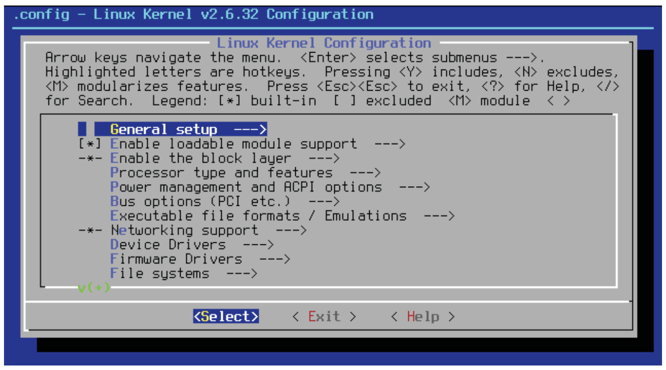
04-4 Graphical Front End via node.js

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
  - node.js (http://nodejs.org/)

ncurses



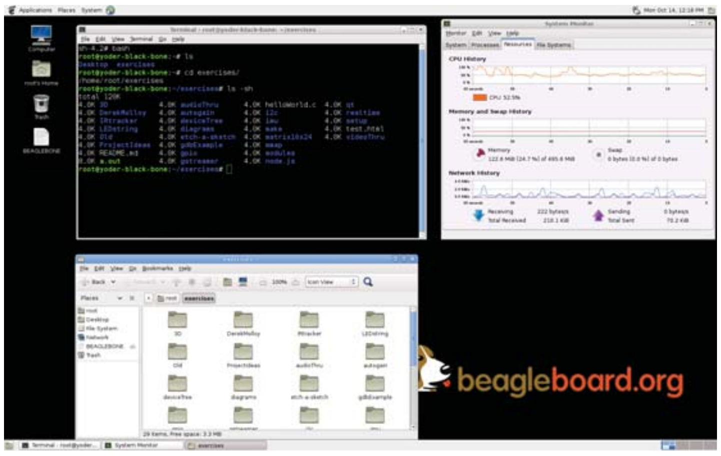
```
.config - Linux Kernel v2.6.32 Configuration
                         Linux Kernel Configuration
  Arrow keys navigate the menu.  <Enter> selects submenus --->.
  Highlighted letters are hotkeys.  Pressing <Y> includes, <N> excludes,
  <M> modularizes features.  Press <Esc><Esc> to exit, <?> for 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 >
```

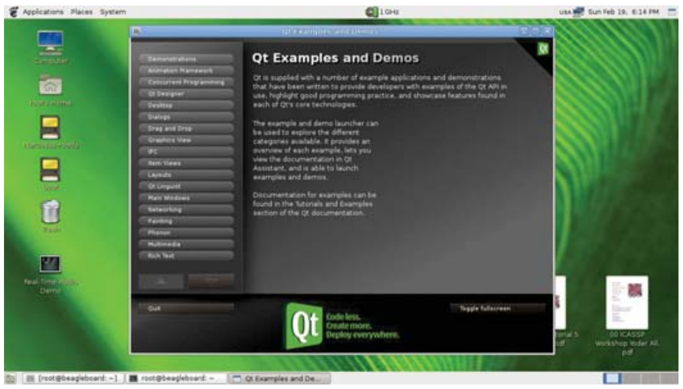
http://en.wikipedia.org/wiki/File:Linux-menuconfig.png

X Windows



```
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# 
```

Qt – Both X and embedded



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.

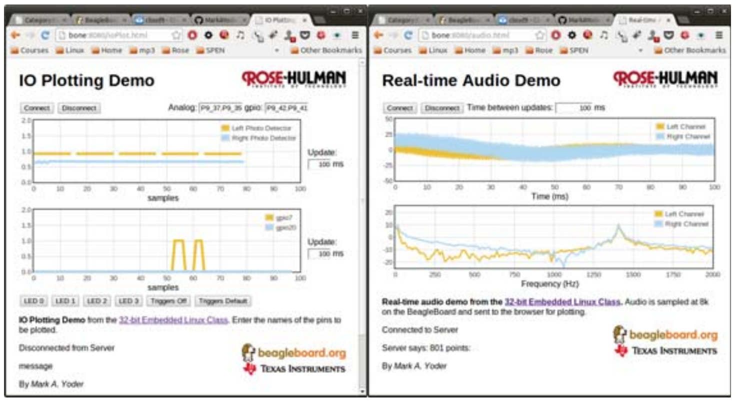
The example and demo launcher can be used to explore the different categories available. It provides an overview of each example, lets you view the documentation in Qt Assistant, and is able to launch examples and demos.

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

```
$ opkg install qt4-demos
$ qtdemo
```

http://elinux.org/ECE497_Notes_on_Qt

Via the Web via node.js



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

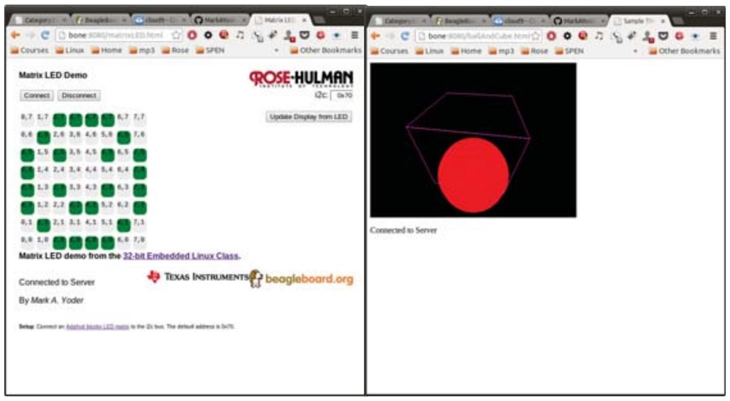
Connected to Server

Server says: 801 points:

By *Mark A. Yoder*

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

Via the Web via node.js



Matrix LED Demo

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
```

node.js

- Platform built on Chrome's JavaScript runtime for easily building fast, scalable network applications.
- Uses an event-driven, non-blocking I/O model that makes it lightweight and efficient, perfect for data-intensive real-time applications that run across distributed devices.
- Programmed in JavaScript on both server and client.

http://nodejs.org/

node.js example: Webserver

- This simple web server written in Node responds with "Hello World" for every request.

```
var http = require('http');
http.createServer(function (req, res) {
  res.writeHead(200, {'Content-Type': 'text/plain'});
  res.end('Hello World\n');
}).listen(1337);
console.log('Server running on port 1337');
```

- To run the server, put the code into a file example.js and execute it with the node program:

```
$ node example.js
Server running on port 1337
```

Things to know

- JavaScript
  - socket.io
  - jQuery
  - DOM
- html
- CSS

- Where to you start?

Javascript – C-like

```
#include <stdio.h>
main() {
    int i;
    for(i=0; i<5; i++) {
       printf("i=%d\n", i);
    }
}
```

```
var i;
for(i=0; i<5; i++) {
    console.log("i=%d", i);
}
```

JavaScript in 10 minutes

- By Spencer Tipping
  - https://github.com/spencertipping/js-in-ten-minutes
  - 27 pages
- **OR**
- https://sites.google.com/site/solopurotutoriales/javascript-in-ten-minutes
  - **9 pages**
  - Here are the highlights…

JS - Types

- **Strings** – e.g. 'foo', "foo" (single vs. double quotation – no difference)
- **Numbers** – e.g. 5, 3e+10 (all numbers behave as floats)
- **Booleans** – true and false
- **Arrays** – e.g. **[**1, 2, "foo", [3, 4]**]**
- **Objects** – e.g. {foo**:** 'bar', bif**:** [1, 2]}, which are really just hashtables
- **Functions** – e.g. var example=function (x) {return x + 1}

JS - Functions

- Functions are first-class lexical closures

```
var f = function () { // f is toplevel, so global
    var x = 5;        // x is local to f
    y = 6;            // y is global
};
```

- Watch out

```
var f = function () { // f is toplevel, so global
    y = 6;            // y is global
    x = 42;
Do stuff…
    var x = 5;        // x is local to f
};
```

JS - Semicolon

- Javascript doesn't require a semicolon at the end of each line, but you should anyway.

```
var x = f
(y = x) (5)
```

- Is treated as:

```
var x = f(y = x) (5)
```

- You probably meant

```
var x = f;
(y = x) (5);
```

JS - Equality

- Never use `==` or `!=`
- Always use `===` or `!==`
- All these are `true`:

```
null  == undefined
null  == 0
false == ''
''    == 0
true  == 1
true  == '1'
```

JavaScript: The Good Parts

- Intended for programmers who, by happenstance or curiosity, are venturing into JavaScript.
- Also intended for programmers who have been working with JavaScript at a novice level and are now ready for a more sophisticated relationship with the language.
- Most programming languages contain **good parts and bad parts**. I discovered that I could be a better programmer by using only the good parts and avoiding the bad parts.
- JavaScript is a language with more than its share of bad parts.
- 172 pages

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socket.io

- http://socket.io/
- **Socket.IO** aims to make realtime apps possible in every browser and mobile device, blurring the differences between the different transport mechanisms.
- It's care-free realtime 100% in JavaScript.

socket.io

- Server

```
var io = require('socket.io').listen(80);
io.sockets.on('connection', function (socket) {
  socket.emit('news', { hello: 'world' });
  socket.on('my other event', function (data) {
    console.log(data);
  });
});
```

- Client - Browser

```
<script>
var socket = io.connect('http://localhost');
socket.on('news', function (data) {
  console.log(data);
  socket.emit('my other event', { my: 'data' });
});
</script>
```

socket.io

- See: **Getting Started With node.js and socket.io (v0.7+) – Part 2**
- http://codehenge.net/blog/2011/12/getting-started-with-node-js-and-socket-io-v0-7-part-2/
- My code is based on this

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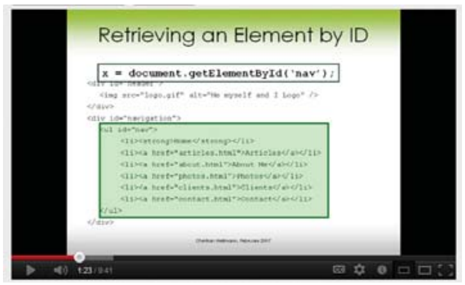
DOM

- **Essentials of the DOM and JavaScript in 10 Minutes**
- http://www.youtube.com/watch?v=URF2sVQWuxU
- **10 minute YouTube video**
- **However we'll use jQuery, it's much more compact**


Retrieving an Element by ID

```
x = document.getElementById('nav');
<div id="header">
  <img src="logo.gif" alt="Me myself and I logo" />
</div>
<div id="navigation">
  <ul id="nav">
    <li><strong>Home</strong></li>
    <li><a href="articles.html">Articles</a></li>
    <li><a href="about.html">About Me</a></li>
    <li><a href="photos.html">Photos</a></li>
    <li><a href="clients.html">Clients</a></li>
    <li><a href="contact.html">Contact</a></li>
  </ul>
</div>
```

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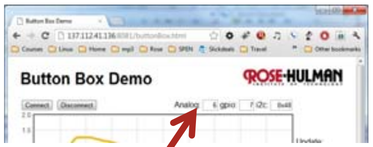
jQuery



- http://jquery.org/
- jQuery is a fast and concise JavaScript Library that simplifies HTML document traversing, event handling, animating, and Ajax interactions for rapid web development.
- jQuery is designed to change the way that you write JavaScript
- Looks like `$()` in html

```
Analog: <input id="ainNum" type="text" value=""
style="text-align: right; width:2em">
```

- **In JavaScript**

```
$("#ainNum").val(ainNum).change(function () {
        ainNum = $(this).val();
    });
```

Things to know

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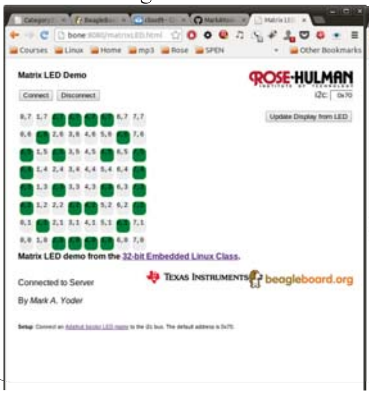
  - jQuery
- html
- CSS
- FLOT
- http://www.flotcharts.org/
- Flot is a pure JavaScript plotting library for jQuery, with a focus on simple usage, attractive looks and interactive features.

To Do

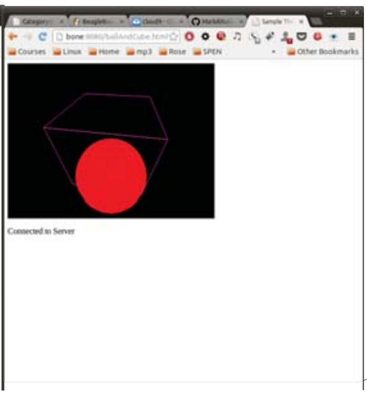
- Look at `~/exercises/realtime` and see what you can figure out.



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

Connected to Server

By Mark A. Yoder



Connected to Server