

Network Working Group
Request for Comments: 2616
Obsoletes: 2068
Category: Standards Track

R. Fielding
UC Irvine
J. Gettys
Compaq/W3C
J. Mogul
Compaq
H. Frystyk
W3C/MIT
L. Masinter
Xerox
P. Leach
Microsoft
T. Berners-Lee
W3C/MIT
June 1999

Hypertext Transfer Protocol -- HTTP/1.1

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Copyright Notice

Copyright (C) The Internet Society (1999). All Rights Reserved.

Abstract

The Hypertext Transfer Protocol (HTTP) is an application-level protocol for distributed, collaborative, hypermedia information systems. It is a generic, stateless, protocol which can be used for many tasks beyond its use for hypertext, such as name servers and distributed object management systems, through extension of its request methods, error codes and headers [47]. A feature of HTTP is the typing and negotiation of data representation, allowing systems to be built independently of the data being transferred.

HTTP has been in use by the World-Wide Web global information initiative since 1990. This specification defines the protocol referred to as "HTTP/1.1", and is an update to RFC 2068 [33].

Table of Contents

1	Introduction	7
1.1	Purpose.....	7
1.2	Requirements	8
1.3	Terminology	8
1.4	Overall Operation	12
2	Notational Conventions and Generic Grammar	14
2.1	Augmented BNF	14
2.2	Basic Rules	15
3	Protocol Parameters	17
3.1	HTTP Version	17
3.2	Uniform Resource Identifiers	18
3.2.1	General Syntax	19
3.2.2	http URL	19
3.2.3	URI Comparison	20
3.3	Date/Time Formats	20
3.3.1	Full Date	20
3.3.2	Delta Seconds	21
3.4	Character Sets	21
3.4.1	Missing Charset	22
3.5	Content Codings	23
3.6	Transfer Codings	24
3.6.1	Chunked Transfer Coding	25
3.7	Media Types	26
3.7.1	Canonicalization and Text Defaults	27
3.7.2	Multipart Types	27
3.8	Product Tokens	28
3.9	Quality Values	29
3.10	Language Tags	29
3.11	Entity Tags	30
3.12	Range Units	30
4	HTTP Message	31
4.1	Message Types	31
4.2	Message Headers	31
4.3	Message Body	32
4.4	Message Length	33
4.5	General Header Fields	34
5	Request	35
5.1	Request-Line	35
5.1.1	Method	36
5.1.2	Request-URI	36
5.2	The Resource Identified by a Request	38
5.3	Request Header Fields	38
6	Response	39
6.1	Status-Line	39
6.1.1	Status Code and Reason Phrase	39
6.2	Response Header Fields	41

7	Entity	42
7.1	Entity Header Fields	42
7.2	Entity Body	43
7.2.1	Type	43
7.2.2	Entity Length	43
8	Connections	44
8.1	Persistent Connections	44
8.1.1	Purpose	44
8.1.2	Overall Operation	45
8.1.3	Proxy Servers	46
8.1.4	Practical Considerations	46
8.2	Message Transmission Requirements	47
8.2.1	Persistent Connections and Flow Control	47
8.2.2	Monitoring Connections for Error Status Messages	48
8.2.3	Use of the 100 (Continue) Status	48
8.2.4	Client Behavior if Server Prematurely Closes Connection ..	50
9	Method Definitions	51
9.1	Safe and Idempotent Methods	51
9.1.1	Safe Methods	51
9.1.2	Idempotent Methods	51
9.2	OPTIONS	52
9.3	GET	53
9.4	HEAD	54
9.5	POST	54
9.6	PUT	55
9.7	DELETE	56
9.8	TRACE	56
9.9	CONNECT	57
10	Status Code Definitions	57
10.1	Informational lxx	57
10.1.1	100 Continue	58
10.1.2	101 Switching Protocols	58
10.2	Successful 2xx	58
10.2.1	200 OK	58
10.2.2	201 Created	59
10.2.3	202 Accepted	59
10.2.4	203 Non-Authoritative Information	59
10.2.5	204 No Content	60
10.2.6	205 Reset Content	60
10.2.7	206 Partial Content	60
10.3	Redirection 3xx	61
10.3.1	300 Multiple Choices	61
10.3.2	301 Moved Permanently	62
10.3.3	302 Found	62
10.3.4	303 See Other	63
10.3.5	304 Not Modified	63
10.3.6	305 Use Proxy	64
10.3.7	306 (Unused)	64

10.3.8	307 Temporary Redirect	65
10.4	Client Error 4xx	65
10.4.1	400 Bad Request	65
10.4.2	401 Unauthorized	66
10.4.3	402 Payment Required	66
10.4.4	403 Forbidden	66
10.4.5	404 Not Found	66
10.4.6	405 Method Not Allowed	66
10.4.7	406 Not Acceptable	67
10.4.8	407 Proxy Authentication Required	67
10.4.9	408 Request Timeout	67
10.4.10	409 Conflict	67
10.4.11	410 Gone	68
10.4.12	411 Length Required	68
10.4.13	412 Precondition Failed	68
10.4.14	413 Request Entity Too Large	69
10.4.15	414 Request-URI Too Long	69
10.4.16	415 Unsupported Media Type	69
10.4.17	416 Requested Range Not Satisfiable	69
10.4.18	417 Expectation Failed	70
10.5	Server Error 5xx	70
10.5.1	500 Internal Server Error	70
10.5.2	501 Not Implemented	70
10.5.3	502 Bad Gateway	70
10.5.4	503 Service Unavailable	70
10.5.5	504 Gateway Timeout	71
10.5.6	505 HTTP Version Not Supported	71
11	Access Authentication	71
12	Content Negotiation	71
12.1	Server-driven Negotiation	72
12.2	Agent-driven Negotiation	73
12.3	Transparent Negotiation	74
13	Caching in HTTP	74
13.1.1	Cache Correctness	75
13.1.2	Warnings	76
13.1.3	Cache-control Mechanisms	77
13.1.4	Explicit User Agent Warnings	78
13.1.5	Exceptions to the Rules and Warnings	78
13.1.6	Client-controlled Behavior	79
13.2	Expiration Model	79
13.2.1	Server-Specified Expiration	79
13.2.2	Heuristic Expiration	80
13.2.3	Age Calculations	80
13.2.4	Expiration Calculations	83
13.2.5	Disambiguating Expiration Values	84
13.2.6	Disambiguating Multiple Responses	84
13.3	Validation Model	85
13.3.1	Last-Modified Dates	86

13.3.2	Entity Tag Cache Validators	86
13.3.3	Weak and Strong Validators	86
13.3.4	Rules for When to Use Entity Tags and Last-Modified Dates.	89
13.3.5	Non-validating Conditionals	90
13.4	Response Cacheability	91
13.5	Constructing Responses From Caches	92
13.5.1	End-to-end and Hop-by-hop Headers	92
13.5.2	Non-modifiable Headers	92
13.5.3	Combining Headers	94
13.5.4	Combining Byte Ranges	95
13.6	Caching Negotiated Responses	95
13.7	Shared and Non-Shared Caches	96
13.8	Errors or Incomplete Response Cache Behavior	97
13.9	Side Effects of GET and HEAD	97
13.10	Invalidation After Updates or Deletions	97
13.11	Write-Through Mandatory	98
13.12	Cache Replacement	99
13.13	History Lists	99
14	Header Field Definitions	100
14.1	Accept	100
14.2	Accept-Charset	102
14.3	Accept-Encoding	102
14.4	Accept-Language	104
14.5	Accept-Ranges	105
14.6	Age	106
14.7	Allow	106
14.8	Authorization	107
14.9	Cache-Control	108
14.9.1	What is Cacheable	109
14.9.2	What May be Stored by Caches	110
14.9.3	Modifications of the Basic Expiration Mechanism	111
14.9.4	Cache Revalidation and Reload Controls	113
14.9.5	No-Transform Directive	115
14.9.6	Cache Control Extensions	116
14.10	Connection	117
14.11	Content-Encoding	118
14.12	Content-Language	118
14.13	Content-Length	119
14.14	Content-Location	120
14.15	Content-MD5	121
14.16	Content-Range	122
14.17	Content-Type	124
14.18	Date	124
14.18.1	Clockless Origin Server Operation	125
14.19	ETag	126
14.20	Expect	126
14.21	Expires	127
14.22	From	128

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.