Små datamaskiner

… store muligheter

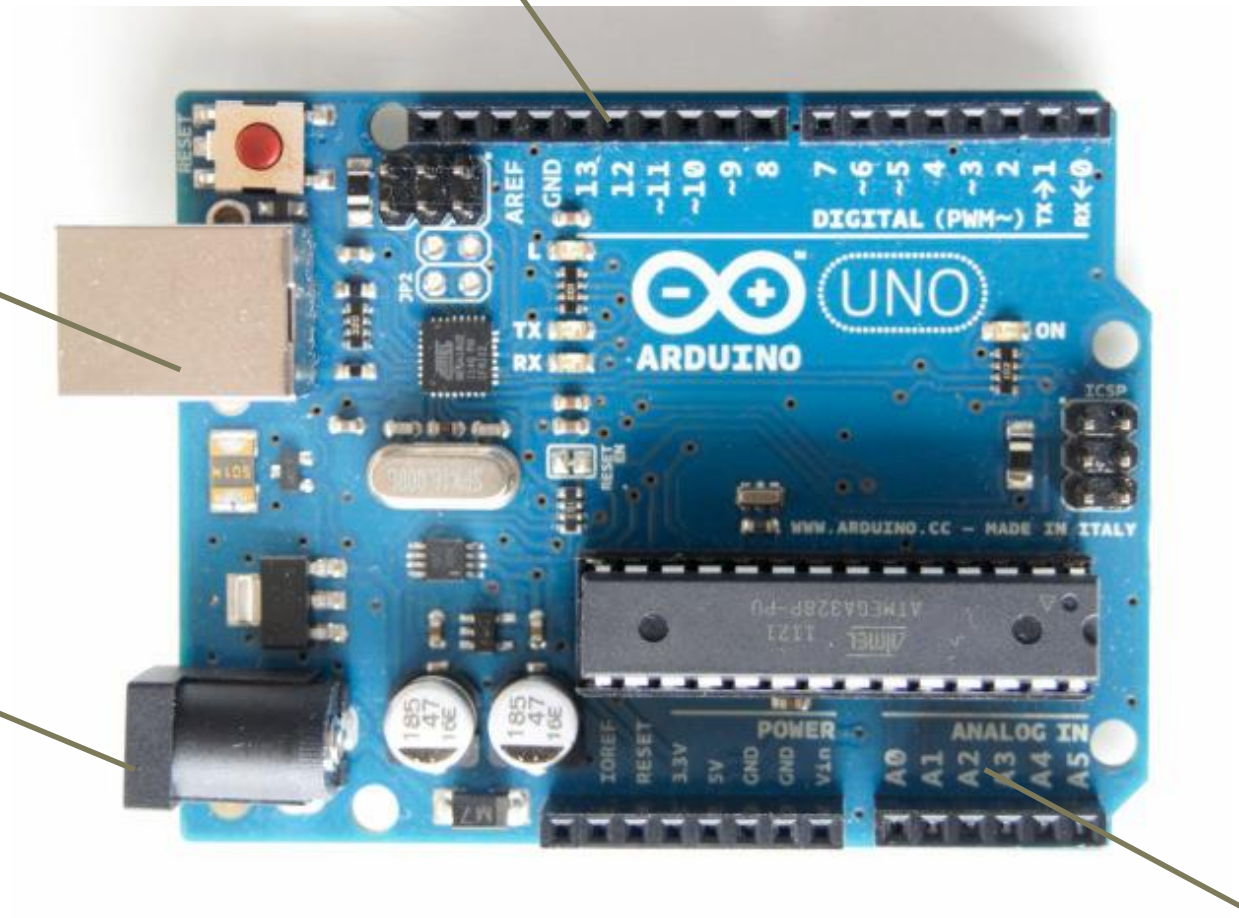
Terje Husby LA3MAA oktober 2014

la3maa@nrrl.no

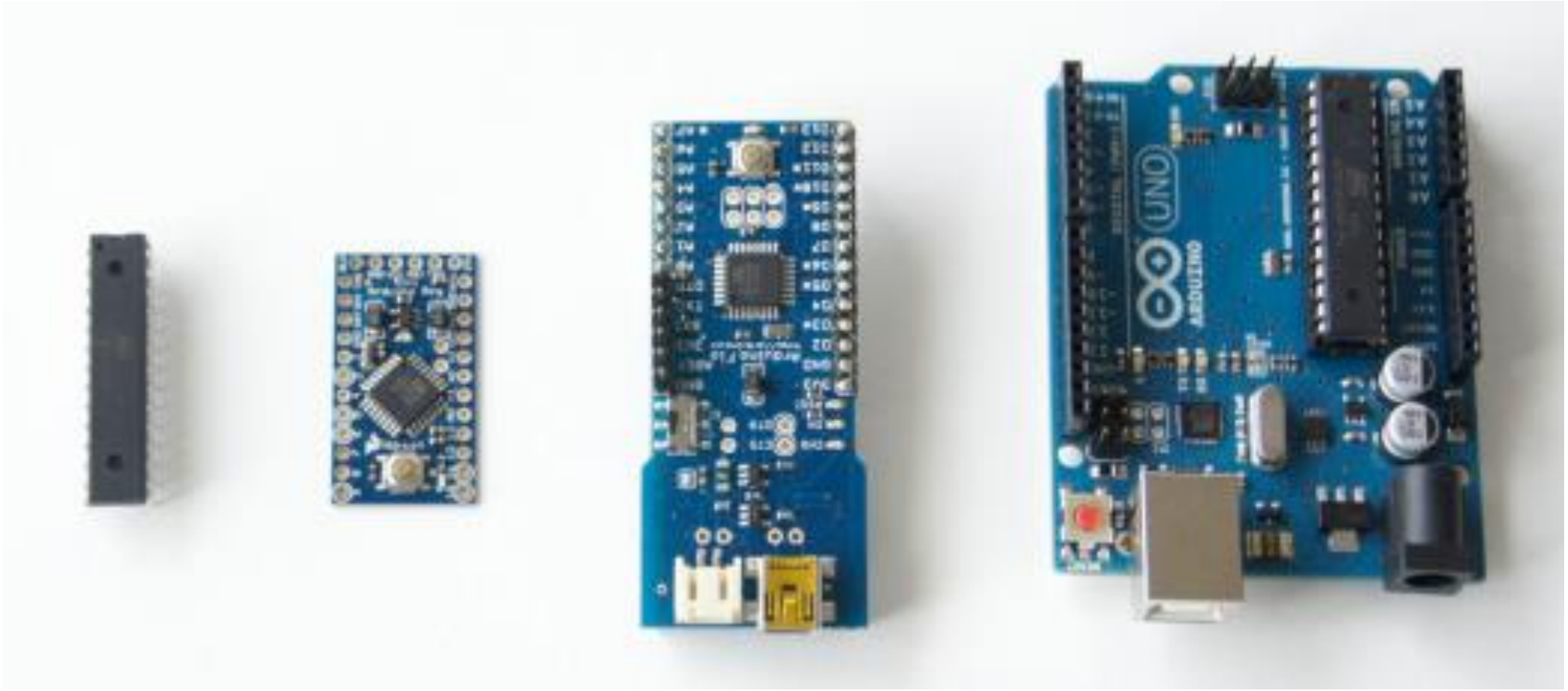
Mikrokontrollere og datamaskiner finner du du overalt i hverdagen. I bilen du kjører, i kjøkkenutstyr, i tv og lydutstyr, i fjernstyringen til garasjeporten, i klokka di ... kort sagt overalt.

Mange forskjellige plattformer

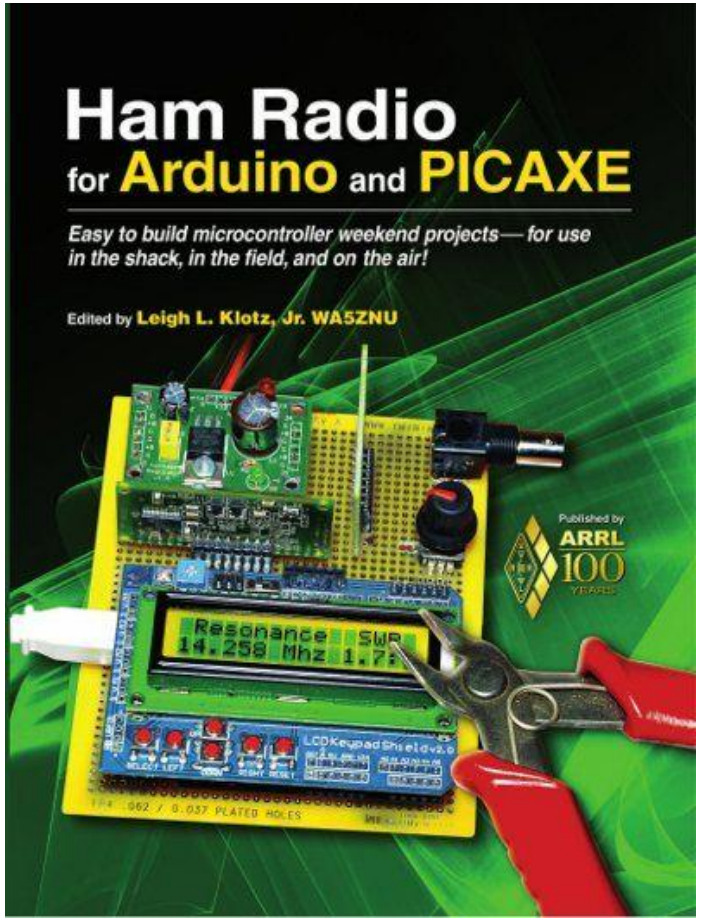
Arduino


GPIO
USB
Strøm
Analog
DIGITAL (PWM~)
UNO
ARDUINO
POWER
ANALOG IN
WWW.ARDUINO.CC – MADE IN ITALY

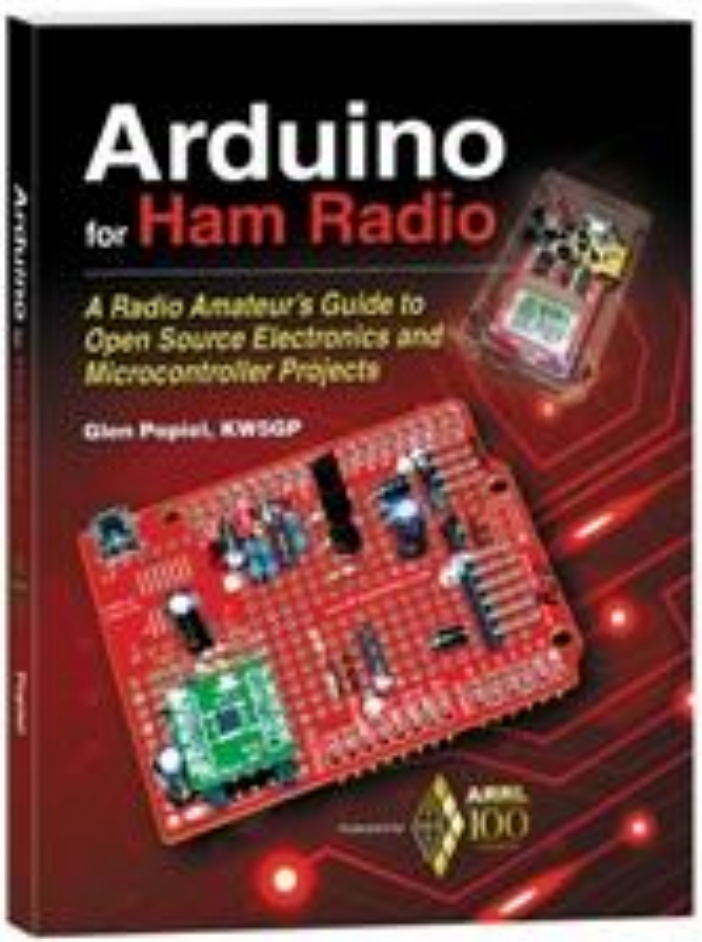
Mange størrelser



Mange spennende prosjekter



http://www.w5dor.com/W5DOR-Arduino.html



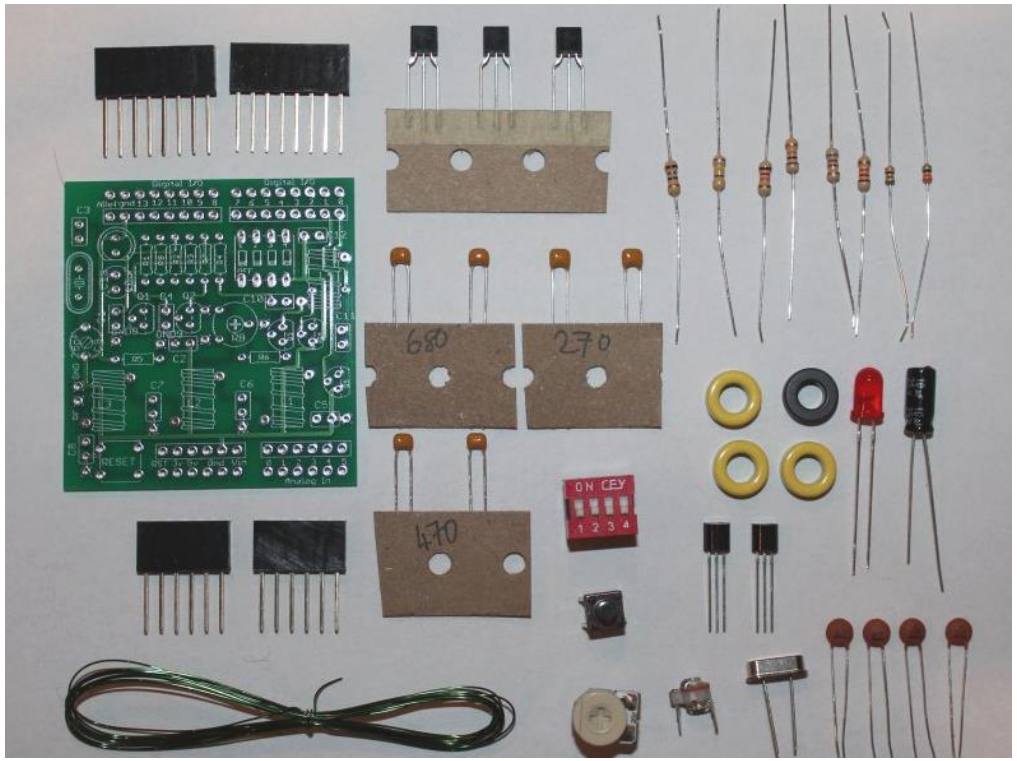
http://www.arrl.org/arduino

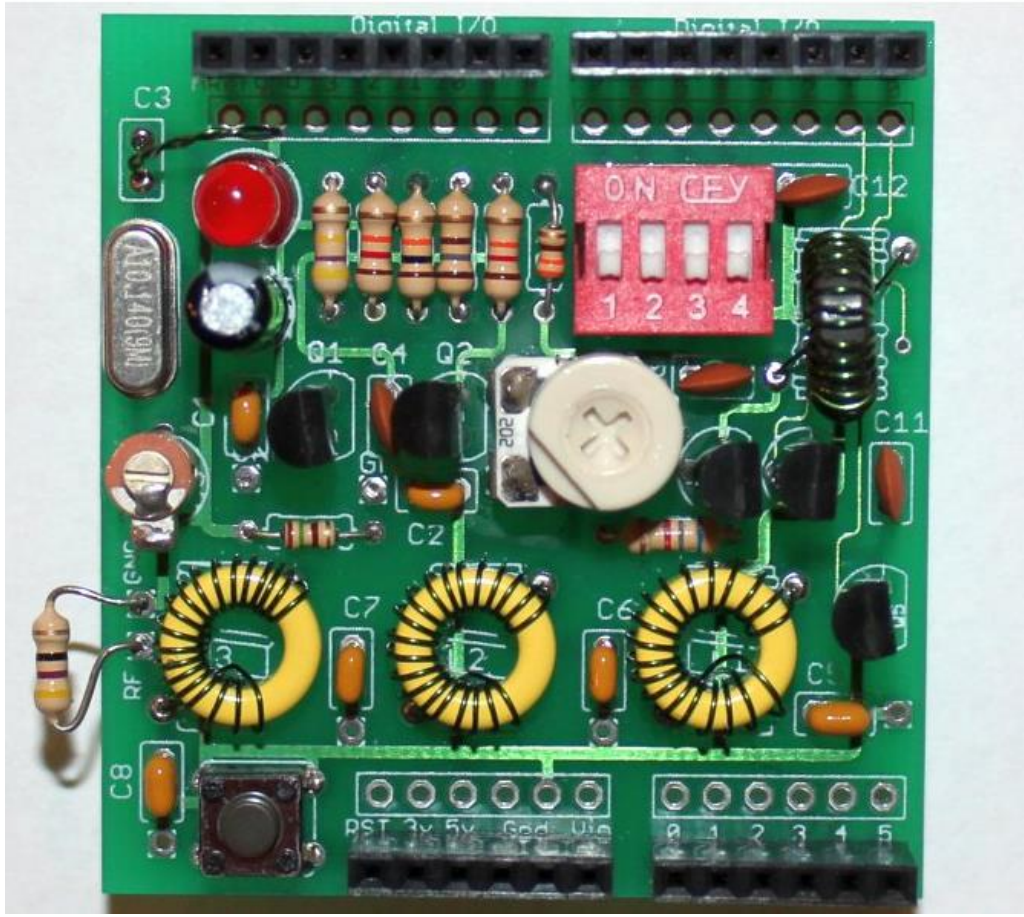
Prosjekter andre har gjort

- APRS Data Logger
- QRSS Beacon
- Multimode Transmitter Shield
- High Voltage, High Frequency and High Temperature Data Logger
- Receive-Only, Low-Power APRS iGate
- PICAXE Keyer and CW Beacon Keyer
- Solar Tracker
- Nanokeyer
- Handheld Radio Talk Timer
- APRS Messenger
- DMTF Controlled SSTV Camera
- APRS Display
- Waterfall
- SWR Scanner

QRSS shield

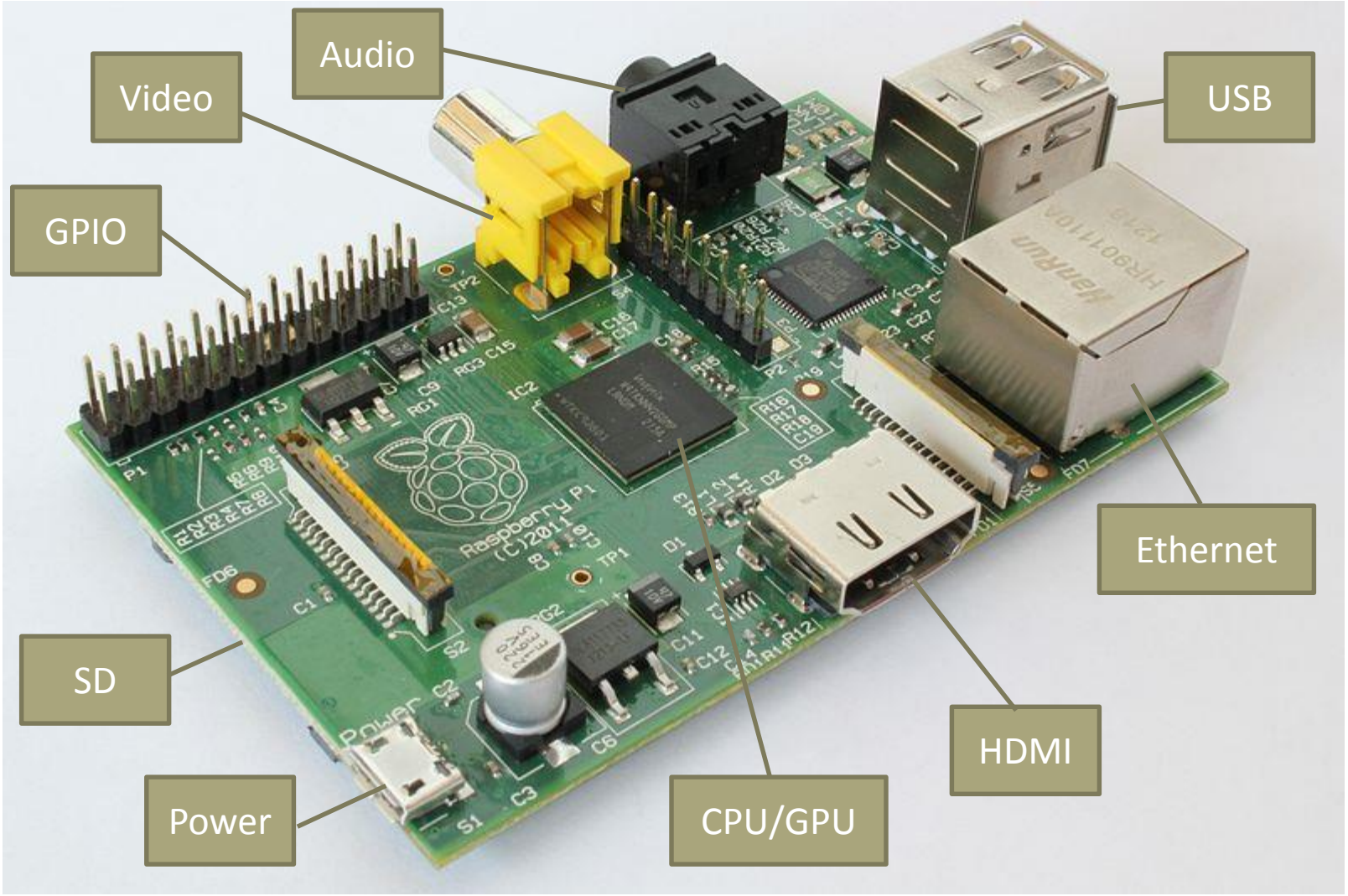
http://www.hanssummers.com/qrssarduino.html





Utviklingsmiljø

RaspberryPi



Oppsett

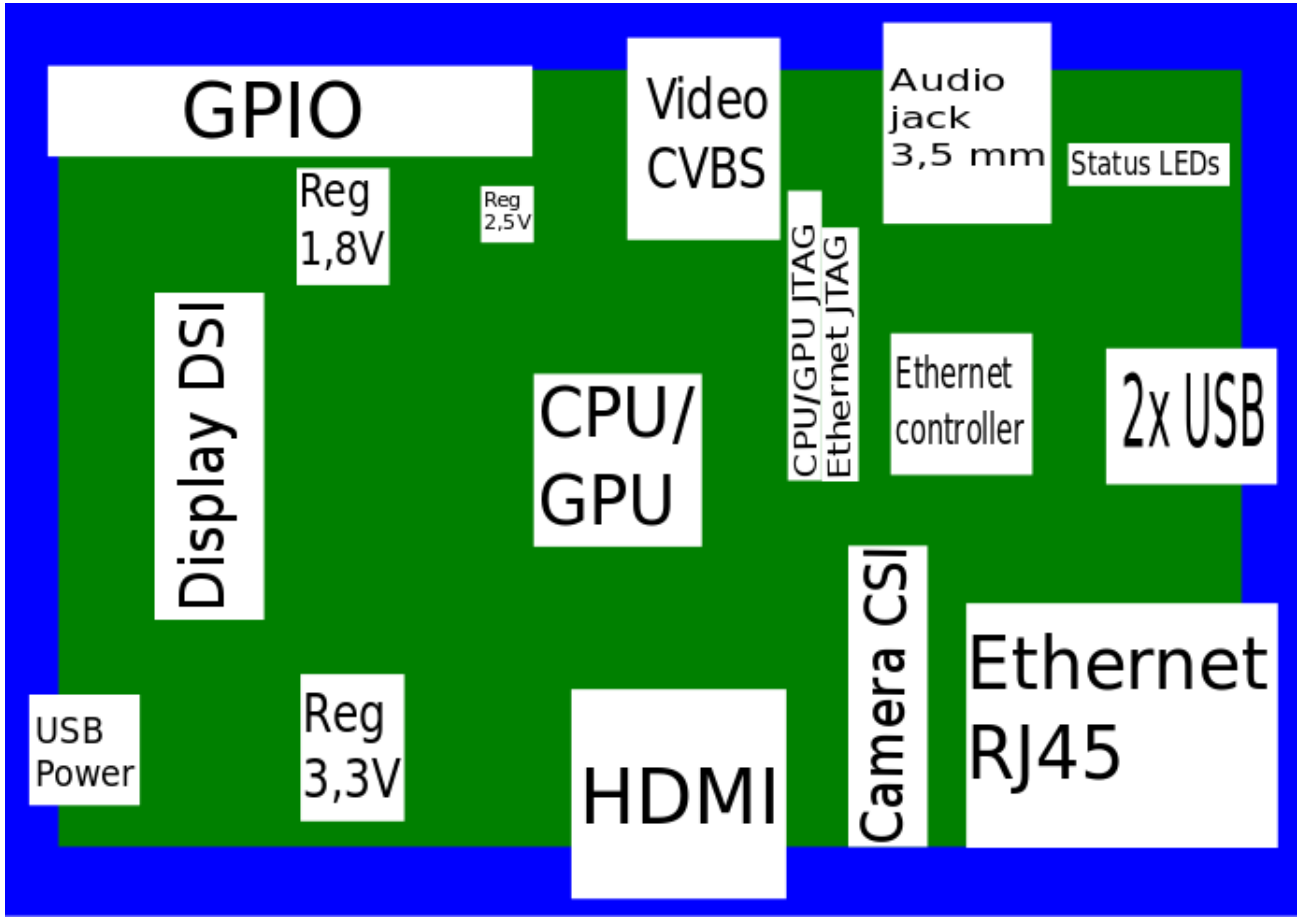

MOTOROLA

Sette opp

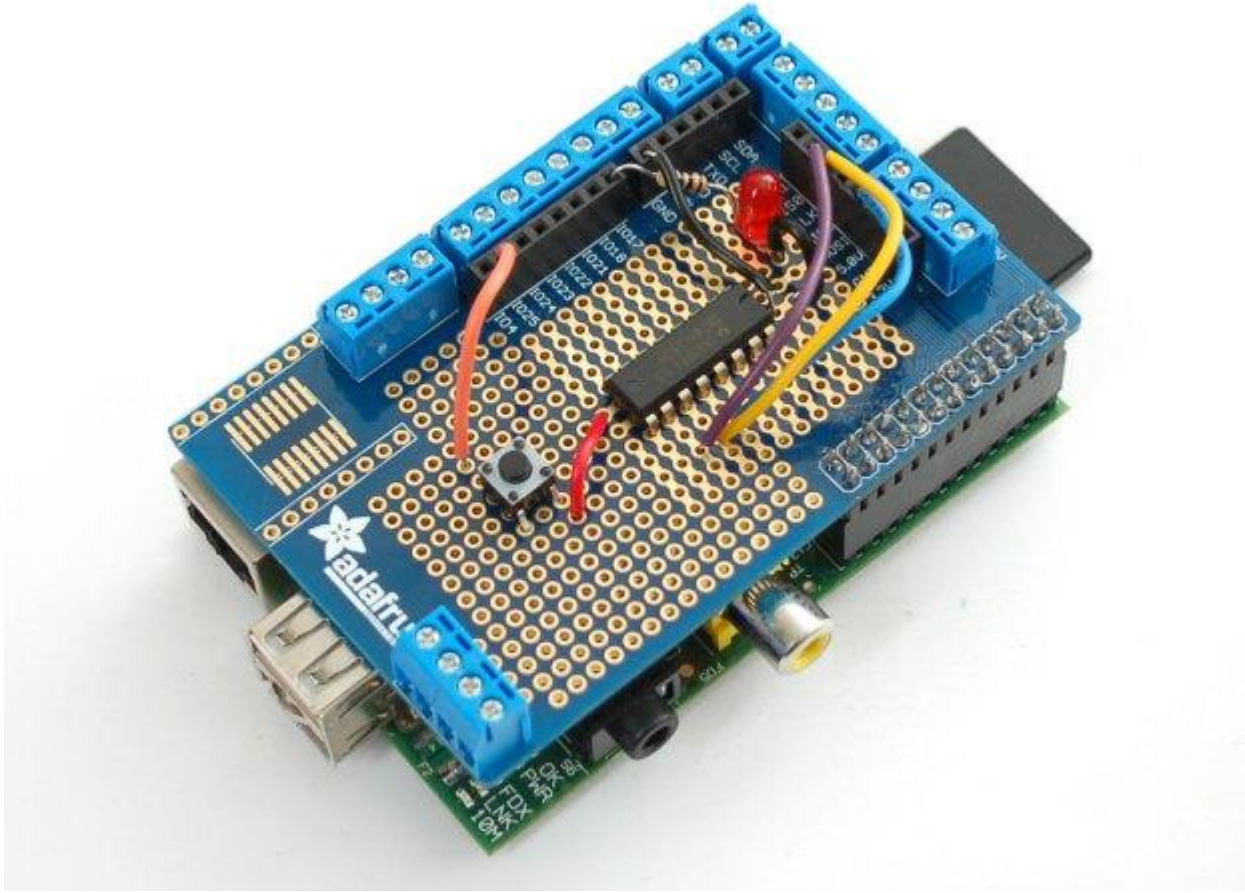
- SD kort(Minimum size 4Gb)
- HDMI til HDMI / DVI / VGA kabel
- RCA video (kan bruke en tv)
- Tastatur og mus (USB 2.0)
- Ethernet kabel eller trådløs adapter
- Strømforsyning(micro USB **700mA og5V)**
- Lydkabel(hvis du ikke bruker hdmi)

HDMI connector

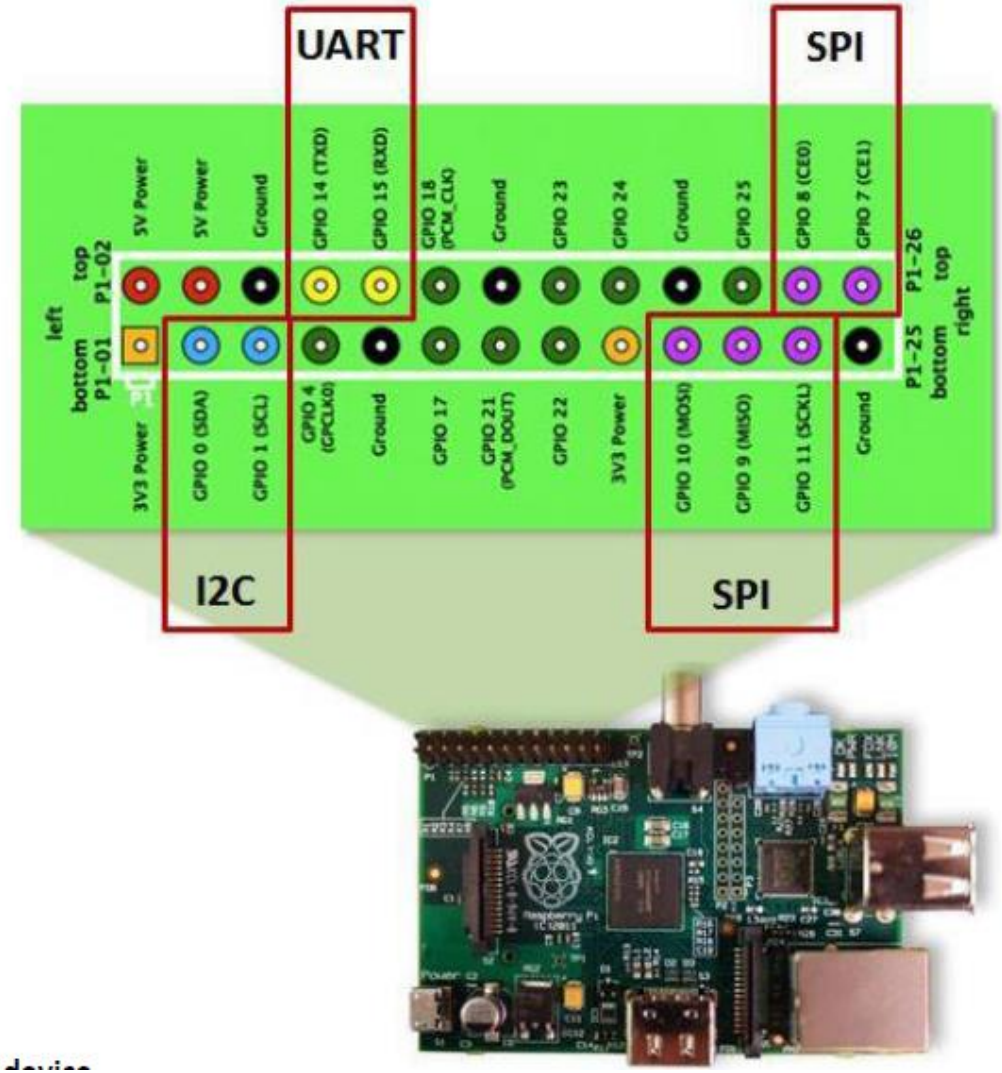
Litt overblikk



Integrasjon



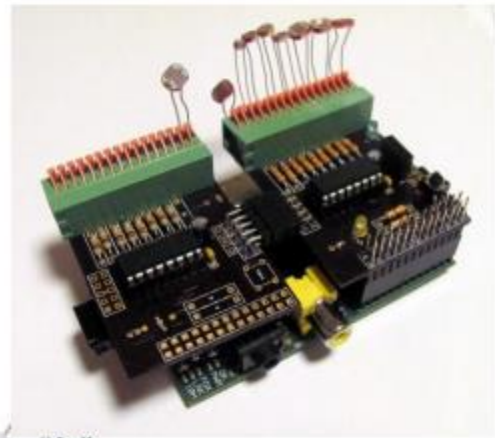
RPi GPIO Pinout



- a 3.3V device

Grensenitt for eksperiment

And Many More

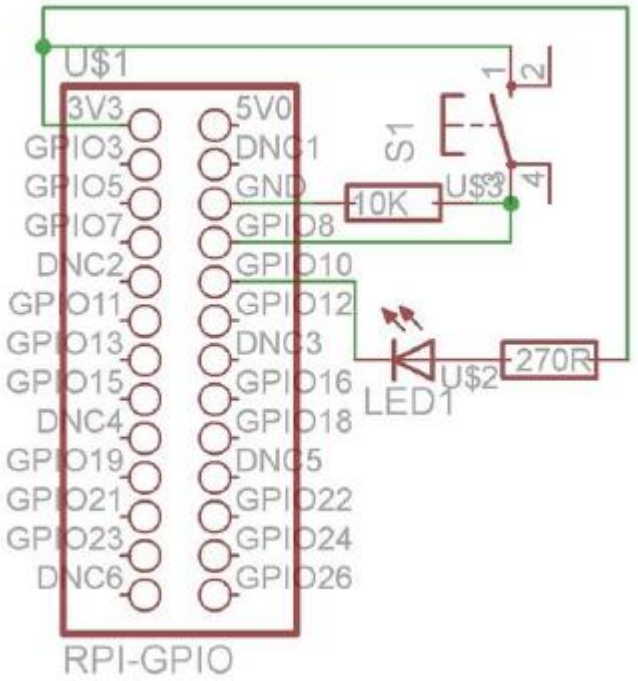


Over 75 different boards and counting!

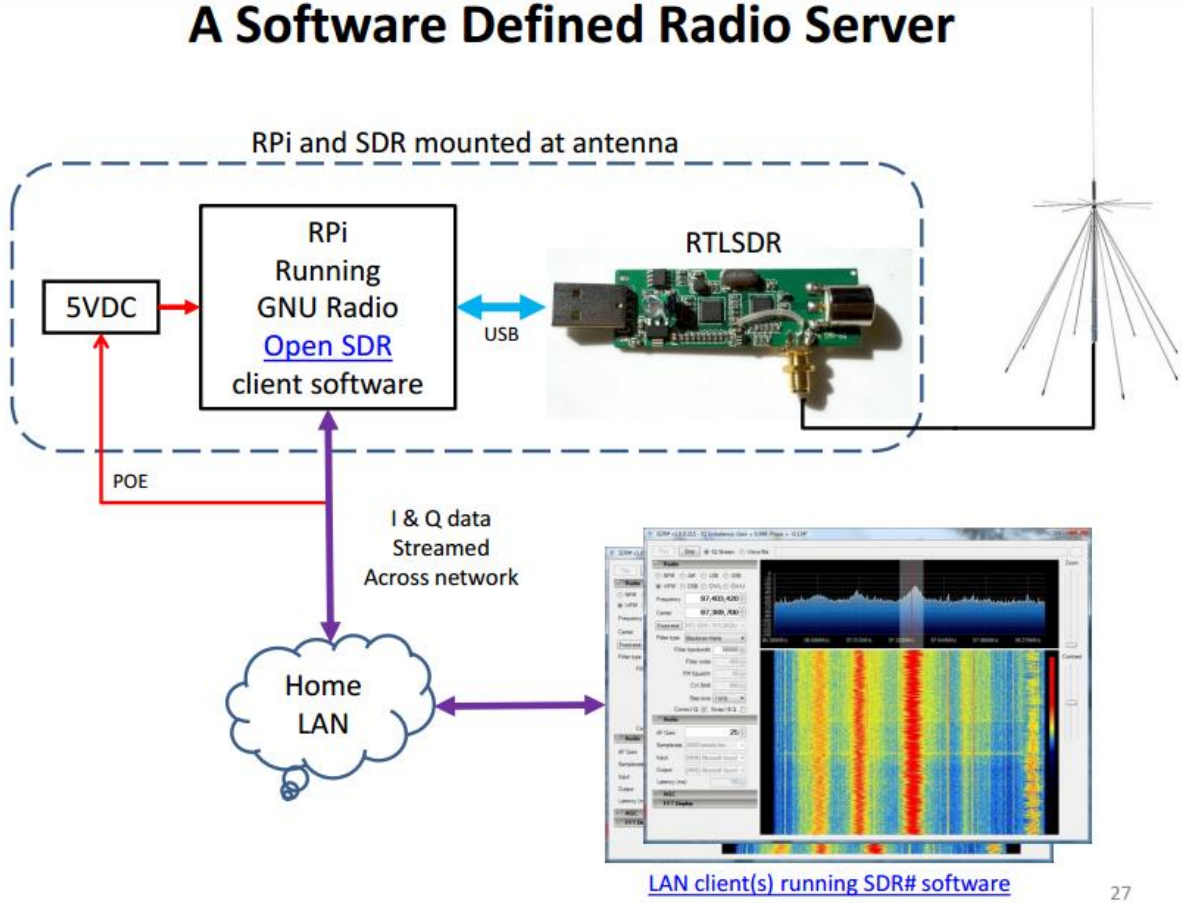
http://elinux.org/RPi_Expansion_Boards

Skript i pyton

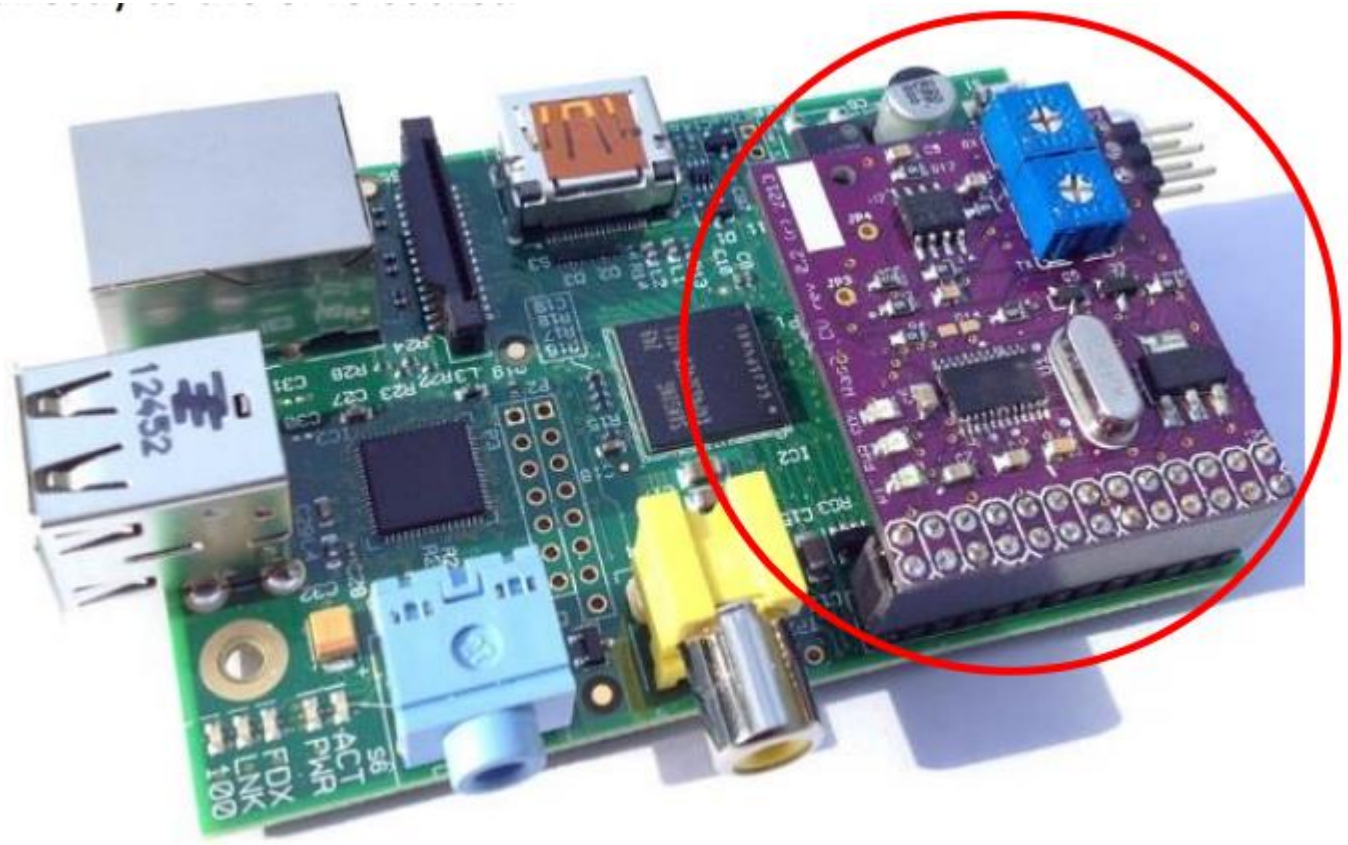
```
# example1.py
# Import the required module.
import RPi.GPIO as GPIO
# Set the mode of numbering the pins.
GPIO.setmode(GPIO.BOARD)
# GPIO pin 10 is the output.
GPIO.setup(10, GPIO.OUT)
# GPIO pin 8 is the input.
GPIO.setup(8, GPIO.IN)
# Initialise GPIO10 to high (true) so that the LED is off.
GPIO.output(10, True)
            while 1:
                        if GPIO.input(8):
                                    GPIO.output( 10, False) else:
# When the button switch is not pressed, turn off the LED.
GPIO.output( 10, True)
```



A Software Defined Radio Server

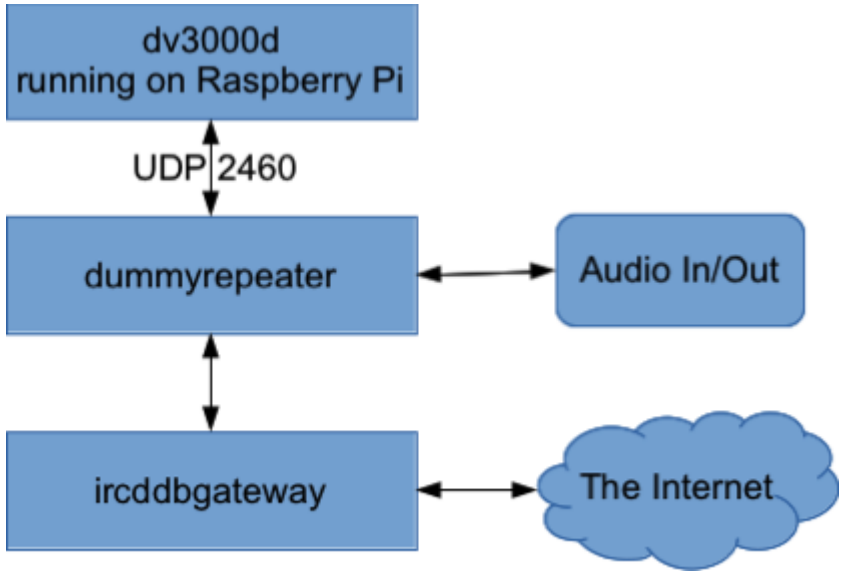


GMSK modem



Raspberry PI og D-star

- http://www.youtube.com/watch?v=_CgWXFflW7c

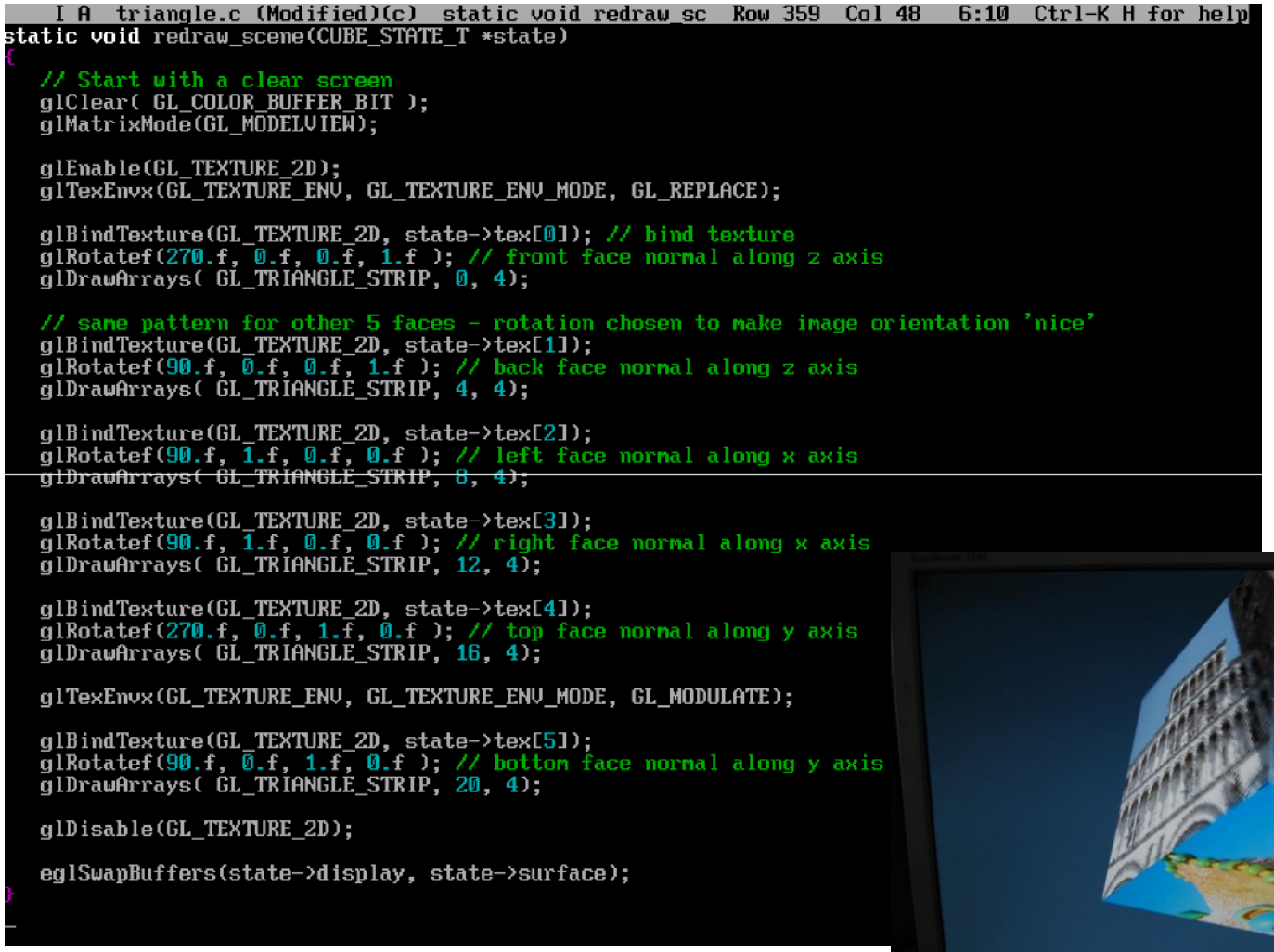


Linux er spennende

- Lett å komme i gang
- Mye spennende anvendelser fra og for radioamatørmiljøer
- For amatører og eksperter

- Kjempestort bibliotek med anvendelser

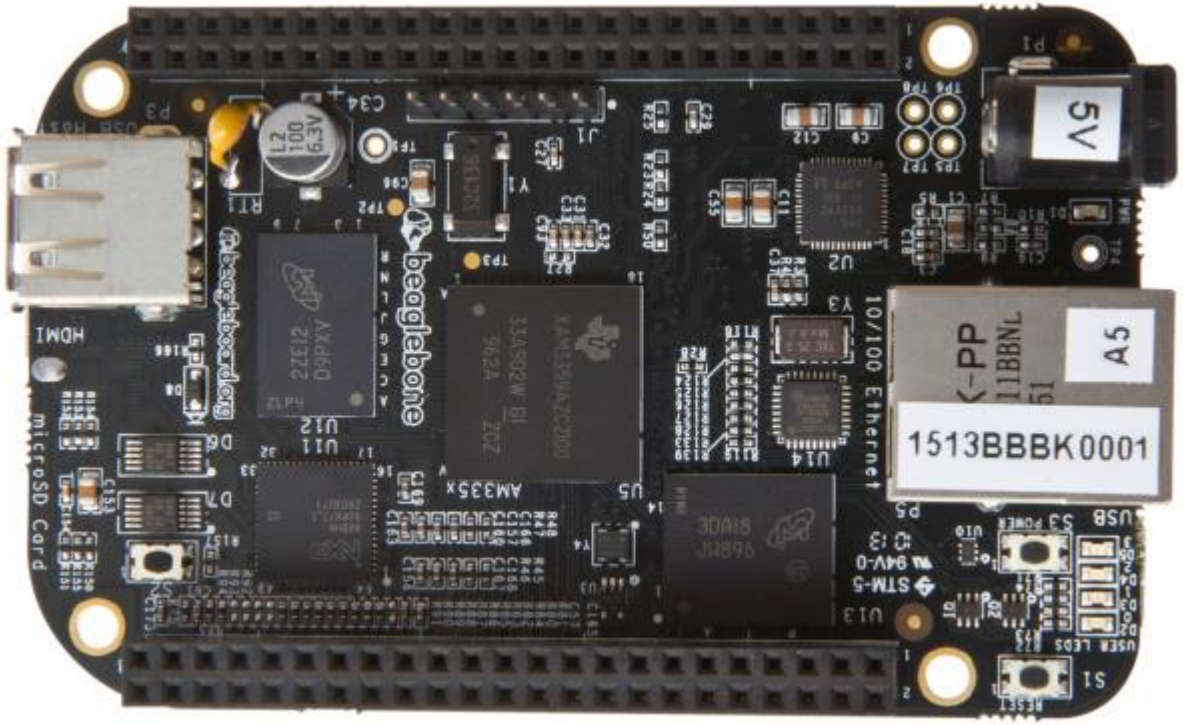
Programmering



Mange programmer tilgjengelig

- http://www.raspberryconnect.com/raspbian-packages-list/item/71-raspbian-hamradio
- Bruk google.com

Beaglebone Black



beagleBone Black

ALE – Automatic Link Establishment, https://groups.yahoo.com/neo/groups/BeagleBoneBlack-ALE/info

Comparing Raspberry Pi and BeagleBone Black

	BeagleBone Black	Raspberry Pi
Base Price	45	35
Processor	1GHz TI Sitara AM3359 ARM Cortex A8	700 MHz ARM1176JZFS
RAM	512 MB DDR3L @ 400 MHz	512 MB SDRAM @ 400 MHz
Storage	2 GB on-board eMMC, MicroSD	SD
Video Connections	1 Micro-HDMI	1 HDMI, 1 Composite
Supported Resolutions	1280×1024 (5:4), 1024×768 (4:3), 1280×720 (16:9), 1440×900 (16:10) all at 16 bit	Extensive from 640×350 up to 1920×1200, this includes 1080p
Audio	Stereo over HDMI	Stereo over HDMI, Stereo from 3.5 mm jack
Operating Systems	Angstrom (Default), Ubuntu, Android, ArchLinux, Gentoo, Minix, RISC OS, others...	Raspbian (Recommended), Ubuntu, Android, ArchLinux, FreeBSD, Fedora, RISC OS, others...
Power Draw	210-460 mA @ 5V under varying conditions	150-350 mA @ 5V under varying conditions
GPIO Capability	65 Pins	8 Pins
Peripherals	1 USB Host, 1 Mini-USB Client, 1 10/100 Mbps Ethernet	2 USB Hosts, 1 Micro-USB Power, 1 10/100 Mbps Ethernet, RPi camera connector

Billig å komme i gang

- Du trenger en pc med windows eller linux
- Og må kjøpe:

Raspberry Pi	Kr. 250,-
Strøm, tastatur, mus	Kr. 150-200
Hdmi kabel eller adapter	Kr. 100,-
Beaglebone Black	Kr. 350,-
Strøm, tastatur, mus	Kr. 150-200
Hdmi kabel eller adapter	Kr. 100,-
Arduino	Kr. 100-500
Strøm og usb kabel	Kr. 100,-

Sammenligne

Name	Arduino Uno	Raspberry Pi	BeagleBone
Model Tested	R3	Model B	Rev A5
Price	$29.95	$35	$89
Size	2.95"x2.10"	3.37"x2.125"	3.4"x2.1"
Processor	ATMega 328	ARM11	ARM Cortex-A8
Clock Speed	16MHz	700MHz	700MHz
RAM	2KB	256MB	256MB
Flash	32KB	(SD Card)	4GB(microSD)
EEPROM	1KB		
Input Voltage	7-12v	5v	5v
Min Power	42mA (.3W)	700mA (3.5W)	170mA (.85W)
Digital GPIO	14	8	66
Analog Input	6 10-bit	N/A	7 12-bit
PWM	6		8
TWI/I2C	2	1	2
SPI	1	1	1
UART	1	1	5
Dev IDE	Arduino Tool	IDLE, Scratch, Squeak/Linux	Python, Scratch, Squeak, Cloud9/Linux
Ethernet	N/A	10/100	10/100
USB Master	N/A	2 USB 2.0	1 USB 2.0
Video Out	N/A	HDMI, Composite	N/A
Audio Output	N/A	HDMI, Analog	Analog

Referanser

- *www.raspberrypi.org*
- *en.wikipedia.org/wiki/Raspberry_Pi*
- https://www.modmypi.com/raspberry-pi-hacking