



Communication en temps réel

introduction à websocket

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Problématique

- Échanger le plus rapidement possible des informations avec le client
- Canal de communication simple à mettre en oeuvre



Ajax ?

- Connu depuis 2005
- Permet de communiquer en asynchrone
- Repose sur HTTP
- Lourd et coûteux en ressource
- Pas d'échange temps réel des données



WebSocket

- Envoi de données bi-directionnelles
- Ne repose pas sur http / Peu coûteux en ressource
- Envoi par paquet sur une connexion ouverte
- Protocole toujours en brouillon mais bien implémenté dans les navigateurs



Comment ça marche ?

HTTP/1.1



Client

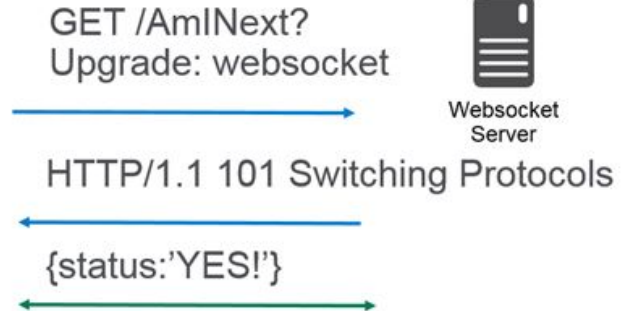


Web Server

Websockets



Client



Websocket
Server



Poignée de main

Requête

GET wss://websocket.org HTTP/1.1

Host: websocket.org

Connection: Upgrade

Upgrade: websocket

Origin: https://www.websocket.org

Sec-WebSocket-Version: 13

Sec-WebSocket-Key: zigDI7tK3w+TZ4Tbo1PsrA==

Sec-WebSocket-Extensions: permessage-deflate;

client_max_window_bits

Réponse

HTTP/1.1 101 Switching Protocols

Upgrade: websocket

Connection: Upgrade

Sec-WebSocket-Accept:

Gt6vEo8L5pzXgPWBvuIRh5wv5hM=





En-tête d'un paquet

0										1										2										3									
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1								
+ - + - + - + - - - - - + - + - - - - - - - + - - - - - - - - - - - +																																							
F R R R opcode M Payload len										Extended payload length																													
I S S S (4) A (7)										(16/64)																													
N V V V										S										(if payload len == 126/127)																			
1 2 3										K																													
+ - + - + - + - - - - - + - + - - - - - - - + - - - - - - - - - - - +																																							
										Extended payload length continued, if payload len == 127																													
+ - - - - - - - - - - - - - - - - + - - - - - - - - - - - +																																							
										Masking-key, if MASK set to 1																													
+ - - - - - - - - - - - - - - - - + - - - - - - - - - - - +																																							
Masking-key (continued)																				Payload Data																			
+ - +																																							
:										Payload Data continued ...																				:									
+ - +																																							



Comparaison ajax / websocket

```

> Frame 29: 429 bytes on wire (3432 bits), 429 bytes captured (3432 bits) on
> Ethernet II, Src: Sagemcom_b3:9b:cc (e8:be:81:b3:9b:cc), Dst: LiteonTe_a3:6
> Internet Protocol Version 4, Src: 69.164.217.35, Dst: 192.168.1.102
> Transmission Control Protocol, Src Port: 80 (80), Dst Port: 56700 (56700),
▲ Hypertext Transfer Protocol
  > HTTP/1.1 200 OK\r\n
    Server: nginx\r\n
    Date: Wed, 27 Jul 2016 21:13:34 GMT\r\n
    Content-Type: text/html\r\n
  > Content-Length: 187\r\n
    Connection: keep-alive\r\n
    Vary: Accept-Encoding\r\n
    Content-Encoding: gzip\r\n
    \r\n
    [HTTP response 2/3]
    [Time since request: 0.093530000 seconds]
    [Prev request in frame: 17]
    [Prev response in frame: 21]
    [Request in frame: 25]
    [Next request in frame: 36]
    [Next response in frame: 43]
    Content-encoded entity body (gzip): 187 bytes -> 262 bytes
▲ Line-based text data: text/html
  [truncated]Lorem ipsum dolor sit amet, consectetur adipiscing elit. Eti
```

```

> Frame 136: 89 bytes on wire (712 bits), 89 bytes captured (712 b
> Ethernet II, Src: Apple_56:52:f2 (00:23:12:56:52:f2), Dst: Liteo
> Internet Protocol Version 4, Src: 192.168.1.60, Dst: 192.168.1.1
> Transmission Control Protocol, Src Port: 51774 (51774), Dst Port
▲ WebSocket
  1... .... = Fin: True
  .100 .... = Reserved: 0x04
  .... 0001 = Opcode: Text (1)
  1... .... = Mask: True
  .001 0001 = Payload length: 17
  Masking-Key: adb51072
  Masked payload
  Payload
  JavaScript Object Notation
  > Line-based text data
```



Un peu de RFC

URL: `ws://` ou `wss://`

Pour décoder

$j = i \text{ MOD } 4$

$\text{transformed-octet-}i = \text{original-octet-}i \text{ XOR } \text{masking-key-octet-}j$

Exemple

```
var DECODED = "";  
for (var i = 0; i < ENCODED.length; i++) {  
    DECODED[i] = ENCODED[i] ^ MASK[i % 4];  
}
```

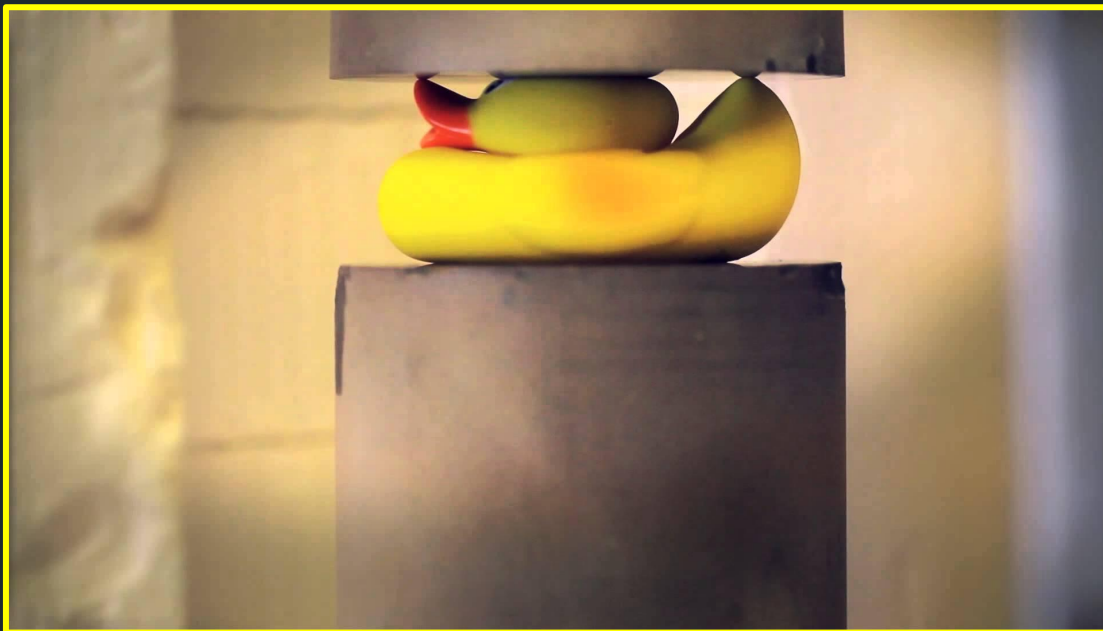


Implémentation

- NodeJS : socket.io
- PHP : php-websocket
- Python : websocket



Démo ?



Références

- <https://tools.ietf.org/html/draft-ietf-hybi-thewebsocketprotocol-17#section-5.3>
- <https://github.com/Textalk/websocket-php/blob/master/lib/Base.php>
- <http://blog.clever-age.com/fr/2011/02/28/le-web-en-temps-reel-avec-socket-io/>
- http://www.slideshare.net/Ericom_Software/websockets-everywhere-the-future-transport-protocol-for-everything-almost
- https://developer.mozilla.org/fr/docs/WebSockets/ecrire_des_serveurs_WebSocket

