סב"ד

LIVEPERSON

Websockets - Best Practice

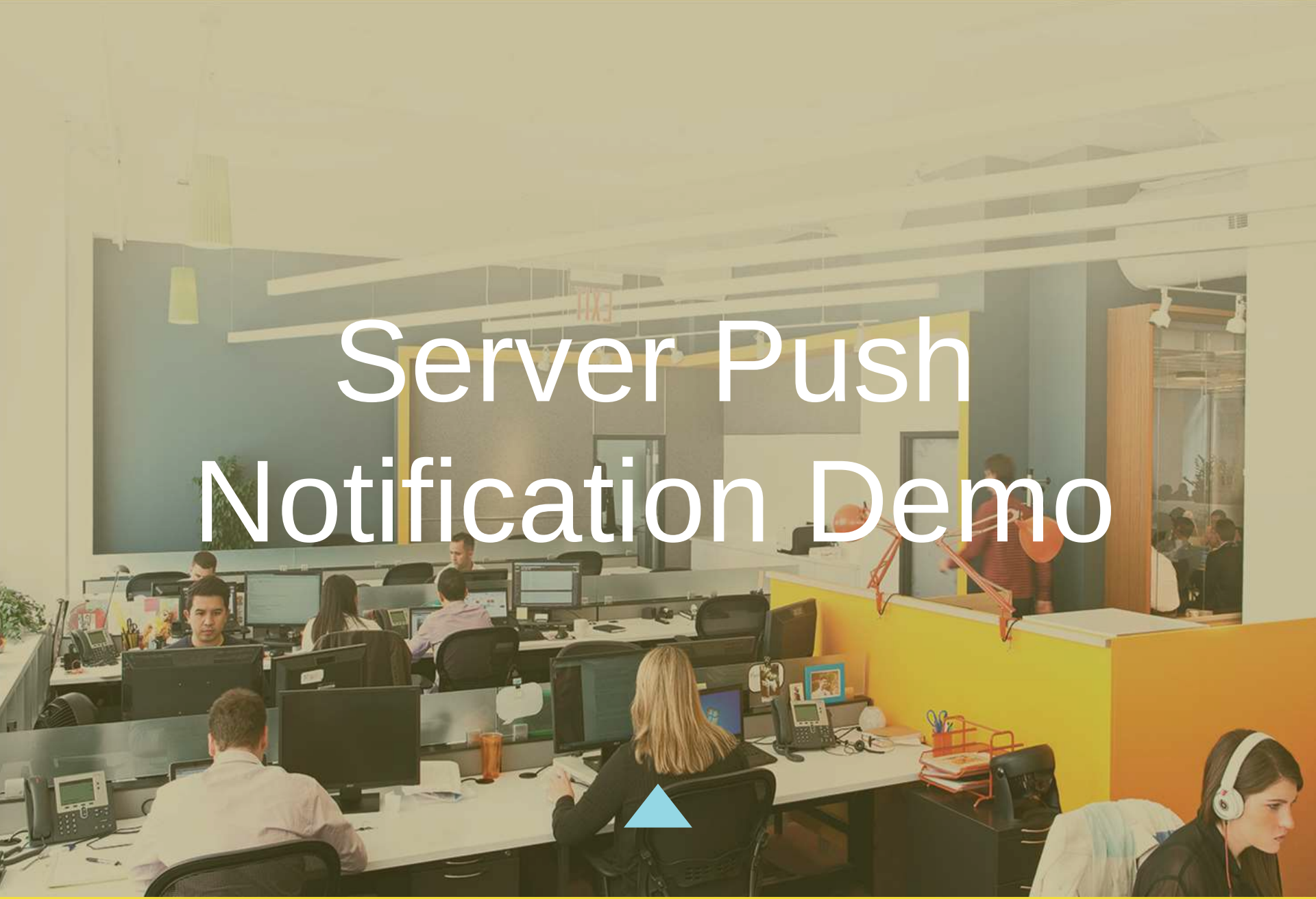
at Liveperson

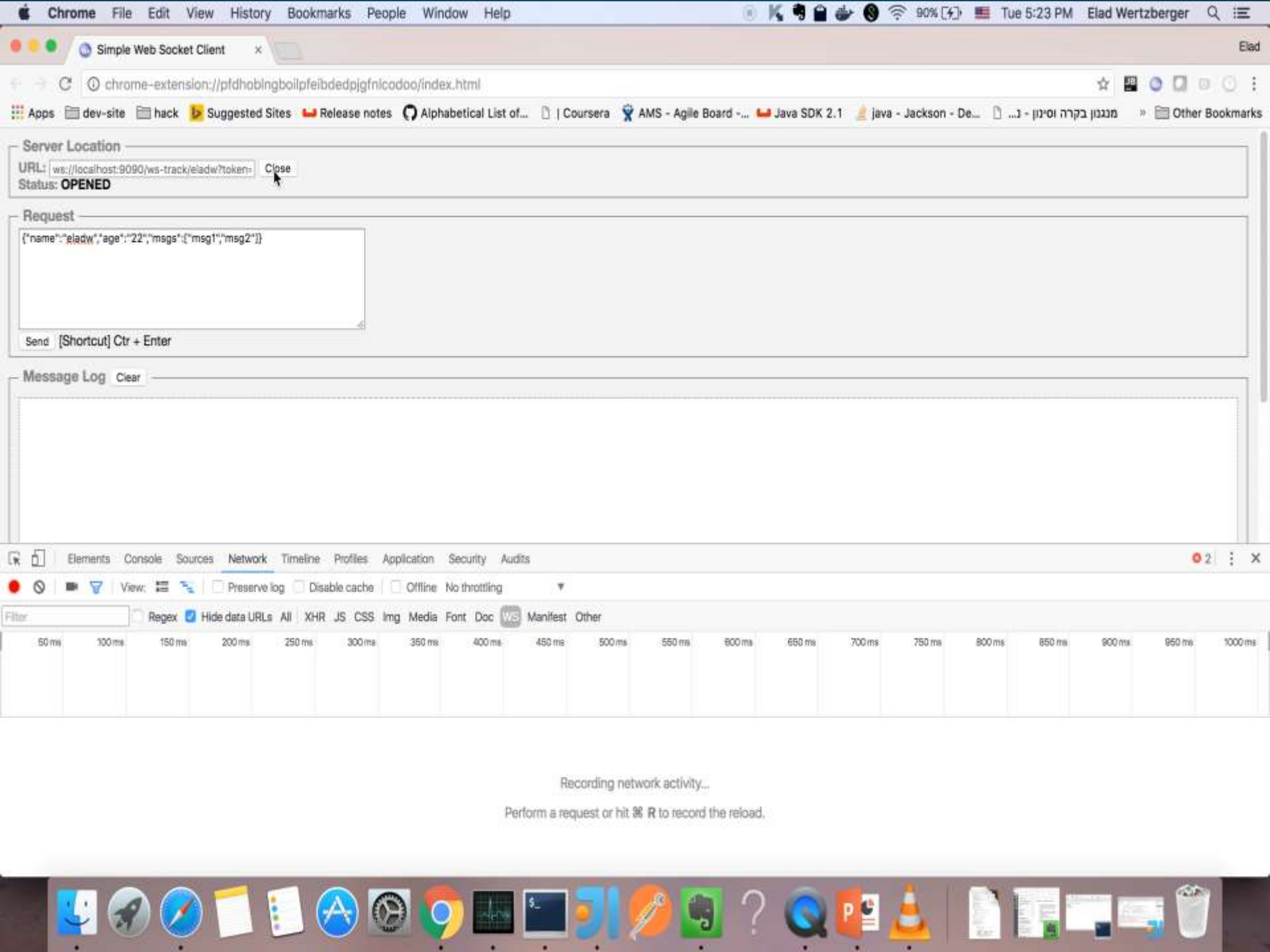
Elad Wertzberger | Tech Lead

TADS 2016
TELECOM APPLICATION DEVELOPER SUMMIT

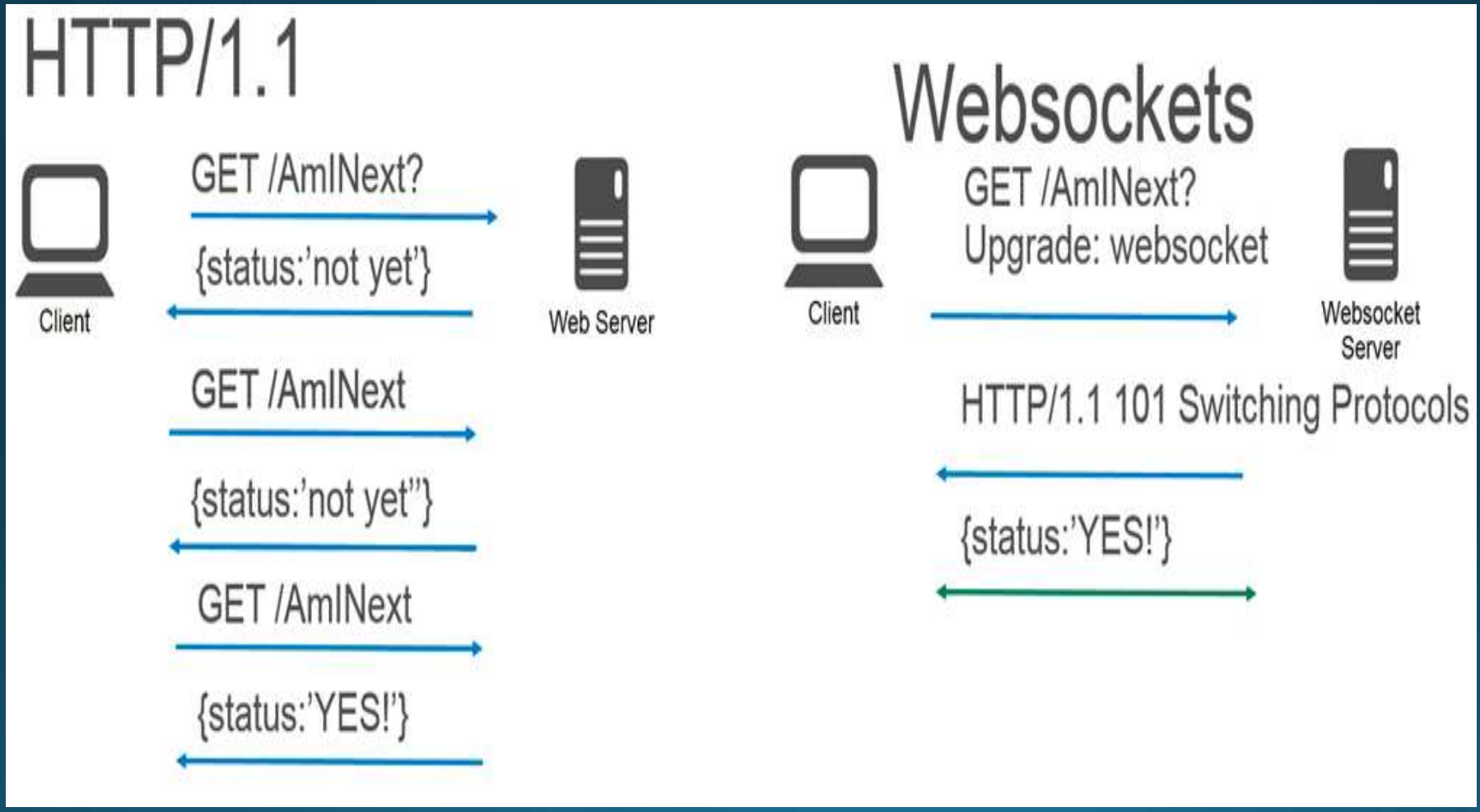
Agenda

- Websocket Basics
- Websocket Real Life experience


Server Push
Notification Demo


Chrome File Edit View History Bookmarks People Window Help
90% Tue 5:23 PM Elad Wertzberger
Simple Web Socket Client
Elad
chrome-extension://pfdhobingboilpfeibdedpjgfnlcodoo/index.html
Apps dev-site hack Suggested Sites Release notes Alphabetical List of... | Coursera AMS - Agile Board -... Java SDK 2.1 java - Jackson - De... Other Bookmarks
Server Location
URL: ws://localhost:9090/ws-track/eladw?token= Close
Status: OPENED
Request
{"name":"eladw","age":"22","msgs":["msg1","msg2"]}
Send [Shortcut] Ctr + Enter
Message Log Clear
Elements Console Sources Network Timeline Profiles Application Security Audits
Preserve log Disable cache Offline No throttling
Filter Regex Hide data URLs All XHR JS CSS Img Media Font Doc WS Manifest Other
50 ms 100 ms 150 ms 200 ms 250 ms 300 ms 350 ms 400 ms 450 ms 500 ms 550 ms 600 ms 650 ms 700 ms 750 ms 800 ms 850 ms 900 ms 950 ms 1000 ms
Recording network activity...
Perform a request or hit ⌘ R to record the reload.

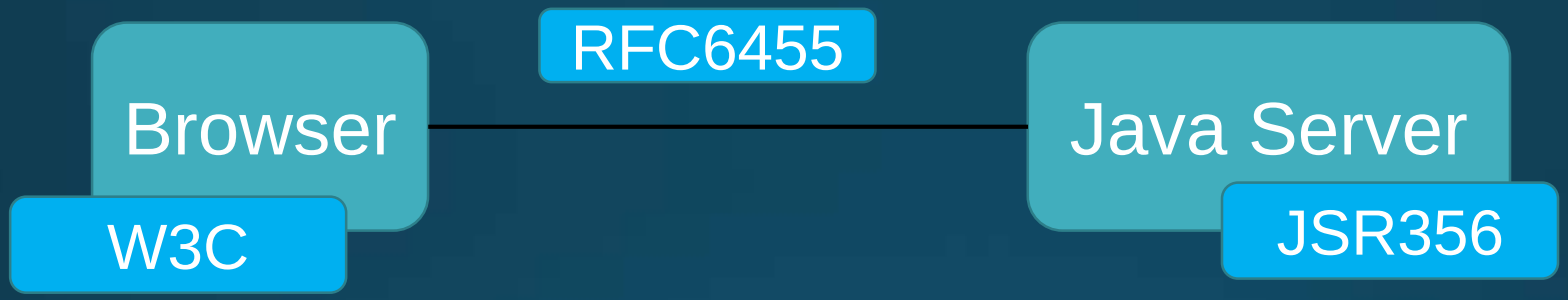
Websocket Basics


HTTP/1.1
Client
GET /AmINext?
{status:'not yet'}
Web Server
GET /AmINext
{status:'not yet''}
GET /AmINext
{status:'YES!'}
Websockets
Client
GET /AmINext?
Upgrade: websocket
Websocket Server
HTTP/1.1 101 Switching Protocols
{status:'YES!'}

What are Websockets

- Bi-directional
- Full-duplex communication channel
- Single TCP connection

Standards



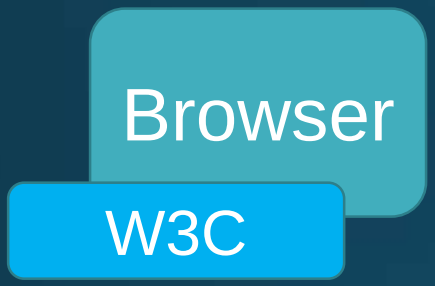
JSR356

Java Server

JSR356

Method and Description
`onClose(Session session, CloseReason closeReason)` This method is called immediately prior to the session with the remote peer being closed.
`onError(Session session, Throwable thr)` Developers may implement this method when the web socket session creates some kind of error that is not modeled in the web socket protocol.
`onOpen(Session session, EndpointConfig config)` Developers must implement this method to be notified when a new conversation has just begun.

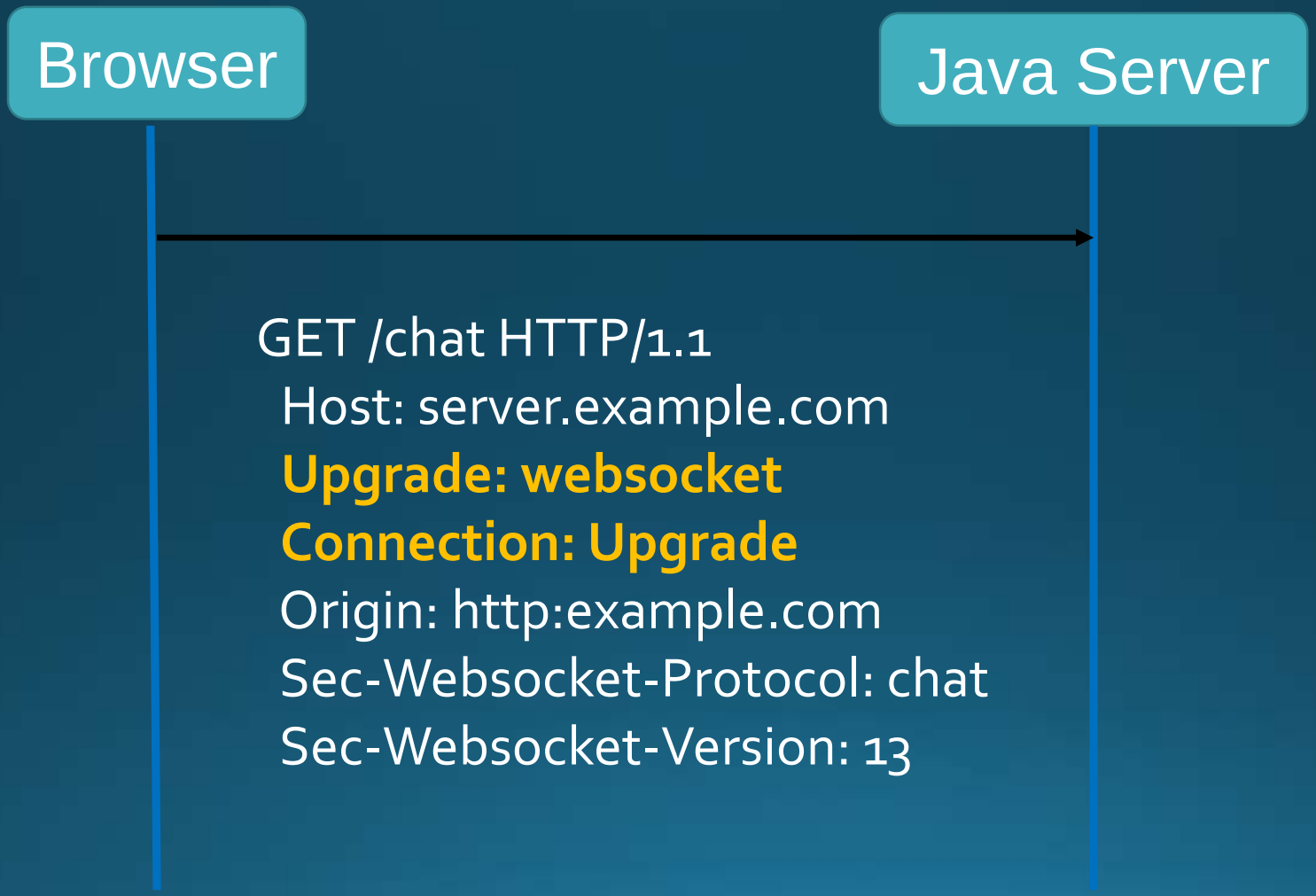
W3C



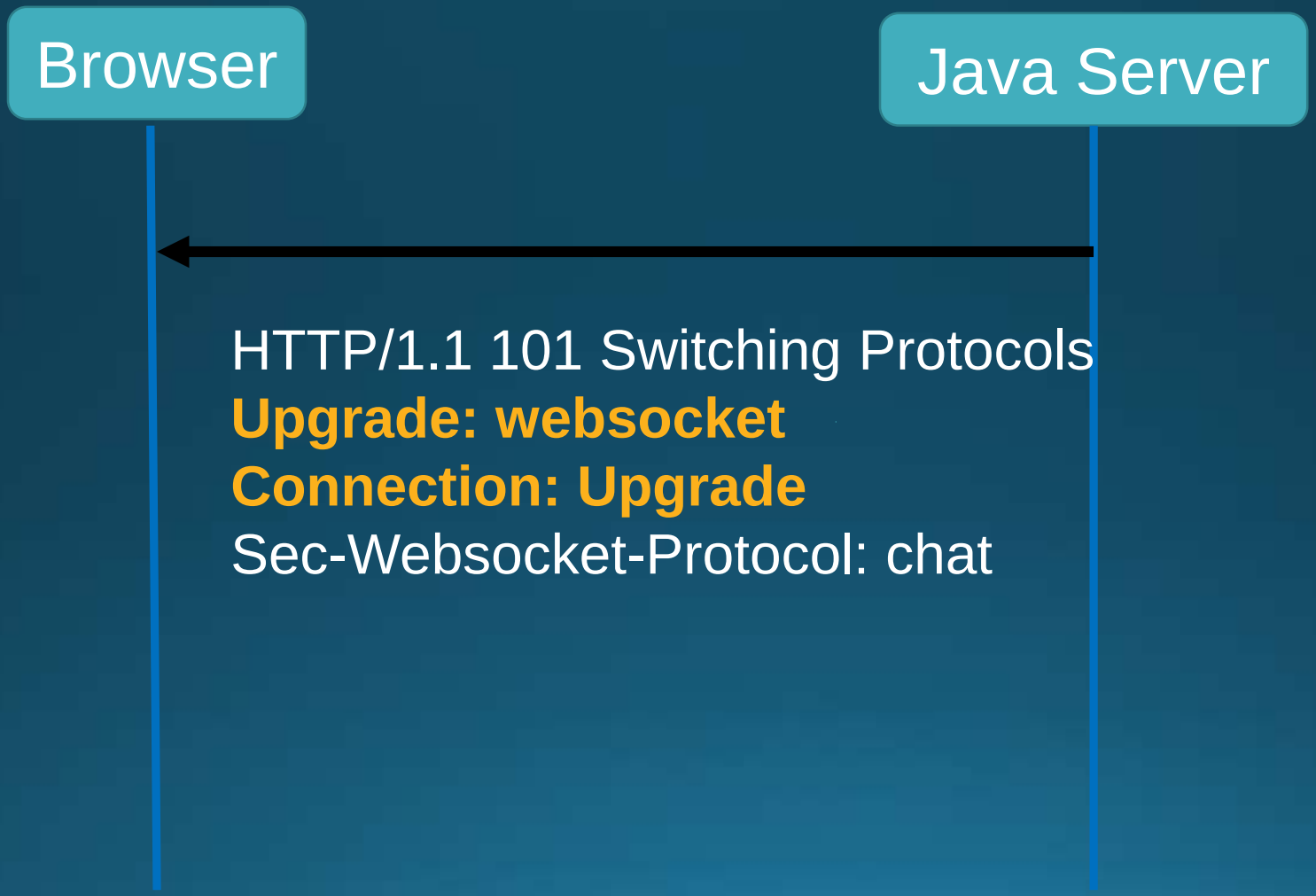

```
interface WebSocket {
  readonly attribute DOMString URL;

  attribute Function onopen;
  attribute Function onmessage;
  attribute Function onclose;
  boolean send(in DOMString data);
  void close();
};
```

RFC-6455

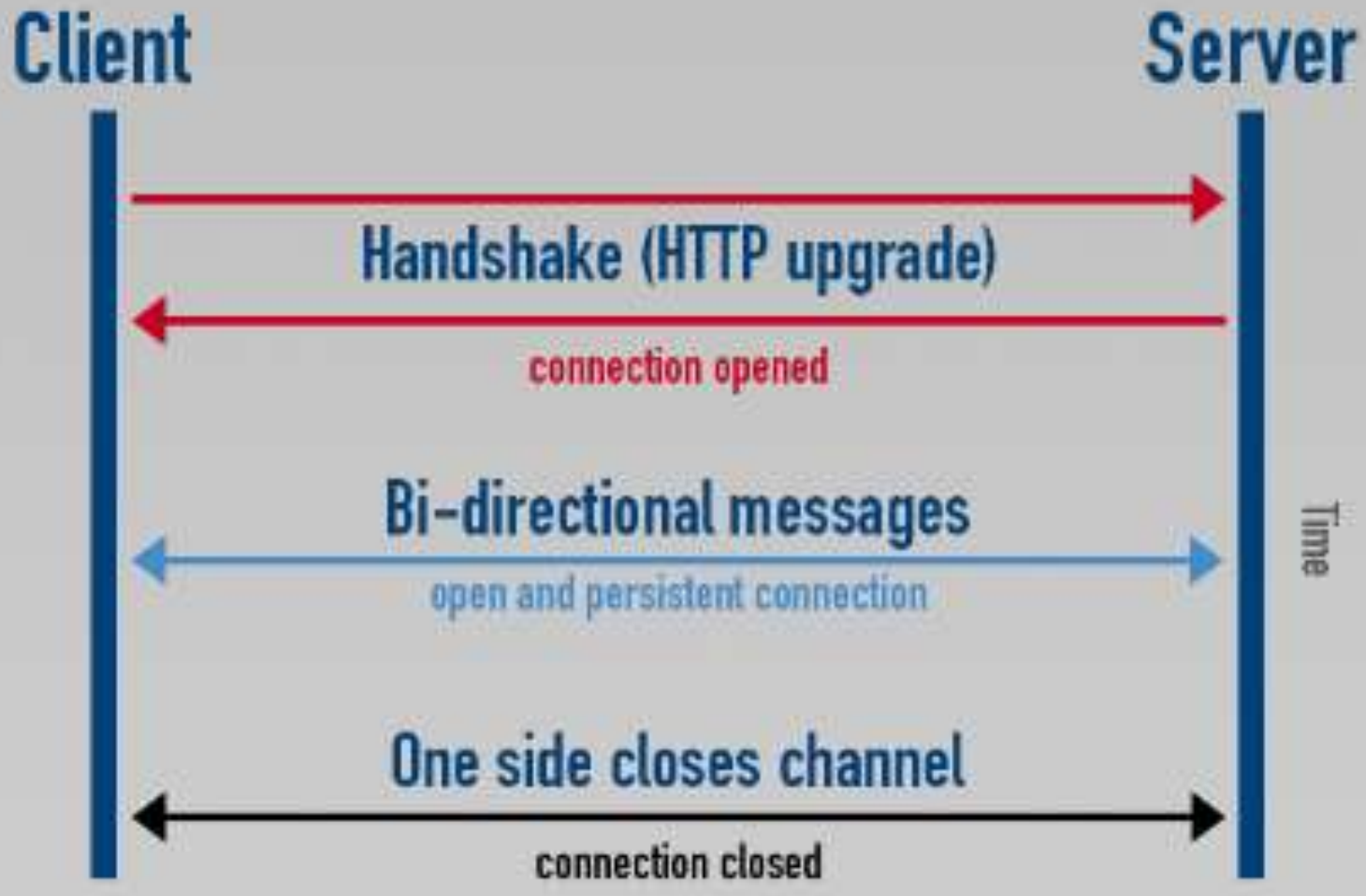

Browser
Java Server
GET /chat HTTP/1.1
Host: server.example.com
Upgrade: websocket
Connection: Upgrade
Origin: http:example.com
Sec-Websocket-Protocol: chat
Sec-Websocket-Version: 13

RFC-6455

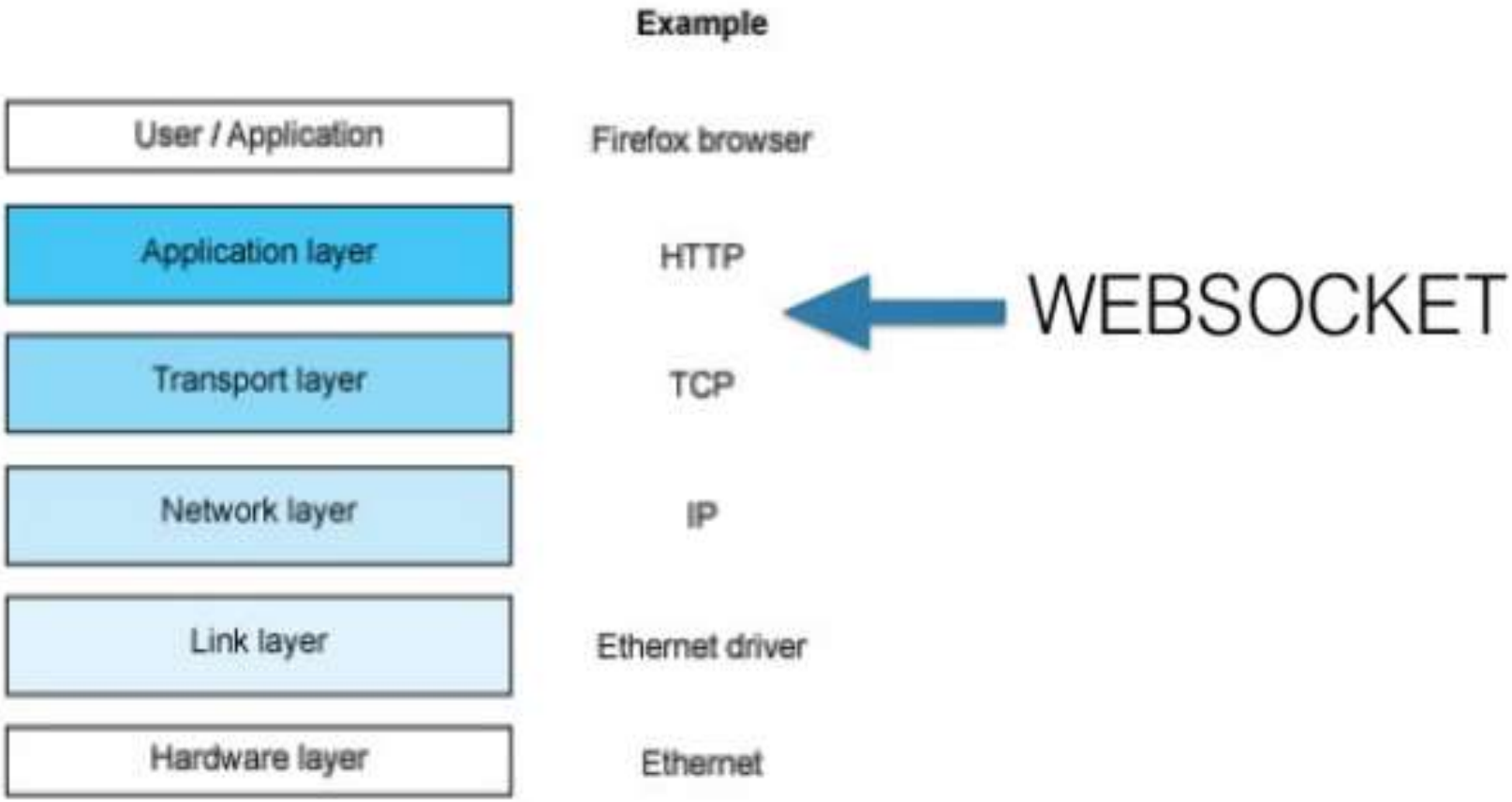

Browser
Java Server
HTTP/1.1 101 Switching Protocols
Upgrade: websocket
Connection: Upgrade
Sec-Websocket-Protocol: chat

WEBSOCKETS

A VISUAL REPRESENTATION



The TCP / IP stack



Browser Support - 11/2016

http://caniuse.com/

Websocket Real Life experience

Light Side Vs Dark Side (of Websockets)

Websockets - The Light Side

- Low latency
- Real time
- Bandwidth efficient
- Built in session manageme (advantage)

- Online games
- Dashboards
- Financial applications
- Messaging

Websockets - The Dark Side

Low level protocol

- Single endpoint
- Connections
- Messages
- Everything else has to be built on top

Low level protocol

- In most real life cases you do need a delivery confirmation

- Implement yourself (implement timeouts, retries, ordering,…)

Define the Protocol

API Patterns

Each message must be one of the following types:

- Request-Response pattern.
- Subscribe-notify pattern.

Subscribe Request

```
"com.liveperson.api.ams.aam.SubscribeExConversations" : {
    "kind" : "req",
    "id" : "",
    "body" : {
      "maxLastUpdatedTime" : 0,
      "minLastUpdatedTime" : 0,
      "agentIds" : [ "" ],
      "consumerId" : "",
      "brandId" : "",
      "maxETTR" : 0,
      "convState" : [ "OPEN", "CLOSE" ],
      "skills" : [ "45" ]
    },
    "type" : ".ams.aam.SubscribeExConversations"
  },
```

Subscribe Response


```
  "com.liveperson.api.ams.aam.SubscribeExConversations$Response"
: {
      "kind" : "resp",
      "reqId" : "",
      "code" : 200,
      "body" : {
        "subscriptionId" : ""
      },
      "type" : ".ams.aam.SubscribeExConversations$Response"
    },
```

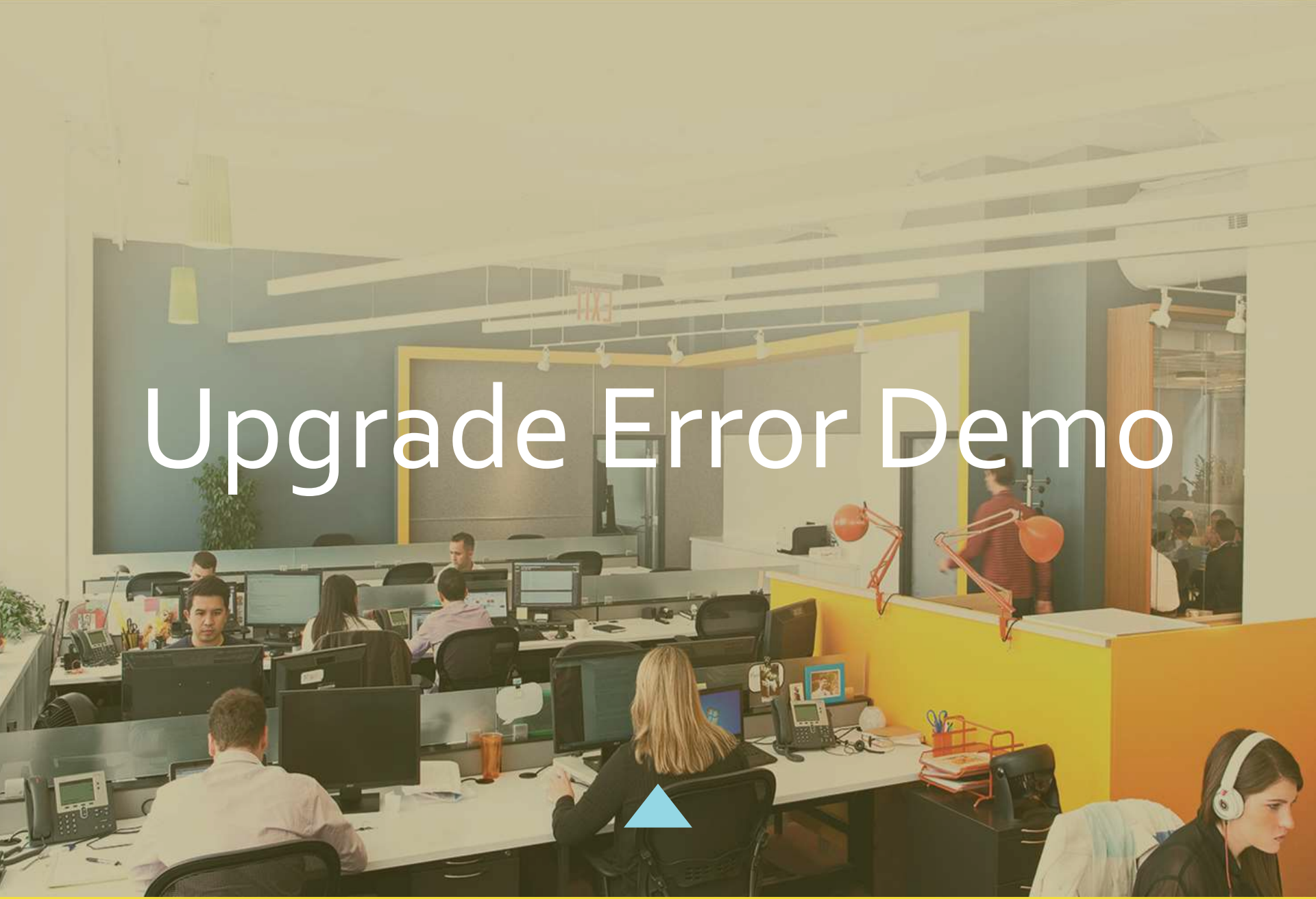
Subscribe Notification

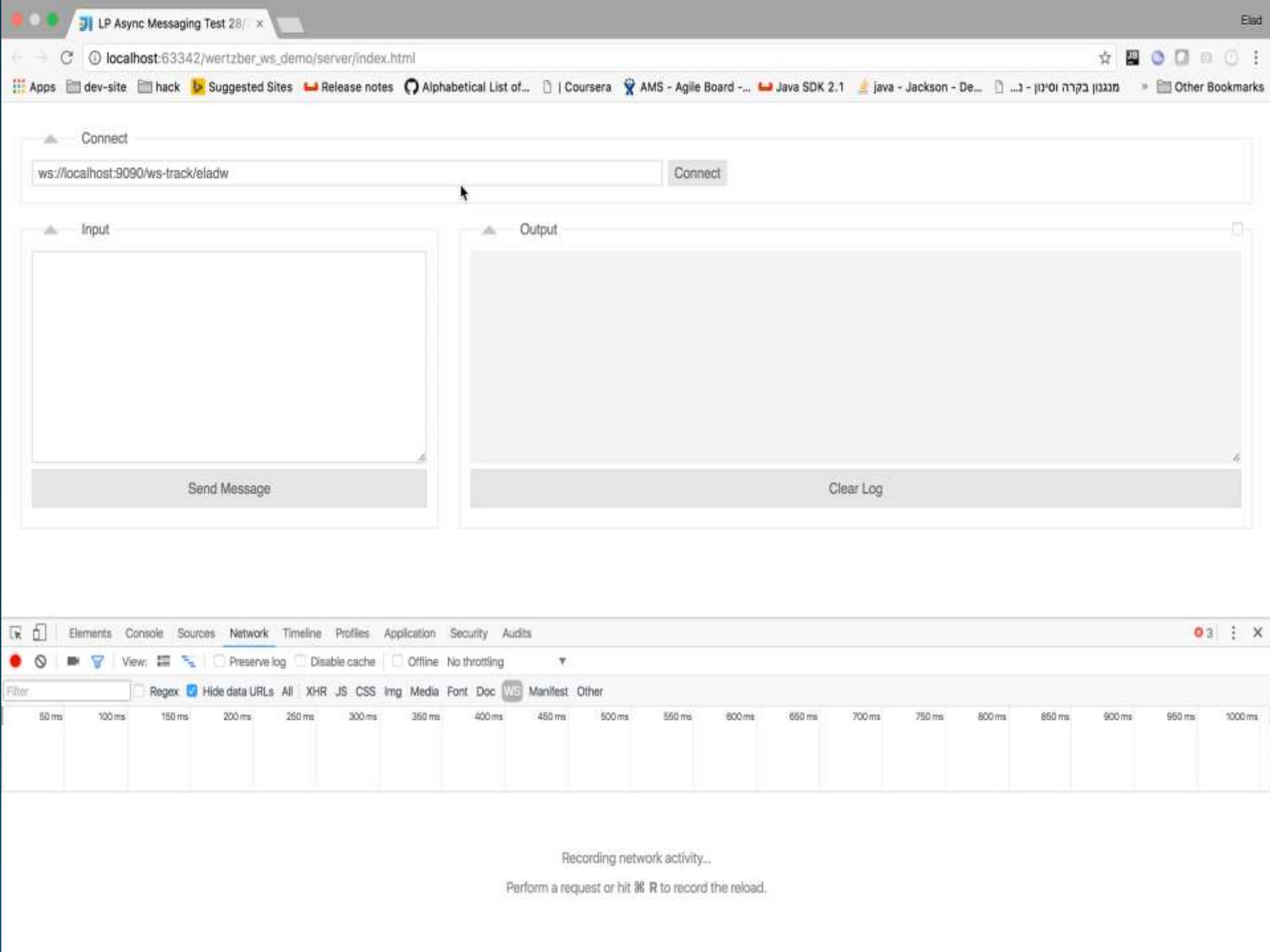

```
"com.liveperson.api.ams.routing.RingUpdated" : {
      "kind" : "notification",
      "body" : {
        "ringId" : "c692b037-03bf-42c4-9c8f-29832e5d9d8c",
        "ringExpiration" : 0,
        "ringState" : "WAITING",
        "weight" : 0,
        "brandId" : "2134rfdsw2",
        "convId" : "a9961e6d-281c-4c68-9335-0de8c10f5ccf",
        "consumerId" : "a27eb8e3-3919-46ee-ba29-f8d3d992c385",
        "skillId" : "33"
      },
      "type" : ".ams.routing.RingUpdated"
    },
```

Browser And Server Mismatch

Browser And Server Not Aligned

- Upgrade error messages not received in client javascript.
- Ping pong is part of the RFC but browsers doesn’t support it.
- Server allow to get headers, but browser not allow to send them


Upgrade Error Demo

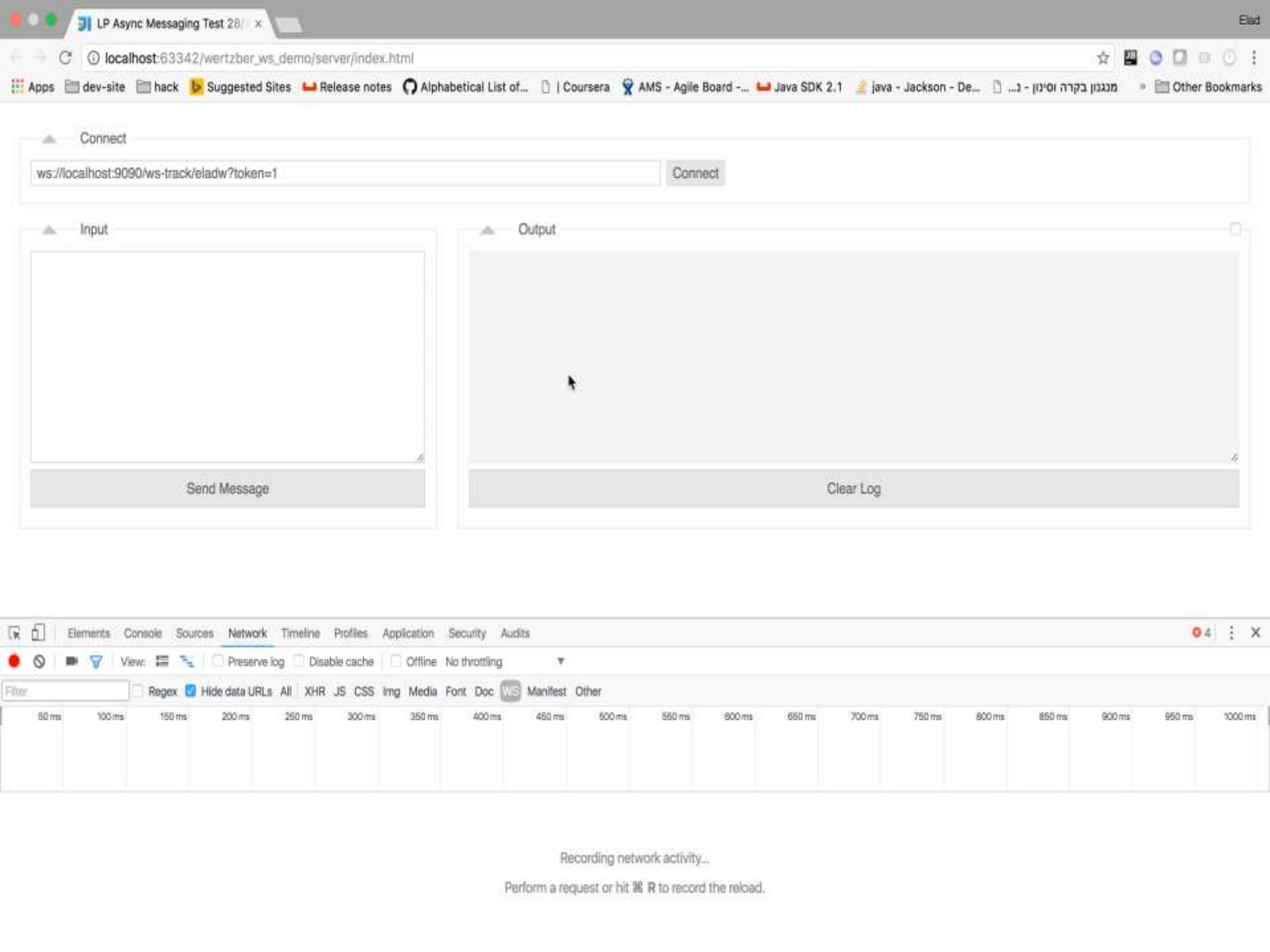

LP Async Messaging Test 28/
Elad
localhost:63342/wertzber_ws_demo/server/index.html
Apps
dev-site
hack
Suggested Sites
Release notes
Alphabetical List of...
| Coursera
AMS - Agile Board -...
Java SDK 2.1
java - Jackson - De...
Other Bookmarks
Connect
ws://localhost:9090/ws-track/eladw
Connect
Input
Output
Send Message
Clear Log
Elements
Console
Sources
Network
Timeline
Profiles
Application
Security
Audits
Preserve log
Disable cache
Offline
No throttling
Regex
Hide data URLs
All
XHR
JS
CSS
Img
Media
Font
Doc
WS
Manifest
Other
Recording network activity...
Perform a request or hit ⌘ R to record the reload.

Browser And Server Not Aligned

Our Solution: use websocket error code instead of http error code (for browsers).

Our Solution: use http error code instead (for Mobile).

Websocket Error After Upgrade Demo


LP Async Messaging Test 28
Elad
localhost:63342/wertzber_ws_demo/server/index.html
Apps
dev-site
hack
Suggested Sites
Release notes
Alphabetical List of...
| Coursera
AMS - Agile Board -...
Java SDK 2.1
java - Jackson - De...
Other Bookmarks
Connect
ws://localhost:9090/ws-track/eladw?token=1
Connect
Input
Output
Send Message
Clear Log
Elements
Console
Sources
Network
Timeline
Profiles
Application
Security
Audits
Preserve log
Disable cache
Offline
No throttling
Regex
Hide data URLs
All
XHR
JS
CSS
Img
Media
Font
Doc
WS
Manifest
Other
Recording network activity...
Perform a request or hit ⌘ R to record the reload.

Browser And Server Not Aligned

- Upgrade error messages not received in client javascript.
- Ping pong(keep alive) is part of the RFC but browsers doesn’t support it.
- Server allow to get headers, but browser not allow to send them

Keep Alive

- Implement a Ping-Pong mechanism of websocket.
- Implement Application level keep alive.

Keep alive

- Browser doesn’t support Ping pong as keep-alive
  Our Solution: applicative keep-alive.
- Mobile clients can uses the Ping-Pong.
  Our Solution: Ping-Pong.

Browser And Server Not Aligned

- Upgrade error messages not received in client javascript.
- Ping pong is part of the RFC but browsers doesn’t support it.
- Server allow to get headers, but browser not allow to send them

Http Headers – Client Side

- **Client side:** no APIs for add headers to Websockets

```
websocket = new WebSocket(webSocketUrl);
websocket.onopen = onOpen;
websocket.onclose = onClose;
websocket.onmessage = onMessage;
websocket.onerror = onError;
```

Http Headers – Server Side

- JSR356: need to use the ModifyHandshake()

```
@Override
public void modifyHandshake(ServerEndpointConfig config,
                            HandshakeRequest request,
                            HandshakeResponse response)
{
    HttpSession httpSession = (HttpSession)request.getHttpSession();
    if (httpSession != null) {
        final AuthData authData = (AuthData) httpSession.getAttribute("authData");
        LOGGER.info("ModifyHandshake auth data: {}", authData);
        config.getUserProperties().put("authData", authData);
    }
}
```

Authentication

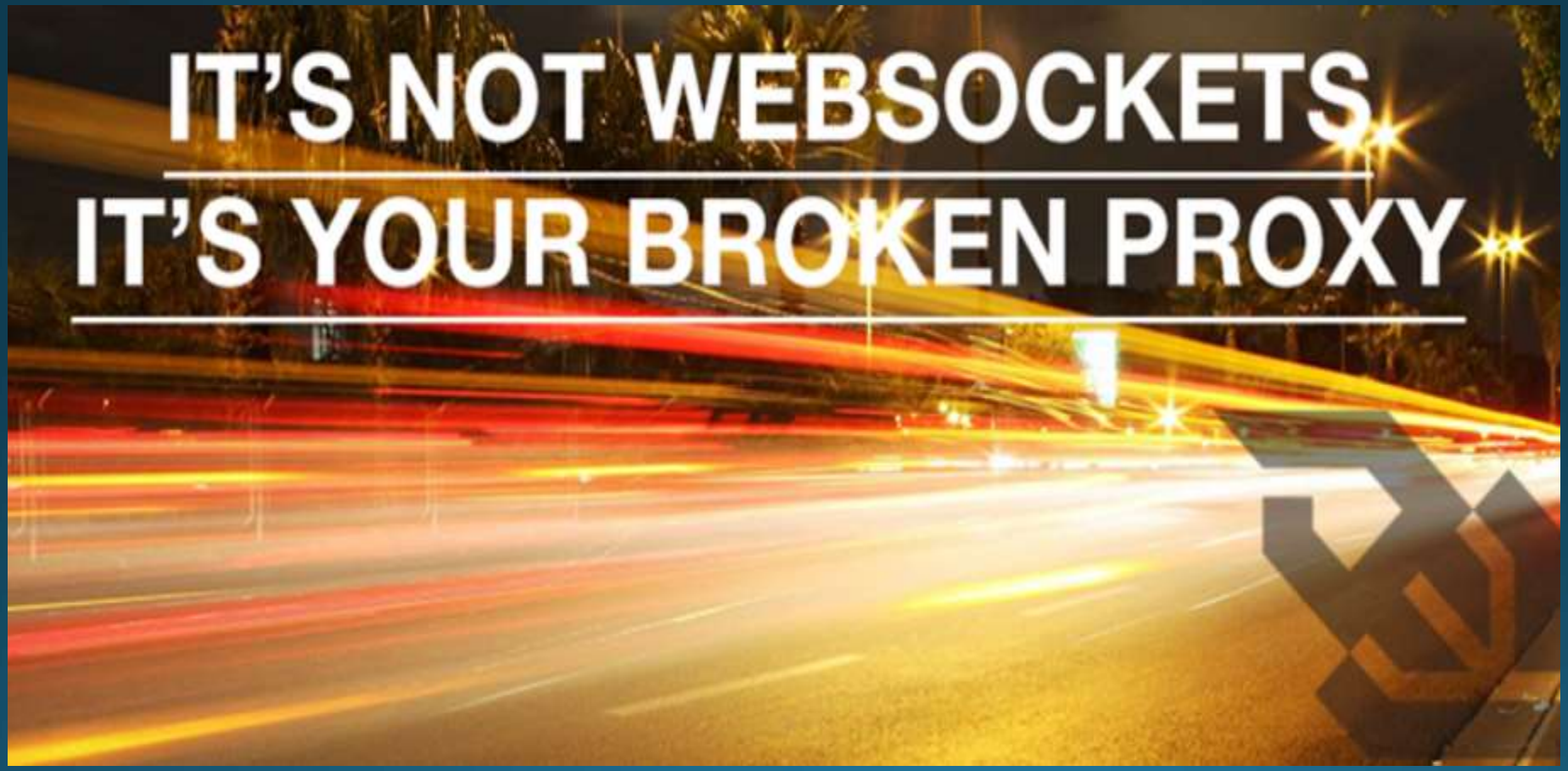
- No Standard way to pass authentication data
- Headers can’t be used from browsers (mobile can add the headers)
- URL parameters are not security wise.

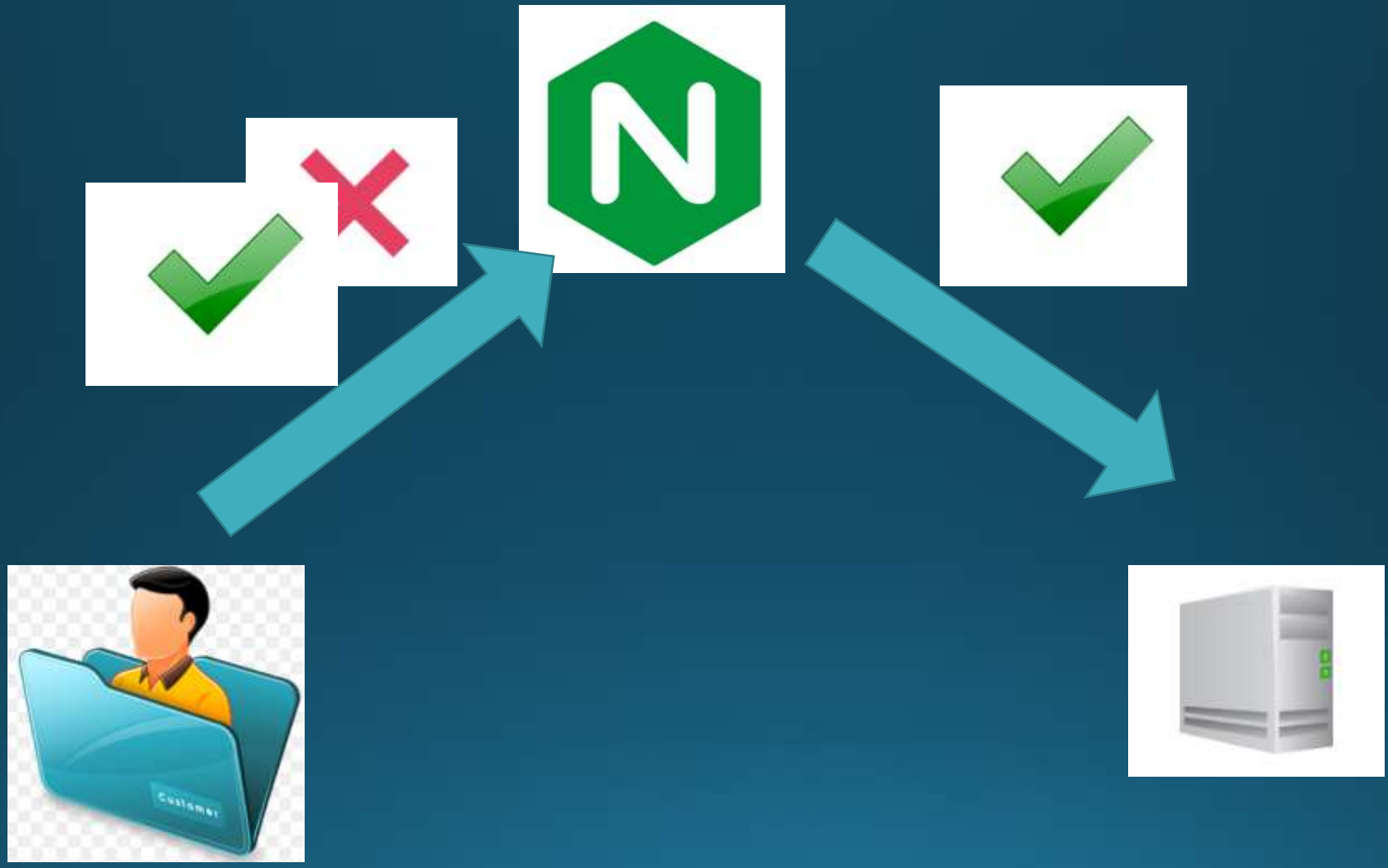
Authentication

Our Solution: Support authentication headers for mobile devices

Our Solution: In-session authentication messages for browsers.

Proxies





Proxies Disconnections

- Sometimes server & client does not get “onClose”

Our Solution: configure the websocket to close outgoing/incoming session when the other session is broken.

Testing Tools

- Http has many existing tools, Websockets has fewer tools
- Upgrade existing tools in order to support websocket
- **Our Solution part 1:** upgrade Jmeter

Testing Tools

- **Our Solution:** developed new tool: "WsTester".
- Soon will be release as open source (Github)

```
@Test
public void testSyncRecv(){
    try {
        WsTester<JsonNode> client = JsonWsTester.connect(CONSUMER_URI);
        Assert.assertTrue("Connection success", client!=null);
        // In order to create json msg fluently
        JsonNode json1 = JSON.object().put("name", "elad").put("age", 22);

        // sending msgs is easy
        client.send(json1);

        // wait until getting one msg
        JsonNode result = client.waitForMsgs(withProperty("name", "elad"));

        LOGGER.info("return val: " + result);
    }
```

API Documentation Tools

- For HTTP we have many tools(swagger..)

- No tools for websockets !!

  Our Solution: moved to json_scheme

Rest Fallback

Still in some cases websockets might not work so we must add rest fallback:

- Old browsers
- Call centers which doesn't supports websocket.

Rest Fallback

our solution:

- Server map between rest requests and websocket sessions.
- Server buffer all the responses from the web socket.
- Client uses the REST pooling in order to get the data.

Thank you…..

Github repository. (ws-demo)

https://github.com/wertzber/ws_demo.git


THE END