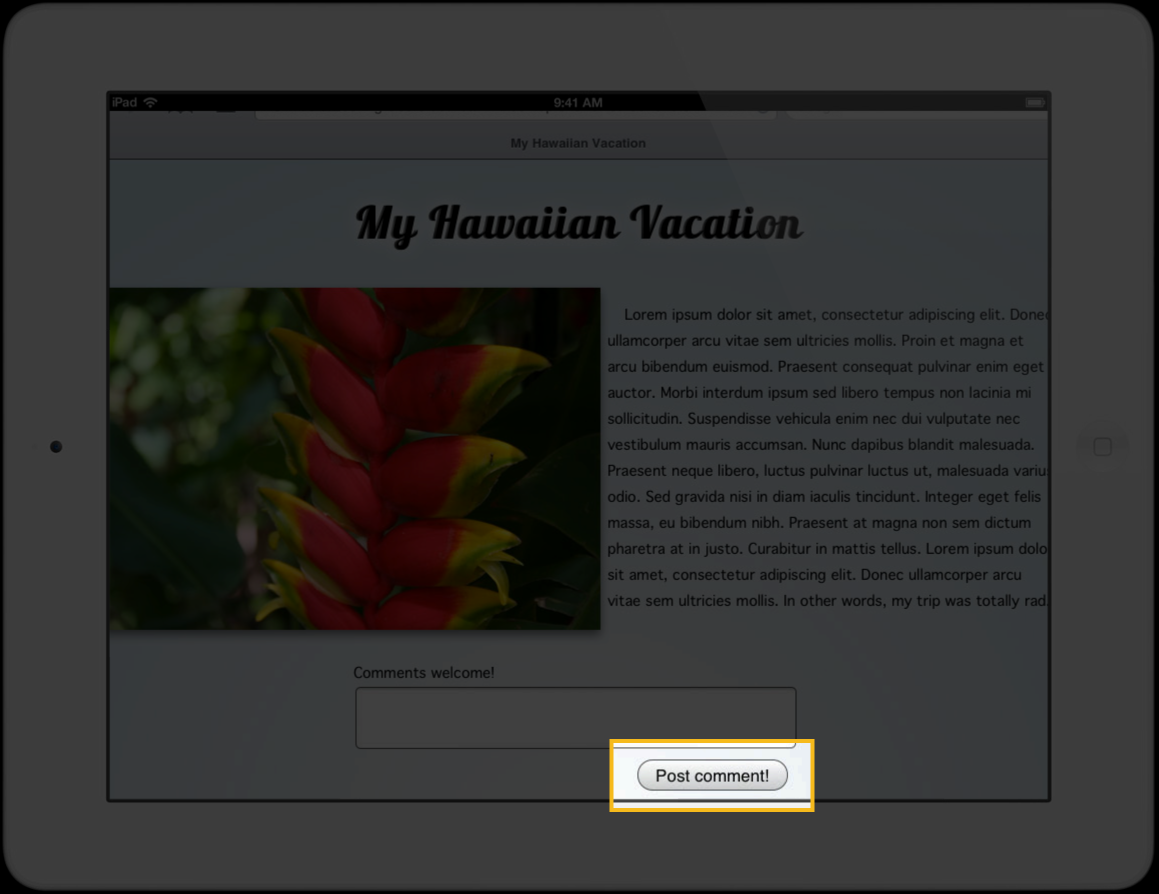
Comments welcome!

# Making Image-Free Glossy Buttons



My Hawaiian Vacation

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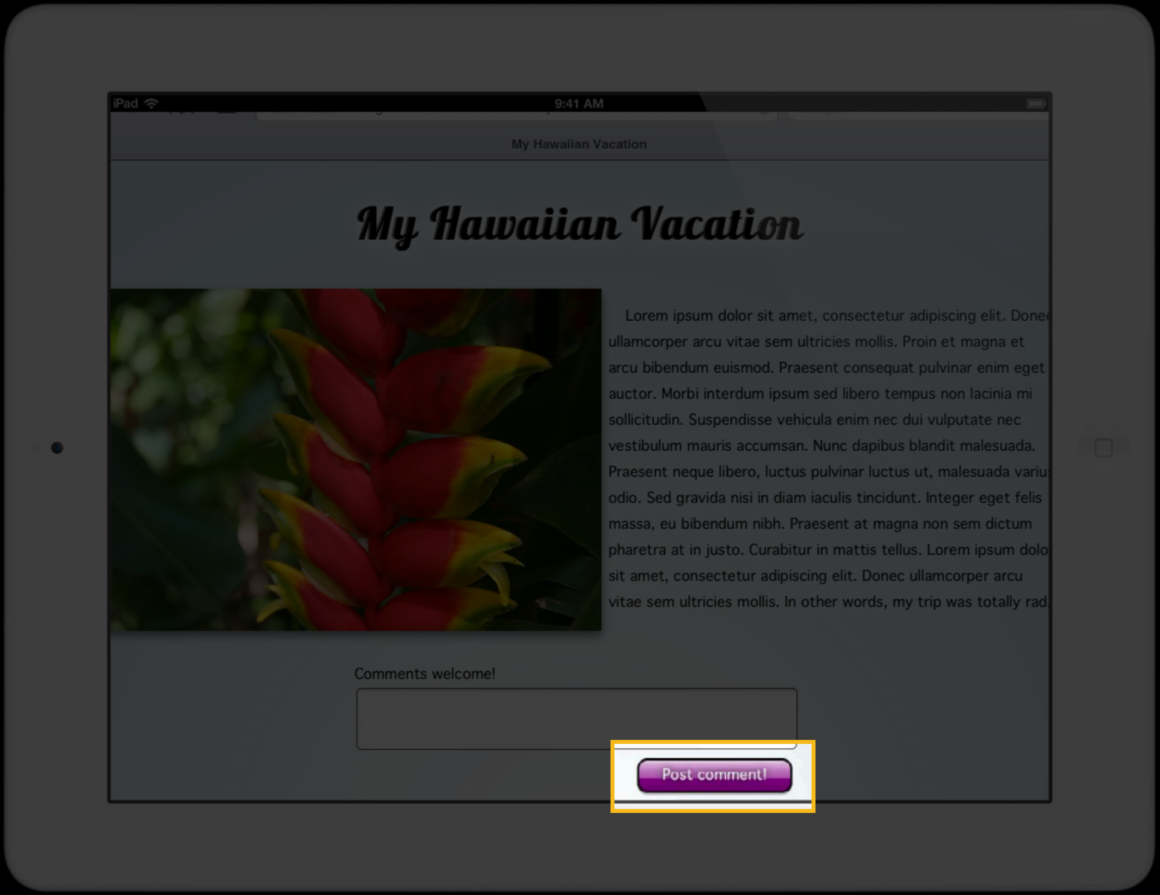

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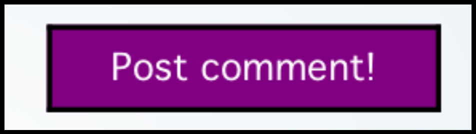
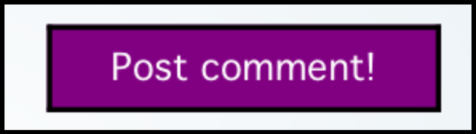
# Making Image-Free Glossy Buttons



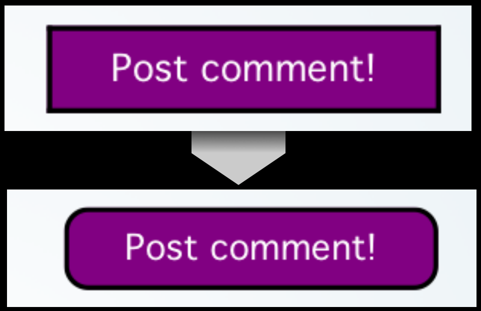
```
.button {
   width: 150px; height: 30px;
   border: 2px solid black;
   background-color: purple;
   color: white;
   text-align: center;
}
…
<div class=”button”>Post comment!</div>
```

# Making Image-Free Glossy Buttons



```
<div class=”button”>Post comment!</div>
```

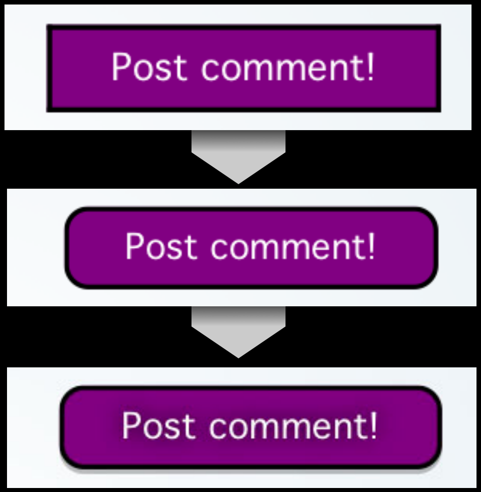
# Making Image-Free Glossy Buttons



```
<div class=”button”>Post comment!</div>
```

```
border-radius: 10px;
```

# Making Image-Free Glossy Buttons

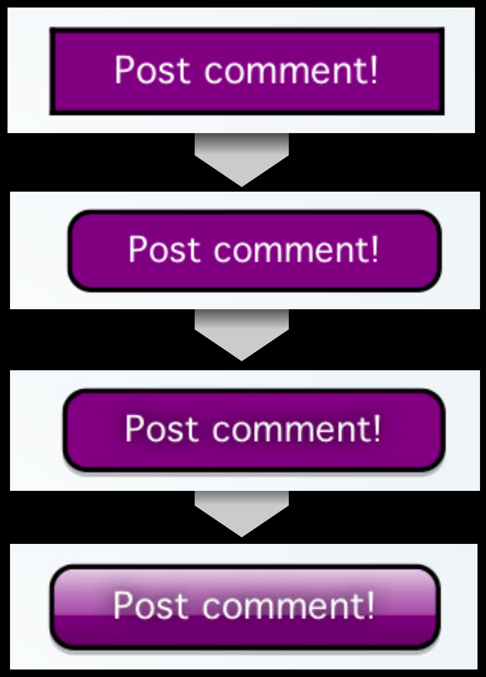


```
<div class=”button”>Post comment!</div>
```

```
border-radius: 10px;
```

```
-webkit-box-shadow: 0px 2px rgba(0, 0, 0, 0.25);
text-shadow: 0px 0px 8px black;
```

# Making Image-Free Glossy Buttons



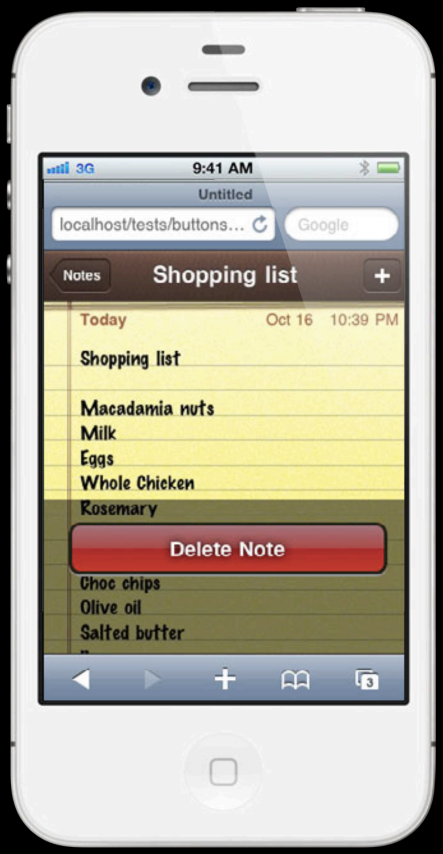
```
<div class=”button”>Post comment!</div>
```

```
border-radius: 10px;
```

```
-webkit-box-shadow: 0px 2px rgba(0, 0, 0, 0.25);
text-shadow: 0px 0px 8px black;
```

```
background-image: -webkit-linear-gradient(top,
        rgba(255, 255, 255, 0.8),
        rgba(255, 255, 255, 0.5) 30%,
        rgba(255, 255, 255, 0.8) 60%,
        transparent 60%,
        rgba(255, 255, 255, 0.2));
```

# Making Image-Free Glossy Buttons



Today Oct 16 10:39 PM

Shopping list

Macadamia nuts
Milk
Eggs
Whole Chicken
Rosemary
Choc chips
Olive oil
Salted butter

# Leveraging the Power of WebKit

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- Let text be text
- SVG

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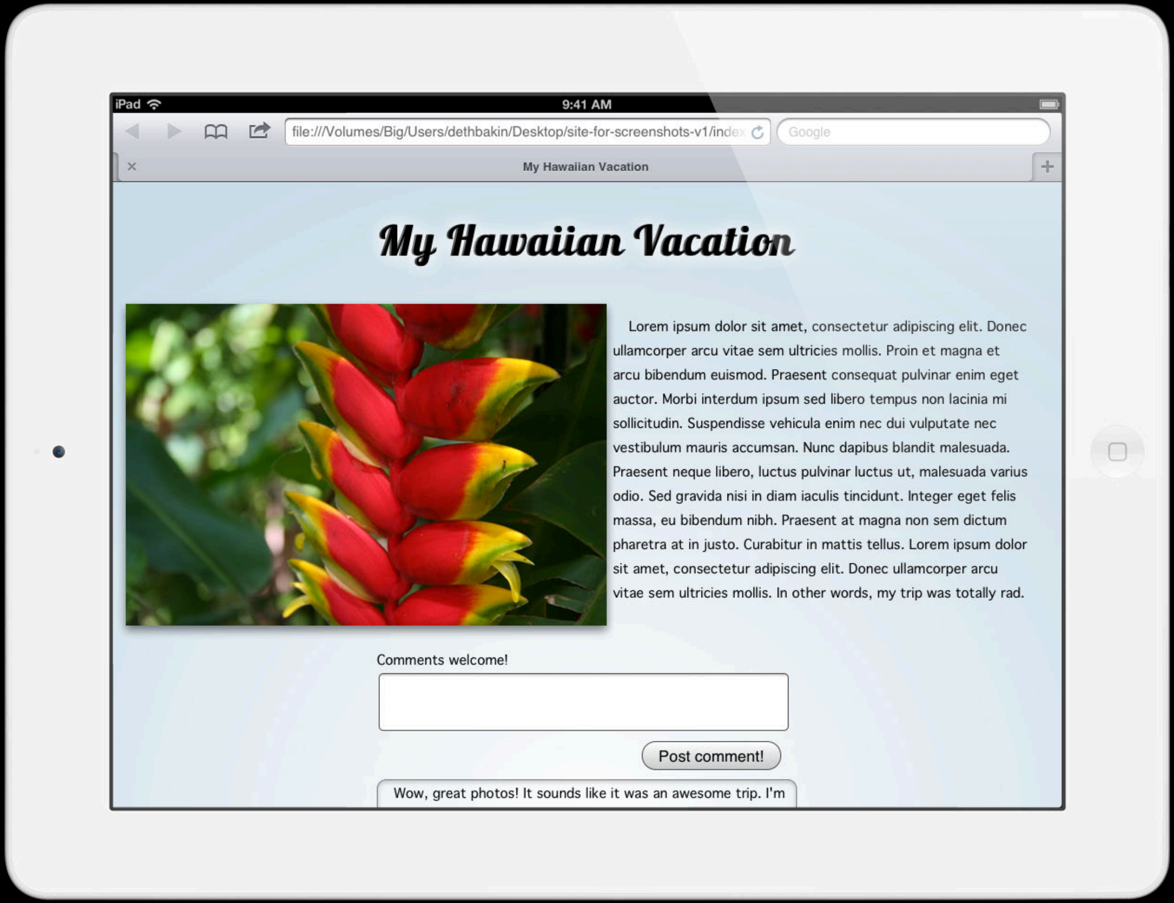
# Let Text Be Text



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## My Hawaiian Vacation

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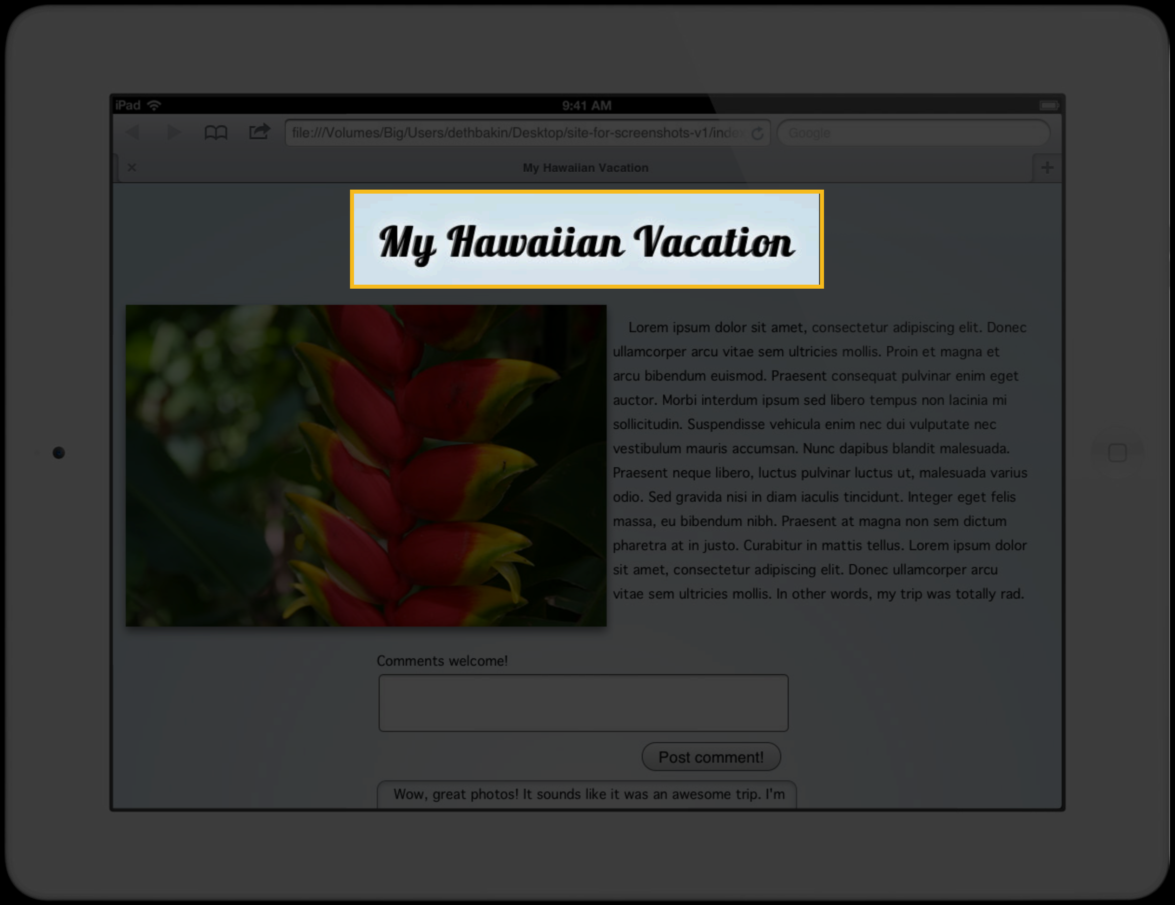
Comments welcome!

Wow, great photos! It sounds like it was an awesome trip. I'm

# Let Text Be Text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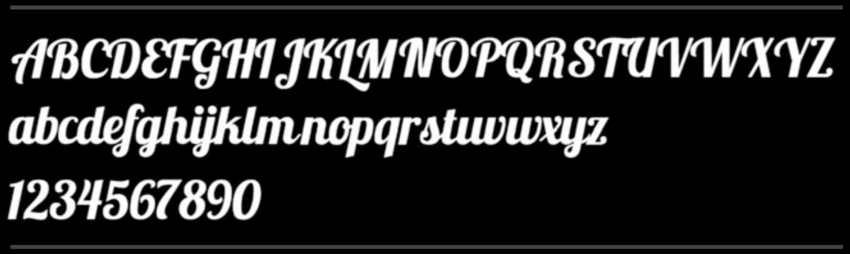
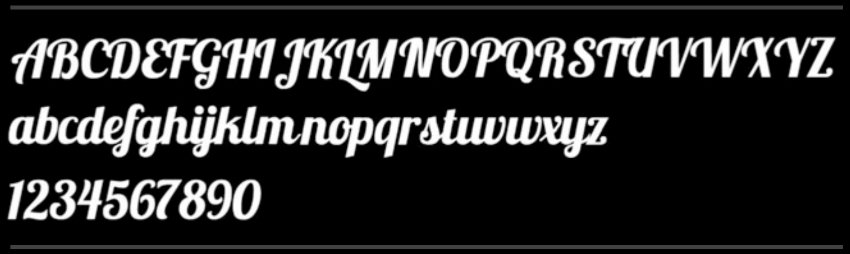


*ABCDEFGHIJKLMNOPQRSTUVWXYZ*
*abcdefghijklmnopqrstuvwxyz*
*1234567890*

# Let Text Be Text

```
@font-face {
  font-family: “Lobster”;
  src: url(“Lobster1.1.otf”);
}
```

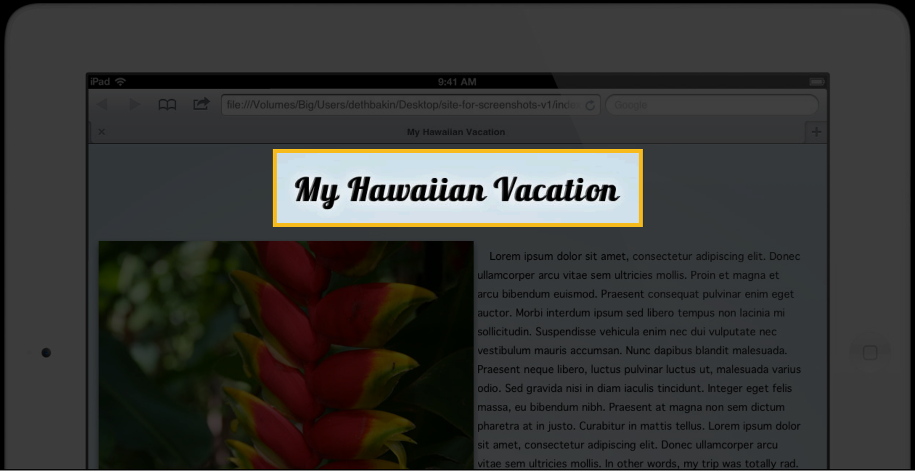


# Let Text Be Text

```
@font-face {
  font-family: “Lobster”;
  src: url(“Lobster1.1.otf”);
}
```

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

```
#content h1 {
  font-family: Lobster, Impact, cursive;
}
```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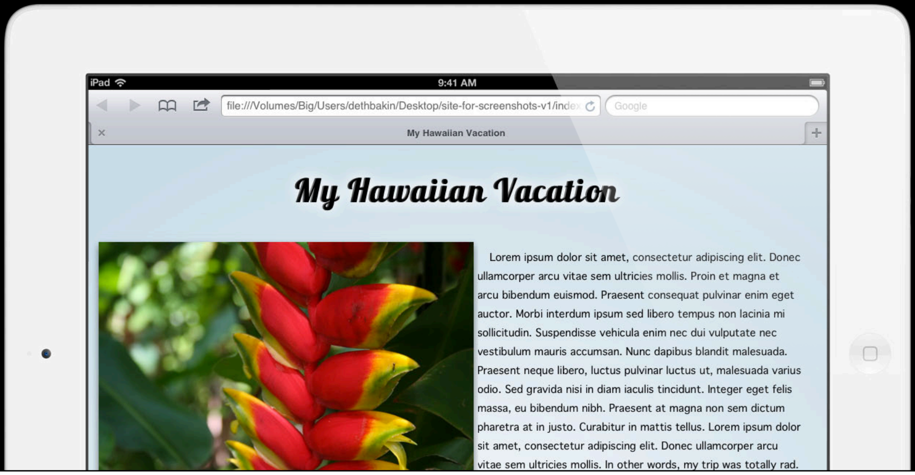

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Google
My Hawaiian Vacation

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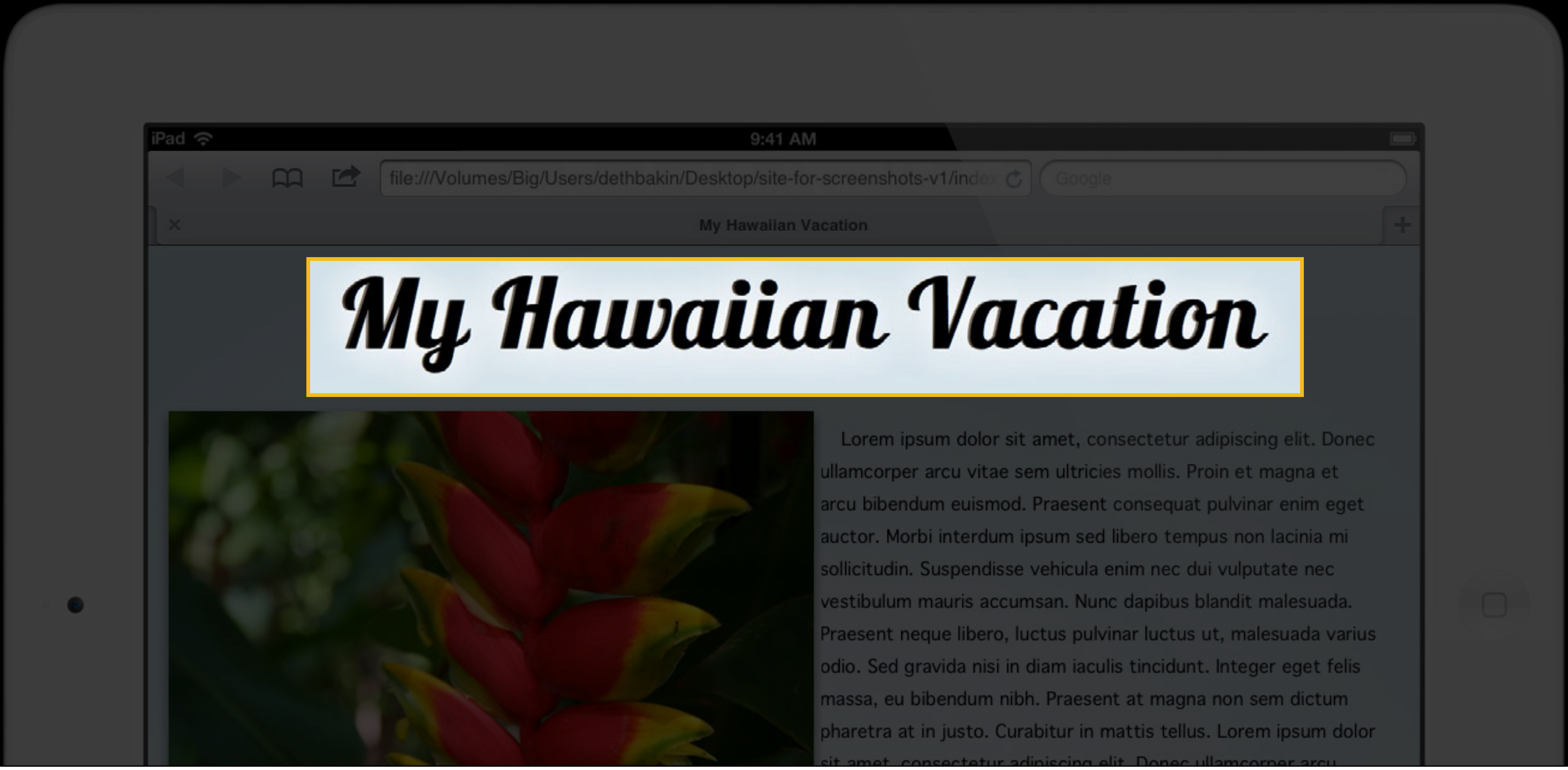
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# Leveraging the Power of WebKit

- Make image-free glossy buttons
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# *Demo*

**Dean!**
Safari & WebKit Engineer

# Leveraging the Power of WebKit

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# Summary

## Summary

- Most things look great, as is

# Summary

- Most things look great, as is
- Make your image pixels == display pixels

# Summary

- Most things look great, as is
- Make your image pixels == display pixels
- Always give your images a width and height

# Summary

- Most things look great, as is
- Make your image pixels == display pixels
- Always give your images a width and height
- Consider image alternatives!

# More Information

**Vicki Murley**
Safari Technologies Evangelist
vicki@apple.com

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

# Related Sessions

| | |
|---|---|
| Debugging UIWebViews and Websites on iOS | Marina<br>Tuesday 3:15PM |
| Optimizing Web Content in UIWebViews and Websites on iOS | Marina<br>Tuesday 4:30PM |
| HTML, CSS, and DOM for Book Authors | Nob Hill<br>Wednesday 3:15PM |
| Advanced Effects with HTML5 Media Technologies | Marina<br>Thursday 2:00PM |

# Labs

| | |
|---|---|
| Safari and Web Tools Lab | Safari & Web Lab<br>Wednesday 2:00PM |
| Web Content Optimization Lab | Safari & Web Lab<br>Wednesday 3:15PM |
| Safari and WebKit Open Lab | Safari & Web Lab<br>Thursday 3:15PM |

# Q&A

WWDC2012

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