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

Oleg Bilovus

Università degli Studi di Salerno

1st Scalability Research Forum

WebSocket

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We will talk about WebSockets and compare its performance with TCP Socket. But, before diving into analyzing the performance we need to understand why we needed WebSockets and what they are.

Outline

Background

- *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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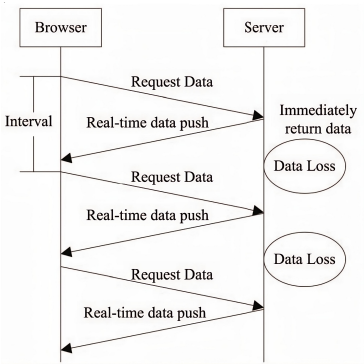
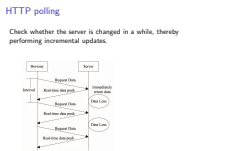
HTTP polling

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





A client can send data and ask for data at the same time. But, if client has no data and server has no data, a request and response will still be generated with all the HTTP headers and thus wasting resources.No real-time data because while the client waits, an event could occur and the client will know about it only when the timeout expires.

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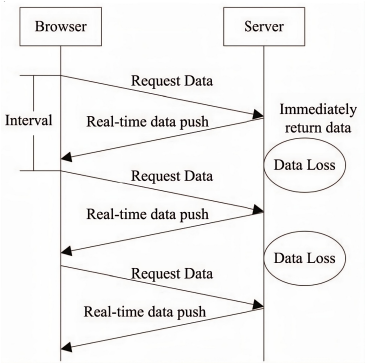

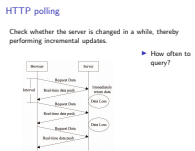

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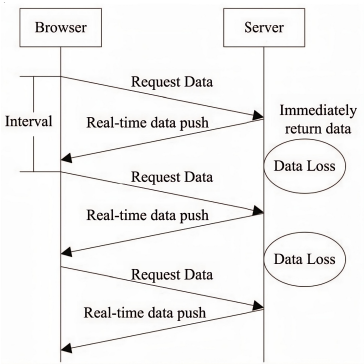

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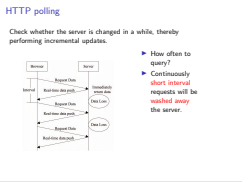

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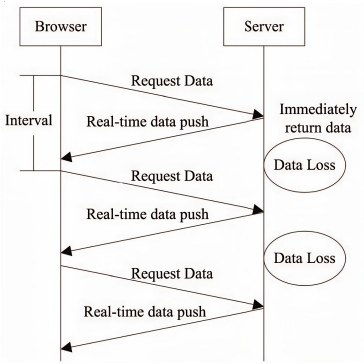

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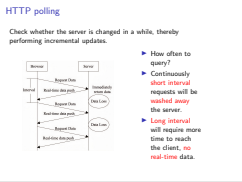
- Long interval will require more time to reach the client, no real-time data.



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HTTP long polling

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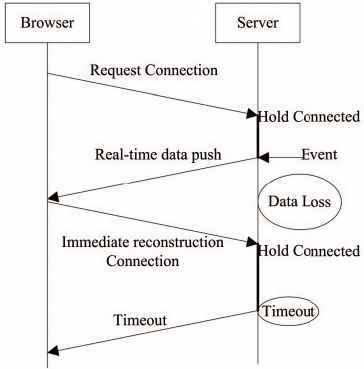

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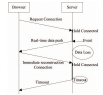

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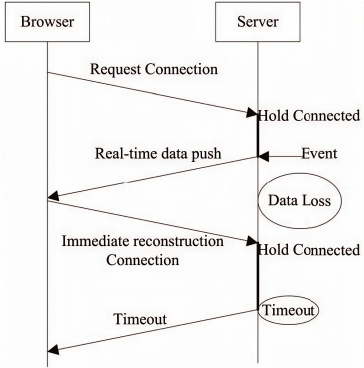

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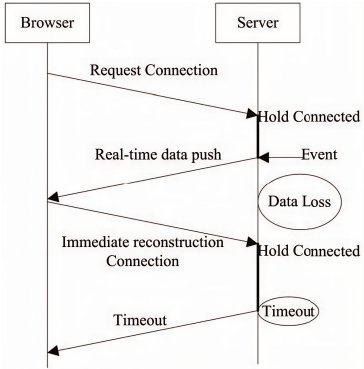

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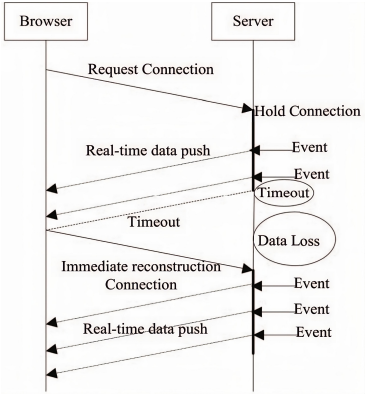

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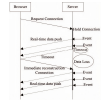

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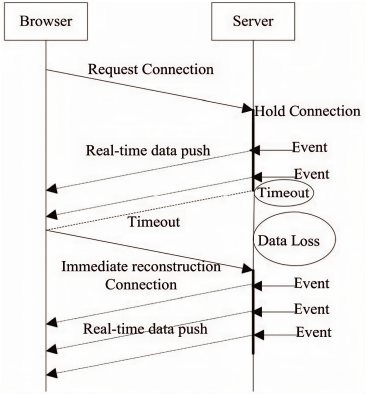

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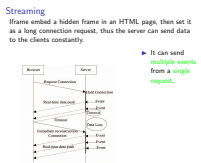

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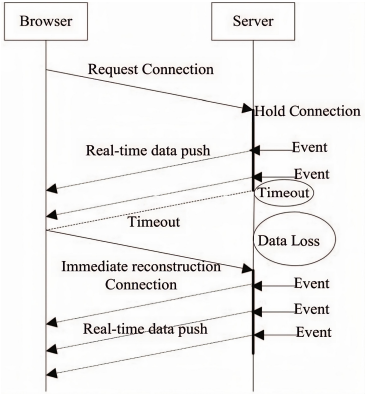

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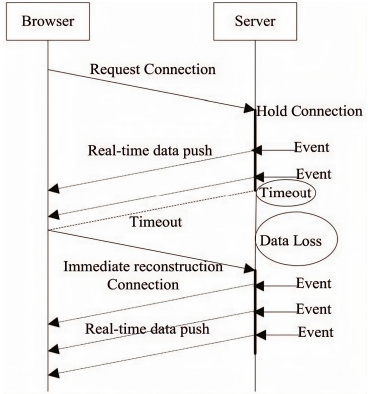

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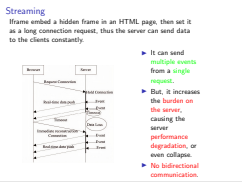

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Background
HTTP polling
HTTP long polling
Streaming

WebSocket protocol
Definition
Handshake
Frame
API

Performance vs TCP Socket
Performance Evaluation
WebSocket TCP
Network traffic

RFC 6455

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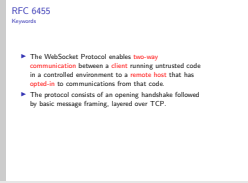

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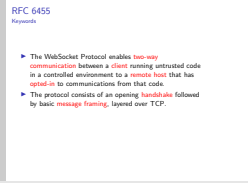

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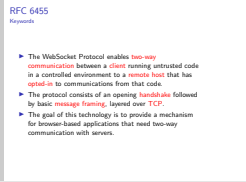

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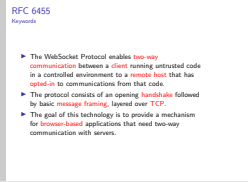

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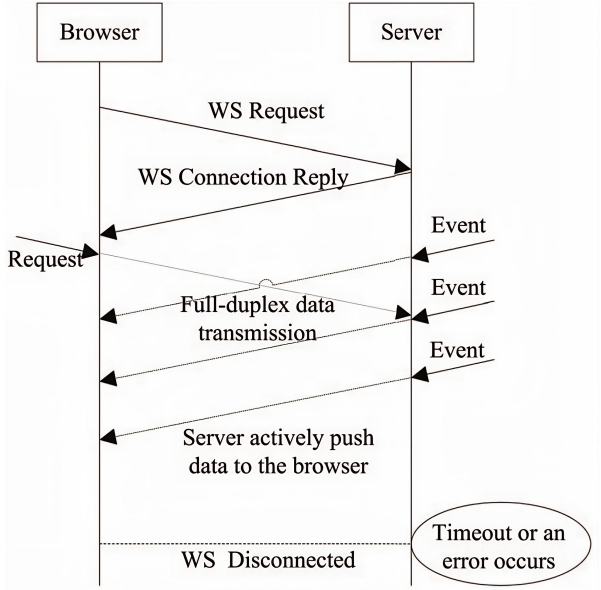

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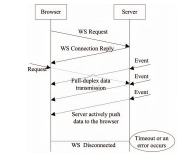

There is the initial handshake, after that, client and server can send and receive data at any moment without further interaction.There is no timeout. If it disconnects, it is because of an error and to establish the connection, the handshake has to be done again.

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Host: server.example.com
Upgrade: WebSocket
Connection: Upgrade
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Different URI can be used to identify different endpoints. A URI can be regular HTTP, another can be WebSocket.

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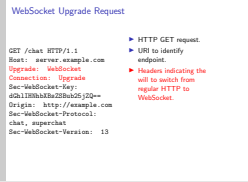

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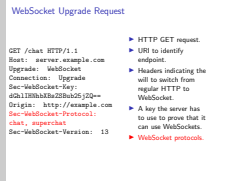

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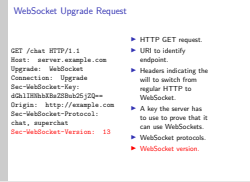

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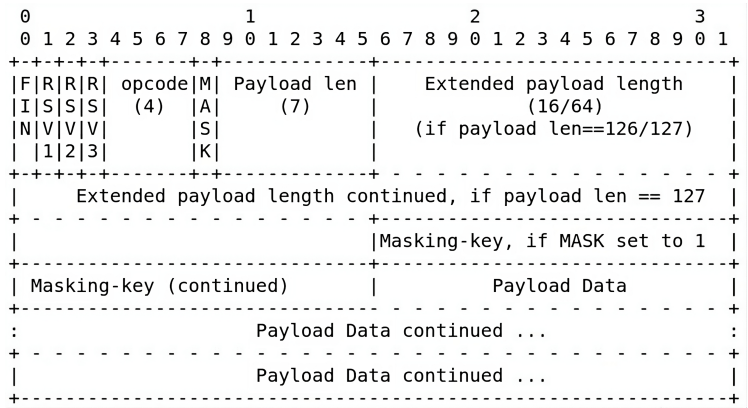

WebSocket Frame Structure

We will not go into the details because it is out of the scope of this presentation and, as mentioned earlier, the added overhead to the payload data is minimal.

WebSocket API

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

Callback	Description
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Outline

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Background
HTTP polling
HTTP long polling
Streaming

WebSocket protocol
Definition
Handshake
Frame
API

Performance vs TCP Socket
Performance Evaluation
WebSocket TCP
Network traffic

We will now try to evaluate the WebSocket performance compared to the raw TCP Socket.

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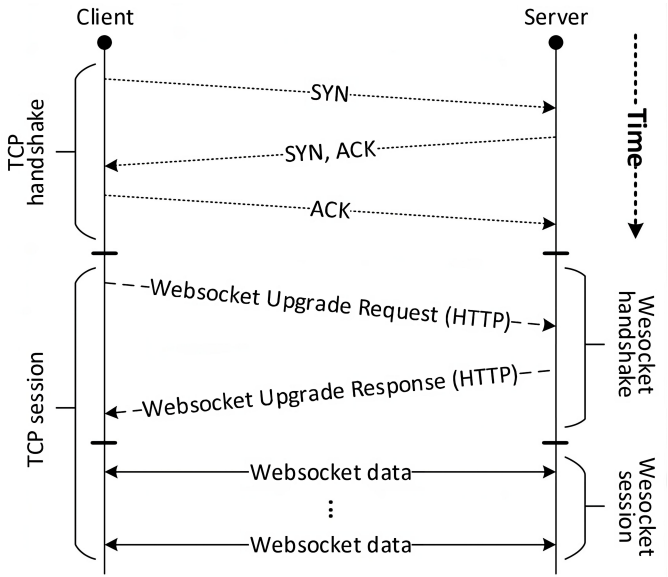

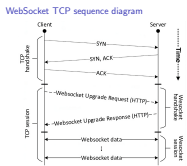

WebSocket stay on top of TCP which means it will always add more overhead than the raw TCP Socket, but WebSocket is easier to use in a web environment.

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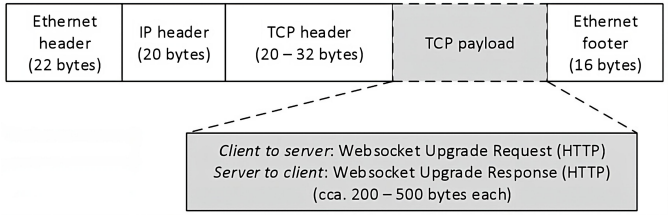

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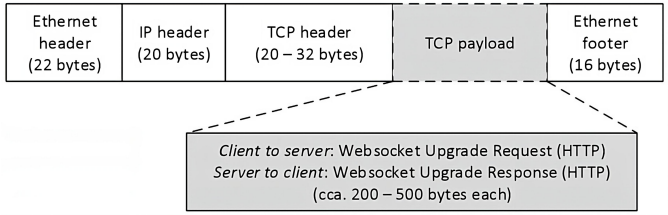

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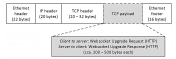

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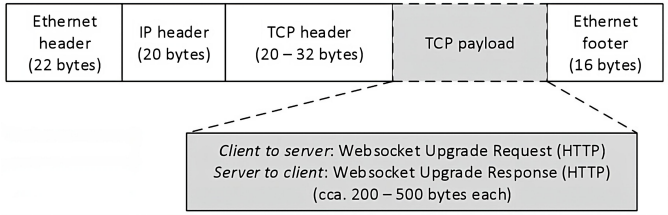

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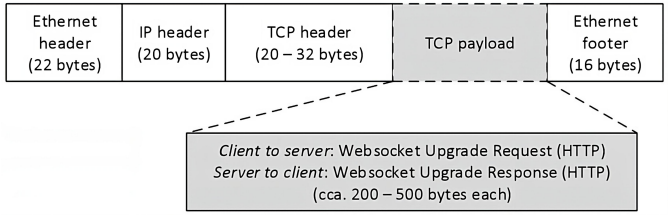

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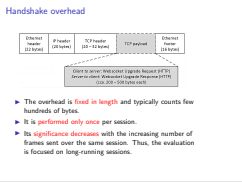

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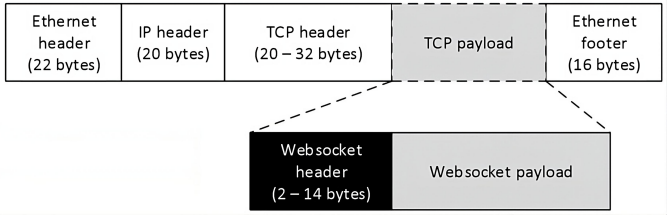

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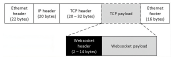

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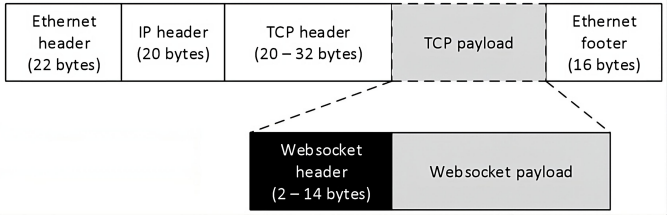

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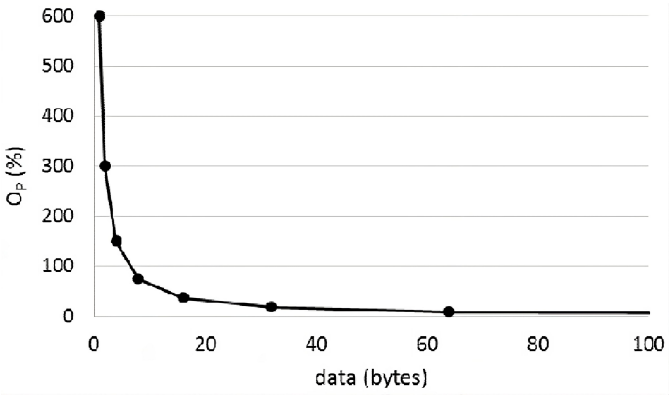

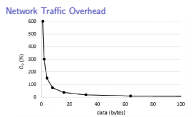

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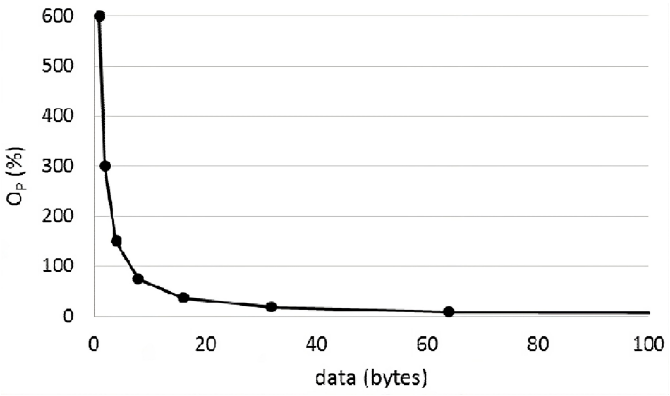

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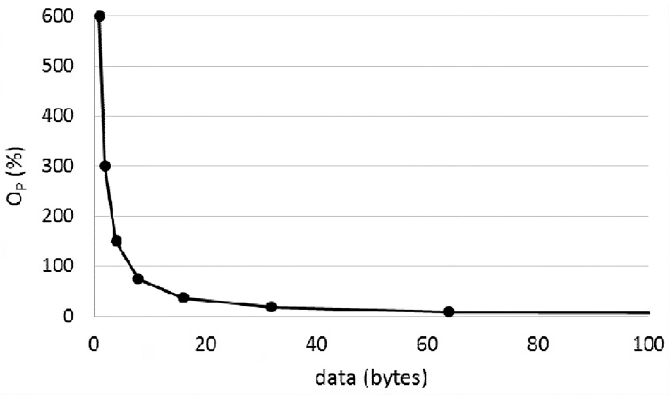

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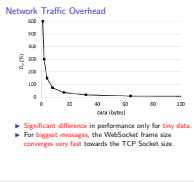

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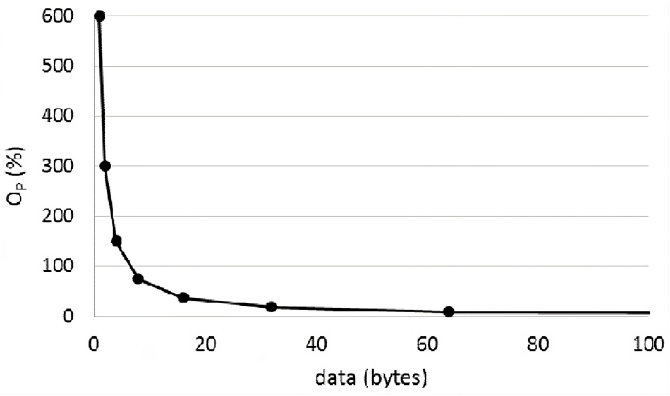

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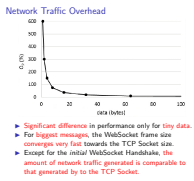

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