Arduino Introduction

What is an Arduino and how do they apply to model railroading?

Introduction

- The presentation is geared towards DIY (Do It Yourself) modelers that like to dabble in electronics.
- It is not the intent to replace or discourage the use of commercial products.
- There is a learning curve
- For those who enjoy the adventure of discovery.

What is an Arduino

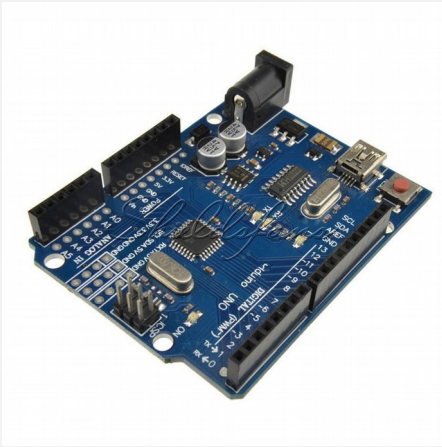
- Arduino is an open source computer hardware and software company out of Italy
- Original product was developed for education by offering a low cost development product
- Rapidly grew into a DIY ecosystem with a large product range and following.

What is an Arduino

- “Arduino” commonly refers to the hardware and software platform
- The company also developed software to ease the development (programming) process
- There are many components or shields available to address many sensing and automation needs

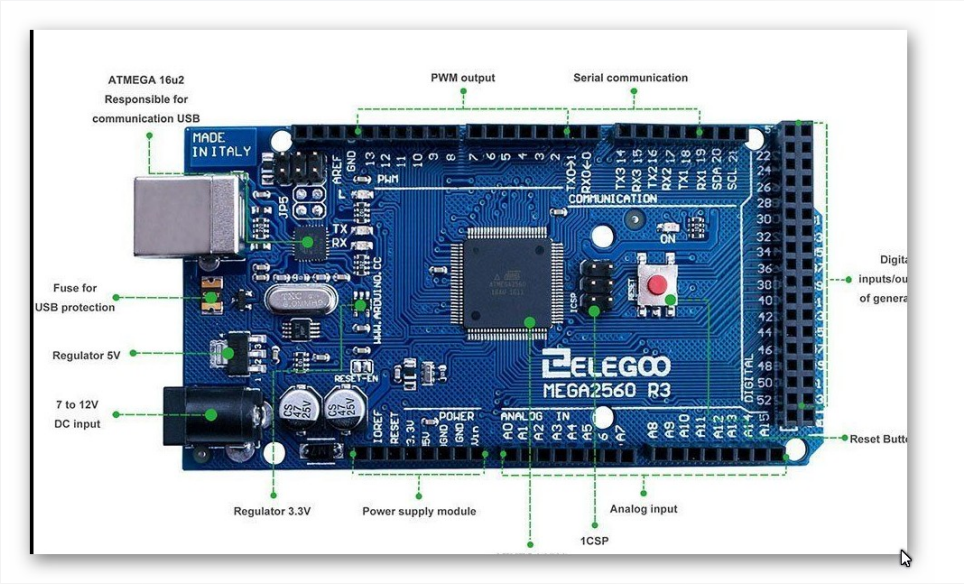
Arduino Processor Types

- The original “Arduino Uno” was a large scale board that defined a standard for shields(add on boards)
- The basic design remains but components have changed



Arduino Processor Types

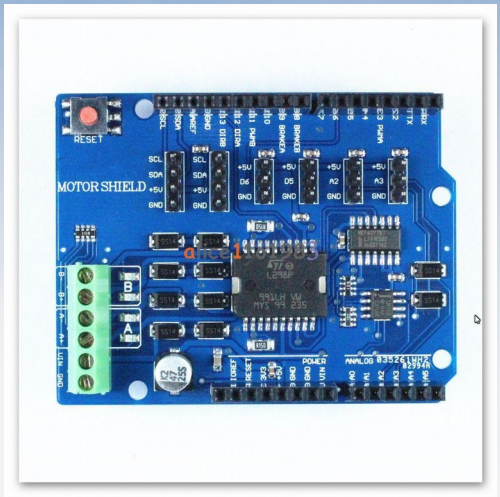
- Based on the UNO the MEGA has the same capabilities but add more input output ports
- Also has a larger memory capacity for larger programs

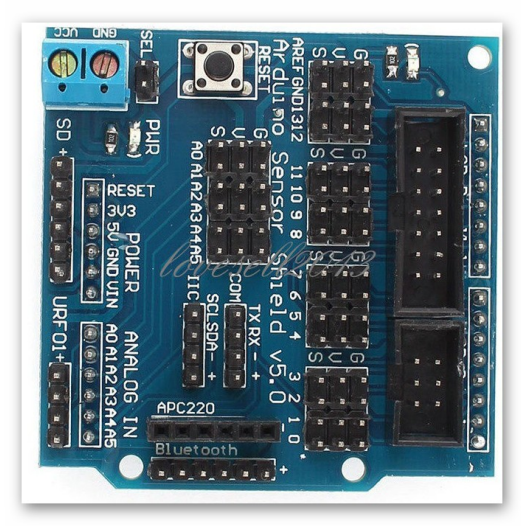


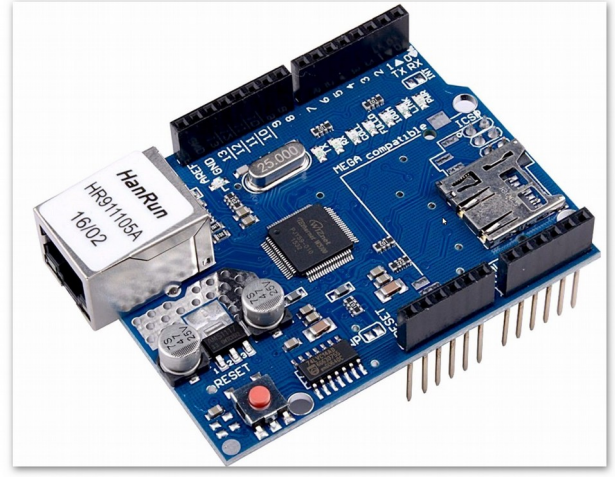
Arduino Shields

- Shields extend the capabilities of the UNO and MEGA
- The shields are all of the same electronic profile
  - pin layout are the same
  - physical size is the same
- Shields can be stacked to allow for even more flexibility

Shield Examples



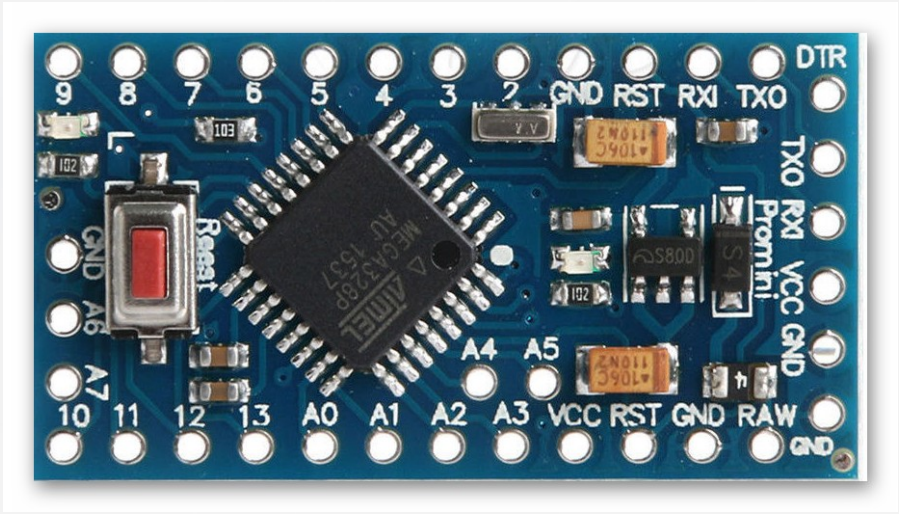


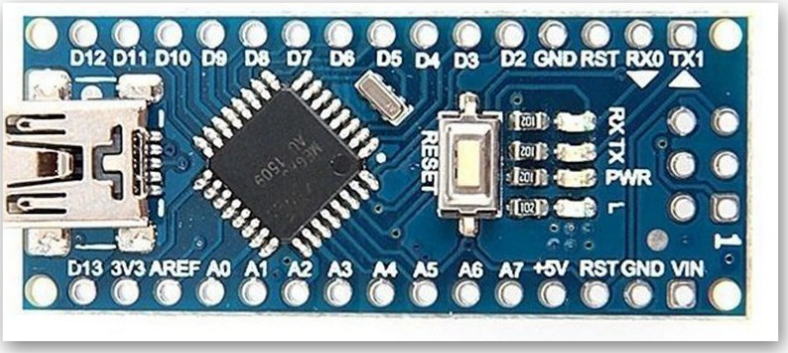


Thomas Ose
OMS(re)Models 03/2018

Arduino variations

- To achieve a smaller form factor variations were developed
- All are programmed the same
- All have the same software specifications
- All belong to the same ecosystem





What are some Applications

- Education
- Home Automation
- Drones
- CNC Milling Machines
- 3D Printers
- Anything that requires controllable input outputs with high accuracy and motor control

Model Railroading Examples

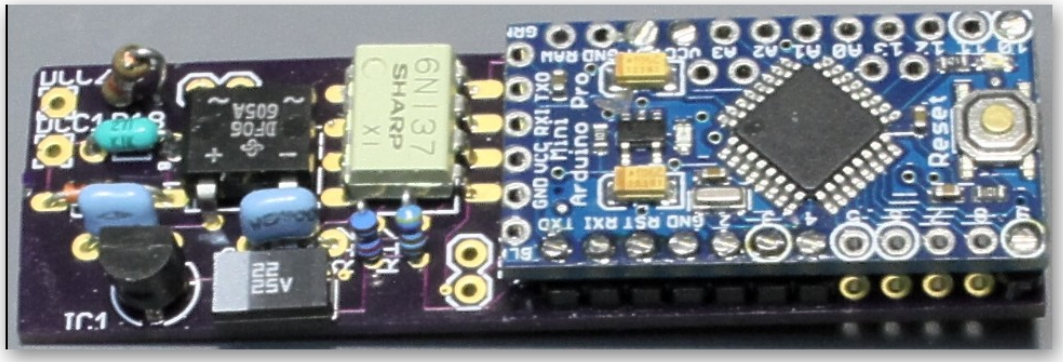
- Model Railroading is a prime use case for the Arduino
- Model Railroading has a need to control many diverse devices
  - Motors
  - Servos
  - Turnout
  - Signal
  - Lamps

DCC Controller

- Using a UNO and a motor controller board loaded with the DCC++ software library we can build a complete DCC controller and booster for under $30
  - fully NMRA compliant
  - 3 amp Booster
  - PC interface
  - JMRI support
  - Network interface
  - expansion to control other devices

Stationary Decoder

- Geoff Bunza designed a 17 channel decoder board
  - uses an Arduino Pro with 17 functions
  - has servo and motor control
  - uses an open source DCC software library
  - needs to be assembled and programed



Digitrax - LocoNet

- Digitrax has a control network know as LocoNet
- Used to connect throttles and other devices to the control station
- Arduino can be used as:
  - throttle
  - i/o module
  - control unit
- Software is open source

RFID

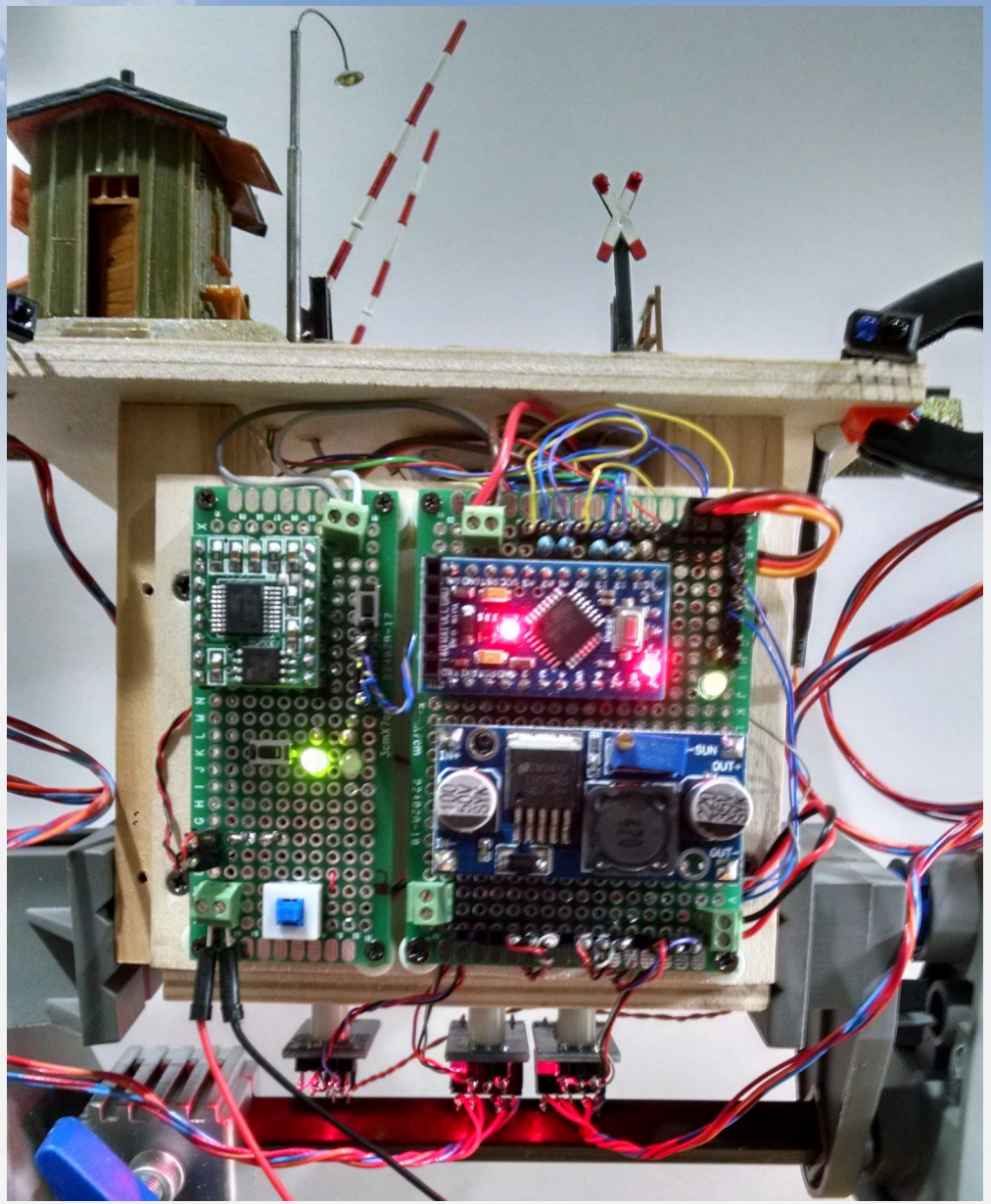
- Radio-frequency identification (RFID) can be used to identify rolling stock
- Tags are mounted on rolling stock
- A sensor reads the tag and reports back to the Arduino
- Arduino then calculates the identity and location of rolling stock and reports back to the control station
- Control Station takes appropriate action

C/MRI

- Computer/Model Railroad Interface (C/MRI) is used to control devices such as:
  - Control Panel
  - Signals
  - Turnouts
  - Turntables
  - Automation
- Developed by Bruce Chubb in 1985
- Arduino can be used
  - node for input and output
  - position decoder
  - control panel driver
- NMRA Supported

Crossing Gate

- Using Arduino Nano
- sensors embedded in track
- servo motors
- sound module
- light sensor



Video

Thomas Ose
OMS(re)Models 03/2018

Caboose Lighting

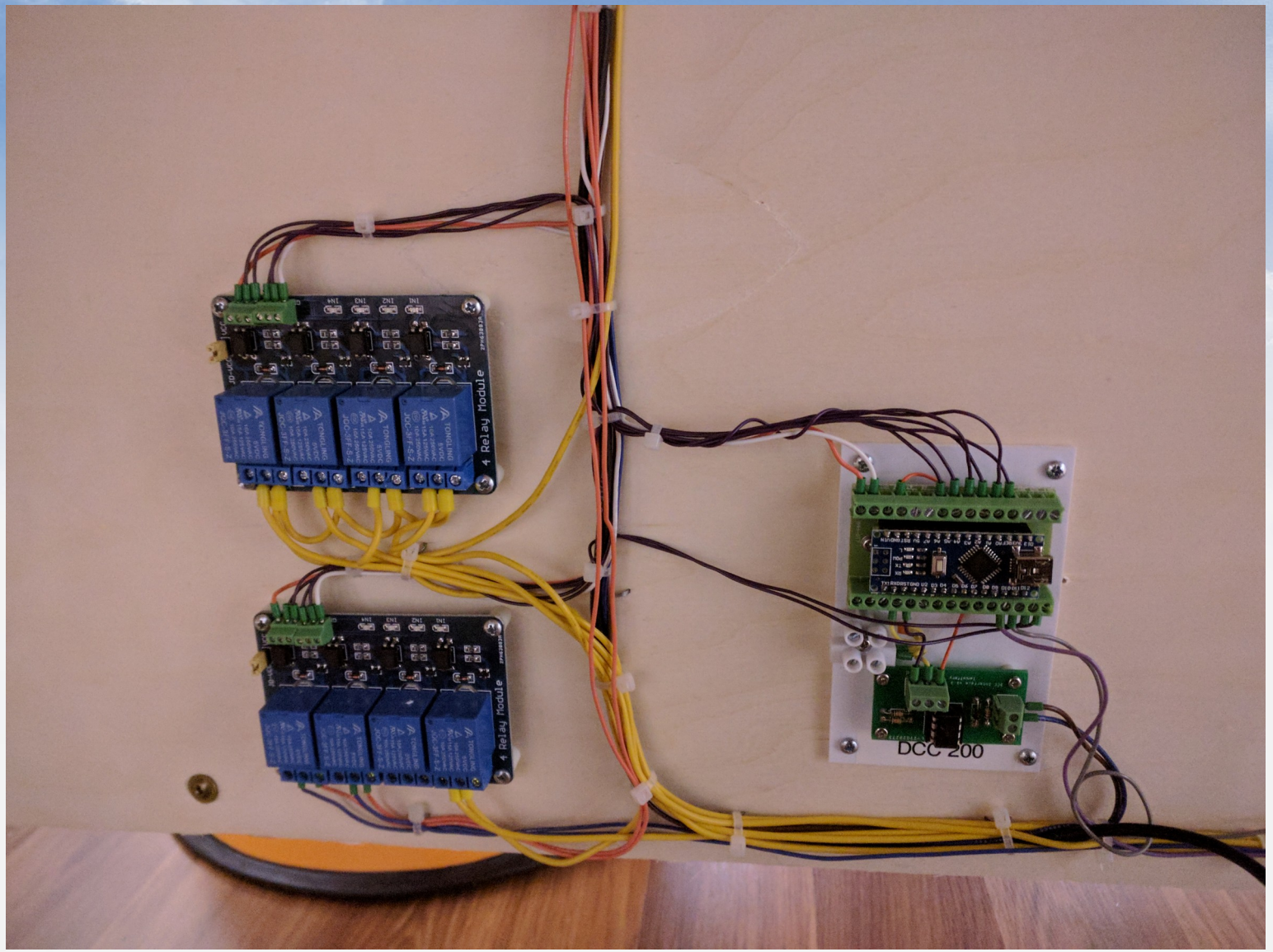
- Using Geoff Bunza board
- uses Arduino Pro
- Top LED are two LED with only 2 wires
- Powered from rail
- Controlled via DCC

- Caboose Demo

Lighting Automation

- Purpose was to control various lighting groups
- Also control 6 power to 6 staging tracks
- Lights should go on automatically
- Separate control circuits for lighting groups
- Uses Arduino Nano, relay shield and DCC Converter
- One photo sensor controls all lighting for the layout

Thomas Ose
OMS(re)Models 03/2018



Video

Thomas Ose
OMS(re)Models 03/2018

Scene Automation

- Uses Multiple Arduino Nano
- Wired on custom boards
- Uses Sound module
- Uses proximity sensor to sense approach of a person
- Outside lighting controlled by photo cell
- Automation Scene includes
  - Barn
  - Crossing
  - Farm House
  - Lighting

Video

Thomas Ose
OMS(re)Models 03/2018

Where to Buy

- Arduino http://www.arduino.cc
- SparkFun http://www.sparkfun.com
- Adafruit http://www.adafruit.com
- Amazon http://www.amazon.com
- ebay http://www.ebay.com

- or you can order them from me

Additional Resources

- Available at Amazon.com
- General books
  - Getting Started with Arduino
  - Programming Arduino
  - Beginning Arduino
- Model Railroading Related
  - Arduino Model Railroad Animation
  - Arduino Model Railroad Signals

Thank You for your time

If you have any further questions you can reach me at

OMS(re)Models
Thomas Ose
tmo@osemicro.com
(217) 483-4368

Credits

- DCC Library - NMRA
- LocoNet Library - NMRA
- C/MRI Library - NMRA

- DCC++ - Gregg
- DCC Interface Shield - Ian Jeffery
- DCC Stationary Decoder - Geoff Bunza
- C/MRI Paul Chubbs