Performance Evaluation of WebSocket Protocol for Implementation of Full-Duplex Web Streams

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1st Scalability Research Forum

Outline

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- *Historically*, creating web applications that need bidirectional communication between a client and a server has required an abuse of HTTP to poll the server for updates while sending upstream notifications as distinct HTTP calls.

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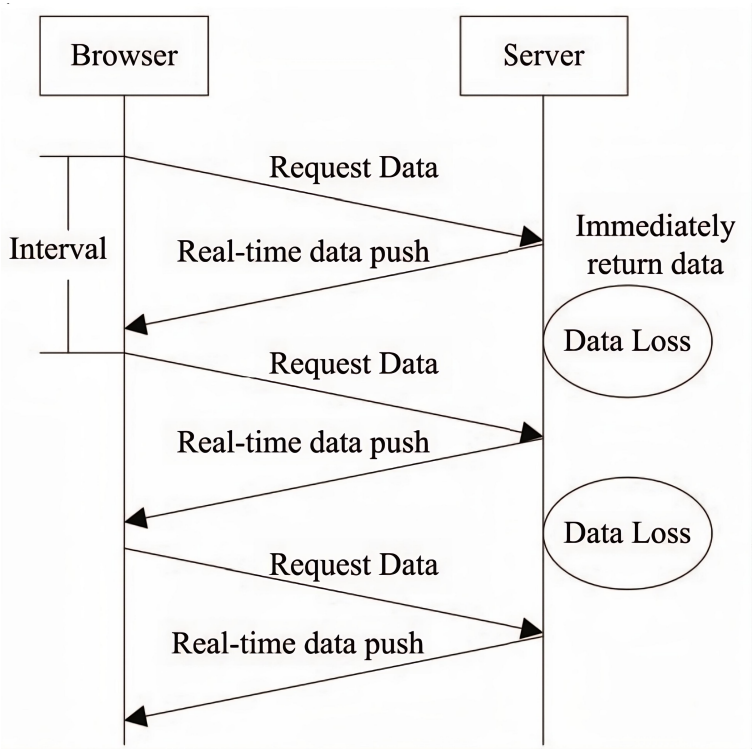
Check whether the server is changed in a while, thereby performing incremental updates.



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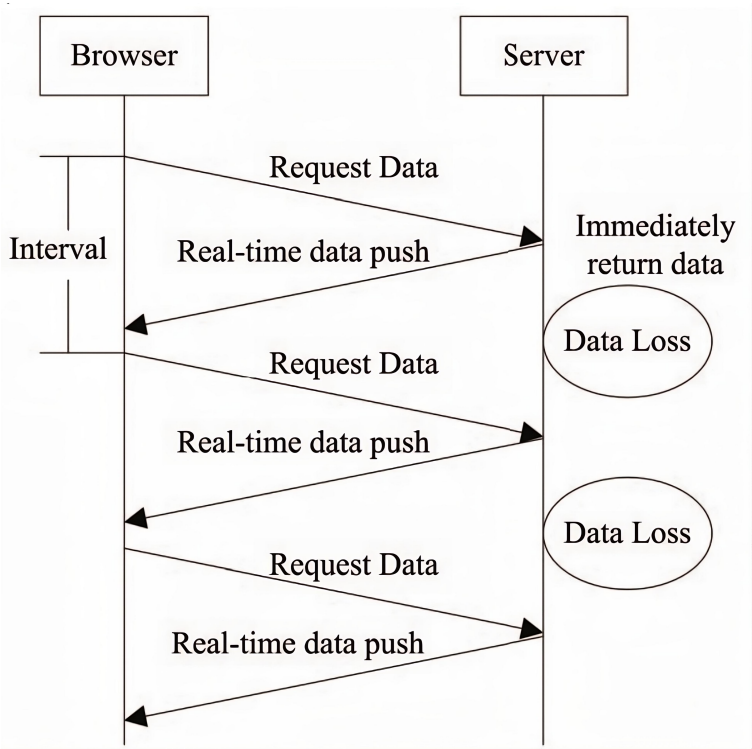

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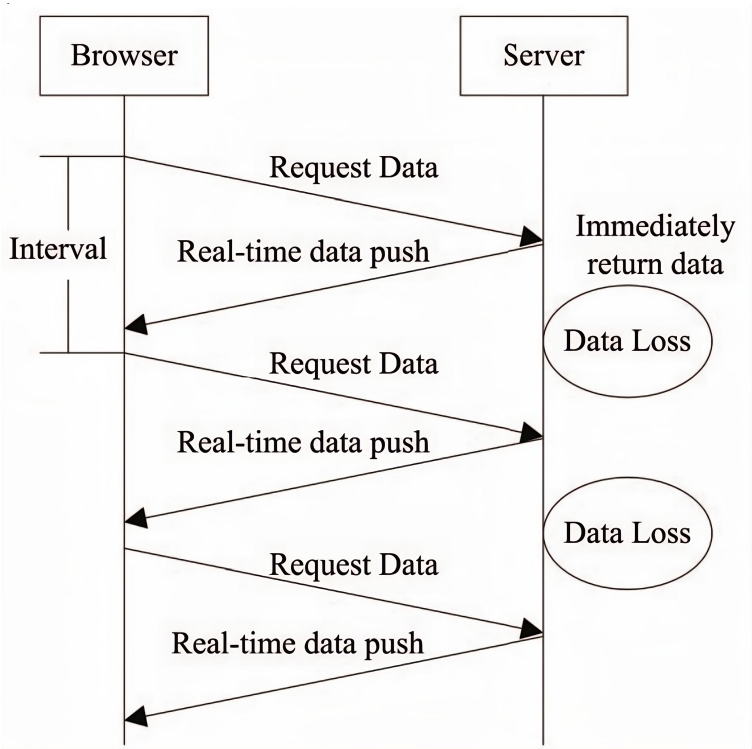

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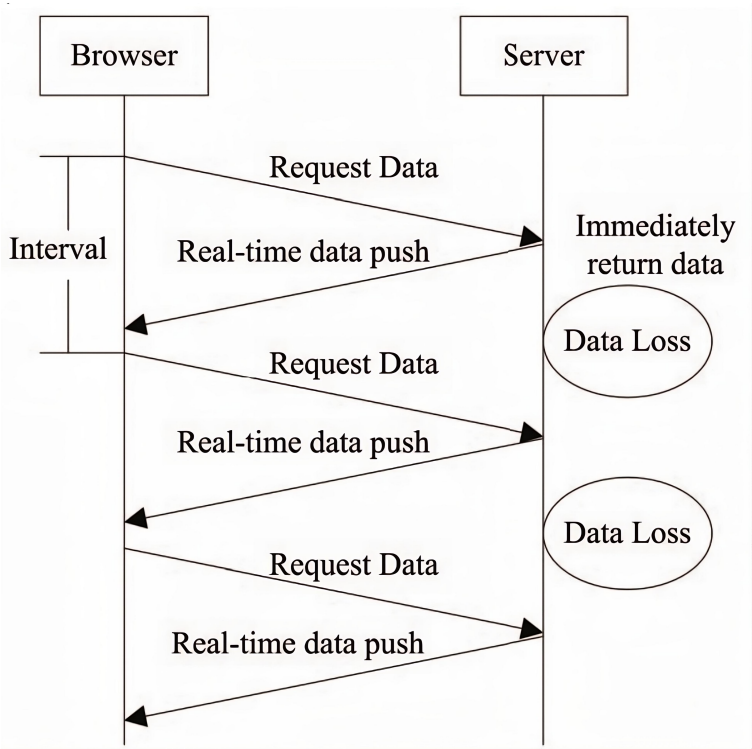

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- Continuously short interval requests will be washed away the server.
- Long interval will require more time to reach the client, no real-time data.

HTTP long polling

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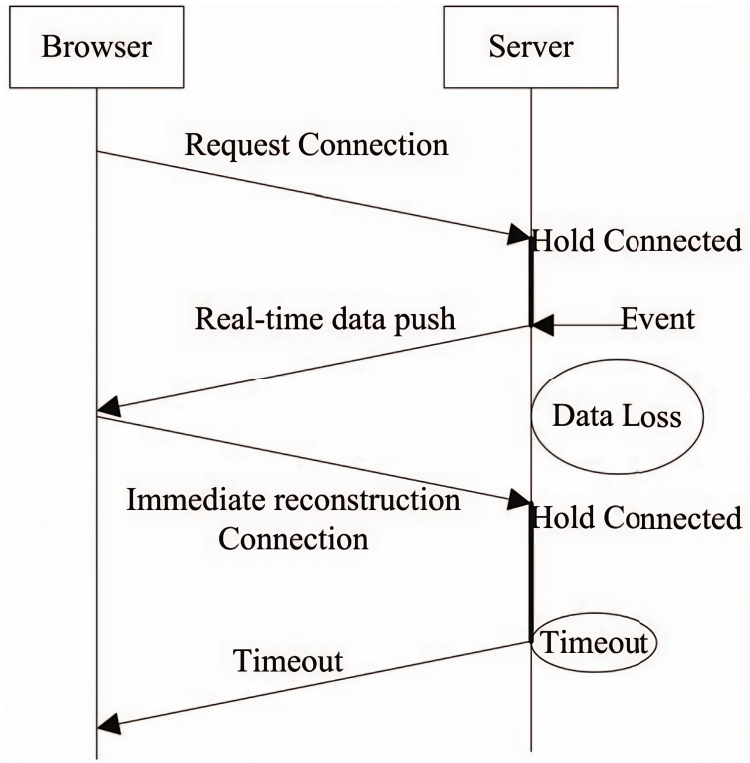

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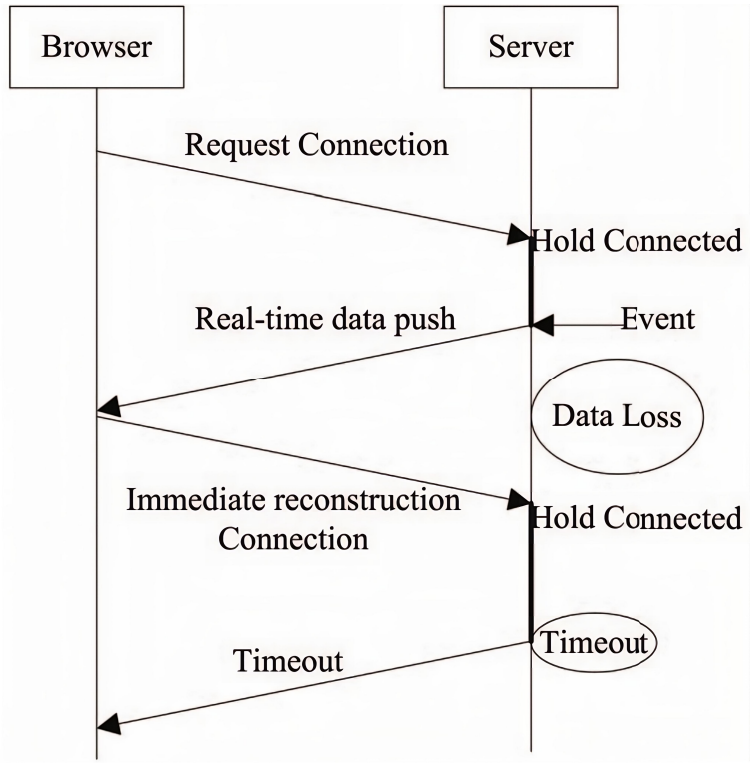

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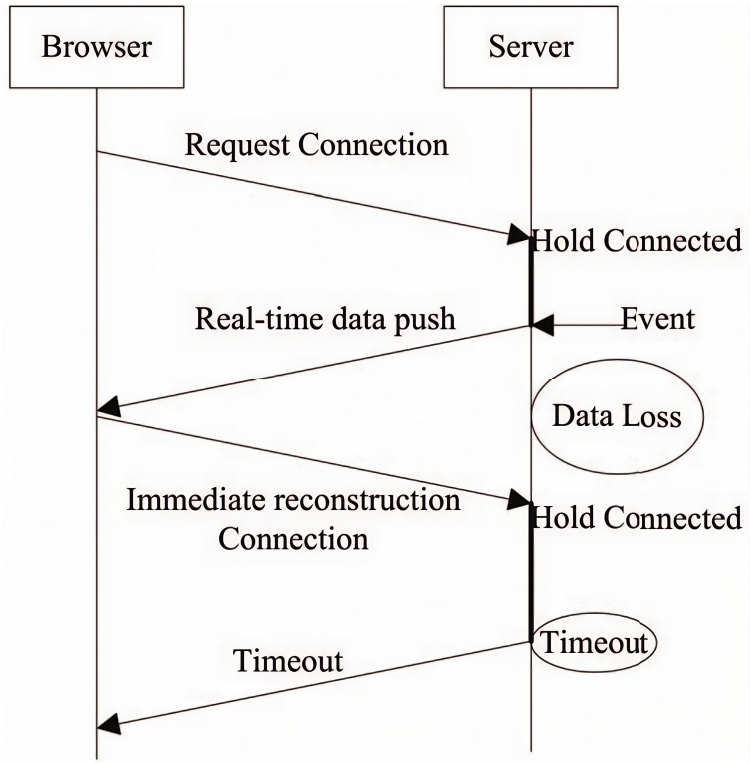

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- No bidirectional communication, server push data.

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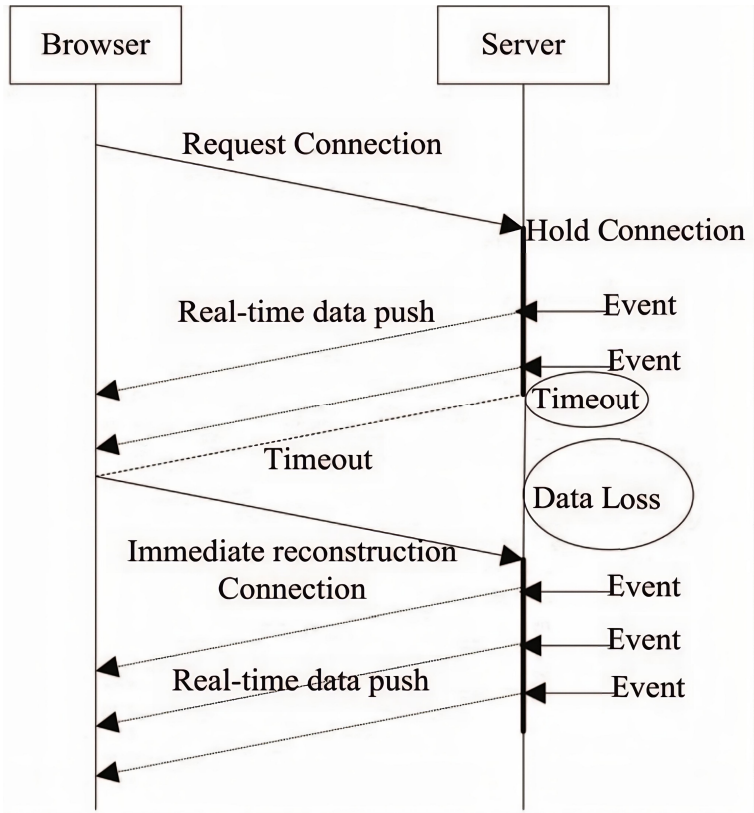

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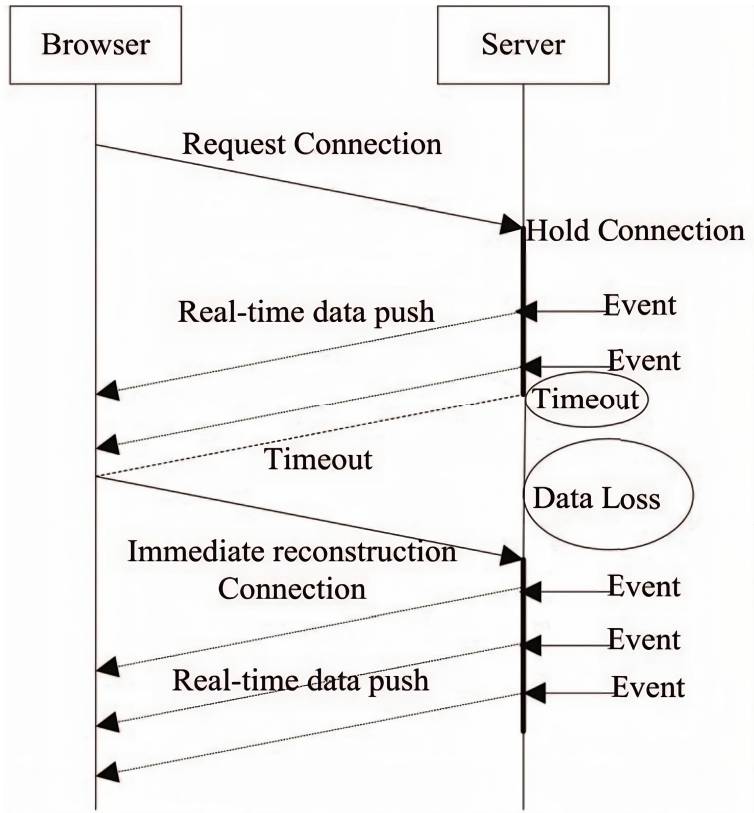

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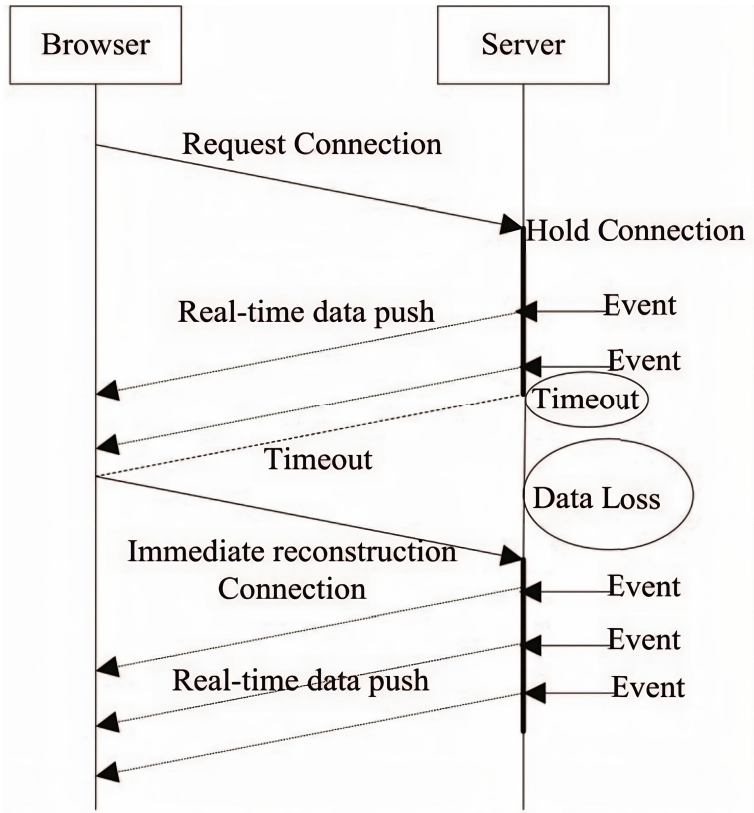

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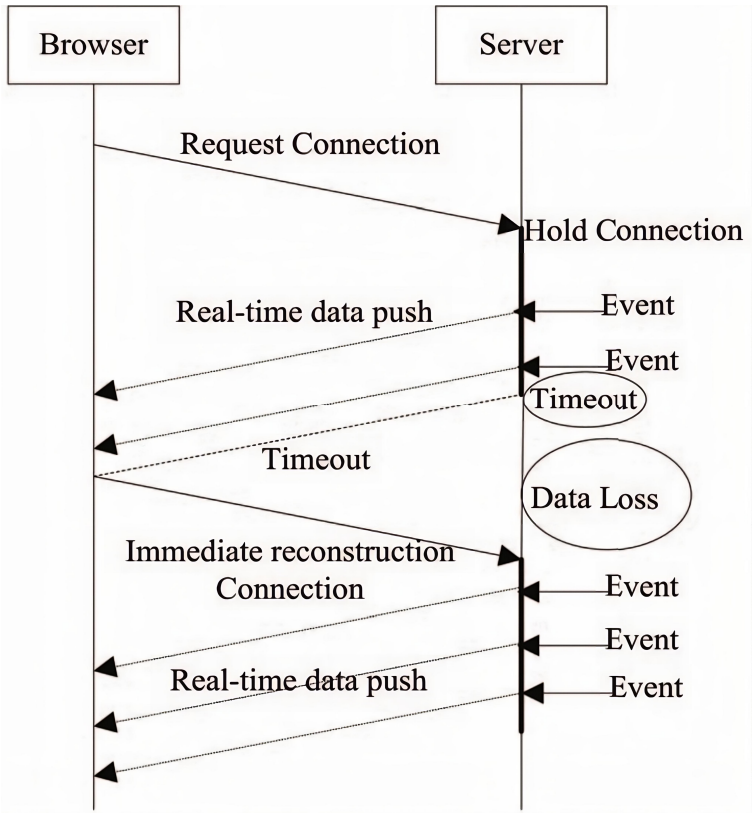

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RFC 6455

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- The WebSocket Protocol enables two-way communication between a client running untrusted code in a controlled environment to a remote host that has opted-in to communications from that code.

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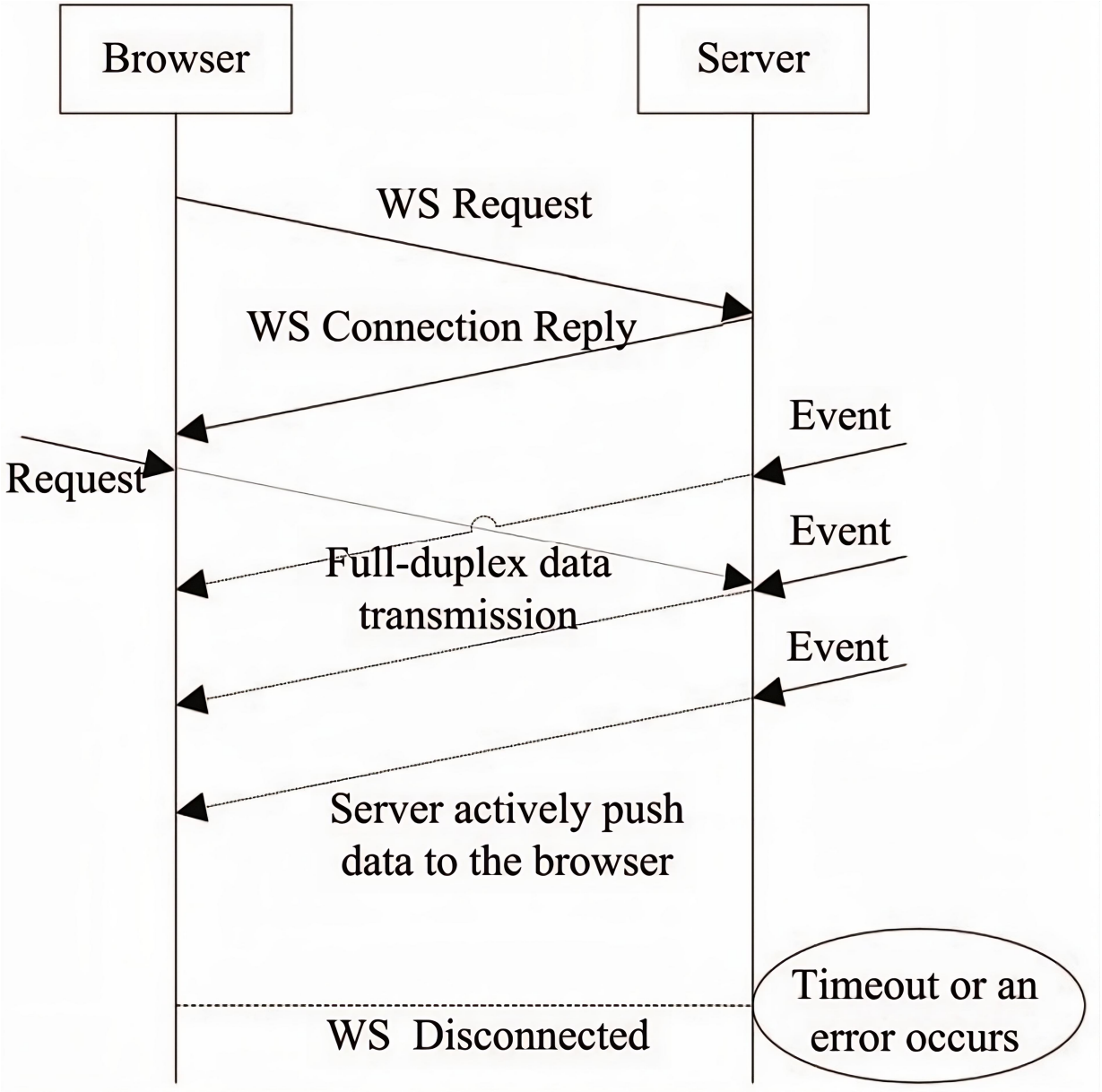

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- To establish a session, client sends a WebSocket Upgrade Request to the server, upon which server responds with a WebSocket Upgrade Response.
- From this point forward, the client and server can send data back and forth in asynchronous full-duplex mode.

WebSocket Upgrade Request

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GET /chat HTTP/1.1
Host: server.example.com
Upgrade: WebSocket
Connection: Upgrade
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- Server tells which protocol it supports.

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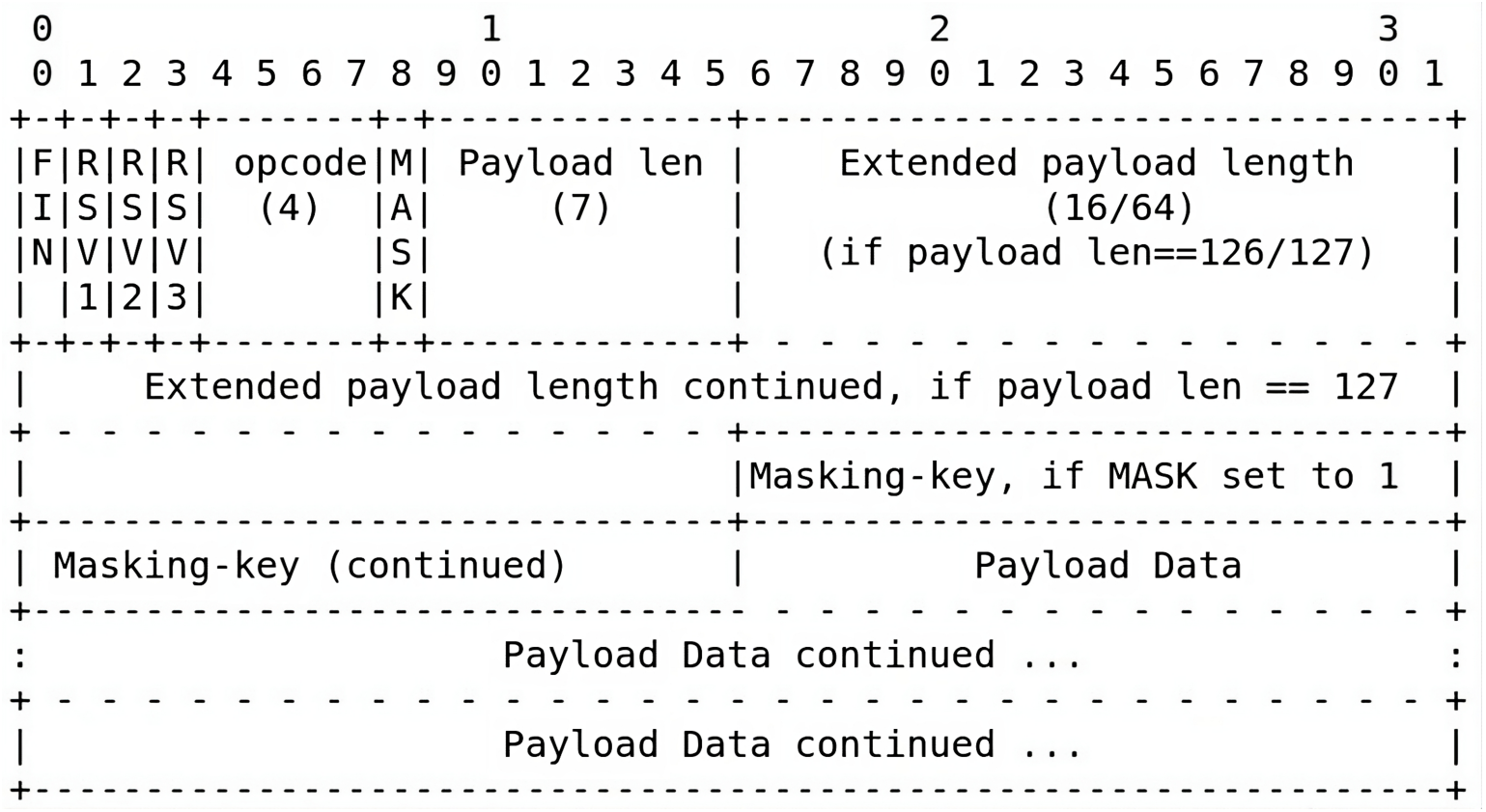
- Each frame adds at least 2 bytes of overhead to the payload data. Depending on the length of the payload data and the direction of the communication, the length of the overhead may increase up to 14 bytes.

WebSocket Frame Structure



WebSocket API

The API is defined by its states of readiness, responses to a networking or messaging event.

Callback	Description
`onopen`	invoked when WebSocket `session is established`, signalizes that the protocol is ready to transfer payload data
`onerror`	invoked whenever an `error occurs`
`onclose`	invoked when one of the peers has `terminated the session`
`onmessage`	invoked when an `incoming message` from another peer has arrived

References


Alexey Melnikov and Ian Fette, *The WebSocket Protocol*, RFC 6455, December 2011.


D. Skvorc, M. Horvat, and S. Srbljic, *Performance evaluation of websocket protocol for implementation of full-duplex web streams*, 2014 37th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), 2014, pp. 1003–1008.


Lijing Zhang and Xiaoxiao Shen, *Research and development of real-time monitoring system based on websocket technology*, Proceedings 2013 International Conference on Mechatronic Sciences, Electric Engineering and Computer (MEC), 2013, pp. 1955–1958.