Viewports

Peter-Paul Koch
http://quirksmode.org
http://twitter.com/ppk
jQuery EU, 28 February 2014

or: Why responsive design works

Peter-Paul Koch
http://quirksmode.org
http://twitter.com/ppk
jQuery EU, 28 February 2014

By the way

I know nothing about jQuery

Pixels

A pixel is not a pixel

- CSS pixels
- Device pixels

You already know what they are. You just don't realise it.

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 is increased or decreased when the user zooms

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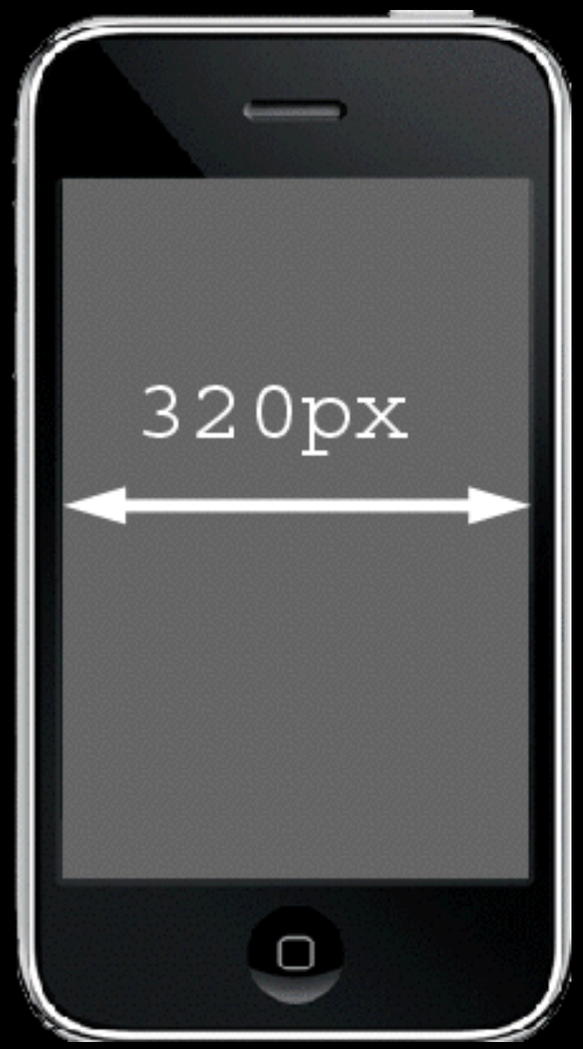
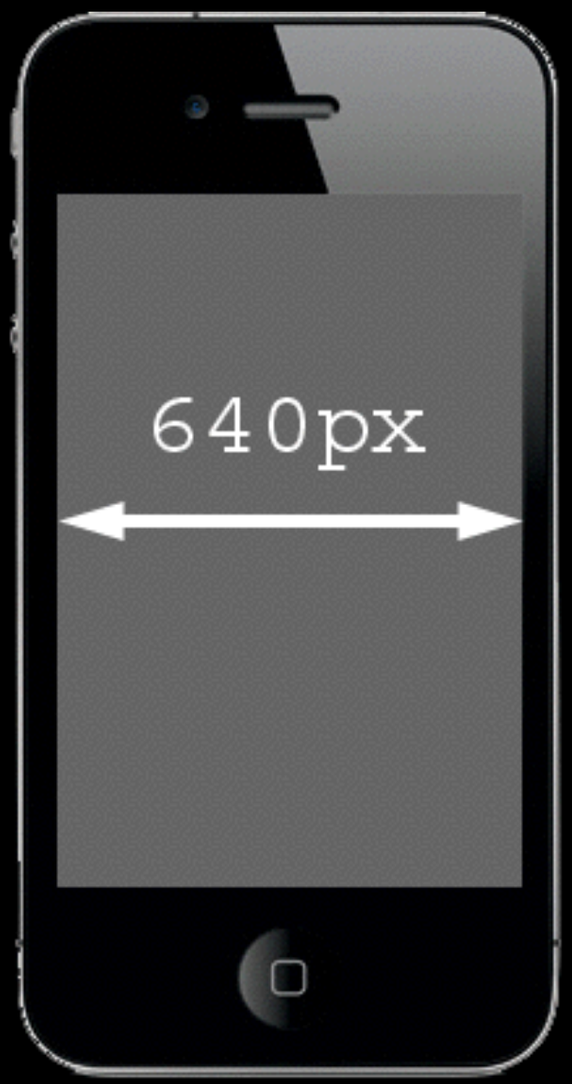
Device pixels

- 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



What kind of pixels?

In general, almost all pixels you use in your code will be CSS pixels.

The only exception is screen.width

… but screen.width is a serious problem that we'll study later

2 Viewports

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34%

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Viewports

- The 34% is calculated relative to its container: the <body>.
- Every block-level element, including <html> and <body>, has an implicit width: 100%.
- So we get 34% of the <body> width of 100%.
- 100% of what? Of the <html> width, which is again 100%.

Viewports

- The <html> element's width is calculated relative to the viewport.
- Also called the initial containing block.
- On desktop it's equal to the browser window width.
- On mobile it's more complicated.

Viewports

- When you zoom in, you enlarge the CSS pixels
- and as a result less of them fit in the browser screen
- Thus the viewport becomes smaller

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viewport (about 720px)

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viewport (about 580px)

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Viewports

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

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Viewports

- That's why the mobile browser vendors changed the rules:
- By default, the viewport is 800-1024px wide (depending on the browser)
- We call this the *layout viewport*
- Responsive design is the art of overriding the default width of the layout viewport

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Viewports

- But this layout viewport is now much wider than the mobile screen
- Therefore we need a separate viewport for the actual window width
- We call this the *visual viewport*

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JavaScript - layout viewport

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

Works (almost) everywhere.

JavaScript - visual viewport

`window.innerWidth`

`window.innerHeight`

Doesn't work in Android 2, Opera Mini, and UC 8.

Viewports

So the desktop viewport has been split into two:

- layout viewport
- visual viewport

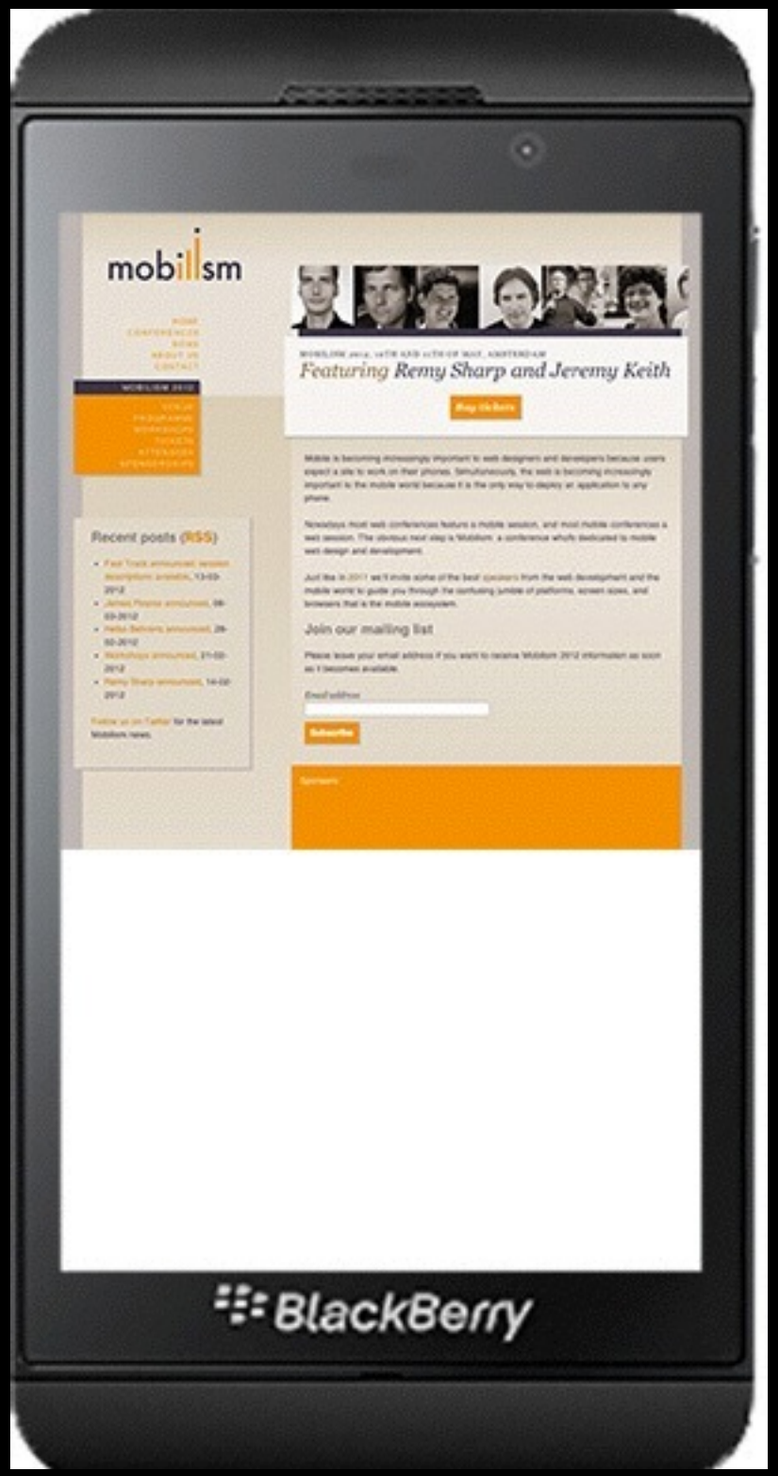
Viewports

So the desktop viewport has been split into two:

- layout viewport
- visual viewport

But there's a third mobile viewport that has no equivalent on the desktop:

- ideal viewport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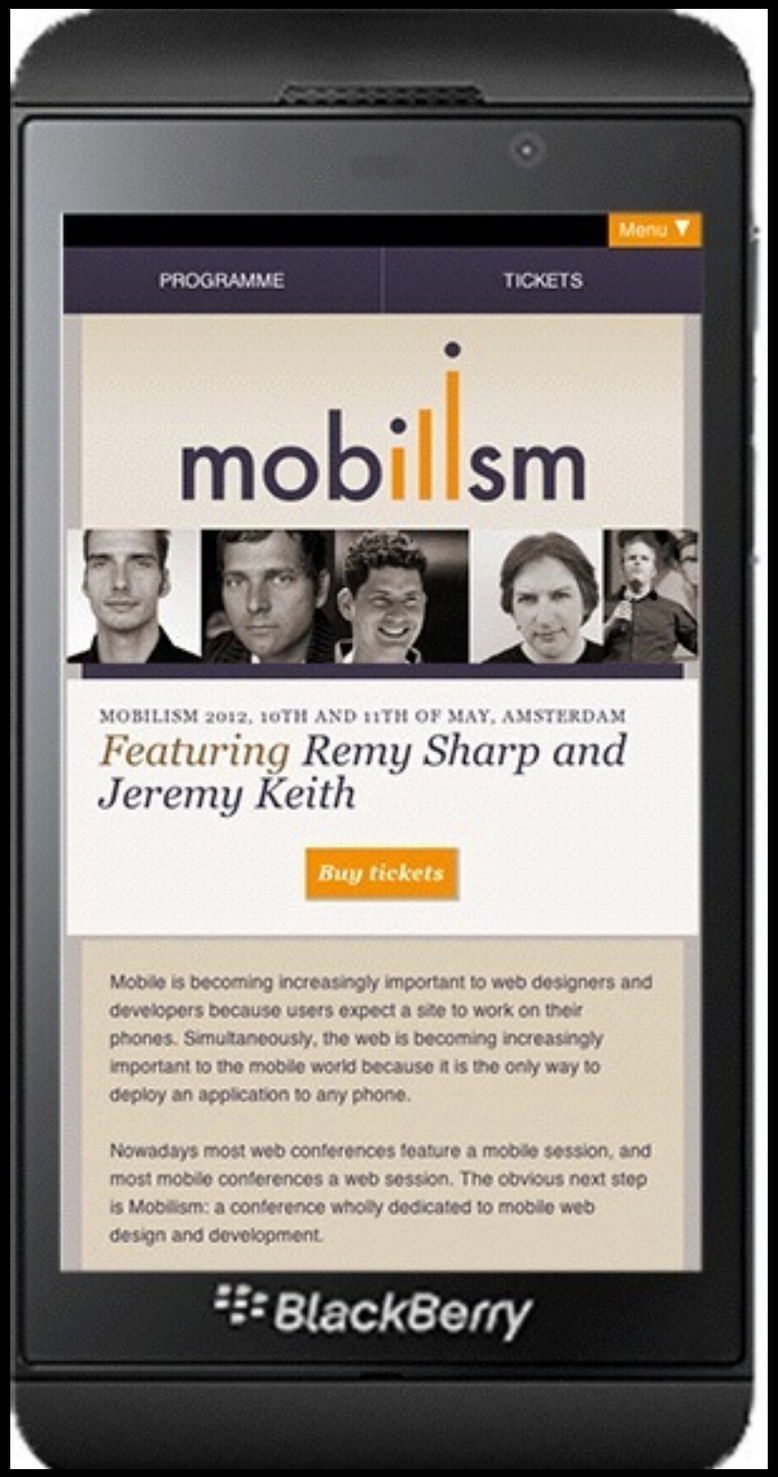
Ideal viewport

- What mobile browser vendors want is to give the site the perfect width for the device
- so that zooming and panning are not necessary
- and the user can read the text
- Enter the ideal viewport, which has the ideal size for the device
- Essentially a width and a height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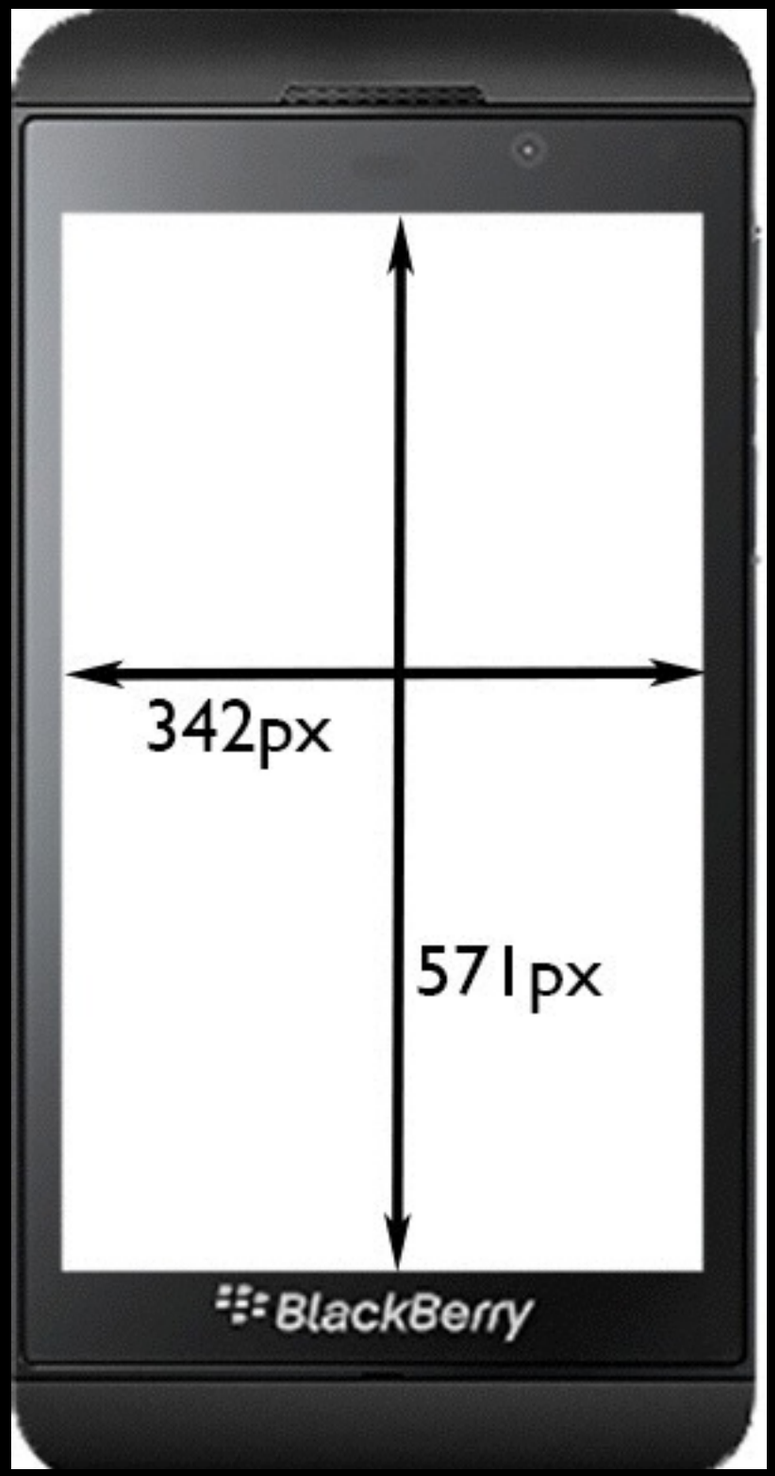
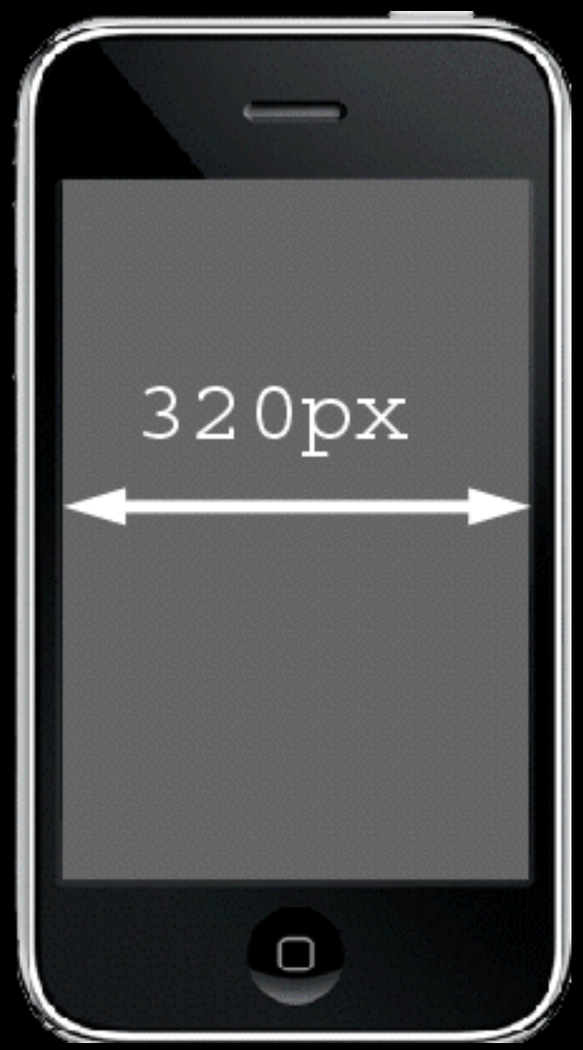

342px
571px
BlackBerry

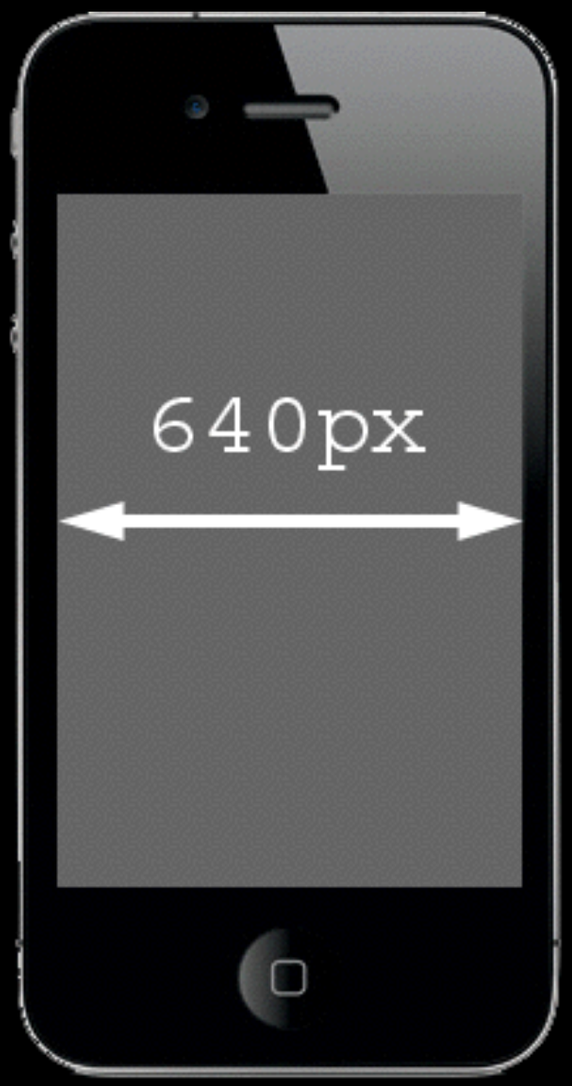
Ideal viewport

- There are no wrong dimensions for the ideal viewport.
- They're what they need to be for the device they run on.
- (Admittedly, there are weird values. But they're not wrong.)

Ideal viewport: 320px



Ideal viewport: 320px



JavaScript - ideal viewport

`screen.width`

`screen.height`

UNRELIABLE!

Some browsers define screen.width and screen.height as the dimensions of the ideal viewport

while others define them as the number of device pixels

Meta viewport

Meta viewport

- In order to create a responsive design we must set the layout viewport dimensions to the ideal viewport dimensions.
- How?

Meta viewport

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

Meta viewport

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

- By default, the layout viewport is between 800 and 1024 pixels wide.
- The meta viewport tag sets the width of the layout viewport to a value of your choice.
- You can use a pixel value (width=400)
- or you can use the device-width keyword to set it to the ideal viewport

Meta viewport

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

- I’m assuming this does not come as a surprise
- But …
- did you know that the following does exactly the same?

Meta viewport

```
<meta name=”viewport”
  content=”initial-scale = 1”>
```

- In theory, initial-scale gives the initial zoom level (where 1 = 100%)
- 100% of WHAT?
- Of the ideal viewport
- In practice, it also sets the layout viewport dimensions to the ideal viewport

Meta viewport

```
<meta name=”viewport”
  content=”initial-scale = 2”>
```

- In theory, initial-scale = 2 tells the browser to zoom in to 200%.
- It does so, but many browsers set the layout viewport to half the ideal viewport.
- Why half? Because zooming to 200% means that only half as many CSS pixels fit the visual viewport

Meta viewport

```
<meta name=”viewport”
  content=”initial-scale = 1”>
```

- And yes, this is weird.
- I wonder what Apple was smoking when it set these rules.

Let’s mess things up

Meta viewport

```
<meta name=”viewport”
  content=”width = 400,initial-scale = 1”>
```

- Now the browser gets conflicting orders.
- Set the layout viewport width to 400px.
- No, wait, set it to the ideal viewport width (and also set the zoom to 100%).
- Browsers react by taking the highest value

Min-width viewport

```
<meta name=”viewport”
  content=”width = 400,initial-scale = 1”>
```

- “Set the layout viewport width to either 400px, or the ideal viewport width, whichever is larger”
- If the device orientation changes, this is recalculated.
- As a result, the layout viewport now has a minimum width of 400.
- Is this useful? Dunno.

Safari workaround

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

- Safari always takes the portrait width (320 on iPhone, 768 on iPad).
- Sometimes this is what you want; at other times it isn’t.
- How to solve this?

Safari workaround

```
<meta name=”viewport”
  content=”initial-scale = 1”>
```

- Now Safari does it right. In portrait mode it’s the ideal portrait width; in landscape mode it’s the ideal landscape width.
- All other browsers do the same.
- Except for IE, which has exactly the opposite bug.

Safari workaround

```
<meta name="viewport"
content="width=device-width,initial-scale=1">
```

- Use both device-width and initial-scale.
- initial-scale works in Safari
- device-width works in IE
- and both work in all other browsers

Perfect meta viewport

```
<meta name=”viewport”
 content=”
    width = device-width,
    initial-scale = 1”>
```

4 Media queries

Media queries

```
@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

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Media queries - device-width

- device-width media query is always equal to screen.width
- but the problem is screen.width may have two meanings, depending on the browser:
- 1) ideal viewport
- 2) number of device pixels

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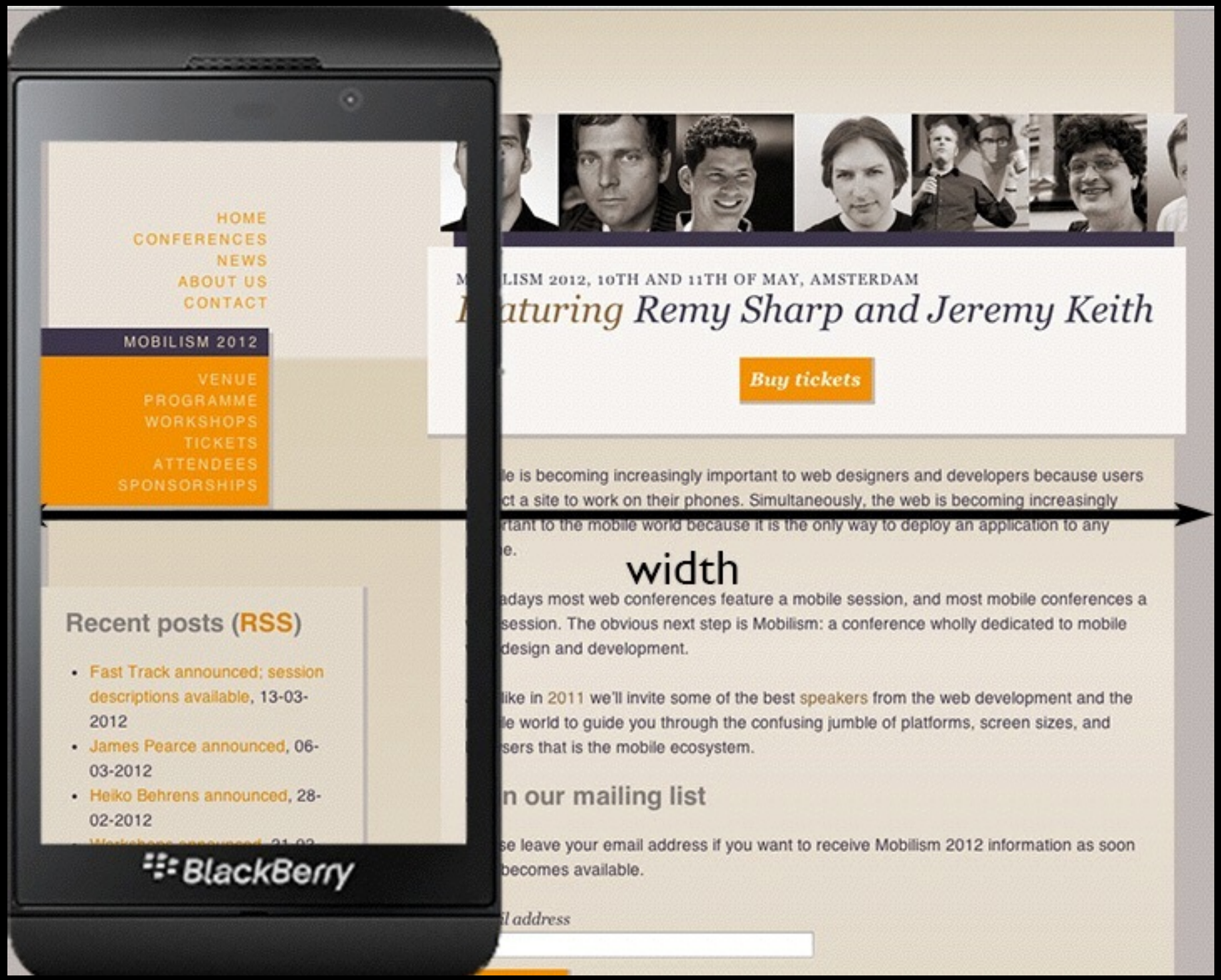
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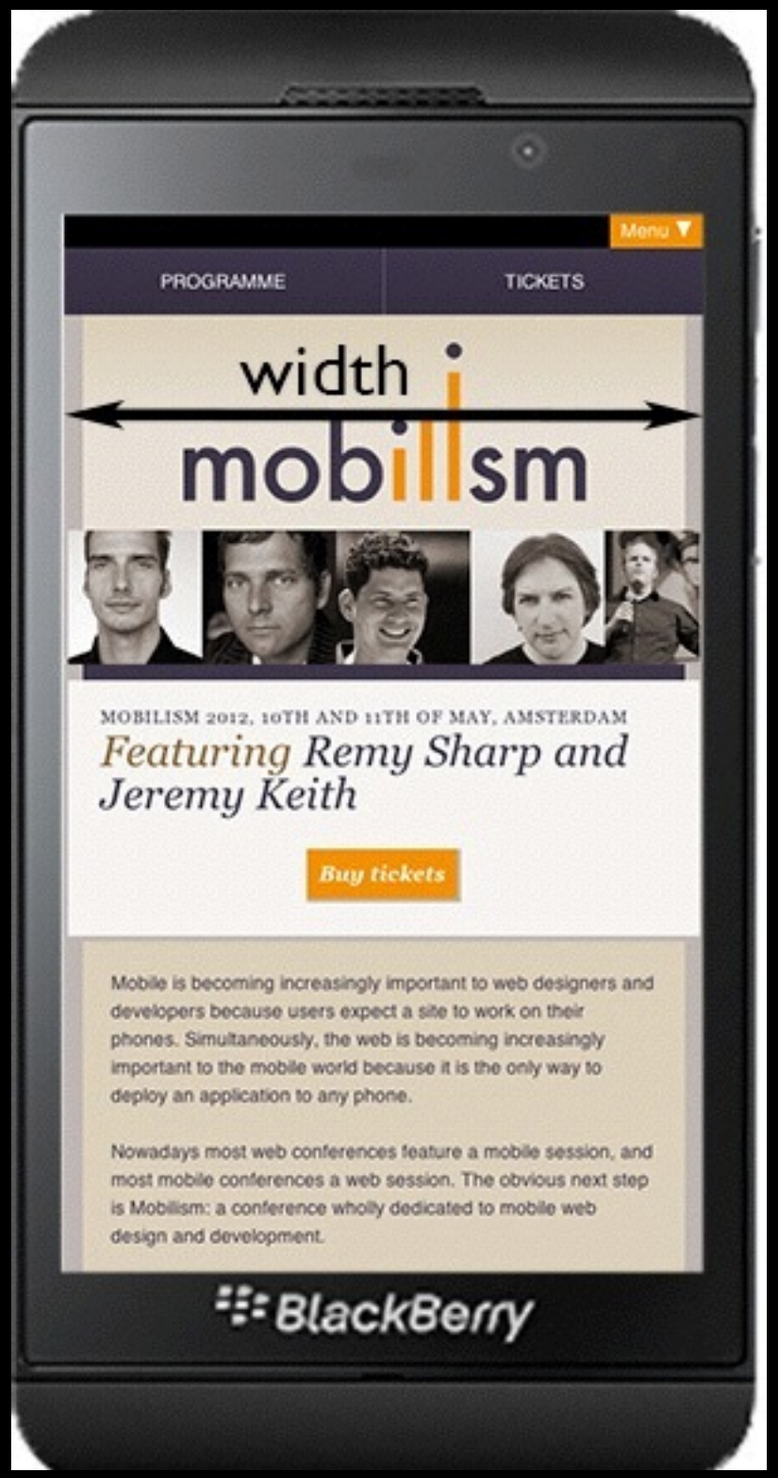
Media queries - width

- width gives the width of the layout viewport
- This is what you want to know
- Works always and everywhere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Responsive design

- Set the layout viewport width to the ideal viewport width (or, rarely, another value)
- Use the width media query to figure out how wide the layout viewport is
- Adjust your CSS to the width you found
- That's how responsive design works. You already knew that, but now you understand *why* it works.

Media queries

- Always use min- or max-width.
- Thus you define a breakpoint: “these styles are valid for all widths equal to or less/ greater than X”
- Exact widths, such as 320, are going to misfire in a lot of browsers. (Remember the 342px of the Z10.)
- There’s more than just the iPhone.

Responsive design

```
<meta name=”viewport”
content=”width=device-width,initial-scale=1”>
```

```
@media all and (max-width: 600px) {


}
```

Responsive design

- But we'd like to make our design respond to the physical width of the device, too.
- For instance, by setting a min-width: 25mm on our navigation items
- Tough luck
- You can't

5 CSS units

CSS units

- width: 25mm does not mean the element is 25 real-life millimeters wide
- Instead, it means 94.488 pixels
- cm, mm, in, pica, and pt are in a sense fake units, because they do not correspond to the real world

CSS units

- 1 inch is **defined** as 96 CSS pixels
- If you zoom, the CSS pixels become larger,
- and your inches become larger, too.
- It has nothing to do with the real world.

CSS units

- 1 inch is defined as 96 CSS pixels
- 1 inch is defined as 2.54 cm
- 1 cm is defined as 10 mm
- 1 inch is defined as 72 points
- 1 pica is defined as 12 points

CSS units

- I used to think this is a bad idea
- But I changed my mind
- If an element would have a width of 25 real-world millimeters
- the browser would have to recalculate its width every single time the user zooms
- Eats too much battery life and processor time

CSS units

- But surely resolution tells us something useful.
- …
- doesn’t it?

6 Resolution

Resolution

```
if (window.devicePixelRatio >= 2)


@media all and (
   (-webkit-min-device-pixel-ratio: 2),
   (min-resolution: 192dpi)
)
```

Resolution

- What is device pixel ratio?
- It's the ratio of screen size in device pixels and ideal viewport size

iPhone 3G

- device pixels: 320
- ideal viewport: 320
- Therefore the devicePixelRatio is 1

iPhone 4S

- device pixels: 640
- ideal viewport: 320
- Therefore the devicePixelRatio is 2

Samsung Galaxy Pocket

- device pixels: 240
- ideal viewport: 320
- Therefore the devicePixelRatio is 0.75

BlackBerry Z10

- device pixels: 768
- ideal viewport: 342
- Therefore the devicePixelRatio is 2.2456140350877192
- (Weird, but not wrong)

Resolution units

- dppx is dots per pixel
- where “dot” is an ideal viewport pixel
- and “pixel” a hardware device pixel.
- And since 1 inch is defined as 96px,
- 96dpi === 1dppx by definition
- So resolution is not going to help here.
- Works for deciding whether to send over those high-res retina images, but that’s about it

7 Question time

Thank you

I'll put these slides online

Questions?

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jQuery EU, 28 February 2014