

- deDECTION for fun and profit v1.0 -

5M7X@mail.ru - 2009



<http://creativecommons.org/licenses/by-sa/3.0/de/>

Content

0x00 - preface

0x01 - terms

0x02 - attack-scenarios

0x03 - hardware

0x04 - software

0x05 - deDECTion

0x06 - plugins/tools

0x07 - references & links

0x08 - credits

0x00 - preface

Probably everybody know the DECT-cordless phones which give you the ability to take phonecalls without beeing bound to a wire. It's fine to be mobile but ist not without risks.

DECT is used for cordless phones, wireless ISDN access, babyphones, emergency calls, remotely controlled door openers, cordless EC terminals, traffic lights and also in the german ICE-train for communication and also for DECT-Computernetworks and maybe some other things.

Since DECT-cordless-phone vendors around the globe dont mark if they have implemented encryption in their phones, a customer has **NO** chance to know wether or not the product fits his personal needs. The sales-personal does not know and some customers even pretend that their hardware is eavasedropping-safe even if it is not true... well thats marketing.

So how can you find out if your phone is leaking information? Take the viewpoint of „the other side“ and attack your DECT-phone to proove ist secure.

Remember that sniffing/tapping into a phone is illegal. In germany there is a law (§201) and probably some others that may put you in jail for 5 years if you do so.

So do only test your own phone or phones you have explicit permission to do so by the resonsible owner of that phone. I can not be held responsible for the actions one is committing using that document. This paper was written with the intention to help pentesters international to add this to their toolkit.

0x01 - terms

DECT - Digital Enhanced Cordless Telecommunication

DSAA – DECT Standard Authentication Algorithm

DSC - DECT Standart Cipher (DECT-encryption algorithm which is held in private)

ETSI - European Telecommunications Standars Institute

FP - Fixed Part (thats the DECT-base-station)

IPUI - International Portable User Identity (identifies a device in a DECT-network)

Impersonation Attack – Fake FP and IPUI to trick a DECT-phone into using your base-station

PCMCIA - Personal Computer Memory Card International Association

PIN - Personal Identification Number (normally needed when adding PP's to FP's)

PP - Portable Part (thats your DECT-phone-handset)

RSSI - Received Signal Strength Indication
(byte-value between 0 - 255 according to IEEE 802.11 the higher the better)

RFPI - Radio Fixed Part Identity (thats the id of the DECT-base-station a.k.a. FP) and its subparts

ARC – Access Right Class

ARD – Access Right Details

ARI – Access Right Identity

PARI – Primary ARI

RPN – Radio Fixed Part Number

SARI – Secondary ARI

TARI – Tertiary ARI

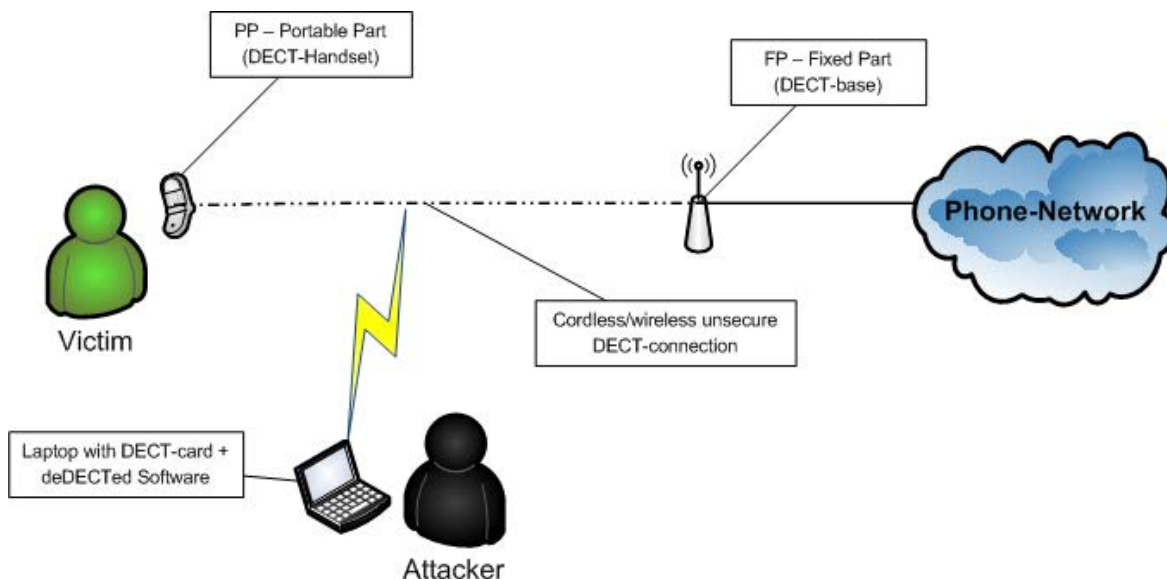
UAK - User Authentication Key (a secret random key to secure the communication between FP and PP)

0x02 - attack scenarios

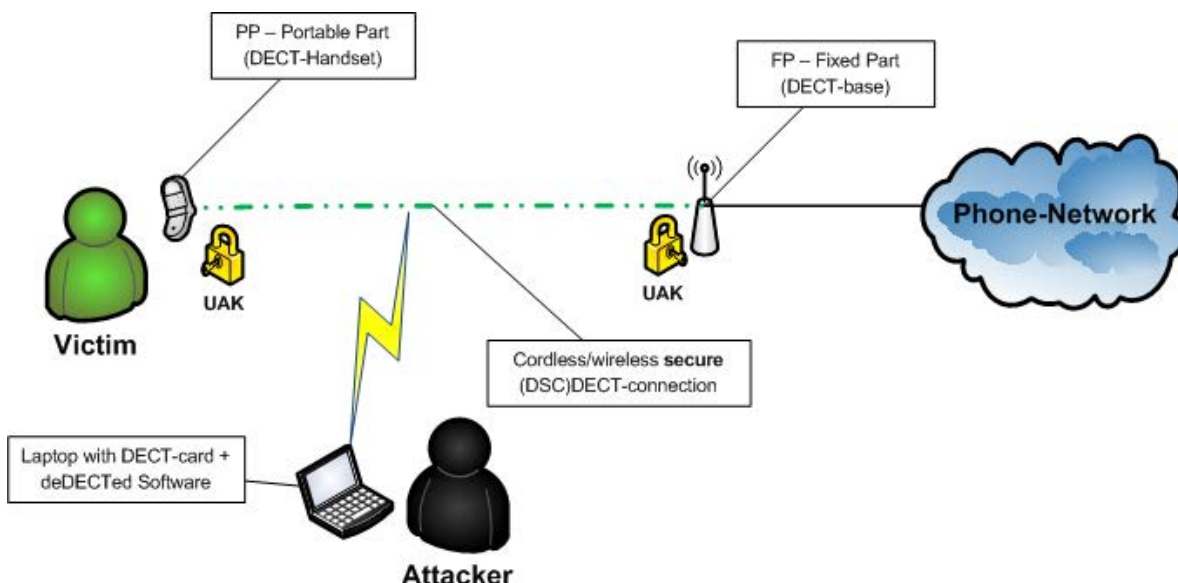
If you're unfamiliar with the DECT-protocol i hardly suggest you to check the references/links section at the end of this paper. You should also get into the protocol using the docs/wikipedia and WireShark to do some packet-analysis. Maybe youre also interessted in [Alexandra Mengele's diploma work](#) which is a much better paper then this since it also contains scientifical crypto-analysis of the algorithms. To make it short DECT has 10 channels each with a width of 1728 kHz which are located in 1880-1900 MHz. In the U.S. ist called DECT 6.0 and the range for the channels is 1920-1930 MHz.. The most interessting parts of a DECT-connection is the C-channel which holds communication-control-infos and the and the B-channel which contains the payload/speech.

DECT-sniffing

The first scenario is the simplest one where we will just sniff the plain DECT-Connection between our PP and the FP and dump out the payload (speech/dialed numbers etc.) of the B-Channel.

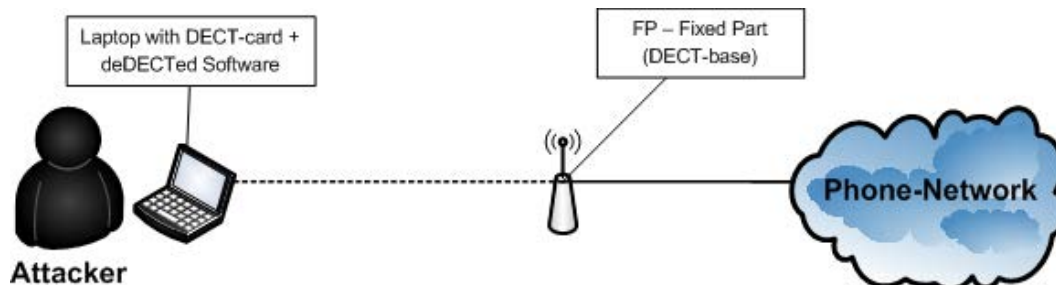


Above you see an attacker sniffing the DECT-connection and listening/examining all the data between PP and FP which is transferred in plaintext. On the bottom you see the same scenario but this time the connection is encrypted via DSC and therefore the attacker is not able the payload until he does not crack it using e.g. an FPGA-cracker ([deDECTed-devs are already reversing the DSC-crypto-algorithm](#)).



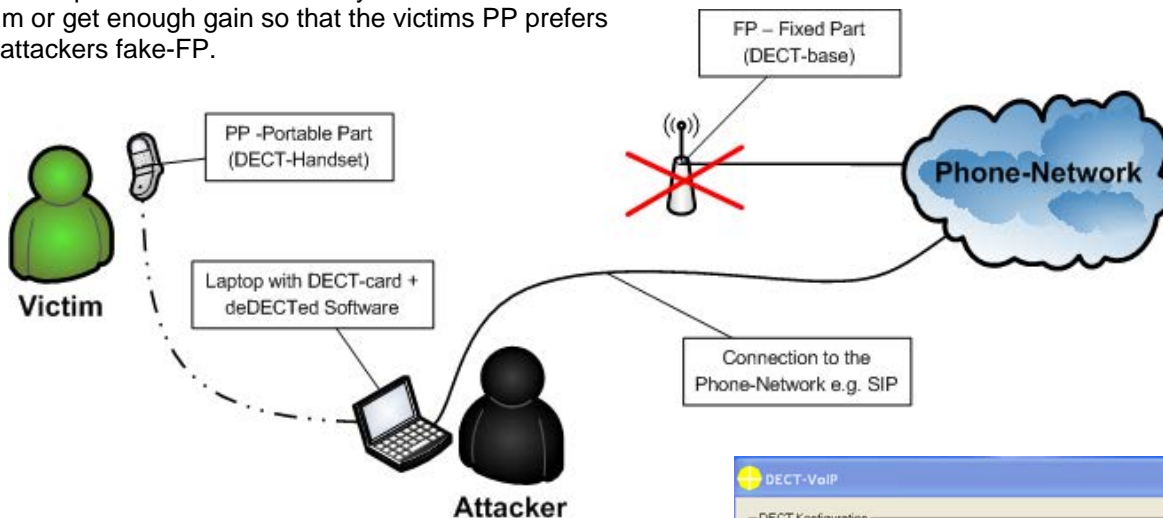
Attacking the base

In this scenario the FP does not force the PP to authenticate itself or we have cracked the UAK of a PP so we are able to trick the base into a situation where it thinks we are allowed to use it for making calls. A successful attack would allow one to do phone-calls via other ppl's base-stations ([deDECTed-devs are already attacking the authentication algorithm](#)).



Impersonating Attack / MITM-Attack

In this scenario we found out the IPUi and the RFPI either by searching all the C-Channel-Data or by using a Fritz!Box 7270 onto which the phone was authed. Then the attacker patches ist card-driver to use the IPUi and RFPI of the FP paired with the PP. Then the attacker has to DDoS the FP or increase gain of his DECT-Card so the Victims PP prefers using the attackers-fake-base instead of his own real base. If the phone uses encryption it can be forced (downgrade-attack) into plaintext-communication. So all information can be retrieved out of that connection. This attack is more complex and its not that easy to DDoS the FP of the victim or get enough gain so that the victims PP prefers the attackers fake-FP.

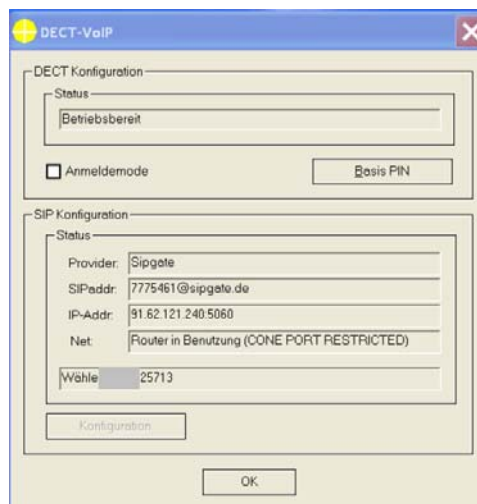


```

Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

G:\Dokumente und Einstellungen\DECT>cd Desktop
G:\Dokumente und Einstellungen\DECT\Desktop>cd install-dect-mitm
G:\Dokumente und Einstellungen\DECT\Desktop\install-dect-mitm>python mxxpatch.py
011139f5a8
453856
SUCCESS. Driver has been patched.
G:\Dokumente und Einstellungen\DECT\Desktop\install-dect-mitm>python ipui.py 011
34679
patching for card with id 43710652712
patching for card with id 45630498568
patching for card with id 45630498569
patching for card with id 47291008896
G:\Dokumente und Einstellungen\DECT\Desktop\install-dect-mitm>
  
```

patching RFPI and IPUi into the driver (A. Mengele)



Successful impersonation attack (A. Mengele)

0x03 - hardware

PCMCIA-DECT-cards

The people from deDECTed.org developed a driver for the „DOSCH & AMAND - COM-ON-AIR“ Type II-cards (a.k.a. CoA) which puts it into some kinda monitor mode. Their research was presented at the 25C3 (a yearly german hacker-convention) and can be reviews at the [deDECTed-wiki](#) . Unfortunately these cards are now being traded far beyond their market-prices because of their new usage. Their current pricing (if your lucky enough to find one on ebay.de) is around 50 - 300,-EU where one has to know that these cards initially where priced around 30,-EU.

So i researched for an other affordable card to be used for my experiments.

Somewhere in the deDECTed-ticket-system i came over the „ASCOM - Voo:doo“ which only costs about 30,-EU. The funny thing is that it internally the same as the CoA Type III card so since the support for Type-III-cards has been included into the deDECTed-driver/software this card does also work. But unfortunately it seems that the „original“ D&A CoA Type-II card has a better range since the driver has been cleaner developed for that.

I bought two of the Voo:doo-Cards with two different hardware-revisions. The first one is a „KED“ and the second one is a „KEE“ i will test both devices in this paper. I also physically disassembled the card since i wanted to have an insight-view.



Ascom Voo:doo Typ III PCMCIA (ARC-Computer)



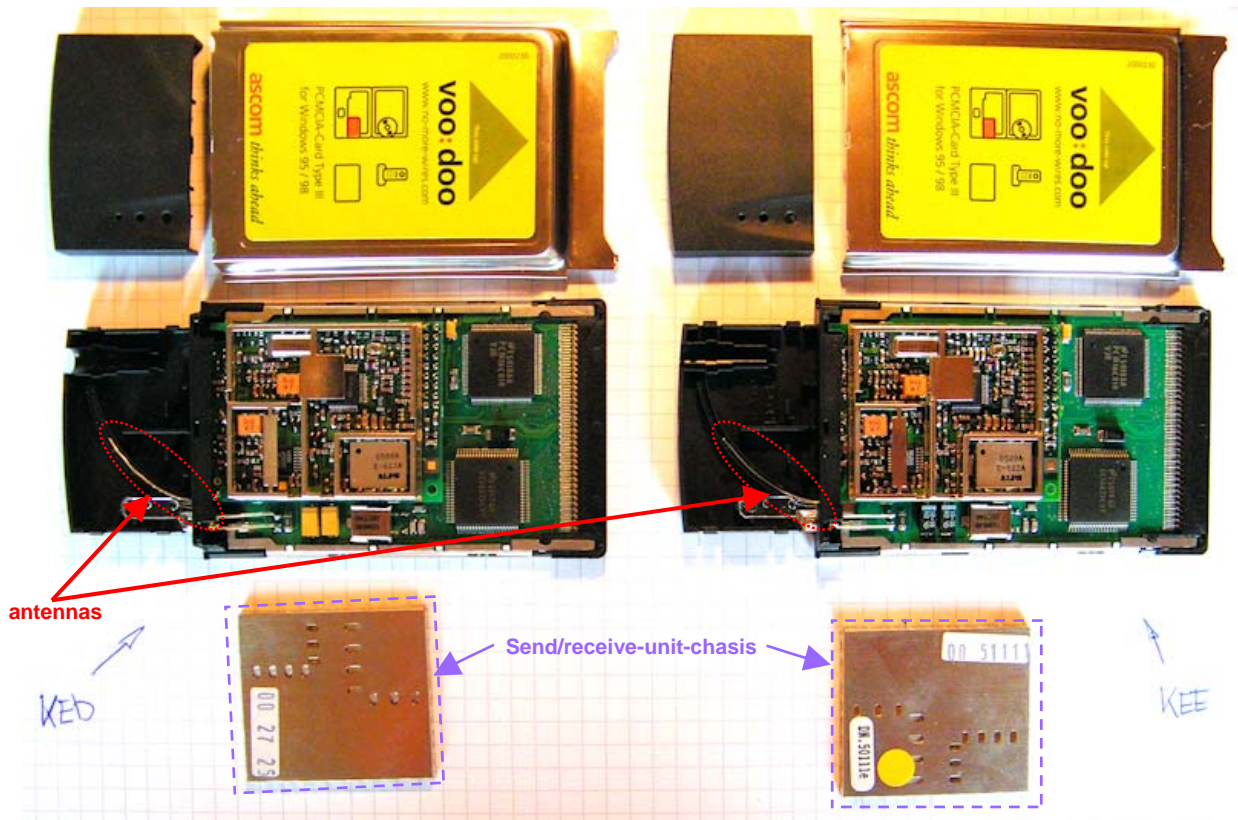
Ascom Voo:doo Typ III PCMCIA (ARC-Computer)



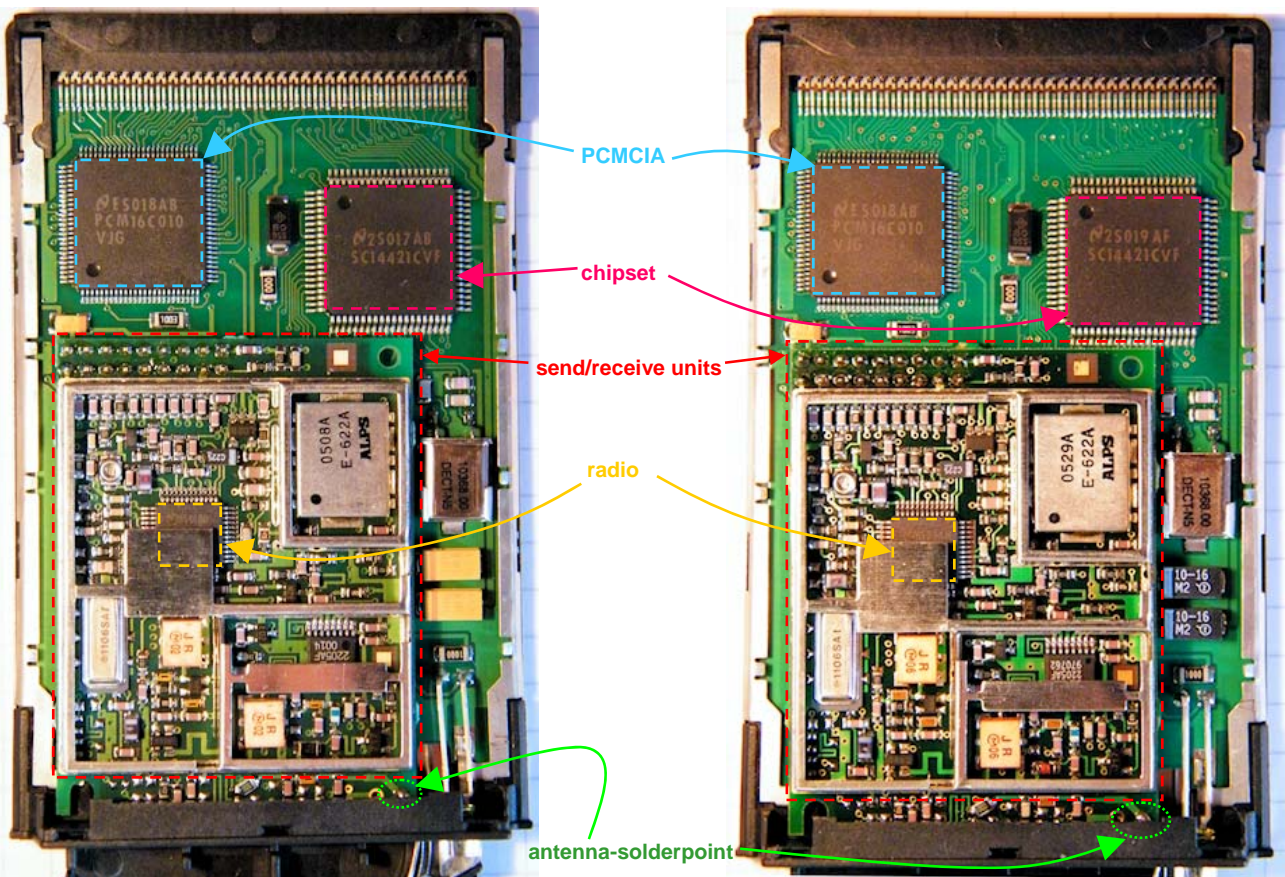
Ascom Voo:doo Typ III PCMCIA package after opening

The card can ship in two different optical tastes. The left one is what i use in this tutorial and the right one is the same but looks more similar to the DOSCH & AMAND COM-ON-AIR Type III cards.

On the left you see the package after opening it. It contains the PCMCIA-DECT-card, a short installation-manual with a serial on ist back for the windows-software and a CD-ROM with drivers for Win95/98, the RVS-COM lite Software and documentation as PDF. The Software seems to have some interessting features but unfortunately i was not able to install it under WindowsXP (even not using win95/98-compatibility-mode) so i have to install win95/98 some day to test it out *ugh!*. The software may give you the ability to create a FP-station at least the original CoA-software seems to be able to do so (<https://dedected.org/trac/wiki/COM-ON-AIR>).



My voo:doo's after disassembling. On the left the KED-Hardware-Revision on the right the KEE-Revision



Voo:doo KED in detail (note the chip-identifications)

Voo:doo KEE in detail (note the chip-identifications)

On the right you can see a table with some informations about the internal-hardware of the Ascom Voo:doo Card which i have found on my card.

I added missing info from a [deDECTed-track-ticket](#) where more info about other cards and chipsets can be found.

The Chips are from National Semiconductors. Datasheet for the Radio-Chip can be found at [the datasheetcatalog-page](#).

Type:	III
Radio	NatSemi LMX3161
Chipset:	SC14421CVF
EEPROM:	93LC86 (16k)
PCMCIA:	PCM16010
Brand	Ascom Voo:doo
Remarks	Different antenna then DOSCH AMAND COM-ON-AIR-Type-III-card but the rest is similar



COA Type II with external antenna mod by Erik Tews

Now here you can see the „original“ Dosch & Amand COM-ON-AIR DECT-Cards used by the deDECTed-research-team. The pictures have also been taken from the deDECTed-Homepage.



COM-ON-AIR Type II PCMCIA-card

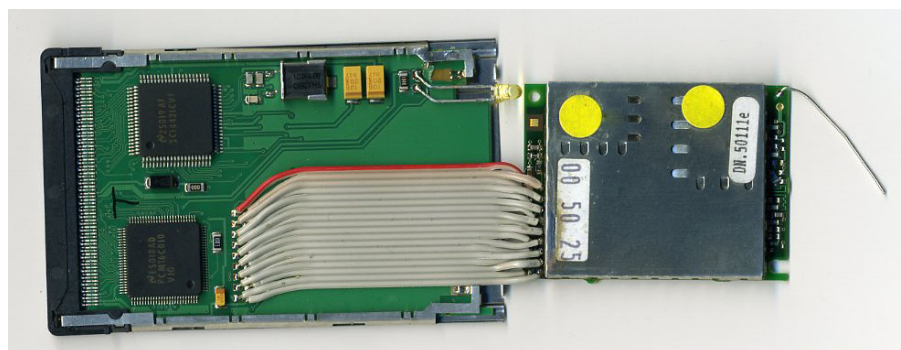


COM-ON-AIR Type III PCMCIA-card



COM-ON-AIR Type III card after opening it

On the right side you can see a Type-III-card-mod where somebody desoldered the send/receive-unit and reconnected it using an old IDE-cable to make it fit into a Type-II-slot.



Type III to Type II mod



CoA Type III to Type II Adapter (ebay)



external antenna soldered (Tews)



DECT-antenna 12dBi biquad (brennpunkt-srl.de)

It's also possible to add an external antenna what makes sense especially on the Ascom Voo:doo-cards since their range is very limited probably because of some missing tweaks in the deDECTed-software.

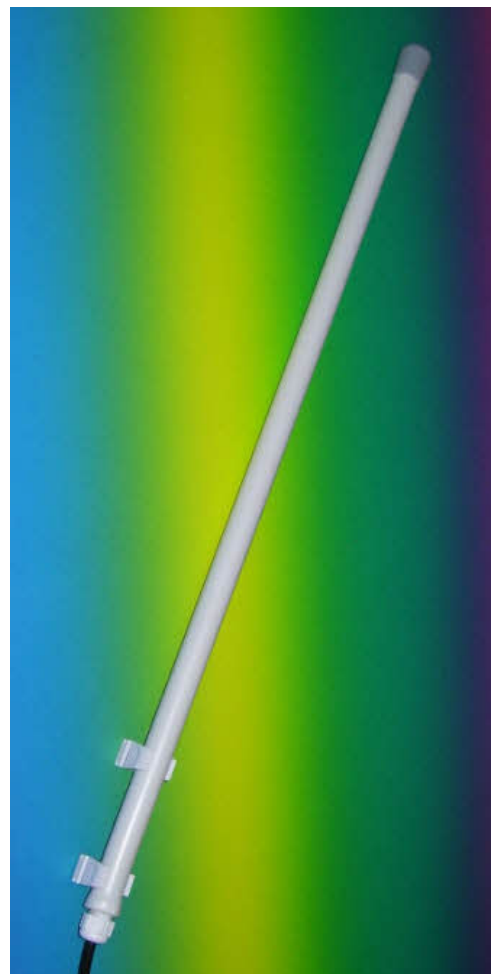
Those antennas can be obtained for about 20,-EU to 30,-EU.

You can also built one yourself like the BiQuad-antenna out of an old CD/DVD-box you just have to calculate the length of the antenna-sides out of the DECT-frequency. Information about that can be found at [mydarc](http://mydarc.de).

There is also a nice software which helps you design and simulating all kind of antennas which is free for private use and can be found at mmhamsoft.amateur-radio.ca.

You should be familiar with soldering if you want to add one and of course you will void your warranty!

You also can built your own Type-III to Type-II adapter out of an old IDE-cable if you want since it's a simple extension nothing else.



DECT antenna 9dBi omni (brennpunkt-srl.de)

Laptop

I am using an old „IBM Thinkpad T41“ Laptop which i bought from ebay around 200,-EU disassembled/cleaned it, added fresh thermal grease to the cpu-heatpipe, 1 GB RAM, a new extended accumulator (the cheap ones from china ;D) and now it works pretty fine for me. In fact it doesnt matter which one u use as long as it runs linux and has a PCMCIA-Type III slot. You can also use a Type II slot with an adapter or an PC with an PCI-PCMCIA-Adapter.

You can also go the hard way and desolder the sender/receiver unit from a Type-III-card to flatten it so it fits in a Type-II-Slot if you feel bored.



IBM T41 Notebook

DECT-Phones

I am testing the attacks on the following DECT-phone hardware: Siemens Gigaset S452 which consists of a base (FP) a handset-phone (PP) and i also used a Siemens Gigaset 4000L Comfort as a Client to the S452 base. In that test the calls where encrypted. But in a seperate test i had a Gigaset A250 on which i was able to obtain the speech since ist not using encryption.

After some research i found out that i can also obtain the speech from the S452 and the 4000L Comfort when setting the S452 base-station to go into the „repeater“-mode which makes all calls be in plaintext. I did that using the Gigaset S452-PP since i found that point in some settings-submenu to be able to have a working setup for my experiment.



Siemens Gigaset S452



Gigaset 4000L Comfort



Siemens Gigaset A250

If you want to know wheter or not your phone is using encryption and on which attacks it may be vulnerable but you dont want to go through that effort of testing it then the following references are for you.

[Siemens official list of vulnerable phones](#) (contains false info according to the computerBILD-tests)

<https://dedected.org/trac/blog/list-of-phones-progress>

<https://dedected.org/trac/wiki/ListOfPhones>

[computerBILD sponsors students to test 50 phones for vuln](#)

[Alexandra Mengers Diploma Thesis](#)

But the best way to verify this is of course to sniff your DECT-phone yourself to be sure ist at least safe against this kind of attack. If you have more confidential information you want to talk about it would be best to use a wired-phone or even better one that uses-end-to-end-encryption e.g. secure SIP.

0x04 - software

The Software used in this paper is the one from the deDECTed.org and i use the most current via a svn-checkout. Packages for BackTrack4 will soon be added to the repository by muts ([offsec-blog](#)).

First of i tested the software on Xubuntu 9.04 x86 32bit on my laptop and that worked just fine. In here i will describe the installation for the world most famous pentesting-liveCD BackTrack in version 3. You will also find a script, which does that automatically for you, attached to this paper. If you dont know BackTrack take a look at [www.remote-exploit.org](#) and [www.offensive-security.com](#) to learn about it.

It is a LiveCD whereas BackTrack 3 is based on Slackware12/SLAX-LiveCD and BackTrack 4 is based on Ubuntu 8.04 LTS which ships with the common tools for hacking-attacks which are used by it-security professionals to verify the (in)security of the companies network in a legal pentest.

There is also the [CHAOS-project](#) which is also a liveCD with all deDECTed-stuff preinstalled.

Install deDECTed driver and software on BackTrack 3 (liveCD)

First of all you need the Sources for the Linux-Kernel that is used within BackTrack3 since they are not included within the BackTrack3-LiveCD. You may retrieve em using Firefox, lynx, curl or wget in a shell. This is needed to built the driver/kernel-module that controls the dect-card.

```
wget http://www.offensive-security.com/kernel.lzm
```

After that the kernel is installed via lzm2dir into the BackTrack3-directory-structure

```
lzm2dir kernel.lzm /
```

Now we make a new „dect“ folder in the linux-kernel-sources dir

```
cd /usr/src/  
mkdir dect  
cd dect
```

After that we will checkout the latest dedected software-sources directly from the subversion-repository. Note that it may cause trouble sometimes to use bleeding-edge software and if you are a linux-newb without any C-programming-knowledge i would suggest to use an oder „stable“ version if it problems occur. In this tutorial i used revision 89.

Note also that you will receive a ssl-certificate warning while the checkout starts. Just press „p“ to permanently accept the key of the dedected.org-SVN-server.

```
svn co https://dedected.org/svn/trunk deDECTed
```

It's time to compile the driver and create a new device in the filesystem which represents our dect-card which will be */dev/coa*.

```
cd deDECTed/com-on-air_cs-linux  
make && make -C tools  
make node
```

If you havent allready done so put in your pcmcia-dect-card into your computer **NOW!** Then load the driver/kernelmodule. To unload it do a *rmmmod com_on_air_cs.ko*

```
insmod com_on_air_cs.ko
```

Alternatively you can use the *make load* and *make unload* to load/unload the driver

Autoload drivers in BackTrack3

If you don't want to load/unload the driver/kernelmodule each time but want it to load automatically when you put in the pcmcia-card just follow these steps.

First of we have to copy the sources of the deDECTed-driver from `/usr/src/dect/` into the kernel-source-folder and update dependencies.

```
cd /usr/src/dect/dedected/com-on-air_cs-linux/
cp com_on_air_cs.ko /lib/modules/$(uname -r)/kernel/drivers/
depmod -a
```

To have the driver automatically loaded by the `udev`-system when you put in the card into the PCMCIA-slot you have to set a rule. Start with reading out the `udevinfo` properties of the currently plugged in card.

```
udevinfo -a -p /sys/bus/pcmcia/devices/1.0
```

`Udevinfo` starts with the device specified by the `devpath` and then walks up the chain of parent devices. It prints for every device found, all possible attributes in the `udev` rules key format. A rule to match, can be composed by the attributes of the device and the attributes from one single parent device.

```
looking at device '/devices/pci0000:00/0000:00:1e.0/0000:02:00.1/1.0':
  KERNEL=="1.0"
  SUBSYSTEM=="pcmcia"
  DRIVER==" "
  ATTR{modalias}
=="pcmcia:m0204c0000fFEfn00pfn00pa4BC552E7pb0DF519BBpc09E43C7Cpd3488C81A"
  ATTR{prod_id4}=="V1.00"
  ATTR{prod_id3}=="MXM500"
  ATTR{prod_id2}=="MMAP PCMCIA"
  ATTR{prod_id1}=="DOSCH-AMAND"
  ATTR{card_id}=="0x0000"
  ATTR{manf_id}=="0x0204"
  ATTR{func_id}=="0xfe"
  ATTR{pm_state}=="on"
  ATTR{function}=="0x00"

## -- rest is cut off -- ##
```

As you can see, we need the name of the card which is to be found after `ATTR{prod_id1}` so its „DOSCH-AMAND“. On a original DOSCH-AMAND COM-ON-AIR TypeII-Card it would probably be something like „DECTDataDevice“. With this infos we create a `99-dect.rules` in `/etc/udev/rules.d/` via the editor `nano`, or as i prefer `vi` (in fact you can use any editor you want e.g. `kate` which is the most easiest to handle) and put in the following rules:

```
# first entry is for "original" DOSCH-AMANN-Cards
ACTION=="add", SUBSYSTEM=="pcmcia", ATTR{prod_id1}=="DECTDataDevice", RUN+="/bin/mknod /dev/coa --mode 666 c 3564 0"
# second entry is for TypeIII-Cards like the Ascom Voo:doo
ACTION=="add", SUBSYSTEM=="pcmcia", ATTR{prod_id1}=="DOSCH-AMAND", RUN+="/bin/mknod /dev/coa --mode 666 c 3564 0"
```

Now you can plug in the card without having to load the kernelmodule by hand each time and also the device-nodes in `/dev/coa` will be created automatically. Now your card should be plug&play.

Install deDECTed driver and software on BackTrack 4 pre final

This first step should only be used if you're using a harddisk-install of BackTrack4. We update the packet-manager and upgrade BT4pf with the latest security-patches which may take a little while depending on your internet-connection.

```
apt-get -y update && apt-get -y upgrade
```

Normally you don't need to install anything on BackTrack 4 pre final and muts will add the necessary packages to the BackTrack4-repositories but you do it pretty much the same as on BackTrack3 just without the need to add anything despite the deDECTed-software. So first of load the PCMCIA-kernel-driver.

```
insmod /lib/modules/2.6.29.4/kernel/drivers/pcmcia/pcmcia.ko
```

After inserting the PCMCIA-Kernel-drivers checkout the deDECTed-source from the repository.

```
svn co https://dedected.org/svn/trunk deDECTed
```

Compile the software and drivers. After that a new device node.

```
cd deDECTed/com-on-air_cs-linux  
make && make -C tools  
make node
```

Now we insert the kernel-module/driver.

```
insmod com_on_air_cs.ko
```

And then we check the dmesg-log if it has been loaded successful.

```
dmesg | tail -n 37
```

You need to download and install the decoder for the .IMA to .WAV files yourself.

```
mkdir /usr/src/g72x  
cd /usr/src/g72x/  
wget http://www.ps-auxw.de/g72x++.tar.bz2  
bzip2 -d g72x++.tar.bz2  
tar xfv g72x++.tar  
cd g72x  
./build.sh
```

Now copy the *decode-g72x* binary into the folder of the deDECTed-tools

You also need to add the *decode.sh* script which uses sox, decode-72x and lame to create .wav/.mp3 files.

Now you're done and can continue with deDECTion.

For the usage you can also check my short video on [youtube](#).

0x05 - deDECTion

So after meeting the prerequisites for this experiment we can now start to pentest our cordless-DECT-phone at home.

For testing-purpose i did a call to a service that tells you the current time which can be reached via **+49 30 2 555 555 7**.

Since i am running short on time i point you to my [youtube-video](#) Which shows a session in detail.

To make it short ist just *fpscan* scanning for base-stations and you will get more information if you use *verb* to turn on verbosity. After that use the *ignore <rfpi>* to ignore all bases-stations but yours. You can find out which is yours via using *callscan* and then make a call so you see what station your call is on. Finally start *autorec* which will synch into a call if it finds one and dump the snifflog into pcap-files.

Using the *decode.sh*-script you can easily get the payload/speec out of the dump-files.

0x06 - plugins/tools

DECTshark

There is also a nice tool called dectshark in the *tools/dectshark* dir which can be compiled via *make*. Help is available via the *./dectshark --help*

```
bt dectshark # make
g++ -Wall -O2 -I../.. -c -o dectshark.o dectshark.cpp
g++ -Wall -O2 -I../.. -c -o gui.o gui.cpp
g++ -Wall -O2 -I../.. -c -o foundinfo.o foundinfo.cpp
g++ -Wall -O2 -I../.. -c -o scanmode_gui.o scanmode_gui.cpp
g++ -Wall -O2 -I../.. -c -o syncmode_gui.o syncmode_gui.cpp
g++ -Wall -O2 -I../.. -c -o packetparser.o packetparser.cpp
g++ -Wall -O2 -I../.. -c -o packetsaver.o packetsaver.cpp
g++ -Wall -O2 -I../.. dectshark.o gui.o scanmode_gui.o syncmode_gui.o foundin
packetparser.o packetsaver.o -o dectshark -lcurses -lpthread -lpcap
bt dectshark # ./dectshark --help
Usage: ./dectshark [--fp|--pp]
  --fp    Scan Fixed Part (DECT Basestation)
  --pp    Scan Portable Part (DECT Handset)
  --help  This text
./dectshark without any parameter scans for Fixed Parts by default.

bt dectshark #
```

The above picture shows how dectshark is to be compiled under BackTrack3.

RFPI	Ch	Pkt	RSSI	Founds:	Packets:	Channel:
00b5f6dd50	07	7	10	2	0	0
00b5f6dd50	01	3	14			

Here you can see my DECT-base-station on channel 07 and the DECT-phone on channel 01 after calling the time-telling-service.

metasploit plugin

There is also a metasploit plugin included in the deDECTed-Software. Recording is buggy but loggin phone-calls works. To install it just go into the `/usr/src/dect/deDECTed/metasploit-dect` and take a look in the README which tells you to do the following.

1. Copy `coa.rb` [`msf directory`]/`lib/msf/core/exploit/`
2. Edit [`msf directory`]/`lib/msf/core/exploit.rb` and add `require 'msf/core/exploit/coa'`

Example Scanner Modules:

1. Create [`msf directory`]/`modules/auxiliary/scanner/coa/` directory
2. Copy `call_scanner.rb` and `station_scanner.rb` to the above directory

Unfortunately it did not work for me on BackTrack3 and i got several errors. After examining the code and comparing it to other Framework3-Plugins i was able to some little changes to make it work (code is attached). I had a conversation with H.D. Moore who told me that this is okay for short-time but he is working on a complete rewrite of the code and will add this to the Metasploit-Framework-3-repos soon. So plz check via `msfupdate` before using the attached code since it will be probably outdated.

<http://lists.gnumonks.org/pipermail/dedected/2009-September/000719.html>

WireShark plugin

This has no more to be compiled since WireShark after v1.2.0 has built in support for DECT since Timo Boettcher submitted the patch to the wishlist some time ago. A sample pcap-file can also be found there <http://wiki.wireshark.org/SampleCaptures#head-b790c6f5019c289abdb35ea5d4c98b2ea467aeb>

So if you want to use that on BackTrack3 just download and install the latest WireShark-Version from www.wireshark.org or just use the latest windows-install if youre really lazy.

kismet plugin

I pretty much followed the hints from the deDECTed homepage to compile the plugin which can be found at <https://dedected.org/trac/wiki/COM-ON-AIR-Kismet>. After fiddling with it it worked well. One has just to note that `~` triggers the menu in kismet-new-core and that the plugin has to be loaded via the menu to make it really work fine.

realtime listeing patch

You can rewrite a patch which enables you to listen to phone-calls in realtime if you want. This one can be found on the deDECTed-mailinglist:

<http://lists.gnumonks.org/pipermail/dedected/2009-January/000205.html>

The file `audioOTF-patch-revision38-v0.2.tar.bz2` has to be unpacked and ist content copied into the deDECTed-tools folder. But be aware that this code is for an revision which was out at january 2009 so ist not up to date. Since licenseing-problems arose because of the codec used in that patch it was not included to the official-repositories. So if you want that feature look at its code and make the necessary changes.

0x07 - references & links

deDECTed-Homepage

<https://dedected.org/trac>
<http://lists.gnumonks.org/pipermail/dedected/>
<https://dedected.org/trac/report>

List of phones and their vulnerability

http://gigaset.com/shc/0,1935,de_de_0_168074_rArNrNrNrN,00.html
http://www.gigaset.com/repository/1675/167555/Gigaset_DECT_Verschluesselung.pdf
<https://dedected.org/trac/wiki/ListOfPhones>
<https://dedected.org/trac/blog/list-of-phones-progress>

External antennas

<http://www.mycarc.de/dl7afb/projects/DECT-WIFI-Antennas.htm>
<http://www.brennpunkt-srl.de/>

Test PCAP-files

<https://dedected.org/trac/ticket/3>
http://www.lessradiation.co.uk/RFPI_01_14_71_59_e0.pcap (Sagem D16T)
<http://wiki.wireshark.org/SampleCaptures#head-b790c6f5019c289abdb35ea5d4c98b2ea467aaeb>

DECT-Standard and infos

<http://www.dectweb.com>
http://en.wikipedia.org/wiki/Digital_Enhanced_Cordless_Telecommunications
http://de.wikipedia.org/wiki/Digital_Enhanced_Cordless_Telecommunications
http://wireless.subsignal.org/index.php?title=Vergleich_DECT_und_WLAN
<http://www.etsi.org/WebSite/homepage.aspx>
<https://dedected.org/trac/wiki/protocol>
<https://dedected.org/trac/wiki/DSAA-Reversing>
<http://www.datenschutz-praxis.de/lexikon/r/rfpi.html>
https://www.fehcom.net/fh-frankfurt/vorlesungen/2008_WS/itsec/vortraege/DECT-ppt.pdf
https://www.fehcom.net/fh-frankfurt/vorlesungen/2008_WS/itsec/vortraege/FI-DECT_ffa.pdf
http://www.raf-woelfle.de/elektrosmog/technik/dect_2.htm
http://broadcasting.br.funpic.de/dect_inside_gigaset_repeater.html

deDECTed-Tutorials

<http://www.ccc-mannheim.de/wiki/Dedected>
<http://www.wardriving-forum.de/wiki/DeDECTed>
<http://www.dev-tec.de/2009/01/30/dedected-howto-fur-backtrack-3/>
<https://dedected.org/trac/wiki/COM-ON-AIR-Kismet>
<https://dedected.org/trac/ticket/1>
<http://www.youtube.com/watch?v=vAZLZ8dMIL0>

Linux-LiveCDs for deDECTion (note on BackTrack4 the module will be added soon)

BackTrack3 and 4prefinal - www.remote-exploit.org
BackTrack remote-exploit-wiki - <https://wiki.remote-exploit.org/backtrack/>
BackTrack offsec-wiki - http://backtrack.offensive-security.com/index.php/Main_Page
BackTrack4 german review - <http://blog.tuxpost.de/2009/02/11/backtrack-4-beta-freigegeben/>
BackTrack4 german tutorials - <http://backtrack.1rss.de/>
Chaox - <http://blag.chaox.net/>

Presentation on the 25th Chaos Communication Congress in Berlin

<http://www.computerbild.de/videos/DECT-Sicherheitsluecken-aufgedeckt-4068888.html>
<http://chaosradio.ccc.de/cre102.html>
<https://dedected.org/trac/wiki/25C3>
<http://www.tis-gmbh.de/produkte/dect-rfpi-sniffer-pro/>
http://www.tis-gmbh.de/fileadmin/TIS_PDF/PIInfoRFPIsnifferpro_de.pdf

Press-related

<http://www.golem.de/0812/64331.html>

<http://www.mitternachtshacking.de/blog/807-25c3-dect>

<http://www.mathias-schindler.de/2008/12/29/dect-25c3/>

<http://idw-online.de/pages/de/news295118>

<http://www.heise.de/newsticker/25C3-Schwere-Sicherheitsluecken-beim-Schnurlos-Telefonieren-mit-DECT--/meldung/120988>

<http://news.magnus.de/sicherheit/artikel/dect-ist-leicht-abhoerbar.html>

<http://it.slashdot.org/article.pl?sid=08/12/30/133222>

http://www.focus.de/digital/handy/schnurlostelefone-dect-geraete-oft-nicht-abhoersicher_aid_358946.html

http://www.theregister.co.uk/2008/12/31/dect_hack/

http://www.dect.org/UserFiles/file/Press%20releases/DF_Press%20Information_DECT%20Technology_01132009.pdf

<http://www.n-tv.de/incoming/DECT-Telefone-unsicher-article48968.html>

<http://www.heise.de/newsticker/DECT-Abhoerkarte-ist-ausverkauft--/meldung/122230>

<http://www.heise.de/security/Bundesdatenschutzbeauftragter-warnt-vor-Risiken-bei-DECT-Telefonen--/news/meldung/122033>

http://planetopia.de/archiv/2009/planetopia/01_25/1_auswahl.html

<http://frontal21.zdf.de/ZDFde/inhalt/3/0,1872,7505859,00.html>

0x08 - credits

the team from wardriving-forum.de

the ascom-company for producing affordable DECT-cards which make this fun working

the participants of the deDECTed-Mailinglist for Ascom Voo:doo betatesting

Benjamin Schrödl from dev//tec-blog

Muts Maharoni a.k.a. muts from offensive-security.com for testing in the U.S.

and of course

Andreas Schuler, Erik Tews and Ralf-Philipp Weinmann from the deDECTed.org-Team for their stunning work and their presentation on the 25c3 and for their effort to develop the drivers for Type III DECT-cards.