FCCU GNU/Linux Forensic Boot CD

Hack.lu Forensic Workshop

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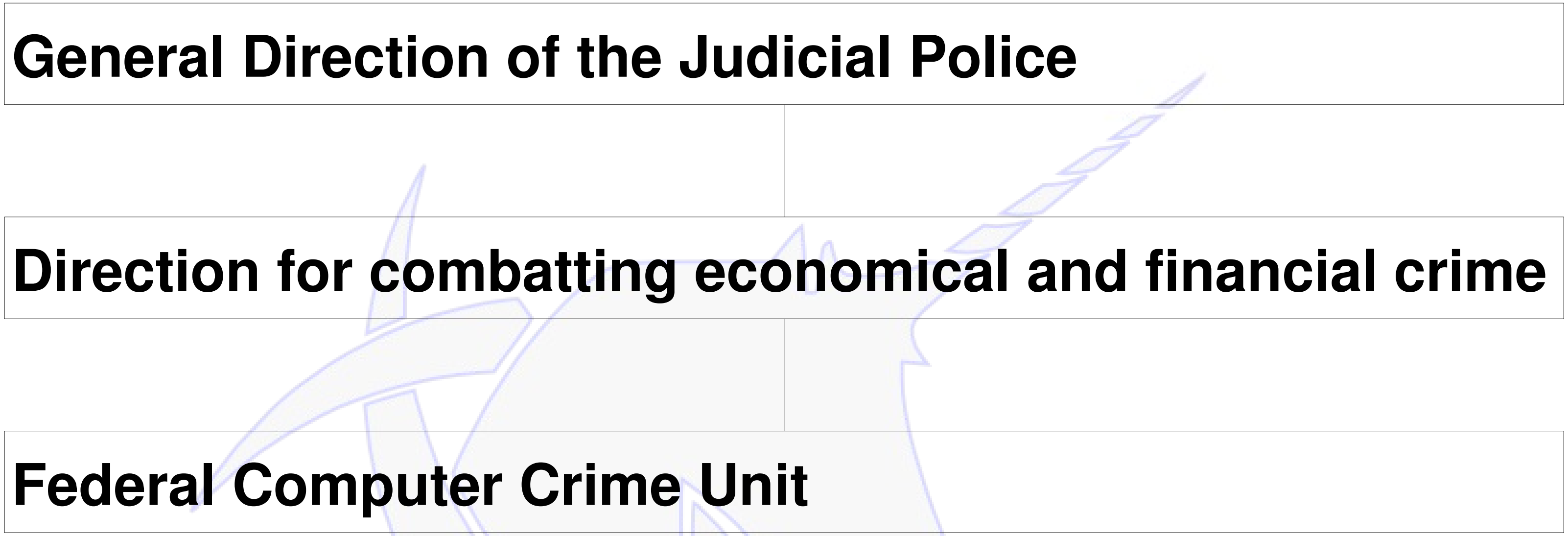
Who we are ...



General Direction of the Judicial Police

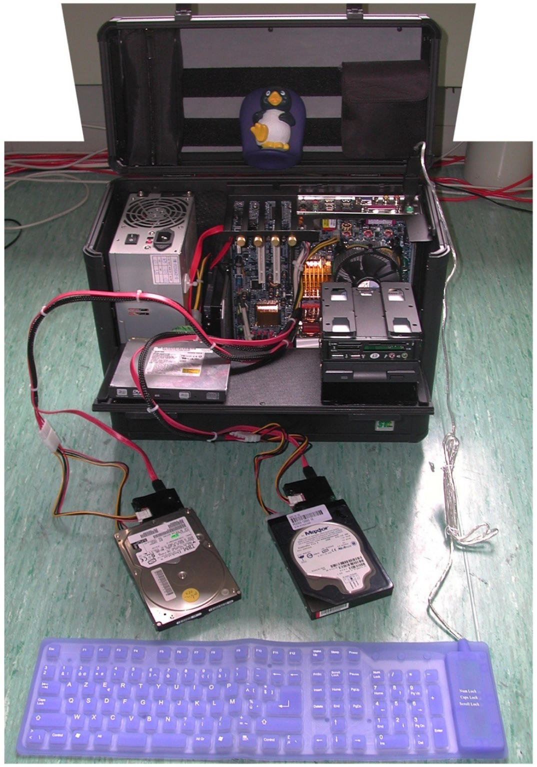
Direction for combatting economical and financial crime

Federal Computer Crime Unit

- Federal Police structured on two levels
- Every district has a “Regional Computer Crime Unit
  - Assistance housesearches
  - Forensic analysis ICT
  - Internet investigations

Flight case ?

- Intervention kit FCCU
- ATA, SATA, FireWire, USB, Cardreader, DVD, ...
- Distribute evidence for this workshop



www.d-fence.be
www.lnx4n6.be

FCCU GNU/Linux Forensic Boot CD

CD presentation

- Primary goal is to make forensic images
  - Disk 2 Disk
  - Partition 2 Partition
  - Disk/partition 2 file

CD presentation

- Difference with other non forensic boot cd
  - No automatic use of swap partitions
  - Lots of forensic tools
  - Doesn't start in graphical mode
  - No daemons at startup
  - Custom kernel with good usb support (8.1 & 9.0)
  - Frequently updated
  - Belgian keyboard by default
  - all FCCU scripts/progs begin by “fccu”

CD Goals

- Determine if PC is suspect (speed)
  - Low level search
    - keyword search
    - salvage based on file signatures
  - Childporn
    - Linux frame buffer image viewer (http://linux.bytesex.org/fbida/)
    - mplayer with framebuffer support
  - Internet traces
    - Mozilla – Firefox
    - Internet Explorer

The evidence

- Presentation of The Evidence
  - A 128 MiB USB key
  - Suspect traces are
    - named "forensic target ..."
    - everithing about "pirates"

The evidence

- Forensic sound imaging
- The tools :
  - dd
  - sdd
  - dcfldd
  - dd_rescue
  - GNU ddrescue
  - dd_rhelp

The evidence

- Through the network using Netcat & dd:
  - Suspect PC:

```
#dd if=/dev/sda conv=noerrors,sync | pipebench | netcat -l -p 2000
```

  - Trusted PC:

```
#netcat 192.168.x.x 200x | pipebench > /mnt/forensic/usbkey.dd
```

```
#netcat 192.168.x.x 200x | pv -i 1 -s 128m > /mnt/forensic/usbkey.dd
```

Tips

- Compression is you friend !
  - Suspect PC :

```
#dd if=/dev/sda conv=noerrors,sync | pipebench | gzip -fast | netcat -l -p 2000
```

  - Clients :

```
#netcat 192.168.x.x 200x | gunzip | pipebench > /mnt/forensic/usbkey.dd
```

```
#netcat 192.168.x.x 200x | gunzip | pv -i 1 -s 128m > /mnt/forensic/usbkey
```

The evidence

- Identifying devices (goals)
  - you have to know what to copy
  - writing an accurate report
  - finding suspicious informations

The evidence

- Identifying devices
  - general informations

```
# cat /proc/partitions
# lshw
# cat /proc/mem
# cat /proc/cpuinfo
# dmesg
```

The evidence

- Identifying devices
  - ATA/IDE
    - Try to find serial numbers
    - name your image using the serial number

```
# ide_info /dev/hdx
# lshw
# hdparm -i /dev/hda
# hdparm -I /dev/hda
```

The evidence

- Identifying devices
  - HPA/DCO

```
# dmesg (maybe kernel 2.6.10 only)
# hdparm -I /dev/hdx
# disk_stat /dev/hdx
```

  - USB/FireWire/SATA

```
# cat /proc/scsi/scsi
# scsiinfo -s /dev/sda
```

Tips

- Redirect into information file(s)

```
# lshw >> usbkey-info.txt
```

- Never forget bash automatic completion
- Read man pages

The evidence

- Imaging verification

```
# md5sum usbkey.dd
```

```
# md5sum /dev/sda
```

```
# sha1sum usbkey.dd
```

```
# sha1sum /dev/hda
```

Tips

- Think like a plumber !
  - Why not using tee to calculate the hash during the imaging

```
#dd if=/dev/sda | tee usbkey.dd | md5sum > usbkey.md5
```

  - The same with a progress bar

```
#dd if=/dev/sda | pipebench | tee usbkey.dd | md5sum > usbkey.md5
```

The evidence

- Once imaging is done, try to identify filesystems
  - DOS type partioning

```
# fdisk -lu usbkey.dd
# sfdisk -luS usbkey.dd
```

  - Other types
    - DOS type
    - MAC type
    - BSD disklabels
    - SUN

```
# mmls usbkey.dd
```

The evidence

- Is it really a partition magic recovery partition ?

```
# disktype usbkey.dd
```

- disktype recognize and probes partition types
  - DOS
  - APPLE
  - AMIGA
  - ATARI ST
  - BSD Disklabels
  - Linux Raid, LVM 1 & 2
  - Solaris (x86 & sparc)

The evidence

- Mounting the filesystem read-only

```
# insmod /lib/modules/2.6.11/kernel/drivers/block/loop.ko.distrib
# mount usbkey /mnt/forensic -o loop,offset=$((51*512)) -r
```

ATTENTION JOURNALING FILESYSTEM

The evidence

- Basic informations about the filesystem
  - Counting regular files

```
# find /mnt/forensic/ -type f | wc -l
```

  - Partition usage

```
# df -h /mnt/forensic/
```

Keyword search

- Choosing the right keywords is the most difficult part
- What are we searching for ?

– “*Wolves of the sea*” by Randall Parrish	“You are pirates”
– “*In Search of the Castaways*” by Jules Verne	“pirates! pirates”
– “*The Prince*” by Nicolo Machiavelli	“fearing no evil”
– “*CryptonomiconCypherFAQ*”	“pizza delivery driver”
– The Doors song “*the end*”	“the end of everything”

Keyword search

- Choose a text editors
  - vim
  - mcedit
  - echo “You are pirates” >> keywords.txt
- Create a text file named keywords.txt with those keywords : (NO EMPTY LINES)
  - You are pirates
  - pirates! pirates
  - fearing no evil
  - pizza delivery driver
  - the end of everything

Low level Keyword search

- The simple way :

```
# cat usbkey | strings | egrep -i -f keywords.txt
```

Finding the position on the image

```
# cat usbkey | strings -td | egrep -i -f keywords.txt
# cat usbkey | strings -tx | egrep -i -f keywords.txt
```

Adding colors

```
# cat usbkey | strings -td | egrep --color -i -f keywords.txt
# cat usbkey | strings -td | glark -N -i -f keywords.txt
(slower but “glark” works with “| less -r”)
```

Viewing more context

```
# cat usbkey | strings -td | egrep -5 --color -i -f keywords.txt
```

Low level Keyword search

- Don't forget other encodings
  - 16 bits little endian

```
# cat usbkey | strings -td -el | egrep --color -i -f keywords.txt
```

  - 16 bits big endian

```
# cat usbkey | strings -td -eb | glark -N -i -f keywords.txt (slower)
```

- Possibility to do all in one pass
  - Think like a plumber !
  - usage of “mkfifo”
  - usage of “tee”

Low level Keyword search

- Extracting fragments of results
  - “You are pirates” was found at offset 15393432

```
#dd if=usbkey.dd skip=$((15393432/512)) count=1 | strings
```

- Use redirection to save in files
- Save in files without filtering with strings
- Scripting possibilities

Low level Keyword search

- That's great but I want to know if the result is in a file or not !
  - Usage of sleuthkit
  - “You are pirates” was found at offset 15393432
  - “ifind“ : a sleuthkit tool to find information about a disk unit
  - “istat” : a tool to display details of an inode

```
# ifind -o 51 -d $((15393432/512)) usbkey.dd
```

- The inode “1397-128-4” is returned

```
# istat -o 51 usbkey.dd 1397 “1397-128-4” | less
```

```
# istat -o 51 usbkey.dd 1397 “1397-128-4” | egrep “^Name:”
```

Low level Keyword search

- Now try it with the other results

```
# ifind -o 51 -d $((26619086/512)) usbkey.dd
```

1469-128-4

```
# istat -o 51 usbkey.dd 1397 “1469-128-4” | less
```

Low level Keyword search

- Let's continue

```
# ifind -o 51 -d $((39473367/512)) usbkey.dd
```

- Inode “1476-128-4”

```
# istat -o 51 usbkey.dd “1476-128-4” | egrep “^Name”
```

```
In_Search_of_the_Castaways_by_Jule
  s_verne.doc
```

Low level Keyword search

- The last one

```
# ifind -o 51 -d $((41624592/512)) usbkey.dd
```

- Inode “1478-128-4”

```
#istat -o 51usbkey.dd 1478 | egrep “^Name”
```

```
65544bytes-doc.txt
```

Low level Keyword search

- Finding the files on the mounted filesystem
  - *Wolves_of_the_sea.doc*

```
#find /mnt/forensic/ -iname “wolves*”
```

  - *Did you find it ?*
  - *Let's verify with a keyword search against the file*

```
# cat “/mnt/forensic/Documents and Settings/Rackham/My Documents/\
Wolves_of_the_sea.doc” | strings | \
egrep -i --color -f /tmp/keywords.txt
```

MS WORD files Tip

- Viewing an MS Word file

```
# cd “/mnt/forensic/Documents and Settings/Rackham/My Documents/”
# wvText “Wolves_of_the_sea.doc” /tmp/wolves.txt
# less /tmp/wolves.txt
```

- Try “wv[TABTAB]”
- wv even support protected MS Word files (you must know the password :-))

```
# antiword “Wolves_of_the_sea.doc”
```

```
# catdoc “Wolves_of_the_sea.doc”
```

MS WORD files Tip

- Obtaining info about MS Word file

```
# wvSummary Wolves_of_the_sea.doc
```

```
# wvVersion Wolves_of_the_sea.doc
```

- Will give info about encryption

```
# find /mnt/forensic/ -iname “*.doc” -exec wvVersion '{}' ';'\
 | egrep -v “Encrypted: No”
```

- Will find all encrypted “.doc”

```
# fccu-docprop Wolves_of_the_sea.doc 2>/dev/null
```

- Usefull informations about dates (last print ...)
- works even better with “xls” files

Low level Keyword search

- Finding the files on the mounted filesystem
  - *In_Search_of_the_Castaways_by_Jules_verne.doc*

```
# find /mnt/forensic/ -iname “in_search*”
```

  - *Did you find it ?*

Low level Keyword search

- Finding the files on the mounted filesystem
  - *65544bytes-doc.txt*

```
#find /mnt/forensic/ -iname “65544bytes*”
#cat 65554bytes-doc.txt | strings | egrep -i --color -f /tmp/keywords.txt
```

Low level Keyword search

- Trying to find answers
- Extracting the unallocated space using The Sleuthkit

```
# dls /dev/loop0 > /tmp/unallocated.dd
```

- Search for keywords in the unallocated space

```
# cat /tmp/unallocated.dd | strings | egrep -i -f /tmp/keywords --color
```

- First answer found !
- Two of the texts are in the unallocated space
- There is a good chance that they may be deleted files

Low level Keyword search

- Trying to find answers
- Extracting the slackspace using The Sleuthkit

```
# dls -s /dev/loop0 > /tmp/slackspace.dd
```

- Search for keywords in the slackspace

```
# cat /tmp/slackspace.dd | strings | egrep -i -f /tmp/keywords --color
```

- Bingo !
- The Doors lyrics are in the slackspace of the file “65544bytes-doc.txt”

Deleted files

- What kind of filesystem ?
  - NTFS -> ntfsundelete
  - FAT -> The Sleuthkit
  - ext2 -> The Sleuthkit

Deleted files

- Finding deleted files
  - In this case, we use /dev/loop0

```
# ntfsundelete /dev/loop0
```

Wow

```
# mkdir /tmp/recovered
# ntfsundelete /dev/loop0 -u1388 -d /tmp/recovered
# fbi /tmp/recovered/forensic-target-1.jpg
```

Wow again !

Deleted files

- Finding deleted files

```
# ntfsundelete /dev/loop0 -u1471 -d /tmp/recovered
# mplayer /tmp/recovered/forensic-target-2.mpeg
```

```
    Another pirate caught !
```

- Scripting

```
# ntfsundelete /dev/loop0 -p 100 | awk '{ print $1 }' |\
 egrep  “^[[:digit:]]” | while read inode ;\
 do ntfsundelete /dev/loop0 -u${inode} -d /tmp/recovered/ ; done
```

```
    All done !
```

Fighting Childpr0n

- Search/view pictures using “fbi”
- On the mounted filesystem

```
# find /mnt/forensic/ -iname “*.jpg” -exec fbi -a '{}' ';'
```

- Use all the power of find

```
# find /mnt/forensic/ -iname “*.jpg” -size +100k -exec fbi -a '{}' ';'
```

Fighting Childpr0n

- Search/view movies using “mplayer”
- On the mounted filesystem

```
# find /mnt/forensic/ -iname “*.mp*” -exec mplayer -ao null '{}' ';'
```

Fighting Childpr0n

- File salvage based on header-footer
- magicrescue
  - Create output directory (can be hughe !)
  - Use it on unallocated space to maximize your chances
  - Recipes are in “/usr/share/magicrecue/recipes”

```
# mkdir /tmp/rescued
# dls /dev/loop0 > /tmp/unallocated.dd
# magicrescue -r /usr/share/magicrescue/recipes/jpeg-jfif -r \
 /usr/share/magicrescue/recipes/jpeg-exif \
 -d /tmp/rescued/ /tmp/unallocated.dd
# fbi /tmp/rescued/*
```

press “i” to view exif informations

Fighting Childpr0n

- Lot of progs to view meta informations in files

```
#extract -f /tmp/rescued/*
```

```
#exif /tmp/rescued/*
```

```
#exiftags /tmp/rescued/*
```

```
#jhead /tmp/rescued/*
```

- U can use dupemap and magicsort
- to remove duplicates
- to sort files

Fighting Childpr0n

- foremost
  - Copy and adapt the config file

```
# cp /etc/foremost.conf /tmp/
# vim /tmp/foremost.com
```

- uncomment all “jpg” lines
- Create an empty directory

```
# mkdir /tmp/fresult
# foremost /tmp/unallocated.dd -o /tmp/fresult -c /tmp/foremost.conf
```

The Way Of The Exploding File

- Is there compressed “zip” files on the system ?

```
#find /mnt/forensic -type f -iname “*.zip”
```

- Maybe a zipped file but without a zip extension

```
#find /mnt/forensic -type f -exec file '{}' ';' | egrep “Zip”
```

- “/mnt/forensic/tempfiles/thisisnotapipe.dll” ???

```
# unzip -l /mnt/forensic/tempfiles/thisisnotapipe.dll
```

```
    Oh Oh
```

The Way Of The Exploding File

```
# unzip /mnt/forensic/tempfiles/thisisnotapipe.dll -d /tmp/
```

- Ooops, password protected

```
#fcrackzip -D -p /usr/share/dict/french -u \
/mnt/forensic/tempfiles/thisisnotapipe.dll
```

```
# unzip /mnt/forensic/tempfiles/thisisnotapipe.dll -d /tmp/
Enter the password you found
```

- All done !

NTFS Alternate Data Streams

- Finding NTFS ADS

```
#fls -r /dev/loop0 | sed “s/:/;/” | egrep “:”
```

```
#ffind /dev/loop0 1470
```

```
#ffind /dev/loop0 1470-128-5
```

```
#icat /dev/loop0 1470-128-5 > /tmp/borderline.dat
#file /tmp/borderline.dat
```

```
#mplayer -ao null /tmp/borderline.dat
```

NTFS Compressed folders

- Natively supported by the GNU/Linux NTFS driver
- Low level search seems compromised !
  - remember your keyword search for “*The Prince*”
  - The keywords were “fearing no evil”
  - they were found in unalocated space
- Try

```
#find /mnt/forensic -iname “*.txt” \
-exec egrep -H -i --color -f /tmp/keywords.txt
```

```
#fls -r /dev/loop0 | egrep -i "theprince.txt"
```

```
#istat /dev/loop0 1469 | less
```

MS WINDOWS leave traces !

NTFS encrypted folders

- Filenames are visible

```
# cd “/mnt/forensic/Documents and Settings/Rackham/My Documents/"
# ls Kryptonite
```

```
# cat “Kryptonite/CryptonomiconCyherFAQ.html”
```

```
# fls -r /dev/loop0 | egrep -i "kryptonite"
# istat /dev/loop0 1472 | less
```

```
# fls -r /dev/loop0 | egrep -i "cypherfaq"
# istat /dev/loop0 1474 | less
# icat /dev/loop0 1474
```

- Start the Evil OS

Timeline filesystem

- Extract MAC times files:

```
# fls -o 51 -m "E:" -r usbkey.dd > /tmp/body
```

  - ils for deleted files

```
# ils -o 51 -m usbkey.dd >> /tmp/body
```

- Presentation:

```
# mactime -d -b /tmp/body 9/08/2005-10/23/2005 | less
```

Web surf traces

- Internet Explorer activity forensic

```
# find /mnt/forensic -iname "index.dat" -exec pasco '{}' ';'
```

- Webmail ?

```
# find /mnt/forensic -iname "index.dat" -exec pasco '{}' ';'\
| egrep -i --color mail
```

- Any password ?

```
# find /mnt/forensic -iname "index.dat" -exec pasco '{}' ';'\
| egrep -i --color pass
```

Web surf traces

- Google searches ?

```
# find /mnt/forensic -iname "index.dat" -exec pasco '{}' ';'\
| egrep -i --color "search\?"
```

- Terrorism interest ?

```
# find /mnt/forensic -iname "index.dat" -exec pasco '{}' ';'\
| egrep -i --color "bomb"
```

Web surf traces

- Mozilla / Firefox history

```
# find /mnt/forensic -iname "history.dat" -exec mork.pl '{}' ';'
```

  - Export to html is possible

Event log files

- Search for EVT files and parse them

```
# find /mnt/forensic -iname "*.evt" -exec fccu.evtreader.pl '{}' ';'
```

  - Export to html is possible
  - May not be complete
  - May help to discover useful events like removable devices
  - may help in timelining
  - more complete tools on the next CD version

Clamscan

- Finding viruses on the mounted filesystem

```
#clamscan -i -r /mnt/forensic
```

- You can use a previously downloaded virus database

```
#clamscan - i -r -d /tmp/mydatabase /mnt/forensic
```

Future

- PXE boot for automatic keyword search in multiple machines
- more tools
  - grokevt
  - reglookup
  - who knows ?

What we didn't talk about

- Many tools that are on the CD
  - See index.html in the root of the CD
- Brief overview :
  - SAM files forensic analysis with "*chntpw*"
  - PST files conversion with "*readpst*"
  - "*Ftimes*" a tool to help in :
    - keyword search
    - alternate streams / hidden files search
    - timeline
  - Network tools
  - Pen testing tools
  - Password cracking tools

That's all

Thank you for your attention