Wireless Garage Door Alarm System

Built around a Raspberry Pi

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Outline

- System Plan and Motives
- Components
- Design
- Development
- Problems

System Plan

- Warn a user when they leave their garage door open
- Assure the user receives the warning
- Car can be in the driveway without alarm
- Door can be open without alarm

Technology

- Use modern exciting tech
- Make a reliable robust system
- This may not be the simplest solution

Components

- Car detector
- Alarm
- Garage door reader
- Application processor

Car Detector

- Method
  - Toggle detector
  - Ping micro controller
  - RFID
- Requirements
  - Long range
  - Very low to no power in car

Alarm

- Method
  - Speaker with micro controller
  - Text message
- Requirements
  - Very long range
  - Very low to no power in car

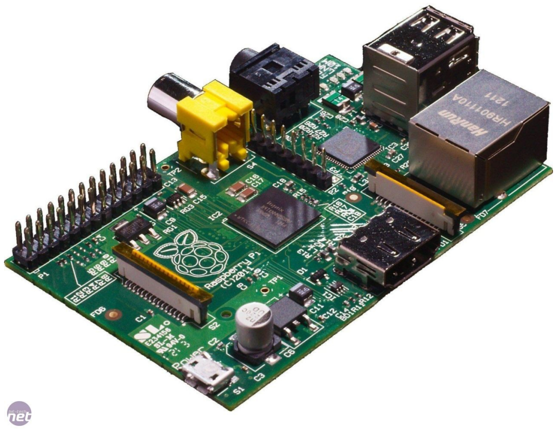
Door reader – Application Module

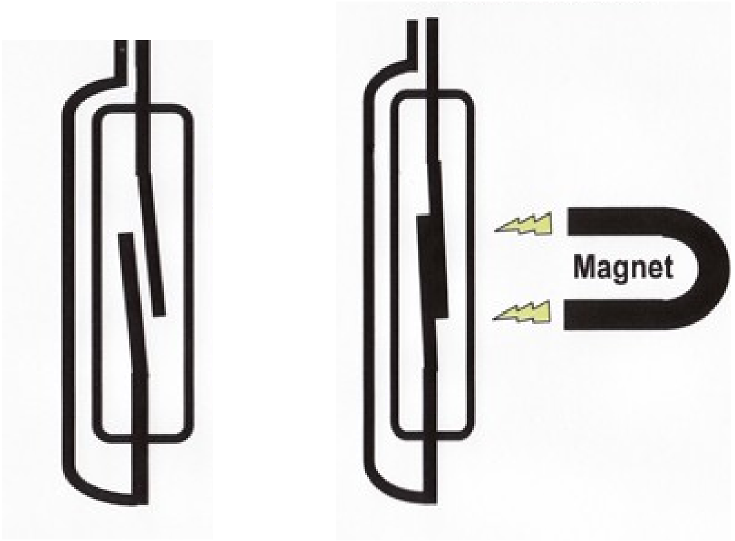
- Door reader
  - Infrared detector
  - Magnetic switch
- Application module
  - Micro controller
  - Raspberry Pi

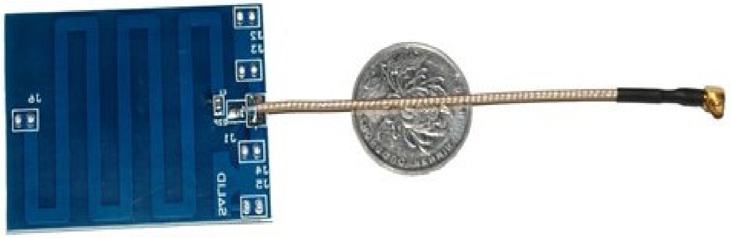
Our Design

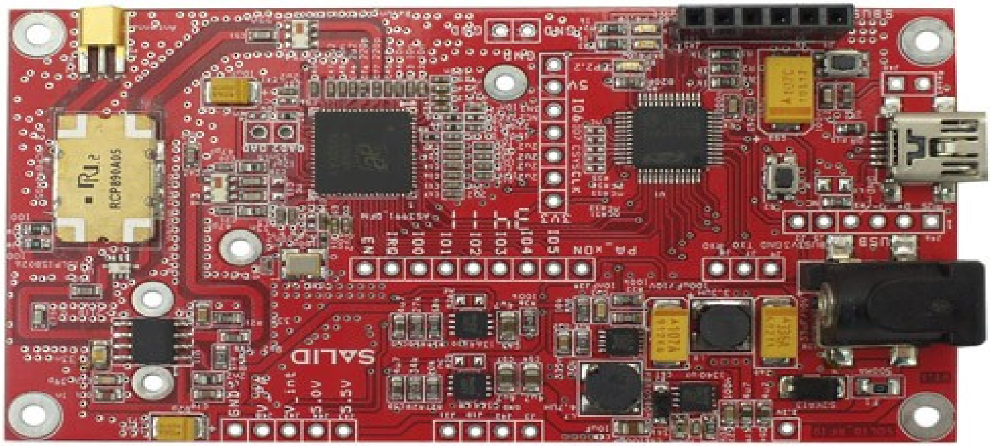
- Linksprite Cottonwood UHF RFID Module
- Text messaging
- Magnetic reed switch
- Raspberry Pi

Our Components







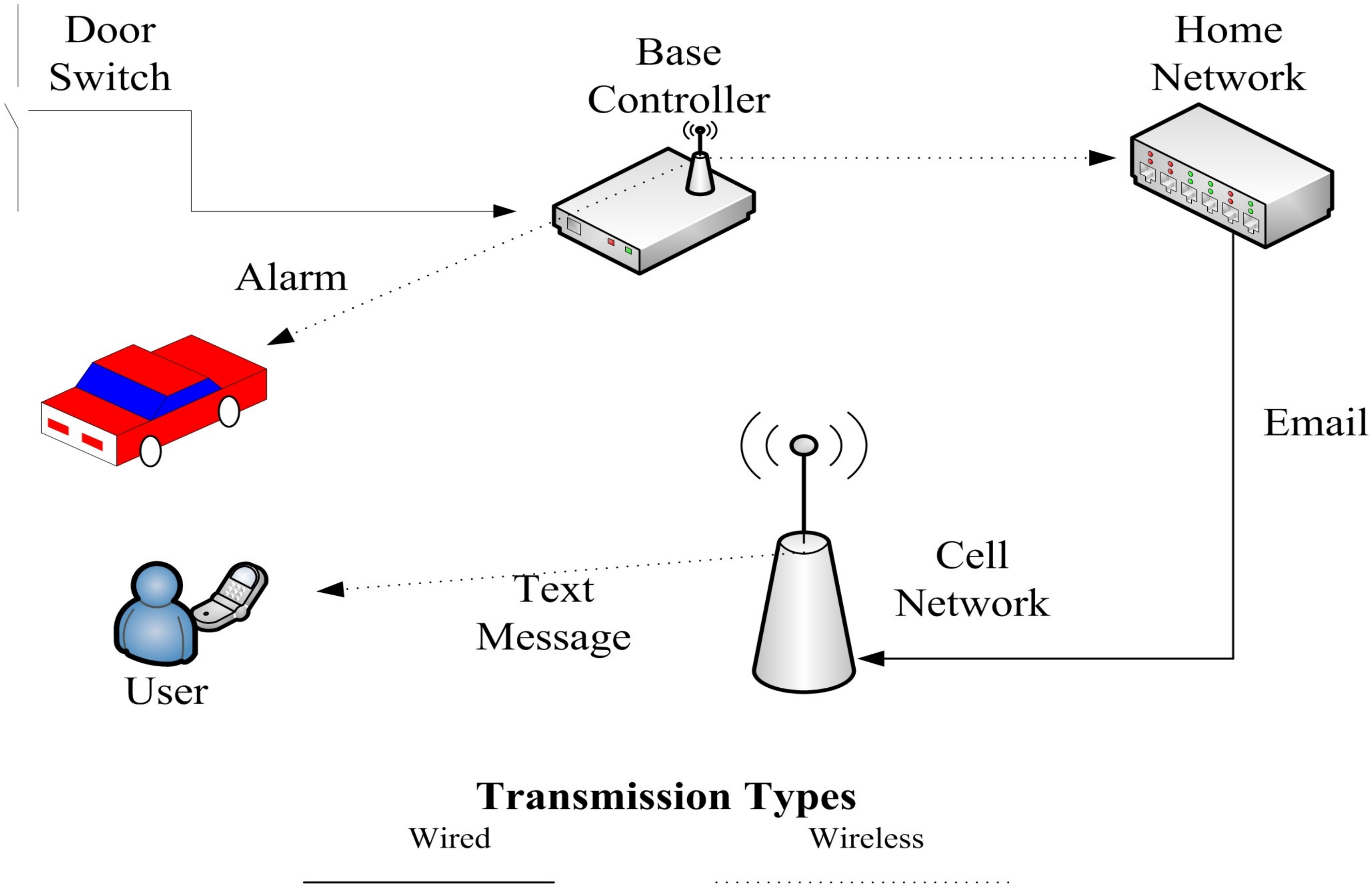


http://www.chicagosensor.com/HowFloatSwitchesWork.html

http://www.bit-tech.net/modding/2013/03/22/raspberry-pi-case-competition-update/1

http://linksprite.com/wiki/index.php5?title=Cuttonwood:_UHF_Long_distance_RFID_reader_module

System Diagram



Door Switch

Base Controller

Home Network

Alarm

Email

Cell Network

Text Message

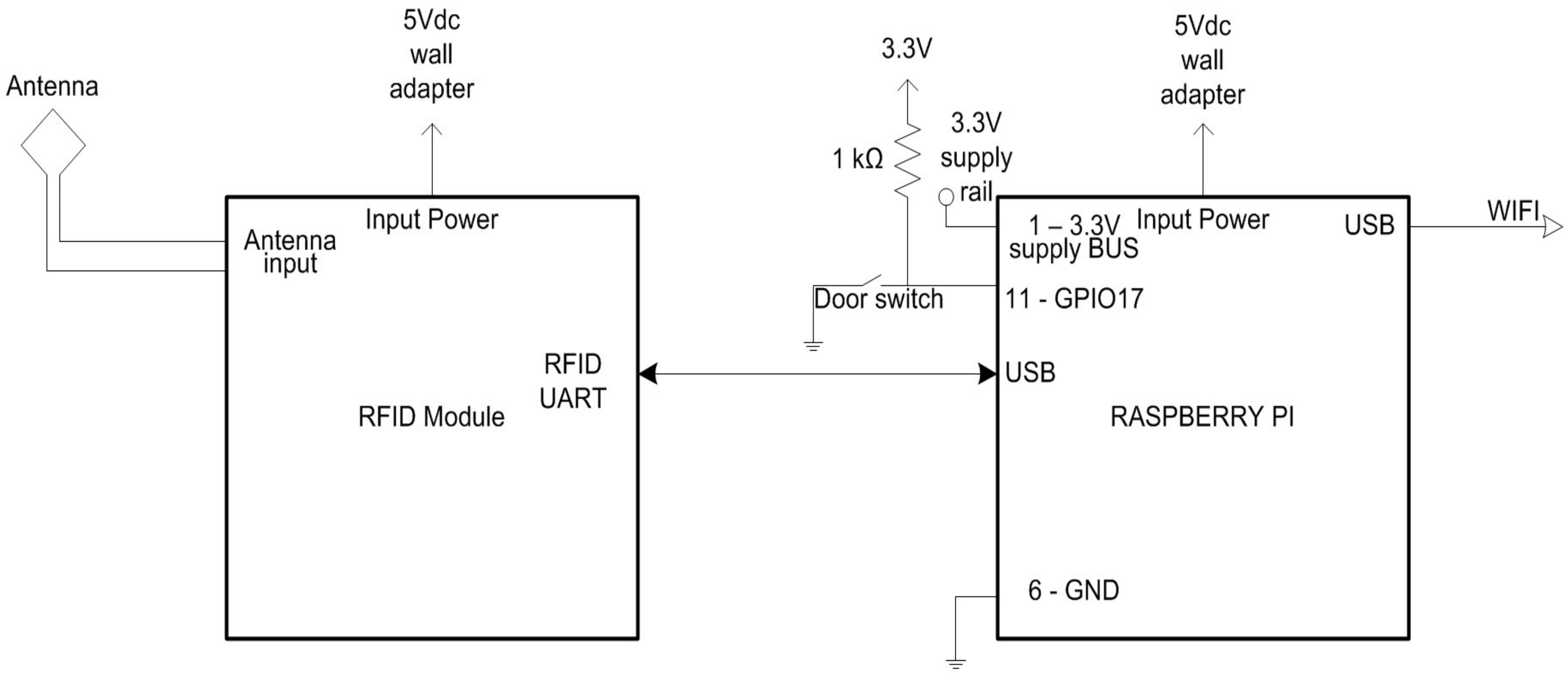
User

Transmission Types

Wired

Wireless

Circuit Diagram



Raspberry Pi Requirements

- USB communication with RFID Module
- Read GPIO input
- Send test messages (sms)

USB Communication

- C++ support for a standard HID driver
- HIDAPI
- Can treat USB as a ttl UART

Read GPIO Input

- No native C++ support on Pi.....
- WiringPi library– based on Arduino
- Initialize, I/O, no deinitialize

Text Messaging

- Send email through SMTP
- Email to users network carrier
- Relay to phone as sms
- Gmail – 100 SMTP per day
- For Verizon 1234567890@vtext.com

Text Messaging

- No native C++ email support
  - Sendmail
  - Postfix
- Native Python email support
- System call
  - Messy?
  - Embedded

Pseudo Code

```
initialize WiringPi_DoorInput
initialize HidApi(RFIDReader)
while on
    if start
    if (readGPIO(DoorInput))
        if TagNotInRange
            SendEmail(DoorOpen)
            while(TagNotInRange)
                sleep(.5)
    sleep(.5)
deinitialize HidApi
```

Problems in Code

Problem	Solution
• Deinitialization never happens	• Cntrl-c interrupt handler
• Noise on GPIO	• Debouncer
• Noise on RFID	• Check multiple times

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Questions