

# Encrypted Walkie-Talkies

**Progress Report 2**  
**ECE 511 – Fall 2017**

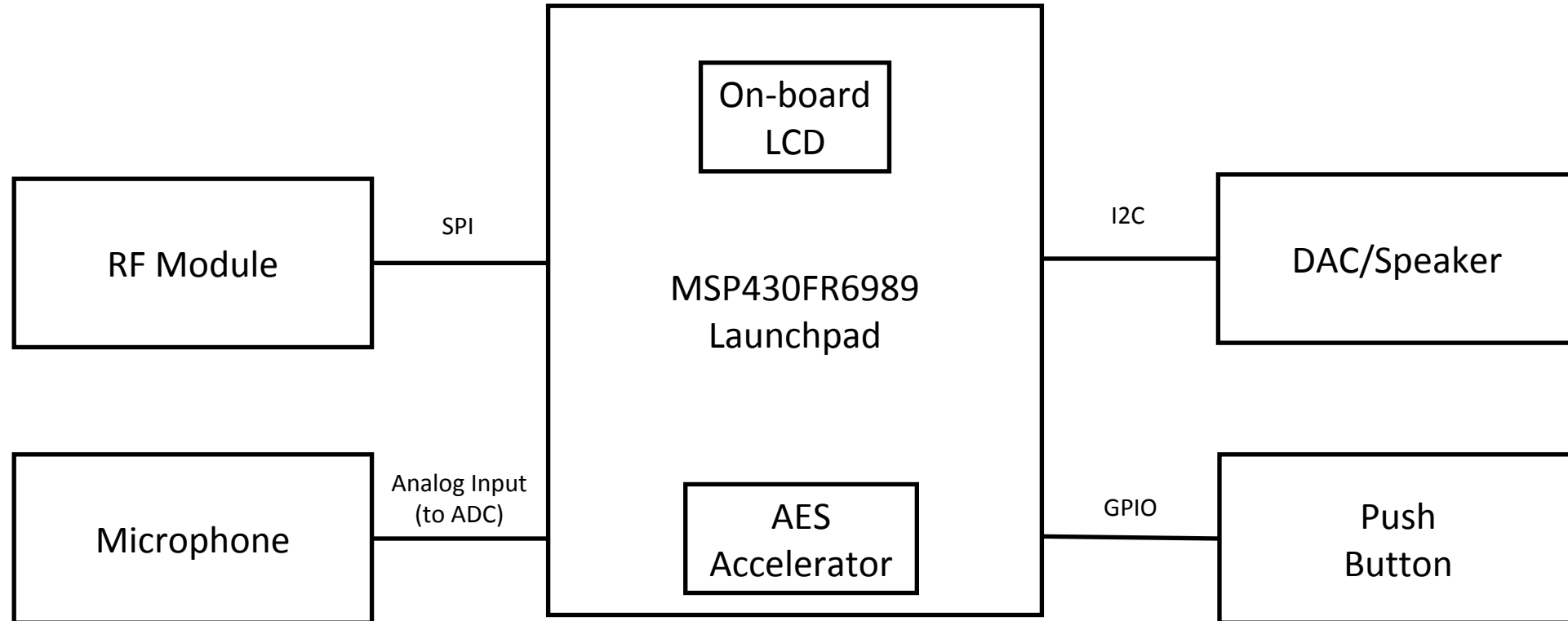
By: Dylan, Vishal, Juan, Tony

November 7, 2017

# Project Status

- Unit tests for each sensor almost complete
- Baseline code for each sensor/device is almost complete
- Continue working on integrating software and parts as design matures.
- Performed first RF transmission test with microphone and RF modules as part of the integration effort.
- New DAC module had to be ordered due to compatibility issues found with the old module.

# Block Diagram



# Components Status

# MSP430FR6989 Launchpad

- **Description:**

- 16-bit RISC architecture
- 16MHz system clock speed
- 320-segment LCD controller
- 16 channel 12-bit ADC
- 5 Timers
- AES256 Accelerator module supporting 128, 192 and 256 bits key lengths
- 83 GPIO

- **Status:** acquired



# Microphone

- Baseline code and unit test complete
  - Code is done at the ADC register level
  - Use bit flags instead of interrupts
  - ADC continuously sample and convert results in the background (Repeat-Single-Channel mode)
- Software and hardware already integrated with the RF module
  - Few minor integration issues were identified and resolved
- Risks:
  - Sensitivity and or quality of the microphone to capture voice signals
    - To be tested once integrated with the audio speaker

# Microphone Cont.



Device Specifications	
Model	BOB-12758
Frequency Range	100Hz-10KHz
Amplifier	60 V/V – TI OPA344
Interface type	Analog
Voltage (VCC)	3.3V-5.0V
Output Voltage	½ VCC
Pins	AUD - Audio GND - Ground VCC - Voltage

Pin Mapping	
BOB-12758	MSP430FR6989
AUD	P2.3 (Analog input A11)
GND	GND
VCC	+3.3V

Software Configuration	
Clock source	5MHz/64/8 = ~10kHz - MODOSC
MCU ADC Bit Resolution	8-bits
ADC Channel	11
ADC Mode	Repeat-Single-Channel
Conversion Start Address	0xB (i.e A11)

# ADC Core Conversion Calculations

Parameters		Conversion (Single-ended mode)	
Bit Resolution	8 bits	Ref. voltage V_R+	3.3 V
Discrete Values	256	Ref. voltage V_R-	0 V
LSB	0.012890625	V_IN*	2.6 V
N_ADC_MAX	0x00FF	N_ADC Output	202.2
N_ADC_MIN	0x0000	Saturation V_IN	3.28 V

\* V\_IN is  $\frac{1}{2} \cdot V_{CC}$ .  $V_{CC} = 3.3V$



# MSP430 AES Accelerator

- AES encryption unit test code complete
  - AES source code use the MSP430 Driver Library
  - Encryption and decryption functionality tested
- Started baseline software and integration with ADC baseline code
  - Need to implement AES encryption and decryption into the main program logic.
  - At the software level, it interfaces with the ADC output and RF module data flows.
- Using 128 bits cipher key to ease the process of matching different data types and sampling rates between ADC and RF module.

# RF Module



- RF module baseline code and unit test complete
- Software and hardware is integrated with microphone
  - Working on minor issues found
- Performed first data transmission test at GMU library.
  - Samples processed by the ADC were sent over the wireless link and picked up by the receiver.
  - Few issues were found from this test and are being worked on

# Audio Module

## Description:

- Audio output Module
- Chip used: MCP4725
- Does digital audio in and analog audio out.
- Supports audio output of up to 12 bit, 44.1 kHz
- Supports a potentiometer for volume control.
- Communicates via I2C
- Powered with 3.3V via Launchpad
- Speaker circuit still needs to be determined

**Status:** acquired, I2C can send and read data

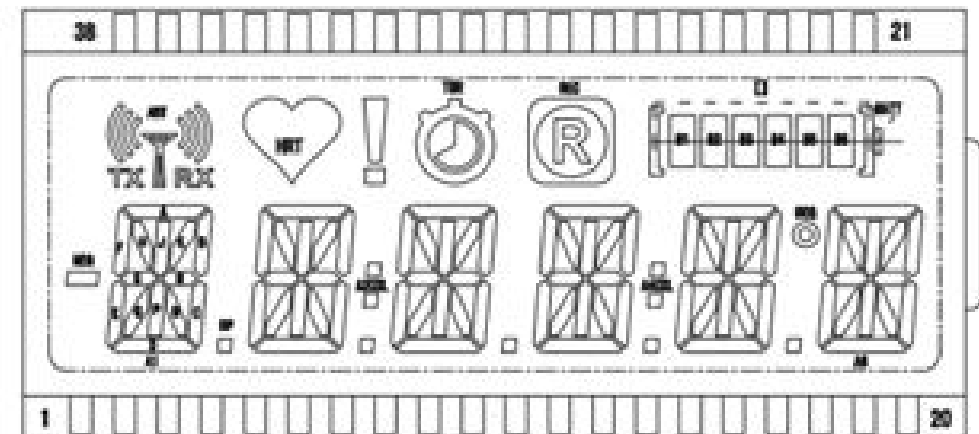
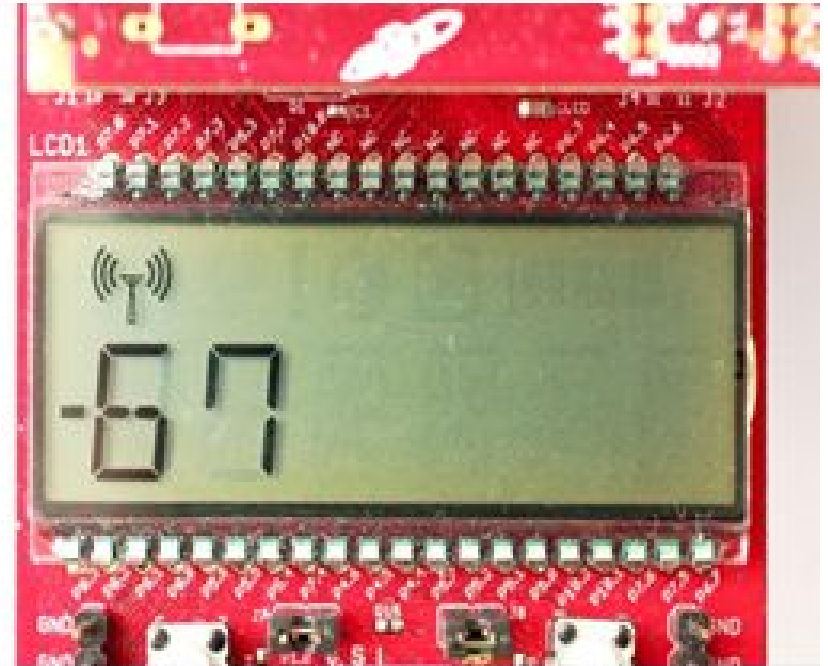


# LCD

## Description:

- Up to 320-segment LCD display.
- Includes 6 alphanumeric numbers or letters.
- Several symbols on top that can be used for many application.
- Power supply: not required powered onboard
- Indicate the status of the device- Tx/Rx
- Display RSSI(Received Signal Strength Indicator).
- Using the segment at the top right battery level will be displayed.
- If time permits we will also add some extra features.

**Status:** Acquired and tested



# Status

Task completed.

- Code for LCD display is tested.
- Code for the button interrupt is also tested.

Task pending.

- Integrating with other components.

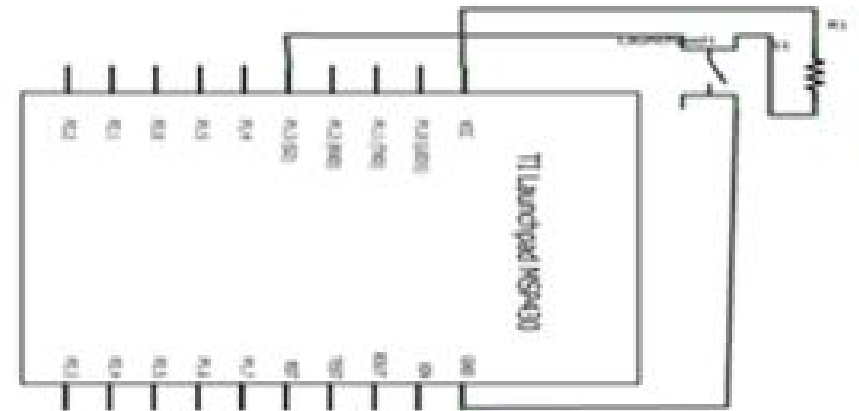
Challenges.

- LCD display is not working properly.
- Unable to display signal strength using antenna symbol.
- Instead we are using the battery symbol.
- Unable to display the battery level on the LCD.

# Button

## Description:

- Tactile push button.
- Model no:CKN9112TR-ND
- CONTACT RATING: 50 mA @ 12 V DC.
- DIELECTRIC STRENGTH: 250 V AC min.
- CONTACT RESISTANCE: 100 m $\Omega$  max. initial.
- INSULATION RESISTANCE: 10<sup>11</sup>  $\Omega$  min.
- Interfaced to MC with a pull-up resistor.
- When pressed will trigger an interrupt that will allow audio stream from microphone.



Status: Acquired and tested

# Task Division

- Dylan – Interfacing with the RF Module
- Tony – Interfacing with the Audio Module
- Vishal – Interfacing with the LCD, buttons, and interrupts  
integration of all software modules(RF, audio, mic, etc..) into  
main program loop.
- Juan – Interfacing with the microphone and AES Accelerator.