Bluesniff - The Next Wardriving Frontier

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Bluetooth Basics

- NOT 802.11! NOT a relative of 802.11!
- Cable replacement technology
  - Low power for embedded devices
- More BT radios than 802.11 radios in existence
  - Phones, headsets, laptops, mice, keyboards
- Master / Slave architecture

Bluetooth Protocol

- Uses 2.4 GHz ISM band, same as 802.11b/g
- Generally low power
  - Class 3 (1mW) for most devices
  - Some Class 1(100mW) devices exist
- Frequency Hopping Spread Spectrum
  - Uses a pre-defined hopping pattern
    - Back in the day, FHSS was a “security” mechanism
  - Resists interference
  - 1MHz wide, hopping every 625 microseconds

Bluetooth Protocol

- A real disaster of a protocol stack
  - Heck, the core spec is 1024 pages.. Good reading!
- Specifies from Layer 1 to Layer 7
- High points
  - RF-level sync
  - Inquiry/request
  - Service discovery
  - Low power modes

Bluetooth Security

- Pairing
  - Using a shared secret (PIN), exchange random number to form key
  - Key used to derive session key for future comms
  - Used for Trusted <-> Trusted comms

Bluetooth Security

- Authentication / Authorization
  - Per connection AA
  - Per service AA
- Encryption
  - Ditto
- It’s all OPTIONAL!
  - Left to the developer/user to decide
    - This ends well… :(

Bluetooth Profiles

- Profiles exist to ease interoperability

  wink *wink*
- Keyboard, file transfer, handsfree (and headset), etc…

Bluetooth vs. 802.11b

- More at stake
  - Compromise 802.11 security = Access to network
  - Compromise BT Security = Gateway directly to App level functionality
- More personalized information
  - Phone conversations, calendar info, etc
  - Less interesting for Joe 12-pack, more interesting for executives

Discovery of 802.11

- Direct Sequence Spread spectrum
- Transmitters always in the same “place” in a channel
  - DSSS pretty easy to find
  - Granted, transmitters may be on different channels
    - Cisco - hardware channel switching RF Monitor
    - Prism 2 - firmware channel switching RF Monitor
    - Orinoco - need external channel hopper

Discovery of 802.11

- Beacons
  - “I’m here” every 100ms
  - Can be turned off for “cloaking”
    - Fools Netstumbler
    - Doesn’t fool Kismet or Airsnort
- Regular traffic
  - Windows boxen are noisy
  - Regardless of OS, generally frequent traffic

Discovery of Bluetooth

- FHSS harder to “find”
  - Must align with hopping pattern
  - BT uses 1/2 the normal hop time to Jump Around
  - Still averages 2.5 to 10 secs to find known device
- Devices can be Discoverable
  - Respond to inquiry requests

Discovery of Bluetooth

- Devices can also be non-discoverable
  - Must be directly probed by MAC addr
- Little to no traffic for extended periods of time (esp in low power mode)
  - Cannot easily be listened to b/c receiver cannot sync on hopping pattern
- Sophisticated RF gear can find and intercept traffic
  - Currently no one can make a standard card do this

Bluetooth Attacks

- Interception of traffic during pairing
  - Brute force guess the PIN to recover key
  - Know the PIN b/c it's imbedded
- More likely poorly developed software
  - In BT, security is "optional"
- Or simply bad defaults
  - File sharing with no AA/E in discoverable mode was the DEFAULT for my BT driver on my PDA
  - Just like the early days of 802.11b

Bluetooth Tracking

- Even Class 3 devices can be intercepted at a distance
- If your phone/PDA/earpiece is BT enabled, attacker can follow you using commodity gear
  - Like your own RFID tag

Bluetooth Wardriving

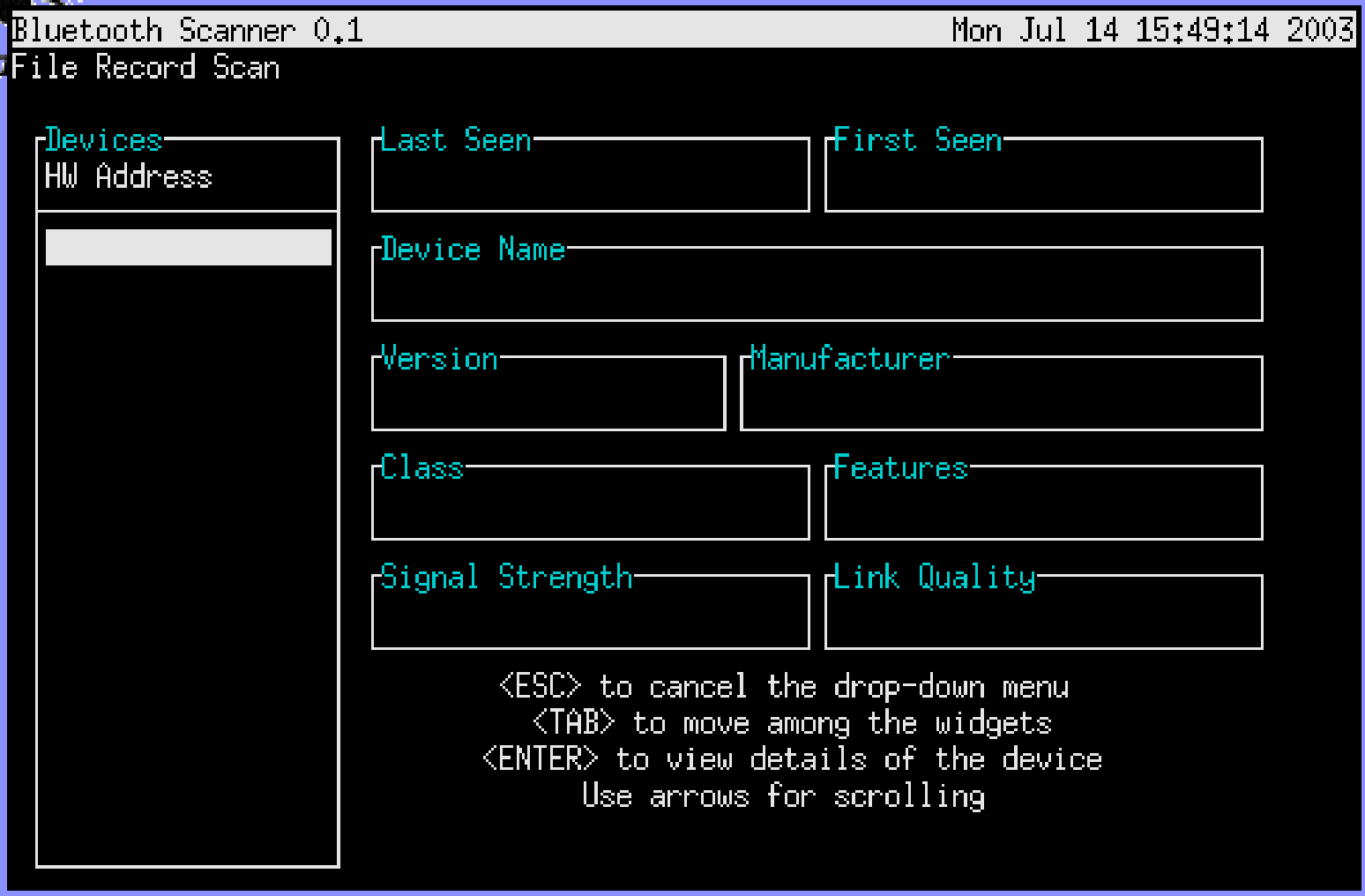
- Used to walk around hitting “scan” button on BT driver UI
- Does not find non-discoverable devices
- Needs new tools to catch on
- Same voyeuristic appeal of 802.11 wardriving
- As it becomes popular, BT developers and users will get a swift kick in the butt to make things more secure

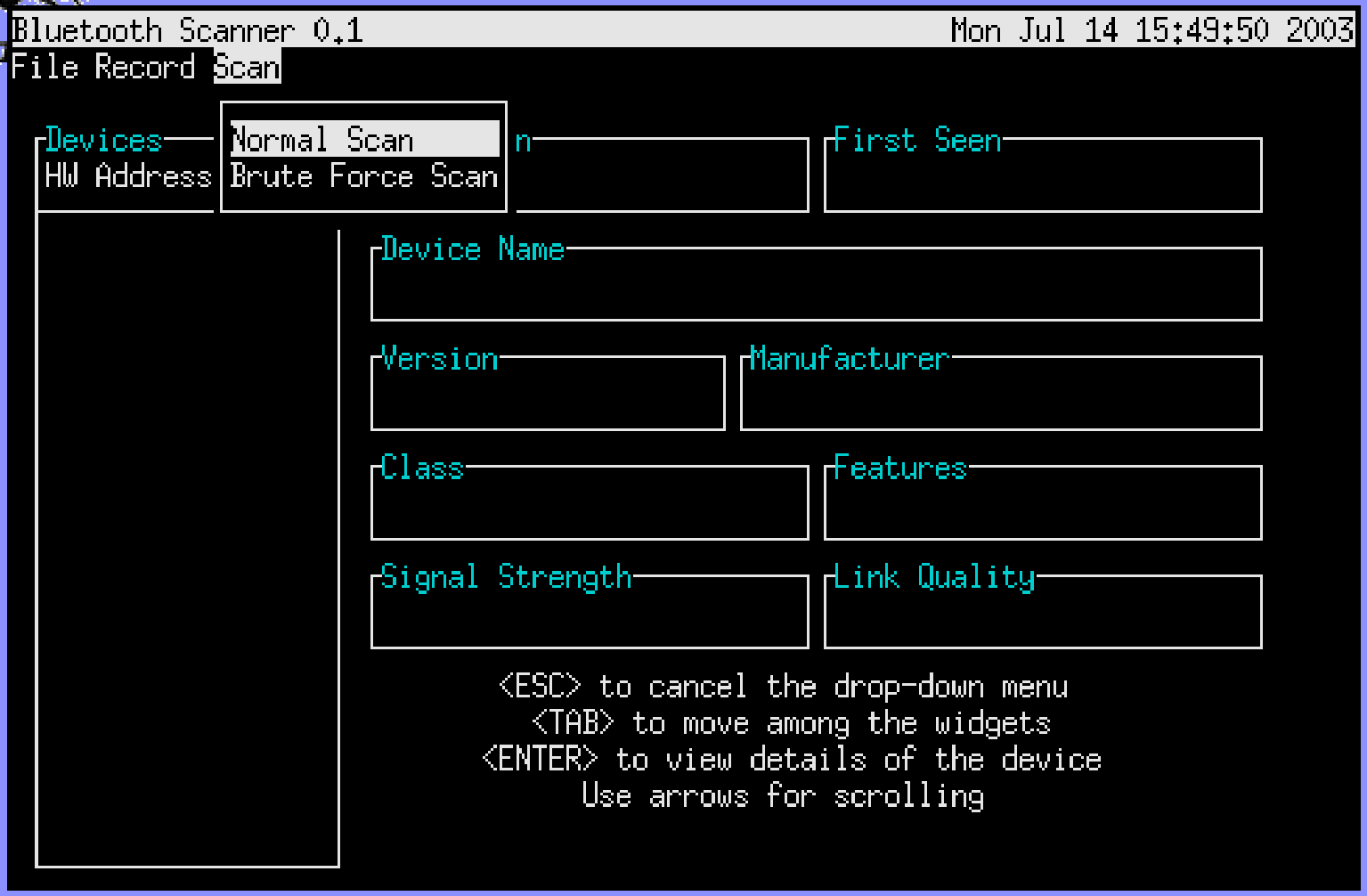
Redfang

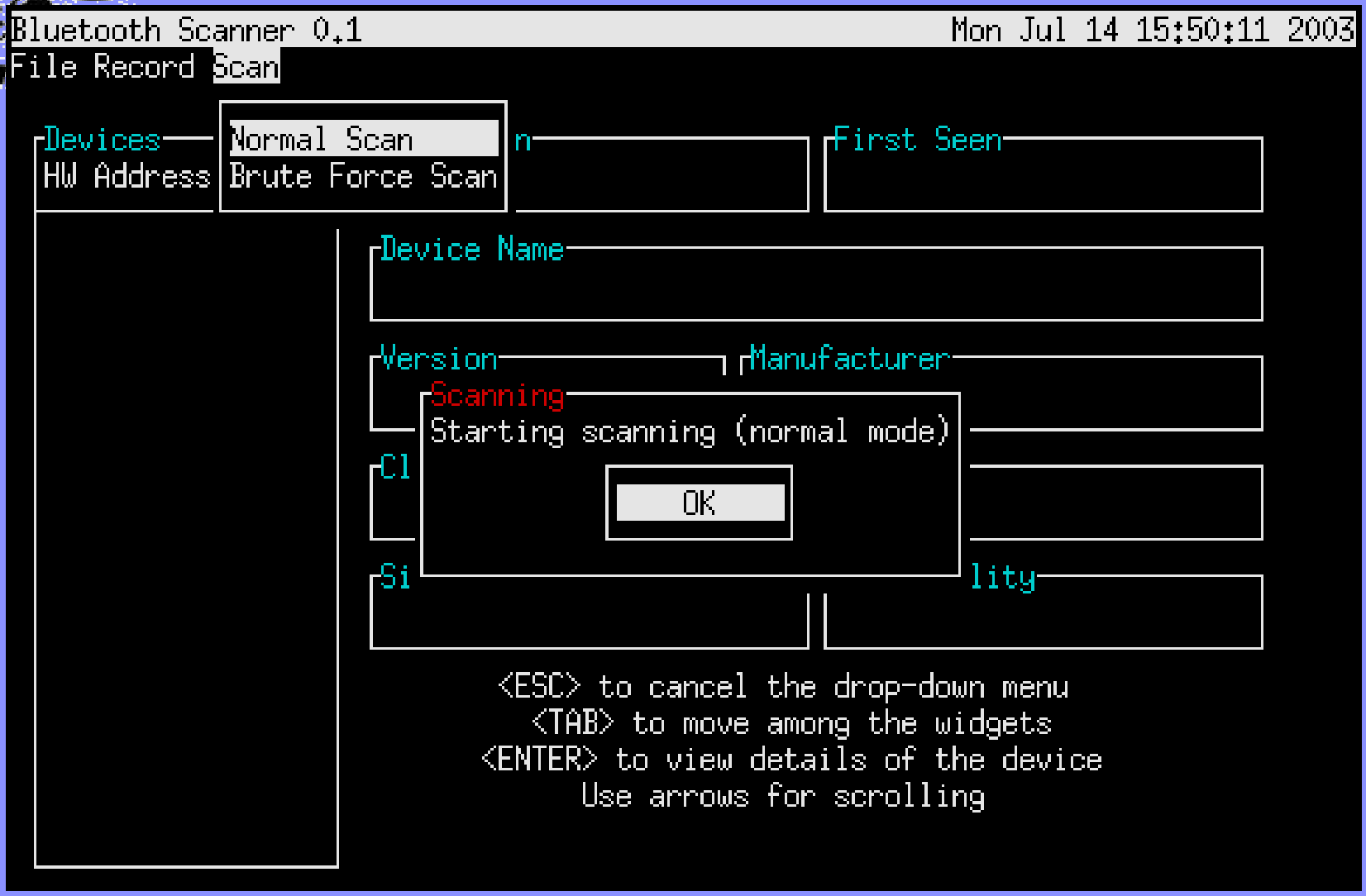
- Released by @Stake, Spring 2003
- Looks for devices that do not want to be discovered
  - Brute forces through MAC addresses attempting to find devices
    - First 3 octets fixed, rotates through last three
  - Can take a long time, since FHSS sync can take ~10 seconds per MAC
  - The only way so far…

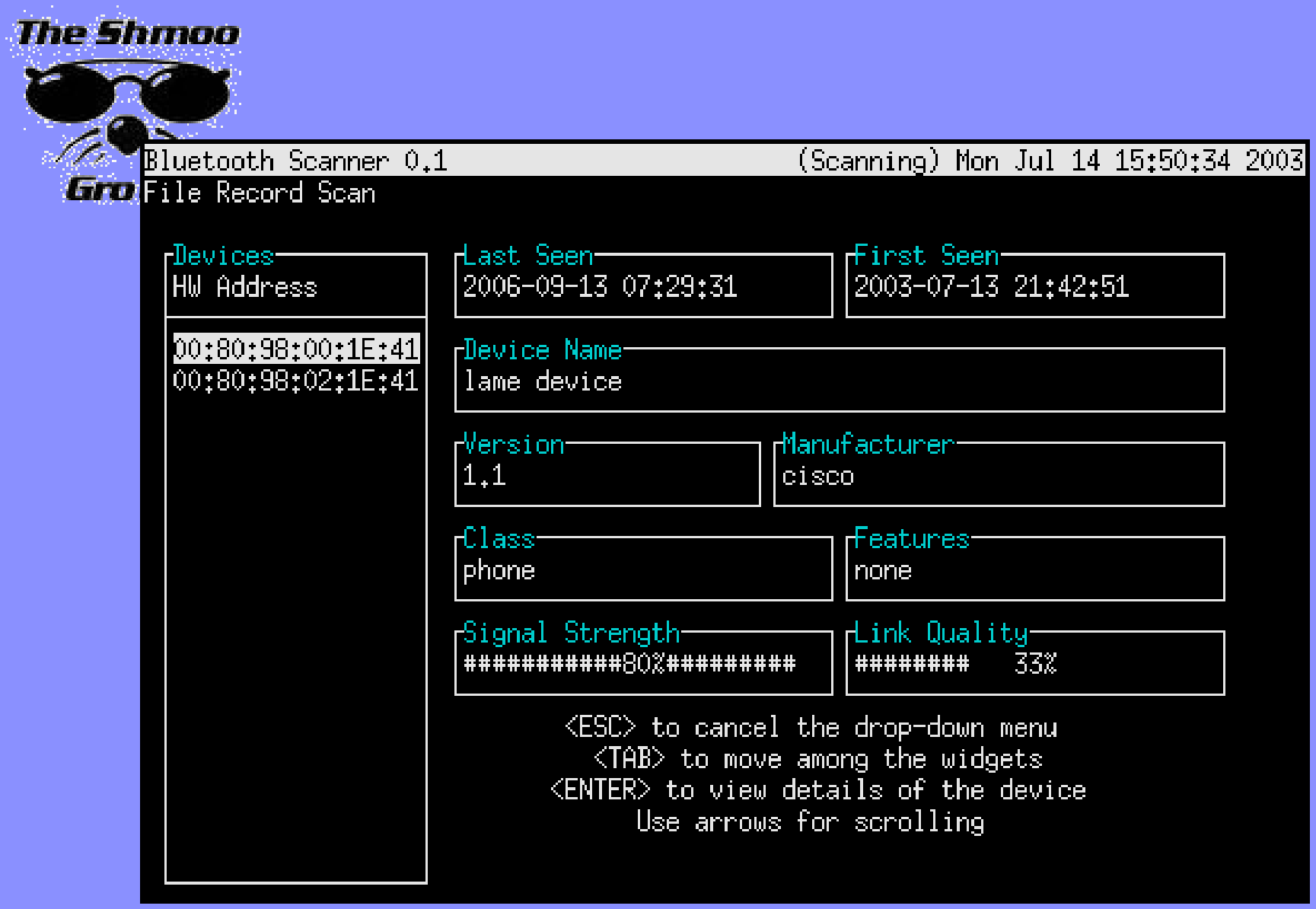
Bluesniff

- http://bluesniff.shmoo.com/
- Our tool (heh.. he said tool…)
- Focused on providing a UI
  - Front-end for Redfang
  - Also finds devices in discoverable mode
    - Yes, people leave things to be discovered
- Making BT wardrivers easier and more efficient will raise awareness of BT security issues


Bluetooth Scanner 0.1
Mon Jul 14 15:49:14 2003
File Record Scan
Devices
HW Address
Last Seen
First Seen
Device Name
Version
Manufacturer
Class
Features
Signal Strength
Link Quality
<ESC> to cancel the drop-down menu
<TAB> to move among the widgets
<ENTER> to view details of the device
Use arrows for scrolling


Bluetooth Scanner 0.1
Mon Jul 14 15:49:50 2003
File Record Scan
Devices
HW Address
Normal Scan
Brute Force Scan
n
First Seen
Device Name
Version
Manufacturer
Class
Features
Signal Strength
Link Quality
<ESC> to cancel the drop-down menu
<TAB> to move among the widgets
<ENTER> to view details of the device
Use arrows for scrolling


Bluetooth Scanner 0.1
Mon Jul 14 15:50:11 2003
File Record Scan
Normal Scan
Brute Force Scan
Devices
HW Address
First Seen
Device Name
Version
Manufacturer
Scanning
Starting scanning (normal mode)
OK
<ESC> to cancel the drop-down menu
<TAB> to move among the widgets
<ENTER> to view details of the device
Use arrows for scrolling


Bluetooth Scanner 0.1
(Scanning) Mon Jul 14 15:50:34 2003
File Record Scan
Devices
HW Address
00:80:98:00:1E:41
00:80:98:02:1E:41
Last Seen
2006-09-13 07:29:31
First Seen
2003-07-13 21:42:51
Device Name
lame device
Version
1.1
Manufacturer
cisco
Class
phone
Features
none
Signal Strength
##########80%#########
Link Quality
######## 33%
<ESC> to cancel the drop-down menu
<TAB> to move among the widgets
<ENTER> to view details of the device
Use arrows for scrolling

Future work

- Integration with WiFi scanning tools (namely Airsnort)
- New scanning methods