

A pixel is not a pixel

Peter-Paul Koch

<http://quirksmode.org>

<http://twitter.com/ppk>

MoBeers, 10 April 2012

Example site

- <http://mobilism.nl/2012/>
- A proper responsive site that you can use on any device
- However, for most of the presentation I'm going to pretend it's *not* mobile-optimised

What we'll discuss

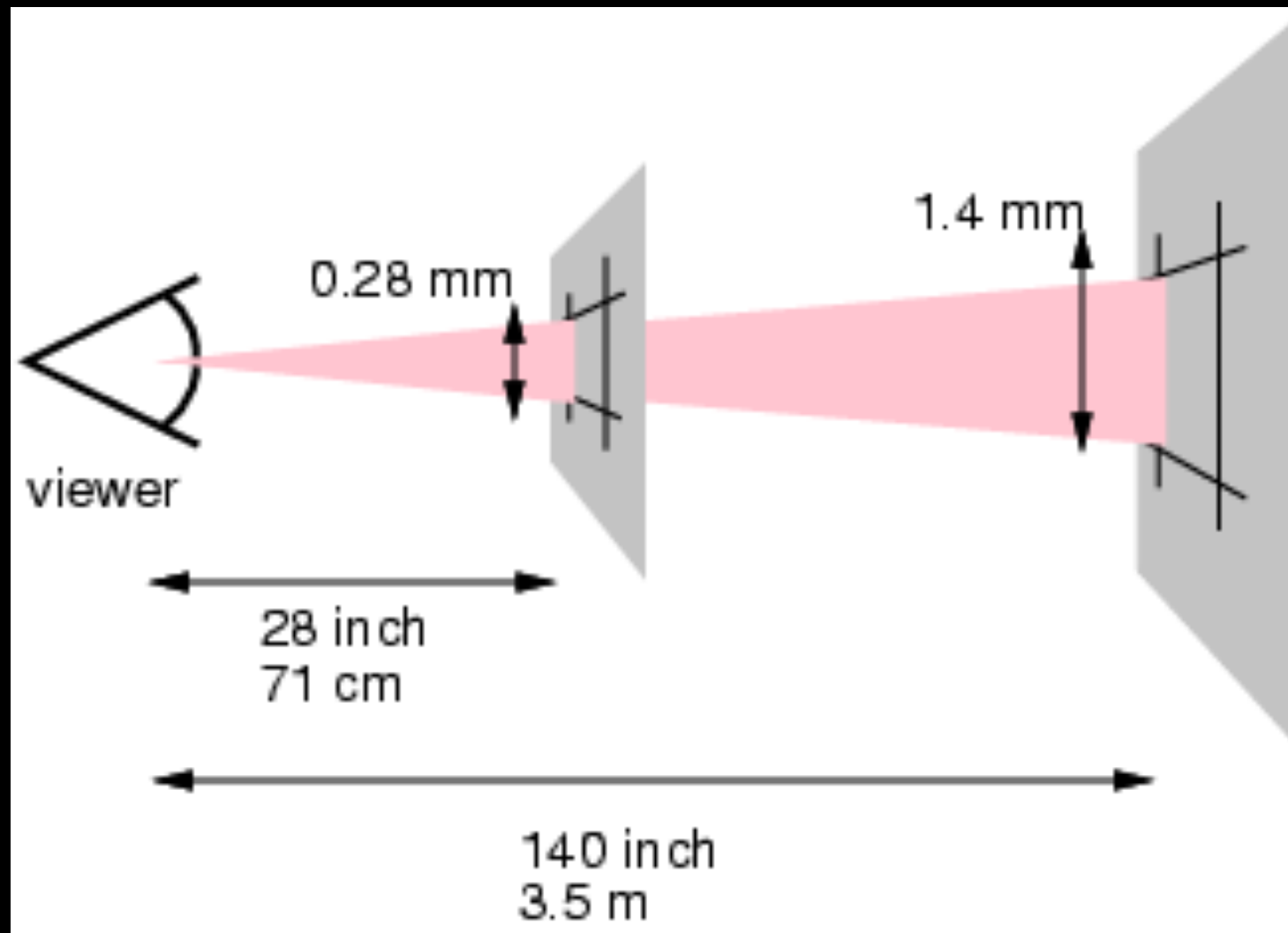
- Three kinds of pixels
- Two viewports
- Two kinds of zooming
- Five JavaScript property pairs
- Two media queries
- One meta viewport to rule them all

Pixels

Pixels according to W3C

“The reference pixel is the visual angle of one pixel on a device with a pixel density of 96dpi and a distance from the reader of an arm's length. For a nominal arm's length of 28 inches, the visual angle is therefore about 0.0213 degrees. For reading at arm's length, 1px thus corresponds to about 0.26 mm (1/96 inch).”

Pixels according to W3C



Source: <http://www.w3.org/TR/css3-values/#reference-pixel>

Pixels according to W3C

This is a monkey
Laughing at W3C



Pixels according to W3C

- So the pixel is a certain angle in your view
- which means you cannot zoom it
- An inch is defined as 96 pixels
- and it gets progressively worse from there

Pixels according to W3C

- You can't use min-height: 6mm and be certain that your element is at least 6 **real** mm high
- Zooming is not mentioned at all
- W3C's definition is useless and everybody ignores it
- Especially mobile browsers

A pixel is not a pixel

- CSS pixels
- Density-independent pixels
- Device pixels

None of these have anything to do with W3C's definition.

CSS pixels

- CSS pixels are the ones we use in declarations such as `width: 190px` or `padding-left: 20px`
- They are an abstract construct
- Their size may be increased or decreased



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190px
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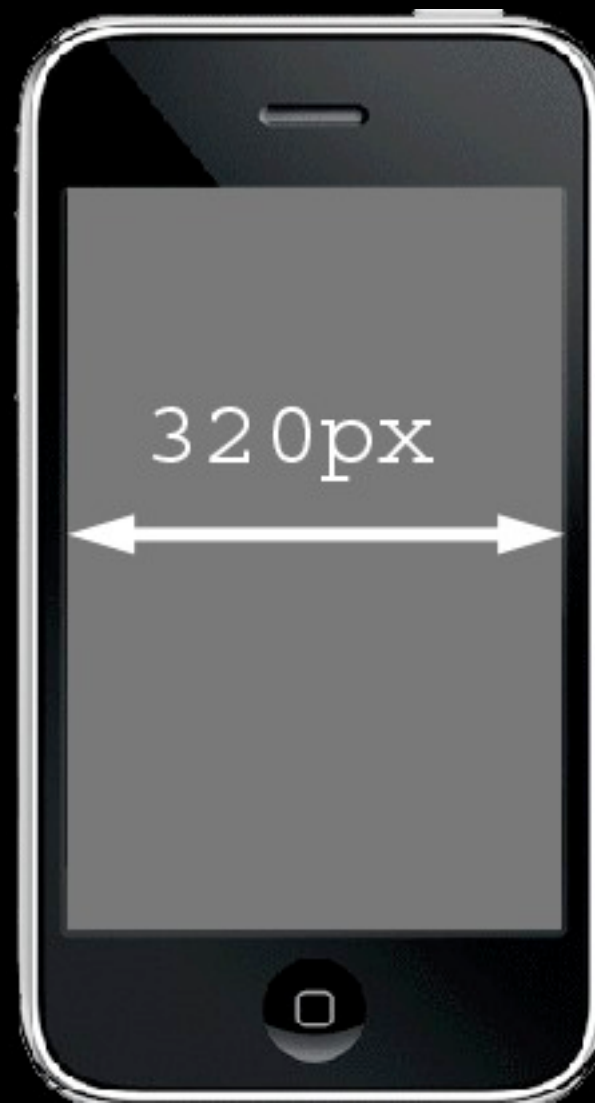
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Device pixels

- Device pixels are the physical pixels on the device
- There's a fixed amount of them that depends on the device

Device pixels



Device pixels

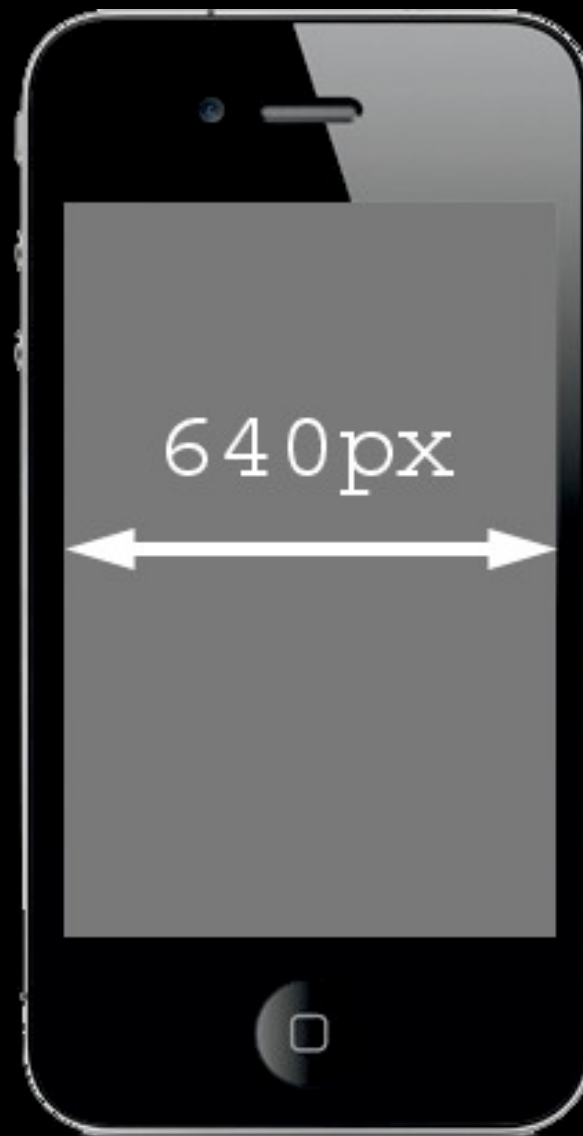
```
<meta name="viewport"  
      content="width = device-width">
```

- What is the device width?
- The number of device pixels
- So on the iPhone, your site is restricted to 320px

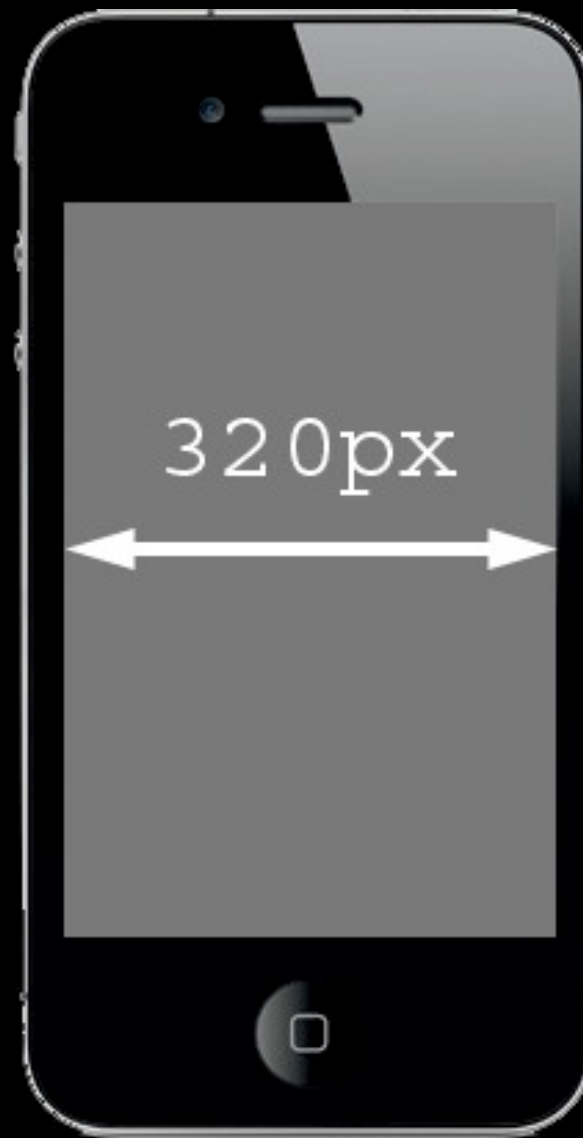
Device pixels

- But ...
- Devices get higher and higher pixel densities
- In theory this would mean that the meta viewport width also goes up
- But that would break sites

Device pixels



Density-independent pixels



Density-independent pixels

- Thus device vendors created density-independent pixels (dips)
- They are another abstraction layer
- The number of dips is equal to the number of CSS pixels that is optimal for viewing a website on the device at 100% zoom
- For the iPhone that's 320px

Density-independent pixels

```
<meta name="viewport"  
  content="width = device-width">
```

- What is the device width?
- The number of dips
- So on the iPhone, your site is still restricted to 320px
- even on a Retina display

What do we need?

- CSS pixels
- Density-independent pixels
- Device pixels

What do we need?

- CSS pixels
- Density-independent pixels
- Device pixels

Viewports

Viewports

- The viewport is the total amount of space available for CSS layouts
- On the desktop it's equal to the browser window
- The `<html>` element has an implicit width: 100% and spans the entire viewport



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Viewports

- On mobile it's quite a bit more complicated
- If the (narrow) browser window were to be the viewport, many sites would be squeezed to death
- And mobile browsers must render all sites correctly, even if they haven't been mobile-optimized



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Viewports

- That's why the mobile browser vendors have split the viewport into two:
- The layout viewport, the viewport that CSS declarations such as padding-left: 34% use,



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Viewports

- That's why the mobile browser vendors have split the viewport into two:
- The layout viewport, the viewport that CSS declarations such as padding-left: 34% use,
- and the visual viewport, which is the part of the page the user is currently seeing
- Both are measured in CSS pixels



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Viewports

- Initially most browsers make the visual viewport equal to the layout viewport
- by zooming the page out as much as possible

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Viewports

- Initially most browsers make the visual viewport equal to the layout viewport
- by zooming the page out as much as possible
- Although the page is unreadable, the user can at least decide which part he'd like to concentrate on and zoom in on that part

Zooming

Zooming

- On the desktop the viewport becomes less wide and the CSS pixels become larger.
- The same amount of device pixels now contains less CSS pixels, after all.
- So padding-left: 34% is recalculated,
- and width: 190px now covers more device pixels



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Zooming

- On mobile the visual viewport becomes less wide, but the layout viewport remains static. Thus CSS declarations are not re-computed.
- The visual viewport now contains less CSS pixels.
- The user sees less of the complete site.



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JavaScript properties

JavaScript properties

`screen.width` and `screen.height`

- The width and height of the screen
- In device pixels (or dips)
- Totally useless. Don't bother reading it out

JavaScript properties

`document.documentElement.clientWidth` and
`document.documentElement.clientHeight`

- The width and height of the layout viewport
- In CSS pixels
- Useful, though mostly because of media queries

JavaScript properties

`window.innerWidth` and `window.innerHeight`

- The width and height of the visual viewport
- In CSS pixels
- Extremely important. It tells you how much the user is currently seeing

JavaScript properties

`document.documentElement.offsetWidth` and
`document.documentElement.offsetHeight`

- The width and height of the `<html>` element
- In CSS pixels
- Very occasionally useful

JavaScript properties

`window.pageXOffset` and `window.pageYOffset`

- The current scrolling offset
- In CSS pixels
- Useful. Works just as on desktop

JavaScript properties

- System pioneered by Nokia and BlackBerry
- Picked up by Apple
- Android supports it only from 3 on
- IE9 on Windows Phone does not support it
- But otherwise browser compatibility is quite decent

JavaScript properties

`document.documentElement.clientWidth /
window.innerWidth`

- This gives the current zoom level
- You're not interested in the zoom level, though
- You want to know how much the user is currently seeing
- The visual viewport, in other words

Media queries

Meta viewport

```
@media all and (max-width: 600px) {  
  .sidebar {  
    float: none;  
  }  
}
```

Media queries

- There are two important media queries:
- width (min-width and max-width)
- device-width (min-device-width and max-device-width)
- width is the one you want

Media queries - device-width

- device-width gives the width of the device screen
- in device pixels
- Equal to screen.width



Media queries - width

- width gives the width of the viewport
- in CSS pixels
- (There are a few zooming problems on desktop, though)
- Equal to
`document.documentElement.clientWidth`



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Media queries - device-width

- device-width gives the width of the device screen
- in device pixels or dips
- Equal to screen.width
- On mobile the screen is far smaller than on desktop, but that doesn't matter



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Media queries - width

- width gives the width of the viewport
- in CSS pixels
- Equal to
`document.documentElement.clientWidth`
- On mobile this means the layout viewport



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Media queries

- width is the media query you want
- but at first sight it seems to be totally useless on mobile
- Usually we don't care about the width of the layout viewport
- We need to treat one more element, though.

Meta
viewport

Meta viewport

```
<meta name="viewport"  
      content="width=device-width">
```

Meta viewport

```
@viewport {  
    width: device-width;  
}
```

Only Opera for now

Meta viewport

```
<meta name="viewport"  
      content="width = device-width">
```

- The meta viewport tag tells the browser to set the size of the layout viewport
- You can give a pixel value
- or device-width, which means the screen size in dips (or device pixels)



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Meta viewport

```
<meta name="viewport"  
  content="width = device-width">
```

- There is little reason to use other values than device-width
- And because you tell the layout viewport to become as wide as the device
- the width media query now contains useful data

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Media queries

- In theory the device-width and width media queries would now return the same values
- but it uses device pixels or dips, which is not what you want
- This is a frighteningly complicated area
- Don't go there
- Use width

Responsive design

- So the trick for creating a responsive design
- is using `<meta name="viewport" content="width=device-width" />`
- in combination with width media queries
- You probably already knew that
- but now you also understand why

Thank you

I'll put these slides online

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