Design DAQ system using Arduino and LabVIEW

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Graduated BioMedical Engineering at HCMcUT.

Moderator forum https://codientu.org/ from 2012- 2014

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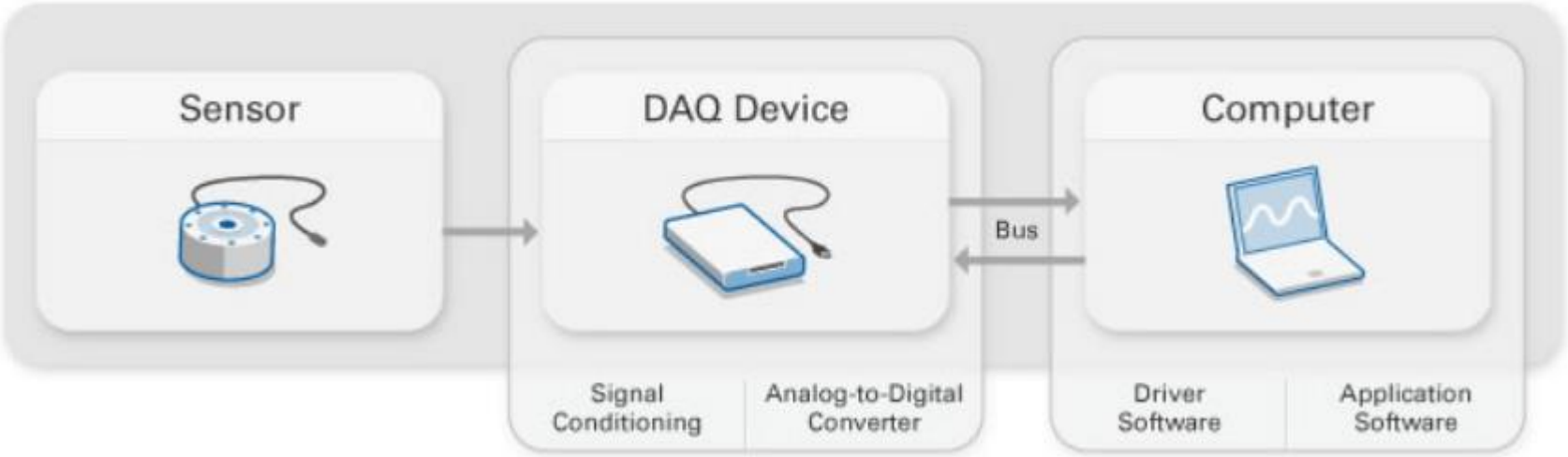
LabVIEW Enigineer at Peritec coporation from 2017

More than 4 years work with LabVIEW.

Contents

1. What is DAQ

Data acquisition (DAQ) is the process of measuring an electrical or physical phenomenon such as voltage, current, temperature, pressure, or sound with a computer. A DAQ system consists of sensors, DAQ measurement hardware, and a computer with programmable software



1. What is DAQ

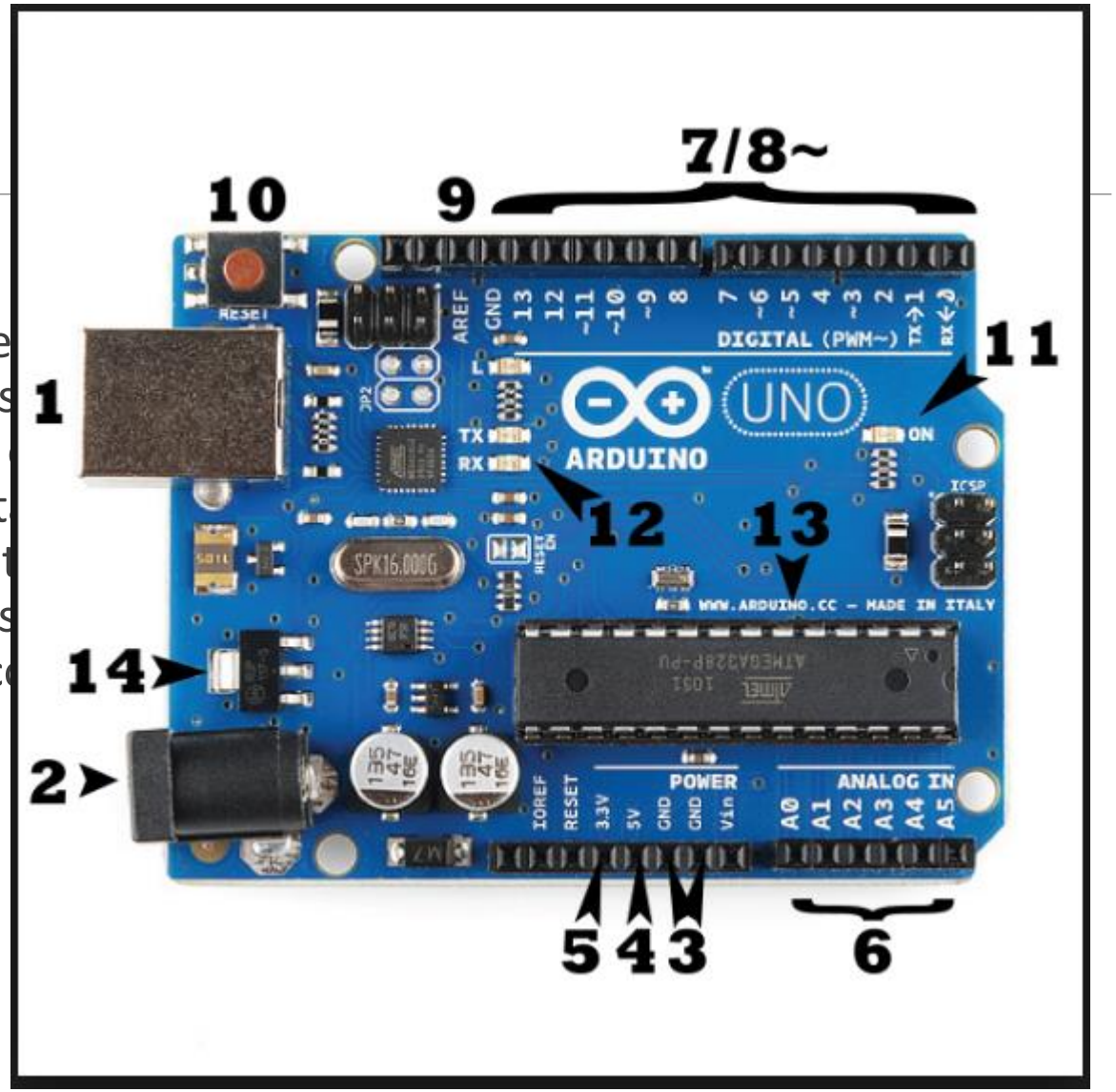
Sensor:

The measurement of a physical phenomenon
of a light source, or the force applied to an ob
transducer, converts a physical phenomenon
the type of sensor, its electrical output can be
attribute that varies over time. Some sensors
to properly produce a signal that can accurate

1. What is DAQ

DAQ Board:

DAQ hardware acts as the interface betwee
primarily functions as a device that digitizes
interpret them. The three key components
signal conditioning circuitry, analog-to-digit
devices include other functions for automat
example, digital-to-analog converters (DACs
output digital signals, and counter/timers c



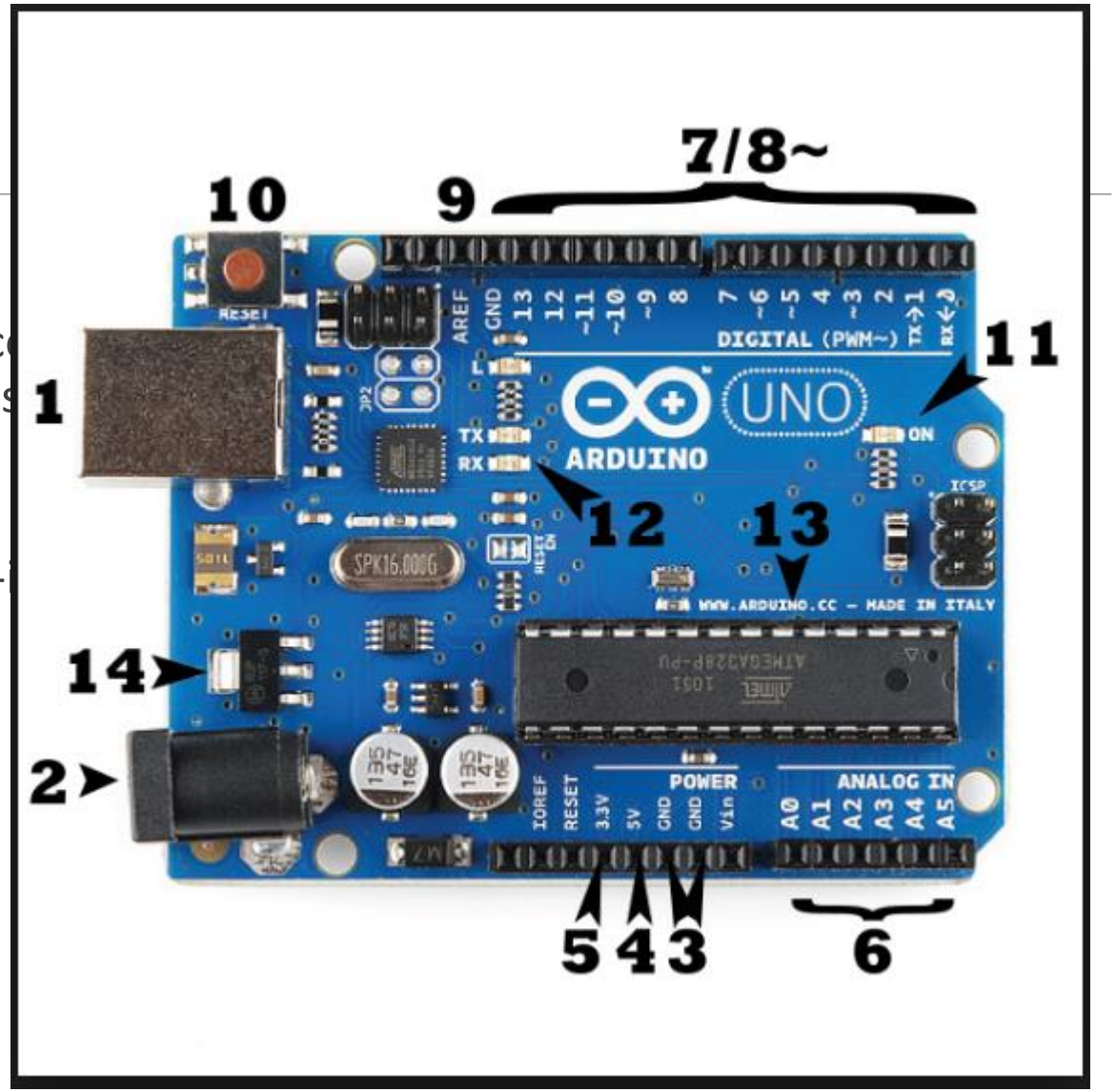
1. What is DAQ

PC and software:

A computer with programmable software c
for processing, visualizing, and storing meas

For more information:

http://www.ni.com/data-acquisition/what-



2. What is LabVIEW

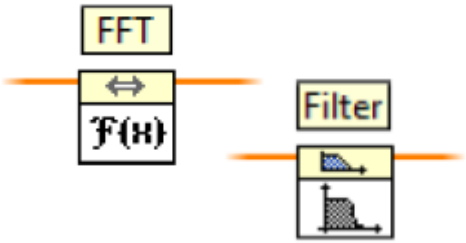
LabVIEW is systems engineering software for applications that require test, measurement, and control with rapid access to hardware and data insights(ni.com)

Laboratory Virtual Instrument Engineering Workbench (LabVIEW) is a system-design platform and development environment for a visual programming language from National Instruments.

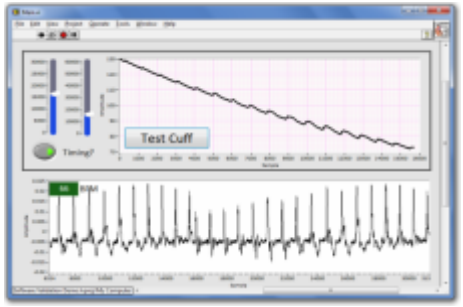
NATIONAL INSTRUMENTS

LabVIEW™

Hardware APIs

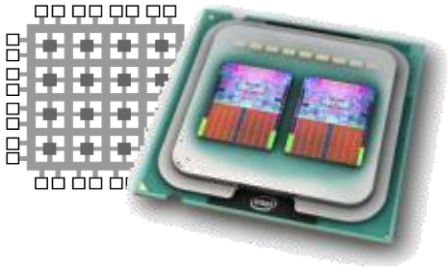


Built-in Libraries

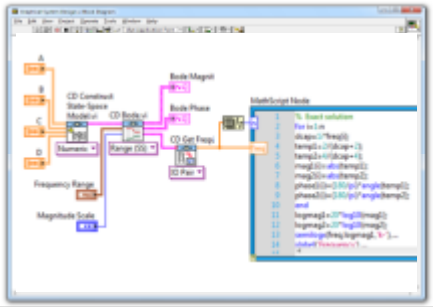


Custom User Interfaces

Deployment Targets



Technology Abstractions



Programming Approaches

A Graphical System Design Environment for Engineers and Scientists Worldwide

3. How to program Arduino with LabVIEW?

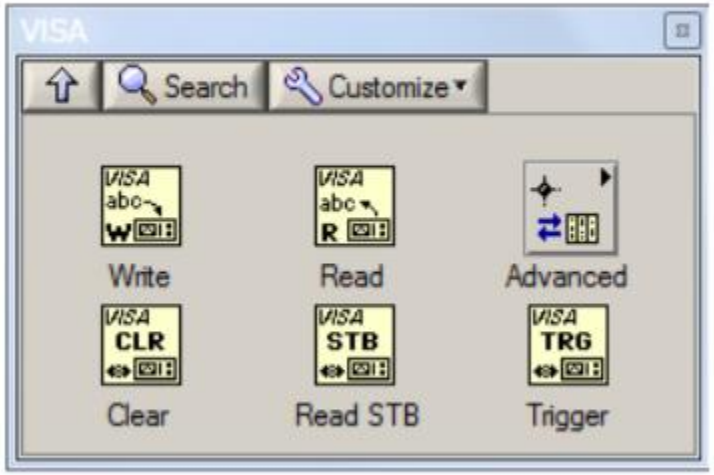
To program Arduino in LabVIEW, we need:

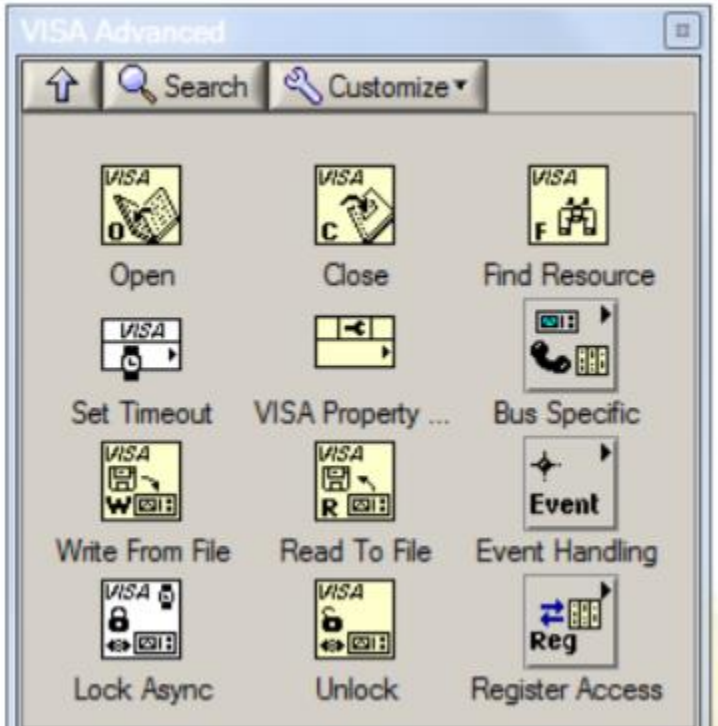
- LabVIEW development program(with license or Academic license for University)
- NI VISA(Free)
- LabVIEW Interface toolkit(Free)
-Student can access resource in NI: https://learn.ni.com/teach

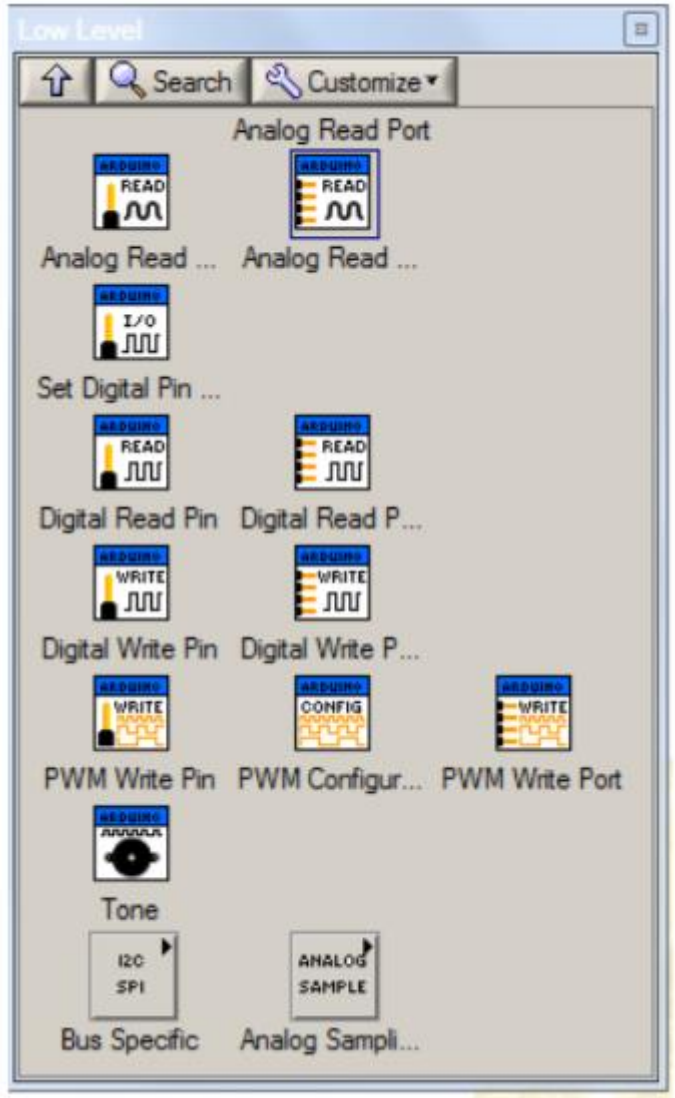
3. How to program Arduino with LabVIEW?

We have 2 method to program Arduino:

- Using NI VISA
- Using LabVIEW Interface For Arduino(LIFA) toolkit.







3. How to program Arduino with LabVIEW?

But program with NI VISA require developer must have good knowledge both LabVIEW and Arduino backround.

So, in this topic we will learn how to use LIFA tool kit.

3. How to program Arduino with LabVIEW?

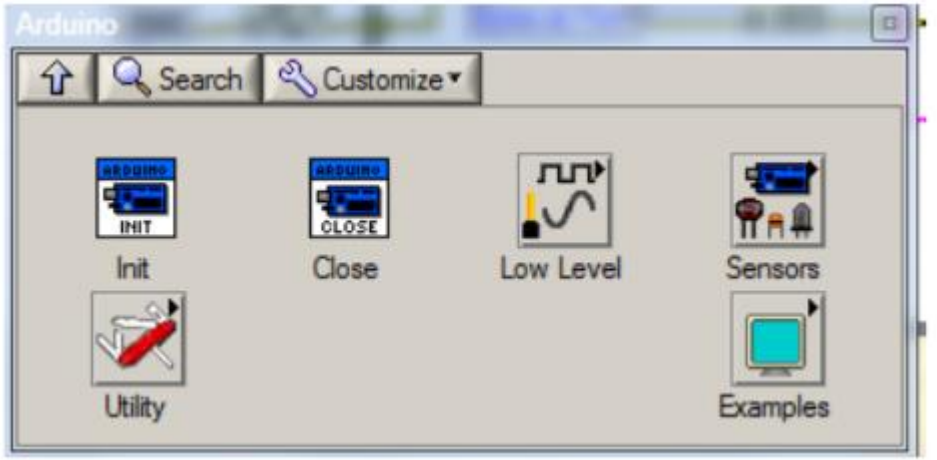
The LabVIEW Interface for Arduino (LIFA) Toolkit allows developers to acquire data from the Arduino microcontroller and process it in the LabVIEW

- Install LIFA on your LabVIEW

- Download LIFA Firmware to your Arduino (via Arduino IDE)

- Build your code in Arduino with LIFA

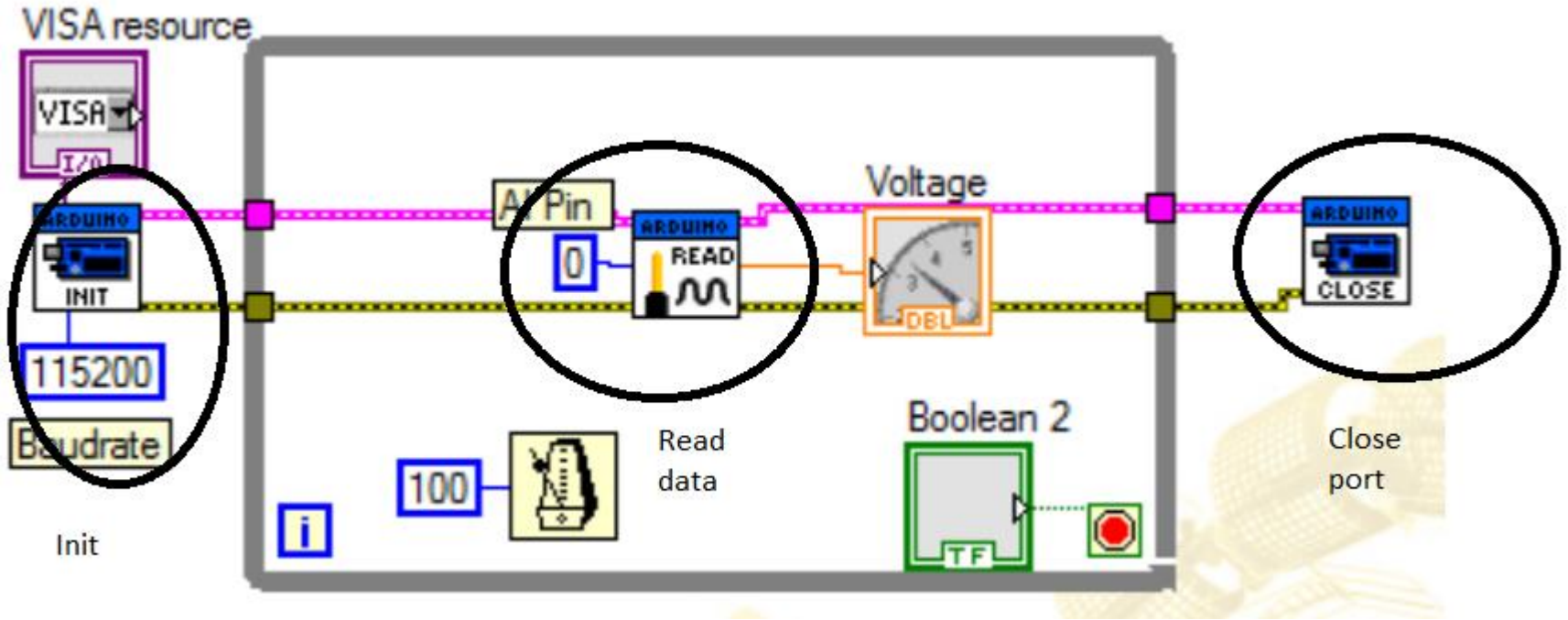
Block Diagram



3. How to program Arduino with LabVIEW?

A simple example using Analog input to read voltage from A0 pin.

A program has 3 block:

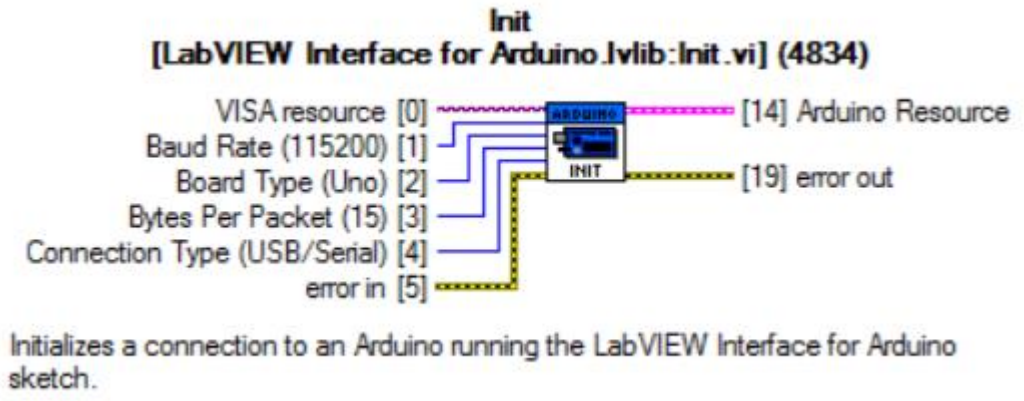


3. How to program Arduino with LabVIEW?

Some important block diagram from LIFA's pallete

1. Initialize

This is the first function and very important in LIFA's pallete

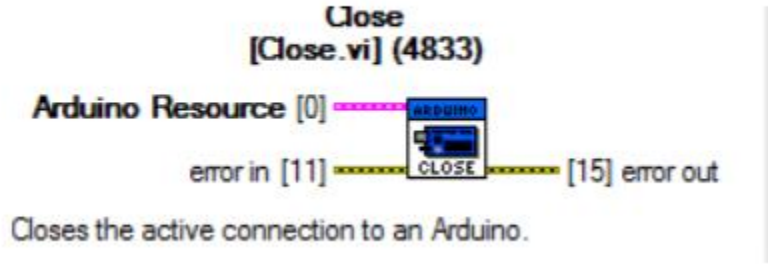


3. How to program Arduino with LabVIEW?

Some important block diagram from LIFA's pallete

2. Close:

Close function closes connection between Arduino board and PC.



3. How to program Arduino with LabVIEW?

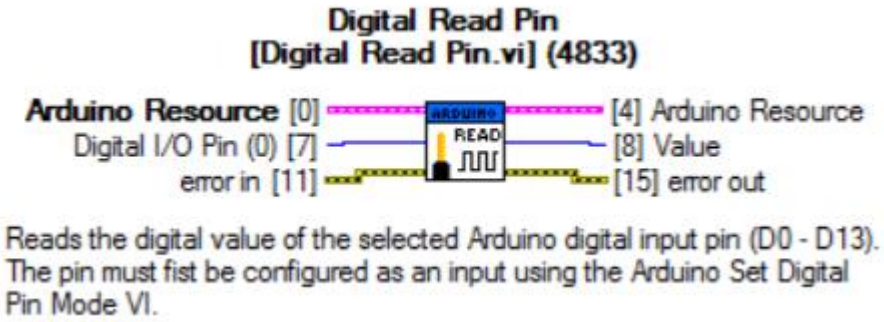
Some important block diagram from LIFA's pallete

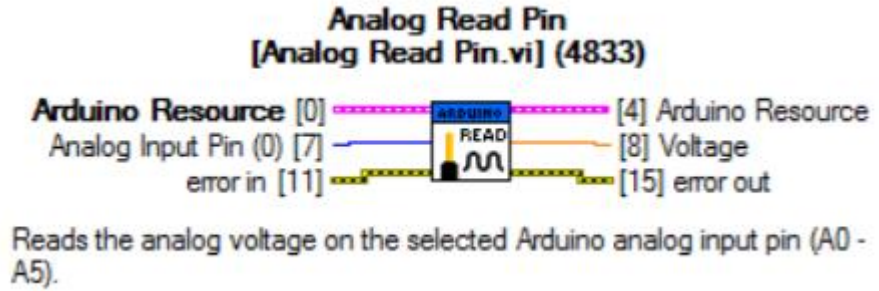
3. Analog Read Pin:

Acquire analog signal from Analog pin from A0 to A5 with Uno and from A0-A7 with Mega.

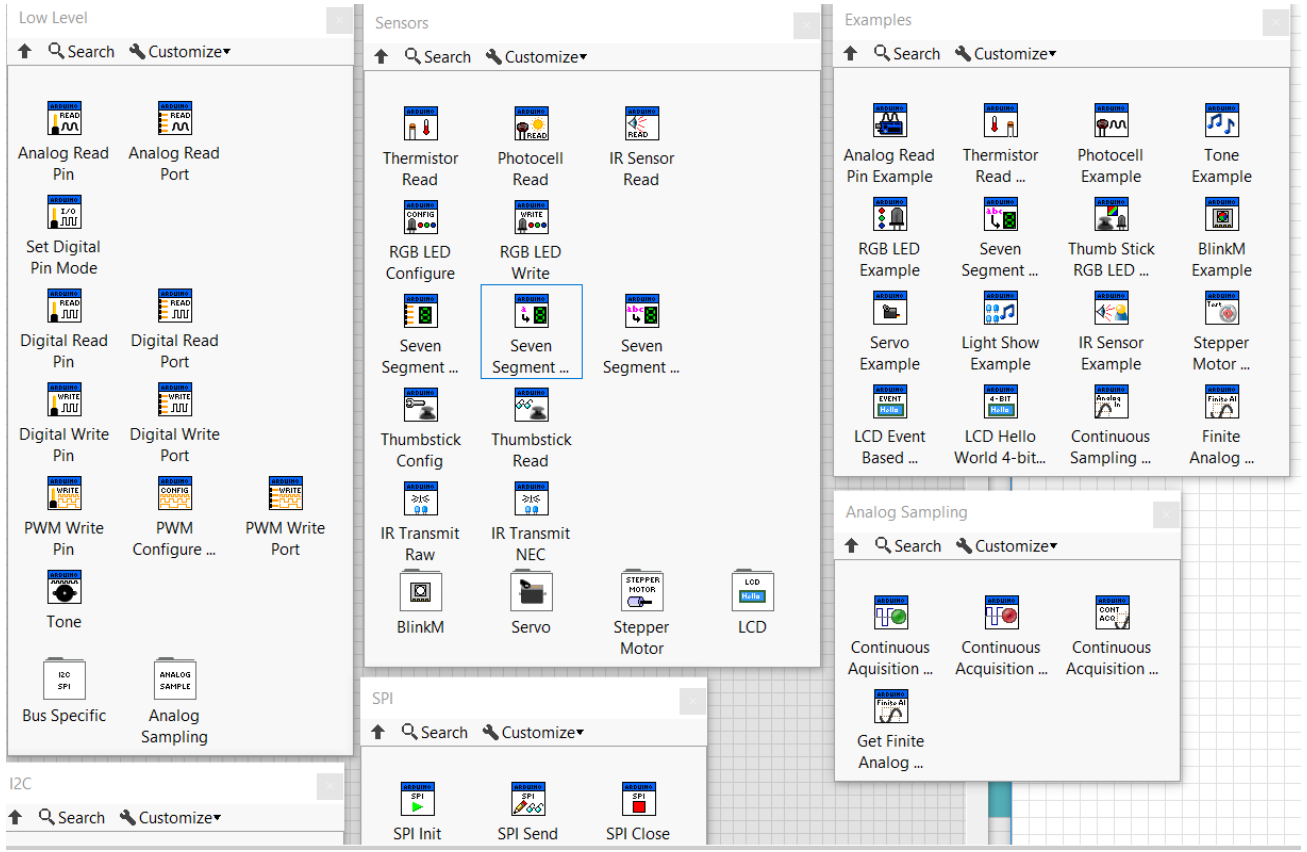
4. Digital Read Pin:

reads the digital value of the selected Arduino Digital Input Pin (D0-D13)

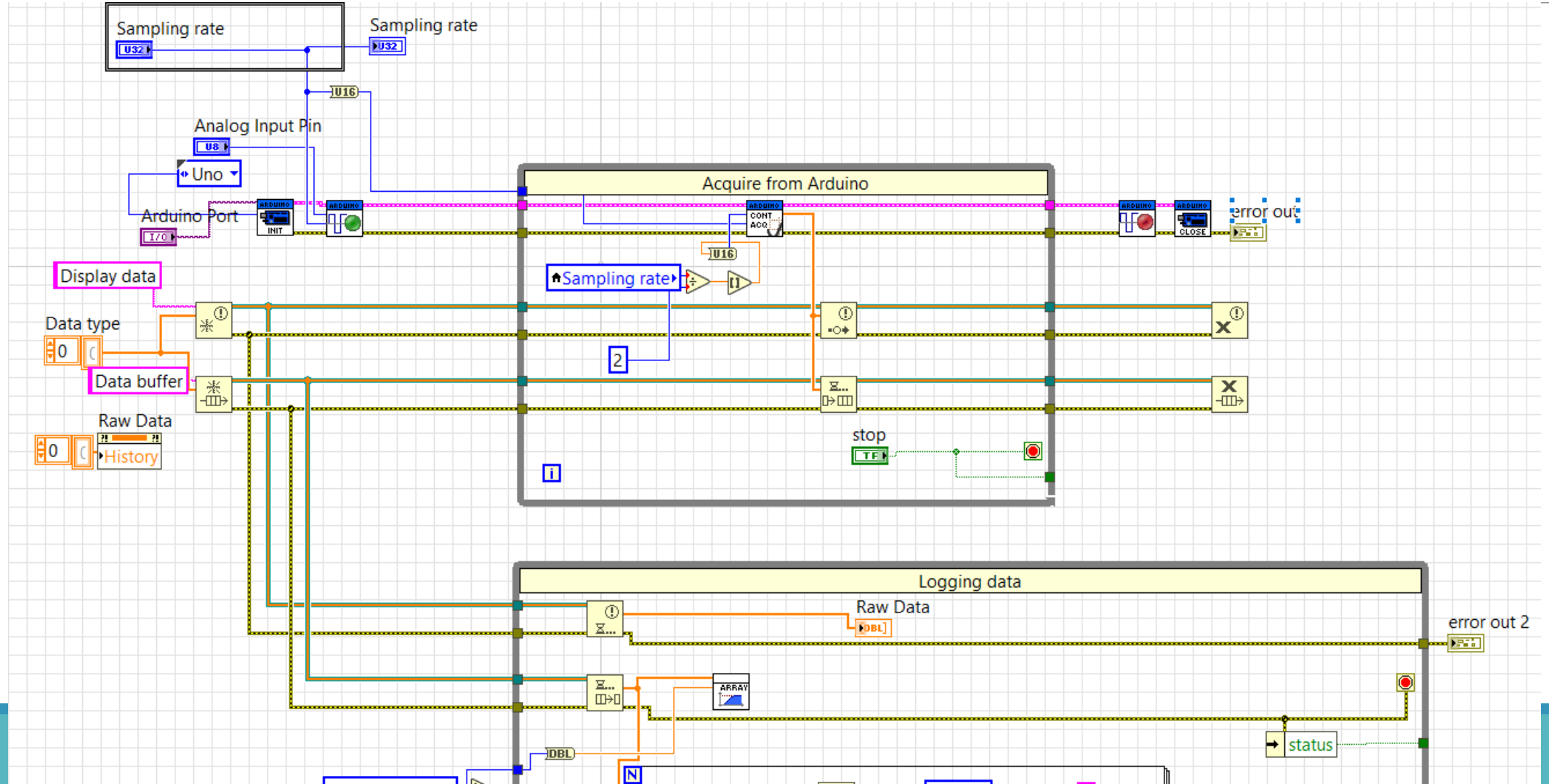


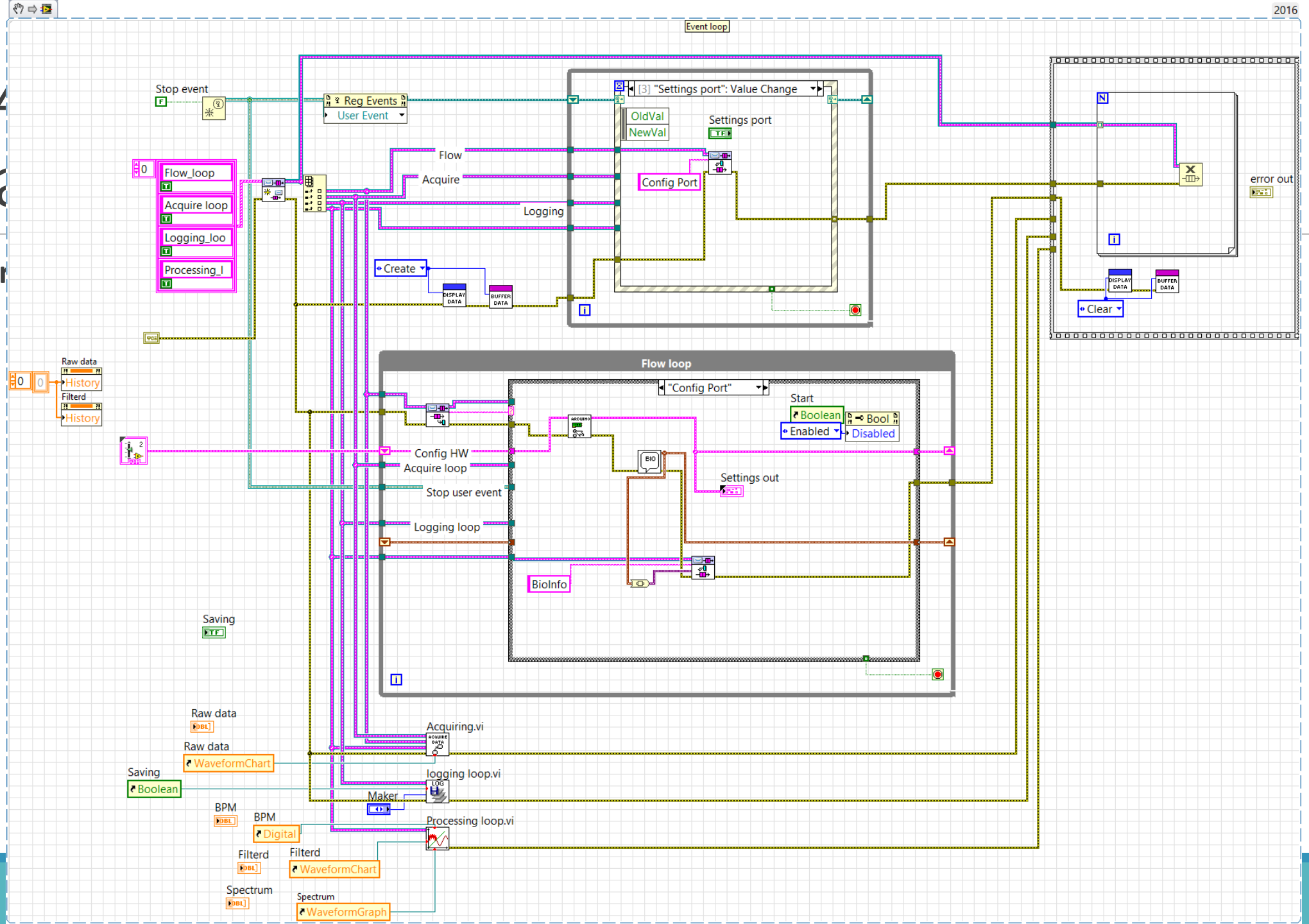


More function!!!



4. Building DAQ system with LabVIEW and Arduino




2016
Event loop
Stop event
Reg Events
User Event
[3] "Settings port": Value Change
OldVal
NewVal
Settings port
Flow
Acquire
Logging
Config Port
Flow_loop
Acquire loop
Logging_loo
Processing_l
Create
DISPLAY DATA
BUFFER DATA
error out
Clear
Raw data
History
Filterd
History
Flow loop
"Config Port"
Start
Boolean
Enabled
Bool
Disabled
Config HW
Acquire loop
Stop user event
Logging loop
Settings out
BioInfo
Saving
Raw data
Acquiring.vi
Raw data
WaveformChart
Saving
Boolean
logging loop.vi
Maker
BPM
BPM
Digital
Processing loop.vi
Filterd
Filterd
WaveformChart
Spectrum
Spectrum
WaveformGraph

4. Building DAQ system with LabVIEW and Arduino

Sampling Palette tool

4. Building DAQ system with LabVIEW and Arduino

Sampling Theorem

http://www.ni.com/white-paper/5509/en/

http://download.ni.com/evaluation/pxi/Acquiring_Analog_Signal.pdf

http://www.ni.com/white-paper/3041/en/