WebSockets for Real-Time and Interactive Interfaces

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NCSU Libraries
@ronallo

Participate! Go to this address now:
http://go.ncsu.edu/websocket

Audience Participation

Go to this address: http://go.ncsu.edu/websocket

Number of Audience Connections

Let's Try WebSockets

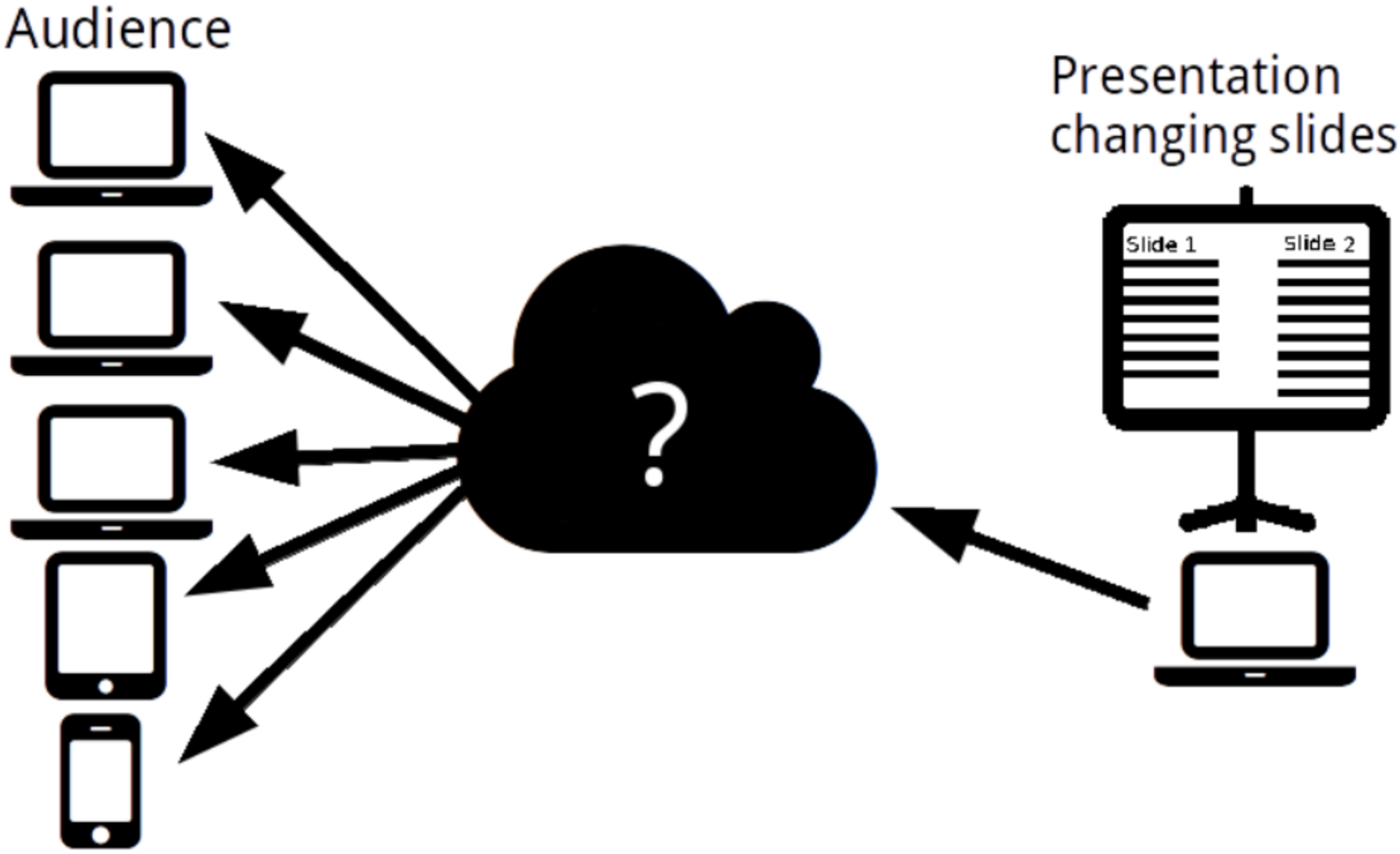
Gratuitous Chat Application

Now that that is out of the way.

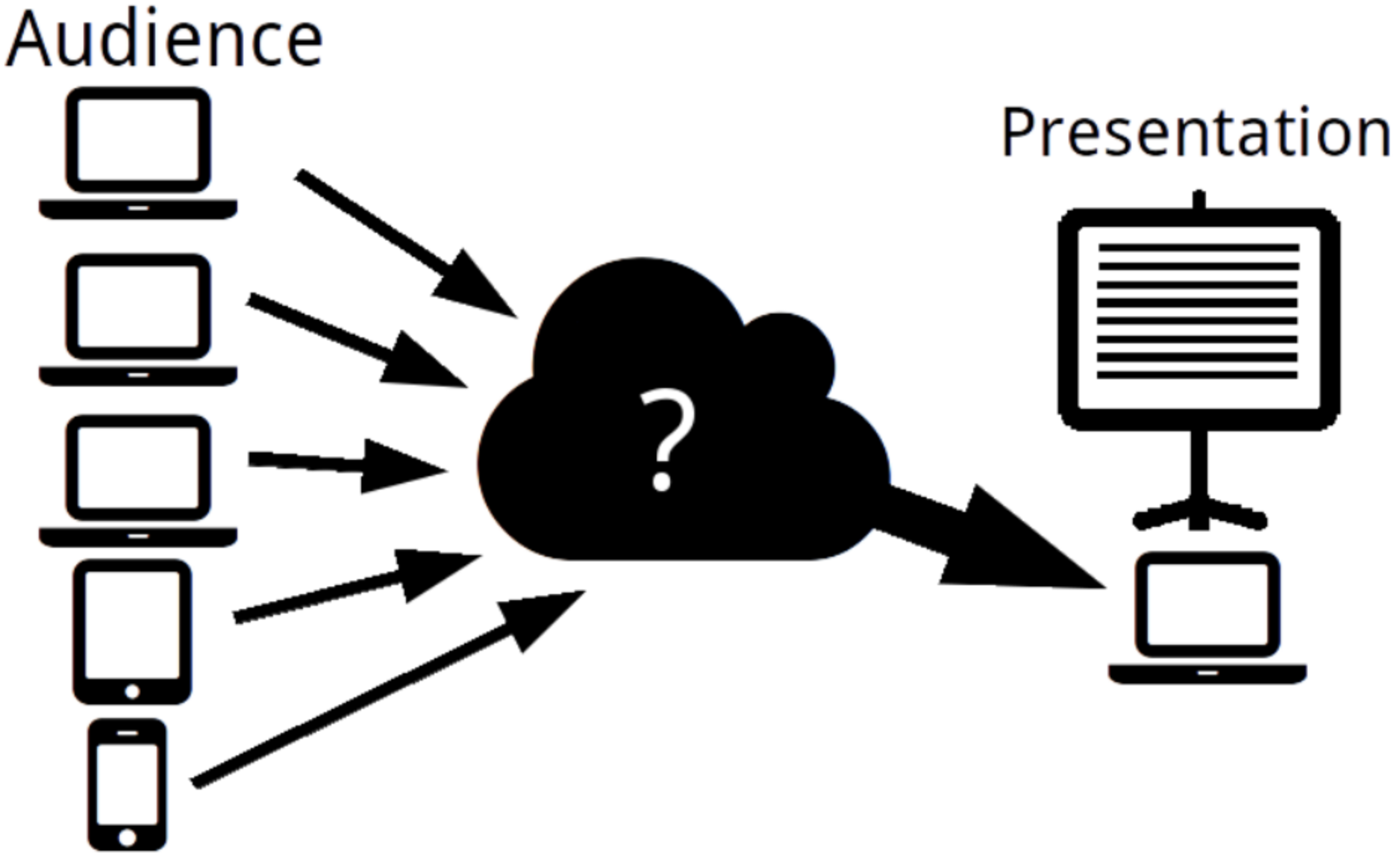
What just happened?

Or should have happened. ;-)

Presentation Slides

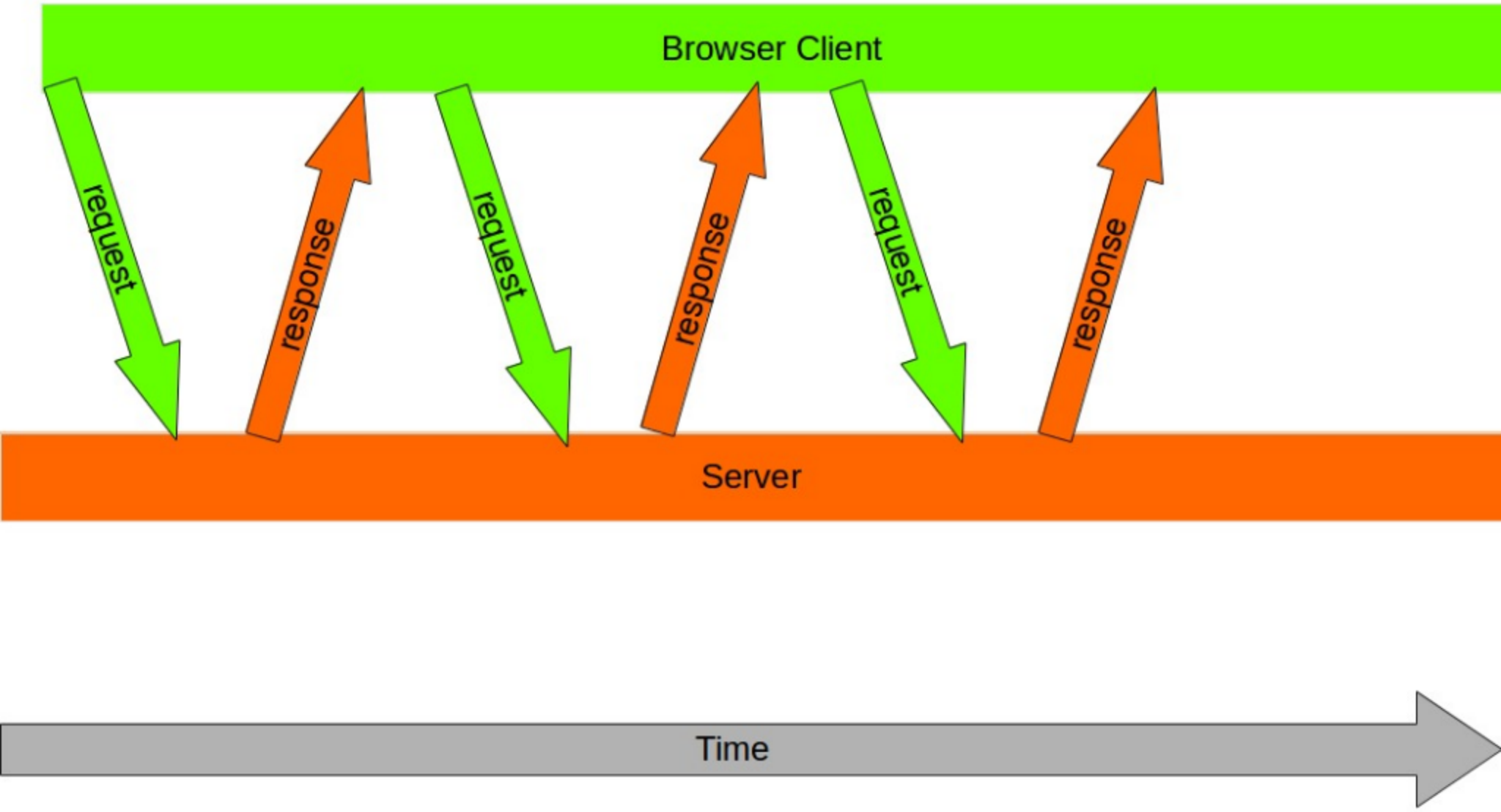


Presentation Chat



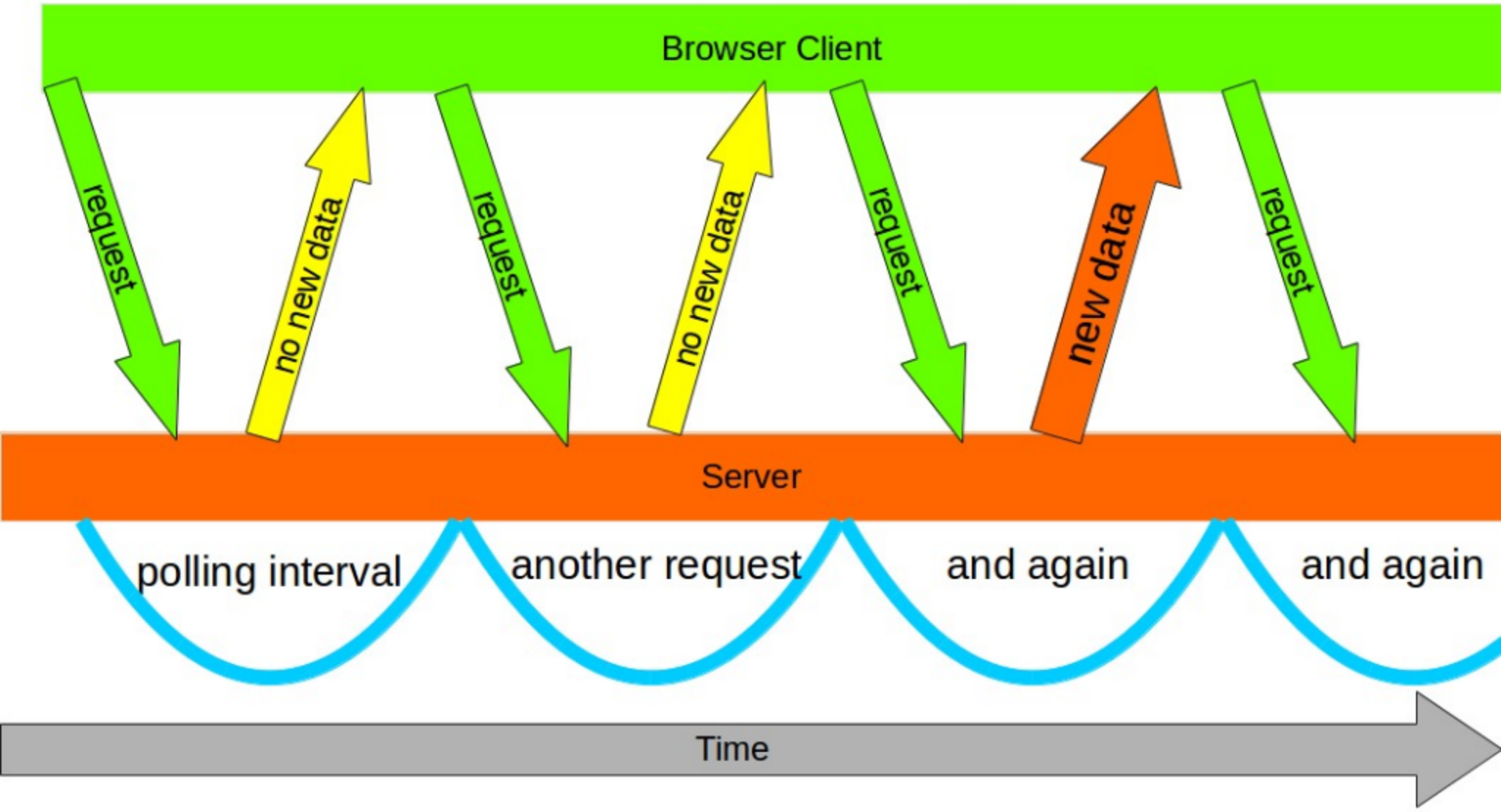
WebSocket Server
Node + socket.io

HTTP

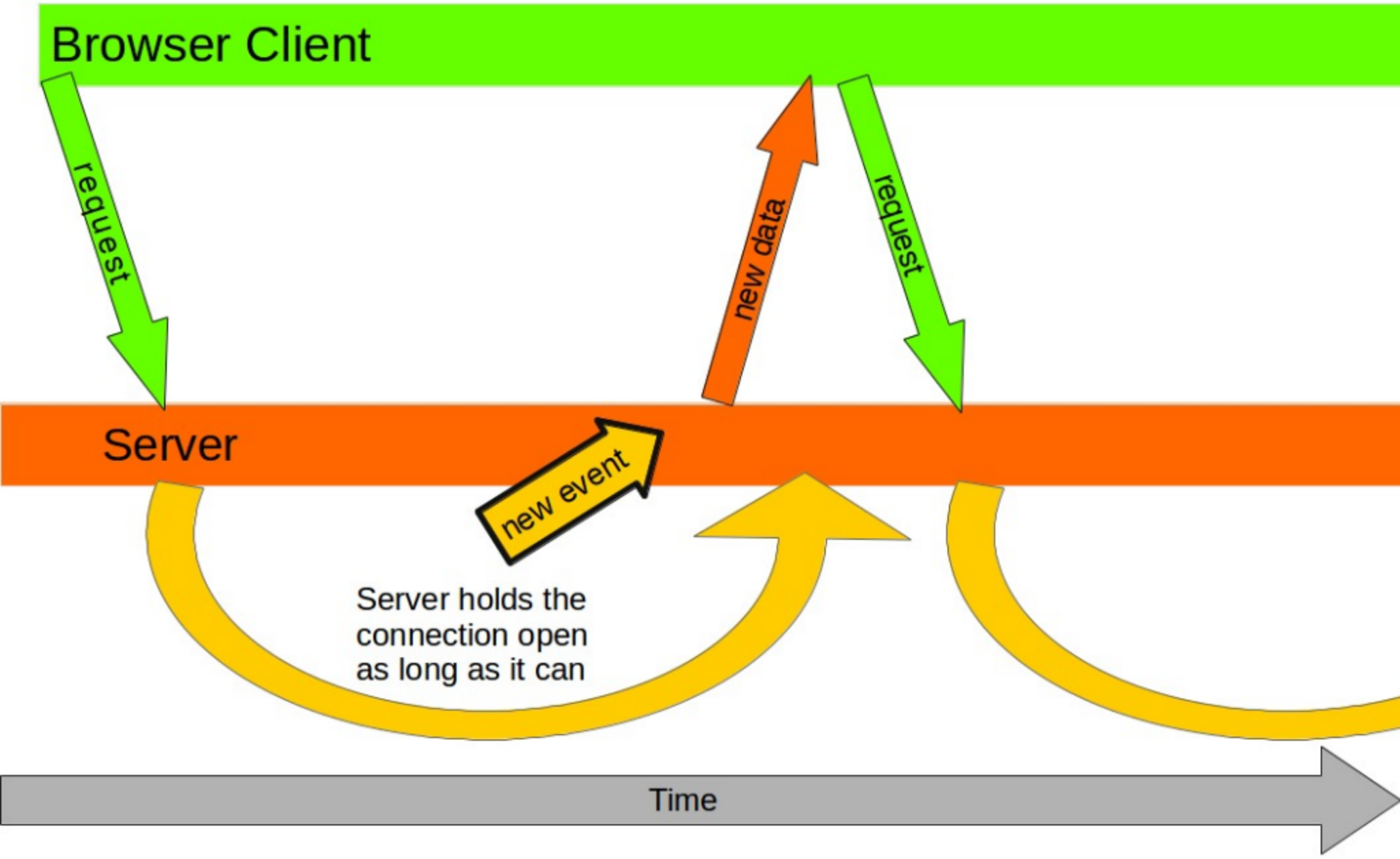

Browser Client
request
response
request
response
request
response
Server
Time

Solutions

Polling (AJAX)



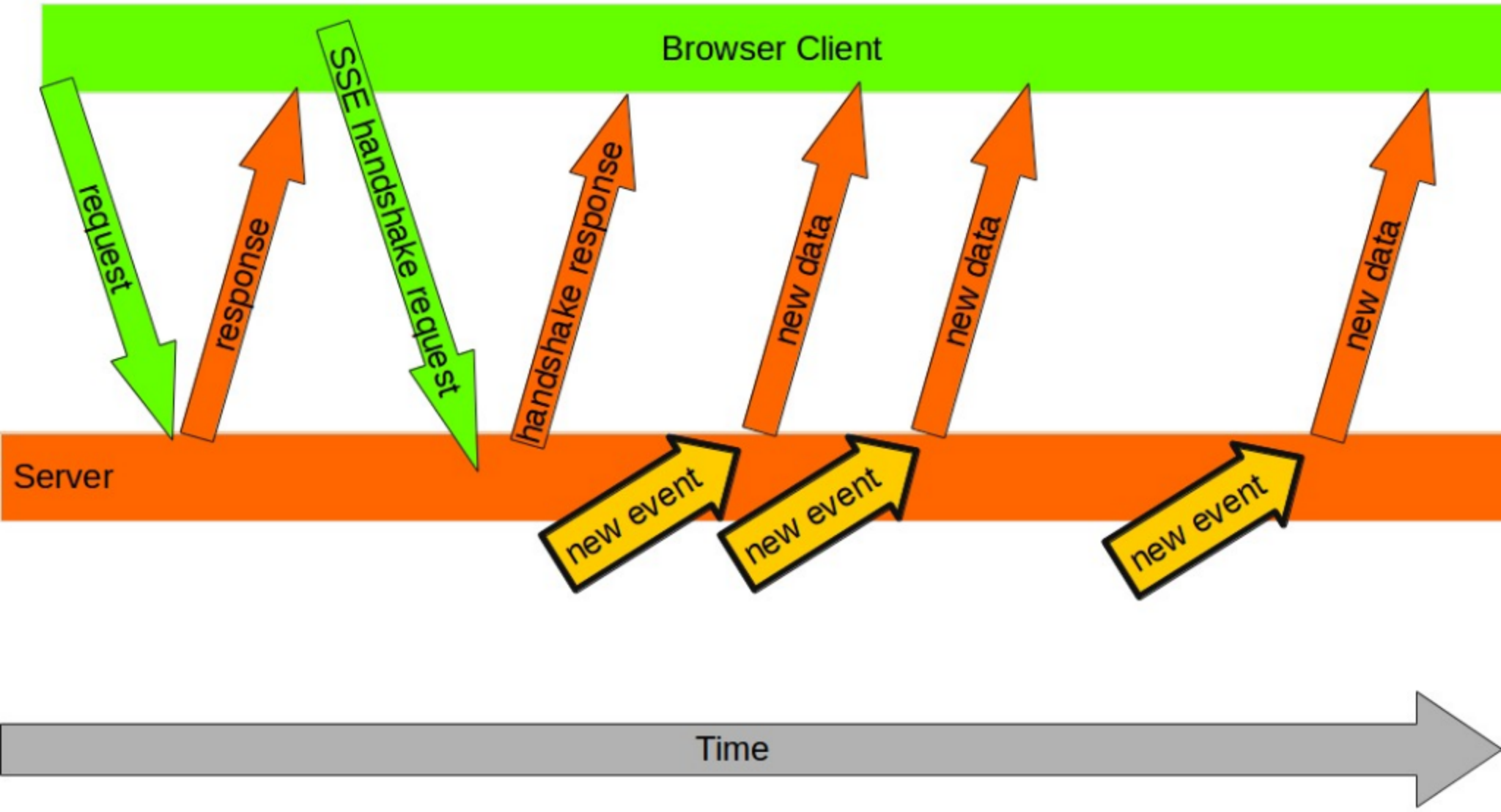
Long Polling (Hanging GET)

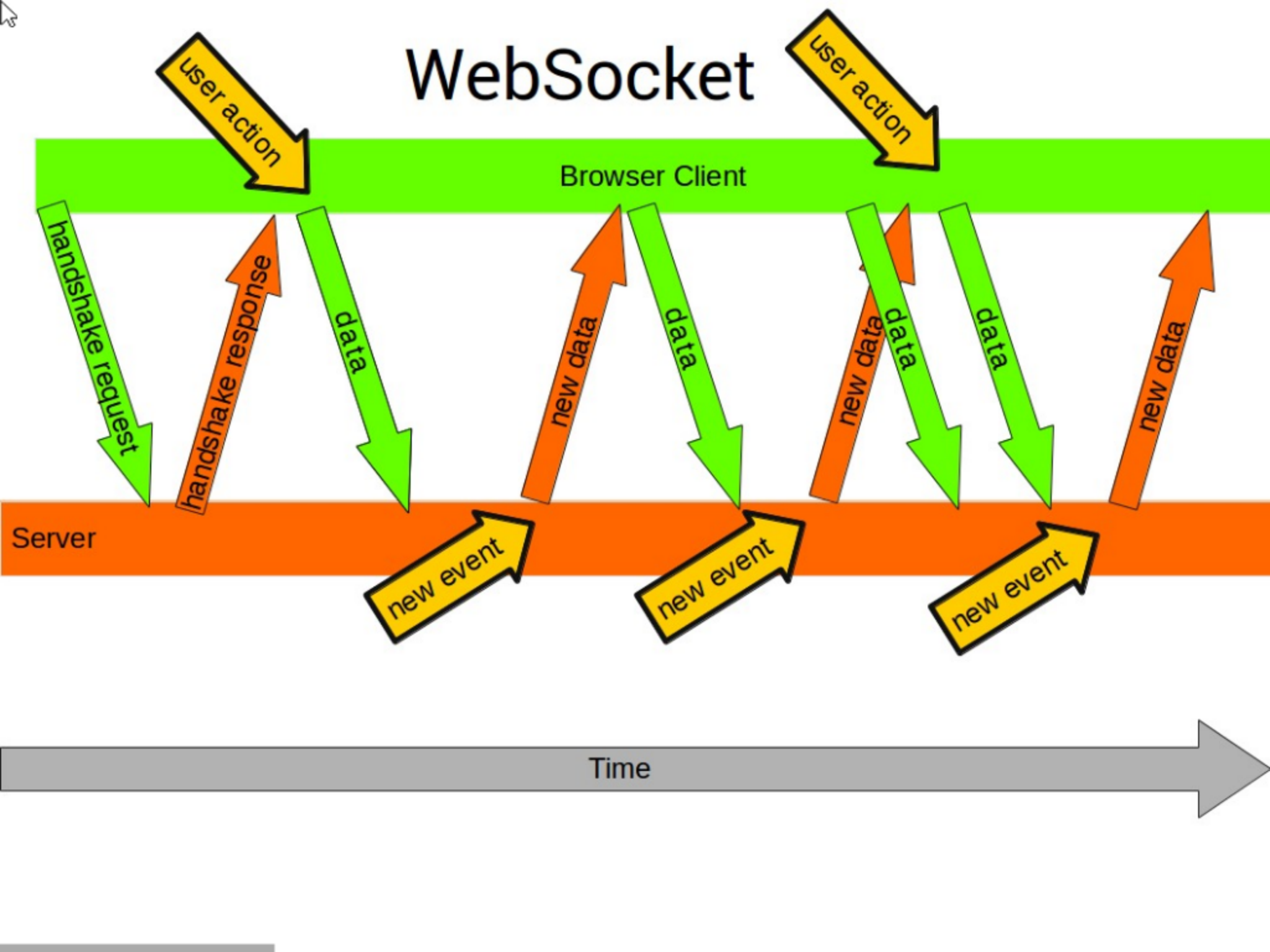


Queuing Latency

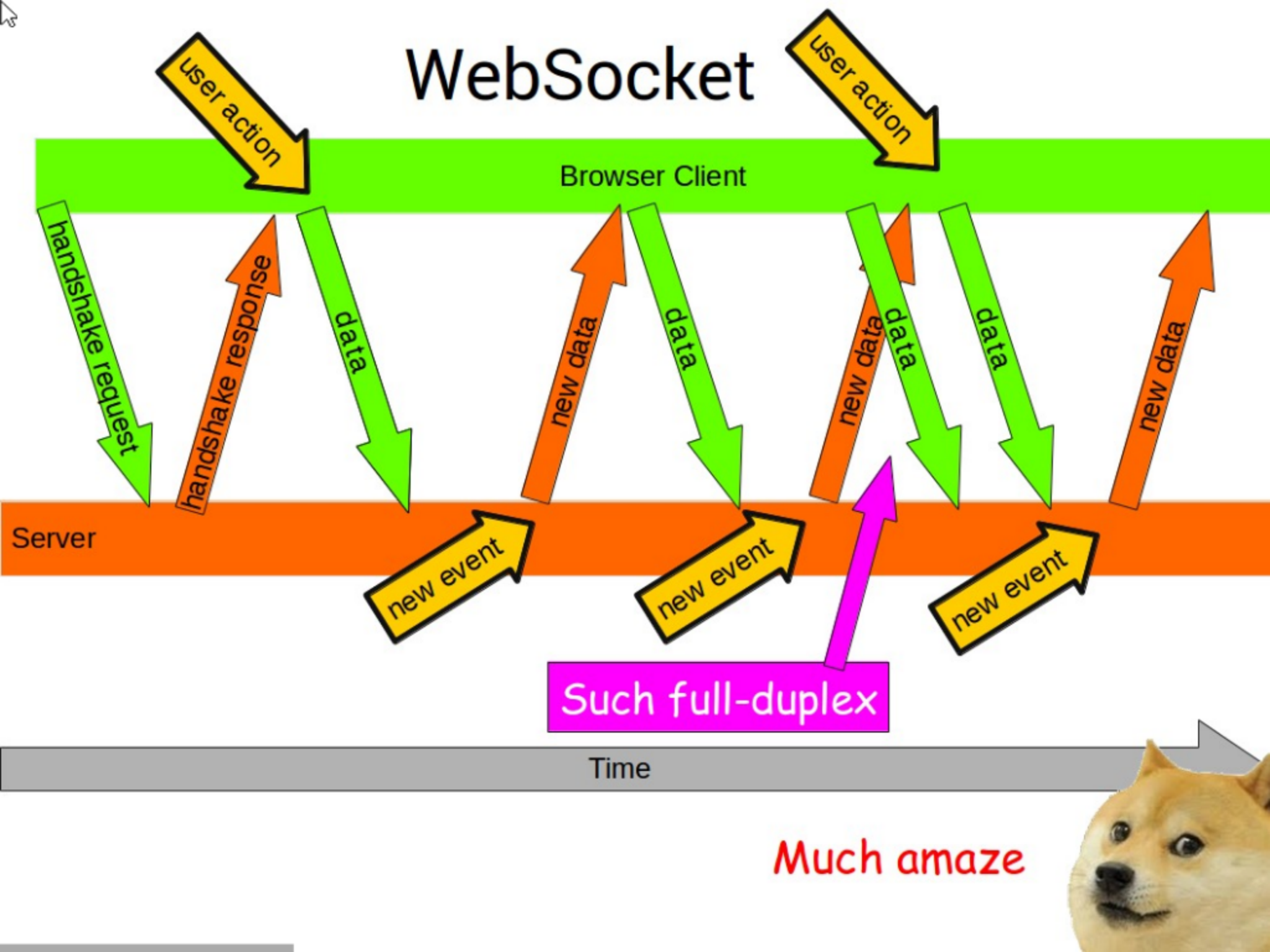
The time a message has to wait in the server before it can be delivered to the client.

Server Sent Events




WebSocket
user action
user action
Browser Client
handshake request
handshake response
data
new data
data
new data
data
data
new data
Server
new event
new event
new event
Time

WebSocket



Much amaze

WebSockets Message Payload

- UTF-8 encoded text
    - plain text
    - JSON
- binary
    - ArrayBuffer
    - ArrayBufferView
    - Blob

It is possible to implement subprotocols over WebSockets if you need to.

WebSockets sound great! Why not use WebSockets for everything?!

When you use WebSockets you lose caching, state management, and other services that XHR and HTTP in the browser give you for free without thinking too much about them.

Use the right protocol for the job.

What can you do with WebSockets?

- Chat
- Collaborative editing
- HTML5 games
- Social networking apps
- Finance
- News feeds
- Anything that needs to be real-time on the Web

My Use Cases

- Real-time display of activity
- Remote controls

Limit your search

Topic

Architecture	17593
Campus and Town	8116
Student Life	6414
Agriculture	6313
Sports	5508

more »

Decade

Undated	22915
1960s	8959
1950s	7820
1970s	6000
1940s	5295

more »

Buildings

Location

Subject

Names

Collection

Format

Genre

NCSU Libraries' Rare and Unique Digital Collections

Documenting NC State and North Carolina through historic photographs, architectural drawings, yearbooks, archival materials, and more.

Architecture

Agriculture

Campus and Town

Community and

Sports

Student Life

Google Analytics Real-time

Right now

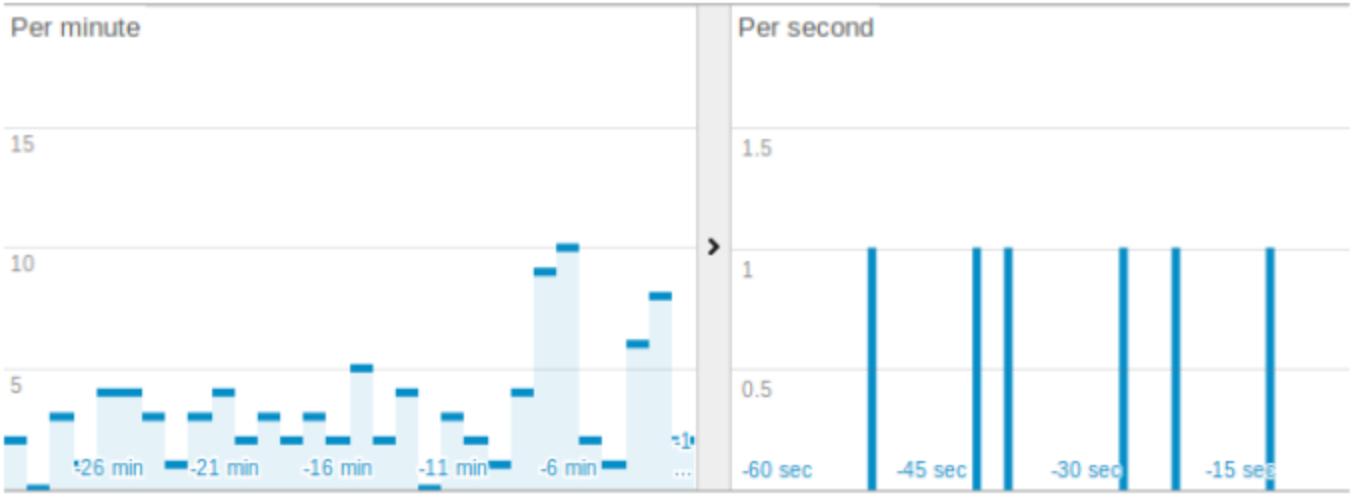
25

active visitors on site

MOBILE DESKTOP TABLET

52% 24% 24%

Pageviews



Top Referrals:

	Source	Active Visitors ↓
1.	r.search.yahoo.com	1

Top Social Traffic:

Source	Active Visitors ↓
There is no data for this view.	

Top Keywords:

	Keyword	Active Visitors ↓
1.	(not provided)	15

Top Active Pages:

	Active Page	Active Visitors ↓	
1.	/collections/catalog/ua023_025-002-bx0003-004-002	10	40.00%
2.	/collections/catalog/0008928	6	24.00%
3.	/collections/catalog/ua015_010-004-bx0091-011-001	3	12.00%
4.	/collections/catalog/ua023_025-002-bx0003-004-013	2	8.00%
5.	/collections/catalog/0008626	1	4.00%
6.	/collections/catalog/bh021608406	1	4.00%
7.	/collections/catalog/buch1044	1	4.00%
8.	/collections/catalog/ua02...23_004-005-am0072-000-012	1	4.00%

Digital Collections Now!

Popularity This Week & Today

Popular This Week

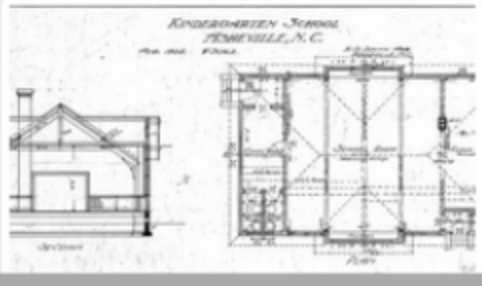
Updated at 2014-03-14 14:03:12 -0400 (Updated hourly)

N. C. State basketball player Tony Warren
607 views this week

Men's basketball team roster, 1983 season
256 views this week

Hawkeye Whitney (#43) and Tony Warren (#24)
255 views this week

Floor plan and elevations, 2 bed room house
Woman's Day Magazine Houses
125 views this week



Real-time

See resources currently being viewed.

A. W. Jenkins
just now

Woman boarding knit hosiery at North Carolina State College School of Textiles.
less than a minute ago

Rendering
Black River Hunting Club Lodge
about a minute ago

President Holladay and the first graduating class
about a minute ago

President Alexander Q. Holladay (center) and faculty of North Carolina College of Agriculture and Mechanic Arts, April 28, 1896.
about a minute ago

Hawkeye Whitney (#43) and Tony Warren (#24)
8 minutes ago

8

1963-1964 N.C. State varsity basketball team
9 minutes ago

N.C. State College basketball team, 1960
9 minutes ago

Head Coach James "Jim" Valvano and basketball team pose with NCAA tournament trophy, 1983
9 minutes ago

N. C. State basketball player Tony Warren
10 minutes ago

15

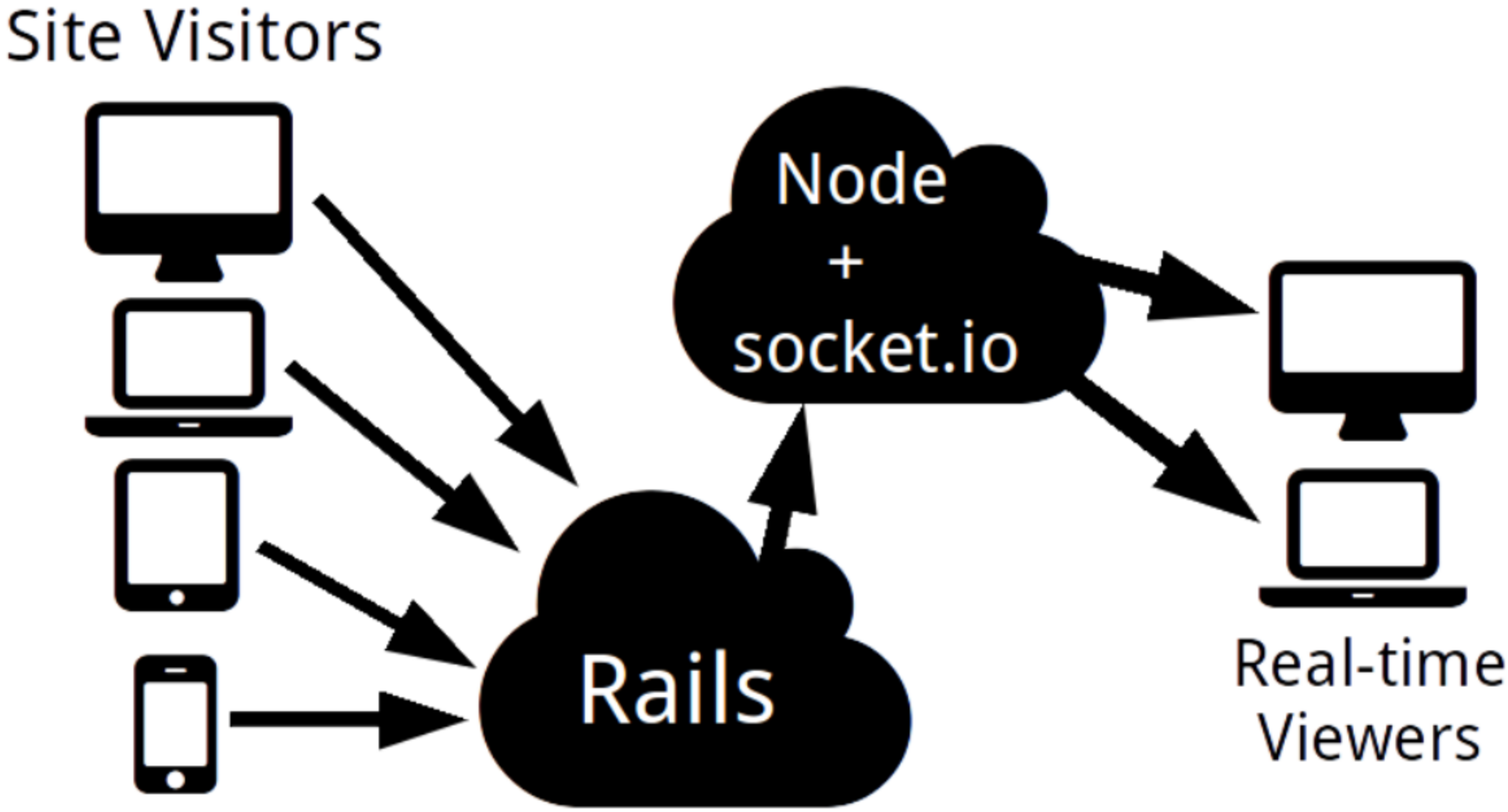
1976-1977 N.C. State basketball team
10 minutes ago

Robert N. Wood
11 minutes ago

Men's basketball team roster, 1983 season
11 minutes ago

6

Architecture of Now



Code

WebSockets on the Server

```
# catalog_controller.rb
after_filter :websocket_update, only: [:show]
# POST id to
# http://lib.example.edu:1337/message/room-name-development
def websocket_update
  if !robot_request?
    begin
      client = HTTPClient.new
      body = { id: params[:id] }
      post_url = "http://lib.example.edu:1337/message/room-name
      res = client.post(post_url, body)
    rescue
    end
  end
end
```

Node Express + socket.io

```
// some other requires for Express etal.
var io = require('socket.io').listen(server);

// Route for POSTs
app.post('/message/:room', function(req, res){
  io.sockets.in(req.params.room)
    .emit('update', req.body);
  res.send(200); // success!
});
```

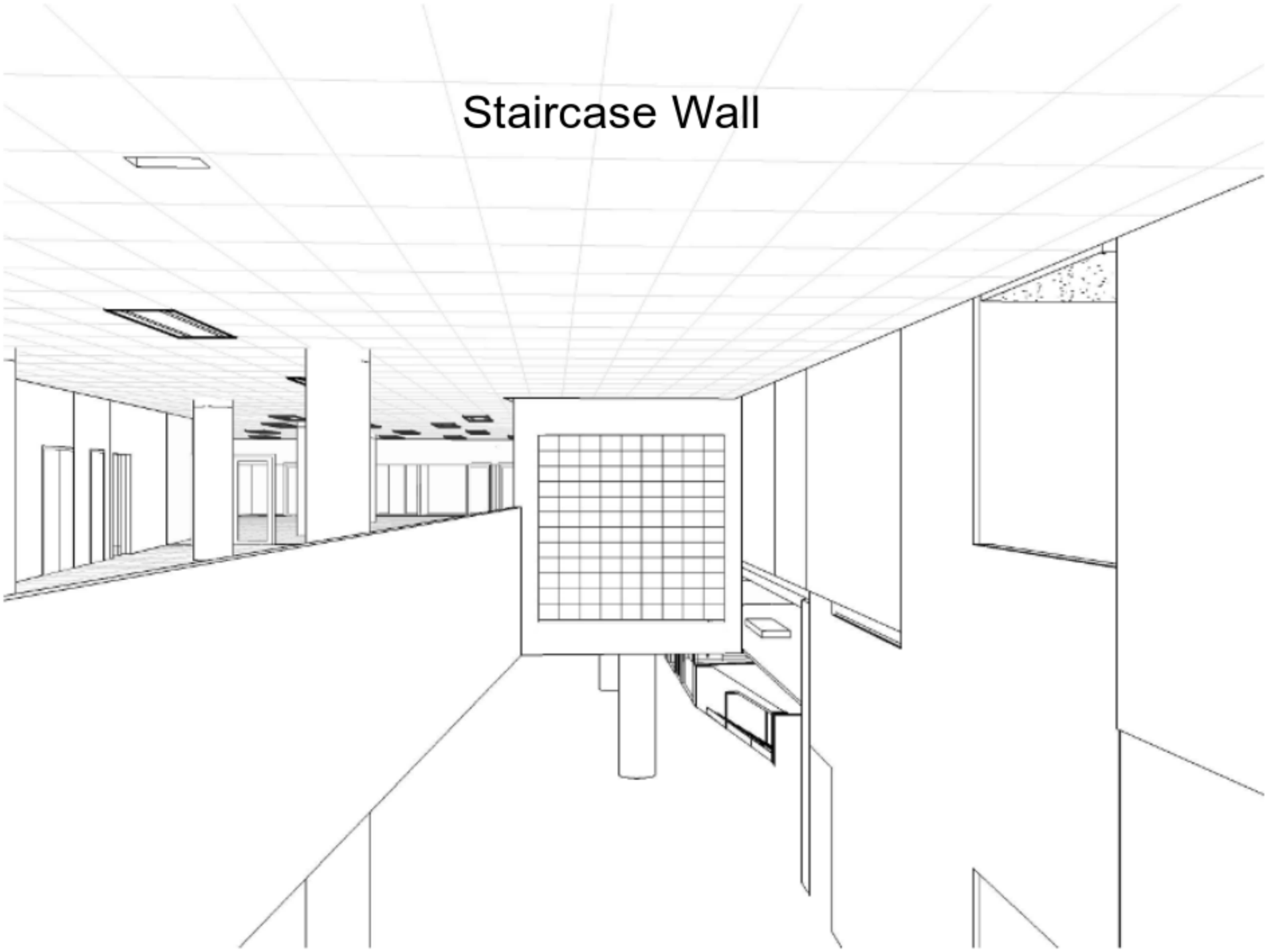
WebSocket Client Using socket.io

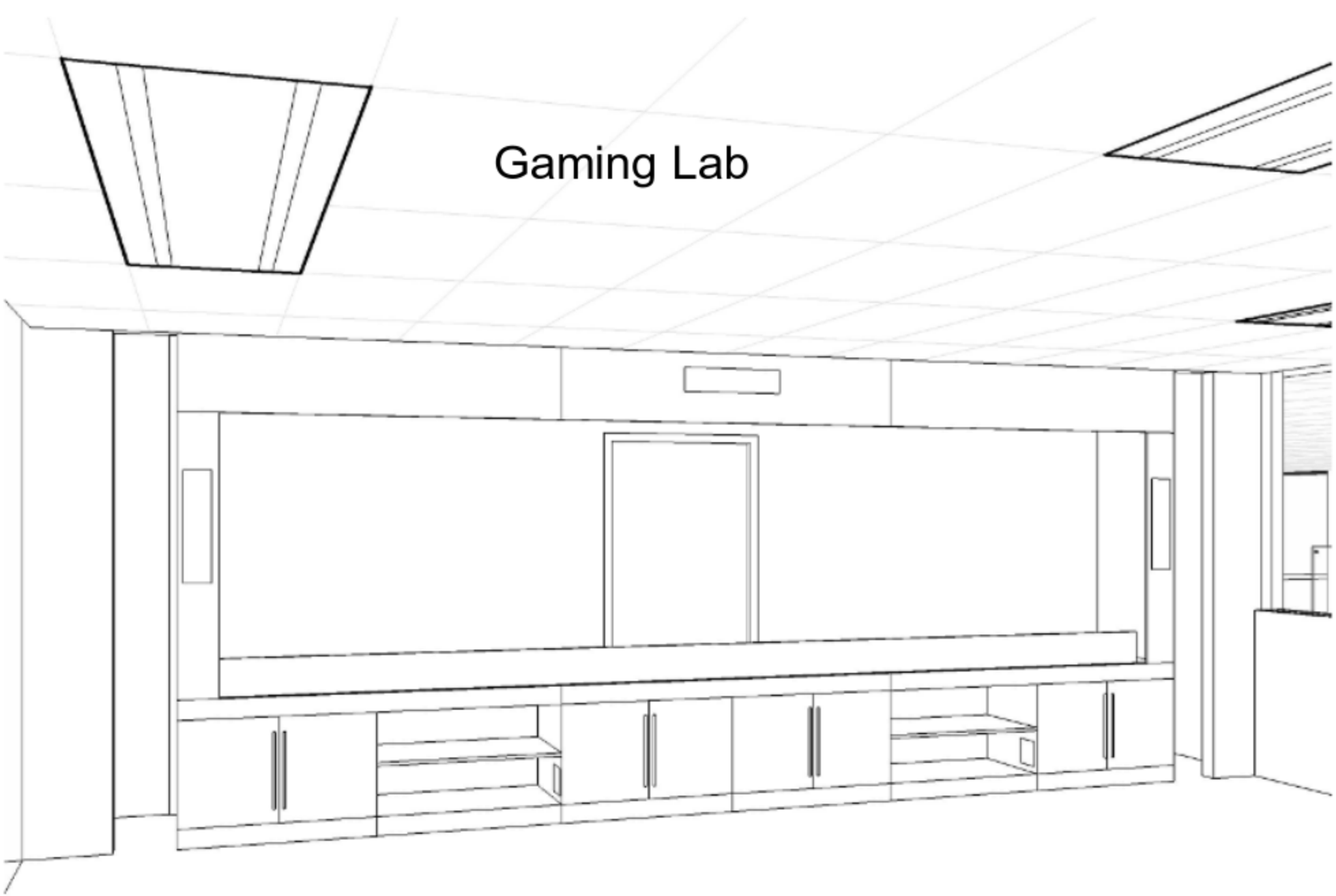
```
// set up the socket.io connection
var host = location.protocol + '//' +
           location.host;
var socket = io.connect(host);

socket.emit('subscribe',
            {room: 'digital_collections'});

socket.on('update', function(data){
  console.log(data);
  // Do something like make a request for the
  // partial of the most recently viewed image.
});
```

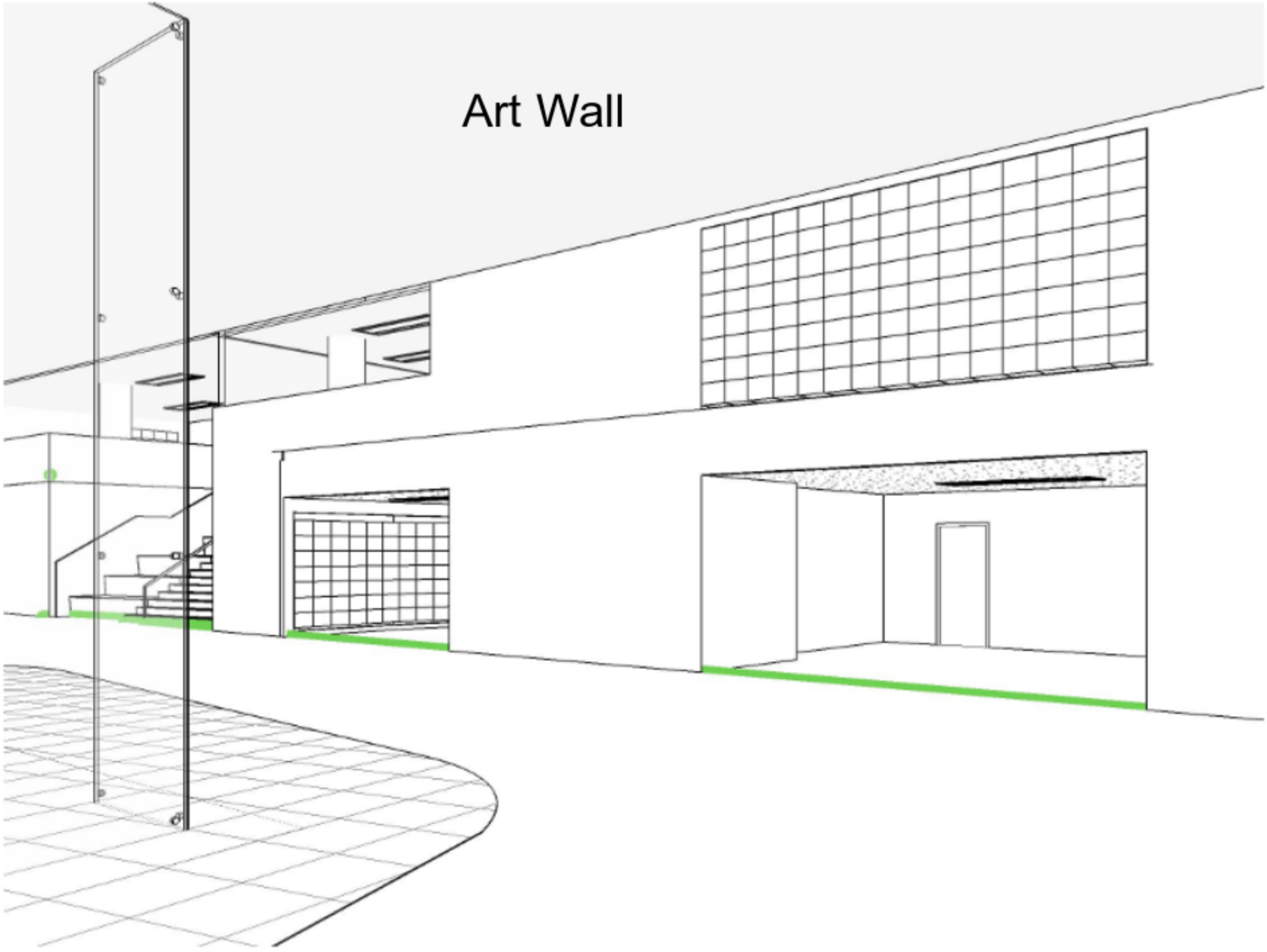
Raw WebSockets

```
// Create a new WebSocket
var socket =
  new WebSocket("ws://echo.websocket.org");
// receive a message from the server
socket.onmessage = function(event) {
  console.log(event.data);
}
// Send a message to the server.
// See it echo back in this example.
socket.send("Sending a message to the server!");
// close the connection
socket.close();
```

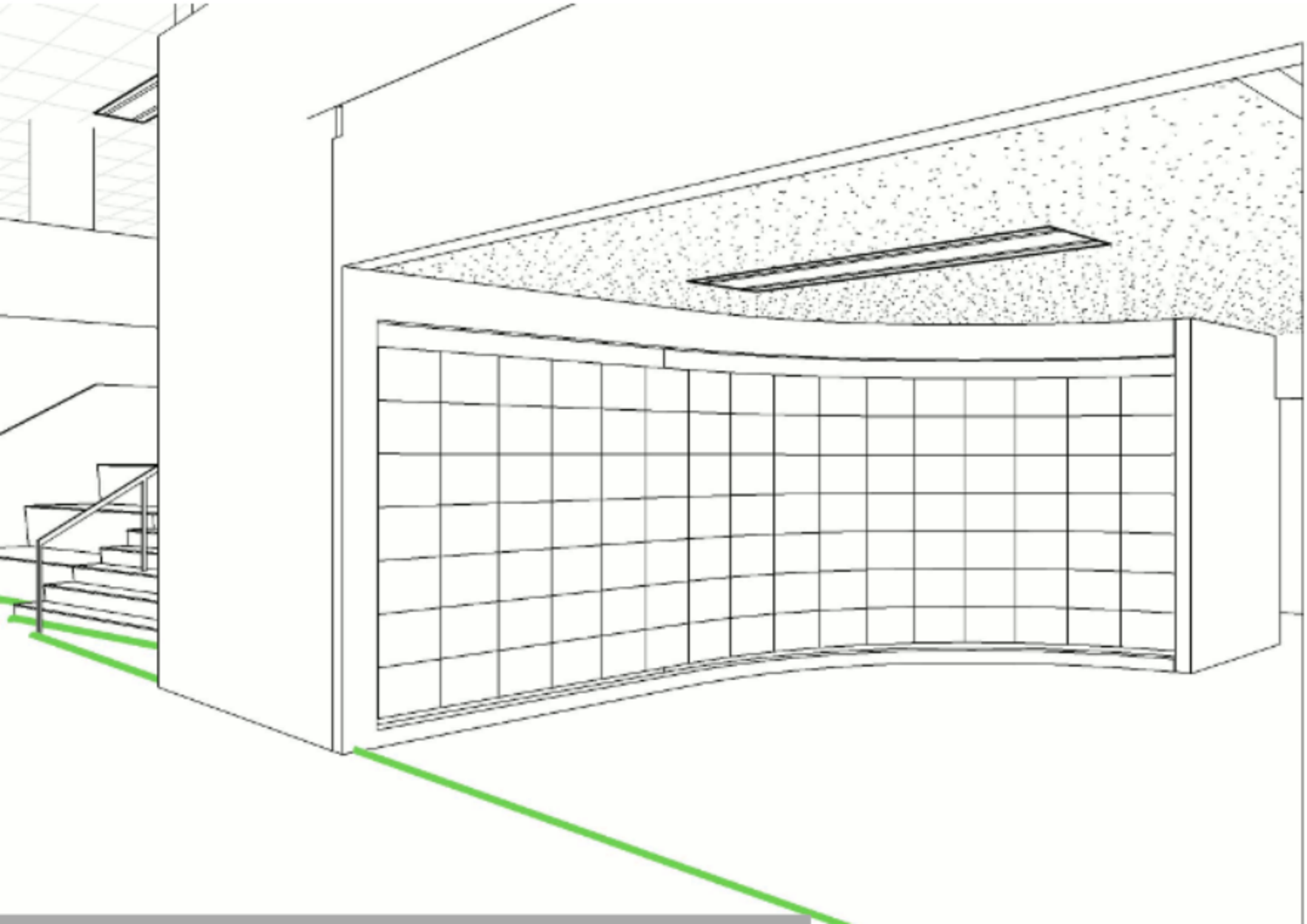
Big Video Walls

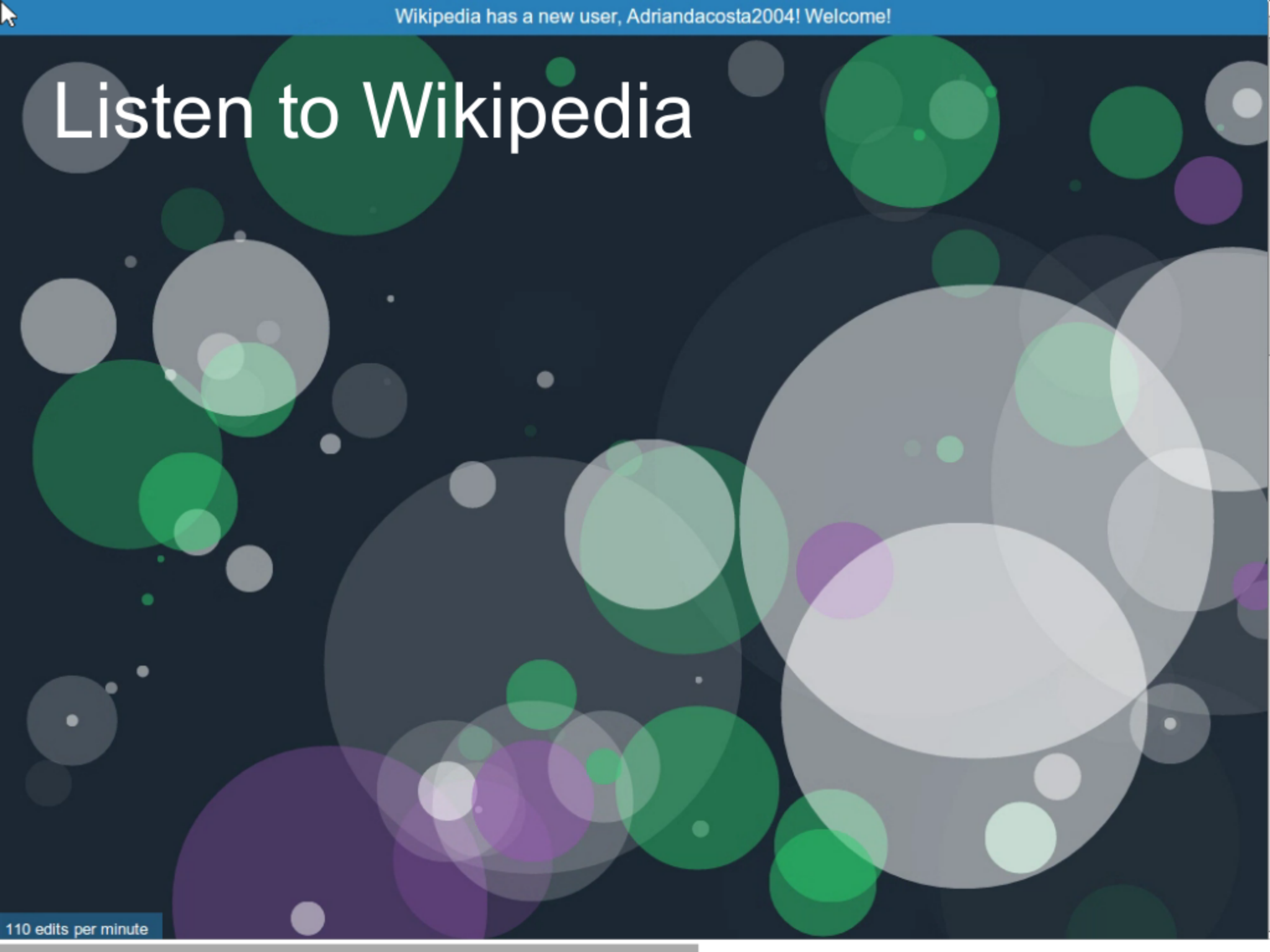

Staircase Wall


Gaming Lab


Art Wall

Immersion Theater (6824 x 2240)




Wikipedia has a new user, Adriandacosta2004! Welcome!
Listen to Wikipedia
110 edits per minute

Listen to Wikipedia

- Bells => additions
- String plucks => subtractions
- Size of the edit determines
    - Pitch: larger edit => deeper note
    - Size of the bubble
- Green circles => unregistered contributors
- Purple circles => automated bots
- New Wikipedia users => string swells

How's It Work?

Listen to Wikipedia Uses WebSockets

1. Wikipedia uses IRC to broadcast changes for each language
2. Wikimon listens to the IRC channels and broadcasts the data over WebSockets
3. Listen to Wikipedia listens to wikimon for the changes and visualizes and audiates them

Also uses:

- D3
- Web Audio API

Adapting to a Big Wall

- Change the CSS
- Add messaging
- Include information for the library and academic context

Listen to Wikipedia Languages

1. Wikidata
2. English
3. German
4. Russian
5. Japanese
6. Spanish
7. French
8. Dutch
9. Italian
10. Swedish
11. Arabic
12. Farsi
13. Hebrew
14. Indonesian
15. Assamese
16. Hindi
17. Bengali
18. Punjabi
19. Telugu
20. Tamil
21. Western Mari
22. Kannada
23. Oriya
24. Sanskrit
25. Gujarati

Remote Controls

Complicated Remote Controls

Simple Remote Controls

Interact!

Token-based Authentication

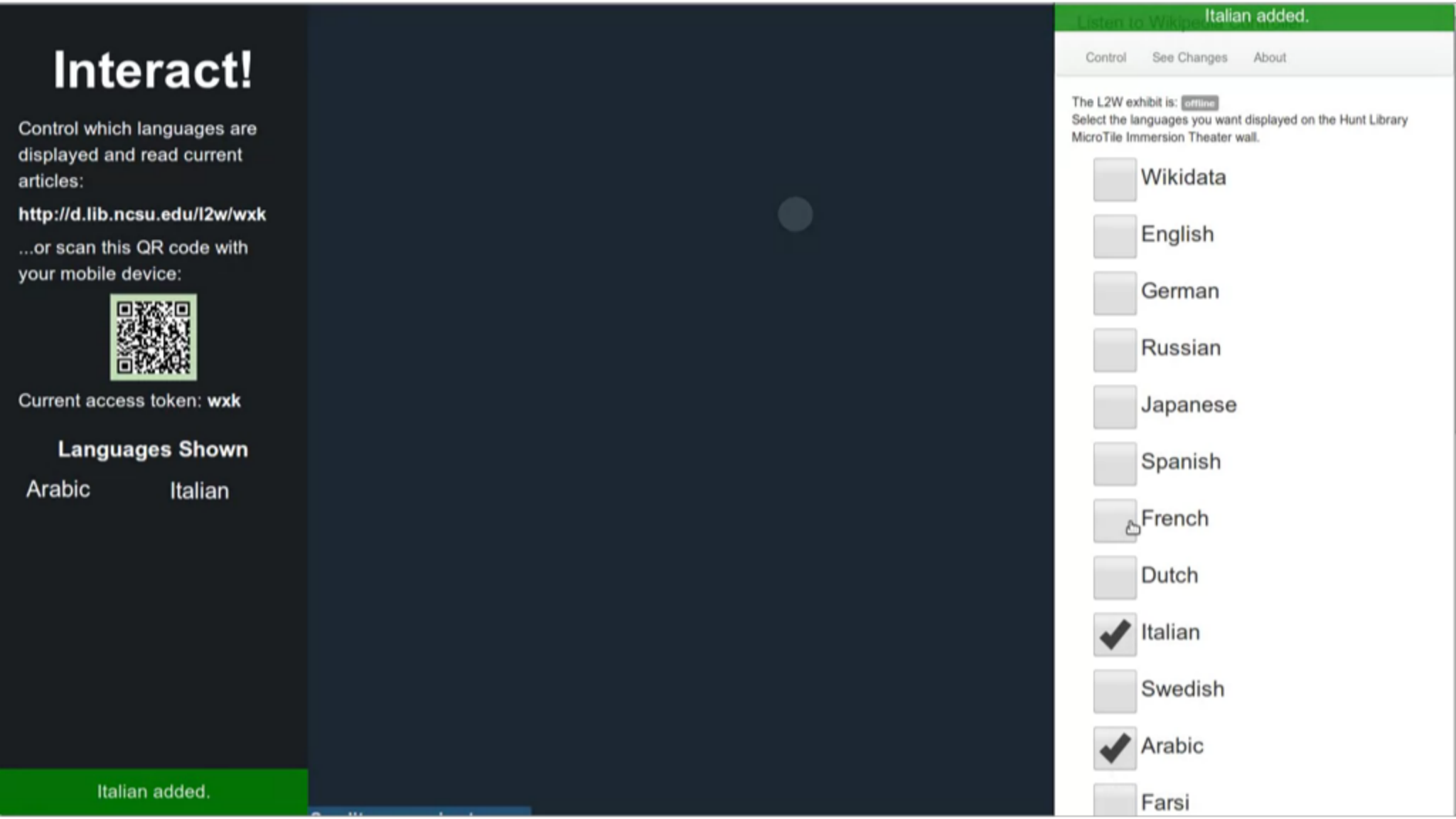
3-letter token: xyz

QR: 80%

URL: 20%

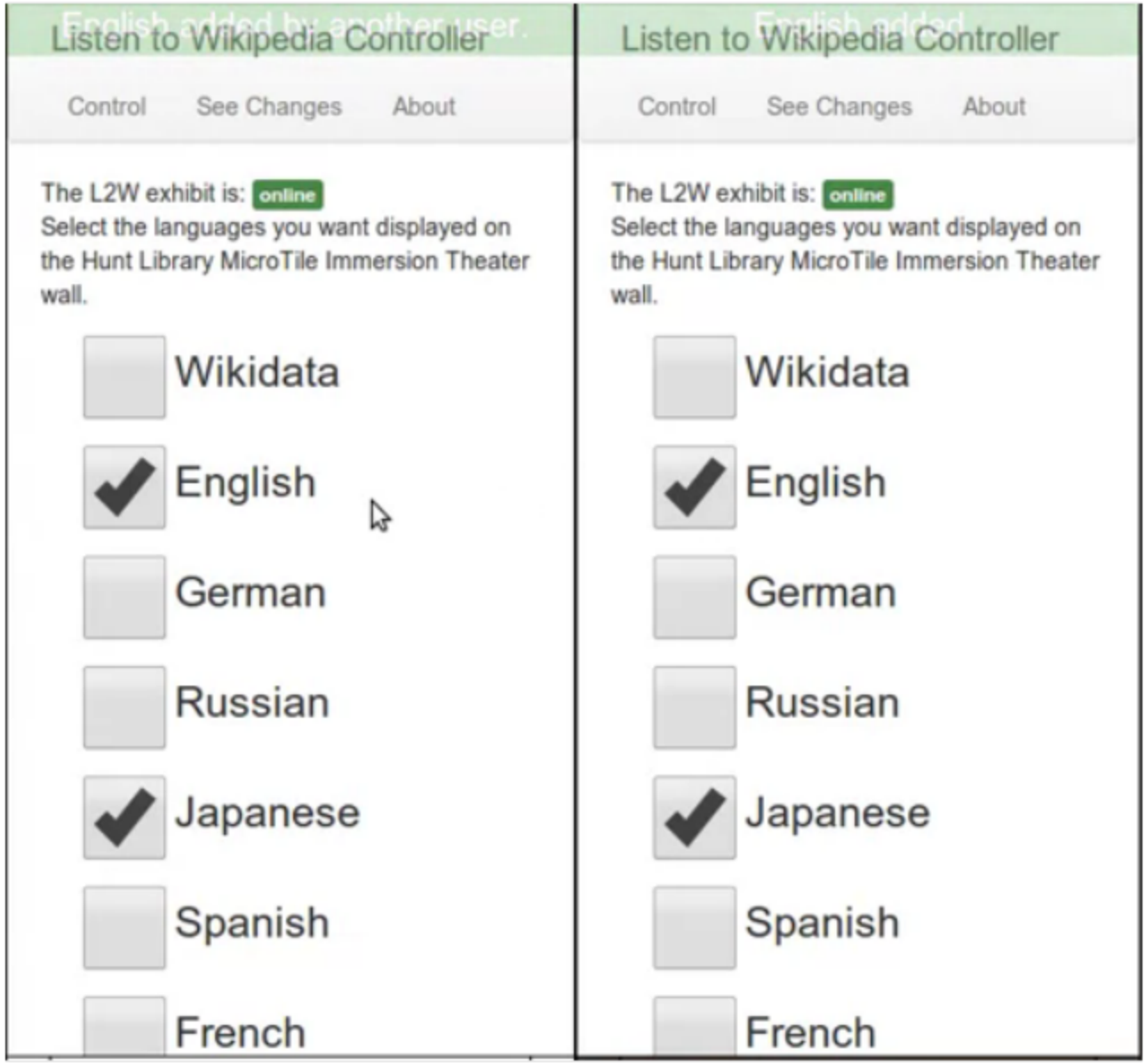
http://lib.example.edu/l2w/xyz

Remote Control Interface



Real-Time Experience

Keeping Clients in Sync



Listen to Wikipedia Controller

Control See Changes About

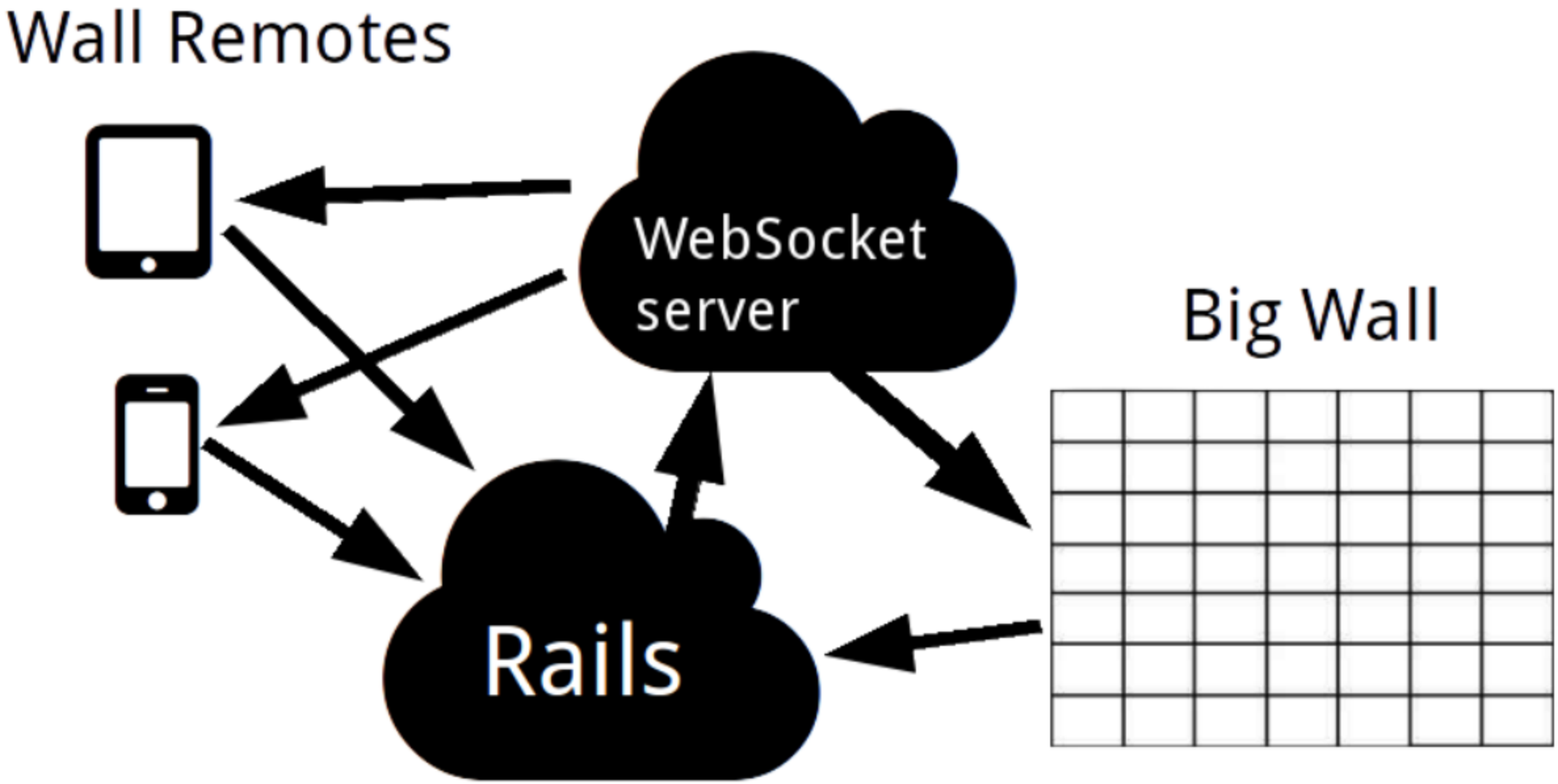
The L2W exhibit is: online

Current Changes

Pause

(أي خدمة (مسلسل	(Arabic)
2014 Sony Open Tennis – Men's Singles	(English)
Arif Mardin	(English)
Turkish delight	(English)
Sydney Middleton	(English)
Indian general election in Andhra Pradesh, 1967	(English)
Batavia (opera)	(English)
Tik Tok	(English)
E. Rose Sabin	(English)
Hey Brother	(English)

Wall Remote Architecture



Reasons why I should come to the library more often. #huntlibrary

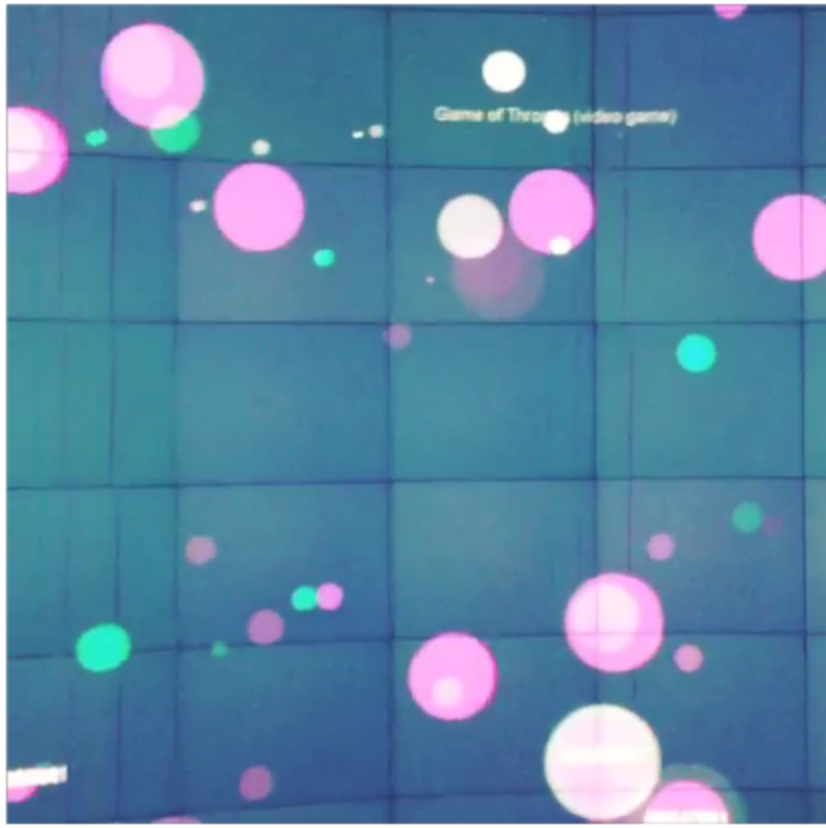
lainiepaynie Follow

3 months ago

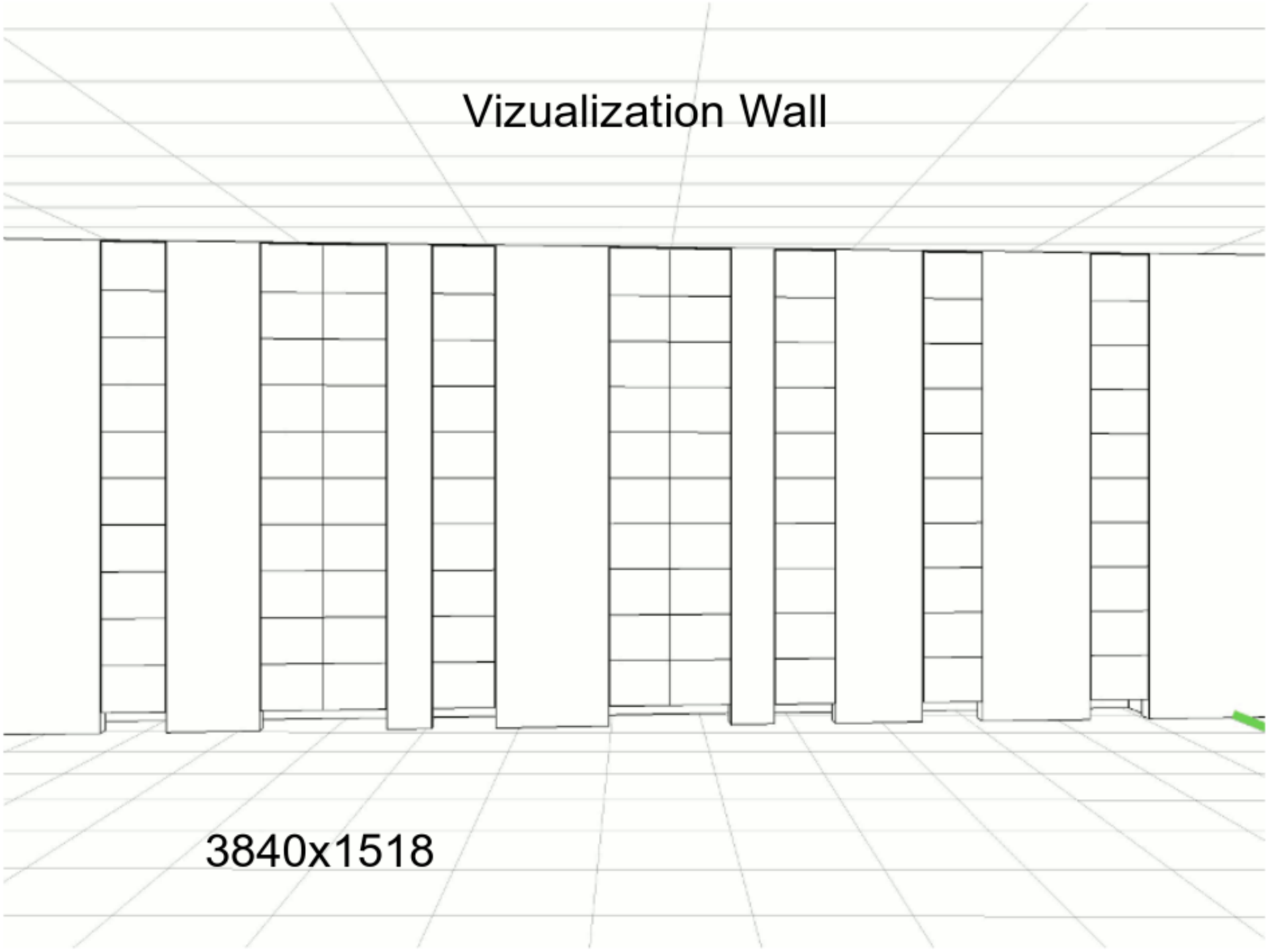
Reasons why I should come to the library more often. #huntlibrary

lilytatmas, **toyboxshark** and **lookingforpennsylvania** like this.

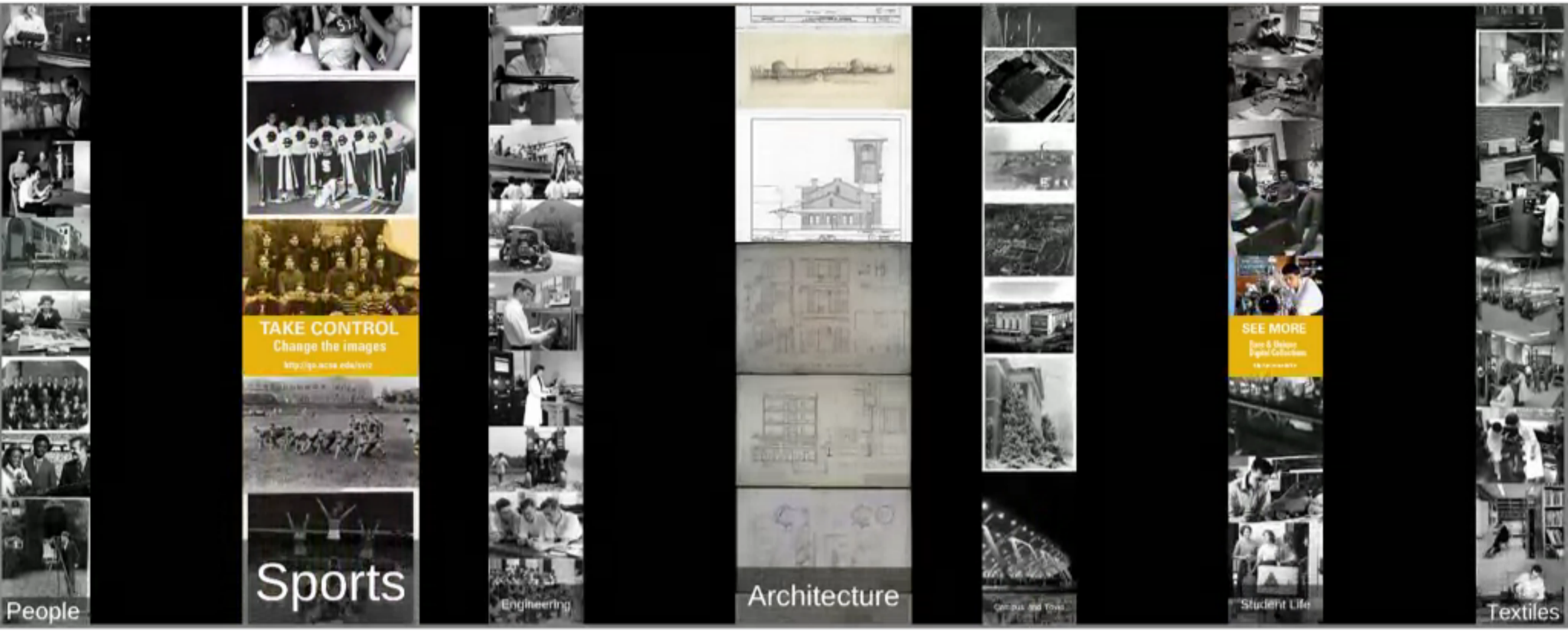
This is people editing--Oh, someone just edited Home Alone--editing Wikipedia in this exact moment.



Unintended Consequences


Vizualization Wall
3840x1518

Digital Collections Explorer



This is just a screencast. On the wall it doesn't loop the animations through so quickly!

Invitation to Take Control

Vizualization Wall Controller

Rare Unique Digital

Control the Visualization Wall in Hunt Library

See more information about the images on the wall

Select a column

Column 1 is the left-most column.

1 | 2 || 3 | 4 || 5 | 6 | 7 |

Add a Column by Topic

- Agriculture
- Architecture
- Campus and Town
- Community and Extension
- Engineering
- Forestry
- People
- Sports

Rare Unique Digital

Explore the Content Currently on the Vizualization Wall

Control the Vizualization Wall | Refresh this page

Columns numbered from left to right.

- 1 People >
- 2 Sports >
- 3 Engineering >
- 4 Architecture >
- 5 Campus and Town >

Back to Topics

Column 5: Campus and Town

View from southwest showing University Plaza (the Brickyard) and D. H. Hill Library's eleven-story bookstack tower, completed in 1971.

Chrome Screen Emulation

Elements Network Sources Timeline Profiles Resources Audits Console Ember

```
<!DOCTYPE html>
▼<html lang="en" data-ember-extension="1">
```

html body.slabtexted.socketio

Styles Computed Event Listeners »

```
element.style {
}
```

Console Search Emulation

Device
Screen ✓
User Agent
Sensors

☑ Emulate screen

Resolution: 3840 ⇄ 1518

Device pixel ratio: 1

Font scale factor: 1

☑ Emulate viewport

☐ Enable text autosizing

Hunt Tour

Conclusion

Credits

- Listen to Wikipedia
- Remote controls by http://www.flickr.com/photos/redjar/
- Zenith Space Command remote control by http://www.flickr.com/people/eklektikos/
- Font Awesome by Dave Gandy - http://fontawesome.io
- Presentation Icon made by Freepik from www.flaticon.com

Links

- Rare & Unique Now!
- Listen to Wikipedia Controller is formatted specifically for the Hunt Library Immersion Theater, but could be changed to work on another display. MIT license.
- WebSockets for Real-Time and Interactive Interfaces. Presentation slides and audience notes. Press "n" for speaker notes.

Jason Ronallo

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http://ronallo.com http://github.com/jronallo

Questions?

Bonus Slides!

Places and Spaces

Realtime Searches

QuickSearch