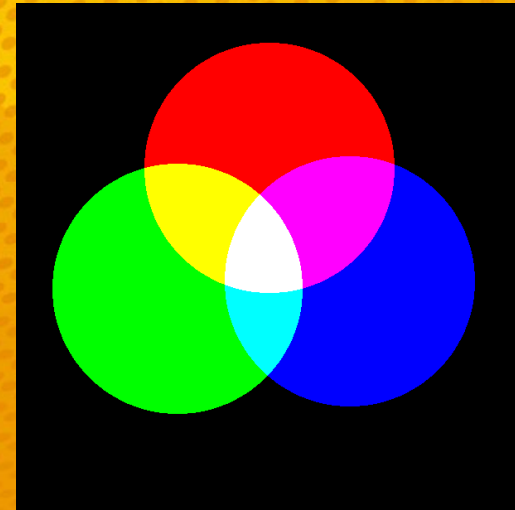
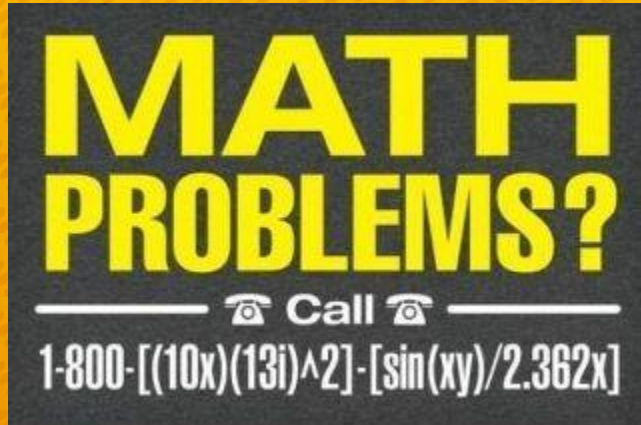




**BASTA!**  
.NET, WINDOWS, VISUAL STUDIO

# Arduino and C# Things

Max Kleiner



***Yes, we scan...***

[http://en.wikipedia.org/wiki/Web\\_of\\_Things](http://en.wikipedia.org/wiki/Web_of_Things)

# Be aware of

(Web of No Things)

- You deal with physics and elements (xyz)
- Lots of sensors & actuators to solder
- Memory on microcontroller is very small
- Which Casing..., ex. [336 digiclock 3.txt](#)
- Keep it simple:  $\text{not } (A \vee B) = \text{not } A \wedge \text{not } B$   
 $A = A+B, B = A-B, A = A-B$
- Push a Session or pull a Service ?
- Call it Host to Device Ident (master-slave)
- Which Use Case ex. App or DigiCam?

<http://en.wikipedia.org/wiki/Anti-pattern>

## A Short History of Time

1991 Application Program

1995 Application

1998 Applet

2010 App

2015 A

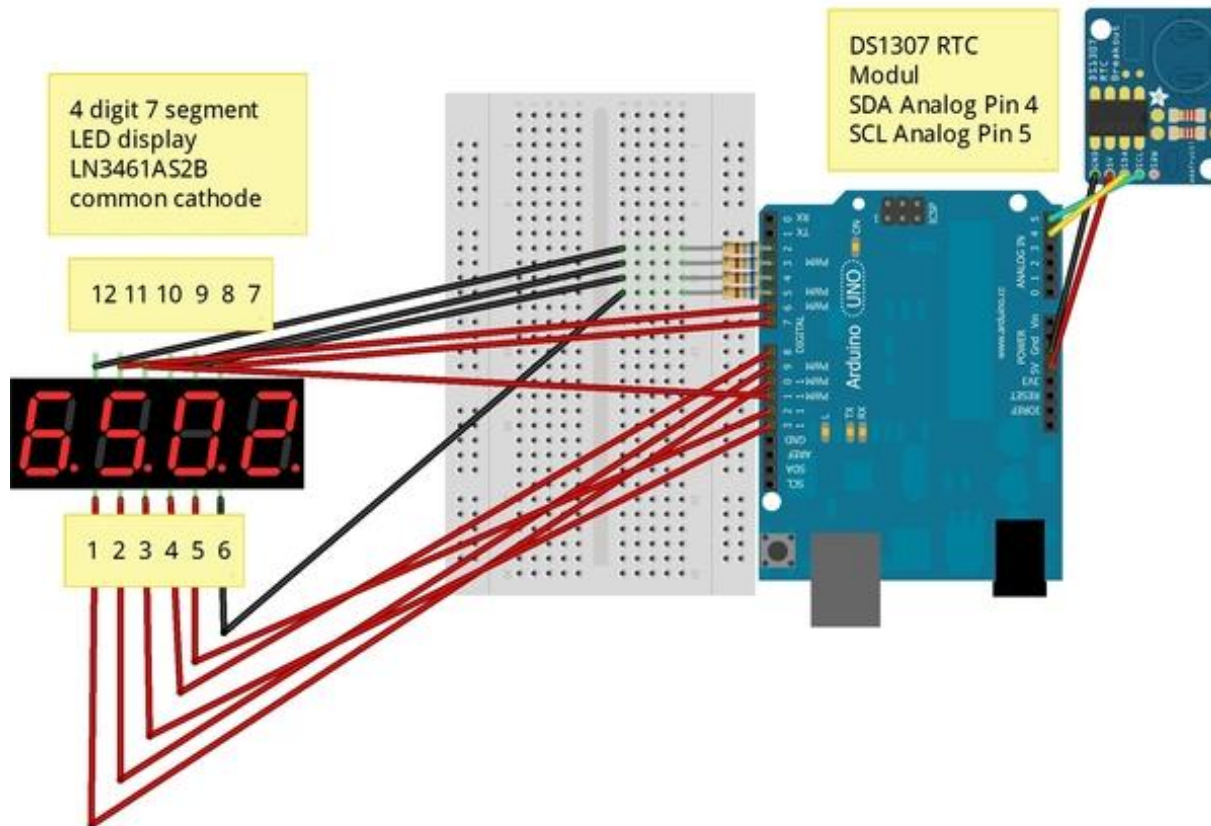
(Android, Arduino, ARM)



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# How to Start ?



Made with  Fritzing.org

- With a Starter Kit you have everything you need to start learning the basics of electronics: an Arduino UNO, an essential set for wiring things up, a lot of sensors and actuators.

Ex. Blink (out of the Box)

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# List of Things

- 1 Arduino UNO R3
- 1 Arduino Editor V 1.0.5
- 1 Steckbrett (solderless breadboard)
- 1 multiplexed 4-Digit-7-Segment LED Display **LN3461AS2B, common cathode, 12 Pins** (Bezugsquelle Datenblatt)
- 4 Widerstände 680 Ohm (resistor)
- 12 Jumperkabel M/M (hookup-wires)
- 4 Jumperkabel M/F (jumper-wires)
- Stiftheiste 7 Pin einfach (pin strip or socket board)
- ein paar Drahtverbindungen, damit das Display im Kabelsalat nicht total verschwindet
- **RTC-Modul DS1307, konkret ein DS1307 und AT 24C32 Combo Breakout**

<http://en.wikipedia.org/wiki/RFID>

ex. SimLogicBox - Chess Roboter Topic – First Web of Things

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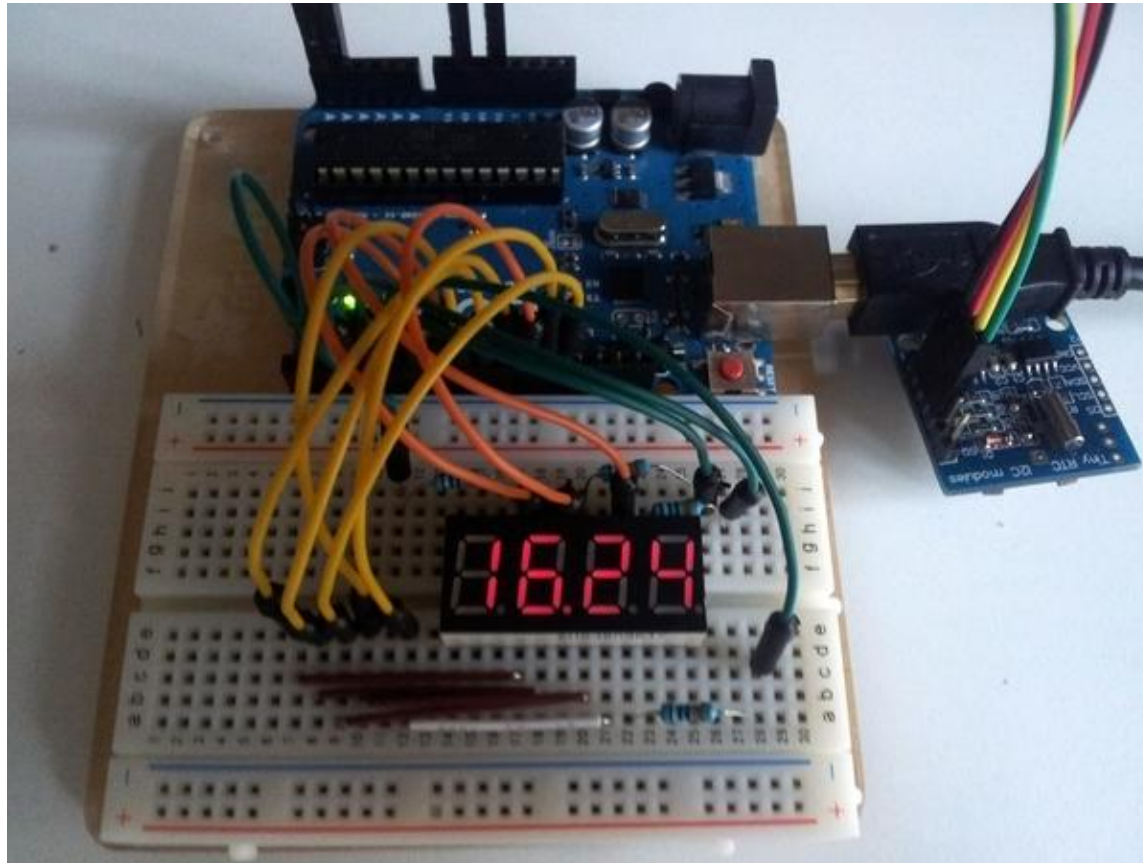
# Programming Things

## RTC and COM time consuming process

```
• namespace ch.maxbox.arduino.time {  
•     class ArduinoTimeSetter {  
•         static void Main(string[] args) {  
•             Settings settings = new Settings();  
•             SerialPort port = new SerialPort(settings.port, 9600);  
•             DateTime now = DateTime.Now;  
•             port.Open();  
•             //time formatting, be aware new format (incl weekdays) for DS1307  
•             String arduinoTime = String.Format("{0:HHmmssddMMyy}", DateTime.Now) + ((int)  
•                                     DateTime.Now.DayOfWeek);  
•             Console.WriteLine(arduinoTime);  
•             //pass the time to COM  
•             port.Write(arduinoTime);  
•             while (true) {  
•                 Console.WriteLine("From Arduino "+ port.ReadLine());  
•             }  
•         }  
•     }  
• }
```

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# Proof of Concept Lord of the Things



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# Decison Process

- **Before starting, the following questions should be answered:**
- **What is the scope of the application?**
  - Monitoring measurements and devices?
  - Mobile Gadget?
- **What is the scenario Use Case?**
  - A thing with embedded web service?
  - A set of things connected through a gateway or bus?
- **What programming language or IDE?**
  - Options: C, Pascal, Java, C#, Processing, ADT, AVR Studio, POSIX Cygwin core API, Atmel Programmer
- **What is the runtime, publishing infrastructure?**
  - None, custom ASIC, third party (AVR, ARM, Udoo, PIC, PI...).
  - Hardware casing, box or integration.

# Function Memory Thinking

- **function** StartLoadSrvc (afname: **string**): TStringList;
- **begin**
- **if** fileExists (ExePath+'examples/'+afname) **then begin**
- result := TStringList.create;
- result.loadFromFile (ExePath+'examples/'+afname);
- **end**
- **end;**
- mycipher := encrypDecryp (StartLoadSrvc (fname).text, MYKEY, 'E')
- Object Passing:     writeln (getFileList (TStringList.create,  
                                  'D:\kleiner2014\EA\_docus\\*.\*)'.strings[i]);

## Arduino UNO Memory

<b>Flash</b>	32,768 bytes	non-volatile	Stores the program source code and Arduino bootloader
<b>SRAM</b>	2048 bytes	volatile	Operating space for accessing variables and functions
<b>EEPROM</b>	1024 bytes	non-volatile	Permanent storage for user data like readings or settings

036\_pas\_includetest\_basta.txt / 383\_MDAC\_DCOM.txt

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# Use Q Rules

- **CA1303: Do not pass literals as localized parameters**

- ```
public void TimeMethod(int hour, int minute)

{ if (hour < 0 || hour > 23) { MessageBox.Show( "The valid range is 0 -
23."); //CA1303 fires because the parameter for method Show is Text }
```

- **CA1302: Do not hardcode locale specific strings**

- ```
static void Main()

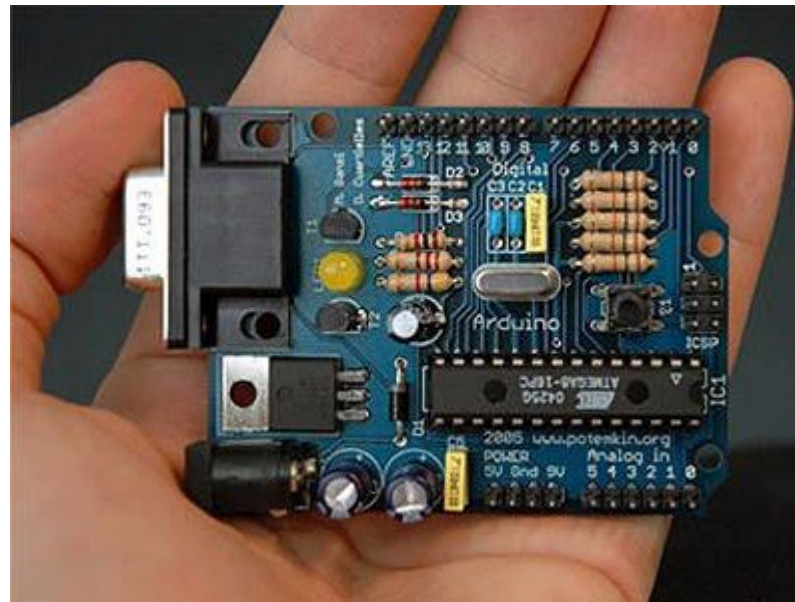
{ string string0 = "C:";
```

- **Sonar/PMD: Avoid duplicate literals (hard coded string or numeric)**

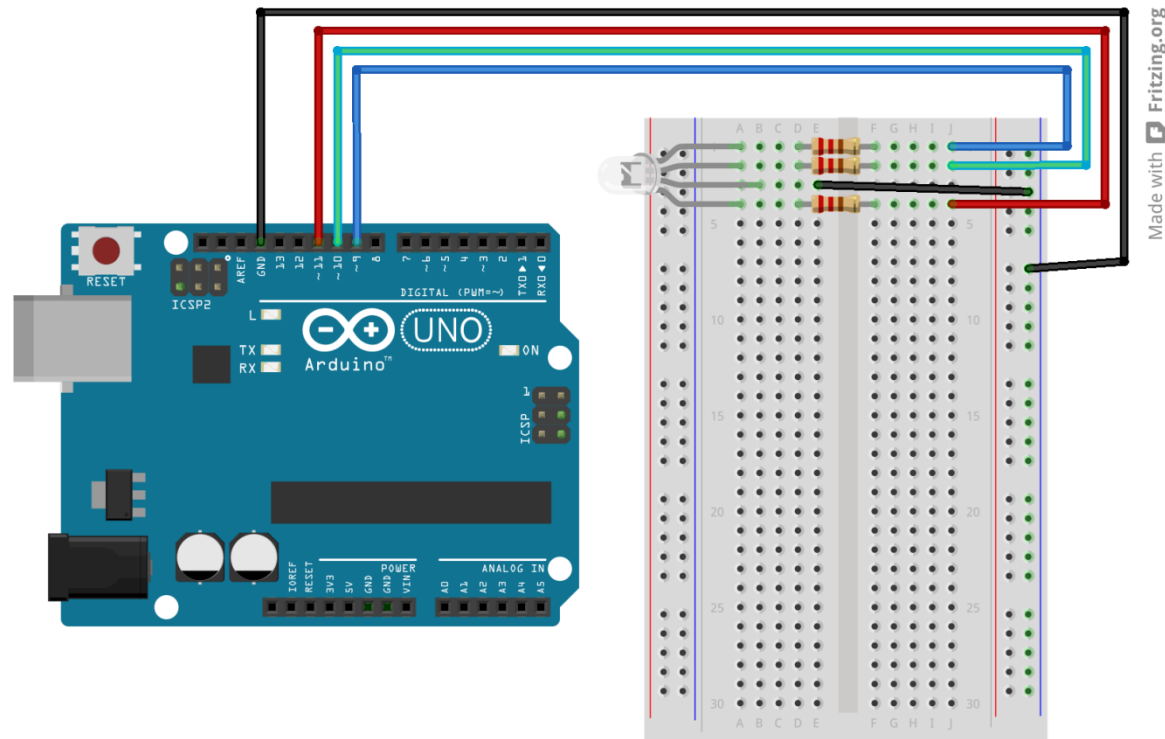
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# Case Study

- Arduino Uno Board with RGB LED COM Box



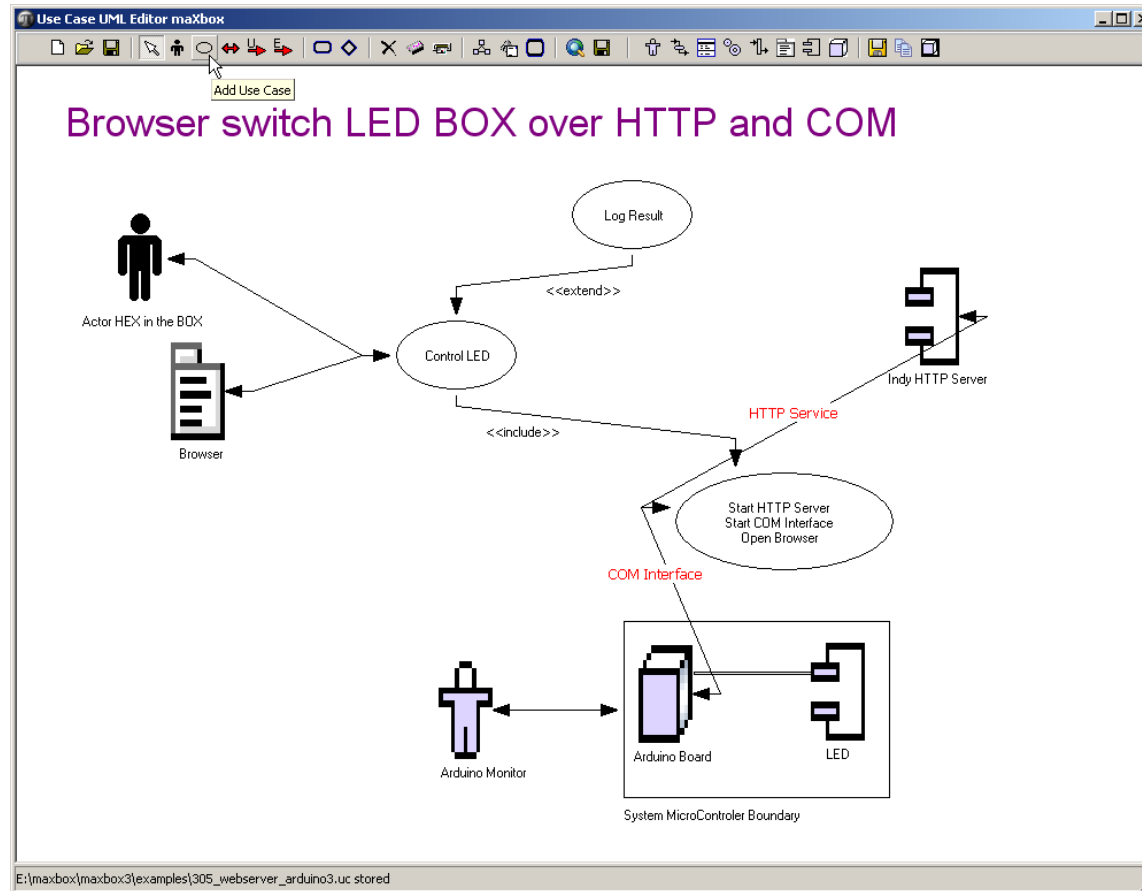
# LED Box Solution



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# Use Case Shine on you crazy...



Send a command over http to com on board to light a rgb led

~~maxbox~~

# Solution Arduino C

Standard Arduino Library

```
void setup() {  
    // initialize digital pin as an output.  
    pinMode(ledPin11, OUTPUT);  
    Serial.begin(9600);  
  
    void loop () {  
        val = Serial.read();    //read serial port  
        if (val != -1){  
            if (val == '1'){  
                digitalWrite(ledPin1, HIGH);  
            }  
            else if (val == 'A'){  
                digitalWrite(ledPin1, LOW);  
            }  
        }  
    }  
}
```

Tutor: [http://www.softwareschule.ch/download/maxbox\\_starter18\\_3.pdf](http://www.softwareschule.ch/download/maxbox_starter18_3.pdf)

*maxbox*

# Solution HTTP Server

```
76 with HTTPServer do begin
77   if Active then Free;
78   if not Active then begin
79     bindings.Clear;
80     bindings.Add;
81     bindings.items[0].Port:= APORT;
82     bindings.items[0].IP:= IPADDR; //'127.0.0.1'; {GetHostIP}
83     Active:= true;
84     onCommandGet:= @HTTPServerGet;
85     Printf('Listening HTTP on %s:%d.', [Bindings[0].IP, Bindings[0].Port]);
86   end;
```

[http://www.softwareschule.ch/examples/443\\_webserver\\_arduino\\_rgb\\_light.txt](http://www.softwareschule.ch/examples/443_webserver_arduino_rgb_light.txt)



# Solution COM Port

```
procedure HTTPServerGet(aThr: TIdPeerThread; reqInfo:  
    TIdHTTPRequestInfo; respInfo: TIdHTTPResponseInfo);
```

```
54 if uppercase(localcom) = uppercase('/LED') then begin  
55   cPort.WriteStr('1')  
56   writeln(localcom+ ': LED on');  
57   RespInfo.ContentText:= getHTMLContentString('LED is: ON');  
58 end else  
59 if uppercase(localcom) = uppercase('/DEL') then begin  
60   cPort.WriteStr('A');  
61   writeln(localcom+ ': LED off');  
62   RespInfo.ContentText:= getHTMLContentString('LED is: OFF')  
63 end;
```

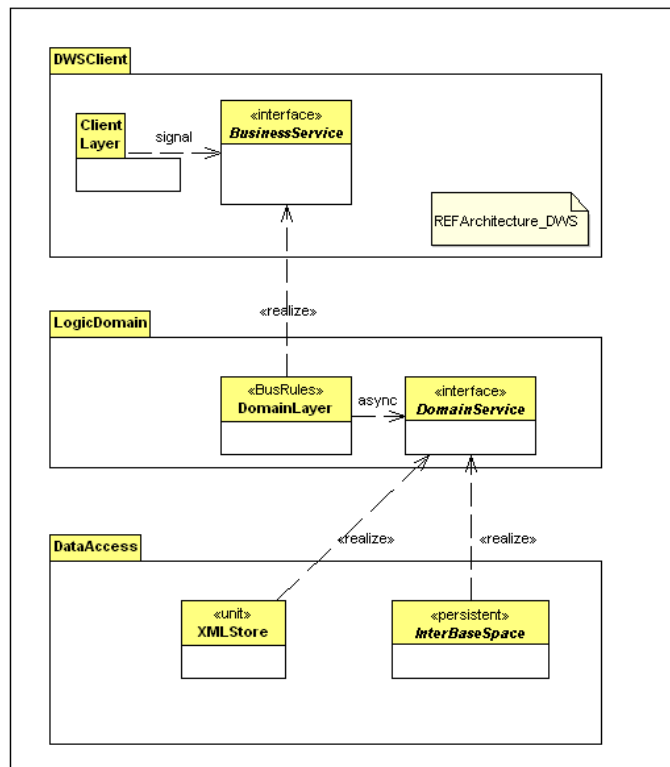
361 heartbeat wave.txt

[http://en.wikipedia.org/wiki/Household appliances](http://en.wikipedia.org/wiki/Household_appliances)

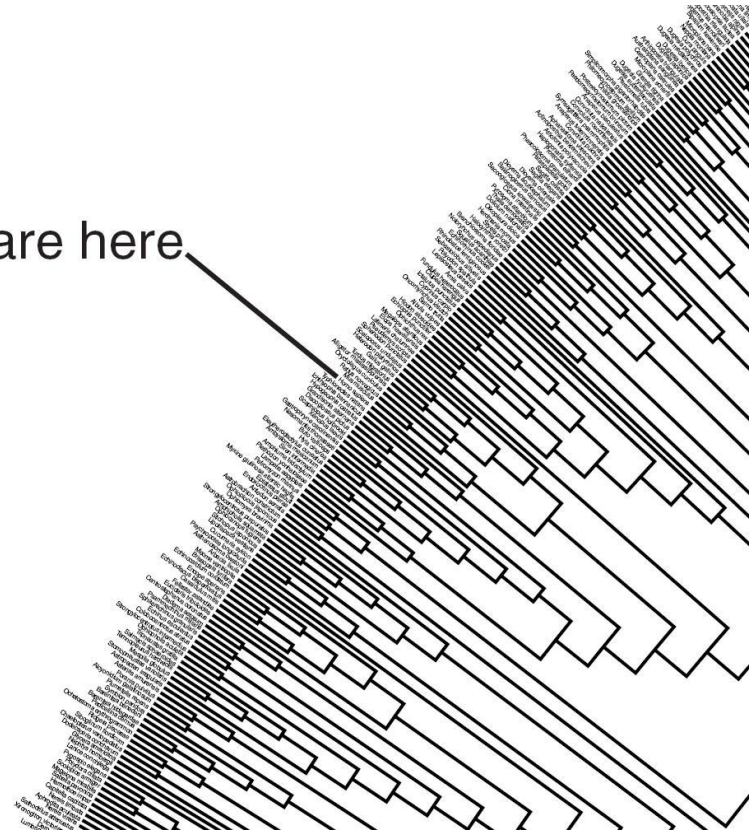
*maxbox*

# Test the Light

<http://192.168.1.40:8080/R>



You are here

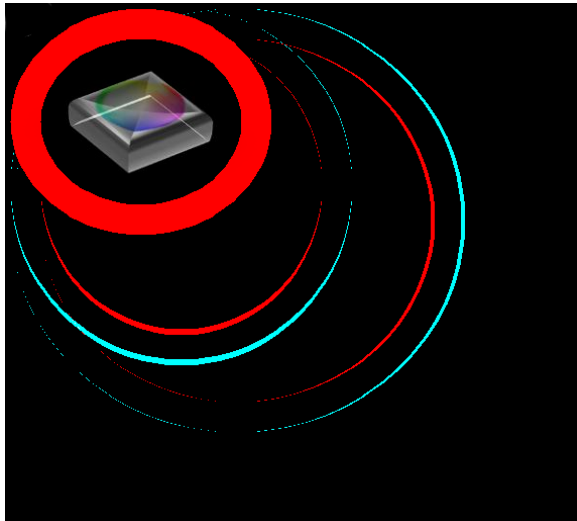


Ein Spermium enthält 37,5 MB DNA-Daten. Eine Ejakulation entspricht einem Datentransfer von 1500 TB in 3 Sek. Und ihr denkt DSL sei schnell... ;).

~~maxbox~~ 

# Thanks! Links to Rights

the source is the code



<http://www.softwareschule.ch/maxbox.htm>

<http://sourceforge.net/projects/maxbox>

<http://sourceforge.net/apps/mediawiki/maxbox/>

<http://en.wikipedia.org/wiki/Arduino>

<http://www.softwareschule.ch/download/webofthings2013.pdf>

**Book Patterns konkret**

<http://www.amazon.de/Patterns-konkret-Max-Kleiner/dp/3935042469>

**RTClock, Arduino and C# by Silvia Rothen**

<http://ecotronics.ch.honorius.sui-inter.net/wordpress/2013/arduino-als-uhr-version-2-mit-rtc-komponente-und-led-display/>

<http://www.ecotronics.ch/ecotron/arduinocheatsheet.htm>

<http://carolinafortuna.com/web-of-things-tutorial/>

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# Code a World



# Yes, we hack...

The logo for maXbox, featuring the text "maXbox" in a red, stylized font. The letter 'X' is significantly larger and more prominent than the other letters. A horizontal red line runs through the middle of the text. To the right of the text, there is a small, colorful, multi-colored sphere or ball.