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An HTTP Status Code for Indicating Hints
draft-ietf-httpbis-early-hints-04

Abstract

This memo introduces an informational HTTP status code that can be used to convey hints that help a client make preparations for processing the final response.

Note to Readers

Discussion of this draft takes place on the HTTP working group mailing list (ietf-http-wg@w3.org), which is archived at <https://lists.w3.org/Archives/Public/ietf-http-wg/> .

Working Group information can be found at <https://httpwg.github.io/> ; source code and issues list for this draft can be found at <https://github.com/httpwg/http-extensions/labels/early-hints> .

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Internet-Draft

Early Hints

July 2017

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Table of Contents

1.	Introduction	2
1.1.	Notational Conventions	3
2.	103 Early Hints	3
3.	Security Considerations	4
4.	IANA Considerations	5
5.	References	5
5.1.	Normative References	5
5.2.	Informative References	5
Appendix A.	Changes	6
A.1.	Since draft-ietf-httpbis-early-hints-03	6
A.2.	Since draft-ietf-httpbis-early-hints-02	6
A.3.	Since draft-ietf-httpbis-early-hints-01	6
A.4.	Since draft-ietf-httpbis-early-hints-00	6
Appendix B.	Acknowledgements	6
	Author's Address	6

[1.](#) Introduction

It is common for HTTP responses to contain links to external resources that need to be fetched prior to their use; for example, rendering HTML by a Web browser. Having such links available to the client as early as possible helps to minimize perceived latency.

The "preload" ([\[Preload\]](#)) link relation can be used to convey such links in the Link header field of an HTTP response. However, it is not always possible for an origin server to generate the header block of a final response immediately after receiving a request. For example, the origin server might delegate a request to an upstream HTTP server running at a distant location, or the status code might depend on the result of a database query.

The dilemma here is that even though it is preferable for an origin server to send some header fields as soon as it receives a request, it cannot do so until the status code and the full header fields of the final HTTP response are determined.

HTTP/2 ([\[RFC7540\]](#)) server push can be used as a solution to this issue, but has its own limitations. The responses that can be pushed using HTTP/2 are limited to those belonging to the same origin. Also, it is impossible to send only the links using server push. Finally, sending HTTP responses for every resource is an inefficient way of using bandwidth, especially when a caching server exists as an intermediary.

This memo defines a status code for sending an informational response ([\[RFC7231, Section 6.2\]](#)) that contains header fields that are likely to be included in the final response. A server can send the informational response containing some of the header fields to help the client start making preparations for processing the final response, and then run time-consuming operations to generate the final response. The informational response can also be used by an origin server to trigger HTTP/2 server push at a caching intermediary.

[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 [\[RFC2119\]](#).

[2.](#) 103 Early Hints

The 103 (Early Hints) informational status code indicates to the client that the server is likely to send a final response with the header fields included in the informational response.

Typically, a server will include the header fields sent in a 103 (Early Hints) response in the final response as well. However, there might be cases when this is not desirable, such as when the server learns that they are not correct before the final response is sent.

A client can speculatively evaluate the header fields included in a

103 (Early Hints) response while waiting for the final response. For example, a client might recognize a Link header field value containing the relation type "preload" and start fetching the target resource. However, these header fields only provide hints to the client; they do not replace the header fields on the final response.

Aside from performance optimizations, such evaluation of the 103 (Early Hints) response's header fields MUST NOT affect how the final response is processed. A client MUST NOT interpret the 103 (Early Hints) response header fields as if they applied to the informational response itself (e.g., as metadata about the 103 (Early Hints) response).

The following example illustrates a typical message exchange that involves a 103 (Early Hints) response.

Client request:

```
GET / HTTP/1.1
Host: example.com
```

Server response:

```
HTTP/1.1 103 Early Hints
Link: </style.css>; rel=preload; as=style
Link: </script.js>; rel=preload; as=script
```

```
HTTP/1.1 200 OK
Date: Fri, 26 May 2017 10:02:11 GMT
Content-Length: 1234
Content-Type: text/html; charset=utf-8
Link: </style.css>; rel=preload; as=style
Link: </script.js>; rel=preload; as=script
```

```
<!doctype html>
```

[... rest of the response body is omitted from the example ...]

As is the case with any informational response, a server might emit more than one 103 (Early Hints) response prior to sending a final response. This can happen for example when a caching intermediary generates a 103 (Early Hints) response based on the header fields of

a stale-cached response, then forwards a 103 (Early Hints) response and a final response that were sent from the origin server in response to a revalidation request.

[3.](#) Security Considerations

Some clients might have issues handling 103 (Early Hints), since informational responses are rarely used in reply to requests not including an Expect header field ([\[RFC7231\]](#), [Section 5.1.1](#)).

In particular, an HTTP/1.1 client that mishandles an informational response as a final response is likely to consider all responses to the succeeding requests sent over the same connection to be part of the final response. Such behavior might constitute a cross-origin information disclosure vulnerability in case the client multiplexes requests to different origins onto a single persistent connection.

Therefore, a server might refrain from sending Early Hints over HTTP/1.1 unless the client is known to handle informational responses correctly.

HTTP/2 clients are less likely to suffer from incorrect framing since handling of the response header fields does not affect how the end of the response body is determined.

[4.](#) IANA Considerations

The HTTP Status Codes Registry will be updated with the following entry:

- o Code: 103
- o Description: Early Hints
- o Specification: [this document]

[5.](#) References

[5.1.](#) Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<http://www.rfc-editor.org/info/rfc2119>>.
- [RFC7230] Fielding, R., Ed. and J. Reschke, Ed., "Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing", [RFC 7230](#), DOI 10.17487/RFC7230, June 2014, <<http://www.rfc-editor.org/info/rfc7230>>.
- [RFC7231] Fielding, R., Ed. and J. Reschke, Ed., "Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content", [RFC 7231](#), DOI 10.17487/RFC7231, June 2014, <<http://www.rfc-editor.org/info/rfc7231>>.
- [RFC7540] Belshe, M., Peon, R., and M. Thomson, Ed., "Hypertext Transfer Protocol Version 2 (HTTP/2)", [RFC 7540](#), DOI 10.17487/RFC7540, May 2015, <<http://www.rfc-editor.org/info/rfc7540>>.

[5.2.](#) Informative References

- [Preload] Grigorik, I., "Preload", n.d., <<https://w3c.github.io/preload/>>.

Oku

Expires January 12, 2018

[Page 5]

Internet-Draft

Early Hints

July 2017

[Appendix A.](#) Changes

[A.1.](#) Since [draft-ietf-httpbis-early-hints-03](#)

- o Removed statements that were either redundant or contradictory to [RFC7230](#)-7234.
- o Clarified what the server's expected behavior is.
- o Explain that a server might want to send more than one 103 response.
- o Editorial Changes.

[A.2.](#) Since [draft-ietf-httpbis-early-hints-02](#)

- o Editorial changes.
- o Added an example.

[A.3.](#) Since [draft-ietf-httpbis-early-hints-01](#)

- o Editorial changes.

[A.4.](#) Since [draft-ietf-httpbis-early-hints-00](#)

- o Forbid processing the headers of a 103 response as part of the informational response.

[Appendix B.](#) Acknowledgements

Thanks to Tatsuhiro Tsujikawa for coming up with the idea of sending the Link header fields using an informational response.

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