HACKING RFIDs UNDER 2000INR

-Jayesh Singh Chauhan

About Me

- Sr. Security Engineer at PwC SDC
- OWASP SKANDA and CSRF POC generator
- OSCP
- Epitome of laziness

Topics

- RFID history
- History of RFID
- Death of the Technology
- Resurrection
- The Future
- Delve deeper
- Types of RFID

How it Began

- World War II, and the Germans rolled.
  - To distinguish the planes from that of the enemies'
- Commercialization of RFID
  - Tracking utility
  - Trucks, cows, carriages

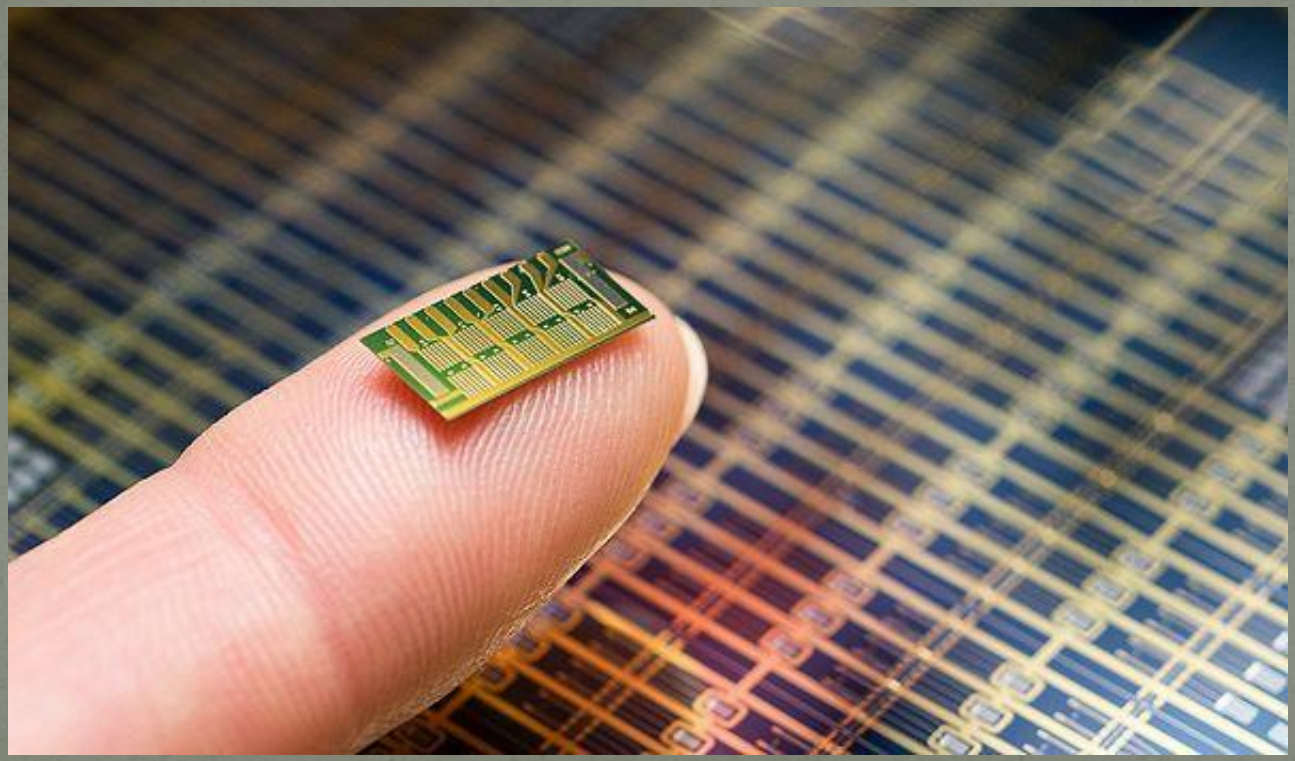
Technology Death

- 2 reasons
  - The impractical size of the RFID system
  - Cost of Production

- Early face of RFID tags
  - Inductively coupled RFID tags
  - Capacitively couple RFID tags

Resurrection of RFID

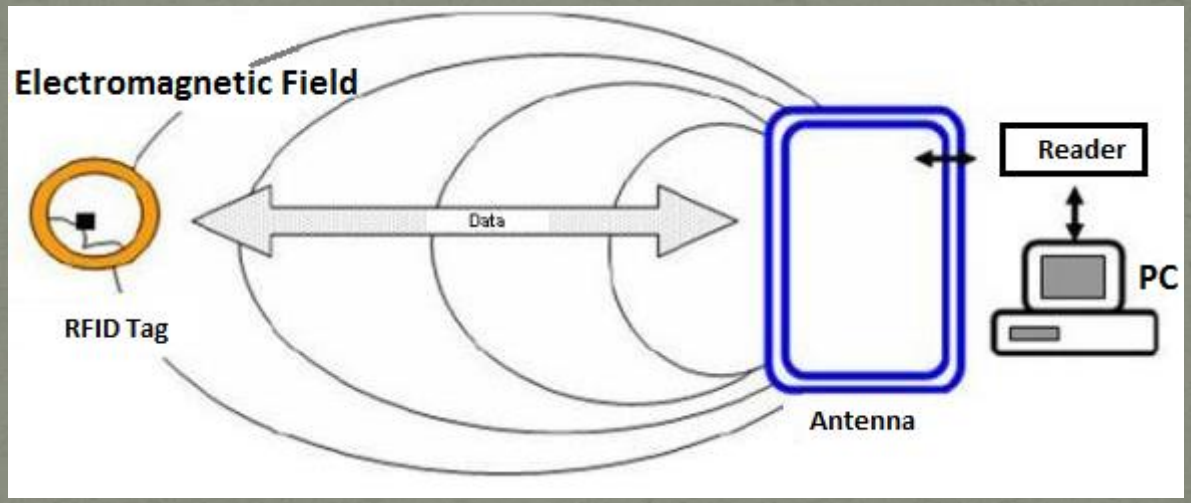
- The change – Introduction of Microchips



Where the Future lies

- Tracking and identification
- Payment and stored-value systems
- Access control
- Anti-Counterfeiting

Delving into the Technology



Types of RFID (Frequency based)

- Low Frequency
  - 30kHz to 300kHz
  - Typical: 125kHz
- High Frequency
  - 3 to 30 MHz
  - Typical: 13.56MHz
- Ultra High Frequency
  - 300MHz to 3GHz
  - Typical: 900 to 915Mhz

Types of RFID (design based)

- Active
  - Battery powers the system
- Semi-Passive
  - This too has a battery
- Passive
  - No battery

More on Active Tags

- Two types of Active Tags:
  - Transponders
  - Beacons

Types of RFID (based on usability)

- Read-only
- Read-Write
- WORM – Write Once Read Many

Important Blocks

- Block 0:

byte															byte
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Serial number				CB	manufacturer data										

CB: "serial number check byte" CB = byte 0 ^ byte 1 ^ byte 2 ^ byte 3 (^ ... XOR)

- Block 3 in each sector is the Sector Trailer

default coding:

byte															byte
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
transport key A						FF	07	80	xx	transport key B					

(blocks 3 / 7 / 11 / 15 / 19 / 23 / 27 / 31 / 35 / 39 / 43 / 47 / 51 / 55 / 59 / 63)
Byte 9 of all sector trailers is not defined. Its memory contents after IC test can vary.

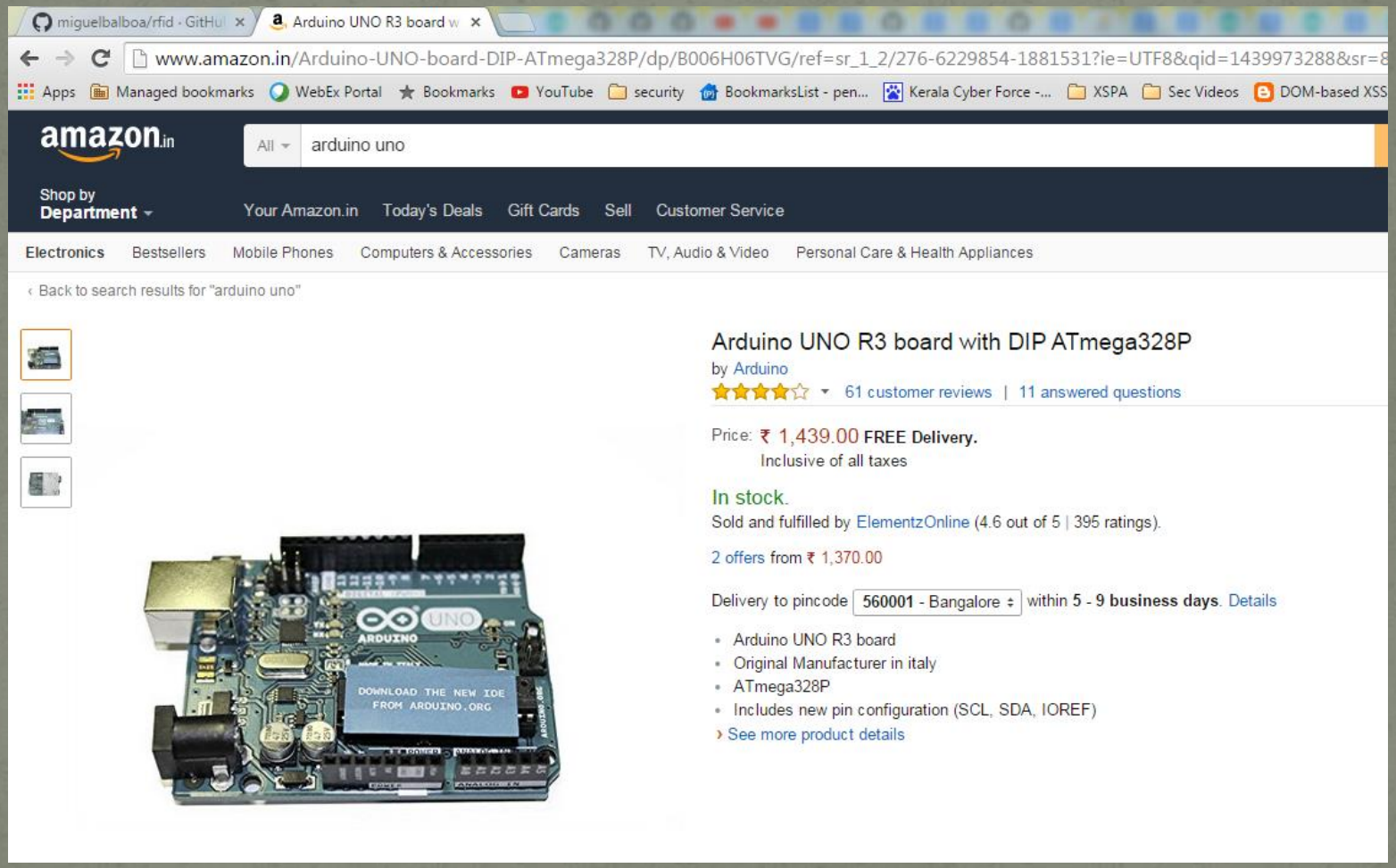
Data space in MIFARE Classic (1 KB)

- (16 sectors/card x 3 data blocks/sector X 16 bytes/block) – 16 bytes (first block) = 752 bytes/card

Setup

- Arduino Uno
- MFRC522
- MIFARE Classic Card/Tags – 13.56 Mhz
- Jumper Wires
- MFRC522.h Library

Arduino Uno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Arduino UNO R3 board w
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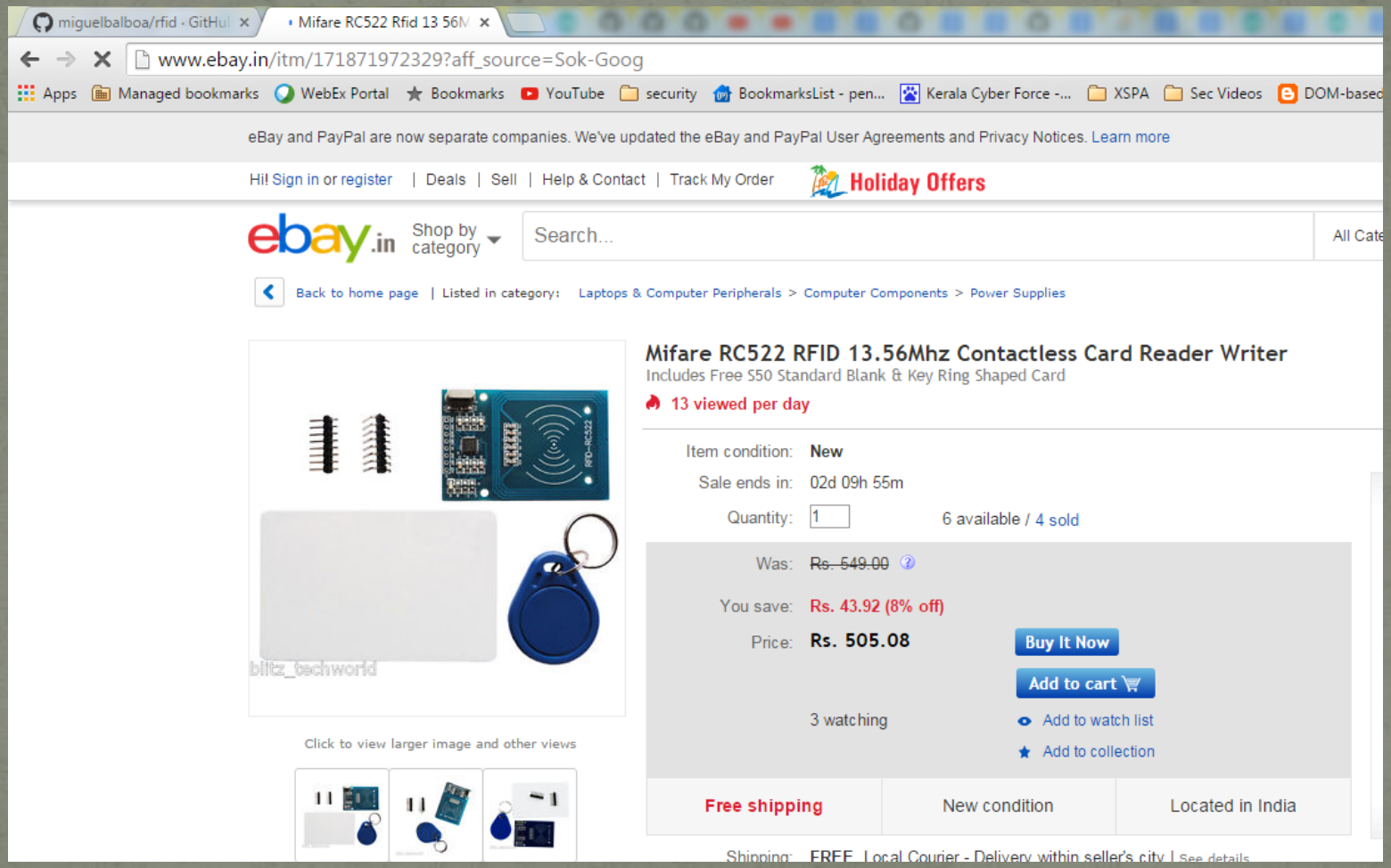
MFRC522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DOM-based
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13 viewed per day
Item condition: New
Sale ends in: 02d 09h 55m
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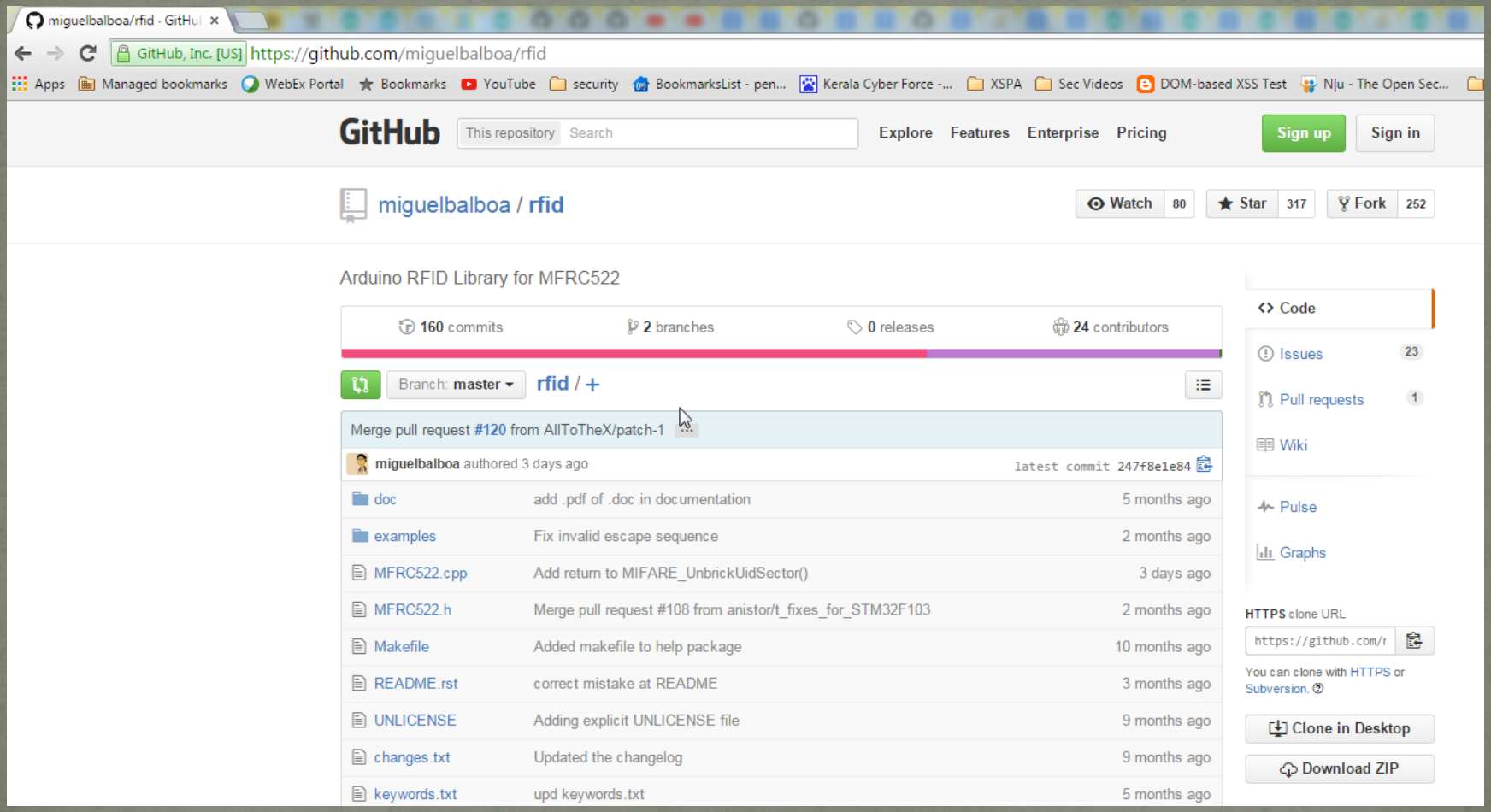
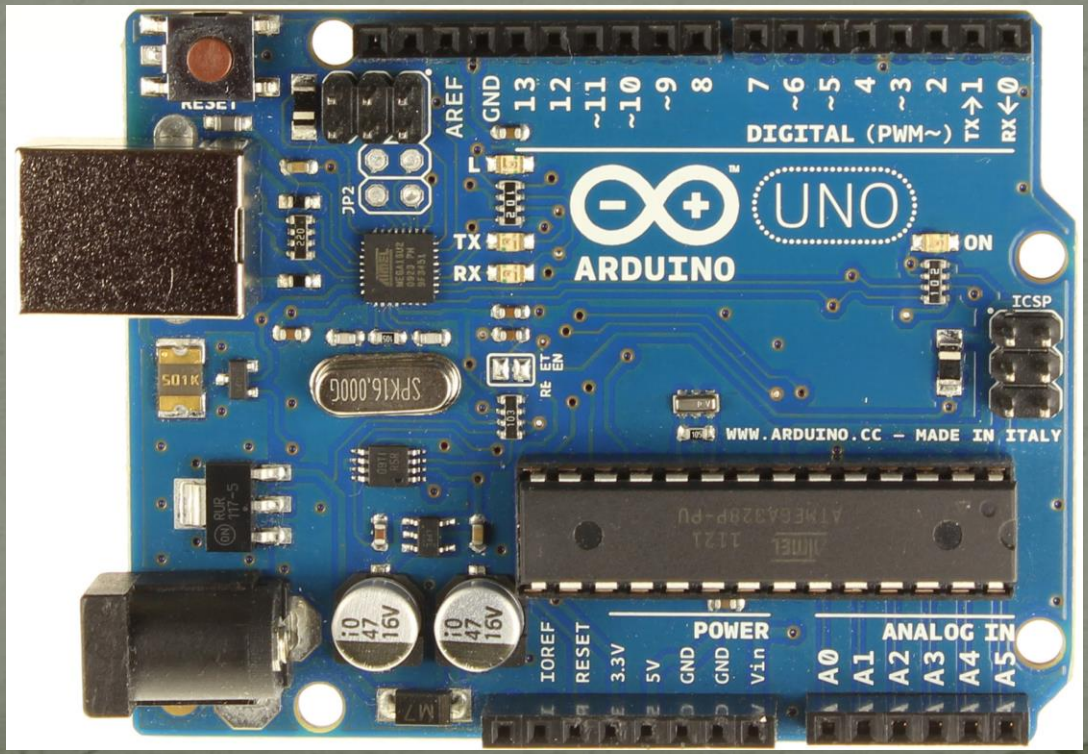
RFID Library



Important Hardware Involved

- Micro Controller: An Arduino
- PCD(Proximity Coupling Device):MFRC522
- PICC (Proximity Integrated Circuit Card): card
  - 16 sectors * 4 blocks/sector * 16 bytes/block = 1024 bytes

Demo


RESET
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM~)
L
TX
RX
UNO
ARDUINO
ON
ICSP
JP2
WWW.ARDUINO.CC – MADE IN ITALY
POWER
ANALOG IN
IOREF
RESET
3.3V
5V
GND
GND
Vin
A0
A1
A2
A3
A4
A5

Cloners - Out of the box

- Proxmark3
- BishopFox

Q & A ?

Credits

- Yashin Mehaboobe
- Miguel Balboa

Contact

- @jayeshsch