

Modular Rapid Monitoring System

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Bradley University Electrical and Computer Engineering

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Agenda

- Problem Overview
- Gateway Interface System Progress
- Sensor Interface System Progress
- Closing Remarks
- Q&A Session

Problem Background

- Sponsored by Martin Engineering
- Modular Rapid Monitoring System
 - Logs analog and digital signals.
 - Ability to easily add additional inputs.
 - Low cost design.
- Past Project Progress
 - Team in class of 2015 worked on same project.
 - Goal: Continue development to make a “proof-of-concept” system for sponsor.

Problem Background

- System logging data within 50 ms after boot.
- Accelerometer and ADC operating at 600 Hz.
- Permanently store the first five minutes of incoming data.
- Permanently store the five minutes of data after power down.
- Keep cost under \$300.

Problem Background

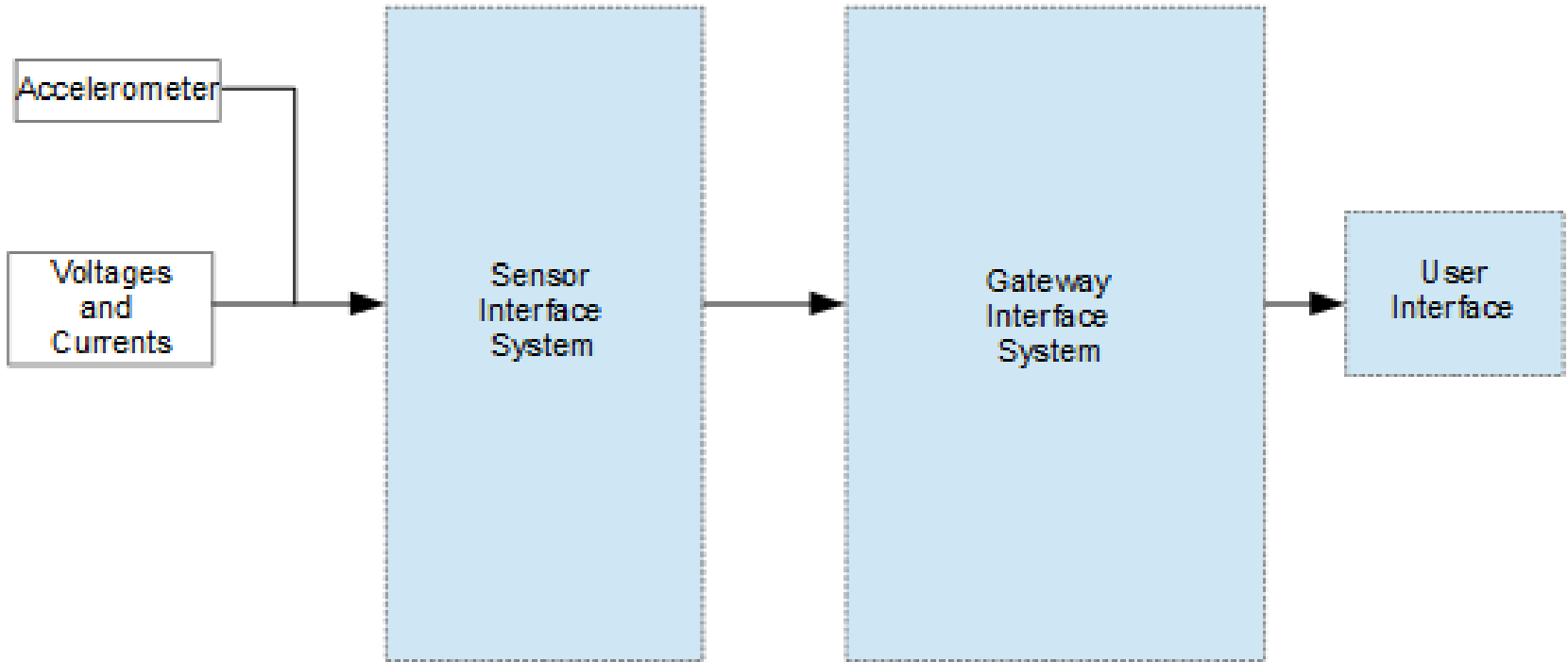


Figure 1: System Block Diagram

Gateway Interface System Progress

- Progress at end of 2015
 - UART
 - In the middle of developing UART communication to SIS.
 - Successfully “unlocked” device from OS use.
 - OS uses it for console connection.
 - GCC setup for compiling communication program.
 - WIFI
 - Driver has successfully been installed.

Gateway Interface System Progress

- Progress this semester
 - Setup and tested ad-hoc wireless network.
 - Connected to device using my laptop.
 - Still need to add configuration commands to startup script.
 - Researched potential web server applications for TinyCore Linux
 - Hard to find up to date information.
 - Have a list of 3 potential applications

Gateway Interface System Progress

- UART Communication
 - Modifying previous year C code for communication protocol is currently in progress.
 - PC console does not receive any data.
 - Tektronix MSO2014B oscilloscope has serial triggering capability.
 - Write transmit loop in program and use scope to analyze data.
 - Finished modifying program and will test this week.

Gateway Interface System Progress

Original Schedule

Research and decide base OS	9/8/2015	9/24/2015	3 weeks
Interface Wifi	9/29/2015	10/8/2015	2 weeks
Develop UART Access program	10/13/2015	11/12/2014	5 weeks
Develop lightweight web server	11/12/2015	1/28/2016	5 weeks
Optimize Web server GUI	2/2/2016	2/11/2016	2 weeks
Combined SIS/GIS Testing and debugging	2/16/2016	3/10/2016	4 weeks

Revised Schedule

Develop UART Access program		3/27/2016	3 weeks
Develop lightweight web server	3/28/2016	4/11/2016	3 weeks

Analog To Digital Converter

- 6 channels using header J2
- Rotary buffer stores data
- Fully completed at the end of the Fall semester

Overview

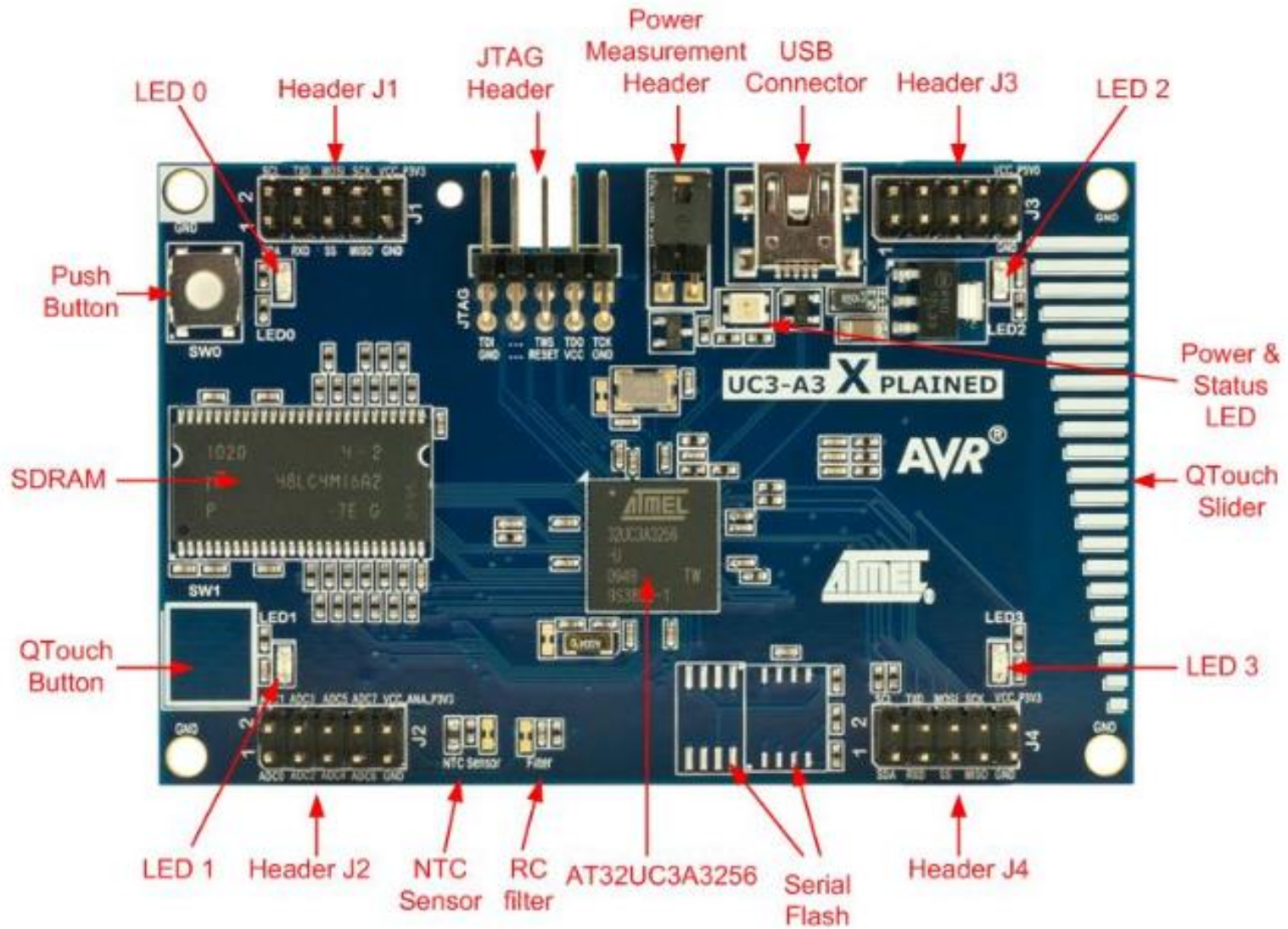


Fig. 1: Atmel UC3-A3 Microcontroller Overview

Communication

- Connect with GIS utilizing USART communication

- Mapping on:

```
# define EXAMPLE_USART (&AVR32_USART1)
# define EXAMPLE_USART_RX_PIN AVR32_USART1_RXD_0_0_PIN
# define EXAMPLE_USART_RX_FUNCTION AVR32_USART1_RXD_0_0_FUNCTION
# define EXAMPLE_USART_TX_PIN AVR32_USART1_TXD_0_0_PIN
# define EXAMPLE_USART_TX_FUNCTION AVR32_USART1_TXD_0_0_FUNCTION

// GPIO mapping
static const gpio_map_t USART_GPIO_MAP =
{
    {USART_RX_PIN, USART_RX_FUNCTION},
    {USART_TX_PIN, USART_TX_FUNCTION}
};

// USART options.
static const usart_options_t USART_OPTIONS =
{
    .baudrate = 115200,
    .charlength = 8,
    .paritytype = USART_NO_PARITY,
    .stopbits = USART_1_STOPBIT,
    .channelmode = USART_NORMAL_CHMODE
};
```

Testing

- Initial testing through PuTTY
- ADC working properly
- A few errors in the transmission from the rotary buffer

Future Work

- Implement a checksum for the communication process to compensate for bad transmission
- Analyze rotary buffer functionality
- Synchronize communication settings between SIS and GIS
- Testing of UART communication with GIS
- Set up the accelerometer and incorporate it with the data transfer
 - I²C

Updated Schedule

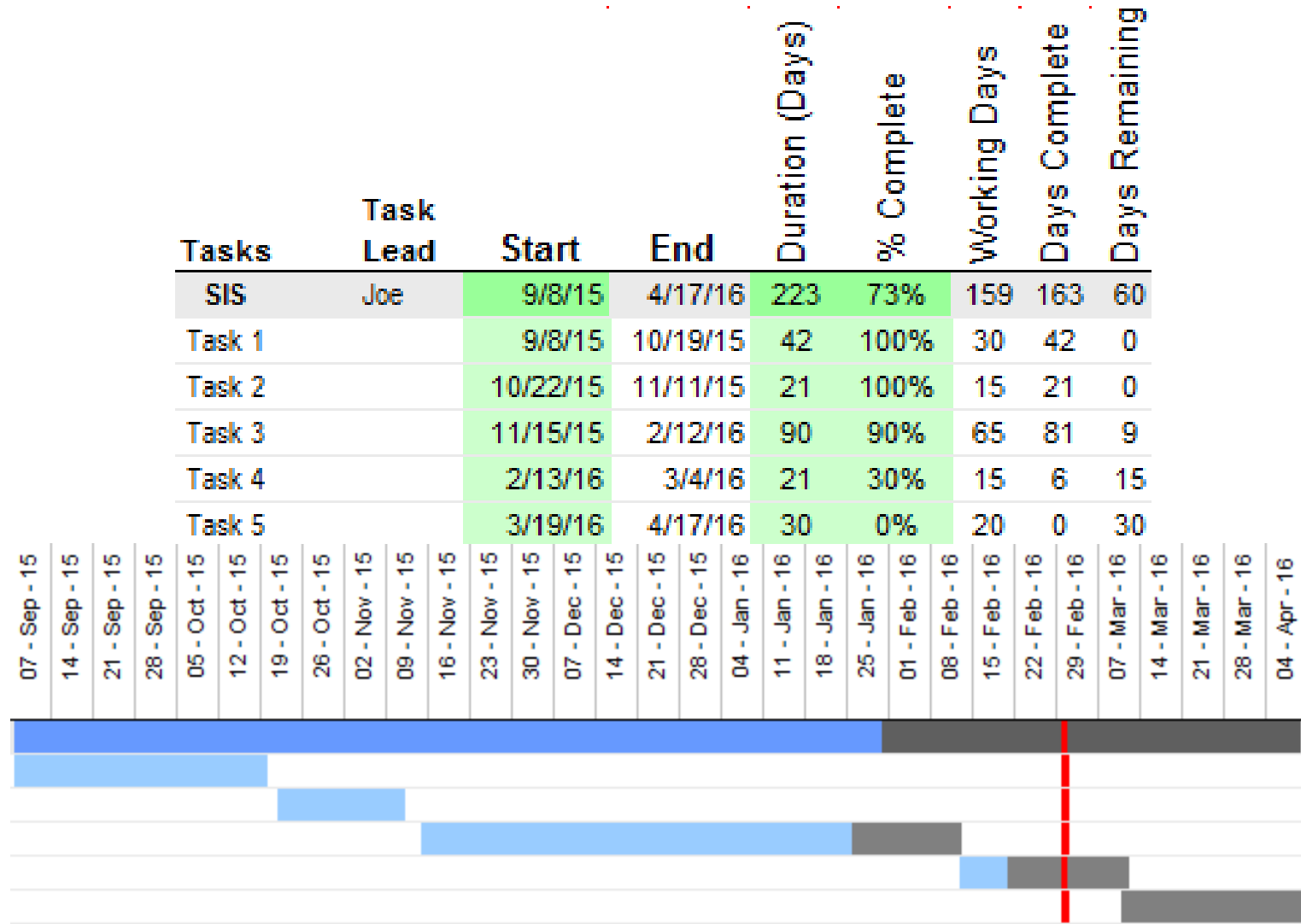


Fig. 2: SIS Gantt Chart

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