

# Technical Workshop

## Academic High Altitude Conference

Ethan Harstad and Matthew Nelson

Stratospheric Ballooning Association

June 23-24, 2014

# Outline

- 1 mbed Environment
  - What is mbed
  - Nucleo Platform
- 2 Software Overview
- 3 Hardware Overview
  - Atlas Data Logger
  - ADC: Analog to Digital Converter
  - USART: Universal Asynchronous Receiver/Transmitter
  - SPI: Serial Peripheral Interface
  - I2C: Inter-Integrated Circuit

# What is mbed?

The mbed system provides:

- **Free** software libraries
- **Free** hardware designs
- **Free** online development tools
- Developer community

## What this means

Shorter development, lower cost

# Software Development Kit

- Open source C/C++ libraries  
Safe for personal or commercial use
- Hardware abstraction layer  
Isolate your application code from hardware changes
- Built from CMSIS APIs  
Work with high level functions or bare metal hardware
- Pretested startup and peripheral libraries

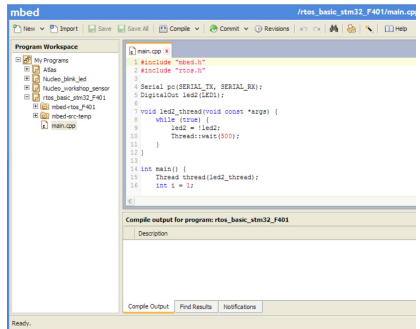
# Hardware Development Kit

The mbed Hardware Development Kit provides ready to use boards like the Nucleo as well as open source tools to develop custom boards.

- CMSIS-DAP based USB drag-n-drop programmer and debugger
- Virtual serial port

# Online Development Tools

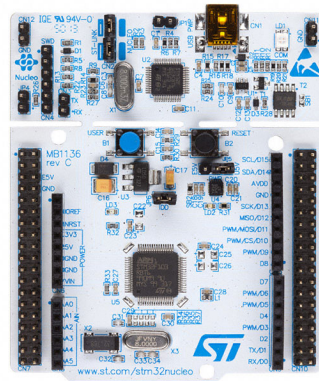
- Professional ARM C/C++ compiler with optimization
- Cloud based IDE that allows you to work from anywhere
- Tightly integrated with a Mercurial based version control system
- Search, import, and publish open source libraries
- Export to several offline toolchains



# Nucleo F401RE

The Nucleo platform combines a programmer/debugger and an STM32 based development board with Arduino compatible expansion headers.

- Up to 84 MHz clock speed
- 512 KBytes flash memory
- 12-bit 2.4 Msps ADC with up to 10 channels
- Three hardware USART
- Three hardware SPI
- Three hardware I2C



# Outline

- 1 mbed Environment
  - What is mbed
  - Nucleo Platform
- 2 Software Overview
- 3 Hardware Overview
  - Atlas Data Logger
  - ADC: Analog to Digital Converter
  - USART: Universal Asynchronous Receiver/Transmitter
  - SPI: Serial Peripheral Interface
  - I2C: Inter-Integrated Circuit



# Outline

- 1 mbed Environment
  - What is mbed
  - Nucleo Platform
- 2 Software Overview
- 3 Hardware Overview
  - Atlas Data Logger
  - ADC: Analog to Digital Converter
  - USART: Universal Asynchronous Receiver/Transmitter
  - SPI: Serial Peripheral Interface
  - I2C: Inter-Integrated Circuit

# Atlas Data Logger

# ADC Overview

# USART Overview

# SPI Overview

# I2C Overview

# Outline

- 1 mbed Environment
  - What is mbed
  - Nucleo Platform
- 2 Software Overview
- 3 Hardware Overview
  - Atlas Data Logger
  - ADC: Analog to Digital Converter
  - USART: Universal Asynchronous Receiver/Transmitter
  - SPI: Serial Peripheral Interface
  - I2C: Inter-Integrated Circuit

# Online Resources



# Outline

## 1 mbed Platform

# What is mbed?

# Outline

## 1 Open Session

# What is mbed?