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A JSON Meta Application Protocol (JMAP) Subprotocol for WebSocket
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Abstract

This document defines a binding for the JSON Meta Application Protocol (JMAP) over a WebSocket transport layer. A WebSocket binding for JMAP provides higher performance than the current HTTP binding for JMAP.

Open Issues

- o Should we allow push notifications over the WS connection?
- o Should we allow out of order processing of requests?

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Table of Contents

1.	Introduction	2
2.	Conventions Used in This Document	3
3.	Discovering Support for JMAP over WebSocket	3
4.	JMAP Subprotocol	3
4.1.	Handshake	3
4.2.	WebSocket Messages	4
4.3.	Examples	4
5.	Security Considerations	6
6.	Privacy Considerations	7
7.	IANA Considerations	7
7.1.	Registration of the WebSocket JMAP Sub-Protocol	7
8.	References	7
8.1.	Normative References	7
8.2.	Informative References	8
8.3.	URIs	8
Appendix A.	Change History (To be removed by RFC Editor before publication)	8
	Author's Address	8

[1.](#) Introduction

JMAP over HTTP requires that every JMAP API request be authenticated. Depending on the type of authentication used by the JMAP client and the configuration of the JMAP server, authentication could be an expensive operation both in time and resources. In such circumstances, authenticating every JMAP API request may harm performance.

The WebSocket binding for JMAP eliminates this performance hit by authenticating just the WebSocket handshake request and having those credentials remain in effect for the duration of the WebSocket connection.

Furthermore, the WebSocket binding for JMAP can optionally compress [\[RFC7692\]](#) JMAP API requests. Although compression of HTTP responses is ubiquitous, compression of HTTP requests has very low, if any deployment, and therefore isn't an option for JMAP API requests over HTTP.

2. Conventions Used in This Document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14](#) [1] [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

The same terminology is used in this document as in the core JMAP specification.

3. Discovering Support for JMAP over WebSocket

The capabilities object is returned as part of the standard JMAP Session object (see Section 2 of [I-D.ietf-jmap-core]). Servers supporting this specification MUST add a property called "urn:ietf:params:jmap:websocket" to the capabilities object. The value of this property is an object which MUST contain the following information on server capabilities:

wsUrl: "String" The URL to use for JMAP over WebSocket.

4. JMAP Subprotocol

The term WebSocket subprotocol refers to an application-level protocol layered on top of a WebSocket connection. This document specifies the WebSocket JMAP subprotocol for carrying JMAP API requests and responses through a WebSocket connection. Binary data MUST NOT be uploaded or downloaded through a WebSocket JMAP connection.

4.1. Handshake

The JMAP WebSocket client and JMAP WebSocket server negotiate the use of the WebSocket JMAP subprotocol during the WebSocket handshake, either via a HTTP/1.1 Upgrade request (see [Section 1.3 of \[RFC6455\]](#)) or a HTTP/2 Extended CONNECT request (see Section 5 of [I-D.ietf-httpbis-h2-websockets]).

Regardless of the method used for the WebSocket handshake, the client MUST make an authenticated [RFC7235] HTTP request on the JMAP 'wsURL' ([Section 3](#)), and the client MUST include the value 'jmap' in the list of protocols for the 'Sec-WebSocket-Protocol' header field. The reply from the server MUST also contain 'jmap' in its corresponding 'Sec-WebSocket-Protocol' header field in order for a JMAP subprotocol connection to be established.

If a client receives a handshake response that does not include 'jmap' in the 'Sec-WebSocket-Protocol' header, then a JMAP subprotocol WebSocket connection was not established and the client MUST close the WebSocket connection.

Once the handshake has successfully completed, the WebSocket connection is established and can be used for JMAP API requests and responses. Messages other than JMAP API requests and responses MUST NOT be transmitted over this connection.

The credentials used for authenticating the HTTP request to initiate the handshake remain in effect for the duration of the WebSocket connection.

[4.2.](#) WebSocket Messages

Data frame messages in the JMAP subprotocol MUST be of the text type and contain UTF-8 encoded data. The messages MUST be in the form of a single JMAP request object (see Section 3.2 of [\[I-D.ietf-jmap-core\]](#)) when sent from the client to the server, and in the form of a single JMAP Response object or JSON Problem Details object (see Sections [3.4](#) and [3.6.1](#) respectively of [\[I-D.ietf-jmap-core\]](#)) when sent from the server to the client.

[4.3.](#) Examples

The following examples show WebSocket JMAP handshakes and a subsequent JMAP for Mail [\[I-D.ietf-jmap-mail\]](#) request and response. The examples assume that the JMAP 'wsURL' has been advertised in the JMAP Session object as '/jmap/'. Note that folding of header fields is for editorial purposes only.

WebSocket JMAP handshake via HTTP/1.1 which also negotiates compression [[RFC7692](#)]:

```
[[ From Client ]]                [[ From Server ]]

GET /jmap/ HTTP/1.1
Host: server.example.com
Upgrade: websocket
Connection: Upgrade
Authorization: Basic Zm9vOmJhcg==
Sec-WebSocket-Key:
    dGhlIHNhbXBsZSBub25jZQ==
Sec-WebSocket-Protocol: jmap
Sec-WebSocket-Version: 13
Sec-WebSocket-Extensions:
    permessage-deflate
Origin: http://www.example.com

                                HTTP/1.1 101 Switching Protocols
                                Upgrade: websocket
                                Connection: Upgrade
                                Sec-WebSocket-Accept:
                                    s3pPLMBiTxaQ9kYGzzhZRbK+x0o=
                                Sec-WebSocket-Protocol: jmap
                                Sec-WebSocket-Extensions:
                                    permessage-deflate

[WebSocket connection established]

{
  "using": [ "urn:ietf:params:jmap:core",
             "urn:ietf:params:jmap:mail" ],
  "methodCalls": [
    ...
  ]
}

{
  "methodResponses": [
    ...
  ]
}
```


WebSocket JMAP handshake on a HTTP/2 stream:

```
[[ From Client ]]                [[ From Server ]]  
  
                                SETTINGS  
                                SETTINGS_ENABLE_CONNECT_PROTOCOL = 1  
  
HEADERS + END_HEADERS  
:method = CONNECT  
:protocol = websocket  
:scheme = https  
:path = /jmap/  
:authority = server.example.com  
authorization = Basic Zm9vOmJhcg==  
sec-websocket-protocol = jmap  
sec-websocket-version = 13  
origin = http://www.example.com  
  
                                HEADERS + END_HEADERS  
                                :status = 200  
                                sec-websocket-protocol = jmap  
  
[WebSocket connection established]  
  
DATA  
{  
  "using": [ "urn:ietf:params:jmap:core",  
             "urn:ietf:params:jmap:mail" ],  
  "methodCalls": [  
    ...  
  ]  
}  
  
                                DATA  
                                {  
                                  "methodResponses": [  
                                    ...  
                                  ]  
                                }
```

5. Security Considerations

TODO

6. Privacy Considerations

TODO

7. IANA Considerations

7.1. Registration of the WebSocket JMAP Sub-Protocol

This specification requests IANA to register the WebSocket JMAP sub-protocol under the "WebSocket Subprotocol Name" Registry with the following data:

Subprotocol Identifier: JMAP

Subprotocol Common Name: WebSocket Transport for JMAP (JSON Meta Application Protocol)

Subprotocol Definition: RFCXXXX (this document)

8. References

8.1. Normative References

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McManus, P., "Bootstrapping WebSockets with HTTP/2",
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[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in [RFC 2119](#) Key Words", [BCP 14](#), [RFC 8174](#), DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.

8.2. Informative References

[I-D.ietf-jmap-mail]
Jenkins, N., "JMAP for Mail", [draft-ietf-jmap-mail-06](#)
(work in progress), July 2018.

[RFC7692] Yoshino, T., "Compression Extensions for WebSocket",
[RFC 7692](#), DOI 10.17487/RFC7692, December 2015,
<<https://www.rfc-editor.org/info/rfc7692>>.

8.3. URIs

[1] <https://tools.ietf.org/html/bcp14>

Appendix A. Change History (To be removed by RFC Editor before publication)

Changes since -00:

- o Fleshed out section on discovery of support for JMAP over WebSocket.
- o Allow JSON Problem Details objects to be returned by the server for toplevel errors.
- o Mentioned the ability to compress JMAP API requests.
- o Minor Editorial changes.

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