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HTTP Client Hints draft-grigorik-http-client-hints-02

Abstract

An increasing diversity of Web-connected devices and software capabilities has created a need to deliver optimized content for each device.

This specification defines a set of HTTP request header fields, colloquially known as Client Hints, to address this. They are intended to be used as input to proactive content negotiation; just as the Accept header allows clients to indicate what formats they prefer, Client Hints allow clients to indicate a list of device and agent specific preferences.

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Table of Contents

- [1. Introduction](#) [3](#)
- [1.1. Notational Conventions](#) [3](#)
- [2. Client Hint Request Header Fields](#) [4](#)
- [2.1. Sending Client Hints](#) [4](#)
- [2.2. Server Processing of Client Hints](#) [4](#)
- [2.2.1. Advertising Support for Client Hints](#) [4](#)
- [2.2.2. Interaction with Caches](#) [5](#)
- [3. The DPR Client Hint](#) [5](#)
- [4. The RW Client Hint](#) [6](#)
- [4.1. Confirming Selected DPR](#) [6](#)
- [5. Example](#) [6](#)
- [6. IANA Considerations](#) [7](#)
- [7. Security Considerations](#) [8](#)
- [8. Normative References](#) [8](#)
- [Author's Address](#) [8](#)

1. Introduction

There are thousands of different devices accessing the web, each with different device capabilities and preference information. These device capabilities include hardware and software characteristics, as well as dynamic user and client preferences.

One way to infer some of these capabilities is through User-Agent (UA) detection against an established database of client signatures. However, this technique requires acquiring such a database, integrating it into the serving path, and keeping it up to date. However, even once this infrastructure is deployed, UA sniffing has numerous limitations:

- o UA detection cannot reliably identify all static variables
- o UA detection cannot infer any dynamic client preferences
- o UA detection requires an external device database
- o UA detection is not cache friendly

A popular alternative strategy is to use HTTP cookies to communicate some information about the client. However, this approach is also not cache friendly, bound by same origin policy, and imposes additional client-side latency by requiring JavaScript execution to create and manage HTTP cookies.

This document defines a set of new request header fields that allow the client to perform proactive content negotiation [[RFC7231](#)] by indicating a list of device and agent specific preferences, through a mechanism similar to the Accept header which is used to indicate preferred response formats.

Client Hints does not supersede or replace the User-Agent header field. Existing device detection mechanisms can continue to use both mechanisms if necessary. By advertising its capabilities within a request header field, Client Hints allows for cache friendly and proactive content negotiation.

1.1. Notational Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [[RFC2119](#)].

This document uses the Augmented Backus-Naur Form (ABNF) notation of [[RFC5234](#)] with the list rule extension defined in [[RFC7230](#)], [Appendix B](#). It includes by reference the DIGIT rule from [[RFC5234](#)]; the OWS, field-name and quoted-string rules from [[RFC7230](#)]; and the parameter rule from [[RFC7231](#)].

2. Client Hint Request Header Fields

A Client Hint request header field is a HTTP header field that is used by HTTP clients to indicate configuration data that can be used by the server to select an appropriate response. Each one conveys a list of client preferences that the server can use to adapt and optimize the response.

This document defines a selection of Client Hint request header fields, and can be referenced by other specifications wishing to use the same syntax and processing model.

2.1. Sending Client Hints

Clients control which Client Hint headers and their respective header fields are communicated, based on their default settings, user configuration and/or preferences. The user may be given the choice to enable, disable, or override specific hints.

The client and server, or an intermediate proxy, may use an opt-in mechanism to negotiate which fields should be reported to allow for efficient content adaptation.

2.2. Server Processing of Client Hints

Servers can modify the response sent based upon Client Hints. When doing so, it **MUST** confirm the selection for certain hints and indicate the value of selected resource via corresponding response header. For example, this specification defines "DPR" that corresponds to the "DPR" request header field.

2.2.1. Advertising Support for Client Hints

Servers can advertise support for Client Hints using the Accept-CH header or an equivalent HTML meta element with http-equiv attribute.

```
Accept-CH = #token
```

For example:

```
Accept-CH: DPR, RW
```

When a client receives Accept-CH, it **SHOULD** append the Client Hint headers that match the advertised field-values. For example, based on Accept-CH example above, the client would append DPR and RW headers to all subsequent requests.

2.2.2. Interaction with Caches

Client Hints MAY be combined with Key ([\[I-D.fielding-http-key\]](#)) to enable fine-grained control of the cache key for improved cache efficiency. For example, the server may return the following set of instructions:

```
Key: DPR;r=[1.5:]
```

Above examples indicates that the cache key should be based on the DPR header, and the resource should be cached and made available for any client whose device pixel ratio is 1.5, or higher.

```
Key: RW;r=[320:640]
```

Above example indicates that the cache key should be based on the RW header, and the resource should be cached and made available for any request whose display width falls between 320 and 640px.

In absence of support for fine-grained control of the cache key via the Key header field, Vary response header can be used to indicate that served resource has been adapted based on specified Client Hint preferences.

```
Vary: DPR
```

Above example indicates that the cache key should be based on the DPR header.

```
Vary: DPR, RW
```

Above example indicates that the cache key should be based on the DPR and RW headers.

3. The DPR Client Hint

The "DPR" header field is a number that, in requests, indicates the client's current Device Pixel Ratio (DPR), which is the ratio of physical pixels over CSS px of the layout viewport on the device.

```
DPR = 1*DIGIT [ "." 1*DIGIT ]
```

If DPR occurs in a message more than once, the last value overrides all previous occurrences.

4. The RW Client Hint

The "RW" header field is a number that, in requests, indicates the Resource Width (RW) in CSS px, which is either the display width of the requested resource (e.g. display width of an image), or the layout viewport width if the resource does not have a display width (e.g. a non-image asset).

RW = 1*DIGIT

If RW occurs in a message more than once, the last value overrides all previous occurrences.

4.1. Confirming Selected DPR

The "Content-DPR" header field is a number that indicates the ratio between physical pixels over CSS px of the selected image response.

Content-DPR = 1*DIGIT ["." 1*DIGIT]

DPR ratio affects the calculation of intrinsic size of image resources on the client - i.e. typically, the client automatically scales the natural size of the image by the DPR ratio to derive its display dimensions. As a result, the server must explicitly indicate the DPR of the selected image response whenever the DPR hint is used, and the client must use the DPR value returned by the server to perform its calculations. In case the server returned Content-DPR value contradicts previous client-side DPR indication, the server returned value must take precedence.

Note that DPR confirmation is only required for image responses, and the server does not need to confirm the resource width (RW) as this value can be derived from the resource itself once it is decoded by the client.

If Content-DPR occurs in a message more than once, the last value overrides all previous occurrences.

5. Example

For example, given the following request headers:

DPR: 2.0
RW: 160

The server knows that the device pixel ratio is 2.0, and that the intended display width of requested resource is 160 CSS px.

If the server uses above hints to perform resource selection for an image asset, it must confirm its selection via the Content-DPR response header to allow the client to calculate the appropriate intrinsic size of the image response. The server does not need to confirm resource width, only the ratio between physical pixels and CSS px of the selected image resource:

Content-DPR: 1.0

The Content-DPR response header indicates to the client that the server has selected resource with DPR ratio of 1.0. The client may use this information to perform additional processing on the resource - for example, calculate the appropriate intrinsic size of the image resource such that it is displayed at the correct resolution.

6. IANA Considerations

This document defines the "Accept-CH", "DPR", and "RW" HTTP request fields, "Content-DPR" HTTP response field, and registers them in the Permanent Message Header Fields registry.

- o Header field name: DPR
- o Applicable protocol: HTTP
- o Status: standard
- o Author/Change controller: Ilya Grigorik, ilya@igvita.com
- o Specification document(s): [this document]
- o Related information: for Client Hints
- o Header field name: RW
- o Applicable protocol: HTTP
- o Status: standard
- o Author/Change controller: Ilya Grigorik, ilya@igvita.com
- o Specification document(s): [this document]
- o Related information: for Client Hints
- o Header field name: Content-DPR
- o Applicable protocol: HTTP
- o Status: standard
- o Author/Change controller: Ilya Grigorik, ilya@igvita.com
- o Specification document(s): [this document]
- o Related information: for Client Hints
- o Header field name: Accept-CH
- o Applicable protocol: HTTP
- o Status: standard
- o Author/Change controller: Ilya Grigorik, ilya@igvita.com
- o Specification document(s): [this document]
- o Related information: for Client Hints

7. Security Considerations

The client controls which header fields are communicated and when. In cases such as incognito or anonymous profile browsing, the header can be omitted if necessary.

8. Normative References

[I-D.fielding-http-key]

Fielding, R. and M. Nottingham, "The Key HTTP Response Header Field", [draft-fielding-http-key-02](#) (work in progress), February 2013.

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[RFC7230] Fielding, R. and J. Reschke, "Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing", [RFC 7230](#), June 2014.

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