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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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

320px
Device pixels

640px
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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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
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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Mobile is becoming increasingly important to web designers and developers because...

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190px

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NEWS ABSTRACTS CONFERENCES CONTENT OF MAY, AMSTERDAM

Mobilism

Featuring Tony Sharp Jeremy Kush
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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**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*
Viewports

• 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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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
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

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.
So the desktop viewport has been split into two:

- layout viewport
- visual viewport

But there’s a third construct:

- the document
Visualisation

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

\[\text{<meta name="viewport" content="initial-scale = 1"}>\]

• 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

```html
<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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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

<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.)
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/Y0ffset

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/
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
```

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>width and height</td>
<td>the width and height (surprise!)</td>
</tr>
<tr>
<td>pageLeft and pageTop</td>
<td>Offset relative to the document</td>
</tr>
<tr>
<td>offsetLeft and offsetTop</td>
<td>Offset relative to layout viewport</td>
</tr>
<tr>
<td>scale</td>
<td>Zoom level relative to layout viewport</td>
</tr>
</tbody>
</table>
JavaScript properties

Sounds good, right?
JavaScript properties

Sounds good, right?

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.pageXOffset/YOffset`

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

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>width and height</code></td>
<td>the width and height (surprise!)</td>
</tr>
<tr>
<td><code>pageLeft and pageTop</code></td>
<td>Offset relative to the document</td>
</tr>
<tr>
<td><code>offsetLeft and offsetTop</code></td>
<td>Offset relative to layout viewport</td>
</tr>
<tr>
<td><code>scale?</code></td>
<td>Zoom level relative to … something?</td>
</tr>
</tbody>
</table>
So we’re stuck right now.

And there’s something else …
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.
Situation as of October 2016: not too bad, but some browsers have problems.

<table>
<thead>
<tr>
<th>Dimensions of the ideal layout viewport.</th>
<th>portrait</th>
<th>physical</th>
<th>yes</th>
<th>yes</th>
<th>physical</th>
<th>yes</th>
<th>yes</th>
<th>layout</th>
<th>yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **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](https://www.quirksmode.org/mobile/tableViewport.html)
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?
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?

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