



# Server-Sent Events

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## Abstract

This specification defines an API for opening an HTTP connection for receiving push notifications from a server in the form of DOM events. The API is designed such that it can be extended to work with other push notification schemes such as Push SMS.

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# Table of Contents

[1 Introduction](#)

[2 Conformance requirements](#)

[2.1 Dependencies](#)

[3 Terminology](#)

[4 The EventSource interface](#)

[5 Processing model](#)

[6 Parsing an event stream](#)

[7 Interpreting an event stream](#)

[8 Notes](#)

[9 Connectionless push and other features](#)

[10 Garbage collection](#)

[11 IANA considerations](#)

[11.1 text/event-stream](#)

[11.2 Last-Event-ID](#)

[References](#)

[Acknowledgements](#)

# 1 Introduction

*This section is non-normative.*

To enable servers to push data to Web pages over HTTP or using dedicated server-push protocols, this specification introduces the [EventSource](#) interface.

Using this API consists of creating an [EventSource](#) object and registering an event listener.

```
var source = new EventSource('updates.cgi');
source.onmessage = function (event) {
  alert(event.data);
};
```

On the server-side, the script ("updates.cgi" in this case) sends messages in the following form, with the [text/event-stream](#) MIME type:

```
data: This is the first message.

data: This is the second message, it
data: has two lines.

data: This is the third message.
```

Authors can separate events by using different event types. Here is a stream that has two event types, "add" and "remove":

```
event: add
data: 73857293

event: remove
data: 2153

event: add

data: 113411
```

The script to handle such a stream would look like this (where `addHandler` and `removeHandler` are functions that take one argument, the event):

```
var source = new EventSource('updates.cgi');
source.addEventListener('add', addHandler, false);
source.addEventListener('remove', removeHandler, false);
```

The default event type is "message".

Event streams requests can be redirected using HTTP 301 and 307 redirects as with normal HTTP requests. Clients will reconnect if the connection is closed; a client can be told to stop reconnecting using the HTTP 204 No Content response code.

Using this API rather than emulating it using `XMLHttpRequest` or an `iframe` allows the user agent to make better use of network resources in cases where the user agent

implementor and the network operator are able to coordinate in advance. Amongst other benefits, this can result in significant savings in battery life on portable devices. This is discussed further in the section below on [connectionless push](#).

## 2 Conformance requirements

All diagrams, examples, and notes in this specification are non-normative, as are all sections explicitly marked non-normative. Everything else in this specification is normative.

The key words "MUST", "MUST NOT", "REQUIRED", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in the normative parts of this document are to be interpreted as described in RFC2119. For readability, these words do not appear in all uppercase letters in this specification. [\[RFC2119\]](#)

Requirements phrased in the imperative as part of algorithms (such as "strip any leading space characters" or "return false and abort these steps") are to be interpreted with the meaning of the key word ("must", "should", "may", etc) used in introducing the algorithm.

Some conformance requirements are phrased as requirements on attributes, methods or objects. Such requirements are to be interpreted as requirements on user agents.

Conformance requirements phrased as algorithms or specific steps may be implemented in any manner, so long as the end result is equivalent. (In particular, the algorithms defined in this specification are intended to be easy to follow, and not intended to be performant.)

The only conformance class defined by this specification is user agents.

User agents may impose implementation-specific limits on otherwise unconstrained inputs, e.g. to prevent denial of service attacks, to guard against running out of memory, or to work around platform-specific limitations.

When support for a feature is disabled (e.g. as an emergency measure to mitigate a security problem, or to aid in development, or for performance reasons), user agents must act as if they had no support for the feature whatsoever, and as if the feature was not mentioned in this specification. For example, if a particular feature is accessed via an attribute in a Web IDL interface, the attribute itself would be omitted from the objects that implement that interface — leaving the attribute on the object but making it return null or throw an exception is insufficient.

### 2.1 Dependencies

This specification relies on several other underlying specifications.

#### **HTML**

Many fundamental concepts from HTML are used by this specification. [\[HTML\]](#)

#### **WebIDL**

The IDL blocks in this specification use the semantics of the WebIDL specification. [\[WEBIDL\]](#)

### 3 Terminology

The construction "a `Foo` object", where `Foo` is actually an interface, is sometimes used instead of the more accurate "an object implementing the interface `Foo`".

The term DOM is used to refer to the API set made available to scripts in Web applications, and does not necessarily imply the existence of an actual `Document` object or of any other `Node` objects as defined in the DOM Core specifications. [\[DOMCORE\]](#)

An IDL attribute is said to be *getting* when its value is being retrieved (e.g. by author script), and is said to be *setting* when a new value is assigned to it.



## 4 The [EventSource](#) interface

IDL

```
[Constructor(DOMString url, optional EventSourceInit
eventSourceInitDict)]
interface EventSource : EventTarget {
    readonly attribute DOMString url;
    readonly attribute boolean withCredentials;

    // ready state
    const unsigned short CONNECTING = 0;
    const unsigned short OPEN = 1;
    const unsigned short CLOSED = 2;
    readonly attribute unsigned short readyState;

    // networking
    [TreatNonCallableAsNull] attribute Function? onopen;
    [TreatNonCallableAsNull] attribute Function? onmessage;
    [TreatNonCallableAsNull] attribute Function? onerror;
    void close();
};

dictionary EventSourceInit {
    boolean withCredentials = false;
};
```

The `EventSource()` constructor takes one or two arguments. The first specifies the URL to which to connect. The second specifies the settings, if any, in the form of an [EventSourceInit](#) dictionary. When the `EventSource()` constructor is invoked, the UA must run these steps:

1. Resolve the URL specified in the first argument, relative to the [entry script's base URL](#). [\[HTML\]](#)
2. If the previous step failed, then throw a `SyntaxError` exception.
3. Create a new [EventSource](#) object.
4. Let *CORS mode* be [Anonymous](#).
5. If the second argument is present, and the [withCredentials](#) dictionary member has the value true, then set *CORS mode* to [Use Credentials](#) and initialize the new [EventSource](#) object's [withCredentials](#) attribute to true.
6. Return the new [EventSource](#) object, and continue these steps in the background (without blocking scripts).
7. Do a potentially CORS-enabled fetch of the resulting absolute URL, with the *mode* being *CORS mode*, and the *origin* being the [entry script's origin](#), and process the resource obtained in this fashion, if any, as described below.

**Note:** The definition of the [fetching algorithm](#) (which is used by [CORS](#)) is such that if the browser is already fetching the resource identified by the given [absolute URL](#), that connection can be

*reused, instead of a new connection being established. All messages received up to this point are dispatched immediately, in this case.*

This constructor must be visible when the script's global object is either a `Window` object or an object implementing the `WorkerUtils` interface.

The `url` attribute must return the absolute URL that resulted from resolving the value that was passed to the constructor.

The `withCredentials` attribute must return the value to which it was last initialized. When the object is created, it must be initialized to false.

The `readyState` attribute represents the state of the connection. It can have the following values:

**CONNECTING (numeric value 0)**

The connection has not yet been established, or it was closed and the user agent is reconnecting.

**OPEN (numeric value 1)**

The user agent has an open connection and is dispatching events as it receives them.

**CLOSED (numeric value 2)**

The connection is not open, and the user agent is not trying to reconnect. Either there was a fatal error or the `close()` method was invoked.

When the object is created its `readyState` must be set to `CONNECTING` (0). The rules given below for handling the connection define when the value changes.

The `close()` method must abort any instances of the fetch algorithm started for this `EventSource` object, and must set the `readyState` attribute to `CLOSED`.

The following are the event handlers (and their corresponding event handler event types) that must be supported, as IDL attributes, by all objects implementing the `EventSource` interface:

Event handler	Event handler event type
<code>onopen</code>	open
<code>onmessage</code>	message
<code>onerror</code>	error

In addition to the above, each `EventSource` object has the following associated with it:

- A **reconnection time**, in milliseconds. This must initially be a user-agent-defined value, probably in the region of a few seconds.
- A **last event ID string**. This must initially be the empty string.

These values are not currently exposed on the interface.

## 5 Processing model

The resource indicated in the argument to the [EventSource](#) constructor is fetched when the constructor is run.

For HTTP connections, the `Accept` header may be included; if included, it must contain only formats of event framing that are supported by the user agent (one of which must be [text/event-stream](#), as described below).

If the event source's [last event ID string](#) is not the empty string, then a [Last-Event-ID](#) HTTP header must be included with the request, whose value is the value of the event source's [last event ID string](#), encoded as UTF-8.

User agents should use the `Cache-Control: no-cache` header in requests to bypass any caches for requests of event sources. (This header is not a custom request header, so the user agent will still use the CORS simple cross-origin request mechanism.) User agents should ignore HTTP cache headers in the response, never caching event sources.

As data is received, the tasks queued by the networking task source to handle the data must act as follows.

HTTP 200 OK responses with a `Content-Type` header specifying the type [text/event-stream](#), ignoring any MIME type parameters, must be processed line by line as described below.

When a successful response with a supported MIME type is received, such that the user agent begins parsing the contents of the stream, the user agent must announce the connection.

The task that the networking task source places on the task queue once the fetching algorithm for such a resource (with the correct MIME type) has completed must cause the user agent to asynchronously reestablish the connection. This applies whether the connection is closed gracefully or unexpectedly. It doesn't apply for the error conditions listed below.

HTTP 200 OK responses that have a Content-Type specifying an unsupported type, or that have no Content-Type at all, must cause the user agent to fail the connection.

HTTP 305 Use Proxy, 401 Unauthorized, and 407 Proxy Authentication Required should be treated transparently as for any other subresource.

HTTP 301 Moved Permanently, 302 Found, 303 See Other, and 307 Temporary Redirect responses are handled by the fetching and CORS algorithms. In the case of 301 redirects, the user agent must also remember the new URL so that subsequent requests for this resource for this [EventSource](#) object start with the URL given for the last 301 seen for requests for this object.

Any other HTTP response code not listed here, and any network error that prevents the HTTP connection from being established in the first place (e.g. DNS errors), must

cause the user agent to [fail the connection](#).

For non-HTTP protocols, UAs should act in equivalent ways.

When a user agent is to **announce the connection**, the user agent must queue a task which, if the [readyState](#) attribute is set to a value other than [CLOSED](#), sets the [readyState](#) attribute to [OPEN](#) and fires a simple event named `open` at the [EventSource](#) object.

When a user agent is to **reestablish the connection**, the user agent must run the following steps. These steps are run asynchronously, not as part of a task. (The tasks that it queues, of course, are run like normal tasks and not asynchronously.)

1. Queue a task to run the following steps:
  1. If the [readyState](#) attribute is set to [CLOSED](#), abort the task.
  2. Set the [readyState](#) attribute to [CONNECTING](#).
  3. Fire a simple event named `error` at the [EventSource](#) object.
2. Wait a delay equal to the reconnection time of the event source.
3. Wait until the aforementioned task has run, if it has not yet run.
4. Queue a task to run the following steps:
  1. If the [readyState](#) attribute is not set to [CONNECTING](#), abort these steps.
  2. Perform a potentially CORS-enabled fetch of the absolute URL of the event source resource, with the *mode* and the *origin* being the same as those used in the original request triggered by the [EventSource\(\)](#) constructor, and process the resource obtained in this fashion, if any, as described earlier in this section.

When a user agent is to **fail the connection**, the user agent must queue a task which, if the [readyState](#) attribute is set to a value other than [CLOSED](#), sets the [readyState](#) attribute to [CLOSED](#) and fires a simple event named `error` at the [EventSource](#) object. **Once the user agent has [failed the connection](#), it does *not* attempt to reconnect!**

The task source for any tasks that are queued by [EventSource](#) objects is the **remote event task source**.

## 6 Parsing an event stream

This event stream format's MIME type is [text/event-stream](#).

The event stream format is as described by the `stream` production of the following ABNF, the character set for which is Unicode. [\[ABNF\]](#)

```
stream      = [ bom ] *event
event       = *( comment / field ) end-of-line
comment     = colon *any-char end-of-line
field       = 1*name-char [ colon [ space ] *any-char ] end-of-line
end-of-line = ( cr lf / cr / lf )

; characters
lf          = %x000A ; U+000A LINE FEED (LF)
cr          = %x000D ; U+000D CARRIAGE RETURN (CR)
space       = %x0020 ; U+0020 SPACE
colon       = %x003A ; U+003A COLON (:)
bom         = %xFEFF ; U+FEFF BYTE ORDER MARK
name-char   = %x0000-0009 / %x000B-000C / %x000E-0039 / %x003B-10FFFF
              ; a Unicode character other than U+000A LINE FEED (LF),
              U+000D CARRIAGE RETURN (CR), or U+003A COLON (:)
any-char    = %x0000-0009 / %x000B-000C / %x000E-10FFFF
              ; a Unicode character other than U+000A LINE FEED (LF) or
              U+000D CARRIAGE RETURN (CR)
```

Event streams in this format must always be encoded as UTF-8. [\[RFC3629\]](#)

Lines must be separated by either a U+000D CARRIAGE RETURN U+000A LINE FEED (CRLF) character pair, a single U+000A LINE FEED (LF) character, or a single U+000D CARRIAGE RETURN (CR) character.

Since connections established to remote servers for such resources are expected to be long-lived, UAs should ensure that appropriate buffering is used. In particular, while line buffering with lines are defined to end with a single U+000A LINE FEED (LF) character is safe, block buffering or line buffering with different expected line endings can cause delays in event dispatch.

## 7 Interpreting an event stream

Streams must be decoded as UTF-8, with error handling. [\[HTML\]](#)

One leading U+FEFF BYTE ORDER MARK character must be ignored if any are present.

The stream must then be parsed by reading everything line by line, with a U+000D CARRIAGE RETURN U+000A LINE FEED (CRLF) character pair, a single U+000A LINE FEED (LF) character not preceded by a U+000D CARRIAGE RETURN (CR) character, a single U+000D CARRIAGE RETURN (CR) character not followed by a U+000A LINE FEED (LF) character, and the end of the file being the four ways in which a line can end.

When a stream is parsed, a *data* buffer, an *event name* buffer, and a *last event ID* buffer must be associated with it. They must be initialized to the empty string

Lines must be processed, in the order they are received, as follows:

- ↪ **If the line is empty (a blank line)**  
[Dispatch the event](#), as defined below.
- ↪ **If the line starts with a U+003A COLON character (:)**  
Ignore the line.
- ↪ **If the line contains a U+003A COLON character (:)**  
Collect the characters on the line before the first U+003A COLON character (:), and let *field* be that string.  
  
Collect the characters on the line after the first U+003A COLON character (:), and let *value* be that string. If *value* starts with a U+0020 SPACE character, remove it from *value*.  
  
[Process the field](#) using the steps described below, using *field* as the field name and *value* as the field value.
- ↪ **Otherwise, the string is not empty but does not contain a U+003A COLON character (:)**  
[Process the field](#) using the steps described below, using the whole line as the field name, and the empty string as the field value.

Once the end of the file is reached, any pending data must be discarded. (If the file ends in the middle of an event, before the final empty line, the incomplete event is not dispatched.)

The steps to **process the field** given a field name and a field value depend on the field name, as given in the following list. Field names must be compared literally, with no case folding performed.

- ↪ **If the field name is "event"**

Set the *event name* buffer to field value.

↪ **If the field name is "data"**

Append the field value to the *data* buffer, then append a single U+000A LINE FEED (LF) character to the *data* buffer.

↪ **If the field name is "id"**

Set the *last event ID* buffer to the field value.

↪ **If the field name is "retry"**

If the field value consists of only characters in the range U+0030 DIGIT ZERO (0) to U+0039 DIGIT NINE (9), then interpret the field value as an integer in base ten, and set the event stream's [reconnection time](#) to that integer. Otherwise, ignore the field.

↪ **Otherwise**

The field is ignored.

When the user agent is required to **dispatch the event**, then the user agent must act as follows:

1. Set the [last event ID string](#) of the event source to value of the *last event ID* buffer. The buffer does not get reset, so the [last event ID string](#) of the event source remains set to this value until the next time it is set by the server.
2. If the *data* buffer is an empty string, set the *data* buffer and the *event name* buffer to the empty string and abort these steps.
3. If the *data* buffer's last character is a U+000A LINE FEED (LF) character, then remove the last character from the *data* buffer.
4. Create an event that uses the `MessageEvent` interface, with the event name `message`, which does not bubble, is not cancelable, and has no default action. The `data` attribute must be initialized to the value of the *data* buffer, the `origin` attribute must be initialized to the Unicode serialization of the origin of the event stream's final URL (i.e. the URL after redirects), and the `lastEventId` attribute must be initialized to the [last event ID string](#) of the event source.
5. If the *event name* buffer has a value other than the empty string, change the [type](#) of the newly created event to equal the value of the *event name* buffer.
6. Set the *data* buffer and the *event name* buffer to the empty string.
7. Queue a task which, if the [readyState](#) attribute is set to a value other than [CLOSED](#), dispatches the newly created event at the [EventSource](#) object.

**Note:** If an event doesn't have an "id" field, but an earlier event did set the event source's [last event ID string](#), then the event's `lastEventId` field will be set to the value of whatever the last seen "id" field was.

|| The following event stream, once followed by a blank line:



```
data: YHOO
data: +2
data: 10
```

...would cause an event message with the interface `MessageEvent` to be dispatched on the [EventSource](#) object. The event's `data` attribute would contain the string `YHOO\n+2\n10` (where `\n` represents a newline).

This could be used as follows:

```
var stocks = new
EventSource("http://stocks.example.com/ticker.php");
stocks.onmessage = function (event) {
    var data = event.data.split('\n');
    updateStocks(data[0], data[1], data[2]);
};
```

...where `updateStocks()` is a function defined as:

```
function updateStocks(symbol, delta, value) { ... }
```

...or some such.

The following stream contains four blocks. The first block has just a comment, and will fire nothing. The second block has two fields with names "data" and "id" respectively; an event will be fired for this block, with the data "first event", and will then set the last event ID to "1" so that if the connection died between this block and the next, the server would be sent a [Last-Event-ID](#) header with the value "1". The third block fires an event with data "second event", and also has an "id" field, this time with no value, which resets the last event ID to the empty string (meaning no [Last-Event-ID](#) header will now be sent in the event of a reconnection being attempted). Finally, the last block just fires an event with the data " third event" (with a single leading space character). Note that the last still has to end with a blank line, the end of the stream is not enough to trigger the dispatch of the last event.

```
: test stream

data: first event
id: 1

data:second event
id

data:  third event
```

The following stream fires two events:

```
data

data
data

data:
```

The first block fires events with the data set to the empty string, as would the

last block if it was followed by a blank line. The middle block fires an event with the data set to a single newline character. The last block is discarded because it is not followed by a blank line.

The following stream fires two identical events:

```
data:test
```

```
data: test
```

This is because the space after the colon is ignored if present.

## 8 Notes

Legacy proxy servers are known to, in certain cases, drop HTTP connections after a short timeout. To protect against such proxy servers, authors can include a comment line (one starting with a ':' character) every 15 seconds or so.

Authors wishing to relate event source connections to each other or to specific documents previously served might find that relying on IP addresses doesn't work, as individual clients can have multiple IP addresses (due to having multiple proxy servers) and individual IP addresses can have multiple clients (due to sharing a proxy server). It is better to include a unique identifier in the document when it is served and then pass that identifier as part of the URL when the connection is established.

Authors are also cautioned that HTTP chunking can have unexpected negative effects on the reliability of this protocol. Where possible, chunking should be disabled for serving event streams unless the rate of messages is high enough for this not to matter.

Clients that support HTTP's per-server connection limitation might run into trouble when opening multiple pages from a site if each page has an [EventSource](#) to the same domain. Authors can avoid this using the relatively complex mechanism of using unique domain names per connection, or by allowing the user to enable or disable the [EventSource](#) functionality on a per-page basis, or by sharing a single [EventSource](#) object using a shared worker. [\[WEBWORKERS\]](#)

## 9 Connectionless push and other features

User agents running in controlled environments, e.g. browsers on mobile handsets tied to specific carriers, may offload the management of the connection to a proxy on the network. In such a situation, the user agent for the purposes of conformance is considered to include both the handset software and the network proxy.

For example, a browser on a mobile device, after having established a connection, might detect that it is on a supporting network and request that a proxy server on the network take over the management of the connection. The timeline for such a situation might be as follows:

1. Browser connects to a remote HTTP server and requests the resource specified by the author in the [EventSource](#) constructor.
2. The server sends occasional messages.
3. In between two messages, the browser detects that it is idle except for the network activity involved in keeping the TCP connection alive, and decides to switch to sleep mode to save power.
4. The browser disconnects from the server.
5. The browser contacts a service on the network, and requests that that service, a "push proxy", maintain the connection instead.
6. The "push proxy" service contacts the remote HTTP server and requests the resource specified by the author in the [EventSource](#) constructor (possibly including a [Last-Event-ID](#) HTTP header, etc).
7. The browser allows the mobile device to go to sleep.
8. The server sends another message.
9. The "push proxy" service uses a technology such as OMA push to convey the event to the mobile device, which wakes only enough to process the event and then returns to sleep.

This can reduce the total data usage, and can therefore result in considerable power savings.

As well as implementing the existing API and [text/event-stream](#) wire format as defined by this specification and in more distributed ways as described above, formats of event framing defined by [other applicable specifications](#) may be supported. This specification does not define how they are to be parsed or processed.

## 10 Garbage collection

While an [EventSource](#) object's [readyState](#) is [CONNECTING](#), and the object has one or more event listeners registered for `open`, `message` or `error` events, there must be a strong reference from the `Window` or `WorkerUtils` object that the [EventSource](#) object's constructor was invoked from to the [EventSource](#) object itself.

While an [EventSource](#) object's [readyState](#) is [OPEN](#), and the object has one or more event listeners registered for `message` or `error` events, there must be a strong reference from the `Window` or `WorkerUtils` object that the [EventSource](#) object's constructor was invoked from to the [EventSource](#) object itself.

While there is a task queued by an [EventSource](#) object on the [remote event task source](#), there must be a strong reference from the `Window` or `WorkerUtils` object that the [EventSource](#) object's constructor was invoked from to that [EventSource](#) object.

If a user agent is to **forcibly close** an [EventSource](#) object (this happens when a `Document` object goes away permanently), the user agent must abort any instances of the `fetch` algorithm started for this [EventSource](#) object, and must set the [readyState](#) attribute to [CLOSED](#).

If an [EventSource](#) object is garbage collected while its connection is still open, the user agent must abort any instance of the `fetch` algorithm opened by this [EventSource](#).

***Note: It's possible for one active network connection to be shared by multiple [EventSource](#) objects and their `fetch` algorithms, which is why the above is phrased in terms of aborting the `fetch` algorithm and not the actual underlying download.***

## 11 IANA considerations

### 11.1 `text/event-stream`

This registration is for community review and will be submitted to the IESG for review, approval, and registration with IANA.

**Type name:**

text

**Subtype name:**

event-stream

**Required parameters:**

No parameters

**Optional parameters:****charset**

The `charset` parameter may be provided. The parameter's value must be "utf-8". This parameter serves no purpose; it is only allowed for compatibility with legacy servers.

**Encoding considerations:**

8bit (always UTF-8)

**Security considerations:**

An event stream from an origin distinct from the origin of the content consuming the event stream can result in information leakage. To avoid this, user agents are required to apply CORS semantics. [\[CORS\]](#)

Event streams can overwhelm a user agent; a user agent is expected to apply suitable restrictions to avoid depleting local resources because of an overabundance of information from an event stream.

Servers can be overwhelmed if a situation develops in which the server is causing clients to reconnect rapidly. Servers should use a 5xx status code to indicate capacity problems, as this will prevent conforming clients from reconnecting automatically.

**Interoperability considerations:**

Rules for processing both conforming and non-conforming content are defined in this specification.

**Published specification:**

This document is the relevant specification.

**Applications that use this media type:**

Web browsers and tools using Web services.

**Additional information:****Magic number(s):**

No sequence of bytes can uniquely identify an event stream.

**File extension(s):**

No specific file extensions are recommended for this type.

**Macintosh file type code(s):**

No specific Macintosh file type codes are recommended for this type.

**Person & email address to contact for further information:**

Ian Hickson <ian@hixie.ch>

**Intended usage:**

Common

**Restrictions on usage:**

This format is only expected to be used by dynamic open-ended streams served using HTTP or a similar protocol. Finite resources are not expected to be labeled with this type.

**Author:**

Ian Hickson <ian@hixie.ch>

**Change controller:**

W3C

Fragment identifiers have no meaning with [text/event-stream](#) resources.

## 11.2 Last-Event-ID

This section describes a header field for registration in the Permanent Message Header Field Registry. [\[RFC3864\]](#)

**Header field name:**

Last-Event-ID

**Applicable protocol:**

http

**Status:**

standard

**Author/Change controller:**

W3C

**Specification document(s):**

This document is the relevant specification.

**Related information:**

None.

## References

All references are normative unless marked "Non-normative".

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## Acknowledgements

For a full list of acknowledgements, please see the HTML specification. [\[HTML\]](#)