



Web of Things Platform

Uros Petrevski & Drasko Draskovic

nodesign.net

Want to make Internet of Things?

nodesign.net



2015

25 billion connected objects

2020

50 billion connected objects

but...

How to innovate?
How to create NéoObjects?

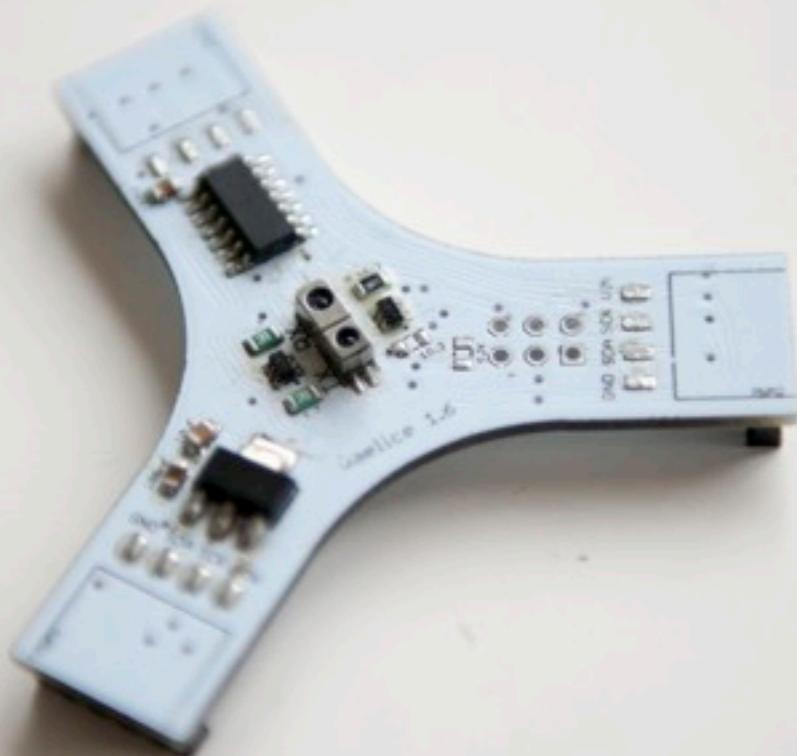
how to

LEARN

INNOVATE

PRODUCE

?



usages, poetry



<http://www.nodesign.net/portfolio/waelice>

Today we have one user friendly tool that comes from Italy

ARDUINO

is great to learn basics but...

We need **versatile** and **friendly** platform that can be easily **connected** with Web services or offer new ones. Connecting objects must be as **easy** as “hello world”

Today we have miniature
and cheap computer
coming from UK

Raspberry Pi
is great real computer
but...

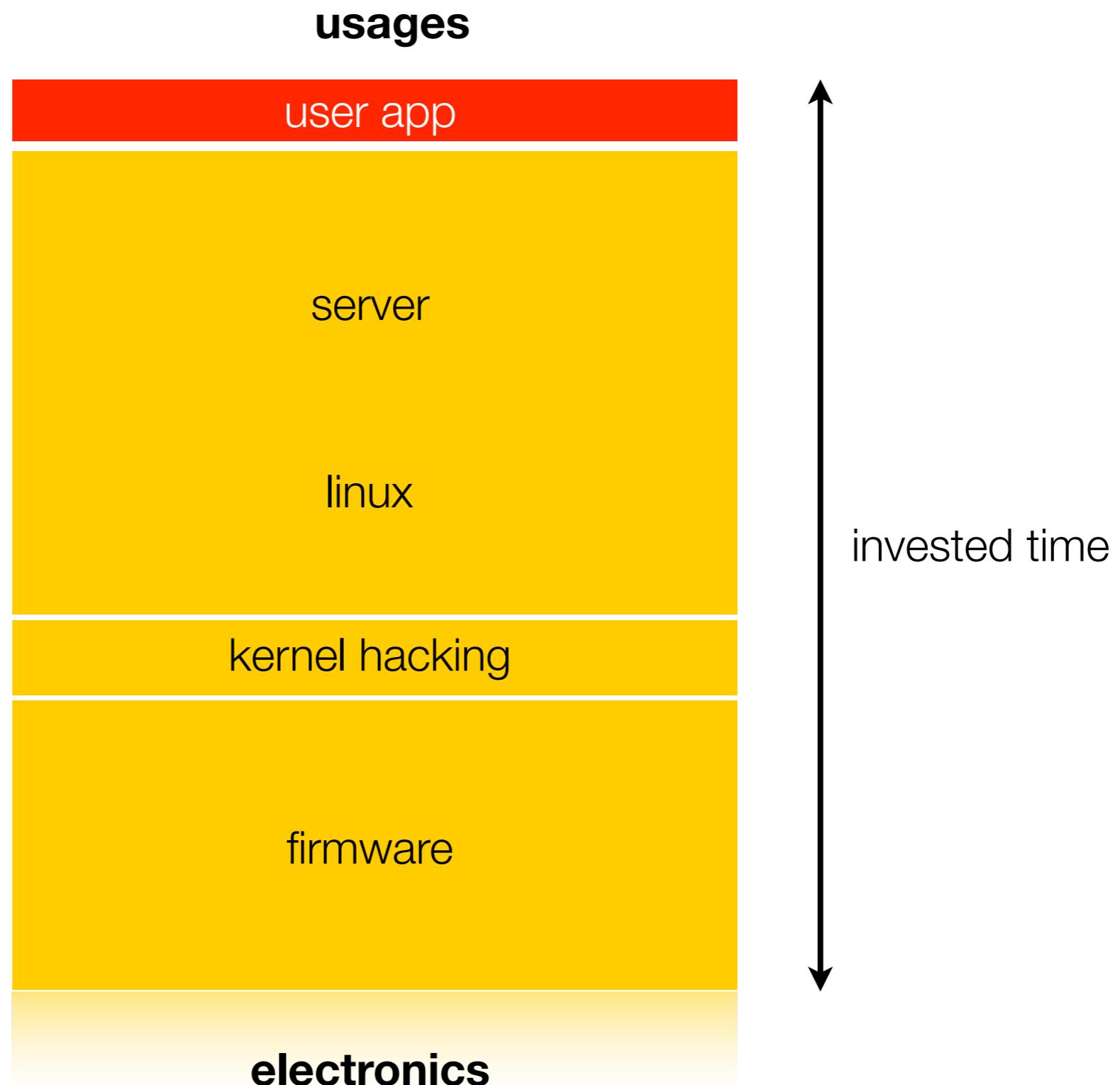
NéoObjects need **dedicated** interfaces and hardware.
Computers are too generalist platform for them. Also, they need **wireless** connectivity.

How we are making NéoObjects today?

Think USAGE
Think Object

MAKE!

but...



Hey, do you know
that firmware
hacking,
crosscompiling,
and Linux patching
are not for kids ;-)

but that's long
way to go...

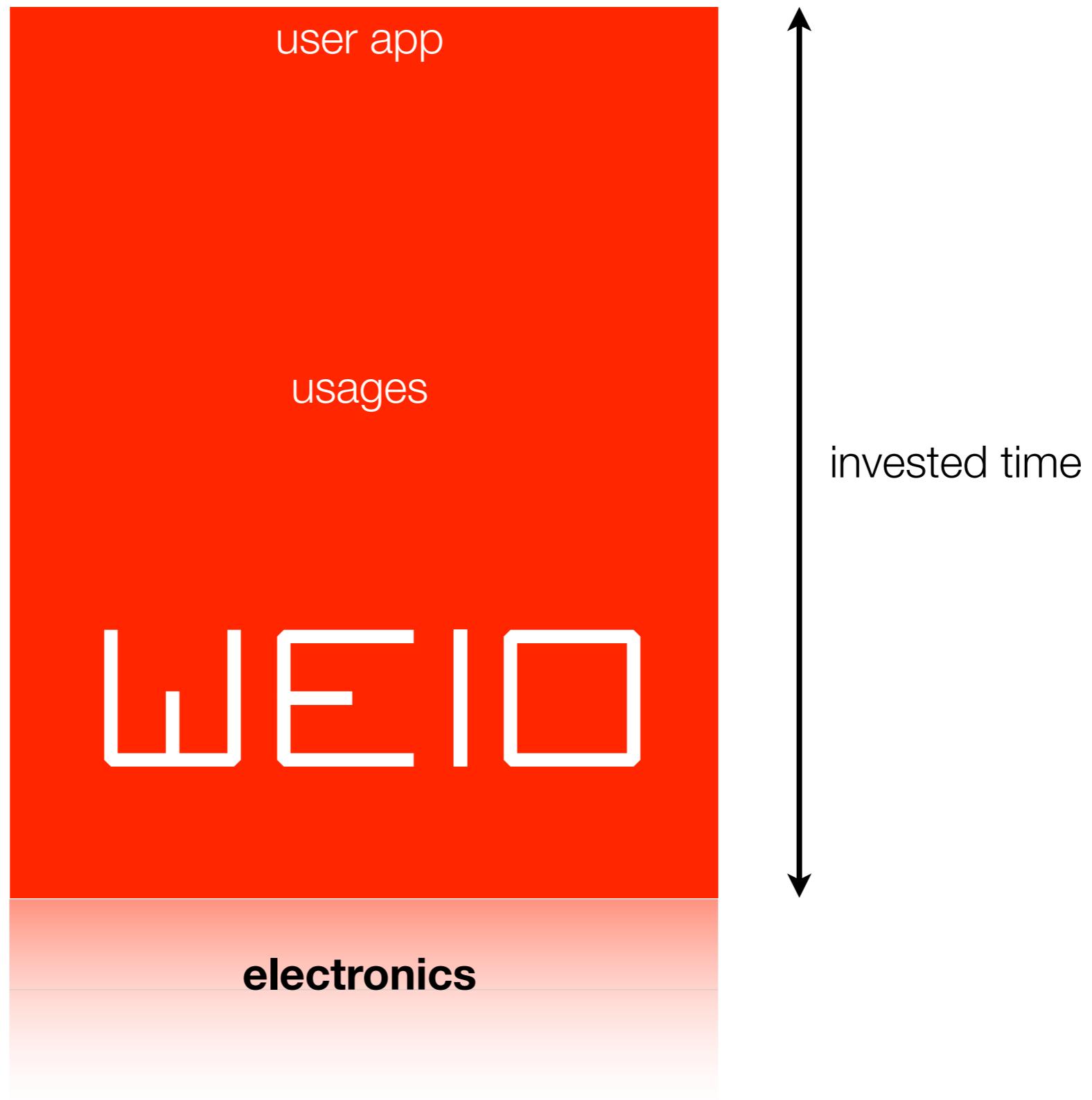
**WHO WILL LEARN
ALL OF THIS?**

here we go!
WEIO

We need new **friendly** and **desirable** interfaces that will connect **Web** directly to electronics. Thus people will think more **USAGE** than how to do something



Web language



We need new **graphical**
environment that will offer
possibility to make **rich**
user applications and new
graphical programming
tools and...

...it must be **zero** installation,
super **easy** configuration and
cross platform (**desktop** &
mobile) and...

... we must be able to possess
our development **tools** at any
time...

And it must be Open Source!

... and innovative **USAGES** will follow with **beautiful** interfaces once you have developed that environment

that environment is called Web.

What is
WEIO

Prototype, produce and
learn to make NéoObjects
only using the language of
the Web

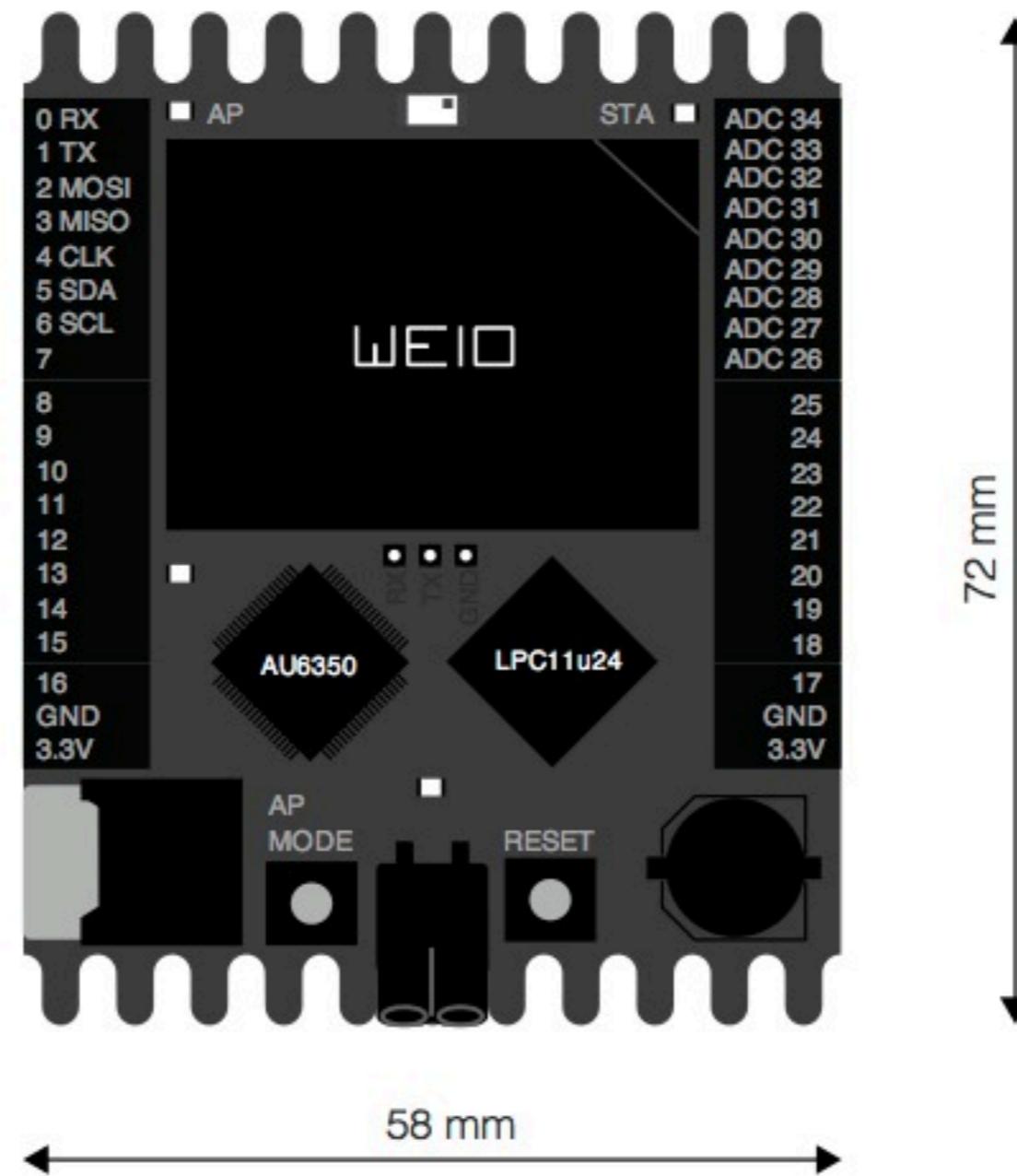
nodesign.net

How many of you know to
make simple Web site?

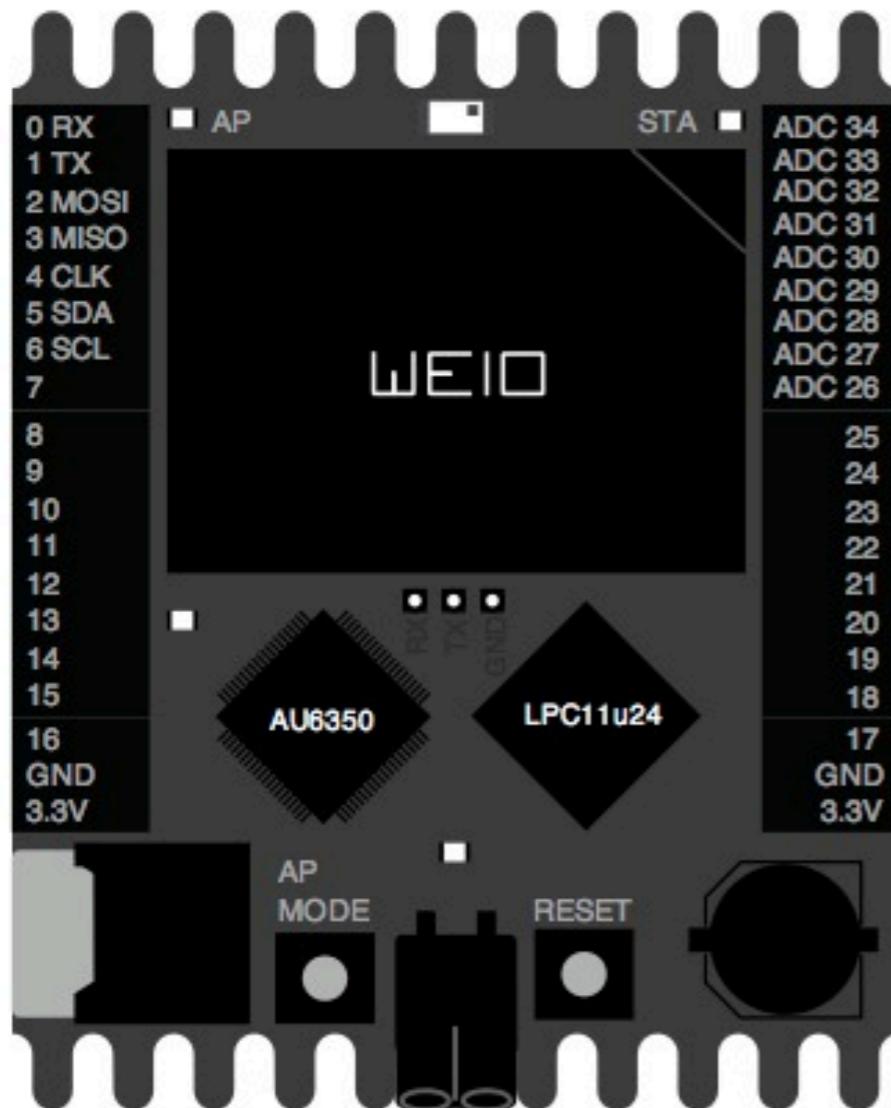
How many of you know to program hardware?

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All in one



Plug & Web
Web & Objects
Wireless & Less wires

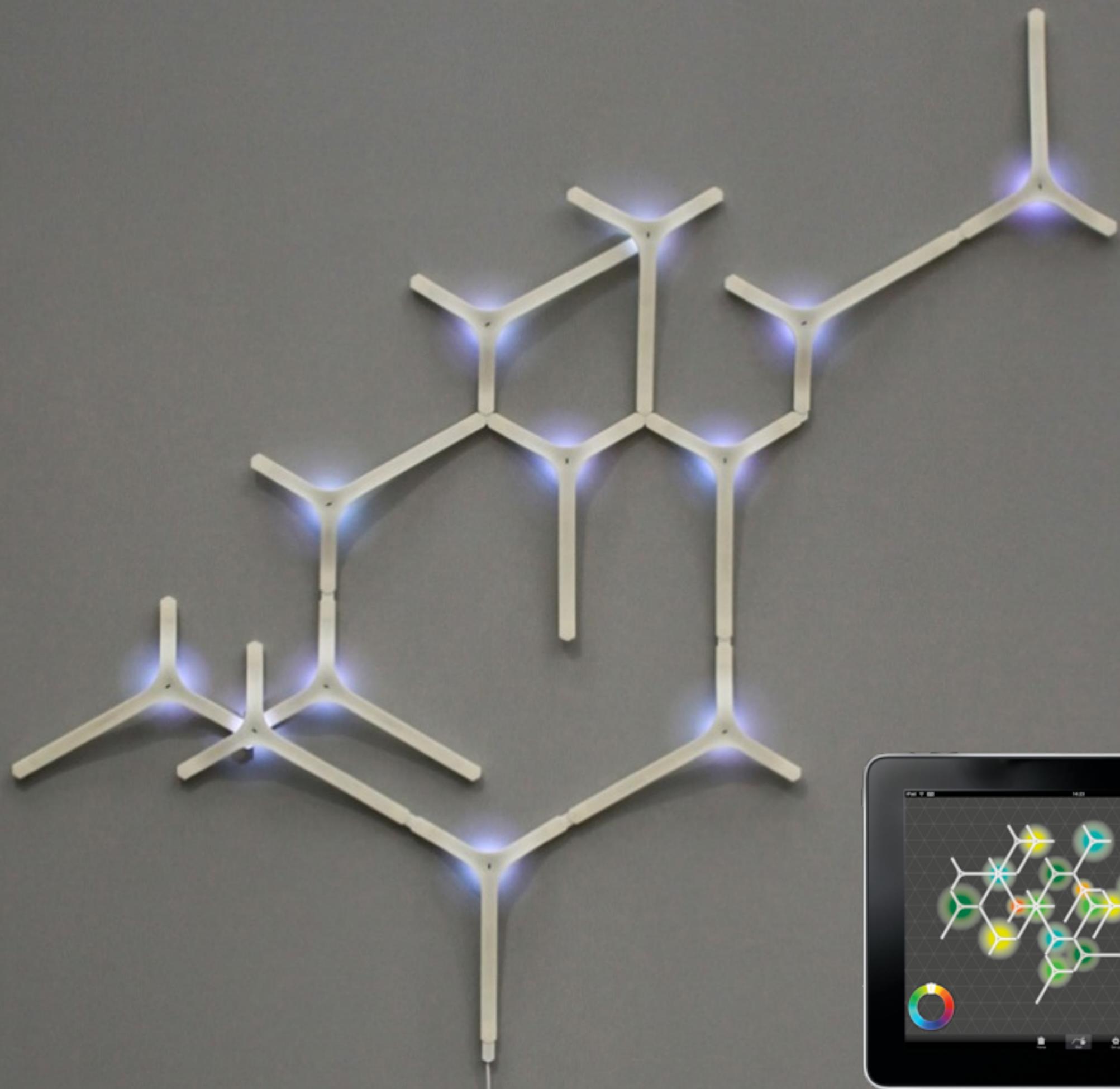
WeIO makes that each object has it's own web site, more precisely has it's own **WebApp**

Finally programing connected objects means making **WebApps** for your objects

What we make with Wel0 at *nodesign.net*

nodesign.net







<http://vimeo.com/59979841>

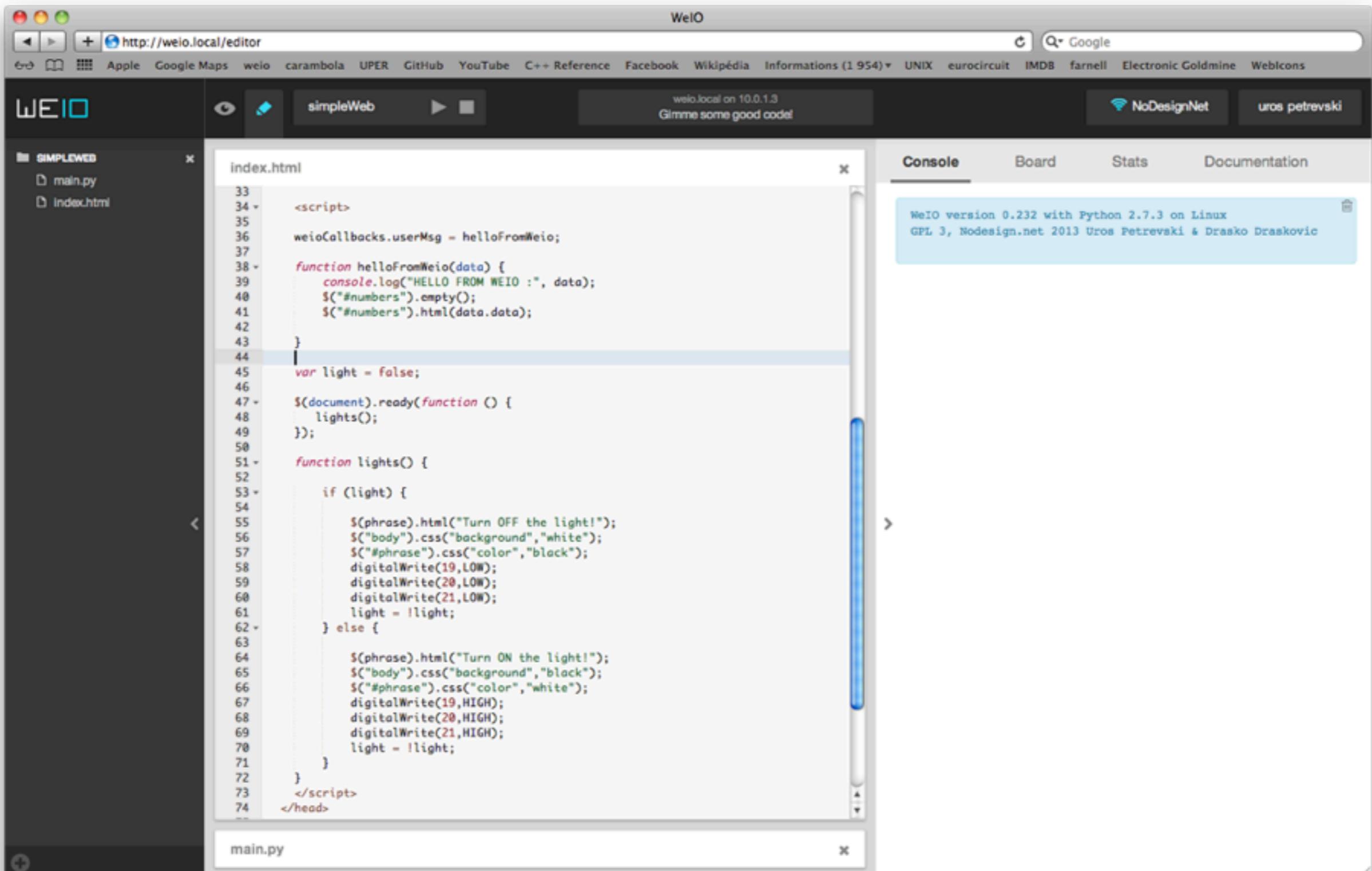
node
design.net



How Wel0 programming environment looks like?

nodesign.net





The screenshot shows the WeIO editor interface. The top bar displays the URL <http://weio.local/editor>. The main workspace contains two files: `index.html` and `main.py`.

index.html:

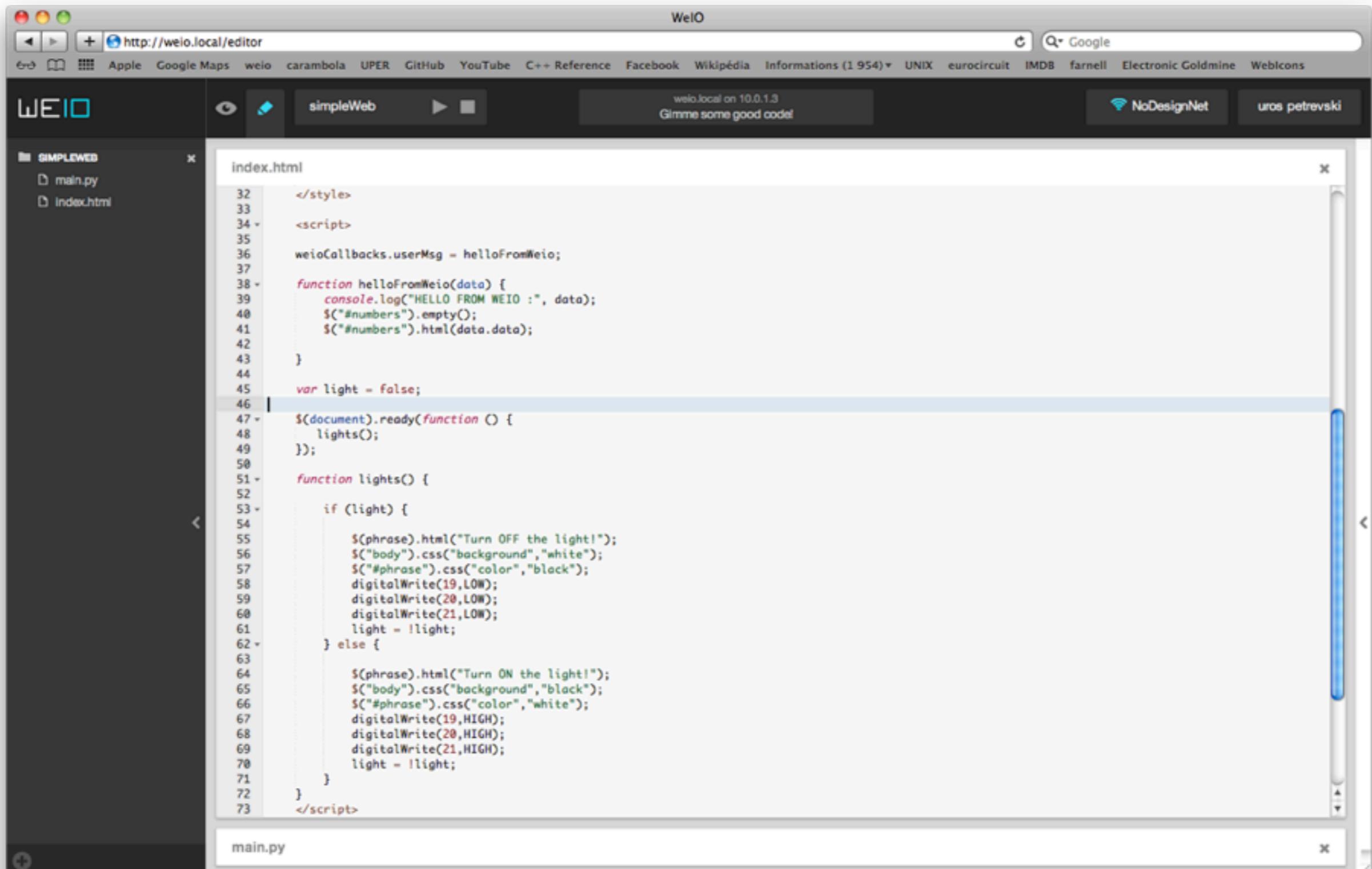
```
33<script>
34    weioCallbacks.userMsg = helloFromWeio;
35
36    function helloFromWeio(data) {
37        console.log("HELLO FROM WEIO :", data);
38        $("#numbers").empty();
39        $("#numbers").html(data.data);
40
41    }
42
43    var light = false;
44
45    $(document).ready(function () {
46        lights();
47    });
48
49    function lights() {
50
51        if (light) {
52
53            $("#phrase").html("Turn OFF the light!");
54            $("body").css("background", "white");
55            $("#phrase").css("color", "black");
56            digitalWrite(19,LOW);
57            digitalWrite(20,LOW);
58            digitalWrite(21,LOW);
59            light = !light;
60        } else {
61
62            $("#phrase").html("Turn ON the light!");
63            $("body").css("background", "black");
64            $("#phrase").css("color", "white");
65            digitalWrite(19,HIGH);
66            digitalWrite(20,HIGH);
67            digitalWrite(21,HIGH);
68            light = !light;
69        }
70    }
71
72}
73</script>
74</head>
```

main.py:

```
1# Import the WeIO library
2import weio
3
4# Set up pins
5pin19 = weio.DigitalOut(19)
6pin20 = weio.DigitalOut(20)
7pin21 = weio.DigitalOut(21)
```

The right side of the interface features a **Console** window displaying the message: "WeIO version 0.232 with Python 2.7.3 on Linux GPL 3, Nodesign.net 2013 Uros Petrevski & Drasko Drašković". Navigation tabs include **Board**, **Stats**, and **Documentation**.





WeIO

http://weio.local/editor

Apple Google Maps weio carambola UPER GitHub YouTube C++ Reference Facebook Wikipédia Informations (1 954) UNIX eurocircuit IMDB farnell Electronic Goldmine WebIcons

WEIO simpleWeb weio.local on 10.0.1.3 Gimme some good code!

NoDesignNet uros petrevski

SIMPLEWEB

index.html

```
32     </style>
33
34     <script>
35
36     weioCallbacks.userMsg = helloFromWeio;
37
38     function helloFromWeio(data) {
39         console.log("HELLO FROM WEIO :", data);
40         $("#numbers").empty();
41         $("#numbers").html(data.data);
42
43     }
44
45     var light = false;
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47     $(document).ready(function () {
48         lights();
49     });
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51     function lights() {
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53         if (light) {
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55             $(phrase).html("Turn OFF the light!");
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67             digitalWrite(19,HIGH);
68             digitalWrite(20,HIGH);
69             digitalWrite(21,HIGH);
70             light = !light;
71         }
72     }
73 </script>
```

main.py

WeIO

http://weio.local/editor

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WEIO simpleWeb weio.local on 10.0.1.3 Gimme some good code!

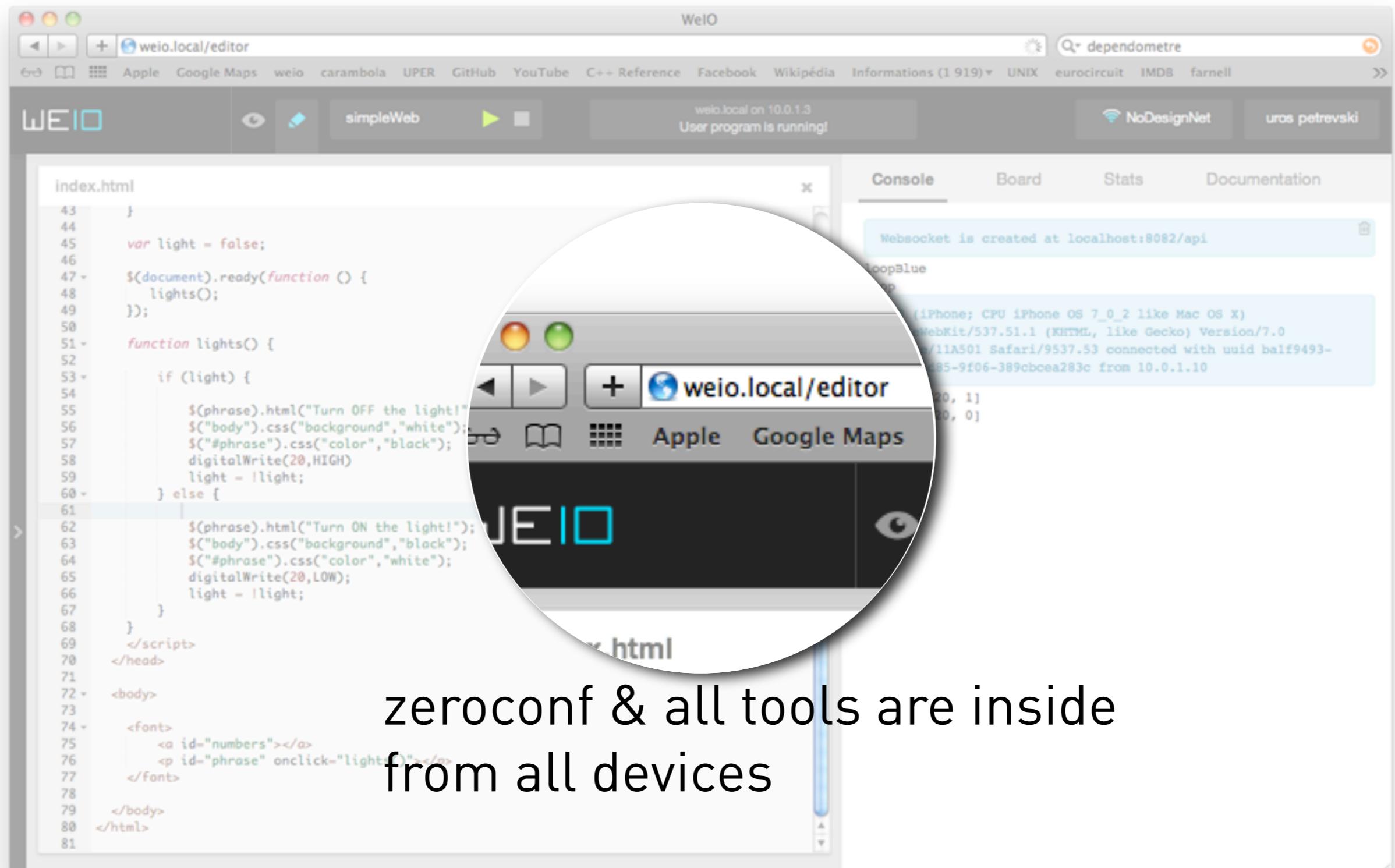
NoDesignNet uros petrevski

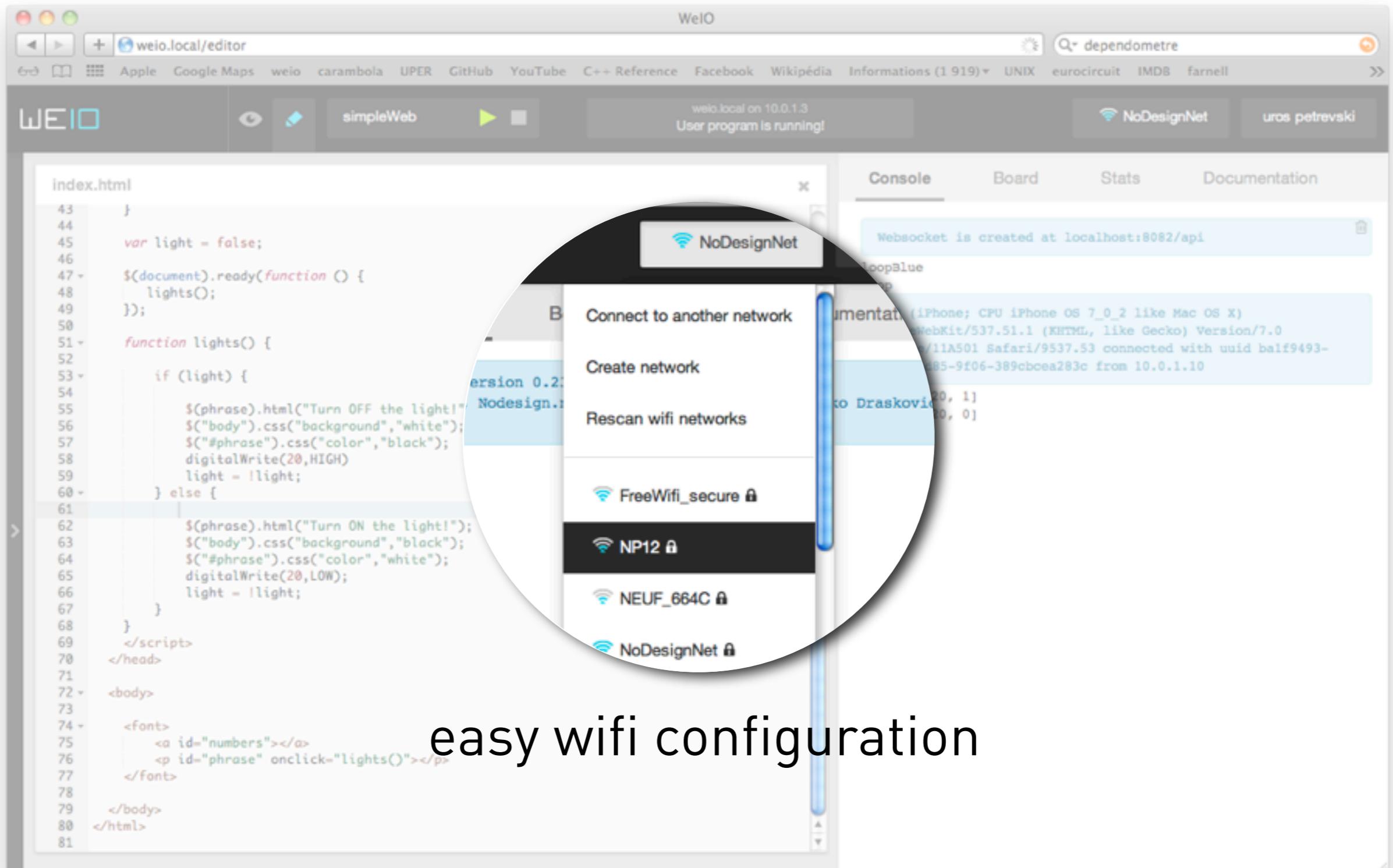
index.html

```
32 </style>
33
34 <script>
35
36 weioCallbacks.userMsg = helloFromWeio;
37
38 function helloFromWeio(data) {
39     console.log("HELLO FROM WEIO :", data);
40     $("#numbers").empty();
41     $("#numbers").html(data.data);
42 }
43
44 var light = false;
45
46 $(document).ready(function () {
47     lights();
48 });
49
50
51 function lights() {
52
53     if (light) {
54
55         $(phrase).html("Turn OFF the light!");
56         $("body").css("background","white");
57         $("#phrase").css("color","black");
58         digitalWrite(19,LOW);
59         digitalWrite(20,LOW);
60         digitalWrite(21,LOW);
61         light = !light;
62     } else {
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64         $(phrase).html("Turn ON the light!");
65         $("body").css("background","black");
66         $("#phrase").css("color","white");
67         digitalWrite(19,HIGH);
68         digitalWrite(20,HIGH);
69         digitalWrite(21,HIGH);
70         light = !light;
71     }
72 }
73 </script>
```

main.py







WeIO

weio.local/editor

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WEIO simpleWeb

weio.local on 10.0.1.3
User program is running!

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Console Board Stats Documentation

index.html

```
43      }
44      var light = false;
45
46      $(document).ready(function () {
47          lights();
48      });
49
50      function lights() {
51          if (light) {
52              $("#phrase").html("Turn OFF the light!");
53              $("body").css("background", "white");
54              $("#phrase").css("color", "black");
55              digitalWrite(20,HIGH)
56              light = !light;
57          } else {
58              $("#phrase").html("Turn ON the light!");
59              $("body").css("background", "black");
60              $("#phrase").css("color", "white");
61              digitalWrite(20,LOW);
62              light = !light;
63          }
64      }
65      </script>
66  </head>
67
68  <body>
69
70      <Font>
71          <a id="numbers"></a>
72          <p id="phrase" onclick="lights()"></p>
73      </Font>
74
75  </body>
76 </html>
77
```

NoDesignNet

Connect to another network

Create network

Rescan wifi networks

FreeWifi_secure

NP12

NEUF_664C

NoDesignNet

easy wifi configuration

websocket is created at localhost:8082/api

loopBlue

Documentation (iPhone; CPU iPhone OS 7_0_2 like Mac OS X) AppleWebKit/537.51.1 (KHTML, like Gecko) Version/7.0

/11A501 Safari/9537.53 connected with uid balf9493-185-9f06-389cbcea283c from 10.0.1.10

to Draskovic [20, 1]

[0, 0]

nodesign.net

WeIO

weio.local/editor

Apple Google Maps weio carambola UPER GitHub YouTube C++ Reference Facebook Wikipédia Informations (1 919) UNIX eurocircuit IMDB farnell

WEIO simpleWeb weio.local on 10.0.1.3 User program is running!

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index.html

```

43      }
44
45      var light = false;
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47      $(document).ready(function () {
48          lights();
49      });
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51      function lights() {
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53          if (light) {
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55              $("#phrase").html("Turn OFF the light!");
56              $("body").css("background", "white");
57              $("#phrase").css("color", "black");
58              digitalWrite(20,HIGH)
59              light = !light;
60      } else {
61
62              $("#phrase").html("Turn ON the light!");
63              $("body").css("background", "black");
64              $("#phrase").css("color", "white");
65              digitalWrite(20,LOW);
66              light = !light;
67      }
68  
```

Board

Console Board Stats Documentation

Websocket is created at localhost:8082/api

loopBlue

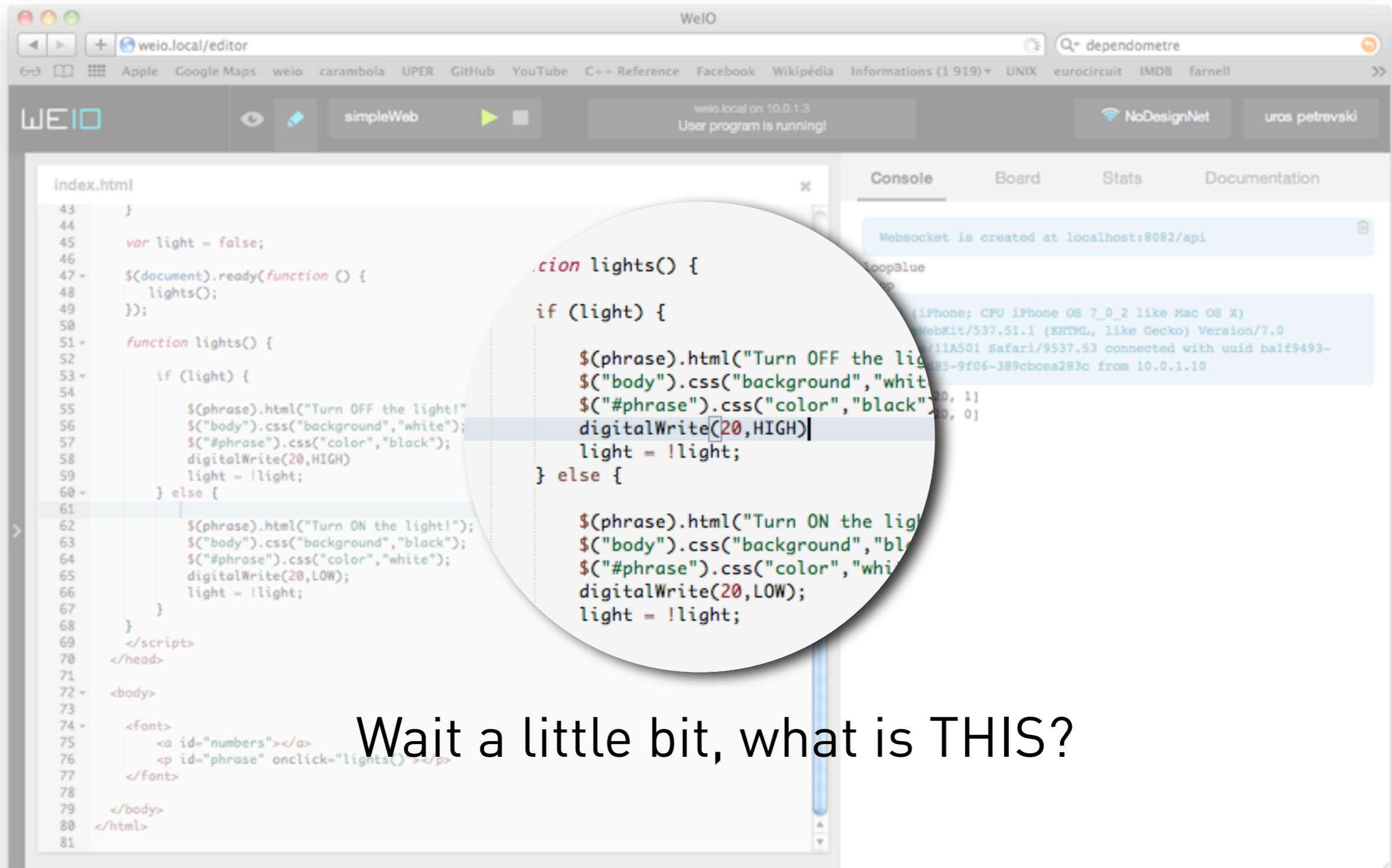
loop

5.0 (iPhone; CPU iPhone OS 7_0_2 like Mac OS X) AppleWebKit/537.51.1 (KHTML, like Gecko) Version/7.0 Mobile/11A501 Safari/9537.53 connected with uuid balf9493-8a86-4d85-9f06-389cbcea283c from 10.0.1.10

FROM JS [20, 1]

FROM JS [20, 0]

see who is connecting and when



WeIO

weio.local/editor

WEIO simpleWeb weio.local on 10.0.1.3 User program is running!

NoDesignNet uros petrevski

Console Board Stats Documentation

index.html

```
43      }
44      var light = false;
45
46      $(document).ready(function () {
47          lights();
48      });
49
50      function lights() {
51          if (light) {
52              $(phrase).html("Turn OFF the light!");
53              $("body").css("background", "white");
54              $("#phrase").css("color", "black");
55              digitalWrite(20,HIGH);
56              light = !light;
57          } else {
58              $(phrase).html("Turn ON the light!");
59              $("body").css("background", "black");
60              $("#phrase").css("color", "white");
61              digitalWrite(20,LOW);
62              light = !light;
63          }
64      }
65      </script>
66  </head>
67
68  <body>
69
70      <Font>
71          <a id="numbers"></a>
72          <p id="phrase" onclick="lights();"></p>
73      </Font>
74
75  </body>
76 </html>
77
```

.action lights() {
 if (light) {
 \$(phrase).html("Turn OFF the light!");
 \$("body").css("background", "white");
 \$("#phrase").css("color", "black");
 digitalWrite(20, HIGH);
 light = !light;
 } else {
 \$(phrase).html("Turn ON the light!");
 \$("body").css("background", "black");
 \$("#phrase").css("color", "white");
 digitalWrite(20, LOW);
 light = !light;
 }
}

WebSocket is created at localhost:8082/api
loopBlue
(iPhone; CPU iPhone OS 7_0_2 like Mac OS X)
WebKit/537.51.1 (KHTML, like Gecko) Version/7.0
11A501 Safari/9537.53 connected with uuid balf9493-
85-9f06-389cbcea283c from 10.0.1.10

Wait a little bit, what is THIS?

```
if (light) {  
  
    $(phrase).html("Turn OFF the light!");  
    $("body").css("background", "white");  
    $("#phrase").css("color", "black");  
    digitalWrite(19,LOW);  
    digitalWrite(20,LOW);  
    digitalWrite(21,LOW);  
    light = !light;  
} else {  
  
    $(phrase).html("Turn ON the light!");  
    $("body").css("background", "black");  
    $("#phrase").css("color", "white");  
    digitalWrite(19,HIGH);  
    digitalWrite(20,HIGH);  
    digitalWrite(21,HIGH);  
    light = !light;  
}
```

We are driving electronics
directly from HTML/Javascript
and from any device!

and of course with Arduino
compatible API



And you will be ready to
program really rich web apps.

WeIO natively supports
jQuery, Bootstrap and ChartJS

but you can add whatever you
want as library

but that's not all...

The screenshot shows the WEIO software interface. On the left is a code editor with the file 'index.html' open, containing JavaScript code for controlling a light via a web interface. On the right is a visualization of the WEIO board, showing digital pins (D0-D25) and analog pins (A0-A3), along with other components like a microcontroller chip and push buttons.

```
index.html
43 }
44
45 var light = false;
46
47 $(document).ready(function () {
48   lights();
49 });
50
51 function lights() {
52   if (light) {
53     $('#phrase').html("Turn OFF the light!");
54     $('body').css("background", "white");
55     $('#phrase').css("color", "black");
56     digitalWrite(28,HIGH);
57     light = !light;
58   } else {
59     $('#phrase').html("Turn ON the light!");
60     $('body').css("background", "black");
61     $('#phrase').css("color", "white");
62     digitalWrite(28,LOW);
63     light = !light;
64   }
65 }
66 </script>
67 </head>
68
69 <body>
70   <font>
71     <ul id="numbers"></ul>
72     <p id="phrase" onclick="lights()></p>
73   </font>
74
75 </body>
76 </html>
77
```

Visualize in realtime what are you doing with inputs and outputs at each moment

The screenshot shows the WEIO software interface with the 'Stats' tab selected. It displays real-time system statistics: CPU usage (9% user, 9% system, 81% idle), RAM usage (46.5MB used, 15.3MB free), and Flash usage (2.5Mb used, 4.6Mb free).

Cpu	9%	9%	81%
user			
system			
idle			

Ram	46.5MB	15.3Mb
used		
free		

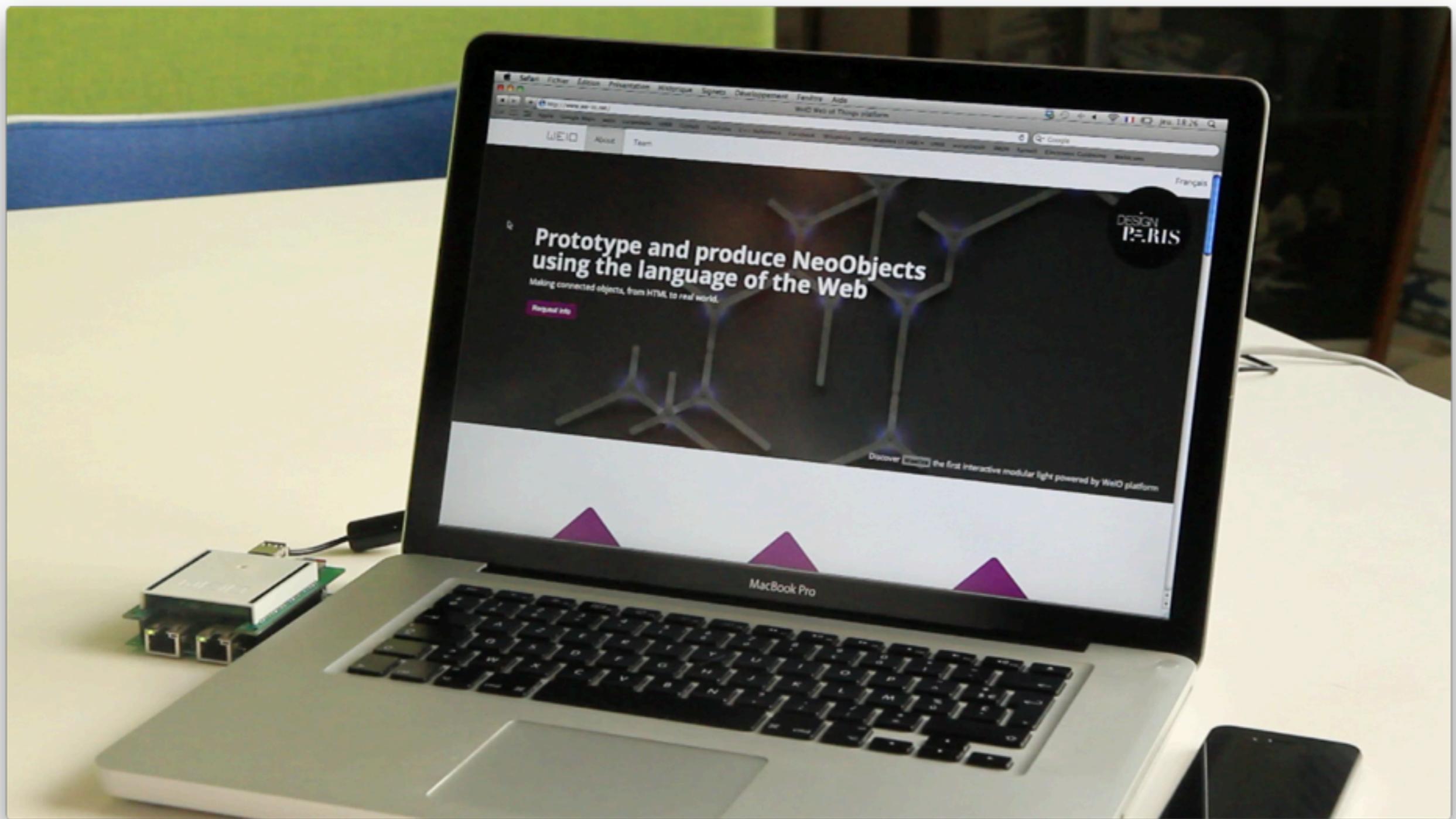
Flash	2.5Mb	4.6Mb
used		
free		

Visualize in realtime what is happening in OS and your program



What WYSIWYG is to press,
WeIO is to programming
connected objects

WeIO “Hello world!” WebApp

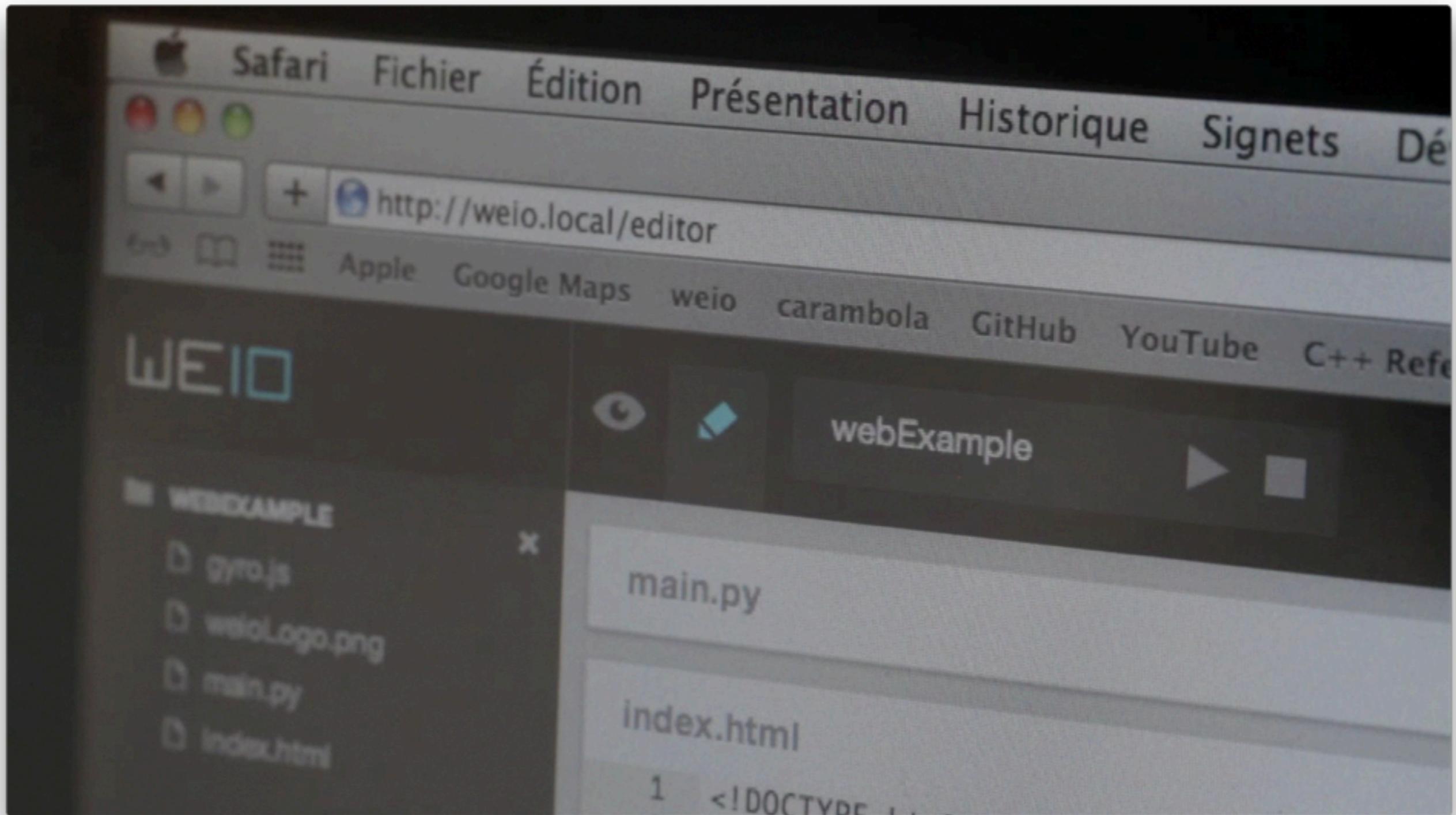


<http://vimeo.com/76410801>

nodesign.net



You said connected objects?



<http://vimeo.com/75567901>



What if I want
something that is
standalone?

Well, do it in Python!

WeIO

http://weio.local/editor

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WEIO pwmTest weio.local on 10.0.1.3 User program is running!

main.py

```
1 from weioLib.weioGpio import WeioGpio
2 from weioLib.weioUserApi import attach, shared
3 import time
4
5 def setup() :
6     attach.process(loop)
7
8 def loop() :
9     weio = shared.gpio
10    while True:
11        print "fade in"
12        for i in xrange(0,255,5):
13            weio.pwmWrite(19,i)
14            weio.pwmWrite(20,i)
15            weio.pwmWrite(21,i)
16            time.sleep(0.03)
17        print "fade out"
18        for i in xrange(0,255,5):
19            weio.pwmWrite(19,255-i)
20            weio.pwmWrite(20,255-i)
21            weio.pwmWrite(21,255-i)
22            time.sleep(0.03)
```

Console

Board

Websocket is created at local

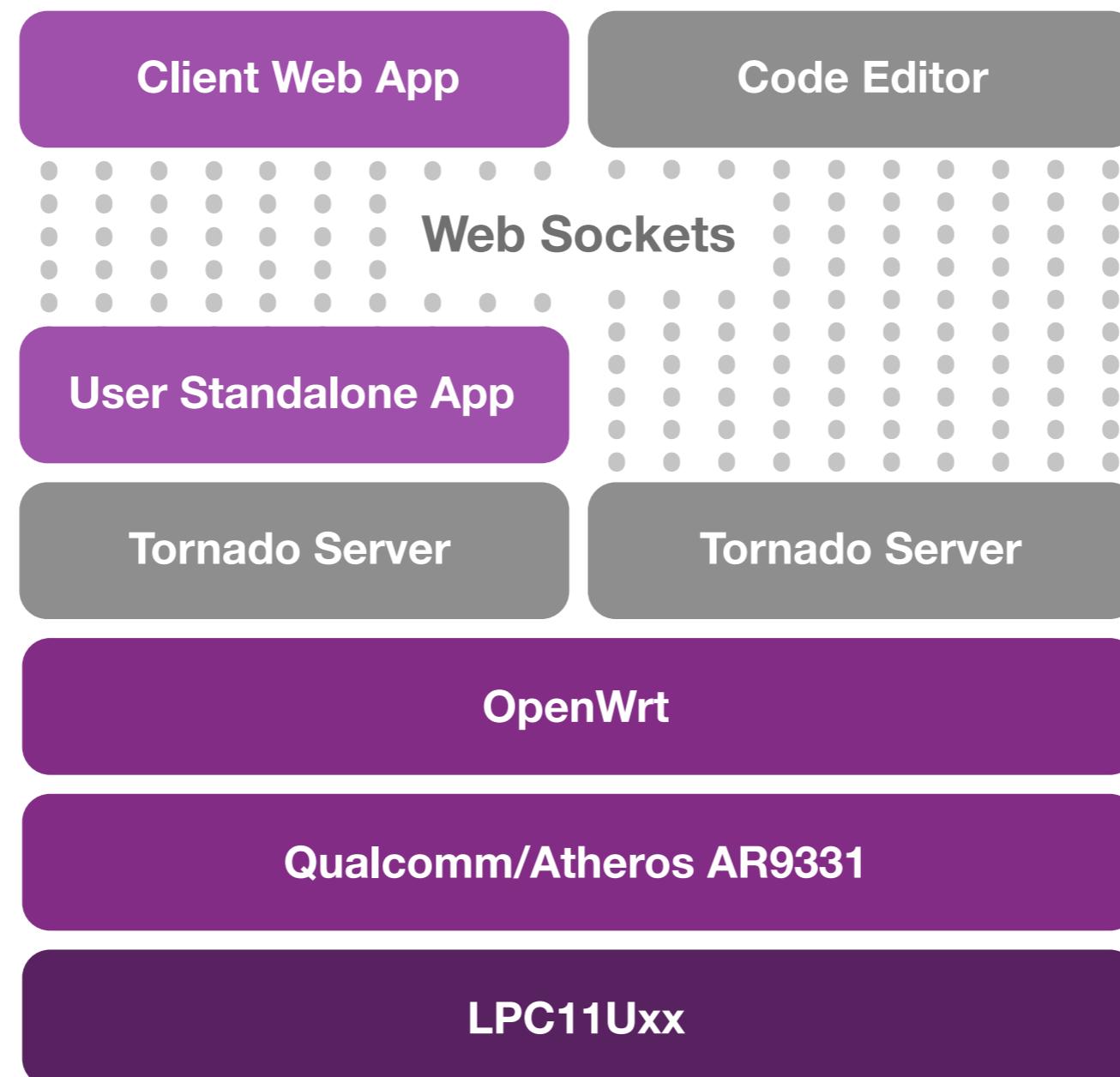
loop
fade in
fade out
fade in



Future of
programming
microcontrollers is
in interpreted
languages

No more
compiling,
crosscompiling,
lost months of
setting up tools...

WeIO is NOT a toy!



Create,
innovate,
learn!

WEIO

is Open source and
Open hardware
project