CHURCH OF WIFI

TIME TO PLAY

New Wireless Fun From the Church Of WiFi

Who we are

Founded by Blackwave

Reformed in 2005 after Blackwave vanished

An attempt to facilitate collaboration and skills sharing

Free for anyone to join, but you should contribute

Trying to bring ideas to light that might otherwise never be acted on

Members Present

- Speaking
  - RenderMan
  - Thorn
  - H1kari
- In the audience
  - Dutch
  - Joshua Wright
  - Skynetos
  - GB3

Project Updates

- CoWF WPA lookup tables
  - Torrent Online and a few archives of individual files
  - 7 gb
  - Anyone with reliable large hosting, please help!
- Evil Bastard
  - Evil bastard finally here (and so is Dutch)
  - Demo
- Kiswin
  - Depreciated until newcore

New stuff

We've been busy since Shmoocon and Layerone:

Look ma' no head!

Sneaky bastard

When hardware attacks!

Bigger, faster better WPA cracking

Breaking WPA is fun, but WPA2 is more fun

Headless wardriving

The dream of a small automated wardriving unit

WRT54G is the perfect platform

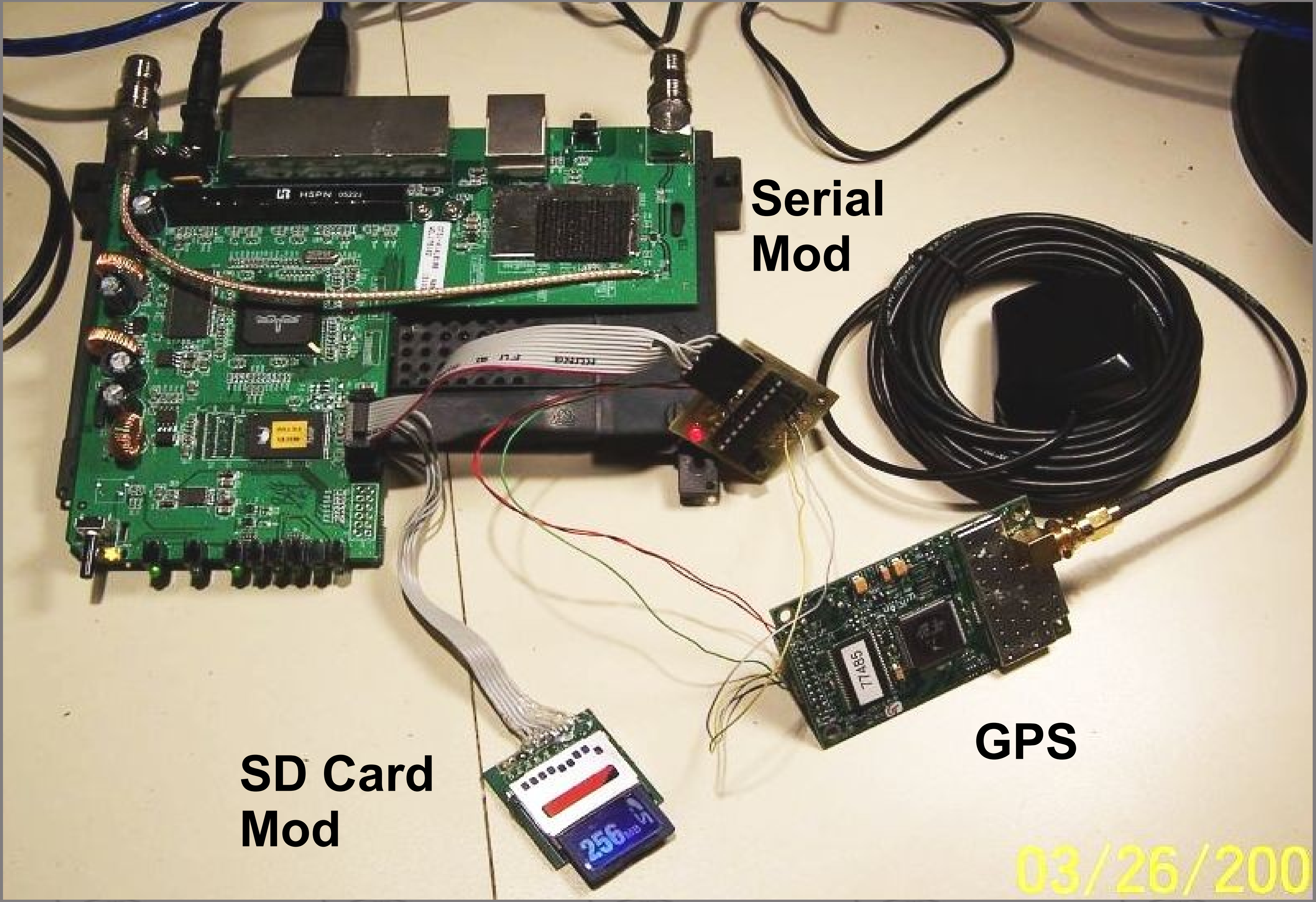
Need GPS, storage, power circuit

Beakmyn, King_Ice_Flash, Mother, Scrudge and others stepped up

Beakmyn's Headless Wardriver

- Integrated GPS internal, SD card
- External active GPS antenna
- Logs saved to removable SD card
- Beakmyn did the hard work (Kismet and GPSD crosscompiles)
- Rough ipkg available for OpenWRT
- Backup power circuit in the works

Beakmyn's Headless Wardriver



Serial Mod

GPS

SD Card Mod

Beakmyn's Headless Wardriver

King_Ice_Flash's Headless Wardriver

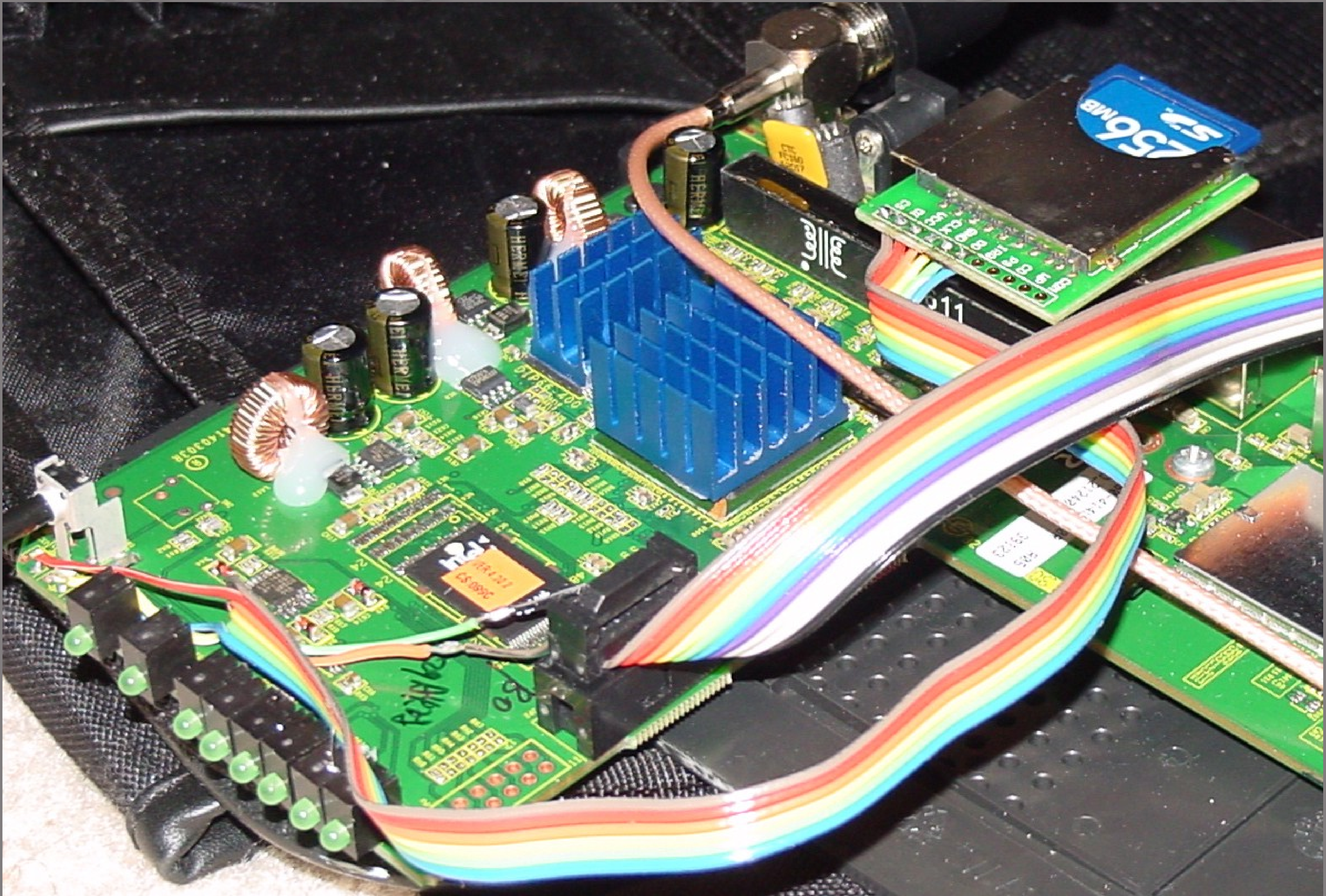
Based off Beakmyn's design with some changes

Temperature controlled heatsinks and fans

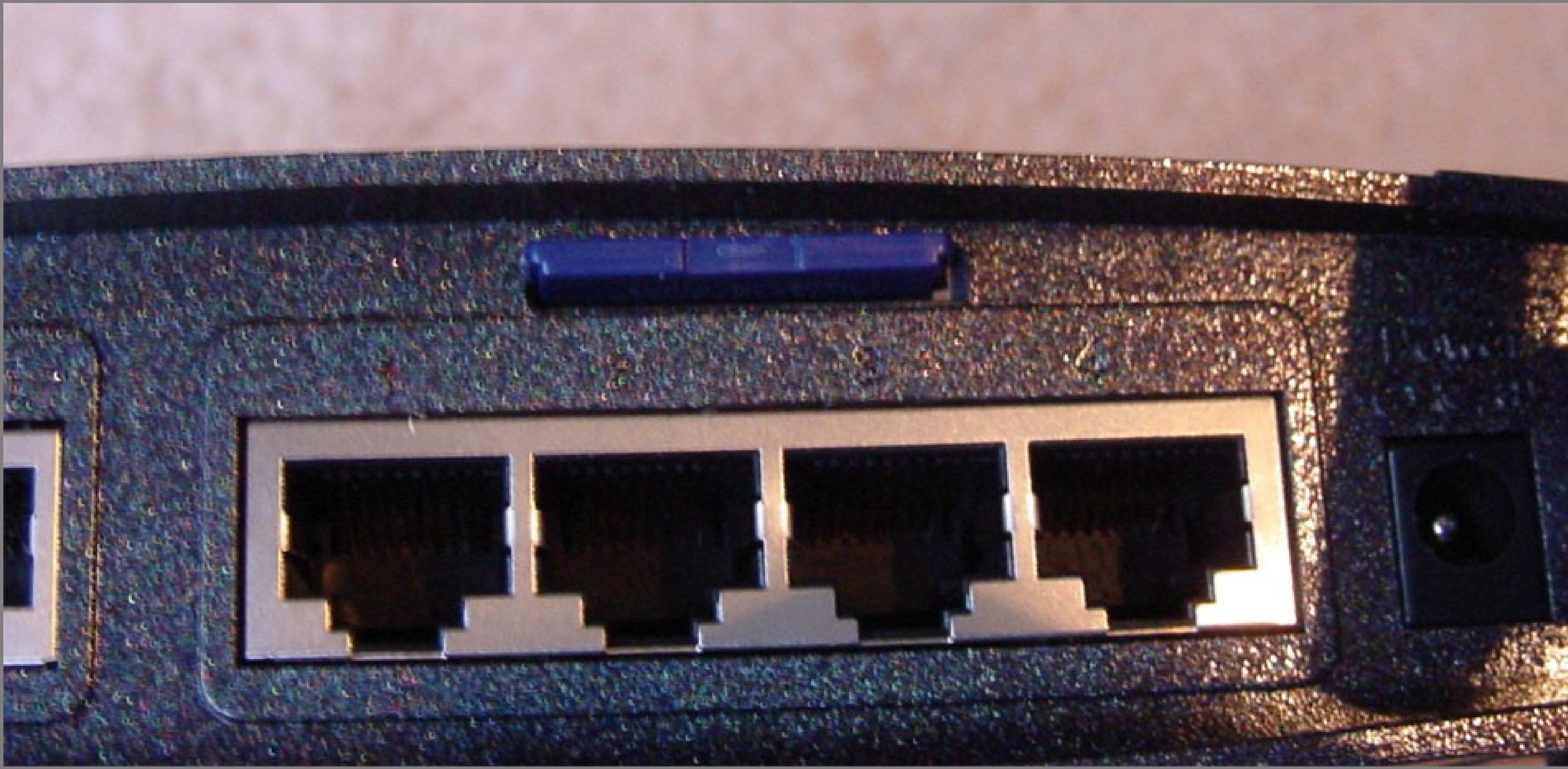
Sexy laser cut SD card

Integrated internal GPS

King_Ice_Flash's Headless Wardriver



King_Ice_Flash's Headless Wardriver

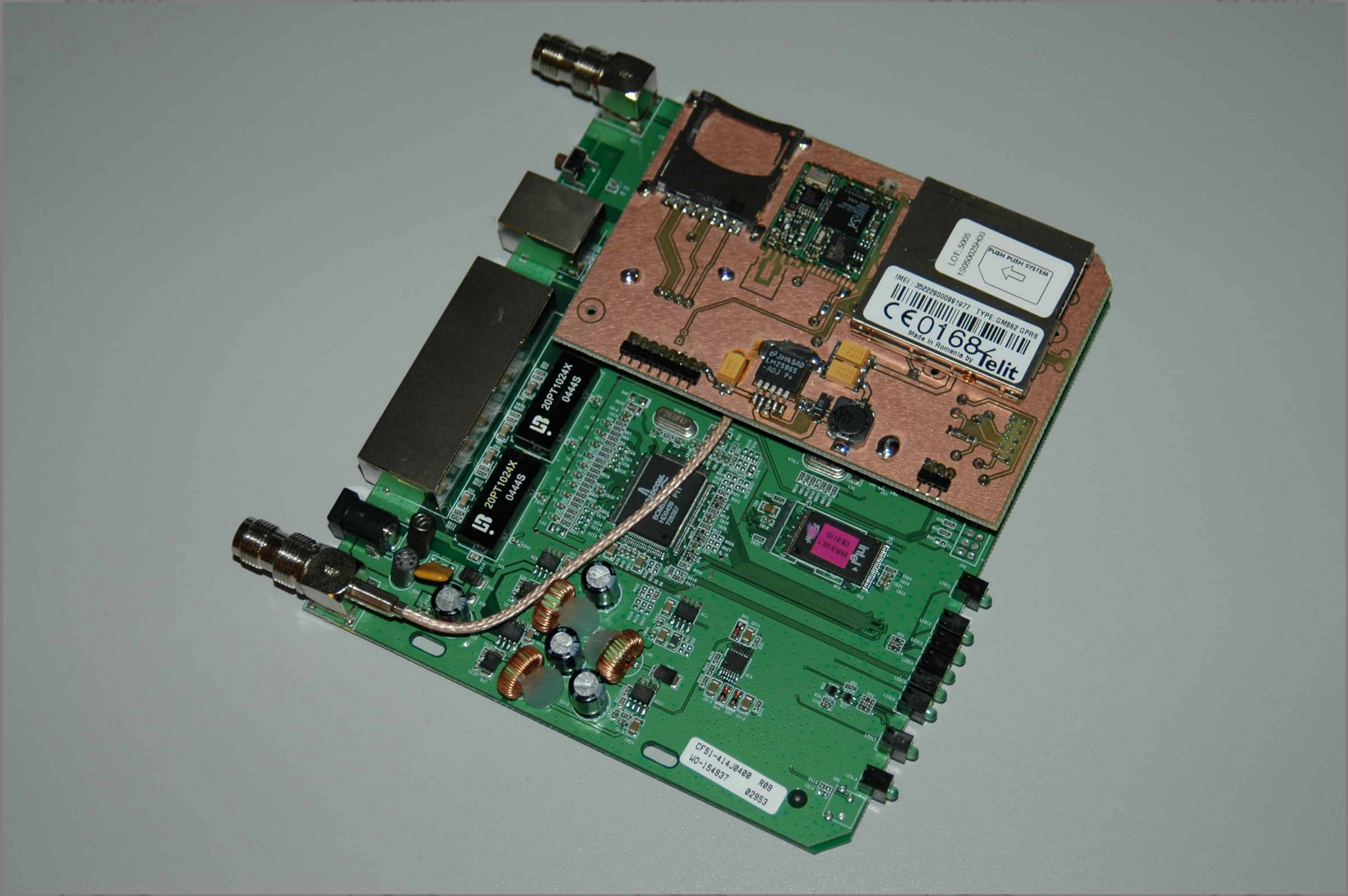


Mother's Headless Wardriver

SD card, GPS, GSM/GPRS!

All integrated on a sexy custom board

Mother's Headless Wardriver



Sneaky Bastard

- Inspired by Inventgeek.com's 'Rogue server' – Hidden storage server in a UPS
- Well, we can do better
- Integrate a rogue access point into a UPS
- Normally plugs into a wall (provides power)
- Normally has network pass through surge protection (network access)
- Fun for pen tests

Sneaky bastard

APC 350 Ups that got wet and fried

Gutted power circuitry, removed battery case

Jumpered around the circuitry and powered the sockets (they still work!)

Spliced in WRT54G wallwart

Installed patch cables into network surge protector (both hooked to the WRT switch)

Voila!, Hidden rogue AP

Load EB firmware for maximum fun

Sneaky Bastard

Pics go here

When hardware turns evil

Based off ideas from Ciscogate and the Evil Bastard

If you 0wn the hardware in the middle, you own everything

How do you know the firmware your running is original

What about consumers? How do you clean a virus from your router? How do you know it's not a linksys firmware?

Wireless virus concept

No POC, too dangerous

Based off of Pre-Set Kill Limit's 'killbot' WRT

Open source firmware gives intimate knowledge of internals, vulns

Settings maintained through flash in the Nvram

Raises many questions about what consumers and admins can do

No integrity checking for hardware, particularly COTS gear

The Problem

Default AP's a lot more dangerous

User has no way to verify the integrity of the running firmware, no anti-virus solution

Any vulnerability on the WAN side could expose a huge number of AP's to re-flashing/infection/bricking

Spambots, backdoors, DoS bots, whatever

Could be used to infect connected hosts

Evil bastard type actions

Step by step

Assume a WRT54G(S)(L)

At 3am, WRT runs cron job and goes into client mode and scans for nearby networks named 'linksys'

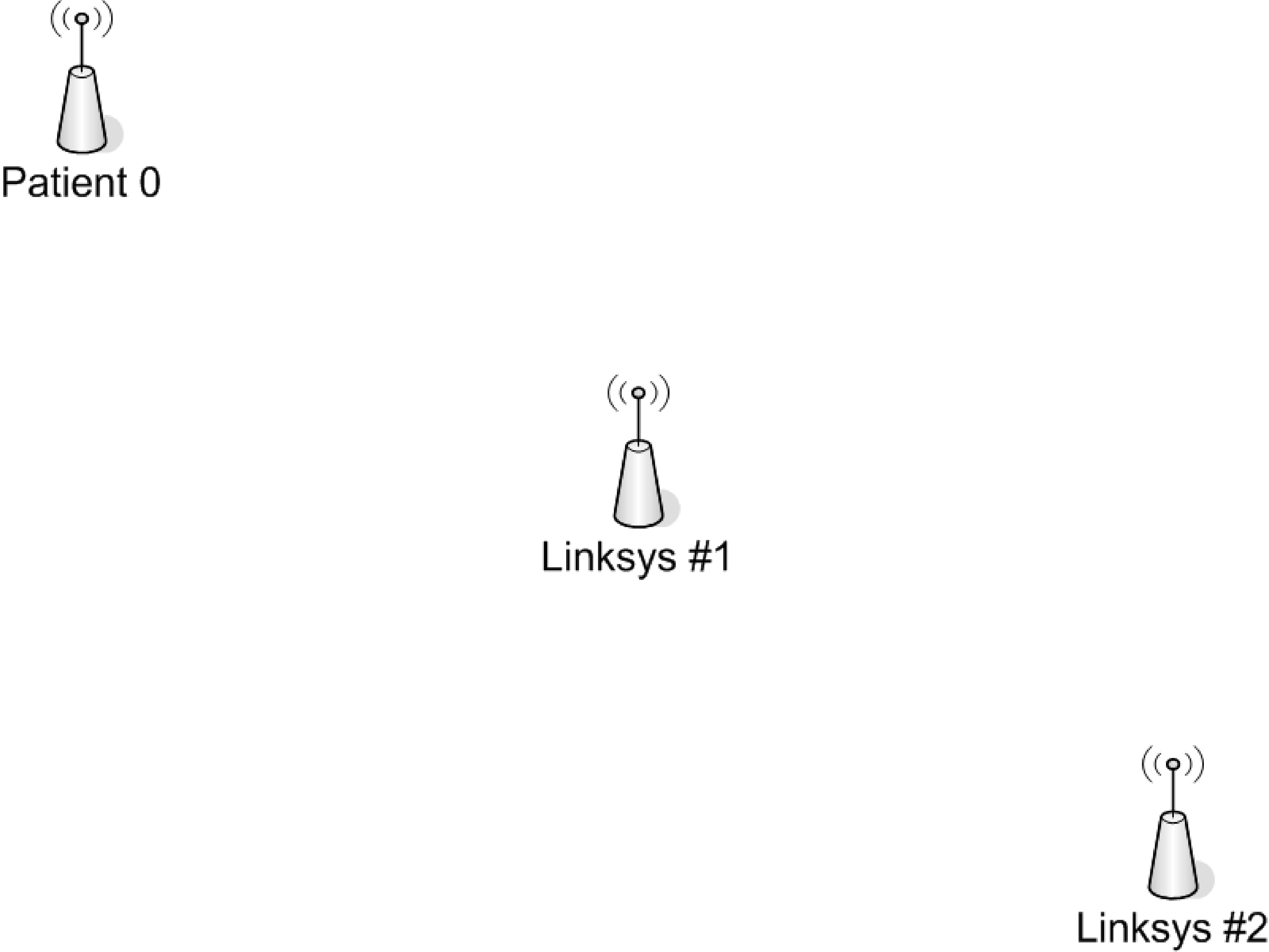
If open, connect and try the admin page

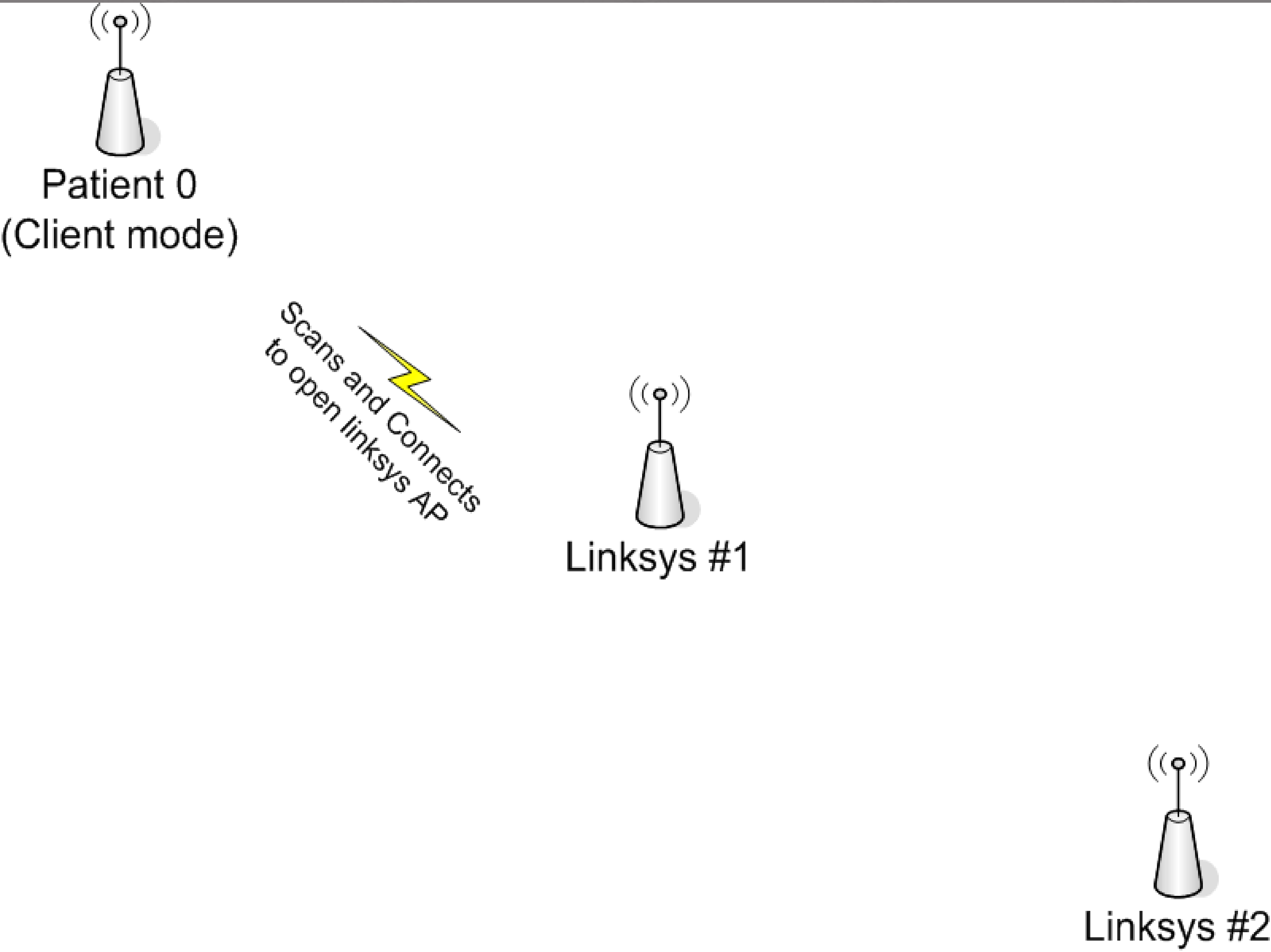
If no password (or default password), upload copy of the evil firmware (Yes, you can reflash over wireless)

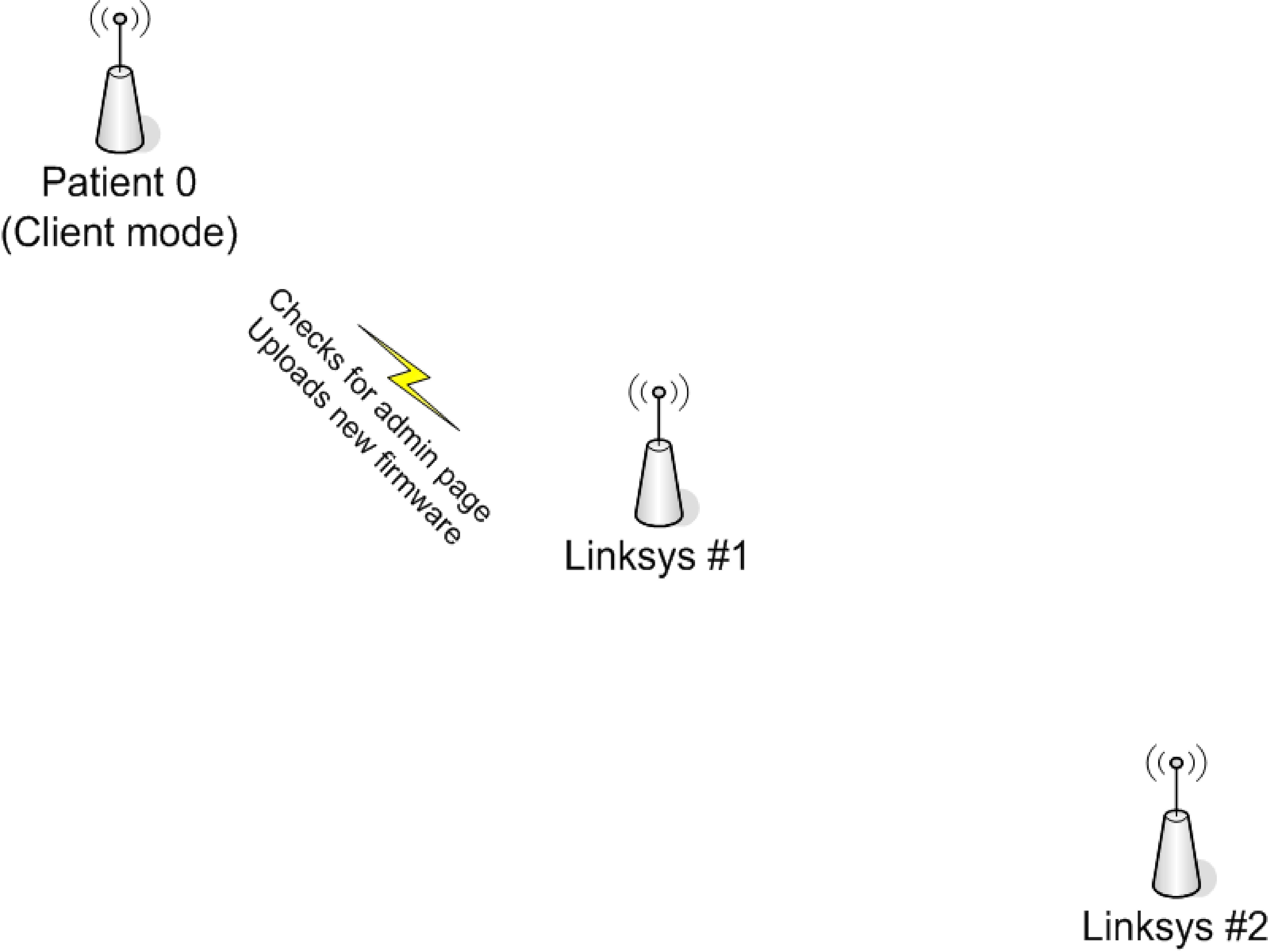
Unit reboots, maintaining SSID, channel, etc, but running new firmware

Newly infected unit repeats process, passing the infection along

AP continues to function normally, user unaware of what firmware is now doing (except for outage at 3am)


Patient 0
Linksys #1
Linksys #2


Patient 0
(Client mode)
Scans and Connects
to open linksys AP
Linksys #1
Linksys #2

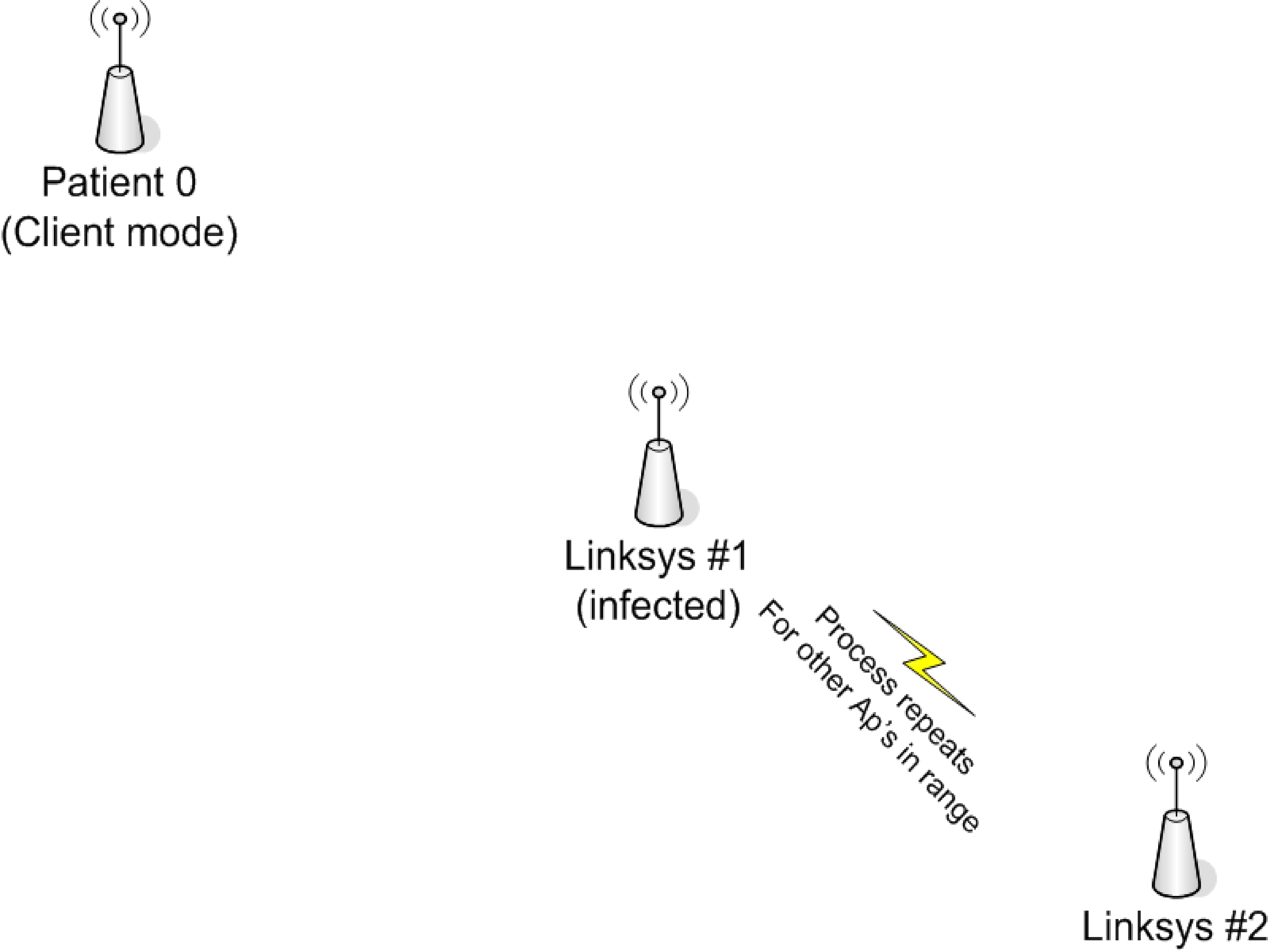


Patient 0
(Client mode)

Checks for admin page
Uploads new firmware

Linksys #1

Linksys #2



Patient 0
(Client mode)

Linksys #1
(infected)

Process repeats
For other Ap's in range

Linksys #2

Caveats

- Unit must be in default modes
  - Rudimentary brute force for admin page could be made
  - Login banners could trigger unit specific attacks from known exploits
- Not suitable where only one AP in range (campus's on the other hand)
- Flashing over wireless can brick the router (still not a good thing)
- Only suitable for open firmwares, but there's a lot of AP's using them
- Care could be taken to clone the linksys web admin to appear to the user to be acting normal

Solutions?

- Checksum facility for running firmware?
  - Easily worked around
- Non-flashable hardware
- Proprietary firmware with digital signatures
- TCP profiling for changes
- Suggestions?
- A lot of consumer hardware running open source firmware, problem could grow to switches, modems, etc.

WPA-PSK cracking tables

- Debuted at Shmoocon
- Applying pre-computation attack to WPA-PSK
  - Genpmk util in CoWPAtty 3.0
  - Allows for 3 order of magnitude increase in speed
- CoWF lookup tables
  - 1000 top SSID's computed against 172,000 word dictionary
  - 7GB
- Torrent available (finally), thanks Audit, c0n!
- OSX can do it as well (thx beetle)

Bigger, faster, better!

7 GB is a good start, but I wanted more

SkynetOS & GB3 wrangled 14 CPU's for 'testing'

Mark Burnett provided list of actual used passwords

Marinate, shake and stir = Million word dictionary

3 weeks, 3 blown fuses....

Bigger, Faster, Better

And the damn tables did'nt work!!!

Always doublecheck your UNIX/DOS text files

Luckily, H1kari steps up with coWPAtty -f

CoWPAtty -f

Hardware FPGA implementation of PBKDF2 algorithm

P4 3.8 Ghz – 69 keys/sec

FPGA – 200 keys/sec per card

We have 15 cards!

~3000 keys/sec

What took 3 weeks took 3 days!

CoWF WPA Uber-lookup tables

40 gig

1000 top SSID's against a million word dictionary

Torrent online at www.churchofwifi.org after con

Please seed!

WPA2 Through Brute Force

- Shmoocon release of coWPAtty 3.0 went well, a lot of conversation afterwards
- Josh Wright mentioned possible WPA2 vulns
- Kept a fire under him to follow the path
- So simple he had to explain it twice

CoWPAtty 4.0

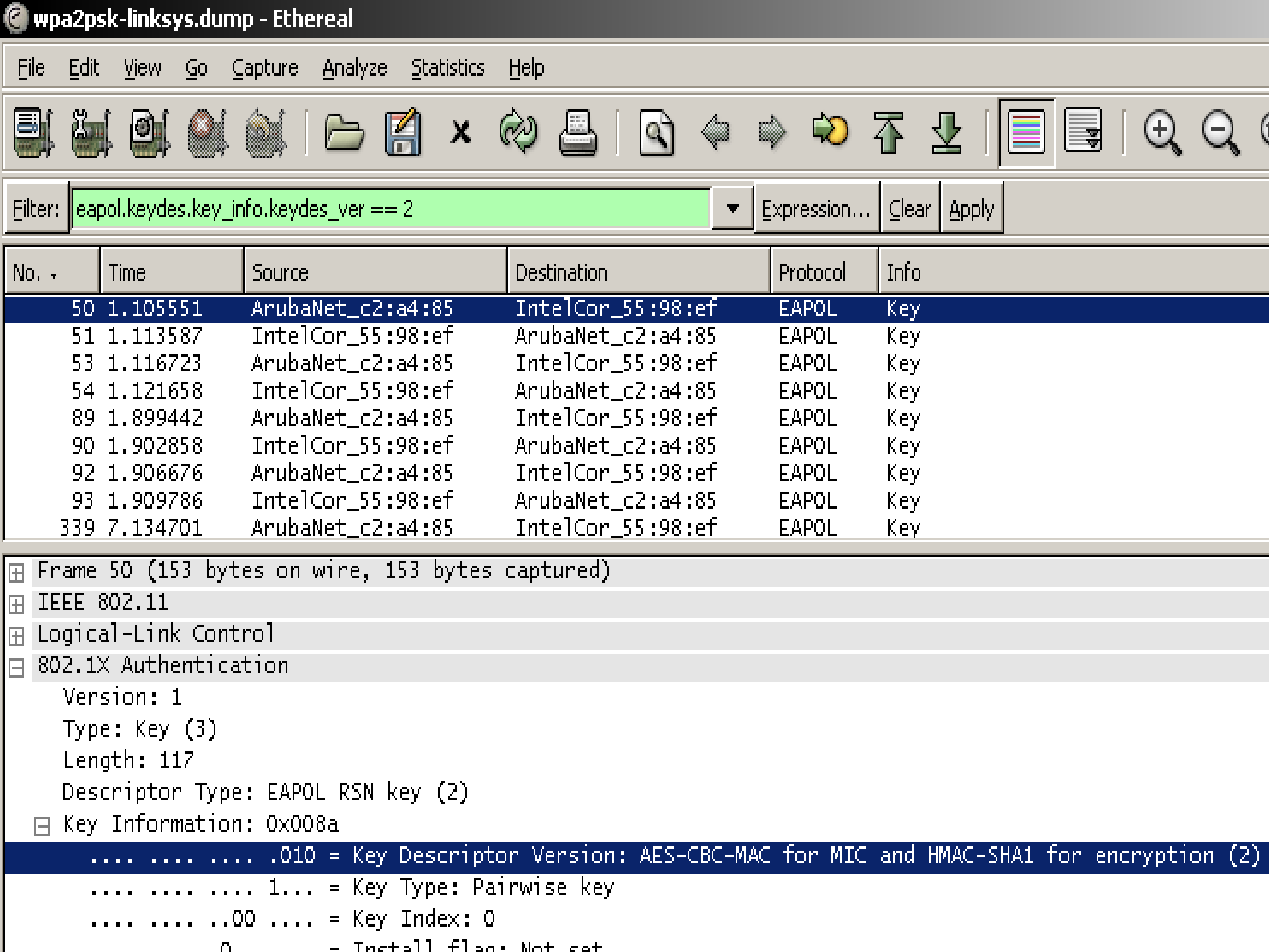
WPA-PSK and WPA2-PSK share the same PBKDF2 function

The same problem with WPA1 is present in WPA2

WPA2 might use stronger crypto, but only as strong as the weak link

CoWPAtty 4.0 supports WPA2-PSK

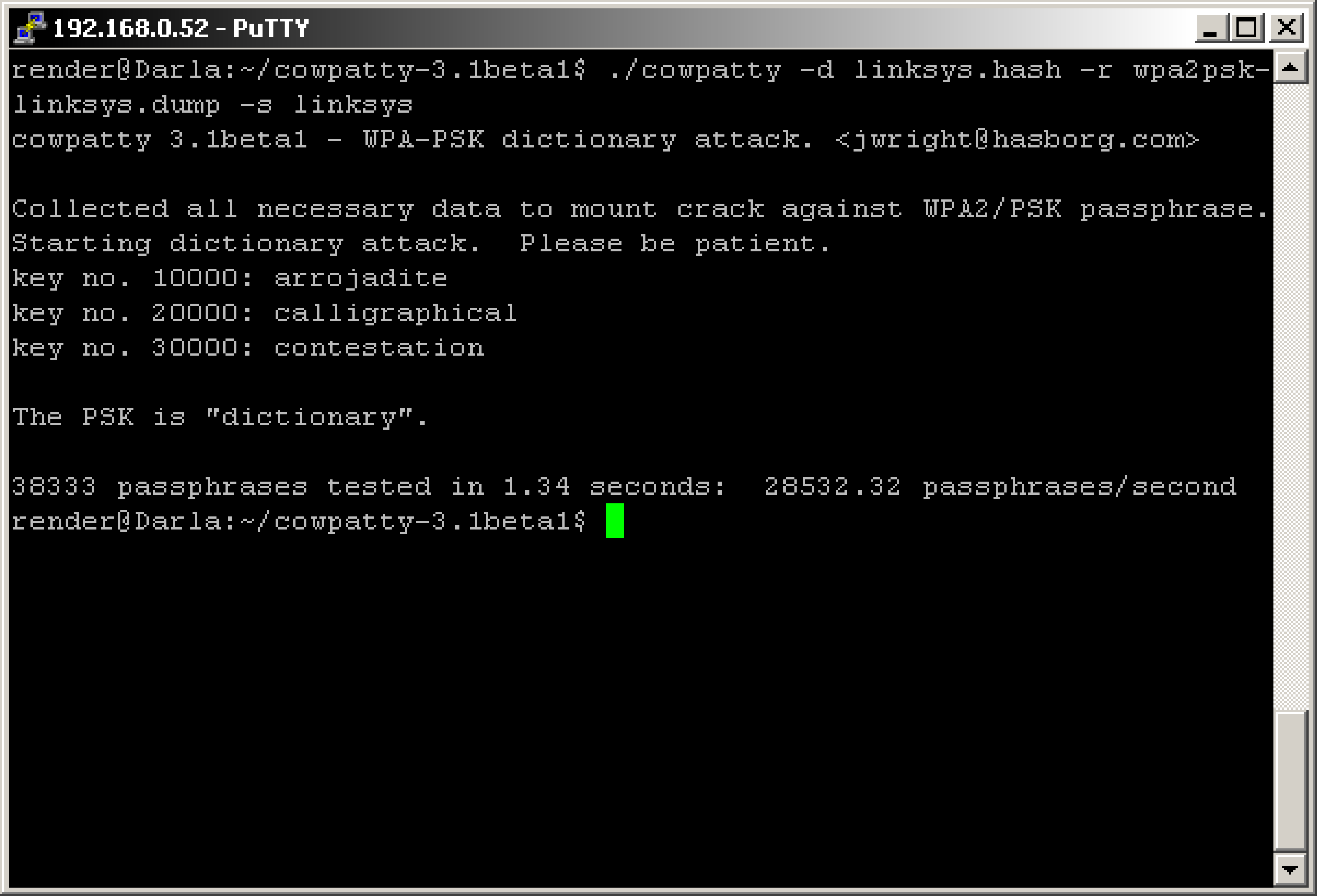
Demo



Filter: eapol.keydes.key_info.keydes_ver == 2

```
No. -  Time      Source              Destination         Protocol  Info
   50  1.105551  ArubaNet_c2:a4:85   IntelCor_55:98:ef   EAPOL     Key
   51  1.113587  IntelCor_55:98:ef   ArubaNet_c2:a4:85   EAPOL     Key
   53  1.116723  ArubaNet_c2:a4:85   IntelCor_55:98:ef   EAPOL     Key
   54  1.121658  IntelCor_55:98:ef   ArubaNet_c2:a4:85   EAPOL     Key
   89  1.899442  ArubaNet_c2:a4:85   IntelCor_55:98:ef   EAPOL     Key
   90  1.902858  IntelCor_55:98:ef   ArubaNet_c2:a4:85   EAPOL     Key
   92  1.906676  ArubaNet_c2:a4:85   IntelCor_55:98:ef   EAPOL     Key
   93  1.909786  IntelCor_55:98:ef   ArubaNet_c2:a4:85   EAPOL     Key
  339  7.134701  ArubaNet_c2:a4:85   IntelCor_55:98:ef   EAPOL     Key
```

```
⊞ Frame 50 (153 bytes on wire, 153 bytes captured)
⊞ IEEE 802.11
⊞ Logical-Link Control
⊟ 802.1X Authentication
    Version: 1
    Type: Key (3)
    Length: 117
    Descriptor Type: EAPOL RSN key (2)
  ⊟ Key Information: 0x008a
      .... .... .... .010 = Key Descriptor Version: AES-CBC-MAC for MIC and HMAC-SHA1 for encryption (2)
      .... .... .... 1... = Key Type: Pairwise key
      .... .... ..00 .... = Key Index: 0
      .... .... .0.. .... = Install flag: Not set
```



```
render@Darla:~/cowpatty-3.1beta1$ ./cowpatty -d linksys.hash -r wpa2psk-
linksys.dump -s linksys
cowpatty 3.1beta1 - WPA-PSK dictionary attack. <jwright@hasborg.com>

Collected all necessary data to mount crack against WPA2/PSK passphrase.
Starting dictionary attack.  Please be patient.
key no. 10000: arrojadite
key no. 20000: calligraphical
key no. 30000: contestation

The PSK is "dictionary".

38333 passphrases tested in 1.34 seconds:  28532.32 passphrases/second
render@Darla:~/cowpatty-3.1beta1$
```

BTW...

- Since WPA1-PSK and WPA2-PSK share the same key hash, the lookup tables for WPA1 are compatible with WPA2
- 47 gig of tables all ready for WPA2
- Torrents ready to go!

Future projects

Integrated WoS (Wall of sheep) appliance

WiFi grenade

Bigger tables (please help with hosting)

Special targeted tables (4.7GB linksys table anyone?)

Links

http://www.churchofwifi.org

http://www.inventgeek.com/Projects/projectsilver/Overview.aspx

http://www.frontiernet.net/~beakmyn/OpenWRT%20Kimset%20Server.htm

http://www.renderlab.net/projects/sneaky/