

Smartphone Control of Advanced Sensor Systems



Facilitator:
Dr. Jian Ren

Company Contact:
Christopher D. Ball, PhD

Team Eight

- Michael Allon – Introduction/Background
- Steve Hilton – Hardware
- Micah Zastrow - Software
- Donghun “Hun” Ha – Risks and Project Schedule
- Paul Krutty – Budget and Wrap-up

Introduction & Background

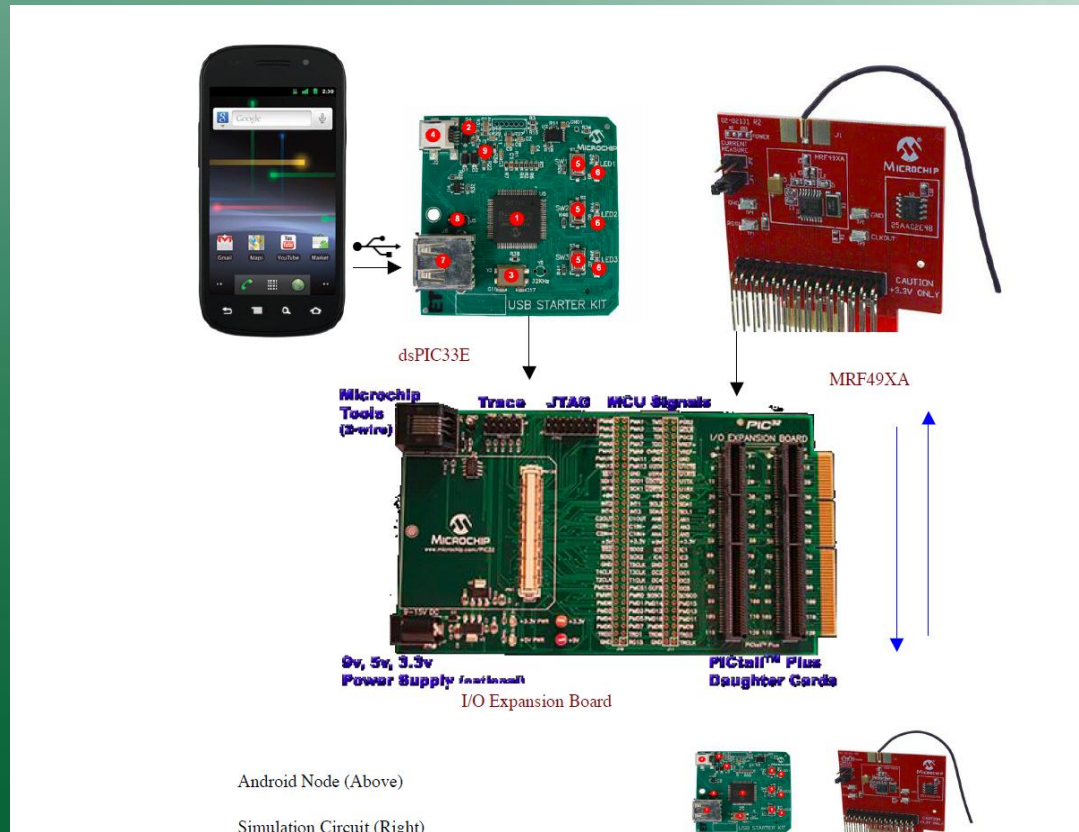
- Wireless communication between a smart phone and sensors.



Requirements

- Wireless communication with four or more sensors
- Cannot use existing communication networks
- Mobility
- Simple, user friendly interface

Fall 2011 Design



Problems?

- Unable to interface transceiver and I/O expansion board
- Incompatibilities between transceiver and dsPIC33E

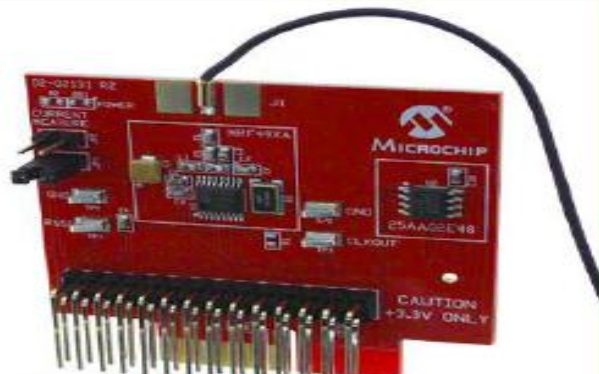
Spring 2012 Design

ANDROID NODE (x1)

SENSOR NODE (x4)



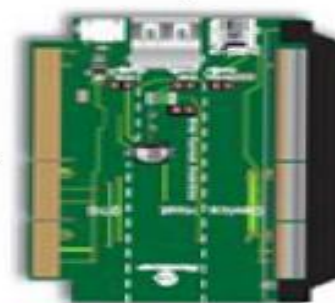
PIC24FJ256GB110
PIM



MRF49XA



EXPLORER 16 BOARD



USB PICTAIL+

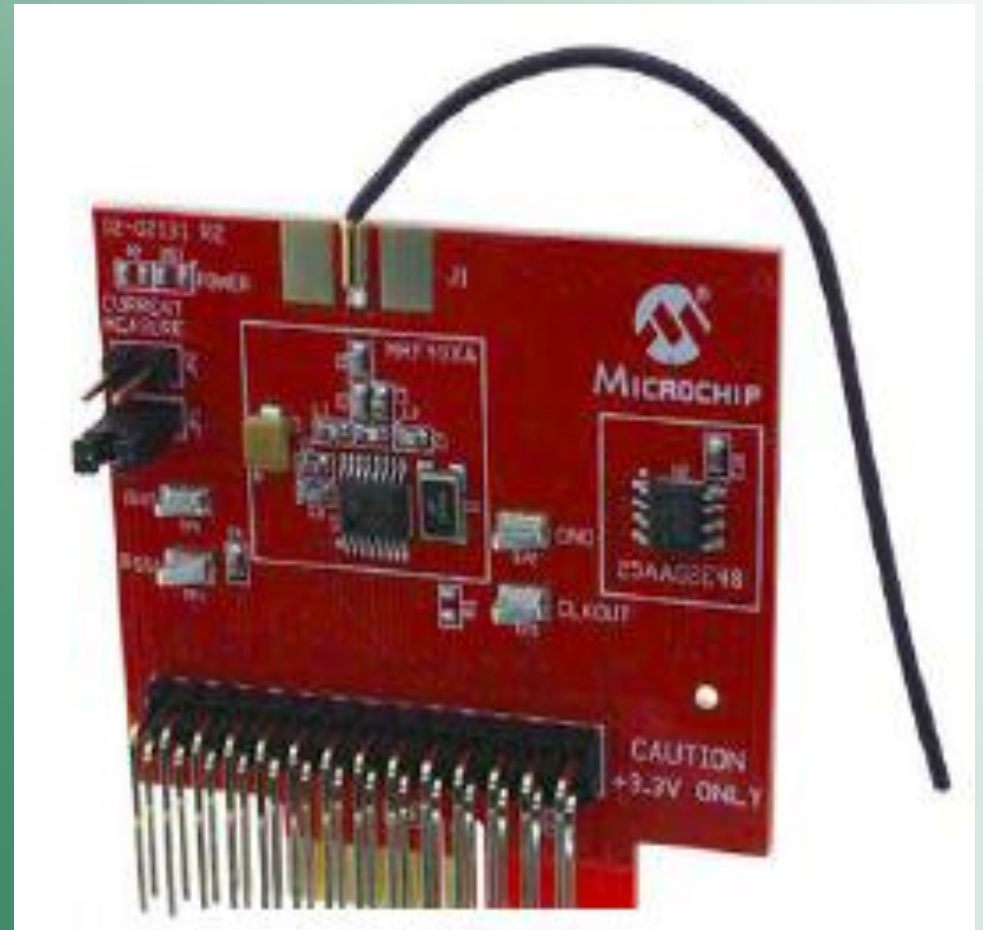
Explorer 16 Development Board



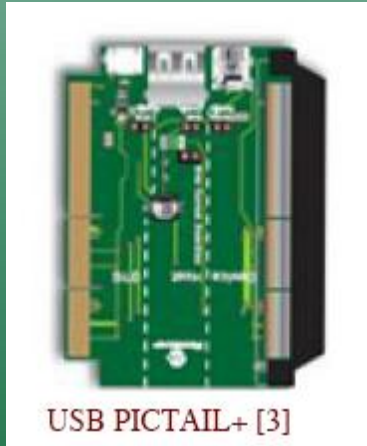
- Powered by 9VDC supply.
- 100-pin PIM riser
- Push button switches (needed for Sensor nodes)
- Comes with dsPIC33F processor module:
- 16-bit Architecture
- 30kB RAM
- 85 I/O PINS.
- Similar to last year's design – allows for use of code as guide.

MRF49XA Trancievers

- Communication without use of existing networks (e.g. WiFi, Cellular)
- Using a MiWi Network (low-power/low-data rate)
- Range of ~300 meters.
- Power-saving modes
- Operating Voltage: 2.2V-3.8V
- Low-Current: 11mA/15mA for RX/TX



USB PICTAIL+ and PIC24 Processor Module



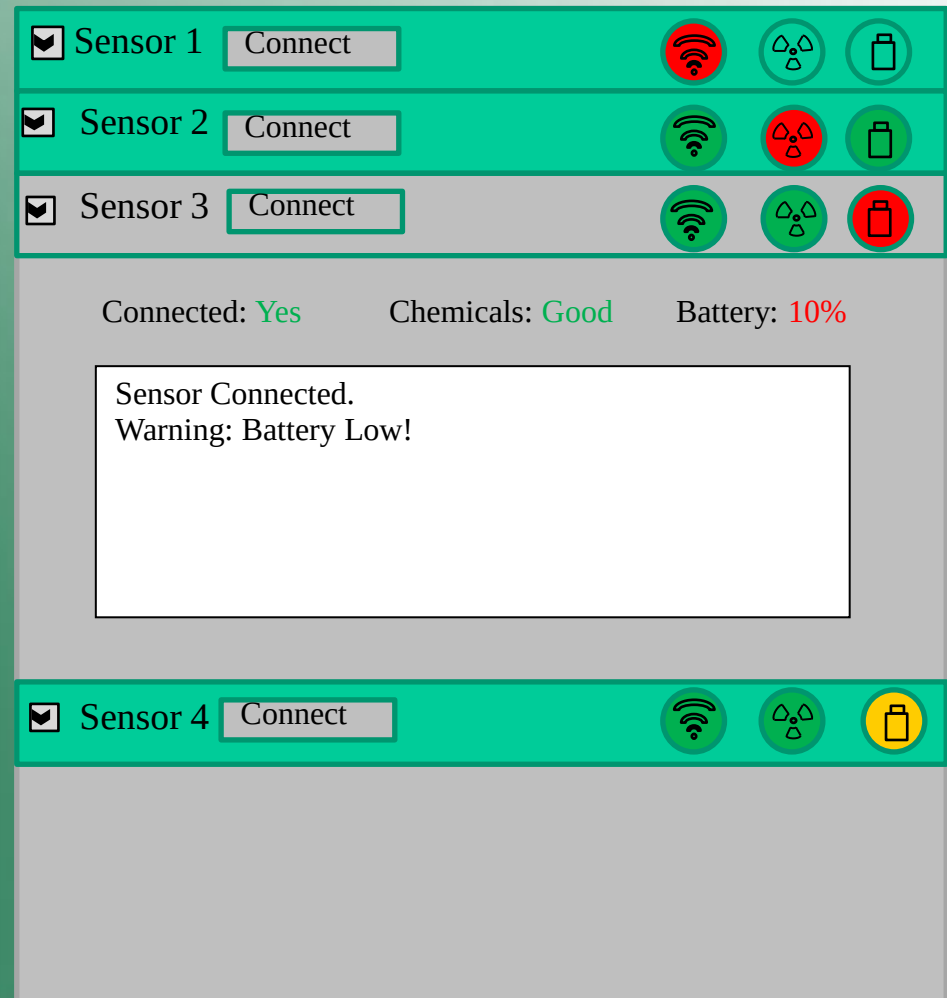
- PICTAIL+ allows USB connectivity between Explorer 16 Development Board and Smart Phone.
- This PIC24 met the minimum requirements of processor modules needed with the Explorer 16 for Android development.
- 16-bit Architecture
- 16kB RAM
- nanoWatt Power Modes
- Full speed USB operation (12 Mb/s)

Software-GUI

- Eclipse
 - Android Development Tools plugin
- Android OS
 - 2.3 gingerbread
 - Google API version 10
- Must be simple and reliable

Software-GUI (cont.)

- One main screen
- Multiple sensors on screen
 - Receive status updates
 - Low power
 - Functioning/Not Functioning
 - Dangerous chemicals
 - Connects to sensor
 - Color Coded

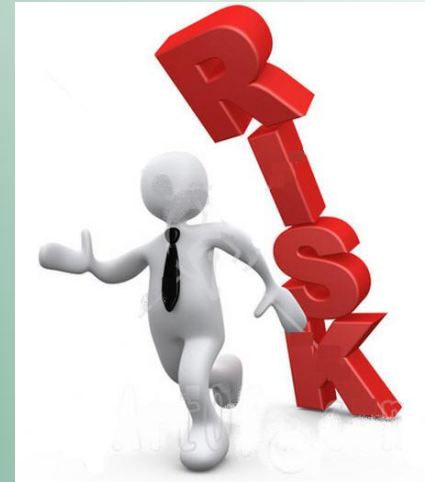


Android/Sensor Node Code

- MPLAB ICD 3
- Functionality:
 - Android Node
 - Receive signals from sensor node
 - Convert to digital and transmit to phone through USB
 - Receive digital signal from phone, convert and transmit to sensors
 - Sensor Nodes
 - Receive and process signals from Android node
 - Transmit signals representing the various states the actual sensor can detect

Risks & Concerns

- Channel Noise
 - testing is the KEY.
- Portable Power Sources
 - by adding secondary batteries.
- Channel Security
 - by developing encryption.



Project Manegement

Android GUI	• Micah, Paul
Android Node	• Michael, Hun
Sensor Node	• Michael, Hun, Steve
Mi-Wi Communication Code	• Steve
Interface Components	• All together

Budget

- Paid for by Battelle

Item	Quantity	Cost	Total
Explorer 16 Development Board	5	129.99	649.95
MRF49XA RF Transceivers	5	39.99	199.95
USB PICtail+ Board	1	60.00	60.00
PIC 24FJ256G13110 PIM	1	25.00	25.00
Microchip MPLAB ICD3	1	189.99	189.99
Total:			1124.89

Budget(cont.)

- Ece budget - \$500

Item	Quantity	Cost	Total
Samsung Nexus S Smartphone	1	329.99	329.99

- Incidentals/Unforeseen - \$170

In Conclusion

- Requirements
 - Wireless communication with four or more sensors
 - Cannot use existing communication networks
 - Mobility
 - Simple, user friendly interface
- Solution:
 - GUI – Android OS
 - Explorer 16 board – base for android and sensor nodes
 - USB Pictail attachment to connect to phone
 - MiWi RF Transceivers for communication

Questions?

