AlgoBuilder

Rapid Prototyping with MEMS Sensors and Microcontrollers – Introduction to the ST AlgoBuilder

Thiago Reis & Mauro Scandiuzzo

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Technology Tour 2019

Anaheim, CA | March 26

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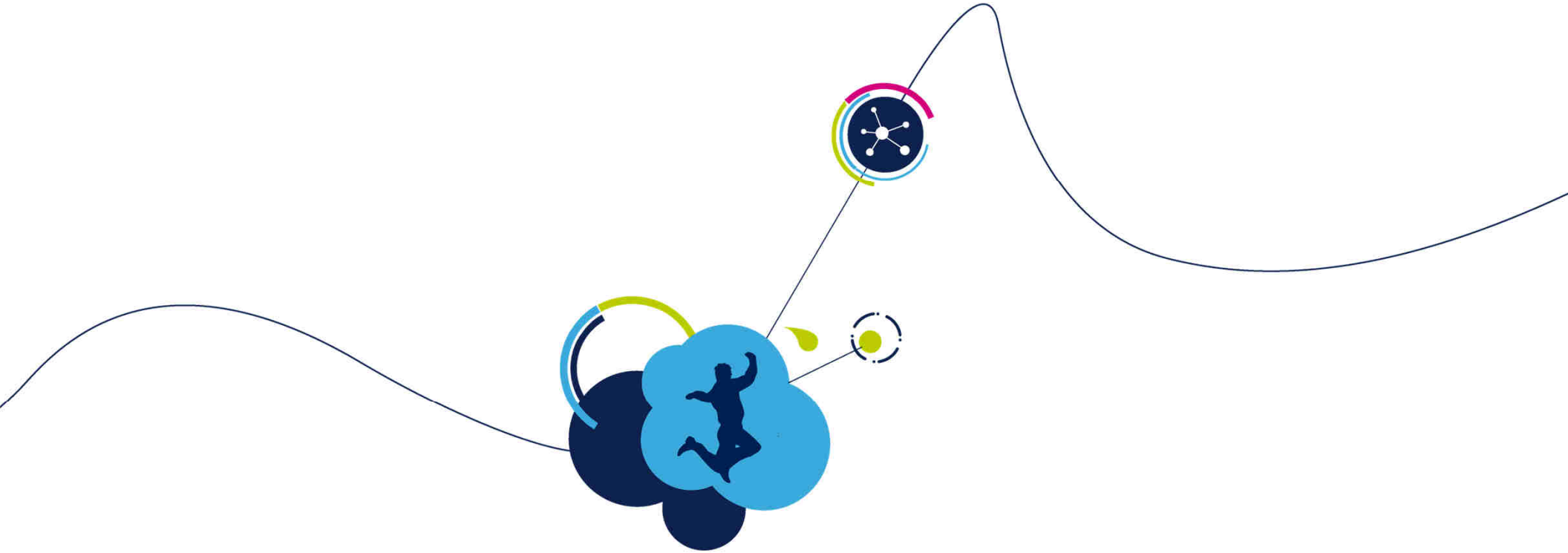

Introduction

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Who Is ST

- A global semiconductor leader
- 2017 revenues of **$8.35B** with year-on-year growth of **19.7%**
- Listed: NYSE, Euronext Paris and Borsa Italiana, Milan

- Research & Development
- Main Sales & Marketing
- Front-End
- Back-End

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- Approximately **45,500** employees worldwide
- Approximately **7,400** people working in R&D
- **11** manufacturing sites
- Over **80** sales & marketing offices

As of December 31, 2017

ST: Products & Ecosystem
to Match IoT Market Trends

Market Trends

Smart Things	Smart Home	Smart City	Smart Industry
Ultra-low power, Form Factor, Sensors Performance…	Wifi, BTLE, sub-GHz, Sensors, Audio, Touch, Graphics…	LTE, Sub-GHz, Motion Sensors	Longevity, Certification, motion sensors…

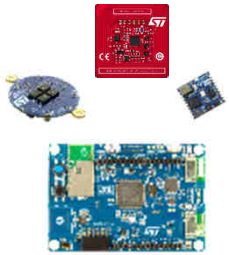
ST Offering

Broad Technology Offer

Ecosystem for application development

STM32 Nucleo development kits

STM32 Nucleo expansion boards for connectivity, sensing, actuating



Starter Kits and Form Factor Boards

STM32 Cube

STM32 Open Development Environment

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Partner Program

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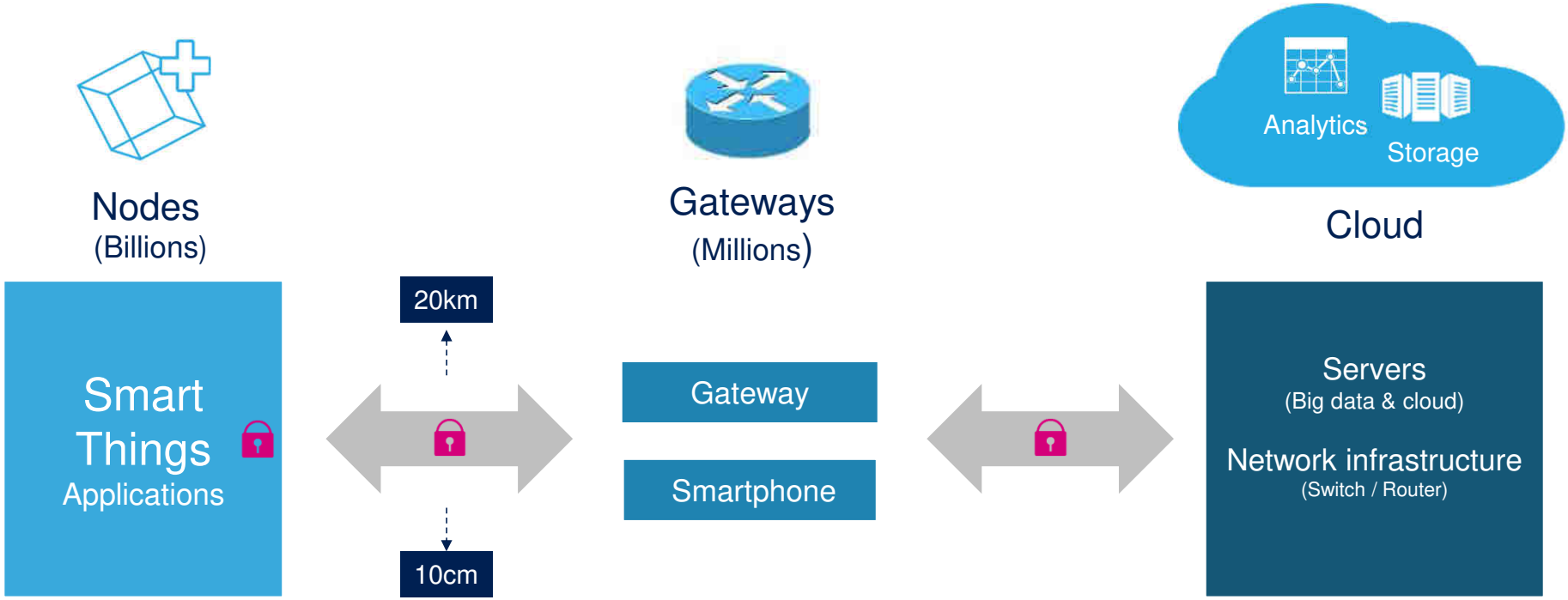
The IoT Trend

Any system able to leverage the Internet and its ecosystem



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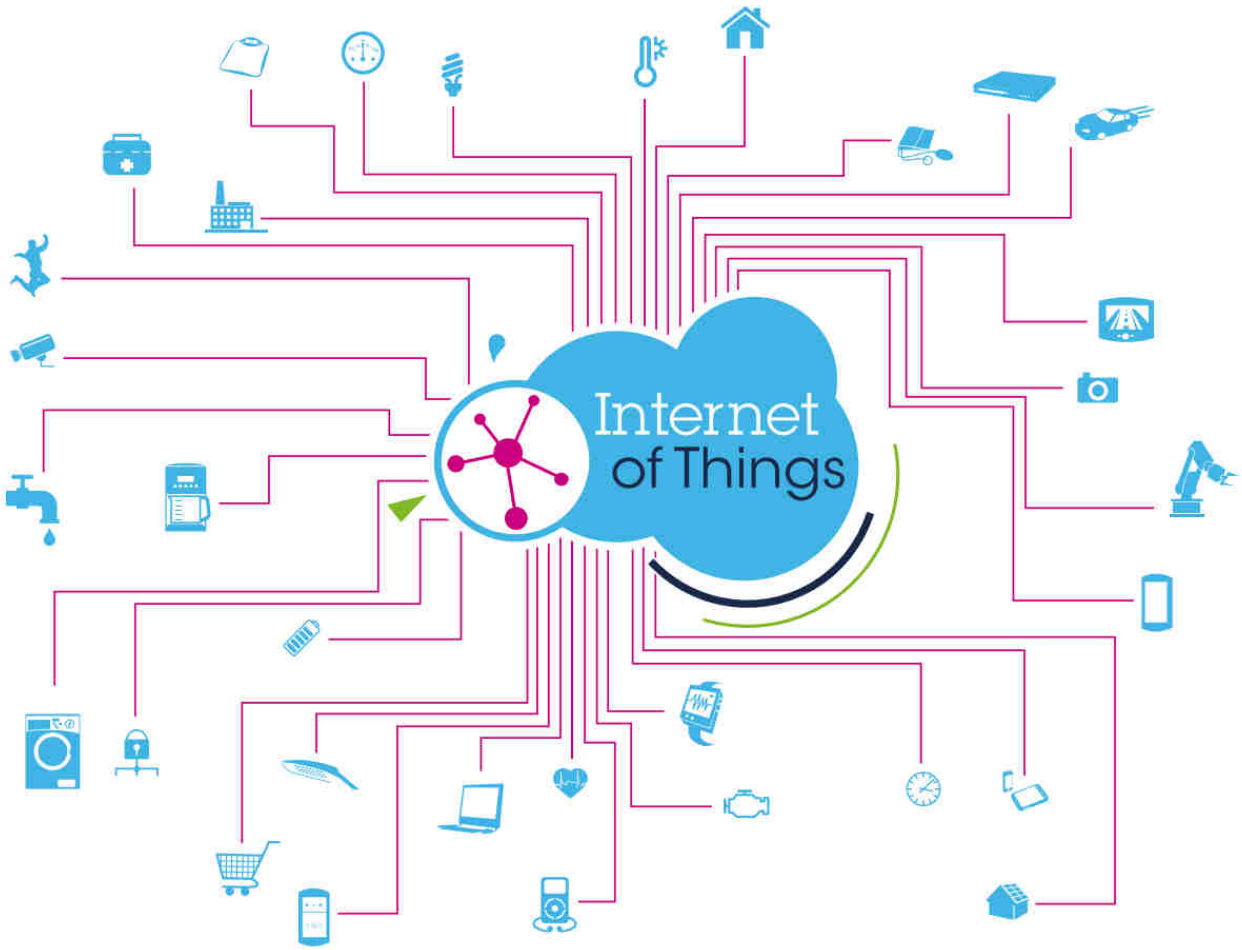
IoT Devices Come in Many Form Factors



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…but Their Needs are the Same

	Sensing & Actuating	Processing & Security	Connectivity	Signal Conditioning & Protection	Power & Energy Management
Smart Things	Full range of sensors and actuators	Ultra-Low Power to High Performance Scalable Security solutions	10 cm to 10 km	Nano Amps to Kilo Amps	Nano Watt to Mega Watt
Smart Home					
Smart City					
Smart Industry					

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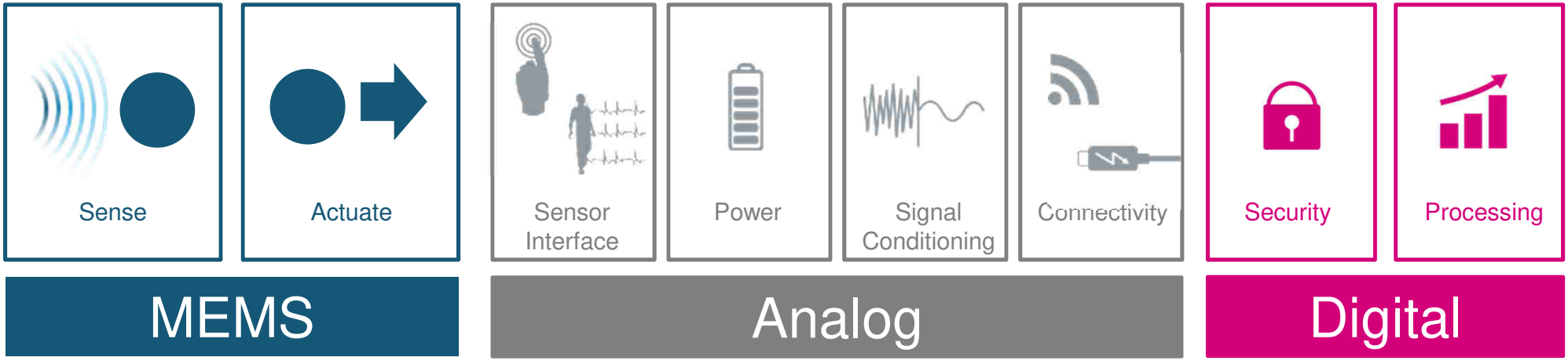
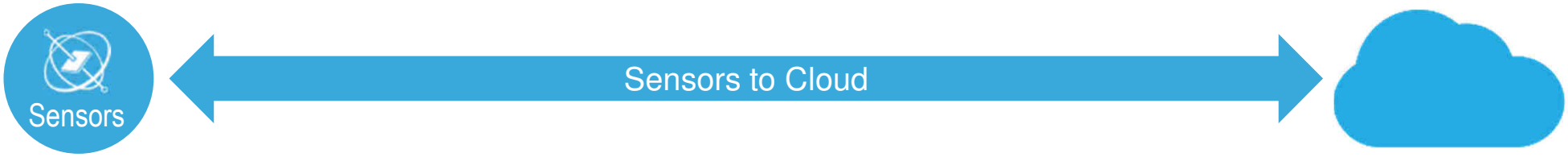
MEMS and Analog Empower the IoT





Today only a tiny portion of the sensory data that would be useful is captured, stored and analyzed
…and even smaller part of that is used to carry out actions through actuators

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Supporting the IoT Movement

Connect

Translate

Move
Actuate

Power

Secure

Process

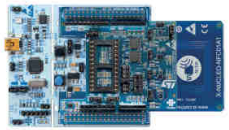
Sense

SensorTile

BlueCoin

SmarTAG

Discovery Kit IoT Node



STM32 Nucleo Development
& Expansion boards

Pre-integrated SW for vertical applications

Smart Things

Smart Home

Smart City

Smart Industry

Development Ecosystem

Code generators

Prototyping
software

Development
environments

Debug
solutions

Simulation
and analysis tools

On-line
design tools

ST Community

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Partner
Program

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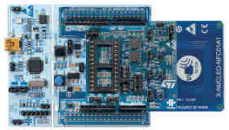

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Pre-integrated SW for vertical applications

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Development Ecosystem

AlgoBuilder

ST Community

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Partner Program

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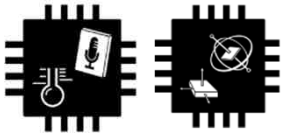
ST as Sensors & Actuators Supplier

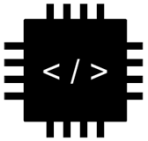
Market-proven Manufacturing Technologies

Front-End / Back-End/ Testing & Calibration

High Volume Manufacturing



Expertise in multi-sensor Integration



Leading Smart Functions Integration

Key Partnerships in product development

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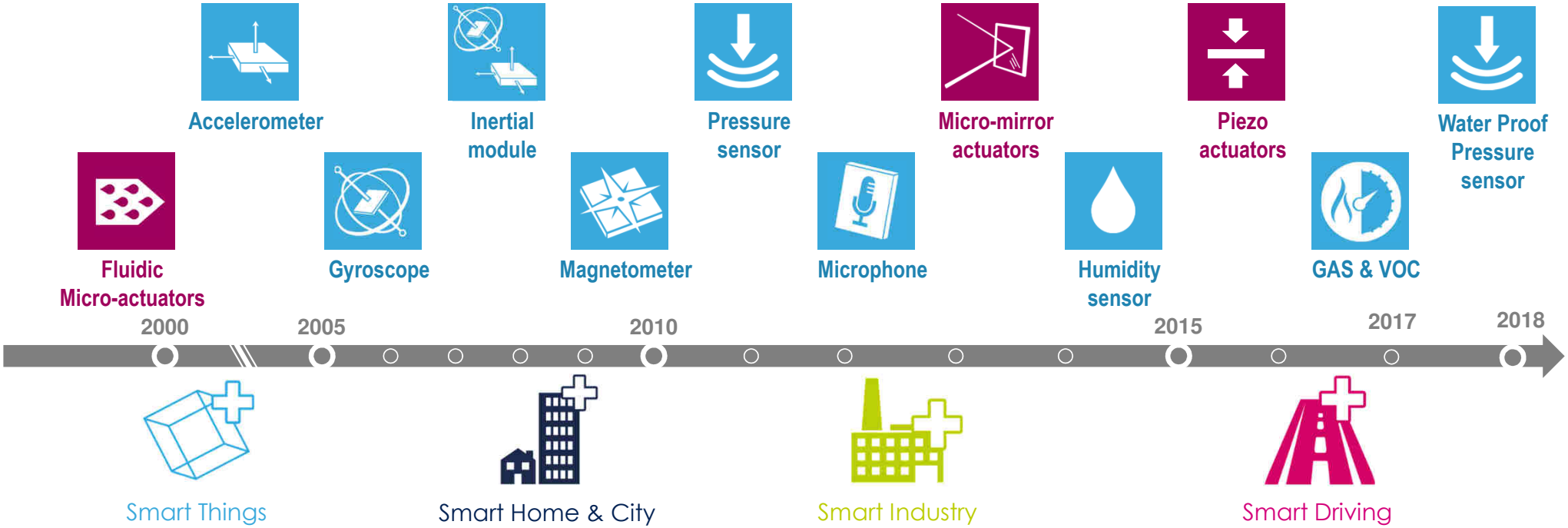
20 Years of MEMS at ST



Smart Things

Smart Home & City

Smart Industry

Smart Driving

Smart Industry

Advanced Industrial Sensors

10-Year Product Longevity

Industrial | Appliances | Building automation | Medical | Defense | Navigation

ST Longevity Program Benefits

- 10-YEAR LONGEVITY FROM PRODUCT INTRODUCTION DATE
- DESIGN AND MANUFACTURING FOR HIGHER ROBUSTNESS & PERFORMANCES
- CALIBRATION & TESTING FOR HIGHER ACCURACY & QUALITY
- EXTENDED TEMPERATURE RANGE AND ENDURANCE TO SHOCK AND VIBRATION

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STM32 portfolio positioning

12 product series / More than 800 Parts

More than
40,000 customers

Note ● : Cortex-M0+ Radio Co-processor

Supporting the IoT Movement

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Translate

Move
Actuate

Power

Secure

Process

Sense

SensorTile

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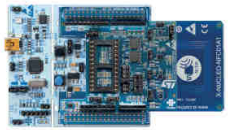
Discovery Kit IoT Node



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Pre-integrated SW for vertical applications

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Community

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Partner
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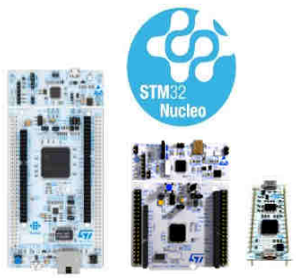
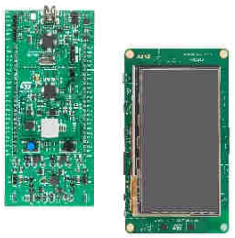
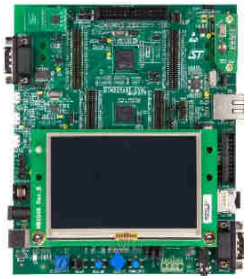
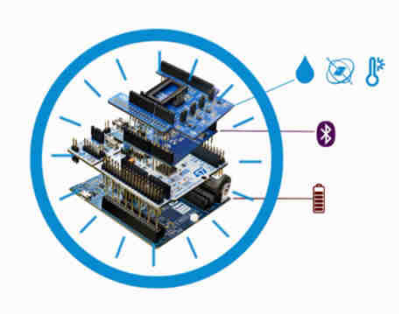
HW Development Tools

Development Tools adapted to your needs









STM32 Nucleo	Discovery kits	Evaluation boards	STM32 Nucleo expansion	Third-party boards
Flexible prototyping	Key feature prototyping	Full feature evaluation	Functionality add-on	From full evaluation to open hardware
www.st.com/stm32nucleo	www.st.com/stm32discovery	www.st.com/stm32evaltools	www.st.com/x-nucleo	

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An Application-Oriented Approach

Your need

- Sensors
- Connectivity
- Translate
- Motor drivers
- Power
- Processing

Application software
and development tools

The building blocks

Processor boards (Nucleo 64)
Expansion boards (X-NUCLEO)

- Motion
- Environmental
- Bluetooth LE
- Sub-1GHz
- NFC
- Op Amp
- Motor controller
- Power manager
- Microcontroller

STM32 Cube

Integrated Development Environment
and middleware

Our answer

Function Packs (FP)

Ready-to-use
application-oriented package

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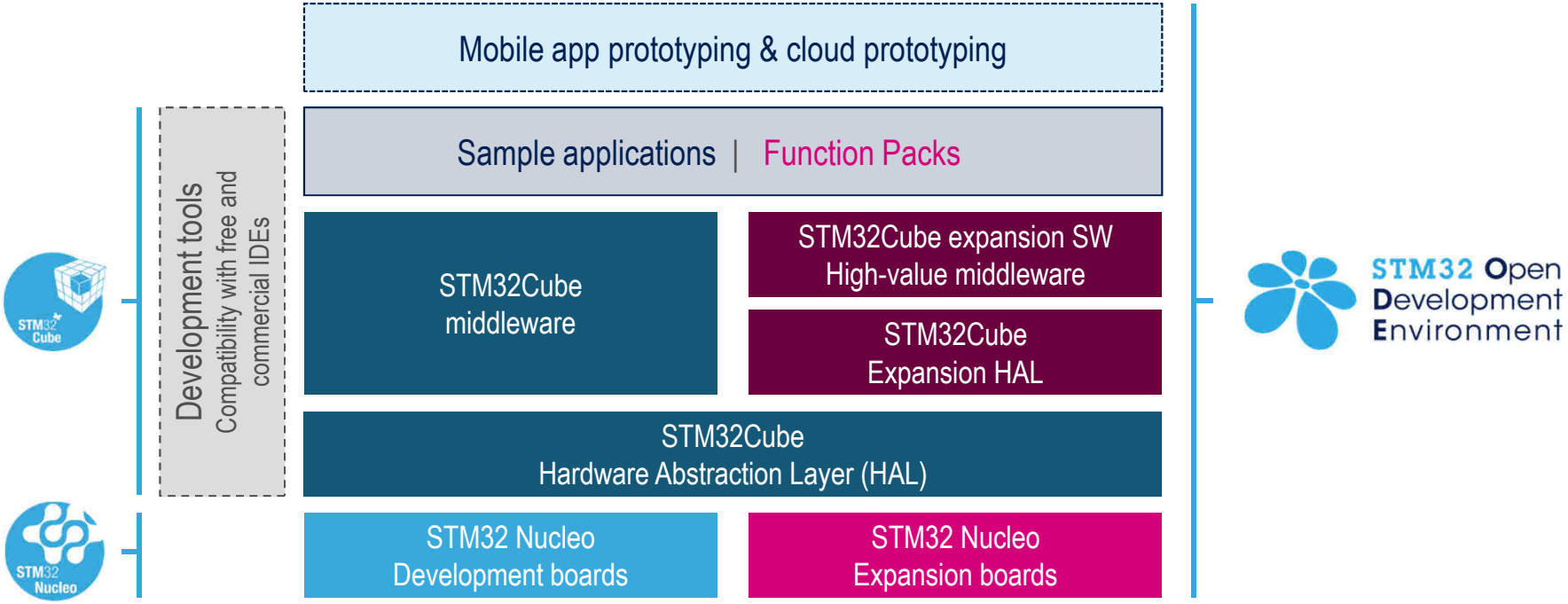
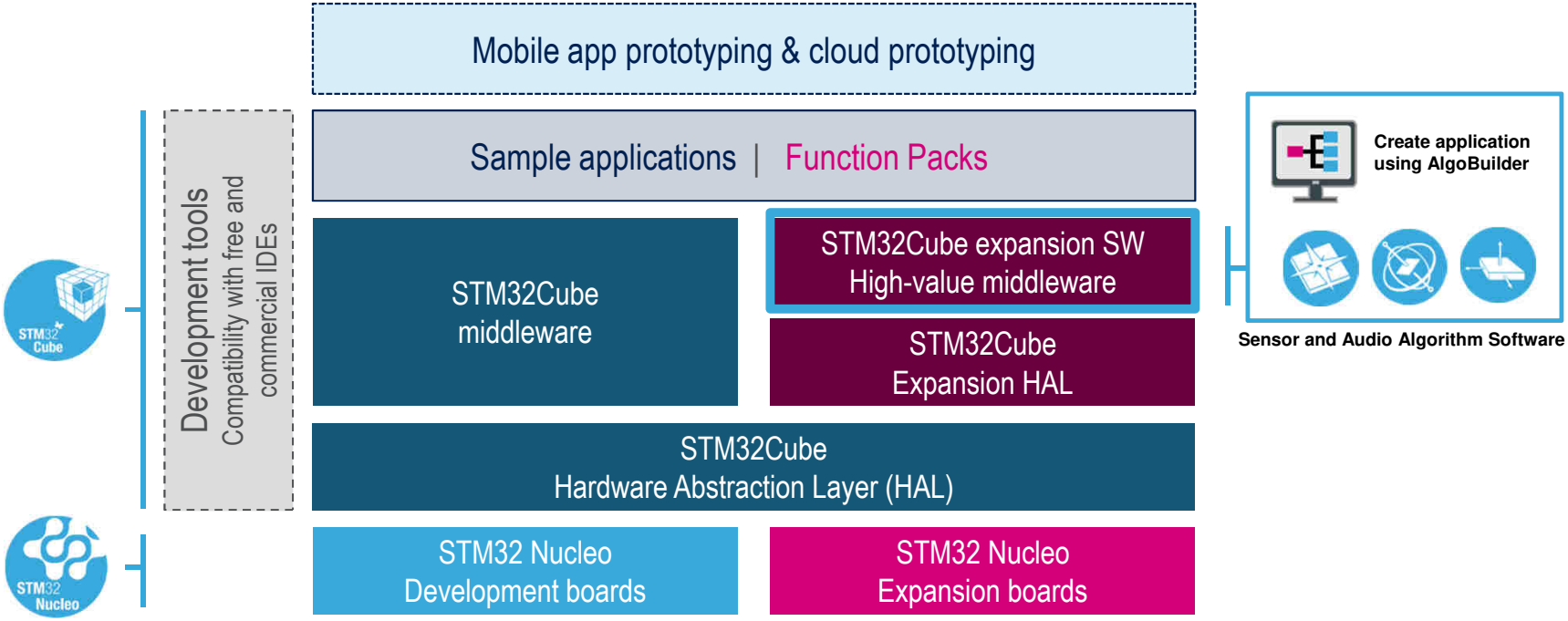
Development Software Architecture



Development Software Architecture



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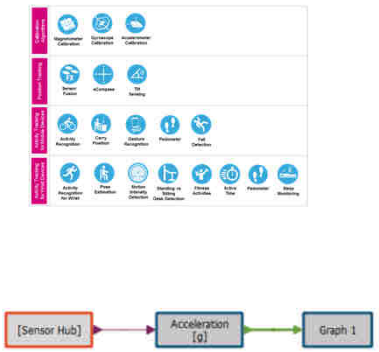
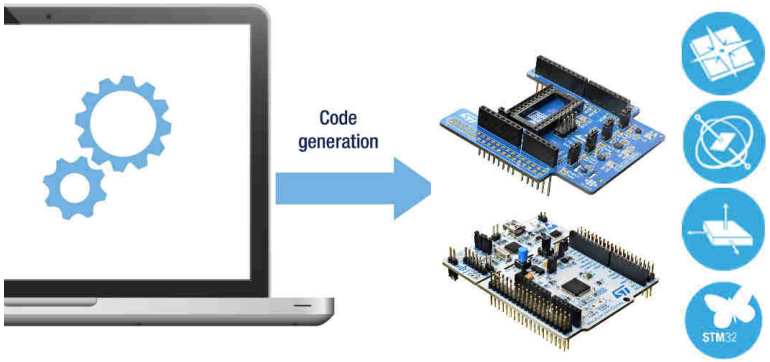
AlgoBuilder

An application for the graphical design and testing of algorithms



Existing algorithms
User-defined data processing blocks
Additional functionalities



GUI quickly elaborates proto applications
for
MEMS sensors
and
STM32 microcontrollers

AlgoBuilder
eases the process of implementing
proof of concept
without writing the code

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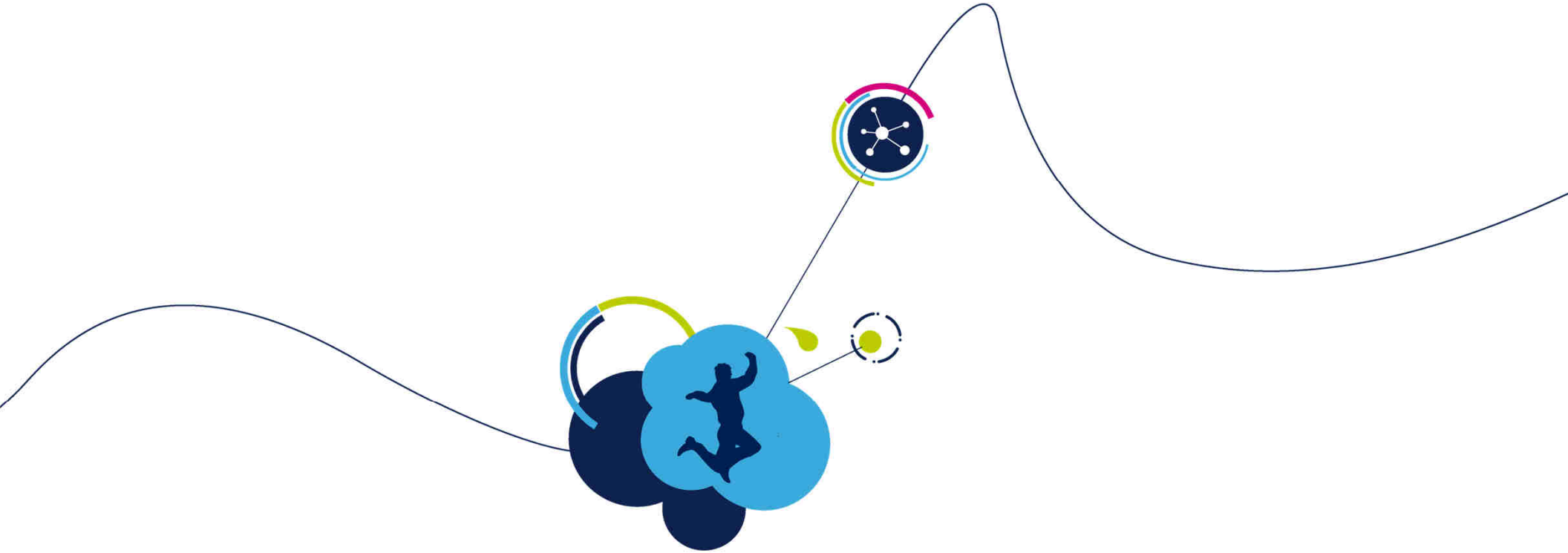

AlgoBuilder Overview

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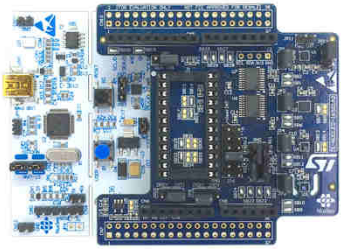
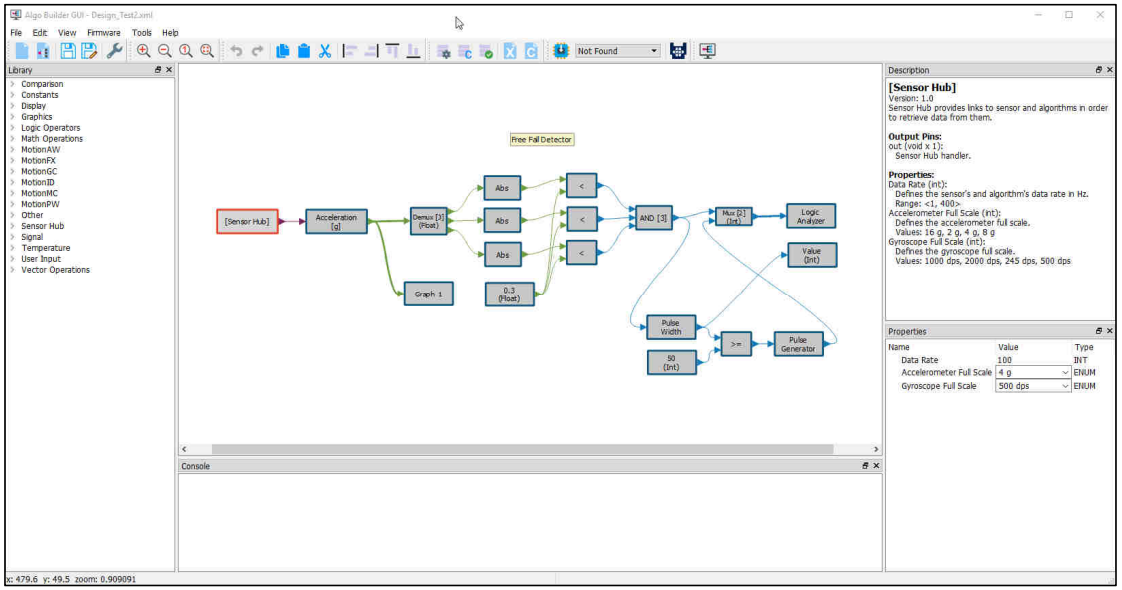
AlgoBuilder

Overview

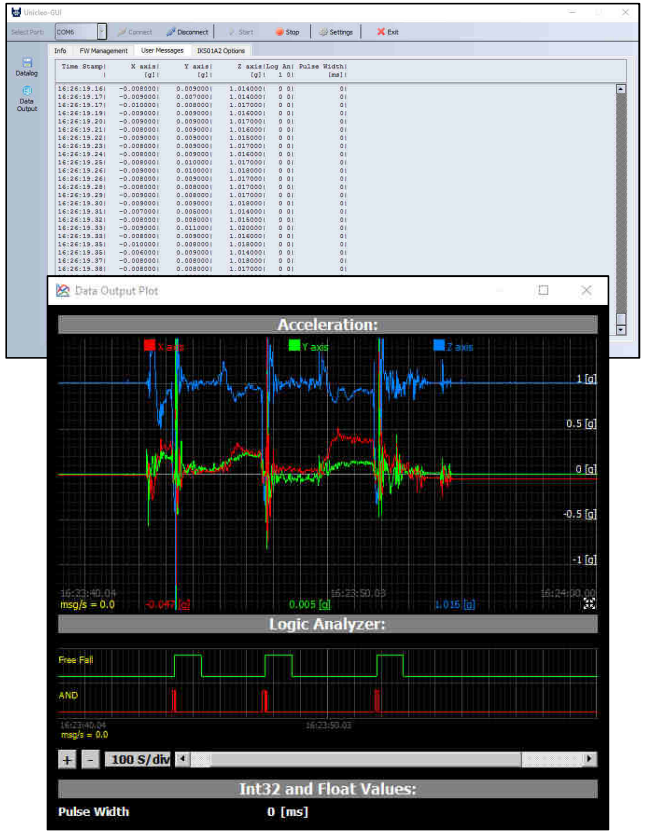


DEVELOPMENT BOARD

IDEA



GRAPHIC DESIGN



RESULT

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AlgoBuilder

Overview

AlgoBuilder is an application for the graphical design of algorithms.

The main objectives of this application are:

- Quick prototyping of applications for STM32 microcontrollers and MEMS sensors which include already existing algorithms (i.e. sensor fusion or pedometer), user-defined data processing blocks and additional functionalities.
- Ease the process of implementing proof of concept using graphical interface without writing the code.
- Visualize the data on Unicleo-GUI in real time using plot and display.

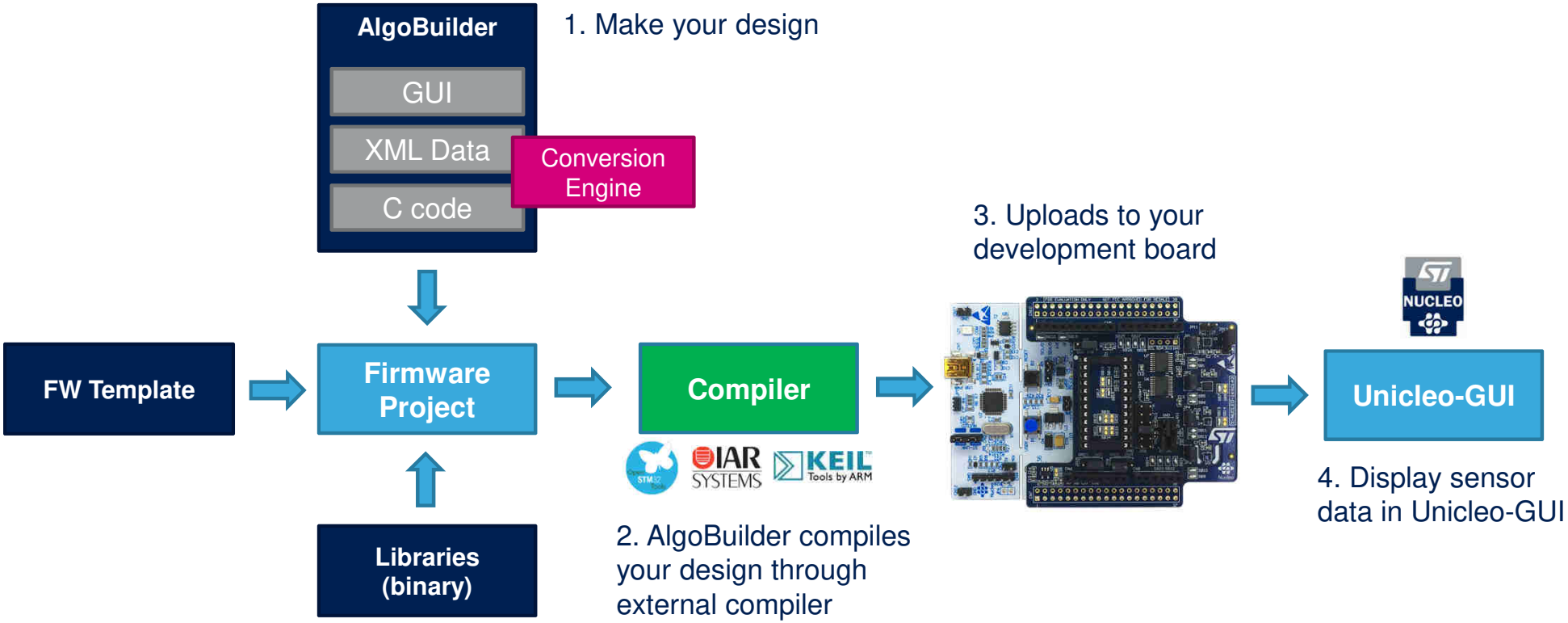
- **The main feature of this application:**
  - Simple graphical design (drag and drop, connect, set properties)
  - A wide range of function blocks are available in libraries including motion sensor algorithms.
  - Customize function blocks. Open XML for function blocks and design storage.
  - C code generated from the graphical design.
  - Support for various compilers: SW4STM32 (GCC), IAR EWARM, Keil uVision.
  - Outputs from generated firmware can be displayed in Unicleo-GUI application.

AlgoBuilder
Version 1.5

The new features in version 1.5:

- Unlimited number of display charts and inputs values
- New displays (Bar, Scatter, 3D plot, Tea pot, Histogram)
- Search box in library dock
- Hide unused items in properties dock
- Node names based on function block output name
- Function block version control and automatic conversion to the newest version
- Function block creator (GUI)
- More function blocks
- Support for SensorTile (STEVAL-STLKT01V1)
- Update based on the feedback from version v 1.0

AlgoBuilder
Principle



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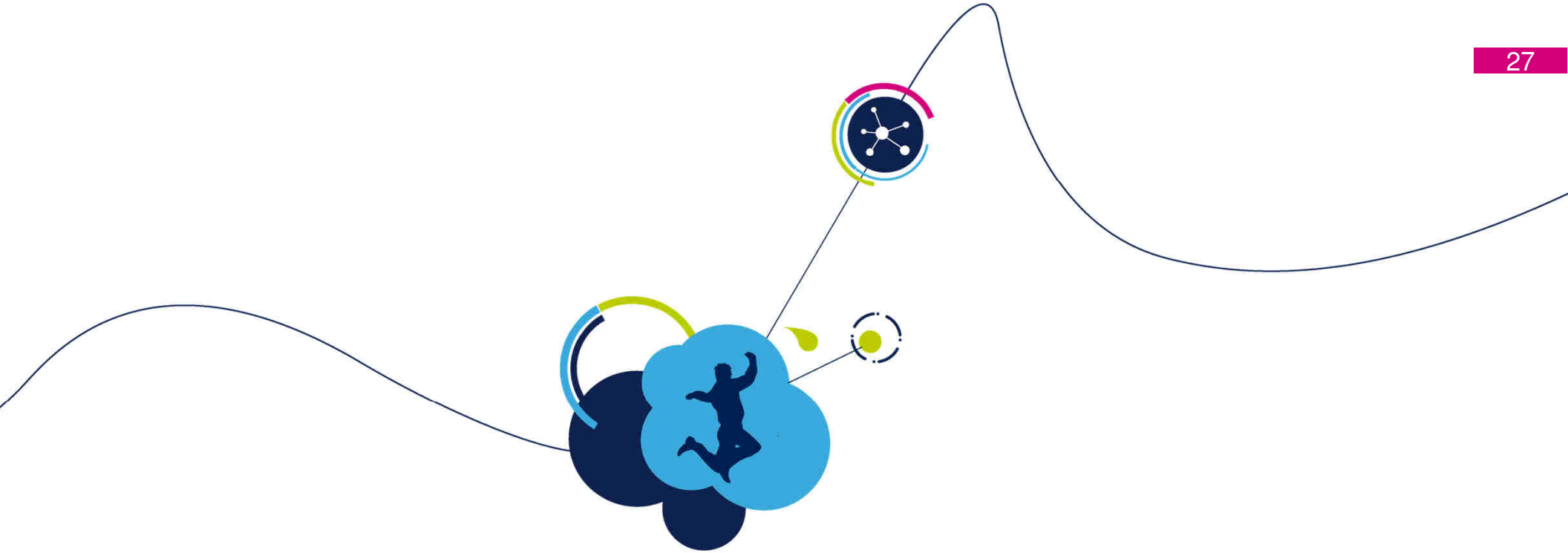

Environment Setup

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Prerequisites: Software

- AlgoBuilder: Application for the graphical design of algorithms
- Unicleo-GUI

  The Unicleo-GUI is used to display outputs from the running FW generated by the AlgoBuilder
- STM32 ST-LINK utility
- STM32 Virtual COM Port Driver

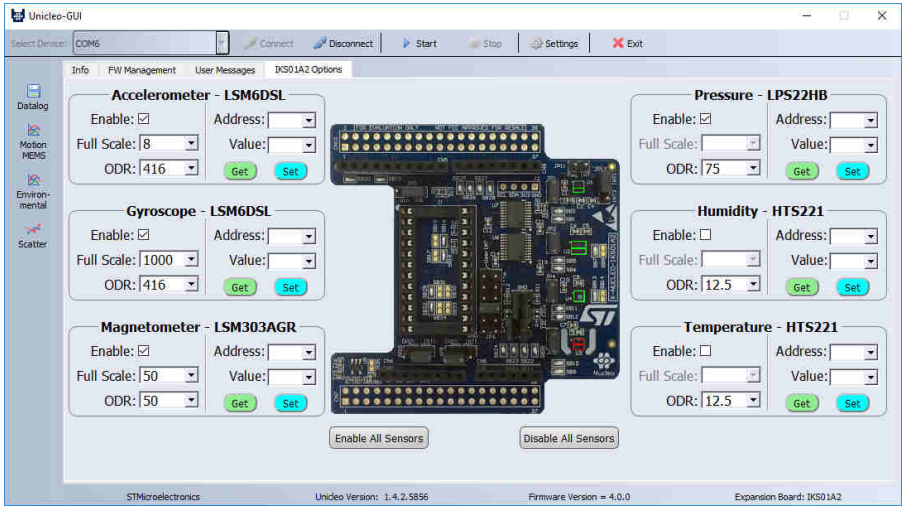
- AlgoBuilder uses external compiler to build the FW.

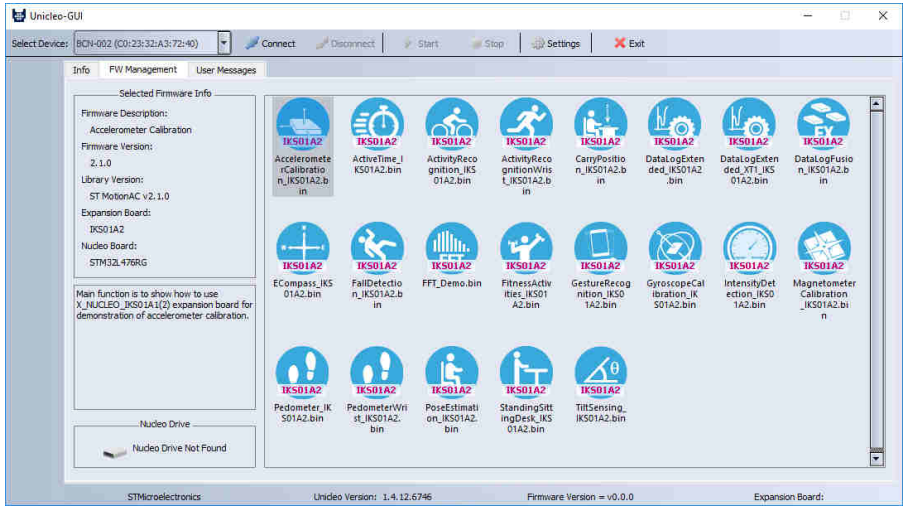
  It is mandatory to have available at least one of the IDE if you want to compile a project.
- Supported IDEs
  - System Workbench for STM32 v1.13.1 or newer
  - IAR EWARM 7.80.4 or newer
  - Keil uVision 5.22 or never

Unicleo-GUI
X-CUBE-MEMS1

Key features:

- Display output data from connected sensors in various views (**X-NUCLEO-IKS01A1**, **X-NUCLEO-IKS01A2**)
- Display outputs from algorithms
- Save data to comma separated (CSV) or tab separated (TSV) files
- Configure sensor output data rate and full scale
- Direct read from and writes to sensor registers
- Program NUCLEO board with selected FW





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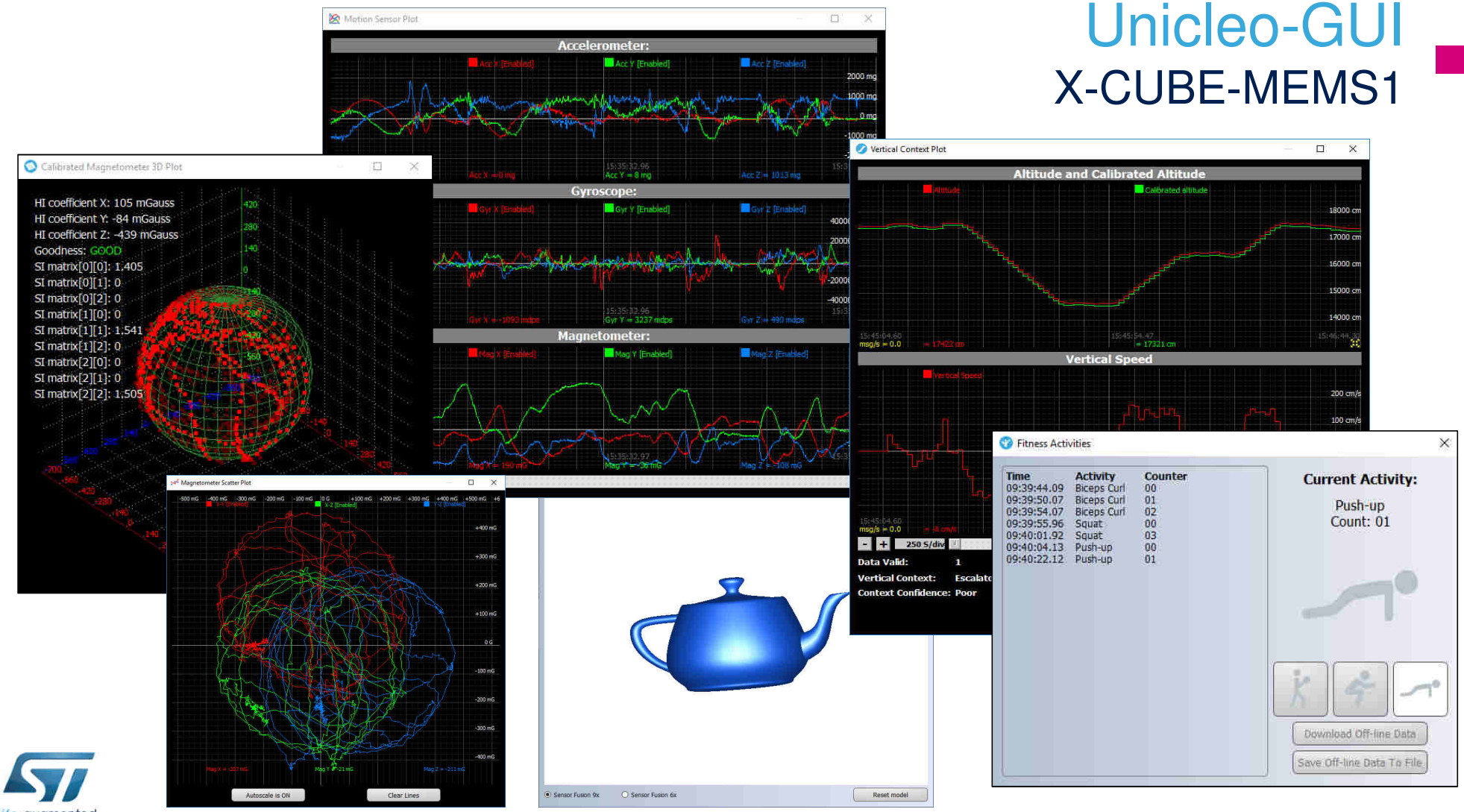
Unicleo-GUI
X-CUBE-MEMS1



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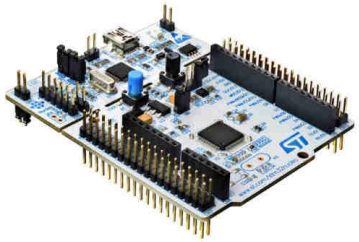
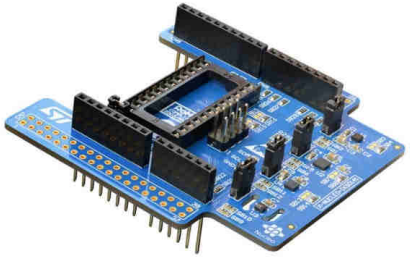
Prerequisites: Hardware

Nucleo Development & Expansion Boards

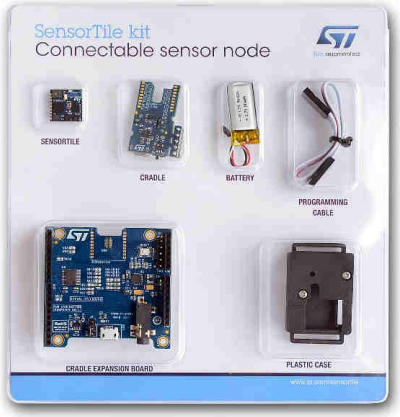
- NUCLEO-F401RE or NUCLEO-L476RG
- X-NUCLEO-IKS01A2: Motion MEMS and environmental sensor expansion board for STM32 Nucleo





Sensor Tile

- The development kit simplifies prototyping, evaluation and development of innovative solutions.



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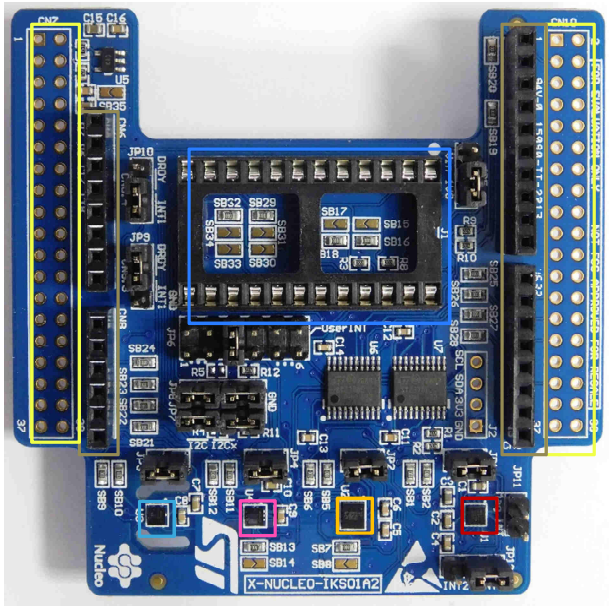
Motion MEMS and environmental sensor expansion board

X-NUCLEO-IKS01A2 Hardware Description

- The X-NUCLEO-IKS01A2 is a motion MEMS and environmental sensor evaluation board system.
- It is compatible with the Arduino UNO R3 connector layout, and is designed around ST's latest sensors.

Key Product on board

LSM6DSL
MEMS 3D accelerometer (±2/±4/±8/±16 g) + 3D gyroscope (±125/±245/±500/±1000/±2000 dps)
LSM303AGR
MEMS 3D magnetometer (±50 gauss) + MEMS 3D accelerometer (±2/±4/±8/±16 g)
LPS22HB
MEMS pressure sensor, 260-1260 hPa absolute digital output barometer
HTS221
Capacitive digital relative humidity and temperature DIL 24-pin
Socket available for additional MEMS adapters and other sensors (UV index)



HTS221 LSM6DSL ST morpho connector**
LPS22HB LSM303AGR Arduino UNO R3 connector
DIL 24-pin

Latest info available at www.st.com
X-NUCLEO-IKS01A2

** Connector for the STM32 Nucleo Board

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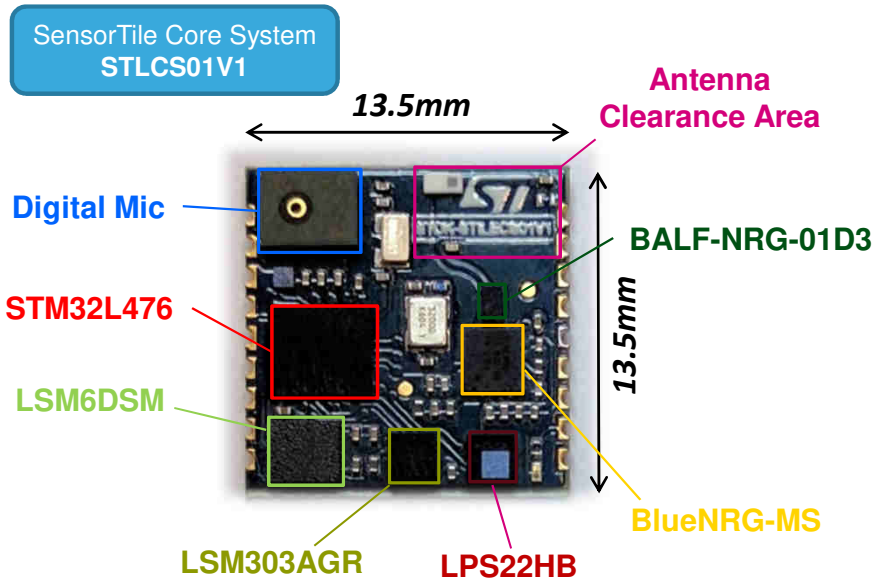
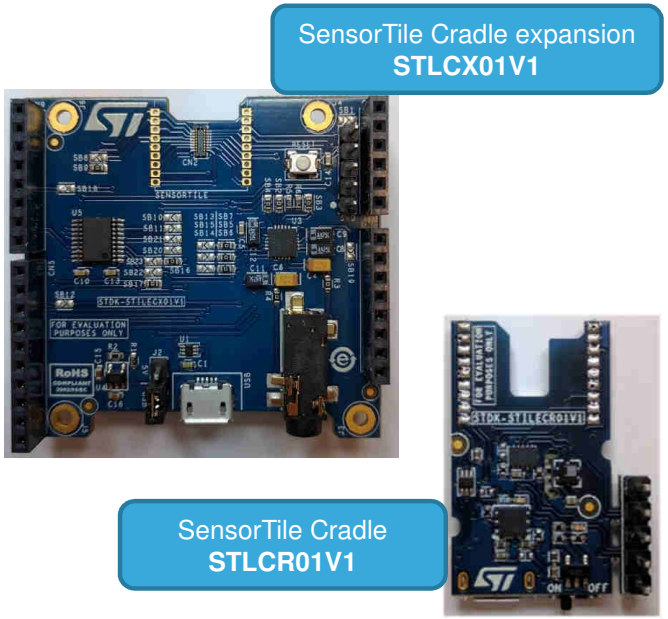
SensorTile Platform

STEVAL-STLKT01V1 Hardware Description

- STEVAL-STLKT01V1 is the development kit for the SensorTile board (STLCS01V1), a highly Integrated Development Platform with a broad range of functionalities aiming to improve system design cycle and accelerate delivery of results





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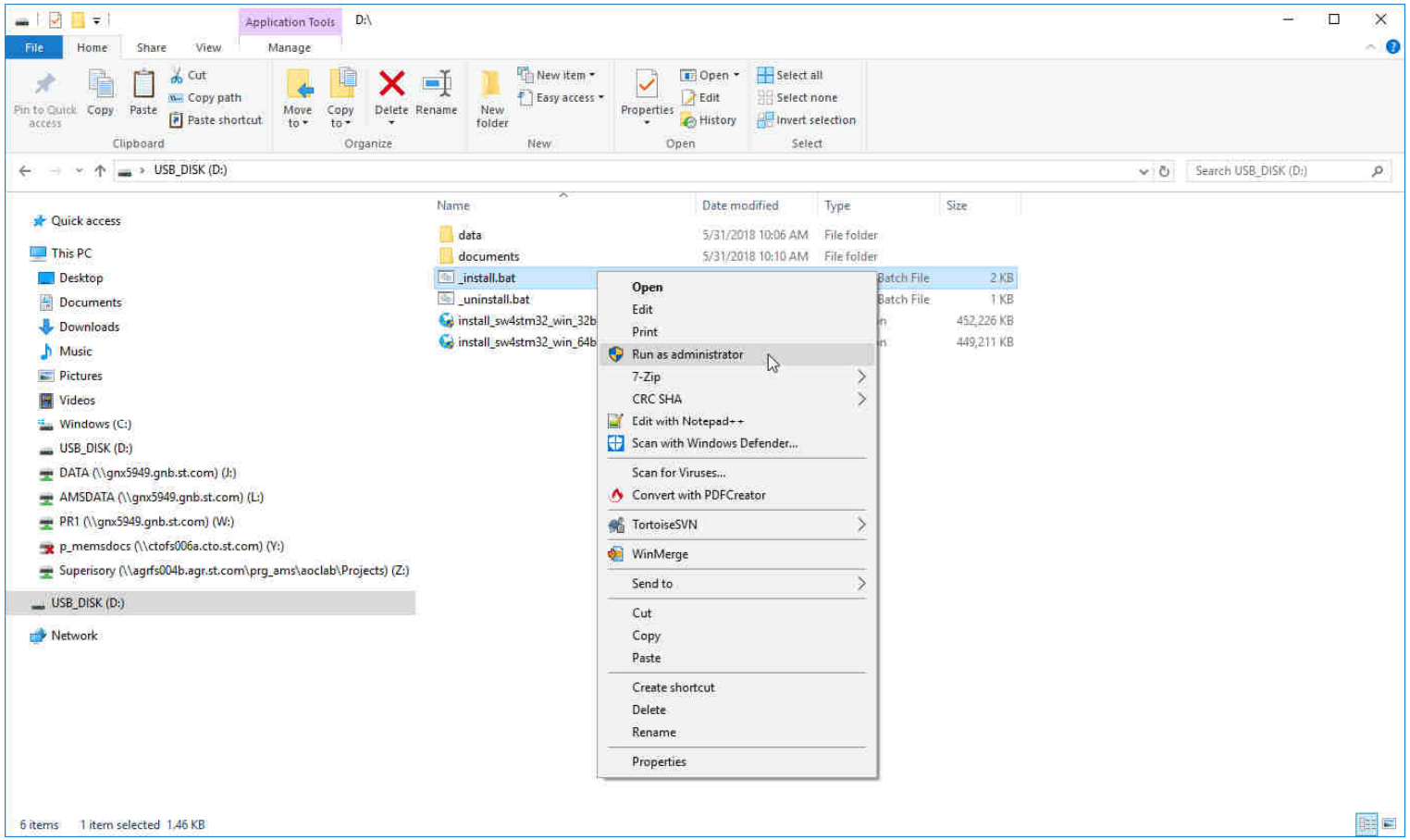
1. Run _install.bat as administrator.



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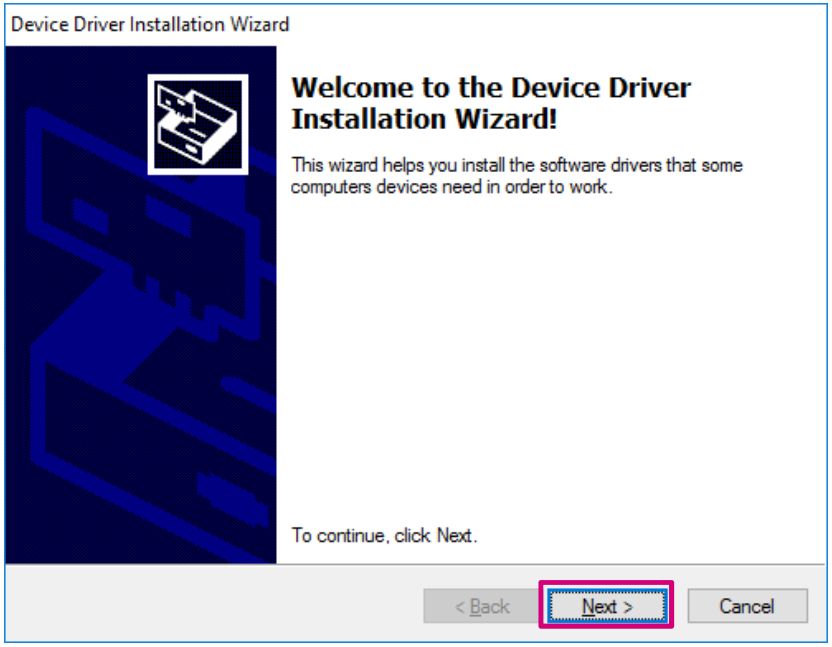
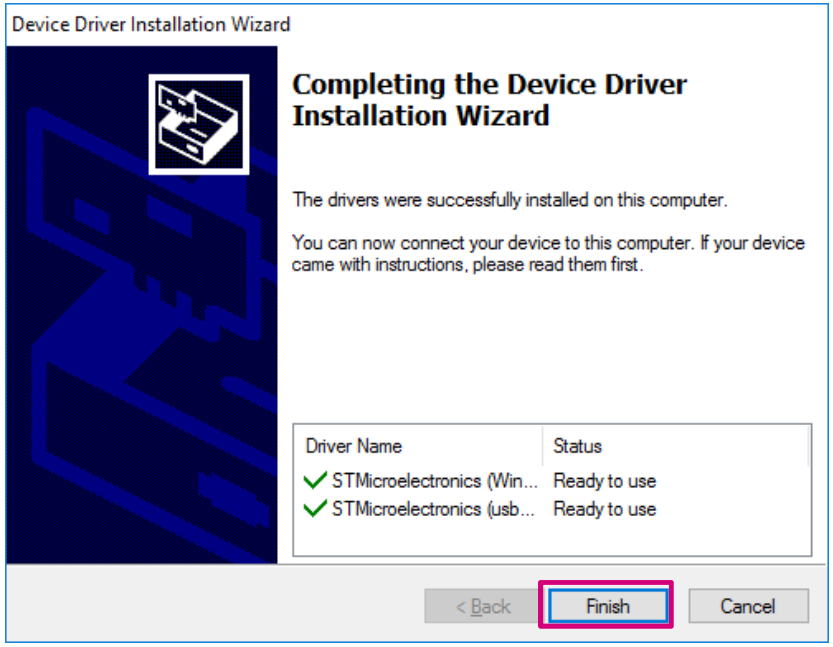
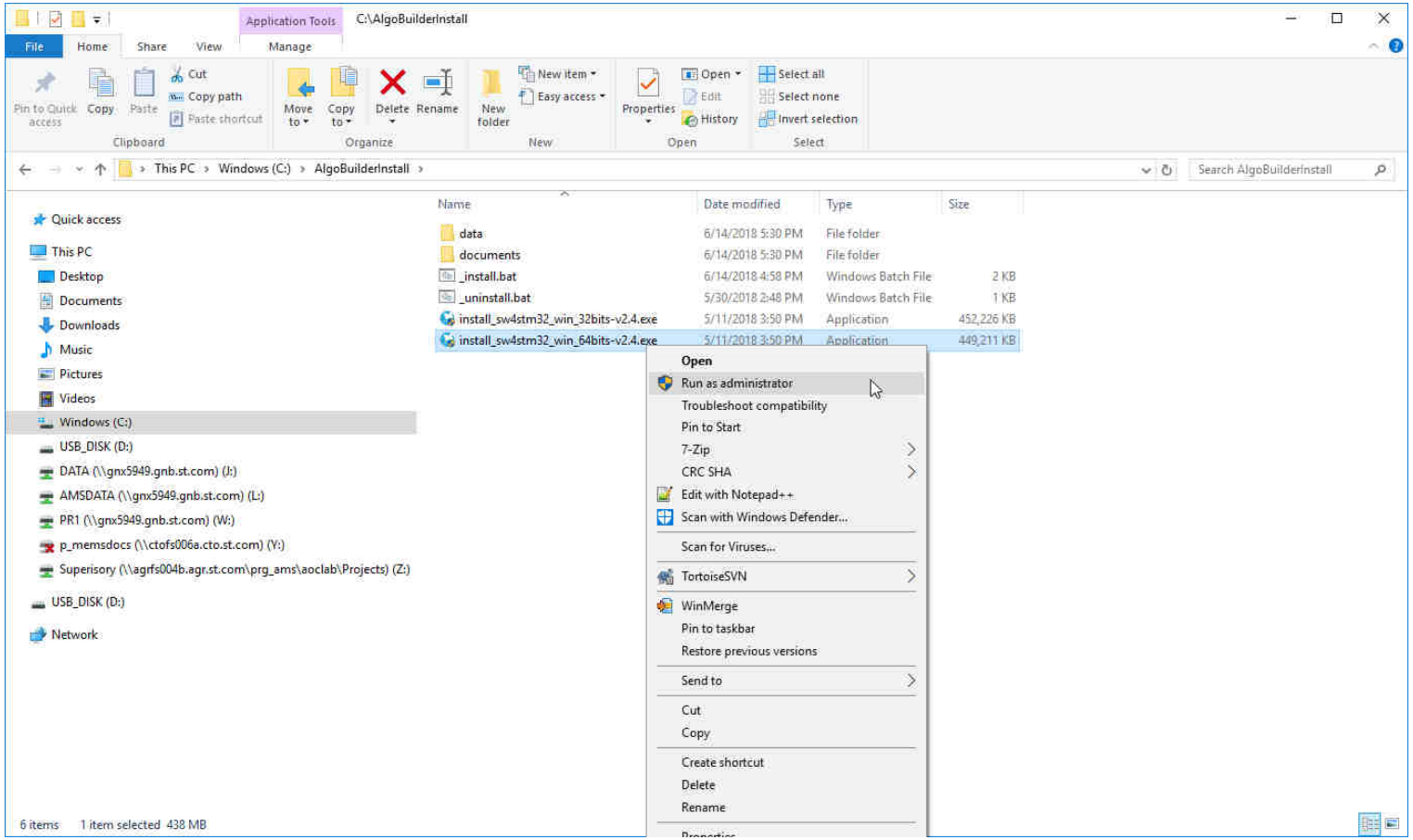
2. Confirm Device Drivers installation.





This will install ST-Link and Virtual Com Port Drivers.

3. Remove USB and open C:/AlgoBuilderInstall/ folder.
Run install_sw4stm32_win_64bits-v2.4.exe as administrator.



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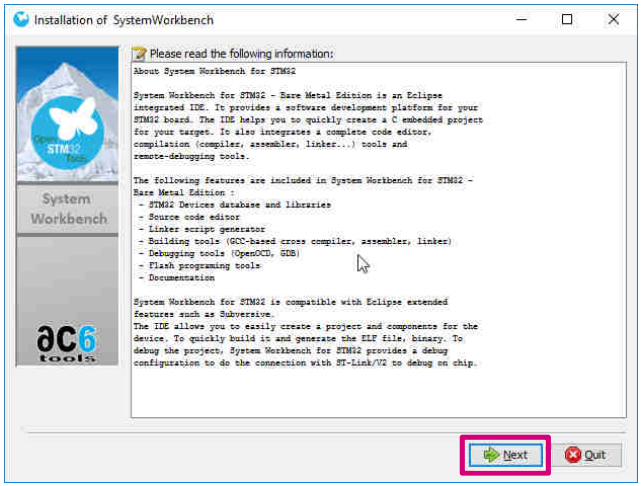
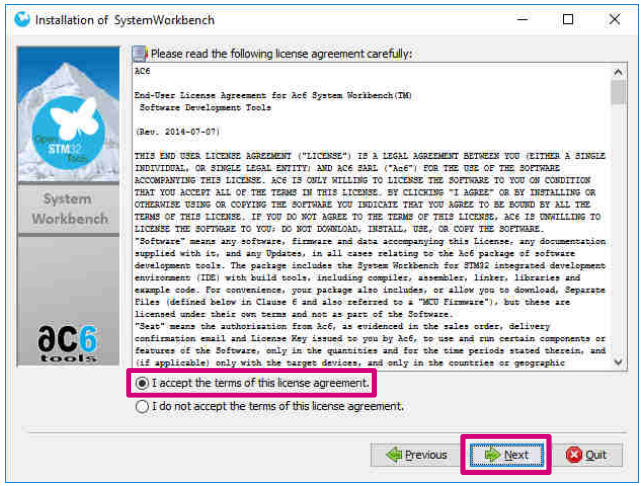
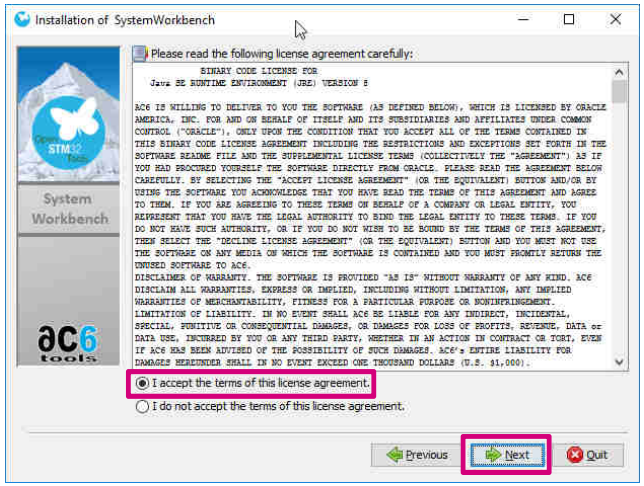
4. Execute the install_sw4stm32_win_64bits-v2.4.exe as administrator and confirm default settings.

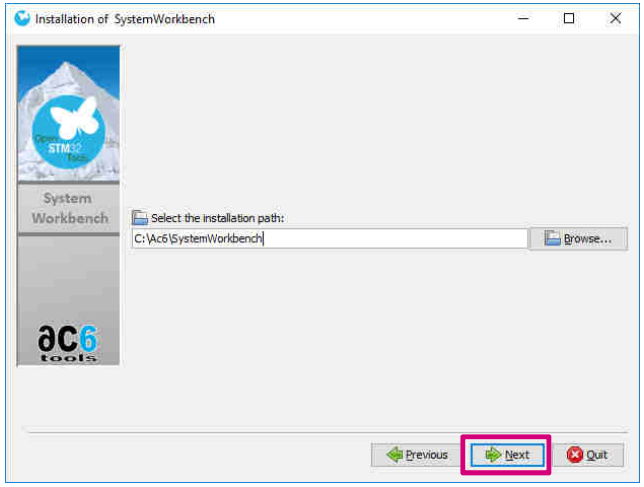


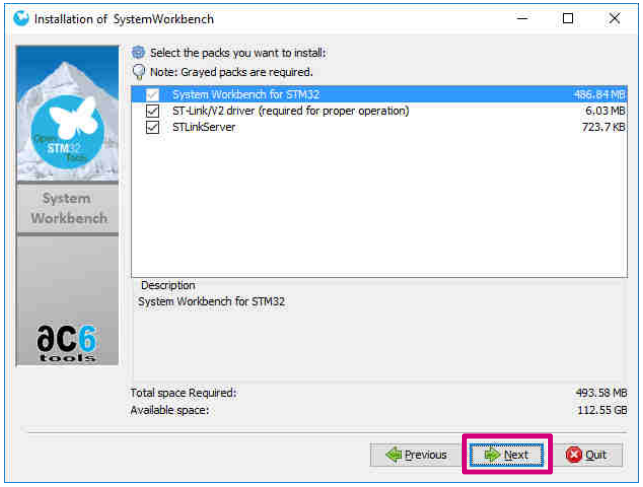


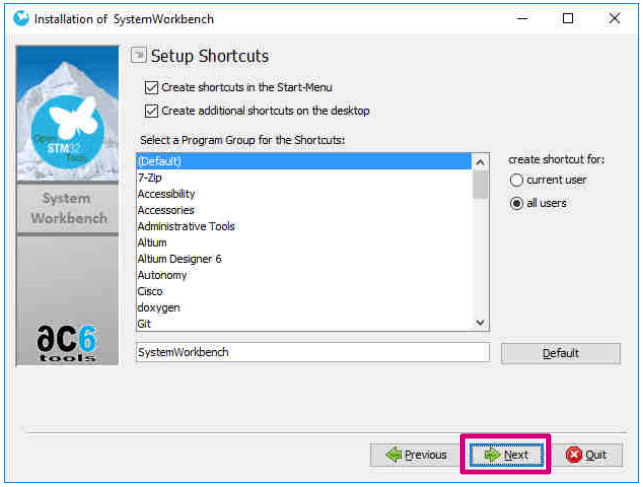


AlgoBuilder

Installation







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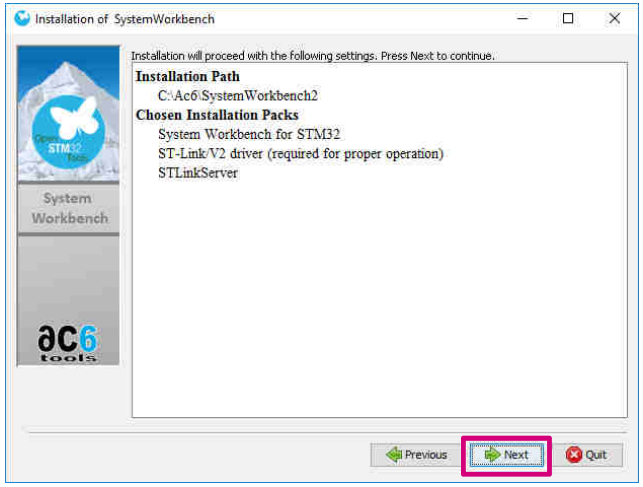
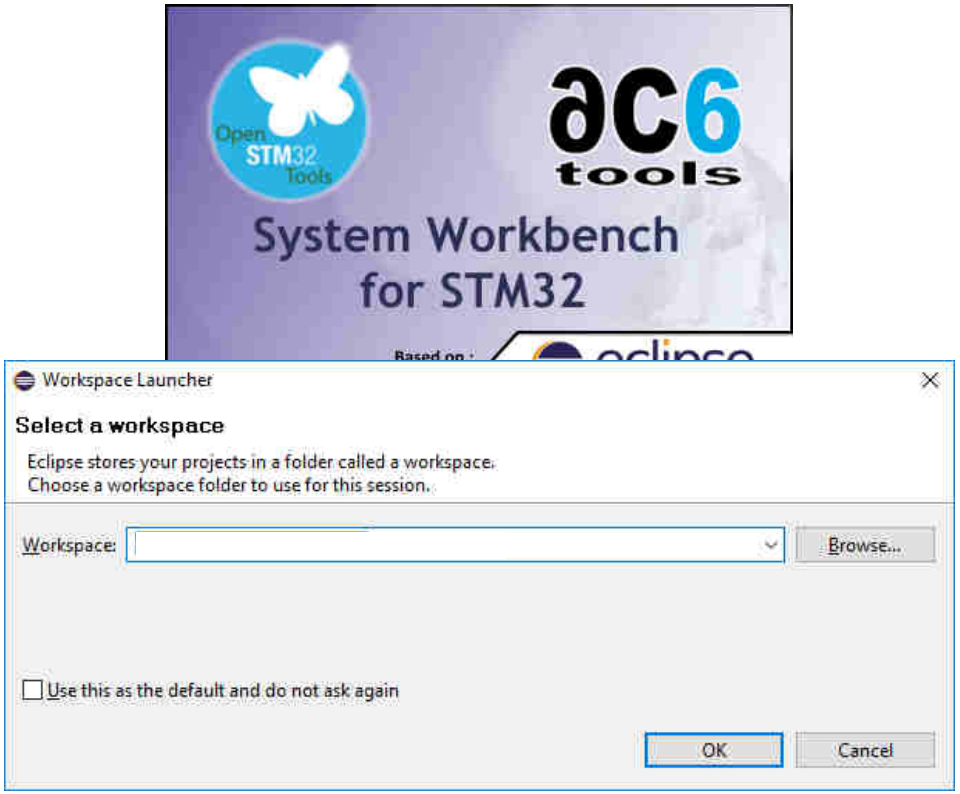
AlgoBuilder

Installation

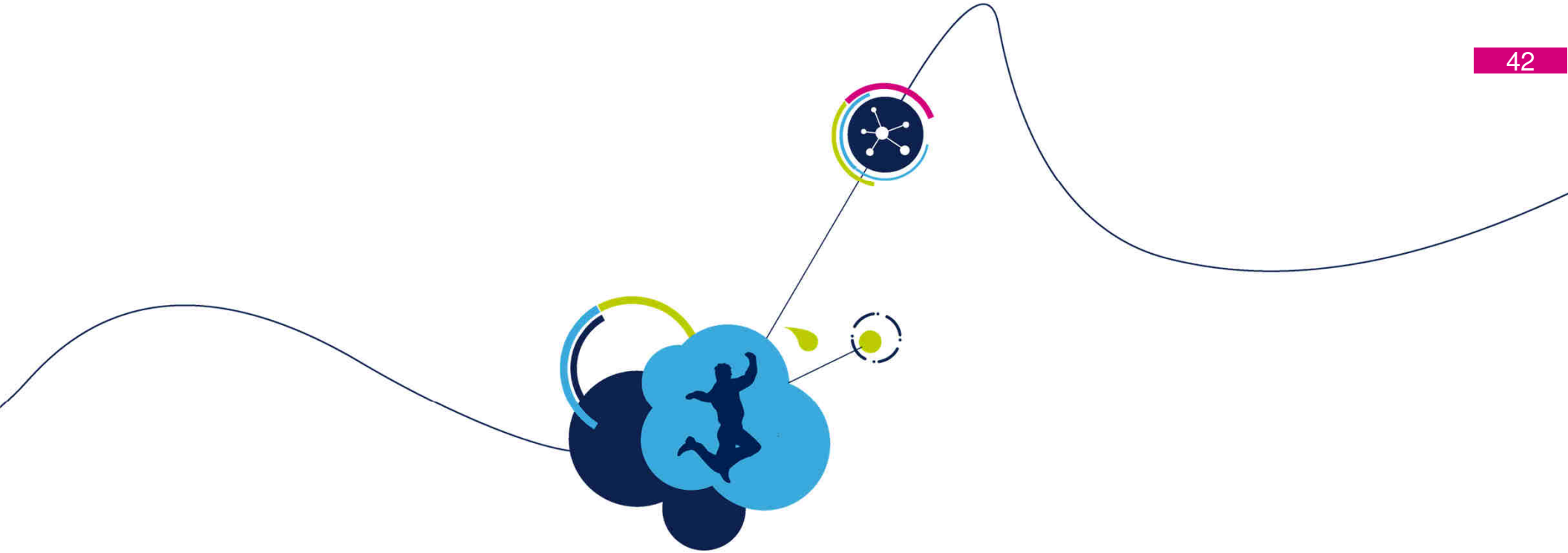


5. **Execute SW4STM32, set the Workspace directory to the default options, then close the application.**



6. Check that following applications were installed on your PC:

- ✓ **AlgoBuilder v2.0.0**
- ✓ **Unicleo-GUI v1.5.0**
- ✓ **STM32 ST-LINK Utility**
- ✓ **System Workbench for STM32 (AC6)**



AlgoBuilder GUI walkthrough

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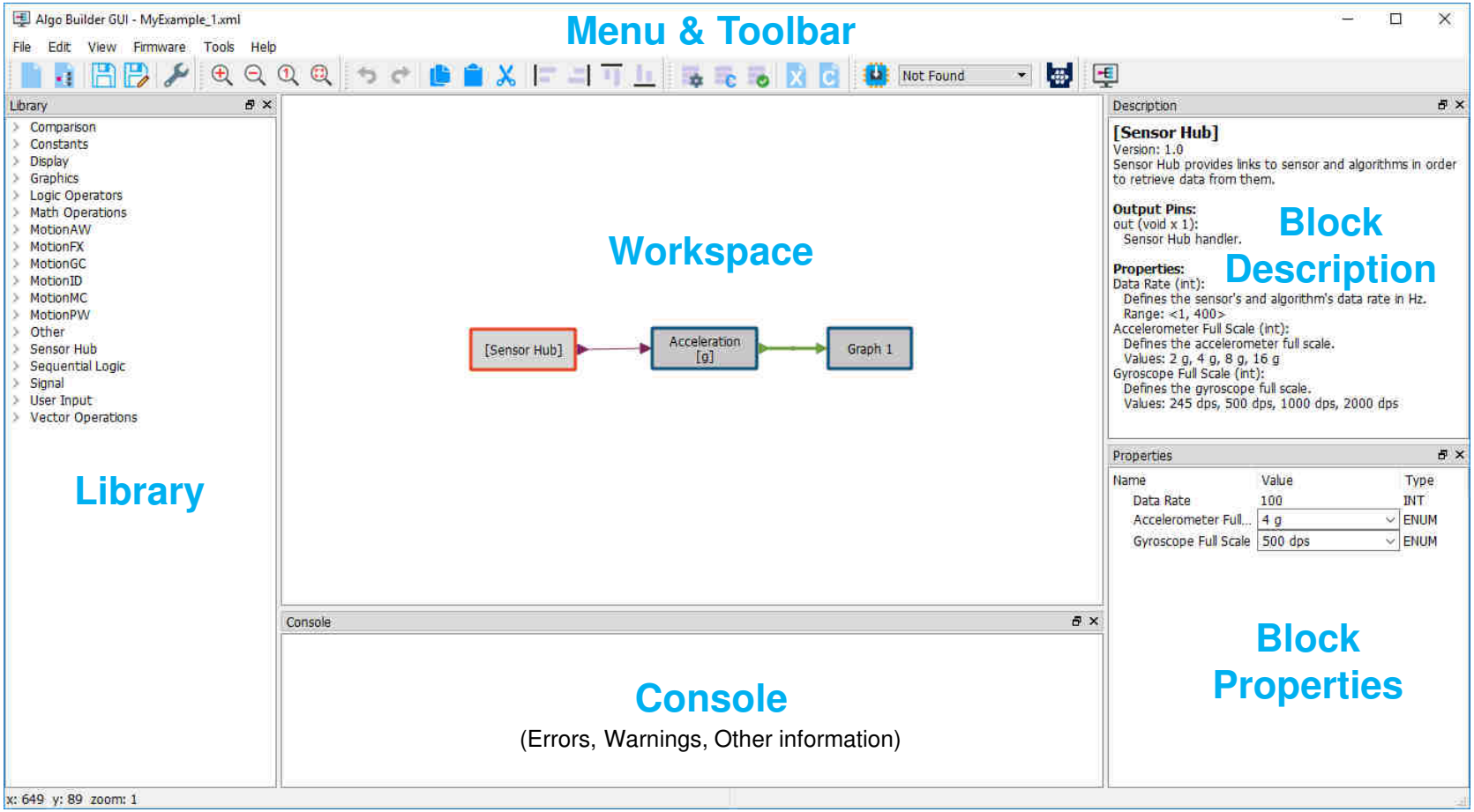
AlgoBuilder



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Display:

Several options can be used to display output data.

Properties

Name	Value	Type
Number of Curves	4	INT
Graph Name	Arbitrary Float ...	STRING
Waveform 1 Name	Float 1	STRING
Waveform 2 Name	Float 2	STRING
Waveform 3 Name	Float 3	STRING
Waveform 4 Name	Float 4	STRING
Waveform 5 Name		STRING
Waveform 6 Name		STRING
Unit Name		STRING

Properties

Name	Value	Type
Number of Values	4	INT
Value 1 Name	Float 1	STRING
Value 2 Name	Float 2	STRING
Value 3 Name	Float 3	STRING
Value 4 Name	Float 4	STRING
Value 5 Name		STRING
Value 6 Name		STRING
Value 7 Name		STRING
Value 8 Name		STRING
Unit 1 Name	Unit 1	STRING
Unit 2 Name	Unit 2	STRING
Unit 3 Name	Unit 3	STRING
Unit 4 Name	Unit 4	STRING
Unit 5 Name		STRING
Unit 6 Name		STRING
Unit 7 Name		STRING
Unit 8 Name		STRING

Properties

Name	Value	Type
Number of Channels	4	INT
Channel 1 Name	Sw 1	STRING
Channel 2 Name	Sw 2	STRING
Channel 3 Name	Sw 3	STRING
Channel 4 Name	Sw 4	STRING
Channel 5 Name		STRING
Channel 6 Name		STRING
Channel 7 Name		STRING
Channel 8 Name		STRING

Properties

Name	Value	Type
Number of Values	4	INT
Value 1 Name	Int 1	STRING
Value 2 Name	Int 2	STRING
Value 3 Name	Int 3	STRING
Value 4 Name	Int 4	STRING
Value 5 Name		STRING
Value 6 Name		STRING
Value 7 Name		STRING
Value 8 Name		STRING
Unit 1 Name	Unit 1	STRING
Unit 2 Name	Unit 2	STRING
Unit 3 Name	Unit 3	STRING
Unit 4 Name	Unit 4	STRING
Unit 5 Name		STRING
Unit 6 Name		STRING
Unit 7 Name		STRING
Unit 8 Name		STRING

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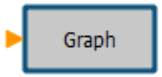
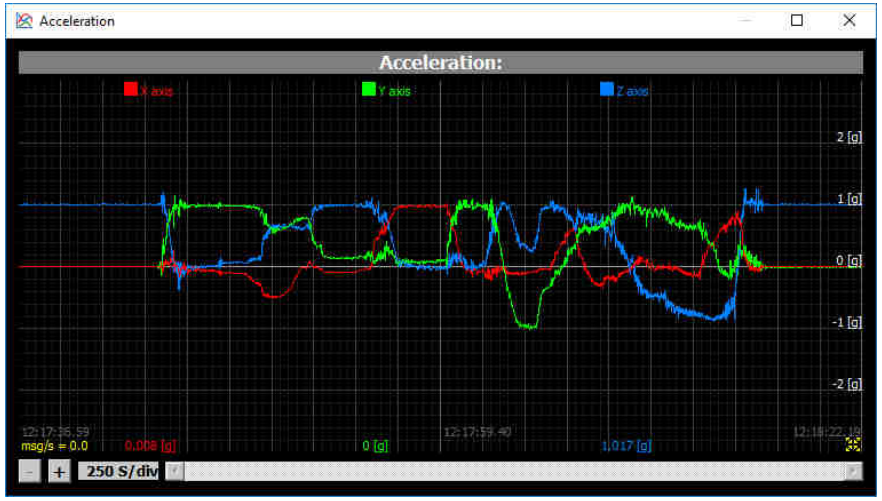
Graph - Displays data as a time graph

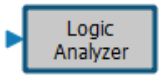


Properties

Name	Value	Type
Number of Curves	6	INT
Graph Name	Graph	STRING
Waveform 1 Name	Waveform 1	STRING
Waveform 2 Name	Waveform 2	STRING
Waveform 3 Name	Waveform 3	STRING
Waveform 4 Name	Waveform 4	STRING
Waveform 5 Name	Waveform 5	STRING
Waveform 6 Name	Waveform 6	STRING
Unit Name		STRING
Zero axis position	Middle	ENUM
Auto-scale	OFF	ENUM
Full Scale	1	STRING

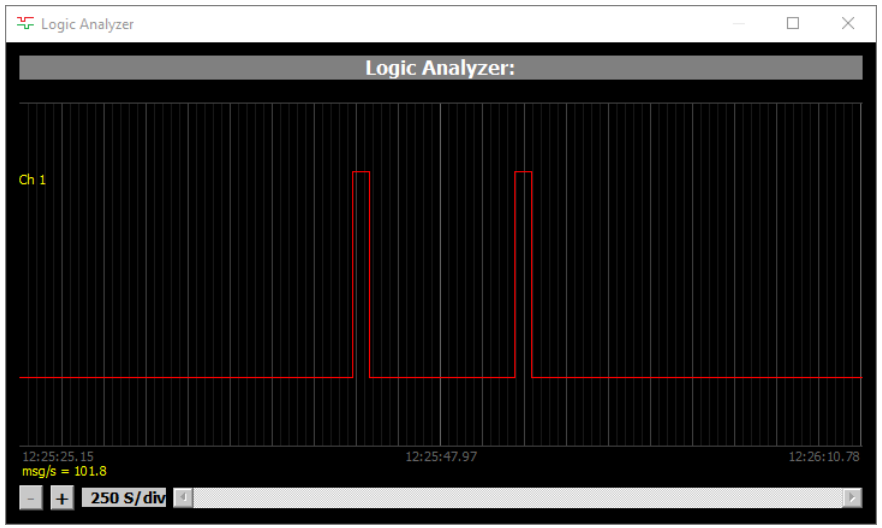


Logic Analyzer - Displays logic signals which can have values only 0 or 1



Properties

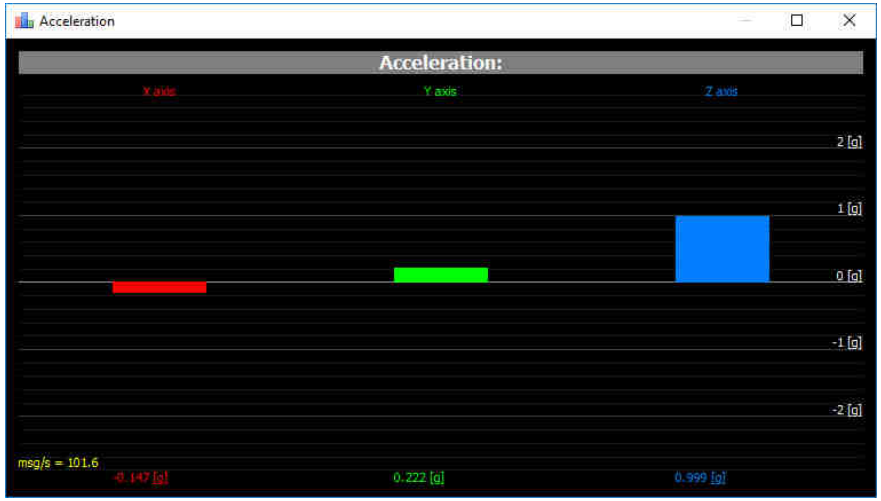
Name	Value	Type
Number of Channels	8	INT
Logic Analyzer Name	Logic##Analyzer	STRING
Channel 1 Name	Ch 1	STRING
Channel 2 Name	Ch 2	STRING
Channel 3 Name	Ch 3	STRING
Channel 4 Name	Ch 4	STRING
Channel 5 Name	Ch 5	STRING
Channel 6 Name	Ch 6	STRING
Channel 7 Name	Ch 7	STRING
Channel 8 Name	Ch 8	STRING



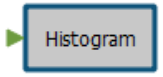
Bar Graph - Displays actual value as bar

Properties

Name	Value	Type
Number of Bars	6	INT
BarGraph Name	BarGraph	STRING
Bar 1 Name	Bar 1	STRING
Bar 2 Name	Bar 2	STRING
Bar 3 Name	Bar 3	STRING
Bar 4 Name	Bar 4	STRING
Bar 5 Name	Bar 5	STRING
Bar 6 Name	Bar 6	STRING
Unit Name		STRING
Zero axis position	Middle	ENUM
Auto-scale	OFF	ENUM
Full Scale	1	STRING

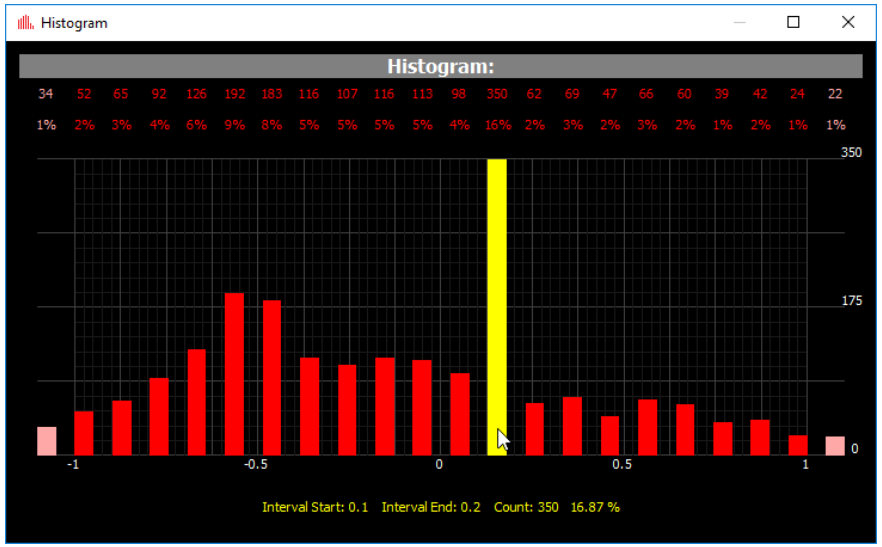


Histogram - Displays values distribution



Properties

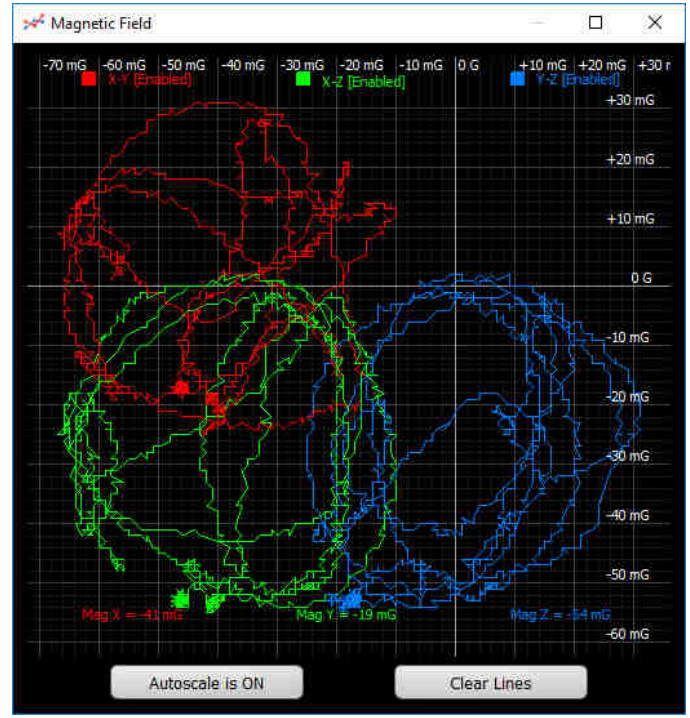
Name	Value	Type
Histogram Name	Histogram	STRING
Unit Name		STRING
Number of Intervals	10	INT
Zero axis position	Middle	ENUM
Auto-scale	OFF	ENUM
Full Scale	1	STRING



Scatter - Displays X,Y,Z data in 2D X-Y, X-Z, Y-Z chart

Properties

Name	Value	Type
Size of Input	3	INT
Scatter Name	Scatter	STRING
Value 1 Name	Value 1	STRING
Value 2 Name	Value 2	STRING
Value 3 Name	Value 3	STRING
Unit Name		STRING
Auto-scale	OFF	ENUM
Full Scale	1	STRING



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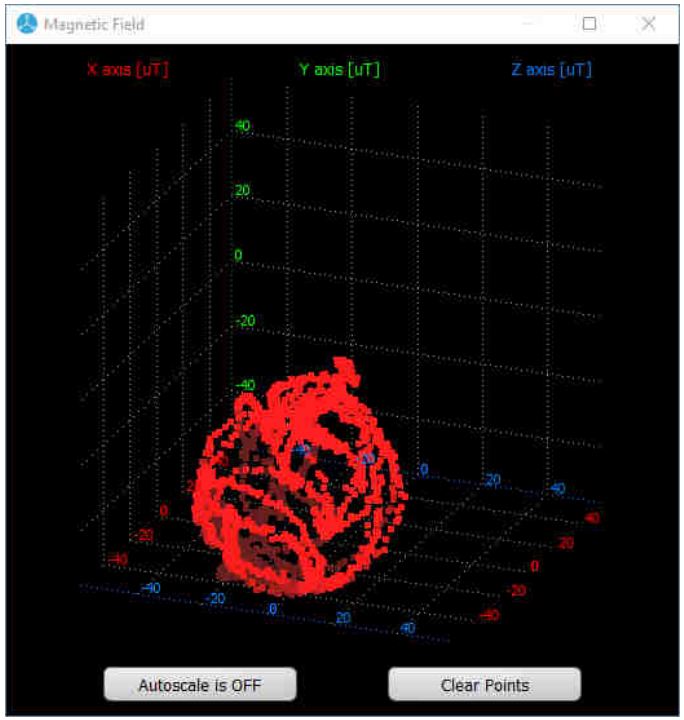
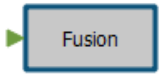
3D Plot - Displays X,Y,Z data in 3D chart

Properties

Name	Value	Type
Plot Name	3D Plot	STRING
Value 1 Name	Value 1	STRING
Value 2 Name	Value 2	STRING
Value 3 Name	Value 3	STRING
Unit Name		STRING
Auto-scale	OFF	ENUM
Full Scale	1	STRING

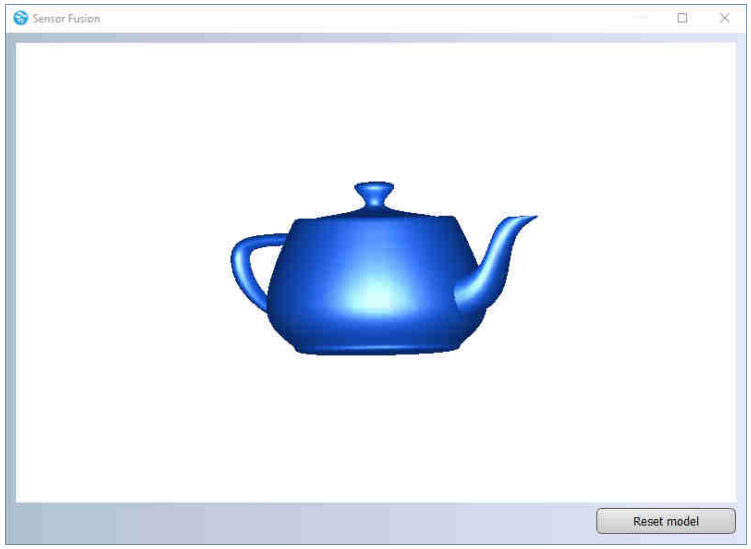


Fusion - Displays quaternion data as teapot 3D model.



Properties

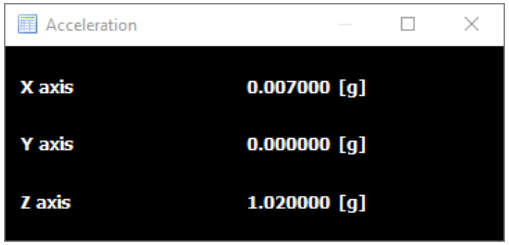
Name	Value	Type
Window Name	Sensor##Fusion	STRING
Model Name	Teapot	ENUM



Value - Displays the exact float or integer value

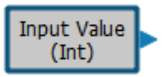
Properties

Name	Value	Type
Number of Values	8	INT
Window Name	Values	STRING
Value 1 Name	Value 1	STRING
Value 2 Name	Value 2	STRING
Value 3 Name	Value 3	STRING
Value 4 Name	Value 4	STRING
Value 5 Name	Value 5	STRING
Value 6 Name	Value 6	STRING
Value 7 Name	Value 7	STRING
Value 8 Name	Value 8	STRING
Unit 1 Name	Unit 1	STRING
Unit 2 Name	Unit 2	STRING
Unit 3 Name	Unit 3	STRING
Unit 4 Name	Unit 4	STRING
Unit 5 Name	Unit 5	STRING
Unit 6 Name	Unit 6	STRING
Unit 7 Name	Unit 7	STRING
Unit 8 Name	Unit 8	STRING



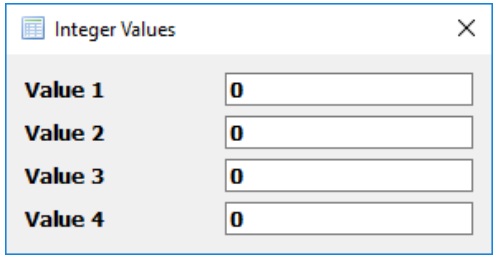
User Input:

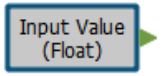
Three types of data can be sent from Unicleo-GUI to running firmware: Binary, Integer and Float.
Input blocks can be used in the design to allow user interaction with the running firmware.



Properties

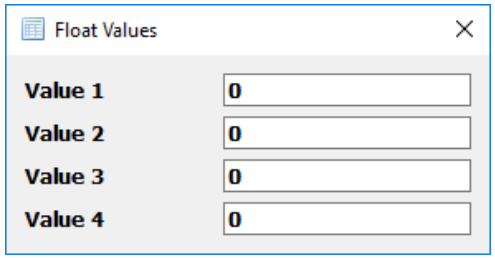
Name	Value	Type
Window Name	Integer Values	STRING
Number of Values	4	INT
Default Value 1	0	INT
Default Value 2	0	INT
Default Value 3	0	INT
Default Value 4	0	INT
Value 1 Name	Value 1	STRING
Value 2 Name	Value 2	STRING
Value 3 Name	Value 3	STRING
Value 4 Name	Value 4	STRING

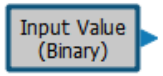




Properties

Name	Value	Type
Window Name	Float Values	STRING
Number of Values	4	INT
Default Value 1	0	FLOAT
Default Value 2	0	FLOAT
Default Value 3	0	FLOAT
Default Value 4	0	FLOAT
Value 1 Name	Value 1	STRING
Value 2 Name	Value 2	STRING
Value 3 Name	Value 3	STRING
Value 4 Name	Value 4	STRING





Properties

Name	Value	Type
Window Name	Binary Values	STRING
Number of Values	4	INT
Default Value 1	0	INT
Default Value 2	0	INT
Default Value 3	0	INT
Default Value 4	0	INT
Value 1 Name	Value 1	STRING
Value 2 Name	Value 2	STRING
Value 3 Name	Value 3	STRING
Value 4 Name	Value 4	STRING

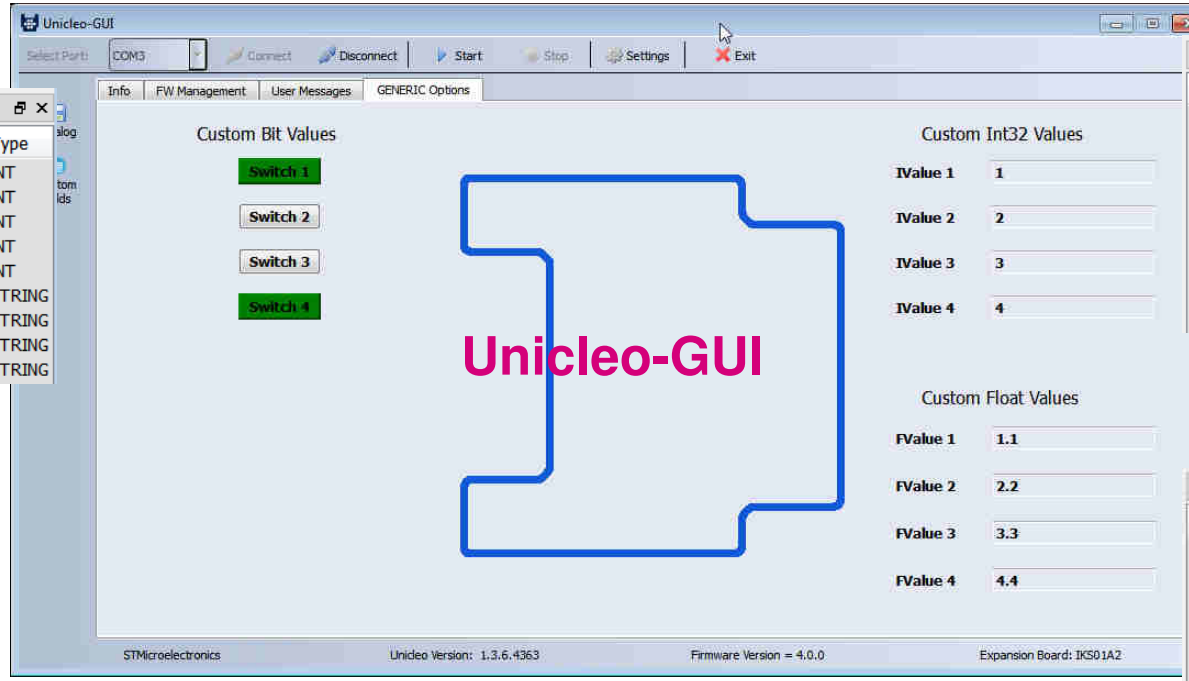
User Input:

Input blocks can be used in the design to allow user interaction with the running firmware.

Input Value (Binary)

Properties

Name	Value	Type
Number of Values	4	INT
Default Value 1	1	INT
Default Value 2	0	INT
Default Value 3	0	INT
Default Value 4	1	INT
Value 1 Name	Switch 1	STRING
Value 2 Name	Switch 2	STRING
Value 3 Name	Switch 3	STRING
Value 4 Name	Switch 4	STRING



Input Value (Int)

Properties

Name	Value	Type
Number of Values	4	INT
Default Value 1	1	INT
Default Value 2	2	INT
Default Value 3	3	INT
Default Value 4	4	INT
Value 1 Name	IValue 1	STRING
Value 2 Name	IValue 2	STRING
Value 3 Name	IValue 3	STRING
Value 4 Name	IValue 4	STRING

Input Value (Float)

Properties

Name	Value	Type
Number of Values	4	INT
Default Value 1	1.1	FLOAT
Default Value 2	2.2	FLOAT
Default Value 3	3.3	FLOAT
Default Value 4	4.4	FLOAT
Value 1 Name	FValue 1	STRING
Value 2 Name	FValue 2	STRING
Value 3 Name	FValue 3	STRING
Value 4 Name	FValue 4	STRING

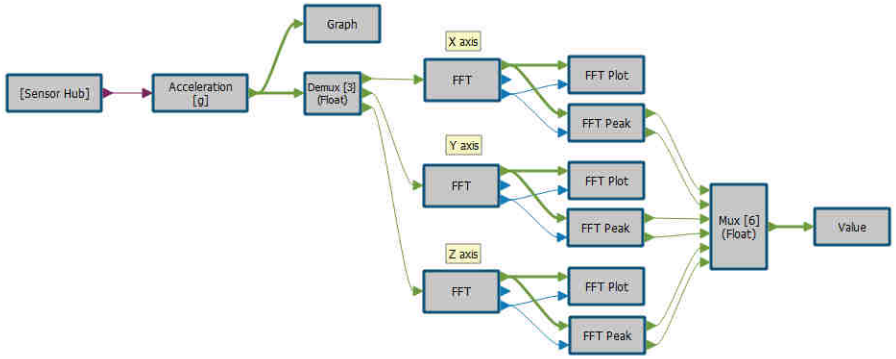
AlgoBuilder

New Features v1.5 - v2.0

FFT analysis, FFT plot, Window, Peak detection in frequency spectrum

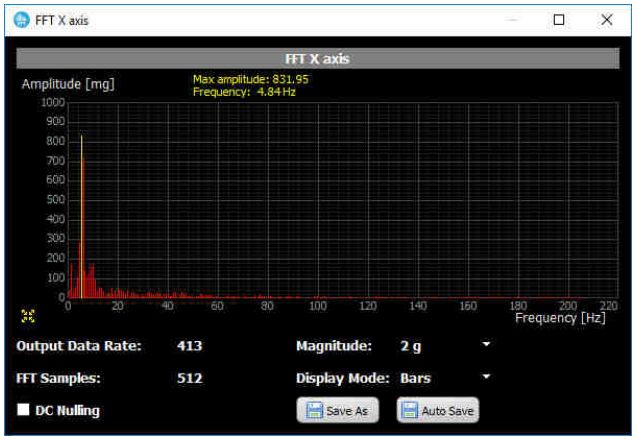
Real ODR measurement for accurate FFT analysis

New example for FFT analysis



Properties

Name	Value	Type
Data length	1024	ENUM
Window Type	None	ENUM



Data length: 32, 64, 128, 256, 512, 1024

Window: Hanning, Hamming, Flat Top

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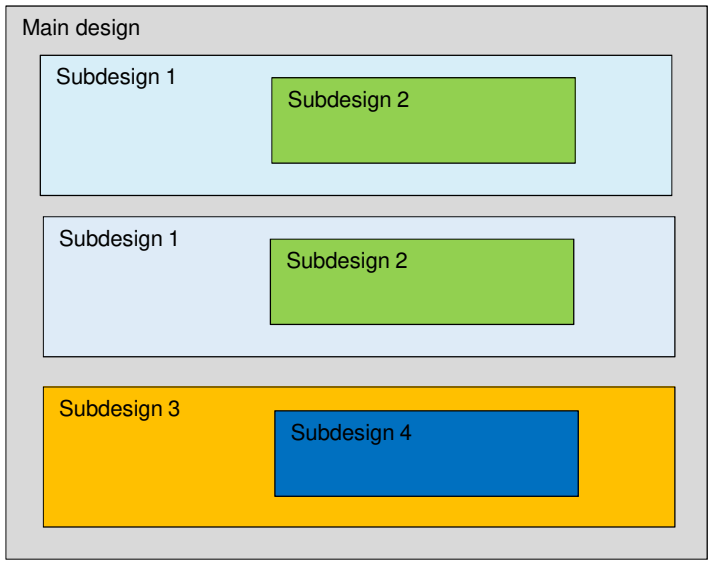
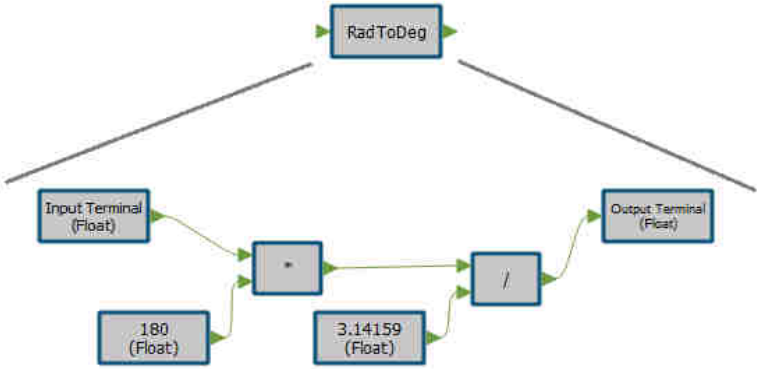
Multi level design

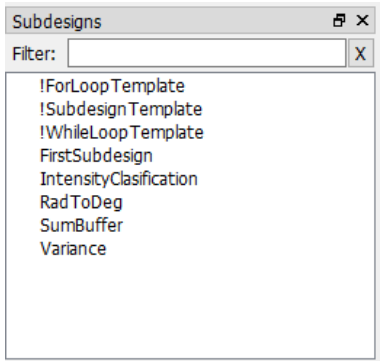
Possibility encapsulate part of the design into one function block, which can be saved into a library to be reused many times

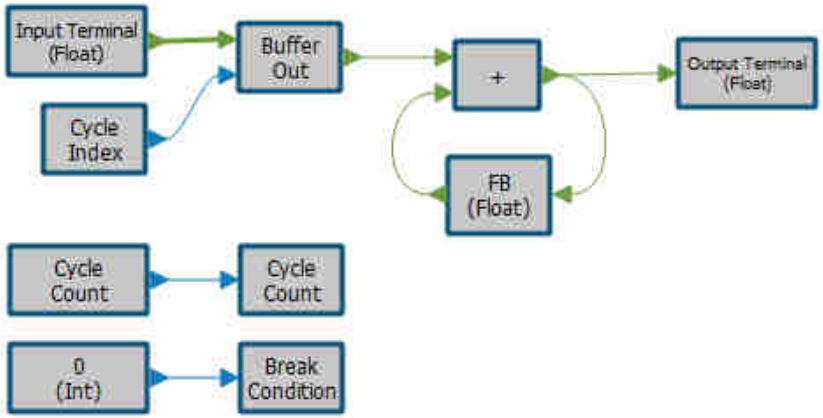




Loops (for, while)

For Loop - is subdesign intended for loop, which is used if number of iteration is known before entering the loop
While Loop - is subdesign intended for loop, which is executed until a defined condition is valid

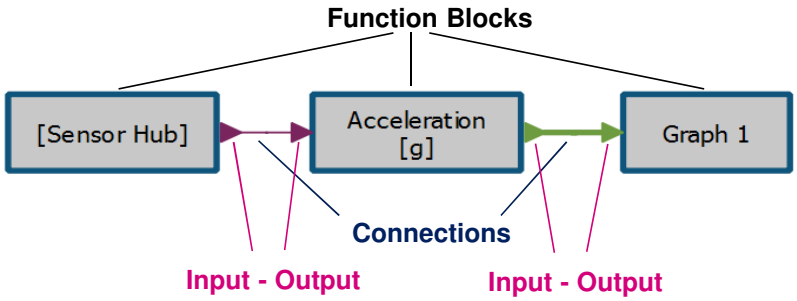


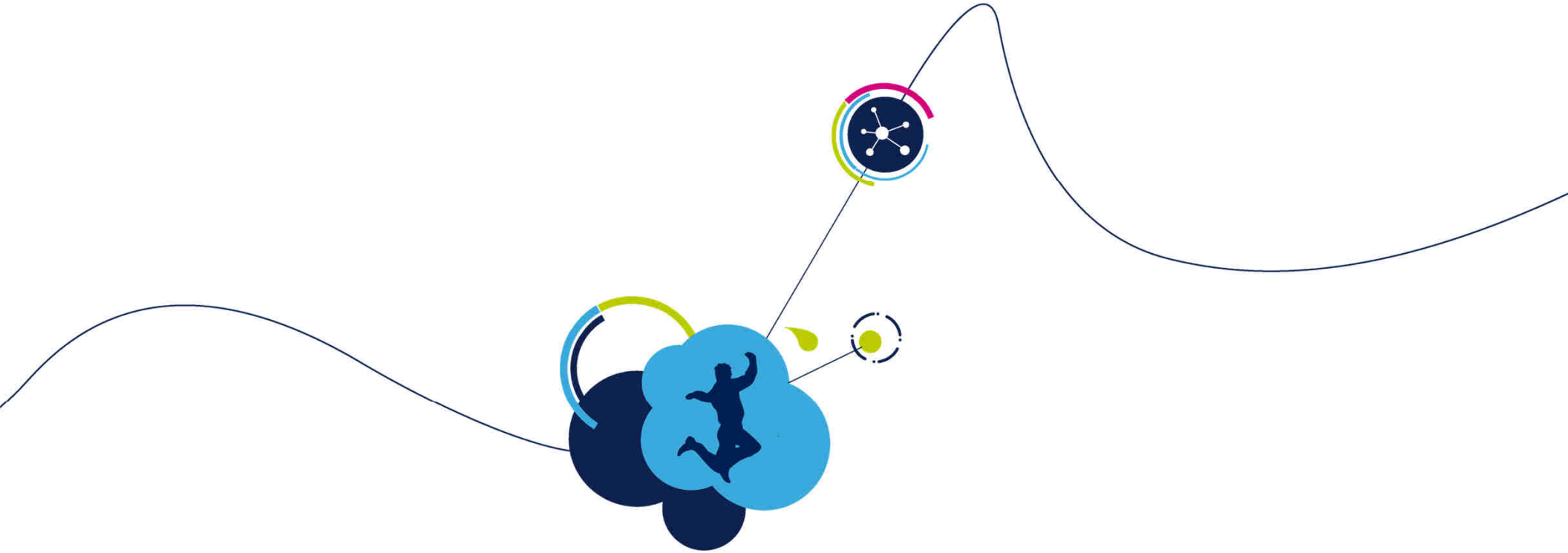


Design Rules:

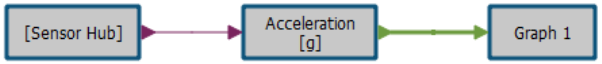
Several rules must be kept during project design to create project which could be validated and compiled.

- Connection can be made between input and output of different function blocks
- It is impossible to connect two inputs or two outputs together
- Only input and output of the same type can be connected, exception is variant input which will get the type of connected output
- Only input and output of the same size can be connected together. Some inputs and outputs can have variable size. Size value can be changed inside properties window. The size of input or output can be seen in the description window when the block is selected.
- For clarity the thickness of the connection line indicates the size of input and output and color of the connection line indicated the type (default: green – float, blue – integer, violet – other).
- All inputs must be connected

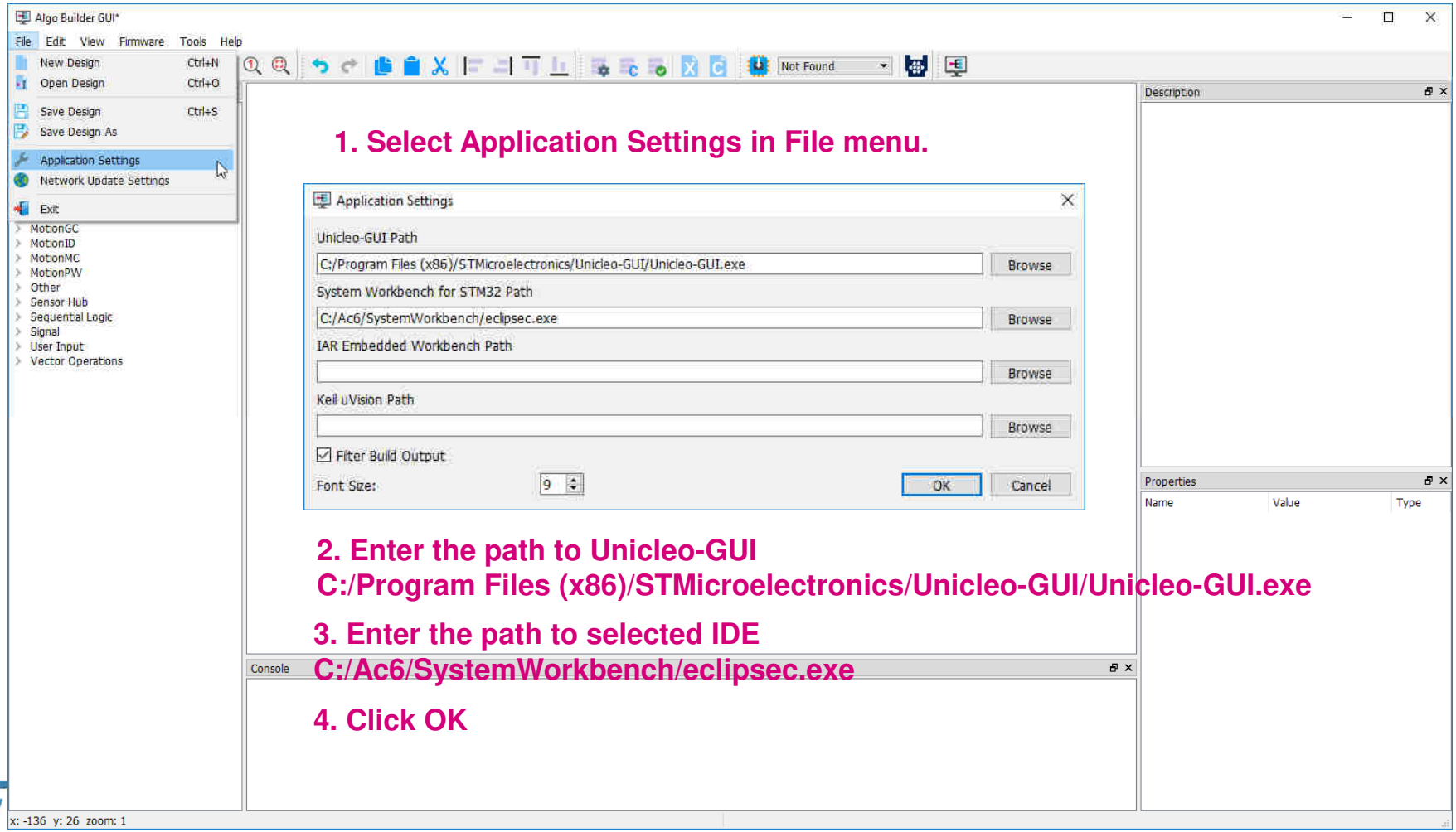




Demo 1
Reading Data From Sensors



life.augmented

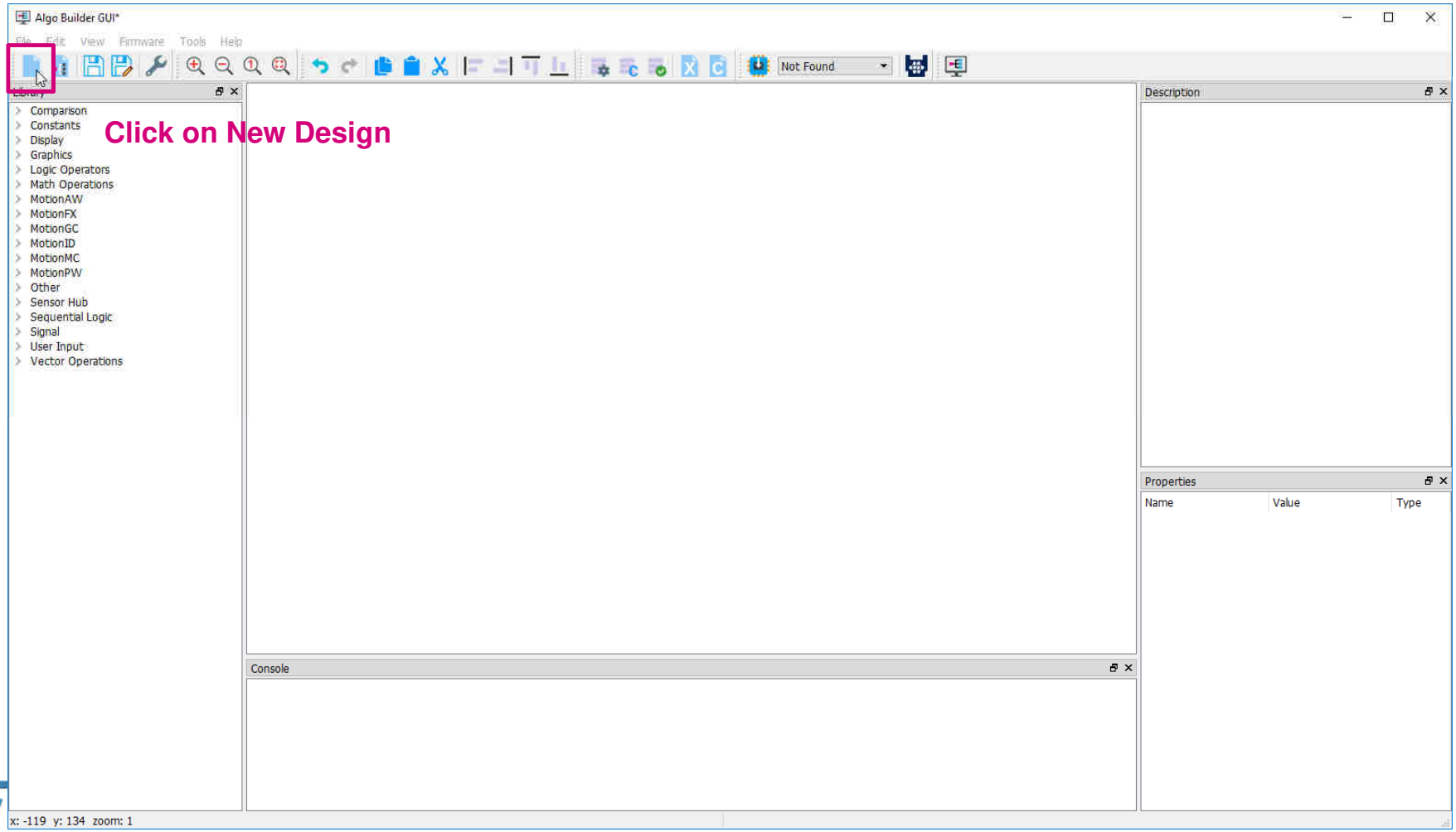


1. Select Application Settings in File menu.

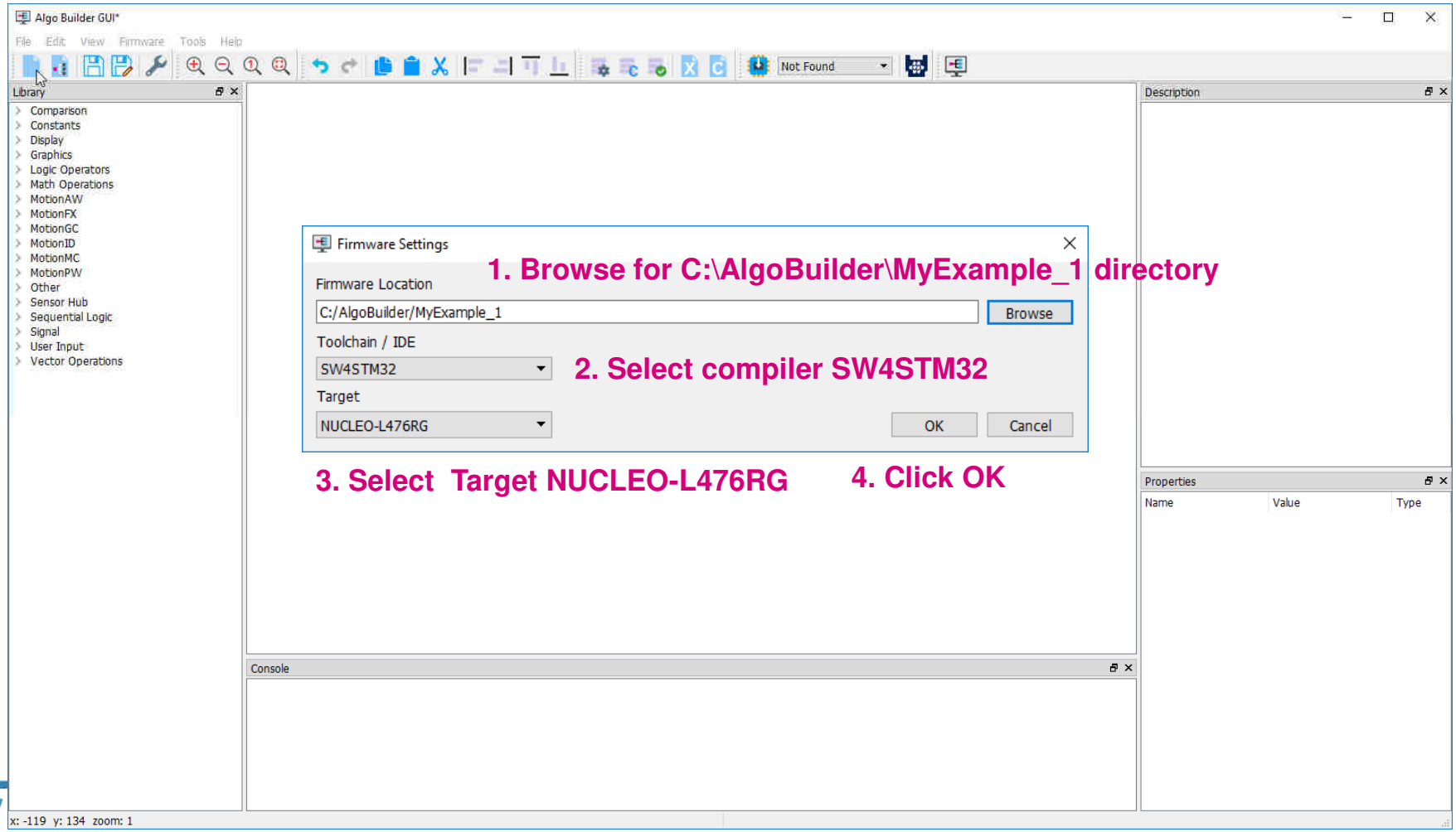
2. Enter the path to Unicleo-GUI
C:/Program Files (x86)/STMicroelectronics/Unicleo-GUI/Unicleo-GUI.exe

3. Enter the path to selected IDE
C:/Ac6/SystemWorkbench/eclipsec.exe

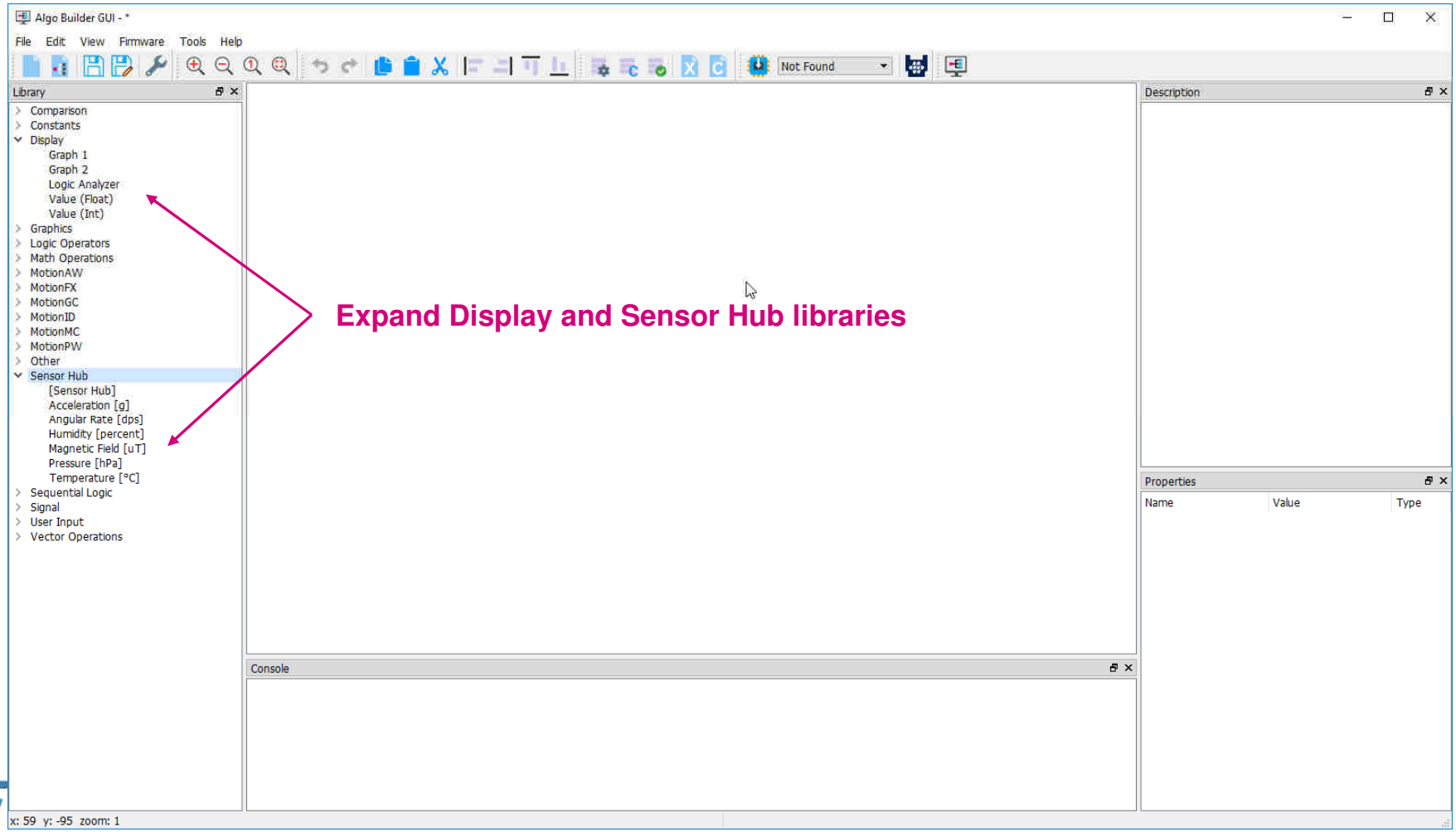
4. Click OK



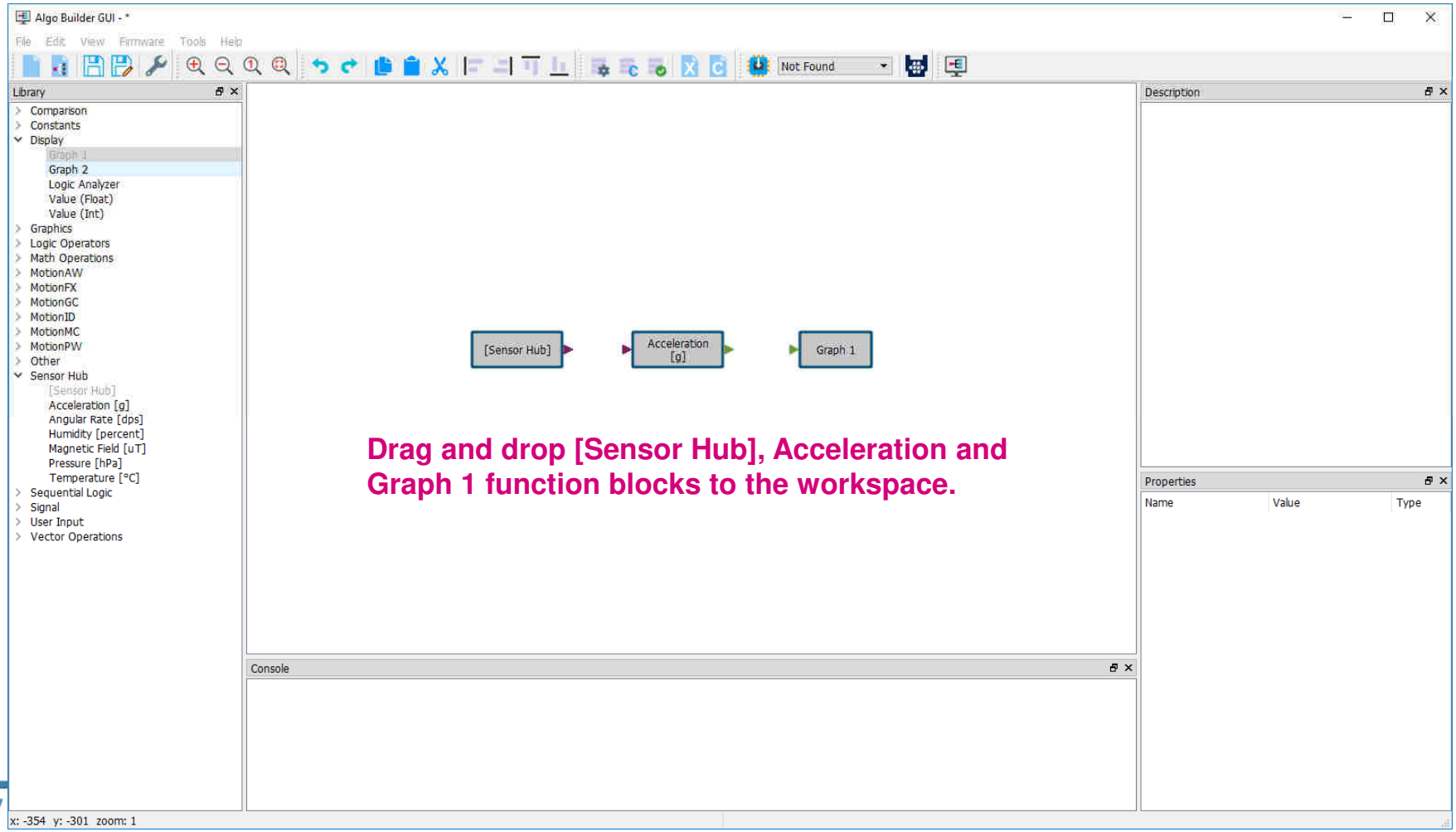
life.augmented



life.augmented

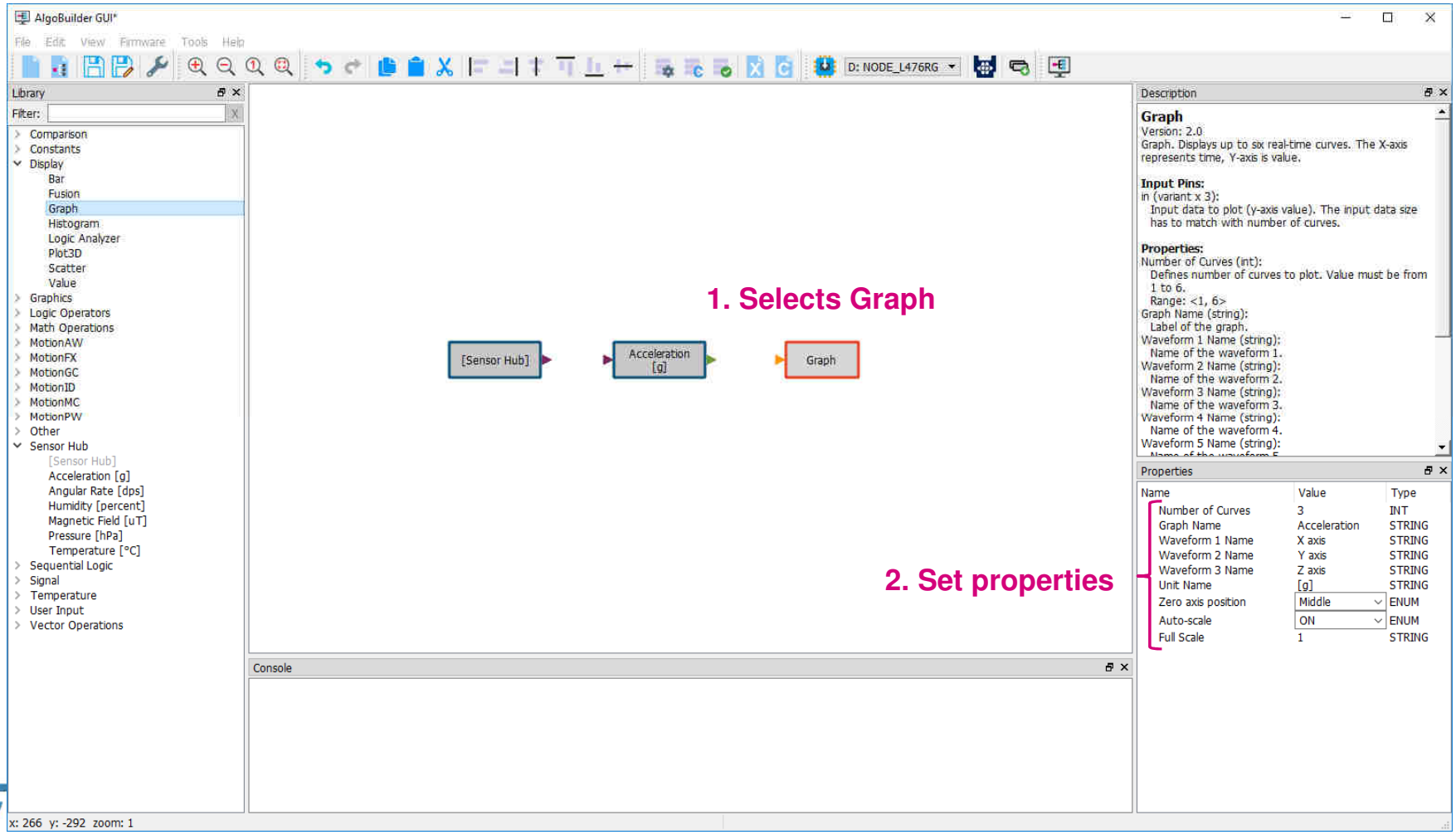


life.augmented

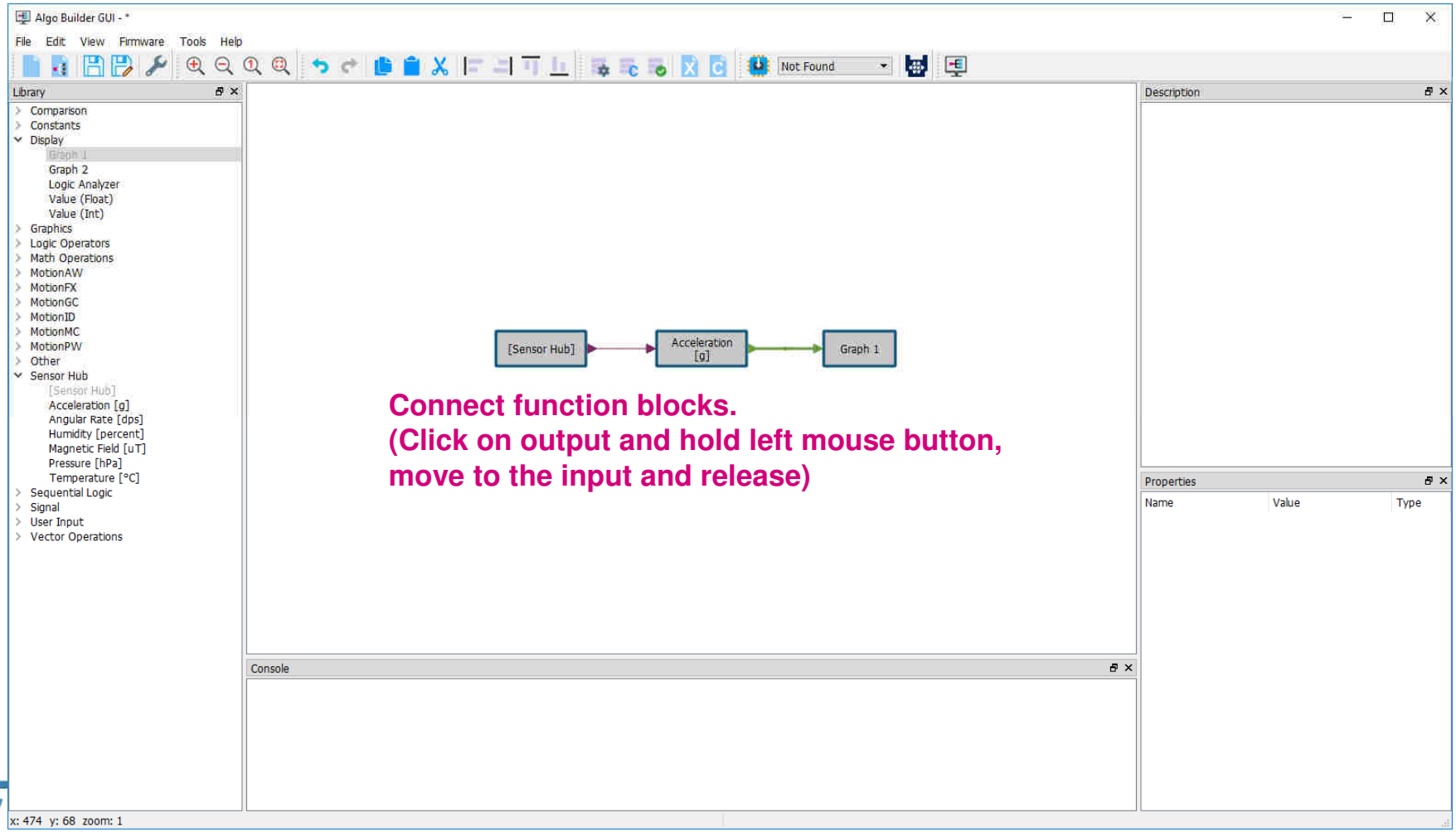


Drag and drop [Sensor Hub], Acceleration and Graph 1 function blocks to the workspace.

life.augmented



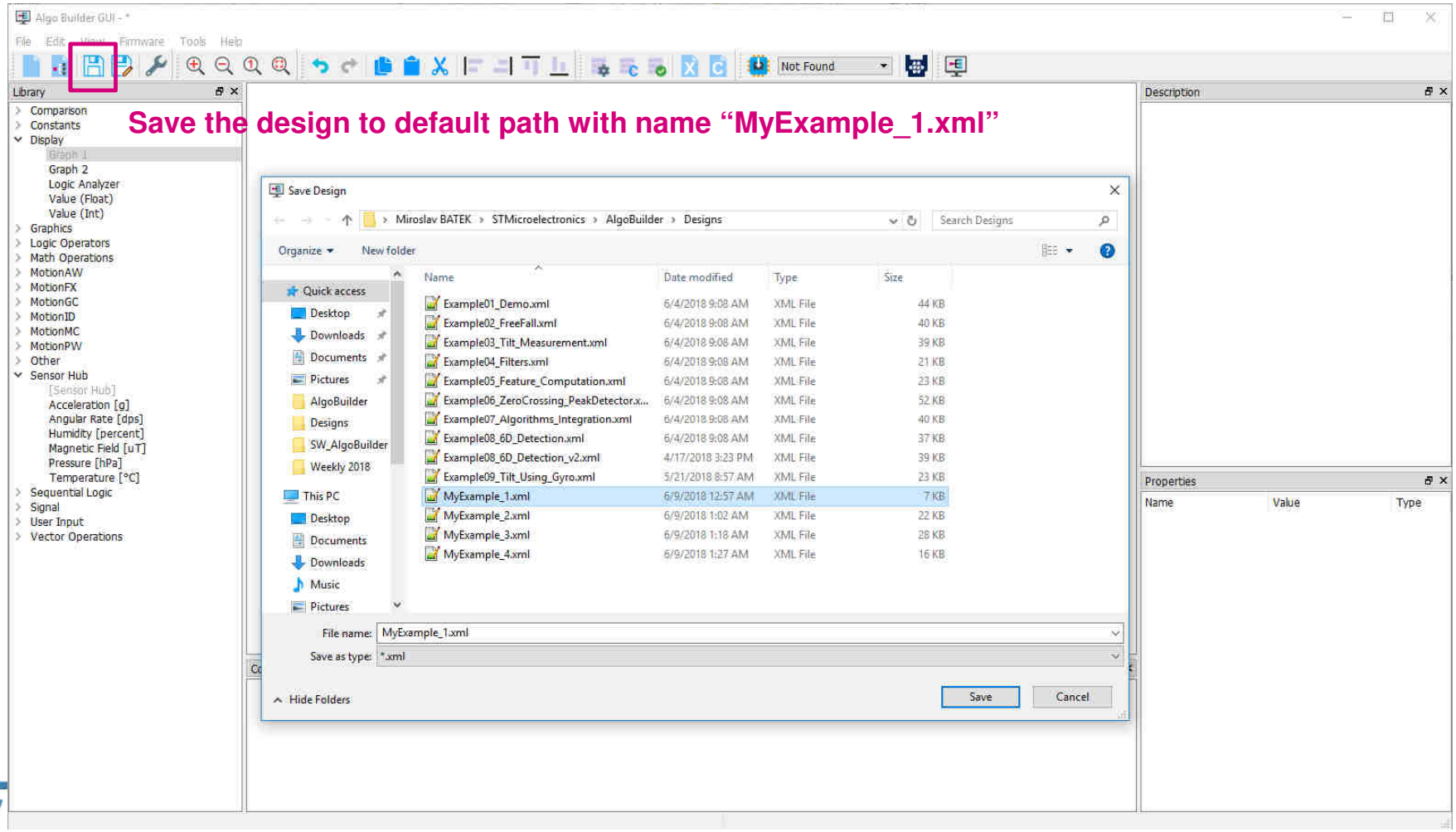
life.augmented



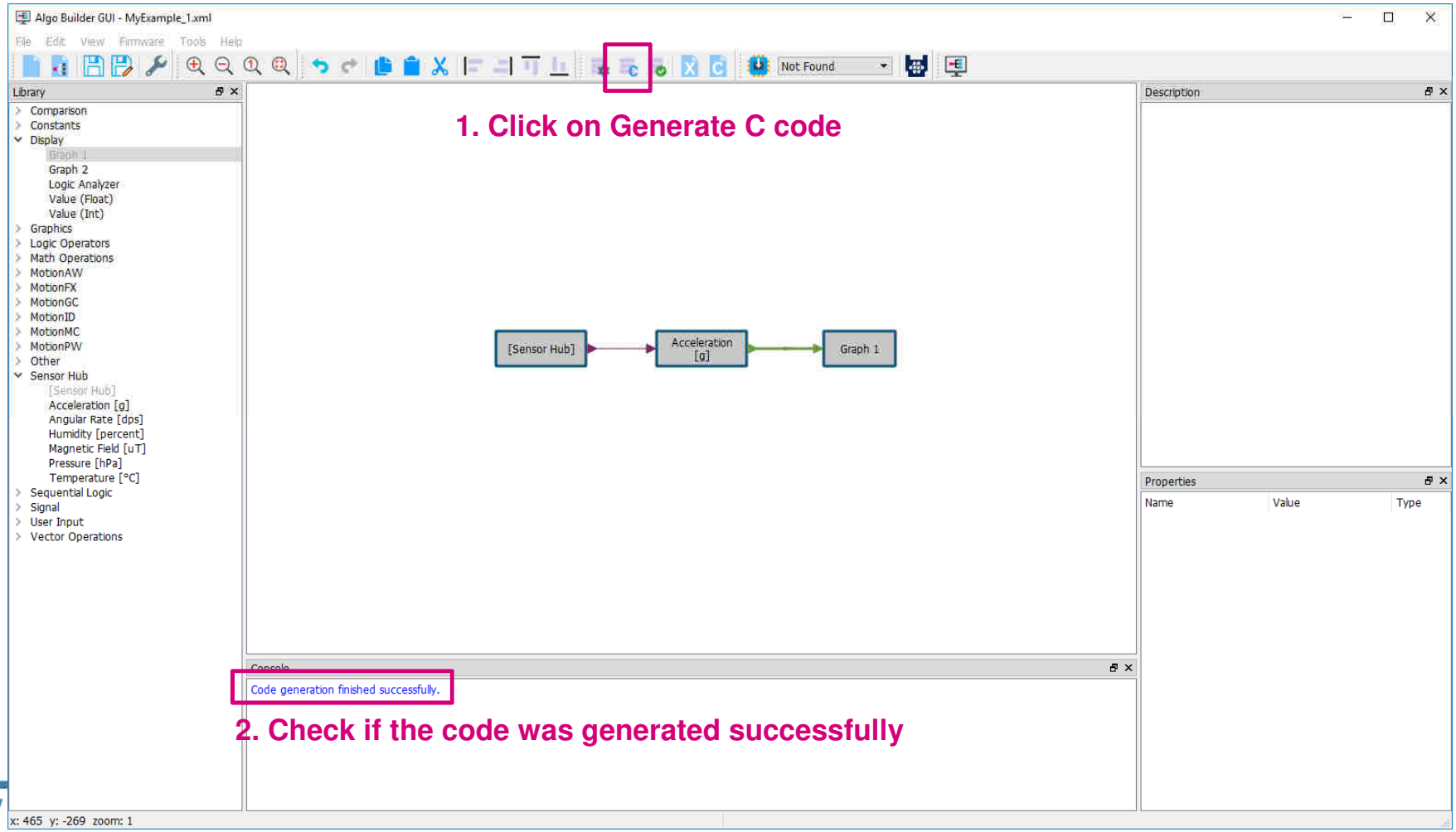
Connect function blocks.
(Click on output and hold left mouse button, move to the input and release)

life.augmented

Save the design to default path with name “MyExample_1.xml”



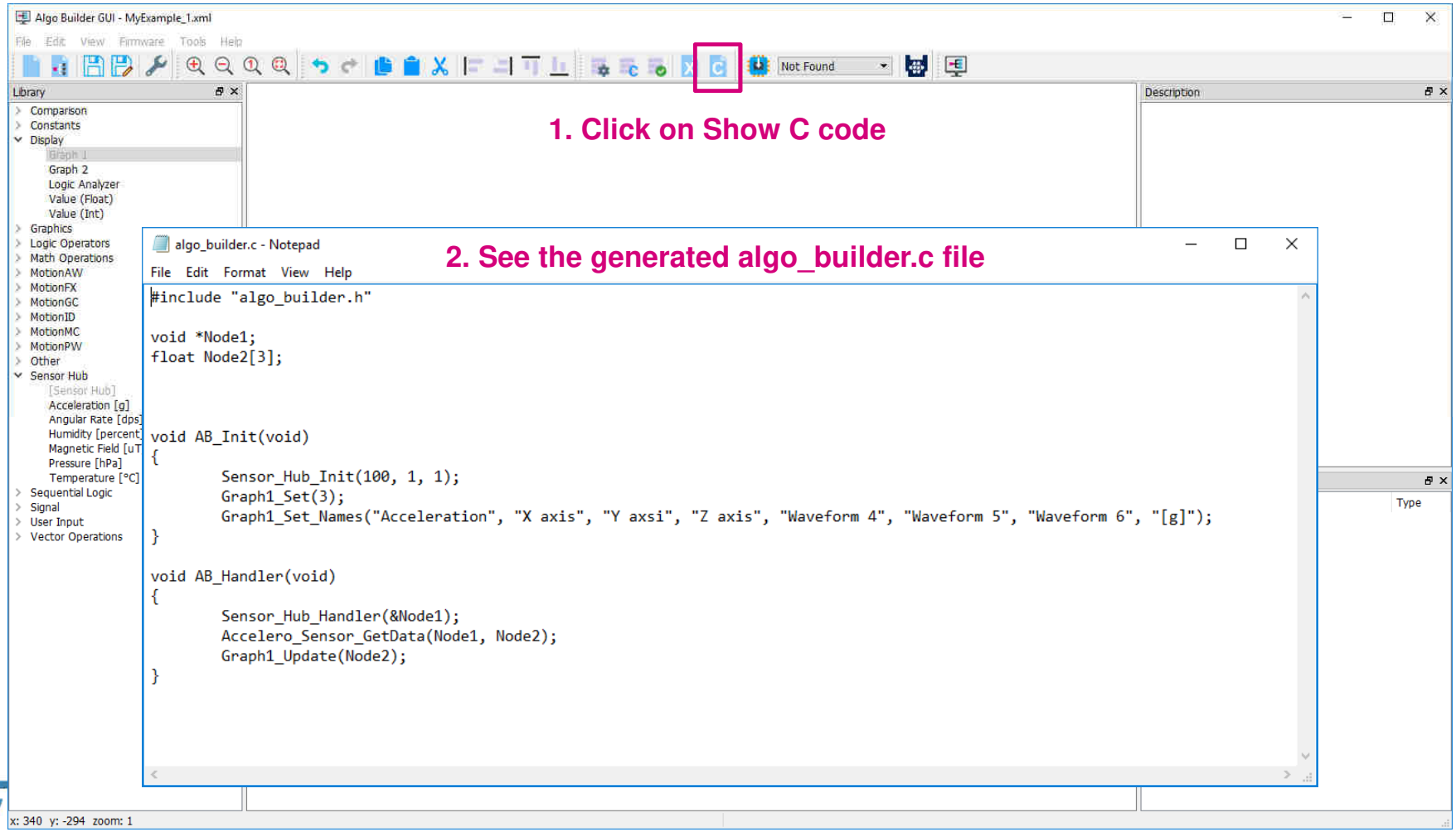
life.augmented



1. Click on Generate C code

2. Check if the code was generated successfully

life.augmented



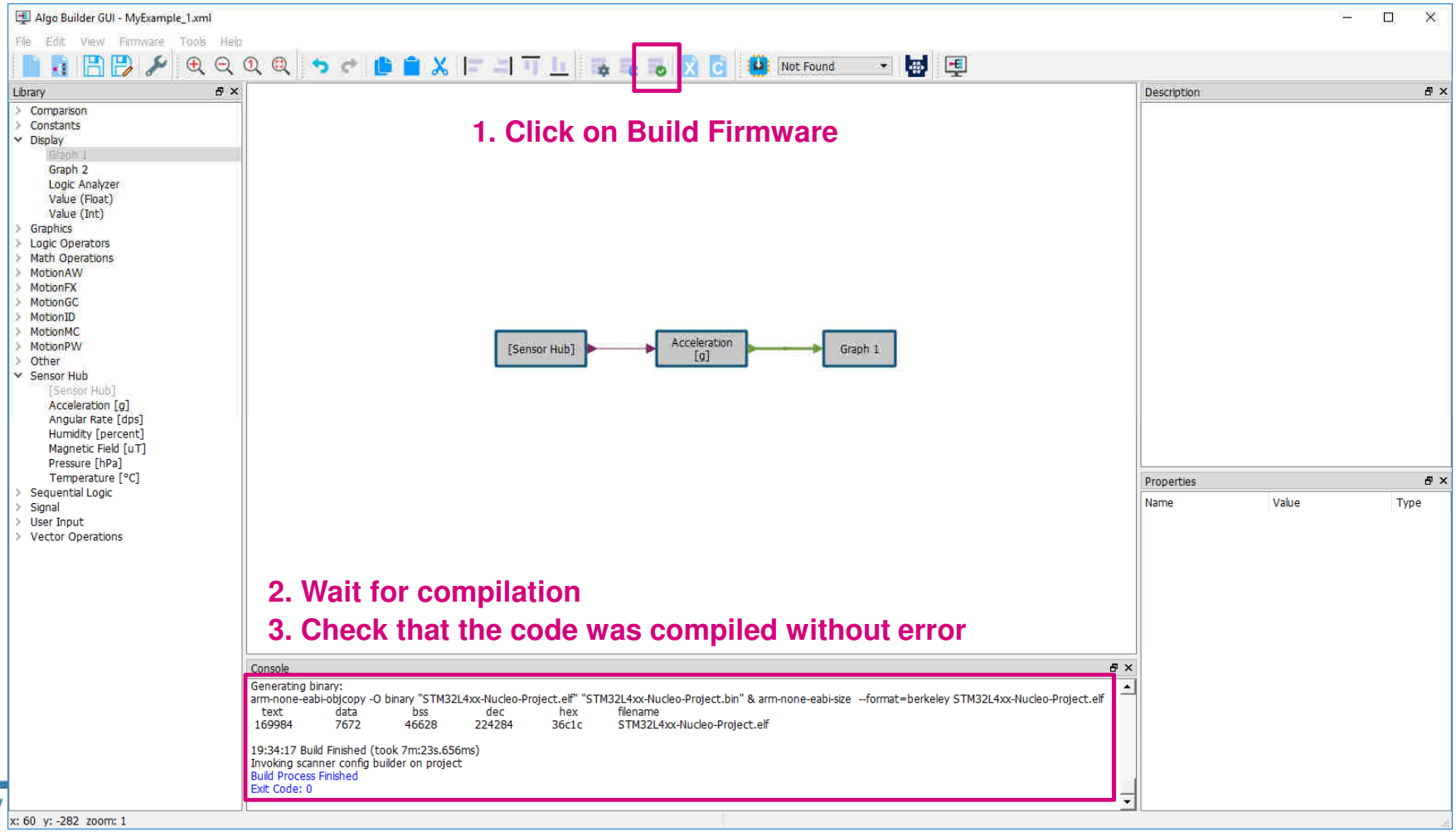
1. Click on Show C code

2. See the generated algo_builder.c file

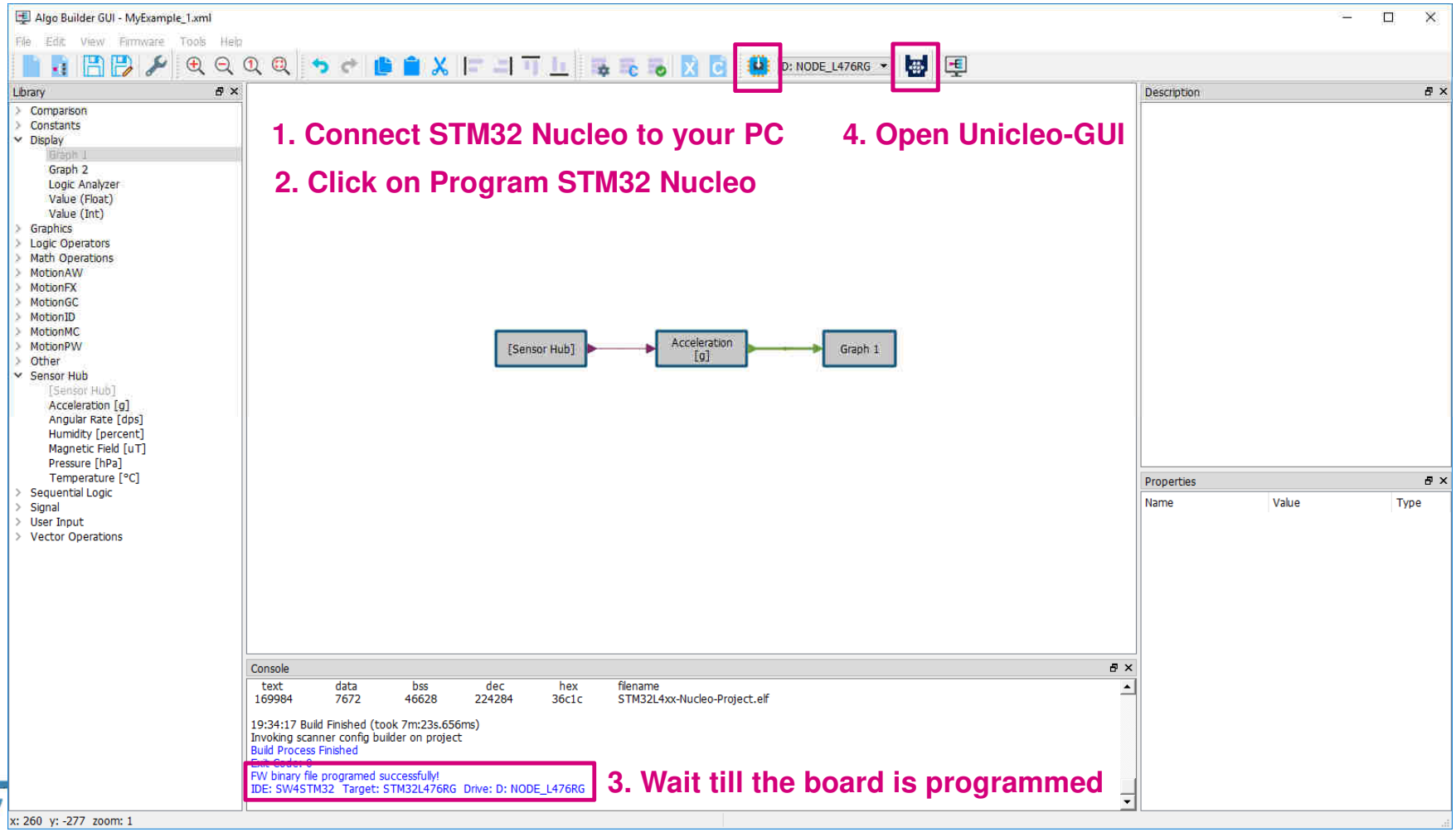
algo_builder.c - Notepad

File Edit Format View Help

```
#include "algo_builder.h"

void *Node1;
float Node2[3];



void AB_Init(void)
{
        Sensor_Hub_Init(100, 1, 1);
        Graph1_Set(3);
        Graph1_Set_Names("Acceleration", "X axis", "Y axsi", "Z axis", "Waveform 4", "Waveform 5", "Waveform 6", "[g]");
}

void AB_Handler(void)
{
        Sensor_Hub_Handler(&Node1);
        Accelero_Sensor_GetData(Node1, Node2);
        Graph1_Update(Node2);
}
```



life.augmented



1. Connect STM32 Nucleo to your PC

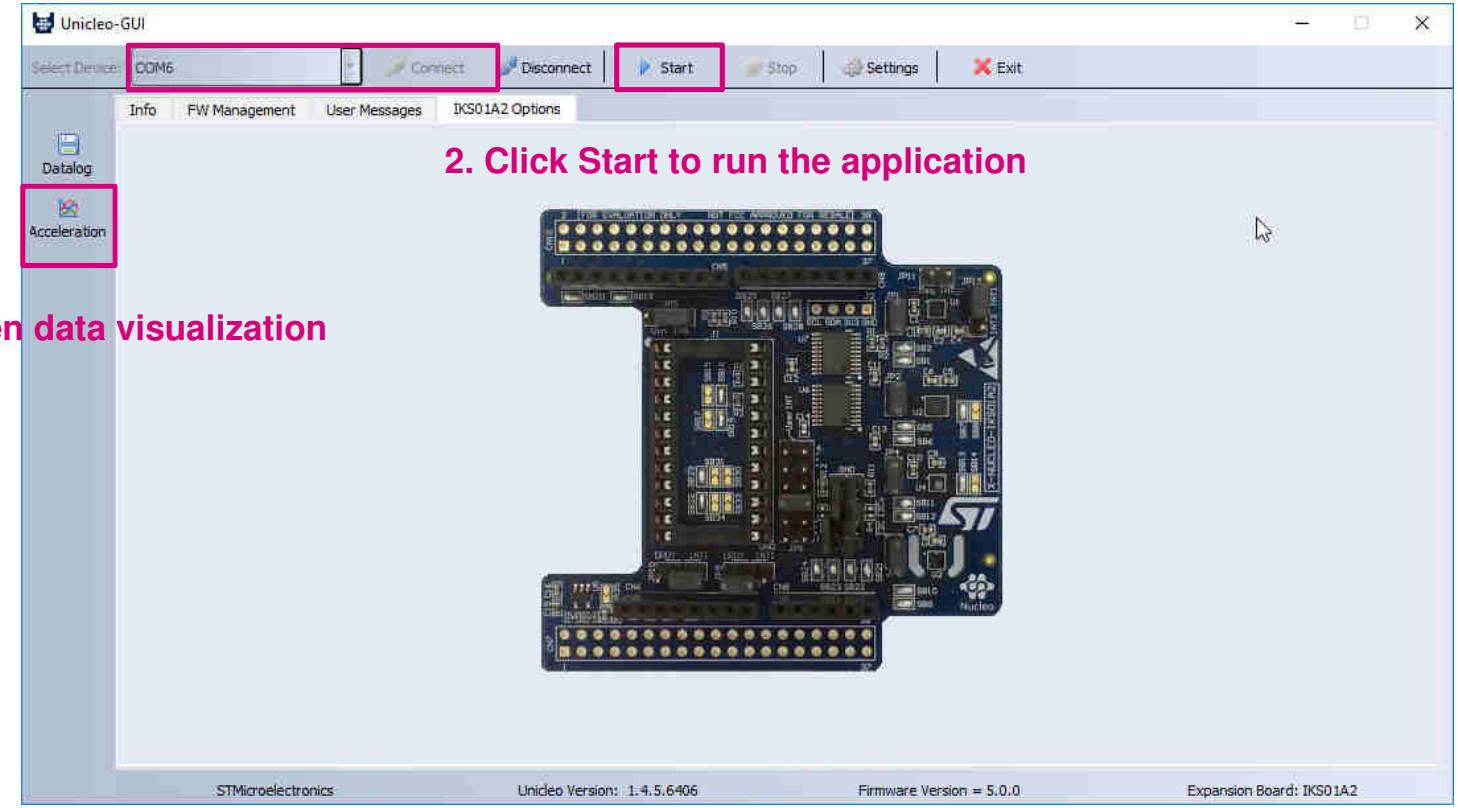
2. Click on Program STM32 Nucleo

3. Wait till the board is programmed

4. Open Unicleo-GUI

life.augmented

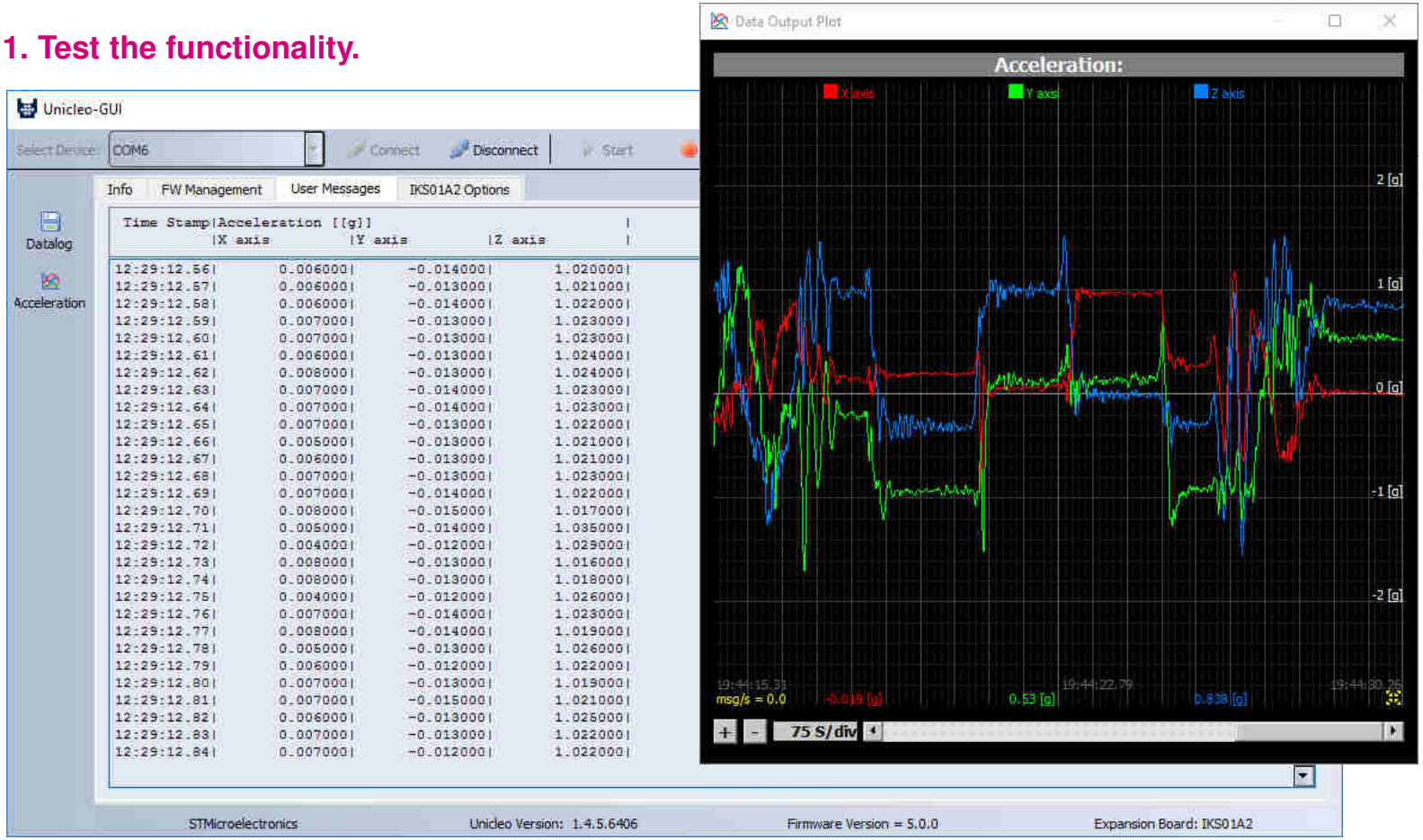
1. Check the boards is connected to Unicleo GUI



2. Click Start to run the application

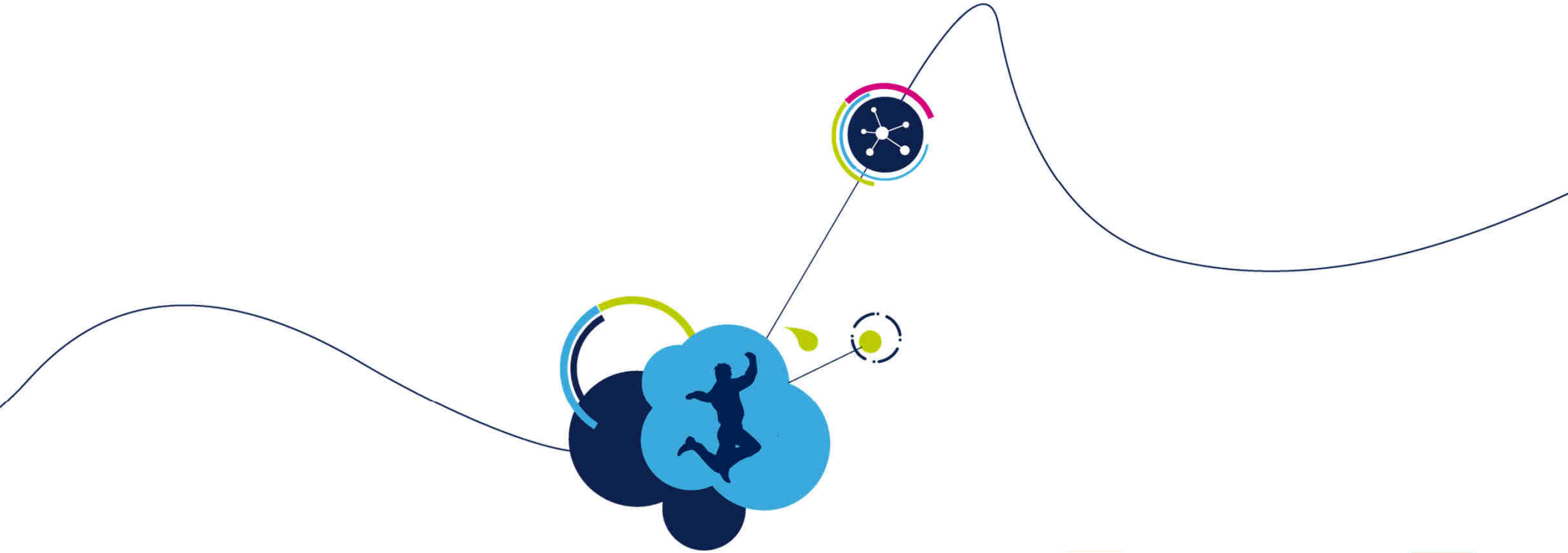
3. Open data visualization

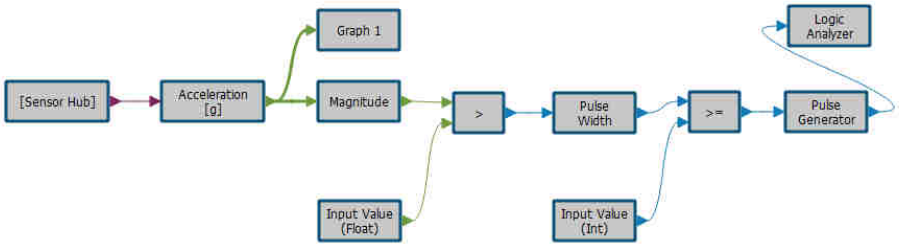
1. Test the functionality.



← Autoscale

2. Close Unicleo-GUI when you finished the testing.

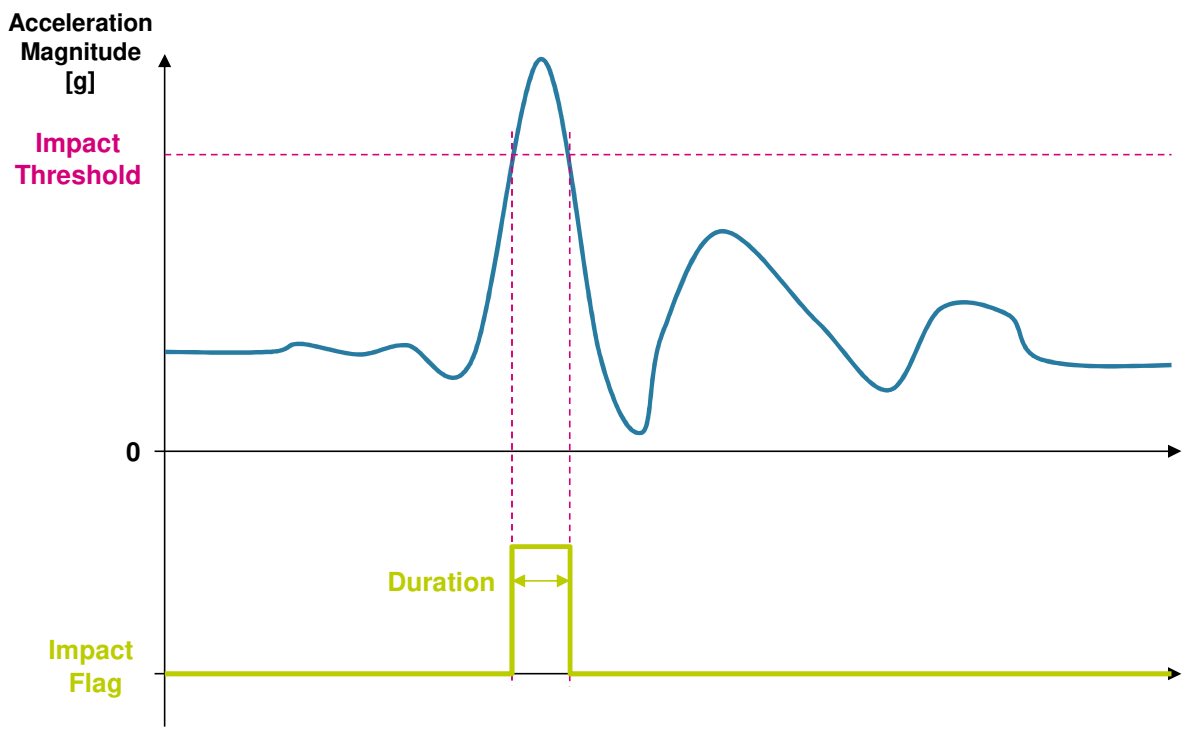


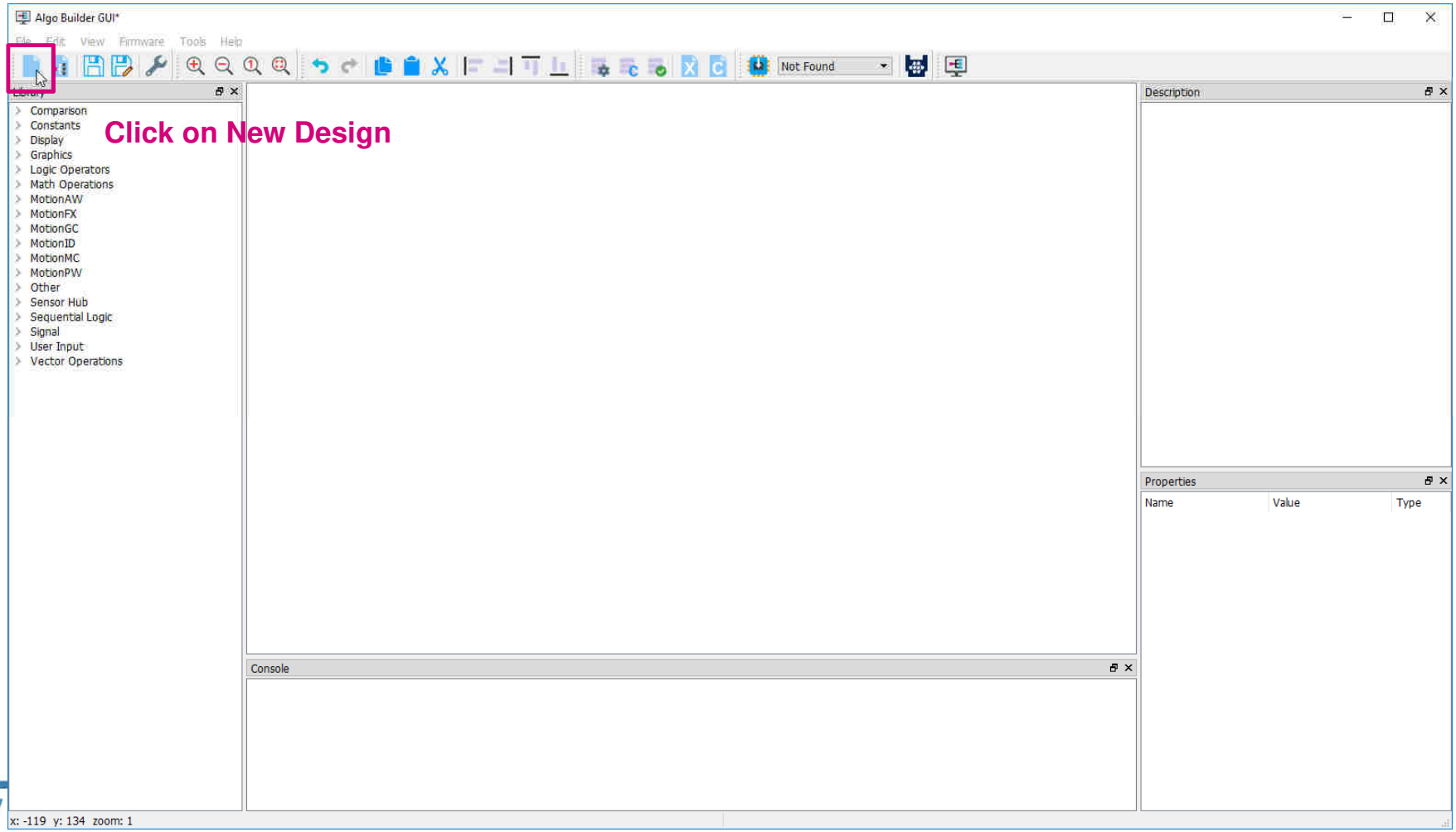


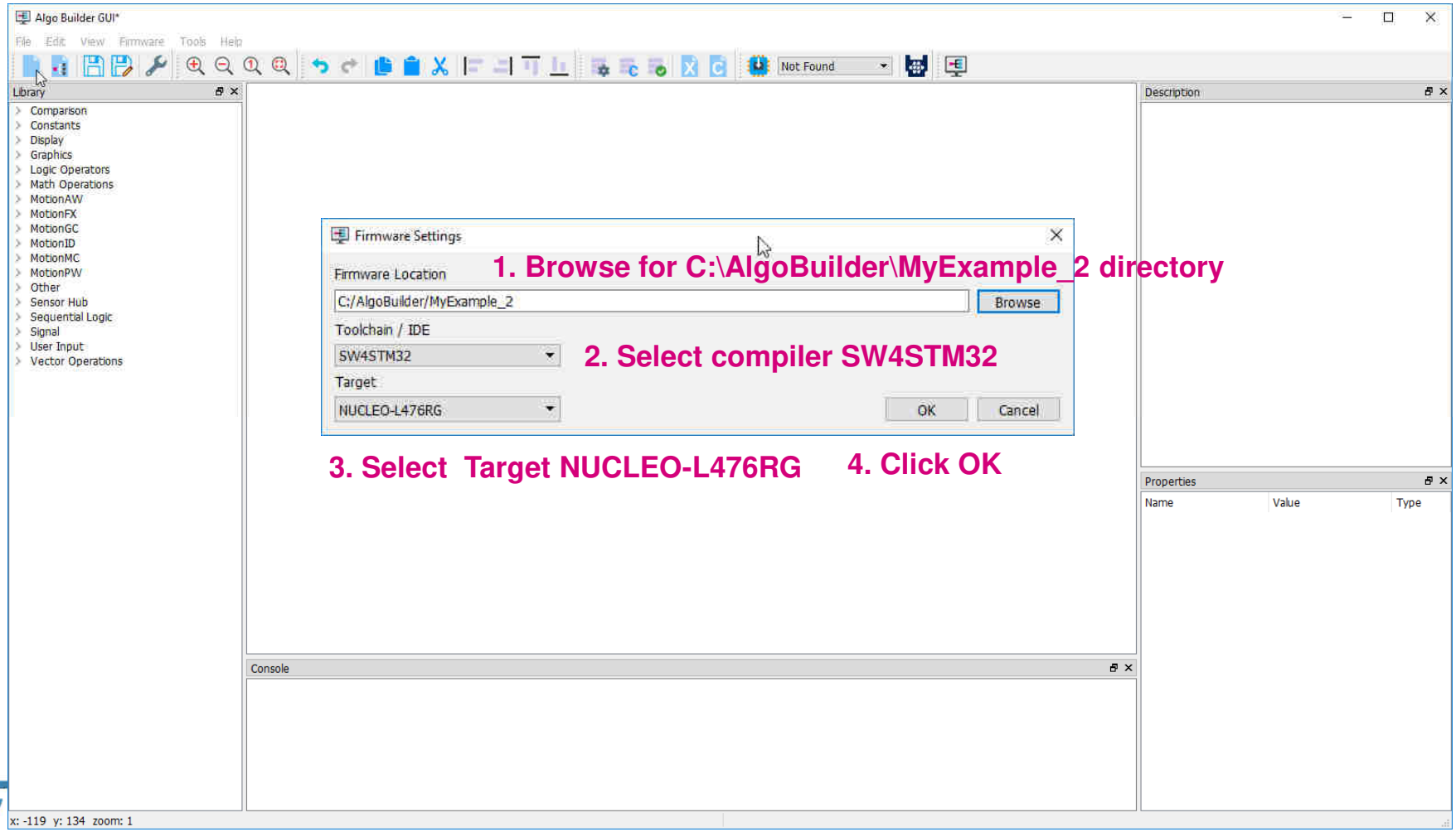
Demo 2
Impact Detection

life.augmented

Impact Detection … Evaluate if magnitude of acceleration is above given threshold for certain time.




Algo Builder GUI*
File Edit View Firmware Tools Help
Not Found
Library
Comparison
Constants
Display
Graphics
Logic Operators
Math Operations
MotionAW
MotionFX
MotionGC
MotionID
MotionMC
MotionPW
Other
Sensor Hub
Sequential Logic
Signal
User Input
Vector Operations
Click on New Design
Description
Properties
Name
Value
Type
Console
x: -119 y: 134 zoom: 1



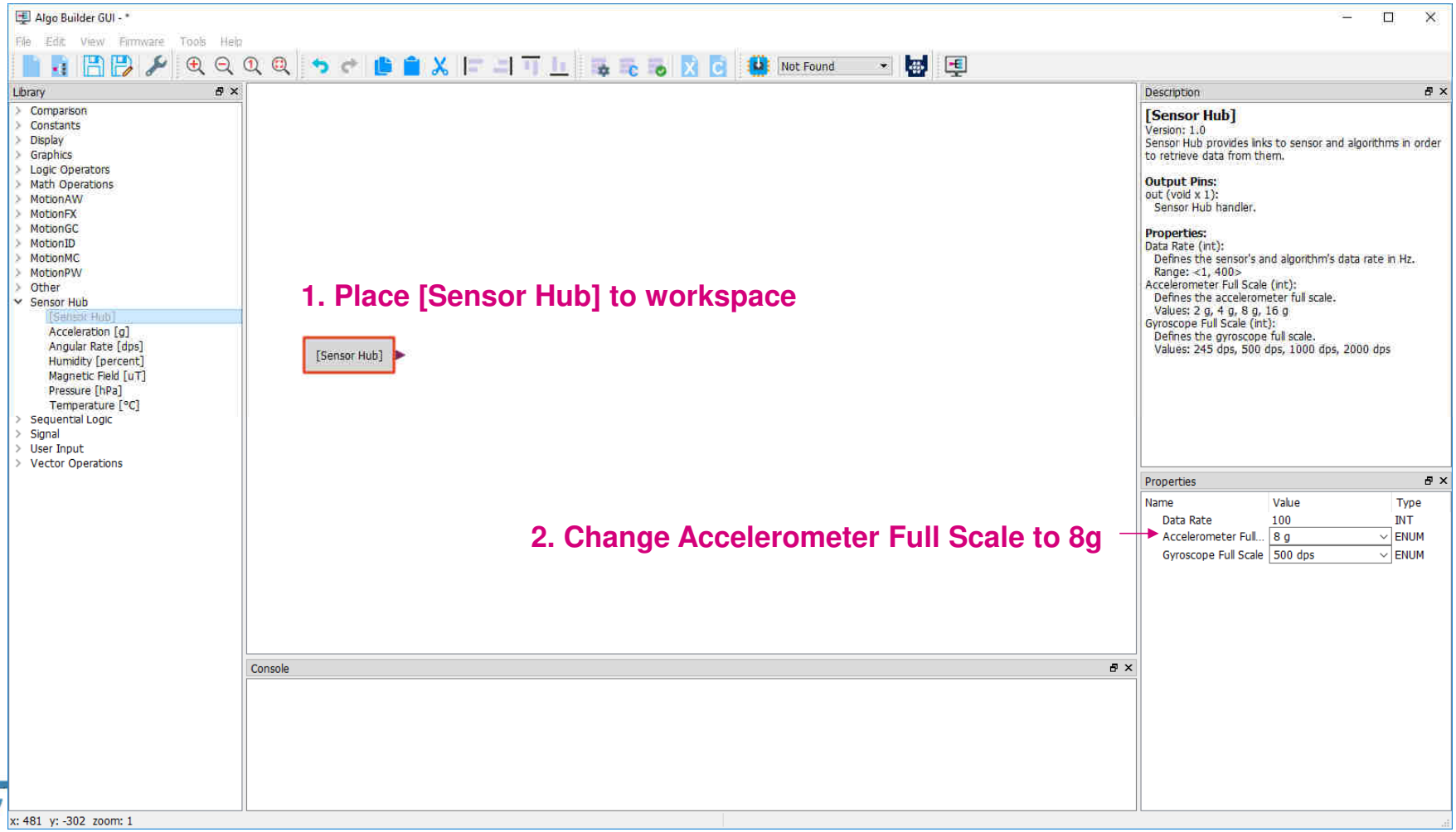
1. Browse for C:\AlgoBuilder\MyExample_2 directory

2. Select compiler SW4STM32

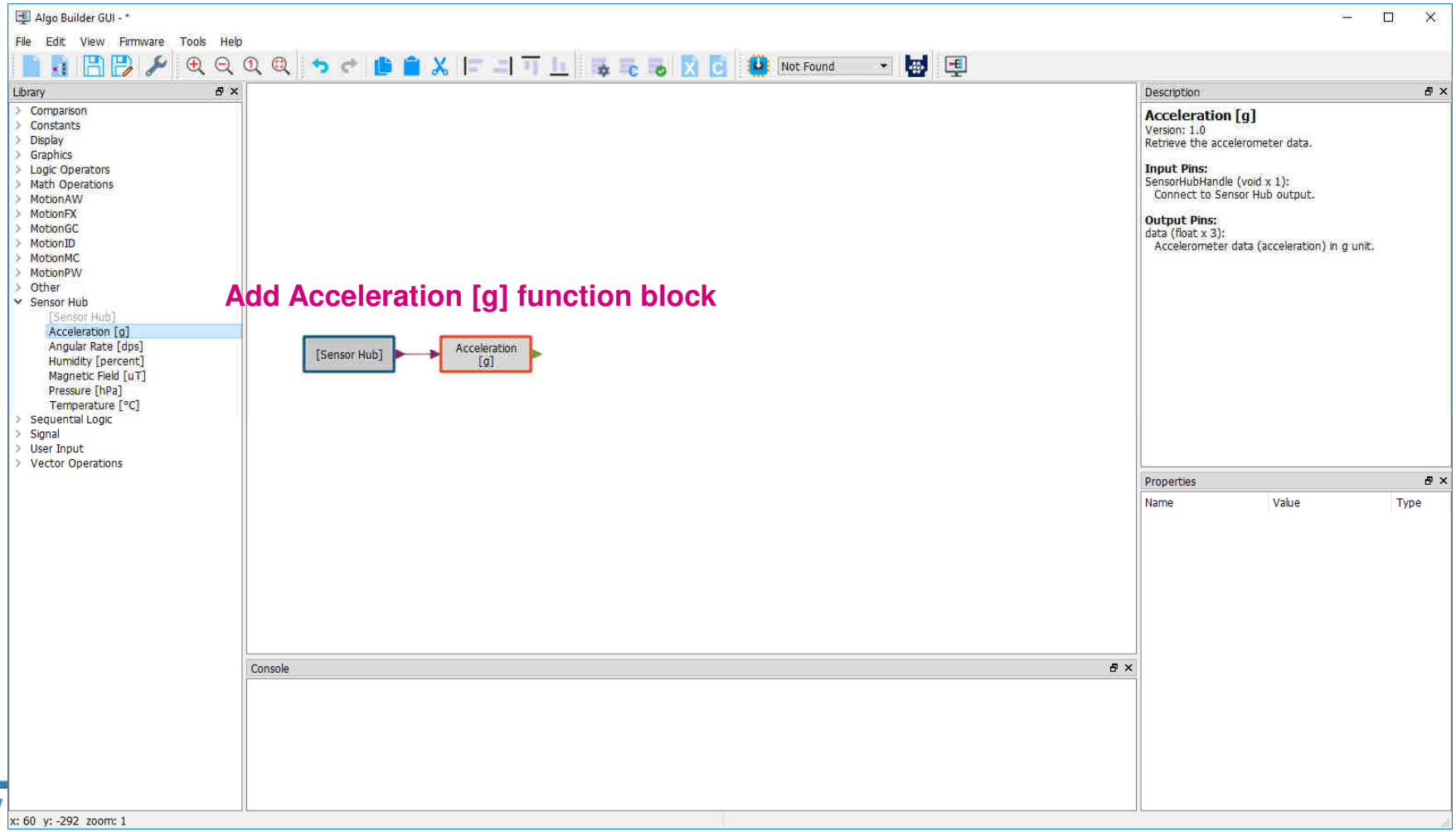
3. Select Target NUCLEO-L476RG

4. Click OK

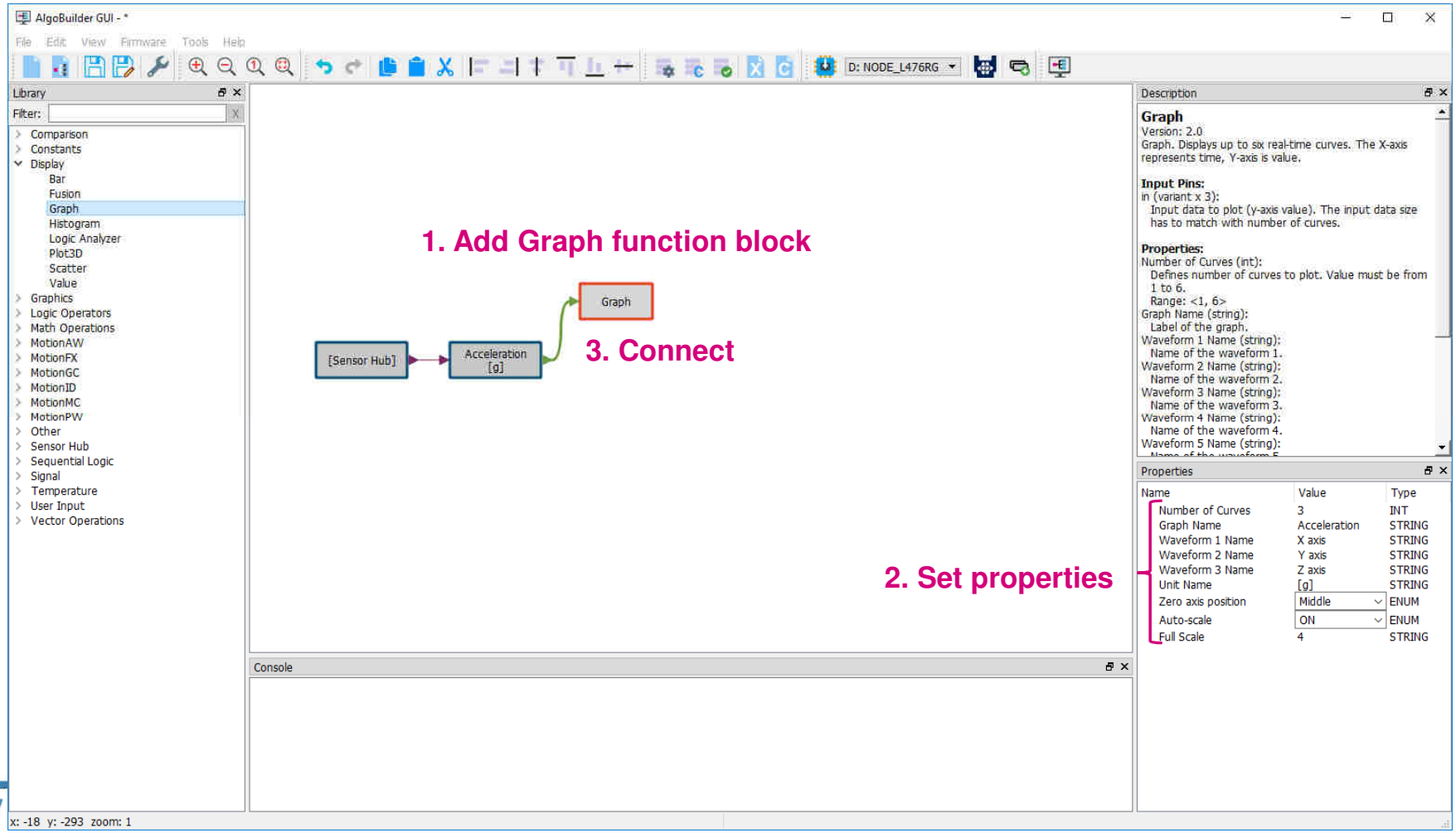
life.augmented



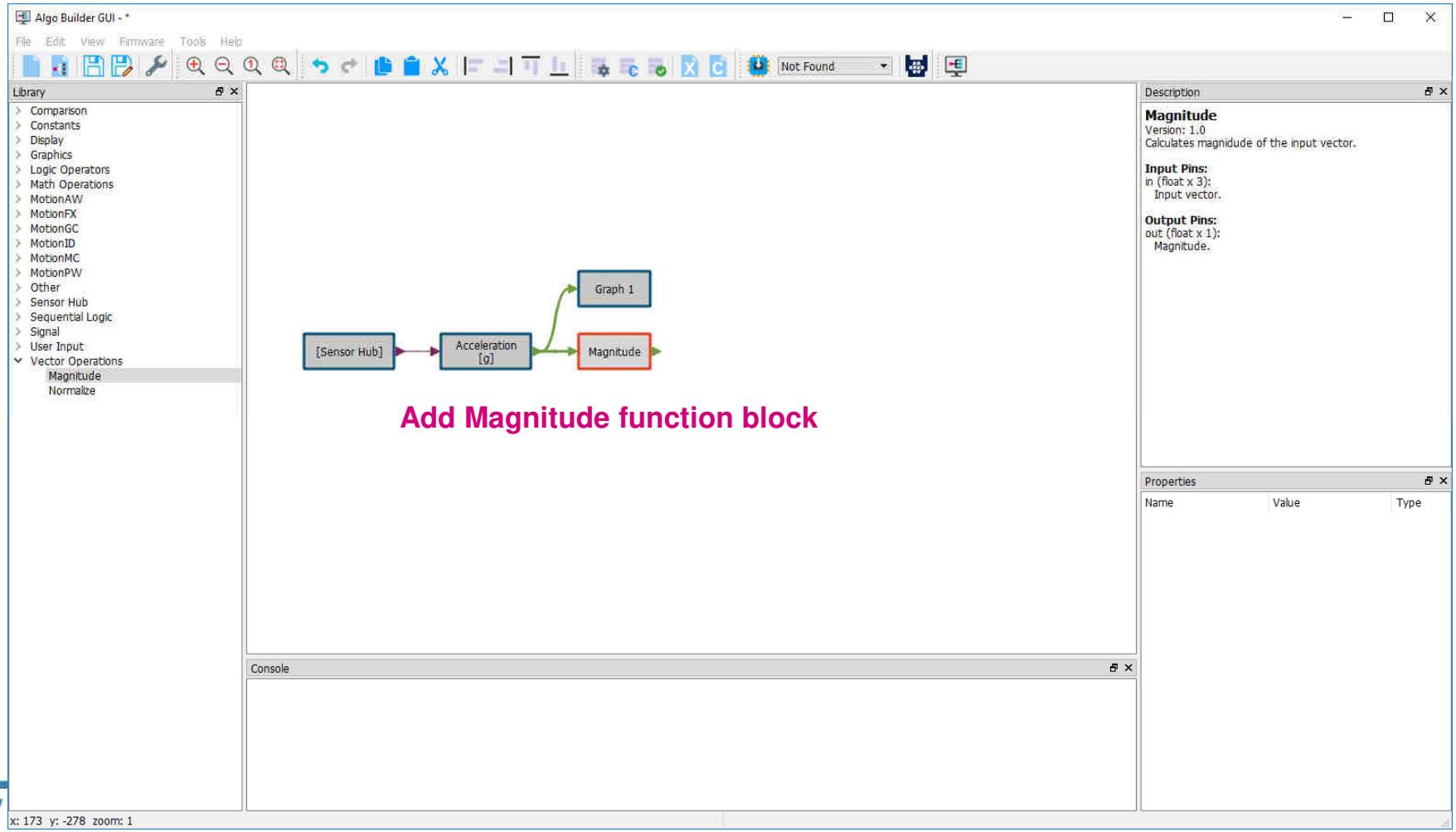
life.augmented



Add Acceleration [g] function block

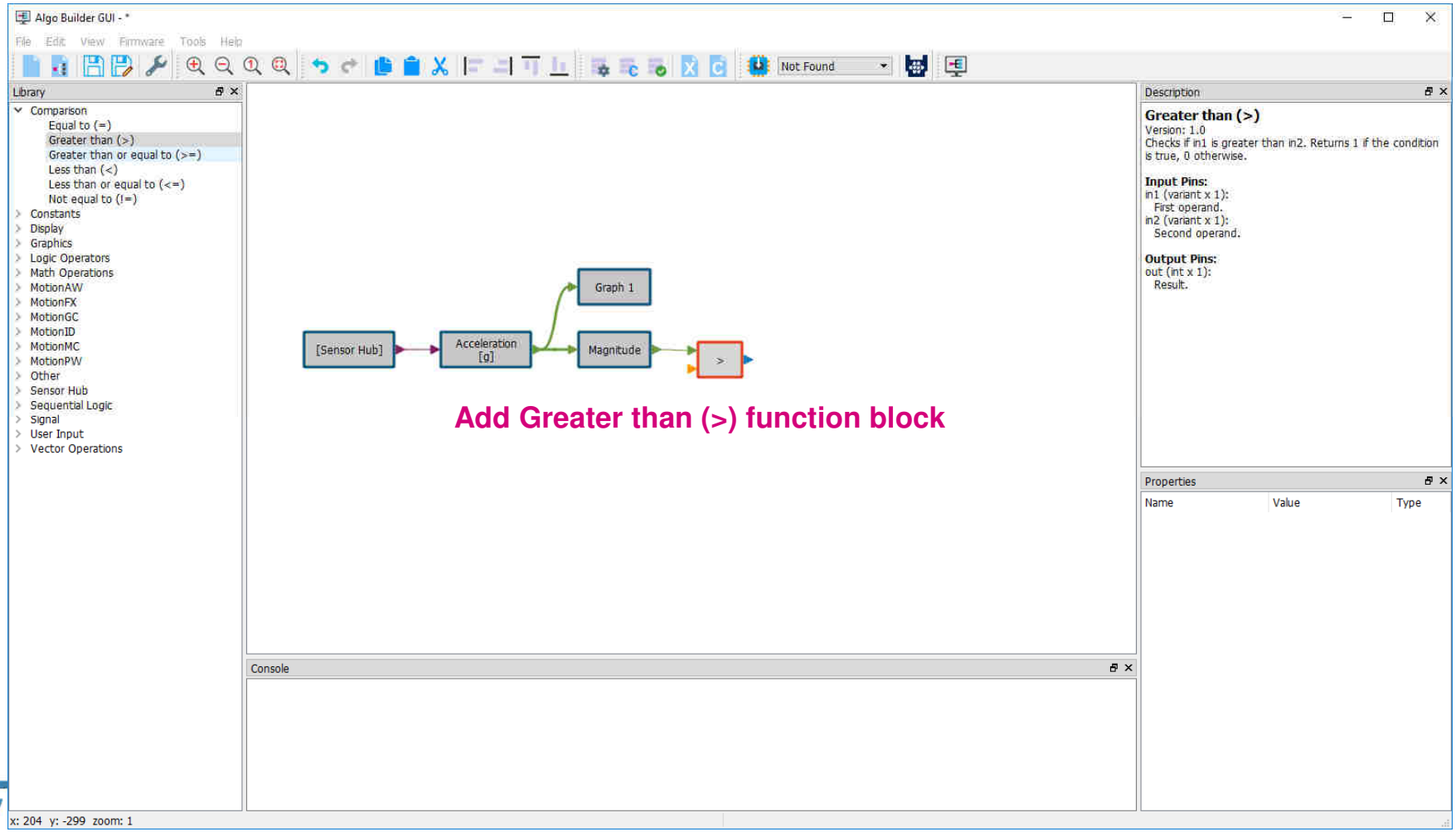


life.augmented

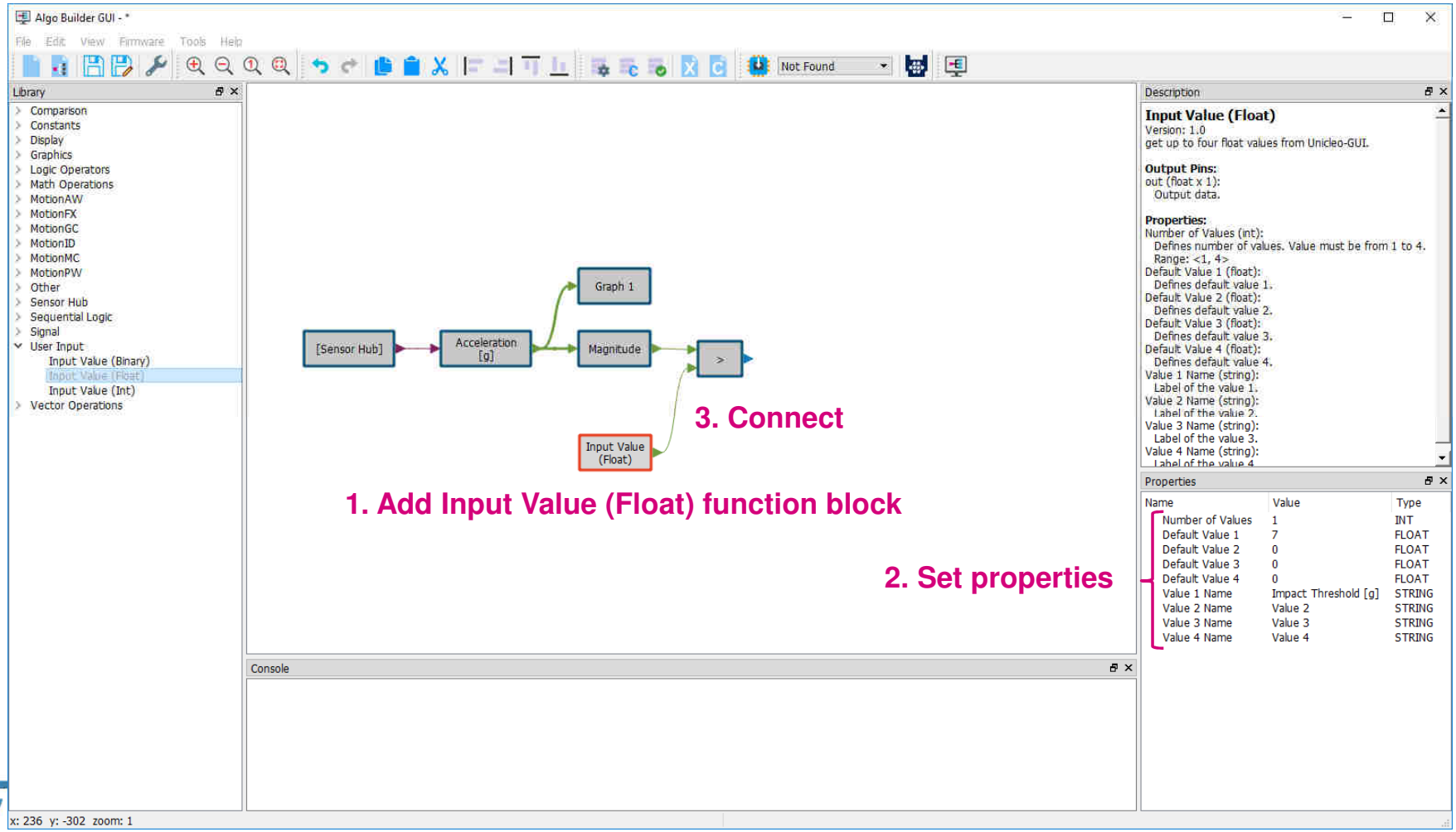


Add Magnitude function block

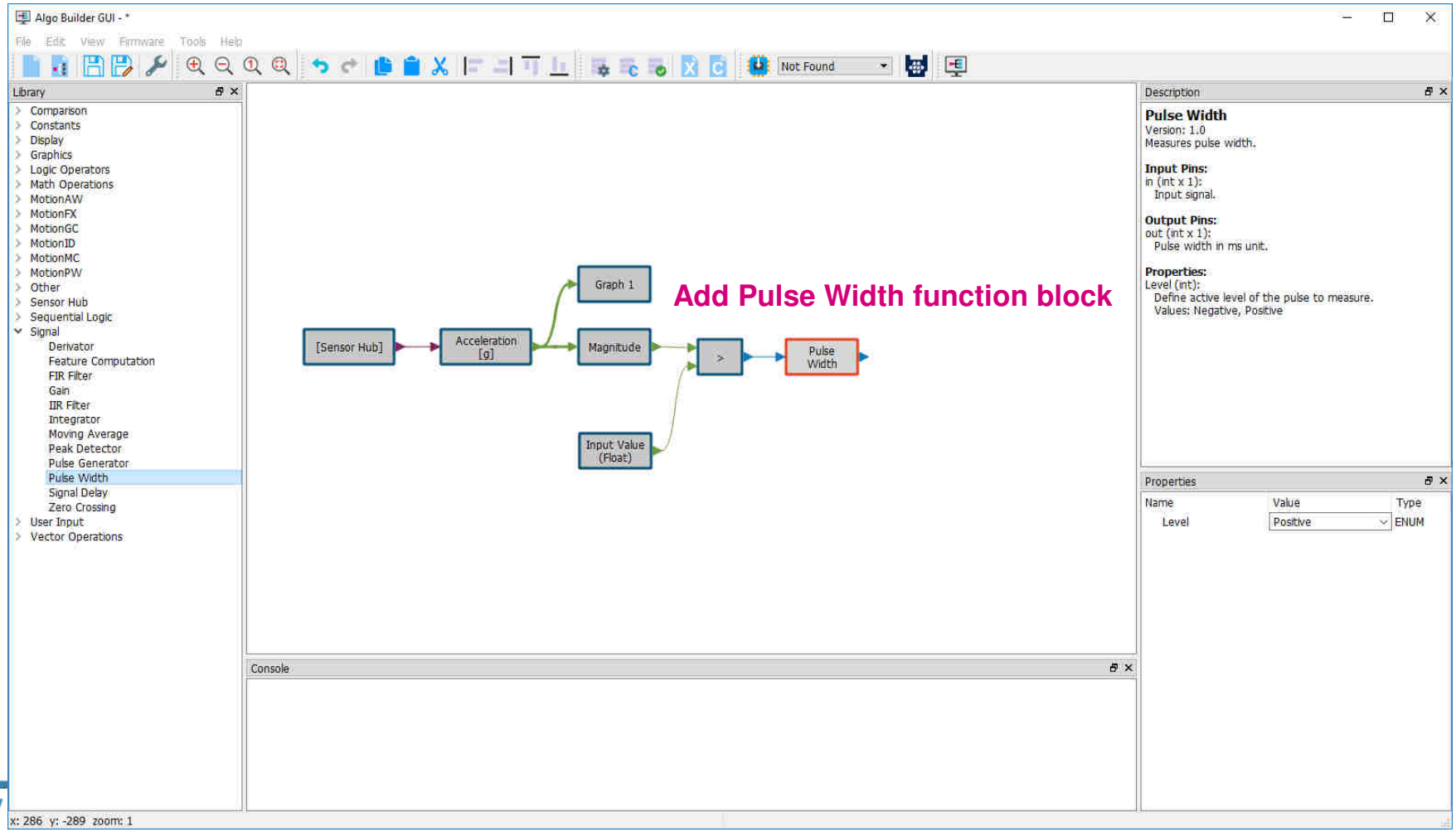
life.augmented



life.augmented

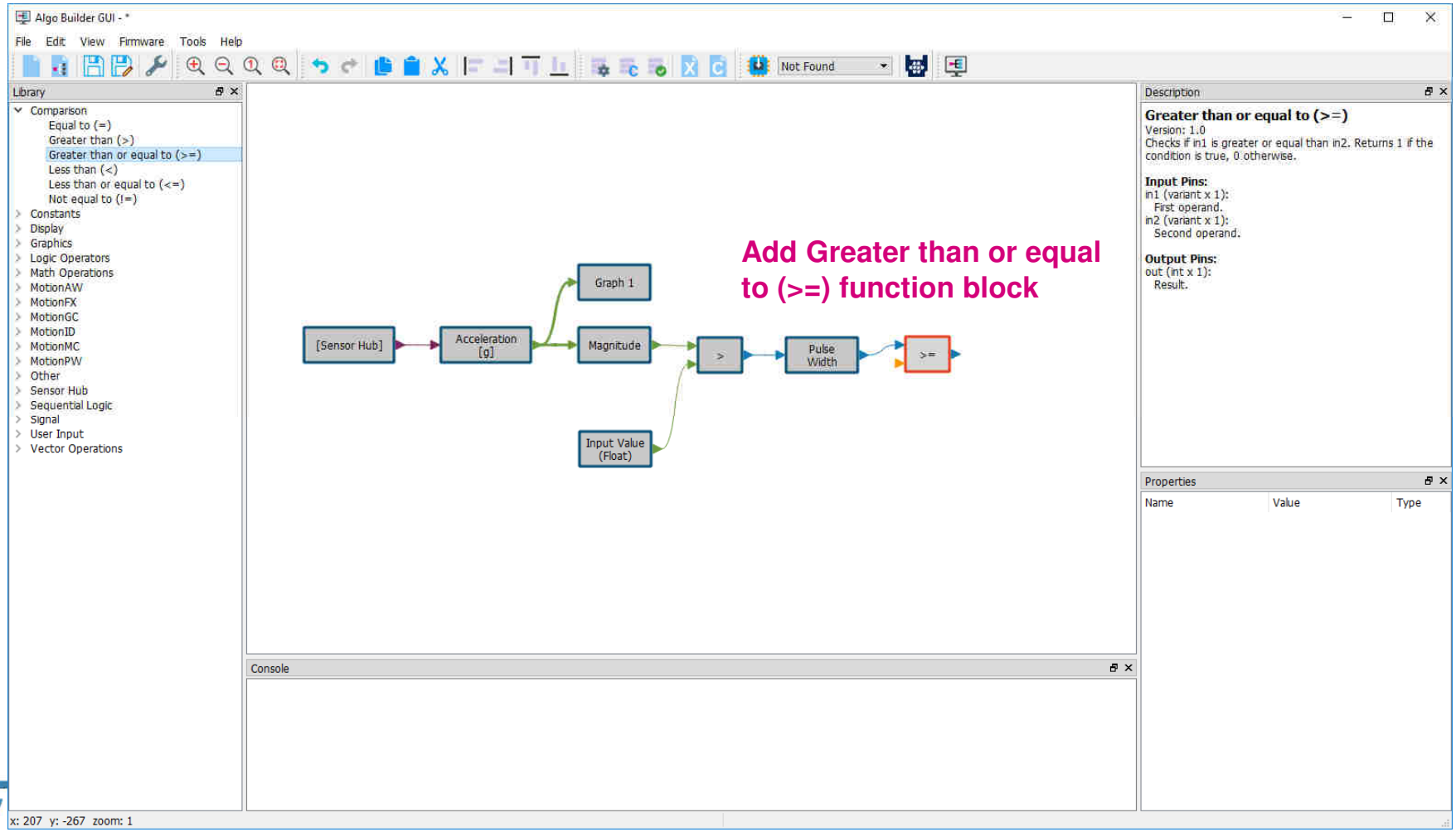


life.augmented

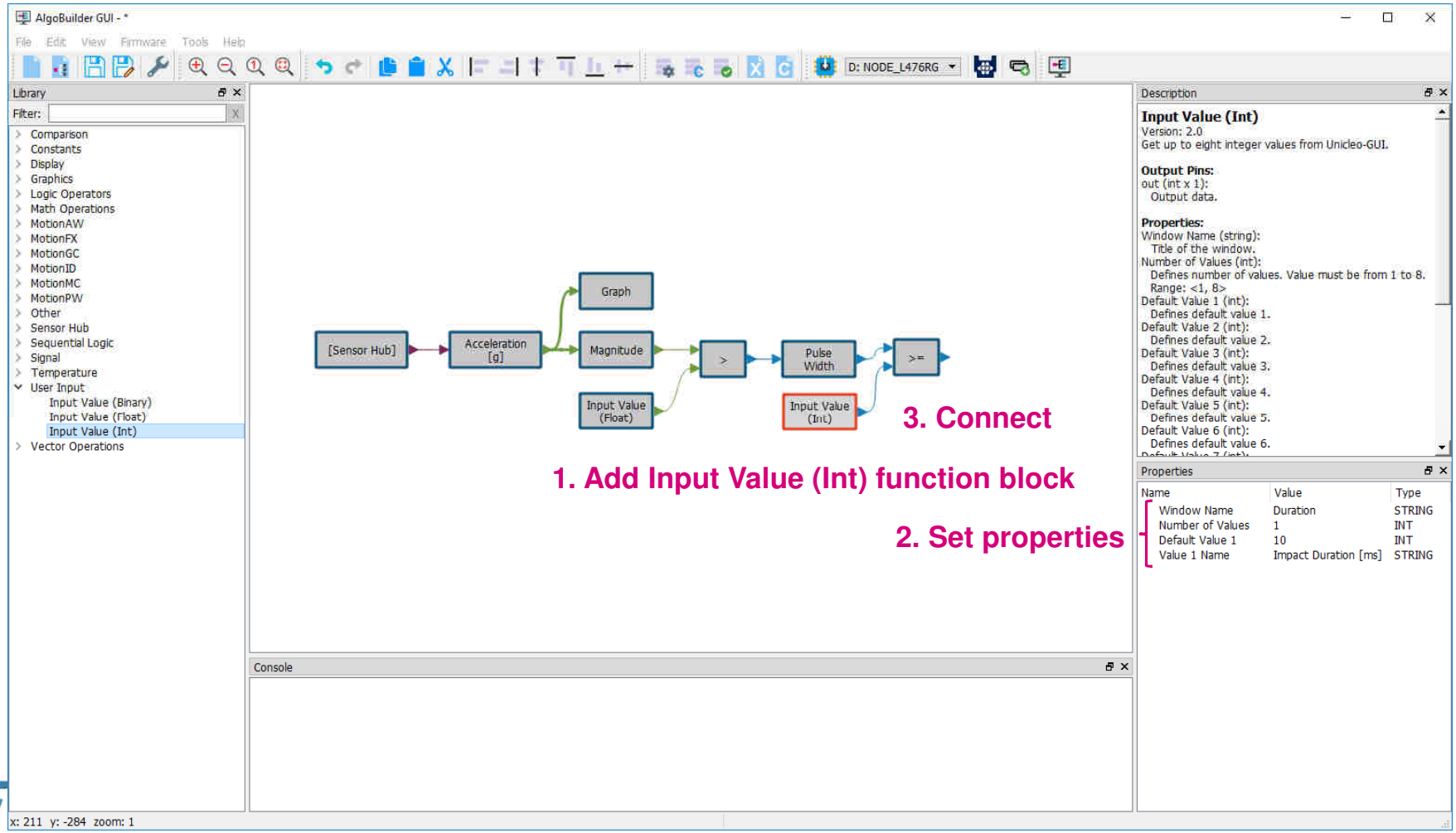


Add Pulse Width function block

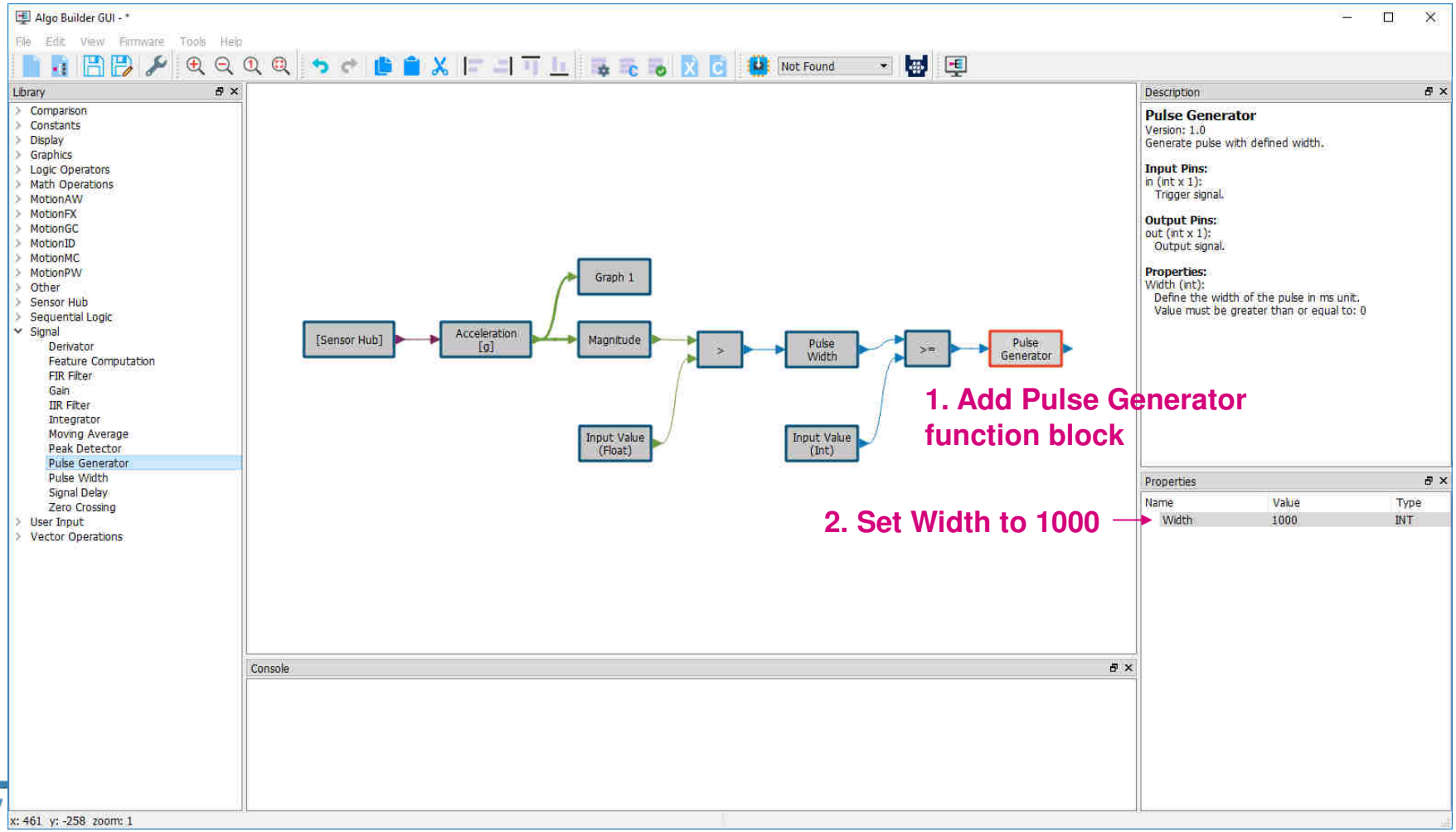
life.augmented



life.augmented



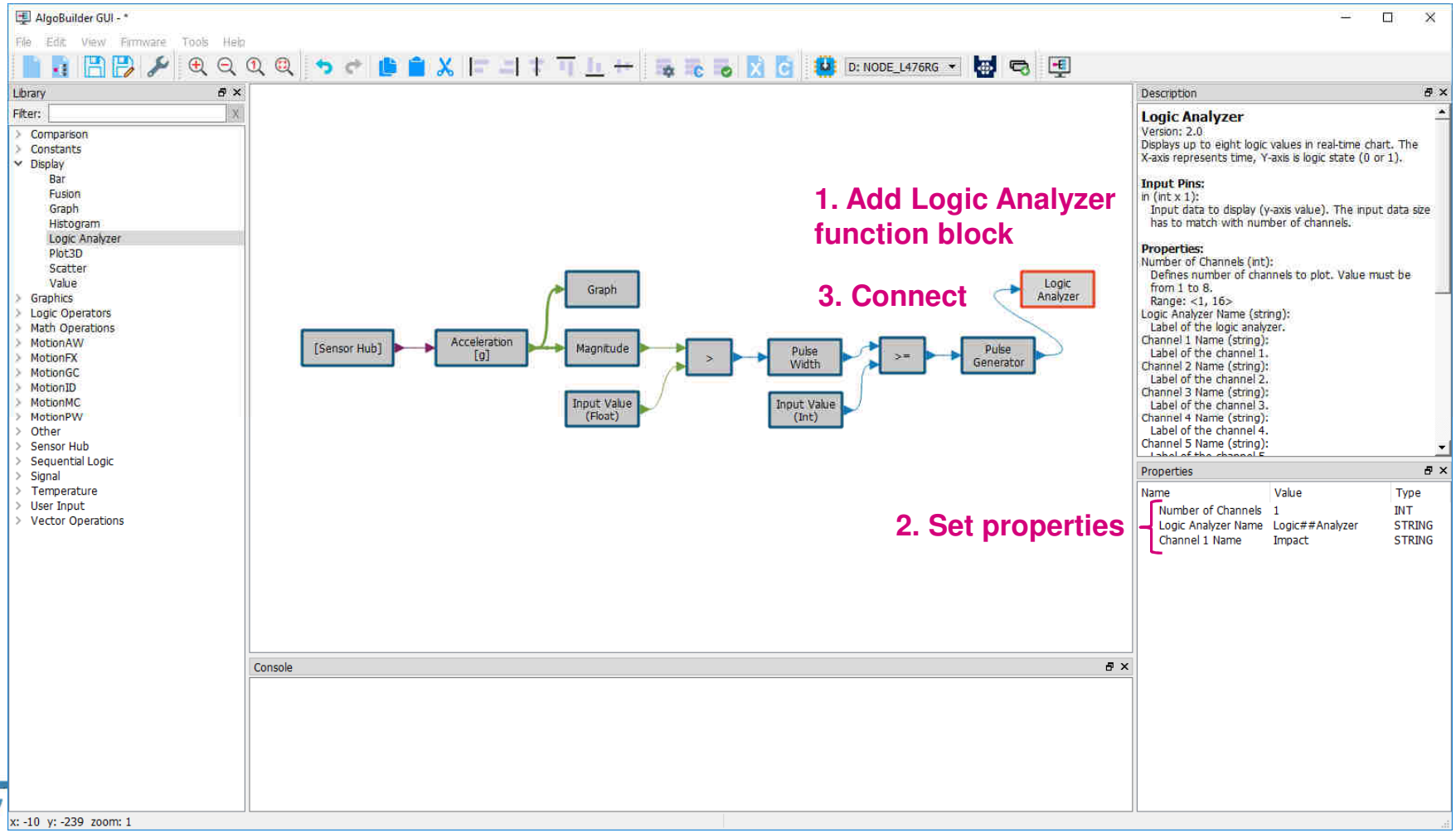
life.augmented



1. Add Pulse Generator function block

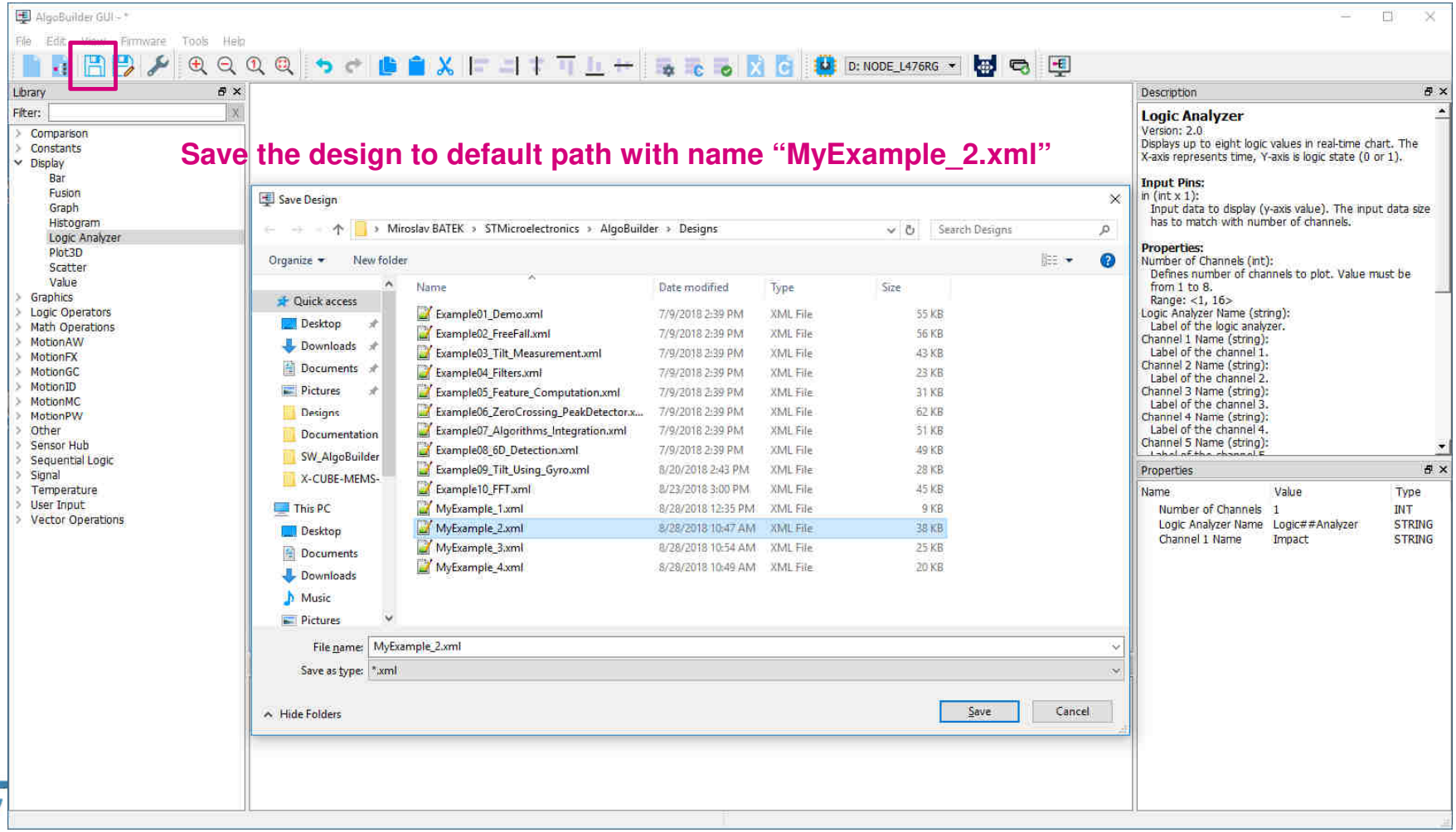
2. Set Width to 1000

life.augmented



life.augmented

Save the design to default path with name “MyExample_2.xml”



AlgoBuilder GUI - MyExample_2.xml

File Edit View Firmware Tools Help

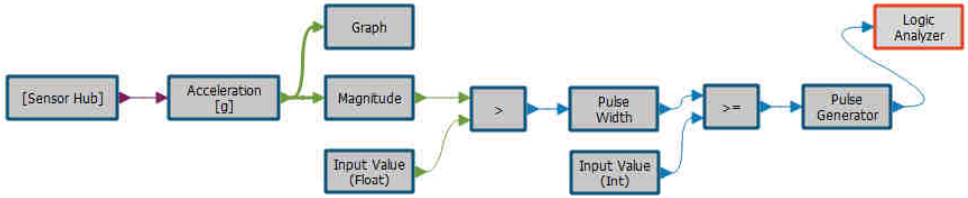
D: NODE_L476RG

Library

Filter:

- Comparison
- Constants
- Display
  - Bar
  - Fusion
  - Graph
  - Histogram
  - Logic Analyzer
  - Plot3D
  - Scatter
  - Value
- Graphics
- Logic Operators
- Math Operations
- MotionAW
- MotionFX
- MotionGC
- MotionID
- MotionMC
- MotionPW
- Other
- Sensor Hub
- Sequential Logic
- Signal
- Temperature
- User Input
- Vector Operations

1. Click on Build Firmware



2. Wait for compilation

3. Check that the code was compiled without error

Console

```
arm-none-eabi-objcopy -O binary "STM32L4xx-Nucleo-Project.elf" "STM32L4xx-Nucleo-Project.bin" & arm-none-eabi-size  --format=berkeley STM32L4xx-Nucleo-Project.elf
   text    data     bss     dec     hex filename
 169464    5752   46632  221848   36298 STM32L4xx-Nucleo-Project.elf

13:27:24 Build Finished (took 4s.583ms)
Invoking scanner config builder on project
Build Process Finished
Exit Code: 0
```

Description

Logic Analyzer
Version: 2.0
Displays up to eight logic values in real-time chart. The X-axis represents time, Y-axis is logic state (0 or 1).

Input Pins:
in (int x 1):
Input data to display (y-axis value). The input data size has to match with number of channels.

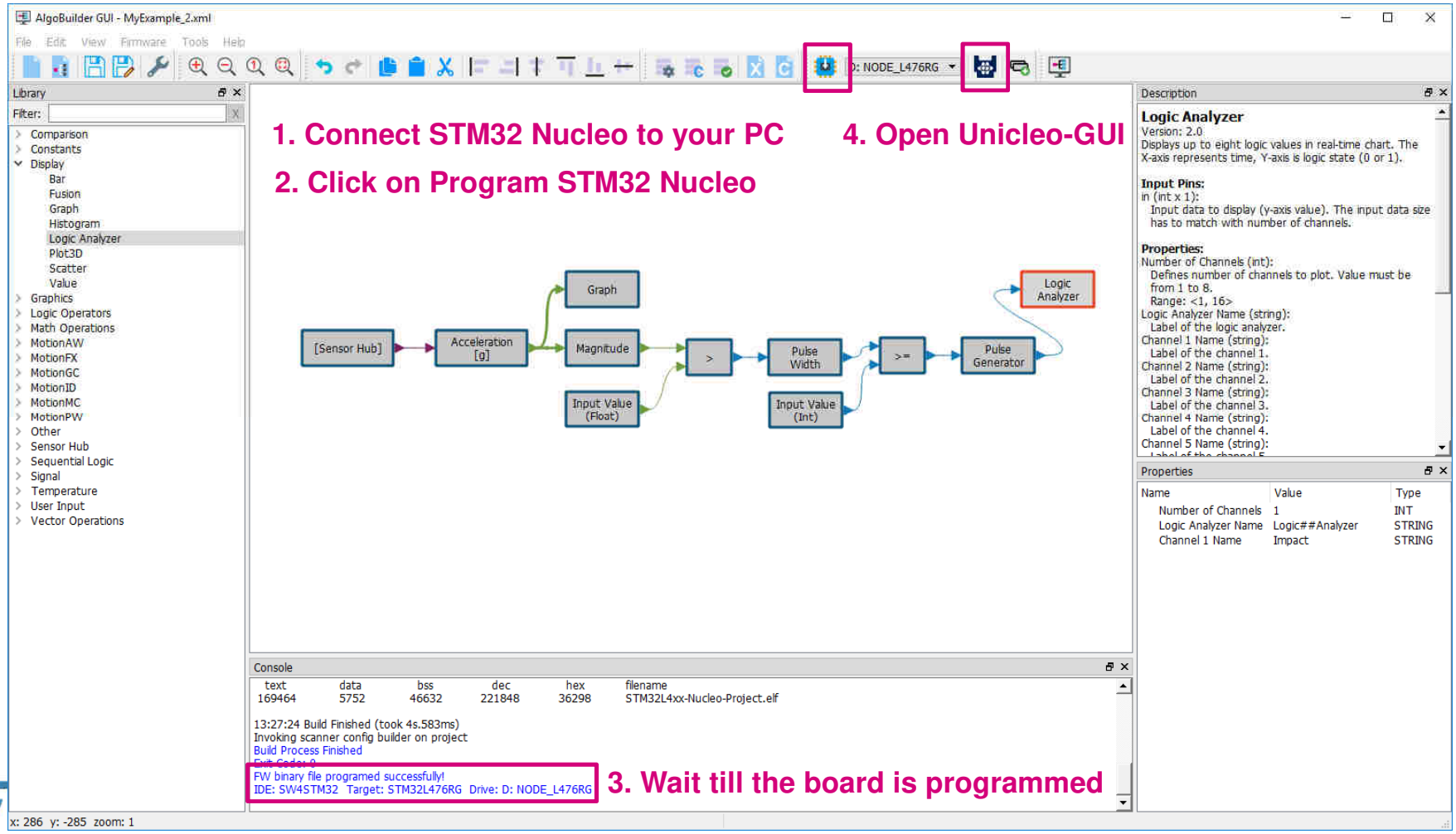
Properties:
Number of Channels (int):
Defines number of channels to plot. Value must be from 1 to 8.
Range: <1, 16>
Logic Analyzer Name (string):
Label of the logic analyzer.
Channel 1 Name (string):
Label of the channel 1.
Channel 2 Name (string):
Label of the channel 2.
Channel 3 Name (string):
Label of the channel 3.
Channel 4 Name (string):
Label of the channel 4.
Channel 5 Name (string):

Properties

Name	Value	Type
Number of Channels	1	INT
Logic Analyzer Name	Logic##Analyzer	STRING
Channel 1 Name	Impact	STRING

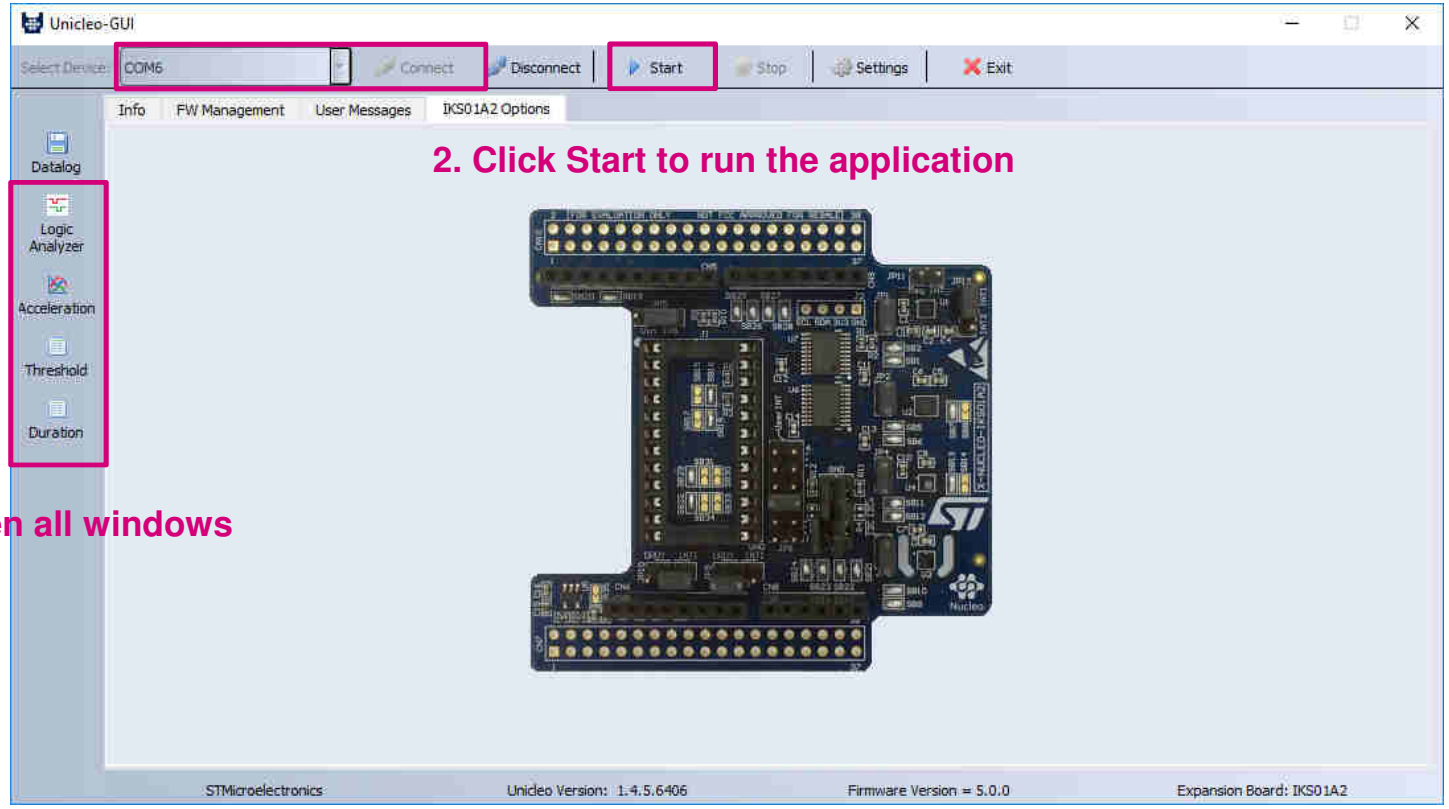
x: -70 y: -285 zoom: 1

life.augmented



life.augmented

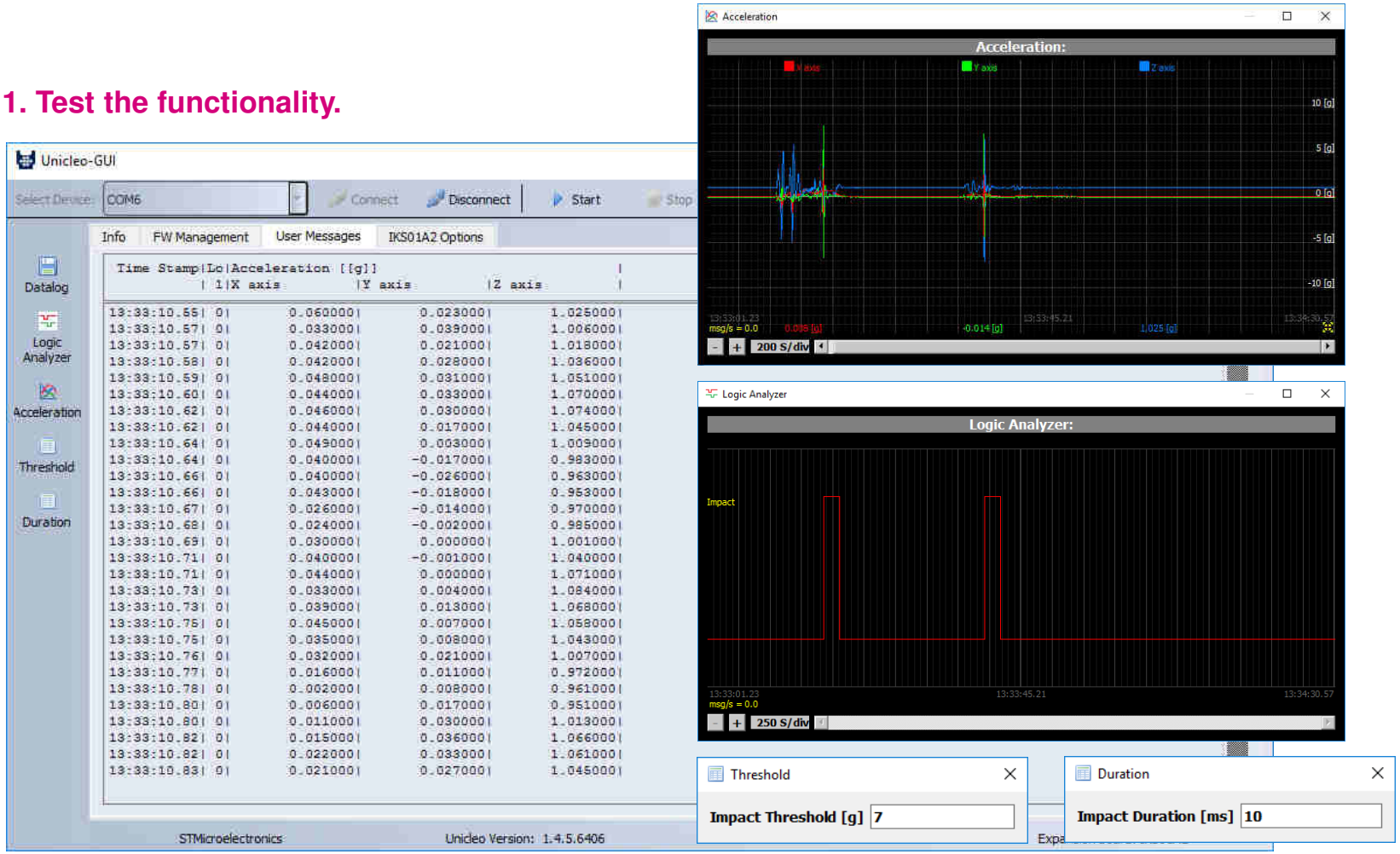
1. Check the boards is connected to Unicleo GUI



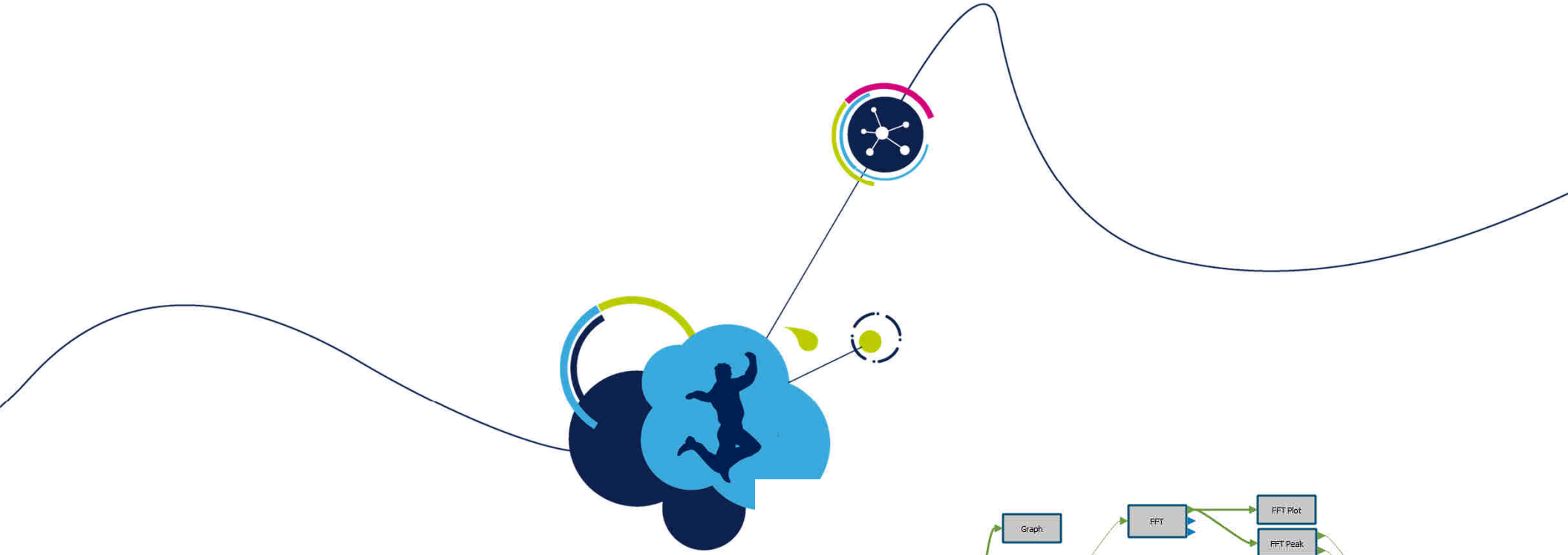
2. Click Start to run the application

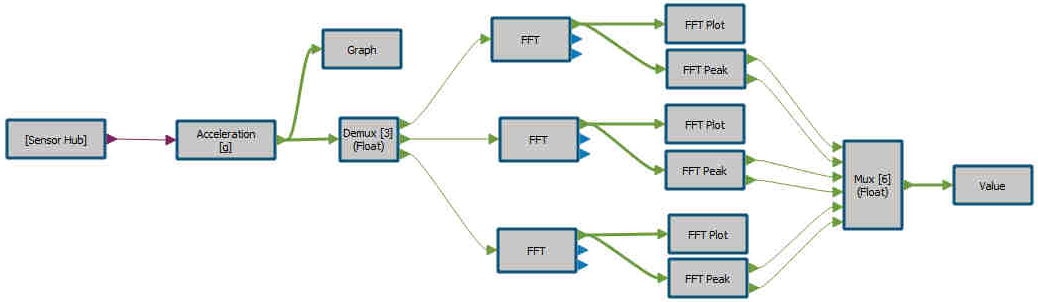
3. Open all windows

1. Test the functionality.



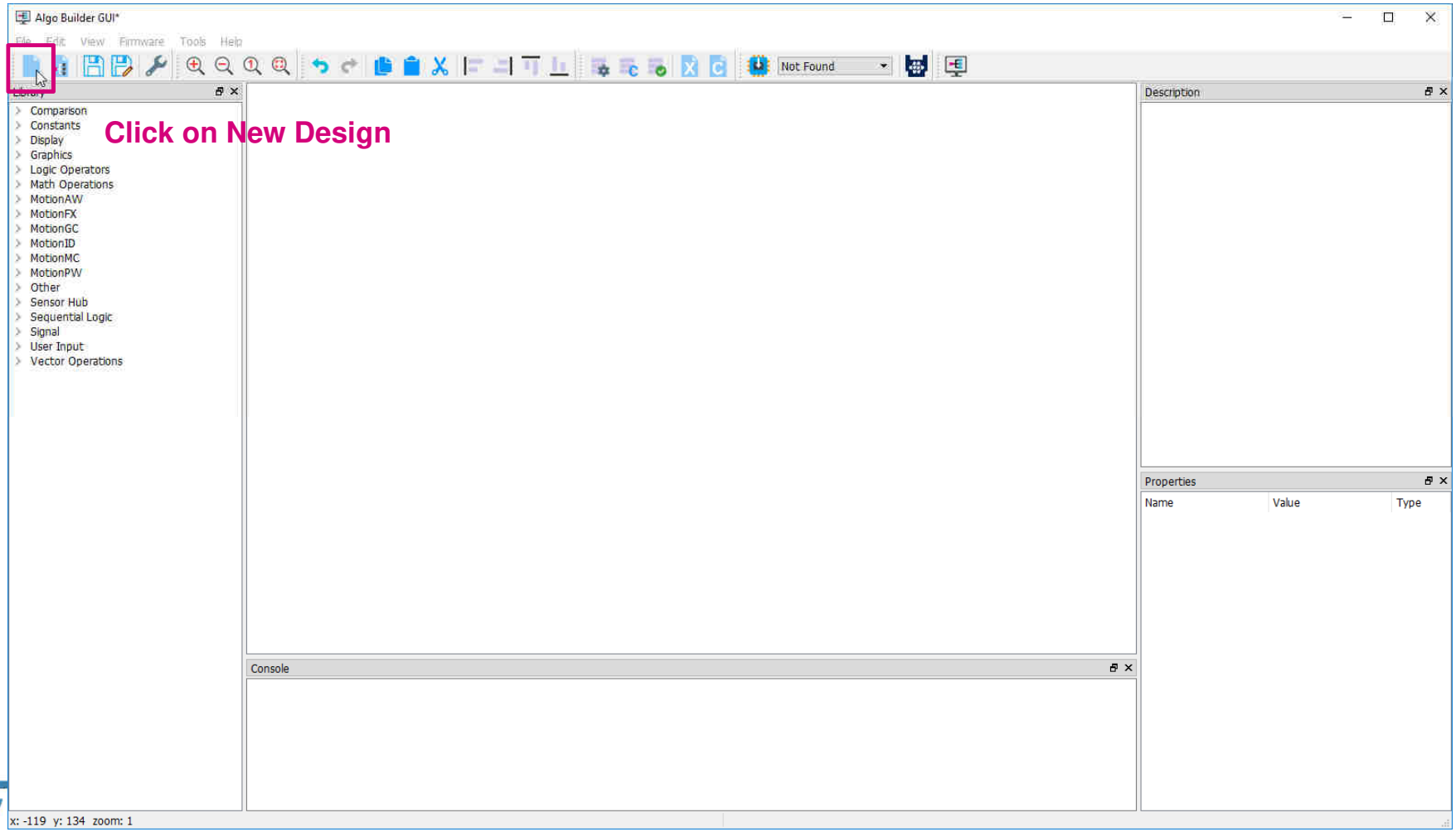
2. Close Unicleo-GUI when you finished the testing.



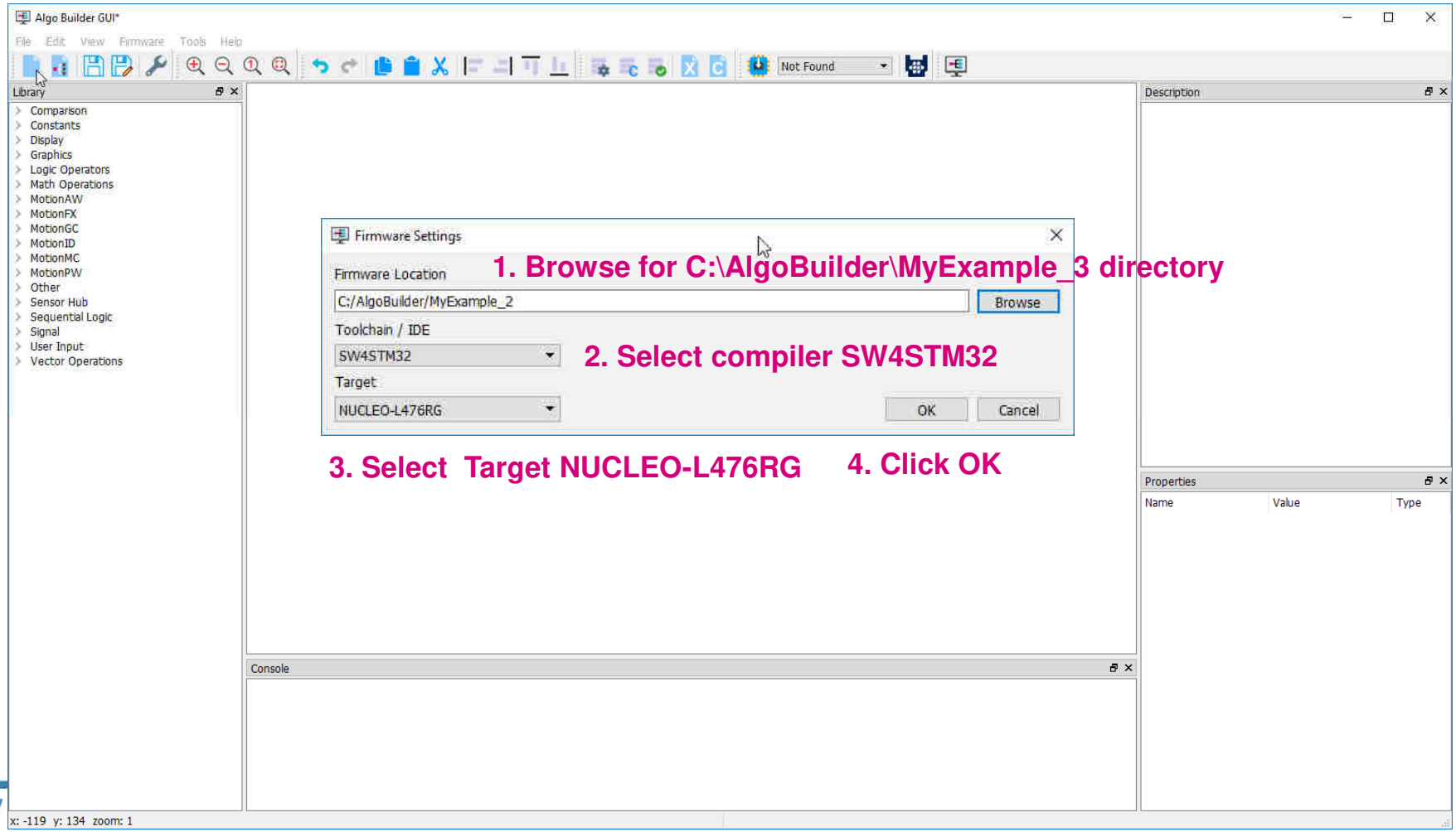


Demo 3
FFT Analysis

life.augmented



life.augmented



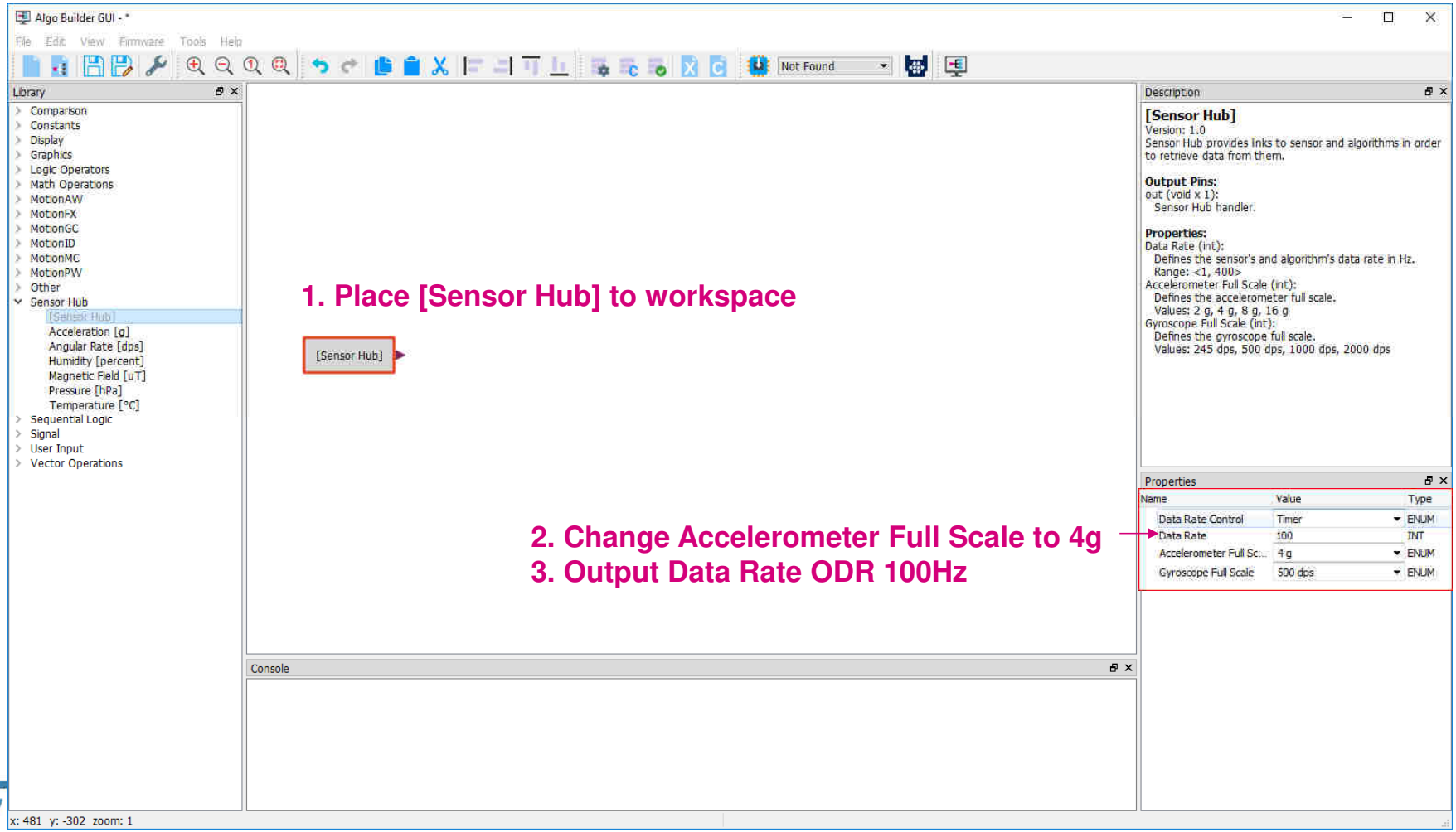
1. Browse for C:\AlgoBuilder\MyExample_3 directory

2. Select compiler SW4STM32

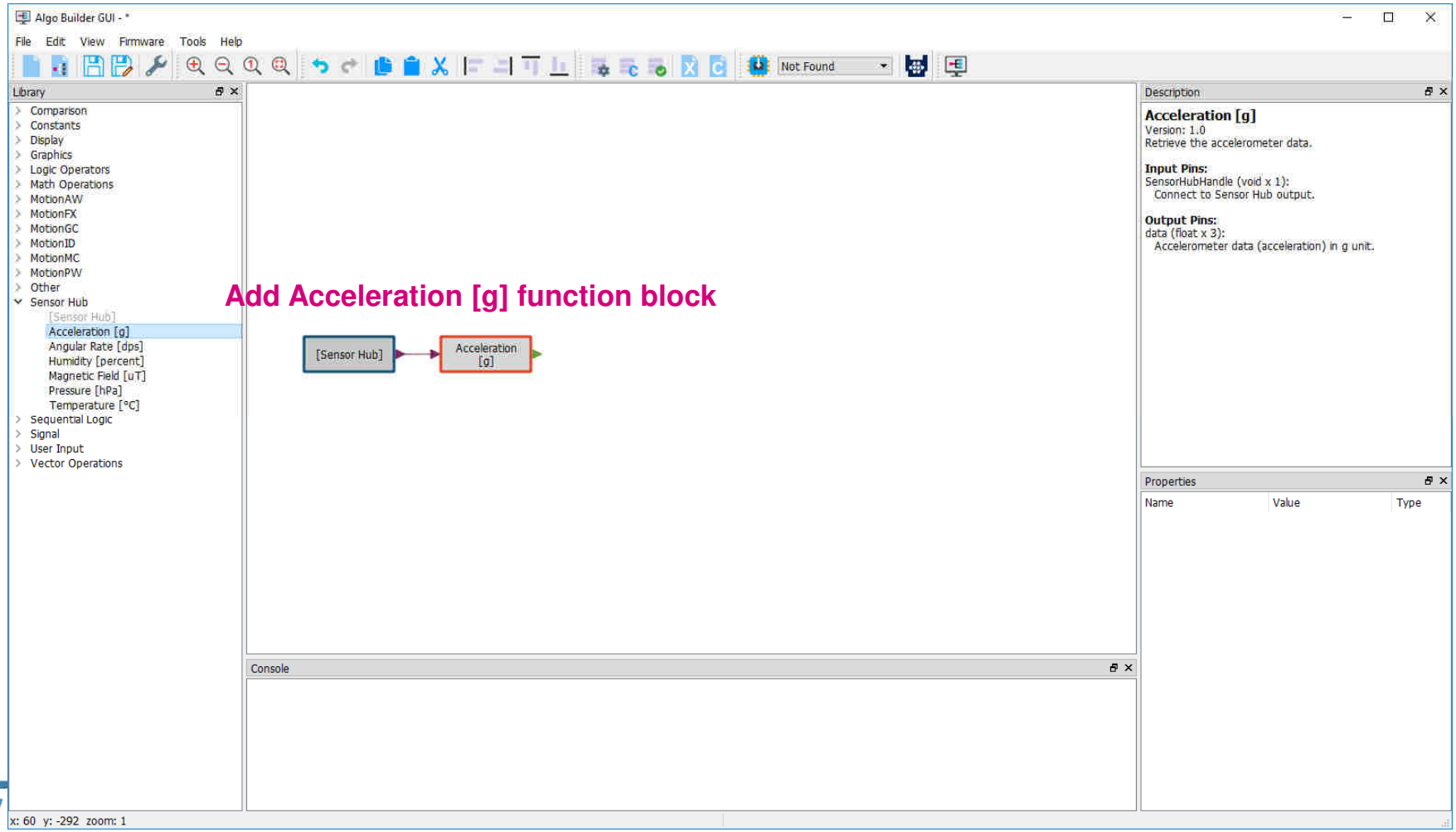
3. Select Target NUCLEO-L476RG

4. Click OK

life.augmented

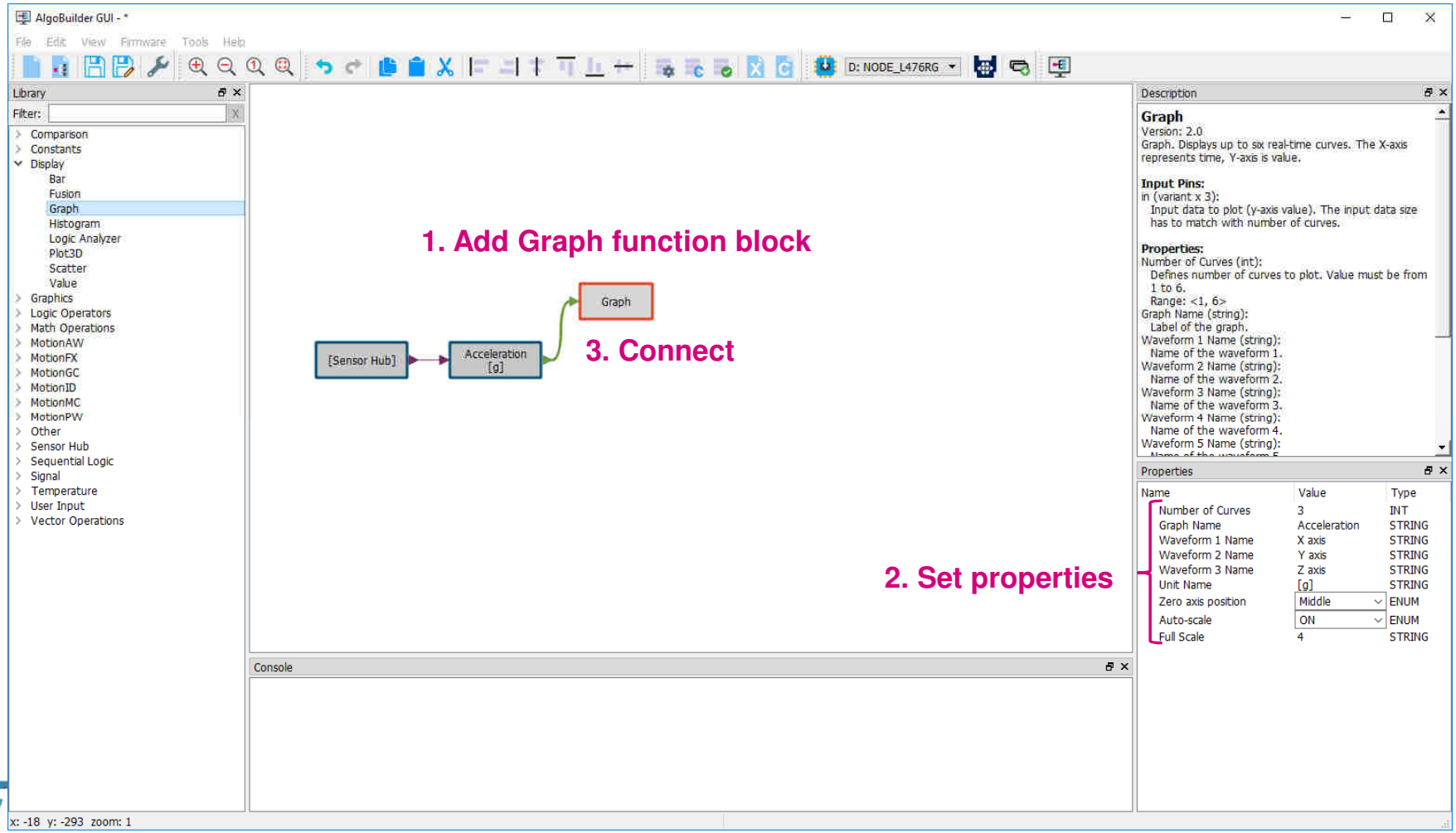


life.augmented



Add Acceleration [g] function block

life.augmented



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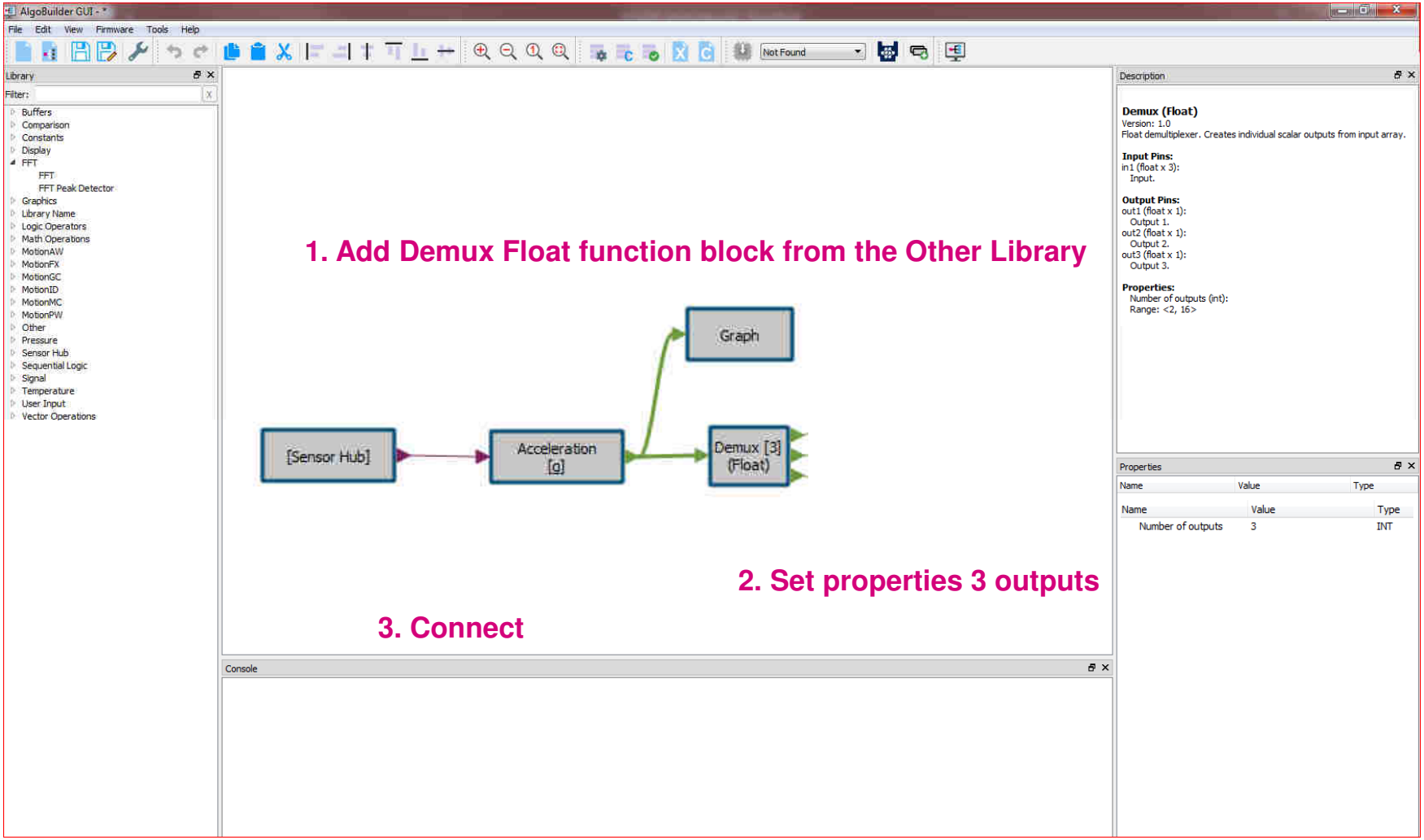

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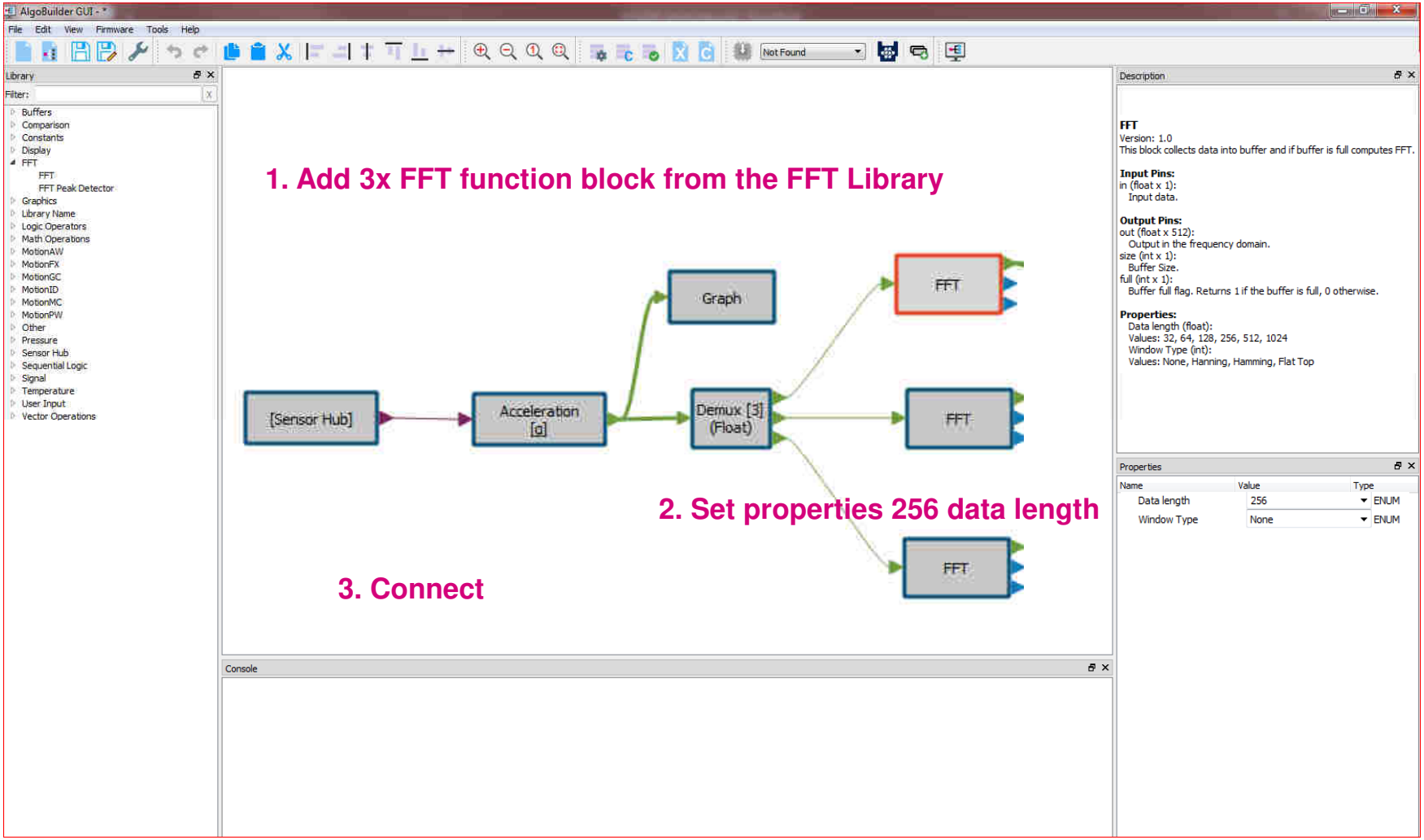

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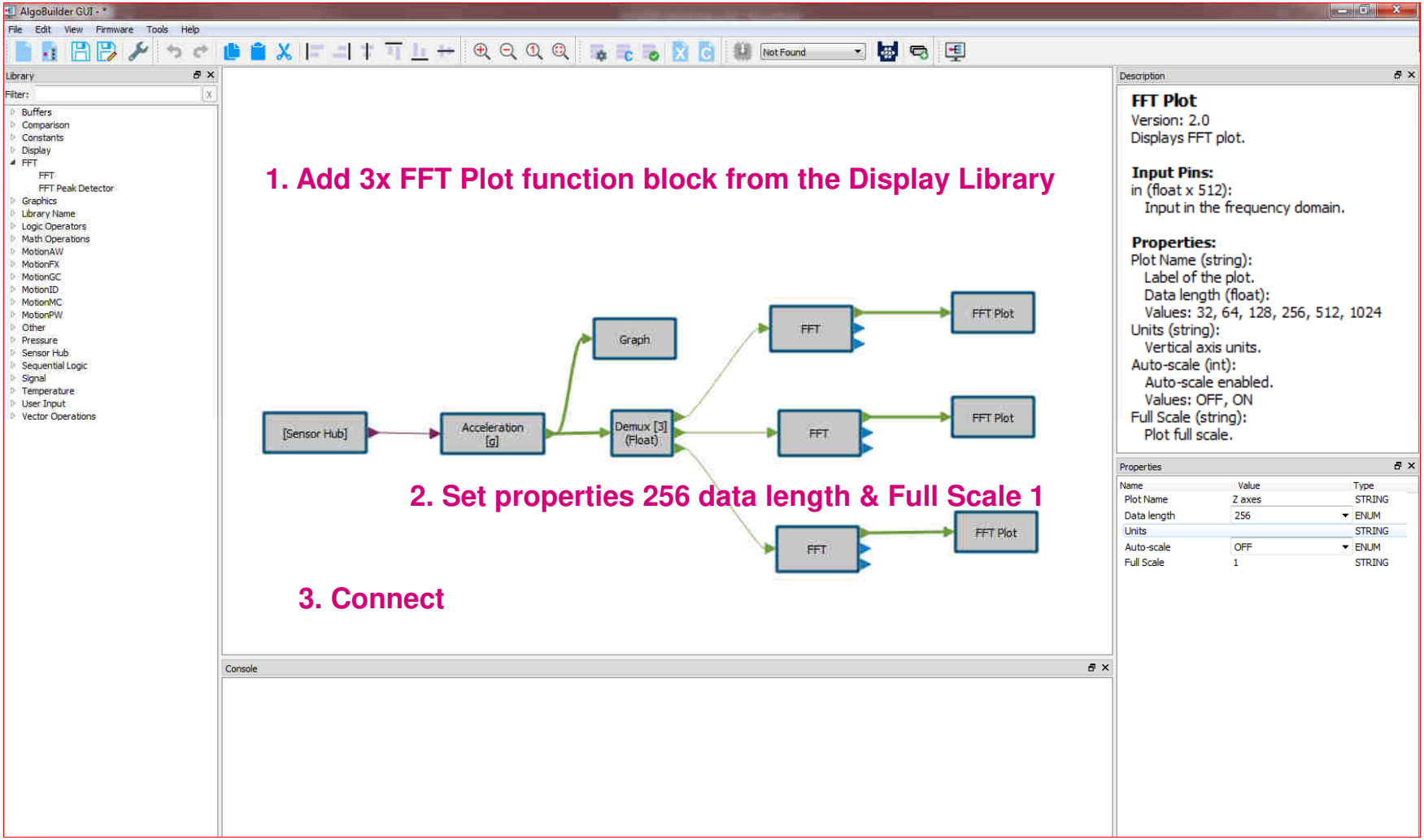

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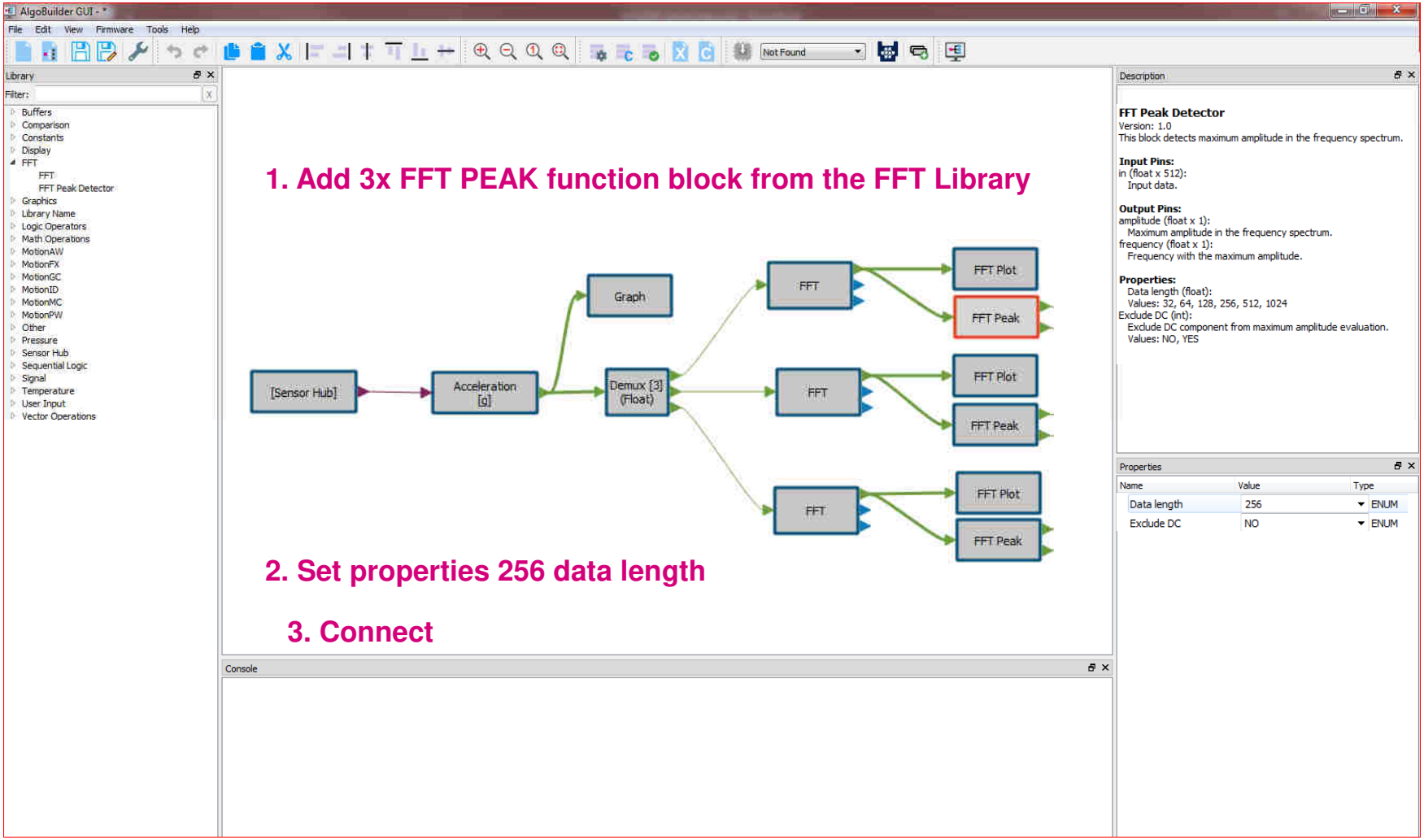

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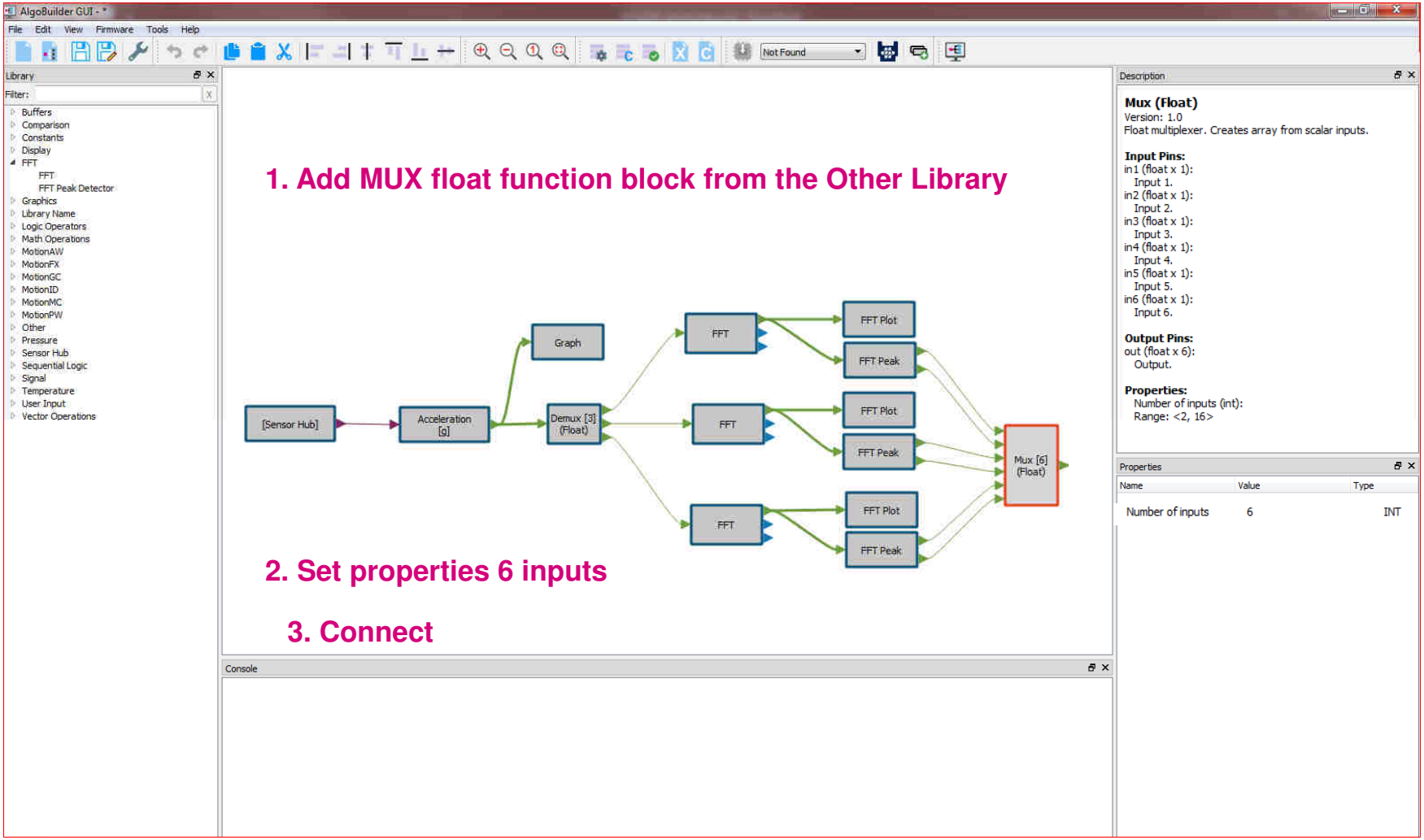

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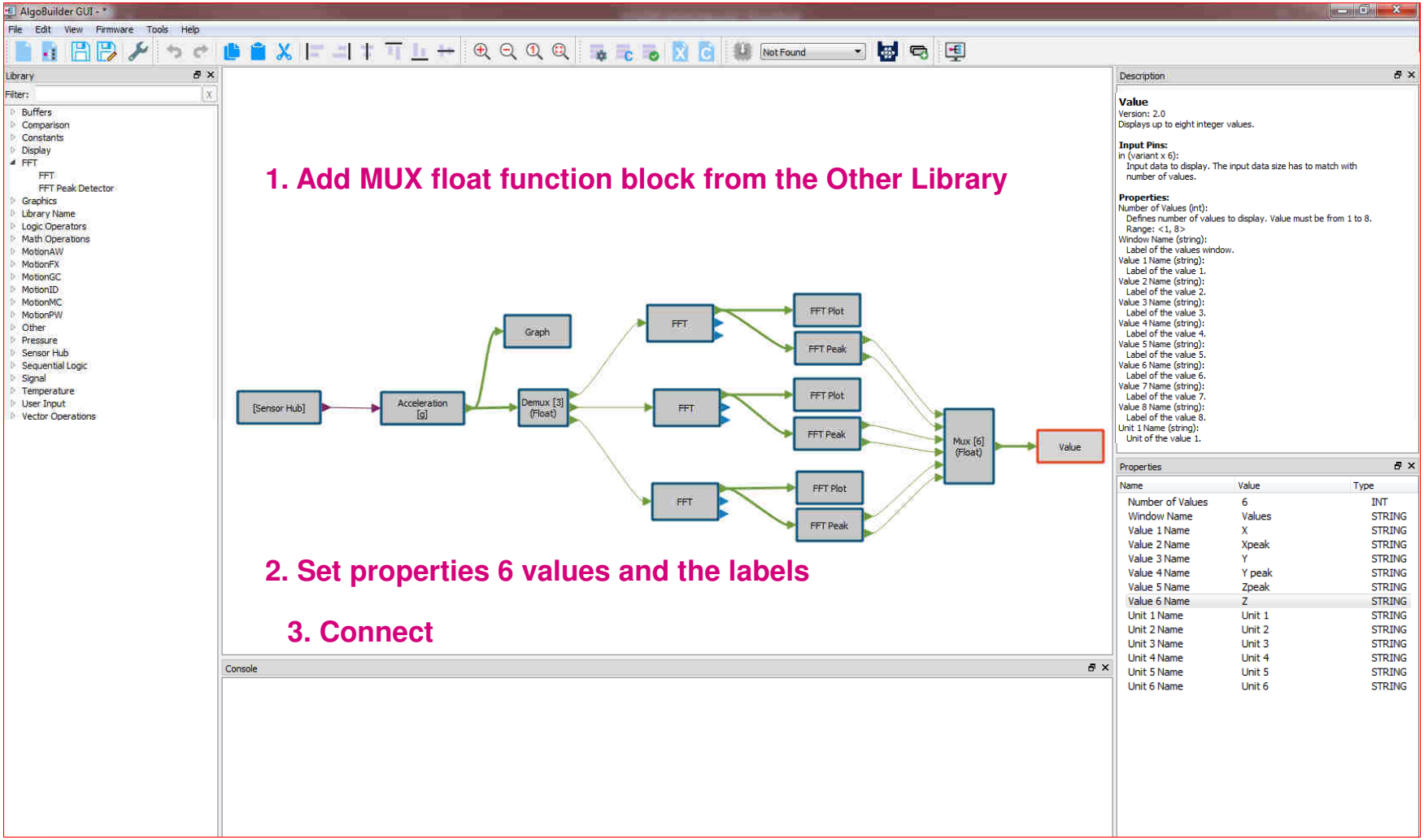

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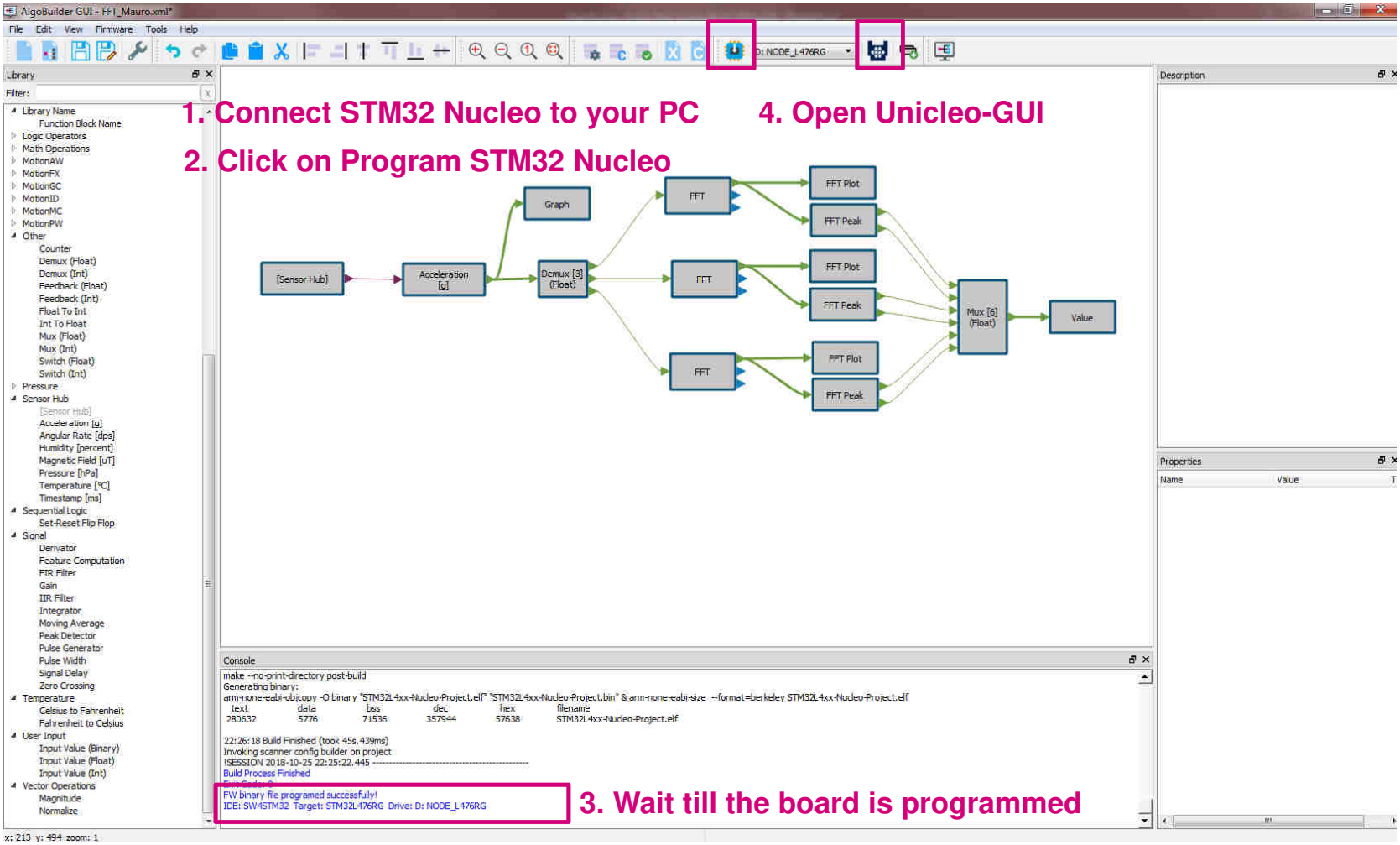

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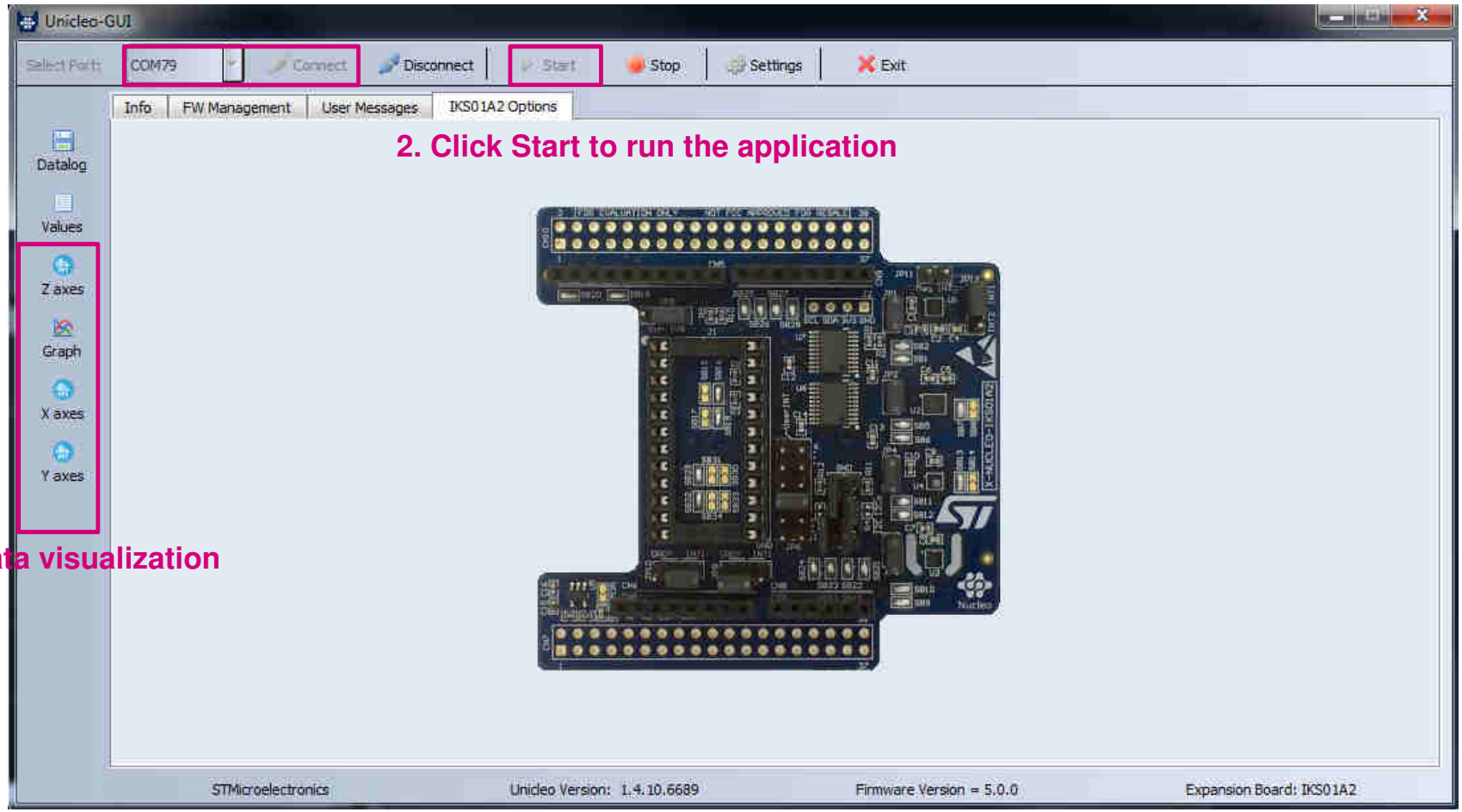
1. Check the boards is connected to Unicleo GUI



2. Click Start to run the application

3. Open data visualization

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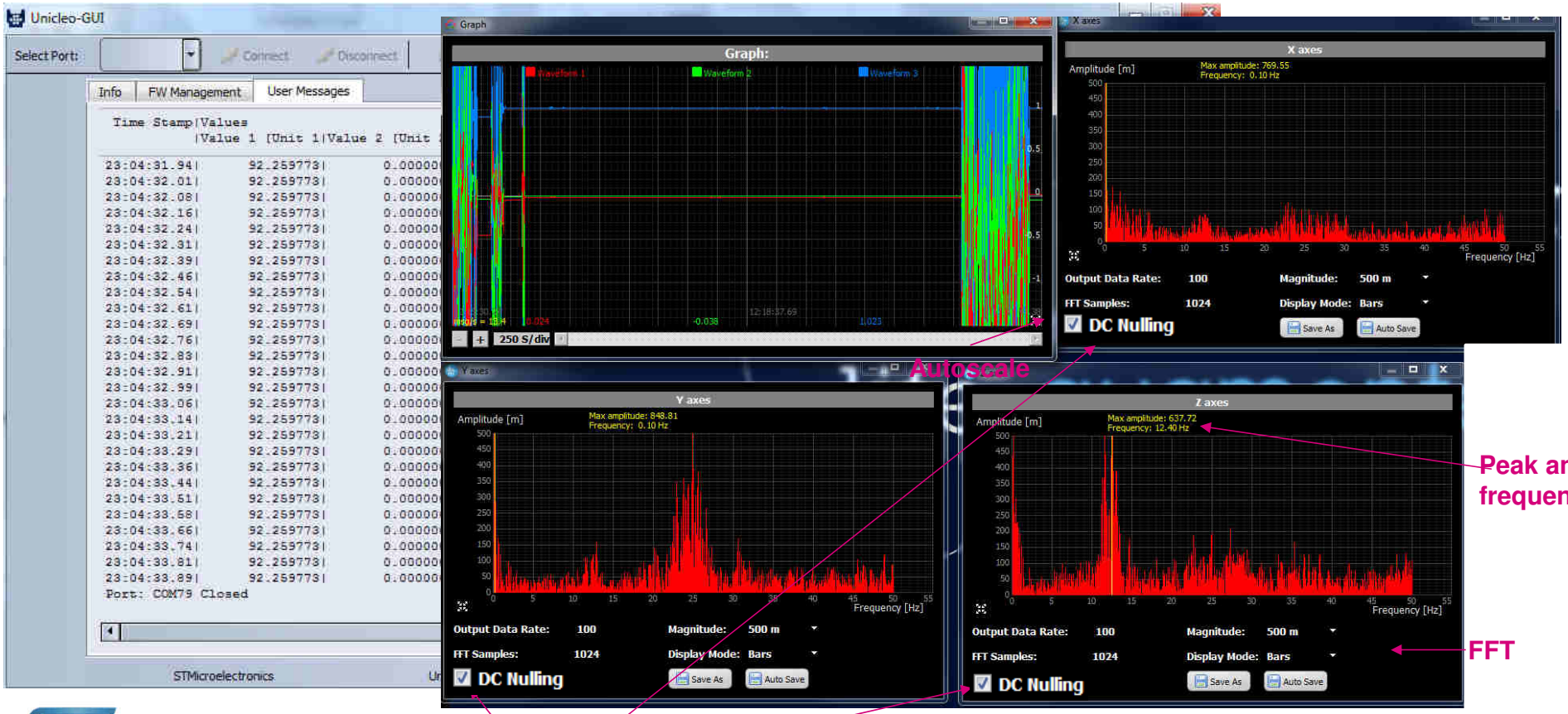
1. Test the functionality.

2. Remove the DC
3. Move the board
4. FFT , check the peak and frequency



ST MEMS complete software solution

From drivers to software development tools

Low-level Drivers

Standard C Platform Independent drivers

Windows drivers

Linux drivers

MEMS and Sensors Software - STMicroelectronics

X-CUBE-MEMS-XT1
X-CUBE_MEMS1

Development Tool based on Low level drivers

Runs on STM32

Sample implementation of device embedded features

Go to st.com

Libraries

Generic SW libraries

Accuracy, Calibration, Positioning, Activity tracking, Health monitoring

Dedicated SW libraries

Open.MEMS - STMicroelectronics

AlgoBuilder Tool

Dedicated software Tool for libraries development

Graphical design apps to build and use algorithms

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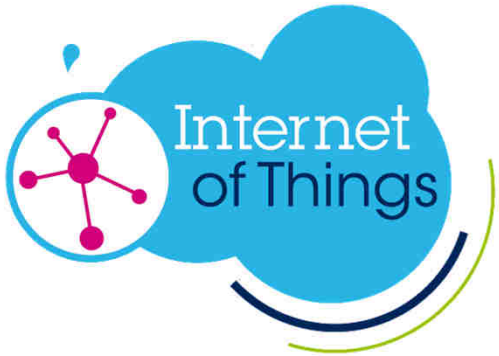
Takeaways

- Internet of Things offers many opportunities for ST from Sensor to Cloud
- ST has all the building blocks for the IoT
  - MEMS and Analog portfolio from consumer to industrial applications
  - AlgoBuilder allows fast proof of concept of Sensor based algorithms
- We keep the commitment on MEMS innovation
- Our constantly expanding development ecosystem makes design fast



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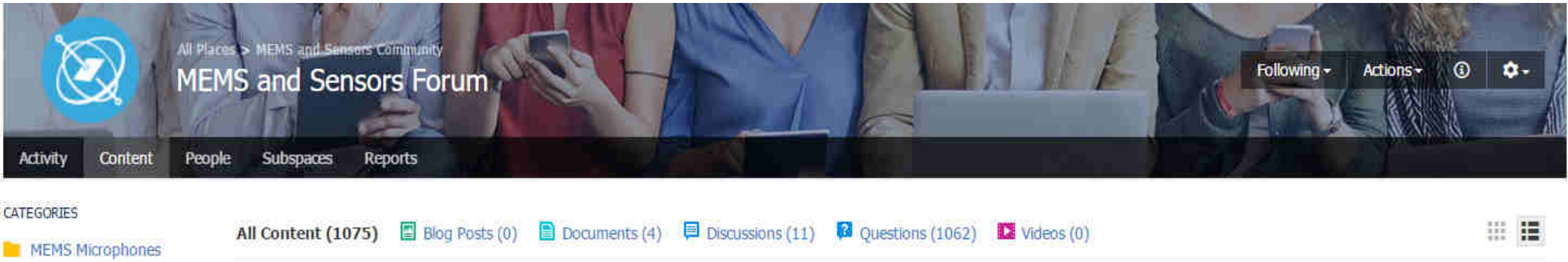
ST Community – Mass Market Support



Mass Market Support: **MEMS Forum**

For more information on sensors: **www.st.com/sensors**

Information on longevity: **10yr Longevity Program**

Android / Linux / Open Drivers: **Drivers for MEMS**

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Thank You!

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