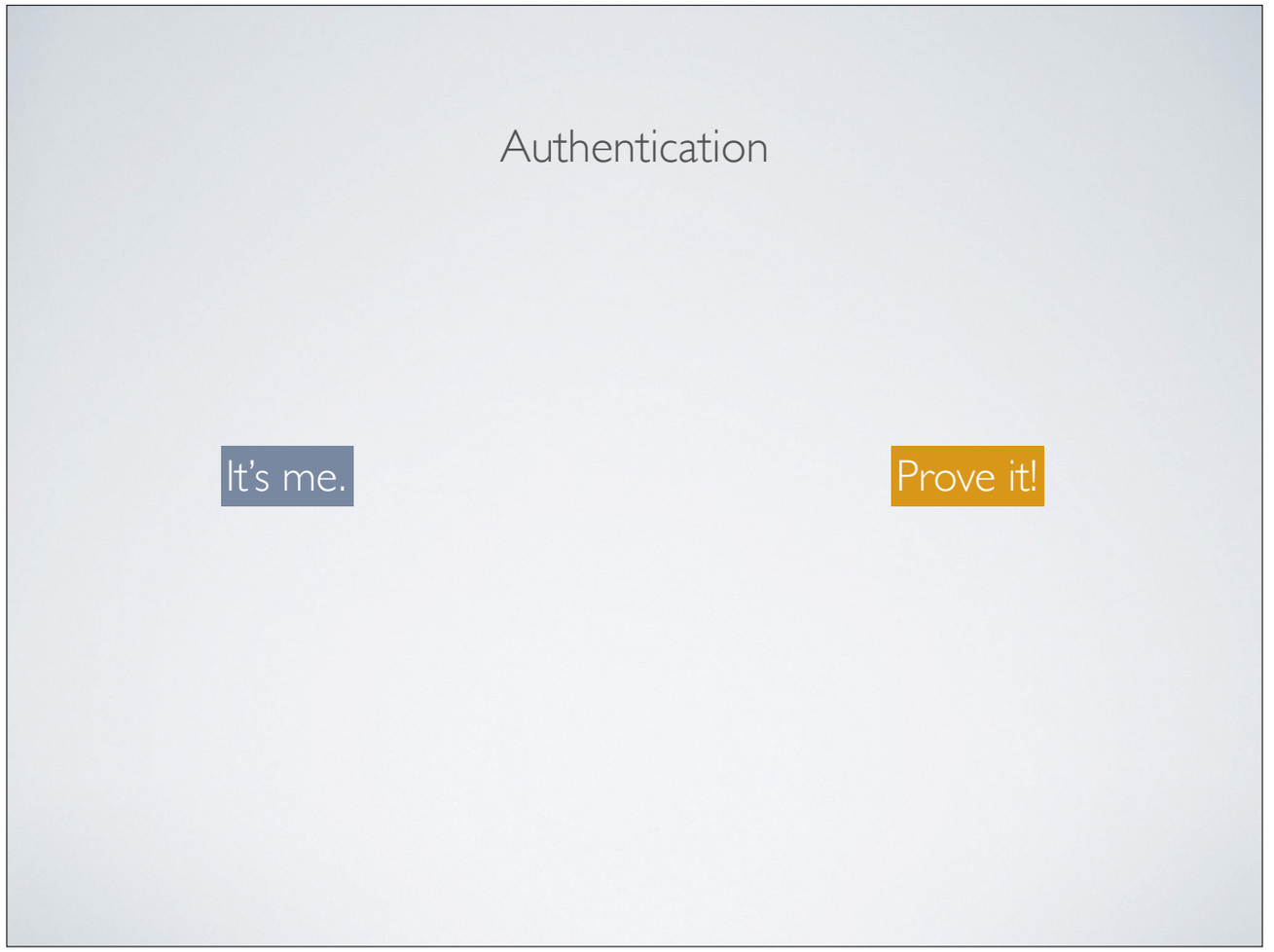
KEYSTROKE DYNAMICS

2FA in web apps



An authentication factor is a category of credential that is intended to verify, sometimes in combination with other factors, that an entity involved in some kind of communication or requesting access to some system is who, or what, they are declared to be.

Authentication factors

something you **know**
something you **have**
something you **are**

An authentication factor is a category of credential that is intended to verify, sometimes in combination with other factors, that an entity involved in some kind of communication or requesting access to some system is who, or what, they are declared to be.

Authentication factors

something you **know**

password, passphrase, PIN

Authentication factors

something you **have**

and can **not** be easily duplicated:
smartcard, token, OTP generator

Authentication factors

something you **are**

fingerprint, retina, iris
keystroke dynamics (typing pattern)

Keystroke dynamics or typing dynamics refers to the automated method of identifying or confirming the identity of an individual based on the manner and the rhythm of typing on a keyboard. Keystroke dynamics is a behavioral biometric, this means that the biometric factor is 'something you do'.

Keystroke dynamics

something you **do**

behavioral biometric

Keystroke dynamics

typing pattern

dwell time: KeyDown - KeyUp
travel time: KeyDown - KeyDown

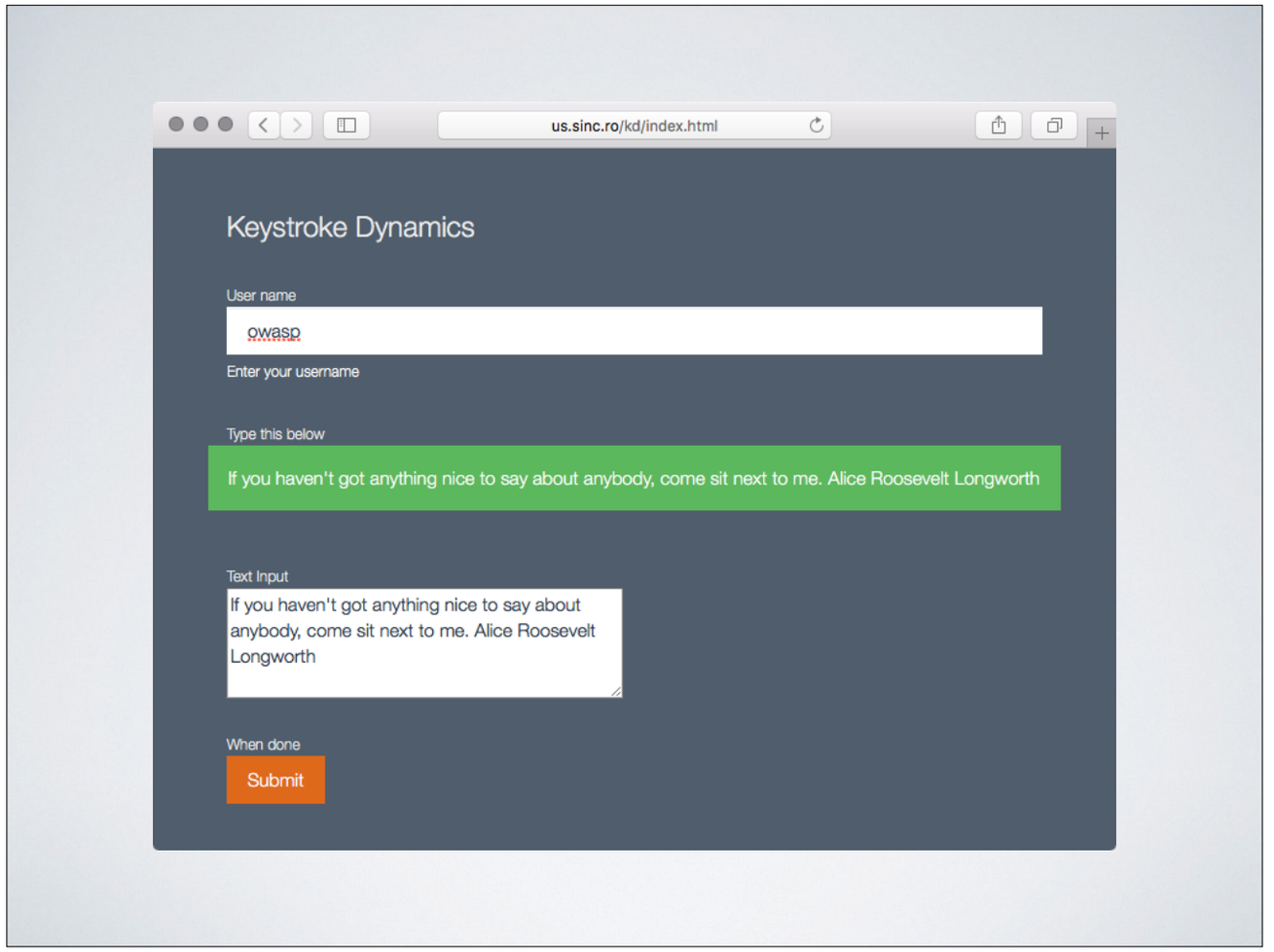
Keystroke dynamics

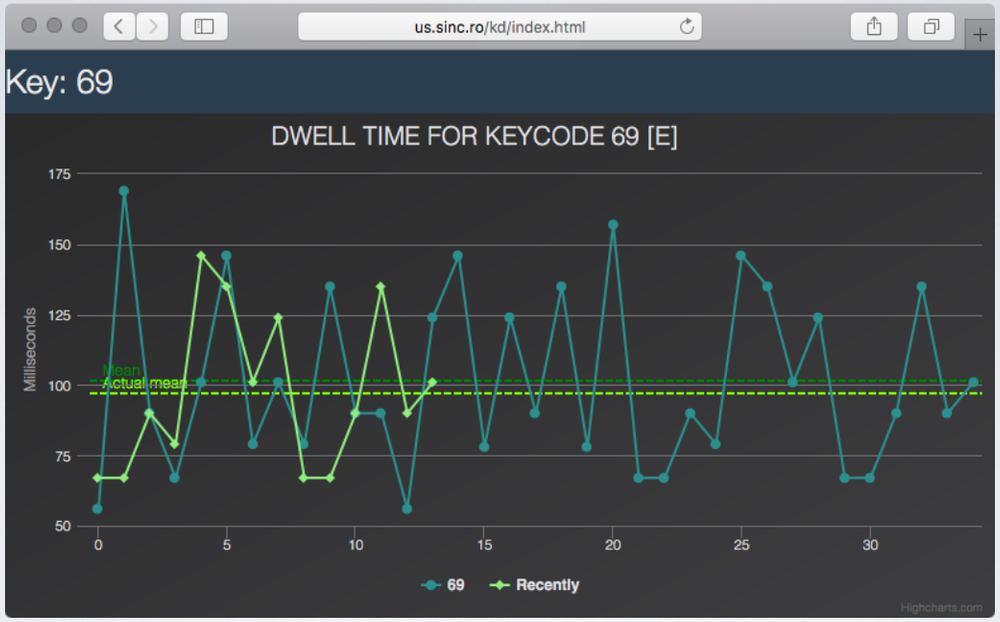
+

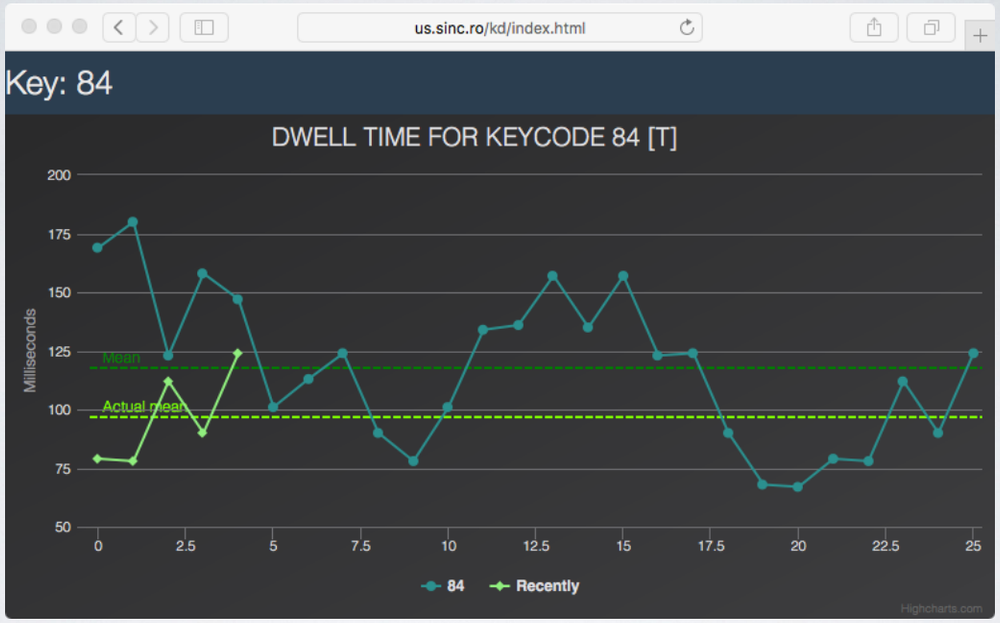
uniqueness
low implementation and deployment cost
transparency and noninvasiveness
continuous monitoring and authentication

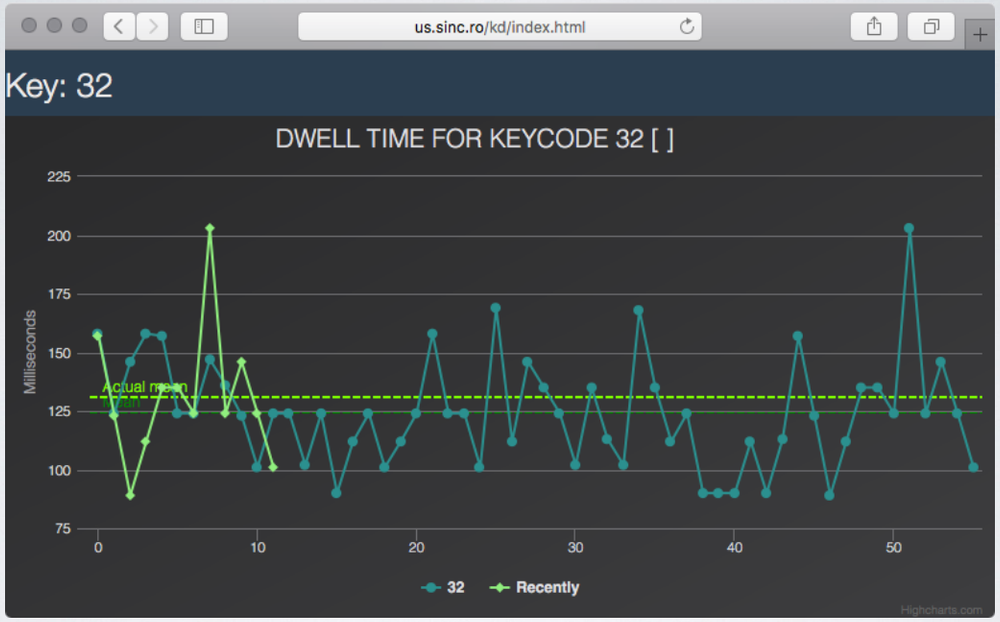
-

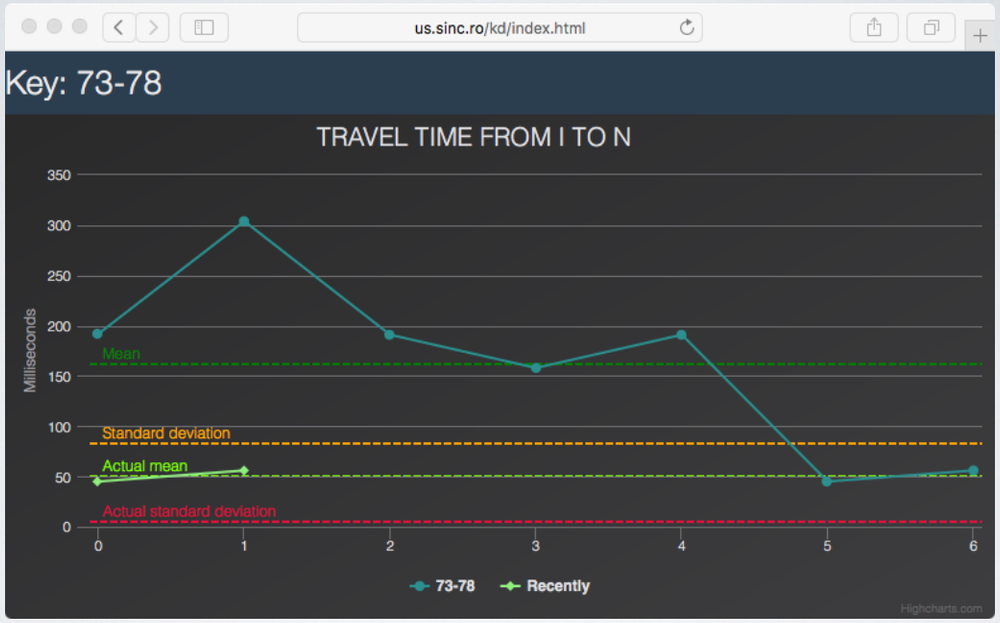
lower accuracy
lower permanence

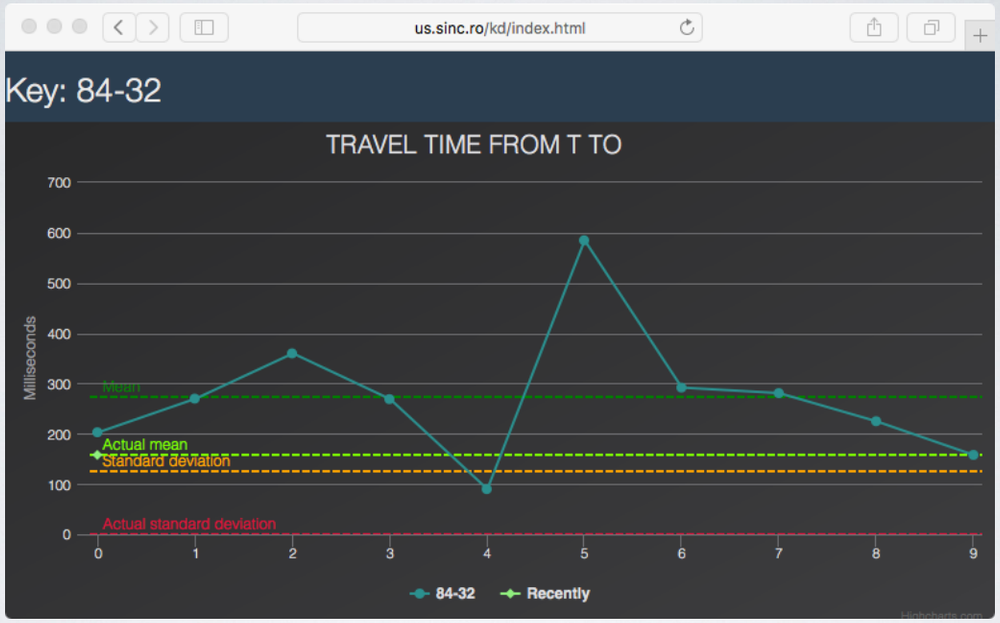

us.sinc.ro/kd/index.html
Keystroke Dynamics
User name
owasp
Enter your username
Type this below
If you haven't got anything nice to say about anybody, come sit next to me. Alice Roosevelt Longworth
Text Input
If you haven't got anything nice to say about anybody, come sit next to me. Alice Roosevelt Longworth
When done
Submit


us.sinc.ro/kd/index.html
Key: 69
DWELL TIME FOR KEYCODE 69 [E]
Milliseconds
175
150
125
100
75
50
0
5
10
15
20
25
30
Mean
Actual mean
69
Recently
Highcharts.com


us.sinc.ro/kd/index.html
Key: 84
DWELL TIME FOR KEYCODE 84 [T]
Milliseconds
200
175
150
125
100
75
50
Mean
Actual mean
0
2.5
5
7.5
10
12.5
15
17.5
20
22.5
25
84
Recently
Highcharts.com


us.sinc.ro/kd/index.html
Key: 32
DWELL TIME FOR KEYCODE 32 [ ]
Milliseconds
225
200
175
150
125
100
75
0
10
20
30
40
50
Actual mean
32
Recently
Highcharts.com


us.sinc.ro/kd/index.html
Key: 73-78
TRAVEL TIME FROM I TO N
Milliseconds
350
300
250
200
150
100
50
0
Mean
Standard deviation
Actual mean
Actual standard deviation
0
1
2
3
4
5
6
73-78
Recently
Highcharts.com


us.sinc.ro/kd/index.html
Key: 84-32
TRAVEL TIME FROM T TO
Milliseconds
700
600
500
400
300
200
100
0
Mean
Actual mean
Standard deviation
Actual standard deviation
0
1
2
3
4
5
6
7
8
9
84-32
Recently

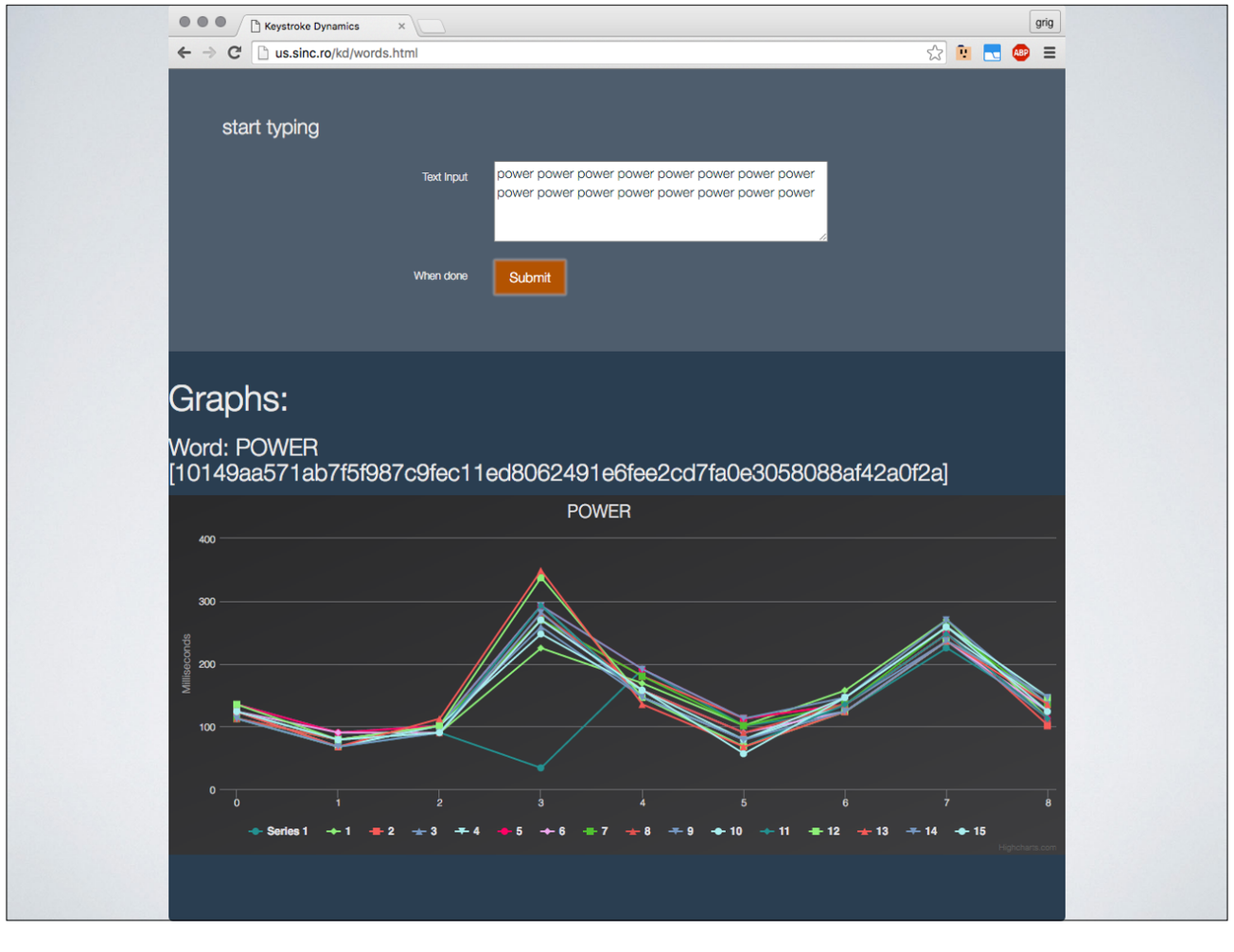
Keystroke dynamics

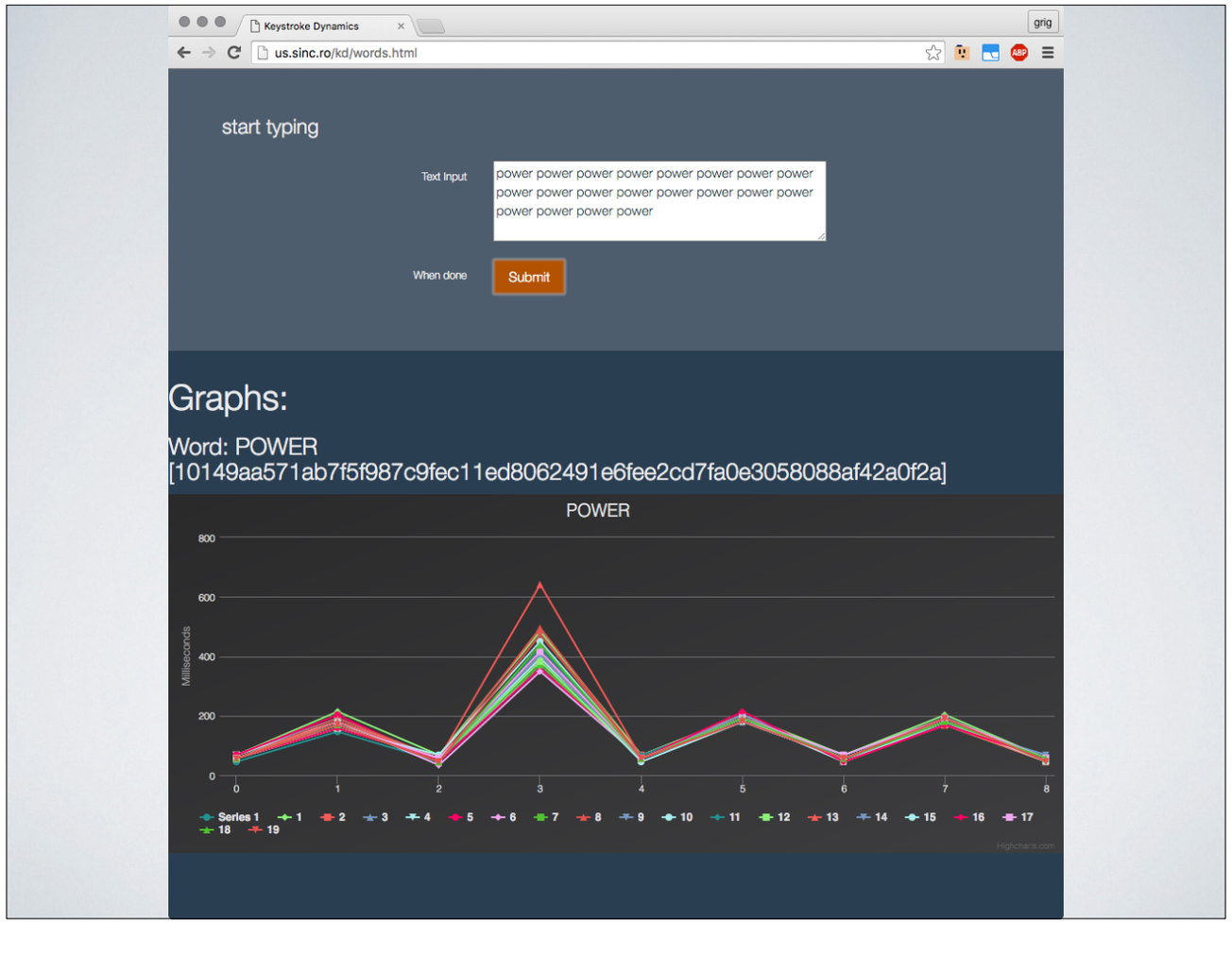
deaf flea

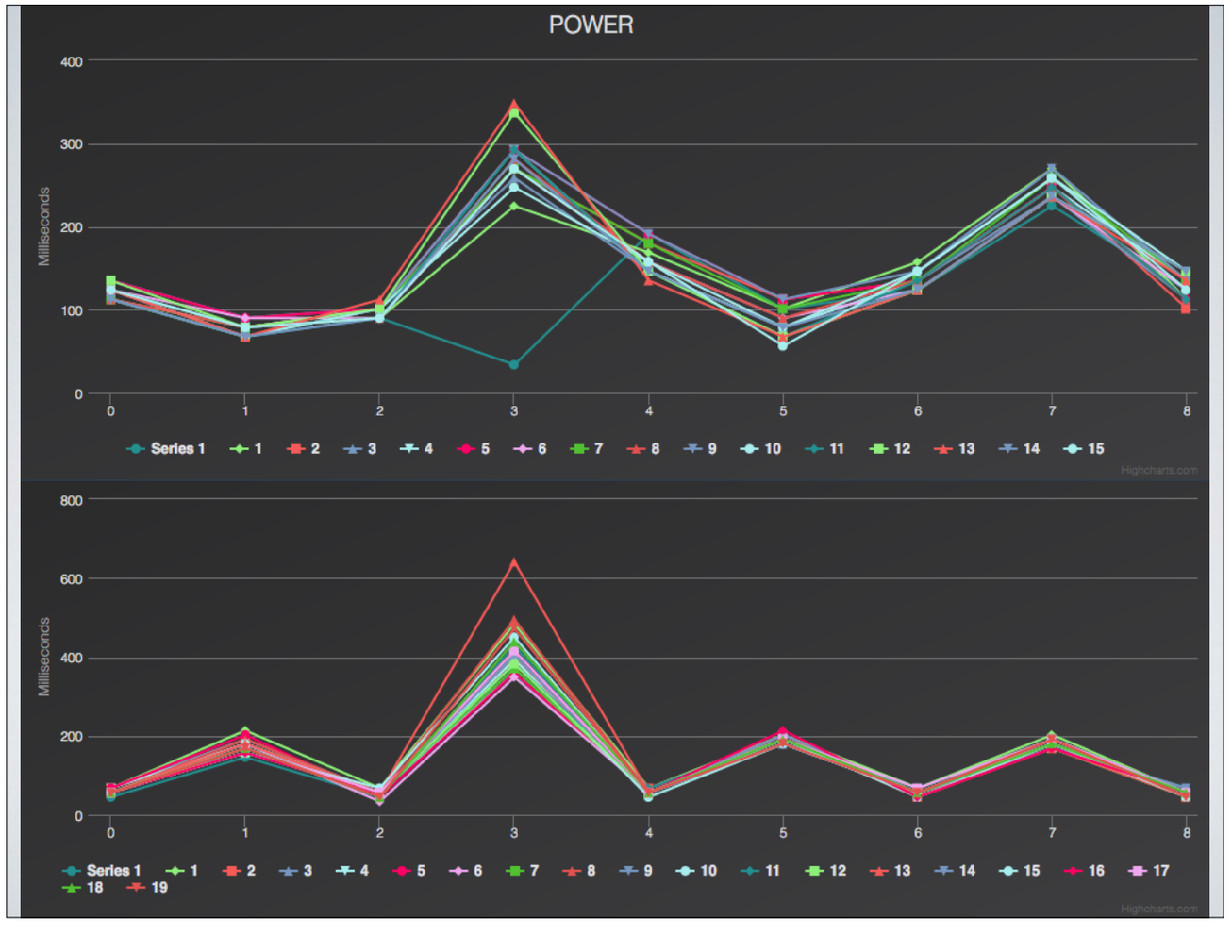
Keystroke dynamics

brain - notion - word

notion: concept, idea

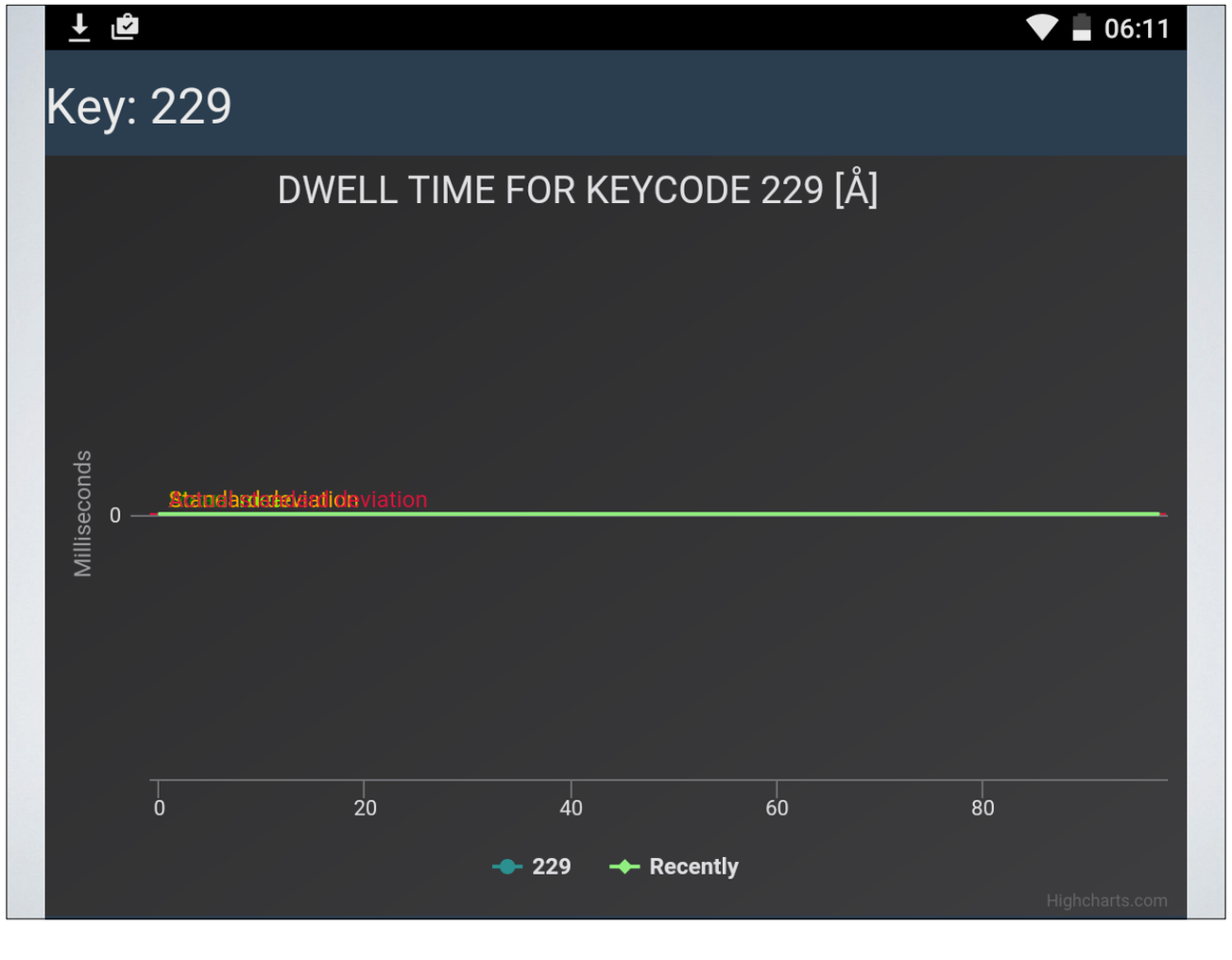

Keystroke Dynamics
grig
us.sinc.ro/kd/words.html
start typing
Text Input
power power power power power power power power power power power power power power power power
When done
Submit
Graphs:
Word: POWER
[10149aa571ab7f5f987c9fec11ed8062491e6fee2cd7fa0e3058088af42a0f2a]
POWER
Milliseconds
400
300
200
100
0
0
1
2
3
4
5
6
7
8
Series 1
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Highcharts.com


Keystroke Dynamics
us.sinc.ro/kd/words.html
start typing
Text Input
power power power power power power power power power power power power power power power power power power power power
When done
Submit
Graphs:
Word: POWER
[10149aa571ab7f5f987c9fec11ed8062491e6fee2cd7fa0e3058088af42a0f2a]
POWER
Milliseconds
800
600
400
200
0
0 1 2 3 4 5 6 7 8
Series 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19


POWER
Milliseconds
400
300
200
100
0
0
1
2
3
4
5
6
7
8
Series 1
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Highcharts.com
Milliseconds
800
600
400
200
0
0
1
2
3
4
5
6
7
8
Series 1
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
Highcharts.com

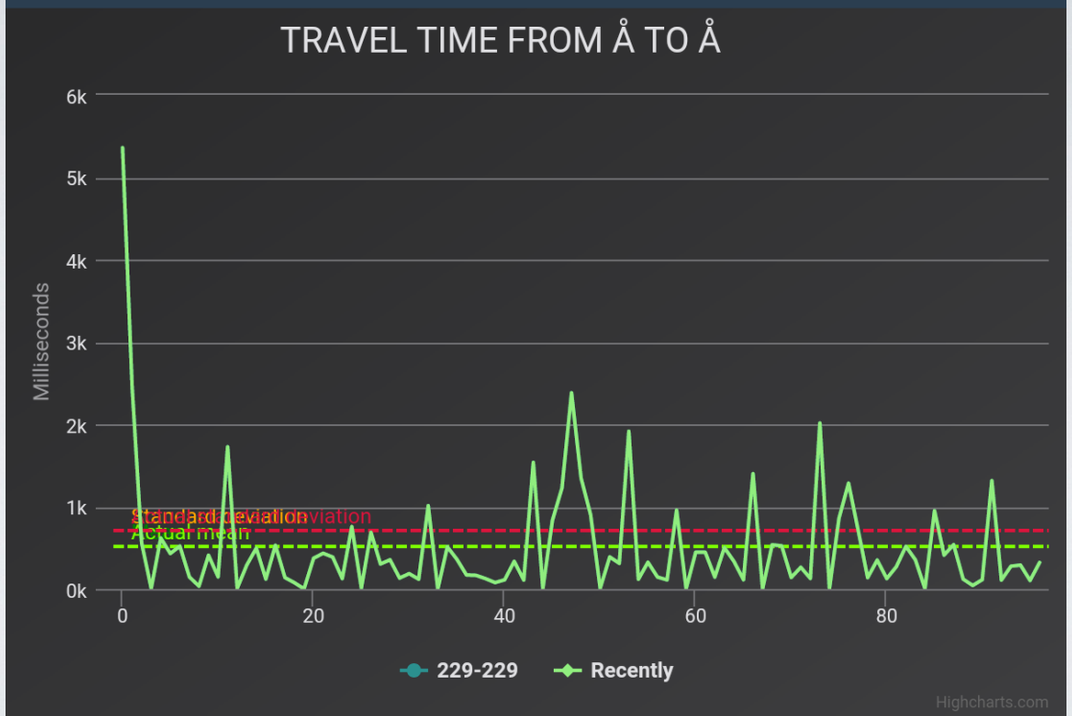
Keystroke dynamics

mobile devices: android


06:11
Key: 229
DWELL TIME FOR KEYCODE 229 [Å]
Milliseconds
0
Standard deviation
0
20
40
60
80
229
Recently
Highcharts.com

Travel graphs

Key: 229-229



Keystroke dynamics

confidence factor

tired
injured
drunk/drugs
moody

Keystroke dynamics

```
$('body').on('keydown', function(evt) {
   var key = evt.keyCode;
});

$('body').on('keyup', function(evt) {
   var key = evt.keyCode;
});
```

Keystroke dynamics

Possible uses

enhance authentication
detect user change
identify trolls

Keystroke dynamics

Countermeasures

typing pattern randomization

hardware: FPGA
software: keyboard driver

THE END