# Viewports

Peter-Paul Koch
http://quirksmode.org
http://twitter.com/ppk
DevReach, 13 November 2017

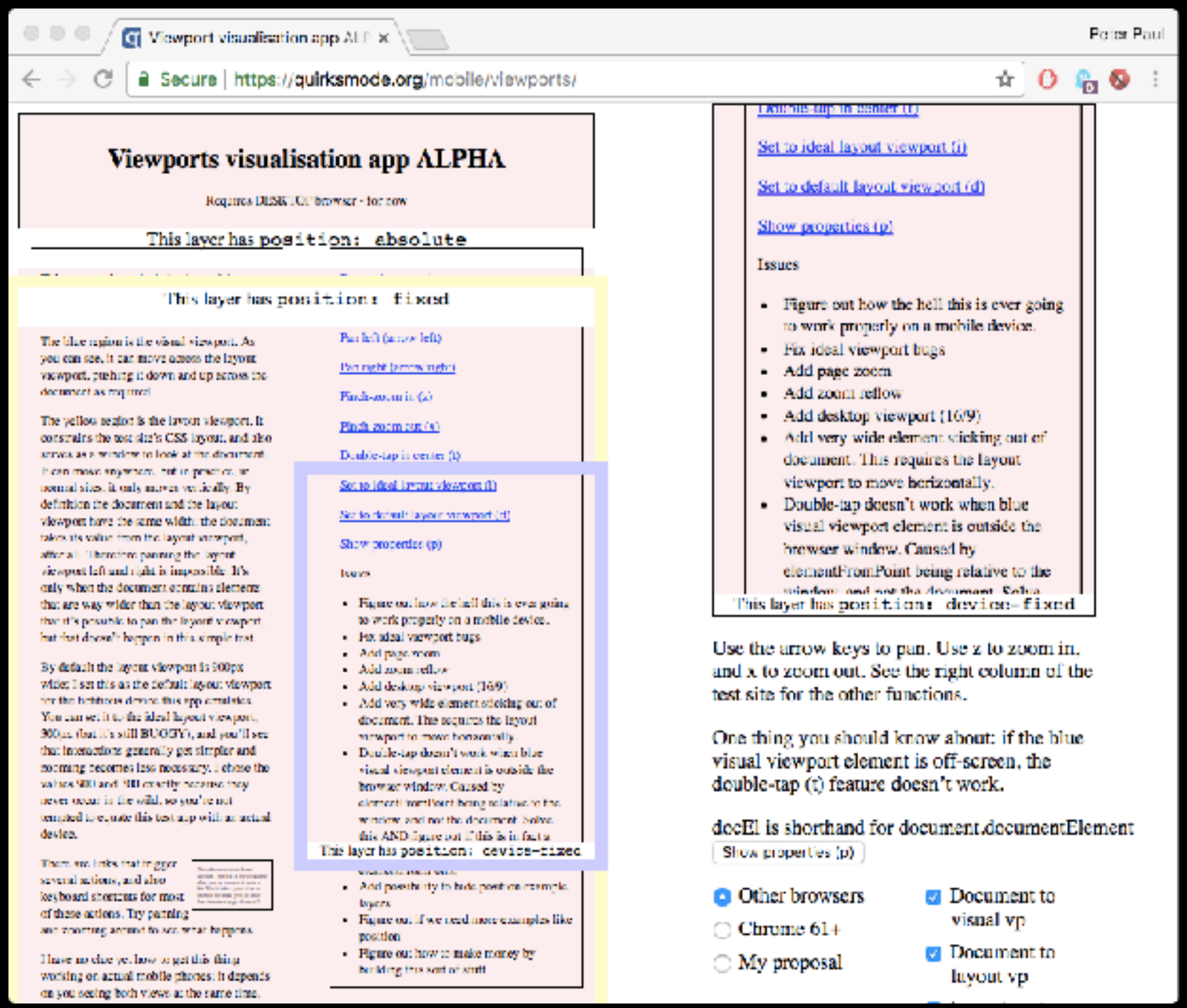
# or: Why responsive design works

Peter-Paul Koch
http://quirksmode.org
http://twitter.com/ppk
DevReach, 13 November 2017

I made something for you

# Viewport visualisation

https://quirksmode.org/mobile/viewports/



# 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 increases or decreases when the user zooms

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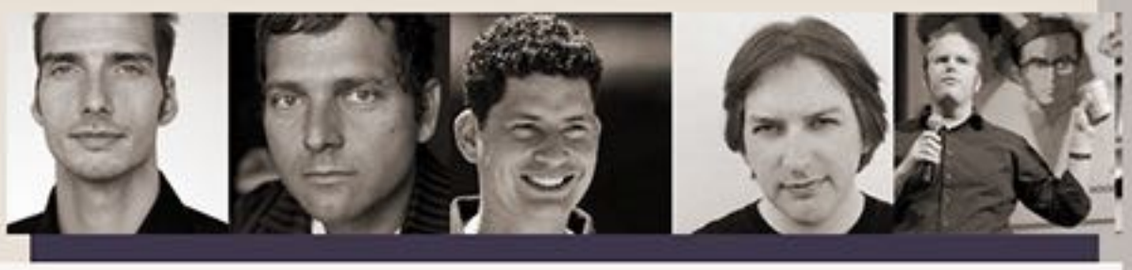



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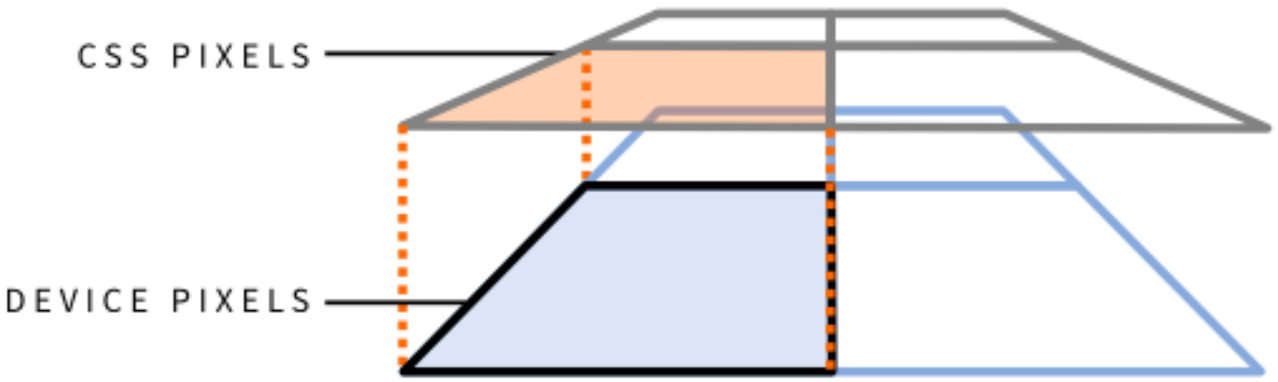
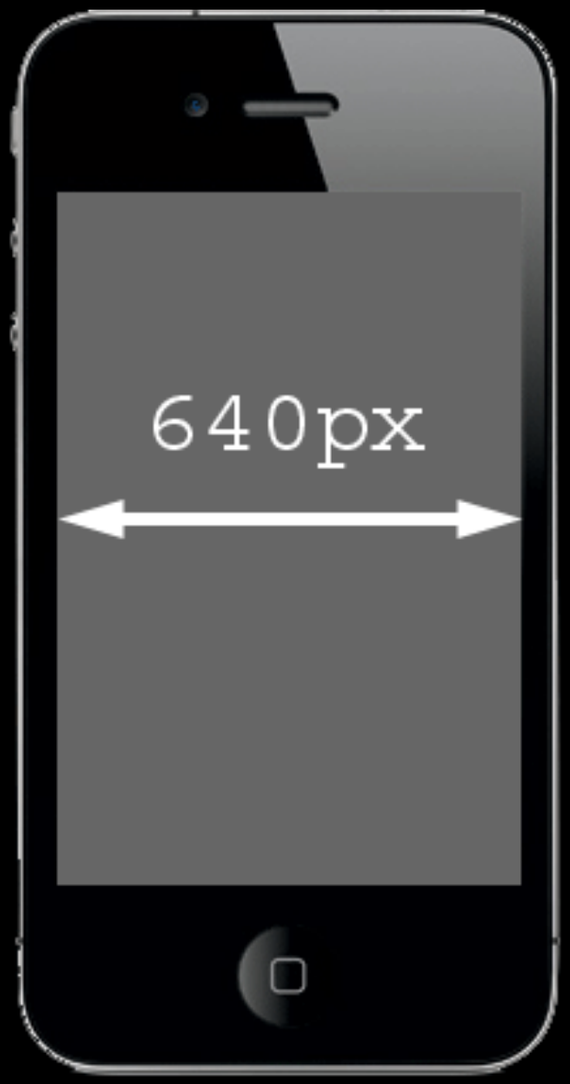
# Device pixels

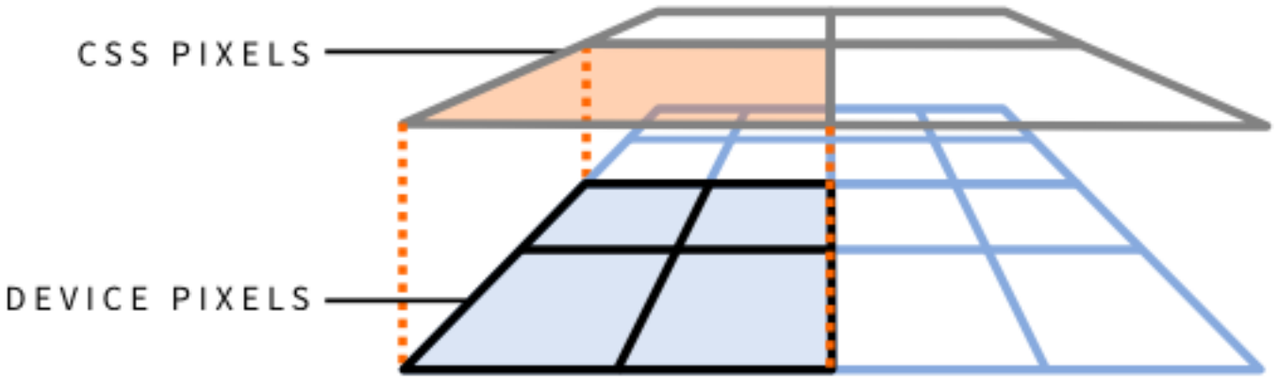
- Device pixels are the physical pixels on the device
- There's a fixed amount of them that depends on the device

# Device pixels


CSS PIXELS
DEVICE PIXELS

# Device pixels




CSS 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 page-zoom in with Ctrl/Cmd +, you enlarge the CSS pixels
- and as a result fewer of them fit on the browser screen
- Thus the viewport becomes smaller

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viewport (about 720px)

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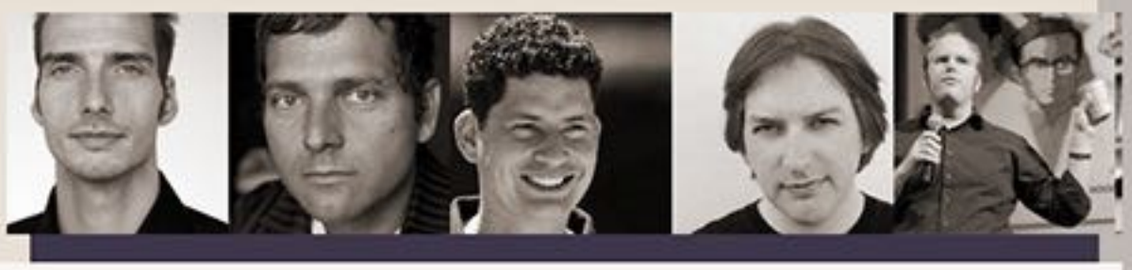

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viewport (about 580px)

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- 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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34%

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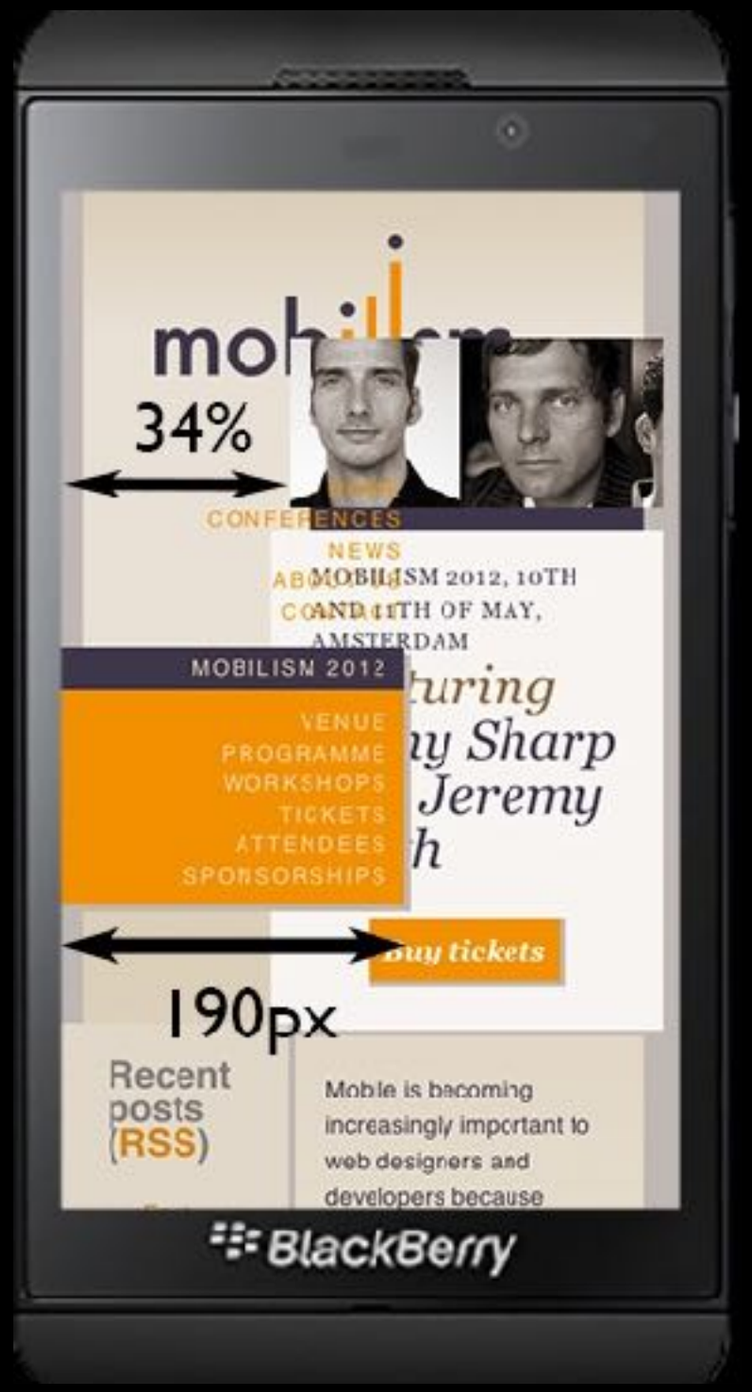
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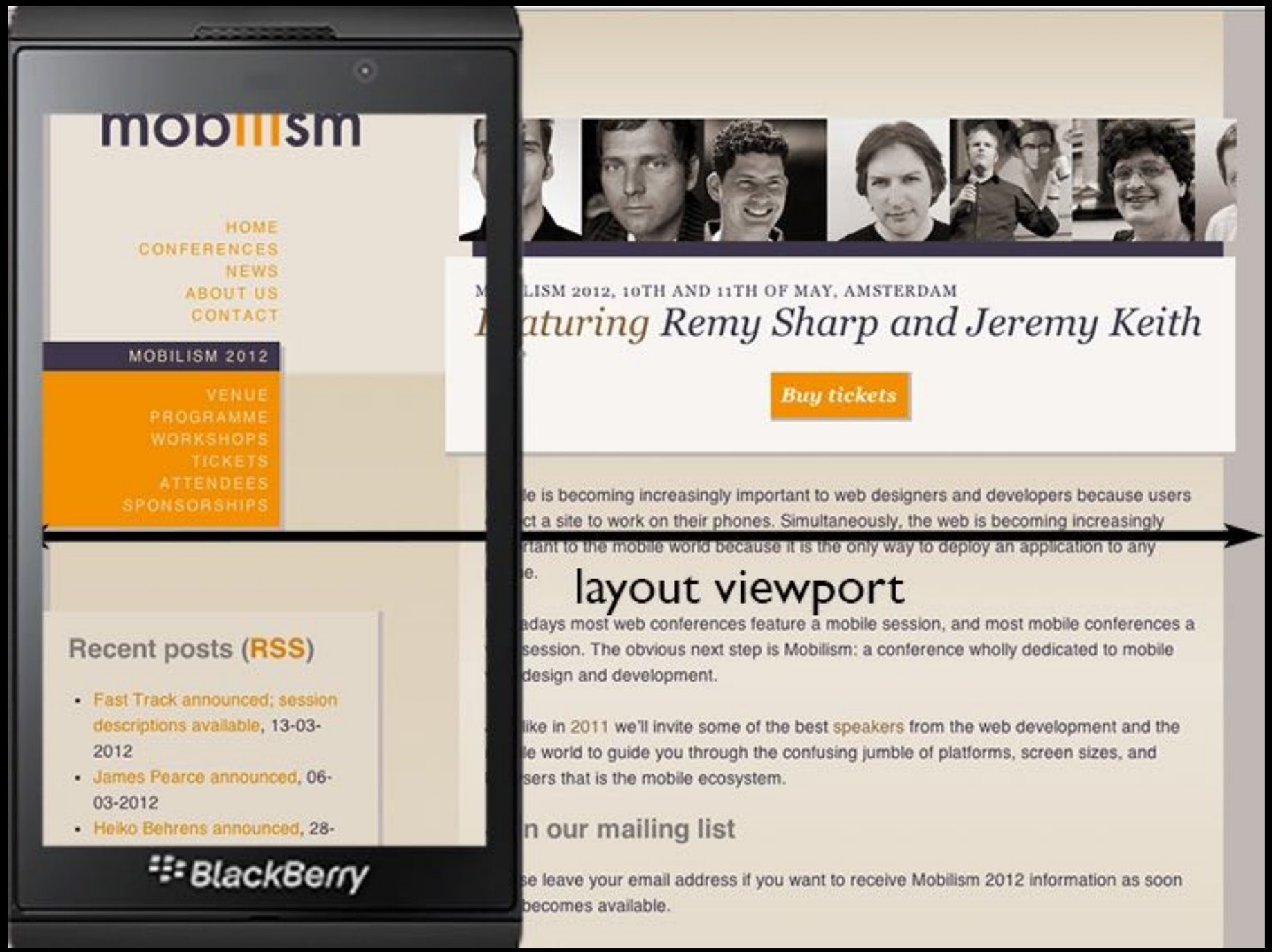
# Viewports

- That's why the mobile browser vendors changed the rules:
- By default, the viewport is 768-1024px wide (depending on the browser), with 980px the most common size
- We call this the *layout viewport*
- Responsive design is the art of overriding the default width of the layout viewport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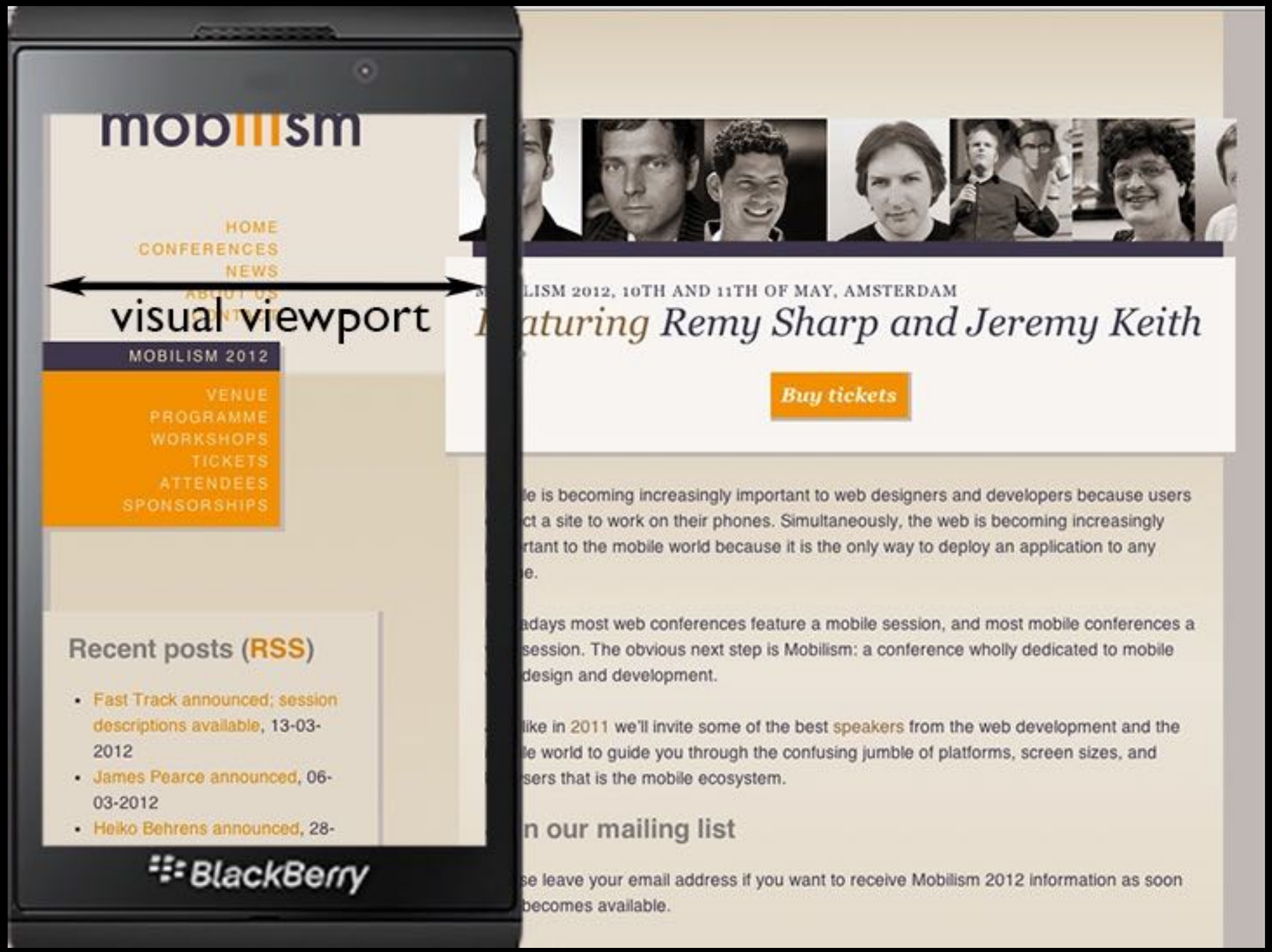
# Viewports

- 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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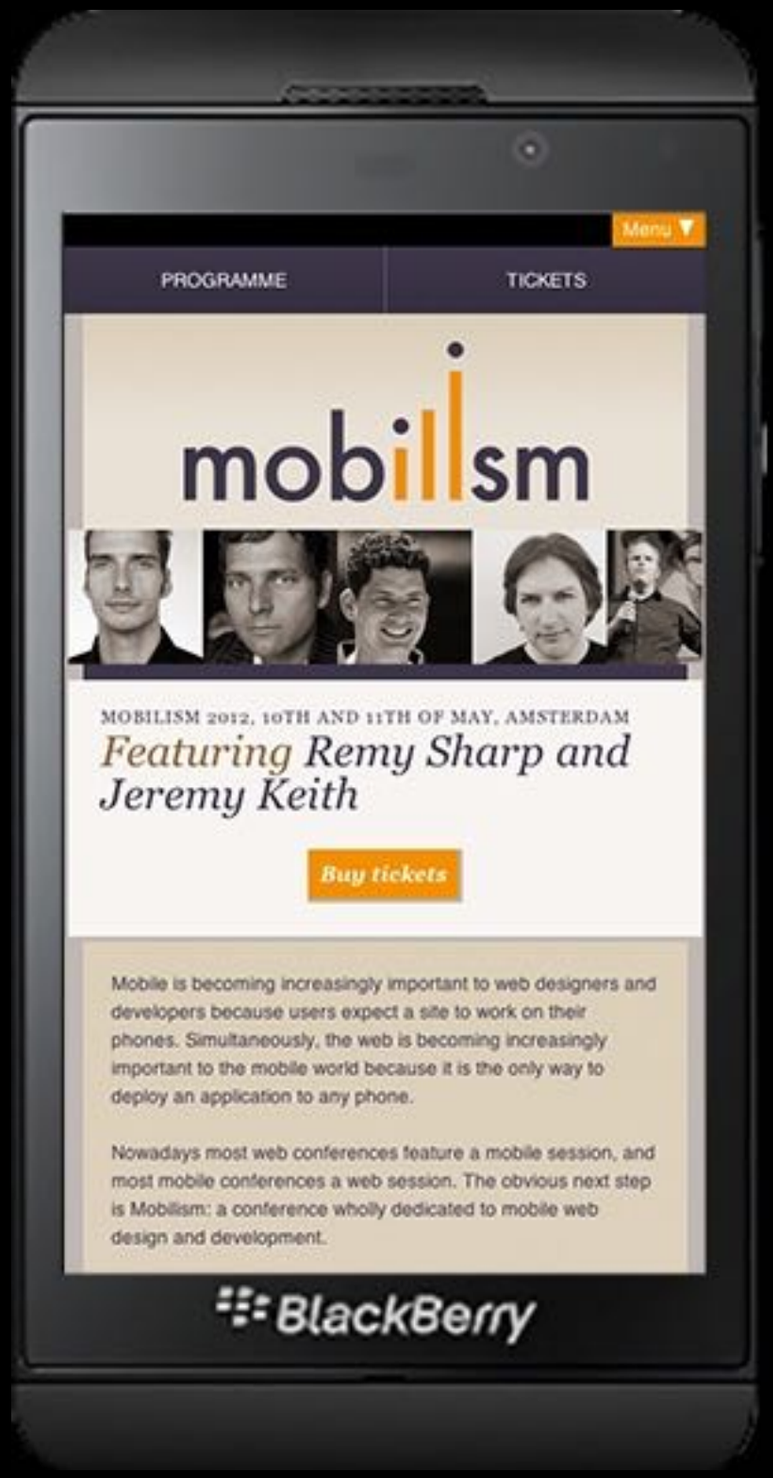
- By default, the layout viewport is 768-1024px wide (depending on the browser), with 980px the most common size
- This is the *default layout viewport*
- But for a proper mobile experience that's not what we want.
- Enter the *ideal layout viewport*.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342px
570px
BlackBerry

# Ideal layout viewport

- There are no wrong dimensions for the ideal layout 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 layout viewport:

375px 320px 414px

# Viewports

So the desktop viewport has been split into two:

- layout viewport
- visual viewport

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- layout viewport
- visual viewport

Fun game: whenever you see “viewport” in a W3C spec, ask “Which viewport?”

# Viewports

So the desktop viewport has been split into two:

- layout viewport
- visual viewport

Fun game: whenever you see “viewport” in a W3C spec, ask “Which viewport?”

The spec *never* answers that question, because the viewports haven’t been officially specified.

# Viewports

So the desktop viewport has been split into two:

- layout viewport
- visual viewport

But there's a third construct:

- the document

# Visualisation

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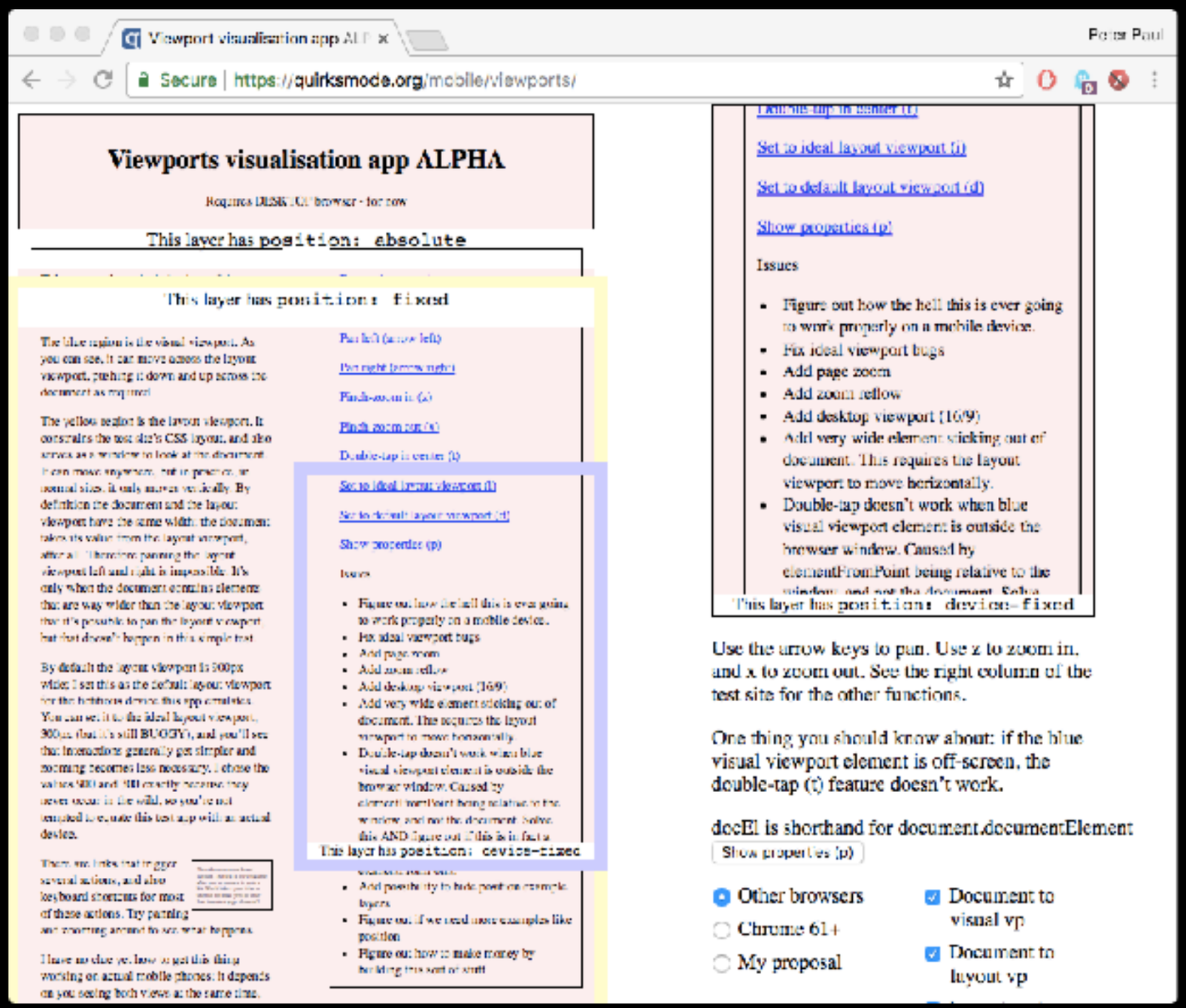

# Document and viewports

- The visual viewport moves inside the layout viewport.
- But the layout viewport may also move inside the document.
- Usually you don’t notice, except when you use position: fixed

# position: fixed

"For a fixed positioned box, the containing block is established by the viewport."

Great!

But WHICH viewport?

Browsers were first all over the place, but recently standardised on the layout viewport.

Note that this is not officially specified anywhere; W3C is still in state of denial.

# position

- position: absolute means the element is positioned relative to the document
- position: fixed means the element is positioned relative to the layout viewport
- … and what about the visual viewport?

# position

- Ages ago I proposed position: device-fixed, that would position an element relative to the visual viewport, and also would take it out of the pinch zoom.
- So far only IE/Edge has implemented it.

# 3 Meta viewport

# Meta viewport

- In order to create a responsive design we must set the layout viewport dimensions to the ideal layout 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 768 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 layout 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 layout viewport
- In practice, it also sets the layout viewport dimensions to the ideal layout 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 layout 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. I want some.

# 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 layout 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 layout 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 400px.
- Is this useful? Dunno.

# Safari problem

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

- Safari always takes the portrait width (320 on iPhone 5-, 768 on iPad).
- Sometimes this is what you want; at other times it isn’t.
- How to solve this?

# Safari problem

```
<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.

# Safari problem

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

- Use both device-width and initial-scale.
- initial-scale works in Safari
- (device-width was needed for IE10, if you’re still interested)
- 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 layout viewport
- 2) number of device pixels

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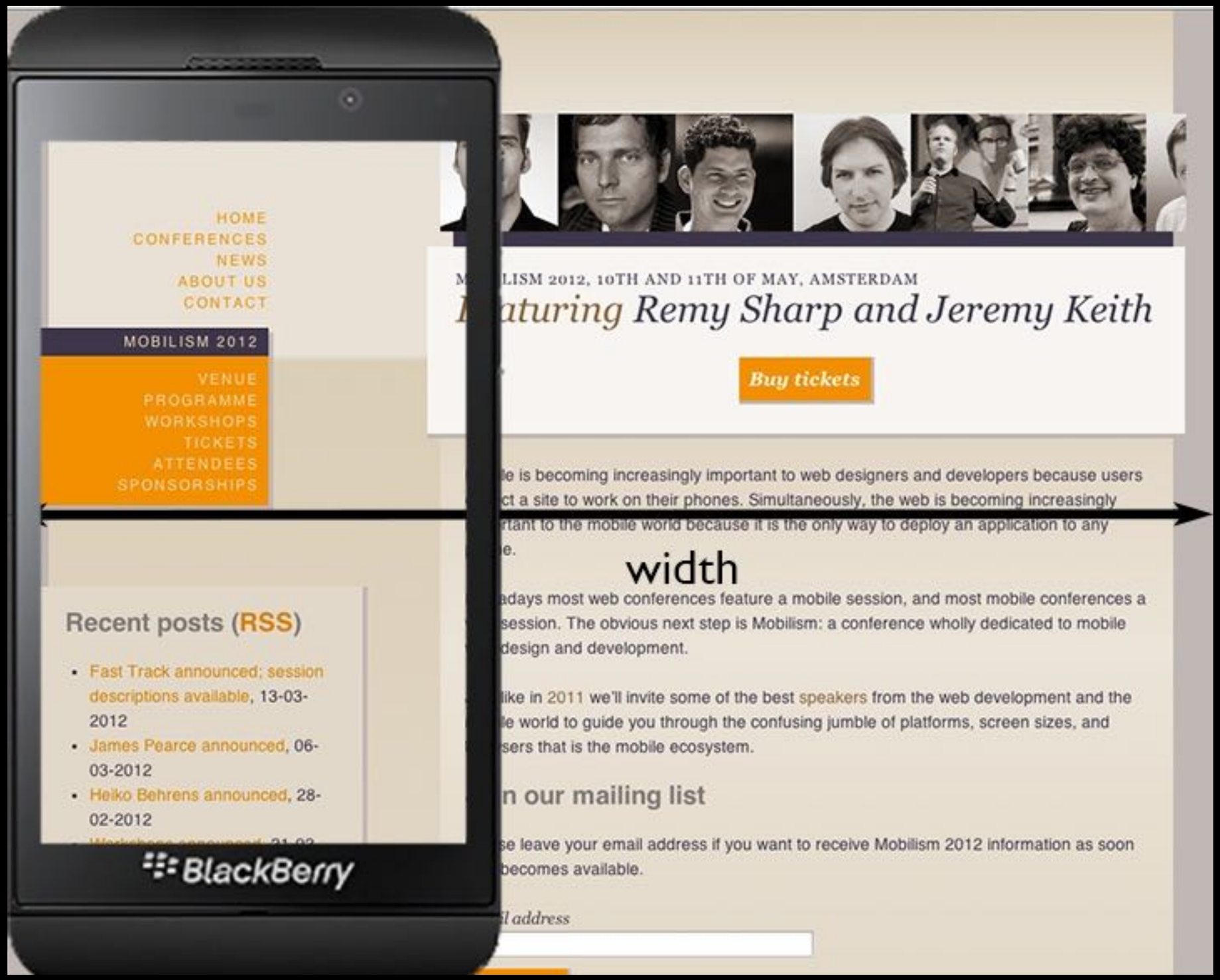
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session. The obvious next step is Mobilism: a conference wholly dedicated to mobile
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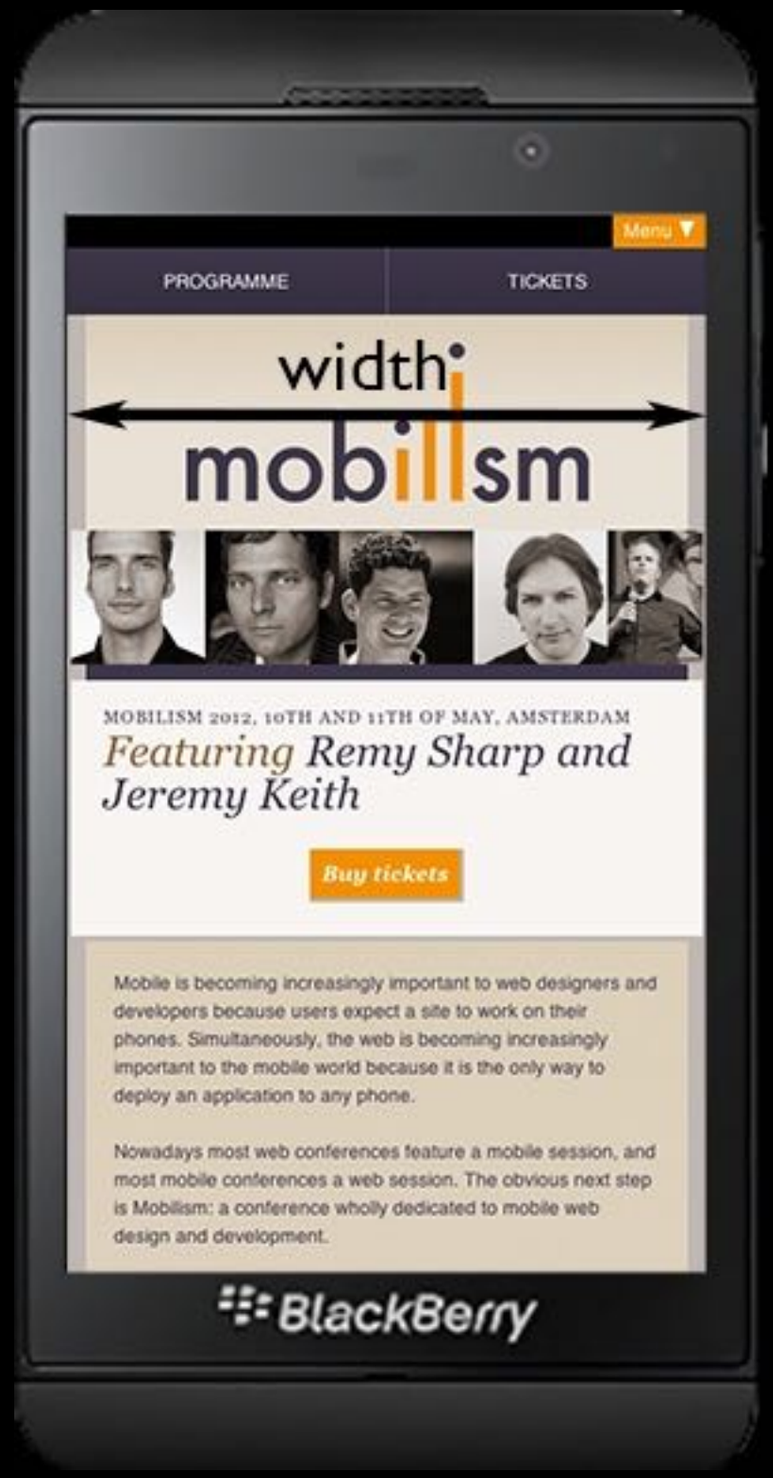
l address

# 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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Mobile is becoming increasingly important to web designers and developers because users expect a site to work on their phones. Simultaneously, the web is becoming increasingly important to the mobile world because it is the only way to deploy an application to any phone.
Nowadays most web conferences feature a mobile session, and most mobile conferences a web session. The obvious next step is Mobilism: a conference wholly dedicated to mobile web design and development.
BlackBerry

# Responsive design

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

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


}
```

# Responsive design

- Set the layout viewport width to the ideal layout 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. (Even modern iPhones need different values.)

# 5 JavaScript properties

# Layout viewport dimensions

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

Works (almost) everywhere.

# Layout viewport offset

-document.

documentElement.

getBoundingClientRect().left/top

# JavaScript - visual viewport

`window.innerWidth`

`window.innerHeight`

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

Or in Chrome 61+.

# Visual viewport offset

`window.pageX/YOffset`

Relative to the document.

# Visual viewport offset

`window.pageX/YOffset`

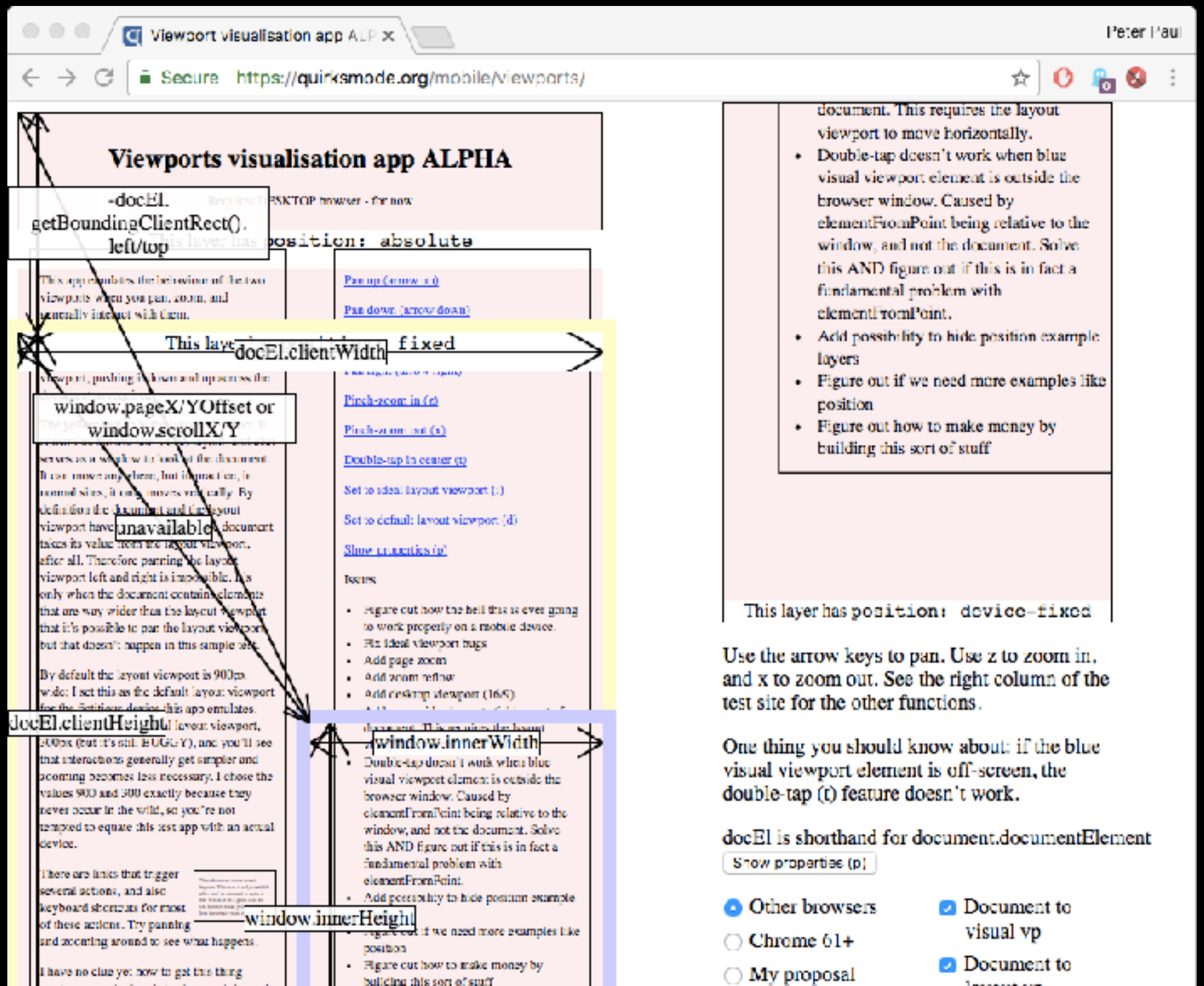
Relative to the document.

And what if you want the offset relative to the layout viewport? Not available.

But you can calculate it.

# Properties

https://quirksmode.org/mobile/viewports/



# JavaScript properties

Confusing! Is there method to this madness?

Nope.

Back 10 years ago, mobile browser vendors needed new properties for new viewports.

The Browser Wars had left behind some IE- and Netscape-specific debris,

and mobile browser vendors just took it and shaped it.

# JavaScript properties

Meanwhile, W3C has *still* not specified any of this.

I mean, it's been only 10 years, so what's the rush?

Google, however, took action recently.

# Visual viewport

`window.visualViewport`

| width and height | the width and height (surprise!) |
| --- | --- |
| pageLeft and pageTop | Offset relative to the document |
| offsetLeft and offsetTop | Offset relative to layout viewport |
| scale | Zoom level relative to layout viewport |

# JavaScript properties

Sounds good, right?

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Unfortunately, Google also decided that all old properties should refer to the layout viewport.

# JavaScript properties

Sounds good, right?

Unfortunately, Google also decided that all old properties should refer to the layout viewport.

`window.pageX/YOffset`

- Visual viewport offset in all browsers
- Except for Chrome 61+, where it's the *layout* viewport offset

# JavaScript properties

Sounds good, right?

Unfortunately, Google also decided that all old properties should refer to the layout viewport.

`window.innerWidth/Height`

- Visual viewport dimensions
- Except for Chrome 61+, where it's the *layout* viewport dimensions

# JavaScript properties

But Google wouldn't be Google if it didn't make things needlessly complicated.

So here we are now …

The theoretical solution is simple, but Google is not going to implement it

because Important Reasons

# Layout viewport

`window.layoutViewport`

| width and height | the width and height (surprise!) |
| --- | --- |
| pageLeft and pageTop | Offset relative to the document |
| ~~offsetLeft and offsetTop~~ | ~~Offset relative to layout viewport~~ |
| scale? | Zoom level relative to … something? |

# JavaScript properties

So we're stuck right now.

And there's something else …

# screen.width

`screen.width`

`screen.height`

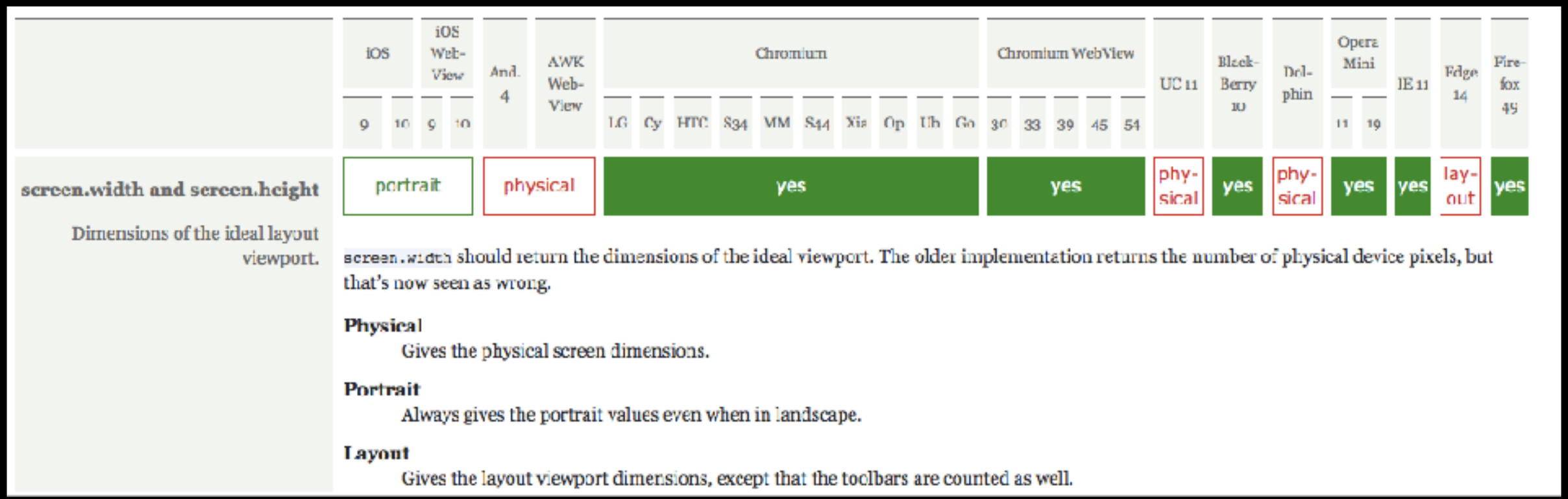
UNRELIABLE!

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

while others define them as the number of device pixels

# screen.width

Situation as of October 2016: not too bad, but some browsers have problems.



| | iOS | | iOS Web-View | | And. 4 | AWK Web-View | Chromium | | | | | | | | | | Chromium WebView | | | | | UC 11 | Black-Berry 10 | Del-phin | Opera Mini | | IE 11 | Edge 14 | Fire-fox 49 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9 | 10 | 9 | 10 | | | LG | Cy | HTC | S34 | MM | S44 | Xia | Op | Ub | Go | 30 | 33 | 39 | 45 | 54 | | | | 11 | 19 | | | |
| **screen.width and screen.height**<br>Dimensions of the ideal layout viewport. | portrait | | physical | | yes | | | | | | | | | | | | yes | | | | | phy-sical | yes | phy-sical | yes | yes | lay-out | yes |

`screen.width` should return the dimensions of the ideal viewport. The older implementation returns the number of physical device pixels, but that's now seen as wrong.

**Physical**
Gives the physical screen dimensions.

**Portrait**
Always gives the portrait values even when in landscape.

**Layout**
Gives the layout viewport dimensions, except that the toolbars are counted as well.

Note: Safari stuck in portrait mode.

Source: https://www.quirksmode.org/mobile/tableViewport.html

# screen.width

Not reliable right now.

And there's something else …

All analytics scripts that give you screen sizes?

They're unreliable as well

because they use screen.width.

Check your logs: did you EVER see an iOS device in landscape mode?

You see?

# Depressed?

I hope you don't feel too depressed after this presentation.

Some things DO work well.

Still, having a minor depression is the proper reaction to these examples.

But you'll survive.

And the really important stuff DOES work.

# Thank you

## I'll put these slides online

## Questions?

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DevReach, 13 November 2017