Day 6-1

Assignment:

Keep working on labs

Today's Topics:

Projects

Graphical Frontends

Bonescript RPC (again)

Node-Red

03-1 Graphical Frontend via BoneScript RPC

HOW TO ADD A PRETTY FACE VIA A WEB BROWSER

Ways to Add Graphics

ncurses (http://www.gnu.org/software/ncurses/)

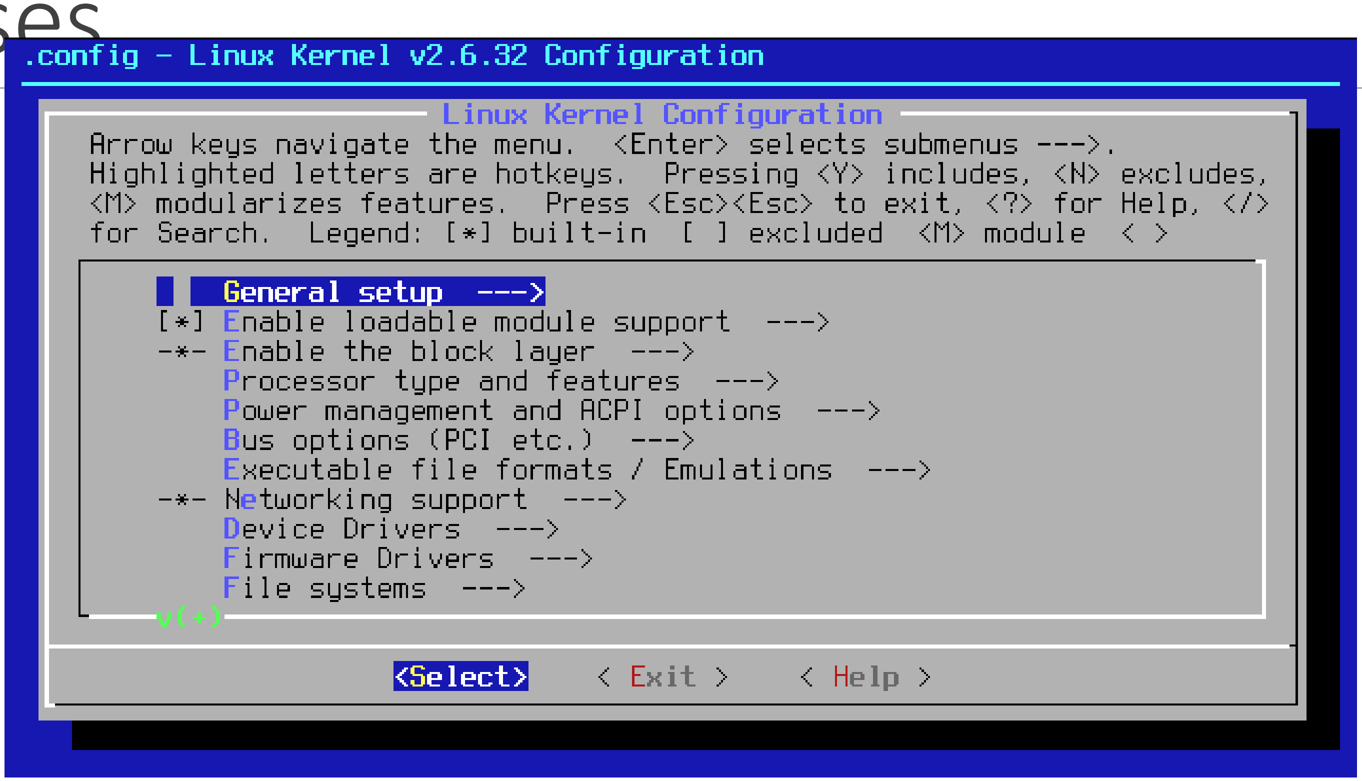
X Window System (http://www.x.org/wiki/)

Qt (http://qt.digia.com/) both X-based and embedded

Web server

- BoneScipt RPC

ncurses



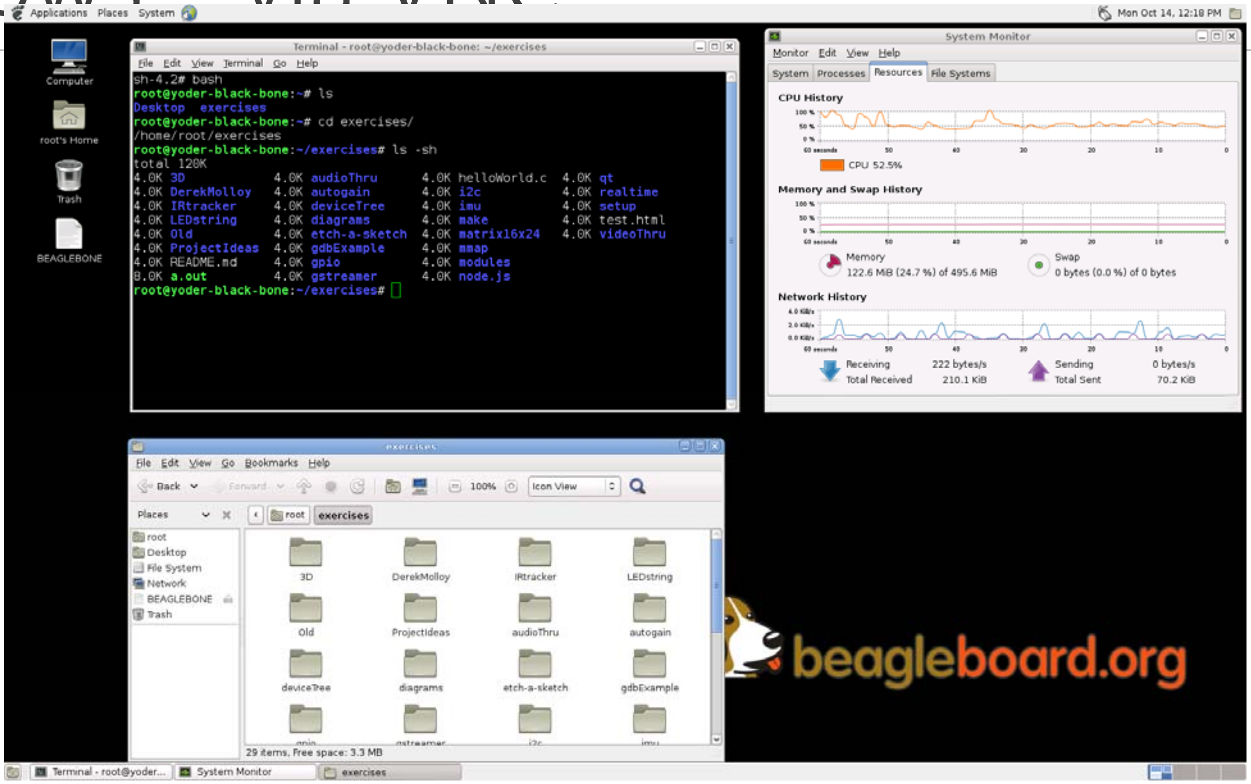
```
.config - Linux Kernel v2.6.32 Configuration
                    Linux Kernel Configuration
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for Help, </>
  for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < >

          General setup  --->
      [*] Enable loadable module support  --->
      -*- Enable the block layer  --->
          Processor type and features  --->
          Power management and ACPI options  --->
          Bus options (PCI etc.)  --->
          Executable file formats / Emulations  --->
      -*- Networking support  --->
          Device Drivers  --->
          Firmware Drivers  --->
          File systems  --->
      v(+)

              <Select>    < Exit >    < Help >
```

http://en.wikipedia.org/wiki/File:Linux-menuconfig.png

X Windows – via VNC



```
sh-4.2# bash
root@yoder-black-bone:~# ls
Desktop  exercises
root@yoder-black-bone:~# cd exercises/
/home/root/exercises
root@yoder-black-bone:~/exercises# ls -sh
total 120K
4.0K 3D           4.0K audioThru     4.0K helloWorld.c  4.0K qt
4.0K DerekMolloy  4.0K autogain      4.0K i2c           4.0K realtime
4.0K IRtracker    4.0K deviceTree    4.0K imu           4.0K setup
4.0K LEDstring    4.0K diagrams      4.0K make          4.0K test.html
4.0K Old          4.0K etch-a-sketch 4.0K matrix16x24   4.0K videoThru
4.0K ProjectIdeas 4.0K gdbExample    4.0K mmap
4.0K README.md    4.0K gpio          4.0K modules
8.0K a.out        4.0K gstreamer     4.0K node.js
root@yoder-black-bone:~/exercises# 
```

CPU 52.5%

Memory
122.6 MiB (24.7 %) of 495.6 MiB

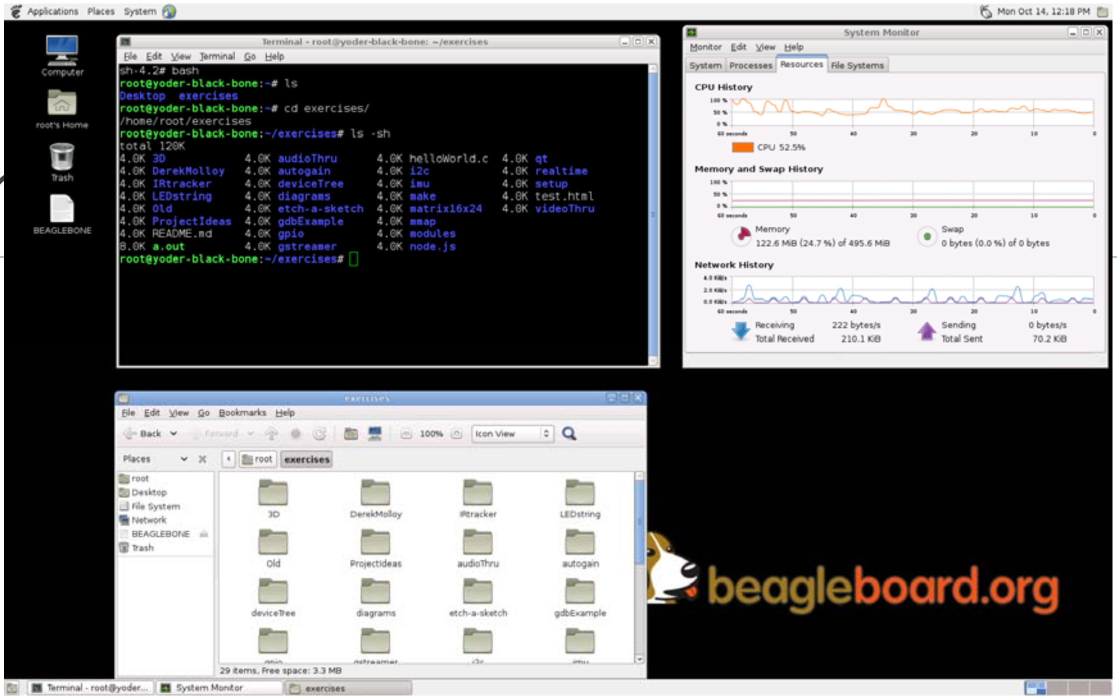
Swap
0 bytes (0.0 %) of 0 bytes

Receiving 222 bytes/s
Total Received 210.1 KiB

Sending 0 bytes/s
Total Sent 70.2 KiB

29 items, Free space: 3.3 MB

X Wi


Applications Places System
Mon Oct 14, 12:18 PM
Computer
root's Home
Trash
BEAGLEBONE
Terminal - root@yoder-black-bone: ~/exercises
File Edit View Terminal Go Help
System Monitor
Monitor Edit View Help
System Processes Resources File Systems
CPU History
CPU 52.5%
Memory and Swap History
Memory
122.6 MiB (24.7 %) of 495.6 MiB
Swap
0 bytes (0.0 %) of 0 bytes
Network History
Receiving 222 bytes/s
Total Received 210.1 KiB
Sending 0 bytes/s
Total Sent 70.2 KiB
exercises
File Edit View Go Bookmarks Help
Back Forward 100% Icon View
Places
root
Desktop
File System
Network
BEAGLEBONE
Trash
root exercises
3D DerekMolloy IRtracker LEDstring
Old ProjectIdeas audioThru autogain
deviceTree diagrams etch-a-sketch gdbExample
29 items, Free space: 3.3 MB
beagleboard.org
Terminal - root@yoder... System Monitor exercises

```
sh-4.2# bash
root@yoder-black-bone:~# ls
Desktop  exercises
root@yoder-black-bone:~# cd exercises/
/home/root/exercises
root@yoder-black-bone:~/exercises# ls -sh
total 120K
4.0K 3D           4.0K audioThru      4.0K helloWorld.c  4.0K qt
4.0K DerekMolloy  4.0K autogain       4.0K i2c           4.0K realtime
4.0K IRtracker    4.0K deviceTree     4.0K imu           4.0K setup
4.0K LEDstring    4.0K diagrams       4.0K make          4.0K test.html
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4.0K ProjectIdeas 4.0K gdbExample     4.0K mmap
4.0K README.md    4.0K gpio           4.0K modules
8.0K a.out        4.0K gstreamer      4.0K node.js
root@yoder-black-bone:~/exercises# 
```
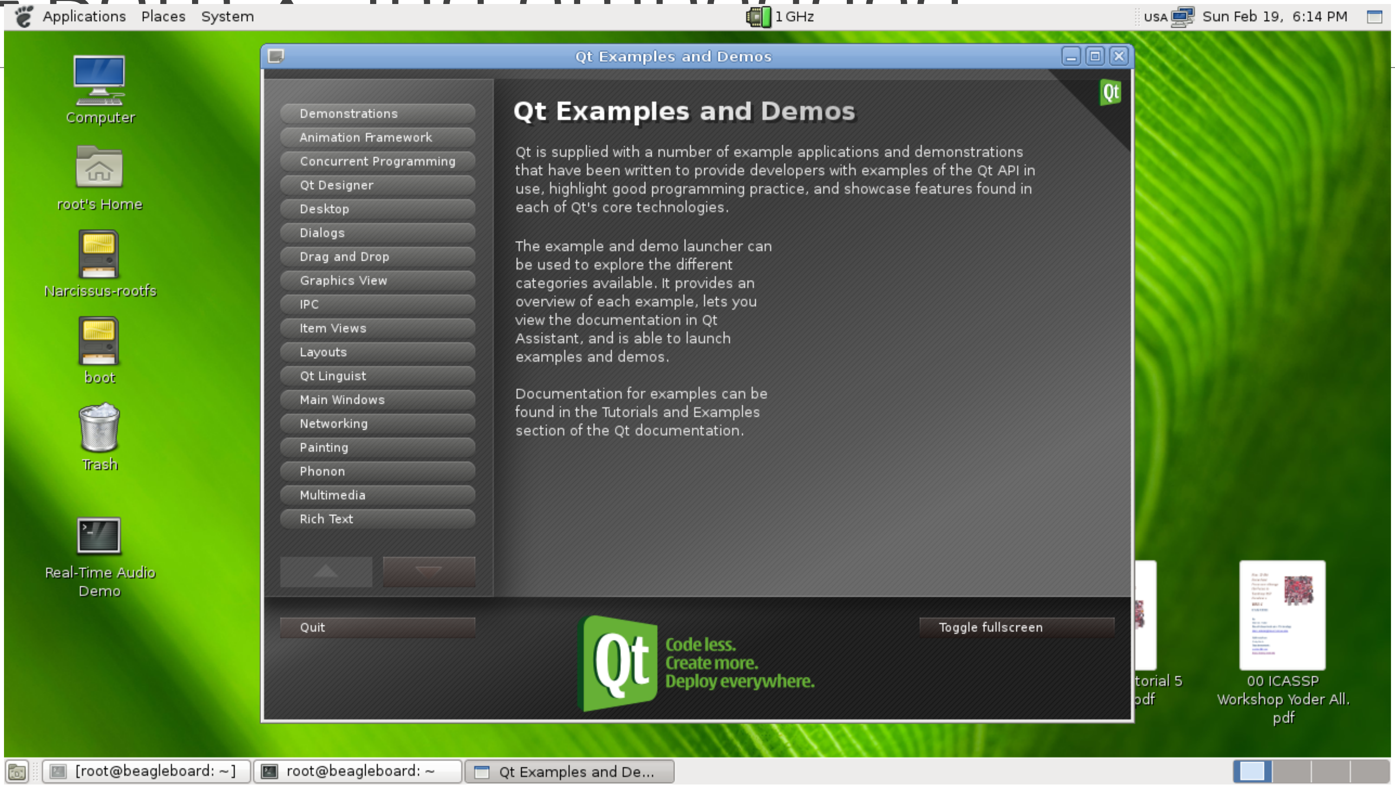

```
bone$ su debian –c tightvncserver
```

Run vnc client and connect to 192.168.7.2:5901

Don’t run as root

Default port

Qt – Both X and embedded



Qt Examples and Demos

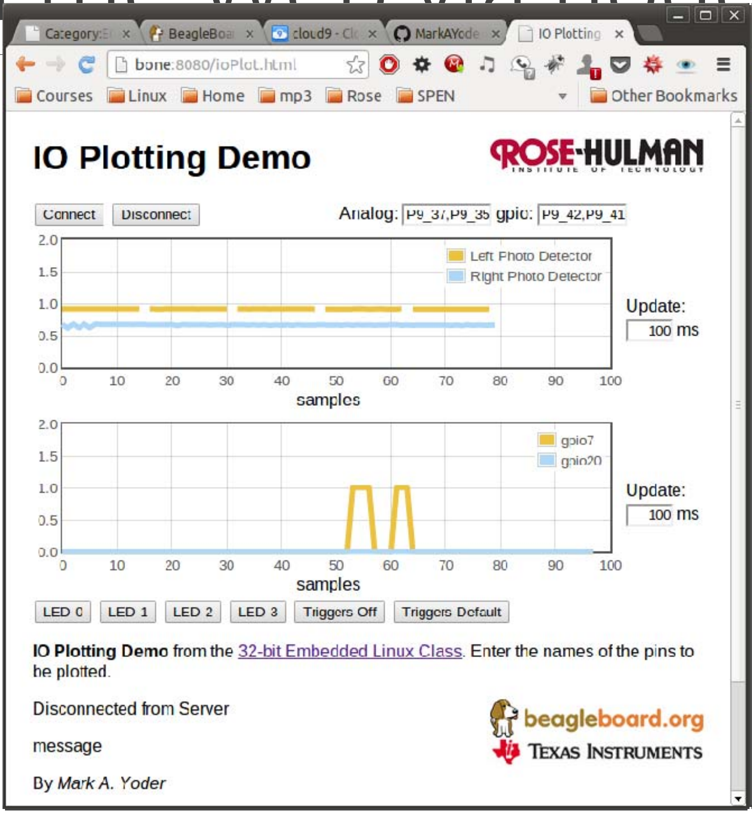
Qt is supplied with a number of example applications and demonstrations that have been written to provide developers with examples of the Qt API in use, highlight good programming practice, and showcase features found in each of Qt's core technologies.

The example and demo launcher can be used to explore the different categories available. It provides an overview of each example, lets you view the documentation in Qt Assistant, and is able to launch examples and demos.

Documentation for examples can be found in the Tutorials and Examples section of the Qt documentation.

```
$ apt-get install qt4-demos
$ qtdemo
```

Via the Web via node.js



IO Plotting Demo

Analog: P9_37,P9_35 gpio: P9_42,P9_41

Update: 100 ms

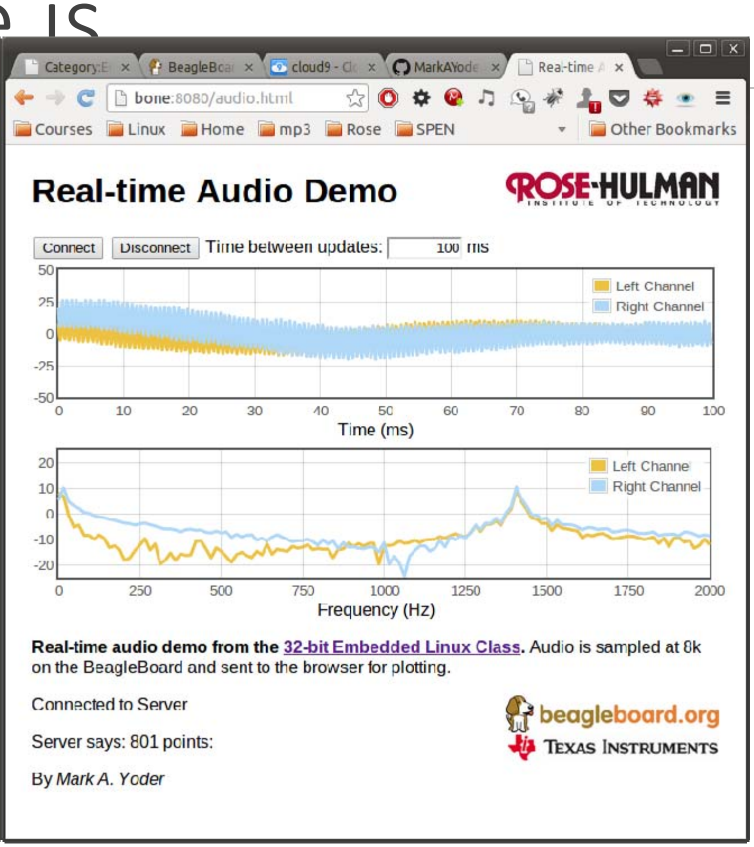
Update: 100 ms

IO Plotting Demo from the 32-bit Embedded Linux Class. Enter the names of the pins to be plotted.

Disconnected from Server

message

By *Mark A. Yoder*



Real-time Audio Demo

Time between updates: 100 ms

Real-time audio demo from the 32-bit Embedded Linux Class. Audio is sampled at 8k on the BeagleBoard and sent to the browser for plotting.

Connected to Server

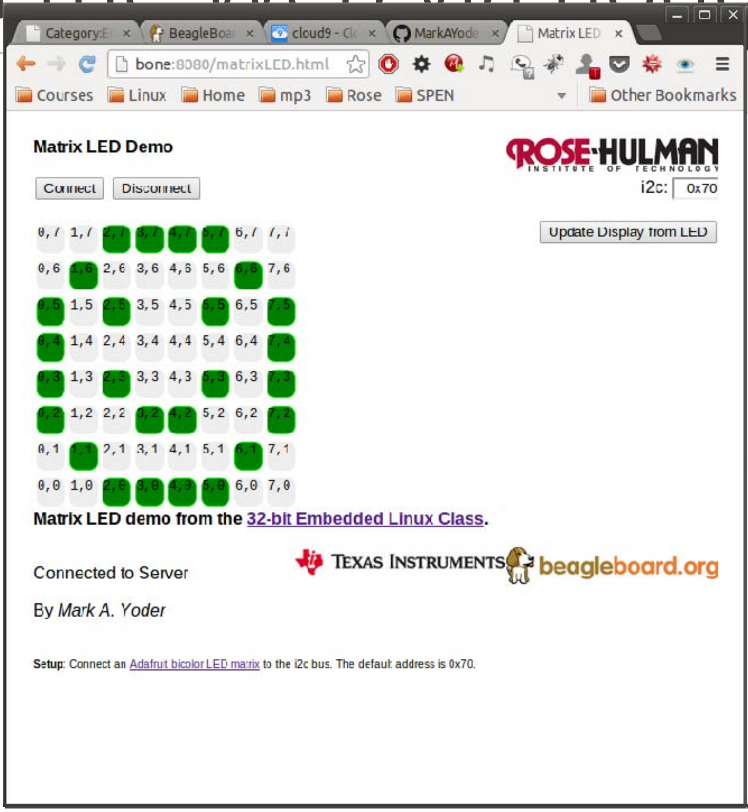
Server says: 801 points:

By *Mark A. Yoder*

```
bone$ cd ~/exercises/realtime
bone$ ./boneServer.js
```

Browse to 192.168.7.2:9090

Via the Web via node.js



Matrix LED Demo

Connect Disconnect

i2c: 0x70

Update Display from LED

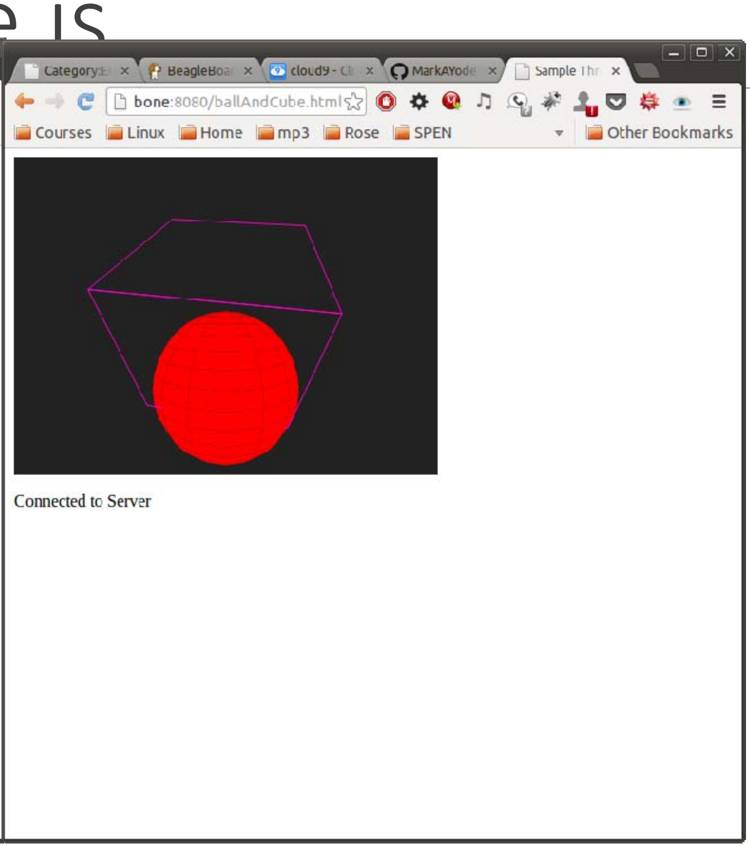
0,7	1,7	🟩 2,7	🟩 3,7	🟩 4,7	🟩 5,7	6,7	7,7
0,6	🟩 1,6	2,6	3,6	4,6	5,6	🟩 6,6	7,6
🟩 0,5	1,5	🟩 2,5	3,5	4,5	🟩 5,5	6,5	🟩 7,5
🟩 0,4	1,4	2,4	3,4	4,4	5,4	6,4	🟩 7,4
🟩 0,3	1,3	🟩 2,3	3,3	4,3	🟩 5,3	6,3	🟩 7,3
🟩 0,2	1,2	2,2	🟩 3,2	🟩 4,2	5,2	6,2	🟩 7,2
0,1	🟩 1,1	2,1	3,1	4,1	5,1	🟩 6,1	7,1
0,0	1,0	🟩 2,0	🟩 3,0	🟩 4,0	🟩 5,0	6,0	7,0

Matrix LED demo from the 32-bit Embedded Linux Class.

Connected to Server

By *Mark A. Yoder*

Setup: Connect an Adafruit bicolor LED matrix to the i2c bus. The default address is 0x70.



Connected to Server

```
bone$ cd ~/exercises/realtime
bone$ ./boneServer.js
```

Ways to Add Graphics

ncurses (http://www.gnu.org/software/ncurses/)

X Window System (http://www.x.org/wiki/)

Qt (http://qt.digia.com/) both X-based and embedded

Web server

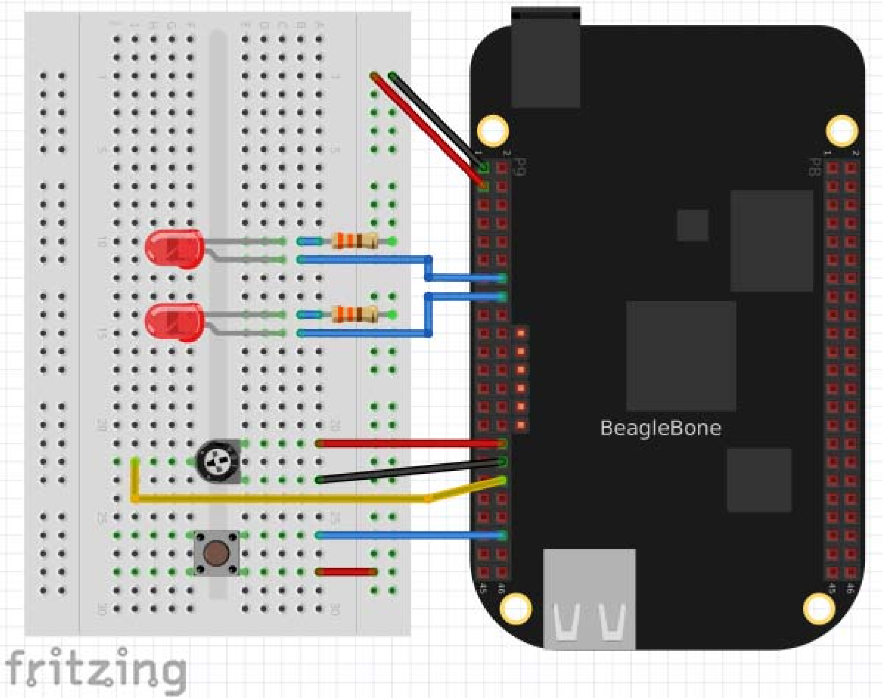
- BoneScipt RPC

Connecting physical to the web

Now that

- The Bone is on the network and
- You know how to read switches and blink LEDs

It’s easy to have a web page read your Bone

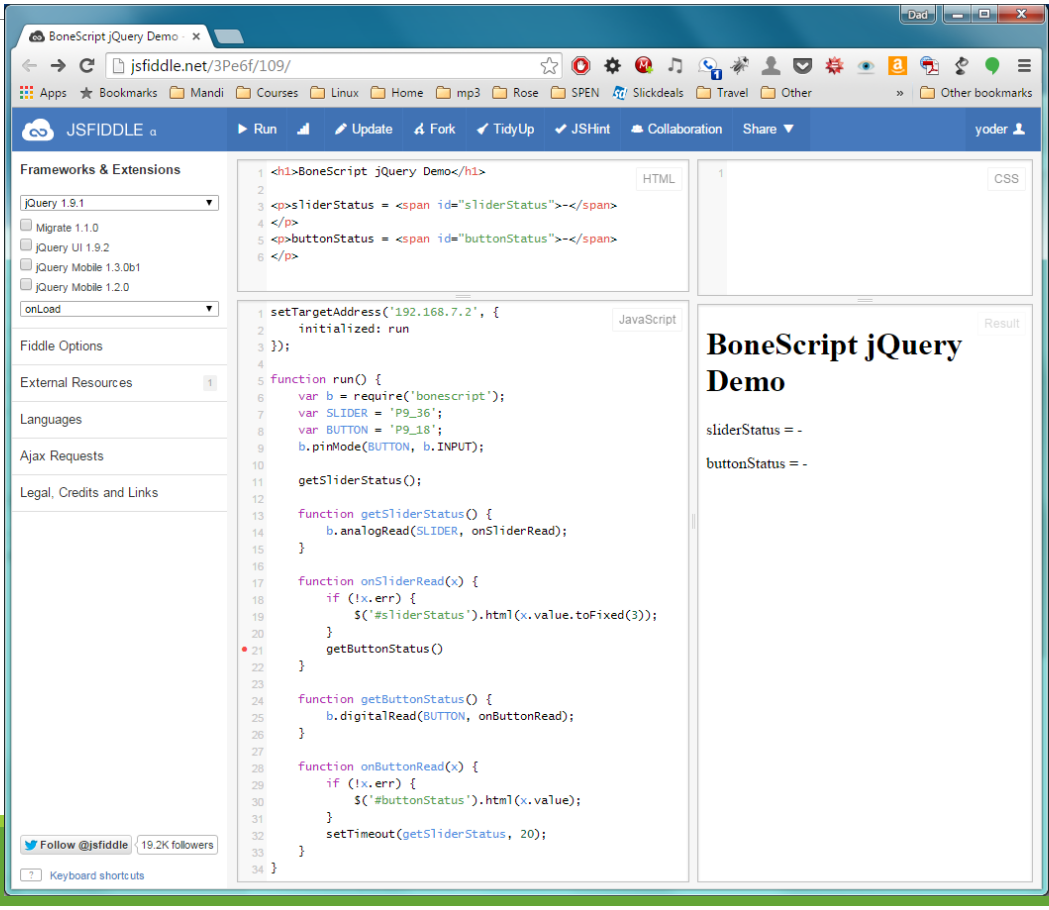


jsfiddle

Jsfiddle is a site for fiddling with your JavaScript

For example: http://jsfiddle.net/3Pe6f/109/

Before!



jQuery 1.9.1

□ Migrate 1.1.0
□ jQuery UI 1.9.2
□ jQuery Mobile 1.3.0b1
□ jQuery Mobile 1.2.0

onLoad

```html
<h1>BoneScript jQuery Demo</h1>

<p>sliderStatus = <span id="sliderStatus">-</span>
</p>
<p>buttonStatus = <span id="buttonStatus">-</span>
</p>
```

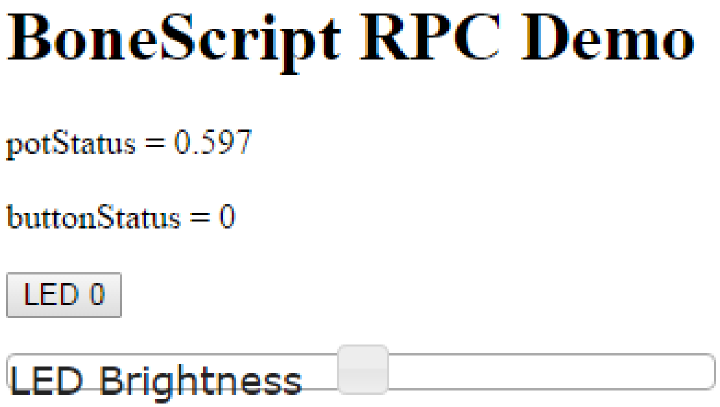
```javascript
setTargetAddress('192.168.7.2', {
    initialized: run
});

function run() {
    var b = require('bonescript');
    var SLIDER = 'P9_36';
    var BUTTON = 'P9_18';
    b.pinMode(BUTTON, b.INPUT);

    getSliderStatus();

    function getSliderStatus() {
        b.analogRead(SLIDER, onSliderRead);
    }

    function onSliderRead(x) {
        if (!x.err) {
            $('#sliderStatus').html(x.value.toFixed(3));
        }
        getButtonStatus()
    }

    function getButtonStatus() {
        b.digitalRead(BUTTON, onButtonRead);
    }

    function onButtonRead(x) {
        if (!x.err) {
            $('#buttonStatus').html(x.value);
        }
        setTimeout(getSliderStatus, 20);
    }
}
```

BoneScript jQuery Demo

sliderStatus = -

buttonStatus = -

html

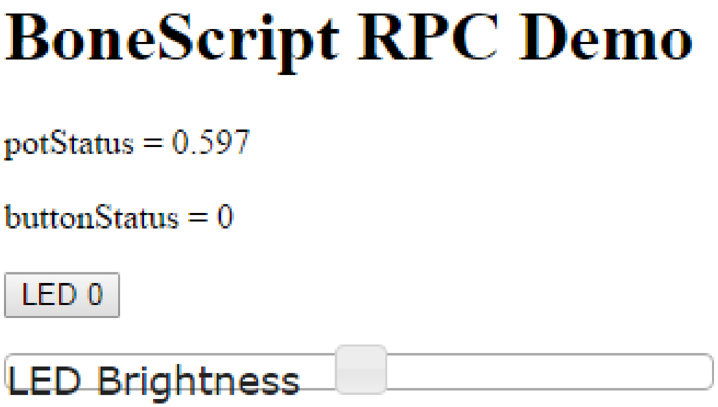


BoneScript RPC Demo

potStatus = 0.597

buttonStatus = 0

```
<body>
  <h1>BoneScript RPC Demo</h1>
  <p>potStatus = <span id=“potStatus">-</span></p>
  <p>buttonStatus = <span id="buttonStatus">-</span></p>
  <p><button id="led0" onClick='led(0)'/>LED 0</button></p>
  <p><div id="slider1">LED Brightness</div></p>
</body>
```



BoneScript RPC Demo

potStatus = 0.597

buttonStatus = 0

html

```
<head>
<title>BoneScript RPC Demo</title>
<link href="/static2/jquery-ui.css" rel="stylesheet" type="text/css"/>
<script src="/static2/jquery.min.js"></script>
<script src="/static2/jquery-ui.min.js"></script>
<script src="/static/bonescript.js"></script>
<script src="/bonescriptRPC/rpcDemol.js"></script>
</head>
```

```
<button id="led0" onClick='led(0)'/>LED 0</button>
<div id="slider1">LED Brightness</div>
```

/bonescriptRPC/rpcDemol.js

```
 setTargetAddress('192.168.7.2', {

     initialized: run

 });
var POT    = 'P9_36';
var BUTTON = 'P9_42';
var LED    = 'P9_14';
var FADE   = 'P9_16';
var toggle = true; // State LED
var ms = 200; // Polling in ms
```

```
function led(x) {
  console.log("led called with: ..
  b.digitalWrite(LED, toggle);
  toggle = !toggle;
}

function fade(x) {
  console.log("fade: %s", …
  b.analogWrite(FADE, x);
}
```

/bonescriptRPC/rpcDemol.js

```
function run() {
  b = require('bonescript');
  b.pinMode(BUTTON, b.INPUT );
  b.pinMode(LED,    b.OUTPUT);
  b.pinMode(FADE,   b.ANALOG_OUTPUT);

  initFade = 0.5;

  b.analogWrite(FADE, initFade);
```

```
potStatus = <span id=“potStatus">-</span>

buttonStatus = <span id="buttonStatus">-</span>
```

/bonescriptRPC/rpcDemol.js

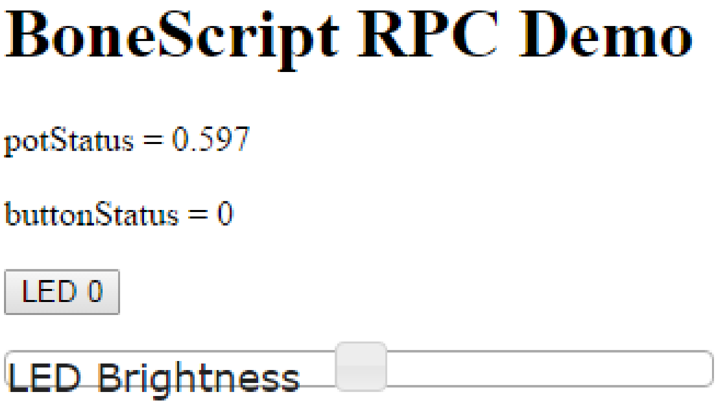
```
setInterval(getPotStatus, ms);

b.detachInterrupt(BUTTON); // The detaches …
b.attachInterrupt(BUTTON, true, b.CHANGE,
                           getButtonStatus);


function getPotStatus() {
  b.analogRead(POT, onPotRead);
}

function onPotRead(x) {
 if (!x.err) {
  $('#potStatus').html(x.value.toFixed(3));
 }
}
```

```
 function getButtonStatus() {

    b.digitalRead(BUTTON, onButtonRead);

 }


 function onButtonRead(x) {

    if (!x.err) {

        $('#buttonStatus').html(x.value);

    }

  }

} // End of run
```

```
<div id="slider1">LED Brightness</div>
```

/bonescriptRPC/rpcDemol.

```
$(function () {
  $("#slider1").slider(
    {min:0, max:100, value: 100*initFade,
      slide: function(event, ui) {
        // console.log("slider: %d", ui.value);
        fade(ui.value/100);
      }});
});
```



BoneScript RPC Demo

potStatus = 0.597

buttonStatus = 0

Web Server

The Bone already has a web server running

/var/lib/cloud9 is the ‘root’ of the server

If you move your files there, the server will see them

exercises/bonescriptRPC has this example

```
bone$ cd /var/lib/cloud9
bone$ ln –s ~/exercises/bonescriptRPC .
bone$ ls
```

Link to current directory

Browse to **192.168.7.2/bonescriptRPC/rpcDemo.html**

Setup

jQuery files in **`/var/lib/cloud9/static`** are old and have a bug with sliders

This links the newer files from *exercises/realtime* to */var/lib/cloud9/static2* so this code can use them.

```
bone$ cd exercises/bonescriptRPC
bone$ ./setup.sh
```

```
c9=/var/lib/cloud9
here=$PWD
jq=$here/../realtime/js
cd $c9
ln -s $here .
mkdir static2
cd static2
ln -s $jq/jquery-ui.css \
   $jq/jquery-ui.min.js \
   $jq/jquery.min.js .
ln -s ../static/images .
```