Media Queries Level 5

W3C Working Draft, 31 July 2020

This version:
https://www.w3.org/TR/2020/WD-mediaqueries-5-20200731/

Latest published version:
https://www.w3.org/TR/mediaqueries-5/

Editor's Draft:
https://drafts.csswg.org/mediaqueries-5/

Previous Versions:
https://www.w3.org/TR/2020/WD-mediaqueries-5-20200715/
https://www.w3.org/TR/2020/WD-mediaqueries-5-20200603/
https://www.w3.org/TR/2020/WD-mediaqueries-5-20200318/
https://www.w3.org/TR/2020/WD-mediaqueries-5-20200303/

Issue Tracking:
Inline In Spec
GitHub Issues

Editors:
Dean Jackson (Apple)
Florian Rivoal (Invited Expert)
Tab Atkins Jr. (Google)

Suggest an Edit for this Spec:
GitHub Editor

Abstract

Media Queries allow authors to test and query values or features of the user agent or display device, independent of the document being rendered. They are used in the CSS @media rule to conditionally apply styles to a document, and in various other contexts and languages, such as HTML and JavaScript.

Media Queries Level 5 describes the mechanism and syntax of media queries, media types, and media

features. It extends and supersedes the features defined in Media Queries Level 4.

CSS is a language for describing the rendering of structured documents (such as HTML and XML) on screen, on paper, etc.

Status of this document

This section describes the status of this document at the time of its publication. Other documents may supersede this document. A list of current W3C publications and the latest revision of this technical report can be found in the W3C technical reports index at https://www.w3.org/TR/.

Publication as a Working Draft does not imply endorsement by the W3C Membership. This is a draft document and may be updated, replaced or obsoleted by other documents at any time. It is inappropriate to cite this document as other than work in progress.

GitHub Issues are preferred for discussion of this specification. When filing an issue, please put the text “mediaqueries” in the title, preferably like this: “[mediaqueries] *...summary of comment...*”. All issues and comments are archived, and there is also a historical archive.

This document was produced by the CSS Working Group.

This document was produced by a group operating under the W3C Patent Policy. W3C maintains a public list of any patent disclosures made in connection with the deliverables of the group; that page also includes instructions for disclosing a patent. An individual who has actual knowledge of a patent which the individual believes contains Essential Claim(s) must disclose the information in accordance with section 6 of the W3C Patent Policy.

This document is governed by the 1 March 2019 W3C Process Document.

The following features are at-risk, and may be dropped during the CR period:

- The ‘update’ media feature

“At-risk” is a W3C Process term-of-art, and does not necessarily imply that the feature is in danger of being dropped or delayed. It means that the WG believes the feature may have difficulty being interoperably implemented in a timely manner, and marking it as such allows the WG to drop the feature if necessary when transitioning to the Proposed Rec stage, without having to publish a new Candidate Rec without the feature first.

Table of Contents

1 Introduction
1.1 Module interactions
1.2 Values
1.3 Units
1.4 Prefers-* Media Features Security and Privacy

2 Media Queries
2.1 Combining Media Queries
2.2 Media Query Modifiers
2.2.1 Negating a Media Query: the ‘not’ keyword
2.2.2 Hiding a Media Query From Legacy User Agents: the ‘only’ keyword
2.3 Media Types
2.4 Media Features
2.4.1 Media Feature Types: “range” and “discrete”
2.4.2 Evaluating Media Features in a Boolean Context
2.4.3 Evaluating Media Features in a Range Context
2.4.4 Using “min-” and “max-” Prefixes On Range Features
2.5 Combining Media Features

3 Syntax
3.1 Evaluating Media Queries
3.2 Error Handling

4 Viewport/Page Characteristics Media Features
4.1 Width: the ‘width’ feature
4.2 Height: the ‘height’ feature
4.3 Aspect-Ratio: the ‘aspect-ratio’ feature
4.4 Orientation: the ‘orientation’ feature
4.5 Block-Axis Overflow: the ‘overflow-block’ feature
4.6 Inline-Axis Overflow: the ‘overflow-inline’ feature

5 Display Quality Media Features
5.1 Display Resolution: the ‘resolution’ feature
5.2 Display Type: the ‘scan’ feature
5.3 Detecting Console Displays: the ‘grid’ feature
5.4 Display Update Frequency: the ‘update’ feature
5.5 Detecting the display technology: the ‘environment-blending’ feature

6 Color Media Features

6.1 Color Depth: the 'color' feature
6.2 Paletted Color Screens: the 'color-index' feature
6.3 Monochrome Screens: the 'monochrome' feature
6.4 Color Display Quality: the 'color-gamut' feature
6.5 Dynamic Range: the 'dynamic-range' feature
6.5.1 Determining contrast and brightness of display
6.6 Detecting inverted colors on the display: the 'inverted-colors' feature

7 Interaction Media Features
7.1 Pointing Device Quality: the 'pointer' feature
7.2 Hover Capability: the 'hover' feature
7.3 All Available Interaction Capabilities: the 'any-pointer' and 'any-hover' features

8 Video Prefixed Features
8.1 Video Color Display Quality: the 'video-color-gamut' feature
8.2 Video Dynamic Range: the 'video-dynamic-range' feature
8.3 Video-Width: the 'video-width' feature
8.4 Video-Height: the 'video-height' feature
8.5 Video Display Resolution: the 'video-resolution' feature

9 Scripting Media Features
9.1 Scripting Support: the 'scripting' feature

10 Custom Media Queries
10.1 Script-based Custom Media Queries

11 User Preference Media Features
11.1 Detecting the desire for less motion on the page: the 'prefers-reduced-motion' feature
11.2 Detecting the desire for reduced transparency on the page: the 'prefers-reduced-transparency' feature
11.3 Detecting the desire for increased or decreased color contrast from elements on the page: the 'prefers-contrast' feature
11.4 Detecting the desire for light or dark color schemes: the 'prefers-color-scheme' feature
11.5 Detecting a forced color palette: the 'forced-colors' feature
11.6 Detecting the desire for reduced data usage when loading a page: the 'prefers-reduced-data' feature
11.7 Automatic handling of User Preferences

Appendix A: Deprecated Media Features

Changes
Changes Since the 2020-07-15 Working Draft
Changes Since the 2020-06-03 Working Draft
Changes Since the 2020-03-18 Working Draft
Changes Since the First Public Working Draft
Changes since the Media Queries Level 4

Acknowledgments

Conformance
Document conventions
Conformance classes
Requirements for Responsible Implementation of CSS
- Partial Implementations
- Implementations of Unstable and Proprietary Features
- Implementations of CR-level Features

Index
Terms defined by this specification
Terms defined by reference

References
Normative References
Informative References

Property Index
@media Descriptors

Issues Index

§ 1. Introduction

This section is not normative.

In 1997, HTML4 [HTML401] defined a mechanism to support media-dependent style sheets, tailored for different media types. For example, a document may use different style sheets for screen and for print. In HTML, this can be written as:

EXAMPLE 1

```
<link rel="stylesheet" type="text/css" media="screen" href="style.css">
<link rel="stylesheet" type="text/css" media="print" href="print.css">
```

CSS adapted and extended this functionality with its '@media' and '@import' rules, adding the ability to query the value of individual features:

EXAMPLE 2

Inside a CSS style sheet, one can declare that sections apply to certain media types:

```
@media screen {
  * { font-family: sans-serif }
}
```

Similarly, stylesheets can be conditionally imported based on media queries:

```
@import "print-styles.css" print;
```

Media queries can be used with HTML, XHTML, XML [xml-stylesheet] and the @import and @media rules of CSS.

EXAMPLE 3

Here is the same example written in HTML, XHTML, XML, @import and @media:

```
<link media="screen and (color), projection and (color)"
      rel="stylesheet" href="example.css">

<link media="screen and (color), projection and (color)"
      rel="stylesheet" href="example.css" />

<?xml-stylesheet media="screen and (color), projection and (color)"
                 rel="stylesheet" href="example.css" ?>

@import url(example.css) screen and (color), projection and (color);

@media screen and (color), projection and (color) { … }
```

§ 1.1. Module interactions

This module extends and supersedes [MEDIAQUERIES-4] and its predecessor [MEDIAQUERIES-3], which themselves built upon and replaced CSS 2.2 §7 Media types.

§ 1.2. Values

Value types not defined in this specification, such as <integer>, <number> or <resolution>, are defined in [CSS-VALUES-4]. Other CSS modules may expand the definitions of these value types.

§ 1.3. Units

The units used in media queries are the same as in other parts of CSS, as defined in [CSS-VALUES-4]. For example, the pixel unit represents CSS pixels and not physical pixels.

Relative length units in media queries are based on the initial value, which means that units are never based on results of declarations. For example, in HTML, the 'em' unit is relative to the initial value of 'font-size', defined by the user agent or the user's preferences, not any styling on the page.

§ 1.4. Prefers-* Media Features Security and Privacy

ISSUE 1 Information about a user can be used as an active fingerprinting vector. Analysis of impact pending, more information to be provided before spec is published.

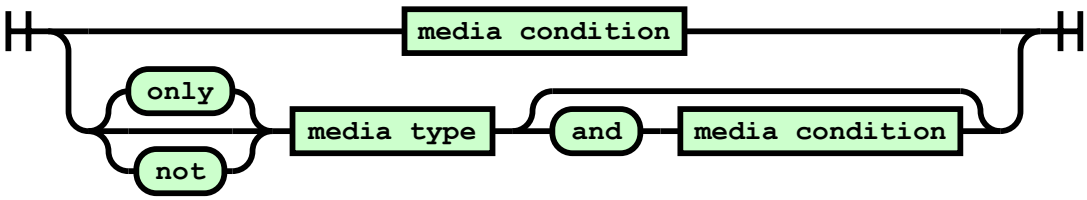
User agents and developers implementing this specification need to be aware of this vector and take it into consideration when deciding whether to use the feature. Specifically `prefers-reduced-motion`, `prefers-color-scheme` and `prefers-reduced-data` are currently of concern for exploitation.

§ 2. Media Queries

A ***media query*** is a method of testing certain aspects of the user agent or device that the document is being displayed in. Media queries are (almost) always independent of the contents of the document, its styling, or any other internal aspect; they're only dependent on "external" information unless another feature explicitly specifies that it affects the resolution of Media Queries.

The syntax of a media query consists of an optional media query modifier, an optional media type, and

zero or more media features:



A media query is a logical expression that is either true or false. A media query is true if:

- the media type, if specified, matches the media type of the device where the user agent is running, and
- the media condition is true.

Statements regarding media queries in this section assume the syntax section is followed. Media queries that do not conform to the syntax are discussed in § 3.2 Error Handling. I.e. the syntax takes precedence over requirements in this section.

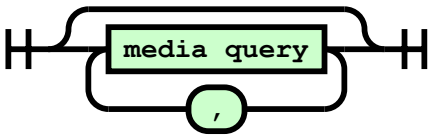
> EXAMPLE 4
> Here is a simple example written in HTML:
>
> ```
> <link rel="stylesheet" media="screen and (color)" href="example.css" />
> ```
>
> This example expresses that a certain style sheet (`example.css`) applies to devices of a certain media type ('screen') with certain feature (it must be a color screen).
>
> Here is the same media query written in an @import-rule in CSS:
>
> ```
> @import url(example.css) screen and (color);
> ```

User agents must re-evaluate media queries in response to changes in the user environment that they're aware of, for example if the device is tiled from landscape to portrait orientation, and change the behavior of any constructs dependent on those media queries accordingly.

Unless another feature explicitly specifies that it affects the resolution of Media Queries, it is never necessary to apply a style sheet in order to evaluate expressions.

§ 2.1. Combining Media Queries

Several media queries can be combined into a comma-separated ***media query list***.



A media query list is true if *any* of its component media queries are true, and false only if *all* of its component media queries are false.

> EXAMPLE 5
> For example, the following media query list is true if either the media type is 'screen' and it's a color device, **or** the media type is 'projection' and it's a color device:
>
> ```
> @media screen and (color), projection and (color) { … }
> ```

An empty media query list evaluates to true.

> EXAMPLE 6
> For example, these are equivalent:
>
> ```
> @media all { … }
> @media { … }
> ```

§ 2.2. Media Query Modifiers

A media query may optionally be prefixed by a single ***media query modifier***, which is a single keyword which alters the meaning of the following media query.

§ 2.2.1. Negating a Media Query: the 'not' keyword

An individual media query can have its result negated by prefixing it with the keyword ***'not'***. If the media query would normally evaluate to true, prefixing it with 'not' makes it evaluate to false, and vice versa.

EXAMPLE 7

For example, the following will apply to everything except color-capable screens. Note that the entire media query is negated, not just the media type.

```
<link rel="stylesheet" media="not screen and (color)" href="example.css" />
```

§ 2.2.2. Hiding a Media Query From Legacy User Agents: the 'only' keyword

The concept of media queries originates from HTML4 [HTML401]. That specification only defined media types, but had a forward-compatible syntax that accommodated the addition of future concepts like media features: it would consume the characters of a media query up to the first non-alphanumeric character, and interpret that as a media type, ignoring the rest. For example, the media query 'screen and (color)' would be truncated to just 'screen'.

Unfortunately, this means that legacy user agents using this error-handling behavior will ignore any media features in a media query, even if they're far more important than the media type in the query. This can result in styles accidentally being applied in inappropriate situations.

To hide these media queries from legacy user agents, the media query can be prefixed with the keyword ***'only'***. The 'only' keyword **has no effect** on the media query's result, but will cause the media query to be parsed by legacy user agents as specifying the unknown media type "only", and thus be ignored.

EXAMPLE 8

In this example, the stylesheet specified by the `<link>` element will not be used by legacy user agents, even if they would normally match the 'screen' media type.

```
<link rel="stylesheet" media="only screen and (color)" href="example.css" />
```

Note: Note that the 'only' keyword can only be used before a media type. A media query consisting only of media features, or one with another media query modifier like 'not', will be treated as false by legacy user agents automatically.

Note: At the time of publishing this specification, such legacy user agents are extremely rare, and so using the 'only' modifier is rarely, if ever, necessary.

§ 2.3. Media Types

A ***media type*** is a broad category of user-agent devices on which a document may be displayed. The original set of media types were defined in HTML4, for the `media` attribute on `<link>` elements.

Unfortunately, media types have proven insufficient as a way of discriminating between devices with different styling needs. Some categories which were originally quite distinct, such as 'screen' and 'handheld', have blended significantly in the years since their invention. Others, such as 'tty' or 'tv', expose useful differences from the norm of a full-featured computer monitor, and so are potentially useful to target with different styling, but the definition of media types as mutually exclusive makes it difficult to use them in a reasonable manner; instead, their exclusive aspects are better expressed as media features such as 'grid' or 'scan'.

As such, the following media types are defined for use in media queries:

'all'
: Matches all devices.

'print'
: Matches printers, and devices intended to reproduce a printed display, such as a web browser showing a document in "Print Preview".

'screen'
: Matches all devices that aren't matched by 'print'.

In addition, the following **deprecated** media types are defined. Authors must not use these media types; instead, it is recommended that they select appropriate media features that better represent the aspect of the device that they are attempting to style against.

User agents must recognize the following media types as valid, but must make them match nothing.

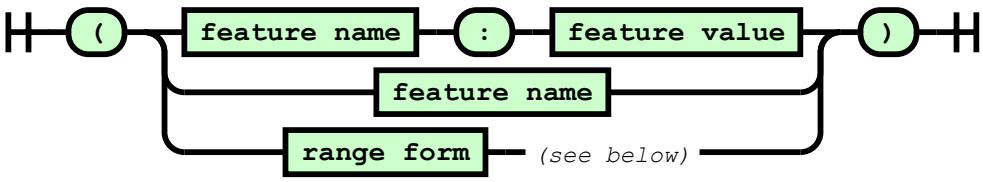
- ***'tty'***
- ***'tv'***
- ***'projection'***
- ***'handheld'***
- ***'braille'***
- ***'embossed'***
- ***'aural'***
- ***'speech'***

> Note: It is expected that all of the media types will also be deprecated in time, as appropriate media features are defined which capture their important differences.

§ 2.4. Media Features

A ***media feature*** is a more fine-grained test than media types, testing a single, specific feature of the user agent or display device.

Syntactically, media features resemble CSS properties: they consist of a feature name, a colon, and a value to test for. They may also be written in boolean form as just a feature name, or in range form with a comparison operator.



There are, however, several important differences between properties and media features:

- Properties are used to give information about how to present a document. Media features are used to describe requirements of the output device.
- Media features are always wrapped in parentheses and combined with the 'and' or 'or' keywords, like '(color) and (min-width: 600px)', rather than being separated with semicolons.
- A media feature may be given with *only* its name (omitting the colon and value) to evaluate the feature in a boolean context. This is a convenient shorthand for features that have a reasonable value representing 0 or "none". For example, '(color)' is true if the 'color' media feature is non-zero.
- Media features with "range" type can be written in a range context, which uses standard mathematical comparison operators rather than a colon, or have their feature names prefixed with "min-" or "max-".
- Properties sometimes accept complex values, e.g., calculations that involve several other values. Media features only accept single values: one keyword, one number, etc.

If a media feature references a concept which does not exist on the device where the UA is running (for example, speech UAs do not have a concept of "width"), the media feature must always evaluate to false.

EXAMPLE 9

The media feature ‘device-aspect-ratio’ only applies to visual devices. On an ‘speech’ device, expressions involving ‘device-aspect-ratio’ will therefore always be false:

```
<link media="speech and (device-aspect-ratio: 16/9)"
      rel="stylesheet" href="example.css">
```

§ 2.4.1. Media Feature Types: “range” and “discrete”

Every media feature defines its “type” as either “range” or “discrete” in its definition table.

“Discrete” media features, like ‘pointer’ take their values from a set. The values may be keywords or boolean numbers (0 and 1), but the common factor is that there’s no intrinsic “order” to them—none of the values are “less than” or “greater than” each other.

“Range” media features like ‘width’, on the other hand, take their values from a range. Any two values can be compared to see which is lesser and which is greater.

The only significant difference between the two types is that “range” media features can be evaluated in a range context and accept “min-” and “max-” prefixes on their name. Doing either of these changes the meaning of the feature—rather than the media feature being true when the feature exactly matches the given value, it matches when the feature is greater than/less than/equal to the given value.

EXAMPLE 10

A "(width >= 600px)" media feature is true when the viewport’s width is ‘600px’ *or more*.

On the other hand, ‘(width: 600px)’ by itself is only true when the viewport’s width is *exactly* ‘600px’. If it’s less or greater than ‘600px’, it’ll be false.

§ 2.4.2. Evaluating Media Features in a Boolean Context

While media features normally have a syntax similar to CSS properties, they can also be written more simply as just the feature name, like ‘(color)’.

When written like this, the media feature is evaluated in a ***boolean context***. If the feature would be true for any value *other than* the number ‘0’, a <dimension> with the value ‘0’, the keyword ‘none’, or a value explicitly defined by that media feature to evaluate as false in a boolean context, the media

feature evaluates to true. Otherwise, it evaluates to false.

EXAMPLE 11

Some media features are designed to be written like this.

For example, 'update' is typically written as '(update)' to test if any kind of updating is available, or 'not (update)' to check for the opposite.

It can still be given an explicit value as well, with '(update: fast) or (update: slow)' equal to '(update)', and '(update: none)' equal to 'not (update)'.

EXAMPLE 12

Some numeric media features, like 'width', are rarely if ever useful to evaluate in a boolean context, as their values are almost always greater than zero. Others, like 'color', have meaningful zero values: '(color)' is identical to '(color > 0)', indicating that the device is capable of displaying color at all.

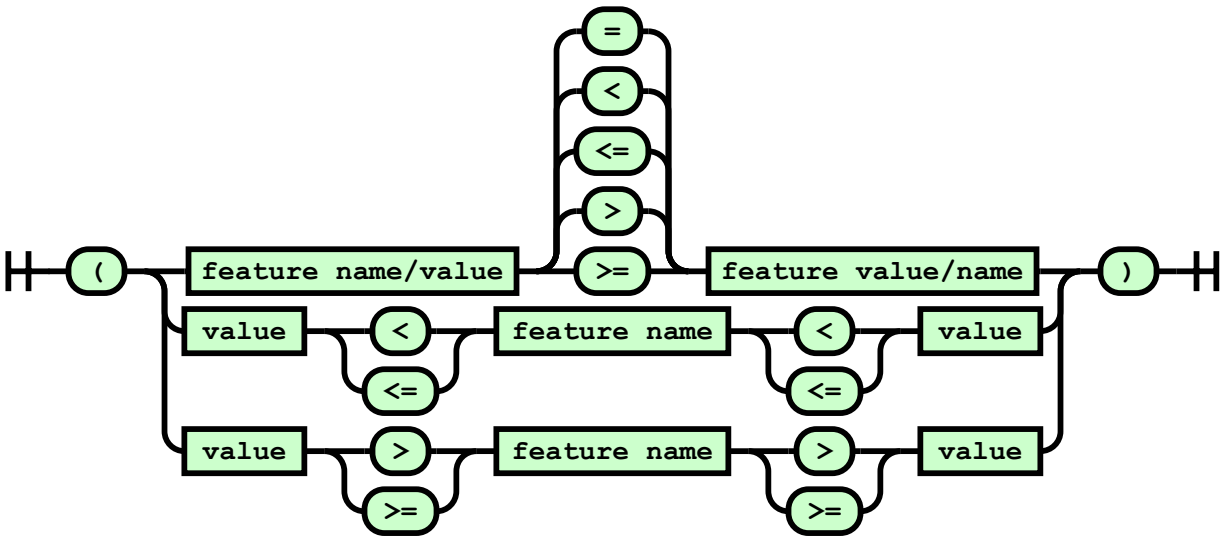
EXAMPLE 13

Only some of the media features that accept keywords are meaningful in a boolean context.

For example, '(pointer)' is useful, as 'pointer' has a 'none' value to indicate there's no pointing device at all on the device. On the other hand, '(scan)' is just always true or always false (depending on whether it applies at all to the device), as there's no value that means "false".

§ 2.4.3. Evaluating Media Features in a Range Context

Media features with a "range" type can be alternately written in a ***range context*** that takes advantage of the fact that their values are ordered, using ordinary mathematical comparison operators:



Note: This syntax is new to Level 4 of Mediaqueries, and thus is not as widely supported at the moment as the ‘min-’/‘max-’ prefixes.

The basic form, consisting of a feature name, a comparison operator, and a value, returns true if the relationship is true.

EXAMPLE 14

For example, ‘(height > 600px)’ (or ‘(600px < height)’) returns true if the viewport height is greater than ‘600px’.

The remaining forms, with the feature name nested between two value comparisons, returns true if both comparisons are true.

EXAMPLE 15

For example, ‘(400px < width < 1000px)’ returns true if the viewport width is between ‘400px’ and ‘1000px’ (but not equal to either).

Some media features with a "range" type are said to be ***false in the negative range***. This means that negative values are valid and must be parsed, and that querying whether the media feature is equal to, less than, or less or equal than any such negative value must evaluate to false. Querying whether the media feature is greater, or greater or equal, than a negative value evaluates to true if the relationship is true.

Note: If negative values had been rejected at parse time instead, they would be treated as 'unknown' based on the error handling rules. However, in reality, whether a device's 'resolution' is '-300dpi' is not unknown, it is known to be false. Similarly, for any visual device, the 'width' of the targeted display area is known to be greater than '-200px' The above rule reflects that, making intuition match what UAs do.

EXAMPLE 16

The following examples result in a green background on all visual devices:

```
@media not (width <= -100px) {
  body { background: green; }
}

@media (height > -100px) {
  body { background: green; }
}

@media not (resolution: -300dpi) {
  body { background: green; }
}
```

This is a behavior change compared to Media Queries Level 3 [MEDIAQUERIES-3], where negative values on these properties caused a syntax error. In level 3, syntax errors—including forbidden values—resulted in the entire media query being false, rather than the 'unknown' treatment defined in this level. Implementations updating from level 3 should make sure to change the handling of negative values for the relevant properties when they add support for the richer syntax defined in § 2.5 Combining Media Features, to avoid introducing unintended semantics.

§ 2.4.4. Using "min-" and "max-" Prefixes On Range Features

Rather than evaluating a "range" type media feature in a range context, as described above, the feature may be written as a normal media feature, but with a "min-" or "max-" prefix on the feature name.

This is equivalent to evaluating the feature in a range context, as follows:

- Using a “min-” prefix on a feature name is equivalent to using the “>=” operator. For example, ‘(min-height: 600px)’ is equivalent to "(height >= 600px)".
- Using a “max-” prefix on a feature name is equivalent to using the “<=” operator. For example, ‘(max-width: 40em)’ is equivalent to "(width <= 40em)".

Note: because “min-” and “max-” both equate to range comparisons that **include** the value, they may be limiting in certain situations.

EXAMPLE 17

For instance, authors trying to define different styles based on a breakpoint in the viewport width using “min-” and “max-” would generally offset the values they’re comparing, to ensure that both queries don’t evaluate to true simultaneously. Assuming the breakpoint is at 320px, authors would conceptually use:

```
@media (max-width: 320px) { /* styles for viewports <= 320px */ }
@media (min-width: 321px) { /* styles for viewports >= 321px */ }
```

While this ensures that the two sets of styles don’t apply simultaneously when the viewport width is 320px, it does not take into account the possibility of fractional viewport sizes which can occur as a result of non-integer pixel densities (e.g. on high-dpi displays or as a result of zooming/scaling). Any viewport widths that fall between 320px and 321px will result in none of the styles being applied.

One approach to work around this problem is to increase the precision of the values used for the comparison. Using the example above, changing the second comparison value to 320.01px significantly reduces the chance that a viewport width on a device would fall between the cracks.

```
@media (max-width: 320px) { /* styles for viewports <= 320px */ }
@media (min-width: 320.01px) { /* styles for viewports >= 320.01px */ }
```

However, in these situations, range context queries (which are not limited to “>=” and “<=” comparisons) offer a more appropriate solution:

```
@media (width <= 320px) { /* styles for viewports <= 320px */ }
@media (width > 320px) { /* styles for viewports > 320px */ }
```

“Discrete” type properties do not accept “min-” or “max-” prefixes. Adding such a prefix to a “discrete” type media feature simply results in an unknown feature name.

EXAMPLE 18

For example, ‘(min-grid: 1)’ is invalid, because ‘grid’ is a “discrete” media feature, and so doesn’t accept the prefixes. (Even though the ‘grid’ media feature appears to be numeric, as it accepts the values ‘0’ and ‘1’.)

Attempting to evaluate a min/max prefixed media feature in a boolean context is invalid and a syntax error.

§ 2.5. Combining Media Features

Multiple media features can be combined together into a ***media condition*** using full boolean algebra (not, and, or).

- Any media feature can be negated by placing ‘not’ before it. For example, ‘not (color)’ inverts the meaning of ‘(color)’—since ‘(color)’ matches a device with any kind of color display, ‘not (color)’ matches a device *without* any kind of color display.
- Two or more media features can be chained together, such that the query is only true if *all* of the media features are true, by placing ‘and’ between them. For example, ‘(width < 600px) and (height < 600px)’ only matches devices whose screens are smaller than ‘600px’ wide in both dimensions.
- Alternately, two or more media features can be chained together, such that the query is true if *any* of the media features are true, by placing ‘or’ between them. For example, ‘(update: slow) or (hover: none)’ matches if the device is slow to update the screen (such as an e-reader) *or* the primary pointing device has no hover capability, perhaps indicating that one should use a layout that displays more information rather than compactly hiding it until the user hovers.
- Media conditions can be grouped by wrapping them in parentheses ‘()’ which can then be nested within a condition the same as a single media query. For example, ‘(not (color)) or (hover)’ is true on devices that are monochrome and/or that have hover capabilities. If one instead wanted to query for a device that was monochrome and *didn’t* have hover capabilities, it must instead be written as ‘not ((color) or (hover))’ (or, equivalently, as ‘(not (color)) and (not (hover))’).

It is *invalid* to mix ‘and’ and ‘or’ and ‘not’ at the same “level” of a media query. For example, ‘(color) and (pointer) or (hover)’ is illegal, as it’s unclear what was meant. Instead, parentheses can be used to group things using a particular joining keyword, yielding either ‘(color) and ((pointer) or (hover))’ or ‘((color) and (pointer)) or (hover)’. These two have very different meanings: if only ‘(hover)’ is true, the first one evaluates to false but the second evaluates to true.

§ 3. Syntax

Informal descriptions of the media query syntax appear in the prose and railroad diagrams in previous sections. The formal media query syntax is described in this section, with the rule/property grammar syntax defined in [CSS-SYNTAX-3] and [CSS-VALUES-4].

To parse a ***'<media-query-list>'*** production, parse a comma-separated list of component values, then parse each entry in the returned list as a <media-query>. Its value is the list of <media-query>s so produced.

> Note: This explicit definition of <media-query-list> parsing is necessary to make the error-recovery behavior of media query lists well-defined.

> Note: This definition of <media-query-list> parsing intentionally accepts an empty list.

> Note: As per [CSS-SYNTAX-3], tokens are ASCII case-insensitive.

```
<media-query> = <media-condition>
              | [ not | only ]? <media-type> [ and <media-condition-without-or> ]?
<media-type> = <ident>

<media-condition> = <media-not> | <media-in-parens> [ <media-and>* | <media-or>* ]
<media-condition-without-or> = <media-not> | <media-in-parens> <media-and>*
<media-not> = not <media-in-parens>
<media-and> = and <media-in-parens>
<media-or> = or <media-in-parens>
<media-in-parens> = ( <media-condition> ) | <media-feature> | <general-enclosed>

<media-feature> = ( [ <mf-plain> | <mf-boolean> | <mf-range> ] )
<mf-plain> = <mf-name> : <mf-value>
<mf-boolean> = <mf-name>
<mf-range> = <mf-name> <mf-comparison> <mf-value>
           | <mf-value> <mf-comparison> <mf-name>
           | <mf-value> <mf-lt> <mf-name> <mf-lt> <mf-value>
           | <mf-value> <mf-gt> <mf-name> <mf-gt> <mf-value>
<mf-name> = <ident>
<mf-value> = <number> | <dimension> | <ident> | <ratio>
<mf-lt> = '<' '='?
<mf-gt> = '>' '='?
<mf-eq> = '='
<mf-comparison> = <mf-lt> | <mf-gt> | <mf-eq>
```

<general-enclosed> = [<function-token> <any-value>)] | (<ident> <any-value>)

The <media-type> production does not include the keywords 'only', 'not', 'and', and 'or'.

No whitespace is allowed between the "<" or ">" <delim-token>s and the following "=" <delim-token>, if it's present.

> Note: Whitespace is required between a 'not', 'and', or 'or' keyword and the following '(' character, because without it that would instead parse as a <function-token>. This is not made explicitly invalid because it's already covered by the above grammar. It's fine to have whitespace between a ')' and a following keyword, however.

When parsing the <media-in-parens> production, the <general-enclosed> branch must only be chosen if the input does not match either of the preceding branches. <general-enclosed> exists to allow for future expansion of the grammar in a reasonably compatible way.

§ 3.1. Evaluating Media Queries

Each of the major subexpression of <media-condition> or <media-condition-without-or> is associated with a boolean result, as follows:

<media-condition>
<media-condition-without-or>
: The result is the result of the child subexpression.

<media-in-parens>
: The result is the result of the child term.

<media-not>
: The result is the negation of the <media-in-parens> term. The negation of unknown is unknown.

<media-in-parens> **<media-and>***
: The result is true if the <media-in-parens> child term and all of the <media-in-parens> children of the <media-and> child terms are true, false if at least one of these <media-in-parens> terms are false, and unknown otherwise.

<media-in-parens> **<media-or>***
: The result is false if the <media-in-parens> child term and all of the <media-in-parens> children of the <media-or> child terms are false, true if at least one of these <media-in-parens> terms are true, and unknown otherwise.

<general-enclosed>
: The result is unknown.

Authors must not use <general-enclosed> in their stylesheets. It exists only for future-compatibility, so that new syntax additions do not invalidate too much of a <media-condition> in older user agents.

<media-feature>
The result is the result of evaluating the specified media feature.

If the result of any of the above productions is used in any context that expects a two-valued boolean, "unknown" must be converted to "false".

Note: This means that, for example, when a media query is used in a '@media' rule, if it resolves to "unknown" it's treated as "false" and fails to match.

Media Queries use a three-value logic where terms can be "true", "false", or "unknown". Specifically, it uses the Kleene 3-valued logic. In this logic, "unknown" means "either true or false, but we're not sure which yet".

In general, an unknown value showing up in a formula will cause the formula to be unknown as well, as substituting "true" for the unknown will give the formula a different result than substituting "false". The only way to eliminate an unknown value is to use it in a formula that will give the same result whether the unknown is replaced with a true or false value. This occurs when you have "false AND unknown" (evaluates to false regardless) and "true OR unknown" (evaluates to true regardless).

This logic was adopted because <general-enclosed> needs to be assigned a truth value. In standard boolean logic, the only reasonable value is "false", but this means that 'not unknown(function)' is true, which can be confusing and unwanted. Kleene's 3-valued logic ensures that unknown things will prevent a media query from matching, unless their value is irrelevant to the final result.

§ 3.2. Error Handling

A media query that does not match the grammar in the previous section must be replaced by 'not all' during parsing.

Note: Note that a grammar mismatch does **not** wipe out an entire media query list, just the problematic media query. The parsing behavior defined above automatically recovers at the next top-level comma.

EXAMPLE 19

```
@media (example, all,), speech { /* only applicable to speech devices */ }
@media &test, speech           { /* only applicable to speech devices */ }
```

Both of the above media query lists are turned into 'not all, speech' during parsing, which has the same truth value as just 'speech'.

Note that error-recovery only happens at the top-level of a media query; anything inside of an invalid parenthesized block will just get turned into 'not all' as a group. For example:

```
@media (example, speech { /* rules for speech devices */ }
```

Because the parenthesized block is unclosed, it will contain the entire rest of the stylesheet from that point (unless it happens to encounter an unmatched ")" character somewhere in the stylesheet), and turn the entire thing into a 'not all' media query.

An unknown <media-type> must be treated as not matching.

EXAMPLE 20

For example, the media query 'unknown' is false, as 'unknown' is an unknown media type.

But 'not unknown' is true, as the 'not' negates the false media type.

EXAMPLE 21

Remember that some keywords aren't allowed as <media-type>s and cause parsing to fail entirely: the media query 'or and (color)' is turned into 'not all' during parsing, rather than just treating the 'or' as an unknown media type.

An unknown <mf-name> or <mf-value>, or disallowed <mf-value>, results in the value "unknown". A <media-query> whose value is "unknown" must be replaced with 'not all'.

EXAMPLE 22

```
<link media="screen and (max-weight: 3kg) and (color), (color)"rel="stylesheet" |
```

As 'max-weight' is an unknown media feature, this media query list is turned into 'not all, (color)', which is equivalent to just '(color)'.

EXAMPLE 23

```
@media (min-orientation:portrait) { … }
```

The ‘orientation’ feature does not accept prefixes, so this is considered an unknown media feature, and turned into ‘not all’.

EXAMPLE 24

The media query ‘(color:20example)’ specifies an unknown value for the ‘color’ media feature and is therefore turned into ‘not all’.

Note that media queries are also subject to the parsing rules of the host language. For example, take the following CSS snippet:

```
@media test;,all { body { background:lime } }
```

The media query ‘test;,all’ is, parsed by itself, equivalent to ‘not all, all’, which is always true. However, CSS’s parsing rules cause the ‘@media’ rule, and thus the media query, to end at the semicolon. The remainder of the text is treated as a style rule with an invalid selector and contents.

§ 4. Viewport/Page Characteristics Media Features

§ 4.1. Width: the ‘width’ feature

Name:	***‘width’***
For:	‘@media’
Value:	<length>
Type:	range

The ‘width’ media feature describes the width of the targeted display area of the output device. For continuous media, this is the width of the viewport (as described by CSS2, section 9.1.1 [CSS2]) including the size of a rendered scroll bar (if any). For paged media, this is the width of the page box (as described by CSS2, section 13.2 [CSS2]).

<length>s are interpreted according to § 1.3 Units.

'width' is false in the negative range.

EXAMPLE 25

For example, this media query expresses that the style sheet is used on printed output wider than 25cm:

```
<link rel="stylesheet" media="print and (min-width: 25cm)" href="http://…" />
```

EXAMPLE 26

This media query expresses that the style sheet is used on devices with viewport (the part of the screen/paper where the document is rendered) widths between 400 and 700 pixels:

```
@media (400px <= width <= 700px) { … }
```

EXAMPLE 27

This media query expresses that style sheet is used if the width of the viewport is greater than 20em.

```
@media (min-width: 20em) { … }
```

The 'em' value is relative to the initial value of 'font-size'.

§ 4.2. Height: the 'height' feature

Name:	***'height'***
For:	'@media'
Value:	<length>
Type:	range

The 'height' media feature describes the height of the targeted display area of the output device. For continuous media, this is the height of the viewport including the size of a rendered scroll bar (if any). For paged media, this is the height of the page box.

<length>s are interpreted according to § 1.3 Units.

'height' is false in the negative range.

§ 4.3. Aspect-Ratio: the 'aspect-ratio' feature

Name:	***'aspect-ratio'***
For:	'@media'
Value:	<ratio>
Type:	range

The 'aspect-ratio' media feature is defined as the ratio of the value of the 'width' media feature to the value of the 'height' media feature.

§ 4.4. Orientation: the 'orientation' feature

Name:	***'orientation'***
For:	'@media'
Value:	portrait | landscape
Type:	discrete

'portrait'
: The 'orientation' media feature is 'portrait' when the value of the 'height' media feature is greater than or equal to the value of the 'width' media feature.

'landscape'
: Otherwise 'orientation' is 'landscape'.

EXAMPLE 28

The following media query tests for "portrait" orientation, like a phone held upright.

```
@media (orientation:portrait) { … }
```

§ 4.5. Block-Axis Overflow: the 'overflow-block' feature

Name:	***'overflow-block'***
For:	'@media'
Value:	none | scroll | paged
Type:	discrete

The 'overflow-block' media feature describes the behavior of the device when content overflows the initial containing block in the block axis.

'none'
: There is no affordance for overflow in the block axis; any overflowing content is simply not displayed. Examples: billboards

'scroll'
: Overflowing content in the block axis is exposed by allowing users to scroll to it. Examples: computer screens

'paged'
: Content is broken up into discrete pages; content that overflows one page in the block axis is displayed on the following page. Examples: printers, ebook readers

Media that match 'none' or 'scroll' are said to be ***continuous media***, while those that match 'paged' are said to be ***paged media***

> Note: Additional values for this media feature may be added in the future to describe classes of user agents with a hybrid behavior combining aspects of continuous and paged media. For example, the Presto layout engine (now discontinued) shipped with a semi-paginated presentation-mode behavior similar to 'continuous' except that it honored forced page breaks. Not knowing of any currently-shipping user agent with this type of behavior, the Working Group has decided not to add such a value in this level to avoid miscaracterizing any such user agent. Anyone implementing a user agent not adequately described by any of the values specified above is encouraged to contact the Working Group so that extensions to this media feature may be considered.

§ 4.6. Inline-Axis Overflow: the 'overflow-inline' feature

Name:	***'overflow-inline'***
For:	'@media'
Value:	none | scroll
Type:	discrete

The 'overflow-inline' media feature describes the behavior of the device when content overflows the initial containing block in the inline axis.

'none'
: There is no affordance for overflow in the inline axis; any overflowing content is simply not displayed.

'scroll'
: Overflowing content in the inline axis is exposed by allowing users to scroll to it.

Note: There are no known implementations of paged overflow of inline-overflowing content, and the very concept doesn't seem to make much sense, so there is intentionally no 'paged' value for 'overflow-inline'.

§ 5. Display Quality Media Features

§ 5.1. Display Resolution: the 'resolution' feature

Name:	***'resolution'***
For:	'@media'
Value:	<resolution> | infinite
Type:	range

The 'resolution' media feature describes the resolution of the output device, i.e. the density of the pixels, taking into account the page zoom but assuming a pinch zoom of 1.0.

The 'resolution' media feature is false in the negative range

When querying media with non-square pixels, ‘resolution’ queries the density in the vertical dimension.

For printers, this corresponds to the screening resolution (the resolution for printing dots of arbitrary color). Printers might have a different resolution for grayscale printing.

For output mediums that have no physical constraints on resolution (such as outputting to vector graphics), this feature must match the ***‘infinite’*** value. For the purpose of evaluating this media feature in the range context, ‘infinite’ must be treated as larger than any possible <resolution>. (That is, a query like ‘(resolution > 1000dpi)’ will be true for an ‘infinite’ media.)

EXAMPLE 29

This media query simply detects “high-resolution” screens (those with a hardware pixel to CSS ‘px’ ratio of at least 2):

```
@media (resolution >= 2dppx)
```

EXAMPLE 30

For example, this media query expresses that a style sheet is used on devices with resolution greater than 300 dots per CSS ‘in’:

```
@media print and (min-resolution: 300dpi) { … }
```

This media query is equivalent, but uses the CSS ‘cm’ unit:

```
@media print and (min-resolution: 118dpcm) { … }
```

<resolution> does not refer to the number of device pixels per physical length unit, but the number of device pixels per css unit. This mapping is done by the user agent, so it is always known to the user agent.

If the user agent either has no knowledge of the geometry of physical pixels, or knows about the geometry physical pixels and they are (close enough to) square, it would not map a different number of device pixels per css pixels along each axis, and the would therefore be no difference between the vertical and horizontal resolution.

Otherwise, if the UA chooses to map a different number along each axis, this would be to respond to physical pixels not being square either. How the UA comes to this knowledge is out of scope, but having enough information to take this decision, it can invert the mapping should the device be rotated 90 degrees.

§ 5.2. Display Type: the 'scan' feature

Name:	***'scan'***
For:	'@media'
Value:	interlace | progressive
Type:	discrete

The 'scan' media feature describes the scanning process of some output devices.

'interlace'

CRT and some types of plasma TV screens used "interlaced" rendering, where video frames alternated between specifying only the "even" lines on the screen and only the "odd" lines, exploiting various automatic mental image-correction abilities to produce smooth motion. This allowed them to simulate a higher FPS broadcast at half the bandwidth cost.

When displaying on interlaced screens, authors should avoid very fast movement across the screen to avoid "combing", and should ensure that details on the screen are wider than '1px' to avoid "twitter".

'progressive'

A screen using "progressive" rendering displays each screen fully, and needs no special treatment.

Most modern screens, and all computer screens, use progressive rendering.

EXAMPLE 31

For example, the “feet” of letters in serif fonts are very small features that can provoke “twitter” on interlaced devices. The ‘scan’ media feature can be used to detect this, and use an alternative font with less chance of “twitter”:

```
@media (scan: interlace) { body { font-family: sans-serif; } }
```

Note: At the time of writing, all known implementations match `scan: progressive` rather than `scan: interlace`.

§ 5.3. Detecting Console Displays: the ‘grid’ feature

Name:	***‘grid’***
For:	‘@media’
Value:	<mq-boolean>
Type:	discrete

The ‘grid’ media feature is used to query whether the output device is grid or bitmap. If the output device is grid-based (e.g., a “tty” terminal, or a phone display with only one fixed font), the value will be 1. Otherwise, the value will be 0.

The ***‘<mq-boolean>’*** value type is an <integer> with the value ‘0’ or ‘1’. Any other integer value is invalid. Note that ‘-0’ is always equivalent to ‘0’ in CSS, and so is also accepted as a valid <mq-boolean> value.

Note: The <mq-boolean> type exists only for legacy purposes. If this feature were being designed today, it would instead use proper named keywords for its values.

EXAMPLE 32

Here is an example that detects a narrow console screen:

```
@media (grid) and (max-width: 15em) { … }
```

Note: At the time of writing, all known implementations match `grid: 0` rather than `grid: 1`.

§ 5.4. Display Update Frequency: the 'update' feature

Name:	***'update'***
For:	'@media'
Value:	none | slow | fast
Type:	discrete

The 'update' media feature is used to query the ability of the output device to modify the appearance of content once it has been rendered. It accepts the following values:

'none'
: Once it has been rendered, the layout can no longer be updated. Example: documents printed on paper.

'slow'
: The layout may change dynamically according to the usual rules of CSS, but the output device is not able to render or display changes quickly enough for them to be perceived as a smooth animation. Example: E-ink screens or severely under-powered devices.

'fast'
: The layout may change dynamically according to the usual rules of CSS, and the output device is not unusually constrained in speed, so regularly-updating things like CSS Animations can be used. Example: computer screens.

EXAMPLE 33

For example, if a page styles its links to only add underlines on hover, it may want to always display underlines when printed:

```
@media (update) {
  a { text-decoration: none; }
  a:hover, a:focus { text-decoration: underline; }
}
/* In non-updating UAs, the links get their default underline at all times. */
```

§ 5.5. Detecting the display technology: the 'environment-blending' feature

Name:	***'environment-blending'***
For:	'@media'
Value:	opaque | additive | subtractive
Type:	discrete

The 'environment-blending' media feature is used to query the characteristics of the user's display so the author can adjust the style of the document. An author might choose to adjust the visuals and/or layout of the page depending on the display technology to increase the appeal or improve legibility.

The following values are valid:

'opaque'
: The document is rendered on an opaque medium, such as a traditional monitor or paper. Black is dark and white is 100% light.

'additive'
: The display blends the colors of the canvas with the real world using additive mixing. Black is fully transparent and white is 100% light.
For example: a head-up display in a car.

'subtractive'
: The display blends the colors of the canvas with the real world using subtractive mixing. White is fully transparent and dark colors have the most contrast.
For example: an LCD display embedded in a bathroom mirror.

ISSUE 2 Is there a need for the 'subtractive' value?

EXAMPLE 34

```
body { background-color: white; }
p { color: black; }

@media(environment-blending: additive) {
    body { background-color: black; }
    p { color: white; font-size: 16px; font-weight: 1000; }
}
```

§ 6. Color Media Features

§ 6.1. Color Depth: the 'color' feature

Name:	***'color'***
For:	'@media'
Value:	<integer>
Type:	range

The 'color' media feature describes the number of bits per color component of the output device. If the device is not a color device, the value is zero.

'color' is false in the negative range.

EXAMPLE 35

For example, these two media queries express that a style sheet applies to all color devices:

```
@media (color) { … }
@media (min-color: 1) { … }
```

EXAMPLE 36

This media query expresses that a style sheet applies to color devices with at least 8 bits per color component:

```
@media (color >= 8) { … }
```

If different color components are represented by different number of bits, the smallest number is used.

EXAMPLE 37

For instance, if an 8-bit color system represents the red component with 3 bits, the green component with 3 bits, and the blue component with 2 bits, the 'color' media feature will have a value of 2.

In a device with indexed colors, the minimum number of bits per color component in the lookup table is used.

Note: The described functionality is only able to describe color capabilities at a superficial level. 'color-gamut', is generally more relevant to authors' needs. If further functionality is required, RFC2879 [RFC2879] provides more specific media features which may be supported at a later stage.

§ 6.2. Paletted Color Screens: the 'color-index' feature

Name:	***'color-index'***
For:	'@media'
Value:	<integer>
Type:	range

The 'color-index' media feature describes the number of entries in the color lookup table of the output device. If the device does not use a color lookup table, the value is zero.

'color-index' is false in the negative range.

EXAMPLE 38

For example, here are two ways to express that a style sheet applies to all color index devices:

```
@media (color-index) { … }
@media (color-index >= 1) { … }
```

EXAMPLE 39

This media query expresses that a style sheet applies to a color index device with 256 or more entries:

```
<?xml-stylesheet media="(min-color-index: 256)"
  href="http://www.example.com/…" ?>
```

§ 6.3. Monochrome Screens: the 'monochrome' feature

Name:	***'monochrome'***
For:	'@media'
Value:	<integer>
Type:	range

The 'monochrome' media feature describes the number of bits per pixel in a monochrome frame buffer. If the device is not a monochrome device, the output device value will be 0.

'monochrome' is false in the negative range.

EXAMPLE 40

For example, this is how to express that a style sheet applies to all monochrome devices:

```
@media (monochrome) { … }
```

EXAMPLE 41

Express that a style sheet applies to monochrome devices with more than 2 bits per pixels:

```
@media (monochrome >= 2) { … }
```

EXAMPLE 42

Express that there is one style sheet for color pages and another for monochrome:

```
<link rel="stylesheet" media="print and (color)" href="http://…" />
<link rel="stylesheet" media="print and (monochrome)" href="http://…" />
```

§ 6.4. Color Display Quality: the 'color-gamut' feature

Name:	***'color-gamut'***
For:	'@media'
Value:	srgb | p3 | rec2020
Type:	discrete

The 'color-gamut' media feature describes the approximate range of colors that are supported by the UA and output device. That is, if the UA receives content with colors in the specified space it can cause the output device to render the appropriate color, or something appropriately close enough.

Note: The query uses approximate ranges for a few reasons. Firstly, there are a lot of differences in display hardware. For example, a device might claim to support "Rec. 2020", but actually renders a significantly lower range of the full gamut. Secondly, there are a lot of different color ranges that different devices support, and enumerating them all would be tedious. In most cases the author does not need to know the exact capabilities of the display, just whether it is better than sRGB, or significantly better than sRGB. That way they can serve appropriate images, tagged with color profiles, to the user.

'srgb'

The UA and output device can support approximately the sRGB gamut or more.

Note: It is expected that the vast majority of color displays will be able to return true to a query of this type.

'p3'

The UA and output device can support approximately the gamut specified by the DCI P3 Color Space or more.

Note: The 'p3' gamut is larger than and includes the 'srgb' gamut.

'rec2020'

The UA and output device can support approximately the gamut specified by the ITU-R Recommendation BT.2020 Color Space or more.

Note: The 'rec2020' gamut is larger than and includes the 'p3' gamut.

The following table lists the primary colors of these color spaces in terms of their color space chromaticity coordinates, as defined in [COLORIMETRY].

Color Space	White Point		Primaries					
			Red		Green		Blue	
	x_W	y_W	x_R	y_R	x_G	y_G	x_B	y_B
srgb	0.3127	0.3290	0.640	0.330	0.300	0.600	0.150	0.060
p3	0.3127	0.3290	0.680	0.320	0.265	0.690	0.150	0.060
rec2020	0.3127	0.3290	0.708	0.292	0.170	0.797	0.131	0.046

Note: The table above does not contains enough information to fully describe the color spaces, but is sufficient to determine whether an output device approximately covers their respective gamuts. See [SRGB] for more information on sRGB, [SMPTE-EG-432-1-2010] and [SMPTE-RP-431-2-2011] for more information on DCI P3, and [ITU-R-BT-2020-2] for more information on ITU-R Recommendation BT.2020.

EXAMPLE 43

For example, this media query applies when the display supports colors in the range of DCI P3:

```
@media (color-gamut: p3) { … }
```

Note: An output device can return true for multiple values of this media feature, if its full output gamut is large enough, or one gamut is a subset of another supported gamut. As a result, this feature is best used in an "ascending" fashion—set a base value when ‘(color-gamut: srgb)’ is true, then override it if ‘(color-gamut: p3)’ is true, etc.

Note: Some output devices, such as monochrome displays, cannot support even the ‘srgb’ gamut. To test for these devices, you can use this feature in a negated boolean-context fashion: ‘not (color-gamut)’.

§ 6.5. Dynamic Range: the ‘dynamic-range’ feature

Name:	***'dynamic-range'***
For:	'@media'
Value:	standard | high
Type:	discrete

'dynamic-range' represents the combination of max brightness, color depth, and contrast ratio that are supported by the UA and output device.

'high'
The combination of the User Agent and the output device fulfill all of the following criteria:

- it has a high peak brightness
- it has a high contrast ratio
- its color depth is greater than 24 bit or 8 bit per color component of RGB

'standard'
One or more of the criteria for a 'high' 'dynamic-range' is not fulfilled.

§ 6.5.1. Determining contrast and brightness of display

Peak brightness refers to how bright the brightest point a light-emitting device such as an LCD screen can produce, or in the case of a light reflective device such as paper or e-ink, the point at which it least absorbs light.

> Note: Some devices can only produce their peak brightness for brief periods of time or on a small portion of their surface at any given time.

The ***contrast ratio*** is the ratio of the luminance of the brightest color to that of the darkest color that the system is capable of producing.

This specification does not define precise ways by which these qualities can be measured; it also lets the User Agent determine what counts as a ***high*** contrast ratio and as a ***high*** peak brightness. User Agents must nonetheless attempt to conform to the following intent: a device capable of high peak brightness can display "brighter than white" highlights, and a simultaneous ability to do so while also presenting deep blacks (rather than an overall bright but washed out image) is indicative of a high contrast ratio.

Note: The determination for ‘dynamic-range’ and ‘video-dynamic-range’ will be vary depending on the User Agent, but is expected to have broadly dependable semantics.

§ 6.6. Detecting inverted colors on the display: the ‘inverted-colors’ feature

Name:	***‘inverted-colors’***
For:	‘@media’
Value:	none | inverted
Type:	discrete

The ‘inverted-colors’ media feature indicates whether the content is displayed normally, or whether colors have been inverted.

Note: This is an indication that the user agent or underlying operating system has forcibly inverted all colors, not a request to do so. This is sometimes provided as a simple accessibility feature, allowing users to switch between light-on-dark and dark-on-light text. However, this has unpleasant side effects, such as inverting pictures, or turning shadows into highlights, which reduce the readability of the content.

‘none’
: Colors are displayed normally.

‘inverted’
: All pixels within the displayed area have been inverted.
This value must not match if the User Agent has done some kind of content aware inversion such as one that preserves the images (except through its UA style sheet, see below).

Note: This is because the goal of this media feature is to enable authors to mitigate the undesirable effects of the non content aware approach that invert *all* the pixels. If the author were to take counter measures even in the content-aware cases, their counter measures and the UA’s would be at risk of cancelling each other.

User agents must add the following rule to their UA style sheet:

```
@media (inverted-colors) {
```

```
    img:not(picture>img), picture, video { filter: invert(100%); }
  }
```

EXAMPLE 44

In addition to this UA style sheet rule, and depending on their style sheet, authors may also wish to invert images injected via CSS (such as backgrounds), or to disable shadows:

```
@media (inverted-colors) {
  * {
    text-shadow: none !important;
    box-shadow: none !important;
  }
}
```

§ 7. Interaction Media Features

The “interaction” media features reflect various aspects of how the user interacts with the page.

Typical examples of devices matching combinations of ‘pointer’ and ‘hover’:

	‘pointer: none’	**‘pointer: coarse’**	**‘pointer: fine’**
‘hover: none’	keyboard-only controls, sequential/spatial (d-pad) focus navigation	smartphones, touch screens	basic stylus digitizers (Cintiq, Wacom, etc)
‘hover: hover’		Nintendo Wii controller, Kinect	mouse, touch pad, advanced stylus digitizers (Surface, Samsung Note, Wacom Intuos Pro, etc)

The ‘pointer’ and ‘hover’ features relate to the characteristics of the “primary” pointing device, while ‘any-pointer’ and ‘any-hover’ can be used to query the properties of all potentially available pointing devices.

Note: While this specification does not define how user agents should decide what the “primary” pointing device is, the expectation is that user agents should make this determination by combining knowledge about the device/environment they are running on, the number and type of pointing devices available, and a notion of which of these is generally and/or currently being used. In situations where the primary input mechanism for a device is not a pointing device, but there is a secondary – and less frequently used – input that is a pointing devices, the user agent may decide to treat the non-pointing device as the primary (resulting in 'pointer: none'). user agents may also decide to dynamically change what type of pointing device is deemed to be primary, in response to changes in the user environment or in the way the user is interacting with the UA.

Note: The ‘pointer’, ‘hover’, ‘any-pointer’ and ‘any-hover’ features only relate to the characteristics, or the complete absence, of pointing devices, and can not be used to detect the presence of non-pointing device input mechanisms such as keyboards. Authors should take into account the potential presence of non-pointing device inputs, regardless of which values are matched when querying these features.

While ‘pointer’ and ‘hover’ can be used to design the main style and interaction mode of the page to suit the primary input mechanism (based on the characteristics, or complete absence, of the primary pointing device), authors should strongly consider using ‘any-pointer’ and ‘any-hover’ to take into account all possible types of pointing devices that have been detected.

§ 7.1. Pointing Device Quality: the ‘pointer’ feature

Name:	***‘pointer’***
For:	‘@media’
Value:	none | coarse | fine
Type:	discrete

The ‘pointer’ media feature is used to query the presence and accuracy of a pointing device such as a mouse. If multiple pointing devices are present, the ‘pointer’ media feature must reflect the characteristics of the “primary” pointing device, as determined by the user agent. (To query the capabilities of *any* available pointing devices, see the ‘any-pointer’ media feature.)

‘none’

The primary input mechanism of the device does not include a pointing device.

'coarse'

The primary input mechanism of the device includes a pointing device of limited accuracy. Examples include touchscreens and motion-detection sensors (like the Kinect peripheral for the Xbox.)

'fine'

The primary input mechanism of the device includes an accurate pointing device. Examples include mice, touchpads, and drawing styluses.

Both 'coarse' and 'fine' indicate the presence of a pointing device, but differ in accuracy. A pointing device with which it would be difficult or impossible to reliably pick one of several small adjacent targets at a zoom factor of 1 would qualify as 'coarse'. Changing the zoom level does not affect the value of this media feature.

> Note: As the UA may provide the user with the ability to zoom, or as secondary pointing devices may have a different accuracy, the user may be able to perform accurate clicks even if the value of this media feature is 'coarse'. This media feature does not indicate that the user will never be able to click accurately, only that it is inconvenient for them to do so. Authors are expected to react to a value of 'coarse' by designing pages that do not rely on accurate clicking to be operated.

For accessibility reasons, even on devices whose pointing device can be described as 'fine', the UA may give a value of 'coarse' or 'none' to this media query, to indicate that the user has difficulties manipulating the pointing device accurately or at all. In addition, even if the primary pointing device has 'fine' pointing accuracy, there may be additional 'coarse' pointing devices available to the user. Authors may wish to query the 'any-pointer' media feature to take these other 'coarse' potential pointing devices into account.

EXAMPLE 45

```
/* Make radio buttons and check boxes larger if we have an inaccurate primary po
@media (pointer:coarse) {
  input[type="checkbox"], input[type="radio"] {
    min-width:30px;
    min-height:40px;
    background:transparent;
  }
}
```

§ 7.2. Hover Capability: the 'hover' feature

Name:	***'hover'***
For:	'@media'
Value:	none | hover
Type:	discrete

The 'hover' media feature is used to query the user's ability to hover over elements on the page with the primary pointing device. If a device has multiple pointing devices, the 'hover' media feature must reflect the characteristics of the "primary" pointing device, as determined by the user agent. (To query the capabilities of *any* available pointing devices, see the 'any-hover' media feature.)

'none'

Indicates that the primary pointing device can't hover, or that there is no pointing device. Examples include touchscreens and screens that use a basic drawing stylus.

Pointing devices that can hover, but for which doing so is inconvenient and not part of the normal way they are used, also match this value. For example, a touchscreen where a long press is treated as hovering would match 'hover: none'.

'hover'

Indicates that the primary pointing device can easily hover over parts of the page. Examples include mice and devices that physically point at the screen, like the Nintendo Wii controller.

EXAMPLE 46

For example, on a touch screen device that can also be controlled by an optional mouse, the 'hover' media feature should match 'hover: none', as the primary pointing device (the touch screen) does not allow the user to hover.

However, despite this, the optional mouse does allow users to hover. Authors should therefore be careful not to assume that the ':hover' pseudo class will never match on a device where 'hover:none' is true, but they should design layouts that do not depend on hovering to be fully usable.

For accessibility reasons, even on devices that do support hovering, the UA may give a value of 'hover: none' to this media query, to opt into layouts that work well without hovering. Note that even if the primary input mechanism has 'hover: hover' capability, there may be additional input mechanisms available to the user that do not provide hover capabilities.

EXAMPLE 47

```
/* Only use a hover-activated drop down menu on devices that can conveniently ho
@media (hover) {
  .menu > li        {display:inline-block;}
  .menu ul          {display:none; position:absolute;}
  .menu li:hover ul {display:block; list-style:none; padding:0;}
  /* ... */
}
```

§ 7.3. All Available Interaction Capabilities: the 'any-pointer' and 'any-hover' features

Name:	***'any-pointer'***
For:	'@media'
Value:	none | coarse | fine
Type:	discrete

Name:	***'any-hover'***
For:	'@media'
Value:	none | hover
Type:	discrete

The 'any-pointer' and 'any-hover' media features are identical to the 'pointer' and 'hover' media features, but they correspond to the union of capabilities of all the pointing devices available to the user. In the case of 'any-pointer', more than one of the values can match, if different pointing devices have different characteristics.

'any-pointer' and 'any-hover' must only match 'none' if *all* of the pointing devices would match 'none' for the corresponding query, or there are no pointing devices at all.

‘any-pointer’ is used to query the presence and accuracy of pointing devices. It does not take into account any additional non-pointing device inputs, and can not be used to test for the presence of other input mechanisms, such as d-pads or keyboard-only controls, that don’t move an on-screen pointer. 'any-pointer:none' will only evaluate to true if there are no pointing devices at all present.

EXAMPLE 48

On a traditional desktop environment with a mouse and keyboard, 'any-pointer:none' will be false (due to the presence of the mouse), even though a non-pointer input (the keyboard) is also present.

'any-hover:none' will only evaluate to true if there are no pointing devices, or if all the pointing devices present lack hover capabilities. As such, it should be understood as a query to test if any hover-capable pointing devices are present, rather than whether or not any of the pointing devices is hover-incapable. The latter scenario can currently not be determined using ‘any-hover’ or any other interaction media feature. Additionally, it does not take into account any non-pointing device inputs, such as d-pads or keyboard-only controls, which by their very nature are also not hover-capable.

EXAMPLE 49

On a touch-enabled laptop with a mouse and a touchscreen, 'any-hover:none' will evaluate to false (due to the presence of the hover-capable mouse), even though a non-hover-capable pointing device (the touchscreen) is also present. It is currently not possible to provide different styles for cases where different pointing devices have different hover capabilities.

Designing a page that relies on hovering or accurate pointing only because ‘any-hover’ or ‘any-pointer’ indicate that at least one of the available input mechanisms has these capabilities is likely to result in a poor experience. However, authors may use this information to inform their decision about the style and functionality they wish to provide based on any additional pointing devices that are available to the user.

EXAMPLE 50

A number of smart TVs come with a way to control an on-screen cursor, but it is often fairly basic controller which is difficult to operate accurately.

A browser in such a smart TV would have 'coarse' as the value of both 'pointer' and 'any-pointer', allowing authors to provide a layout with large and easy to reach click targets.

The user may also have paired a Bluetooth mouse with the TV, and occasionally use it for extra convenience, but this mouse is not the main way the TV is operated. 'pointer' still matches 'coarse', while 'any-pointer' now both matches 'coarse' and 'fine'.

Switching to small click targets based on the fact that '(any-pointer: fine)' is now true would not be appropriate. It would not only surprise the user by providing an experience out of line with what they expect on a TV, but may also be quite inconvenient: the mouse, not being the primary way to control the TV, may be out of reach, hidden under one of the cushions on the sofa...

By contrast, consider scrolling on the same TV. Scrollbars are difficult to manipulate without an accurate pointing device. Having prepared an alternative way to indicate that there is more content to be seen based on '(pointer: coarse)' being true, an author may want to still show the scrollbars in addition if '(any-pointer: fine)' is true, or to hide them altogether to reduce visual clutter if '(any-pointer: fine)' is false.

§ 8. Video Prefixed Features

Some user agents, including many TVs, render video and graphics in two separate "planes" (bi-plane) with distinct screen characteristics. A set of video-prefixed features is provided to describe the video plane.

Any bi-plane implementation must return values based on the video plane for the following features: 'video-color-gamut'; 'video-width'; 'video-height'; 'video-resolution'; 'video-dynamic-range'. All other features must return values based on the graphics plane.

Non bi-plane implementations must return the same values for video-prefixed features and their non-prefixed counterparts.

ISSUE 3 ‘video-width’, ‘video-height’, ‘video-resolution’ are still under discussion. It isn’t clear yet whether they are the right approach to address the video use case, and even if they are, the details of how they work aren’t fully figured out yet. Shipping them as specified would be premature, and would-be implementors are strongly encouraged to get in touch with the CSS Working Group. <https://github.com/w3c/csswg-drafts/issues/5044>

§ 8.1. Video Color Display Quality: the ‘video-color-gamut’ feature

Name:	***‘video-color-gamut’***
For:	‘@media’
Value:	srgb | p3 | rec2020
Type:	discrete

The ‘video-color-gamut’ media feature describes the approximate range of colors that are supported by the UA and output device’s video plane. That is, if the UA receives content with colors in the specified space it can cause the output device to render the appropriate color, or something appropriately close enough.

Value and color space definitions are the same as ‘color-gamut’

§ 8.2. Video Dynamic Range: the ‘video-dynamic-range’ feature

Name:	***‘video-dynamic-range’***
For:	‘@media’
Value:	standard | high
Type:	discrete

‘video-dynamic-range’ represents the combination of max brightness, color depth, and contrast ratio that are supported by the UA and output device’s video plane.

Supported values are the same as dynamic-range.

§ 8.3. Video-Width: the 'video-width' feature

ISSUE 4 'video-width', 'video-height', 'video-resolution' are still under discussion. It isn't clear yet whether they are the right approach to address the video use case, and even if they are, the details of how they work aren't fully figured out yet. Shipping them as specified would be premature, and would-be implementors are strongly encouraged to get in touch with the CSS Working Group. <https://github.com/w3c/csswg-drafts/issues/5044>

Name:	***'video-width'***
For:	'@media'
Value:	<length>
Type:	range

The 'video-width' media feature describes the width of the targeted display's video plane area of the output device. For continuous media, this is the width of the viewport (as described by CSS2, section 9.1.1 [CSS2]) including the size of a rendered scroll bar (if any). For paged media, this is the width of the page box (as described by CSS2, section 13.2 [CSS2]).

<length>s are interpreted according to Media Queries 4 §1.3 Units.

'video-width' is false in the negative range.

§ 8.4. Video-Height: the 'video-height' feature

ISSUE 5 'video-width', 'video-height', 'video-resolution' are still under discussion. It isn't clear yet whether they are the right approach to address the video use case, and even if they are, the details of how they work aren't fully figured out yet. Shipping them as specified would be premature, and would-be implementors are strongly encouraged to get in touch with the CSS Working Group. <https://github.com/w3c/csswg-drafts/issues/5044>

Name:	***'video-height'***
For:	'@media'
Value:	<length>
Type:	range

The 'video-height' media feature describes the height of the targeted display's video plane area of the output device. For continuous media, this is the height of the viewport including the size of a rendered scroll bar (if any). For paged media, this is the height of the page box.

<length>s are interpreted according to Media Queries 4 §1.3 Units.

'video-height' is false in the negative range.

§ 8.5. Video Display Resolution: the 'video-resolution' feature

ISSUE 6 'video-width', 'video-height', 'video-resolution' are still under discussion. It isn't clear yet whether they are the right approach to address the video use case, and even if they are, the details of how they work aren't fully figured out yet. Shipping them as specified would be premature, and would-be implementors are strongly encouraged to get in touch with the CSS Working Group. <https://github.com/w3c/csswg-drafts/issues/5044>

Name:	***'video-resolution'***
For:	'@media'
Value:	<resolution> | infinite
Type:	range

The 'video-resolution' media feature describes the resolution of the output device's video plane, i.e. the density of the pixels, taking into account the page zoom but assuming a pinch zoom of 1.0.

The 'video-resolution' media feature is false in the negative range.

§ 9. Scripting Media Features

§ 9.1. Scripting Support: the 'scripting' feature

Name:	***'scripting'***
For:	'@media'
Value:	none | initial-only | enabled
Type:	discrete

The 'scripting' media feature is used to query whether scripting languages, such as JavaScript, are supported on the current document.

'enabled'
: Indicates that the user agent supports scripting of the page, and that scripting in the current document is enabled for the lifetime of the document.

'initial-only'
: Indicates that the user agent supports scripting of the page, and that scripting in the current document is enabled during the initial page load, but is not supported afterwards. Examples are printed pages, or pre-rendering network proxies that render a page on a server and send a nearly-static version of the page to the user.

> ISSUE 7 Should there be an explicit minimum threshold to meet before a UA is allowed to claim 'initial-only'? Having one would mean authors would know what they can depend on, and could tailor their scripts accordingly. On the other hand, pinpointing that threshold is difficult: if it is set too low, the scripting facilities that authors can depend on may be to constrained to be practical, even though actual UAs may potentially all support significantly more. But trying to set it higher may cause us to exclude UAs that do support scripting at loading time, but restrict it in some cases based on complex heuristics. For instance, conservative definitions likely include at least running all inline scripts and firing the DOMContentLoaded event. But it does not seem useful for authors to constrain themselves to this if most (or maybe all) 'initial-only' UAs also load external scripts (including 'async' and 'defer') and fire the load event. On the other hand, requiring external scripts to be loaded and the load event to be fired could exclude UAs like Opera mini, which typically do run them, but may decide not to based on timeouts and other heuristics. <https://github.com/w3c/csswg-drafts/issues/503>

'none'

> Indicates that the user agent will not run scripts for this document; either it doesn't support a scripting language, or the support isn't active for the current document.

Some user agents have the ability to turn off scripting support on a per script basis or per domain basis, allowing some, but not all, scripts to run in a particular document. The 'scripting' media feature does not allow fine grained detection of which script is allowed to run. In this scenario, the value of the 'scripting' media feature should be 'enabled' or 'initial-only' if scripts originating on the same domain as the document are allowed to run, and 'none' otherwise.

> Note: A future level of CSS may extend this media feature to allow fine-grained detection of which script is allowed to run.

§ 10. Custom Media Queries

When designing documents that use media queries, the same media query may be used in multiple places, such as to qualify multiple '@import' statements. Repeating the same media query multiple times is an editing hazard; an author making a change must edit every copy in the same way, or suffer from difficult-to-find bugs in their CSS.

To help ameliorate this, this specification defines a method of defining custom media queries, which are simply-named aliases for longer and more complex media queries. In this way, a media query used in multiple places can instead be assigned to a custom media query, which can be used everywhere, and editing the media query requires touching only one line of code.

A ***custom media query*** is defined with the '@custom-media' rule:

```
@custom-media = @custom-media <extension-name> [ <media-query-list> | true | false
```

The <extension-name> can then be used in a media feature. It **must** be used in a boolean context; using them in a normal or range context is a syntax error. If a <media-query-list> is given, the custom media query evaluates to true if the <media-query-list> it represents evaluates to true, and false otherwise. If ***'true'*** or ***'false'*** is given, the custom media query evaluates to true or false, respectively.

A '@custom-media' rule can refer to other custom media queries. However, loops are forbidden, and a custom media query must not be defined in terms of itself or of another custom media query that directly or indirectly refers to it. Any such attempt of defining a custom media query with a circular dependency must cause all the custom media queries in the loop to fail to be defined.

If multiple '@custom-media' rules declare the same <extension-name>, the truth value is based on the last one alone, ignoring all previous declarations of the same <extension-name>.

Note: For error handling purposes, an undefined media feature is different from a media feature that evaluates to false. See Media Queries 4 §3.2 Error Handling for details.

EXAMPLE 51

For example, if a responsive site uses a particular breakpoint in several places, it can alias that with a reasonable name:

```
@custom-media --narrow-window (max-width: 30em);

@media (--narrow-window) {
  /* narrow window styles */
}
@media (--narrow-window) and (script) {
  /* special styles for when script is allowed */
}
/* etc */
```

§ 10.1. Script-based Custom Media Queries

ISSUE 8 Define a map of names to values for JS. Values can be either a MediaQueryList object or a boolean, in which case it's treated identically to the above, or can be a number or a string, in which case it's treated like a normal MQ, and can use the normal or range context syntax. Like:

```
<script>
CSS.customMedia.set('--foo', 5);
</script>
<style>
@media (_foo: 5) { ... }
@media (_foo < 10) { ... }
</style>
```

§ 11. User Preference Media Features

§ 11.1. Detecting the desire for less motion on the page: the 'prefers-reduced-motion' feature

Name:	***'prefers-reduced-motion'***
For:	'@media'
Value:	no-preference | reduce
Type:	discrete

The 'prefers-reduced-motion' media feature is used to detect if the user has requested the system minimize the amount of animation or motion it uses.

'no-preference'
: Indicates that the user has made no preference known to the system. This keyword value evaluates as false in the boolean context.

'reduce'
: Indicates that user has notified the system that they prefer an interface that minimizes the amount of movement or animation, preferably to the point where all non-essential movement is removed.

§ 11.2. Detecting the desire for reduced transparency on the page: the 'prefers-reduced-transparency' feature

Name:	***'prefers-reduced-transparency'***
For:	'@media'
Value:	no-preference | reduce
Type:	discrete

The 'prefers-reduced-transparency' media feature is used to detect if the user has requested the system minimize the amount of transparent or translucent layer effects it uses.

'no-preference'
: Indicates that the user has made no preference known to the system. This keyword value evaluates as false in the boolean context.

'reduce'
: Indicates that user has notified the system that they prefer an interface that minimizes the amount of transparent or translucent layer effects.

ISSUE 9 How does this interact with preferences around e.g. pattern fills and backgrounds? They're not about transparency, but they also interfere with shape recognition.

§ 11.3. Detecting the desire for increased or decreased color contrast from elements on the page: the 'prefers-contrast' feature

Name:	***'prefers-contrast'***
For:	'@media'
Value:	no-preference | high | low | forced
Type:	discrete

The 'prefers-contrast' media feature is used to detect if the user has requested the system increase or decrease the amount of contrast between adjacent colors. For example, many users have difficulty reading text that has a small difference in contrast to the text background and would prefer a larger contrast.

'no-preference'
: Indicates that the user has made no preference known to the system. This keyword value evaluates as false in the boolean context.

'high'
: Indicates that user has notified the system that they prefer an interface that has a higher level of contrast.

'low'
: Indicates that user has notified the system that they prefer an interface that has a lower level of contrast.

'forced'
: Indicates that forced colors mode is active, identically to 'forced-colors: active'. See § 11.5 Detecting a forced color palette: the forced-colors feature and CSS Color Adjust §3 Forced Color Schemes: the forced-color-adjust property.

> This does *not* necessarily indicates a preference for a high contrast. The colors have been forcibly adjusted to match the preference of the user, but that preference can be for a low contrast or a high one, or some other arrangement that is neither particularly low or high contrast.

Note: When the User Agent can determine whether the particular forced color scheme chosen by the user is high or low contrast, one of 'prefers-contrast: high' or 'prefers-contrast: low' should match, in addition to 'prefers-contrast: forced'.

Note: Authors can respond to specific user preferences for a higher or lower contrast using 'prefers-contrast: high' or 'prefers-contrast: low', as appropriate.

Using an unqualified `@media (prefers-contrast) { … }` to apply high contrast styles is incorrect and user-hostile, as it would also impose high contrast styles to people who have requested the exact opposite.

However, it is also common to reduce visual clutter in response to both high and low contrast preferences. In that case, it is appropriate to use `@media (prefers-contrast) { … }` without specifying 'high' or 'low', to do things like replacing background images with plain colors, turning off decorative gradients, or replacing border images or box shadows with simple solid borders. As 'forced', like 'high' or 'low', evaluates to true in a boolean context, this syntax also benefits users of forced colors mode, even when it isn't know whether their colors of choice result in a high or low contrast (or something else).

ISSUE 10 Split 'high' into two levels, "extremely high" (as used in MSFT's black-on-white high contrast theme) and "increased (as implemented in Apple's Increased Contrast settings)? <https://github.com/w3c/csswg-drafts/issues/2943>

§ 11.4. Detecting the desire for light or dark color schemes: the 'prefers-color-scheme' feature

Name:	***'prefers-color-scheme'***
For:	'@media'
Value:	light | dark
Type:	discrete

The 'prefers-color-scheme' media feature reflects the user's desire that the page use a light or dark color theme.

'light'

Indicates that user has expressed the preference for a page that has a light theme (dark text on light background), or has not expressed an active preference (and thus should receive the "web default" of a light theme).

'dark'

Indicates that user has expressed the preference for a page that has a dark theme (light text on dark background).

Note: The values for this feature might be expanded in the future (to express a more active preference for light color schemes, or preferences for other types of color schemes like "sepia"). As such, the most future-friendly way to use this media feature is by negation such as '(prefers-color-scheme: dark)' and '(not (prefers-color-scheme: dark))', which ensures that new values fall into at least one of the styling blocks.

The method by which the user expresses their preference can vary. It might be a system-wide setting exposed by the Operating System, or a setting controlled by the User Agent.

Note: User preferences can also vary by medium. For example, a user may prefer dark themes on a glowing screen, but light themes when printing (to save ink and/or because inked text on blank paper prints better than blank letterforms knocked out of an inked background). UAs are expected to take such variances into consideration so that 'prefers-color-scheme' reflects preferences appropriate to the medium rather than preferences taken out of context.

This feature, like the other 'prefers-*' features, previously had a 'no-preference' value to indicate an author not expressing an active preference. However, user agents converged on expressing the "default" behavior as a 'light' preference, and never matching 'no-preference'.

If a future user agent wishes to expose a difference between "no preference" and "really wants a light display", please contact the CSSWG to discuss this.

§ 11.5. Detecting a forced color palette: the 'forced-colors' feature

Name:	***'forced-colors'***
For:	'@media'
Value:	none | active
Type:	discrete

The 'forced-colors' media feature is used to detect if the user agent has enabled a forced colors mode where it enforces a user-chosen limited color palette on the page.

'none'
: Forced colors mode is not active; the page's colors are not being forced into a limited palette.

'active'
: Indicates that forced colors mode is active. The UA will provide the color palette to authors through the CSS system color keywords and, if appropriate, trigger the appropriate value of 'prefers-color-scheme' so that authors can adapt the page. See CSS Color Adjust §3 Forced Color Schemes: the forced-color-adjust property for details.

§ 11.6. Detecting the desire for reduced data usage when loading a page: the 'prefers-reduced-data' feature

ISSUE 11 This feature may be an undesired source of fingerprinting, with a bias towards low income with limited data. A Privacy and Security section should be added to this spec, and it should address this concern. <https://github.com/w3c/csswg-drafts/issues/4832>

ISSUE 12 This feature is an early draft, and the CSS-WG does not consider it ready for shipping in production. <https://github.com/w3c/csswg-drafts/issues/4834>

Name:	***'prefers-reduced-data'***
For:	'@media'
Value:	no-preference | reduce
Type:	discrete

The 'prefers-reduced-data' media feature is used to detect if the user has a preference for being served alternate content that uses less data for the page to be rendered.

'no-preference'
: Indicates that the user has made no preference known to the system. This keyword value evaluates as false in the boolean context.

'reduce'
: Indicates that user has expressed the preference for lightweight alternate content.

The method by which the user expresses their preference can vary. It might be a system-wide setting exposed by the Operating System, or a setting controlled by the User Agent.

> Note: User Agents may consider setting this based on the same user or system preference as they use to set the Save-Data HTTP request header.

EXAMPLE 52

For example, a site could honour the preference of a user who has turned on data-saving mode by serving a smaller image.

```
.image {
  background-image: url("images/heavy.jpg");
}

@media (prefers-reduced-data: reduce) {
  /* Save-Data: On */
  .image {
    background-image: url("images/light.jpg");
  }
}
```

§ 11.7. Automatic handling of User Preferences

User agents may have explicit settings allowing users to indicate their preferences or may make the determination based on settings in the underlying operating system. User agents may also automatically infer the preferences of the user based on knowledge about the device, the environment, etc. In such case, it is recommended that they also offer a way for users to opt out of or override the automatically determined preferences.

EXAMPLE 53

In addition to allowing users to explicitly choose between a preference for a 'light' or 'dark' color scheme, a user agent could have a mode where the determination is automatically made based on the current time, expressing a preference for 'dark' between sunset and dawn.

EXAMPLE 54

Depending on the type of display used, changes in the ambient light level may make the reading experience difficult or uncomfortable.

For instance, liquid crystal displays can be washed out and very hard to read in brightly lit environments. A device with such a screen and with an ambient light sensor could automatically switch 'prefers-contrast' to 'high' when it detects conditions that would make the screen difficult to read. A user agent on a device with an e-ink display would not make the same adjustment, as such displays remain readable in bright daylight.

In the opposite situation, user agents running of device with a light-emitting screen (LCD, OLED, etc.) and an ambient light sensor could automatically switch 'prefers-contrast' to 'low' and 'prefers-color-scheme' to 'dark' when used in a dim environment where excessive contrast and brightness would be distracting or uncomfortable to the reader.

EXAMPLE 55

A user agent could automatically switch between 'prefers-reduced-data: no-preference' and 'reduce' depending on whether the network connection in use allows for unlimited data or is on a metered plan.

§ Appendix A: Deprecated Media Features

The following media features are **deprecated**. They are kept for backward compatibility, but are not appropriate for newly written style sheets. Authors must not use them. User agents must support them as specified.

To query for the size of the viewport (or the page box on page media), the ‘width’, ‘height’ and ‘aspect-ratio’ media features should be used, rather than ‘device-width’, ‘device-height’ and ‘device-aspect-ratio’, which refer to the physical size of the the device regardless of how much space is available for the document being laid out. The device-* media features are also sometimes used as a proxy to detect mobile devices. Instead, authors should use media features that better represent the aspect of the device that they are attempting to style against.

§ device-width

Name:	***‘device-width’***
For:	‘@media’
Value:	<length>
Type:	range

The ‘device-width’ media feature describes the width of the rendering surface of the output device. For continuous media, this is the width of the Web-exposed screen area. For paged media, this is the width of the page sheet size.

‘device-width’ is false in the negative range.

EXAMPLE 56

```
@media (device-width < 800px) { … }
```

In the example above, the style sheet will apply only to screens less than ‘800px’ in length. The ‘px’ unit is of the logical kind, as described in the Units section.

Note: If a device can be used in multiple orientations, such as portrait and landscape, the ‘device-*’ media features reflect the current orientation.

§ device-height

Name:	***'device-height'***
For:	'@media'
Value:	<length>
Type:	range

The 'device-height' media feature describes the height of the rendering surface of the output device. For continuous media, this is the height of the Web-exposed screen area. For paged media, this is the height of the page sheet size.

'device-height' is false in the negative range.

EXAMPLE 57

```
<link rel="stylesheet" media="(device-height > 600px)" />
```

In the example above, the style sheet will apply only to screens taller than 600 vertical pixels. Note that the definition of the 'px' unit is the same as in other parts of CSS.

§ device-aspect-ratio

Name:	***'device-aspect-ratio'***
For:	'@media'
Value:	<ratio>
Type:	range

The 'device-aspect-ratio media feature is defined as the ratio of the value of the 'device-width' media feature to the value of the 'device-height media feature.

EXAMPLE 58

For example, if a screen device with square pixels has 1280 horizontal pixels and 720 vertical pixels (commonly referred to as “16:9”), the following media queries will all match the device:

```
@media (device-aspect-ratio: 16/9) { … }
@media (device-aspect-ratio: 32/18) { … }
@media (device-aspect-ratio: 1280/720) { … }
@media (device-aspect-ratio: 2560/1440) { … }
```

§ Changes

§ Changes Since the 2020-07-15 Working Draft

The following additions were made to this module since the 2020-07-15 Working Draft:

- Added a UA style sheet rule for ‘inverted-colors’.
- Added the ‘prefers-contrast: forced’ value.
- Remove the `light-level` media feature as it is redundant with ‘prefers-contrast’ and ‘prefers-color-scheme’; add examples of how these media features may be automatically inferred by the user agent based on the same factors `light-level` was expected to respond to.

§ Changes Since the 2020-06-03 Working Draft

The following additions were made to this module since the 2020-06-03 Working Draft:

- Merged the content of level 4 into this specification. It previously was maintained as a delta over level 4.
- Made a few editorial tweaks.

§ Changes Since the 2020-03-18 Working Draft

The following additions were made to this module since the 2020-03-18 Working Draft:

- Added ‘video-*’ and ‘dynamic-range’ media features
- Removed 'prefers-color-scheme: no-preference'

§ Changes Since the First Public Working Draft

The following additions were made to this module since the 2020-03-03 First Public Working Draft:

- Highlight some known issues inline in the document.

§ Changes since the Media Queries Level 4

The following additions were made to the First Public Working Draft of this module since the Media Queries Level 4:

- Reinstate the ‘light-level’, ‘inverted-colors’, and Custom Media Queries sections from earlier Media Queries Level 4 drafts.
- Added ‘prefers-reduced-motion’, ‘prefers-reduced-transparency’, ‘prefers-contrast’, ‘prefers-color-scheme’, and ‘forced-colors’ media features.

§ Acknowledgments

This specification is the product of the W3C Working Group on Cascading Style Sheets.

Comments from Adam Argyle, Amelia Bellamy-Royds, Andreas Lind, Andres Galante, Arve Bersvendsen, Björn Höhrmann, Chen Hui Jing, Chris Lilley, Chris Rebert, Christian Biesinger, Christoph Päper, Elika J. Etemad (fantasai), Emilio Cobos Álvarez, François Remy, Frédéric Wang, Fuqiao Xue, Greg Whitworth, Ian Pouncey, James Craig, Jinfeng Ma, Kivi Shapiro, L. David Baron, Masataka Yakura, Melinda Grant, Michael Smith, Nicholas C. Zakas Patrick H. Lauke, Philipp Hoschka, Rick Byers, Rijk van Geijtenbeek, Rik Cabanier, Roger Gimson, Rossen Atanassov, Sam Sneddon, Sigurd Lerstad, Simon Kissane, Simon Pieters, Steven Pemberton, Susan Lesch, Tantek Çelik, Thomas Wisniewski, Vi Nguyen, Xidorn Quan, Yves Lafon, akklesed, and 張俊芝 improved this specification.

§ Conformance

§ Document conventions

Conformance requirements are expressed with a combination of descriptive assertions and RFC 2119 terminology. The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in the normative

parts of this document are to be interpreted as described in RFC 2119. However, for readability, these words do not appear in all uppercase letters in this specification.

All of the text of this specification is normative except sections explicitly marked as non-normative, examples, and notes. [RFC2119]

Examples in this specification are introduced with the words “for example” or are set apart from the normative text with `class="example"`, like this:

> EXAMPLE 59
>
> This is an example of an informative example.

Informative notes begin with the word “Note” and are set apart from the normative text with `class="note"`, like this:

> Note, this is an informative note.

Advisements are normative sections styled to evoke special attention and are set apart from other normative text with `<strong class="advisement">`, like this:

> **UAs MUST provide an accessible alternative.**

§ Conformance classes

Conformance to this specification is defined for three conformance classes:

style sheet
: A CSS style sheet.

renderer
: A UA that interprets the semantics of a style sheet and renders documents that use them.

authoring tool
: A UA that writes a style sheet.

A style sheet is conformant to this specification if all of its statements that use syntax defined in this module are valid according to the generic CSS grammar and the individual grammars of each feature defined in this module.

A renderer is conformant to this specification if, in addition to interpreting the style sheet as defined

by the appropriate specifications, it supports all the features defined by this specification by parsing them correctly and rendering the document accordingly. However, the inability of a UA to correctly render a document due to limitations of the device does not make the UA non-conformant. (For example, a UA is not required to render color on a monochrome monitor.)

An authoring tool is conformant to this specification if it writes style sheets that are syntactically correct according to the generic CSS grammar and the individual grammars of each feature in this module, and meet all other conformance requirements of style sheets as described in this module.

§ Requirements for Responsible Implementation of CSS

The following sections define several conformance requirements for implementing CSS responsibly, in a way that promotes interoperability in the present and future.

§ Partial Implementations

So that authors can exploit the forward-compatible parsing rules to assign fallback values, **CSS renderers *must* treat as invalid (and ignore as appropriate) any at-rules, properties, property values, keywords, and other syntactic constructs for which they have no usable level of support**. In particular, user agents *must not* selectively ignore unsupported property values and honor supported values in a single multi-value property declaration: if any value is considered invalid (as unsupported values must be), CSS requires that the entire declaration be ignored.

§ Implementations of Unstable and Proprietary Features

To avoid clashes with future stable CSS features, the CSSWG recommends following best practices for the implementation of unstable features and proprietary extensions to CSS.

§ Implementations of CR-level Features

Once a specification reaches the Candidate Recommendation stage, implementers should release an unprefixed implementation of any CR-level feature they can demonstrate to be correctly implemented according to spec, and should avoid exposing a prefixed variant of that feature.

To establish and maintain the interoperability of CSS across implementations, the CSS Working Group requests that non-experimental CSS renderers submit an implementation report (and, if necessary, the testcases used for that implementation report) to the W3C before releasing an

unprefixed implementation of any CSS features. Testcases submitted to W3C are subject to review and correction by the CSS Working Group.

Further information on submitting testcases and implementation reports can be found from on the CSS Working Group's website at https://www.w3.org/Style/CSS/Test/. Questions should be directed to the public-css-testsuite@w3.org mailing list.

§ Index

§ Terms defined by this specification

active, in §11.5

additive, in §5.5

all, in §2.3

any-hover, in §7.3

any-pointer, in §7.3

aspect-ratio, in §4.3

aural, in §2.3

boolean context, in §2.4.2

braille, in §2.3

coarse, in §7.1

color, in §6.1

color-gamut, in §6.4

color-index, in §6.2

continuous media, in §4.5

contrast ratio, in §6.5.1

@custom-media, in §10

custom media query, in §10

dark, in §11.4

device-aspect-ratio, in §Unnumbered section

device-height, in §Unnumbered section

device-width, in §Unnumbered section

dynamic-range, in §6.5

embossed, in §2.3

enabled, in §9.1

environment-blending, in §5.5

false, in §10

false in the negative range, in §2.4.3

fast, in §5.4

fine, in §7.1

forced, in §11.3

forced-colors, in §11.5

<general-enclosed>, in §3

grid, in §5.3

handheld, in §2.3

height, in §4.2

high

- value for @media/dynamic-range, in §6.5
- value for @media/prefers-contrast, in §11.3

high contrast ratio, in §6.5.1

high peak brightness, in §6.5.1

hover
descriptor for @media, in §7.2
value for @media/hover, in §7.2
infinite, in §5.1
initial-only, in §9.1
interlace, in §5.2
inverted, in §6.6
inverted-colors, in §6.6
landscape, in §4.4
light, in §11.4
low, in §11.3
<media-and>, in §3
<media-condition>, in §3
media condition, in §2.5
<media-condition-without-or>, in §3
<media-feature>, in §3
media feature, in §2.4
<media-in-parens>, in §3
<media-not>, in §3
<media-or>, in §3
<media-query>, in §3
media query, in §2
<media-query-list>, in §3
media query list, in §2.1
media query modifier, in §2.2
<media-type>, in §3
media type, in §2.3
<mf-boolean>, in §3
<mf-comparison>, in §3
<mf-eq>, in §3
<mf-gt>, in §3
<mf-lt>, in §3
<mf-name>, in §3
<mf-plain>, in §3
<mf-range>, in §3
<mf-value>, in §3
monochrome, in §6.3
<mq-boolean>, in §5.3
none
value for @media/hover, in §7.2
value for @media/inverted-colors, in §6.6
value for @media/overflow-block, in §4.5
value for @media/overflow-inline, in §4.6
value for @media/pointer, in §7.1
value for @media/prefers-color-scheme, in §11.5
value for @media/scripting, in §9.1
value for @media/update, in §5.4
no-preference
value for @media/prefers-contrast, in §11.3
value for @media/prefers-reduced-data, in §11.6
value for @media/prefers-reduced-motion, in §11.1
value for @media/prefers-reduced-transparency, in §11.2
not, in §2.2.1
only, in §2.2.2
opaque, in §5.5
orientation, in §4.4
overflow-block, in §4.5
overflow-inline, in §4.6
p3, in §6.4
paged, in §4.5

paged media, in §4.5

Peak brightness, in §6.5.1

pointer, in §7.1

portrait, in §4.4

prefers-color-scheme, in §11.4

prefers-contrast, in §11.3

prefers-reduced-data, in §11.6

prefers-reduced-motion, in §11.1

prefers-reduced-transparency, in §11.2

print, in §2.3

progressive, in §5.2

projection, in §2.3

range context, in §2.4.3

rec2020, in §6.4

reduce

- value for @media/prefers-reduced-data, in §11.6
- value for @media/prefers-reduced-motion, in §11.1
- value for @media/prefers-reduced-transparency, in §11.2

resolution, in §5.1

scan, in §5.2

screen, in §2.3

scripting, in §9.1

scroll

- value for @media/overflow-block, in §4.5
- value for @media/overflow-inline, in §4.6

slow, in §5.4

speech, in §2.3

srgb, in §6.4

standard, in §6.5

subtractive, in §5.5

true, in §10

tty, in §2.3

tv, in §2.3

update, in §5.4

video-color-gamut, in §8.1

video-dynamic-range, in §8.2

video-height, in §8.4

video-resolution, in §8.5

video-width, in §8.3

width, in §4.1

§ Terms defined by reference

[css-cascade-4] defines the following terms:

- @import
- initial value
- ua style sheet

[css-color-adjust-1] defines the following terms:

- forced colors mode

[css-conditional-3] defines the following terms:

- @media

[CSS-EXTENSIONS] defines the following terms:

- <extension-name>

[css-fonts-3] defines the following terms:

- font-size

[CSS-SYNTAX-3] defines the following terms:

- <any-value>
- <delim-token>
- <function-token>
- parse a comma-separated list of component values

[CSS-VALUES-4] defines the following terms:

- <dimension>
- <ident>
- <integer>
- <length>
- <number>
- <ratio>
- <resolution>
- cm
- em
- in
- px
- relative length
- |

[css-writing-modes-4] defines the following terms:

- block axis
- inline axis

[cssom-view-1] defines the following terms:

- page zoom
- pinch zoom
- web-exposed screen area

[INFRA] defines the following terms:

- ascii case-insensitive

§ References

§ Normative References

[COLORIMETRY]
Colorimetry, Fourth Edition. CIE 015:2018. 2018. URL: http://www.cie.co.at/publications/colorimetry-4th-edition

[CSS-CASCADE-4]
Elika Etemad; Tab Atkins Jr.. CSS Cascading and Inheritance Level 4. 28 August 2018. CR. URL: https://www.w3.org/TR/css-cascade-4/

[CSS-COLOR-ADJUST-1]
Elika Etemad; et al. CSS Color Adjustment Module Level 1. 2 April 2020. WD. URL: https://www.w3.org/TR/css-color-adjust-1/

[CSS-CONDITIONAL-3]
CSS Conditional Rules Module Level 3 URL: https://www.w3.org/TR/css3-conditional/

[CSS-EXTENSIONS]
Tab Atkins Jr.. CSS Extensions. ED. URL: https://drafts.csswg.org/css-extensions/

[CSS-SYNTAX-3]
Tab Atkins Jr.; Simon Sapin. CSS Syntax Module Level 3. 16 July 2019. CR. URL: https://www.w3.org/TR/css-syntax-3/

[CSS-VALUES-4]
Tab Atkins Jr.; Elika Etemad. CSS Values and Units Module Level 4. 31 January 2019. WD. URL: https://www.w3.org/TR/css-values-4/

[CSS-WRITING-MODES-4]
Elika Etemad; Koji Ishii. CSS Writing Modes Level 4. 30 July 2019. CR. URL: https://www.w3.org/TR/css-writing-modes-4/

[CSS2]
Bert Bos; et al. Cascading Style Sheets Level 2 Revision 1 (CSS 2.1) Specification. 7 June 2011. REC. URL: https://www.w3.org/TR/CSS2/

[CSSOM-VIEW-1]
Simon Pieters. CSSOM View Module. 17 March 2016. WD. URL: https://www.w3.org/TR/cssom-view-1/

[MEDIAQUERIES-3]
Florian Rivoal; et al. Media Queries. 19 June 2012. REC. URL: https://www.w3.org/TR/css3-mediaqueries/

[MEDIAQUERIES-4]
Florian Rivoal; Tab Atkins Jr.. Media Queries Level 4. 5 September 2017. CR. URL: https://www.w3.org/TR/mediaqueries-4/

[RFC2119]
S. Bradner. Key words for use in RFCs to Indicate Requirement Levels. March 1997. Best Current Practice. URL: https://tools.ietf.org/html/rfc2119

§ Informative References

[CSS-FONTS-3]
John Daggett; Myles Maxfield; Chris Lilley. CSS Fonts Module Level 3. 20 September 2018. REC. URL: https://www.w3.org/TR/css-fonts-3/

[HTML401]
Dave Raggett; Arnaud Le Hors; Ian Jacobs. HTML 4.01 Specification. 27 March 2018. REC. URL: https://www.w3.org/TR/html401/

[INFRA]
Anne van Kesteren; Domenic Denicola. Infra Standard. Living Standard. URL:

https://infra.spec.whatwg.org/

[ITU-R-BT-2020-2]
Parameter values for ultra-high definition television systems for production and international programme exchange. October 2015. URL: https://www.itu.int/rec/R-REC-BT.2020/en

[RFC2879]
G. Klyne; L. McIntyre. Content Feature Schema for Internet Fax (V2). August 2000. Proposed Standard. URL: https://tools.ietf.org/html/rfc2879

[SMPTE-EG-432-1-2010]
SMPTE Engineering Guideline - Digital Source Processing — Color Processing for D-Cinema. 2010. URL: http://ieeexplore.ieee.org/document/7289763/

[SMPTE-RP-431-2-2011]
SMPTE Recommended Practice - D-Cinema Quality — Reference Projector and Environment. 2011. URL: http://ieeexplore.ieee.org/document/7290729/

[SRGB]
Multimedia systems and equipment - Colour measurement and management - Part 2-1: Colour management - Default RGB colour space - sRGB. URL: https://webstore.iec.ch/publication/6169

[XML-STYLESHEET]
James Clark; Simon Pieters; Henry Thompson. Associating Style Sheets with XML documents 1.0 (Second Edition). 28 October 2010. REC. URL: https://www.w3.org/TR/xml-stylesheet/

§ Property Index

No properties defined.

§ '@media' Descriptors

Name	Value	Initial	Type
'any-hover'	none | hover		discrete
'any-pointer'	none | coarse | fine		discrete
'aspect-ratio'	<ratio>		range
'color'	<integer>		range
'color-gamut'	srgb | p3 | rec2020		discrete
'color-index'	<integer>		range
'device-aspect-ratio'	<ratio>		range

Name	Value	Initial	Type
‘device-height’	<length>		range
‘device-width’	<length>		range
‘dynamic-range’	standard | high		discrete
‘environment-blending’	opaque | additive | subtractive		discrete
‘forced-colors’	none | active		discrete
‘grid’	<mq-boolean>		discrete
‘height’	<length>		range
‘hover’	none | hover		discrete
‘inverted-colors’	none | inverted		discrete
‘monochrome’	<integer>		range
‘orientation’	portrait | landscape		discrete
‘overflow-block’	none | scroll | paged		discrete
‘overflow-inline’	none | scroll		discrete
‘pointer’	none | coarse | fine		discrete
‘prefers-color-scheme’	light | dark		discrete
‘prefers-contrast’	no-preference | high | low | forced		discrete
‘prefers-reduced-data’	no-preference | reduce		discrete
‘prefers-reduced-motion’	no-preference | reduce		discrete
‘prefers-reduced-transparency’	no-preference | reduce		discrete
‘resolution’	<resolution> | infinite		range
‘scan’	interlace | progressive		discrete
‘scripting’	none | initial-only | enabled		discrete
‘update’	none | slow | fast		discrete
‘video-color-gamut’	srgb | p3 | rec2020		discrete
‘video-dynamic-range’	standard | high		discrete
‘video-height’	<length>		range
‘video-resolution’	<resolution> | infinite		range
‘video-width’	<length>		range
‘width’	<length>		range

§ Issues Index

ISSUE 1 Information about a user can be used as an active fingerprinting vector. Analysis of impact pending, more information to be provided before spec is published.
User agents and developers implementing this specification need to be aware of this vector and take it into consideration when deciding whether to use the feature. Specifically `prefers-reduced-motion`, `prefers-color-scheme` and `prefers-reduced-data` are currently of concern for exploitation.

↲

ISSUE 2 Is there a need for the 'subtractive' value? ↲

ISSUE 3 'video-width', 'video-height', 'video-resolution' are still under discussion. It isn't clear yet whether they are the right approach to address the video use case, and even if they are, the details of how they work aren't fully figured out yet. Shipping them as specified would be premature, and would-be implementors are strongly encouraged to get in touch with the CSS Working Group. <https://github.com/w3c/csswg-drafts/issues/5044> ↲

ISSUE 4 'video-width', 'video-height', 'video-resolution' are still under discussion. It isn't clear yet whether they are the right approach to address the video use case, and even if they are, the details of how they work aren't fully figured out yet. Shipping them as specified would be premature, and would-be implementors are strongly encouraged to get in touch with the CSS Working Group. <https://github.com/w3c/csswg-drafts/issues/5044> ↲

ISSUE 5 'video-width', 'video-height', 'video-resolution' are still under discussion. It isn't clear yet whether they are the right approach to address the video use case, and even if they are, the details of how they work aren't fully figured out yet. Shipping them as specified would be premature, and would-be implementors are strongly encouraged to get in touch with the CSS Working Group. <https://github.com/w3c/csswg-drafts/issues/5044> ↲

ISSUE 6 'video-width', 'video-height', 'video-resolution' are still under discussion. It isn't clear yet whether they are the right approach to address the video use case, and even if they are, the details of how they work aren't fully figured out yet. Shipping them as specified would be premature, and would-be implementors are strongly encouraged to get in touch with the CSS Working Group. <https://github.com/w3c/csswg-drafts/issues/5044> ↲

ISSUE 7 Should there be an explicit minimum threshold to meet before a UA is allowed to claim 'initial-only'? Having one would mean authors would know what they can depend on, and could tailor their scripts accordingly. On the other hand, pinpointing that threshold is difficult: if it is set too low, the scripting facilities that authors can depend on may be to constrained to be practical, even though actual UAs may potentially all support significantly more. But trying to set it higher may cause us to exclude UAs that do support scripting at loading time, but restrict it in some cases based on complex heuristics. For instance, conservative definitions likely include at least running all inline scripts and firing the DOMContentLoaded event. But it does not seem useful for authors to constrain themselves to this if most (or maybe all) 'initial-only' UAs also load external scripts (including 'async' and 'defer') and fire the load event. On the other hand, requiring external scripts to be loaded and the load event to be fired could exclude UAs like Opera mini, which typically do run them, but may decide not to based on timeouts and other heuristics. <https://github.com/w3c/csswg-drafts/issues/503> ↵

ISSUE 8 Define a map of names to values for JS. Values can be either a MediaQueryList object or a boolean, in which case it's treated identically to the above, or can be a number or a string, in which case it's treated like a normal MQ, and can use the normal or range context syntax. Like:

```
<script>
CSS.customMedia.set('--foo', 5);
</script>
<style>
@media (_foo: 5) { ... }
@media (_foo < 10) { ... }
</style>
```

↵

ISSUE 9 How does this interact with preferences around e.g. pattern fills and backgrounds? They're not about transparency, but they also interfere with shape recognition. ↵

ISSUE 10 Split 'high' into two levels, "extremely high" (as used in MSFT's black-on-white high contrast theme) and "increased (as implemented in Apple's Increased Contrast settings)? <https://github.com/w3c/csswg-drafts/issues/2943> ↵

ISSUE 11 This feature may be an undesired source of fingerprinting, with a bias towards low income with limited data. A Privacy and Security section should be added to this spec, and it should address this concern. <https://github.com/w3c/csswg-drafts/issues/4832> ↵

ISSUE 12 This feature is an early draft, and the CSS-WG does not consider it ready for shipping in production. <https://github.com/w3c/csswg-drafts/issues/4834> ↵