Stealth File Systems for Proactive Forensics Support in Custom Android ROMs

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Outline

1. Background
   - Forensic Rom
   - Shortfalls
   - Possible Solutions

2. Proposed Framework
   - File System in User Space
   - Linux Cloud Drive
   - Android Rootkits
   - Stealth File Systems

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Forensic Rom

Work Done Till Now

- Features of Aiyappan Et.al [1] and Karthik Et.al [2] Forensic Rom:
- Captures All User Activities.
- Key-logging and Call Tapping Facility.
- Opportunistically Uploads In Cloud.
- Hiding the Process using hidepid =2.
- Data Stored in /forensic partition only accessible to Root.

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Shortfalls

- What if The Suspect Roots the Phone ?
- Can Find the /forensic Partition.

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Posible Solutions

- Encrypting The /forensic partition can Still arise Suspicion.
- Creating A Fuse File System and enable Stealth Features and Copy all Forensically Relevant Data in that File System.

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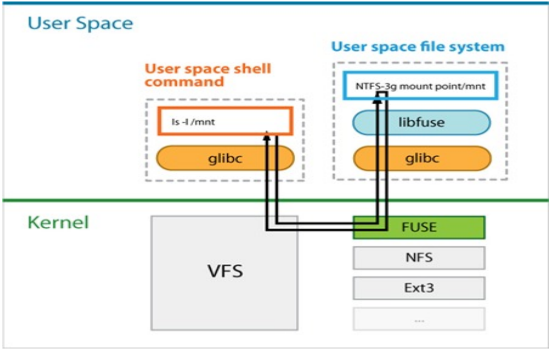
File System in User Space

- The Filesystem in Userspace (FUSE) is a special part of the Linux kernel that allows regular users to make and use their own file-systems without needing to change the kernel or have Root privileges.

Figure : A Fuse Filesystem.



Source:en.wikipedia.org/wiki/Filesystem in Userspace

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Linux Cloud Drive

- Using FUSE we can mount Cloud Drive in Our System and Use it Like a Local File System.
- Gcsfuse: A user-space file system for interacting with Google Cloud Storage.
- Wingfs: A debian Package to mount various cloud storage drives as user-space file systems.
- Azurefs: A python package to mount Azure blob storage as Local File system.

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Android Rootkits

- Dong-Hoon Et.al [3] has listed the various ways Rootkits can infect Android Kernel Like:
  - sys_call_table hooking through /dev/kmem access technique.
  - exception vector table modifying hooking techniques.
- Our Objective is to Make the /Forensic Partition a Fuse File system and Hide it using Rootkits.

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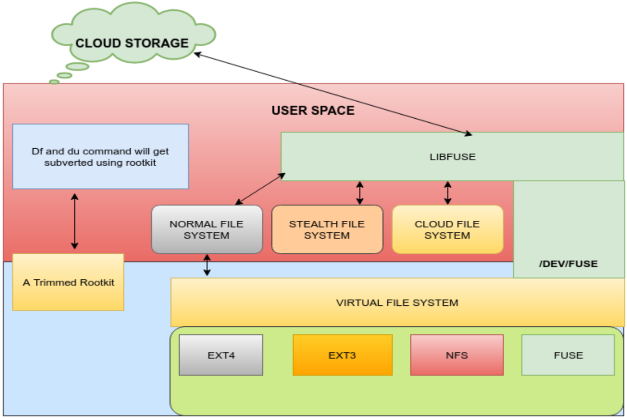
Stealth File Systems

Proposed Framework

Figure : The Stealth File System Framework.



Summary

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This Framework can effectively Hide the forensic as well as the cloud file system so that even if the Suspect is connecting to adb to check the internal state , He will not be able to find the hidden File systems.

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- Process Hiding can also be Implemented Using this Technique
- The Stealth File-system will periodically copy the forensically relevant data from the normal file system
- This data will be moved to the Mounted Cloud Drive and opportunistically uploaded to the cloud server.
- Outlook
  - Have Developed a High-Level Overview of the Framework.
  - Implementation Needs to be done.

References I

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- *Proactive Forensic Support for Android Devices*, Karthik K. Advisor:Prabhaker Mateti M.Tech thesis, Amrita Vishwa Vidyapeetham,2016
- *Android platform based linux kernel rootkit*, Dong-Hoon You, Bong-Nam Noh, Malicious and Unwanted Software (MALWARE), 2011 6th International Conference ,IEEE