Computer Forensics:

Tool Testing
&
National Software Reference Library

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Outline

- Overview of computer forensics
- CFTT – Computer Forensics Tool [illegible]ing
- NSRL – National Software Reference Library

A Shocking Revelation . . .

- Computers can be involved in crime …
- As a victim
- As a weapon
- As a witness
- As a record
- As contraband

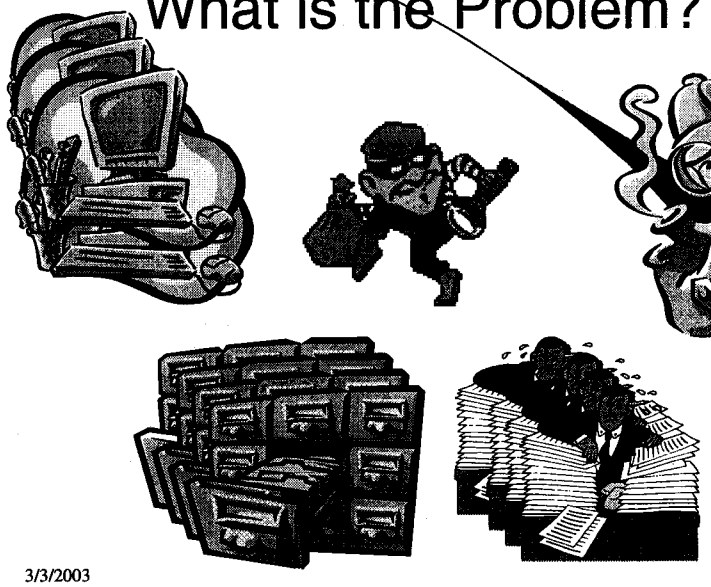
Outline of an Investigation

- Get proper authorization
- Seize evidence (Hard drives, floppies, …)
- Create duplicates for analysis
- Search the duplicates
  - Exclude known benign files
  - Examine obvious files
  - Search for hidden evidence
- Act on results

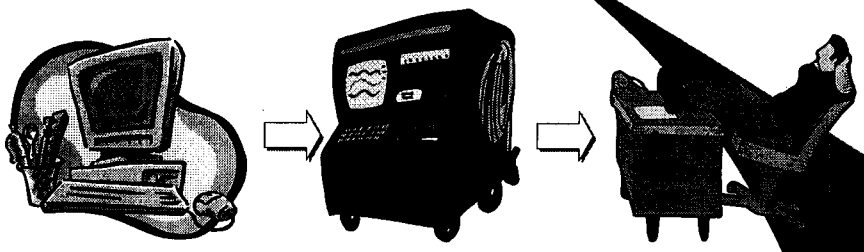
Investigators Need …

- Computer forensic investigators need tools that …
- Work well and
- Produce results admissible in court

What is the Problem?



What are NSRL and CFTT?



Automate the process to find evidence (NSRL)

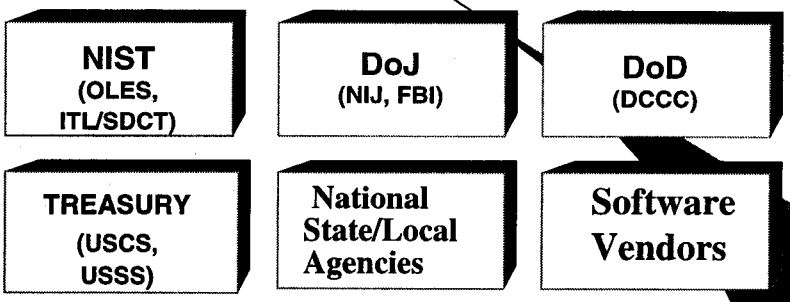
Verify that tools work as expected (CFTT)

Get results accepted in court (CFTT)

Goals of CF at NIST

- Establish methodology for testing computer forensic tools
- Provide international standard reference data that tool makers and investigators can use in an investigations

Why NIST/ITL is involved



- Mission: Assist federal, state & local agencies
- NIST is a neutral organization – not law enforcement or ven
- NIST provides an open, rigorous process

Computer Forensics Tool Testing (CFTT)

A Problem for Investigators

- Results of a forensic analysis must be admissible in court
- Software tools must be …
  - Tested
  - Peer reviewed
  - Generally accepted
- … by whom?

CFTT Goal

- To ensure that computer forensics tools work as expected by law enforcement community
- Help law enforcement meet requirements of scientific evidence and expert testimony
- Allow results to be accepted in court
- Improve vendor software

Project Tasks

- Identify tool categories e.g.,
  - disk imaging,
  - hard drive write protect,
  - deleted file recovery
- Develop standards for each category
- Peer review of standards
- Test methodology for each category
- Report results

Current Activities

Evaluating test methodology for ...

- Hard drive imaging tools
- Software hard drive write protect
- Hardware hard drive write protect
- Deleted file recovery

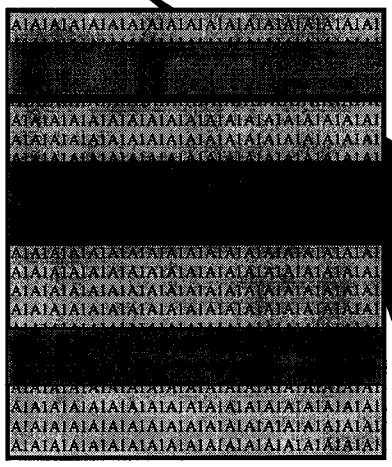
Testing Hard Disk Drive Imaging Tools

Need to verify…

- Source disk not changed
- Copied information is accurate
- Behavior if source is smaller than destination
- Behavior if source is larger than destination

Testing Hard Disk Drive Imaging Tools

Setup Source
Wipe
Load OS
Hash



Testing Hard Disk Drive Imaging Tools

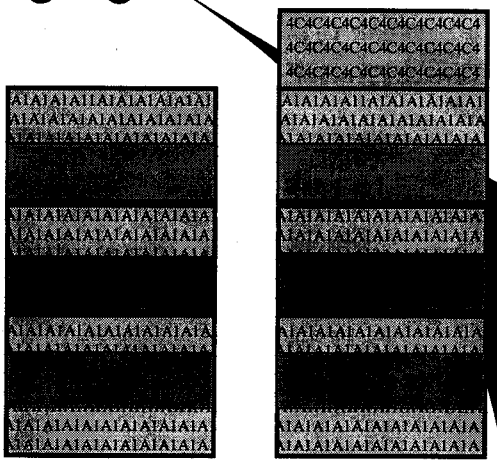
Select Source

Wipe Destination

Run Tool

Compare Src : Dst

Hash Source



Impact

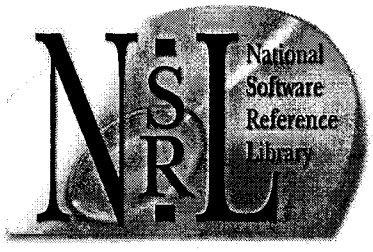
- Release 18 (Feb 2001) - A US gove[illegible]ment organization was doing some testing a[illegible] uncovered an issue under a specific set o[illegible] circumstances.
- Linux doesn't use the last sector if odd
- EnCase
- iLook
- CFTT is a topic of discussion at various forensic meetings and criminal cases

Benefits of CFTT

Benefits of a forensic tool testing program

- Users can make informed choices
- Neutral test program (not law enforcement)
- Reduce challenges to admissibility of digital evidence
- Tool creators make better tools

NSRL Project



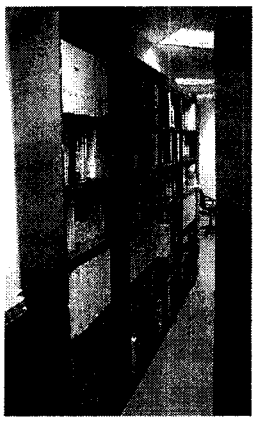
What is the NSRL?

- National Software Reference Library (NSRL)
  - Physical library of software, 4000 products
  - SQL Server database of known file signatures
  - Reference Data Set (RDS)
    - Extract of database on CD: 12,000,000 file signatures
- Goals
  - Automate the process of identifying known files on computers used in crimes
  - Allow investigators to concentrate on files that could contain evidence (unknown and suspect files)

Addressing Law Enforcement Needs

- LE needed an unbiased organization
- LE needed traceability for the NSRL contents
- No repositories of original software available for reproducing data
- NSRL needs to work with many CF tools

Scope of the NSRL



- NIST has collected softw[illegible]e for 2 years
- Software is recorded as the o[illegible]inal source for known files and stored as a [illegible]f the NSRL
- Versions of OS, DBMS, photo edit[illegible] word processors, network browsers, compilers...
- Data formats, data dictionary and projec[illegible] status information is available on the website for RDS users and industry reference

What is the RDS?

NIST Special Database #28

NSRL National Software Reference Library

Reference Data Set

Version 1.2 06/06/2002

NIST

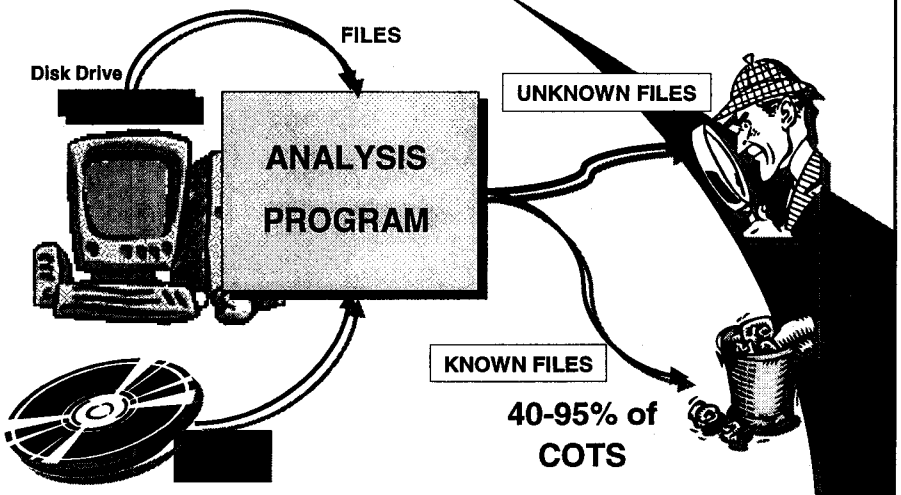
What is the RDS?

- Reference set of file profiles
  - Each profile includes file name, file s[illegible]4 file signatures (SHA1, MD5, CRC32), appl[illegible] name, operating system, etc.
  - Extracted from files on original software CD[illegible] diskettes, and network downloads
  - A single application has between 50 and 10,00[illegible] separate file profiles

How to Use the RDS

- Eliminate as many known files as possibl[illegible]rom the examination process using automated means
- Look for files that <u>should</u> be installed, but are m[illegible] (incomplete deletion of pirated software)
- Look for files that could be suspect (hash matches, b[illegible] name does not)
  - Discover files that do not contain expected contents (.exe file containing a bomb schematic, facility map)
- Look for "bad" files (e.g., hacker tools)
- Provide rigorously verified data for forensic investigations

RDS Field Use



RDS Field Use Example

You are looking for facility maps on a computer which is running Windows NT 4.0 Workstation.

Windows NT 4.0 operating system software contains 6753 images which are known gifs, icons, jpeg files

e.g., 

By using the RDS and an analysis program the investigator would not have to look at these files to complete his investigation.

Hash Examples

Filename	Bytes	SHA-1
NT4\ALPHA\notepad.exe	68368	F1F284D5D757039DEC1C44A05AC148B9D204E467
NT4\I386\notepad.exe	45328	3C4E15A29014358C61548A981A4AC8573167BE37
NT4\MIPS\notepad.exe	66832	33309956E4DBBA665E86962308FE5E1378998E69
NT4\PPC\notepad.exe	68880	47BB7AF0E4DD565ED75DEB492D8C17B1BFD3FB23
WINNT31.WKS\I386\notepad.exe	57252	2E0849CF327709FC46B705EEAB5E57380F5B1F67
WINNT31.SRV\I386\notepad.exe	57252	2E0849CF327709FC46B705EEAB5E57380F5B1F67

NSRL Accomplishments

- RDS CD 5 releases:
  - From 1 million to 12 million files
  - Free redistribution
- Incorporated into vendor products
- Used by FBI, DCCC, Secret Service, Customs Service

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