IR Process & Smart Phones

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Overview

cmdLabs>
Forensics | Response | Training

- Smart phones
  - Android, iPhone, Blackberry
- Volatile data
  - Running processes
  - Malware / spyware
- File system examination
  - Installed applications

Bank Robbery

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Forensics | Response | Training

- Fake banking applications for Android
- ZeuS in the mobile (Zitmo)
  - Symbian and possibly Blackberry
- Starts by compromising computers
  - Captures online banking details
  - Asks users for cell phone number and model
- Intercepts SMS associated with online banking
  - Mobile transaction authentication numbers
  - Approve unauthorized bank transactions

DroidDream

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- Targeting legitimate application developers
  - Embed malicious code within their applications
  - Trojaned apps put on Android market place
- Broad capabilities
  - Root the operating system
  - Exfiltrate IMEI and IMSI

Mobile Incident Response

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- Closely monitor access to sensitive data
- Mobile Forensic Preparedness
  - forensic preservation of volatile data
  - Forensic examination of mobile device
- Limited network visibility
  - Banks with mobile applications
  - Organizations with company mobile devices

UNIX IR Refresher

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- Network traffic shows intruder connecting

  Snort: 18:39:02 victim.3800 > attacker.3096: P 3707982354:3707982447(93) ack 220800367
- Network connections show intruder

  # netstat -a

  victim.3800 attackerIP.3096ESTABLISHED

  victim.32828 irc-server.6667 ESTABLISHED

  victim.telnet investigator.2666 ESTABLISHED
- Processes show intruder activities

  # ps -ef

  hacked 11749 1 0 Mar 30 ? 0:13 irc-client

Incident Response Data

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- Full memory dump
- Volatile Data
- Non Volatile Data
- Network Logs

Android Systems

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Forensics | Response | Training

- Remember it's UNIX
- Linux based OS
  - Droid x
  - G1/MyTouch
- File systems
  - YAFFS2
  - ext4

Android Memory Forensics

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- Physical memory dump
  - DMD module developed by Joe Sylve
- Insert module on device (insmod dmd)
  - Creates /dev/dmd device
- Get start and end memory address(es)
  - grep –i “system ram” /proc/iomem
- Dump memory to removale media
  - echo "0x80c00000 0x9fdfffff /sdcard/mem.dump" > /dev/dmd

Android Memory Forensics

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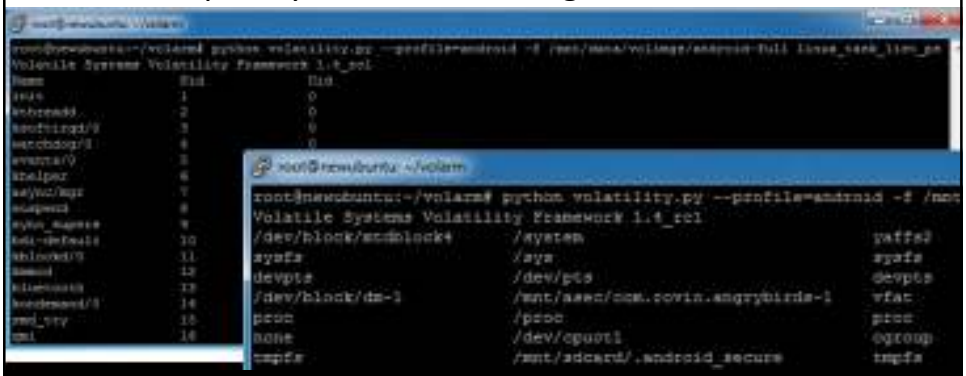
- Examination of Android physical memory
  - Volatility plugin for Android memory
  - Developed by Andrew Case, Digital Forensics Solutions



Android Volatile Data

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- Running processes through adb shell

```
$ ps
USER     PID   PPID  VSIZE  RSS     WCHAN    PC         NAME
root      1     0     284    196   c00be1ac 0000c86c S /init
root      2     0     0      0     c006687c 00000000 S kthreadd
<edited for length>
system    75    50    164160 23888 ffffffff afe0c51c S system_server
radio     119   50    100864 16812 ffffffff afe0d4a4 S com.android.phone
app_8     122   50    111900 19192 ffffffff afe0d4a4 S android.process.acore
app_14    151   50    102920 17548 ffffffff afe0d4a4 S com.google.process.gapps
app_16    187   50    89808  14116 ffffffff afe0d4a4 S android.process.media
root      217   2     0      0     c00334c0 00000000 D audmgr_rpc
app_2     246   50    93852  16520 ffffffff afe0d4a4 S com.android.calendar
app_19    289   50    88648  13088 ffffffff afe0d4a4 S com.android.alarmclock
app_8     297   50    96736  14584 ffffffff afe0d4a4 S com.tmobile.myfaves
app_6     304   50    94356  13656 ffffffff afe0d4a4 S com.android.mms
app_24    317   50    89356  13076 ffffffff afe0d4a4 S
com.google.android.apps.uploader
app_37    327   50    97320  13932 ffffffff afe0d4a4 S com.vonagemobile.fbphone
app_17    333   50    88288  12176 ffffffff afe0d4a4 S com.android.voicedialer
app_22    342   50    90068  13820 ffffffff afe0d4a4 S com.google.android.gm
shell     375   57    740    316   c0054578 afe0d14c S /system/bin/sh
shell     381   375   884    316   00000000 afe0c27c R ps
```

Android Volatile Data

cmdLabs>
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- **top**

```
User 2%, System 2%, IOW 0%, IRQ 0%
User 9 + Nice 0 + Sys 7 + Idle 295 + IOW 0 + IRQ 0 + SIRQ 0 = 311
  PID CPU% S  #THR     VSS     RSS PCY UID      Name
2161   2% R     1    860K    432K  fg root     top
1259   0% S    63 259604K  62492K  fg system   system_server
2141   0% S     8 153252K  24456K  fg app_99   jackpal.androidterm
 715   0% S     1       0K      0K  fg root     pvrflip/0
```

- **/system/xbin/busybox netstat**

Forensic Acquisition

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Forensics | Response | Training

- mre$ **./adb shell**
  $ su
- **# dd if=/dev/block/userdata bs=1024 | /system/bin/busybox nc 192.168.2.2 755**
  7028736+0 records in
  7028736+0 records out
  7197425664 bytes transferred in 24211.203 secs

Remote Acquisition

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- F-Response
  - ARM agent
  - On SDCard
- Expanding Android device support
  - Segmentation Faults on some devices

```
# ./f-response-ce-e-android -c ./fresponse.ini
F-Response Consultant/Enterprise(Android/ARM Edition) Version 3.09.08
F-Response Disk: /dev/mtd/mtd0 (26624 sectors, 512 sector size)
13 MB write blocked storage on F-Response Disk:mtd0
F-Response Disk: /dev/mtd/mtd1 (5120 sectors, 512 sector size)
2 MB write blocked storage on F-Response Disk:mtd1
F-Response Disk: /dev/mtd/mtd2 (640 sectors, 512 sector size)
0 MB write blocked storage on F-Response Disk:mtd2
F-Response Disk: /dev/mtd/mtd3 (128 sectors, 512 sector size)
0 MB write blocked storage on F-Response Disk:mtd3
F-Response Disk: /dev/mtd/mtd4 (128 sectors, 512 sector size)
0 MB write blocked storage on F-Response Disk:mtd4
F-Response Disk: /dev/mtd/mtd5 (128 sectors, 512 sector size)
0 MB write blocked storage on F-Response Disk:mtd5
F-Response Disk: /dev/mtd/mtd6 (6144 sectors, 512 sector size)
3 MB write blocked storage on F-Response Disk:mtd6
F-Response Disk: /dev/mtd/mtd7 (614400 sectors, 512 sector size)
300 MB write blocked storage on F-Response Disk:mtd7
F-Response Disk: /dev/mtd/mtd8 (12288 sectors, 512 sector size)
6 MB write blocked storage on F-Response Disk:mtd8
F-Response Disk: /dev/mtd/mtd9 (3561472 sectors, 512 sector size)
1739 MB write blocked storage on F-Response Disk:mtd9
```

File System Examination

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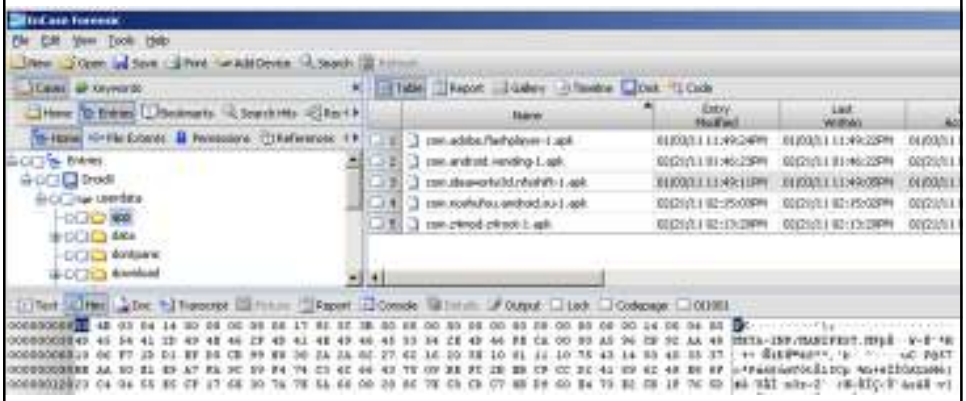
- Android file system forensics



Malware Analysis

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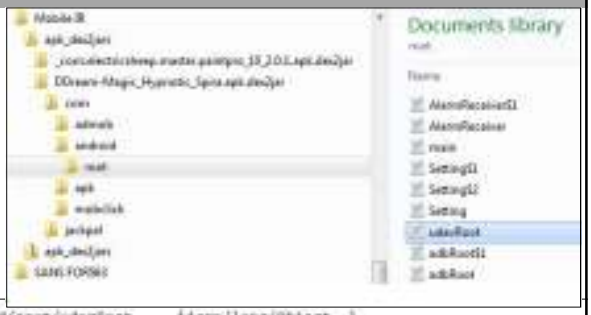
- DroidDream
  - Root exploit
  - Data theft
  - Updates



Live Response Lessons

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- Don't trust the operating system
  - May give false information
  - Seek corroborating sources of evidence
- No extensive examination and searching
  - If it is that interesting, acquire memory and disk
- Don't copy large amounts of data remotely
  - Slow and prone to failure
  - Get physical access if possible

17

Android Challenges

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- Root access
  - alters the system
- YAFFS2 file system
  - File carving as an alternative

Hope for the future:

- Recovery partition and boot loader acquisition
  - Does not require rooting the device
- File system moving to ext4
  - Similar to common Linux file systems

iPhone Overview

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- Remember it's UNIX!
- Volatile data
  - Jailbreak (redsn0w)
  - Terminal, adv-cmds, and top
- File System
  - Physical acquisition

iPhone Volatile Data

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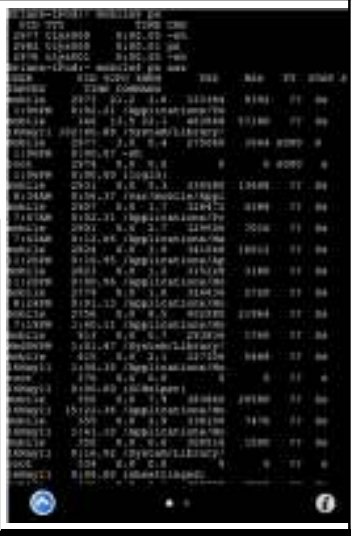
- Process list
  - ps and top
- Network connections

```
Processes:  37 total, 1 running, 36 sleeping... 215 threads            13:08:38
Load Avg:  0.85,  0.80,  0.63    CPU usage:  9.40% user, 17.09% sys, 73.50% idl
SharedLibs: num =     0, resident =     0 code,     0 data,     0 linkedit.
MemRegions: num = 10536, resident =  137M +     0 private,    51M shared.
PhysMem:    64M wired,    14M active, 8504K inactive,  249M used, 4224K free.
VM: 1986M + 0   936464(0) pageins, 5924(0) pageouts

  PID COMMAND      %CPU   TIME    #TH #PRTS #MREGS  RPRVT  RSHRD  RSIZE  VSIZE
 2987 assetsd      0.0%  0:00.53   3    81    99  1752K  2296K  3132K    70M
 2985 top         13.7%  0:04.10   1    23    39   432K  1448K   980K    14M
 2977 bash         0.0%  0:00.07   1    14    50   292K  1964K   904K    14M
 2976 bash         0.0%  0:00.05   1    14    50   276K  1964K   908K    14M
 2975 login        0.0%  0:00.06   1    19    59   248K  1344K   548K    15M
 2974 login        0.0%  0:00.08   1    19    59   248K  1344K   548K    15M
 2973 Terminal     6.0%  0:12.56   4   116   470  5276K    10M    11M    85M
 2931 Twitter      0.0%  0:56.37   8   143   228  6984K  2816K    12M    80M
 2907 Preference   0.0%  0:02.31   5   139   248  3096K  2736K  4264K    75M
 2901 Maps-iphon   0.0%  0:12.06   9   166   235  4420K  2736K  6900K    76M
 2824 AppStore     0.0%  0:10.95   7   145   256  8660K  3132K    10M    88M
 2823 MobileTime   0.0%  0:00.96   5    94   182  2460K  2736K  3180K    61M
 2779 MobileCal    0.0%  0:01.13   5   103   219  2008K  2736K  2720K    70M
 2756 MobileSafa   0.0%  1:40.11  11   186   457 19072K  3544K    21M   148M
  913 iapd         0.0%  1:01.51   5   151   113  1156K  1824K  1680K    39M
  415 MobileMusi   0.0%  1:08.39   5   147   211  3892K  2756K  5540K    74M
  376 SCHelper     0.0%  5:10.22   4    52    58   360K  1224K   476K    18M
  356 MobileMail   0.0% 15:22.56  13   324   637 13932K  3628K    19M   118M
  355 MobilePhon   0.0%  1:41.14   6   164   473  5480K  2832K  7272K    85M
```



Non Jailbroken iPad2

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Physical Acquisition

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Forensics | Response | Training

Encryption Barriers

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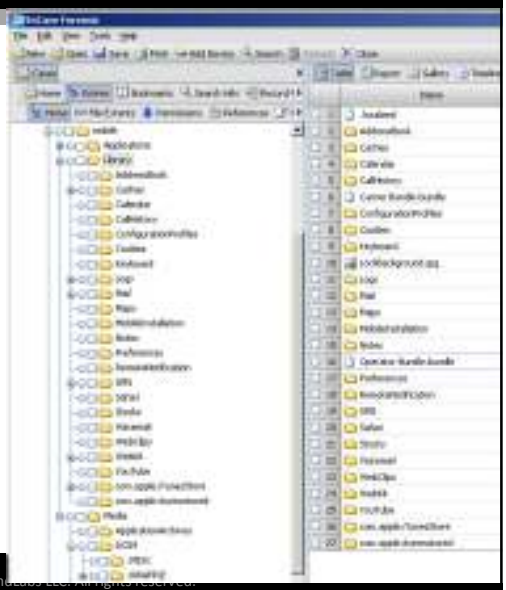
Forensics | Response | Training

File System Examination

cmdLabs>
Forensics | Response | Training

- Apple HFSX / HFS+
- Keyword searches
- File carving
  - Screen captures



Keychains

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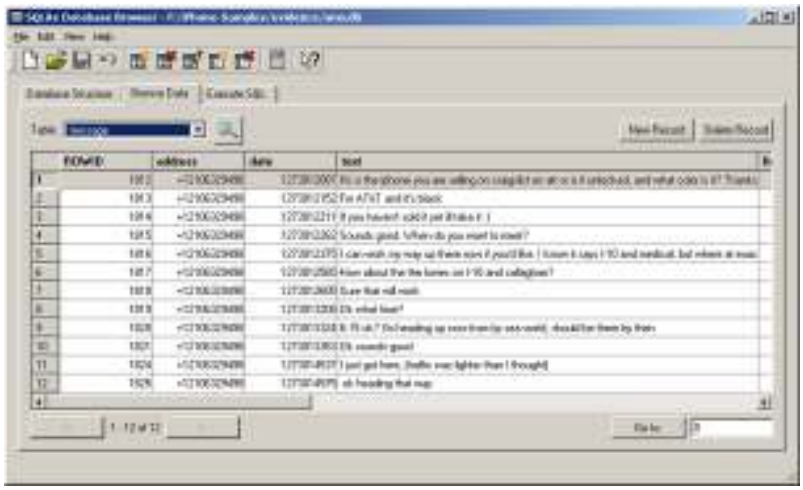
- F:\MacSamples>sqlite3.exe "iPhone2\Keychains\keychain-2.db"
- SQLite version 3.6.16
- Enter ".help" for instructions
- Enter SQL statements terminated with a ";"
- sqlite> select labl,acct,svce from genp;
- |eric.rooster@yahoo.com|Yahoo-token
- |erooster@live.com|
- |erikroost@hotmail.com|
- |therooster@hotmail.com|
- |therooster@hotmail.com|com.apple.itunesstored.keychain
- erooster|MMODBracketsAccount|
- LumosityBrainTrainer|erooster|LumosityBrainTrainer

Text Messages

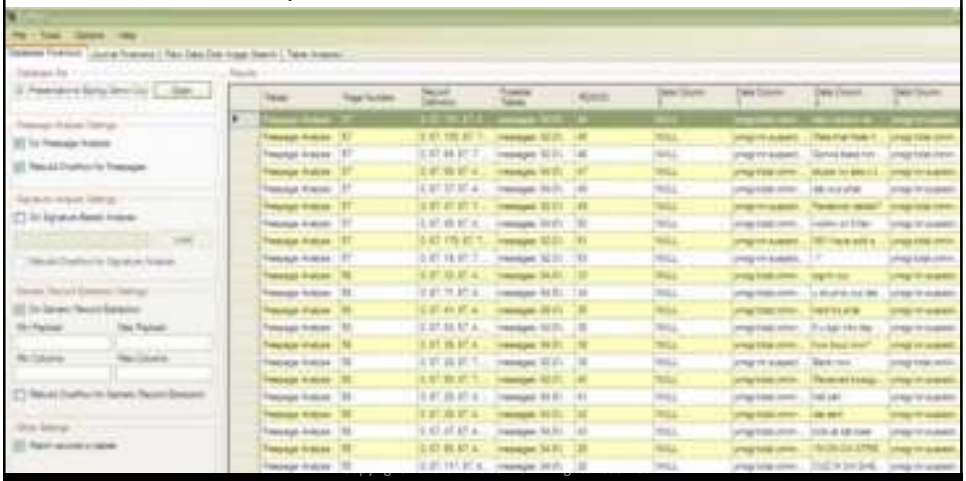
cmdLabs>
Forensics | Response | Training



Epilog

cmdLabs>
Forensics | Response | Training

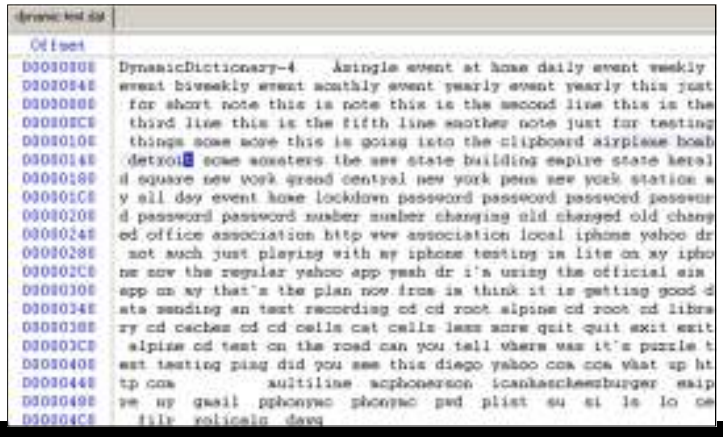
- Deleted SQLite entries



Keylogger

cmdLabs>
Forensics | Response | Training

- User entered strings



Locations

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- cells.plist
- cells-local.plist

Blackberry

cmdLabs>
Forensics | Response | Training

- Loaded modules and dependencies
  - javaloader
- File System
  - Blackberry Desktop Manager
  - Mounted logically

Compromised Blackberry

cmdLabs>
Forensics | Response | Training

- Malicious program running on Blackberry

```
Name                                 Version    Size     Created
-----------------------------------  ---------  -------  ------------------------
net_rim_platform_resource__en_US     4.0.2.49   2288     Thu Sep 01 15:20:30 2005
net_rim_platform_im_resource__en_US  4.0.2.49   1824     Thu Sep 01 15:20:24 2005
net_rim_app_manager                  4.0.2.49   1796     Thu Sep 01 15:20:32 2005
net_rim_app_manager_console          4.0.2.49   3364     Thu Sep 01 15:20:33 2005
<edited for length>
net_rim_bb_phone_app                 4.0.2.49   79768    Thu Sep 01 15:23:38 2005
net_rim_bb_task_app                  4.0.2.49   38732    Thu Sep 01 15:35:35 2005
InstantMessaging                     4.1.7      329920   Fri Aug 12 13:54:17 2005
Smartphone                             0.0      28988    Sat Jan 30 09:54:08 2010
-----------------------------------  ---------  -------  ------------------------
167 modules; 9282804 bytes total
```


MobileSpy

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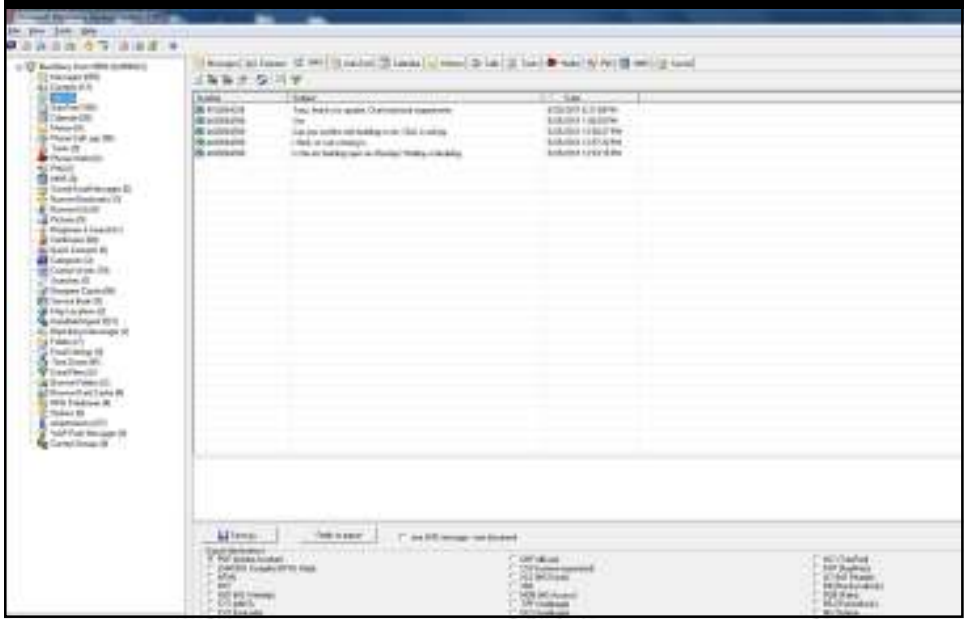
Blackberry Backup (IPD)

cmdLabs>
Forensics | Response | Training



Blackberry Options

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- Mass Storage Mode
  - Access device via desktop OS
  - Enabled by default
  - Requires password access
- Access items in file system
  - Saved BBIM chats
  - Malware artifacts

Blackberry File System

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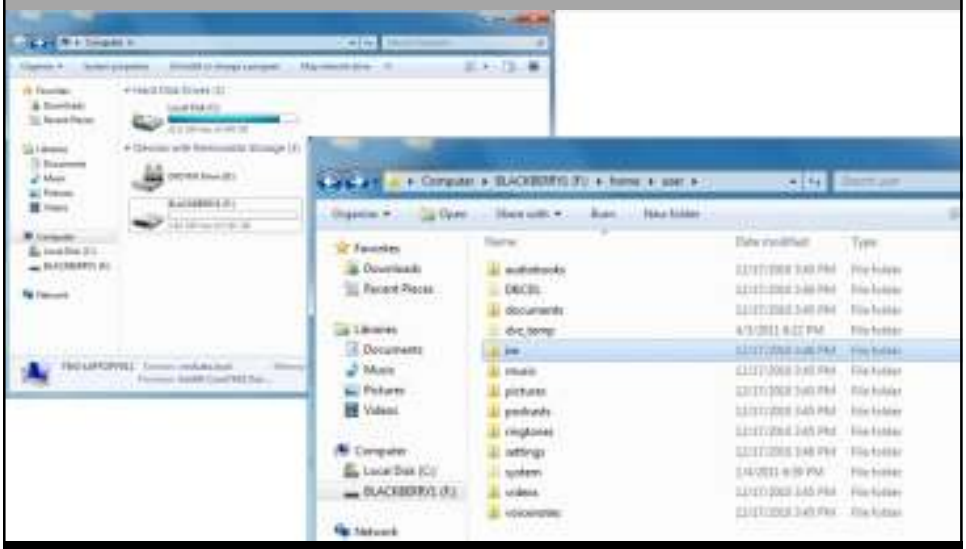
Forensics | Response | Training



Questions & Contact

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