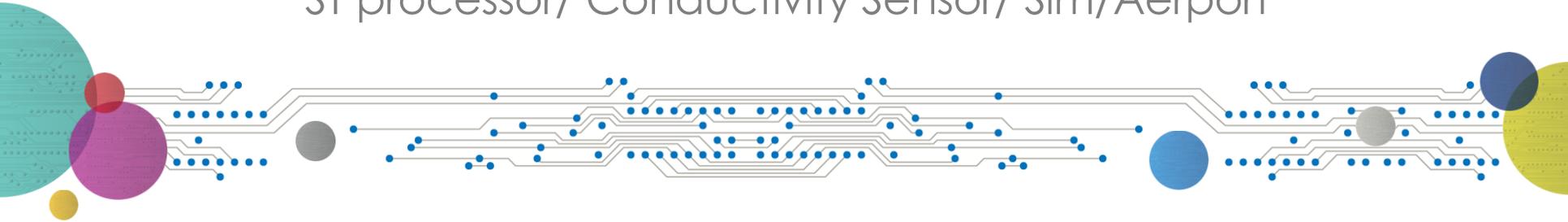




LAB Overview

mbed Instructions for MultiTech SocketModem
ST processor/ Conductivity Sensor/ Sim/Aerport



Lab Overview

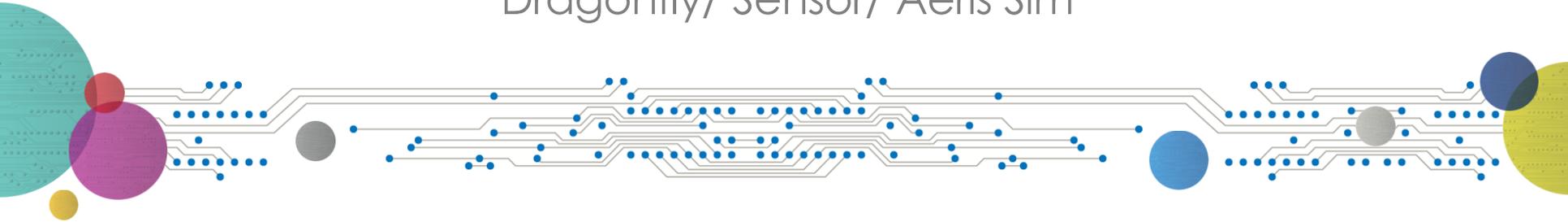
Labs

- Lab1: Verify we can talk on the cell network.
- Lab2: Read sensor data from I2C sensor.
- Lab3: Read A/D data.
- Lab4: Send data via HTTP to AerCloud



LAB 1

MBED Instructions for MultiTech SocketModem
Dragonfly/ Sensor/ AERIS SIM



Lab Overview

Lab 1

- Hello World (aka Blinky)
- Send SMS Message via AT commands
- Ping Google
- Use mBed to send an SMS
- Conductivity Sensor application

Cables and Power

1. **SIM Card** should be in Dragonfly
2. **UFL Connectors** should be attached (or shorting out power)
3. **Cell Antenna** are attached on the right and left cables. GPS is in the center
4. **Apply DC Power**
5. **USB Cable**
6. **Wait....** Device drivers may take a period of time to load.
A MULTITECH Drive "D:" should appear.
7. **Login to mbed.org**
8. **Open <https://developer.mbed.org/betamode/?pre=newboards>**
9. **Click** on blue box "**Beta Mode**" end of page
10. **Go back to mbed.org, Click on Developer, Click on Compiler.**
You should see Beta Mode in top right corner

Hello World

Yes it's silly, but lets get the LED to blink and test TeraTerm.

In mbed.org session. (home, compiler, verify the right board is there).

1. **Double Click** DragonflyHelloWorld
2. **Double Click** on **main.cpp**
3. **Modify** the code as you see fit
4. **Click** on **Compile, Save** the file to your favorite location, **Open** the download folder
5. **Right Click** and **Send** the new file to the **MULTITECH Drive:**. The RG LED should be on for a few seconds during the download process. The small Blue LEDs should be blinking.
6. **Start Teraterm, Click** on **Serial, Select** the right **PORT**.

Settings: Setup, Serial, values are: Baud rate: 9600, Data: 8, Parity: N, Stop: 1, Flow: none.

You should see Hello World! Every 5 seconds. You can adjust variables in Main.cpp.

LAB: Get the Modem on the Network

AT Commands are still valid.

Tasks

- Set up the APN.
- Cell signal strength.
- Verify device is on the network (Ping Google)
- Send a text to your phone.
- Receive a text from your phone.

Dragonfly_Terminal

1. **Double Click** Dragonfly_Terminal
2. **Double Click** on main.cpp
3. **Modify** the code?: Serial port connection – do nothing.
USB: **Change** line 5 to Serial ext(**USBTX, USBRX**);
4. **Click** on **Compile, Save** the file to your favorite location, **Open** the download folder, **Right Click** and **Send** the new file to the **MULTITECH Drive**:
5. **Add** a **USB cable** to D.fly USB connector. **Wait** for the drivers
6. **Start Teraterm, Click** on **Serial, Select** the **CORRECT PORT**. (the “ “ one)
 - a) Settings: Setup, Serial, values are:
Baud rate: 230400(**serial**) 115200(**Dfly USB**), Data: 8, Parity: N, Stop: 1, Flow: none. **ECHO** may need to be turned **On (Terminal)**

Dragonfly_Terminal and AT Commands

NOTE: BACKSPACE will cause the instructions to **FAIL**. Just hit enter and re-type

- a) at [if working, command responds with "OK"]
- b) at+cpin? [Check SIM is detected] READY
- c) at+cgdcont=1,"IP","aer.aerisapn.net" [programs SIM APN into modem]
- d) at+cgdcont? [verify APN is correct]
- e) at+csq [Check signal strength >10, but 8 will still work]
- f) at+creg? [Check for successful network registration] +CREG:0,1 or +CREG:0,5
- g) at+cnmi=2,2,0,1,0 [Configure to route received SMS text direct to serial interface]
- h) at+cmgf=1 [text mode for SMS]
- i) at+cmgs="1#####"<cr> [enter phone number # to send SMS text message]
>type sms message at greater than prompt<Control-Z> to send

Verify SMS is received. On phone that received SMS, respond by sending SMS back to modem number.

Send a PING

1. `at#sgact=1,1` [verify packet data connection] `CONNECT 10.123.54.21`
2. `at#ping="www.google.com"`
[Successful Ping response indicates Packet-Data is working]
3. If you have a server with a debug port: `at#sd=1,0,7000,"xxx.xxx.xxx.xxx"`
[Packet-Data connect to TCP Svr xxx.xxx.xxx.xxx. on port 7000]
4. `at#sgact=1,0` [terminate packet data connection]

NOTE: System may need to be unplugged from usb to recycle power (wait 5 seconds for pc to catchup up).

NOTE: Terminal may hang at random times, close and restart may be required. (or Alt+i, Alt+n)

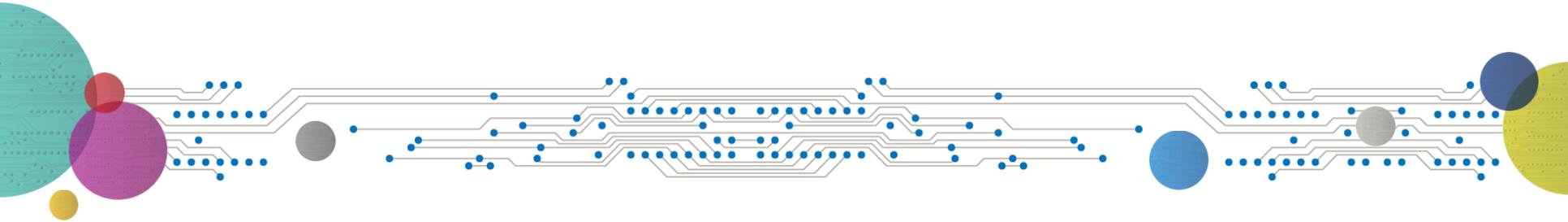


Why did I spend all that time with AT Commands?



LAB 2

mbed Instructions for Dragonfly / ST Sensor



Replace Grove with STMicro Sensor Board

1. **Unplug** the UDK from power, remove the Grove Board,
2. **Replace** the Grove board with **ST Sensor board**
3. Plug **Power** then **USB** into the system.
4. Go to **Compiler**, Find the **"Dragonfly_ST_Mems"** program to bring it into your Program Workspace.
5. **Compile, Save, Download** file to MULTITECH Drive:
(Chrome: Ctrl+J shows the file location)
6. **Run Teraterm** (
7. Configure the PC Terminal program for 9600bps, 8, None, 1 and select the correct Com port.

The terminal will show you the values of sensor data.

Z is vertical

X is the USB Programming side of the board

Y is the RS232 side of the board.

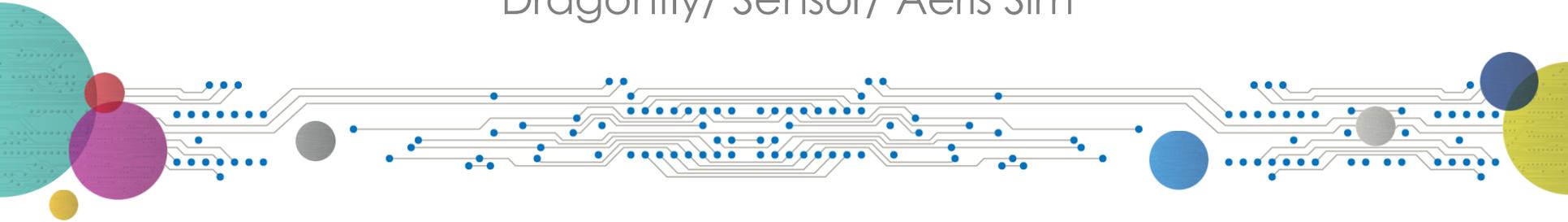
8. **Commit** the code. **Without breaking the system.** Try to see if the board can detect a free fall. Or Enable other sensors.





LAB 3

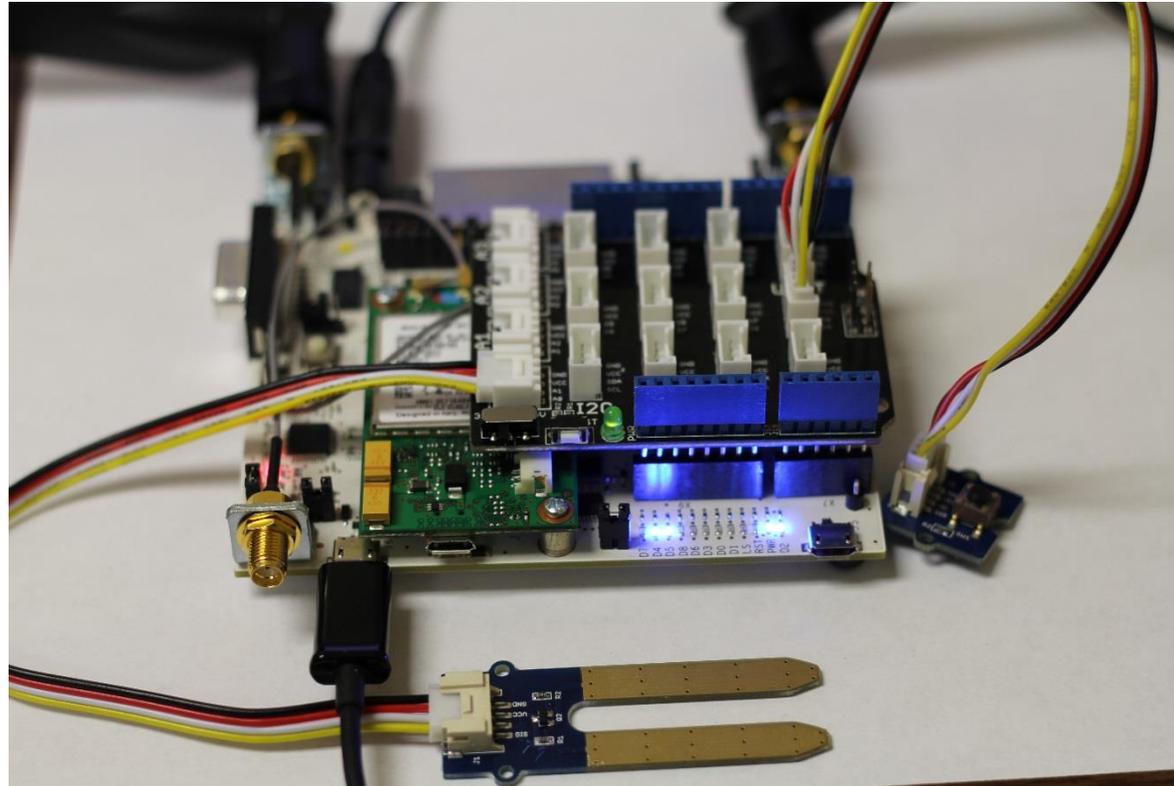
MBED Instructions for
Dragonfly/ Sensor/ AERIS Sim



Moisture Sensor Lab

Connection Locations

- Attach the Grove Shield to the MultiTech UDK
- Attach the Moisture to A0
- Attach the button to D5



Dragonfly_Moisture

1. In the program **Click** Dragonfly_Moisture and **Double Click main.cpp**.
2. In Line 22 **change** the number to your cell phone
3. **Change** the **APN** to aer.aerisapn.net
4. **Click** Compile and Send to MULTITECH Drive:
5. **Start** Terminal Program and select serial port
6. Try changing the value of the meter.

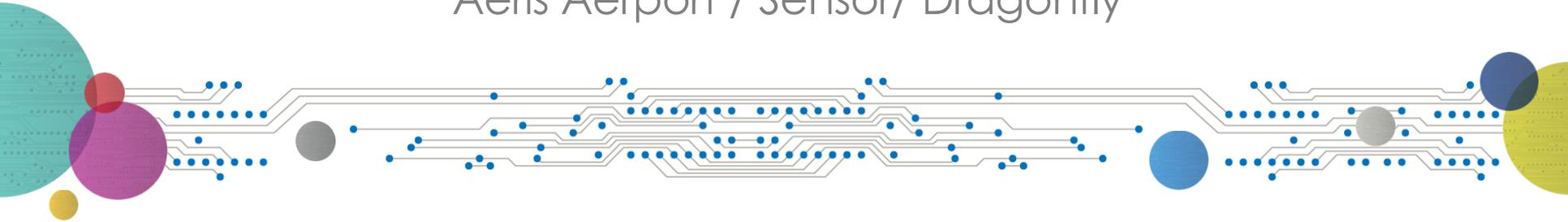
BREATHALYZER DEMO

15 MINUTE BREAK



LAB 4

mbed Instructions for Sending data to the Cloud
Aeris Airport / Sensor/ Dragonfly





Dragonfly (MTQ) pin out assignments

MTQ Pin	MTQ Name	UDK 2.0 Arduino pin	mbed GPIO	Programming Interface	SPI Interface	I2C Interface	USARTs	Timer functions	SDIO Functions	ADC Channels
1	DBG_TX (mbed dbgTX)		PB_6			I2C1_SCL	USART1_TX	TIM4_CH1		
2	J_TCK/SWCLK		PA_14	JTCK-SWCLK						
3	J_TDI/C_MON		PA_15	JTDI	SPI1_NSS		USART1_TX	TIM2_CH1/TIM2_ETR		
4	J_RST/P_GOOD		PB_4	JTRST	SPI1_MISO	I2C3_SDA		TIM3_CH1	SDIO_D0	
9	IO_00/RXD	D1	PA_2				USART2_TX	TIM2_CH3, TIM5_CH3, TIM9_CH1		ADC1_2
10	IO_01/DCD	D4	PA_7		SPI1_MOSI			TIM1_CH1N, TIM3_CH2		ADC1_7
11	IO_02/RI	D8	PB_1					TIM1_CH3N, TIM3_CH4		ADC1_9
12	IO_03/CTS	D6	PA_1				USART2_RTS	TIM2_CH2, TIM5_CH2		ADC1_1
14	IO_04/MOSI	D11	PB_5		SPI1_MOSI	I2C1_SMBA		TIM3_CH2	SDIO_D3	
15	IO_05/SCK	D13	PA_5		SPI1_SCK			TIM2_CH1/TIM2_ET		ADC1_5
16	IO_06/SCL/SS1	D15	PB_8			I2C1_SCL, I2C3_SDA		TIM4_CH3, TIM10_CH1		
17	IO_07	D2	PB_15		SPI2_MOSI			TIM1_CH3N	SDIO_CK	
18	IO_08	A0	PC_2		SPI2_MISO					ADC1_12
19	IO_09	A3	PB_0					TIM1_CH2N, TIM3_CH3		ADC1_8
20	IO_10	A1	PC_0							ADC1_10
21	IO_11	A4	PC_1							ADC1_11
22	IO_12	A2	PC_4							ADC1_14
23	IO_13	D9	PB_13		SPI2_SCK			TIM1_CH1N		
24	IO_14	A5	PC_9			I2C3_SDA		MCO_2, TIM3_CH4	SDIO_D1	
25	IO_15/SDA/SRDY	D14	PB_9		SPI2_NSS	I2C1_SDA		TIM4_CH4, TIM11_CH1		
26	IO_16/MISO	D12	PA_6		SPI1_MISO			TIM1_BKIN, TIM3_CH1	SDIO_CMD	ADC1_6
27	IO_17/SS2	D10	PC_8					TIM3_CH3	SDIO_D0	
29	IO_18/RTS	D3	PA_0 (WKUP)				USART2_CTS	TIM2_CH1/TIM2_ET, TIM5_CH1		ADC1_0
30	IO_19/DSR	D5	PA_9			I2C3_SMBA	USART1_TX	TIM1_CH2	SDIO_D2	
31	IO_20/DTR	D7	PA_8			I2C3_SCL		MCO_1, TIM1_CH1	SDIO_D1	
32	IO_21/TXD	D0	PA_3				USART2_RX	TIM2_CH4, TIM5_CH4, TIM9_CH2		ADC1_3
38	J_TDO/SWO		PB_3	JTDO-SWO	SPI1_SCK		USART1_RX	TIM2_CH2		
39	J_TMS/SWDIO		PA_13	JTMS-SWDIO						
40	DBG_RX (mbed dbgRX)		PB_7			I2C1_SDA	USART1_RX	TIM4_CH2	SDIO_D0	