



**Boston University  
Electrical and Computer Engineering  
EC464 Senior Design Project**

# **Final Test Report**

## **VETCON BADGE**



**By**

**Team 32**

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## Equipment & Setup:

The equipment used for our prototype testing followed the hardware and software specifications listed below.

### Hardware:

1. 2 Texas Instruments (TI) MSP430FR2433 LaunchPad™
  - a. 16 bit MCU
  - b. 20-pin LaunchPad Kit Standard Leveraging The BoosterPack Ecosystem
  - c. On-Board eZ-FET Debug Probe
  - d. 2 Buttons And 3 LEDs For User Interaction
  - e. 2 HC-05 Bluetooth Modules
  - f. 2 LCD Alphanumeric Displays
2. 2 Computer/Laptops
3. 2 Micro USB Cables
  - a. Connection Between MSP430 & Computer
4. Arduino, Wires, Resistors, and Extra LEDs for Testing

### Software:

1. Visual Studio Code
  - a. Source Code Editor
2. PlatformIO
  - a. Cross Platform / Cross Architecture IDE tool
  - b. Embedded Application Software Development
3. Scripts
  - a. C++ Script, main.cpp
4. Package Extensions
  - a. Monitoring Button State & Debouncing
5. Github Pages
  - a. Hosting Of Web Games

### Setup:

The setup for our final testing was very simple. One of our team members cloned our Github repository with our prototype code from the testing branch. The project was then opened with PlatformIO on the Visual Studio Code IDE. Following this, the MSP430FR2433's were connected to 2 team members' computers with the

micro USB cable. Using PlatformIO, the project was built and flashed onto both boards, ready for demonstration. Furthermore, a breadboard with correct pin connections to the 3 LED's, LCD, and Bluetooth module was set up for each MSP.

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## Testing Procedure:

1. Initialize the MSP + software (build, upload, and monitor)
2. Demonstrate option 1 (Set Name Tag)
  - a. Demonstrate that repeating option 1 prompts message that name has already been set
3. Demonstrate option 2 (Display Name Tag)
4. Demonstrate option 3 (Game Link)
  - a. Demonstrate the Dino Game
  - b. Show winning condition secret code
5. Demonstrate option 0 (Reset)
6. Demonstrate secrets
  - a. Show a secret username through option 1
  - b. Select option 3, prompting "access denied"
  - c. Select 'secret' option 9, unlocking option 3 in the menu
  - d. Enter secret token from game 1, changing LED1 state
7. Demonstrate option 4 (Game Link 2)
  - a. Demonstrate the coin flip game
  - b. Select option 6 again and enter secret token from game 2, changing LED2 state
8. Demonstrate Game 3 using code from Game 2
  - a. Demonstrate the game
  - b. Select option 7 again and enter secret token from game 3, changing LED3 state
9. Demonstrate saved data between device power states
  - a. Disconnect device from power and show that it is fully off
  - b. Reconnect device to power and show the information saved in the previous session
10. Demonstrate option 8 (Bluetooth)
  - a. Show bluetooth communication between both MSP's
  - b. Demonstrate exiting the bluetooth menu

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## Measurement Criteria:

1. VETCON BADGE displays on startup
2. "WELCOME TO VETCON 30" is printed to the LCD
3. Main menu displays in terminal
4. User can select from given options
5. User can enter name to nametag
6. User's name can be displayed on the LCD
7. Game link(s) can be retrieved
8. Online game(s) run (Game 1,2,3)
9. Secret phrase can be retrieved on winning the game(s) (Game 1,2,3)
10. All LED's turn on corresponding to their secret phrase being entered
11. Users can send and receive data by Bluetooth
12. User can reset badge
13. User can select to abort / continue with reset
14. User can power off and on the badge without data loss

Upon startup, VETCON text was displayed correctly alongside the menu of options in the terminal. "WELCOME TO VETCON 30" was displayed across the LCD as well. All options were able to be selected by the user during the demonstration. These options included the ability for the user to enter a username, change their username, display their username to the LCD, and obtain a link to a short game. We also showed upon entering the secret retrieved from both game 1 and 2 then a subsequent link to a following game displayed to the user. We demonstrated that the badge could be reset and a new username could then be set for the badge. The game links functioned correctly and allowed the user to play a dino game, a coin flip game and download a text-based adventure. Also, upon entering the secrets retrieved from each game, their corresponding LEDs were lit. Finally we showed that the badge can lose and regain power without any loss of data.

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## **Conclusion:**

The final prototype testing was a complete success, with all features running smoothly, with our client and professors all commending our nearly finalized design. Currently we are finishing up our research on battery capabilities as well as finalizing our PCB design. Then we will finalize our housing design and have 10 prototypes in time for ECE day as per Professor Osama's request. We are also considering forking our 3 games, as well as our user interface to "simplify" them and make them more appealing to an audience that is not as well versed in cybersecurity practices.