

why-fi?

Discovery | Privacy | Tracking | Mapping

[laury@mozfest]\$ whoami

- > **Laury Bueno**
- > **Journalist**
- > **Software developer**

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151  
152 /* -Menu  
153 -----  
154  
155 #access {  
156     display: inline-block;  
157     height: 69px;  
158     float: right;  
159     margin: 11px 10px  
160  
161 #access-ul {  
162     font-size: 13px;  
163     list-style: none;  
164     margin: 0 0 0 -0.8125em;  
165     padding-left: 0;  
166     z-index: 99999;  
167     text-align: right;  
168  
169 #access-li {  
170     display: inline-block;  
171     text-align: left;  
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Who doesn't love Wi-Fi?

Who doesn't love Wi-Fi?

Gives us wireless internet access (duh!)

It's convenient

It's fast (mostly)

It's everywhere

A laptop screen is shown with a red overlay. The screen displays CSS code in a code editor. The code includes a menu item with a right margin and a list with a left margin. The text "There is always a 'but'" is overlaid in white.

**There is always
a “but”**

```
151  
152 /* -Menu  
153 -----  
154  
155 #access {  
156     display: inline-block;  
157     height: 69px;  
158     float: right;  
159     margin: 11px 28px 0px 0px;  
160     max-width: 800px;  
161 }  
162  
163 #access ul {  
164     font-size: 13px;  
165     list-style: none;  
166     margin: 0 0 0 20px;  
167 }  
168  
169 #access ul li {  
170     display: inline-block;  
171     vertical-align: top;  
172     margin-left: 10px;  
173 }
```

**There is always a
“but”**

The constant search for a Wi-Fi signal
turn our phones into **beacons** signaling
where we are, who we are and even **where
we have been.**



Transport
for London

Movement tracking in the Tube

In 2016, between 21st November and 19th December, TfL was actively collecting our Wi-Fi data

The goals:

- better alerts about overcrowding
- help prioritise investment

WiFi data collection

We are collecting WiFi data at this station to test how it can be used to improve our services, provide better travel information and help prioritise investment.

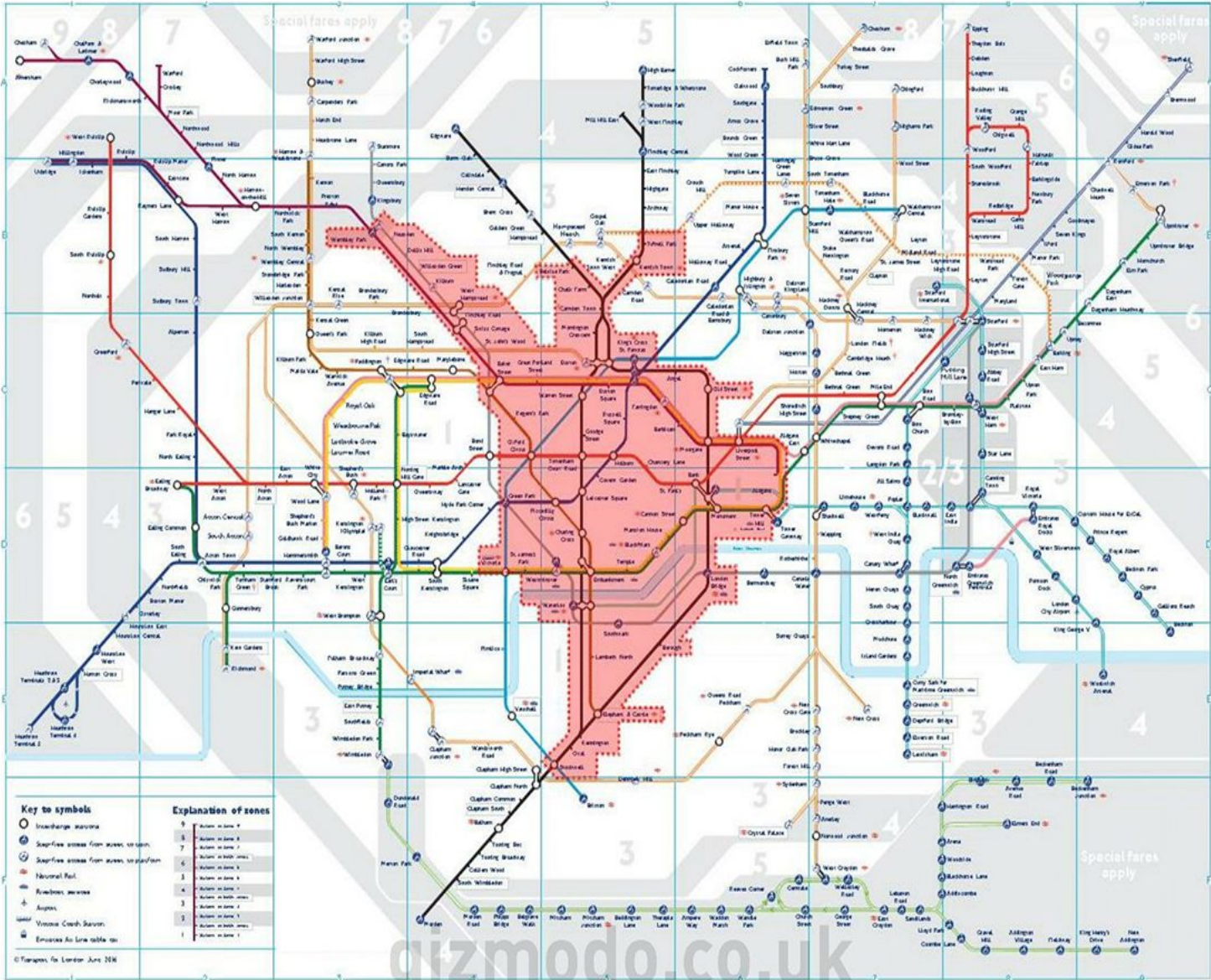
We will not identify individuals or monitor browsing activity.

We will collect data between Monday 21 November and Monday 19 December.

For more information visit: tfl.gov.uk/privacy



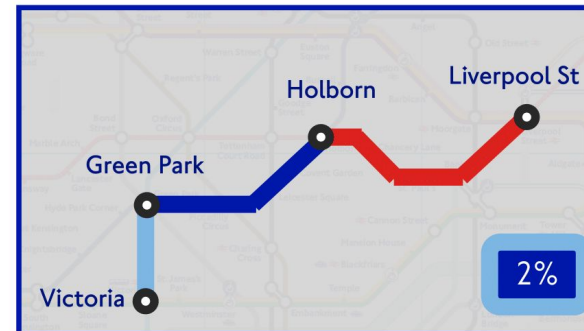
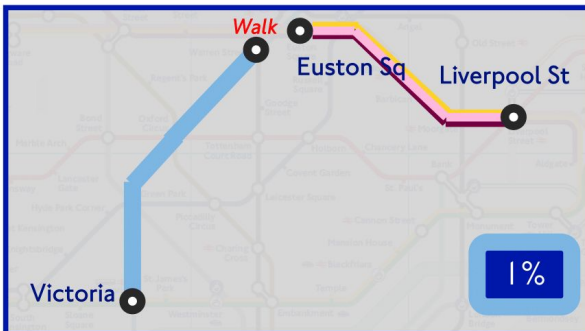
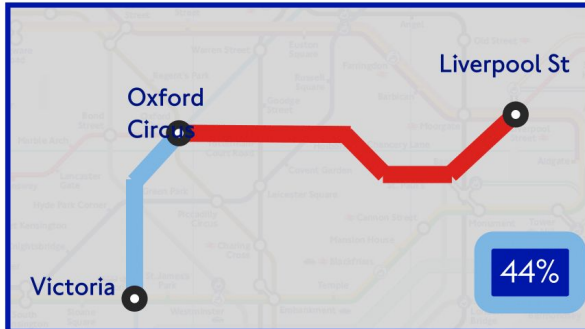
Stations Included in the Pilot (Not for external distribution)



Collect area

Route tracking

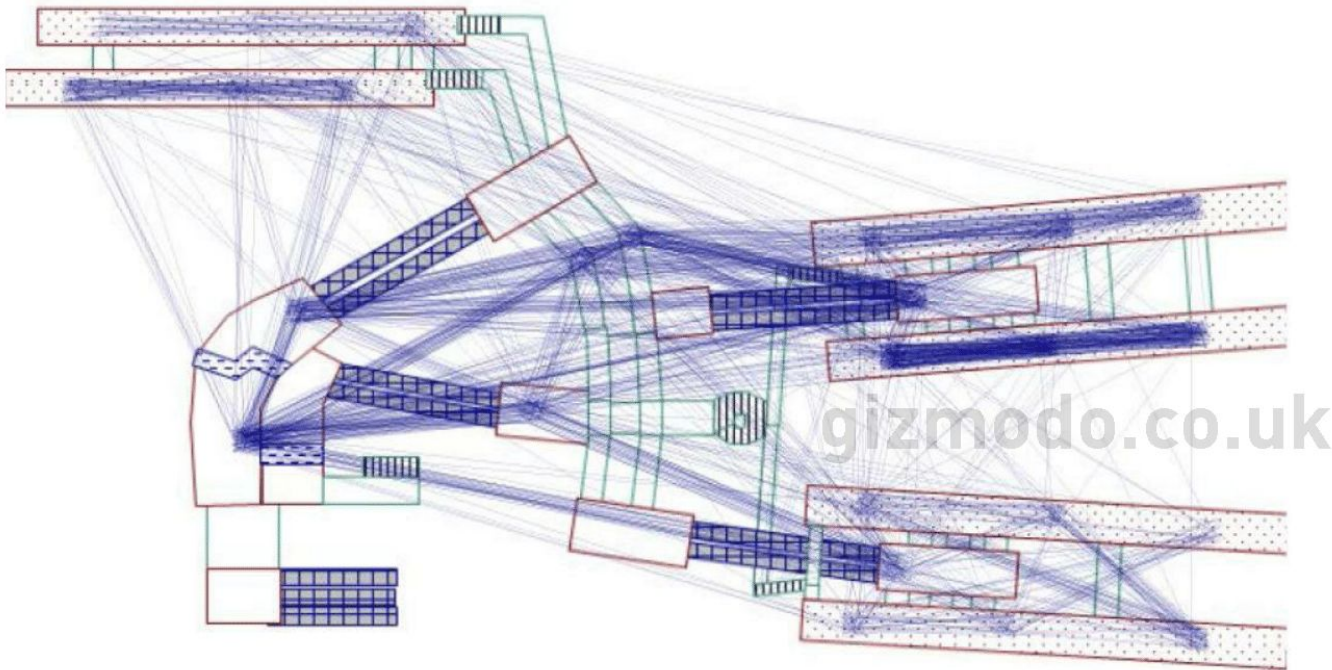
Route identified for 75% of Liverpool Street to Victoria devices



25% no intermediate location

2% other and more complex routes

In-station tracking



**Since July, they're
doing it again**

The background of the slide features a light gray, stylized circuit board pattern. The pattern consists of various geometric shapes, including rectangles, lines, and dots, arranged in a complex, interconnected manner that resembles a printed circuit board (PCB).

**But, is that a
problem?**

Surveilling ON THE CHEAP

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152 /* -Menu  
153 -----  
154  
155 #access {  
156     display: inline-block;  
157     height: 69px;  
158     float: right;  
159     margin: 11px 28px 0px 0px;  
160     max-width: 800px;  
161 }  
162  
163 #access ul {  
164     font-size: 13px;  
165     list-style: none;  
166     margin: 0 0 0 8125px;  
167 }  
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```

How it works?

```
150  
151  
152 /* -Menu  
153 -----  
154  
155 #access {  
156     display: inline-block;  
157     height: 69px;  
158     float: right;  
159     margin: 11px 28px 0px 0px;  
160     max-width: 800px;  
161 }  
162  
163 #access ul {  
164     font-size: 13px;  
165     list-style: none;  
166     margin: 0 0 0 -0.8125em;  
167     padding-left: 0;  
168     z-index: 99999;  
169     text-align: right;  
170  
171     display: inline-block;  
172     text-align: left;
```


All Wi-Fi devices send probes while trying to find hotspots to connect to.

The **trick is finding these beacons** in the midst of a sea of data packets traveling through the Wi-Fi frequency spectre.

How it works?

Free software to the rescue

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150  
151  
152 /* -Menu  
153 -----  
154  
155 #access {  
156     display: inline-block;  
157     height: 69px;  
158     float: right;  
159     margin: 11px 28px 0px 0px;  
160     max-width: 800px;  
161 }  
162  
163 #access ul {  
164     font-size: 13px;  
165     list-style: none;  
166     margin: 0 0 0 -0.8125em;  
167     padding-left: 0.40625em;  
168 }
```

Free software to the rescue

Kali - a Linux distribution designed for digital forensics and penetration testing

Scapy - Python-based interactive packet manipulation program & library

D3 - a JavaScript library for manipulating documents based on data

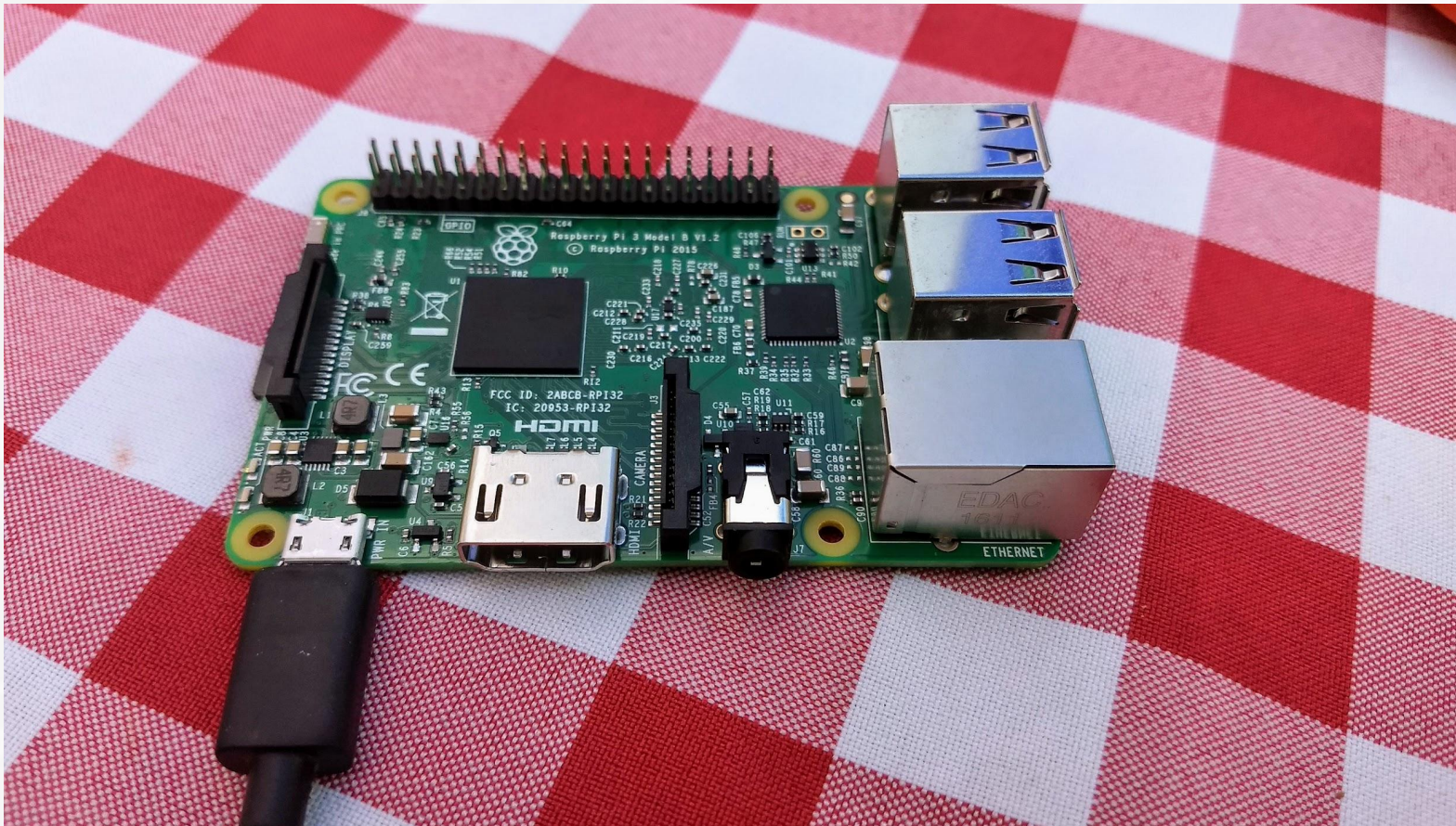
Getting the actual data

```
151  
152 /* -Menu  
153 -----  
154  
155 #access {  
156     display: inline-block;  
157     height: 69px;  
158     float: right;  
159     margin: 11px 28px 0px 0px;  
160     max-width: 800px;  
161 }  
162  
163 #access ul {  
164     font-size: 13px;  
165     list-style: none;  
166     margin: 0 0 0 -0.5em;  
167     padding-left: 0.5em;  
168 }  
169  
170 #access li {  
171     display: inline-block;  
172     text-align: left;
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```


Three Raspberry Pi 3B collected data for about 3 hours in a event.

Getting the actual data



Three Raspberry Pi 3B collected data for about 3 hours in a event.

Getting the actual data



1



Getting the actual data



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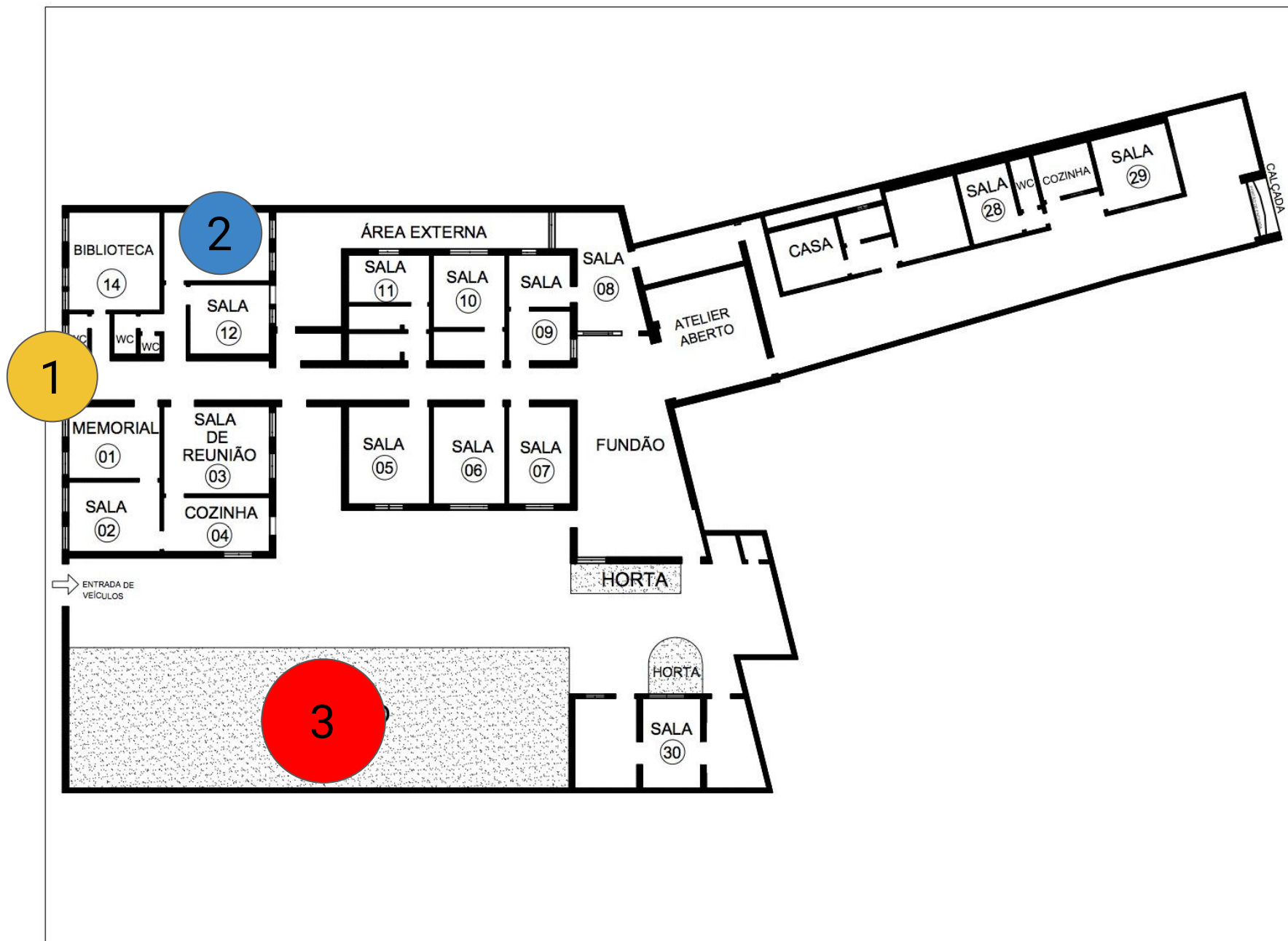
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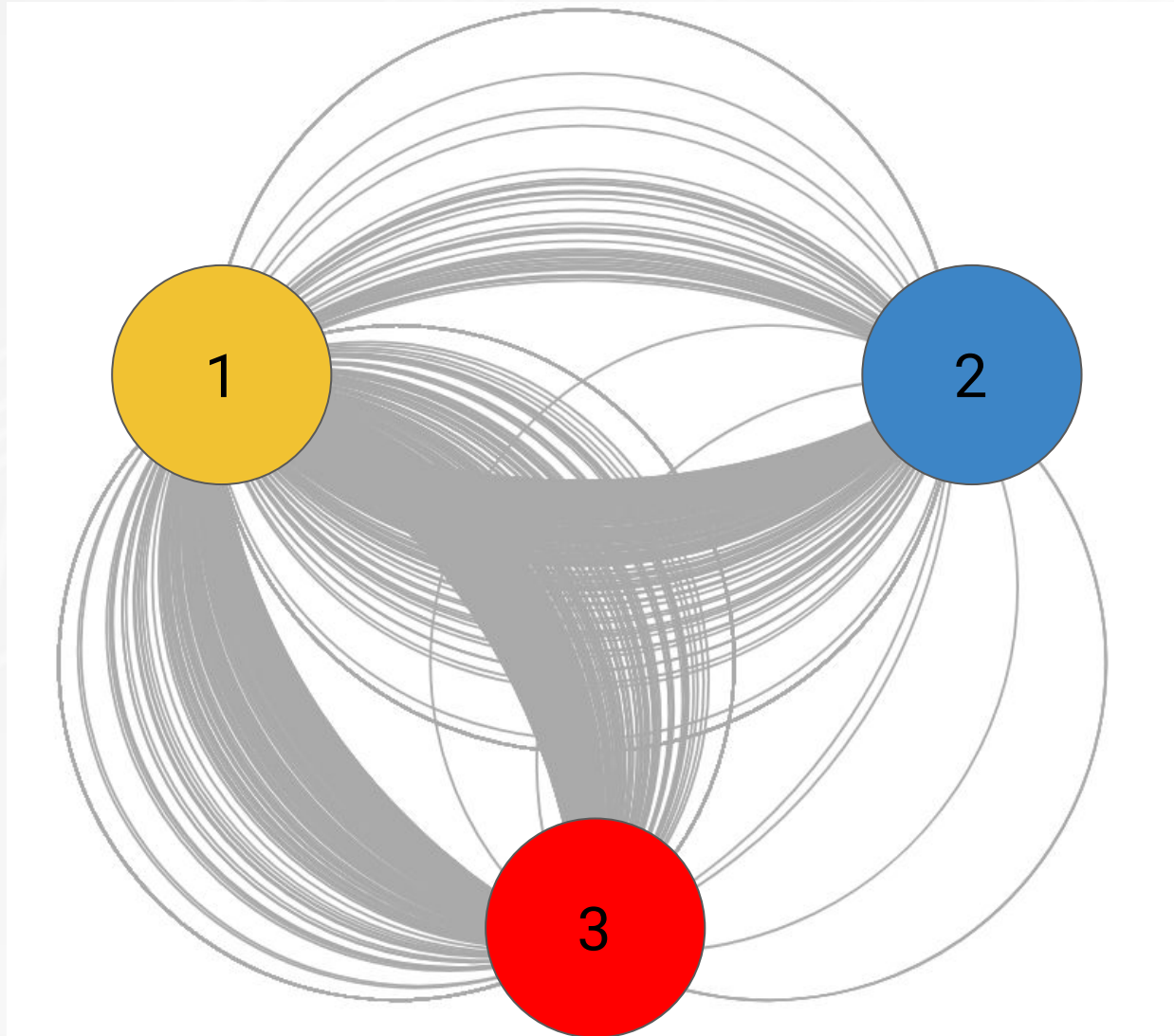
Brace yourselves
It's code time

What we found

```
150  
151  
152 /* -Menu  
153 -----  
154  
155 #access {  
156     display: inline-block;  
157     height: 69px;  
158     float: right;  
159     margin: 11px 28px 0px 0px;  
160     max-width: 800px;  
161 }  
162  
163 #access ul {  
164     font-size: 13px;  
165     list-style: none;  
166     margin: 0 0 0 -0.8125em;  
167     padding-left: 0;  
168     z-index: 99999;  
169     text-align: right;  
170 }  
171  
172 #access ul li {  
173     display: inline-block;  
174     text-align: left;
```



Detected movements



References

Here's What TfL Learned From Tracking Your Phone On the Tube

<https://www.gizmodo.co.uk/2017/02/heres-what-tfl-learned-from-tracking-your-phone-on-the-tube/>

London Underground to start tracking all phones using Wi-Fi starting in July

<https://www.theverge.com/2019/5/22/18635584/london-underground-tube-tfl-wi-fi-tracking-privacy-data-security-transport>

What does the GDPR say about WiFi tracking?

<https://www.privacycompany.eu/en/what-does-the-gdpr-say-about-wifi-tracking/>

TfL to give customers better information about their Tube journeys

<https://tfl.gov.uk/info-for/media/press-releases/2019/may/tfl-to-give-customers-better-information-about-their-tube-journeys>

why-fi?

Discovery | Privacy | Tracking | Mapping

Laury Bueno

Telegram: @laurybueno