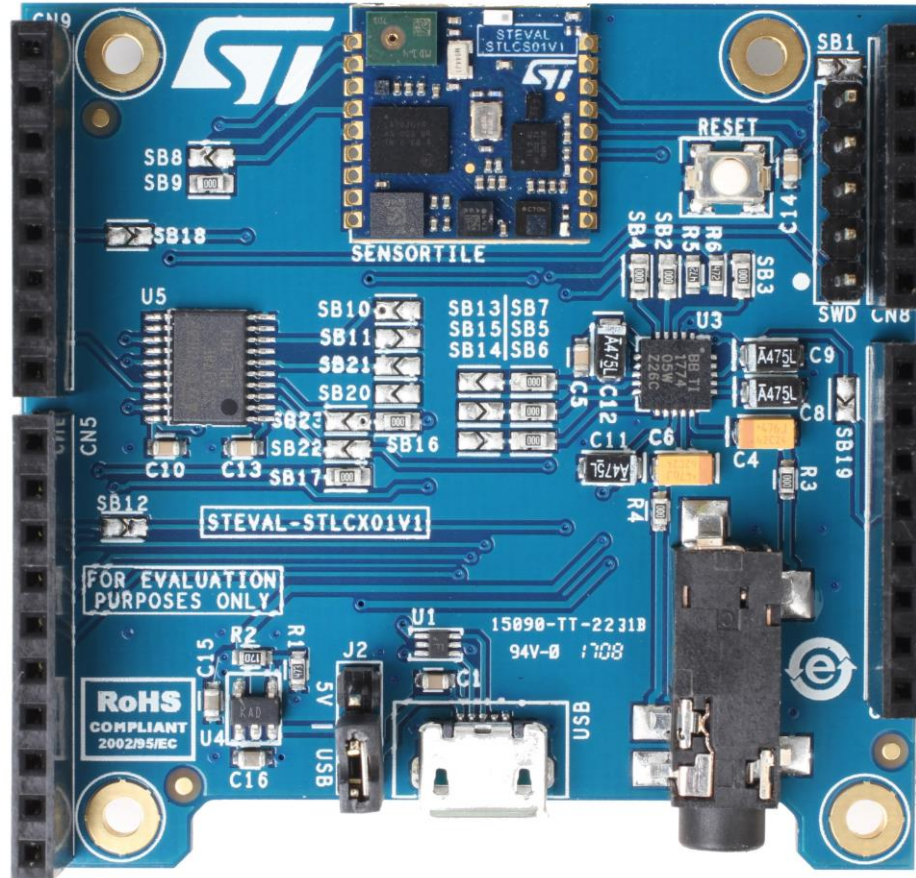


# ARM Your Sensors



**Prototyping an ARMED Connectable Sensor Node**

August 31, 2018

Fred Eady

# ARM Your Sensors

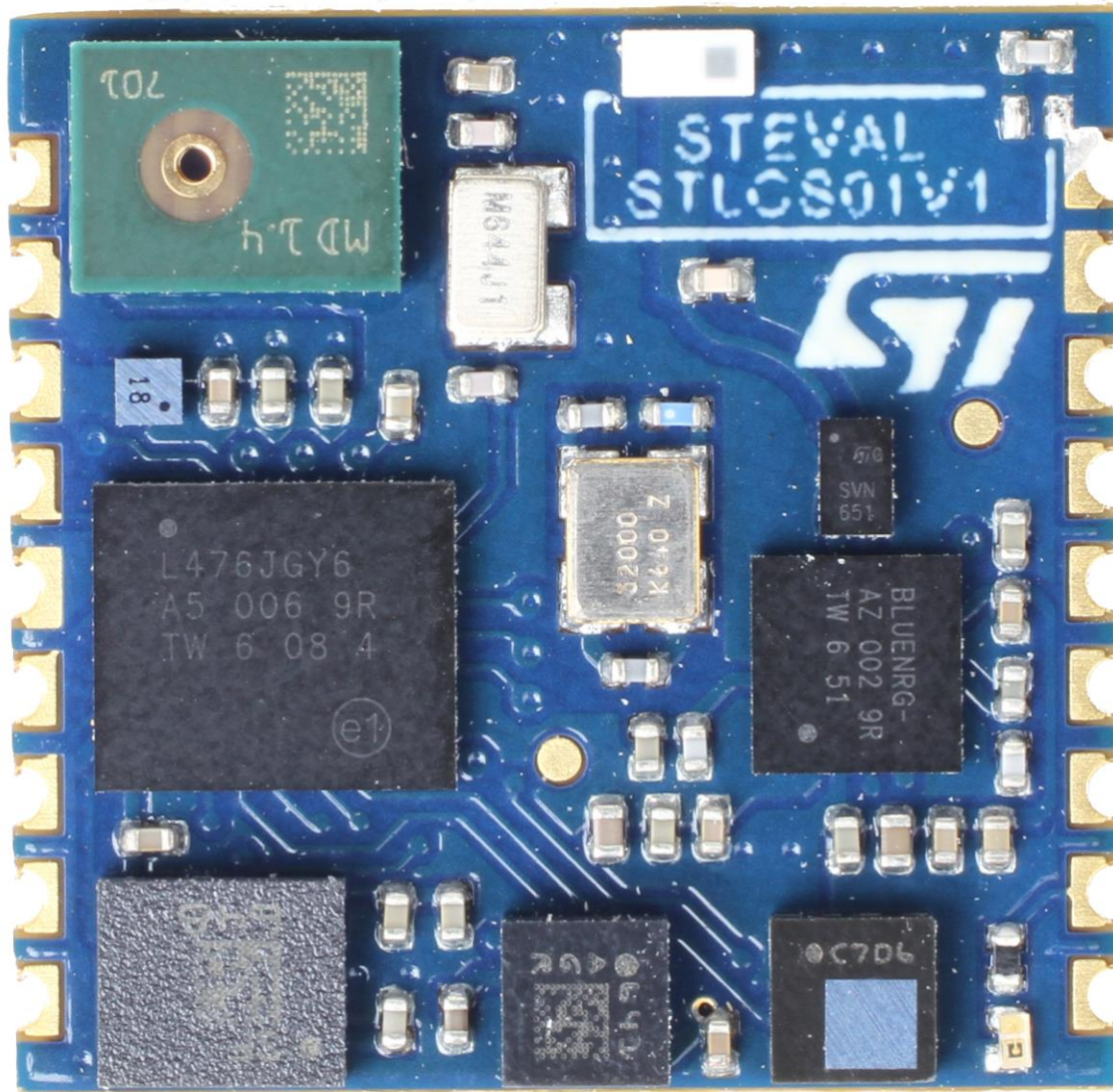
# AGENDA

- The "Tile"
- The "Kit"
- **ARMing the Cradle**
- Day 5 Summary



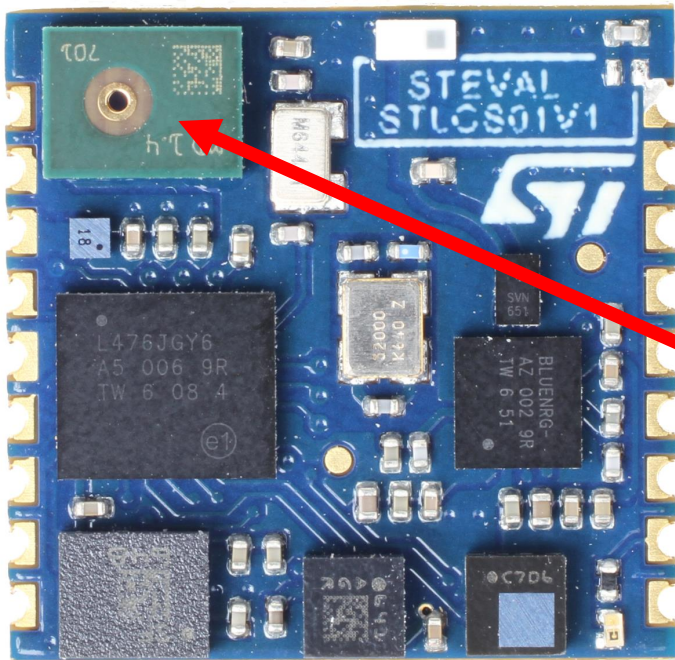
# ARM Your Sensors

## The "Tile"



# ARM Your Sensors

## The "Tile"



MP34DT05 microphone

Integrated Antenna

BALF-NRG-01D3  
Integrated Balun

32kHz

32MHz

32kHz

LSM6DSM acc+gyro

LSM303AGR acc+mag

LPS22HB barometer

STM32L476JGY  
Cortex-M4F  
80MHz

BlueNRG-MS  
Bluetooth 4.1

2 X GPIO  
(SWD)

NRST

SPI I2S  
PDM

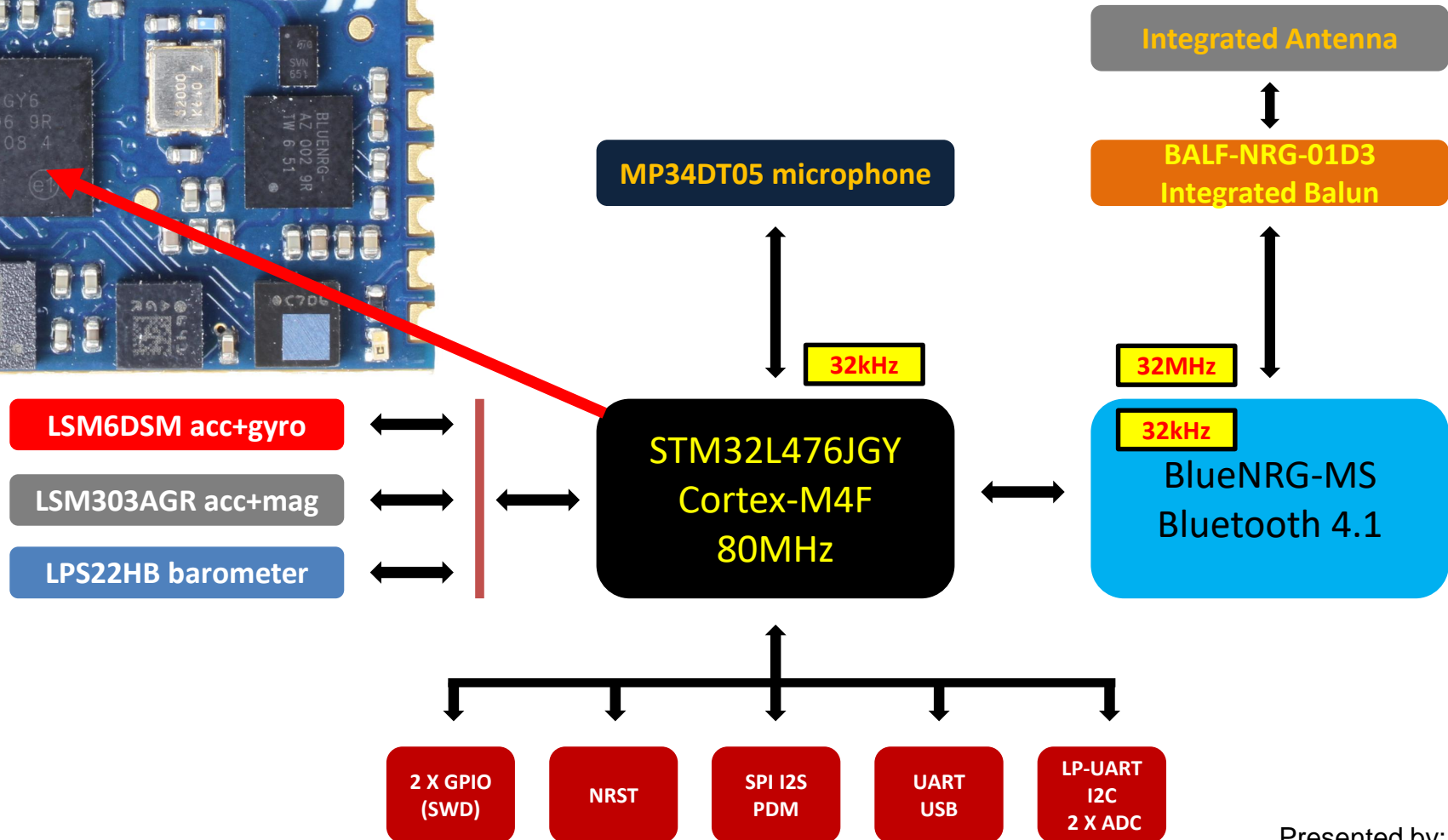
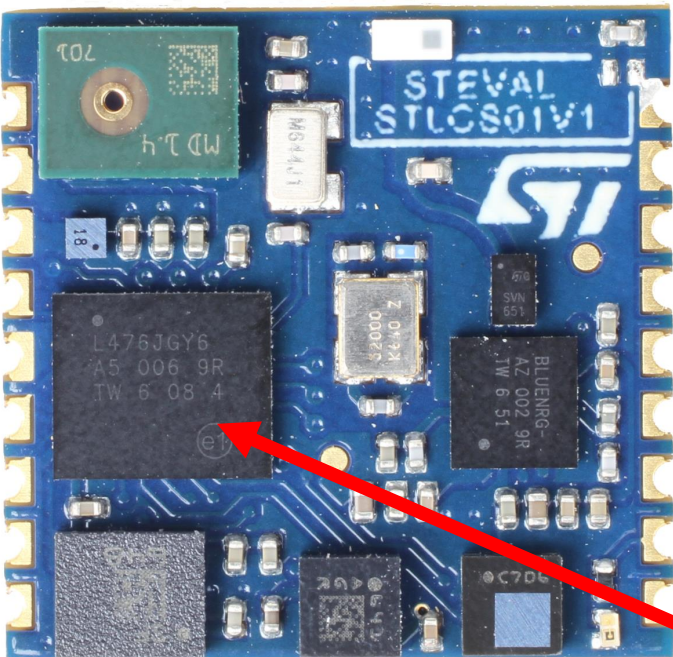
UART  
USB

LP-UART  
I2C  
2 X ADC



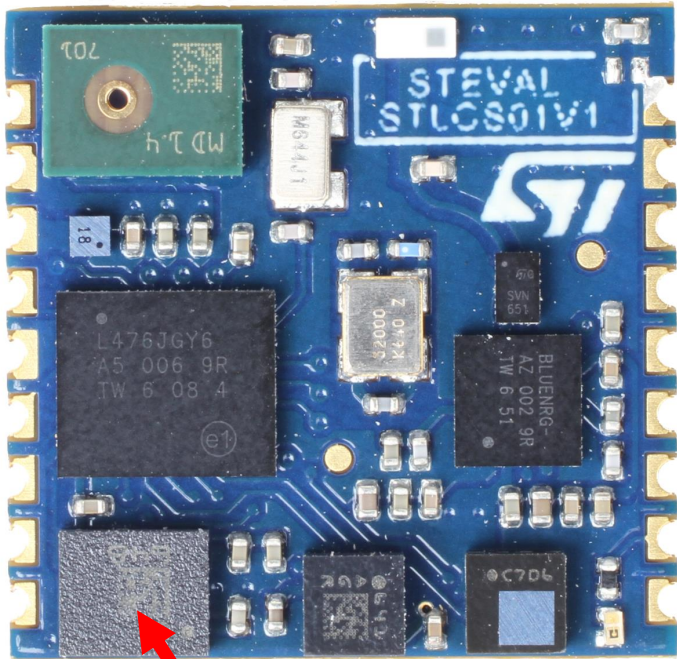
# ARM Your Sensors

## The "Tile"



# ARM Your Sensors

## The "Tile"



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BALF-NRG-01D3  
Integrated Balun

STM32L476JGY  
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80MHz

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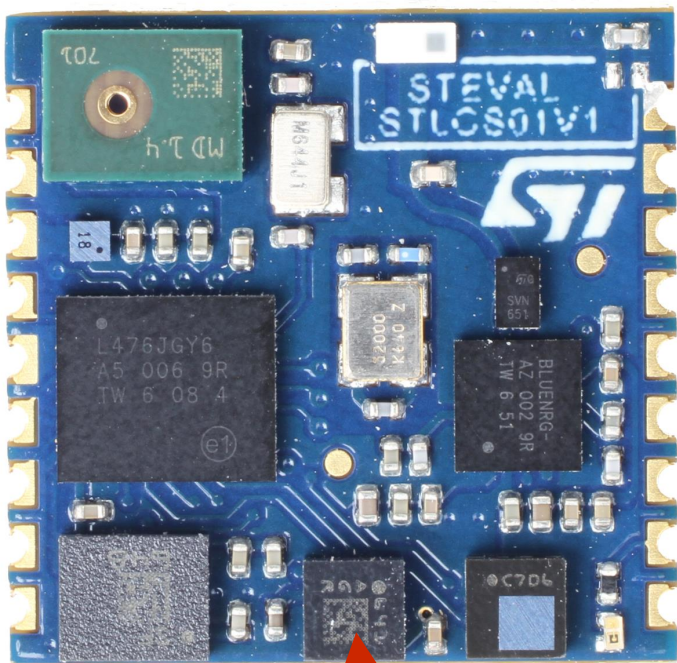
UART  
USB

LP-UART  
I2C  
2 X ADC



# ARM Your Sensors

## The "Tile"



- LSM6DSM1 acc+gyro
- LSM303AGR acc+mag
- LPS22HB barometer

MP34DT05 microphone

32kHz

STM32L476JGY  
Cortex-M4F  
80MHz

Integrated Antenna

BALF-NRG-01D3  
Integrated Balun

32MHz

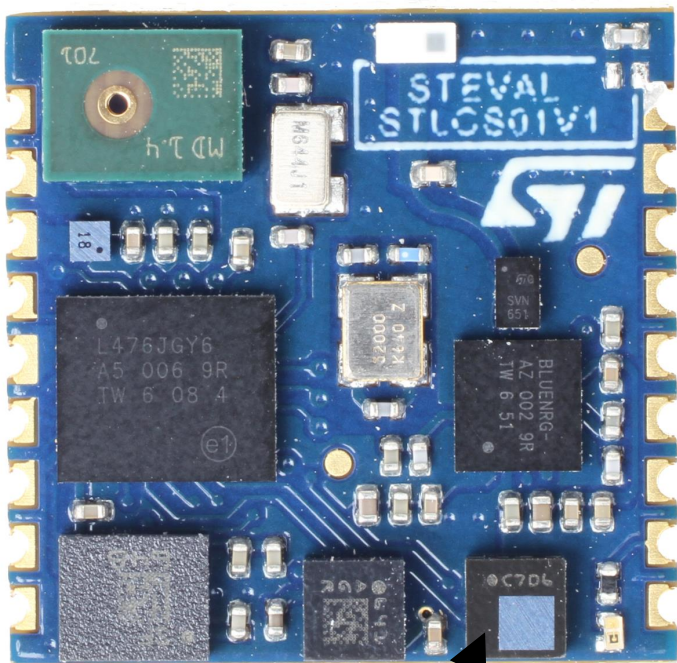
BlueNRG-MS  
Bluetooth 4.1

- 2 X GPIO (SWD)
- NRST
- SPI I2S PDM
- UART USB
- LP-UART I2C 2 X ADC



# ARM Your Sensors

## The "Tile"



- LSM6DSM acc+gyro
- LSM303AGR acc+mag
- LPS22HB barometer

MP34DT05 microphone

32kHz

STM32L476JGY  
Cortex-M4F  
80MHz

Integrated Antenna

BALF-NRG-01D3  
Integrated Balun

32MHz

BlueNRG-MS  
Bluetooth 4.1

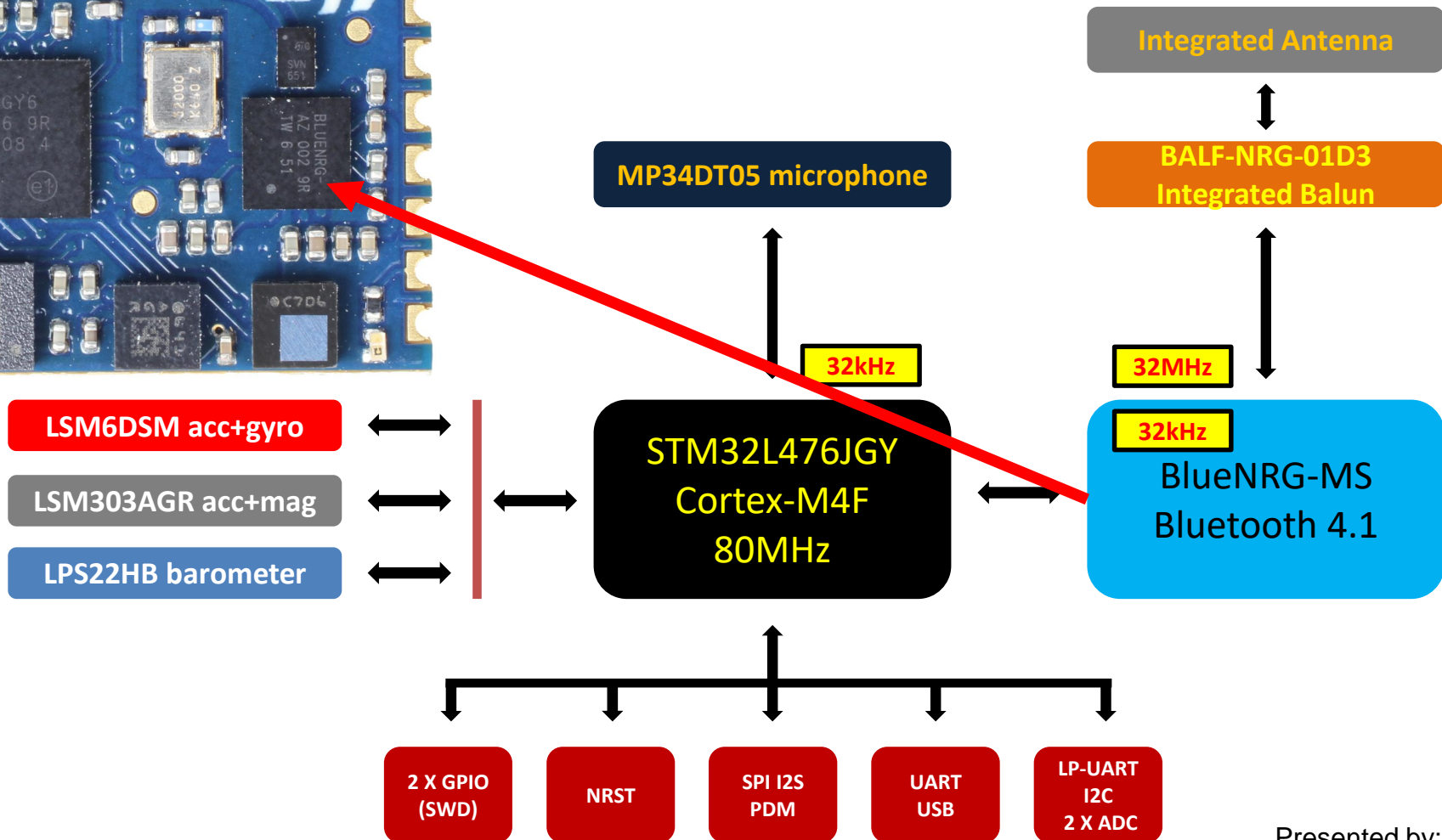
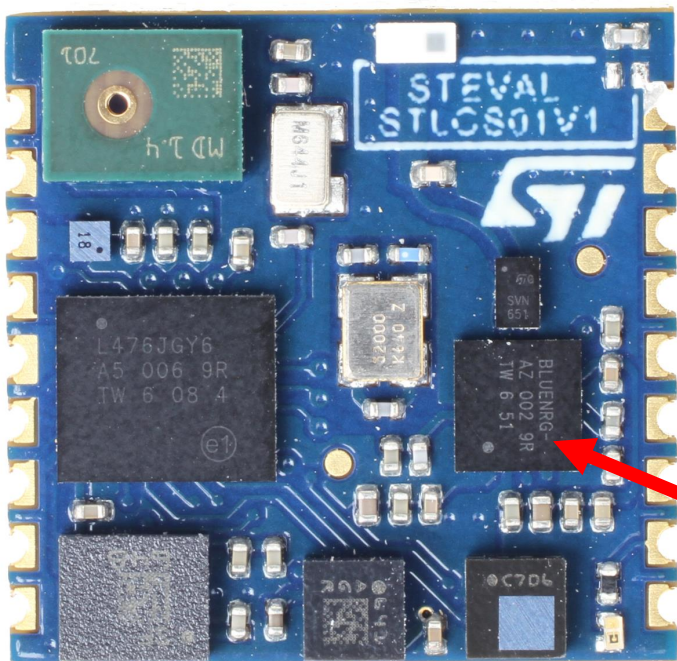
- 2 X GPIO (SWD)
- NRST
- SPI I2S PDM
- UART USB
- LP-UART I2C 2 X ADC





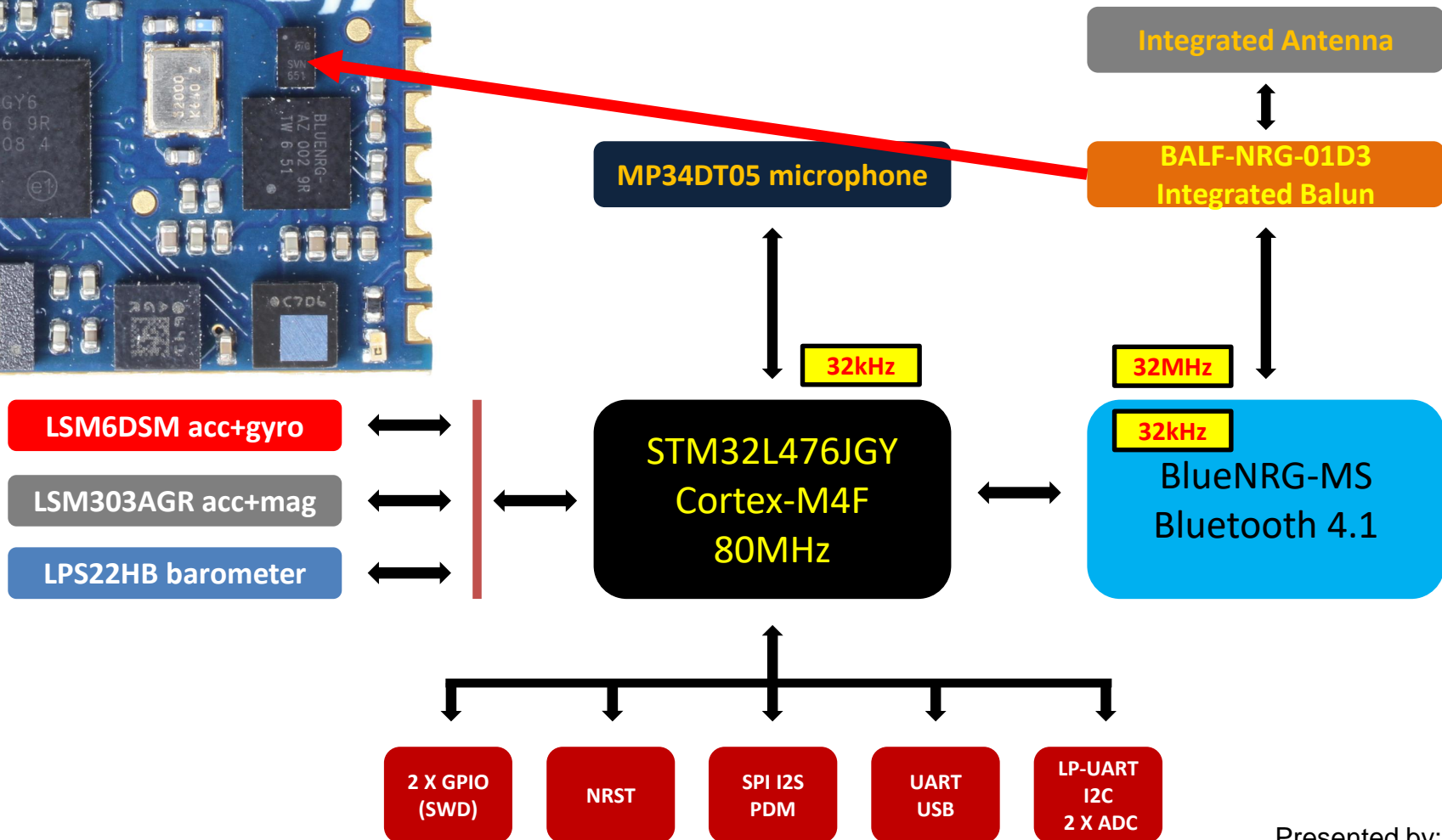
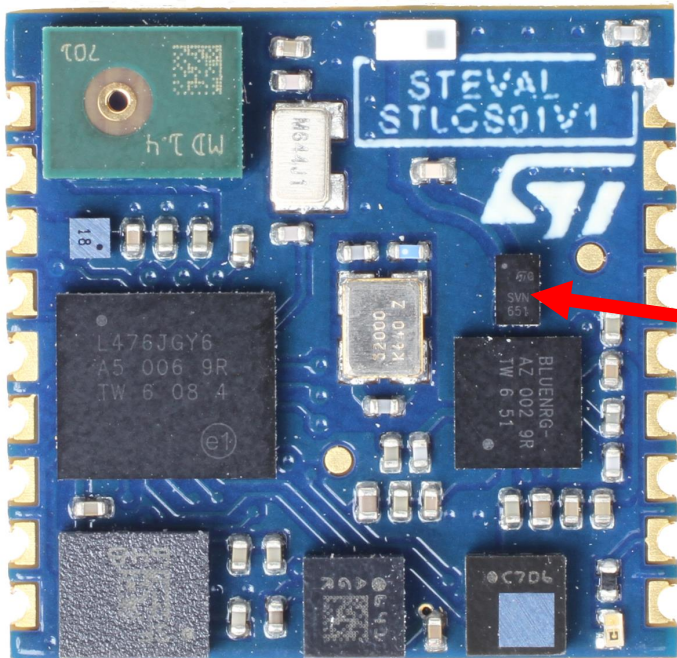
# ARM Your Sensors

## The "Tile"

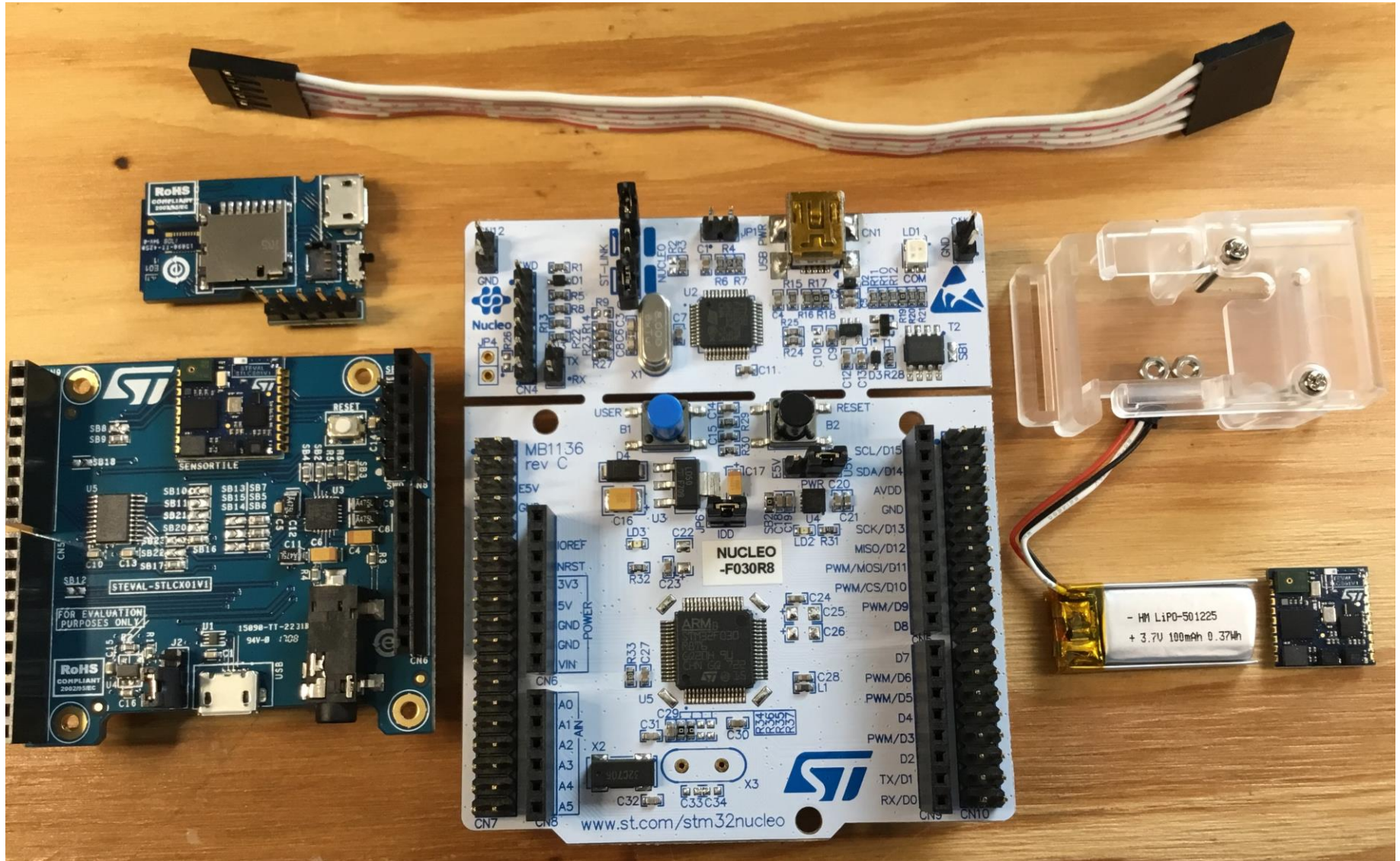


# ARM Your Sensors

## The "Tile"

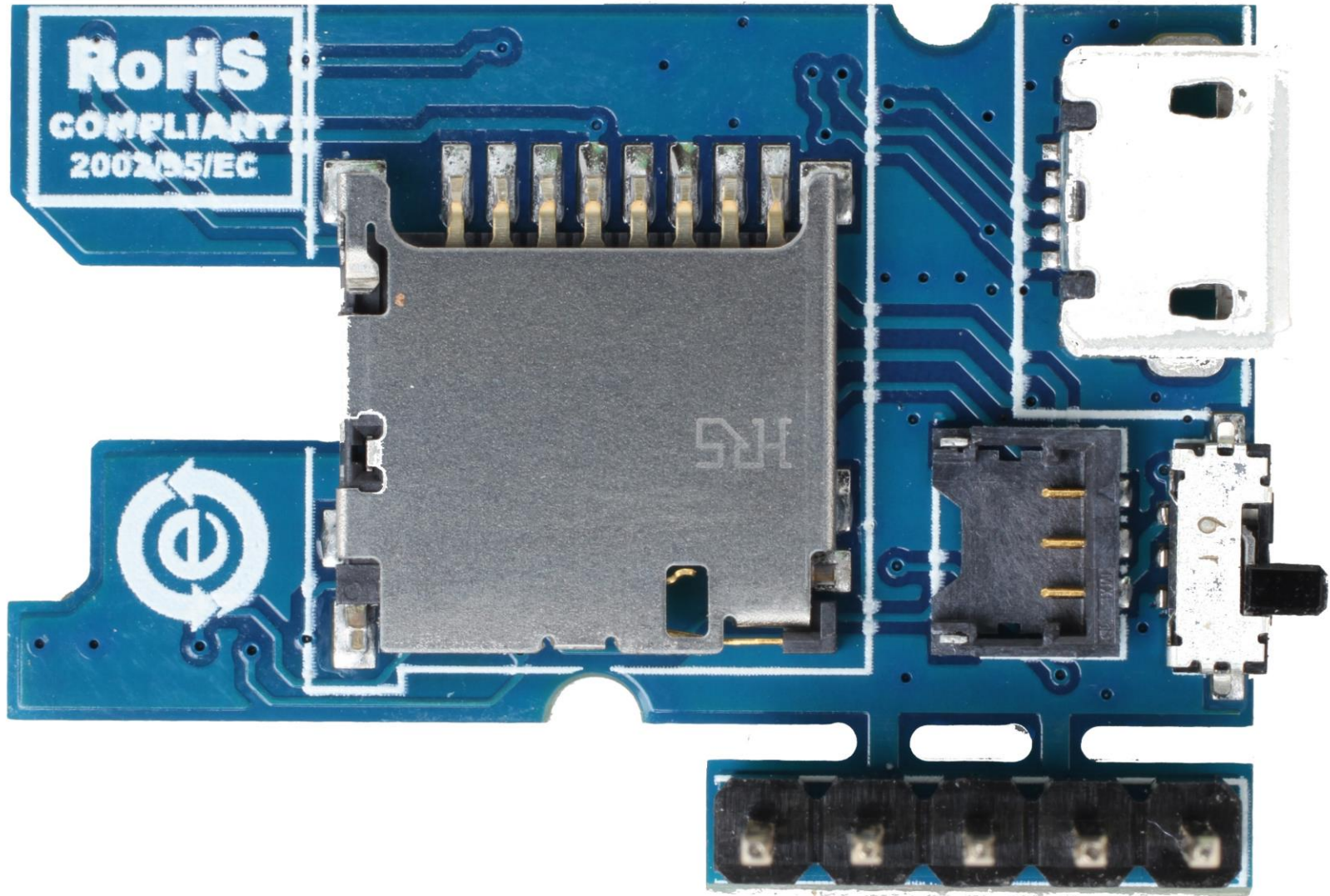


# ARM Your Sensors The "Kit"



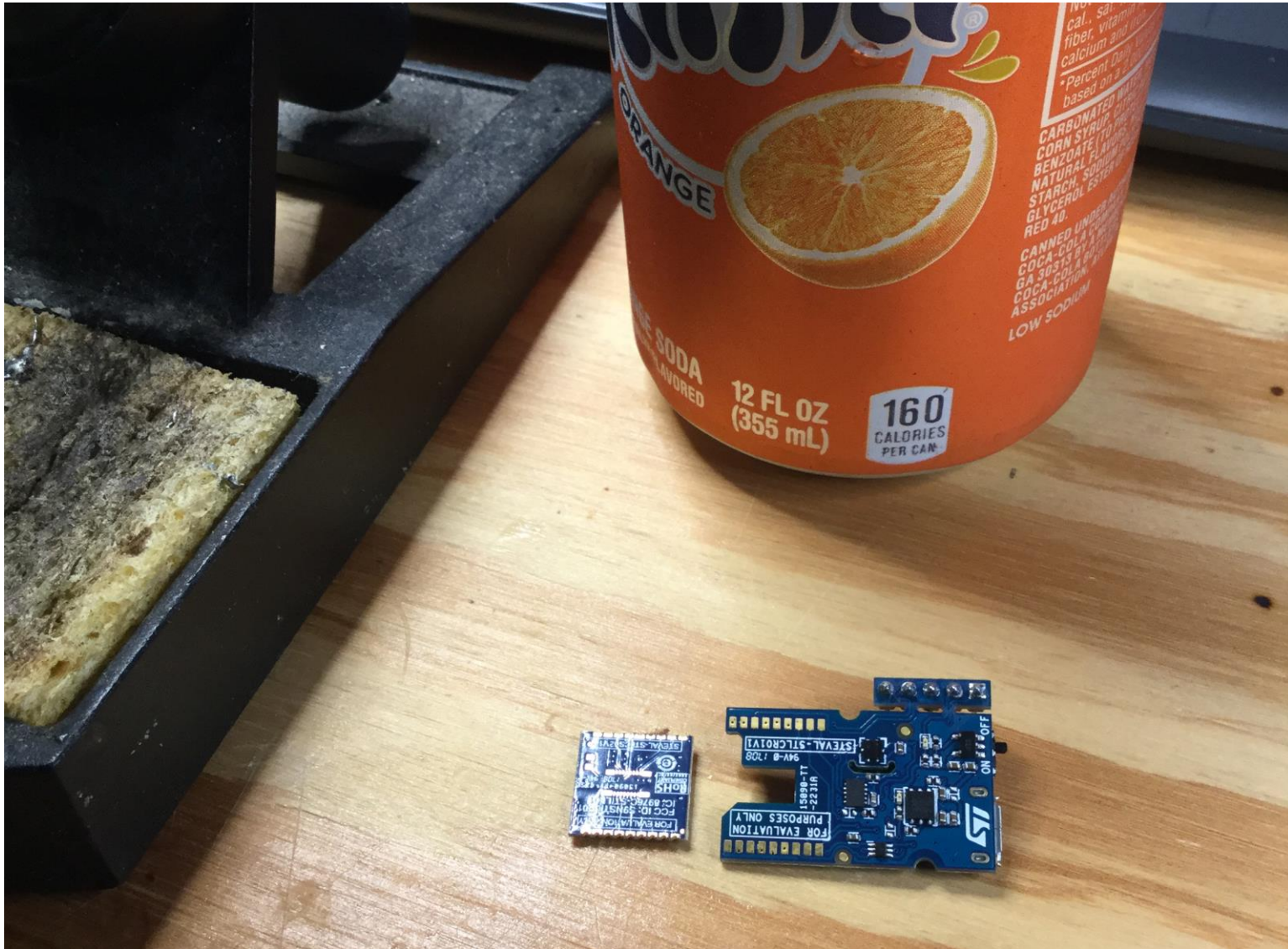
# ARM Your Sensors

## ARMing the Cradle



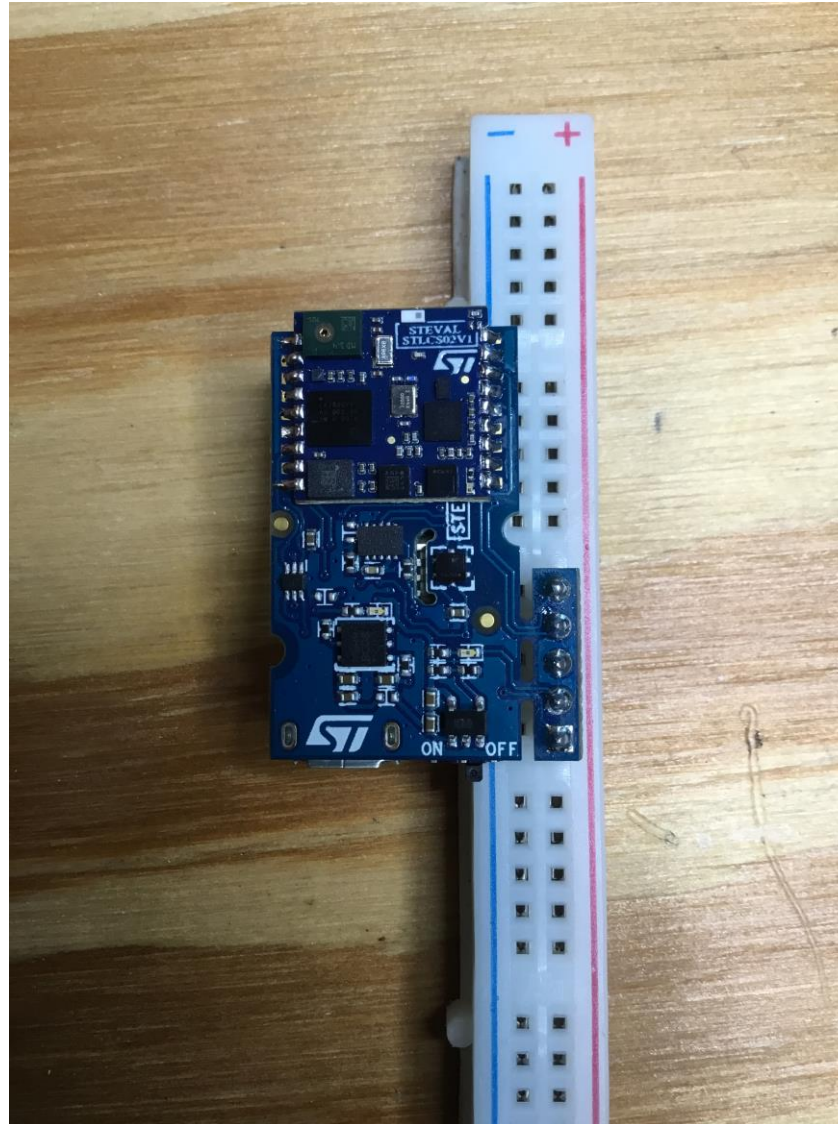
# ARM Your Sensors

## ARMing the Cradle



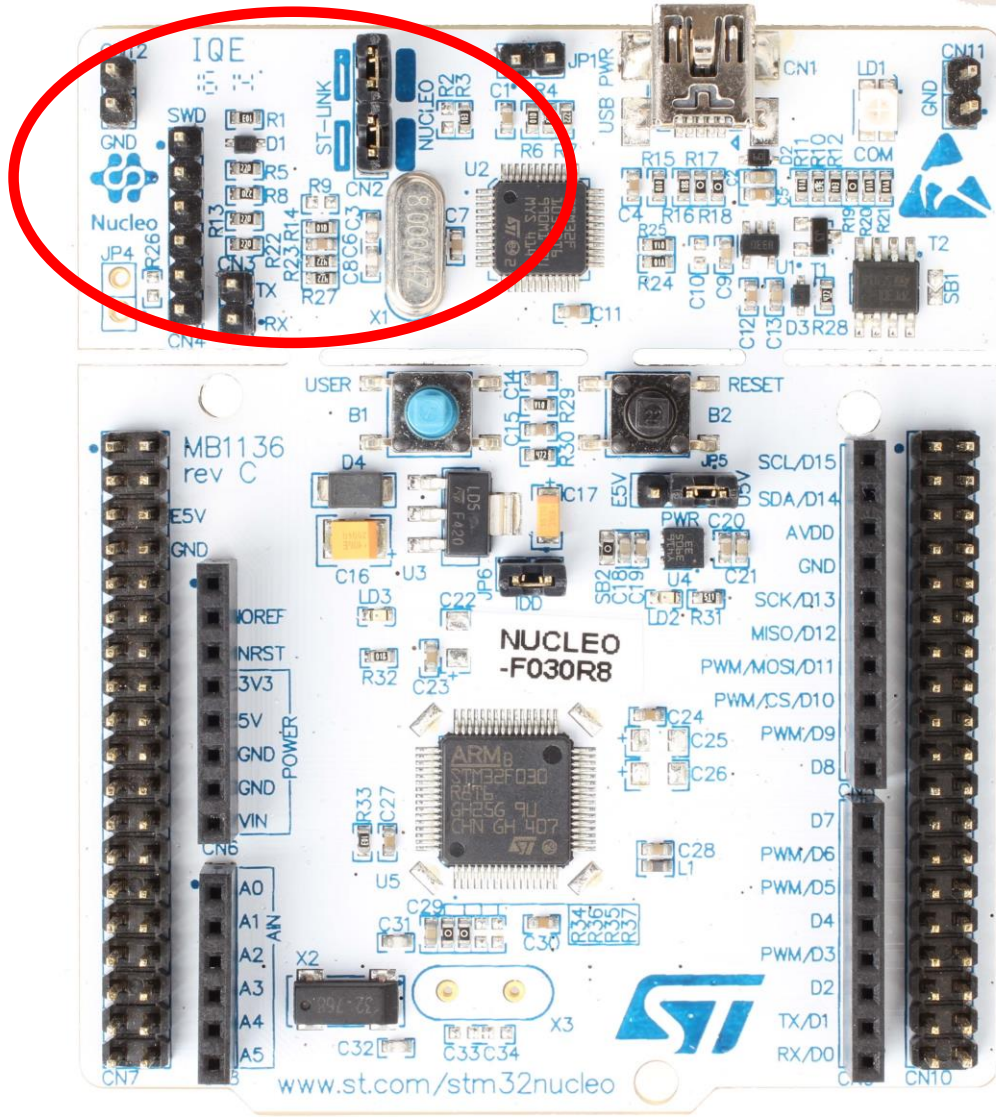
# ARM Your Sensors

## ARMing the Cradle



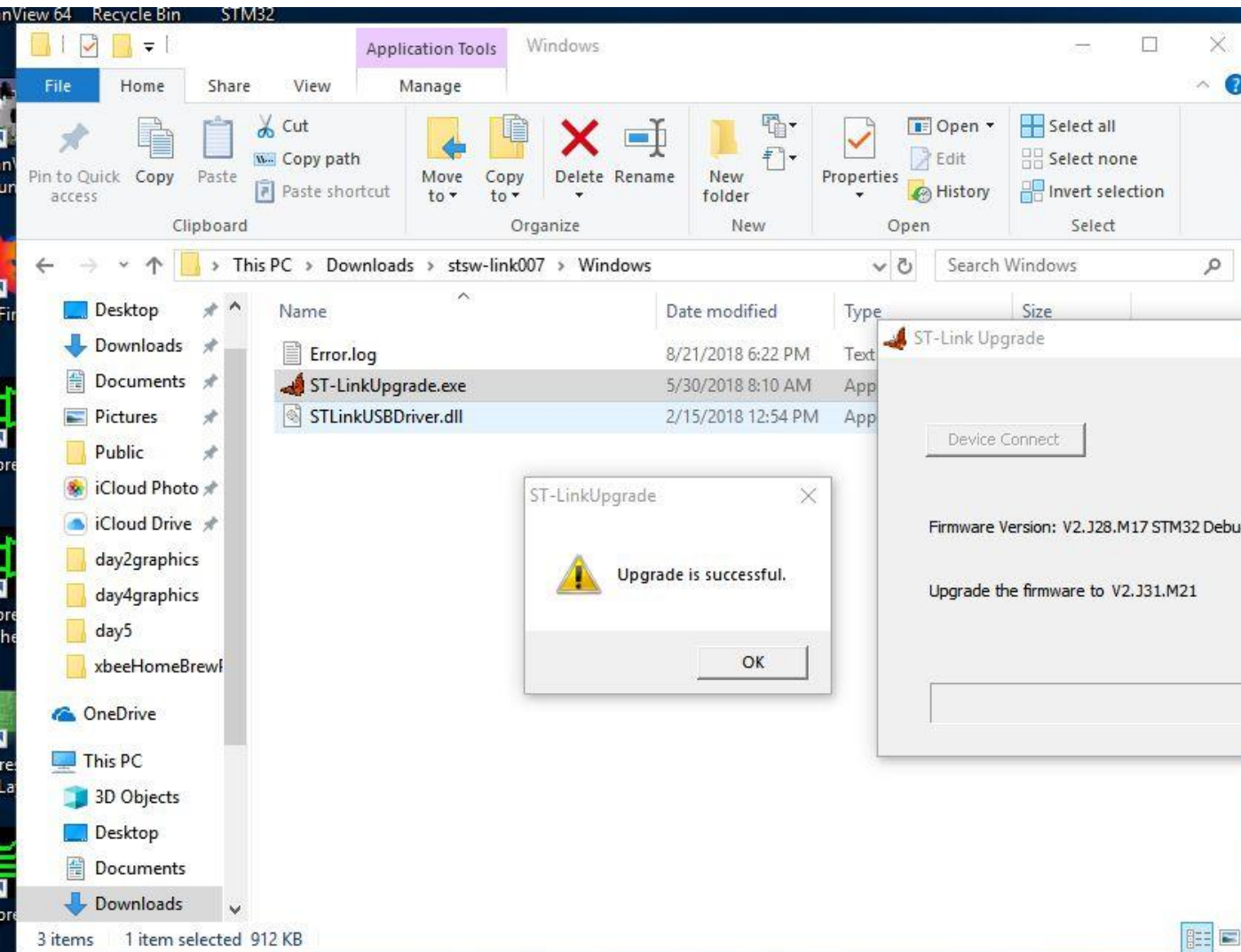
# ARM Your Sensors

## ARMing the Cradle



# ARM Your Sensors

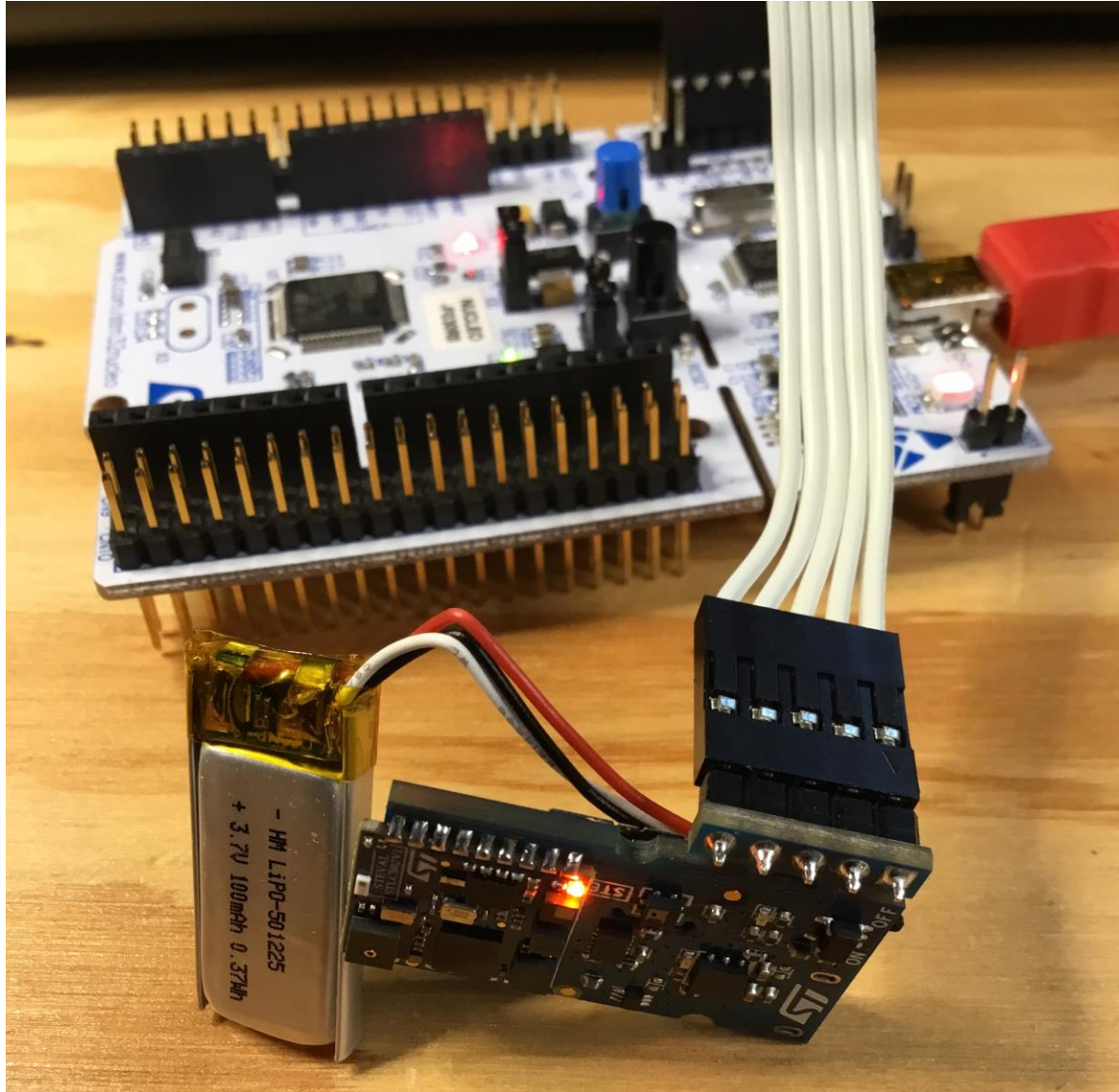
## ARMing the Cradle





# ARM Your Sensors

## ARMing the Cradle



# ARM Your Sensors

## ARMing the Cradle

STM32 ST-LINK Utility

File Edit View Target ST-LINK External Loader Help

Memory display

Address: 0x08000000 Size: 0x13B70 Data Width: 32 bits

Device: STM32L4x1/L4x5/L4x6  
 Device ID: 0x415  
 Revision ID: Rev 4  
 Flash size: 1MBytes

Device Memory @ 0x08000000 : File : STM32L476JG\_SensorTile.hex  LiveUpdate

Target memory, Address range: [0x08000000 0x08013B70]

Address	0	4	8	C	ASCII
0x08000000	2000A400	08000279	0800AAB5	080058B5	.µ. y...µª...µ X..
0x08000010	0800AAB1	08001737	0800DF0B	00000000	±ª..7....ß.....
0x08000020	00000000	00000000	00000000	0800019D	.....
0x08000030	080019F1	00000000	080001F1	0800C2C1	ñ.....ñ...ÁÁ..
0x08000040	08000293	08000293	08000293	08000293	"..."..."..."
0x08000050	08000293	08000293	08000293	08000293	"..."..."..."
0x08000060	080019F3	08000293	08000293	08000293	ó..."..."..."
0x08000070	08000293	08000293	08000293	08000293	"..."..."..."
0x08000080	08000293	08000293	08000293	08000293	"..."..."..."

```

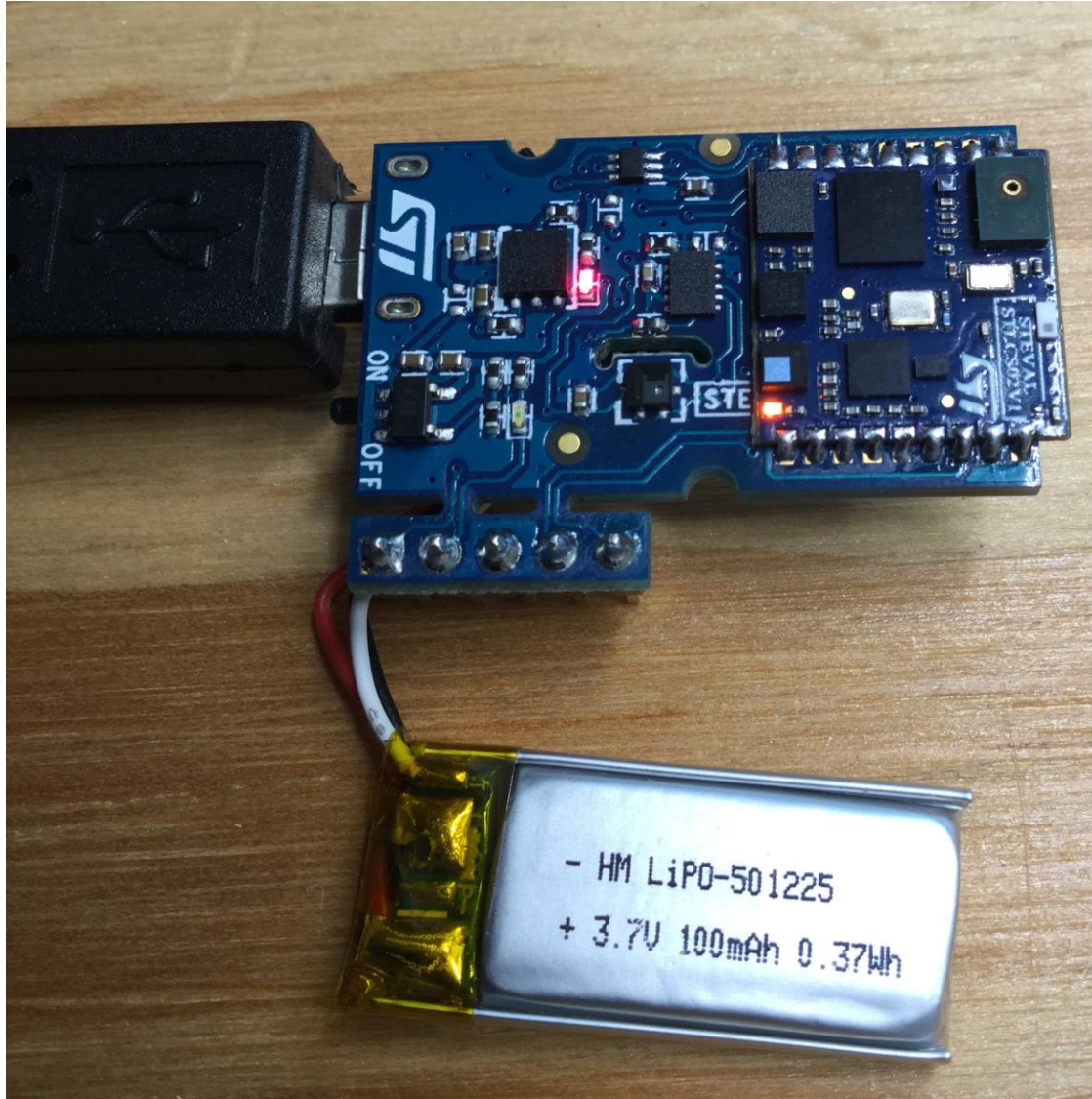
19:31:20 : Connection mode : Connect under Reset.
19:31:20 : Debug in Low Power mode enabled.
19:31:20 : Device ID:0x415
19:31:20 : Device flash Size : 1MBytes
19:31:20 : Device family :STM32L4x1/L4x5/L4x6
19:32:20 : [STM32L476JG_SensorTile.hex] opened successfully.
19:32:20 : [STM32L476JG_SensorTile.hex] checksum : 0x0078B618
19:33:17 : Memory programmed in 3s and 812ms.
19:33:17 : Verification...OK
19:33:17 : Programmed memory Checksum: 0x0078B618
  
```

Debug in Low Power mode enabled. Device ID:0x415 Core State : Live Update Disabled



# ARM Your Sensors

## ARMing the Cradle



# ARM Your Sensors

## ARMing the Cradle

```
VT Tera Term - [disconnected] VT
File Edit Setup Control Window Help
Acc_X: 94, Acc_Y: -171, Acc_Z : -1009
Gyro_X:3430, Gyro_Y:-140, Gyro_Z:-2240
Magn_X:-61, Magn_Y:157, Magn_Z:220
Press:988.40, Temp:30.30, Hum:55.8
TimeStamp: 929383
Acc_X: 82, Acc_Y: -178, Acc_Z : -986
Gyro_X:6370, Gyro_Y:840, Gyro_Z:-2030
Magn_X:-61, Magn_Y:154, Magn_Z:216
Press:988.40, Temp:30.30, Hum:55.8
TimeStamp: 929403
Acc_X: 90, Acc_Y: -136, Acc_Z : -986
Gyro_X:7490, Gyro_Y:-1820, Gyro_Z:-2030
Magn_X:-66, Magn_Y:153, Magn_Z:217
Press:988.39, Temp:30.30, Hum:55.8
TimeStamp: 929423
Acc_X: 86, Acc_Y: -139, Acc_Z : -1017
Gyro_X:10080, Gyro_Y:910, Gyro_Z:-3360
Magn_X:-57, Magn_Y:159, Magn_Z:217
Press:988.39, Temp:30.30, Hum:55.8
TimeStamp: 929443
Acc_X: 94, Acc_Y: -163, Acc_Z : -970
Gyro_X:10710, Gyro_Y:-2030, Gyro_Z:-490
Magn_X:-57, Magn_Y:169, Magn_Z:208
Press:988.38, Temp:30.30, Hum:55.8
TimeStamp: 929463
Acc_X: 51, Acc_Y: -206, Acc_Z : -884
Gyro_X:-490, Gyro_Y:1400, Gyro_Z:-840
Magn_X:-60, Magn_Y:160, Magn_Z:204
Press:988.38, Temp:30.30, Hum:55.8
TimeStamp: 929483
Acc_X: 98, Acc_Y: -171, Acc_Z : -1033
Gyro_X:6230, Gyro_Y:-4760, Gyro_Z:-5390
Magn_X:-60, Magn_Y:159, Magn_Z:216
Press:988.38, Temp:30.30, Hum:55.8
TimeStamp: 929503
Acc_X: 109, Acc_Y: -132, Acc_Z : -974
Gyro_X:8890, Gyro_Y:-5950, Gyro_Z:-7140
Magn_X:-57, Magn_Y:153, Magn_Z:220
Press:988.38, Temp:30.30, Hum:55.8
TimeStamp: 929523
Acc_X: 94, Acc_Y: -124, Acc_Z : -974
Gyro_X:4270, Gyro_Y:-3500, Gyro_Z:-2590
Magn_X:-55, Magn_Y:162, Magn_Z:210
Press:988.38, Temp:30.30, Hum:55.8
```



# ARM Your Sensors

## Day 5 Summary

